Cryogenic Thin-Film Memory Plane

The Scientific Extension of the Human Intellect

Delay Lines

The New Electronics Industry, Education, and the Midwest

News of Computers and Data Processors: ACROSS THE EDITOR'S DESK

FEBRUARY 1961
Have you heard about the new Bell System service that lets modern business machines talk with each other over regular telephone lines? Its name is **DATA-phone**

Something new has been added to the art of data processing. Business machine data can now be sent in a new "machine language"—automatically, from machine to machine—by telephone.

A new kind of telephone service—Data-Phone—is the connecting link.

You can send any kind of data—from punched cards, paper tape or magnetic tape—at Super-Phonic speeds. And you pay for your data transmission just as you do for regular telephone calls. You simply place a phone call to the distant machine location, switch on your Data-Phone at both ends, and the machines start "talking." The Data-Phone unit takes little more space than a typewriter, and the monthly rental charge is small.

Data-Phone can speed the handling of accounting and billing information, inventories, payrolls, invoices, sales orders and numerous other forms of business data. And it is compatible with an ever-increasing number of data-processing machines in use today. Many business firms already have it.

Call your Bell Telephone Business Office and ask for a Communications Consultant. He'll show you how new, versatile Data-Phone service can streamline your data processing and improve your profit picture.
PHILCO 2000 Data Processing System

- The majority of all data processing involves sorting. Time saved on this operation is always significant—the answers you need become available more quickly; the equipment itself is freed for other use.

The inherent speed and capacity of the Philco 2000 are your assurance of highest possible sorting speed—faster than any other sorting system!

For example, the Philco 2000 has sorted 100,000 80-character records, having a 16-character key, in 18 minutes!

Such high sorting speed can be obtained on any Philco 2000, regardless of size, without additional sub-systems.

Call or write to arrange a test run of one of your sort problems on the Philco 2000.

These Philco 2000 Features Assure Fast Sorting:

- A powerful SORT Generator—one of the many programming aids provided by Philco.
- High transfer rate on tapes—90,000 alphanumeric characters per second on each tape.
- Simultaneous reading and writing—with up to four tapes operating at the same time.
- Ability to read backward while writing forward—eliminating costly rewind time.
- Tremendous logical flexibility—plus eight or more index registers in an ultra-high-speed system.

Philco Corporation • Government and Industrial Group
Computer Division, 3900 Welsh Road, Willow Grove, Pa.

PHILCO

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Vol. 10, No. 2B
News of Computers and Data Processors:
ACROSS THE EDITOR'S DESK
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Computers and Automation is published 13 times a year (monthly except two issues in June) at 815 Washington St., Newtonville 60, Mass., by Berkeley Enterprises, Inc. Printed in U.S.A.

Subscription Rates: (United States) $7.50 for 1 year, $14.50 for 2 years; (Canada) $8.00 for 1 year, $15.50 for 2 years; (Foreign) $8.50 for 1 year, $16.50 for 2 years. Address all Editorial and Subscription Mail to Berkeley Enterprises, Inc., 815 Washington St., Newtonville 60, Mass.

Entered as Second Class Matter at the Post Office at Boston, Mass.


Change of Address: If your address changes, please send both your new address and your old address (as it appears on the magazine address imprint), and allow three weeks for the change to be made.

Computers and Automation for February, 1961
The Honeywell Word:

How it contributes to the flexibility and efficiency of Honeywell EDP Systems

The basic unit of information in Honeywell Electronic Data Processing Systems is the Honeywell Word. The Honeywell Word contains 48 bits representing information, plus additional bits for checking purposes.

Though the checking function is an important feature, this discussion is primarily concerned with the 48-bit information portion of the word.

This 48-bit portion is extremely versatile. As a data word, it may represent information in the form of decimal or binary numbers, alphanumeric characters or special symbols. As an instruction word, it causes the System to carry out specific data processing functions.

Data While data words are an automatic generated mathematical image of the information in the record. If portions of the record should—for any reason—be unreadable at some later time, Orthotronic control not only assures detection, but permits the original information to be reconstructed by the system.

Instruction Three-address instruction logic, because of its speed and programming advantages, is standard in Honeywell EDP Systems. Honeywell instruction words are interpreted fundamentally as four groups of 12 bits each. The first group represents a command code or function to be performed. The remaining three groups represent address groups normally used to designate the location of operands and results. In certain instructions, however, they may contain special information—such as the number of data words to be transferred, the number of decimal or binary digits to be shifted, or the number of words to be edited.

<table>
<thead>
<tr>
<th>INSTRUCTION WORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATION CODE</td>
</tr>
<tr>
<td>12 Bits</td>
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</table>

Programming Exceptional programming flexibility is achieved in several ways. One of these is the ability to specify the location of data relative to other data without relying on specific or absolute addresses (indexing). Masking permits the selection and manipulation of information units smaller than a word. A special type of instruction called a Simulator Instruction permits any routine to be treated as if it were a built-in instruction.

Orthotronic Still another special word in the Honeywell control System vocabulary is called an Ortho word. Ortho words are generated by the System and appended to the end of each record as it is recorded on magnetic tape. Unique to Honeywell Systems, these Ortho words are automatically generated mathematical image of the information in the record. If portions of the record should—for any reason—be unreadable at some later time, Orthotronic control not only assures detection, but permits the original information to be reconstructed by the system.

Get the whole story The flexibility and efficiency of the Honeywell word are indicative of the many advances in logic and engineering that are typical of Honeywell equipment. To get full descriptive information on either or both Honeywell 800 and Honeywell 400 Transistorized Data Processing Systems, just write: Honeywell Electronic Data Processing Division, Wellesley Hills 81, Massachusetts.
FRONT COVER: CRYOGENIC THIN-FILM MEMORY PLANE

The front cover shows an experimental cryogenic thin-film memory plane. It consists of 135 cryotron devices built up in a 19-layer "sandwich." It has been successfully duplicated many times by automatic control techniques at International Business Machines Corp. The memory plane is about the size of a large postage stamp, and stores 40 separate bits of information in 120 of its cryotrons. Of the remaining 15 cryotrons, 10 permit access to the stored bits of information; the other five are "in-line" cryotrons which switch bits of information from one memory plane to another.

Cryogenics is the branch of solid-state physics which is concerned with the properties of materials and devices at temperatures of about 450°F below zero. At such low temperatures certain metals permit electric current to flow endlessly, without additional power, in devices that can be used to perform logic and to store information in a computer memory. Cryotrons are devices in a cryogenic computer which will perform addition, subtraction, multiplication, division, logical switching operations, and amplification.

A key to this new development is the special technique which permits accurate duplication of devices. By means of this technique, microscopically thin layers of metals and insulating materials are automatically deposited on a glass substrate.

The equipment used for deposition allows each layer of a metal or insulator to be sequentially deposited through 17 microscopically adjusted masks, or perforated metal sheets. The masks are changed automatically like records in a juke box and are held in a large metal cylinder operating under high vacuum. Once the masks have been properly aligned, the process automatically produces duplicate superconducting memory planes with similar electrical and mechanical characteristics.

COMPUTERS IN INSPECTION FOR DISARMAMENT

I. From R. L. Turnbow
Modesto, Calif.

I am currently a student at Stanislaus State College in Turlock, California. In one of my courses, "Economics of Free Enterprise," I am doing a term paper.

My instructor, Mr. E. J. Haga, showed me the November 1960 issue of Computers and Automation, where the article, "The Social Responsibilities of Computer People and Peace Engineering," appeared.

In this article, you noted a bill, H.R. 9305, and a specific provision of it, "The Agency shall undertake programs to carry out the purpose of this act, including among others, programs for development and application of communications and advanced computer techniques for analyzing the problems involved in inspection of national budgets and economic indicators as they bear upon disarmament inspection systems."

This provision is the topic I have chosen for my term paper.

As this is an entirely new field to me, I would more than appreciate any and all aid you could give me in its development, or references to people who know about this area or have written about it.

I am also writing for a copy of the House Debate on Bill H.R. 9305, and to Congressman Charles E. Bennett, who introduced the bill.

II. From the Editor

I am very glad that you have chosen for your term paper the interesting topic of the application of computers to inspection of national budgets and economic indicators as they bear upon disarmament inspection.

The book which I believe you should begin with is "Inspection for Disarmament" edited by Seymour Melman, Columbia University Press, New York, 1958, 291 pages, particularly the paper "The Control of Disarmament by Fiscal Inspection" by Jesse Burdell, pp. 75-84 in that book. I would also suggest that you take a look at the other papers in the book.

The first problem as I see it is proof by a nation that it is honestly adhering to disarmament agreements and not spending more than an allowed sum for military expenses. The second problem as I see it is detection of attempted concealment by a faction within a nation that the spending money for arms contrary to international agreement.

In the case of the first aim, proof of full conformity with agreement, we can assume full cooperation in obtaining figures from all parts of the government. Then it seems to me it would be possible rather easily to set up a computer program for verifying say 1,000 different tests every 3 months or so on figures and information coming into the system.

In the case of the second aim, detection of illegal nonconformity by a faction not the majority of a government, it seems to me that pretty much the same plan of checking data, applying great variety of tests to data coming in, would succeed in focusing on spots where unexplained amounts were occurring. This kind of problem is quite similar to auditing to prevent dishonesty. References on auditing and auditing articles related to computer applications in this field would be relevant.

I hope these suggestions will be of use to you.
With the Bendix
G-20 Computer
You Can

MOVE UP

to

TODAY'S MOST ADVANCED COMPUTING "PACKAGE"

Today's high-powered computing equipment is only as good as the programming systems that enable it to do useful work. In the development of the Bendix G-20, these all-important programming systems were planned and perfected in close coordination with the equipment designers, and received equal emphasis. The result: today's most powerful computing "package:

• The G-20's simplified programming enables your present personnel to take advantage of the powerful problem-solving abilities of the computer, regardless of their previous computer experience. Such a programming system is ALCOM—an algebraic problem-solver based on the international mathematical language of ALGOL. Compatible with the ALGO programming system for the Bendix G-15, ALCOM permits your technical staff to transmit problems to the floating point circuitry of the G-20 in universal mathematical language.

• ALCOM is complemented by a library of sorting, file maintenance and other routines for specific tasks. The refined indexing and decision-making capabilities of a powerful command vocabulary have been instrumental in making these simplified techniques possible. They are unmatched for ease of use and efficiency.

• Not overlooking the G-20 proper, we have recently increased computing speeds by 40% ... to the rate of 83,000 additions per second (average, floating point, one-word precision). Magnetic tape speed is now 240,000 digits per second ... and printing speed can be up to 1500 lines per minute. These new characteristics, combined with the G-20's efficient "organization chart" system design and perfected programming ease, provide an unmatched return on your computing dollar. Prove this fact to your own satisfaction.

Call the nearest Bendix Computer office, or write:

Bendix Computer Division
DEPT. D-29, LOS ANGELES 45, CALIFORNIA

COMPUTERS and AUTOMATION for February, 1961
Farrington Optical Scanners on the Job

UTILITY COMPANY CUTS COSTS WITH MACHINE THAT READS DATA FROM CUSTOMERS' BILL STUBS

When you send in your electric bill with payment, a machine may be waiting to read it and to translate what it says into computer language. Atlantic City Electric Company already uses a Farrington Optical Scanner for this purpose.

Here's how it works: bill stubs are run through the Scanner (also known as the EYE) at the rate of 240 a minute. The Scanner reads each account number and the amount paid. It instantly converts this "people language" into "machine language" (computer tape, punched cards or magnetic tape).

By eliminating time-consuming and laborious manual punching, the Farrington Scanner makes possible such high-speed, high-accuracy cash accounting systems. You'll find it also being used for Insurance Premium Cash Accounting and for Subscription Promotion Entry.

The versatility of Optical Scanning permits almost unlimited applications. You can build an entirely new system around it. Or, if your present system uses three or more operators who read and punch, chances are that you can profitably use an Optical Scanner right now. Only Farrington has the experience to go with it.

For further information, write Farrington Electronics Inc., Needham Heights 94, Massachusetts

FARRINGTON

FUTURE NAME IN OPTICAL SCANNING
We all now realize that we are in rapid transition to a new, highly technological society. The needs of the new age will present many challenges to the scientist and engineer. However, these challenges are as nothing compared with the challenges that scientific advance will offer to society as a whole.

Gross Imbalance

Already a gross imbalance exists between technological and sociological progress. Will the transition to the new society be orderly or chaotic? Civilization must adapt; the impact of technology must be absorbed. We have no take-it-or-leave-it choice. The expanding, increasingly fast-paced, complex, and interacting world urgently requires solutions to the problems of its physical operations of production, communication, transportation and resources control and distribution. Because technological creativity is able to do so, it is furnishing the answers. A match between need for solutions and supply of solutions exists. Science and society have finished their courtship and are now getting married. Will it be wedded bliss, with the offspring sources of pride and joy, or will it be a shaky, unstable partnership?

The H-bomb is the established symbol of the growing disparity between rapid scientific change and the lagging adjustment of society. We have learned how to release quickly such tremendous amounts of energy as to destroy a civilization that has not yet produced accepted, respected conduct to preclude the use of force. But the bomb is not the best example. It emphasizes the military side of the world's problems. Even if no war or peace issue existed, disorder threatens if and as we fail to assimilate the technological revolution.

Outer Space

Outer space is the newest symbol of the influence of technology on world affairs, and it brings us headlong into a striking array of challenges in the making of unprecedented national and international arrangements. What is the role of private, free enterprise? Where do national boundaries end? How will the world judge the contest for the limited radio spectrum as satellite repeaters make possible the wholesale interconnection of communications into a single, endless, world-wide web? What bodies and agreements will decide how space technology, meteorology, and nuclear energy will be applied, not only to predict but ultimately to influence the earth's weather?
engineer has already been revolutionized by intellec
tronics. The intercontinental ballistic missiles, if the
brains of the designer were not extended by elec
tronics, would be many years away. Thousands of
flights would be needed in a clumsy, trial-and-error
approach to optimizing the design. Instead, mere
dozens of actual flights have been sufficient to finalize
the engineering and prove out the design. The thou
sands of other trial flights took place in the simulation
laboratories; and the selection of the right combina
tion of parameters out of the myriad of possibilities—
too huge a task for human comparison and sorting
alone—was made by a man-machine, intellec
tronics partnership.

Practice of Law

Picture the practice of law in the technological
world of a decade from now—or, at least, law as it
might be practiced if technology is used to the fullest.
Every practicing attorney would have in his office
means for convenient electronic connection to a huge
national central repository of facts, rules, procedures,
and precedents. For the routine filing of papers, rec
ords, and petitions, he or his assistant would intro
duce his data into the intellec
tronics system, a tech
ique his legal training would include. Any conflict,
 omission, inconsistency, or other shortcoming of his
work, any problems with the law or the existing
records or the claims of another; would be automati
cally, instantly displayed to him. And it would cover
not just the few possibilities an unaided human brain
might have handled, given enough time. It will scan,
select, reject, and present the result of the equiva
lent of the work of thousands of searchers covering many
decades of records over the entire nation in a split
second.

It elevates the lawyer’s intellect to the more complex
intellectual tasks, giving him better tools with which
to work. It alters a substantial fraction of legal prac
tice.

Even on the nonroutine legal processes, the attorney,
in the coming intellec
tronic age, will be able to con
sult with the equivalent of a host of informed fellow
attorneys. His request to the system for similar cases
will yield an immediate response from the central
store, together with questions and advice filed by
other attorneys on those similar cases—even as he will
add his facts and guidance into the system for future
use by all.

Consultations for Physicians

This concept of man-machine partnership on diffi
cult intellectual tasks is made clearer by considering
the physician’s potential approach in the latter part
of the century. He also will routinely introduce his
data on a given patient to the network of “consulta
tive wisdom.” The system will quickly react to give
him some key portions of what would have been the
results of many consultations with other physicians.
It will call out questions he may not have asked him
self. It will give statistical probabilities of relative
effectiveness of various treatments with numerous
variations to account for the corollary possibilities.

Notice that with diseases—their symptoms, char
acteristics, treatments—all nationally monitored, the
statistical approach to medical practice takes on an
entirely new stature. New branches of medicine will
emerge based on the practical possibility of studying
cause and effect on a large-scale, yet rapid, basis with
detailed up-to-the-minute facts on the relationship of
aliment to treatment covering many thousands of
cases.

Partnership of Machine and Man

We observe, from both the legal and medical ex
amples, that merely extending man’s memory through
electronics, creating a library that is both mammoth
yet accessible with electronic speed, offers radical ad
vantages in achieving excellence of professional ac
tivity. But the memory extension is far from the total
effect. The properly designed system does some of the
processing of the library’s information. It handles
the lower intellectual tasks of the first sorting, catego
rizing, comparing, selecting, questioning. These
tasks, done well, require ideally that tremendous vol
umes of data be processed quickly. The machine
member of the partnership does this high-quantity,
high-rate part of the intellectual job, allowing the
higher intellect of the human partner to concentrate
on the more subtle, less clearly defined, less routine
conclusion drawing, decision making, judgment as
pects of the intellectual task.

Let us continue our quick look at what man is
today engaged in doing with his remarkable intellect,
and we shall see much evidence to suggest that too
often the task is intellectually, qualitatively beneath
him, while oftentimes too much for him quantitatively.
The coming technological age will be characterized
by a much better match between man’s intellectual
capabilities and the assigned thinking role, thanks to
the concept of man-machine partnership in mental
activity.

Keeping Track in Banking

Take, for instance, money and banking, and the
whole process of keeping track of who owns what,
where it is, and who owes whom. How absurd that
millions of people are engaged all day in putting little
marks on pieces of paper, reading them off, and re
introducing similar ones on other pieces of paper,
without much need for deliberation in the process!
This is as unsuitable for the human intellect as pull
ing huge stone blocks to build the pyramids was to
human muscles. Currency and coins will be for the
rural areas alone in a few decades. Even checks, and
most other of today’s forms of human record origi
nations, will be extinct. If you buy a necktie or a house,
your thumb before an electronic scanner will identify
you, and the network will debit your account and
credit the seller. The system will automatically do
the routine accounting, call out violation of rules or
problems in the transaction, and list alternatives.
Again, the machine partner does the brainwork when it
is simple but high-quantity and also acts to aid the
human partner for the more difficult aspects. (Of
course, occasionally a transistor burning out in Kansas
City might accidentally wipe out someone’s bank
balance in Philadelphia. One has to expect some
continued dangers and risks in life in the period
ahead, though they will likely be new ones.)

Guidance of Moving Traffic

Hardly a better example can be found of the urgent
need for man-machine, intellectronics partnerships to handle intellectual tasks than the control of things moving in the sky and on the ground. For safety and reliability, at the airports, in the airways, and on our surface freeways and streets, it is clear that human brains unaided (whether a pilot, an airport controller, or a Los Angeles automobile driver) cannot integrate all the data and process it fast enough to make decisions leading to the largest, smoothest, safest use of the artery. Intellectronics systems are needed in which facts as to nature, quantity, rate of change, spatial spread, and interconnection of traffic are all sensed accurately and continuously over wide areas, automatic predictions are made and compared as to consequences and as to alternate directions to influence the flow. Not only will the handling of planes and the role of the pilot be drastically changed with time, but it is not ridiculous to imagine automobiles of the future which go onto electronic control if directed onto crowded freeways, the driver limited to pushing a button for the number of his chosen exit.

Our factories and refineries already have begun to recognize the limitations of reliance on the un­ tended human intellect for control of the operation, even as has the military. Too many things to keep track of, too rapidly changing a situation, too much processing of facts and possibilities. Since much of the intellectual process is clear, only involving high quantities and rates, the machine partner, properly integrated, both relieves and suitably elevates the human intellect and makes for more efficiency, higher profits, or greater security.

World-Wide Integration

It should be clear from these examples that most of the physical operations of the world are candidates for passing under intellectronics systems control. But also much of the operations involve world-wide integration and interconnection. Many millions of human minds and their extensions, in the form of signals and data and information collection, will be connected together, often crossing national and language barriers. No wonder one of the most interesting of intellectronics areas is in machine translation of natural language. Again, the machine member of the team handles the high volume, crude intellectual task. It produces rough translations, identifies double meaning possibilities, weighs alternative meanings based on what preceded and followed—it assists and "sets up" for its more intellectual human partner.

What is less clear is that the nature of language and its function will probably change drastically in the years ahead. The machine partners in the universal intellectronics systems of the future will want the facts and the rules in the most efficient language possible. They will create pressure for a common, purely informational, completely logical and consistent kind of language. The technological age may force on the world a real measure of language reform or at least a new common language for some functions of human endeavor.

Education of Human Beings

The most truly intellectual activity of all must be the education of the human brain. We are approach­ing a crisis in education because the needs of a more complicated, more populous world are increasing rapidly while our ability to place human resources behind the educational system is decreasing. But an intellectronics system of the future can make a ten- or hundred-fold change in the effectiveness of education. The human educator can have tools analogous to the physician's x-rays and electrocardiographs. The routine material can be presented by machine, leaving the more difficult concepts for the higher intellect of the human educator. Programmed machines can stimulate the thinking of the student, alter the presentation, speed it up, slow it down, add more explanations, skip steps—all automatically as a result of continually monitoring the student's responses to questions.

An intellectronics system can remember the progress of millions of students, compare their tested learning with the plan, measure and report deviations. Yet, the same system can immediately recognize an individual student, give him an accelerated or special presentation or test, all by a virtually instantaneous scan of his record and a following of rules put in by wiser human educators as to how to modify the course in relation to the individual record.

Such a future system will involve new large industries employing experts in the subjects to be taught, the design of programs, devices, and systems. It will also call for new professional groups within an augmented educational profession to provide for statistical study, planning, diagnosis of problems, and generally the matching of the synthetic intelligence of the machine with the human brain to achieve the fullest utilization of both human and machine resources in an educational system suited to the coming technological age.

Citizen Participation in National Decisions

These sketchy portrayals of the nature of the coming technological age should not imply one grossly wrong conclusion: that the future world will be automatic, robot-like, every human being only a constrained cog in a tight machine, freedom of spirit and expression and democracy dead. On the contrary, if we should so desire, intellectronics makes possible a degree of citizen participation in policy and goals, both discussion and decision, unthinkable today. Consider only that our Congresses, our policy bodies, could have their deliberations open to millions in their homes, and further—the added future possibility—the entire nation could vote by push-button from their homes on any fraction we might choose of all issues. The result would be known to all instantly. I am not suggesting that it would be practical to seek more than a small, partial attainment of all that technology could be employed to provide in this area. But the future could be one in which a much greater portion of all people are up to date, understanding, interested, anxious to participate and indeed do participate in determining the aims and priorities of our lives and the manner of reaching our objectives.

In summary, a basic characteristic of the future technological society is that brainpower will deter-
mine the course of the world, the stature and influence of nations. But total brainpower will be the sum of natural human intellectual activity and synthetic man-made intelligence. The machine partner will possess less mentality but will have greater capacity for the big, lower-grade load.

Disparity Between Scientific and Sociological Advance

Since the real bottleneck to progress, to a safe, orderly, and happy transition to the coming technological age lies in the severe disparity between scientific and sociological advance, we must now ask the key question: Will electronics aid in removing the imbalance? Obviously, not directly. The challenging intellectual task of accelerating social progress is for the human mind, not his less intellectual electronic partner. But perhaps there is a hope. If the machines do more of the routine, everyday intellectual tasks, man will be elevated to the higher mental domains. He will have the time, the intellectual stature, and hence the inclination to solve the world's social problems. We must believe he has the inherent capability.

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. An audience is many people who have expert knowledge of some part of the field, but who are laymen in other parts of it.

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. Articles should be submitted to us before too much work is done.

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 1/4¢ 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 69, Mass.
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390... an “Electronic Filing System”... electronically classifies and files data without the need for human decisions. Millions of digits can be stored on magnetic-tape ledger records, punched paper tape, and punched cards.

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COMPUTERS and AUTOMATION for February, 1961
Delay Lines and Electromagnetic Filters

Morton Fassberg, President
ESC Electronics Corp.
Palisades Park, N. J.

(From a talk before a group of security analysts, November 30, 1960)

The principal products of this company are precision delay networks which account for about 90 per cent of the company's total volume of sales. Other products include electro-magnetic filters and wide band video transformers.

Delay networks, or, as they are widely known, delay lines, are specially created for specific situations to do definite jobs. Once a prototype, or successful sample, has been produced, then others of identical structure are made under the most precise conditions in whatever numbers the user may wish. To borrow from a current phrase, the priceless ingredient is imagination. This is more than what we commonly call "know-how." It requires creativity.

What is a Delay Line?

It is not easy to arrive at a simple definition of a delay line in one-syllable words. Technicians shudder at the thought of such an effort because there are so many nuances in electronics and especially in the custom-designing of delay lines. A colloquial description of a delay line is less accurate than a technical exposition, but it may be more generally useful.

A good way to get a glimpse at what a delay line does, is to consider the use of delay lines at airports which use aircraft identification in landing systems. During the five years in which delay lines have come into use at airports, it is now possible to identify five times as many planes in the sky, at one time, than was possible just a few years ago. Assigned pulses from individual planes are decoded through delay lines and thus more planes can be identified on the ground. This, of course, means better communication between ground and air, better control, and greater safety. The delay lines may be considered as locks. The impulses would be the keys. Just as keys fit locks and open them, so electrical impulses are identified through delay lines.

Another use of delay networks is on telephone lines. Some frequencies normally would run ahead of others on telephone lines. But, for conveying messages properly, it is necessary for the frequencies to be synchronized, to arrive at a given place at a given time. A delay line equalizes the frequencies, or delays them different amounts of time so that they arrive at the right place at the right time. The process is something like what would happen if an object were dropped through air and then through a layer of water. It would move faster through the air sector than through water, which would slow it up. Scientists could provide just the right amount of air and water to be sure that a weight would use up a predetermined amount of time if it were dropped. Delay lines do to electric impulses what the water and air would do in this homely illustration, but the factors are infinitely more delicate in electronics as we shall see.

Perhaps one more illustration will serve to picture these unique electronic components. Staggered traffic lighting systems, in a sense, perform for traffic what delay lines do for electric impulses. The staggered lighting system can be arranged to move automobiles along at predetermined speeds and thus assure an even flow, eliminating traffic jams. Delay lines can be designed to restrain the motion of electric impulses, similarly, and allow them to flow as required.

Infinitesimal Time

Electrical impulses travel fast. How fast they travel is indicated by the demands made on a delay line that is fashioned to control them. Delay lines reckon with time so brief that a thousandth of a second is a second. A thousandth of a millionth of a second is a commonplace time element in delay lines. In fact, a word has been invented to designate this—"nanosecond." The delay time involved in all the thousands of delay lines thus far built by this company, if operated end-on-end, would add up to less than one minute.

How Delay Networks Grew

As carriers of intelligence, pulses of electrical energy have been used since the invention of the telegraph because of their simplicity of generation, ease of recognition and relative immunity to noise. These inherent characteristics became still more significant during World War II when the development of radar started a wholly new science of pulse technology. Today electrical impulses are the primary carriers of intelligence in almost every sophisticated electronic system.

Of great importance in such systems is a component that has the ability to achieve a desired time relationship among electrical impulses and signals by delaying one or more of them for specific intervals of time, generally running in the order of milli-microseconds to milli-seconds. Pulse delay networks, the principal product of the company, developed as the new...
technology grew. Among their uses are: in the control systems of guided missiles and in telemetering systems between satellites and the earth; in digital computers and electronic data-processing equipment; in communication systems; in radar systems; in television camera chains; and in aircraft identification and landing systems. Because they are passive networks, they perform reliably for long periods in extreme environments.

Why Creativity?

From this record, it can be seen that as electronics develops in all phases of human activity, new and perhaps even unpredictable demands will be made for delay lines or their counterparts. As developments in TV, radar, data processing, missiles, or any of the modern wonders, require new combinations and conditions for controlling electrical impulses, engineers will go to work designing delay lines for the new purposes. Since there currently seems to be no end to the variations and implications in the use of delay lines, there seems to be no end to the combinations of ways in which they will have to be designed to solve problems as they arise. To tackle those problems, awareness of the importance of the creative instinct in a staff of engineers is vital. This company is fully awake to this challenge.

Filters and Transformers

Since 1958, this company has been producing additional electronic components, electro-magnetic filters and wide band video transformers. Our electro-magnetic filters are designed to select useful or desired electrical signals and to reject those that interfere or are undesired. A simple example would be that of a mobile radio unit in a taxicab. For obvious reasons, its reception should be tuned to cab headquarters, not to the police department. The filter keeps the radio signal on beam. Electro-magnetic filters are used in far more complex and diverse situations than that, however. They are useful not only in communications systems, but also in data processing, telemetering, servomechanisms and multiplex telegraphy.

ESC's wide-band transformers have been custom-designed and manufactured to meet the requirements of simultaneous transmission of both low and high frequencies commonly encountered in television, computers, scatter transmission, atomic instruments, etc. Conventional transformers will transmit only a relatively narrow band in audio, intermediate frequency range, radio frequency range and very high frequency range. ESC has constructed a substantial number of prototypes which have been delivered to customers, but to date the production orders have been limited in quantity. It remains to be seen whether a profitable market will develop.

Transformers, nonetheless, currently offer some promise. The layman might identify them as devices which operate like the process that occurs when a city's water supply pours from many sources through huge viaducts and then is divided into diverse directions, sizes and pressures, for use in many faucets. The wide-band transformer, indeed, is an unusual converter and distributor.

Prototypes

Most businesses do not routinely use the prototype as it is known in electronics. It is a tested, working sample, specially designed for the customer's need. In a limited sense, it is the first try-on suit the customer orders; the one he uses for a fitting before it is finished. There the similarity ends, for the suit-wearer orders only one, or perhaps two—but the delay-line user may order only a few dozen, or hundreds, or thousands.

The prototype is the ESC answer to the customer question: "What can you create that will do and be all these things?" in electronics.

In 1959, the company built 288 prototypes. During 1960, up to October 30, ESC built and delivered 333 prototypes. This is at the rate of about 400 for the year 1960.

WHO'S WHO IN THE COMPUTER FIELD

From time to time we bring up to date our "Who's Who in the Computer Field." We are currently asking all computer people to fill in the following Who's Who Entry Form, and send it to us for their free listing in the Who's Who that we publish from time to time in Computers and Automation. We are often asked questions about computer people—and if we have up to date information in our file, we can answer those questions.

If you are interested in the computer field, please fill in and send us the following Who's Who Entry Form (to avoid tearing the magazine, the form may be copied on any piece of paper).

| Name? (please print) ................................... | Year entered the computer field? .................. |
| Your Address? ........................................... | Occupation? ........................................ |
| Your Organization? ...................................... | Anything else? (publications, distinctions, etc.) |
| Its Address? ............................................. | .................................................. |
| Your Title? ............................................... | .................................................. |
| Your Main Computer Interests? ........................ | .................................................. |
| ( ) Applications .......................... | .................................................. |
| ( ) Business ................................ | .................................................. |
| ( ) Construction .................................. | .................................................. |
| ( ) Design ....................................... | .................................................. |
| ( ) Electronics ................................ | .................................................. |
| ( ) Logic .......................................... | .................................................. |
| ( ) Mathematics .................................. | .................................................. |
| ( ) Programming .............................. | .................................................. |
| ( ) Sales ......................................... | .................................................. |
| ( ) Other (specify): ............................ | .................................................. |

Year of birth? .................................. College or last school? .................

When you have filled in this entry form please send it to: Who's Who Editor, Computers and Automation, 815 Washington Street, Newtonville 60, Mass.
Mathematical computation: vital element of Space Technology Leadership

The rapid solution of ever-more complex problems is indispensable in converting physical concepts into specifications for advanced space and ballistic missile systems. Space Technology Laboratories employs the modern, high-speed digital computer as an integral part of systems engineering. At STL's Computation and Data Reduction Center, computing specialists are daily expanding the wide potential of modern computing devices, as well as solving problems arising in advanced space technology. The Center, a modern, flexible facility, has a capability including two IBM 7090's and IBM 1401 auxiliary equipment. Continuing expansion of STL's activities in this vital area now creates the need for additional specialists with B.S., M.S., or Ph.D. in Mathematics, Engineering or the Physical Sciences, and related experience. Those capable of contributing within the environment of Space Technology Laboratories are invited to contact Dr. R. C. Potter, Manager of Professional Placement and Development. Their resumes and inquiries will receive meticulous attention.

SPACE TECHNOLOGY LABORATORIES, INC. P.O. BOX 95005BB, LOS ANGELES 45, CALIFORNIA

a subsidiary of Thompson Ramo Wooldridge Inc.

El Segundo • Santa Maria • Edwards Rocket Base • Canoga Park Cape Canaveral • Manchester, England • Singapore • Hawaii
THE COMPUTER DIRECTORY AND BUYERS' GUIDE FOR 1961, 
7TH ANNUAL EDITION

The Computer Directory and Buyers' Guide 
for 1961, the 7th annual edition, will be 
published this year in July on a new basis.

We shall seek to make it a complete and 
inclusive directory and guide for the greatly 
expanding field of computers and data proces-
sors.

It will contain at least the following reference information:

1. Roster of Organizations
2. Roster of Products and Services: The 
   Buyers' Guide
3. Roster of Computing Services
4. Roster of Consulting Services
5. Descriptions of General Purpose Digi-
tal Computing Systems
6. Descriptions of Analog Computers
7. Descriptions of Special Purpose Comput-
ers, and other reference information

If there is any kind of reference inform-
ation which you would like to see published in 
the Computer Directory, please send us your 
suggestions, QUICKLY.

All regular editorial entries in the di-
rectory will be published FREE, and the first 
25 words of any editorial entry will be FREE. 
For example, there will be no charge for 22 
words of description (subject to editing) of 
a product in the "Roster of Products and 
Services".

For subscriptions received March 1 and 
later, the "Computer Directory" will no longer 
be automatically included in every subscrip-
tion to "Computers and Automation". The price 
of the directory will be $12 before publica-
tion, $15 after publication. Any purchaser 
of the directory will receive the monthly 
issues of "Computers and Automation" at no 
additional cost. If the directory is not in-
cluded in a subscription, the price of the 
monthly issues of "Computers and Automation" 
will remain at $7.50 per year (in the United 
States).

BATTERY OPERATED COMPUTER

Packard Bell Computer 
Subsidiary, Packard Bell Electronics 
1905 Armacost Ave. 
Los Angeles, Calif.

For the first time, we believe, an elec-
tronic computer can operate entirely from a 
battery power supply. The computer, a PB 250 
manufactured by this company, was demonstrated 
at the Eastern Join Computer Conference, New 
York, in December.

The PB 250 is normally operated from the 
battery, which is plugged into a standard 115 
volt power line and is continuously regenerated 
by trickle charging. If the 115 volt input to 
the charger is interrupted, however, the com-
puter can continue in operation without any 
more electricity for more than one hour. The 
PB 250 battery supply incorporates sealed 
cells with a life of more than 5 years with-
out service.

The battery supply can be charged from 
even poorly regulated mobile generators as 
efficiently as from a power line, while the 
computer executes thousands of mathematical 
operations every second.
RUGGED, MOBILE, DIGITAL COMPUTER OFF TO U. S. 7TH ARMY IN WEST GERMANY


In January, the mobile general-purpose digital computer MOBIDIC 7A built by this company was turned over to the United States 7th Army, and shipped to Zweibrucken, West Germany. This digital computer is ruggedized for use in the field; it occupies 3 standard 30-foot Army trailer vans.

The vans contain (1) the complete high-speed computer system, (2) an off-line control system which allows independent performance of large-capacity administrative functions simultaneous with operation of the central computer system, and (3) maintenance and support equipment and facilities. The weight of the equipment is 6 to 10 tons. The power required is 30 to 50 KVA. The computer will perform 50,000 typical operations per second (10 typical operations are defined as 7 additions plus 3 multiplications). It is a 30-bit, parallel, binary machine, with fixed point. It uses 52 instructions (standard Fieldata code). The computer can be rapidly interrupted by a call from high priority program, and when that is completed, will at once return to its original program.

At Zweibrucken, the first assignment of MOBIDIC will be to control thousands of supply requisitions for items such as replacement parts for rockets, guided missiles, electronic warfare, air defense, combat surveillance or atomic artillery. It will process more than 18,000 requisitions each day to and from depots which supply some 200,000 different line items to the 7th Field Army, and dispatch supplies from depots to combat units in hours instead of the days once required. The saving in reduction of inventory combined with increased accessibility should pay for MOBIDIC several times over.

MOBIDIC is made rugged for movement and operation under extreme environmental conditions. Emphasis in design was on performance with extreme reliability in combat, and resistance to extremes of shock, vibration, humidity, dust and temperature. In the hard road testing of ruggedization at the Aberdeen Proving Ground, the truck containing the computer developed defects and not the computer.

An evaluation model of MOBIDIC was publicly displayed in New York in December in conjunction with the Eastern Joint Computer Conference. The picture shows a MOBIDIC computer in Central Park, New York, in a snow storm on December 12, 1959.

Additional models of MOBIDIC are under development for various military uses, including test at the U. S. Army Electronic Proving Ground, Fort Huachuca, Ariz., and applications within the future Army Tactical Operations Center and other projects.

NEW RETAIL ACCOUNTING SYSTEM
WITH OPTICAL SCANNER

Farrington Manufacturing Co.
Needham Heights 94, Mass.

A new retail accounting system designed around an optical scanner has been developed by this company.

The system includes credit card tokens, imprinters, variable encoders, cash registers, forms, the Farrington Optical Scanner, and conventional business machines or other data processing equipment.

The optical scanner can "read" the customer's account number, amount of sale, salesperson's number, transaction code, register and home department number, salescheck number, and convert the information at high speed into a punched card record.

It also can recognize other information such as cash, miscellaneous charges, sales taxes, etc., and punch machine codes for the respective answer permitting mechanical sorting of punch card saleschecks into "yes" or "no" categories. The Farrington reading machine is the only optical scanner in commercial operation today.
FIRST COMPUTER-DESIGNED COMPUTER  
OFF TO SOUTH ATLANTIC  
Bell Telephone Laboratories  
463 West St.  
New York 14, N.Y.

The first computer built from complete wiring information and parts lists furnished by another computer has been completed. It was shipped on Jan. 16 to Ascension Island, near the target area of the Atlantic Missile Range. The computer is to be used in connection with target-tracking tests for NIKE-ZEUS, the U.S. Army's anti-missile defense system.

The entire logic network of the digital computer, consisting of 47 sub assemblies, had been built from wiring diagrams, assembly information, and parts lists produced by a specially-programmed, general-purpose digital computer. The computer was built at Burlington, N.C., by the Western Electric Company.

The Bell Laboratories Automatic Design System, abbreviated BLADES, required less than 25 minutes per subassembly to produce manufacturing information which would have consumed four man-weeks of manual effort with conventional drafting methods. Use of the BLADE System can save thousands of man-weeks of time in the design of equipment.

In addition, manufacturing information can be converted into a control program for an automatic wiring machine, which would do the actual assembly work. Initial experiments on this aspect of the program are now underway. Results indicate that automatic wiring of the mechanically-designed computer is feasible. This will, of course, result in additional substantial savings in time and money.

The first step in designing the computer was the synthesis of the logic network to perform the necessary functions. This network was then converted into a set of topologic equations, expressing both the topology and logic of the network, in computer language. (Topology involves the geometric aspects of the network; i.e., the position of each component and its relation to other components.)

The general purpose computer then used these topologic equations to produce sheets of instructions specifying the number of modular logic packages to be used in a subassembly.

The instructions also specified the pins to be interconnected, the size and length of wire to be used in connecting them, and the wire paths to be followed for minimum path length. Any special-purpose logic packages to be used in a subassembly were also specified by the computer.

After the wiring information sheets were completed, a complete parts list including logic packages, externally wired resistors and capacitors, and necessary wire was prepared.

The majority of the logic packages in the Zeus computer are of a single general-purpose type. Any logic function can be performed anywhere on the subassembly by varying the interconnections among the packages. The module package contains four individual and independent logic switches which can be interconnected to form 2-, 3-, or 4-terminal logic gates, or flip-flop circuits.

A Bell Laboratories' engineer at Whippany, N.J., checks design information for the first computer built from complete information furnished by another computer. A subassembly of the computer is on the table. The computer will be used with the target-track radar for the Army's NIKE-ZEUS anti-missile defense system.
The computer shipped Jan. 16 uses about 2500 of these logic packages, plus about 200 packages of other types in its 47 subassemblies. The BLADE System, as currently designed, can handle up to 12 different types of packages.

Separate wiring instructions for power and signal wiring are provided. Also, power wiring is arranged so that no two successive logic functions are supplied by the same power bus.

**ELECTRONIC TUTOR AND INTERVIEWER GUIDED BY A COMPUTER**

System Development Corp.
2500 Colorado Avenue
Santa Monica, Calif.

A computer-operated teaching system with the ability to tailor its instructions to an individual student's talent was demonstrated at the recent Eastern Joint Computer Conference. The heart of this "automated teaching research machine" is a Bendix G-15 electronic computer, programmed to sense a student's needs, respond to his errors, and build his knowledge and confidence quickly and reliably. Teaching machines may be a major resource in the face of an expected shortage of teachers that may amount to 250,000 instructors within five years.

The electronic tutor could be the forerunner of small individual desk units capable of being centrally controlled by a master computer. When properly programmed the system could simulate a human tutor and work with as many as 100 students simultaneously -- but on an individual basis.

The automated teacher took participants through a series of questions on Christopher Columbus. The questions, all multiple-choice, were displayed by a slide projector controlled by the G-15. The "student" answered by pressing a key on an electric typewriter. The computer immediately acknowledged the answer as "right" or "wrong", ordered up another slide, and kept a record of performance on each question.

When the student missed a question, the machine "detoured" him to a special set of remedial questions. Once his performance on the remedial set was satisfactory, he was returned to the main program of the course, to be detoured again only when he was unsure of an answer.

The machine may take the student out of the original series completely and into other basic series if the student requires excessive remedial help. The computer can make a major change in the training approach according to the individual student's needs, just as a human tutor can do.

Thus the machine can be programmed to help both the bright and the slow learner. If the student's performance is high enough he can skip whole items in the basic series. If the student indicates doubt or confusion or takes too much time in answering, the computer may divert the student to less difficult questions.

This responsiveness to delay in the student's reaction is particularly designed to help the slow learner.

Though designed originally as a teaching aid, the automated teaching machine could also be the basis of other information gathering and dispensing systems.

Two other possible uses of the "humanized" computer were also demonstrated. In one case the system played the role of student counselor and, acting on previously programmed information about the student's interests, quizzed him to determine basic aptitude for a chosen field (in this case, journalism). At the end of the "interview" the machine suggested a course of studies and activities that seemed to best suit the student.

In the other case, the system impersonated a medical interviewer, questioning a patient on a standard series of facts about his family's medical history. (Sample question: Have you, or any blood relatives, ever been afflicted by varicose veins? The patient can answer "Yes," "No," "I don't know," or "I don't know what varicose veins are." In the last case he gets a photographic slide that shows him what varicose veins are and another asking the question again). The information gained from the interview would be immediately available to doctors for making diagnosis, and for permanent retention as a complete file on the patient.

While such machines have certain human qualities, the instruction-giving or information-collecting abilities it may possess are only as good as the stored programs placed in the machines by a teacher, counselor or doctor.
MARYLAND HIGH SCHOOL STUDENTS LEARN COMPUTER PROGRAMMING AND PRACTICE ON THE IBM 709

Zeke Seligsohn, Public Relations Chairman
Association for Computing Machinery
1111 Connecticut Avenue, NW
Washington 6, D.C.

On the morning of January 7, the console lights flashed on the giant IBM 709 computer at the IBM Space Computing Center. An intense group of young computer programmers gathered around the machine, watching as it calculated second-by-second altitudes of five simultaneous rocket shots.

An ordinary sight at the Computing Center? Not quite -- because the group consisted of 26 juniors and seniors from Bethesda-Chevy Chase High School. The students had reached the climax of a 15-week course in High-Speed Digital Computing, and were testing the programs they themselves had written to solve the rocket problem.

The Saturday morning course, sponsored jointly by the Washington, D.C., Chapter of the Association for Computing Machinery and the Board of Education of Montgomery County, Maryland, is an unusual experiment designed to attract talented youngsters to the computing field -- and especially to the computer programming profession. There is a current nationwide shortage of computer programmers. It is expected that some 200,000 new programmers will be needed by business, industry, government and research in the next ten years.

The ACM course covered such topics as the history of computers, the use of binary and octal number systems, analysis of typical problems, fundamentals of programming, and applications of computers. Several outstanding authorities on war gaming, automatic language translation, satellite tracking, and business applications addressed the class during the term.

The students learned how to program a simple, theoretical computer at first. Then they worked up to writing programs for the high-speed IBM 709 computer, capable of 40,000 calculations per second. Actual IBM manuals for the 709 were used as training aids, as well as motion pictures specifically designed to teach computer programming and computer technology. IBM's Federal Systems Division provided free program check-out time on the multi-million dollar 709 computer at the Space Computing Center. First-hand information about the programming profession was
also obtained from IBM personnel during a student field trip to the company's Systems Center in Bethesda, Maryland.

Students who volunteered for the extracurricular course took on three class hours per week, with an average of 4-5 additional hours homework a week. Requirements for the course included: grades of A or B in all regular classwork; two years of algebra, one year of geometry, and one year of physics (or enrollment in one of the latter two courses); and a high degree of interest in mathematics and science.

The current course is part of a rapidly expanding educational program of the ACM -- the nation's largest computer organization, with over 7,000 members. The Washington, D.C. Chapter plans to present similar courses in several other local high schools next semester.

ASSOCIATION OF DATA PROCESSING SERVICE ORGANIZATIONS FORMED

W. H. Evans, Executive Vice President
Association of Data Processing Organizations
1000 Highland Ave.
Abington, Pa.

Leading American and Canadian companies in the computer and punched-card service field have formed the Association of Data Processing Service Organizations (ADAPSO). Its purpose is to maintain high-performance standards and thus further improve service to business and science, and awareness of public service aspects.

The new association is made up of companies which service clients through data processing centers, as distinct from companies which manufacture and rent or sell equipment. Data processing service centers or bureaus perform various tasks on their own premises, for a fee; based on the type of work done and the time required to complete it. They serve firms which do not have sufficient work to justify investing in their own computers or punched-card machines, or who lack the specialized know-how required for data-processing systems.

Association officers include:
President: Mr. Romuald Slimak, Mgr. of Remington Rand Univac Service Centers
Vice Pres.: Z. V. Zakarian, Mgr., New York Electronic Systems Center, Radio Corporation of America
Treasurer: C. G. Green, President, Statistical Reporting & Tabulating Ltd., Toronto, Canada


Other leading organizations in the field, which include a great number of independents, have expressed interest in ADAPSO and are expected to join soon.

The Association is a cross-section of this new and rapidly growing business service. Thus, independents (small and large), chains and manufacturers' centers are equally active. A one-day symposium was scheduled in New York on January 20. A first directory of all American and Canadian centers is in the making.

Membership is limited to those companies which perform on their own premises work which requires the utilization of such equipment as punched-cards, punched and magnetic tapes, optical readers and computers.

Officers of organizations interested in the Symposium, in being listed in the Directory, or in membership, should communicate with W. H. Evans, at the address above.
Chemically-machined glass ceramic boards transport 154 electron tubes at once through a newly-designed automatic conveyor tester, recently put into operation in the receiving tube headquarters of Sylvania Electric Products, Inc., at Emporium, Pa.

The computer-programmed machine performs up to 23 separate measurements per cycle, depending on the tube type being tested. Different sockets permit testing of hundreds of tube types. The capacity of the machine is 2,500 tubes an hour.

The glass-ceramic boards are produced by a photographic-chemical etching process. The pattern of holes and slots are implanted in photosensitive glass; then the image is etched away. The glass is then converted to a glass-ceramic called Fotoceram.

The unique material was chosen because of its insulation resistance and its adaptability to odd patterns and successive design changes.
The U.S. Weather Bureau put into operational use on Dec. 1 an electronic computer-plotter that mechanically draws a complete weather map of the Northern Hemisphere in less than three minutes.

Known as the Weather Plotter, and produced by this company, the electronic unit reads weather information supplied in numerical form on magnetic tape and presents the information to a digital-to-analog converter. The converter then instructs the "mechanical hand" of the plotter to automatically draw contours or isobars, which represent lines of equal barometric pressure, on a 30-by-30 inch map of the Northern Hemisphere. The plotter produces a complete weather map in less than three minutes, compared with approximately 20 minutes required by the former hand-drawn method. Also, the automatic, electronically controlled method produces maps that are much more accurate than those that were hand-drawn.

Figure 1
--- A 30-by-30-inch weather map produced mechanically by the "Weather Plotter". The isobar map depicts air flow patterns from 18,000 to 20,000 feet.
Information fed into the Weather Plotter is gathered from more than 500 weather observation stations throughout the Northern Hemisphere. Observations are taken twice daily, at noon and midnight London time, and fed into the National Meteorological Center by teletype.

Forecasts, for 12, 24, 48 and 72 hours ahead, are calculated on a programmed computer, and the results recorded on magnetic tape. The tape is then put on the plotter for reading, converting, and map plotting.

During the course of a 24-hour day, 64 weather maps are produced for various altitudes from sea level to 40,000 feet. Each map forecasts air flow patterns for a particular forecast period. Maps of these air flow patterns at 40,000 feet and higher are prepared for use by the military and by airlines in determining the best flying routes and altitudes for jet aircraft.

Immediately after each map is produced, it is distributed by facsimile to 26 U.S. Weather Bureau stations throughout the United States for use in local and regional weather forecasting. Maps also are distributed by facsimile to more than 600 military airfields and stations, airlines, universities and commercial weather forecasting operations.

The reduction in time from 20 to less than three minutes for producing a map permits tightened deadlines with a consequent increase in the usefulness of the information. The equipment is an important step forward in the Weather Bureau's efforts to automate weather data processing, weather analysis and weather forecasting. It is another link in the fundamental technological changes now occurring in the science of meteorology.

Figure 2
— Here the plotter draws isobars.
INTELLIGIBLE PHONE CONVERSATIONS
WITH DIFFERENT LANGUAGES AT EITHER END, DUE IN NEXT 20 YEARS

Dr. Edwin G. Schneider
Vice President, Research and Engineering
Sylvania Electric Products
Needham, Mass.

(Based on a talk before the annual convention of the Telephone Association of New England, Sept. 27, Bretton Woods, N.H.)

An intelligible telephone conversation from continent to continent with different languages being spoken on either end of the line will be possible within the next 20 years.

Automatic translation of transoceanic conversations will be performed through advanced communications and data processing devices.

In regard to the future growth and expansion of communications, we can forecast:

1. A communications satellite network that will make possible global television and high-speed data transmission.
2. "Wireless" telephone calls by pedestrians through two-way pocket radios the size of a package of cigarettes.
3. Transmission of still photographs through the telephone system at a moderate cost.

The basic computer mechanism for automatic translation is already in existence, although primitive; to complete the translation for spoken words, it will be necessary to recognize automatically the basic sounds of speech, independent of the peculiarities of the speaker, and to reconstitute these sounds from information stored in the computer memory.

Rudimentary translation of Russian into English is currently being carried out by a computer. A Russian-English dictionary is coded and stored in the computer memory. The document to be translated is typed out on punched paper tape and fed into the computer, which looks up the corresponding words in the other language. The document is then typed in translated form.

The problem of translation of spoken words does not appear very formidable when one considers that there are only 40 basic sounds used in English. To date, a relatively high degree of success has been achieved in generating recognizable speech by piecing together the appropriate artificially generated speech sounds.

However, the process of automatically recognizing the basic sounds has so far only been solved for very limited cases. For example, fairly reliable recognition of vowels clearly spoken by a male voice has been accomplished — but the same equipment was unable to understand women. Maybe this was because the men who made the machine didn't understand women either.

There is little doubt that a solution for the speech pattern recognition will be found, and it will have applications beyond that of automatic translation. Applications cited were more efficient use of phone lines — carrying 100 conversations over a channel which now carries only one, and a speech typewriter, which would reproduce a spoken statement in document form.

NEW DEVICE AIDS HUMAN SUPERVISION
OF COMPUTER OPERATION

The Electrada Corporation
Los Angeles 48, Calif.

An electronic unit which provides a new display and control link between the human operator and high speed data processing systems, has been developed.

By matching the logic and speed requirements of the electronic system and the human operator, the unit, called the Electrada Data-com, increases the flexibility of computers and communication systems. In addition, costly interruptions during monitoring and correcting activities are eliminated.

The device accepts digital information at line speed, automatically translates it to ordinary alpha-numeric characters and presents a display on the screen of a cathode-ray tube. As the information is being displayed, the operator may approve its contents, or he may alter them in part or in total by striking a standard typewriter keyboard.

Both incoming and outgoing records are held in the display. When the operator punches the send button, the unit retranslates the information to coded form and transmits it automatically to the associated communications network or computer.

Capable of receiving and sending digital data at speeds of approximately 3600 characters per second, the unit provides automatic interface matching between data processing units or between communications and data transmission equipment.
processing systems. It allows the operator to perform selective monitoring, correcting, editing or re-routing of data. The operator may also compose, transmit, receive, correct and expand incoming messages, or send messages composed from prerecorded internally stored forms.

Display of incoming and outgoing data takes place in a high-brightness cathode ray tube, the upper part of which shows the incoming information or message, while the lower part displays the revised or approved version which is to be transmitted. A magnetic storage drum with a capacity of 3072 bits provides a display memory which stores the information for the screen and holds them ready for editing or transmittal. The drum uses transistor read-write circuits, and contains an engraved clock track to prevent accidental clock erasure. Larger-size storage-memory drums can be provided to fit any specific application. The Datacom will also display and correct information stored in the computer's own internal memory when linked directly to the computer memory circuits.

OPTICAL SCANNING
INTRODUCED IN TABULATING CARD PUNCH

Remington Rand Univac
A Division of Sperry Rand Corp.
New York, N.Y.

An optical scanning device for data processing systems, called the Optical Scanning Punch, has been developed. It is designed to read handwritten markings on a standard 90-column tabulating card and punch the appropriate code holes into the same card. It works at the speed of 150 cards per minute, it does not require the use of a special magnetic pencil -- any soft lead pencil will do -- and no special symbols are needed. It reads numerals as well as normal pencilled notations such as check marks, lines, X marks and circles.

By eliminating the need for manual card punching from original source documents, the device drastically reduces the most time-consuming phase of punched-card data processing and automatically detects improperly marked cards.

As many as 40 columns of information can be marked on one side of a standard 90 column card. Suitable cards can be designed to provide 80 columns of marking, using both sides. The marking area for each position on the card (which determines the digital value of the mark) is a relatively large rectangle, so that only a reasonable degree of precision is required of the person marking the card.

The machine is equipped with a sensitivity control mechanism which allows adjustment for cards bearing marks of varying density, thus making it possible to process cards which have been too lightly marked with a pencil and others which may be smudged by dirt or improper erasures.

On reading a card with a missing mark or a double mark, the machine automatically catches the error in one of two ways: it either stops until the error has been corrected, or continues, while automatically segregating the error card into a special reject pocket. Then the reader stops, indicator lamps on the machine's operating control panel automatically signal the type of error and indicate the location of the improperly marked columns.

190,000 STOCK ITEMS HANDLED BY COMPUTER

James E. Burd
Spiegel, Inc.
Chicago 6, Ill.

One of the nation's largest mail order houses, Spiegel, Inc., has installed a powerful new computer system -- the IBM 7070 -- which will ultimately provide daily electronic control over its more than one million customer accounts.

The company has a long range program of automating clerical operations using electronic data processing facilities.

The new system will also eventually provide automatic inventory control for some 190,000 stockkeeping units; therefore the company will probably be the first major mail order house in the country to achieve complete inventory control on a computer.

The system installed is comprised of 22 separate pieces of equipment and incorporates three basic types of data processing -- punched cards, punched paper tape and magnetic tape. Eight magnetic tape drive units each will be able to feed data to the computer at speeds ranging from 15,000 to more than 60,000 alpha-numeric characters per second, while data on paper tape is fed at the rate of 500 characters per second.

Extensive use will be made of the new data processing facilities for other applications, such as sales and marketing research, payroll accounting, credit research and other accounting functions.
A new digital telemetering system that makes possible transmission of integrated data over existing analog telemeter channels has been produced.

The system is designed to accumulate and register digital data inexpensively, and yet maintain the usual high accuracy inherent to digital techniques. It is believed to be the first system available that can share an existing frequency-type channel, eliminating the need for additional channel facilities.

A typical application for the device will be to transmit and record kilowatt-hour data from electric utility tie-lines and substations. In the case of tie-line applications, the engineers said, the equipment will handle both "KWH-in" and "KWH-out" data.

The device is also expected to prove useful in petroleum, natural gas, and hydrostation data collection, where it will permit integrated flow values to be telemetered over existing rate-of-flow channels and recorded digitally at the control point.

Advantage of the equipment is that it 1) eliminates the need for a separate channel, and 2) avoids the inherent one percent error characteristic of integrated analog signals. With the new equipment users will be able to telemeter and record integrated digital data from the sensing source with higher accuracy and at roughly the same cost of adding a separate integrating device.

The system's transmitter accumulates pulse signals and sends totalized data to the receiver at intervals programmed by a built-in timer. Values are relayed in two or three digit form. Since the transmission sequence takes only about four seconds, the interruptions this causes in the analog recording system are negligible.

Although the digital signal will be "seen" by the rate readout devices, these are indicated as "pips" which can be identified by their regular occurrence. If desired, the rate-recording and associated control devices can be automatically switched out during transmission of the digital signals.
The Auto-Control Unit of the PHILCO 2000 provides a means of interrupting a program whenever specified conditions appear...

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Upon completion of approximately two months of training, new employees will be assigned to either the headquarters staff or at our expense to one of our regional offices in a major metropolitan area.

If you are a Mathematician, Physicist or Electronic Engineer, or equal, you are invited to investigate Programmer Opportunities in Applied Mathematics, Automatic, Commercial, Scientific and Diagnostic programming. Inquiries are also invited from experienced Computer Sales Representatives and Field Engineers.

APPLY

Mr. John Felos
Professional Employment Mgr.
PHILCO COMPUTER DIVISION
Willow Grove, Pennsylvania

Famous for Quality the World Over
During the last two decades electronics has become one of the most exciting industries of all times. It is exciting because of its diversity and because of the many challenges it offers. Electronics also attracts interest because of its potential for spectacular financial growth.

**A New Electronics**

This situation has been brought about by a new electronics that originated about 20 years ago, and which is based on sophisticated applications of recent developments in science and technology. This new electronics lives close to the frontiers of science, and is exciting because of its diversity and because of the development of new products. It is characterized by the transistor and other solid-state electronic devices, by electronic computers, by microwave technology in general and microwave tubes in particular, by automation, by the electronics associated with outer space research, etc.

**Educational Institutions**

In the new electronics, education and also educational institutions have a new and increasingly important role. To the individual interested in the new electronics, formal university training is essential because of the concepts involved in the more advanced and interesting devices are too complex to be acquired by a combination of home study and on-the-job experience. In fact, a minimum of one full year of graduate training is becoming almost a necessity for the bright young man who wishes to participate importantly in the technical aspects of the rapidly moving and most promising areas of electronics. A Ph.D. has become desirable for the man who aspires to be a technical expert.

Concurrently, the university as an institution is acquiring a new significance. Industry is discovering that for those types of electronic activities that involve a high level of creativity of a scientific and technological character, it is more important to be located near an educational institution (i.e., near a center of brains) than near markets, raw materials, components suppliers, transportation, or factory labor. This is because: First, universities are the sources of the highly trained young men who represent the most important raw material going into creative electronics. Second, universities, through their research activities, are sources of ideas; a few of these ideas are directly exploitable commercially, while many others contribute to an understanding that stimulates useful invention and innovation on the part of industry. Third, the faculty members of a good university provide a panel of experts possessing a wide range of highly developed skills available on a consulting basis to aid industry with its problems; thus even a small company near a university can have access to specialized knowledge in depth on a basis that it can afford. Fourth, a university close at hand can provide educational opportunities for employees, whereby bright young men with good potential but inadequate training can be upgraded, and whereby all can be kept abreast of new scientific developments and technological changes. Finally, in an intangible but very real way, a university provides an atmosphere that stimulates creativity and that also makes a community attractive to scientifically minded individuals.

**The Factor of Education in the Future of Electronics**

When these various factors are viewed in broad perspective, it is seen that education is perhaps the most significant factor affecting the future of electronics. Education is a natural resource of first importance to that part of the electronics industry that is growing through creative activity. Thus, the Boston area may be stagnant in many areas of commerce, but it is one of the liveliest places in the country for the new electronics. The reason for this is easily traceable to the Massachusetts Institute of Technology and Harvard University. Similarly, a spectacular development of creative electronics has taken place on the San Francisco Peninsula during the last dozen years. Stanford University is at the geographical center of this development, and this is not an accident. Stanford University has over 400 day students in its graduate program in electrical engineering, and it trains more Ph.D.'s in electronics than any other school in the country. The faculty at Stanford in the field of electronics also directs a $3.5 million per year research program, the results of which are open to industry.

**Electronics in the Midwest**

Electronics in the midwest in general, and in Chicago in particular, lacks the explosive character of electronics on the Pacific Coast and in New England. This region is not regarded as leading in the development of new ideas and in the opening up of new fronts of activity. An illustration of this is provided by the article “The Egghead Millionaires” appearing in the September issue of Fortune. This paper is about the new breed of young industrial entrepreneurs whose personal roots are founded in technology and applied science, and who have built successful companies based on this fact. Of the 18 proper names men
toned in this article—examples of egghead millionaires—only one lives in the midwest between the Alleghenies and the Rockies. Likewise, while MIT, Stanford, and other schools get favorable mention, not a single college in the whole midwestern area is even referred to. Now there are at least some egghead millionaries in the midwest, but the fact remains that the spotlight is clearly not on the midwest when such matters are being talked about. This is because electronics in the midwest has for over a quarter century been more interested in the exploitation and the refinement of existing ideas and existing product lines than in opening up and entering new fields of activity. It has been more concerned with trying to make money by redesigning established products than with attempting to grow from the exploitation of new products barely invented. It has not developed a strong component of research, and as a result has spawned no Bell Telephone Laboratories, David Sarnoff Laboratory, Lincoln Laboratory, General Electric Research Laboratory, etc. In short, the midwest is still preoccupied with the old electronics.

**Reasons for Lagging**

Now why has the midwest lagged in the new electronics? In searching for the answer one starts with the period before World War II. At that time the midwest was the great center of the nation in electronic manufacturing, with emphasis on such consumer items and components as radio receivers, loud speakers, volume controls, sockets, transformers, etc., in which practical design know-how, materials costs, and efficiency in mass production were critically important in a highly competitive struggle for survival. Early in the decade before the war, the technology of these products had become stabilized to the point where they offered only limited opportunity for creative work growing out of new developments in science and technology. As a result, sophisticated formal college training was not required of the engineers and scientists involved. When the war brought microwave radar, servomechanisms, sonar, the first solid state devices (diodes), computers, etc., the electronics industry of the midwest was unprepared for this turn of events. It did not include very many people who were technically qualified to take a leading part in this type of work, and it did not have in its midst industrial research laboratories capable of pioneering these new developments as did the east with Bell Telephone Laboratories, General Electric, and RCA. Neither did it have government laboratories such as the Naval Research Laboratory. It also did not develop war research laboratories in electronics associated with universities and staffed with academic types, as typified by the Radiation Laboratory at MIT, the Radio Research Laboratory at Harvard, Underwater Sound Laboratory at Harvard, and the Airborne Instruments Laboratory at Columbia, etc.

As a result of this situation most of the electronics industry of the midwest participated only in a second-hand manner in the new electronics involved in World War II. The leadership in these matters came largely from the east coast, and when the midwest did participate it was largely in the design and production of equipment based on concepts, techniques, and laboratory models originated in the east by groups more deeply oriented in science. Midwest electronics simply did not have the scientific competence by and large to stand on its own feet with respect to these war developed techniques and devices. I have been told by men who were connected with handling war production that the lack of scientific depth of the midwest electronics industry—the lack of a research base—made it very difficult—in fact virtually impossible—to use fully the productive capacity of the midwest in getting these new types of devices produced, whereas on the east coast the production capacity for these desperately needed items was greatly over taxed because it was associated with the scientific know-how necessary to do the job.

At the end of the war electronics in the midwest, having been only superficially innoculated with the new ideas of electronics that originated in World War II, happily reverted to its old interests involving the engineering, design, and production of products and components emphasizing the consumer market, and found in television a sufficient challenge. Although this was highly profitable as long as television was being introduced into new areas, it had limited opportunity for further growth once television was established in every community. In recent years the total dollar sales of television and radio receivers has not been growing much and not much growth can be expected in the years ahead. Moreover, the Japanese may well get an increasing share of the total in the future. During the lush profit days of television, too few of the midwest organizations used their television profits and their existing engineering organizations as a means of establishing a strong position in other areas of electronics that had much greater potential for long range expansion. In this connection, Motorola is an exception, and as a result it has achieved a growth situation not dominated by its consumer goods business.

**Electronics on the East Coast**

In contrast with the post war course of events in the electronics industry of the midwest, the electronics industry of the east coast continued its interest in the further development of the new concepts introduced into electronics during the war, and maintained and even strengthened research and technical staffs that were strongly based in science. The result has been that the east is now strong in the new areas of electronics such as microwave tubes, electronic computers, transistors and diodes, ferrites, automation, guided missiles, pulse communication, instrumentation, etc. These are the areas that have almost unlimited growth possibilities, in contrast with the consumer goods business.

**Electronics on the West Coast**

In view of the above, one may wonder why west coast electronics has grown so rapidly during the last 15 years, when it was much less important than the midwest electronics both before and during the war. The answer is that after the war some very strongly science oriented electronics concerns began to develop on the west coast. Hewlett-Packard, Tektronics, Varian Associates, Hughes Aircraft, and Ampex are examples. These companies prospered, and demonstrated the
possibilities of growth and of profits through developing products in which a high proportion of the value was in the engineering involved, in contrast with the principal products of the midwest where the value resided to a much greater degree in material and labor costs. Thus the west, without a tradition, got started in a new and forward looking pattern at the end of the war. An important feature of this development of electronics in the west has been the strong emphasis on graduate training. Many are familiar with the phenomenal concentration of men with M.S. and Ph.D. degrees that Hughes had achieved by the early fifties, and this is a pattern which has been subsequently copied by numerous other west coast companies. This concentration on brains, and along with it an interest in education and in universities has been symbolic of west coast electronics, and probably accounts in large measure for the fact that electronics has grown so rapidly in the west.

**Midwest Interest in the Ph.D.**

In contrast with the electronics industries on the east and west coasts, the electronics industry of the midwest has not been much interested in the man with the Ph.D. and what he can contribute to the opening up of new frontiers and the resultant development of new products. It has also failed signally to exploit the educational resources and the educational institutions that are available to it. It was not willing during the past fifteen years to put much of its own money into the development of new kinds of products; in fact until recently it hasn't shown much interest in research and development even when the government would pay the bill. To be brutally blunt and frank the major path of electronics took off in a new direction in the decade 1940-50, but too little of the electronics industry of the midwest followed the turn. There are, of course, individual exceptions to these general statements, but in broad terms what is said here is true. Electronics in the midwest somehow just has not developed much enthusiasm for staffing up with high concentrations of people who have the highly technical background required to do creative work in the new and rapidly growing areas of electronics. This is emphasized by the fact that there are various companies with headquarters in Chicago that do their creative work elsewhere in the country, while examples of the reverse are scarce indeed. This situation is further emphasized by the distribution of Fellows of the IRE. These men have received this award in recognition of creative technical or administrative leadership. The Chicago Section currently includes about 15 fellows, while the San Francisco Section has 32, and the Los Angeles Section has 47.

**Anti-Intellectualism**

The basic problem of midwest electronics is what academic people call anti-intellectualism. Speaking in broad terms, the midwest is more interested in the man with a lot of practical know-how than in the man whose strength is depth of training in advanced science and technology. Not enough of the midwest companies and their leaders know how to make effective use of the "egghead" type. As a result the midwest companies don't really fight for the men with master's and doctor's degrees in electronics being produced by their own universities, let alone by universities in other parts of the country. The consequence is that the midwest schools don't produce such men in large numbers. For example, Stanford alone, and Stanford is not a large school, produces more men each year with advanced degrees in electronics than do all of the institutions in the entire state of Illinois together. Put another way, the state of California produces more men with advanced degrees in electronics each year than do the states of Illinois, Wisconsin, Indiana, Michigan, Minnesota, Missouri and Iowa all put together. Under these circumstances is it any wonder that many of the brightest boys graduating from midwest schools with bachelor degrees are recruited by west coast colleges, and after completion of advanced training there devote their subsequent professional careers to advancing electronics in the west. The same is true of such institutions as MIT and Harvard, who likewise transplant a group of the brightest young people from the midwest to the east coast for advanced training, after which they either settle down somewhere on the Atlantic seaboard or move to California in order to do the type of work they have come to like and for which they see an attractive future.

Another facet of this same anti-intellectualism referred to above is that the electronics industry in the midwest has not adequately appreciated the importance of the educational institutions that are in its midst, and has not made full use of them. It is surprising that there are not more electronic companies of the creative type clustered around such schools as the University of Illinois, Purdue, University of Michigan, Michigan State University, Wisconsin, Northwestern, etc. This is the result both of lack of vision on the part of industry and of lack of leadership on the part of the educational institutions. On this particular point, the principal blame may well be placed on the doorsteps of the universities involved; they have had it in their power to take much more initiative than they have taken, and it was in their self interest to do so.

**Provocative Intent**

These remarks have deliberately attempted to be provocative. The electronics industry of the midwest is in a rut and needs to be jolted out of it. It currently lacks the glamour and the growth potential that it should have. Electronics in the midwest has a long tradition and a successful past. It can have a worthwhile future, and can participate more in the good new things that are ahead in the field of electronics during the next several decades, but only by developing with the times. If it just plods along, the midwest will become increasingly the peon group in the electronics industry, which does hard, unexciting work and makes a living, while at the same time the east coast and particularly the west coast electronics industries will have all of the fun and most of the growth. If the midwest continues in the present pattern, it will continue to be the happy hunting ground where bright young people are recruited to go to the east and west coasts to make the electronics industries there steadily stronger and ever growing.
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CALENDAR OF COMING EVENTS


Mar. 16-17, 1961: Conference on Data Processing Techniques and Systems, sponsored by Numerical Analysis Laboratory at the University of Arizona, featuring "Discussions of data processing problems in engineering and scientific research," Tucson, Ariz.; contact Miss Betty Takvam, Conference Secretary, Numerical Analysis Lab., Univ. of Arizona, Tucson, Ariz.


April, 1961: Joint Automatic Techniques Conference, Cincinnati, Ohio; contact J. E. Eiselein, RCA Victor Div., Bldg. 10-7, Camden 2, N. J.


May 7-8, 1961: 5th Midwest Symposium on Circuit Theory, Univ. of Ill., Urbana, Ill.; contact Prof. M. E. Van Valkenburg, Dept. EE, Univ. of Illinois, Urbana, Ill.


May 9-11, 1961: Western Joint Computer Conference, Ambassador Hotel, Los Angeles, Calif.; contact Dr. W. F. Bauer, Ramo-Wooldridge Co., 8433 Fallbrook Ave., Canoga Park, Calif.


Sept. 4-9, 1961: Third International Conference on Analog Computation, organized by the International Association for Analog Computation and the Yugoslav National Committee for Electronics, Telecommunications, Automatic Control and Nuclear Engineering, Belgrade, Yugoslavia.

Sept. 6-8, 1961: National Symposium on Space Elec. & Telemetry, Albuquerque, N. M.; contact Dr. B. L. Basore, 2405 Parsifal, N.E., Albuquerque, N. M.


Sept. 6-8, 1961: 1961 Annual Meeting of the Association for Computing Machinery, Starler Hotel, Los Angeles, Calif.; contact Benjamin Handy, Chairman, Local Arrangements Committee, Litton Industries, Inc., 11728 W. Olympic Blvd., Los Angeles, Calif.

Sept. 11-15, 1961: The Third International Congress on Cybernetics, Namur, Belgium; contact Secretariat of the International Association for Cybernetics, 13, rue Basse Marcelle, Namur, Belgium.


Oct., 1961: National Symposium on Space Elec. & Telemetry, Albuquerque, N. M.; contact A. B. Church, 1504 Princeton, S.E., Albuquerque, N. M.

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Computers and Data Processors:
- Survey of Special Purpose Digital Computers (Sept. 1958)
- Computer Census (July 1960)
- Types of Automatic Computing Machinery (Nov. 1958)

Products and Services in the Computer Field:
- Products and Services for Sale or Rent (June 1960)
- Classes of Products and Services (June 1960)
- Types of Components of Automatic Computing Machinery (Nov. 1958)
- Survey of Basic Computer Components (Feb. 1959)

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- Over 300 Areas of Application of Computers (Jan. 1960)

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- New Patents (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.

Beginning with February 1960, Computers and Automation publishes 24 "issues" a year, closing at semimonthly intervals. The dozen regular issues, letterpress, close about the 2nd of the month. The additional issues (numbered B), photo-offset, devoted to "News of Computers and Data Processors: ACROSS THE EDITOR'S DESK" close about the 15th of each month. Both issues in each month are bound together and mailed as a unit to subscribers, except that in June they are not bound together, but are mailed separately—because the regular letterpress issue in June is The Computer Directory and Buyers' Guide, which due to its size of over 80 pages is ordinarily delayed till late in the month.

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COMPUTERS and AUTOMATION for February, 1961
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.

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 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.

If you write to a publisher or issuer we would appreciate your mentioning Computers and Automation.


A chemical company uses a digital computer to control chemical processes, in particular, the process of refining ammonia. This article presents a thorough discussion by several authors of the system, describing how the mathematical model was established, how the ammonia is made, and how complete closed-loop control is effected. Economic aspects are discussed.


The Digital Data Processor, a system which serves as the necessary link between telemeter devices and digital computers, is described. The DDP system's many features include tape and format translation, operation in various modes, and flexibility in the areas of input-output operation. These features and the modes are described.


This paper discusses the possibilities of self-reproduction in various mechanical systems which range from simple, i.e., zip fasteners, to complex, i.e., massive units composed of a great number of components. Machines described fall into two categories: those which can reproduce without self-destruction, and those which cannot. In most cases, the reproduction process involves the creation of cellular processes. The author concludes with a philosophic discussion on the question of whether these mechanisms can be considered "alive."

A Computer as an Experimental Laboratory Machine for Research on Automated Teaching Procedures / Harry F. Silverman / Behavioral Science, vol. 5, no. 2, April, 1960, p 175 / Mental Health Research Institute, Univ. of Michigan, Ann Arbor, Mich.

A plan for using a computer as a tool for teaching procedures is described. The computer is involved in studying various teaching methods and the various teaching methods and the various teaching methods are listed, for computer people interested in further study of the theory.

Intelligence in Computers: The Psychology of Perception in People and in Machines / Leonard Uhr / Behavioral Science, vol. 5, no. 2, April, 1960, p 177 / Mental Health Research Institute, Univ. of Michigan, Ann Arbor, Mich.

After an introductory statement which tends to relegate the computer to idiot status, the author proceeds to explain how the computer, when directed properly, can be used in highly intelligent ways. In particular, machines that "perceive" are discussed.


Often, articles and discussions about computer centers concentrate on the personnel and hardware problems. This article concentrates instead on the question: what effect will computers have on established visions? The field in question is psychology, and the author discusses the influences of computers, and mentions some applications in the field.


This article discusses some of the conditions which must be established for a successful multiprogram system, mentioning the problems which make the conditions necessary. The authors then explain how the STRETCH meets the conditions prescribed.


The first part of this paper discusses in detail the basic concepts and formats of Turing, i.e., "general effective" computability, developed between 1933-43. By "general" is meant that theory which results from removing all limitations of either time or memory upon the action of the computer. The discussion includes a number of theorems and their corollaries which apply to Turing's system, some of which are proven, others being left as exercises for the reader. In the second part of the paper, the author suggests some further interesting applications of theorems that have appeared at an increased rate, up to the present time. A number of references are listed, for computer people interested in further study of the theory.


Research into past attempts to automatically transcribe hand-written Morse code into printed copy led to development of a system which can make successful simulation of manual Morse transcription devices, on a general-purpose digital computer. Problems of logic were solved independently of computer engineering. The results of the research are discussed in this article, and experiments with the computer are described.


An increasing number of British universities are establishing data processing centers on their respective campuses. This article discusses the aims of such centers, and describes some of the work accomplished by the centers at the University of London.


This report on Soviet computer technology is based on a 14-day visit to Moscow, 1960. It discusses current developments, achievements and progress in the design and use of data processing equipment in Russia. The URAL and BESM computers are described. Conclusions reached regarding the state of Russian technology include: technology, several years behind but may be expected to advance rapidly; logical thought and application, comparable with Britain.


The first part of this article presents information about minimizing the number of terms in a logical truth function, appropriate computer circuits necessary to realize the functions, and an algorithm which uses decimal numbers obtained from a binary-decimal conversion of the terms of the Boolean function. Then, several computational aids are given which allow for the development of the algorithm to the solution of problems on a computer.


This article departs from the manager's point of view the extent of management's reliance on the computer, and its mathematical models, which, characteristically, are considered the black boxes of industry. The various decisions that are made, and the various ways of making
them, are discussed. Five conclusions are included which indicate how to adapt to
and make use of the new computer technology.

/ The Office Appliance Co., 600 West Jackson Blvd., Chicago 6, Ill.

An interview with the inventor of the "Termatrix," a simple inexpensive system for
information retrieval, discloses the type of work that the system can do, and some
information about data retrieval in the future. A thoroughly detailed description of
the system is presented.

Human-Factors Engineering / H. J. Williams, Supervisor, Human Factors En-
ingineering, Melpar, Inc. / Industrial Research, vol. 2, no. 5, Oct.-Nov., 1960,

Some experiments conducted to determine the behaviour of human beings under
extreme conditions, are described. Human beings are used as "guinea pigs," while a computer is used to process the results and findings. Moreover, certain conclusions regarding the relationship between man and machine are discussed.


The Common Business Oriented Language, a compiler which is being designed to serve as a common language for computers, is described in detail. The language and the efficacy with which it is adaptable to all systems, is discussed. The current status of its development is explained, and the general workings of the compiler are described.

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.

June 28, 1960 (Cont'd)
2,943,312 / Ferdinand G. von Kummer, Bloomfield, and Frank M. Gallagher, Bristol, Conn. / Royal McBee Corp., Port Chester, N. Y. / A data translating unit.

July 5, 1960

July 12, 1960
2,944,733 / Kenneth L. Austin, Grapevine, Tex. / Burroughs Corp., Detroit, Mich. / A data conversion system.
2,944,738 / Melvin E. Moron, Santa Clara County, and John W. Haanstra, San Jose, Calif. / I. B. M. Corp., New York, N. Y. / A logical data computing device.
2,945,511 / Tom Kilburn and George R. Hoffman, Manchester, Eng. / I. B. M. Corp., New York, N. Y. / A magnetic storage system.
2,945,517 / Robert D. Fisher, Jerome S. Sallo, and Ignatius Tsu, Dayton, Ohio / The National Cash Register Co., Dayton, Ohio / A magnetic data storage device.
2,945,720 / Arnold Lesti, Arlington, Va. and Andrew R. Beccetl, Wheaton, Md. / U. S. A. as represented by the Sec. of Commerce / An analogue to digital converter.

July 19, 1960
2,945,538 / Howard M. Little and Johannes K. Notthoff, Los Angeles, Calif. / Unicon Eng. Corp., Los Angeles, Calif. / A coding apparatus for information storage tapes and the like.
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2.951,240 / Andrew H. Bobeck, Chatham, N. J. / Bell Telephone Lab., Inc., New York, N. Y. / A magnetic core circuit.


2.951,242 / Charles R. Fisher, Jr., and Ben A. Harris, Rochester, and Darrell H. Webster, Palmyra, N. Y. / General Dynamics Corp., Rochester, N. Y. / A serial-to-parallel binary code converter device.

September 6, 1960


September 13, 1960


2.952,839 / Adolfo A. Capanna, Stamford, Conn. / Pitney-Boxes Inc., Stanford, Conn. / An electrical signal storage device.


September 20, 1960

2.953,771 / Ralph J. Stutz, Boulder, Colorado / U. S. A. as represented by the Secretary of Commerce / A magnetic core memory having magnetic core selection gates.

2.953,775 / Vernon L. Newhouse, Mooresville, and Noah Shumara, Puyallup, N. J., R. C. A., a corp. of Delaware / A magnetic storage and counting circuit.

2.953,776 / Eli Blutman, Riverside, and Jacob M. Sacks, Corona, Calif. / U. S. A. as represented by the Secretary of the Navy / A photographic digital readout device.

September 27, 1960


2.954,161 / Kenneth E. Schreiner, Har-
EMPLOYMENT OF COMPUTERS

October 11, 1960
2,955,756 / Robert A. Jensen, Flushing, N. Y. / A serial word checking circuit.
2,955,759 / Gerhard Wolf, Munich-Pasing, Germany / A bistable flip-flop.
2,955,760 / George M. Berkin, Poughkeepsie, New York / An electronic control.
2,955,761 / Theodore Bothwell, Collingswood, N. J. / A parallel binary adder-subtractor circuit.
2,955,762 / Robert H. Hardin, Los Angeles, Calif. / A binary parallel computer.
2,955,763 / William F. Steagall, Mer­ chan­tville, N. J. / Sperry Rand Corp., a corp. of Delaware / A free running digital multivibrator.
2,955,764 / Frank A. Hill, Van Nuys, Calif. / General Precision, Inc., a corp. of Delaware / A direct coupled transistor flip-flop.
2,955,765 / Loring P. Crosman, Wil­ ton, Conn. / Sperry Rand Corp., a corp. of Delaware / An electronic data processing system.
2,955,767 / Andrew E. Brennemann, Ralph B. Delano, Jr., and Donald R. Young, Poughkeepsie, N. Y. / A binary adder-subtractor circuit.

October 18, 1960
2,957,104 / Richard M. Roppel, New­ Haven, Conn. / An analog to digital converter.

November 1, 1960
2,958,852 / Howard M. Robbins, Los Angeles, Calif., and Harold R. Kaiser, New York, N. Y. / Data storage access mechanism.
Woodland Hills, Calif. / Hughes Aircraft Co., Culver City, Calif. / A dielectric magnetic shifting f-A pulse sensing circuit.

November 8, 1960

November 15, 1960
2.560,686 / Robert de Guillard, 12 Rue Marbeuf, Paris, France / A method of and device for recording and reproducing on magnetic carriers at any speed.
2.560,690 / Daniel L. Curria, Manhattan Beach, Calif. / Litton, Inc., Calif. / A computer input-output system.

November 22, 1960
2.561,610 / Hans A. Hoschenthien, Fort Bliss, Texas / U. S. A. as represented by the Sec. of the Army / A reflected nonlinear voltage modulator in alternating current electrical analog computers.
Following is the index of advertisements. Each item contains: Name and address of the advertiser / page number where the advertisements appears / name of agency if any.

American Telephone & Telegraph Co., Bell Telephone System / Page 2 / N. W. Ayer & Son

Bendix-Computer, 5610 Arbor Vitae St., Los Angeles 45, Calif. / Page 7 / Shaw Advertising, Inc.

Berkeley Enterprises, Inc., 813 Washington St., Newtonville 60, Mass. / Page 21--

Digitran Co., 660 So. Arroyo Pkwy., Pasadena, Calif. / Page 28 / Ormsby Advertising

Farrington Electronics, Inc., Needham Heights 94, Mass. / Page 8 / N. W. Ayer & Son

Laboratory for Electronics, 1079 Commonwealth Ave., Boston 15, Mass. / Page 29 / Hoag & Provandie, Inc.

Litton Systems, Inc., Canoga Park, Calif. / Page 30 / Compton Advertising, Inc.

Lockheed Missiles & Space Div., 962 W. El Camino Real, Sunnyvale, Calif. / Page 32 / Hal Stebbings, Inc.

Minneapolis Honeywell Regulator Co., Honeywell Electronic Data Processing Div., Wellesley Hills 81, Mass. / Page 5 / Batten, Barton, Durstine & Osborn

National Cash Register Co., Main & K Sts., Dayton 9, Ohio / Pages 13 & 31 / McCann-Erickson Advertising


R.C.A., Electronic Data Processing Div., Camden, N. J. / Page 27 / Al Paul Lefton


Space Technology Laboratories, Inc., P. O. Box 95004, Los Angeles 45, Calif. / Page 16 / Gaynor & Ducas, Inc.

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