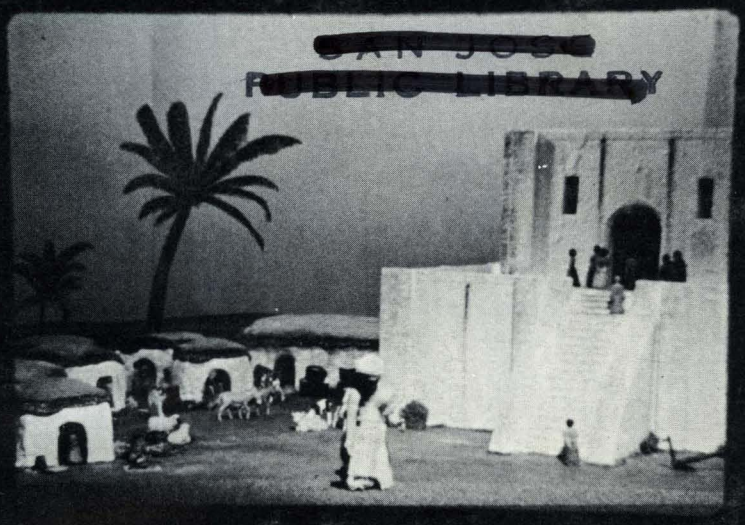
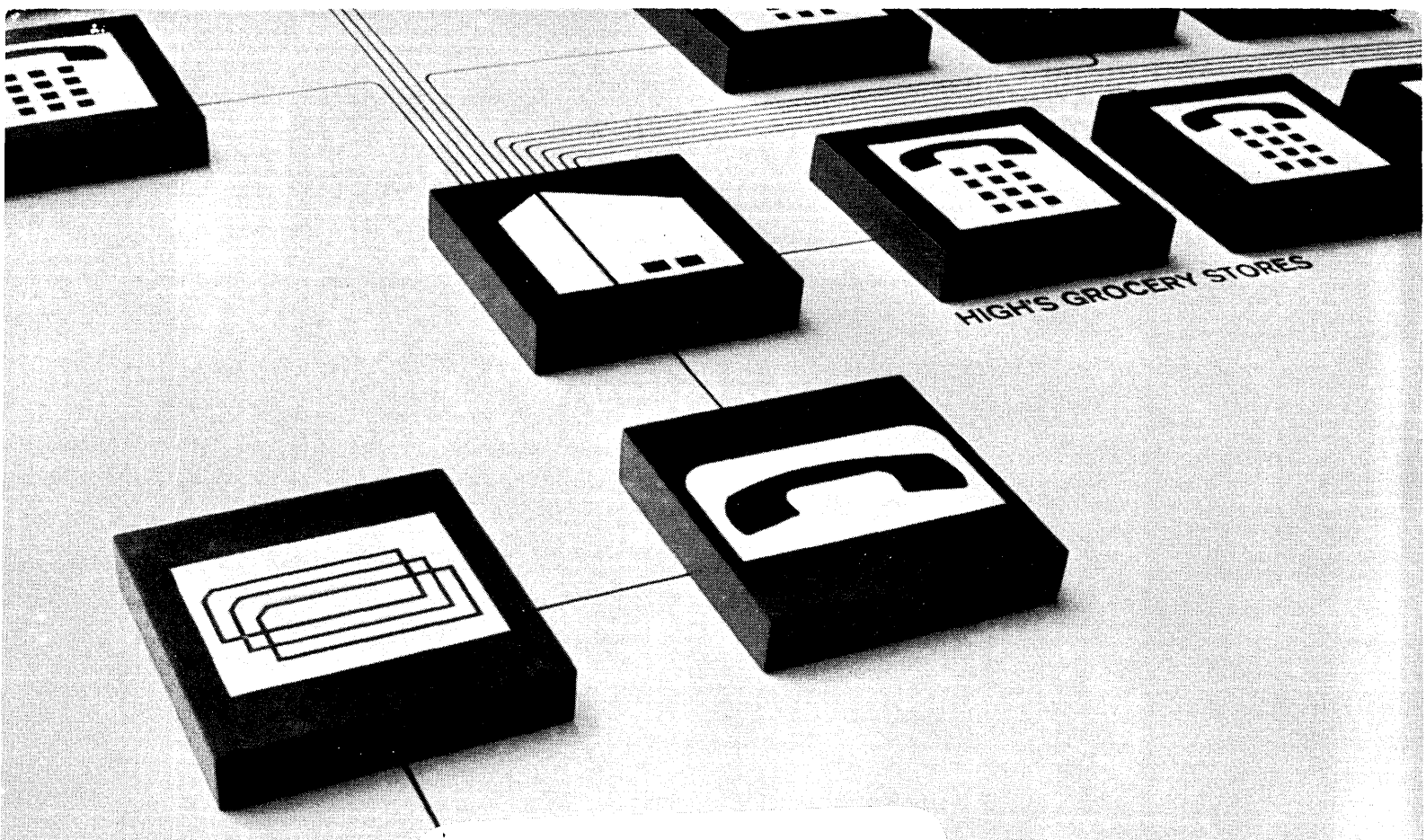
April, 1968

computers and automation

Ruling Lagash — 5500 Years Later





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The NCR Century Series of computers.

When you learn how advanced they are, you'll know why others are old-fashioned.

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Vol. 17, No. 4 — April, 1968

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APRIL, 1968, Vol. 17, No. 4

The front cover shows sixth grader Joanne Chomich trying her hand at running the ancient Mesopotamian city-state of Lagash — with the aid of a computer. Projected on the wall is an artist's conception of what Lagash looked like in its heyday, about 3500 B.C. For the story, see page 60.

Special Feature:

Electronic Data Processing and Management

Regular Features

NOTICE

***D ON YOUR ADDRESS IMPRINT MEANS THAT YOUR SUBSCRIPTION INCLUDES THE COMPUTER DIRECTORY. *N MEANS THAT YOUR PRESENT SUBSCRIPTION DOES NOT INCLUDE THE COMPUTER DIRECTORY. SEE PAGE 51.**

Departments

Are we your type?

It won't cost you anything to find out.

We know your type.

If you're presently making copies from line printer output, it's no pleasure to read. Or to handle.

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Access to Information and a Mailing List of All Computer People — II

In our January editorial, we discussed the continuing problem of access to information for everybody in the computer field, and reported some history; then we said:

> We think the time has come to go back to the simple concept of a mailing list for all computer people. *Computers and Automation* has decided to start a mailing list of all people interested in the field of computers and data processing.
>
> C&A invites everybody who is interested in the field to send us their name and address for inclusion in this list, *Computers and Automation*'s Universal Mailing List, CAUML.

We said that the rules covering the universal mailing list would be about as follows: that anybody who wishes to mail information that bears some reasonable relation to the interests of people in the computer field would automatically have permission to mail to this list, at a mailing list rental fee of $20 per thousand pieces addressed; and that the net income from the list would be contributed to worthy causes for improving education in the computer field.

We discussed the advantages of "junk mail" in the computer field; described the crazy quilt pattern of magazines, associations, and mailing lists to disseminate information in the field of computers and data processing; and concluded that it was silly to try to cover the computer field of over 200,000 persons with the existing pattern of dissemination — and that a universal mailing list was really needed.

To our astonishment, over 1100 persons have so far sent us their names and addresses for inclusion in CAUML. This is the result of just one mention in the January editorial.

We have begun putting these names and addresses not on metal plates, but on magnetic tape, under a system which will enable us to record additional information about these persons as it becomes available. An example might be a code for "Please do not send me information about . . . for I am not interested". We also plan to include in CAUML names and addresses that are in the public domain (such as an officer of a computer association, or the author of a computer magazine article).

Also we have made a decision not to record in CAUML any information which might be derogatory (such as security or credit information), and thus infringe on the privacy of an individual.

Several letters have come in with interesting comments. In particular, Michael F. Weisbard, Senior Programmer and Systems Analyst in a large bank computer installation in Chicago, has written us as follows:

> I have recently re-read your January Editorial, and think it is a most useful idea. Several technical points, however, might be reexamined for possible improvement.
>
> (1) May I argue for a computer-based system of keeping and converting the lists? Several possible advantages appear:
>
> (a) You could carry more information about each name, such as what computers he (or she) has worked on, what languages, what committees and groups affiliated with, etc.
>
> (b) You could form sublists, for better file organizations and accessing.
>
> (c) A computer-based system would allow you to make each search-request more effective because you can program to count-classify-qualify each name and to show the relationship of the names extracted from the total population represented.
>
> (d) Speed and cost could probably be shown to be better for the life of the system, than for the metal plates. This is particularly true in a file where attributes to basic information (such as a person's address) change often.
>
> (2) May I suggest investigation of several supporting ideas?
>
> (a) Organization of the file:
> ZIP-code order is desirable because that is what mailers and the post office seem to require. The advantage of zip codes is lost if the post office (or bulk mailer) must physically sort each item. Zip coding is also useful for geographic selection and for relating to census/economic data. Alphabetical within a zip code might be desirable.
>
> (b) File system: Several short items in your magazine have announced the availability of file systems for storing-extracting-summarizing data. Several that come to mind are: QUICK QWERY from Consolidated Analysis Centers Inc. (CACI), Los Angeles, Cal.; MARK IV from Informatics, Inc.; Sherman Oaks, Cal.; PDQ Information Retrieval System from Applied Data Research, Inc., Princeton, N.J.; and GRS (General Retrieval System) from Information Science Inc., New City, N.Y. Alternatively, I should think that the basic file maintenance system shouldn't be too complex in COBOL, and could be readily done by a local service organization. The benefit of QUICK QWERY and the others is that they are available and probably well-tested, as well as being versatile.
>
> I am enclosing pertinent information about myself on a separate sheet, for inclusion in the CAUML mailing-list file. I hope these suggestions and ideas are of some use and benefit to you.

We promptly telephoned Mr. Weisbard, and asked him please to become a member of an Advisory Committee on

(Please turn to page 55)

Weather has no respect for national boundaries. Perhaps that's why international cooperation in forecasting has for a long time been a constant in an area fraught with inconsistency.

Cooperation is important, but it's not the only answer to more accurate and longer range forecasting. Computer technology is a key factor.

This is fortunate for the United States, because no other nation is further advanced in this area.

And no other nation's weather research establishment has two UNIVAC® 1108 Systems at its disposal.

Scientists at the Environmental Science Services Administration's Geophysical Fluid Dynamics Laboratory use them to simulate the earth's atmosphere by means of theoretical models.

Their goal is to develop a satisfactory model comprised of elements which closely approximate those of the real atmosphere.

By changing just one variable in this mathematical model—sea surface temperature, snow cover, atmospheric pollutants, for instance—scientists can in effect experiment with the atmosphere and determine how that one alteration influences the entire model.

These simulations are so complex, the elements so numerous that a 24-hour forecast for the northern hemisphere can take 10 hours of computing.

Despite this scientists are optimistic. In fact, current results indicate that reliable 14-day forecasts are a distinct future possibility. Also, the observational network must be expanded to the whole of the earth.

It will take some time, therefore, before two week forecasts become standard. Scientists estimate five to ten years.

But if it weren't for computers, it might take forever.

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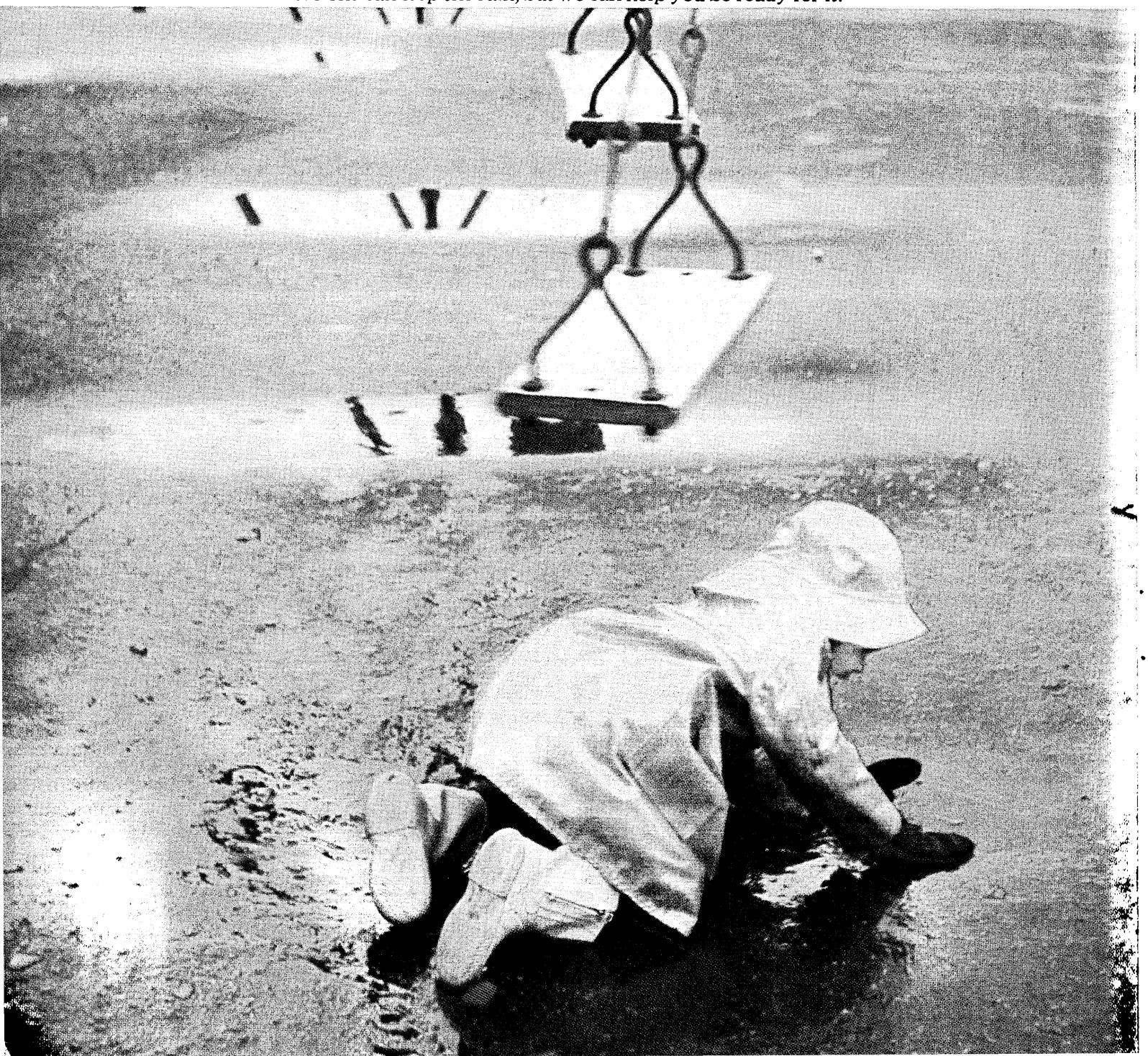

Letters To The Editor

Computer Graphics

I am the engineer at the graphics console used as the cover for your February, 1968 issue, and would like five copies of your magazine for my personal distribution.

For your own interest, I represent Body Engineering Applications and have devised a method of analyzing and designing mechanical linkages, e.g. convertible top mechanisms, hood hinge mechanisms, from suspensions, etc.

I am glad to see the interest that your publication has shown in the field of computer graphics, especially the Ford Computer Graphic's Project ("The Ford Computer Graphics Project", *Computers and Automation,* November, 1967, page 35).

LAWRENCE E. ANTINONE
Dearborn, Mich.

(Ed. Note — *Copies sent.*)

"Embezzling Primer"

The "Worth Reading" section of the February *Systems & Procedures Journal* refers me to your article, "Embezzling Primer" (*Computers and Automation,* November, 1967, page 41). I am interested in reading this article and in having a look at your publication. Will you please forward me a copy of the November, 1967 issue? I will be happy to accept billing.

J. C. STEPHENSON, JR.
Systems Manager
Newport News, Va. 23607

(Ed. Note — *Copy sent.*)

Computer Art Exhibition

An article in your issue of August 1966 in which there is a discussion with photographs concerned with your annual Computer Art Contest has been brought to my attention.

I suspect that other galleries and museums have displayed an interest in these works for exhibition purposes; so perhaps you have already given the matter some thought.

I would be intensely interested in having one of your annual Computer Art Contests for exhibition at our gallery some time during the school year of 1968-69, and would like to enquire about availability.

ALVIN BALKIND,
Curator
Univ. of British Columbia
Vancouver 8, Canada

(Ed. Note — *A copy of our August 1967 art contest issue is being sent to you. We do not have originals of the computer art to loan, but I would suggest that you blow up photographically the art shown in our contest issue and use it for exhibition, with appropriate credit to* Computers and Automation.)

Keeping Up With Reading

Regarding "The Problem of Keeping Up With One's Reading" (editorial in *Computers and Automation,* January, 1968), we suggest an additional scheme: SCHEME 6: Subscribe to *Data Processing Digest,* as many of our subscribers have for the past 14 years.

MARGARET MILLIGAN,
Publisher
Data Processing Digest, Inc.
Los Angeles, Calif. 90035

(Ed. Note — *Thank you for your "Scheme 6"; but it seems to me to be included in Scheme 3!*)

Correction

Please allow me to call your attention to a slight mistake in the address of the Information Processing Association of Israel (IPA) which appears on page 132 of the June, 1967 issue of *Computers and Automation.*

The correct address is: IPA, c/o Dr. D. Chevion, Director, Office Mechanization Centre, Hakirya-Romena, P.O. Box 3016, Jerusalem, Israel.

DA. SALOMON M. DORF RUDICH
Havana, Cuba

Library Selection Guide

The following annotation for your magazine will be included in a list I am preparing for use as a magazine selection guide by libraries:

"This is a good choice for a general periodical on computers, data processors, automation. Lead articles, reflecting state-of-the-art in a multitude of areas (design, programming, applications, education, even art by computers), although ostensibly written on an intermediate level, are still intelligible to the layman. Market reports, newsletters, monthly computer census, new patents, announcements of government contracts, also make this a necessity for any special library serving computer clientele. The June issue alone, consisting of a roster of organizations, products, services, glossary, etc., justifies a subscription."

W. A. KATZ,
Professor
School of Library Science
State University of New York
Albany, N.Y. 12203

(Ed. Note — *Thank you.*)

C.a

MULTI-ACCESS FORUM

IN FAVOR OF MERGING TWO SOCIETIES THAT SUPPLEMENT EACH OTHER

C. M. Rollins
Director, Information Systems
Applied Technology (Div. of Itek Corp.)
3410 Hillview Ave.
Palo Alto, Calif. 94304

I was fortunate to attend the Data Processing Management Association (DPMA) Conference in Boston in June, 1967. At this convention there was considerable representation (several thousand delegates) from various companies that utilize electronic computers for Business Data Processing. I also attended the Systems and Procedures Association (SPA) Conference conducted in Detroit, Michigan in October 1967. The SPA seminar was primarily conducted for systems people representing various companies, and over 2,000 delegates attended. In reviewing the sessions at the DPMA Conference and the SPA Conference I drew some conclusions.

The DPMA Convention in Boston was not very well organized, and it was confusing for delegates to find and attend the proper sessions. However, the DPMA Convention had considerable computer equipment and peripheral equipment on exhibit which was very interesting and informative. On the other hand, the SPA conference in Detroit was very well organized; the delegates seemed pleased with the physical layout, the easy system for room identification, and the relative ease in finding and attending the right sessions. However, at the SPA seminar in Detroit, there were no computers or related peripheral equipment exhibited. The exhibits consisted primarily of Reproduction Equipment.

I would like to recommend that the Data Processing Management Association be merged with the Systems and Procedures Association. There is little justification for having these two groups separate, since Systems and Data Processing are intricately woven together. I think a new combined organization should be created. Consolidation of the two groups would produce a much more effective, more powerful group and could do a considerably better job of explaining and selling the uses of systems and data processing in industry, business, and government. It seems to me than an ecumenical movement should be started on the merging of these two groups.

The combined organization would pool objectives, purpose, resources, facilities; the members would strengthen their overall position and prestige in the business world. Some of the results or objectives from such an integrated organization could be: professional status; standard requirements for computers for business systems; standardization in systems and in data processing; greater power and influence in systems and in the data processing profession; commingling of assets, talents, objectives, and facilities; and elimination of redundance and duplication of effort.

I am directing similar letters to the President of the DPMA, the Editor of *Data Processing* Magazine and the Editor of the *Systems and Procedures Journal.* I hope that a movement can be started for the merging of these two groups.

INTEGRATED CIVIL ENGINEERING SYSTEM (ICES) FOR PROGRAMMING — NON-PROPRIETARY

Civil Engineering Systems Laboratory, Room 1-163
Department of Civil Engineering
Mass. Inst. of Technology
Cambridge, Mass. 02139

The Department of Civil Engineering at Massachusetts Institute of Technology has recently developed and released a large-scale, non-proprietary computer system called the Integrated Civil Engineering System (ICES). The system was developed over the past three years as a cooperative venture between government, industry, foundations, and universities concerned with the use of information systems in civil engineering. The cost of the development exceeds $3 million.

ICES is built upon past work of the Department of Civil Engineering at MIT, including COGO, STRESS and DTM. It provides the engineer with a coherent set of information processors to serve as the basis of his problem-solving needs, rather than making him rely on many special purpose programs for specific applications. The one system allows a non-computer professional to solve many different problems in many areas of engineering.

ICES contains a series of subsystems corresponding to various engineering disciplines. Subsystems presently exist for geometric problem solving, project scheduling, structural analysis and design, soil mechanics, transportation planning, and highway engineering. An engineer can use one or more of these subsystems in the solution of a single problem. Each subsystem has associated with it a problem-oriented language to enable an engineer to easily communicate his problem solving requests to the computer.

All of the ICES subsystems utilize a general set of ICES system programs which provide advanced computer capabilities in secondary storage management, dynamic allocation of primary memory, and dynamic program structure. The ICES subsystem programs are written using ICETRAN (*ICES* FOR*TRAN*), an extension of FORTRAN incorporating such features as dynamic and relational data structures, data management, dynamic program structures, and a push-down program stack. In addition, a command definition language (CDL) is provided to enable programmers to define the problem-oriented user languages associated with each subsystem.

The initial version of ICES is implemented for the IBM System/360, and operates as a normal job under control of OS/360. The system is designed in a modular flexible manners so that each organization can choose which subsystems it wishes to use, modify other subsystems and add new subsystems. Although ICES was initially developed for Civil Engineering applications, new subsystems are currently being developed for other areas of engineering and for management.

We shall be glad to provide further information.

ALL BANK EXPORT CREDITS SHOULD BE EXEMPTED FROM PRESENT CEILINGS

Richard Bliss, Sr. Vice Pres.
International Banking Department
Bankers Trust Co.
P.O. Box 318
New York, N.Y. 10015

Amid all the discussions over encouraging greater U.S. exports, one key point seems to be overlooked. This country has an extremely efficient and imaginative international banking system, which is currently prevented from making its full contribution to export financing. Already handicapped under the so-called voluntary restraint programs, lending ceilings have been further reduced, and the banks are barred from further significant increases in direct export financing.

Major banks have gone on record recommending that all bank export credits be exempted from present ceilings. This position has been advocated continuously since 1965, when "voluntary" restraints on their overseas financing were introduced. Unfortunately, three full years later, with steadily increasing balance of payments problems, no bank export credit exemption has yet been approved.

The Export Import Bank

As a result, a situation has developed where substantial export increases above current levels must now be financed through the Export Import Bank of Washington, the only U.S. lending institution not subject to balance of payments restrictions. In answer to continual requests for more liberal treatment for bank export financing, the authorities seem to have confused the issue by emphasizing that they know of no export sales lost for lack of financing which can be attributed to balance of payments restrictions. In a literal sense this may be true, but their comments not only ignore the clearcut shift from the private sector to the public, but also pay insufficient attention to the impact of severe new restrictions on possible nationwide export financing efforts that might otherwise be developed by the commercial banking system.

In calling for the exemption of their export credits, commercial banks are not expressing reservations about the long-time effective role of the Export Import Bank in the export financing field. It has done well, and merits the increase in its lending authority which it currently seeks. Its basic role, however, has been, and should continue to be, to add to, and not replace, the export financing operations of the American commercial banking system. The Export Import Bank has continually demonstrated an awareness of this basic function, with the need for separate private export activity, as well as for joint public-private export efforts.

But, while commercial bank export financing is being curtailed, the Export Import Bank has recently asked for a 50 percent increase in its total financing authority, from a current $9 billion to $13.5 billion. Obviously, if this is justified, commercial banks should likewise be authorized to increase their export credits, and thus help meet export financing requirements. The system is there. It should be used.

The paradox of the present restrictions is further evidenced by the fact that the Export Import Bank, and other Washington agencies, make constant requests for commercial bank participations in their loans. The added export financing efforts of commercial banks are therefore evidently required, but are sought only after much of the new export financing has been pushed through Washington, a sort of refinancing in reverse.

The "Cash Substitution" Theory

In defense of present limitations, there has been advanced one of the most untenable and frustrating ideas to come out of Washington in recent years. This goes by name of the "cash substitution" theory. It maintains that if current bank restrictions were removed, the banks could and would provide export financing to overseas buyers who would otherwise pay cash. That cash might then be used for other purposes, including gold purchases from the dwindling U.S. reserve.

Practical banking and business experience shows that this reasoning is wholly unfounded. A hard pressed buyer may be forced to pay cash once, but he is certainly going to seek other suppliers the second time around. Under present highly competitive world market conditions, cash is generally not used, nor is it available, except for down payments. Since credit is available from various competing industrial countries, American insistence on full cash payments would therefore simply encourage buyers to shift purchases to other countries. Moreover, any actual credit substitution for cash

payments would create only a temporary advantage for offshore buyers, since much of the U.S. bank export financing is arranged on a relatively short 6-month or, at most, 12-month basis.

Nobody has disputed the present competitive danger. From 1958 through 1966, we have lost ground to Western Europe and Japan. Unfortunately, we do not appear to have reached the obvious conclusion that the risk of further damaging competition must be decreased by a new and more flexible approach, including the exemption of all U.S. commercial bank export credits from present restraints.

The Balance of Payments Problem

Our balance of payments problem is highly complicated, and I certainly do not suggest that increased ability of the banks to finance exports is a panacea. As has been pointed out by many others, a liberal dose of fiscal responsibility must be the starting point. However, any measures that can help to encourage exports should be welcomed.

Most current emphasis has been on the useful increase in aggregate U.S. exports from $25.3 billion in 1964 to $29.2 billion in 1966 and an estimated $31 billion in 1967. Less attention has been focused on the far more significant decrease in the U.S. trade surplus from $6.7 billion in 1964 to $3.7 billion in 1966 and to below $3 billion estimated for 1967. Still less note has been given to the disastrous decline in our commercial trade surplus (after deducting Government financed exports), which has plummeted from $3.9 billion in 1964 to a minuscule $600 million in 1966, with no significant improvement evident.

Certainly we all agree that the balance of payments problem is severe and warrants drastic measures. However, in this atmosphere of crisis, let us not base policies on unproven arguments such as the "cash substitution" theory, nor on the presumption that the public sector has more ability to select and finance "proper" exports than the private sector. Such theories can do a great deal of harm.

The commercial banks have a vital role in export financing. We should not diminish it.

REFUND OF OVERPAYMENT OF SOCIAL SECURITY TAX BY MULTIPLE EMPLOYERS — II

I. From a letter written to Mrs. Helen Solem by Robert M. Ball, Commissioner of Social Security, Dept. of Health, Education, and Welfare, Baltimore, Md. 21235.

The law does not permit employers to consider for social security tax purposes wages paid by other employers during the year. The employer's contribution is an excise tax which the employer pays because he has persons in his employ; it is levied on the covered wages he pays to all his workers. The employer contribution is not set aside for the benefit of any particular employee. It is used to help finance social security benefits for all beneficiaries. The employer has an obligation to contribute toward the social insurance protection of his employees on the basis of wages paid up to the maximum for each employee. He is not relieved of this obligation because the employee may have worked elsewhere during the year.

There are a number of considerations against providing for a refund to employers in cases where an employee is paid a total of more than $6,600 ($7,800 beginning in 1968) by two or more employers. It would be difficult to set up an equitable basis on which to make a refund. Where the individual changes employers during the year, the question would arise as to the extent to which each employer should bear the responsibility for the payment of contributions. If it were decided that all employers should share in a refund of earnings above that amount, fairly complex rules would have to be established to determine the proportionate liability for each employer. A similar situation could apply if the individual worked simultaneously for two or more employers, with the added consideration that the employee might not want either employer to know what the other is paying or even that he has other employment. Any provision for refunding the employer's share of contributions would make it essential that employers have this information.

II. From Mrs. Helen Solem, Accountant, to the Editor
666 E. Main
Hillsboro, Ore. 97123

I do not believe that it would be difficult to equitably administer a refund of overpayment of Social Security tax paid by employers. (See "Refund of Overpayment of Social Security Tax by Multiple Employers", *Computers and Automation,* March, 1968, page 16.) It would, however, require a change in the law.

The computers the Internal Revenue Service now uses could quite easily select the overpayment by individual tax credit application, and the refund could automatically be given to the employer to whom it is due. An example is for the following individual who changed jobs during the year:

S.S. No.	Employer No.	S.S. Tax	Earnings	%	Refund Due Employer
541-34-4467	93 6002236W	$147.66	$3,993	36%	$53
	93 W002231	290.40	6,750	64%	95

Since the Social Security tax is increasing, it will be more important than ever for employers to reduce their payroll costs as best they can. Without computers, refunding this overpayment would of course be a complex problem.

The battle to bring about a change is far from over. The next step is to bring the matter to the attention of Representative Wilbur Mills, Chairman of the House Ways and Means Committee. I urge you and all your readers to help to see that the benefit of refunding overpayments of Social Security taxes to employees is also extended to employers.

THE HUMAN COMPUTER, MR. WILLIAM KLEIN

(Based on an interview with William Klein by David Ehrlich as reported in the January 26, 1968 edition of Medical News, **published in London, England.)**

With all the complicated computers at the European Centre for Nuclear Research, located on the borders of France and Switzerland, the Theory Division of that centre also employs the services of a "human computer", Mr. William Klein.

For many years, Mr. Klein has entertained audiences with exhibitions of lightning speed in manipulating numbers. Multiplication of any five-figure numbers takes a few seconds. Even 1388978361 x 5645418496 = 7841364129733165056 is all done in his head in 64 seconds. This involves 25 multiplications of two-digit numbers, and additions—over 50 operations in all.

Division, addition, subtraction, powers, roots, logarithms and factors come with equal facility. Behind Mr. Klein's unique ability lie a phenomenal memory for numbers and sheer intellectual virtuosity.

Mr. Klein rarely follows a standard sequence of calculation that a computer would follow. His basic material, acquired by long effort, includes knowing by heart the multiplication tables up to 100 x 100, all squares up to 1000 x 1000, logarithms of all numbers less than 150 (to five decimal places), and all prime numbers less than 10,000—plus an enormous number of odd facts and principles, some his own, some adopted from the great theoreticians of history.

An occurrence at a British Business Exhibition a few years ago illustrates how all this helps. Mr. Klein was visiting the Friden Company booth at the Exhibition, and asked for a demonstration of their new "root" machine.

"All right, sir, let's try all the fives," offered a smug salesman, feeding 555555555555 into the machine. Before he could press the button for the result, Mr. Klein said quietly, "745356 should be about right." The operator nearly collapsed when 745355.9924 appeared.

Mr. Klein had obviously not gone through the laborious process of conventional square rooting. He had remembered that 0.5555 . . . is the decimal fraction for 5/9, whose square root is 1/3 root 5. Knowing root 5 and dividing by 3 gives the answer easily.

Describing his life, Mr. Klein told how he had studied medicine, but never higher mathematics. He was born in Amsterdam on December 4, 1912. His first interests in mental arithmetic were factors and prime numbers. In his spare time he worked up to almost 20,000, distinguishing the indivisible prime numbers from those that were products of two or more other numbers.

He became more and more enthusiastic as memorizing became easier with all his basic material. Teachers never encouraged him nor recognized that he could help other pupils. Indeed, they usually asked, "How did you get the solution so quickly?" And when he told them, they would say, "But this is not the way I taught you to do it — and expect you to do it."

What does he think of the New Math and children's education? He declines to comment, but says, "Fortunately there are not yet computers in grammar schools."

"Basically there are two ways of doing multiplication, one bad, used by almost everybody, and the other excellent, but used by very few." (This is the one-line answer, the rest of the operations carried mentally.)

"Mental arithmetic would be very good for general memory training. The next generation would work so much faster, too. . . . Society is the poorer for rejecting mental arithmetic."

Mr. Klein admits that computers can do more and more. When he first joined the Centre for Nuclear Research in 1951 as theoretician supreme for numbers and problem-solving, the scientists relied heavily on him for programming. "Now everyone wants to do his own programming. I don't trust the machine," he comments. "Of course it turns out great quantities of results, five or six thousand. I can't bother to check them all, but I do fifteen or so."

To keep mental arithmetic alive, Mr. Klein gives 37 lectures in schools for 3 weeks each year, in French, German, and Italian.

IFIP CONGRESS 1968 PROGRAM

International Federation for Information Processing
23 Dorset Square
London, N.W.1, England

At the IFIP Congress 68, which will be held in Edinburgh, Scotland, August 5-10, 1968, some 250 papers will be delivered to the 4000 delegates from 40 countries who are expected to attend.

The committee responsible for organizing the program has two aims: (1) to present an authoritative and comprehensive review of the current state of the data processing art, and (2) to disseminate information on the most important developments and significant advances that have occurred throughout the world since the previous IFIP Congress held in New York in 1965.

To achieve the first objective, a number of international experts in particular aspects of computer technology have been invited to speak on computer development and usage. Nine of the 35 invited papers will last for one hour, and will review progress made in major areas of the information sciences. The remaining 26 invited papers will be of half-hour duration, and will deal with subjects of particular importance, or subjects where very rapid developments are taking place.

The program timetable has been arranged so that it will be possible for a delegate to attend all the invited lectures, and in this way obtain a comprehensive view of progress in the information sciences.

The second objective is to be achieved by selecting 200 papers, from the many hundreds submitted, that cover the complete range of information processing activities. Papers will be chosen essentially on quality, but also to maintain a fair balance between the major areas of interest.

To complement this extensive series of lectures, four discussion panel sessions are also being organized.

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Computers and Automation has decided to acquire a PDP-9 Computer made by Digital Equipment Corporation, in order to carry out a number of objectives:

— perform some of our record keeping and calculations;
— investigate some of the properties of computer programs first hand;
— develop to a better extent: the programming language LISP; computer-assisted instruction; computer-assisted explanation;

and to :

— invite all young people: who have not passed their 16th birthday, who can read easily, who can pass a simple math test, and who are children of our subscribers, to come and use our computer and work with it and play with it, at suitable times and under suitable rules.

We think we can make a contribution in this way to the encouragement of young people to become excited about computers and their powers.

We expect that this computer will either be installed in an office right next door to our office, or else at a more generally accessible location in Cambridge, Mass.

PREVIEW OF "WHO'S WHO IN THE COMPUTER FIELD", FIFTH EDITION

Special Abbreviations

b: born
ed: education
ent: entered computer field
m-i: main interests
t: title
org: organization
pb-h: publications, honors, memberships and other distinctions
h: home address

Abbreviations for Main Interests

A Applications
B Business
C Construction
D Design
L Logic
Mg Management
Ma Mathematics
P Programming
Sa Sales
Sy Systems

KAERCHER, Jacque E. / programmer / b: 1927 / ed: Robert Morris Jr. College, Akron Univ., BSIE management, Geneva College / ent: 1957 / m-i: ABMgPS / t: data processing programming supervisor / org: Babcock & Wilcox Co., Tubular Products Div., P. O. Box 401, Beaver Falls, Pa. 15010 / pb-h: director of education Beaver Valley Chapter NAA, 1965 DPMA CDP / h: 109 Oakville Rd., Beaver Falls, Pa. 15010

KAHL, Alfred L., Jr. / professor / b: 1932 / ed: BA Univ. of Md., MBA Univ. of Pittsburgh / ent: 1958 / m-i: ABMgS / t: assistant professor / org: University of Georgia, Athens, Ga. / pb-h: 2 publications and several papers; member ACM, TIMS, AEA, AFA; associate editor Management Science / h: 220 Stoneland Drive, Athens, Ga. 30601

KAHLER, Milford S. / general manager / b: 1932 / ed: AA, business / ent: 1958 / m-i: BMgS / t: general manager / org: Computers & Systems, 30 S. Laura St., Jacksonville, Fla. / pb-h: member DPMA / h: 9241 Altamont Ave., Jacksonville, Fla. 32208

KIVIAT, Philip J. / logistics specialist / b: 1937 / ed: BME & MIE, Cornell Univ. / ent: 1959 / m-i: APS / t: logistics specialist / org: The Rand Corp., 1700 Main St., Santa Monica, Calif. 90406 / pb-h: several publications, TIMS, ORSA, ACM, SCI, AAAS, associate editor Simulation / h: 2654 Roscomare Rd., Los Angeles, Calif. 90049

KORN, Karl E. / engineer / b: 1921 / ed: BME, PE / ent: 1957 / m-i: ASy, theory & concepts of languages including Engl. and artif. intelligence / t: senior research engineer / org: Western Electric Engineering Research Ctr., P. O. Box 900, Princeton, N.J. / pb-h: several publications on production & inventory control, ACM, Professional Engr., N.Y. & N.J. / h: 433 Latona Ave., Trenton, N.J.

KORNBLUH, Marvin / educator & consultant / b: 1927 / ed: BA & MS, psychology / ent: 1955 / m-i: MgSy, consulting & systems education / t: president / org: Kornbluh-Barnett Associates, Inc., 7942 Wisconsin Ave., Bethesda, Md. 20014 / pb-h: book "Effective Systems Development", ORSA, American Psychological Assoc., Institute of Mgt. Sciences, Society for Advancement of Mgt., Washington Operations Research Council / h: 6421 Holins Drive, Bethesda, Md. 20034

KRANZLEY, Arthur S. / consultant / b: 1927 / ed: BS, commerce; MBA, Drexel Inst. of Tech. / ent: 1950 / m-i: Mg / t: managing director / org: Arthur S. Kranzley & Co., Inc., 1110 Wynwood Ave., Cherry Hill, N.J. 08034 / pb-h: author of several articles and papers, member of ACM, IEEE, TIMS, AMA, / h: 1137 Winding Drive, Cherry Hill, N.J.

KRAVET, Morton / principal systems analyst / b: 1934 / ed: BA / ent: 1961 / m-i: LMgSy / t: deputy director, div. of data processing / org: Food & Drug Administration, 200 C St., SW, Washington, D. C. / pb-h: Guide, H.E.W. ADP Career Board / h: B512, 1400 S. Joyce St., Arlington, Va.

KUCH, T. D. C. / manager, computer operations / b: 1937 / ed: BA, Philosophy; PhD, Computer Science / ent: 1960 / m-i: MgP operations / t: manager, computer operations / org: Applied Data Research, Inc., 2425 Wilson Blvd., Arlington, Va. 22201 / pb-h: Datamation, Computing Reviews, etc., ACM, Mensa / h: 1910 13th St. N., Apt. 204, Arlington, Va. 22201

Above are some capsule biographies which we shall publish in the 1968-69 edition of *Who's Who in the Computer Field.*

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(Please turn to page 55)

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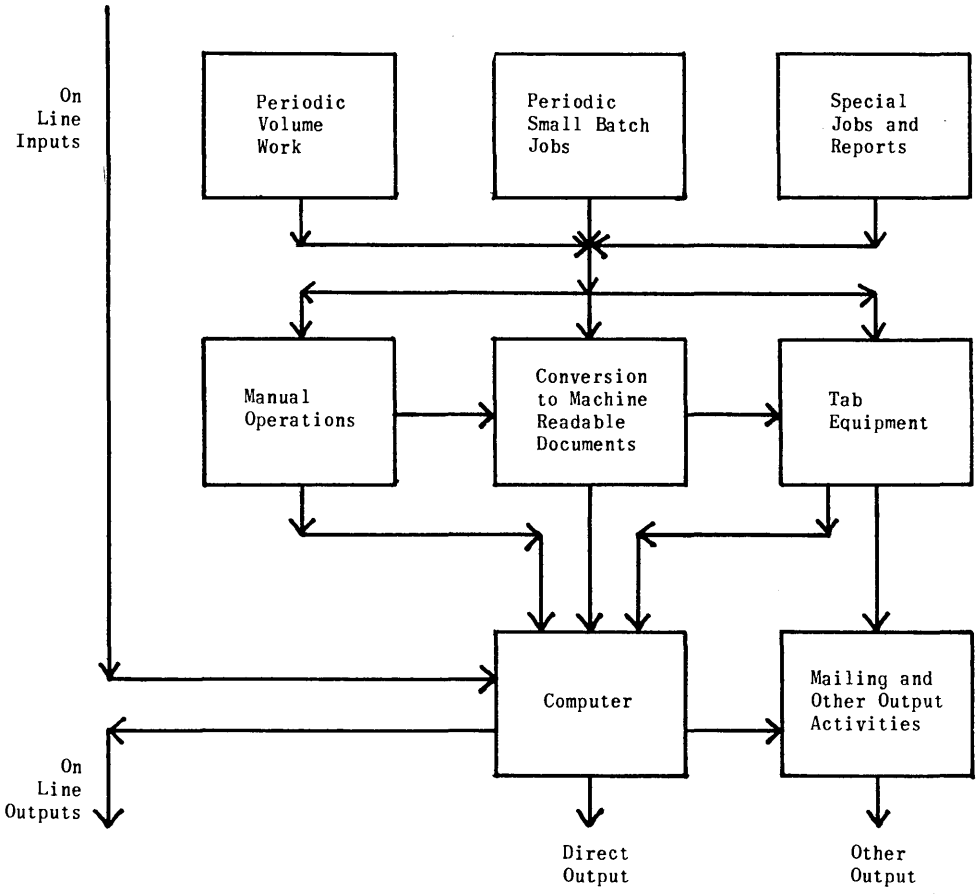
THE FULL CONTROL OF OPERATIONS IN DATA PROCESSING

Russell W. Fenske
School of Business Administration
University of Wisconsin
Milwaukee Wisc. 53201

Figure 1.

TYPICAL OPERATIONS REQUIRING CONTROL



"There are some characteristics which typify a data processing operation which is out of control: peak loads require more and more overtime of personnel; other departments increase their complaints about late deliveries of important information and reports; the work stations and machine areas become clogged with backlogs of jobs; 'crises' occur closer and closer together; and the effects of infrequent equipment breakdowns cause traumatic reactions in the whole organization."

It has become quite popular lately for authors to write "scenarios" of possible or typical world situations. Herman Kahn, the most prolific practitioner of this technique, describes scenarios as ". . . hypothetical sequences of events constructed for the purpose of focusing attention on causal processes and decision-points."[1] A brief scenario of a typical data processing installation will illustrate some of the problems to which this article is addressed.

Scenario of a Data Processing Installation

The XYZ Company originally performed all of its data processing functions on a manual basis with clerical labor, desk calculators, adding machines, and typewriters. In the 1950's due to the expansion of the business the firm installed punched card equipment (key punches, sorters, accounting machines, etc.) and retrained most of the clerical help to operate this equipment. Several new supervisory positions had to be established, but the supervisors were still selected primarily on the basis of seniority, assuming that the individual could handle the position reasonably well.

Each supervisor handled adequately the flow of work within his or her department, but delays in transferring jobs between departments or giving insufficient priority to "rush jobs" often occurred. The supervisors kept cryptic notes and schedules on their desks, but these were usually unintelligible to anyone else and were often not kept up-to-date because of crises that were habitually occurring. Most of the necessary information on previous operation times, schedules, and expected work loads was based on experience and was "in the heads" of the supervisors.

In the early 1960's, the increasing expansion of the business caused the management to lease a second-generation electronic computer with both card and tape capabilities. Some of the punched card equipment was sold. Continued expansion in the mid-60's required the purchase of a second computer. The former supervisor of the punched card operations is now in charge of the computer room but he has hired several professional programmers and a systems analyst. Two machine operators are on duty on the first shift along with the other data processing personnel. Second and third shifts are each manned by one machine operator and an assistant.

The computer room supervisor schedules the computer, based on his experience, but his supervision leaves much to be desired. The Key Punch, Manual Operations, and Tab Room Supervisors each have continued to do their own informal scheduling as described earlier. The top executives are extremely concerned about the catastrophe that might result if one of these supervisors left or were otherwise lost. No single individual actively directs and controls the flow of work through these departments, although all the supervisors report to the Manager of Data Processing. (See Figure 1.)

Lately the effectiveness of the system has been decreasing rapidly. Peak loads are requiring more and more overtime of personnel; other departments are increasing their complaints about late deliveries of important information and reports; the work stations and machine areas are becoming clogged with backlogs of jobs; "crises" are occurring closer and closer together; and the effects of infrequent equipment breakdowns cause traumatic reactions in the whole organization.

Russell W. Fenske is the Assistant Dean of Graduate Programs and an Associate Professor of Quantitative Analysis in the School of Business Administration at the Univ. of Wisc. He earned his B.S. in Mechanical Engineering at the Univ. of Wisc., his MBA in Finance at Northwestern Univ., and his Ph.D. in Business Statistics at Northwestern Univ. He is a member of the Institute of Management Sciences, The American Statistical Association, and the American Production and Inventory Control Society.

[1]Kahn, H. and Wiener A., *The Year 2000,* MacMillan and Co., New York, 1967, p 6.

Generality of This Scenario

This scenario, as many readers of this article will attest, is neither unusual nor extreme in its portrayal of conditions. The system of controlling data processing operations at many rapidly growing companies has developed as the needs arose during a period when the volume and complexity of business was much less than at the present time. These systems develop growing pains as activities, policies, and procedures are stretched beyond their effective capacities. At some point basic changes are required to allow for further growth, much as a point is reached when the cuffs on a teenager's trousers can no longer be lengthened, and a new pair of trousers with more growth potential must be purchased.

Objectives of a Data Processing Control System

The design of a new, or at least improved, control system usually will have short, intermediate, and long term objectives as listed below in a sequence reverse to that usually expressed by harried executives seeking help.

A. *Long Term Objectives*
1. To insure the highest rate of utilization of the existing data processing resources.
2. To produce information of the desired accuracy at the highest speeds, with maximum reliability as close to the desired times as possible consistent with minimum cost.

B. *Intermediate Goal*

To improve the scheduling of operations, in order to eliminate or at least minimize both employee overtime and failing to meet deadlines.

C. *Short Term Goal*

To improve the "effective capacity" of the existing equipment because of some impending crisis (such as a new load or scheduled release or sale of equipment).

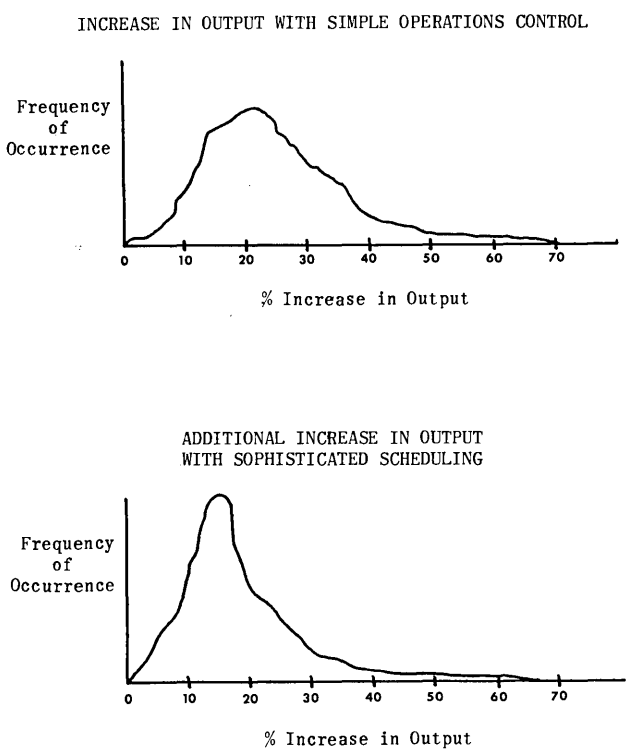
When a call for help is made under the type of conditions described in the scenario, the intermediate goal is usually emphasized most heavily. This is reflected in the fact that the typical request made to a consultant is to develop a highly sophisticated automatic *computer scheduling* procedure that will solve all the computer room problems. However there are two fallacies with this type of reasoning.

First, examination of only *computer* operations will not fulfill the long term objectives desired. This is true of any operations where attention is focused only on one or a few pieces of high-capacity expensive equipment (be it manufacturing machinery, construction equipment, or computers). It is particularly true of operations such as data processing, where document preparation, key punching, tab operations, etc., are intimately related and where schedules and estimates do not always delineate computer and non-computer operations. For these reasons "operations control," hereafter, is meant to include control of all operations from the time the basic job or data is received from the originating department or source, until it is delivered to the terminating department or destination.

Second, any *scheduling* system is only one of many factors that affects data processing performance. All of the other characteristics and activities of the operations control system affect (with varying degrees of significance) the performance of the computer room specifically and the company's data processing in general.

In fact, it is generally true that improvements of a much simpler and more basic nature are required before the sophisticated scheduling step should be taken. Furthermore, these fundamental steps will probably improve operations as much if not more than high-powered scheduling techniques (See Figure 2.) The goal, then, is to improve the system so as to increase its effectiveness as an end in itself and also as a means to incorporating an automatic scheduling system.

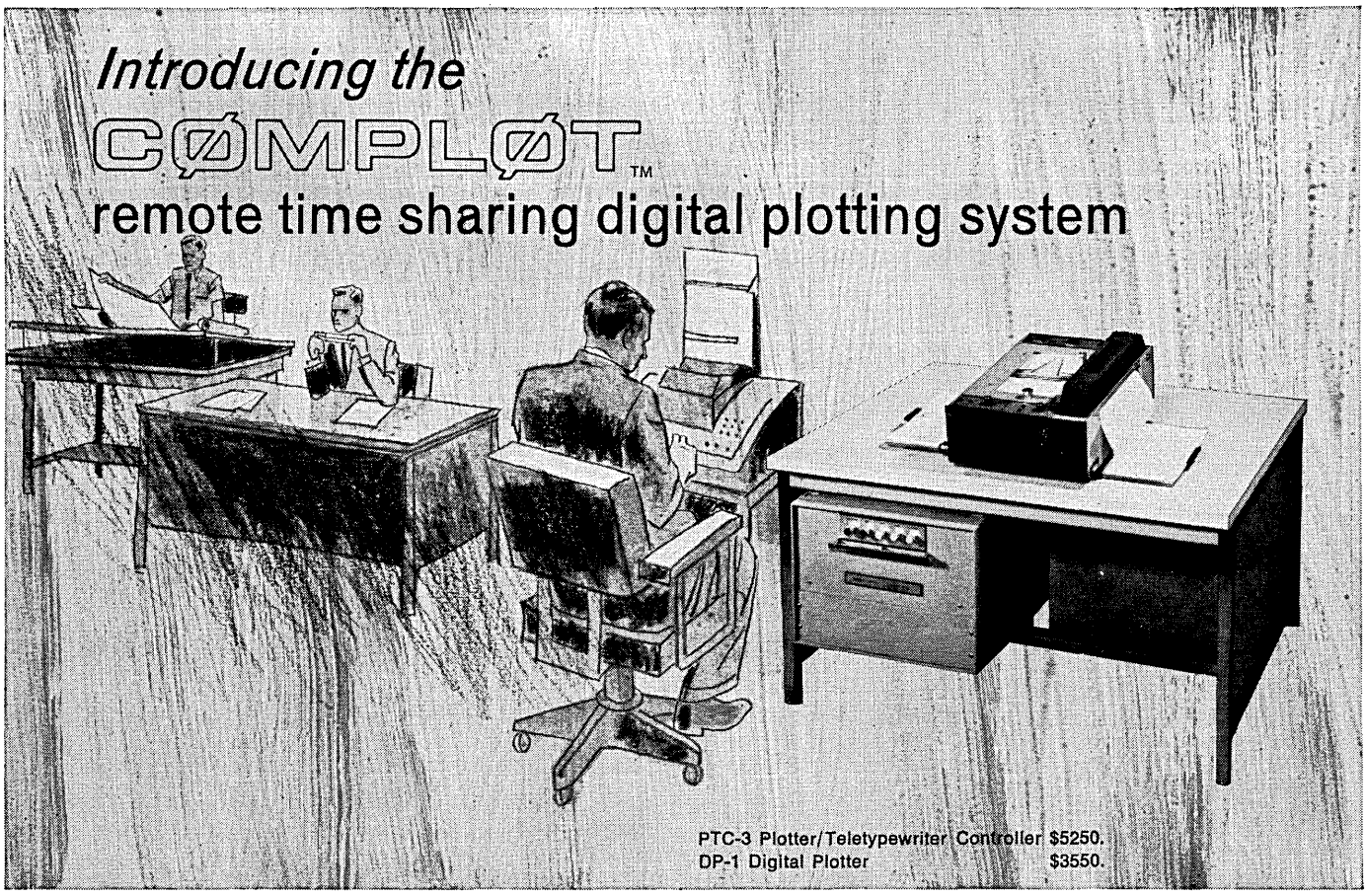
Figure 2



Utilization of Production Control Technology

Data processing operations typically have grown until they are of the magnitude and complexity of many other production operations which contribute a good or a service. The characteristics of data processing which indicate this similarity are listed below:

1. A combination of mass production and job shop data processing.
   a. Quasi-mass-production of operations such as customer billing, payroll, demand deposit accounting, inventory control, etc.
   b. Quasi-mass-production periodic reporting (usually accounting related).
   c. Job shop requests from other departments.
2. A mixture of manual, man-machine, and automatic-machine processing.
3. Existence of limited-capacity bottleneck equipment (such as computers).
4. Fixed schedules of payroll, billing, etc., with sharp deadlines.
5. Seasonal capacity fluctuations due to calendar and seasonal business variations.
6. Rigid requirements for precedence and sequence of operations.
7. Time limitations on availability of raw data.



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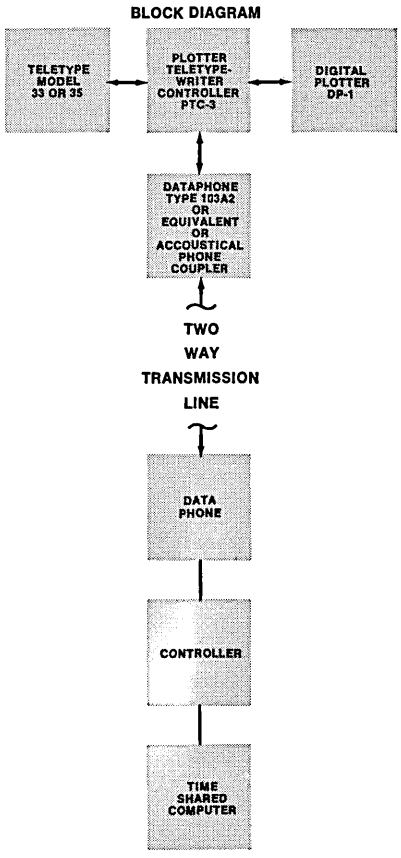

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8. Large numbers of short computer runs with relatively large set-ups.

By changing a few words in these characteristics one would have a description that would fit an innumerable number of manufacturing operations in this country. Consequently the control methods used in manufacturing should be applicable to both types of operation. In fact, the techniques and activities developed for production control prove very effective in controlling data processing operations.

Three Operation-Control Systems

A. Minimum System

For many data processing operations a completely *manual* operations control system can satisfy the control objectives quite effectively. This is the case in most small and medium-sized firms, whether they are in banking, manufacturing or retailing. The "quantum jump" in the efficiency of controlling operations due to the introduction of such a system in place of the informal methods in current use (as described in the scenario) will often exceed that of the further increase in efficiency gained by going to a much more complex system as described below. For this reason the added costs will be more than offset by the resulting economies of operation and control. Justification for such a "Minimum System" is obvious.

B. Ideal System

It was pointed out earlier that the creation of a new control system is often required because the operations have outgrown the existing system. The new system should, if possible, prevent "outgrowing" from occurring again. One method for accomplishing this goal is to describe the type of system (within the present state-of-the-art) that would be required to handle an extremely large and complex data processing operation (for the firm under consideration) such as might develop in the future. Such a system could be termed the "ideal" system (from a purely technical point of view).

An "ideal" operation control system would utilize the computer itself to increase the speed and accuracy of its control. It would also provide greater magnitudes of information for decision-making purposes in operations. Furthermore such a system should be based on "real-time" data processing control. However for most firms, unless a real-time system is justified for other purposes, it cannot be considered a realistic prospect. Instead it must be viewed as a goal toward which a new system would be able to evolve without major "growing pains." Since computer costs for given capabilities are constantly decreasing, real-time systems will become much more economical and commonplace in the next five to ten years, and hence are realistic goals for most firms.

C. Suggested System

This discussion naturally leads to the conclusion that the control system for most firms will be somewhere between the manual "minimum" system suggested for small firms and the real-time "Ideal" system that could be implemented by firms with large, complex, organizations and operations. This suggested system should include the concepts required in the manual system as good production control practice, should utilize "batch process" computer scheduling of operations, and should be compatible with evolution toward the ideal system.

Elements of an Operation Control System

The operations control system is composed, either explicitly or implicitly, of five basic elements. They are:

1. The control activities that must be performed such as scheduling, dispatching, maintaining inventories of cards, tape, and printer forms, etc.
2. The control information that must be processed, stored or transmitted such as promise dates, data volumes, priorities, etc.
3. The documents that must be utilized, such as job routings, run logs, schedules, etc. (These should always be minimized without jeopardizing the efficiency of the system).
4. The organization necessary to perform the activities such as the Director of Operations Control, Scheduler, Expediter, etc.
5. The individuals who must fill the positions in the organization and perform the activities.

Each of these elements will be treated separately, emphasizing problem areas and suggested approaches.

Operation Control Functions

The operation control activities required to effectively constitute a control system are grouped into functions in manufacturing production control. This grouping with a few modifications can be utilized in data processing control.

The first and most important of these functions is *planning*. An operating system functions very inefficiently when it only reacts to customers' demands or changes in demands. Because of lags in all control systems and slowness in the ability to adjust to such changes, insufficient amounts or types of service are available, and so errors occur in the delivery of output.

The most effective system is one that forecasts demand, estimates resource requirements, and schedules operations accordingly. Quite obviously, in the "real" world, there are going to be fluctuations that cannot be forecast and must result in reactions, but these can be minimized and the shocks can be dampened by a rapid response system.

The second function is the *routing* of jobs through the data processing department. This activity is one that can best be performed by the systems analyst, but he should work closely with the individuals in charge of operations control.

The largest function in terms of resource requirements and effect on the system is *operation scheduling*. Since this is a task of relatively large magnitude, it is often best to break it down into manageable proportions without forgetting the relationship of the whole to its parts and the interactions of the individual parts. For this reason, and also because of the greater economic benefits from computer scheduling, it is usually desirable to separate computer-job scheduling from manual- and mechanical-job scheduling, and to give first priority to the former. After the computer-job scheduling is under way, manual and mechanical operations can be analyzed with the same approach, to again divide these large tasks into manageable proportions.

Control Information

One of the elements of operations control mentioned earlier was *control information*. This element is of major significance to the scheduling function. There are three basic types of information about the operations to be scheduled that are required before the function can be performed. These three types are: 1) descriptive information; 2) unit time standards; and 3) nonproductive allowances.

1. Descriptive Information

It is necessary to gather descriptive information on the number and types of computer runs, the frequency of these

runs, and the relative priorities of the runs in reference to each other.

2. Unit Time Standards

It is also necessary to develop, where possible, performance standards for the computers and computer operators. These standards will be expressed in terms of times necessary to perform a unit of work, such as; a particular type of calculation; the loading of a tape drive; the printing of a bill; or unloading forms from a line printer. These standards are utilized with descriptive information on the runs required, in order to estimate processing and setup times for scheduling. This information is sometimes available from the informal scheduling standards in use. However, as often as not, such time standards are too "loose" in the jargon of the time and motion study expert. Scheduling based on them would be sheer folly, since the excessive times would be "built into" the new schedule. It is essential that new standards be developed before scheduling is attempted. This can be accomplished by running conventional stopwatch studies of the operations under consideration. The resulting data can then be used directly in any manual or automatic scheduling system.

3. Nonproductive Allowances

When time standards are established in any kind of a production operation, — it is necessary to include allowances for nonproductive activities. An eight-hour shift cannot be scheduled to perform eight hours of processing, if realistic standards are being used. (This non-productive time is "buried" in the time figures often used for scheduling computers).

The nonproductive activities occur at random and cannot be timed or scheduled. The only way they can be handled is to determine the proportions of total time required by these activities, and allow for these proportions of nonproductive time in the schedules. These proportions can be determined from a work sampling study as described in "Work Sampling in the Computer Room."[2]

The other major elements in operations control are *dispatching* and *followup* (or expediting). Accurate dispatching of jobs to their respective operations is essential since a job that is not dispatched on time cannot be completed on time if the time standards are realistic.

If the control system is operating properly then the amount of followup should be limited to expediting critical jobs (either internally or externally) when there are equipment failures, personnel absences, or rush jobs. Although formal control systems require less followup than haphazard methods, one or more individuals should be responsible for followup.

[2]Fenske, R. W., "Work Sampling in the Computer Room," *Data Processing Magazine*, May, 1966, p. 22.

Operation Control Organization

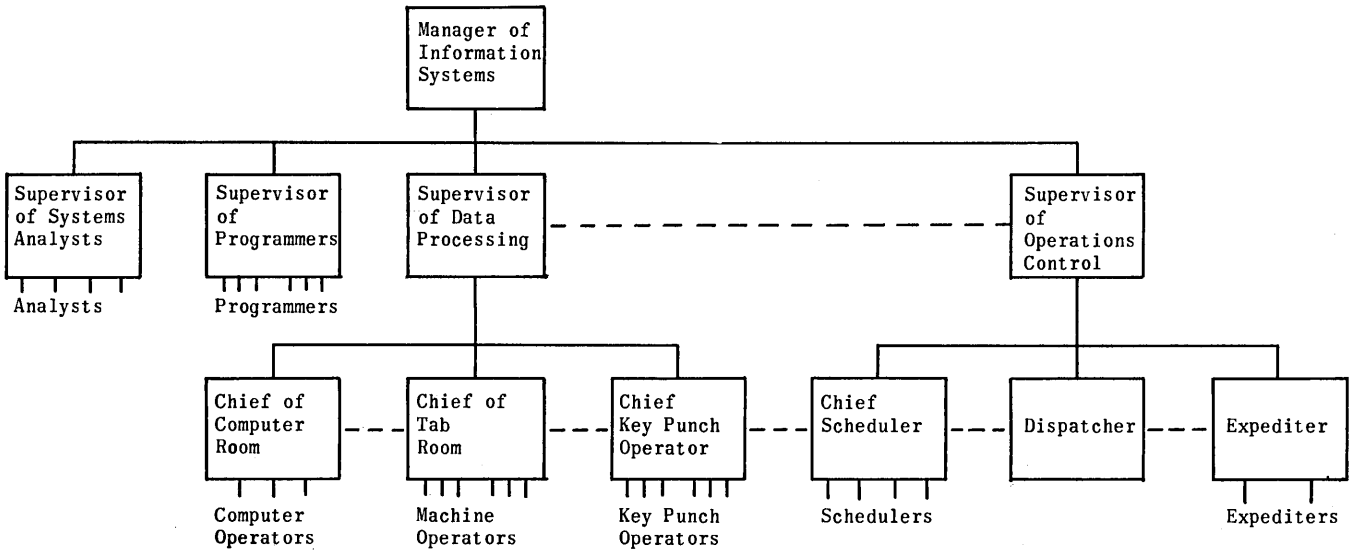
The organization of the operations control for data processing, in most firms, is highly fragmented. Responsibilities for scheduling and followup are often vested in three to five individuals, each operating independently, for instance: the computer scheduler; the chief keypunch operator; the tab room manager; and the clerical supervisor. It is common knowledge that different types of industrial firms group different functions under the heading of production control; and that operations control is basically a staff function with no line authority over operating departments. In spite of these reasons, and also that decentralization of these functions is often advisable, an effective operations control system cannot function without some kind of direction and central control. (In fact, from the organization point of view, it is surprising that some of these data processing control systems are at all effective in achieving their goals). A staff position for operations control supervisor must be set up; and he must be given full authority for all of the operation control functions described previously. In a small firm the supervisor may constitute the whole staff, but in larger firms the organization shown in Figure 3 would be appropriate.

Personnel

It is often suggested that the newly created operations control staff positions be filled by one or more of the firm's present employees in the data processing department. However, usually none have the training or experience needed for these positions. Systems analysts, programmers, or computer supervisors are complete amateurs on this subject. An ideal individual has both data processing and production control

Figure 3

OPERATING CONTROL ORGANIZATION



experience. If such a person cannot be obtained within an office organization, it is regularly more desirable to obtain an individual with production control experience and provide him with the information he needs concerning data processing operations, rather than taking a data processing man and trying to orient him towards production control.

Typical Operation Recommendations for Operation Control

The following are a few of the more common types of recommendations that are appropriate to data processing operations control.

1. Because of the high ratio of computer cost to operator cost, and also because of computer capacity limitations, one or more persons should be available to assist machine operators in "tearing down" one run and "setting up" for the next run.
2. Instead of waiting until a computer run is complete and then obtaining the program, form, tapes, and cards for the next run, these should be assembled during the previous run to minimize the time between runs.
3. Often second and third shift operations in the computer room are handled entirely by the machine operators who are the only personnel on duty. There should be one individual (other than the machine operator) on each shift whose prime responsibility is to make sure that the computer is not idle nor will become idle when the current job is completed. The one man operation is, because of an emphasis on minimization of man-hours, to the detriment of machine utilization; however, the extra cost is more than justified by the minimization of idle machine time.

Introduction of the Suggested System

The introduction of the suggested control system can be implemented with three different approaches.

1. Changes in the system can be introduced in an order of descending magnitude of change. In other words introduce the changes that involve the largest monetary and/or personnel costs first.
2. Changes can be introduced in an order of descending ease of installation of the change.
3. Changes can be introduced in an order of descending importance of change to the operation of the control system.

The first and the last plans are not the same since a recommendation may involve relatively insignificant adjustments in the existing systems, but the effects may be extremely vital. No recommendation can be made that will be satisfactory for all firms but each of these alternatives should be weighed in each case before a plan is made.

Evaluation of the System

As parts or all of the system are implemented the effects of the changes can be evaluated by analyzing the improvements in several critical variables;

1. The quality of information produced
2. The frequency of reporting
3. The amount of information produced per unit time
4. The reaction time to unexpected requests
5. The proportion of capacity utilized

If an effective operations control system has been designed, these critical variables should reflect its efficiency.

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A LINEAR GEOGRAPHICAL CODE FOR MANAGEMENT INFORMATION SYSTEMS

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In making the data base for a management information system, it is useful to code geographical data to correspond geographically with the real physical world.

Since joining the Univac Div. of Sperry Rand Corp. in 1953, Jiri Kallab has worked with management and foreign operations and development. Mr. Kallab majored in Business Administration, and has studied economics, market research, and international trade and development.

The success of business operations in our competitive economy often depends upon the ability to correctly and rapidly accumulate and analyze masses of data directly related to geographical distribution and concentrations. Marketing activities of both perishable and durable goods are concerned with the location of key distribution centers and the means of reaching potential users by the shortest, as well as alternative, routes. Manufacturers wish to analyze the relationship of resources to a new plant; in personnel recruitment the objective is to locate areas of concentration of certain classes of skilled labor. Economists and statisticians in every major field of human endeavor are pressing for improved results which rely heavily on geographical data.

Real-time computer systems, which represent huge networks, require the consideration of geography. In the original layout, in collecting data, in arranging data in the data-base, and in organizing the output logically, we need to consider adjacency.

This article reviews briefly the existing tools in market and economic analysis, and describes a coding system for linear geographical location. The article also recommends ways and rules for implementing the linear geographical code in management information systems.

Existing Tools in Market and Economic Analysis

In any management analysis related to economics and marketing, two criteria have to be considered: (1) the geography of the market, and (2) the industries involved.

Serious problems arise from the fact that market data are rarely available in a form which clearly defines the relationships between various levels of geographical subdivisions and adjacencies. They are most often reported only by general geographical references and broken down alphabetically in an arrangement difficult to manipulate. Such data have to be reclassified and plotted laboriously before they can be made available to management in usable form. Consequently, they are often furnished too late for practical use. Certainly, data so arranged cannot take full advantage of electronic data processing equipment for geographical analysis and plotting.

Let us briefly review the events in a corporation to illustrate the advisability of storing data in a two-dimensional geographical sequence which will be readily available for data processing and analysis.

In a complex manufacturing or distributing enterprise, market data are reflected over and over again in daily, hourly and sometimes minute operations. Function and location seem to be just two sides of the same coin.

The changing economic environment in which a company operates has to be compared frequently to forecasts which have served as a basis for production schedules and marketing quotas. No matter how reliable the indicators are, unless the trends are studied regionally, it is difficult to identify the areas requiring special attention and action. The indicators vary according to the category of industry or business. In an industry producing and marketing consumer goods, the emphasis will be on population data, income groups, and telephone households. An industry manufacturing computers and business equipment will rely mainly on survey data furnished periodically by the company's field organization. Industrial equipment, similarly, has to depend on its own marketing organization, and on physical surveys, to detect the need for capital investment goods. In each case, location and adjacency are constants which do not change in any of these studies.

Development and growth are intrinsically related to geographical locations, and any activity that affects them has to be superimposed on the area where it occurred. Resources, labor market, engineering skills, demand, production facilities, capital and finance have to be studied and considered in relation to locations and adjacencies. Channels of distribution, transportation, warehousing policies, and sales organizations, too, have to fan out from the physical location. To a considerable degree, location will influence the pricing policies, impact of competition, and the interrelation of price and profit.

A New Concept

The linear location coding system, the principles of which are outlined briefly in the following paragraphs, has been tested in volume applications, and offers considerable improvement over methods now used in the aggregation, processing and analysis of data. The concept is based on the realization that coordinates of latitude and longitude are an alignment of physical spaces of certain size, that these can be arranged into a line of two-dimensional spaces, forming a grid, and that each grid can be similarly subdivided.

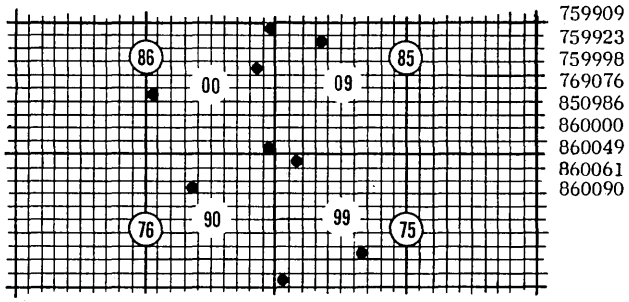
Each level of these units has to be identified by a two-digit number, the first digit signifying distance from South to North, and the second the distance from East to West, in units of that level.

If data are grouped in the data base in a form resembling as closely as possible the physical world, then advanced mathematical methods for the solution of transportation problems, computations of the center of gravity, various statistical methods and correlations, etc., can all be used to best advantage. The value of the Input/Output analysis can be enhanced. The economic profile of a community or region can be obtained either by geography, or by the category of industry, still showing the important geographical relationships. Also, a number of significant indicators and ratios, of interest for the management information system, can be computed.

The learning of the principles of decimal spacial interpolation is essential for the multiple uses of the linear location code in geographical coverage.

The concept of the linear location code is illustrated in Figure 1.

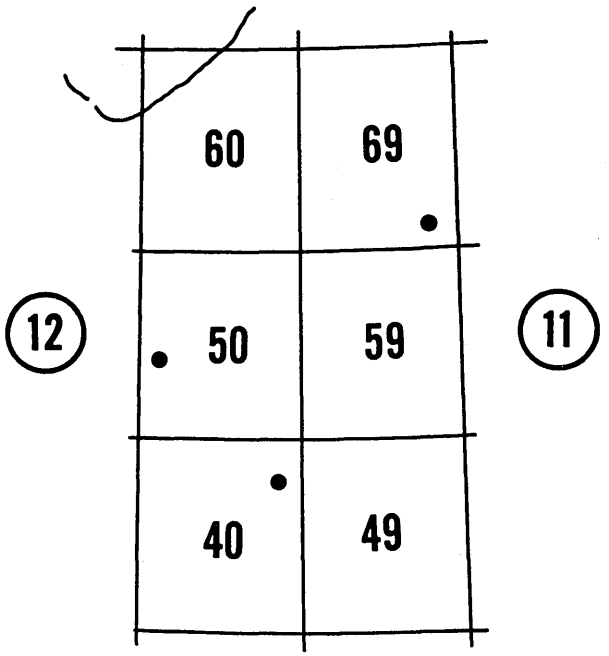
Figure 1
Linear Location Code



There is an alignment of horizontal and vertical identifications throughout units of each level. This is a very important feature and must be followed throughout the entire grid.

In world-wide or nation-wide applications, a space of one degree of latitude and longitude seems advisable as an intermediate level and then major emphasis would have to be placed upon cities as smallest units. The term "level", as used in this paper, is equivalent to the "power" of a numerical system. (See Diagram 1.) Thus, the codes of typical cities might appear as shown in Figure 2.

Figure 2
Linear Code in National Coverage

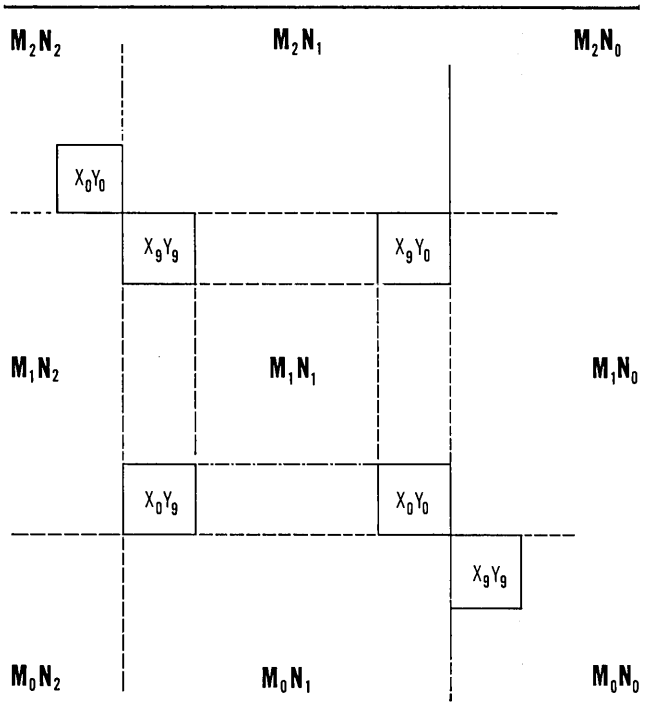


11 69 01 Ft. Wayne

12 40 71 Indianapolis

12 50 49 Lafayette

Diagram 1 — Linear Location Code Concept



If source data is in the form of latitude and longitude, the two numbers can be consolidated into the linear code number by a computer program as shown in Figure 3, and then printed for visual comparison or geographical tabulation.

Figure 3
Conversion to the Linear Code of Locations Identified by Latitude and Longitude

	Latitude N		Longitude W
10 40 00 70 50	40°45'06"N	00 07 03 09 09	73°59'39"W
10 40 10 30 10	41°18'25"N	00 07 02 09 03	72°55'30"W
10 40 20 60 50	42°39'01"N	00 07 03 07 05	73°45'01"W

10 47 03 79 59	40°45'06" LatN	73°59'39" Long W
10 47 12 39 13	41°18'25" LatN	72°55'30" Long W
10 47 23 67 55	42°39'01" LatN	73°45'01" Long W

Examples of world-wide linear code, developed from latitude and longitude identifications, are shown in Figure 4. (See also Hemispheres Map, Diagram 2.)

Aligning Irregular Areas

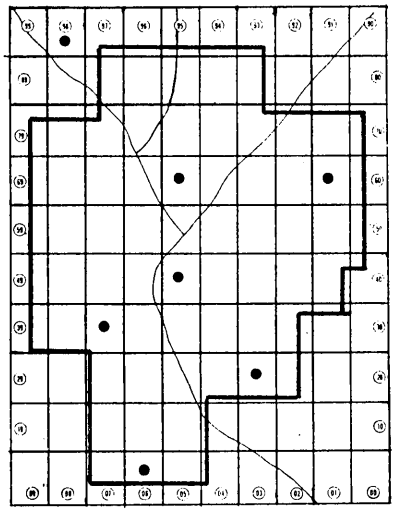
In some business applications it may be necessary to align and code irregular areas, such as states, counties, and even postal zones and census tracts. Such applications of the linear code are feasible, and offer advantages over an arbitrary numerical or alpha-numerical system, as long as the coding has the appearance of a straight-line grid.

For the purposes of a more detailed identification and expansion of the code to include unique account numbers, locations within cities, unless representing a multitude of points, can be identified by spacial interpolation. While in world-wide or nation-wide systems, the city was identified by a single code pinpointing the major section of the town, in this code, the outline of the city would be projected into a two-digit or four-digit grid, to indicate at least the relative position of data, coded within this grid. A variety of meaningless numerical customer codes can thus be replaced by a linear code, in which every two-digit number has a geographical significance. (See Figure 5.)

Figure 4
World-Wide Linear Codes Converted from Latitude and Longitude Identification

34 54 30S	58 30 41W	0055580591	BUENOS AIRES
14 54 12S	172 42 59W	0178521702	PAGO PAGO
34 23 37S	151 42 12E	0252586310	SYDNEY
27 48 18S	28 12 56E	0366212708	JOHANNESBURG
33 45 10N	84 23 37W	1038347359	ATLANTA
38 14 47N	85 45 49W	1038652756	LOUISVILLE
40 45 6N	73 59 39W	1047037959	NEW YORK
41 18 25N	72 55 30W	1047123913	NEW HAVEN
42 39 1N	73 45 1W	1047236755	ALBANY
29 56 53N	90 4 10W	1120909057	NEW ORLEANS
33 27 12N	112 4 28W	1132324057	PHOENIX
34 3 15N	118 14 28W	1132480254	LOS ANGELES
34 44 42N	92 16 37W	1130427258	LITTLE ROCK
35 28 26N	97 31 4W	1130574572	OKLAHOMA CITY
37 41 30N	97 20 16W	1130776394	WICHITA
47 14 59N	122 26 15W	1143722454	TACOMA
36 24 18N	139 54 28E	1234604019	TOKYO
41 42 42N	28 18 15E	1346117710	ISTAMBUL

Figure 5
Decimal Spacial Interpolation of Urban Area



06
23
37
45
61
65
98

In the metropolitan and urban application of the linear code, the metropolitan code represents an extension of the world-wide code. This extension is used when a multitude of points have to be identified and converted from master files listing street addresses. Semi-automatic methods are available for this conversion. The coordinates are replaced by natural arteries, such as expressways, and the size of the spaces and districts is dictated by the physical pattern of minor units, i.e., city blocks. It is evident that in some of the districts or spaces, the capacity of the code (00 to 99) is not exhausted. This same feature acts as a balancing factor and makes possible the mandatory overall alignment of the grid with the coordinates. (See Figure 6.)

Techniques have been developed which make conversions from arbitrary systems to linear code in urban applications simple and feasible wherever there are repetitive sequential or random references to the same locations.

Computerography to the rescue

In an airplane over the plain states, a camera begins photographing the terrain below. It runs continuously, recording thousands of square miles of land under cultivation at several wavelengths of energy simultaneously. Hundreds of photographs will result, and expert analysts examining and comparing them will identify crops, determine their condition, evaluate water resources, count livestock, discover potential oil fields and minerals.

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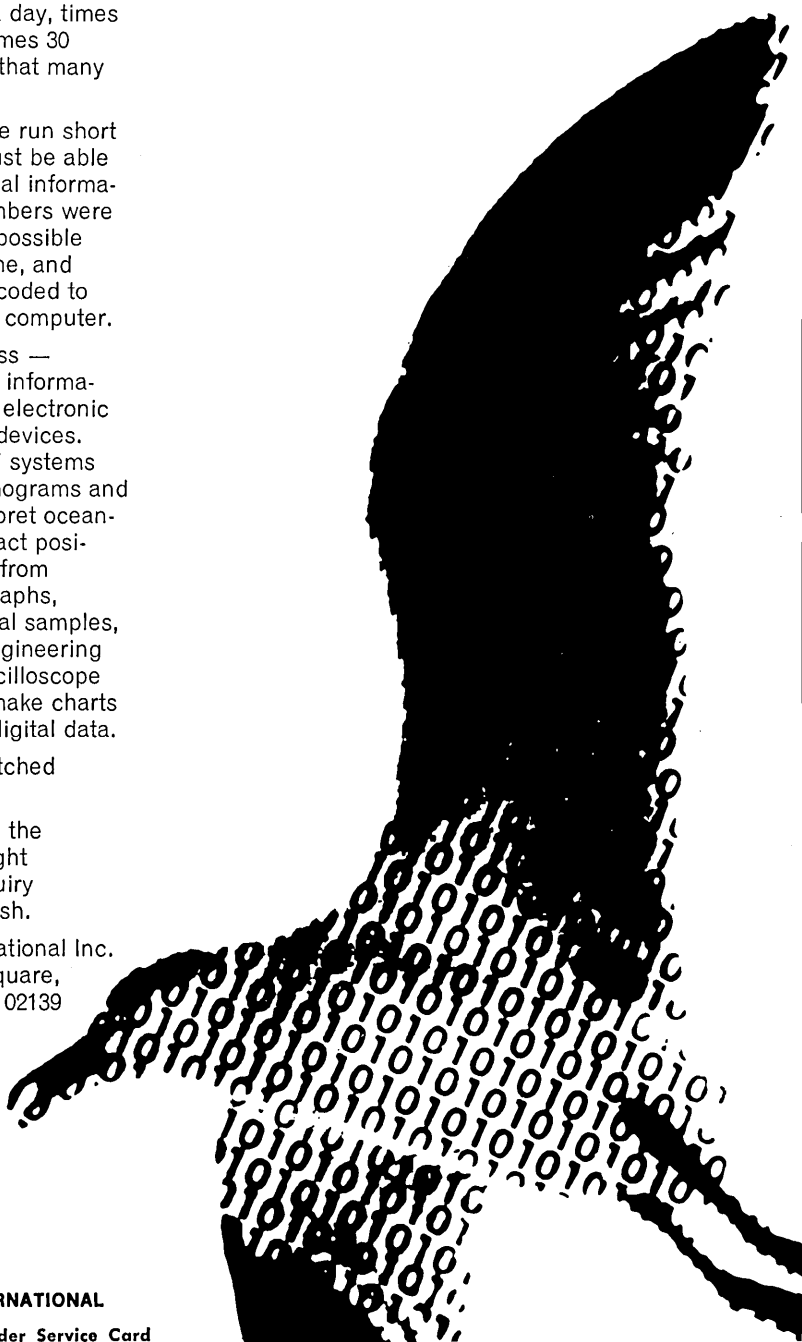

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Diagram 2 — Map of the Hemispheres Showing Linear Masses

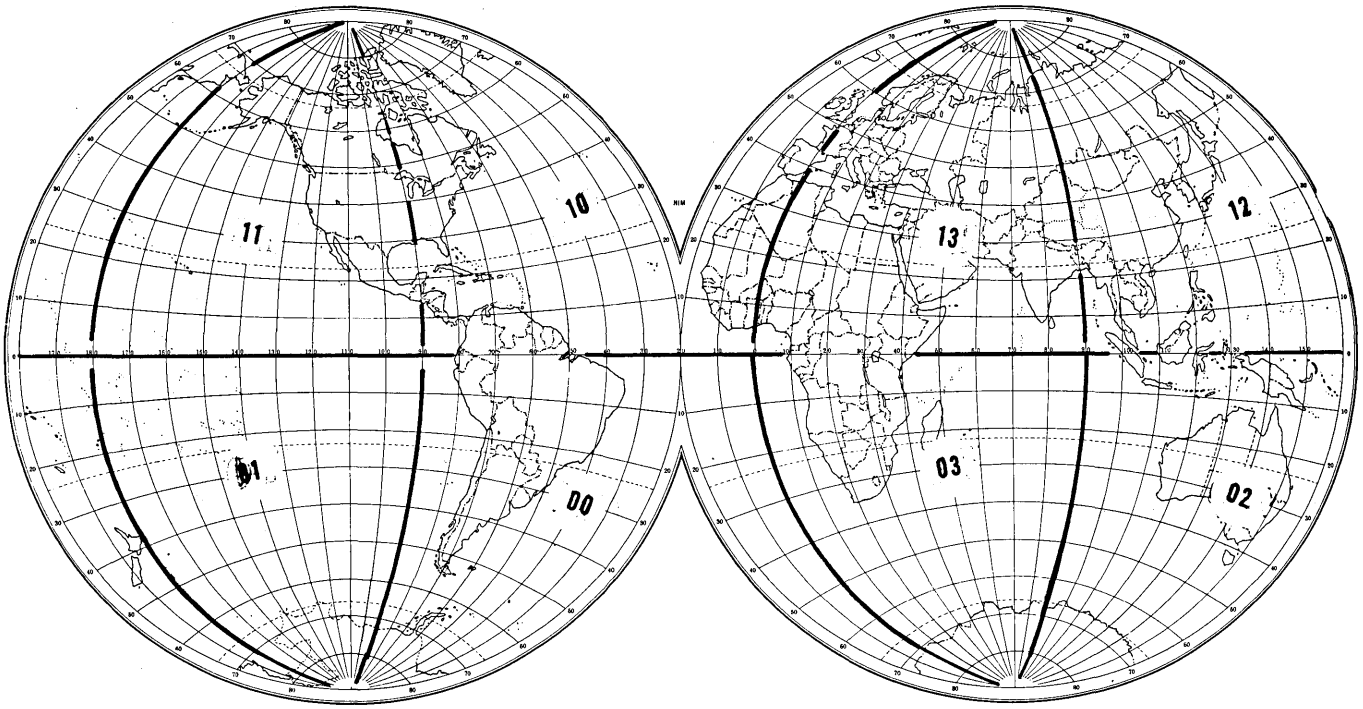
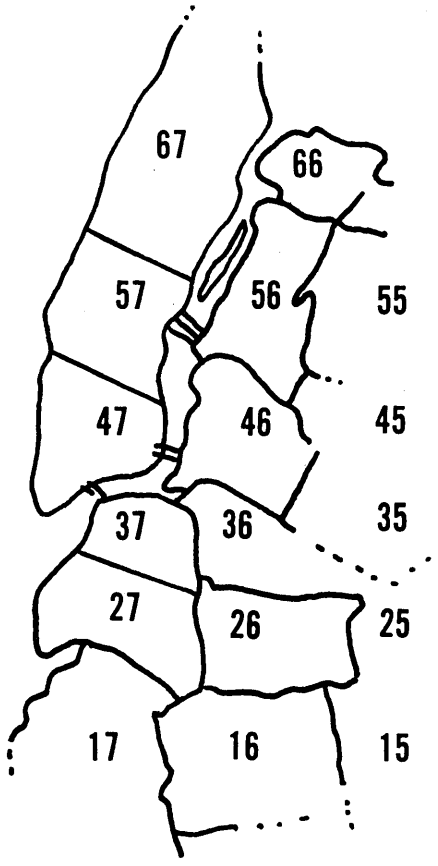


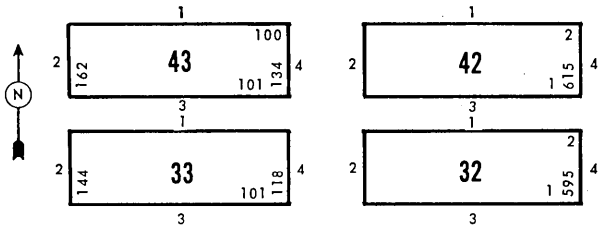
Figure 6
Linear Layout of a Metropolitan Area



Selecting Proper Maps

Great care must be given to the selection of proper maps. It is mandatory that, in metropolitan coverage, the coding maps show the number of the first building on each blockside. (See Figure 7.)

Figure 7
Blocks and Blocksides in Metropolitan Areas



The procedure to follow in developing coding maps is to start with the major divisions, using as boundary lines the major arteries, keeping in mind the coordinates of latitude and longitude, and considering the Northern blockside as "1". Starting at the North-East corner, the blocksides are recognized counterclockwise as 1 (N), 2 (W), 3 (S), 4 (E). Each blockside is considered to have 100 units, irrespective of length, and the street addresses (buildings) are converted to sequenced code according to a simple formula, which permits interpolation of any additional addresses. Within the buildings, customers are coded by alpha-numeric scales to create unique identifications and room for expansion. The term

"alphanumeric" code is used to represent a code which has been initially arranged into alphabetical sequence and then assigned numerical codes in sequence, leaving room for the interpolation of new accounts. Two digits may be sufficient for the alpha-numeric code, except in the case of large buildings, where three digits are allowed for the alpha-numeric code and only one digit for the building (door-code). The rules, applicable to physical variations such as split blocks, combined blocks, parallel or opposite street numbering, are simple and easy to follow.

The linear arrangement of records by buildings, blocksides, blocks, and districts, against alphabetical dispersion by names is evident in Figure 8. The meaningful linear code, as opposed to an arbitrary customer identification, consists of two-digit codes for space (57), district (35), block (62), one-digit code for the blockside (1, 2, 3, 4), two-digit code for the building, and two-digit unique alpha-numeric customer number.

Applications of the Linear System

How does a linear geographical system affect the economics of individual companies, or even the national economy? Many people are active rearranging data, dispersed by men and machines, to the logical geographical relationships on which management decisions have to be made or actions taken. This process takes much time, and often timeliness is lost.

The increased effectiveness of company operations, and the new uses to which market data can be put, should easily absorb the existing skills. The emphasis in the processing of market data would be shifted from historical files to geographical locations and adjacencies; from inability to analyze and correct variations to constructive solutions of problems and expansion of business.

Testing the Reliability of an Indicator

A typical example of the application of the linear system to the optimization of marketing is the case of a corporation which was anxious to test the reliability of an indicator, used to determine potentials and quotas in durable goods sold to industries, against other possible indicators. The conventional indicator was available only by industry classification; the tentative indicators, to be used in the correlation, were collected for each prospect by the field organization through a continuous census.

The enumeration cards, used in the continuous census, were created originally from questionnaires, and included a number of significant characteristics, such as standard industry code, Dun and Bradstreet rating, attitude, competition equipment, and other data.

Through a computer program it was possible to include additional indicators, and test the correlation geographically by industry, as well as overall. Once the user was satisfied as to the reliability of the selected indicators, the prospect records could be weighed, and accumulated in linear sequence by buildings, blocks, districts and spaces. Since the linear code assured shortest distance from prospect to prospect — overall as well as by industry — the lack of balance between sales territories and reservations was easily spotted. The sales territories were then equalized easily. The field organization demonstrated confidence in the new approach, and in many areas, the sequential linear territories replaced previous arbitrary allocations of prospects and reservations.

The Linear Master File

The linear master file, used in the establishment of potentials, can serve as a vehicle for recording performance, such as frequency of calls, distance factors, and sales results. Potentials, performance and booked sales are then accumulated by small and large linear geographical units, overall or industry totals are established, and variances later analyzed down to their original causes.

Modifying Territories

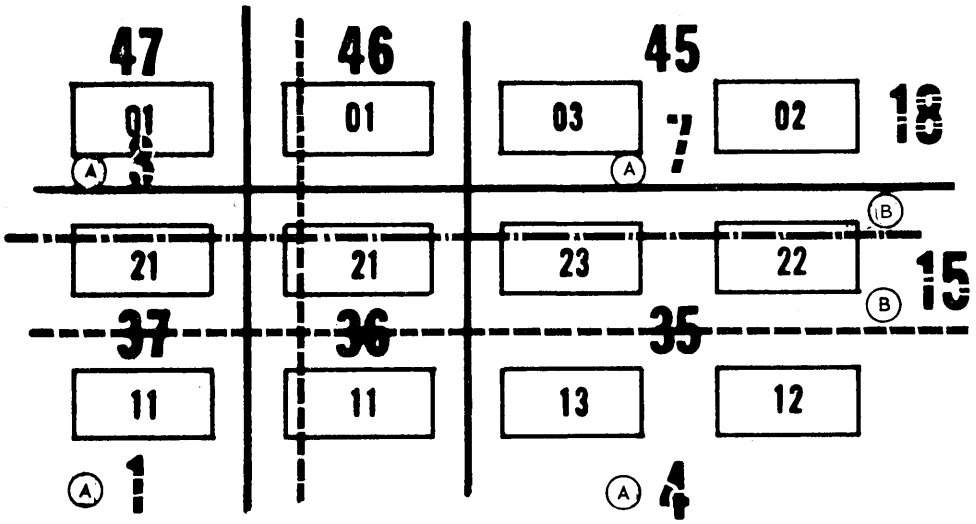
In another application, union opposition prevented modification of territories, assigned on the basis of seniority, and used in the computation of commissions. Actually, three territorial systems were used simultaneously in the same large metropolitan area. By identifying the points at which each system varied from the linear sequence used in computer processing, it was possible to replace the cumbersome manual computation by an electronic procedure, without modification of the union contract. (See Figure 9.)

In another union situation, where the effectiveness of deliveries and service was low, the linear system showed the areas of weakness and permitted reduction of operating expenses through increased speed in dispatching and better scheduling of deliveries of goods and services.

Figure 8
Linear Arrangement of Names By Building, Blockside, Block

573562 1 3800	18 E 41 ST NEW YORK	
573562 1 3805	AUDOGRAPH CO NY	18 E 41 ST NEW YORK
573562 1 3800	HEALTH SERVICE INC	18 E 41 ST NEW YORK
573562 1 3810	BECKER HARRY	18 E 41 ST NEW YORK
573562 1 3818	CONN GENERAL LIFE INS	18 E 41ST NEW YORK
573562 2 3000	475 5TH AVENEW YORK	
573562 2 3010	BARBIZON CORP	475 5TH AV NEW YORK
573562 2 3011	BENENSON REALTY CO	475 5TH AVENEW YORK
573562 2 3012	BUTTERRIESER J L ESTATE	475 5TH AVENEW YORK
573562 2 3016	CESCO CONTAINER CO	475 5TH AVENEW YORK
573562 2 3031	FENESTRA INC	475 5TH AV NEW YORK
573562 3 5000	9 E 40 ST NEW YORK	
573562 3 5017	CAYTON INC	9 E 40 ST NEW YORK
573562 3 5025	DODGE X SALTZMAN	9 E 40 ST NEW YORK
573562 4 6500	292 MADISONNEW YORK	
573562 4 6506	AMERICAN TRANSIT ASSN	292 MADISONNEW YORK
573562 4 6513	BUCHMAN X BUCHMAN	292 MADISONNEW YORK
573562 4 6542	ALFRED HOPKINS X ASSOC	292 MADISONNEW YORK

Figure 9
Method of Identifying Different Territorial Systems Within a Metropolitan Linear Plan



Division Cards
Blockside Territ.

			A	B
35	12	1	4	15
35	22	1	7	18
35	22	2	7	15
35	23	1	7	18
35	23	2	7	15
36	11	1	4	15
36	11	2	1	15
36	11	3	4	15
36	21	1	7	18
36	21	2	3	15
36	21	3	7	15
37	11	1	1	15
37	21	1	3	18
37	21	2	3	15
45	02	1	7	18
46	01	2	3	18
46	01	3	7	18
47	01	1	3	18

Centralized Dispatching

In the case of a nationwide transportation industry, centralization of the dispatching function seemed to be the only solution to the retention of trucks and waste of time as well as facilities by decentralized dispatching offices. The linear system permitted the selection of points of origin, points of destination and reporting points in geographical sequence along the principal routes of movement and became the basis for the modification of the dispatching function.

Computation of the optimal location of manufacturing plants, distribution points, warehouses and terminals is another example where the linear system permits the accumulation of data and computer processing. Inventories and establishment of reorder points would be an application related to the optimization of the distribution network.

Impact of advertising or television commercials can be measured accurately if opinion and consumer research, sampling techniques, and comparison of expenditures to returns follow the same linear arrangement, provided by the linear master file.

Direct Mail Promotion Analysis

Direct mail promotion is another medium in dynamic marketing which is increasingly interested in being able to relate compilation data to physical locations of small centers of distribution or areas of followup activity. Comparison of data accumulated by postal zones is a cumbersome process in itself, but can be considerably simplified if linear code is used to relate geographical locations according to adjacencies. In large metropolitan and adjacent residential areas, the linear code permits identification of both irregular census tracts, as well as arbitrarily numbered postal zones, by computer methods. When linear code is used, any kind of redistricting can be accomplished in a fraction of the time otherwise required.

Advantages of Linear Coding

The benefits resulting from the application of the principle of linear coding and processing are numerous and affect many economic activities.

The dispersion and disorientation resulting from the meaningless alphabetical sequencing of geographical data is removed. With the linear code, minute identifications are not lost once data are accumulated on higher level units. Comparisons are made on higher levels, and variations can be traced to their original sources with great ease.

Tapes with pre-recorded factors can be collated with tapes recording the original data, and regional adjustments can be made through a stored program.

Cumbersome classification of data is unnecessary, as data can be extracted selectively and still remain in optimum linear relation to adjacent data. After selective processing, data can be associated in one computer run with the bulk of data through sequenced collating rather than sorting.

Reapportioning of territories, and balancing of workloads, can be accomplished in the shortest possible time, since any irregular territorial system can easily be identified against the linear system. Thus, while data are accumulated and processed on the computer by the sequenced linear system, assignment can be easily made according to other overruling nonlinear, nonaligned or nonsequential considerations.

The linear code can be subjected to arithmetic and logical operations, and relative distances of selected locations to other locations can be computed as well as accumulated.

Cumulative relative distances of each point to all other points can be arranged in order of magnitude, and the absolute, or weighted, center of data within space can be computed. Starting from the center or from any selected point, locations can be paired for optimum solution of transportation problems.

A third dimension can also be added to the two-dimensional linear code, in order to identify altitude or magnitude. This might prove useful in flight control, weather forecasting, or study of radioactivity.

The linear code, combined with the capabilities of the computers, will improve our access to information about the physical world in which we live and keep us abreast of its constant changes. Data, coded by the linear code, can be programmed to be printed in the form of statistical maps, without the need of cumbersome manual plotting.

The numerous applications of the linear code have been useful and beneficial, and seem to justify wide use of the linear geographical concept.

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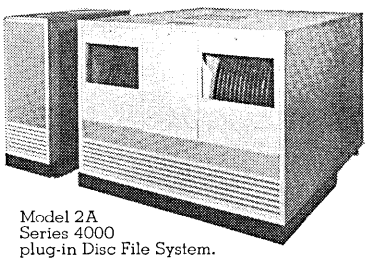

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"Workers don't lay back on the job or strike because of poor lighting, unclean washrooms, or abusive supervisors. It is these situations that irritate them, however, to the point where they will close their minds to management's problems."

During the first seven months of 1967, the number of strikes ("work stoppages") estimated by the U.S. Department of Labor reached a higher level than in any comparable period since 1953, and the number of workers involved in such stoppages was higher than in any year since 1952. Slightly more than 80 per cent of these strikes were in union plants — 45 per cent were due to renegotiation of contracts, and 35 per cent were due to quarrels during the life of the contract.

While the computer industry *per se* is small compared to many other manufacturing industries, many computers are sold to companies in the processing industries (e.g., chemicals, petroleum, food, paper, etc.), and much computer time is purchased by other manufacturers (e.g., textiles, metals, drugs, etc.). All these computer users are well unionized. In addition, many manufacturers of instrumentation and control equipment produce sub-assemblies and components of computers; they too are well unionized. Hence the subject of how to live peaceably with a union is of general interest not only to computer manufacturers, but also to many of their customers, users and suppliers. The examples chosen in this article, therefore, go across the board and illustrate how the entire computer industry complex — producers, customers, users and suppliers — might learn to live with unions, without strikes.

Strikes are expensive. A conservative estimate is that every strike costs a company $1,000 per man-day. Not many corporate managements tabulate the cost of strikes. But some do. Recently, in a quarter-page advertisement in the *Wall Street Journal*, a company reported (for the first six months of its fiscal year) to its shareholders:

> Net sales in the second quarter reflected a decrease of $2,444,000 when compared to the second quarter of last year. *This decrease was due entirely to the work stoppage.* Net earnings in the second quarter declined to $1,935,000 or 54¢ per share compared to $2,603,000 or 71¢ per share in the fiscal 1966.

Union-Management Relationships

For every one company with a strike loss, there are about 10 unionized companies that do not have a strike but suffer financially from unnecessary handicaps and unsolved problems arising out of the union-management relationship. The profit situation of these "other 10 unionized companies" *is often undermined by a combination of some of the following conditions,* most of them related to the labor-management situation:

1. Grievances at a high rate, having little substance, and coming in bunches.
2. Absenteeism high, with no union cooperation on stimulating a decrease.

3. Labor turnover high.
4. Union steward friction with, and hostility to, supervisors, undermining management control in departments.
5. An employee combat attitude towards management.
6. Openly expressed distrust of company motives, policies, statements and executives.
7. Poor or declining productivity, and union resistance to improved methods and/or machinery.
8. Excessive waste, spoilage and customer returns.
9. Careless use and frequent breakdowns of machinery.

Many of these conditions — *costly in themselves* — often foreshadow a strike, since they indicate that unionized employees and their union officials have closed their minds to management's viewpoint and disbelieve management's facts. Moreover, with the industrial slow-up experienced in the "recession" of Spring and Summer of 1967, these cost handicaps become more serious and threaten the very existence of many smaller and medium-size companies.

What is Happening Today

That this is precisely what is happening today may be gauged from a note in *Business Week* on the business outlook:

> . . . The index of labor cost per unit of output has now risen 5% since July 1966, when it began its sharp upward trend . . . Prices are not rising anywhere near so fast as labor costs. That's what put the squeeze on profits in the first quarter — and is doing the same for the second quarter (of 1967) . . .

The ironic fact in all this is that management rarely is aware that employees have closed their minds to the company situation on production, productivity, costs, profits or other aspects of the business. Management ignorance of true employee sentiments is so common, that I accept it almost as a matter of course whenever I am invited to examine a critical industrial situation.

An example might help. An electrical machinery producer had a main plant of 1,600 employees and four smaller plants with 800 employees. The main plant, which had 67 per cent of the employees, produced only 43 per cent of the total output and only 22 per cent of total earnings. Wages in the main plant were higher than in the smaller ones. In 1965, after a contract disagreement, a six-week strike at the main plant directly cost the company $1,700,000, plus the loss of important customers.

After the strike was settled, grievances continued to come in at the incredible average of about 45 a month. (These grievances, including those going to arbitration, cost $300-$500 each, according to management). Productivity was low, spoilage and waste were high, with customer returns (only a part of the total spoilage) amounting to 4.8% of shipments.

Union Attitude

Management had tried many "remedies". Nothing helped. Finally, a new management team was promoted and concluded that the problem was buried in worker/union attitudes; these had to be changed. But how? They decided that plant management was too close to the problem to tackle the job of changing attitudes. A consultant specializing in the area of communications and employee morale was engaged, with special experience in interviewing plant employees. He met regularly with employees. Trouble spot after trouble spot was turned up and reported to management. Each trouble spot had to be studied, evaluated and where feasible, acted upon if the confidence of the union officials was to be won.

Here are some typical employee allegations, among hundreds:

1. Supervisory favoritism determined who worked overtime.
2. New machinery in certain departments was taken to mean that automation was coming and many jobs were to be eliminated. This created union resistance to improvements.
3. Outmoded machinery in other departments was said to prove that the company planned to shut down and shift production to other plants. (Contradictory feelings in the same plant, even in the same department, are not unusual, rather typical. They are signs of an extreme breakdown in communications).
4. The washrooms were inadequate and some dirty.
5. Lighting in Department X was a danger to the men; it was too dark.
6. Lighting in Department Y gave off a glare, endangering men.
7. Foremen pressured, shouted at, and berated employees.
8. Management was out to undermine the union by stalling on grievances.
9. Management didn't care what was going on; they wanted to sell the business to a giant corporation and get out.
10. Management was always "crying po'mouth" and hiding the profits.

Management was unaware of a single one of these conditions and allegations. In addition, dozens of constructive ideas were reported in the employee interviews — ideas dealing with plant inefficiencies, poor equipment, poor practices, waste, etc.

Every complaint or constructive suggestion was evaluated on its merits and either corrective action taken or a reasonable reply given to the complaining employees as to why no action could be taken. A total communications program including a revised house organ, bulletins, special messages, special supervisory training, etc., was set in motion.

Grievances Decline

In the third month of the program, grievances turned down for the first time in 19 months. In addition, the company recorded that most grievances were now being settled at Stage 1, rather than going all the way through Stage 3 or arbitration. New equipment was purchased where investigation agreed it was needed and capital budgets permitted. Repairs were made where they had been neglected. Paint was used to clean up the shops.

In other words, management took seriously what it had learned from listening to its employees and applied itself to correcting the situations thus uncovered. For the first time, management was acting on its real problems rather than to its presumed problems. *Also, for the first time, union employees and officers were listening to management's point of view.*

In the space of 16 months, grievances dropped to an average of 16 per month (from 45) on a two-shift operation of 1,600 employees. Productivity rose by 18 per cent. Annual output of the plant climbed by $4,200,000 putting the division at 60 per cent of the company's total production, a respectable figure. Spoilage dropped by 12 per cent. Earnings rose so that the main plant in this year accounted for 52 per cent of company total earnings. In other words, the company's flagship plant had been turned around.

It was not, however, through any miracle cure. It was rather a sustained, sincere effort over a long period of time that involved skilled assistance plus a shift in management policy. The payoff came in contract negotiations 24 months

after the strike. A full range of issues was negotiated amicably. A settlement was reached that was 0.7 per cent under the industry average — and accepted by union acclamation. In terms of the contract settlement alone, management estimated that it saved $135,000 per year for the next two years. Reductions in grievances were estimated as a direct cash saving of $80,000.

Two-Way Communications

The major shift in management policy involved one important step: the establishment of a permanent two-way communications system — *upward* as well as downward — that enabled management to learn directly what was honestly troubling its employees and why they resisted management's efforts to improve the company situation. Corrective action, where needed, followed as a matter of course, since most managements are sincerely interested in removing causes of dissension and disharmony.

Almost all union and worker distrust of management can be dispelled even though productivity is sagging and costs skyrocketing, even before grievances pile up and foreman frustration becomes uncontrollable — yes, before management and union officials glare at each other across the negotiation table and a strike ensues.

How? *By listening to employees.*

Every employer in the land believes that he listens to his employees. Listening to employees is the one step that simultaneously is meaningful to employees and useful to management in reducing in-plant tensions between union members and managements. This sounds simple. But listening to employees — truly hearing what they have to say with an open mind — is one of the most difficult tasks of management. *Upward communication* is the first line of communication to clog (if it was ever open); it is the hardest to unclog — but it is also the most fruitful step towards bringing labor-management understanding.

Academic investigators for years have found that such is the case; the latest studies by W. J. Dickson and F. J. Roethlisberger (*Counseling in an Organization: A Sequel to the Hawthorne Researches,* Harvard Univ. Press, 1966) and W. F. Whyte and E. L. Hamilton (*Action Research for Management,* Dorsey Press, 1965) both indicate the great efficacy of "listening to employees." Academic investigators have also found that most companies cannot do this for themselves because (1) most employees, when interviewed by their own company personnel, are afraid of foremen reprisals if they complain, and (2) most companies do not have employees skilled in these interviewing techniques. My experience, however, is that some can be taught.[1]

Another example comes to mind. A company manufacturing instrumentation and control equipment with about 2,600 employees had been forced to make drastic reductions in labor costs to maintain its competitive position. A highly competent outside firm of industrial engineers was hired, and under the guise of a "production scheduling program", recommended that about 280 men be cut out of the work force. Before long, however, the story that this was only "a scheduling program" evaporated; the reaction was almost disastrous.

In time, expensive equipment breakdowns became a common occurrence; spoilage, "returns and allows" and fabricating mistakes multiplied many times; late deliveries to customers became usual practice; grievances piled up. Then slowdowns began to crop up which aggravated the labor cost problem. A walkout was rumored.

Corrective Action Needed

As a result of the turmoil, the company hired a consultant in communications. This consultant saw enough of the management data to know that some corrective action had to be taken on labor cost; on the other hand, he had learned through a whole series of employee meetings that the union officials and their members had concluded that the "scheduling program" was nothing but a device to increase each man's work load, and enhance company profits. They were adamantly opposed to it. No effort had been made by management at any time to inform the men why the scheduling program had been necessary and to elicit their cooperation.

A comprehensive program was set in motion whereby the workers would be made aware of the company's cost problems in meeting new competitive methods. The communications program included indoctrination of supervisors and employees through meetings, speeches, special house organ stories, charts and posters. As a first step, it was suggested that the union officials be let in on the truth.

This was a drastic departure from the company's former policy. The meeting with union officials was a real shock to the company. The union stewards and officials asked questions and quickly caught the drift of the answers. After three meetings they suggested several alternate and constructive means of cutting costs in order to protect the jobs of the remaining men.

A few of these methods had considerable merit, and the management agreed tentatively to try two major suggestions involving a change in material flow through the plant, and a change in the allocation of work. The union officials pledged themselves to seek the cooperation of all their members in meeting the company's new situation.

Coupled with this, the communication program was enlarged to enlist more of the workers in various management-labor committees, while interviews with employees were continued on a regular basis. This "upward communication" made clear to the union officials and members that a sincere effort was being made to meet the employees' needs — small or large.

It was not until about five months later that it became evident that the new methods were bearing fruit. Direct labor costs had been cut 14 per cent while productivity showed a 6 per cent gain and spoilage reduced by 9 per cent. This was the beginning of a new era of improved employee morale. The company is not quite out of the woods, but it can see daylight through the trees now.

Reports Are Faulty

Management executives depend upon other people to report on employee morale — e.g., personnel department people, general foremen, line supervisors. But most of these people (consciously or unconsciously) report only what they think is important, and often this is far from the whole employee story.

What can employers do? For this common situation, there is only one weapon: Set up some system for listening to the employees, face-to-face. There is no other way that tells management just what is troubling its employees, or what communications devices must be used to overcome the misunderstanding and enable the company to make progress.

In an interview recently, Manning Riser, plant manager of DuPont's plant in Laplace, La., explained how his plant was able to hang up the best record for any DuPont plant in 1966:

> . . . We try to make our personnel aware of our goals, concerns and successes and we try to be aware of theirs

[1]There are only a few skilled consulting organizations that have the experience on how to use the "face-to-face interviewing" technique and other communications devices in order to eliminate labor-management disputes and to improve productivity and profits in plants. Companies with problems in areas of union-management relations that are not touched on directly in this article may obtain reference material, other research data and counseling recommendations by writing directly to A. A. Imberman, Director, Management Seminar, Illinois Institute of Technology, 3300 South Federal Street, Chicago, Illinois 60616.

as individuals. One way we carry this into action is through a continuous communications program. We talk to each other. *We try to let each other know what we are thinking, why we feel the way we do.*

Coupled with the "face-to-face communications as the single most effective means of creating an interchange of information", the DuPont plant management uses other tools and techniques: better house organs, periodic letters and special messages to employees, visits with employees' families, tailored attractive bulletin boards, and so on. This system did not spring up overnight, nor does it operate automatically. Specially trained people from the outside are involved in its planning and doing.

Of course, most managements believe they do receive reliable reports about employee morale from foremen. Unfortunately, this is not true. Foremen normally are busy trying to get the work out. They must direct the work in their departments, check the work, maintain discipline (despite the stewards in some cases), and enforce company policies and safety rules. The foreman is judged primarily by his work flow. He can listen only "with one ear" to employee complaints and gripes, and occasionally bring those to his superior's attention. But the superior has no more time for those gripes — or even constructive suggestions — than the foreman has, because the major problem facing the superior also is to get the work out. Then the steward gets into the act and the heat increases — but not the efficiency.

As Professor D. Katz and R. L. Kahn of the University of Michigan pointed out recently with regard to foremen reporting on employee morale:

> It is not only that they tell the boss what he wants to hear, but what they want him to know. People do want to get certain information up the line, but generally they are afraid of presenting it to the most relevant person or in the most objective form. Full and objective reporting might be penalized by the supervisor or regarded as espionage by peers. To these difficulties must be added the fact that full and objective reporting is difficult, regardless of the organization situation; no individual is an objective observer of his own performance and problems.[2]

My own experience would indicate that foremen can be taught "to listen" and report objectively — but not all foremen. Typically, about 70 per cent of all foremen are reasonable men, and can be quite objective about employee gripes in their departments. But about 30 per cent of all foremen are *themselves* the source of trouble in their own department, and few employees have the temerity to voice such personal objections to their foremen, or expect to have such objections accepted.

Another Case

In a chemicals manufacturing plant with about 1,100 employees, most employees ranked as assembly line operators; parts came to them in a flowing system, each employee adding a bit of material and work.

A new plant executive, out to set a record in his plant, applied engineering principles: he regarded employees as machine tenders, and thought they would work precisely in accordance with new prescribed work practices laid out by the time-study engineers. When the employees failed to respond to the tasks laid out for them, he exhorted the foremen to apply pressure to the workers — which brought indignant response from the union. These he ignored. Company house organs and bulletins were put out, designed to whip on the employees. The personnel department was kept busy recruiting new employees, partly because the plant was expanding, and partly because of the rise in labor turnover and absenteeism. Productivity began to sag, profits were affected, and the home office started to ask questions.

Negotiations on a new contract seemed to hit many snags, and after a period of legal grips and grapples a 4-week strike followed, settled later on substantially the pre-strike terms.

Subsequent interviewing of employees disclosed that the rapid growth of the plant had shaken the loyalty of a good number of the older employees, but the foremen had never reported this. The older employees no longer were surrounded by familiar faces; they no longer felt that the company had much interest in them. By the plant manager's new ruling, their personal gripes now had to be formalized and channeled by the stewards through a personnel department which was so overworked that it had no time to handle what appeared to be an organized campaign of grievances. Company bulletins assuring the employees of the company concern for them were denounced as dishonest by these employees. Confidence in management seemed to have evaporated. The foremen had never reported this either.

The result was alienation of union officers, stewards, and older employees. The newer employees had no company loyalty; they willingly voted to strike for "more", despite their union local president's plea. The result was foregone. Yet all of this could have been avoided by a procedure of "listening to the employee". Such a communication system — from the bottom up — would have caught the drift of employee opinion and the basis thereof, and enabled management to act in time.

It takes time, effort and skill to listen to employees and to understand what corrective actions have to be taken. Given time, such techniques work splendidly to win employee and union officers' goodwill, so that production and sales may go on uninterruptedly, enabling both management and labor to earn larger returns.

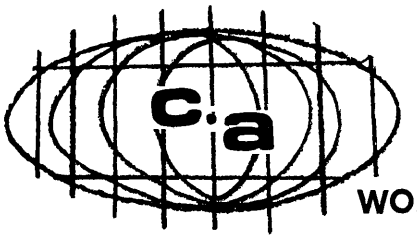
The answer to the increasing numbers of strikes points to the absolute need for upward communication — the kind that tells management on a continuing basis what employees really think and feel about their work situations. Without such information, most plant managers operate in a vacuum, a never-never land of illusion.

My 24 years experience in this area would indicate that a plant, large or small, can have good labor-management relations only if it has good two-way communications. The larger the plant, or the more numerous the plants, the greater the need for communicating and the greater the problems in communicating effectively. This is especially true of *upward* communication. The bigger the company, the more an individual worker feels left out of the picture, the more he feels a need for some method of retaining his individuality, of being able to communicate with someone in management, of finding someone *to listen to him.*

Workers don't lay back on the job or strike because of poor lighting, unclean washrooms, or abusive supervisors. It is these situations that irritate them, however, to the point where they will close their minds to management's problems. When the trouble brews, such "good" reasons as wage rates are trotted out to justify the strikes, while the *real* reasons — the irritating elements — provide the emotional impetus to the strike. Without the emotional impetus, it is rarely possible to have a strike or lagging productivity.

This is why it is vital to listen to employees; that is how their real reasons for stoppages or poor performance are discovered. The overwhelming majority of cases of industrial inefficiency or unrest can be eliminated if management could be taught to listen to employees.

[2] *The Social Psychology of Organizations,* by Daniel Katz and Robert L. Kahn, Wiley and Sons, 1966, P. 247.



REPORT FROM GREAT BRITAIN

The Single British Computer Company

If all goes well, by the time these lines are read, the long and difficult negotiations to set up the single British computer company — likely to be called "International Computers Limited" (ICL) — will have been brought to a successful close.

At the time of this writing (March 1) all seemed to be over, bar the Government's blessing in the form of about £20m. The share-out in the new company should be 50 per cent for International Computers and Tabulators, 20 per cent for the giant Plessey group — the component specialists, 20 per cent for English Electric, and 10 per cent for the British Government.

It is only fair to point out that the merged group may create more problems than its formation could solve. The idea was primarily to put an end to the lunatic situation in which two relatively small companies were fighting each other, in what was often a most ungentlemanly way, for a mere 50 per cent or thereabouts of the British market, while International Business Machines walked off with the plum contracts for the top company names such as Rolls-Royce and Unilever, and Univac captured the major real-time reservation system for British European Airways, among other important jobs.

But now the Government itself has put in some money, although it still is not clear which pocket of the various possible sources it will come from. The question will be asked whether any Government agency which has to assess tenders from the new ICL group against those from U.S.-backed companies can be expected to be scrupulously fair. Spokesmen for several of the U.S. companies established over here have often told me of tenders lost through what they described as "discreet last-minute intervention from extremely influential Ministry quarters".

Another point of concern is the fact that Plessey has come in to save its component outlet. But a major seller to ICT has been Mullard, whose parent company, Philips of Eindhoven, holds the key to any attempt to set up a European-based computer industry around the new British nucleus. If Mullard interests are harmed, the way to some form of European computer link-up will be all the more difficult.

The Giant Machine

The next problem for solution is that of the giant machine. I hardly need to tell readers that with the notable exception of the 1108 from Univac, giant machines by themselves have made midget profits or giant losses. But the British Government wants its giant machine, which it sees as a proof of maturity in the art of computation. It also sees a potential local market of some 50 machines in the class of the Burroughs B7500/8500 in the UK over the next several years. This is just not possible. *Maybe* this figure could be attained in Europe over the next ten years — if communication authorities start to install broad-band links like mad as of tomorrow!

Be that as it may, the hardware will cost about $30 million to develop; add the cost of setting up the first four or five machines on the production line, the cost of the software support such big systems require, and there will not be much left out of $100 million.

Burroughs in Banks

In any case, it almost looks as if the situation is being pre-empted. As I predicted earlier this year, the possibility that Burroughs might scoop all the major British banks has come true. It had already placed a B8500 and a mass of terminals both with National Provincial Bank and with Barclays Bank. Now it has sold two B6500 systems to the Midland Bank, ousting English Electric, which was to have installed six or eight System 4-70's. In the other two instances, IBM was the loser.

But in the meantime, National Provincial has merged with the Westminster Bank which was strongly IBM-oriented, while Barclays is joining forces with Lloyds (IBM) and Martins Bank (NCR). Bearing in mind the immense capacity to run terminals of all types built into the big Burroughs machines, it would surprise no one to see, by 1970, the whole of the UK's big central clearing bank network with its many thousands of branches operating on nothing but Burroughs equipment. The company now holds not far off $90 million worth of contracts in the UK, mostly for the banks. The latter are all in a hurry and most have arranged to operate interim machines such as the 5500, pending the delivery of big brother.

Burroughs is to set up yet another plant in Britain at its Cumbernauld site, it is expected. Plans are afoot to build the TC500 terminals and probably the B2500 medium-sized computer there.

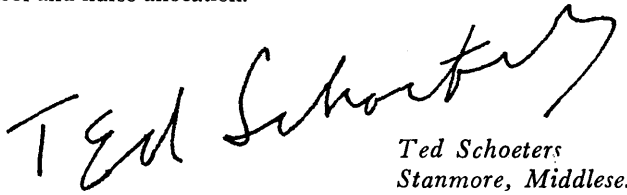
Burroughs, like Honeywell, is a major manufacturer and exporter from Britain and employs many skilled men in areas where bleak economic depression would otherwise prevail. National Cash is another major employer with well over 1 million square feet of factory area in the Dundee district, once a flourishing jute weaving area. But for NCR's quick expansion, Dundee might well have become a dead city.

Now, even more work is in prospect, since NCR is to make central processors and thin film memories for its new computer series in a 440,000 square foot plant it recently acquired. Initially the 100 and 200 will be provided for.

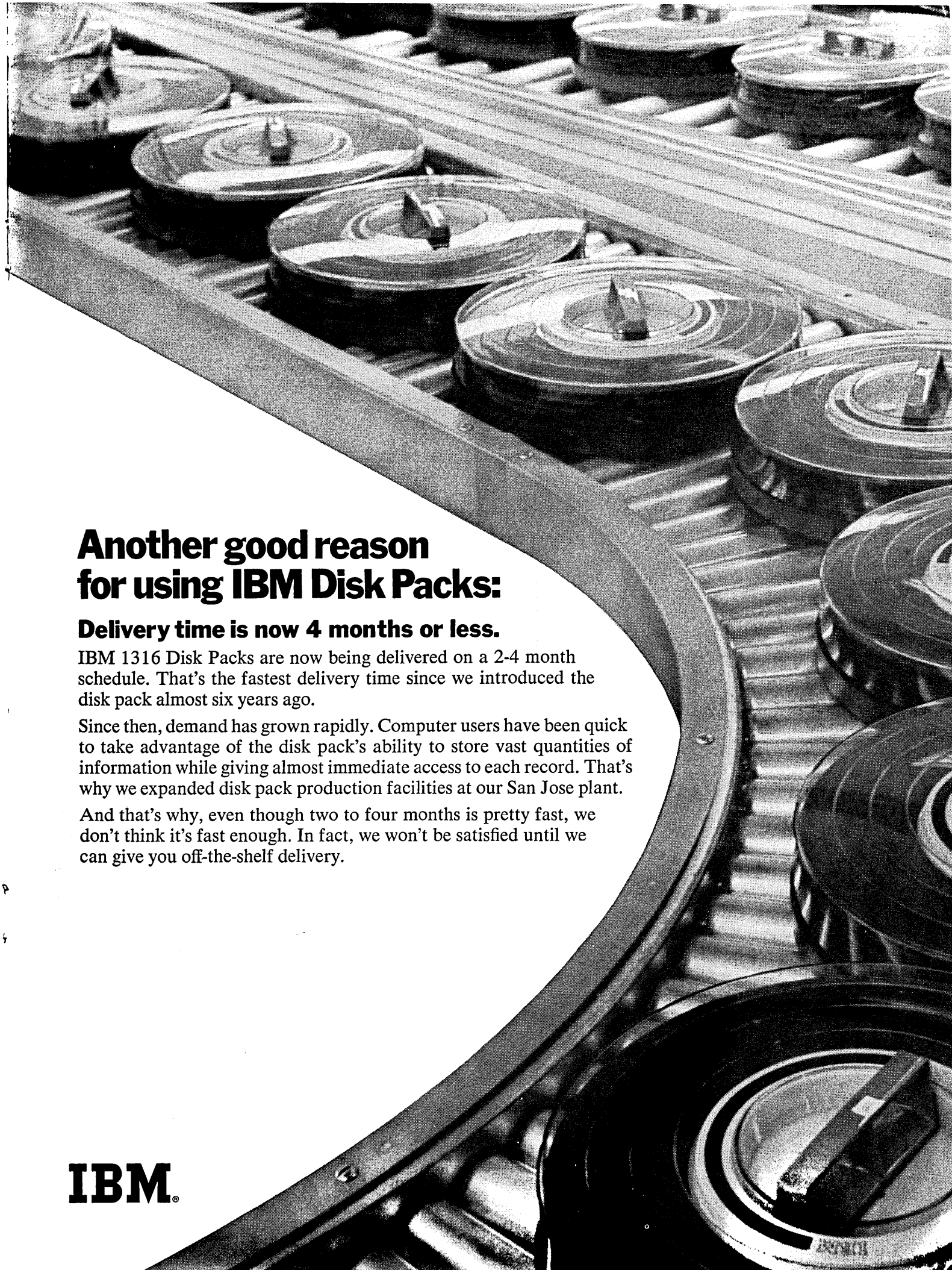
Multi-Access System for Hospital

Britain's first multi-access system for a hospital has been announced. Using an ICT 1905E, it will be set up at King's College Hospital where initially messages from two wards, from the X-ray department and from the pathology department will be received on line and, ultimately, used to provide far more rapid analysis than hitherto of patients' condition.

Further expansion of applications into diagnosis, prognosis and treatment is planned, apart from the routine jobs of admissions, out patient appointments drug and diet control and nurse allocation.



Ted Schoeters
Stanmore, Middlesex
England



Another good reason for using IBM Disk Packs:

Delivery time is now 4 months or less.

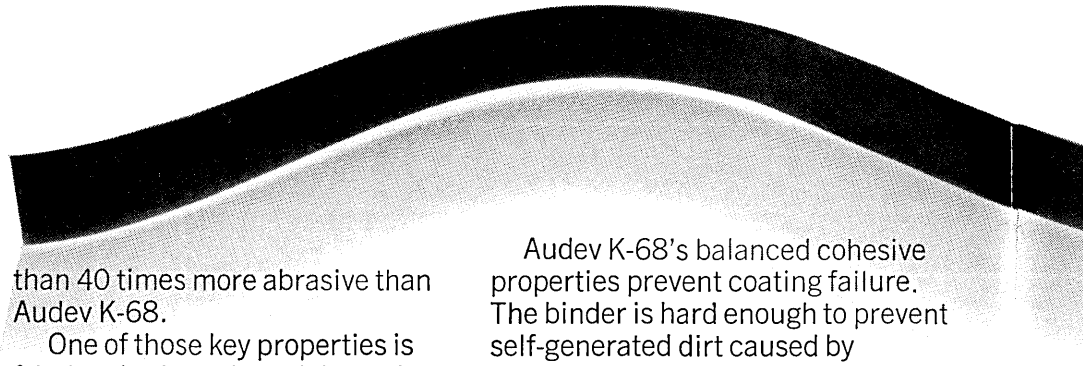
IBM 1316 Disk Packs are now being delivered on a 2-4 month schedule. That's the fastest delivery time since we introduced the disk pack almost six years ago.

Since then, demand has grown rapidly. Computer users have been quick to take advantage of the disk pack's ability to store vast quantities of information while giving almost immediate access to each record. That's why we expanded disk pack production facilities at our San Jose plant.

And that's why, even though two to four months is pretty fast, we don't think it's fast enough. In fact, we won't be satisfied until we can give you off-the-shelf delivery.

IBM®

At last! The computer tape that's not "too good to be true."



Some tapes are. That is, certain of their properties are made "too good." Often at the expense of other, equally important characteristics.

Outstanding tape durability can be gained at the expense of increased head wear; remarkable coating adhesion could mask inherent internal weakness (and result in premature breakdown); "high-powered" magnetic properties may cause the tape to be electrically incompatible with your computer system.

Because magnetic tape properties are frequently interdependent, often conflicting, we make no boasts of specific superiorities for our new Audev K-68 computer tape.

Instead, we deliver a premium tape in which all the critical characteristics have been *balanced* to provide a high initial quality that will not deteriorate with storage or hard use.

What do we mean by balance? Read on.

It's a dirty shame what some "clean" tapes do to your heads.

To begin with, we know what happens when balance is lacking. There is, for example, one computer tape on the market that is excellent in its freedom from dropouts. It makes a remarkable "first-pass" impression. Yet, an imbalance in key properties makes this tape more than 40 times more abrasive than Audev K-68.

One of those key properties is friction, both static and dynamic. And one way to reduce friction is by lubricating the surface of the tape. But this "trick" solution is short-lived and tends to distort start/stop performance.

In Audev K-68, we attacked the problem differently. Carefully combining binder ingredients, processing and surface treatment for proper static and dynamic frictional balance, we've produced a wear-resistant surface that will not break down on high-speed transports.

But, you might ask, couldn't a really hard binder accomplish pretty much the same result? We say...

Don't get stuck by the "sticky tape" test.

Take one of those tough tapes and torture it. No amount of pulling, scratching or stripping off with pressure-sensitive tape will cause the surface to flake or shed oxide.

But this, too, may be an imbalance. What you may not see is a stiffness and brittleness which could make the edges particularly vulnerable to damage.

Audev K-68's balanced cohesive properties prevent coating failure. The binder is hard enough to prevent self-generated dirt caused by abrasion, yet tough enough to keep the edges from deteriorating.

At the same time, K-68's smooth, non-sticky coating provides few anchoring possibilities for ambient dirt or oxide redeposit. And its low resistivity virtually eliminates electrostatic pull on floating dust.

Balance also affects a tape's electrical characteristics.

We do our bit for today's high densities.

The higher bit densities of today's computer systems make demands that previously acceptable tapes can no longer meet. Use of a marginal tape in such circumstances often results in a gradual deterioration of quality. Dropouts increase; costly computer time is lost.

Audev K-68 takes these new, stringent conditions into consideration. Its magnetic properties, coating thickness and surface smoothness are balanced for total compatibility with all computer systems and for equal performance at densities from 556 bpi to 3200 fci and beyond.

How? A balanced interplay between low loss magnetics, precise

coating thickness and surface smoothness reduces pulse crowding, peak shift and dropout sensitivity without changing output or write current requirements.

K-68's balance also contributes to its environmental stability.

Keep cool. K-68 can take the heat.

Some tapes are as perishable as ripe tomatoes. They react poorly to temperature extremes in storage or transit; they "bruise" easily when moved from transport to transport.

Not Audev K-68. Base and coating properties have been balanced to provide uniform dimensional behavior. Cupping, curling and edge ripples caused by differential expansion or contraction of coating and base have been virtually eliminated.

Nor is Audev K-68 prone to skew-produced, time-displacement errors. Precision slitting, together with the scientifically designed Audev reel—and the low moment-of-inertia of the tape/reel combination—provide smooth tape motion on any transport.

Test a sample reel on your transport. For a change, try a balance, not a compromise.

Audio Devices, Inc.
235 E.42 St., NYC 10017

Designate No. 25 on Reader Service Card

The Concept of

THE "DATA ANALYSIS AND CONTROL CATALOG"

William B. Stevens
Arthur S. Kranzley and Co., Inc.
1110 Wynwood Ave.
Cherry Hill, N.J. 08034

Currently many companies are seriously considering the development of a data base as a first step toward a Management Information System (MIS). As estimates of manpower and dollars are prepared, it becomes readily apparent that data collection and data analysis are two of the largest tasks to be performed, and two of the hardest to estimate.

The nature and scope of a study leading towards an MIS requires thorough control of the data collected in the study. What technique for data management and analysis will provide the necessary control? This article presents a concept under development which may be the answer.

Data Collection

Data collection for an MIS study is far more of a problem than it used to be in initial efforts for office automation. The volume of data collected is considerably greater because the study covers all or a major share of the departments within the corporation, rather than just one or two departments. Also, the extent of data required within each department is greater. For instance, in a bank, the initial automation efforts were made in demand deposit accounting. Recording of data pertaining to bank services such as savings or installment loans was temporarily (or permanently) postponed. Some of the important data within the demand deposit accounting, such as the alphabetical cross-reference file or the customer's banking history might also have been ignored. But these data cannot be ignored in creating the data base for a bank-wide management information system.

William B. Stevens joined Arthur S. Kranzley and Co., Inc., after five years with General Electric's Computer Division, where he worked as a system analyst and designer and as a sales representative for computer-oriented products. He has B.S. degrees in Electrical Engineering and Business Administration from the University of Colorado. His experience includes analysis, design, development and documentation for automated computer-assisted information systems.

Volume of Data

Because of the large volume of data to be collected and defined, the study team will include more people, and team members will specialize. For instance, one man may work with the current Demand Deposit Accounting (DDA) reports defining fields to be reported; another may work with the bank's operational management to specify their needs; a third may study the various terminal output devices available; and so on. The study becomes less personal; that is, the team leaders will not be intimately involved in the characteristics of the data, or the overall system's requirements for it. Data definitions will need to be standard in format and easily referenced or confusion will result. An index and catalog for all types of data can provide the central reference for the data, and will force a discipline on the entire effort for data collection.

Depth of Analyses

The depth of analyses needed in the systems design also requires data indexing, cataloging, and control. The desired management information system may well include a wide variety of data capture and reporting techniques, along with stratified files based on demand patterns. To produce such a system requires extensive correlation and analyses. For example, the dollar amount field in a savings account withdrawal must be analyzed to indicate where it is reported, frequency and method of reporting, and value to the organization of having it reported. In addition, it must be correlated to input transactions (frequency, location, method) and analyzed for various storage techniques (demand and volume).

To accomplish this, the data must be well defined and readily accessible. An indexing and cataloging system can aid in producing thorough definitions of the data. The demand for ready accessibility implies using a computer to assist in cataloging and analyzing the data.

The "Data Analysis and Control" Technique

A new concept for management of data in M.I.S. studies is a certain data cataloging technique, which may be named the Data Analysis and Control (DAC) technique. This technique should provide analysis and control sufficient for even the largest management information system.

FOR MANAGEMENT INFORMATION SYSTEMS

"The nature and scope of a study leading towards a Management Information System requires thorough control of the data collected in the study. What technique for data management and analysis will provide the necessary control?"

Basically, the concept works in this way. Through interviews with management and analysis of existing systems, a file of descriptions of all data to be used in the system is compiled. Each item of data considered for the system is defined as follows:

- Name (identification)
- Data Description (field length, character content)
- Literal Description (definition in words)
- Limitations (management level restrictions)
- File
- Volume
- Source
  - — Location
  - — Availability
- Use
  - — Location
  - — Response
  - — Purpose
  - — Display Method
  - — Risk

The *name* is an index code or mnemonic used to identify or address the data; an example might be BALSAV, for "balance, savings." It could (and should) be the same name as used in addressing it in a computer program. *Data description* describes the field's length and digital content, again as in programming; for example, a ten digit numeric field could be specified. The *literal description* briefly describes what the data is. The field BALSAV might have this literal description: "Current savings account balance". *Limitations* lists any management level or department restrictions on the use of the data. To use this parameter requires codification of management levels. For example, BALSAV could be limited to reports going only to "Level 2" bank officers or above.

File defines the linking of this data field to other fields to form records or files for storage purposes. It may be added during the systems analysis phase of the study. The coding used in this field must fit the hierarchy of data files to be used. For the BALSAV field, the mnemonic "MASTER" might be used to indicate storage in the account's master balance file. *Volume* coding will vary depending on the type of data. It can be used for estimates of volume of input transactions, volume of reports, or volume of record storage requirements.

Sources of Data

Source defines the origin of the data. *Source location* may be a department or plant location and a management level, or a computer program. A unique coding system must be devised for each company to describe the possible sources of data. The BALSAV source would probably be a computer program number. A breakdown of the source parameter can be used to indicate the basic source of the data, if it is not a system input. *Source availability* is used to indicate the form and timing of the input to the system. Reference here can be to documents or messages and whether their input is random, batched, etc.

A *use* description will be filled out each time a use for that particular data is determined. Since a given item of data may be used in several places, a given data description may have several use descriptions. The *location* code system is the same as that used to describe source. It must specify a physical location, a functional division such as department, and a management level within the function. As with the source location, the destination may be a computer program.

The *response* portion of the description defines the desirable system response as a period of time such as on-demand, daily or monthly. *Purpose* is coded to indicate whether the data is used for decision making, control of an operation, reference in modelling, etc. The *display method* then indicates whether the data must be written or can be visually or audibly presented. Another choice is a presentation in computer readable form such as punched card.

The final item, *risk,* is the relative value assigned to getting the data to the proper place at the right time. For some data it can be calculated; for other data there is no choice — it must be there. But in most cases it represents a subjective evaluation. It would be best expressed as an order of magnitude of tens of dollars.

Exhibit I shows an example of what one use description for BALSAV might indicate. Theoretical codes have been chosen for illustration.

EXHIBIT I

BALSAV USE NO. 1

Use Descriptor	Code	Code Interpretation
Location	C-2-M	Credit officer, level 2 or above, main office
Response	1	On-demand
Purpose	3	Contributes to decision making process
Display	6	Audio, or better
Risk	5	Management feels that providing BALSAV on-demand to the credit officer will save the bank tens of thousands of dollars a year

Uses for DAC

Creating the necessary descriptive codes and maintaining the DAC catalog described above is obviously not easy. In a study of range size, full time "librarians" would have to be employed for its maintenance. A thorough training and orientation program would be required for all study team members on its *full,* unquestioned use. It sounds like a big order, but it has considerable advantages.

1. **Study Discipline** — A discipline is provided for data collection and analyses. The data which enters the DAC catalog must be uniform and well-defined. The catalog will become a pivotal point of the study. It provides a common base by which all team members, regardless of their specialized skills, can communicate.

2. **Data Cataloging and Indexing** — Its main function is data control through a central index and catalog of the study data. It will be more than that, however, if the study is truly a company-wide effort. The DAC becomes the index of the data flow and demands of the company. Proper (and admittedly extensive) updating will keep it that way. This is, indeed, very important for a company whose planned MIS depends heavily on computers. Such a system will be continually revised and updated. Without a thorough index, the necessary flexibility might not be obtained. The DAC could give immediate response on the inputs, files, reports and programs affected by each data change. The DAC will also be useful in system debugging or, after operation begins, system failure.

3. **Data Analyses** — The DAC use that most directly provides a saving of time and money during the study is analyses of data. Through the proper formatting of the data definition fields, the analysis of the data is limited only by the contents of the definition parameters and codes. Assuming a DAC maintained either on tab cards, disk or tape, the sorts and correlations shown in Exhibit II could be made.

Sorts and manipulations other than the ones illustrated can also be made on the data. Most of these analyses could not be made without the use of the computer. But because of the ready availability of these data, systems analysts should be warned against *overusing* the tool, and so doing, running up sizable computer or tabulating bills.

Computer Program Data Definitions

If the DAC is maintained in the computer, its use can further be expanded into providing a useful tool for computer programming. Computer programs can be written using only DAC index names. By passing the source program by the DAC file, the file descriptions can be checked and completed so that improper references will be caught, and field descriptions will be consistent. In addition, the use descriptions can be automatically updated on the final compilation of the program so that the system documentation will be maintained as the system implementation continues.

EXHIBIT II

SORT KEY	RESULT
a. Source Location — Source Availability	A listing from this sort shows every input point to the system; and by input point, the availability of that data. Duplications or incorrect specification become readily apparent.
b. Use Location — Response — Display	A listing from this sort provides a breakdown of system reports by desired system response, and by acceptable display form. The estimated risk value of each report could be totalled to balance potential *cost of not providing* the report to the *cost of producing it.* Needless to say, the reports with a high cost of both producing and not producing would bear further scrutiny. For ballpark values this method will be quite useful. Again, duplications on file will be quickly detected.
c. Use Response — Volume — Use Risk	This tabulation assists in building the system files and determining storage stratifications (on-line drum versus on-line disk versus tape, etc.).
d. Volume — Use Location — Source Location	This listing will be helpful in designing the communications network, since it will show the areas of heaviest traffic flow.
e. Major Name	Through proper assignment of names, certain data categories can be selected. For instance, every field containing a date could have "DAT" as the first three characters. All dates in the system could then be selected and listed together for duplicate analysis.

Summary

In studies of management information systems there is a need for a Data Analysis and Control catalog. This need exists because of the volume of data collected and the depth of analysis which must be performed on it. The DAC answers this need in four ways:

- It provides a discipline for the data collection and analysis functions.
- As the central index and catalog of the study data, it provides control of the data. Further, its maintenance through implementation will allow it to become the index of the data flow and demands of the company.
- It is a powerful tool for simplifying data correlation and analysis.
- If the DAC is maintained on a computer, it can assist in computer programming and systems documentation.

THE IMPACT OF DATA-PROCESSING TECHNOLOGY ON THE LEGAL PROFESSION

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"A human being's ideas about what to do are hidden inside a computer. What is operating, is still — and always will be — a man-machine combination. And it is our job, as lawyers, to see that nobody is ever allowed to forget that, or to say, 'The machine did it; don't look at me!'"

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What I want to discuss is what I conceive to be the impact of the new technology in data processing and computers upon the legal profession.

Now the hardware — the nuts-and-bolts — is not the thing that will be of most importance to the lawyer. It is the software — the programs, the instructions which one or many human beings give to the machine, that should be, and will become, the focus of interest for the legal profession. Of even more interest will be the human analyses and value judgments that led to the adoption of a particular program and the choice of a particular machine.

When Edgar Allan Poe was alive, Maelzel's chess-playing machine was one of the wonders of the day. It was built by Baron Kempelen, but Maelzel exploited it by touring the world with it — it is said to have defeated Napoleon himself — and Napoleon was no chess dummy. Edgar Allan Poe was no mean detective (he is the father of our detective story) and he showed that a midget could be hidden inside the thing. Poe was proved right when somebody yelled "Fire" during a performance, and the midget came out.

The Chess Playing Computer

The modern chess playing computer which can beat almost anybody in some end games, and a good player on a 6 × 6 board, is genuine. There is no dwarf hidden in it. But it depends on an analysis of the game previously made by

humans and a set of instructions made by humans. A human being's ideas about what to do are hidden inside. What is operating is still, and it always will be, a man-machine combination. And it is our job, as lawyers, to see that nobody is ever allowed to forget that or to say, "The machine did it; don't look at me!"

The area of analyzing a problem and deciding what to tell the computer to do raises a great challenge for the legal profession. Legal problems affected by computers will eventually occupy a great deal of the time of lawyers and courts. There are the problems of contracts covering the acquisition and installation of the new technology by the client, and the tax problems of the equipment itself. Almost every user will make and process records by means of the computer, thus raising evidentiary problems both between himself and people he sues or is sued by, and with the Internal Revenue Service, which is using the computer to check up on him, but is not sure just how much it should let him use the computer in establishing and maintaining his own records.

Problems Created by Computers

There are the problems of patentability of machines and programs connected with machines; of copyright on programs, and of whether use of the content of a conventional copyrighted work in a machine program is an infringement of the copyright. All these last are or have been recently before the Congress. There are the problems of unfair competition, of confidentiality of information, and invasion of privacy.

In the labor law field, there are all the labor law problems raised by the introduction of computer technology to perform tasks previously performed by humans. In a period of rapid change, these problems are enormous, and cannot be brushed off by showing, even if we could show, that the change creates more jobs than it eliminates. You can't tell an Appalachian coal miner that the old job is gone forever, but he is welcome to a new one as an astronaut.

Finally, there are the problems of liability arising out of application of the new computer technology, or the failure to apply it, where it would have prevented the harm.

The legal profession will cope with these problems, because most of these problems come from the novel fact-situations which are imported by computer technology, rather than from a need for new legal rules. They are problems of pouring new factual wine into old legal bottles.

Lawyers Must Use Computer Experts

We, as lawyers, will have to use the experts in this field, in the same way that we have used experts in the medical field, the engineering field, and other fields in the past. And we must learn enough about the field to communicate with those experts. If your client is a man who had a gun, or was on the other end of a gun, you pick up a book on "Ballistics," and educate yourself to talk to the expert — or against him. If your client was another kind of man you may pick up a book called "Lower Back Injuries," and educate yourself. In the future, if your problem is one of computer-controlled production, you will have to be ready to do the same thing. The expert on computer-controlled production comes in, and you ask him, "How did the program and the machine work to produce this result?" If all he will say is "This program califlams the whingdrop and reticulates the residual glob," it is perfectly clear that you are going to have to study up somewhat, in order to make up your mind about what went on. If we run from that education, we will abdicate our responsibility as lawyers. The word sabotage as all of you know, comes from the French for "wooden shoe," and was created when some French workers thought they were thrown out of work by machines. They didn't know that they were only "displaced," so they threw their wooden shoes into the machinery — a very temporary and very unsuccessful reaction. These will be our clients' problems, and if we refuse to understand them, the profession will be left wondering which way everything went.

There is another and even more important reason which requires us to obtain a minimum of education about computer technology. In order to see that our clients' rights are protected, and their duties performed, the legal profession must understand the computer technology for the purpose of seeing through it to the goals of justice. Everything that is done by the "computer" is, in the legal sense, done by some human or group of humans. It is the duty of the legal profession, to my way of thinking, to make sure that this is never lost sight of.

There is a tendency for people to become anthropomorphic when describing the operation of these machines; to say the computer "decided" to do this or that, or it "measured" this and "found" it was not defective; or it "instructed" that so and so be done. If we decide something was not done by any human being, you know how quickly we lose our legal interest in it. We turn it over to the weather man, or the seismologist, and from then on we bawl him out if it doesn't come right. All these systems analyses, and programs, and computer-controlled operations, are merely extensions of humans, who have legal rights and duties, and immunities and liabilities.

Canned Thinking and Canned Prejudgments

Furthermore, in these early stages of the introduction of computer-controlled operations there will be a great many benefits, but also the chance for a great many mistakes, with harmful results. I cannot emphasize too strongly that these machines are things which use stored, canned thinking, canned prejudgments and actions to be executed when certain preselected signals are received from the environment. That means they are no better and no worse than those judgments and that thinking and that decision.

In this early stage of computer use, the opportunity is present for them to produce wonderful results, and also to make some of the largest and stupidest mistakes that any of us ever saw. A stupid human being has literally thousands of different programs which he can plug in and out — thousands of sets of information and canned judgments all available, and scores of ways of taking in different kinds of information. He operates in real time — by which I mean both that he operates in time with what is going on, and that he is flexible. He can change his mind, and his rules, in a way that no machine can do. At present, somebody has to work out — in advance — exactly what a computer is to do — all that it is to consider, and exactly what it is to do in each configuration of those signals. And it is very, very hard for us — any of us, to look ahead in that way with complete success. There is a tremendous fund of stories about such mistakes — most of them put out by the computer people; and they tend to have two characteristics. They are (more or less) humorous, and they either resulted in no harm to anybody, or they are fictional, because the mistake is not the kind that a computer would make at all.

They tell about the shipping program that instructs the whole day's factory output be sent to the smallest customer — some momma and poppa store — and then credits the whole work force with four hours overtime; or the scheduling program that gives the freshman student five lunch hours every Tuesday and none the rest of the week. Or the technical translator that takes the original Greek sentence "The spirit is willing, but the flesh is weak," and turns out the English sentence "The liquor is good, but the meat is not recommended."

"The Monkey's Paw"

These are not what worries anybody. I am quite serious about this. To borrow from Norbert Weiner: He used to point up the dangers involved in the fact that every program is based on partial analysis, and receives only what we give it, and does only what we tell it to do, in the way we have told it to. He used the story of W. W. Jacobs, written at the turn of the century, and called "The Monkey's Paw." An old British soldier returns from India with a talisman made of a monkey's paw, which has the power to grant three wishes to its next owner. His friend manages, over his protest, to become the owner, and immediately wishes for £200. There is a knock at the door, and the factory manager where his son is working tells him that his son has been crushed in the machinery, and the company, without admitting liability, has granted the father £200. The second wish is "I want my boy back," and at once his mutilated corpse is at the doorstep. The third wish is that this horror go away. Weiner used to say that the machine is magic, "but magic is terribly literal-minded. It will give you what you ask for, not what you should have asked for, nor necessarily what you want."

Viewed from the standpoint of computer technology, the story of the monkey's paw may be an example of bad programming, based on inadequate analysis of the problem. And is it clear where the fault was? Would you hold the soldier for letting his friend have the talisman when he as the formbooks say, "then and there well knew, or in the exercise of ordinary care should have known," that there was an unreasonable risk that some such harm would happen? Or the father, who was hasty in framing his wishes? Or was it the monkey's paw? If we treat the talisman as a machine, was it machine error that caused the tragedy? The more complex the technology becomes, the more different the fact-patterns will be from what they were in the past, and the more important it is that the legal profession understand the situation well enough to insure that the values involved in our ideas of justice do not get shuffled aside. The human behind the machine may be distant in time and space, and which human did what may be difficult to identify, but the human beings will need to be identified, if the legal rules are to be properly applied to these situations.

Computers Inside the Legal Profession

I want to switch now from problems for the legal profession caused by other people using computer technology, to internal problems — to the problems of the use of this technology inside the legal profession. If the first part of my remarks could be called the story of "The Monkey's Paw," I would epitomize this last part by taking some conventional wisdom and changing it a little. My notion about computer technology inside the legal profession is that "invention is the mother of necessity." We can consider to a small extent most of the present and future legal implications of computers as an extension of the client.

Perhaps one reason that the computer technology has not gone so far inside the legal profession is the natural caution of the lawyer, born of the notion of *stare decisis*. I would be the last to knock *stare decisis* in court, but its application to the lawyer's own operations is quite another matter. The Duke of Cambridge once said, "the right time for making changes is when you cannot help it," and there is a bit of the Duke in all of us lawyers. We said the telephone would be fine for people in trade, but our clients would insist on speaking to us face-to-face; and the typewriter was all right for others, but a printed letter would never satisfy the client's need for a personal opinion; and so on. If I had lived long enough ago, I could have made a pretty good argument against the adoption of writing itself. "It will," I would have said, "reduce the living language of the law to mere marks on a piece of paper. It will dull men's memories, because they will come to rely slavishly on these marks, and be unable to remember without them." And I would have been absolutely right.

I do not think, however, that notions like this will keep the legal profession from taking advantage of the benefits of computer technology in their own operations, as soon as some meaningful results can be demonstrated at a cost which is not prohibitive.

Law-Office Management

In the area of law-office management, it is as plain as anything can be, that computerized operations of various sorts are on the way. Computer-controlled programs exist or are being worked on which can do the lawyer's time-keeping and bookkeeping and scheduling operation. In the area of the kinds of computations involved in taxation and estate planning, a considerable amount of research is under way. Most of these things involve taking over, without great change, systems already created for situations similar to ours. The same can be said to some extent to the use of computer technology in the operation of the court system. The fiscal management problems of, say, a probate court, are enough like those of other operations, to make the borrowing possible; and there is at least one probate court which has automated most of its bookkeeping so that the money and activity situation of every estate is up to date at the end of each day. Most of you know that trial courts in several large cities make some use of computer-generated summaries of which lawyers are counsel in what cases to aid in case assignment.

One thing that I have been talked to about is the matter of recording minute entries, so I might mention that as something that is technically no real problem. A moment's reflection will show you that a great deal of clerical work is involved in getting entered into the right book a long series of what we call "entries," and a great quantity of books, enough to raise storage problems, are generated that way. It will also show you that the language of those books is very much ritualized. As compared with the possible messages that could be composed out of the whole English language, the total number of different messages that ever get into these books is vanishingly small. Not only that, it is *absolutely* small. This raises the possibility that the entry of these messages could be handled by merely using a code, to indicate which of the messages belong with which cases and dates. When the judge, or anybody, wanted to "read" the entries, he would merely have displayed for him, from a single text which contained them all, the right ones in their order. No paper, as such, would need to be kept — but if you wanted something printed to carry away, or to wear around your neck, you could have it.

Delay in Court

The matter of delay and congestion in court is more complicated, but here again a borrowing process might be helpful. Some work has been done, and more will surely be, along the lines of borrowing the mathematical tools available in queuing theory, or a more simplified form of it called "critical path analysis" — to see what help they can give. Here it is not so much the machine, as the approach, that is promising. The analysis has been invented, and it is necessary now to see what it has to offer.

Another area, in which a good deal of work has been done and a great deal more is on the way, is the application of computer technology to the storage and retrieval of legal literature. Here again there is no question that automatic data processing is coming. There has been a crisis in manual

research of legal materials for a long time, but automated retrieval shows a way out of that crisis. The only questions nowadays are how soon it will come, how much it will cost, and what kinds of systems will be in use. The legal profession has a choice before it. It can keep up with what is being done in automated retrieval systems, and do its best to see that they are developed to do the job properly — or it can sit back and wait until somebody presents it with a result — a result built on a scheme which it has paid little attention to, which it must either accept or struggle on in the old way. I don't consider the second choice to be a complete disaster. It is in fact what happened with our present manual research system, and it has been one of the best in the world, in my opinion. If it weren't, we could not have ignored developments as long as we have. But it will not be the best for very long.

Not every lawyer can make any original contribution to the development of retrieval systems per se. What the generality of lawyers need is enough knowledge to use different systems, to evaluate them, and to make demands as to what they shall be able to do. The systems are being invented right now. When the announcement of the resolution before the World Peace Through Law Center for a research system came out a few days ago, I looked at a list of research projects they had found being worked on. There were over 30, many of them operating on a considerable scale. But they are by no means alike, and a lawyer will need to know at least something about the plan on which each one operates in order to get any real good out of them. He needn't understand hardware, but he can't tell what is being done for him unless he knows the scheme. We could spend a long time on the different schemes, but I can summarize by suggesting that three general plans are being worked on.

Abstract Retrieval Systems

One is what I call abstract systems. Their outstanding feature is that the documents in the store are "represented" by a summary or description in words, prepared by a human, and containing only a tiny fraction of the words in the full text itself. The full text is usually stored, but the machine does not search that; it searches these man-made descriptions. The schemes of the FAA, the Department of Justice, and as near as I can tell from the advertising some of the private retrieval plans are like this. In this, they are a kind of indexing we already have. They work while you sleep, but they have the great defect of the present system. This is, that the indexer must read your mind and you must read his. Any description must "lose" part of the information in the document, making you think you don't want it when you do, and many descriptions also "gain" information — making you think you want it when you don't. Very rigorous rules are needed to hold this gain and loss to a minimum, and such rules are very, very hard to write. The Patent Office has experimented with a set called "ruly English" instead of our present unruly English, and they have had some successes, and also some hard going. I don't mean to deprecate mechanization of present retrieval systems — it can be very helpful, and its use requires less retraining of lawyers than anything else. But its success will always, to my mind, be limited to special situations similar to that of the Patent Office or the tax field, and things like that. Of course, as specialization increases, every field gets more special, and this type of system gets more helpful in its own area.

Another type of system, exemplified by the one of John Horty's group at Pittsburgh, tries to bypass the human abstracter or digester by giving access to nearly the full text of every document. Now you don't have to read the indexer's mind, just that of the author of the document. The amount of information lost and gained by the system is correspondingly reduced, and your problem is solved by a brute-force method very much adapted to the machine's strong suit, which is simple-minded speed. It looks at everything. This method works very well, I think, where you have a data-base covering many different subjects and are willing to accept some over-pull in return for elimination of things you pretty clearly would not want ever to see at all.

Last, there are search systems of a statistical, or probabilistic type. They use statistical methods, by which I mean precise rules to build up patterns of related terms, or if you like, concepts, out of the documents. If you know a little bit of the pattern, this scheme will give you the rest. The ABA foundation has worked on this type of program, and gotten what I consider good results.

These descriptions I have just given are hopelessly inadequate, but they do indicate my point, which is that there is enough differences among systems to prevent a lawyer who knows nothing about them from deciding which is best, or whether he can stop looking when he has used a particular one in a particular way.

New Forms of Analysis

They indicate a further important point: the development of a really different system of storing and retrieving legal data, amounts at bottom to inventing a new *analysis* of that data. We have been thinking of analysis for search purposes, but these new forms of analysis — and others, could be used for other purposes as well. They could tell us whether the concepts we thought were in the data are the most useful ones, and what difference there is — in result, say, in cases having one pattern of factors or another; and what would happen, given a set of rules, if the situation were modified in various ways — called simulation, or trying things out in the machine.

This is what lawyers are trying to get out of the materials right now. I am not now talking only about prediction of outcomes, although I am interested in that, as every lawyer must be, unless his practice is a mere hobby. I am talking about the use of computer programs to serve lawyers as a kind of tool to do drudgery that we don't really do, and can't do, now, just because it is such drudgery.

I have time for just one very simple example. It comes from the research on mechanical translation of foreign languages. That research has been extensive, and it has been less than a resounding success, but its very failures may be of great interest to us as lawyers. A while back a good many of you chuckled when I gave some examples of the "mistakes" mechanical translators make. When I put in the proverb, in Latin, "out of sight, out of mind," and get, in English "invisible idiot," everybody sees the "mistake." They also see how it could happen, and get some little amusement out of having figured it out. But suppose that instead of Latin, I put in the proverb in English, and got out "invisible idiot" — also in English. Suppose further, that I merely gave you the two strings of words, and said "I put one of these in, and got the other out — can you tell me which was the input?"

Interpretation

The machine has now given me an *interpretation*, which is a translation in the same language; and we have trenched close upon a very common legal problem. I write a string of English words, into a statute, a contract, a will, an insurance policy, if you like. Somebody else comes along with another string of English words, and says: your words and mine are equivalent, in the legal sense. Or, your words *include* mine, in the legal sense. Where did he get those words? He could have done it in exactly the way the earliest mechanical translator did. It took each word to its dictionary, looked it up, and wrote under it every word that its dictionary listed as a "translation" of the word. Put the words in the

same language, substitute "meaning" or "interpretation" for translation and you have the idea. Mechanical translation ran into difficulty because our language is ambiguous — for us, it could be an ambiguity detector. All the possible combinations of all the words you have on your lists, thousands of them, constitute logically possible, syntactically possible, "meanings" of the sentence you started with. What courts do is look at the facts, listen to the arguments and decide yes, this combination is in, it is a *legally* acceptable meaning of the first, or no, this combination is not a *legally* acceptable meaning. Then this result goes into *Words and Phrases,* where box scores such as this are kept. This is what you and I do, mentally, and to a very small extent, when we write contracts. But we know that we never really examine all those combinations; we never really even begin to think of all of them. And some of those we neglect, because we know so clearly that we have said exactly what we mean, come back to haunt us. With the machine process, you would have them all, immediately. A large number would be ridiculous — not even amusing; some would be plausible, and some you would say you intended to include. You might easily discover a large number that are plausible, but that you want to eliminate by changing the wording — to prevent the unreasonable people (who invariably show up as your party opponents) from claiming that this was what you both meant.

There is no need to remind lawyers that the urging of strained interpretations is not uncommon. (One side thinks it happens in every case.) Portia came up with one that greatly surprised the Merchant of Venice; and long before that, Queen Dido the Phoenician, built an empire out of one. When she was a mere princess, you remember, she got an African chief to grant her all the land she could enclose with an ox-hide. He thought she wanted to fill a flower pot. She whipped out a knife (they had flowing robes in those days), cut the hide into shoe-laces, tied the ends together, and founded the City of Carthage on the resulting Texas-size spread.

Abolishing the Drudgery of the Legal Profession

I have just scratched a little at the surface of the possibilities involved, but I must return to my original phrase. These new tools have been invented, and more important, new ways of looking at our work have been invented, and have created the necessity to examine them to see what good they can do for us. Some of this may seem simplistic, even petty. But we do not demean ourselves by thinking about ways to abolish the drudgery of our profession. We would demean ourselves if we continued to be drudges without the need of it. Blaise Pascal was, and is remembered as, a great philosopher; but the world may owe him more for having invented the common wheel-barrow. Some exploratory notions will come to nothing except as curiosities, overtaken by nimbler minds. That is no great matter: one success caps many such defeats. As a law teacher, I should be happy to boast that I spurred someone else to do better than I could do myself.

C.a

PROBLEM CORNER

Walter Penney, CDP
Problem Editor
Computers and Automation

Problem 684: A Conversion Trick

"How do you like the 360?", Al asked as he saw Bob working over some output from the machine they had just gotten.

"It's terrific, but it's hard to get used to working with hexadecimal."

"Well, it's very simple to convert from decimal to hexadecimal, so that ought to give you no trouble."

Bob looked a little incredulous. "I don't know of any easy way; I'm spending all my time looking up numbers in these conversion tables."

"Why, all you have to do is write the number backwards and you have its equivalent. Suppose you have 35 in hexadecimal. Then just change it to 53 and there's your decimal equivalent," Al said with a twinkle in his eye.

"Oh, that's just an accident. It wouldn't work for any other number."

"No? Let's take a number at random." Al casually wrote down what seemed like the first number that came into his head. "There. Now just write it backwards and you'll have the decimal equivalent."

What number did Al write?

Solution to Problem 683: What's WHAT?

The program will compute $[1 + (X^{-k} - 1)\,Y]^k$, where $k = 1048576$, (i.e., 2^{20}). As n increases $n(X^{1/n} - 1)$ approaches $\log X$, and $(1 + \frac{Y \log X}{n})^n$ approaches X^Y, so that the program will give a close approximation to X^Y for $1 < X < 10^{10}$.

Readers are invited to submit problems (and their solutions) for this column to: Walter Penney, CDP, Problem Editor, Computers and Automation, 815 Washington St., Newtonville, Mass. 02160.

C.a

COMPUTER MARKET REPORT

The Future of Computer Communications -

Ted Schoeters
Stanmore, Middlesex
England

Two burning topics basic to the future of the electronic data processing industry are being debated right now. They are computer communications, and the survival of the smaller manufacturer of peripheral equipment.

The FCC Inquiry

The FCC (Federal Communications Commission) is just wading through the mass of submissions on the use of computers in communications submitted to it by interested groups. This is after two deadline extensions; the last one was to March 5 at the request of BEMA, the Business Equipment Manufacturers' Association, supported by the Newspaper Publishers' Association and Aeronautical Radio Inc.

This question is likely to be the most hotly debated in an industry tight-packed with major issues — which is inevitable when completely new ground is being broken on a multi-billion dollar scale. Yet it boils down simply to "who does what?", with the overtone that common carriers must not profit from their privileged position.

ADAPSO

ADAPSO, the ebullient Association of Data Processing Service Organizations, has already made public the tenor of its submission to FCC, but a fair number of its demands are unlikely to be met.

It cut right into the meat with its very first claim — that common carriers and their affiliates should not be allowed to sell data processing and other electronic information services unless they first demonstrated to FCC that their prices and terms of sale would not harm the competition.

The Association suggested: (1) That service centres should be allowed to switch messages where this was incidental to a data processing service; and (2) That users should be allowed to use non-carrier terminal or concentrator equipment which met standards, and should be required to use common carrier modems.

Other points put forward by ADAPSO indicated that better quality data transmission lines are wanted, as well as a wider range of transmission speeds than are now available. More options would allow users to select speeds and prices more in line with their requirements.

Its call for imposition of FCC standards on equipment on charges is hardly likely to succeed, at least for several years, in view of the pressure on existing standards organizations for even more fundamental work in EDP.

Bunker Ramo and Scantlin vs. SICOM

ADAPSO can draw but little comfort from an earlier FCC action in turning down petitions from Bunker Ramo and Scantlin Electronics who sought to have Western Union's SICOM tariff suspended and investigated.

SICOM (Securities Industry Communications) is a computer-based information service for members of the Stock Exchange and their correspondents in the U.S. Bunker-Ramo designs and sells a range of peripherals and provides services to some extent competitive with SICOM. The substance of the Bunker claim is that SICOM is discriminatory in that a specially-assigned line service is being offered by Western Union to each customer at charges considerably lower than for a similar service under ordinary private line tariffs.

Scantlin, which provides an information service to stockbrokers, is complaining that the computer functions in SICOM are not common carrier services and Bunker supports this.

FCC in adjudicating on the bid — and rejecting it — made it clear at the same time that the issue should not be prejudged. The validity of SICOM still can be challenged and much will hinge on the outcome of the general enquiry into computer communications.

However, FCC also did state unequivocably that in SICOM the principal function of the computer is message switching, "an integral function of a communication service".

ADAPSO, meanwhile, had been seeking court intervention to stop banks from offering service bureau facilities to clients. It sustained a prompt rebuff, because a Federal District Court ruled that it did not have legal standing and therefore could not plead. This upheld a claim to that effect by the Comptroller of the Currency and the American National Bank and Trust Company of St. Paul, Minn.

These weighty matters have been neatly solved in Britain because of the overwhelming Labour majority in Parliament, and we now have a situation in which the computer industry and the bureaus, as well as the users of terminals, have been handed over, bound hand and foot, to the General Post Office. This has the monopoly of carrier lines — apart from those of the railway monopoly, the gas monopoly and the electric power monopoly — and it will be providing a national data processing service through remote terminals in competition with bureaus and banks over its own data transmission lines.

It is to be hoped that Justice will wear a double blindfold whenever there is a clash of interests in this particular area.

and the Small Peripheral Equipment Manufacturers

The Independent Makers of Peripherals

The urge to merge for mutual defense is running just as strongly among the independent makers of peripherals as among the bureaus.

The reason is that, rightly or wrongly, the smaller companies whose slave equipment has been playing such an important part in advancing the state-of-the-art feel that they are being frozen out of some extremely important data processing contracts by various Government procurement branches who control a truly colossal purse.

The capital value of pheripheral equipment installed each year is now slightly higher than that of the central computers and, as installations increase in size, the ratio is likely to be three to two by 1970. However, in that year, somewhere between 5,000 and 6,000 computers may be installed in the U.S. so that sales of peripherals could be worth well over half a billion.

It is no mystery why the big manufacturers who produce a whole range of computing equipment are expanding into peripherals as fast as they can, either by the purchase of smaller fry or by crash programs of new construction. RCA has set aside over $10m for a design and production plant for peripherals at Marlboro, Mass., to cover 220,000 square feet. CDC has bought a whole series of smaller units, and Honeywell has recently announced the successful engineering of important new designs such as a magnetic tape keyboard unit and the operation of its disk pack plant.

At the same time, the smaller independents, many of whom have risen to fame because they designed a particularly brilliant piece of equipment when the majors were bogged down in central processor troubles, want to stay independent and grow in parallel with the 15 per cent plus growth rate of the EDP market in this sector.

Government Buying Policies Criticized

They are deeply concerned at the attitude of the buying organizations in the government, who apparently cannot be bothered to carry on split negotiations. As a result, the independents sought and obtained a hearing before the U.S. Joint Economic Committee's Sub-Committee on Economy in Government. Speaking for some 50 independents, Mr. Lewis R. Caveney, a high executive of the Bryant Corporation, charged that the Government was following a policy of dealing only with the giants, who were able to tender for the whole system, such as the one in the controversial $68m Air Force contract which ultimately went to Burroughs.

In his view, this practice constituted a threat to economy in such contracts, since the Government clearly had no guarantee that it was getting the lowest-priced equipment for the job (this being the understatement of the year). He pressed for the imposition of Federal standards in the way computers were linked to their peripherals and asserted that each major computer manufacturer should produce a general-purpose adapter for every one of its machines, so that any maker's peripherals could be fitted to do a specific job.

The next move in this fight, which is for very high stakes, will come at the Spring Joint Computer Conference in Atlantic City, New Jersey.

Its outcome will be watched with keen interest from Britain where exports of peripherals have been falling disappointingly to about $30 million in 1967 from $45 million previously. The trouble is that neither major manufacturer was big enough to go in for a complete range of its own, and they were too much at daggers drawn to collaborate, despite the high cost of research and development on big drum units, or optical character readers, for instance.

The new International Computers Limited organization may have the capability of a full range. Both ICT and Plessey have done a good deal of work on character readers and document transports.

This might in turn spell less business in Britain in the years ahead for the smaller U.S. makers of specialized peripherals.

Patent Hope

Cautiously, in typically legal style, the U.S. Patent Office has shifted just about one micron from its long-held stand on Section 106 of the proposed Patent Reform Act that: "A plan of action or set of operating instructions, in whatever form presented, to cause a controllable data processor or computer to perform selected operations, shall not be patentable".

While applications for patents under present law will continue to be denied, the Patent Office view is that there are substantial difficulties in finding an adequate definition for a computer program and that it is premature to enact legislation at the present time.

The suggestion is that no section on computer programs should be put in any patent reform legislation. But this must not be taken to indicate that the Patent Office already considers that programs will without any doubt be patentable.

In Britain, some programs are now being copyrighted, but I do not know of any instance where a patent has been sought.

C.a

CALENDAR OF COMING EVENTS

April 17-19, 1968: Cooperating Users of Burroughs Equipment (CUBE) spring meeting, Roosevelt Hotel, New Orleans, La.; contact John Dorosk, Financial Computer Services Inc., Coronado Tower, El Paso, Texas

Apr. 19, 1968: Technical Symposium on "The Effective Use of High Level Languages", Jack Tarr Hotel, San Francisco, Calif., contact Chairman, San Francisco Bay Area ACM, P.O. Box 2447, Menlo Park, Calif.

Apr. 23-26, 1968: Cybernetics Conference, Munich, F.R., Germany; contact H. H. Burghoff, 6 Frankfurt/Main 70, F.R. Germany, Stresemann Allee 2, VDE-Haus

Apr. 30-May 2, 1968: Spring Joint Computer Conference, Atlantic City Convention Hall, Atlantic City, N.J.; contact American Federation for Information Processing, 345 East 47th St., New York, N.Y. 10017

Apr. 30-May 3, 1968: The Association for Educational Data Systems Convention, Hotel Texas, Fort Worth, Tex.; contact Convention Coordinator, Assoc. for Educational Data Systems, 1201 16th St., N.W., Washington, D.C. 20036

May 1-3, 1968: Sixth National Workshop Conference of the Interagency Data Exchange Program, (IDEP), Ambassador Hotel, Los Angeles, Calif.; contact Peter Amedeo, Grumman Aircraft Engineering Corp., Bethpage, Long Island, N.Y. 11714

May 1-3, 1968: Joint National ORSA/Americans TIMS Meeting, St. Francis Hotel, San Francisco, Calif.; contact Miss Joan T. Sullivan, Computer Usage Co., Inc., 3181 Porter Drive, Palo Alto, Calif.

May 3-4, 1968: Fifth Annual National Colloquium on Information Retrieval, University of Pennsylvania, Philadelphia, Pa.; contact Dr. David Lefkowitz, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pa. 19104

May 6, 1968: Tenth Annual Systems Conference, Dallas Chapter, Systems and Procedures Assoc. (SPA), The Inn of the Six Flags, Arlington, Tex.; contact J. Rowly, Jr., Dallas Chapter, Systems and Procedures Assoc., P.O. Box 474, Dallas, Tex. 75221

May 8-9, 1968: Thirteenth Annual Data Processing Conference, University of Alabama, Engineering Bldg., Birmingham, Ala. 35486; contact Charles E. Adams, Box 2987, University of Alabama, Birmingham, Ala. 35486

May 8-10, 1968: Electronic Components Technical Conference, Marriott Twin Bridges Motor Hotel, Washington, D.C.; contact F. M. Collins, Speer Res. Lab., Packard Rd. & 47th St., Niagara Falls, N.Y. 14302

May 22-24, 1968: Fourth Annual Data Processing & Automation Conference, National Rural Electric Cooperative Assoc. (NRECA), Sheraton-Chicago, Chicago, Ill.; contact Diane Szostek, NRECA, 2000 Florida Ave., N.W., Washington, D.C. 20009

May 24, 1968: New England Systems Seminar, New Ocean House, Swampscott, Mass.; contact Samuel Ryder, 275 Wyman St., Waltham, Mass. 02154

June, 1968: Sixth Annual Conference of The Special Interest Group on Computer Personnel Research of the Association for Computing Machinery; contact A. J. Biamonte, Program Chairman, West Virginia Pulp and Paper Company, 299 Park Ave., New York, N.Y. 10017

June 11-14, 1968: GUIDE International Meeting, Conrad Hilton Hotel, Chicago, Ill.; contact Jack Eggleston, Sec'y., GUIDE International, P.O. Box 1298, Omaha, Nebr. 68101

June 12-14, 1968: Annual Meeting, The Association of Data Processing Service Organizations (ADAPSO), Waldorf-Astoria, New York, N.Y.; contact W. H. Evans, 947 Old York Rd., Abington, Pa. 19001

June 25-27, 1968: Second Annual IEEE Computer Group Conference, "The Impact of LSI [Large-Scale Integration of Circuits] on the Information Processing Profession," International Hotel, Los Angeles, Calif.; contact John L. Kirkley, 9660 Casaba Ave., Chatsworth, Calif 91311

June 25-28, 1968: DPMA International Data Processing Conference and Business Exposition, Statler Hilton Hotel, Washington, D.C.; contact Mrs. Margaret Rafferty, DPMA, 505 Busse Hgwy., Park Ridge, Ill. 60068

July 15-18, 1968: Fifth Annual Design Automation Workshop, sponsored by SHARE-ACM-IEEE Computer Group, Washington, D.C.; contact Dr. H. Frietag, IBM Watson Research Ctre., P.O. Box 218, Yorktown Heights, N.Y. 10598

July 23-24, 1968: National Symposium on Modular Programming, Sheraton Boston, Boston, Mass.; contact Tom O. Barnett, c/o Information & Systems Institute, Inc., 14 Concord Lane, Cambridge, Mass. 02138

July 29-31, 1968: Conference on Pattern Recognition (IEE Control and Automation Div.), National Physical Laboratory, Teddington, Middlesex, England; contact Conference Dept., Institute of Electrical Engineers, Savoy Place, London, W.C.2, England

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

Aug. 27-29, 1968: Association for Computing Machinery National Conference and Exposition, Las Vegas, Nev.; contact Marvin W. Ehlers, Program Committee Chairman, Ehlers, Maremont & Co., Inc., 57 West Grand Ave., Chicago, Ill. 60610

Sept. 22-25, 1968: Fourth National Annual Meeting and Equipment Show of the Data Systems Div. of the Assoc. of American Railroads, Pick Congress Hotel, Chicago, Ill.; contact Frank Masters, Trade Assoc. Inc., 5151 Wisc. Ave., N.W., Washington, D.C. 20016

Oct. 14-16, 1968: System Science & Cybernetics Conference, Towne House, San Francisco, Calif.; contact Hugh Mays, Fairchild Semi-conductor R & D Labs., 4001 Junipero Serra Blvd., Palo Alto, Calif. 94304

Oct. 20-23, 1968: International Systems Meeting, Systems and Procedures Assoc., Chase-Park Plaza Hotel, St. Louis, Mo.; contact Richard L. Irwin, Systems and Procedures Assoc., 24587 Bagley Rd., Cleveland, O. 44138

Oct. 28-Nov. 1, 1968: Business Equipment Manufacturers Assoc. (BEMA) Annual Business Equipment Exposition and Management Conference, International Amphitheater Chicago, Ill.; contact Laurance C. Messick, Business Equipment Manufacturers Assoc., 235 East 42nd St., New York, N.Y. 10017

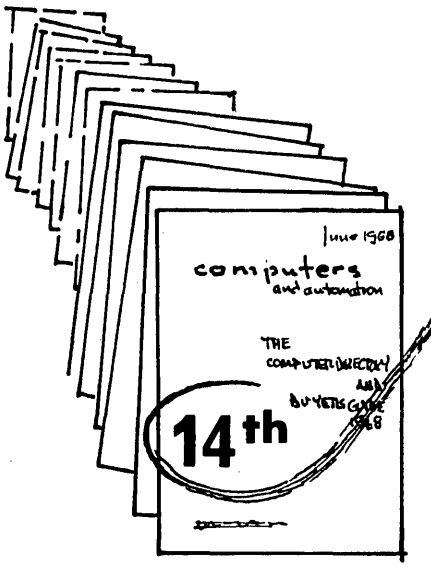
Nov. 17-21, 1968: Engineering in Medicine & Biology Conference, Shamrock Hilton Hotel, Houston, Texas; contact not yet available.

Dec. 9-11, 1968: Fall Joint Computer Conference, San Francisco Hilton Hotel, San Francisco, Calif.; contact American Federation for Information Processing (AFIPS) 345 E. 47th St., New York, N.Y. 10017

March 24-27, 1969: IEEE International Convention & Exhibition, Coliseum and N.Y. Hilton Hotel, New York, N.Y.; contact IEEE Headquarters, 345 East 47th St., New York, N.Y. 10017

May 13-15, 1969: Spring Joint Computer Conference, War Memorial Auditorium, Boston, Mass.; contact American Federation for Information Processing (AFIPS), 345 E. 47th St., New York, N.Y. 10017

June 16-21, 1969: Fourth Congress of the International Federation of Automatic Control (IFAC), Warsaw, Poland; contact Organizing Comm. of the 4th IFAC Congress, P.O. Box 903, Czackiego 3/5, Warsaw 1, Poland.



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the regular June issue of Computers and Automation

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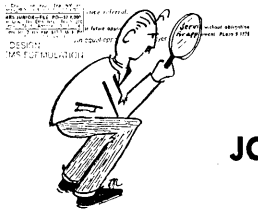


The Ten-Mile Gap — Part 2: Solutions

Stephen F. Keating, President
Honeywell, Inc.
2701 Fourth Ave. S.
Minneapolis, Minn. 55408

In the first part of this article (which appeared in this column last month), we defined the "ten-mile gap" between industrial plant and tenement as being symbolic of the ground that must be covered if the hard-core unemployable are to be assimilated into our modern industrial system. I think we can agree on the problem. It is tangible and visible in city after city. You can measure the problem in blocks of slums, or in drop-out percentages, or in welfare dollars.

Unfortunately, solutions are not as obvious. But there is a key factor that gives real cause for optimism — our steadily growing economy. If the unemployable and the underemployed are to be assimilated into industry, we first of all need jobs for them. And the jobs are there. Industry can provide the work — the task is placing the worker in the job.

When Honeywell opened its Electronic Data Processing operations in the Boston area in 1955, we had little idea of how rapidly this now vast market would expand. Honeywell shipped its 2000th computer earlier this year. Today we have installed and on order more than 3000 computers — with a value of $1 billion.

The electronics industry has consistently outrun its forecasts. Its continued expansion, and that of the rest of business, will require an expanded work force. In fact, the supply of capable, trained people may be the limiting factor in our industrial growth rate. And here it is important to understand that the profit motive of our free enterprise system and the social objectives of government are parallel — together they make a very powerful force.

Industry's Interest in the Urban Crisis

Thus, industry is much interested in solving the urban crisis. The latent manpower wasting away in slum neighborhoods is urgently needed. Industry is interested in getting people off the relief rolls and onto the tax rolls. We would like to broaden the tax base and ease the individual tax burden. Further, a growing incidence of poverty threatens the healthful economic climate required for continued industrial growth. And, in addition, every businessman — like the labor leader, the educator, and the political leader — is a citizen. As a citizen his objectives are social and he often feels deeply his social responsibilities.

Although industry has jobs to offer, it must be recognized that you can't *give* jobs to people. You can only *give* work to slaves or prisoners — free men must be motivated to *want* work. You can't stop rioting and looting by *giving* people work any more than by giving them welfare. Both separate the recipient from the rest of society, whereas the long-term solution lies in bringing him into society. We must make people value the idea of work — the pay, the benefits, the working conditions, and, most of all, the work itself, with the stability, personal development, and human satisfaction it can lead to.

The urban crisis cannot be solved by industry alone nor by government alone. The solution will be found only when we develop an effective format involving cooperation of business and labor, government at all levels, and religious and educational leaders. I believe there are three areas in which cooperation will be most productive.

Education

The first area is education. Here, the work of government bodies is paramount. Ways must be found — primarily through local channels — to expand the *quantity* of people educated, and expand the number of years disadvantaged youngsters stay in school.

But education must mean more than mere time-serving. The *quality* of education must be raised. Education must do more than keep kids off the streets. We must find a way — through their schools and through their parents and their pals — to make them want to learn. Our society puts tremendous pressure on putting kids from slum neighborhoods in school and keeping them in school. Often this means passing them along from grade to grade whether they have mastered the work or not. Honeywell recruiters have observed that it's not unusual for a man to come in with a high school diploma and a fourth-grade ability to read. We must inspire youngsters to want education worthy of their diploma.

Industry can help in the educational process. We can counsel with educators on curricula and course materials and help by providing equipment for training. This is particularly true in vocational high schools and post-graduate technical schools. Industry can continue to expand on-the-job training programs. At Honeywell we have found that when unskilled people have the aptitude and the motivation, it pays to teach them the job. In the Boston area, for example, the Honeywell EDP Division has a faculty of 380 instructors training people in computer technology. Among their programs are classes for people with educational handicaps. Courses are also being conducted in Massachusetts prisons. The first students were all serving life sentences—they were chosen for the very practical reason that they would be around to help with later classes.

Motivation

The second area of cooperation between government and industry involves motivating people to want to work. Here counseling would appear to be the most direct approach. Through the work of government agencies and private social agencies, action groups have been formed and are at work in many cities. As this effort is increased, it becomes vital to coordinate their work with industry efforts. In many communities, businessmen have formed organizations to provide a framework for reviewing programs, counseling with agencies on the structuring and funding of programs, and even creating programs where there is a need that lies

beyond the scope of existing action groups. In Minneapolis, for example, 14 businessmen, including myself, have formed the nucleus of such an organization, the Urban Coalition of Minneapolis, to work with all local groups interested in this problem.

In addition to community work, individual companies can speed the assimilation of hard-core unemployables through specially designed recruiting programs. Such programs should offer meaningful jobs—not just menial jobs—to the disadvantaged. Let me give you an example. One of our Honeywell employment offices has been in close contact with area social groups for some time. We used to notify them regularly of openings, but few applicants showed up. Then we discovered the people we were trying to reach just assumed the openings were for janitors and dishwashers. When we pointed out that they would be considered for production and office jobs—just like anyone else—applicants began to come in. The right job can be motivation in itself.

Here there needs to be a true interface between government agencies, social agencies, and industry to make sure we are getting through—that we're helping people understand an education is worth the effort, that jobs are worth working at, that crossing the ten-mile gap is enormously worthwhile.

Accessible Jobs

The third area of industry-government cooperation is in making work accessible to people in the inner city. There are ways of getting the workers to the suburbs, but perhaps the most direct approach is to create an environment which will encourage industry to build new plants in the city.

These plants would help close the 10-mile geographic gap. And they would do much to fill the cultural gap as well. The newest, most attractive, and inviting industry would become a part of the deprived child's environment. He would have the opportunity to observe productive work going forward as part of his daily experience.

In addition, the handsome new plants built today which are winning architectural awards, and often have open landscaping, which could help to brighten and dress up our inner-city areas.

The Honeywell headquarters building in Minneapolis was built in 1928 in a pleasant middle-class city neighborhood. Through the years, we enlarged our building, but the neighborhood went steadily down hill. Then a few years ago, we were faced with a decision—it was time to significantly renovate our building or move out. We elected to stay because a new freeway being proposed offered hope of a new look for the area. We worked on construction plans with city and state highway officials and are implementing a major program to modernize our building. Now the freeway has replaced rundown dwellings and tawdry stores with open spaces and grassy areas. You can look for blocks down rows of trees to a striking view of the city skyline. There's new life and new vitality in the neighborhood.

Life in the city *can* be pleasant for industry. And industry can certainly be good for the city. I believe all levels of government might work together to make the center city inviting to industry once again. Industry will need ready access to plants via freeways or other open routes. Of course, any company that is proudly putting up a new plant wants to build it in pleasant and attractive surroundings. And by no means last, the company will want a tax climate that makes the city an economical place to operate.

These are some of the questions that will have to be settled. Business will move back to the city if it becomes profitable to move back—and I think that government and industry would find this to be to their mutual advantage. In cooperating with government and social agencies, industry has an important resource to offer—the jobs created by our powerful, fast-moving profit system.

With jobs available, it appears that our social efforts should be directed not toward making work, but toward making *workers* who can take advantage of productive job openings. Government and social agencies can be instrumental in accomplishing this task.

But industry, too, seeks the opportunity to become a partner in the search for answers to our urban problems. Businessmen recognize the job as part of their responsibility—to their companies and to their society. And in the industrial profit system we have a powerful driving force for closing that ten-mile gap.

c.a IDEAS: SPOTLIGHT

THE VALUE OF SWIFT KNOWING OF NEW KNOWLEDGE

Frank J. Moran
Burson Marsteller Associates
One East Wacker Drive
Chicago, Ill. 60601

Approximately $2 billion per year is spent on medical research and development. Every cent is wasted unless this hard-won knowledge is made readily available to the medical community.

All too often, there is a tragic time lag between initial development and widespread application of new medical knowledge.

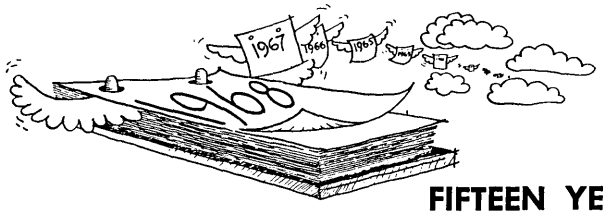
According to Dr. Luther Terry, former U.S. Surgeon General, 150,000 lives will be lost and one million avoidable disabilities will occur this year because knowledge already at our command is not being applied.

The medical community is not at fault. It is physically impossible today for a practicing physician to keep up with each new advance in medicine. To do so, he would have to review more than 18,000 medically oriented journals and periodicals each month. And by 1970, the monthly total of publications is expected to reach 25,000.

A solution to this communications problem is being developed. The solution is Telebiblios, an information storage, retrieval, and transmission system that applies modern communications technology to the medical field.

Developed by the Foundation for Medical Library Communications, a non-profit organization, Telebiblios is in the formative stages. For more information write to,

Telebiblios
Foundation for Medical Library Communications
134 North La Salle St., Suite 908
Chicago, Ill. 60602



Mechanical Translation

Reprinted from Vol. 2, No. 4 — May, 1953

*Andrew D. Booth**
Birkbeck College
London, England

During the summer of 1947 I first suggested that a digital computer having adequate memory facilities could perform the operations necessary to translate a text written in a foreign language (F L) into the desired language or target language (T L). There was, and is, no particular difficulty in doing this, as I hope to show in the present article; but I make no claim that a literary quality in the result of the translation is to be hoped for.

The original proposals covered only the making of a straightforward dictionary translation from the foreign language to the target language. It is convenient to start by seeing how this simple objective may be achieved on a machine whose primary purpose is the manipulation of numbers. It is necessary to assume only the most rudimentary machine functions in order to perform mechanical translation (M T):

a) The machine has a large memory.
b) The input typewriter sends data, either direct to the memory, or to a register provided with subtraction facilities, the accumulator register.
c) The machine contains a conditional transfer order which enables the machine to select between alternative courses of action according to the sign of the number held in the accumulator register.
d) The contents of the accumulator can be typed at the output.

The reader familiar with modern automatic digital computers will see that all of the above functions are present in all such computers existing, with the exception in many cases of the large memory.

How shall we represent the foreign language text in digital form? . . . Suppose that each location (in sequence) in the memory contains a "dictionary" word (D W) having the following composition: the F L word (10 letters, say) and the T L translation (40 letters, say). Assume that the D W's are stored in ascending order of magnitude. Then if the F L word is subtracted from each of the D W's in turn, the result will be negative until the required entry is reached, and positive thereafter. It follows that, if the conditional transfer is used to break off the sequence of subtractions at the first positive result, the remainder in the accumulator at this point will represent the target language translation. The latter may now be printed at the output.

A second obvious point is that the length of the required words (250 binary digits or bits in the above example) is considerable. Existing computing machines fall short of dealing with this by a factor of five or greater. They may, however, easily be programmed to use multiple length words so that this is not an essential difficulty.

If the actual F L word is not contained in the memory, the nearest equivalent will be generated by the above process. Furthermore, since the D W, F L entry will be numerically somewhat larger than the text F L word, the output operation will generate certain nonsensical characters before the T L translation. This will indicate to the reader that an untranslatable word is present.

The preceding simple scheme is much limited by the available memory in existing (and near future) machines. But in 1948 R. H. Richens suggested to me a modification which makes mechanical translation a really practicable operation. Richens pointed out that, with certain limitations, an adequate or passable translation of a foreign language text would result from the following operation:

a) The memory contains a *stem* (or *root*) dictionary and an ending dictionary.
b) The stem dictionary consists of a relatively few entries of general semantic utility plus a vocabulary specific to the subject of the translation.

The method of operation is simple. First the F L word is subtracted in turn from the entries in the stem dictionary. In this way, the longest possible stem entry is found. At this point the stem translation and suitable grammatical notes are typed out. The stem is now removed from the F L word, and the remainder is compared with the entries of the ending dictionary. When coincidence is attained again, the relevant syntactic information, contained with the ending entry, is typed out. Richens has shown that the same method can be applied to multiple words of the type encountered, for instance, in German.

As an example of this procedure consider the translation of the Latin word *amo*. This would proceed as follows:

Stem: Trial 1: *a,* alas
Trial 2: *am,* love (v) (v for "verb")
Ending: Trial 1: o (1.s.p.) (for "1st person singular, present tense")
The total output would be: love (v) (1.s.p.)

*Dr. Andrew D. Booth is now Dean, College of Engineering, Univ. of Saskatchewan, Saskatoon, Saskatchewan, Canada.

. . . The foregoing brief account of mechanical translation is naturally incomplete in many respects. The act of coding a given example for a particular computer involves many points which it has been impossible to cover in a short article. This is particularly true of the stem-ending dictionaries, whose use requires a high degree of sophistication in the program if a good working speed is to be attained.

Some of these problems, however, have been actually examined on our computer APEXC at Birkbeck College, London, and the reader may be interested in the following statistics:

Time taken to translate a 1000 word message by a skilled bilingual human being — 1 hr.
Time of mechanical translation using the above technique, on standard punched card equipment — 1 hr. 54 mins.
Time of mechanical translation on APEXC using teletype output — 2 hrs. 15 mins.
Time of mechanical translation on APEXC with tabulator output — 30 mins.

It does not appear likely that with existing input/output equipment any much greater speed is possible. The translations, produced by the above methods, are of course inelegant, but are easily understood by a person expert in the subject of the paper. Neither the present author not Richens envisage the literary use of mechanical translation in the near future or even foreseeable future; but within its limitations, the method should be of great use to students and institutions confronted with the mass of published material in foreign languages which is currently appearing.

EDITORIAL

(Continued from page 7)

CAUML, and he said yes.

We would like to invite several more computer persons who are interested in developing CAUML into a really helpful, nonpartisan facility for the computer field, to volunteer to become members of our Advisory Committee. This committee would contribute ideas for the better functioning of the universal mailing list and help us answer questions that puzzle us. But naturally the responsibility for management, operation, and solvency of the list will have to remain in *Computers and Automation.*

Are there any volunteers? Please write to the Editor.

And if you would like to have your name and address included in CAUML (*Computers and Automation*'s Universal Mailing List) — so as to receive useful computer-field information through the mail you otherwise might not hear of — please circle No. 1 on the reader service card, or send us your request on any piece of paper.

Edmund C. Berkeley

Editor

FORUM

(Continued from page 14)

Entry Form for WHO'S WHO

If you wish to be considered for inclusion in *Who's Who*, please complete the following form or provide us with the equivalent information:

1. Name? (Please print) _____
2. Home Address? _____
3. Organization? _____
4. Its Address? _____
5. Your Title? _____
6. Your Main Interests?

Applications	( )	Mathematics	( )
Business	( )	Programming	( )
Construction	( )	Sales	( )
Design	( )	Systems	( )
Logic	( )	Other	( )
Management	( )	(Please specify)	_____

7. Year of Birth? _____
8. Education and degrees? _____
9. Year Entered Computer Field? _____
10. Occupation _____
11. Publications, Honors, Memberships, and Other Information? _____

(attach paper if needed)

12. Associates or friends who should be sent "Who's Who" entry forms?

Name and Address

When completed, please send to:
Who's Who Editor, Computers and Automation,
815 Washington St., Newtonville, Mass. 02160

ANTI-COMPLICITY MOVEMENT ORGANIZED

Robert Kirkland
Anti-Complicity Movement
Box 7, Fleetwood Station
Mount Vernon, N. Y. 10552

A group of over 200 computer programmers, mathematicians, and engineers has recently formed the Anti-Complicity Movement, in order to oppose the war in Vietnam. The group is urging that persons in the computer field who oppose the war carefully evaluate any project they are asked to work on, refuse to work on war-related projects, and take other action.

The Movement plans to: form local groups; hold debates; work with other peace groups; etc. It has started to publish a monthly newsletter identifying companies having large-scale interests in the war effort, listing meeting places for anti-war activists, etc.

Any persons interested are invited to write to the address above.

ACROSS THE EDITOR'S DESK

Computing and Data Processing Newsletter

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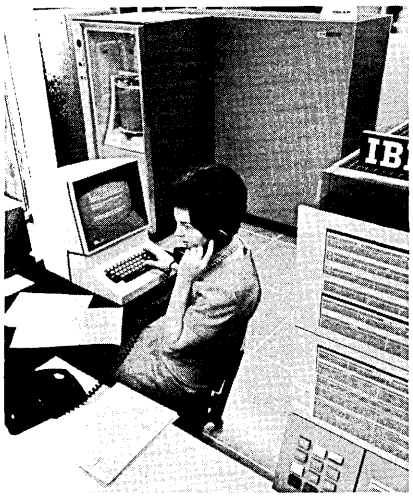
APPLICATIONS

SECURITY LIFE COMPUTERS KNOW 82,500 POLICYOWNERS BY NAME

Security Life & Trust Co., (Winston-Salem, N.C.) is bringing back the good old days of business relations, using computers to get away from numbers and back on a personal-name basis with insurance policyowners. A new information service installed in Security's home office makes it possible to answer questions for some 82,500 individual policyholders, using only a person's name for identification. Security calls the information system SOLAR, a short term for Security Ordinary Life and Alphabetic Response. SOLAR, built around an IBM System/360 Model 30, eventually will include the company's property and liability, group life and health, home protection and credit-life policyowners and its mutual fund shareholders as well.

A request for information is addressed to a visual terminal operator via a direct telephone line, known as "Hotline 360". The policy is called from computer storage using a policyowners' name rather than a number. As seen in the picture, Elaine Hemric of Security Life & Trust Co., given a customer's name by telephone, has only to type the name, which appears on the television-like screen of the IBM



2260 display unit on her desk, and press a button on the keyboard. An IBM System/360 Model 30 retrieves the policy from storage in an IBM 2321 data cell drive, seen in the background, and displays it on the screen in less than a second. If a written copy of a policy is needed, it is printed immediately at the touch of another button on the display device.

Policies are updated daily so that information about premium payments, cash value, length of time in force, and other data is always timely and accurate as well as instantly available.

Security President J. Edwin Collette says, "The irony of our system is that a company has to be a certain size in data processing environment before it can act and react in its services like a small company. The computer, once considered so impersonal, is what makes possible Security's personal individual attention to thousands of policyowners. With SOLAR even the computer refers to our customers by name instead of number."

COMPUTER ANSWERS QUESTION — "DID HOMER WRITE BOTH THE ILIAD AND THE ODYSSEY?"

Prof. Frank P. Jones, a professor of classics and a psychological researcher at Tufts University, Medford, Mass., has spent the last two years studying the distribution of metrical patterns (hexameter patterns) in Homer's famous works, the Iliad and the Odyssey. Prof. Jones has subjected the masterpieces to the critical scrutiny of an IBM 1130 and concluded that Homer was the single author.

Employing the computer to do the hackwork of counting, arranging, indexing, and composing, he arrived at a conclusion that will endear him to allunitarians — those scholars who attribute both epics to the 850-B.C. poet. "The computer," explains Prof. Jones, "allowed us to study the poems' whole form, whereas before, by hand, we could take only samples of the form."

Some scholars contend that the Iliad and Odyssey were written by minstrels over the course of centuries. But now data seems unmistakably to identify Homer's style in all of the 32 metrical patterns of both poems that were studied at Tufts.

It should be added that computers are not new to classic literature. But Prof. Jones, in reanalyzing the dactylic hexameter of the Homeric poems, is the first to publish his conclusions. His findings were presented at the recent annual meeting of the American Philological Association in Boston. A session on Computer-Oriented Classicists gave an official blessing to the value of his computer approach.

COMPUTER-BASED SITE SELECTION SYSTEM FOR STATE OF MISSOURI

Gov. Warren E. Hearnes of Missouri has unveiled a potent new tool in the state's efforts to built its industrial potential — a computerized site selection service. "The computer-based site selection system for helping industrial planners find suitable locations puts Missouri in the position of talking to businessmen on their own terms," the governor said.

The state Division of Commerce and Industrial Development is using the IBM System/360 Model 30 to quickly compare information previously stored in the computer on potential industrial sites within the state with industry requirements. About 25,000 factors on 260 of the state's 928 incorporated towns are currently stored in the computer. More will be added as community leaders complete the questionnaires.

A business official can spell out his firm's needs by completing a detailed questionnaire and receive, in minutes, a printout of the communities offering the facilities and services most closely matching the firm's requirements. "We think this gives us an edge in the competition among the states to bring in new industry which, in turn, creates new jobs and spurs economic growth," Gov. Hearnes said.

Industrial prospects use a 90-point checklist to describe their ideal location. A company official selects up to 10 factors he feels are "critical". The remaining characteristics are indicated as either "desirable" or "unnecessary". The computer first lists all those towns and sites which meet all critical requirements. It analyzes the critical and desirable factors and ranks towns and sites in an order reflecting the manner in which they meet the specified needs.

The System/360 finally prints a list of those characteristics of each community which were present or lacking the stated requirements. The final list is provided in sentence form. The entire process takes only 10-12 minutes.

Newsletter

COMPUTER MAKING IMPACT AT CONSTRUCTION SITES FOR NORAIR ENGINEERING CORP.

The newest in building equipment at Norair Engineering Corporation, Washington, D.C., is an IBM 1130 computer. This compact computer is streamlining work assignments and overseeing costs on Norair's 25 current building projects in the Washington area. At up to 120,000 operations a second, the computer can keep track of as many as 800 building operations at each site, each week, and compute a running total of what they are costing.

At Norair's $15 million construction complex for the National Institutes of Health — as at all Norair project sites — a computerized report issued every Friday tells field supervisors whether all phases in the building process are over or under original price estimates. The Project Cost Report, developed for Norair management, is back in the field within hours after the payroll reports come in.

Corporation President Richard H. Norair, in assessing the computer's impact, says "for the first time in the construction business, we're getting project cost reports in time to make the necessary adjustments at the construction site."

Norair was the general contractor for the Smithsonian's $36-million Museum of History and Technology and the initial building contractor for NASA's Goddard Space Flight Center, Greenbelt, Md.

COMPUTER SPEEDS PUBLISHING AT KEN COOK CO.

Updating and revisions have been something technical publishers had to "live with". Dick Hicke, systems manager for the Ken Cook Co., Milwaukee, Wis., has disclosed that his firm has solved the time-consuming problem of updating technical publications. All updating now is accomplished by an IBM 1130 data processing system installed in Ken Cook Co.'s Data Processing Center. The computer has simplified the process by enabling all changes to be made as they occur, thereby creating peak efficiency.

Productivity has been increased by eliminating the necessity of manual updating. Technical publications and program scripts now are updated by the computer as soon as revisions and changes arrive, and are then stored electronically on magnetic discs. Interchangeable random discs provide virtually unlimited storage facilities.

Once the publishing order is received the computer prints the updated data which is justified automatically. The computer produces justified copy with 99% first choice Webster hyphenation accuracy. This computerized justification makes it possible for a typist to supply only a rough tape to the computer. The computer returns the justified tape to the Justowriter which produces the finished copy, ready to print.

Although computers have been used for some time in hot-type applications, Ken Cook Co.'s cold-type application is unique. The system utilizes a central processing unit, card reader punch, paper tape reader, paper tape punch, card sorter and key punching facilities. "Our application of the computer has resulted in even greater accuracy and has substantially reduced production time", Mr. Hicke stated.

ORGANIZATION NEWS

RCA TO START MARKETING PRECISION CIRCUITS TO ELECTRONICS INDUSTRY

RCA has announced plans for a major entry into the computer, defense and industrial markets for precision printed circuits. RCA, for the first time, will market a complete spectrum of printed circuits ranging from highly complex multi-layer circuits to relatively simple single-sided circuits. The company previously has produced the circuits only for its own programs.

This move was made possible by a $4 million expansion consisting of a new printed circuit manufacturing and engineering facility at Moorestown, N.J., and modernization of existing operations at Camden, N.J. Both the Moorestown and Camden facilities can operate independently, with capability of all production processes from artwork generation to completed circuits and automatic testing. Both employ the photographic-etching and screening processes.

In addition to advanced production equipment, the new Moorestown facility is the first new manufacturing plant to be licensed under New Jersey's Air Pollution Control Code. It has special air scrubbers to eliminate fumes from exhausts and a water treatment plant to neutralize acids in liquid discharges.

HONEYWELL STATES POLICY ON COBOL AND FORTRAN

Following the announcement by Honeywell's competition at a SHARE meeting that they did not intend to make any further commitments to the development of COBOL and FORTRAN, Honeywell Management has released its position on the two languages. Their statement is as follows:

1. Honeywell is committed to protect the programming investment made by many users to high level compilers considered as industry standards up to this point in time.

2. For this reason, we have developed the most efficient compilers available to the market place.

3. We will continue to maintain and upgrade these compilers in the future to support new peripheral devices.

4. We will upgrade these compilers to support new computer systems announced in the future.

5. Should new industry standards be developed and accepted by government, Industry and User Organizations, Honeywell will expand its commitment into these new areas.

Honeywell encourages all companies to contact them for an amplification of this position.

THREE YEAR LEASE PLAN INTRODUCED BY SDS

Scientific Data Systems has announced the introduction of a new three year lease plan for SDS computers. Under the new plan, customers who agree to lease SDS computers for a period of three years pay ten per cent less per month than if they leased the equipment under a one year commitment.

Last year, SDS introduced a plan that provided monthly discounts of 20 per cent for four years, fixed term leases. This plan remains unchanged.

REACH PRELIMINARY AGREEMENT FOR ACQUISITION OF ELECTRONIC ASSOCIATES INC. BY CONTROL DATA CORPORATION

Chairman of the Board and President of Electronic Associates, Inc., Lloyd F. Christianson, and Chairman of the Board and President of Control Data Corporation, William C. Norris, jointly have announced that their companies have reached a preliminary agreement for the acquisition of the assets and business of Electronic Associates, Inc. by Control Data through an exchange of stock. The exchange ratio shall be one full share of Control Data's common stock for each 4.65 shares of Electronic Associates' common stock.

Both Mr. Christianson and Mr. Norris note that the terms of the acquisition are in the preliminary stage and that the proposal is subject to the completion of a definitive agreement, as well as the approval of the Directors of both companies and the stockholders of Electronic Associates, Inc.

BAKKENIST AUERBACH N.V., COMPUTER CONSULTING FIRM, FORMED IN EUROPE

A new computer consulting firm, BAKKENIST AUERBACH N.V. has been formed in Amsterdam as a joint venture beyween AUERBACH Corporation headquartered in Philadelphia, Pa., and Bakkenist, Spits & Company, Amsterdam. The announcement was made by Isaac L. Auerbach, President of AUERBACH Corporation and Mr. N.C.H. Hesterman and Dr. D.E. Beutick, partners of Bakkenist, Spits & Company.

"The administrative and technical resources of both firms are being drawn upon to bring to Europe a unique depth of expertise in all areas of information sciences and technology", said spokesmen for the companies. The new firm will offer their professional consultation services to clients in the Netherlands, Germany, the Flemish-speaking portions of Belgium, and the non-French-speaking part of Switzerland.

Directors of the firm will be Mr. N.C.H. Hesterman and M. Georges Picot; Mr. James Mulford is appointed a Technical Director.

NATIONWIDE NETWORK OF DATA PROCESSING FACILITIES PLANNED BY UNIVAC

Univac Division of Sperry Rand Corporation plans a major expansion in computing services through a nationwide network of data processing facilities. Announcement of plans was made by Robert E. McDonald, president of Univac.

Univac has formed a new Information Services Division, headquartered in Philadelphia, that will utilize an integrated system of nationally deployed computers, communication lines, and terminals. The new division is a restructuring of Univac's Data Processing Centers Division, established in 1964, and represents a major expansion of its charter and service activities.

The network will include large scale UNIVAC 1108 and UNIVAC 418 systems in computing centers and the UNIVAC 9300 system in each branch service center. UNIVAC 1104 card processors and UNIVAC DCT-2000 communication terminals will communicate with the 418/1108 systems from both branch and customer offices.

George E. Vosatka, vice president, marketing, for the Univac Division, said, "We are setting up a communications-oriented system which will overcome the user's concern for where the computers are located." Development of the network has been underway since 1965; the first segment has been operational since the Fall of 1967. Three remaining segments will go operational before the end of 1968.

COMMERCIAL CREDIT AND RCA ARE FORMING COMPANY FOR NATIONWIDE TIME-SHARING COMPUTER SERVICE

A multimillion-dollar corporation is being formed by Commercial Credit Company and RCA to establish and operate computer centers in principal cities across the United States for time-sharing and other data processing service to subscribers on a local and national network basis.

The joint announcement by Donald S. Jones, President and Chief Executive Officer of Commercial Credit Company, and Robert W. Sarnoff, President and Chief Executive Officer of RCA, disclosed that the new company will open its first center in Baltimore during 1968. Similar centers are planned for subsequent establishment in ten or more other cities across the country.

The new enterprise will use RCA Spectra 70/46 Time-Sharing Systems. The initial market for the time-sharing service is expected among such users as engineering organizations, universities, and technically-based businesses. Time-sharing subscribers will use terminal equipment such as teleprinters and display screens to communicate directly with the central computer from offices, libraries, laboratories, or any other location over telephone lines. Since the system can be used by "anyone who can do high-school algebra" it should find growing appeal among institutions and enterprises reluctant to hire computer programmers of their own if the service is available on a subscription basis.

EDUCATION NEWS

KODAK'S CAPAL SYSTEM PLACED IN RESEARCH PROJECT SERVICE WITH 3-COUNTY GROUP OF UPSTATE NY SCHOOLS

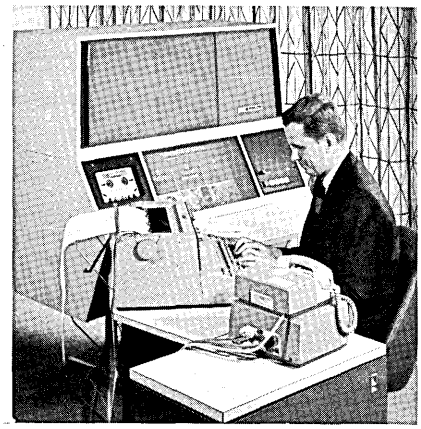
Eastman Kodak Co., Rochester, N.Y., has placed one of its new CAPAL learning systems in service with a three-county group of Upstate New York schools as a research project to determine how CAPAL might apply to public education. Kodak devised CAPAL (Computer and Photographic Assisted Learning) and has been using it in actual training situations for several months in the company's Rochester, N.Y., and Atlanta, Ga., educational facilities. The company has no plans to market CAPAL at the present time.

The Kodak unit has been furnished to the Clifton Springs Computer Center. This is a tri-county headquarters for programmed instruction, computerized learning, and audiovisual systems. Some 25,000 pupils in 15 local school districts are served by the center, operated by the Board of Cooperative Educational Services of Ontario, Seneca, and Yates Counties.

The CAPAL apparatus is designed to present information to the learner and elicit responses from him. The student proceeds at

his own pace, responding to questions flashed at him on a projection screen, spoken to him on a sound tape, or tapped out to him on a teletypewriter. In most of the programmed lectures, all of these methods are combined.

In the picture, a man is shown seated at a teletypewriter which types out information and questions and which can be used to type answers. At his right is a large con-



sole with a screen on which movies or slides are shown; projectors for the visuals are behind the screen. The console also contains a tape deck. At the man's left is a telephone for dialing a computer connection for the entire unit.

"From the short time CAPAL has been operating at Clifton Springs," said Robert E. Kloepfel, director of the Computer Center, "we can see in it the possibility of real value in helping the individual student, no matter which end of the learning scale he's on. The combination of audio, visual, and printed material is a happy one. We are trying to use as many senses in the learning process as we can, because the use of all the senses enhances the learning rate and increases the learning capacity of each student." A seventh-grade boy from Naples, N.Y., put it another way by saying CAPAL made learning "fun".

COVER STORY

COMPUTERIZED GAMES HELP NEW YORK YOUNGSTERS LEARN HOW TO RUN A STORE, A COMPANY OR A COUNTRY

It's not so easy to run a kingdom — particularly when you're only in the sixth grade, the rats eat your grain, and the country you rule existed more than 5,000 years ago. But a typewriter-like communications terminal linked to a computer is bringing these problems, and many others almost as unusual, to youngsters at the Board of Cooperative Educational Services (BOCES) in Westchester County, New York.

The young students can actually take turns ruling a city-state that flourished in 3500 B.C. in the Mesopotamian state of Sumer. Or, if they prefer, they can use the computer-terminal setup to try to manage a toy store, a company that makes surfboards, or serve as advisors to a struggling young African nation.

BOCES, a New York State educational agency, is conducting research in computer-assisted instruction, and has used the games to see if they are an effective means of teaching economic principles.

The terminal is linked by telephone line to an IBM 1401 computer and prints out questions, answers, background information and instructions. A child indicates various alternatives (with hunt-and-peck typing) to make decisions that dramatically affect the development of a country's people and economy, or lead to wealth or bankruptcy in the world of business.

According to Richard Wing, director of curriculum research for BOCES, the computer games incorporate two important learning principles: "(1) They get children to act out situations instead of just reading or being told about them; and (2) They allow a child to proceed at his own pace and receive instruction on an individual basis. Combining these two principles leads to complexities which a computer is marvelously equipped to handle."

Each child rules over Lagash, an ancient Sumerian city-state, for three 12-year periods. As he solves comparatively simple problems, he is presented with increasingly severe crises, such as rats invading the royal storehouse and gobbling up quantities of grain. He is helped in resolving these crises by the use of inventions — for example, clay jars (to foil rats), crop rotation, fertilization, plows and an alphabet — which did actually originate in Lagash.

In almost all cases, the young rulers have left their kingdoms in pretty good shape after a 36-year reign.

COMPUTER RELATED SERVICES

COMPUTER SCIENCES CORP.'S COMPUTER-BASED INSTANT ACCOUNTING SERVICE FOR FINANCIAL INSTITUTIONS

Computer Sciences Corporation, El Segundo, Calif., has initiated its computer-based instant accounting service for financial institutions throughout the Mid-South. The new system has been installed at the two offices of the First Federal Savings and Loan Association of Huntsville, Ala.

Richard A. Lucas, computer center manager for Computer Sciences' Southeastern Operations, said the company plans a rapid expansion of the Huntsville-based service into Birmingham, Atlanta, Memphis and Chattanooga within the next several months.

The remote system operated by Computer Sciences can accommodate 250,000 accounts. The system has add-on capabilities enabling it to serve several million accounts if desired, Mr. Lucas noted.

In the new system, electronic terminal consoles in savings and loan offices are linked by telephone circuits to a central computer at Computer Sciences' Huntsville facilities. Savings and loan tellers communicate with the computer via the terminal consoles, which resemble standard accounting machines. Transactions processed on the consoles are recorded instantly by the computer.

In addition to improving customer service, the new system provides savings and loan management with better control over its business. On any given day, management will know precisely the amount of funds available for investment or loan; information on any of the day's transactions will be readily available. Further, the computer will calculate trial balances, compute interest on savings accounts, and prepare numerous reports required by management and government agencies.
(For more information, designate #41 on the Reader Service Card.)

COMPUTER SERVICE TO AID GOVERNMENT CONTRACTORS

Specification Technology, Inc., Santa Ana, Calif., has developed a new computer service which automates the research and processing of government contract specifications. After eight years of research and development by STI, this new service represents a breakthrough in the solving of a formidable problem facing both defense contractors and government agencies for several decades. This is the need for rapid and accurate analysis of a contract's requirements, imposed by the chain of referenced military specifications and standards (normally called a "specification tree"). With the new computer service, specification research which previously took from 3 weeks to 6 months of tedious effort can be accomplished in hours.

Central to the system is a National Cash Register 315 RMC Computer. The heart of the system is a huge specification library which in turn has been programmed into the computer. The entire library is filed by means of NCR's CRAM (Card Random Access Memory) units. Utilizing STI's program, the new service has the capability of very rapid retrieval of all specifications forming the contractual obligation of any contract, bid or proposal.

STI says that the significance of this new development to defense contractors is that, for the first time, they will have immediately available a complete specification package for ready analysis. This means prompt response to government bids can be made with assured accuracy and virtual elimination of the risk factor inherent in past methods of operation.
(For more information, designate #42 on the Reader Service Card.)

TIME-SHARING SERVICES

DATACOM — A NEW BUSINESS COMMUNICATION SERVICE BEING MARKETED IN CANADA

A new business communication service — Datacom — which allows direct access to time-sharing computers is being marketed by Bell Canada and other Trans-Canada Telephone System companies. Wallace M. Rankin, Vice-President of Bell Canada's Toronto Area, described the new service in an address to the Business Press Editors Association held in Toronto.

The Bell Canada spokesman said new developments in computer service are shifting emphasis from the computer as an "electronic brain" to that of a problem-solving tool of business. Provision of the Datacom linking facilities would enable businesses of any size to take advantage of the money and time-saving benefits that computer time-sharing offers.

-- New Datacom business service provides instant computer access over regular telephone circuits.

"The telecommunications industry is playing a major role in perfecting ways and means of getting all forms of business information to and from computers at increasingly greater speed," he said.

Organizations already taking advantage of time-shared computers include architectural consultants, engineering consultants, railways, public utilities and many other firms involved in problem-solving situations.

NEW PRODUCTS

Digital

NEW MEMBER ADDED TO BURROUGHS 500 SYSTEMS FAMILY

Burroughs Corporation, Detroit, Mich., has announced the addition of the B500 electronic data processing system, another member of Burroughs 500 Systems family. President Ray W. Macdonald said the B500 "will provide a much higher level of data processing capability at lower cost for a very wide segment of the business, governmental and financial communities..."

The B500 was designed to have assembly language compatibility with the B100, B200 and B300 systems, and to have source language compatibility throughout the Burroughs 500 Systems family through the use of higher level COBOL.

A special, compact disc file Systems Memory acts as a high speed extension of the B500's main memory, and contains combinations of software elements used by the computer, such as the operating system, the user's program library and the COBOL compiler.

The systems memory has a capacity of 2.4 million characters of data stored in 240-character segments. Any of the 10,000 segments of data can be accessed in an average of 23 milliseconds, and be transferred to and from core memory at a rate of 100,000 characters-

per-second. Thus, software elements are used in the faster main memory only as they are needed, and the 9,600 or 19,200 positions of computer main memory are kept free for processing of data.

The new system is available in several configurations, including orientation to on-line data communications, random access disc file and magnetic tape processing, and multiprocessing. The system can handle on-line communications and off-line production work at the same time.

Deliveries of the system will begin in the fourth quarter of 1968. (For more information, designate #43 on the Reader Service Card.)

HONEYWELL ANNOUNCES DDP-324 COMPUTER

Honeywell's Computer Control Division, Framingham, Mass., has introduced a general purpose dual processor computer which it said will perform more than 500,000 operations a second. The new DDP-324 computer is designed for use in simulator, process control and communications systems and for scientific applications where large amounts of on-line data reduction are performed.

— Conductron-Missouri in St. Charles, Mo., will use three DDP-324 computers for 747 simulator systems.

The basic DDP-324 has two processing units, each with 8,192 words of shared memory. Word length is 24 bits. Each private memory may be expanded up to 24,576 words. Shared memory may be used for common data and as a communications link between the processors and input/output devices. Basic input/output structure is made up of a typewriter, and paper tape reader and punch.

DDP-324 software consists of 380 field-tested programs which are completely compatible with DDP-224, -124 and -24 computers. Included are Fortran IV compiler, compatible symbolic assembler, systems I/O, math, test and utility programs. Honeywell's users' group provides additional programming support and a library of user subroutines.

T. W. Helweg, division marketing vice president, said the new Honeywell dual processor is priced 16% below comparable machines and speed is 60% faster.

Standard options include direct memory access channels, multi-level priority interrupt, fully buffered channel (FBC) shared setup and time multiplex units.
(For more information, designate #44 on the Reader Service Card.)

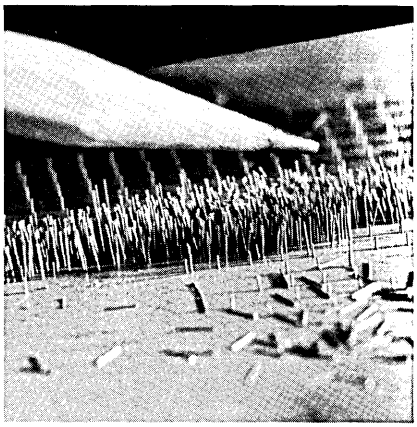
CENTURY SERIES COMPUTERS ANNOUNCED BY NCR

The new Century Series, recently announced by The National Cash Register Company, Dayton, Ohio, is a complete, high-performance family of general-purpose data processing systems. All models in the entire Century Series have on-line, real-time capabilities. A full line of peripheral equipment also was introduced by the company.

Robert S. Oelman, chairman and chief executive officer, said the lower-priced members of the new computer family have been oriented toward the "mass computer market, including the first-time computer users". The systems' capabilities cover all types of business data processing and also special scientific applications. All Century computers use the international and American (ASCII) standard codes for information interchange. Design objectives were to achieve the optimum price-performance ratio and to provide complete software with first deliveries; both objectives have been met.

The Century Series family is based on significant design advances in high-speed thin-film memories, disc memory innovation, monolithic integrated circuitry, and a complete upward compatible family of software.

The NCR developed thin-film "rod" memory employs thousands of tiny "whiskers" in place of the usual doughnut-shaped ferrite cores. Each of these hairlike rods (shown in the picture below) is only 1/10 inch long and is coated with a thin film of magnetic material. The



company's proprietary methods of automatically fabricating and assembling the short rods into memories have been an important contribution to the Century Series' outstanding cost/performance ratio. The same basic memory module is used throughout the entire computer family. It operates at 800 nanosecond (billionths of a second) speeds, and is in the form of modules which can be expanded.

The Century disc (there are two in every system) is used as a reservoir for the storage of operating software, freeing the main memory and extending program performance and compatibility throughout the family. Each of the discs stores more than four million bytes of information. Average access time is 42 milliseconds.

The two removable disc packs are made up of three discs each. Seventy-two read-write heads serve each disc pack, providing 12 times as many heads per disc surface as other systems. The multiple-track heads provide immediate access to 1/16 of the total file (more than half—a-million bytes), compared with 1/200 on typical units available today. The discs are unique in that they are metal-plated instead of oxide-coated, providing an exceptionally clean and long-wearing surface.

Another major area of advanced technology in the Century Series is its use of monolithic integrated circuits throughout the system, including peripheral units as well as the central processor. Only one type of integrated circuit is used

throughout the new family of machines. The circuits are mounted in standardized cards, and only six different types of cards make up 80 percent of the logic circuitry. There are only 120 different card types in the entire system, a fraction of the number used in most computer systems today.

Initially, NCR is releasing two lines of the new computer family — the Century 100, scheduled for delivery next September, and the larger Century 200, scheduled for first deliveries next February. The new computer family also includes still more powerful multiprocessing and time-sharing models scheduled for a later release.
(For more information, designate #45 on the Reader Service Card.)

Special Purpose Systems

GASCHROM-8 FOR ANALYZING DATA FROM MULTIPLE GAS CHROMATOGRAPHS

GasChrom-8, a new computer-based system for analysis of data from multiple gas chromatographs, has been announced by Digital Equipment Corp., Maynard, Mass. The new system includes the company's latest general purpose computer (PDP-8/I), a specially designed chromatograph interface, easy-to-use conversational software and Teletype.

Other types of instruments can be connected to the computer using interfaces available from Digital Equipment Corp. Specially developed software packages, designed for the PDP-8/I, extend the computer's capability to serve other instrumentation such as mass spectrometers, NMR spectrometers and a variety of other instruments.

The new system detects peaks and shoulders, calculates peak areas and peak retention times, allocates overlapping peak areas, corrects for baseline drift, and calculates component concentrations. It also identifies peaks, applies response factors, and types out a complete analyses report immediately after a run is finished. In addition, GasChrom-8 allows parallel operation of a strip chart recorder and attenuation switching.

George L. Rice, Marketing Manager for Digital's PDP-8/I said, "GasChrom-8 is desgined to save the analyst time, reduce the possibility of human error and increase the efficient scheduling of laboratory instrumentation." He also pointed out that the new system, priced at $45,000 plus $1,000 per channel implemented, breaks an established price barrier for high performance computerized systems.
(For more information, designate #46 on the Reader Service Card.)

ALL-ELECTRONIC TYPESETTER SETS TYPE FOR FULL PAGE OR MICROFILM STORAGE IN SECONDS

A new all-electronic typesetter that can set the complete text for a magazine page in less than four seconds or write information for microfilm storage at computer speeds has been announced by RCA, New York, N.Y. The Videocomp 70/830 generates charaters at a rate of up to 6,000 per second — a thousand times faster than manual typesetting machines. Additionally, the Videocomp provides full page composition through its 70 pica (12 inch) line length and its ability to write in sizes from 4 to 96 point type (approximately 1-1/3 inches high) with proportional reduction for 35mm microimage output.

Videocomp can be used to set type in almost every format conceivable — from a full page tabloid newspaper composition to directories or parts manuals. Equally important, the new equipment makes possible quality typeset printout of computer information at speeds well in excess of the 1,100 lines per minute typical of high-speed printers now used for computer readout. This could result in easier handling and reading of the business and scientific data now being processed by computers.

In operation, original copy and composition instructions are fed to a computer which produces an output magnetic tape or sends signals directly to the 70/830. In response to taped or direct signals, the machine generates characters on a cathode ray tube. As the characters appear on the tube they expose standard or 35 microimage film, stabilization paper for quick proofing, or short run offset plates.

Videocomp stores typefonts in electronic memory where they can be used instantly. This internal storage reduces load on computer memory and permits use of the Videocomp off-line with any computer.

Because the entire operation is electronic, every letter can be altered electronically to form roman, oblique, extended, condensed and superior and inferior versions of the basic face. Every face, in every variation, can be mixed at will — on the same line, in the same word — with every other face. In addition, Videocomp can store and write any special form including scientific, mathematical and engineering symbols, foreign alphabets, ideographs or trademarks — literally, almost any visual image.
(For more information, designate #47 on the Reader Service Card.)

Software

CODPAC (Core/Drum Package) / The Foxboro Company, Foxboro, Mass. / The software system, CODPAC, for direct digital control of industrial processes, is designed for Foxboro control systems using PDP 8 computers with core/drum memory. It includes facilities for scanning, data acquisition, alarming and control and permits the development of highly sophisticated control algorithms. The software package, applicable to batch and continuous processes, can be modified easily to fit the specific requirements of individual processes. CODPAC can be used with either single- or multi-computer systems. CODPAC contains all software programs for handling input and output of process data.
(For more information, designate #48 on the Reader Service Card.)

DATA I / Atlantic Software Inc., Philadelphia, Pa. / This special-purpose System 360/Spectra 70 utility is designed to reduce file maintenance programming costs, and to eliminate one-time programs for data and file manipulation. Data I can update tape or disc files from cards, tapes or discs in any format. It also can generate tape, disc or card files. Output formats are completely variable. The program requires 64K core, and will operate under DOS and OS with any combination of disc and tape I/O. Data I is available now, and is fully warranted and supported by Atlantic Software.
(For more information, designate #49 on the Reader Service Card.)

FORCE-III / Honig Time Sharing, Inc., Hartsdale, N.Y. / FORCE-III will operate out of a partition of OS/360 MFT. The subsystem contains: a command language interpreter and file maintenance subsystem; a line editor for creation and correction of files; a FORTRAN IV (G level) compiler; a subroutine library; and scheduling and execution control monitor. The system is designed for an IBM System/360 Model 50 or greater. Using FORCE-III, object programs may be catalogued and filed, thus permitting a library of programs which may be used repeatedly without recompilation. Files may be translated to, or generated from, catalogued OS data sets. Object programs, created and debugged under FORCE-III, may be run under OS in the batch environment and, finally, OS can run simultaneously via multi programming in the background, and provide normal batch processing at the same time.
(For more information, designate #50 on the Reader Service Card.)

GE-PAC® MANAGEMENT INFORMATION SYSTEM / Bonner & Moore Associates, Inc., Houston, Texas / Designed for use with General Electric GE-PAC® 4000 process computers, the system now is being marketed with installation, training, maintenance, and general support being included in the package price. The GE-PAC management information system incorporates a general purpose linear programming capability (GPLP); a management information system symbolic interpretive language (MISSIL) to provide efficient communications with the GPLP segment, as well as extended capabilities for management analysis and reporting; and a stylized matrix generation and solution analysis system (MG/SAS). The new system is designed to handle matrix generation, linear programming and information system requirements from file maintenance and pre-processing of the original data to the preparation of final action reports. At the same time, it is designed to permit efficient ues of computer capabilities and the skills and abilities of the user.
(For more information, designate #51 on the Reader Service Card.)

HOSPACT / Information Management Inc., San Francisco, Calif. / This hospital patient accounting system enables any hospital to heighten efficiency, reduce overhead costs and assure accuracy in statistical transactions involving patients. HOSPACT operates on all current computers for which a COBOL compiler is available. It now is being offered to service bureaus across the nation on an exclusive franchise basis that includes protected territories within normal marketing areas.
(For more information, designate #52 on the Reader Service Card.)

RAIL-CON / American Cyanamid Company, Wayne, N.J. / Licensed for sale by Concept Implementation Corp., Wyckoff, N.J., Rail-Con provides industrial firms with better utilization of their fleets of railroad cars. The new system is designed to help reduce overall transportation costs through more efficient control of fleets, including tank, hopper, and special purpose cars. Rail-Con provides for daily and monthly reports on such factors as location and availability of the cars, and mileage allowances provided by railroads.
(For more information, designate #53 on the Reader Service Card.)

SYSTEM/360 DOCUMENT PROCESSING SYSTEM / IBM Corporation, White Plains, N.Y. / This system allows storage of full text, abstracts, or identifying keywords in machine-readable form. System/360 Document Processing System can be used to process documents in such fields as law, medicine, engineering and the physical sciences. It can be used for the storage and retrieval of document references or index terms. The program notes all descriptive words in the text of incoming documents and compares them to words in a computer-stored dictionary. The document numbers in which these descriptive words occur are then added to an index stored in the computer. To search for a document, a request is prepared using English language statements. A set of punched cards is prepared as input to the computer. The system's output is a bibliography of documents which satisfy the search criteria. Full-text printout also is available, if desired. The system, operating under the control of OS/360, requires a minimum configuration of a System/360 Model 40 with 128K bytes of main storage.
(For more information, designate #54 on the Reader Service Card.)

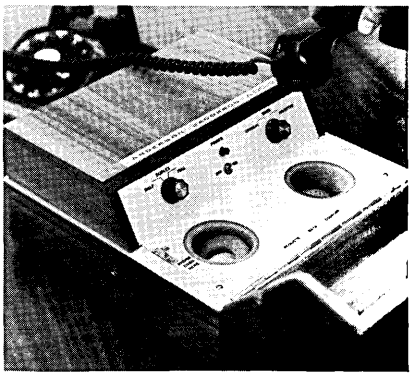
UNITE II and UNITE III / United Computing Corporation, Redondo Beach, Calif. / These packages allow the user to simulate the operation of the SDS 9300 and CDC lower 3000 series computers, respectively, on the SDS Sigma 5 and 7 computers. The UNITE programs execute direct object code for the computers being simulated. This allows codes written for these computers to be run directly on Sigma without modification. These simulators handle all hardware operations such as: boot strap loading, I/O operations, interupts, and console display and switch functions. The packages sell for $8000, including the simulator, a week of on-site support, user's manual, and a lifetime warranty on the program's code structure.
(For more information, designate #55 on the Reader Service Card.)

Peripheral Equipment

PORTABLE DATA COUPLER FOR USE WITH ORDINARY TELEPHONE

The Anderson Jacobson ADC 260 Acoustic Data Coupler, developed by Anderson Jacobson, Inc., Mountain View, Calif., is a device for sending and receiving data between a remote terminal and a time-shared computer using any ordinary telephone. It is used typically with a Model 33 or 35 Teletype but can be used interchangeably with EIA RS-232 Specification interface teleprinters which can operate with a 103A Dataphone. This includes the Friden 7100, Datel Thirty-10, IBM 2741, and various card readers.

The teleprinter-coupler combination provides a remote computer terminal which can be moved easily from one place to another wherever



an ordinary telephone is available. Thus, access to a computer can be from one's own office or home, and there is no need to be constrained to a fixed location.

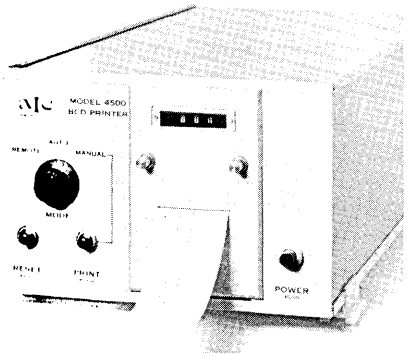
Coupling with the telephone system is acoustic both into and out of the telephone system. No direct connection to telephone equipment is required. Operation is independent of signal level, above a required minimum, and no adjustment is necessary. A "carrier on" indicator is provided to help with system diagnostics.

The ADC 260 is designed to handle a bit rate of approximately 300 Baud. It is used at a 110 Baud rate when used with a Model 33 or 35 Teletype. Reliability is comparable to data sets which are directly attached to the line. Transmission characteristics are fully compatible with using a 103A Dataphone at the computer end of the telephone line, with switches provided for both upright and inverted codes and full and half duplex.

No special interface in the Teletype is required except to install a connection cable which is included. EIA Specification terminals plug in directly. Patents have been applied for.
(For more information, designate #56 on the Reader Service Card.)

NEW BCD PRINTER AVAILABLE FROM AIC INSTRUMENTS

The Model 4500 Printer, available from AIC Instruments, Houston, Texas, is a compact, parallel entry BCD printer. The Model 4500, using all integrated circuit logic, has a print rate of 1 line/second and is available with up to five decades print-out.



The printer accepts inputs in a 1 - 2 - 4 - 8 BCD code. Input data are printed upon receipt of an external command in the EXTERNAL mode; at the maximum printing rate in the AUTO mode; and when the front-panel push button is pressed in the MANUAL mode. When a line has been printed, a print-completed pulse is generated, indicating the printer is ready for another input.

The printing mechanism slides in from the front panel, providing easy access for changing the printing paper. Dimensions are: 5-1/4" high x 8-1/2" wide x 18" deep.
(For more information, designate #61 on the Reader Service Card.)

LOCKHEED OFFERS MAGNETIC TAPE MEMORY READER

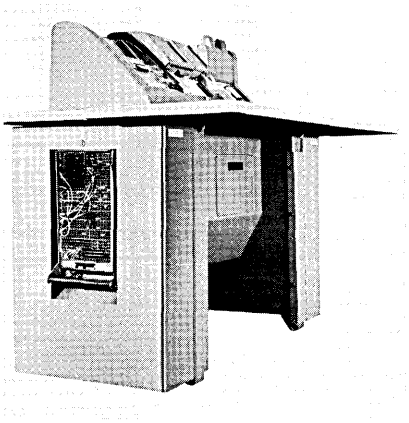
Lockheed Electronics Co., Industrial Technology Div., Edison, N.J., plans production and marketing of a small, lightweight, low powered, seven-track memory reader which is capable of storing up to 125,000 characters. This digital magnetic tape memory reader, called the Model TR 26S, originally was designed for use on Polaris checkout equipment and now is being placed on the commercial market by Lockheed.

The compact device (6-1/2" x 7" x 6-1/2" and weighing less than nine pounds) has read, rewind, search, and standby modes, giving extensive capability and wider flexibility. The TR 26S has rugged aluminum cartridges that handily store data tape making changes quick and convenient. It is especially suited for laboratory, field, shipboard and airborne program insertion in computer systems.

In addition to the many options available, some of the standard control features are — automatic rewind at the end of the tape — automatic stop at the beginning of the tape during rewind — it will generate signals during search — and it also will have automatic "stop" at the programmed tape position during reading.
(For more information, designate #57 on the Reader Service Card.)

FULL ASCII CODE NOW AVAILABLE ON DURA CONVERTERS

A new series of data processing code converters capable of converting a full ASCII code set (128 codes) now is available from Dura Business Machines, Division of Intercontinental Systems, Inc., Madison Heights, Mich. Models available include paper tape to card, card to paper tape, and paper tape to paper tape. In addition to full ASCII code conversion the card punch input/output has been expanded to accommodate the 64 codes required to make it compatible with the new IBM 029 Key Punch.



The devices are capable of converting any five, six, seven or eight channel code. Programming logic is based on principles similar to unit record equipment and is easily understood by non-technicians. Conversion speed is twenty (20) codes-per-second. Coding, decoding and conversion programming are controlled by interchangeable plugboards. Exclusive plugboard wiring templates simplify programming. Optional features include punch parity check and edge card punch and reader.
(For more information, designate #60 on the Reader Service Card.)

COMPUTER DISPLAY STATION FOR SMALL, REMOTE OFFICES ANNOUNCED BY IBM CORPORATION

A new visual communications link with a remote System/360, specifically designed for small branch offices, has been announced by IBM Corporation, White Plains, N.Y. The new equipment — the IBM 2265 display station — has leased line communications capability. Many companies now will be able to extend computer information display networks to locations where it was not economically feasible to do so before.

To enter data into the computer, the 2265 operator uses a typewriter-like keyboard located near the viewing screen. The information is displayed on the screen in much the same way as if it were typed on paper. The operator can review and edit the material on the screen before pressing the button which transmits the message to the computer, at a rate of 240

characters a second over the communications lines.

Visual reports from the computer are displayed and easily read on the device's 67-square-inch viewing area. To accommodate a variety of applications, up to 960 alphabet/number characters can be displayed on the 2265. Two formats are available — either 15 lines with 64 characters to a line, or 12 lines with 80 characters to a line.

While designed to get information into and out of a central computer, the 2265's primary use will be for retrieving and visually displaying blocks of data. The IBM 2265 can be used with System/360 Models 30 through 75. Initial customer shipments are scheduled for the second quarter of 1969.
(For more information, designate #58 on the Reader Service Card.)

ADAGE ANNOUNCES A NEW DATA DISTRIBUTOR FOR DIGITAL-ANALOG SYSTEMS

Adage, Inc.'s (Boston, Mass.), new universal Data Distributor (Model YD2) allows interfacing to any general purpose digital computer without regard to data structure or digital logic levels. The YD2 provides for timing, control and data distribution of digital inputs. Digital data of up to 15 bits may be transferred at rates of up to 500 kHz.

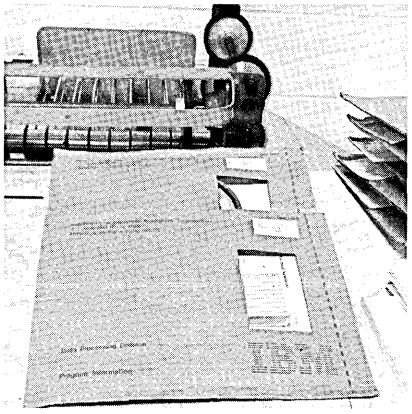
On-line features of the YD2 include the provision for operating in random, sequential or manual modes. A Control and Display panel also is available with the YD2.
(For more information, designate #59 on the Reader Service Card.)

Data Processing Accessories

"SELF-SEAL" PACKAGE USED BY IBM TO MAIL CARDS FOR COMPUTERS

Once the only way to guarantee the safe delivery of computer cards in perfect condition was to package them in a combination of envelopes and cardboard boxes. Although this method was effective in protecting the cards, it also was costly and time consuming.

From Hawthorne, New York, at IBM's Program Information Department, numerous punch cards are mailed out every day to business and industrial clients in every part of the United States. A year ago, the idea of using "Corro-Seal" as an efficient, easy-to-mail wrap for the punched cards and five-inch magnetic tape reels was suggested to IBM. Corro-Seal (available from the Sherman Division of the St. Regis Paper Company, Newton, Mass.) is a self-sealing, flexible corrugated paper that molds snugly to objects of any shape and creates a dust-tight cushioned package.



— Punched IBM cards and magnetic tapes are readied for mailing in a St. Regis "Corro-Seal" package. The package has been die cut to show the contents.

Corro-Seal's soft coating gives fragile surfaces all-round cushioning protection without sticking to them (the cohesive coating will stick only to itself). Light pressure applied manually or by machine is all that is required to seal a Corro-Seal package and render it ready for safe air transit to any location.

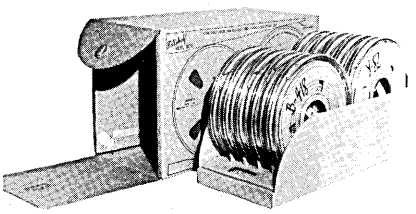
Since it has been using Corro-seal, IBM, Hawthorne has reduced the need for the envelope-and-box wrapping method, which required multiple packaging materials, and Corro-Seal's self-sealing properties virtually have eliminated the need for tape, staples or twine.
(For more information, designate #63 on the Reader Service Card.)

TILTSHELF REEL BOX TO BE AVAILABLE ON A NATIONWIDE BASIS

Record Service Center, Houston, Texas, has begun nationwide marketing of a digital reel container which performs as a reel rack, shipping module, and space saving storage and retrieval system for computer tape.

This container, called the Tiltshelf* Reel Box, was designed by Mr. Paul Farren, President of Geodata Service, Inc., to be used internally by that records storage and retrieval firm in order to facilitate handling of tens of thousands of digital reels and to save valuable storage space. In over two years of heavy service, the system proved so successful in providing instant access to reels, elimination of conventional expensive shelving, more effective use of floor space, reduction in handling costs, and as a rugged shipping container — that the unit is being manufactured and offered nationally.

The Tiltshelf Reel Box, made of heavy duty water-proof corrugated board, offers unlimited flexibility in handling picture film and magnetic tape reels. When boxes are stacked, the door of any box can be unlocked for immediate access to each reel, or to the entire tray full of reels. The removable tray is strongly constructed with a forward tilted floor and dividers that hold two reels in each slot.



Each Tiltshelf Reel Box comes with extra packing dividers and has proved to be a rugged shipping container, with over 1,000 pounds per square inch puncture protection.

Accessories include an outer shipping box and a heavy Vapor Seal bag to provide maximum protection of valuable reels during long transport or shipboard use. The Tiltshelf Reel Box is available for 2400' reels of 1/2" or 1" tape in standard canisters, and 1/2" tape in slim canisters. The different models offered hold from 8 to 12 canisters.

Mr. Farren has licensed IBM Corporation along with Record Service Center to manufacture, use, and sell the Tiltshelf Reel Box. Several patents are pending and issuing on the containers.
(For more information, designate #62 on the Reader Service Card.)
*Trademark, Patent Pending

AUTOMATION

FOREIGN-MONEY VENDING MACHINE OFFERS CHOICE OF EIGHT DIFFERENT CURRENCIES

An actress, a plumber, a sales executive, a housewife, and a scientist line up in front of a square-shaped machine in the International Arrivals Building at New York's John F. Kennedy Airport. They all have one thing in common: they need foreign exchange for the country of their destination.

The machine is called an Automatic Monetary Exchanger. The Exchanger, designed and manufactured

by the Trodyne Corporation, Teterboro, N.J., will provide a packet of foreign money for any one of eight countries. The plumber places a U.S. ten-dollar bill in the slot provided, pushes the slot into the Exchanger, presses a button marked Germany, and in seconds receives a packet containing German marks worth ten U.S. dollars at the current exchange rate.

In designing and developing the Exchanger, Trodyne's aerospace engineers used many of the same techniques they would employ in developing sophisticated control systems for supersonic aircraft. Their knottiest problem was to make a system that was as simple as possible for the public to operate ("idiot-proof", as they say in the trade).

Inside, the machine's system is far from simple. It is a complex robot that scans your bill for fourteen different qualifying characteristics. The machine is fool-proof, pilfer-proof, and tamper-proof. If your bill is bona fide, it allows your request to be processed, otherwise it rejects your bill and returns it to you.

Perera Company, New York City, the world-wide distributor of the Exchanger, expects to place 300 units in the next three years at all major domestic airports. In the near future, these Exchangers will be designed to accept various European currencies and be located at principal European air terminals. (For more information, designate #64 on the Reader Service Card.)

STANDARDS NEWS

STANDARDIZING INPUT LANGUAGES: CALL FOR OPINIONS

A move to explore possibilities of standardizing input languages to operating systems has been given support by the U.S. Navy.

Norman J. Ream, the Special Assistant to the Secretary of the Navy, recently wrote, in response to a call for opinions:

"The Navy Department urges that the United States of America Standards Institute (USASI) consider a program looking to the ultimate standardization of the input language to operating systems.

"The Navy is concerned with the current proliferation of incompatible implementations of operating systems languages and will actively participate in any future USASI standardization effort in this area."

Mr. Ream's comments were directed to Millard H. Perstein of System Development Corporation (SDC), who has been gathering views on this matter for presentation to USASI's Group X3.4.2 on Programming Language Specifications.

According to Mr. Perstein, the crux of the matter is: Do we need a standard operating systems input language, and can we specify one?

The X3.4.2 member claims that standardization activity can begin if there are enough affirmative replies from several organizations — governmental, commercial, academic, and professional. He maintains that incremental standardization is both feasible and urgently needed. "The first task is to propose the standard way to introduce yourself to and get assistance from any interactive computer system. Then we must investigate how far to standardize today, next year, and the year after that."

Anyone having opinions on standardizing top-level control languages is asked to write: Millard H. Perstein, System Development Corporation, 2500 Colorado Ave., Santa Monica, Calif. 90406.

NEW CONTRACTS

TO	FROM	FOR	AMOUNT
Peripheral Systems Crop., subsidiary of Memorex Corporation, Sunnyvale, Calif.	Management Assistance Inc.,(MAI)	Purchase of 630 Disc Drive Units; contract is a 5 year phased program; MAI will place the equipment on lease with lessees of its IBM Series 360 computer systems as replacements for IBM 2311 disc drives otherwise employed by MAI customers	over $20 million
Radio Corporation of America, New York, N.Y.	U. S. Navy	Development of a computer-controlled system that will enable shipboard communications to be reconfigured in minutes	$8 million
Granite Equipment Leasing Corp., Garden City, N.Y.	Allied Chemical Corporation	Leasing of eight computers (four in New York, one in Syracuse, one in Houston, and two in Hopewell, Va.)	about $5 million
Bryant Computer Products, Walled Lake, Mich.	AEG-TELEFUNKEN, Frankfurt, Germany	Purchase of 20 Bryant Series 4000 Disc File Systems which will be used as a mass storage media, interfaced to their TR 440 Digital Computer System	over $3 million
Electronic Associates, Inc., West Long Branch, N.J.	Boeing Company, Commercial Airplane Division, Seattle, Wash.	Lease of EAI digital computing equipment to be used in design and development segments of the Supersonic Transport program	$1.8 million
Data Products Corp., Culver City, Calif.	U.S. Naval Ship Systems Command, Washington, D.C.	High-speed Military LINE/PRINTERS to be used both in shipboard and land-based installations	over $1,442,000
Granite Equipment Leasing Corp., Garden City, N.Y.	Norton Company	Leasing two IBM 360 computers for its Worcester, Mass. facilities	$1.4 million
	Worthington Corporation	Leasing three IBM 360's to be installed one each, at Schenectady, N.Y., and Holyoke and Norwood, Mass.	$1.4 million
	American Cyanamid	Leasing of two IBM 360's installed at the firm's Wayne, N.J. facilities	about $1 million
Scientific Data Systems, Santa Monica, Calif.	Astrodata Inc.	An SDS Sigma 7 and two SDS Sigma 5 computers for use in hybrid computing systems	over $1 million
Wyle Systems Division of Wyle Laboratories, El Segundo, Calif.	Defense Atomic Support Agency	Engineering and installing a control and data acquisition and reduction system for use with a Conical Shock Tube Blast Simulator recently constructed at the Naval Weapons Laboratory, Dahlgren, Va.	$1 million
Rixon Electronics, Silver Spring, Md.	Control Data Corporation	More than 1200 data sets which CDC will incorporate into a nationwide $8-million computer system it is building for Ticket Reservation Systems, Inc. of New York	$340,000
Data Products Corp., Culver City, Calif.	Hewlett-Packard, Palo Alto, Calif.	Core memory stacks to be used in computer systems currently being manufactured by Hewlett-Packard	over $200,000
Planning Research Corp., Los Angeles, Calif.	General Electric Company's TEMPO Division	Continuation of studies under the Fleet Antisubmarine Warfare Data Analysis Program (FADAP)	$180,000
	Rome Air Development Center, USAF, Rome, N.Y.	Advanced computer system design	$98,000
	Naval Air Development Center, Johnsville, Pa.	A study control combining economic analysis, mathematics, and computer technology to develop a computer model that will enable the Navy to get fast, accurate answers on costs for proposed new aircraft	$58,000
	U. S. Navy	Adaptation of the computer programs of the Command Ship Data System (CSDS) to the computer equipment of the Navy Reconnaissance and Technical Support Center, Suitland, Md.	$43,000
Honeywell Electronic Data Processing, Wellesley Hills, Mass.	Computer Learning Corporation	Provision of $3 million worth of small-scale computer equipment (versions of the Honeywell 110) for educational use; 5-year lease agreement	—
Electronic Associates, Inc., West Long Branch, N.J.	Akron Standard Mold Co.	Eight Tire Uniformity Computing Systems, a special-purpose analog system used on a production basis to check tires for radial and lateral uniformity	—
IBM Corporation	NASA's Electronics Research Center, Cambridge, Mass.	Demonstrating guidance and navigational capability of the 59-pound Gemini computer in a helicopter — part of a research program to prove the feasibility of using computers for flight control of V/STOL (vertical short takeoff and landing) aircraft	—
Bonner & Moore Europe S.A.	Alfred Herlicq et Fils; Societe Franco-Belge de Materiel de Chemins de Fer France	A study to define the electronic data processing needs of the two French firms; the contract is being jointly executed by Bonner & Moore consultants in Houston, Texas and Brussels, Belgium	—
Informatics Inc., Sherman Oaks, Calif.	Columbia Broadcasting System	Development of the computer programming for the CBS News 1968 Election System which will be used in the Election Night broadcast on November 5, 1968	—

NEW INSTALLATIONS

OF	AT	FOR
Control Data 3100	Aseguradora Hidalgo, Mexico City, Mexico	Maintaining master files, issuing new policies and renewals, and computing commissions; Aseguradora is a Government-participation insurance company
Control Data 3150	Miller Electric Manufacturing Co., Appleton, Wis.	Engineering, production and marketing data processing applications
Control Data 3300	Grumman Aircraft Engineering Corporation, Bethpage, L.I., N.Y.	Processing test and checkout data on the NASA/Grumman Lunar Module (LM) to be used in the Apollo Space Program
Control Data 6400	Manned Spacecraft Center of the National Aeronautics and Space Administration, Houston, Texas	Driving the MSC Procedures Development Simulator; the system will operate both a Command Module Simulator and a Lunar Module Simulator in a simultaneous real-time mode
IBM System/360 Model 30	Inland Underground Facilities, Inc., Kansas City, Kansas	Allocating space and controlling inventory for the world's largest cold storage warehouse (located 200 feet below Kansas farmland)
	Ames Company, Parkersburg, W. Va.	Monitoring inventory and production control functions; also provides support of such financial control functions as payroll preparation and accounting (firm is oldest metal fabricating company in the U.S. and world's largest manufacturer of shovels)
IBM System/360 Model 65	Frigidaire Division of General Motors, Dayton, Ohio	Evaluating and forecasting the buying habits of the American housewife; appliances to be processed include refrigerators, ranges, food waste disposers, dishwashers, washers, dryers, and room conditioners
IBM 1130	Hiram College, Hiram, Ohio	Student use for class-related work; research projects by faculty members; administrative support tasks including helping plan for school's needs during the next decade
NCR 315	Artisans' Savings Bank, Wilmington, Del.	An on-line system which will provide almost-instaneous account service for its customers
RCA Spectra 70/45	Union Bankers Insurance Company, Dallas, Tex.	Handling of premium accounting, benefit payments, policy reserves, cash values, policyholder dividends, investment income, payroll and general ledger accounting
SDS 940	Software and Computing Center of TRW Systems Group, Redondo Beach, Calif.	Augmenting the on-line computing facilities available to TRW technical personnel; applications include spacecraft structure analysis, heat transfer, fluid dynamics, electronic circuit design, orbit determination, aerosciences laboratory research, bids and proposals
	Com-Share Southern, Inc., Houston,	Expanding capacity to enable the handling of increased demand for service (system valued at $1-1/4 million)
UNIVAC 418	Swiss Postal, Telephone and Telegraph Service (Swiss PTT), Zurich, Switzerland (three systems)	The heart of what is planned to be one of the world's most advanced automatic telegraph exchange systems; the Swiss PTT, operated by the Government of Switzerland, directs all postal, telephone and telegraph service in the country (systems valued at about $6.3 million)
UNIVAC 1108	Information Systems Design, Inc. (ISD), Oakland, Calif.	Keeping pace with a rapidly increasing demand for computing service in the San Francisco Bay area (system valued at $2 million)
	Institute of Technology, Milan, Italy	Solving a wide variety of scientific and engineering problems; planned for operation in a time-sharing capacity (system valued at about $1.6 million)
	Jacobi Computation Center, West Los Angeles, Calif.	Meeting the growing demand for scientific computer services in Southern California
UNIVAC 9200	Bonadelle Construction Co., Inc., Fresno, Calif.	Mortgage loan accounting, work in progress reports, general ledger and financial reports, accounts payable, and payroll processing
	Byron-Jackson, Inc., division of Borg Warner Corp., Houston, Texas	Handling payroll, inventory, and associated analyses
	Station WLEX-TV, Lexington, Ky.	Preparing the master log of programs, invoicing, sales analysis, management information projections, statistical data, general ledger accounting and payroll processing; similar applications will be handled for sister stations in Montgomery, Ala., (Radio Station WCOV and WCOV-TV) by means of a DCT-2000 Data Communications Terminal
	Safety Federal Savings & Loan Association, Kansas City, Mo.	Savings account processing, calculation of dividends and loan processing; also general ledger work and preparation of statistical reports
	Catholic Charities and Social Service, Fresno, Calif.	School applications, hospital applications, pledge accounting and data processing instruction
UNIVAC 9300	Penn Jersey Auto Stores, Philadelphia, Pa.	Processing daily order entry operations, for stock status reports, sales analysis, complete general accounting and management exception reporting

MONTHLY COMPUTER CENSUS

The following is a summary made by "Computers and Automation" of reports and estimates of the number of general purpose electronic digital computers manufactured and installed, or to be manufactured and on order. These figures are mailed to individual computer manufacturers from time to time for their information and review, and for any updating or comments they may care to provide.

Our census has begun to include computers manufactured by organizations outside the United States. We invite all manufacturers located anywhere to submit information for this census. We also invite our readers to submit information that would help make these figures as accurate and complete as possible.

The following abbreviations apply:

(R) - figures derived all or in part from information released directly or indirectly by the manufacturer, or from reports by other sources likely to be informed
(N) - manufacturer refuses to give any figures on number of installations or of orders, and refuses to comment in any way on those numbers stated here
(S) - sale only
X - no longer in production
C - figure is combined in a total (see column to the right)
E - figures estimated by "Computers and Automation"
? - information not received at press time

AS OF MARCH 15, 1968

NAME OF MANUFACTURER	NAME OF COMPUTER	AVERAGE OR RANGE OF MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTALLATIONS	MFR'S TOTAL INSTALLATIONS	NUMBER OF UNFILLED ORDERS	MFR'S TOTAL ORDERS
I. United States Manufacturers							
Autonetics (R)	RECOMP II	$2495	11/58	30		X	
Anaheim, Calif.	RECOMP III	$1495	6/61	6	36	X	0
Bailey Meter Co.	Bailey 756	$60,000-$400,000 (S)	2/65	14		5	
Wickliffe, Ohio	Bailey 855	$100,000 (S)	4/68	0	14	10	15
Bunker-Ramo Corp. (R)	BR-130	$2000	10/61	160		X	
Canoga Park, Calif.	BR-133	$2400	5/64	62		X	
	BR-230	$2680	8/63	15		X	
	BR-300	$3000	3/59	18		X	
	BR-330	$4000	12/60	23		X	
	BR-340	$7000	12/63	19	297	X	0
Burroughs (R)	205	$4600	1/54	38		X	
Detroit, Mich.	220	$14,000	10/58	31		X	
	B200 Series, B100	$5400	11/61	800		31	
	B300 Series	$9000	7/65	370		150	
	B2500	$5000	2/67	35		95	
	B3500	$14,000	5/67	24		74	
	B5500	$22,000	3/63	74		12	
	B6500	$33,000	2/68	0		17	
	B7500	$44,000	4/69	0		6	
	B8500	$200,000	8/67	0	1370 E	5	390 E
Control Data Corp. (R)	G-15	$1600	7/55	295		X	
Minneapolis, Minn.	G-20	$15,500	4/61	20		X	
	LGP-21	$725	12/62	165		X	
	LGP-30	$1300	9/56	322		X	
	RPC-4000	$1875	1/61	75		X	
	636/136/046 Series	?	-	29		C	
	160*/8090 Series	$2100-$12,000	5/60	610		X	
	924/924A	$11,000	8/61	29		X	
	1604/A/B	$45,000	1/60	59		X	
	1700	$3500	5/66	100		C	
	3100/3200/3300	$10,000-$16,250	5/64	261		C	
	3400/3600/3800	$18,000-$48,750	6/63	79		C	
	6400/6500/6600	$52,000-$117,000	8/64	63	(as of	C	
	6800	$130,000	6/67	0	2107 12/30/67)	C	360 E
Digital Electronics Inc. (R)	DIGIAC 3080	$19,500 (S)	12/64	10		1	
Plainview, N.Y.	DIGIAC 3080C	$25,000 (S)	10/67	1	11	1	2
Digital Equipment Corp. (R)	PDP-1	$3400	11/60	59		X	
Maynard, Mass.	PDP-4	$1700	8/62	55		X	
	PDP-5	$900	9/63	114		X	
	PDP-6	$10,000	10/64	22		X	
	PDP-7	$1300	11/64	165		C	
	PDP-8	$525	4/65	1050		C	
	PDP-8/S	$300	9/66	549		C	
	PDP-9	$1000	12/66	81		C	
	PDP-10	$7500	12/67	1		C	
	LINC	?	9/66	90	2186	C	450 E
Electronic Assoc., Inc. (R)	640	$1200	4/67	15		27	
Long Branch, N.J.	8400	$12,000	7/65	21	36	4	31
EMR Computer Div. (R)	ASI 210	$3850	4/62	26		X	
Minneapolis, Minn.	ASI 2100	$4200	12/63	7		X	
	ADVANCE 6020	$4400	4/65	19		C	
	ADVANCE 6040	$5600	7/65	8		C	
	ADVANCE 6050	$9000	2/66	18		C	
	ADVANCE 6070	$15,000	10/66	9		C	
	ADVANCE 6130	$1000	8/67	8	95	C	25
General Electric (N)	115	$1340-$8000	12/65	560 E		600 E	
Phoenix, Ariz.	205	$2500-$10,000	6/64	C		X	
	210	$16,000-$22,000	7/59	C		X	
	215	$2500-$10,000	9/63	C		X	
	225	$2500-$26,000	4/61	200 E		X	
	235	$6000-$28,000	4/64	130 E		C	
	255	$15,000-$26,000	10/67	C		C	
	265	$17,000-$28,000	7/64	C		C	
	405	$5120-$10,000	11/67	C		C	
	415	$4800-$13,500	5/64	350 E		70 E	
	420	$18,000-$28,000	7/67	C		C	
	425	$6000-$20,000	6/64	120 E		C	
	435	$8000-$25,000	9/65	C		C	
	625	$31,000-$135,000	4/65	C		C	
	635	$35,000-$167,000	5/65	C		C	
	645	$40,000-$250,000	7/66	C	1600 E	C	850 E

NAME OF MANUFACTURER	NAME OF COMPUTER	AVERAGE OR RANGE OF MONTHLY RENTAL	DATE OF FIRST INSTALLATION	NUMBER OF INSTAL-LATIONS	MFR'S TOTAL INSTAL-LATIONS	NUMBER OF UNFILLED ORDERS	MFR'S TOTAL ORDERS
Hewlett-Packard (R)	2116A	$600	11/66	80		C	
Palo Alto, Calif.	2115A	$412	11/67	31	111	C	24 E
Honeywell (R)	DDP-24	$2500	5/63	85		X	
Computer Control Div.	DDP-116	$900	4/65	200		30	
Framingham, Mass.	DDP-124	$2050	3/66	46		33	
	DDP-224	$3300	3/65	50		8	
	DDP-516	$700	9/66	85		154	239
Honeywell (R)	H-120	$3900	1/66	650		240	
EDP Division	H-200	$8400	3/64	1130		87	
Wellesley Hills, Mass.	H-400	$8500	12/61	120		X	
	H-800	$28,000	12/60	89		X	
	H-1200	$3800	2/66	175		130	
	H-1400	$14,000	1/64	12		X	
	H-1800	$42,000	1/64	21		X	
	H-2200	$12,000	1/66	78		71	
	H-4200	$20,500	6/67	0		20	
	H-8200	$35,000	4/68	0	2740 E	5	540 E
IBM (N)	305	$3600	12/57	C		X	
White Plains, N.Y.	360/20	$3000	12/65	6000 E		6000 E	
	360/25	$5530	1/68	C		C	
	360/30	$9340	5/65	6000 E		3500 E	
	360/40	$19,550	4/65	3000 E		2000 E	
	360/44	$12,180	7/66	C		C	
	360/50	$32,960	8/65	C		C	
	360/65	$56,650	11/65	C		C	
	360/67	$138,000	10/66	C		C	
	360/75	$81,400	2/66	C		C	
	360/85	$158,000	-	0		C	
	360/90 Series	-	10/67	C		C	
	650	$4800	11/54	C		X	
	1130	$1545	2/66	2700 E		4500 E	
	1401	$6480	9/60	7650 E		X	
	1401-G	$2300	5/64	1700 E		X	
	1401-H	$1300	6/67	C		C	
	1410	$17,000	11/61	C		C	
	1440	$4300	4/63	3600 E		C	
	1460	$10,925	10/63	1400 E		X	
	1620 I, II	$4000	9/60	1500 E		C	
	1800	$4800	1/66	C		C	
	701	$5000	4/53	C		X	
	7010	$26,000	10/63	C		C	
	702	$6900	2/55	C		X	
	7030	$160,000	5/61	C		X	
	704	$32,000	12/55	C		X	
	7040	$25,000	6/63	C		C	
	7044	$36,500	6/63	C		C	
	705	$38,000	11/55	C		X	
	7070, 2, 4	$27,000	3/60	C		X	
	7080	$60,000	8/61	C		X	
	709	$40,000	8/58	C		X	
	7090	$63,500	11/59	C		X	
	7094	$75,500	9/62	C		X	
	7094 II	$82,500	4/64	C	37,700 E	C	18,300 E
Interdata (R)	Model 2	$200-$300	-	0		3	
Oceanport, N.J.	Model 3	$300-$500	3/67	41		97	
	Model 4	$400-$800	-	0	41	5	105
National Cash Register Co. (R)	NCR-304	$14,000	1/60	24		X	
Dayton, Ohio	NCR-310	$2500	5/61	14		X	
	NCR-315	$8500	5/62	625		150	
	NCR-315-RMC	$12,000	9/65	80		50	
	NCR-390	$1850	5/61	600		6	
	NCR-500	$1500	10/65	1550	2893	580	790 E
Pacific Data Systems Inc. (R)	PDS 1020	$550-$900	2/64	135	135	20	20
Santa Ana, Calif.							
Philco (R)	1000	$7010	6/63	16		X	
Willow Grove, Pa.	2000-210, 211	$40,000	10/58	16		X	
	2000-212	$52,000	1/63	12	44	X	0
Potter Instrument Co., Inc.	PC-9600	$12,000 (S)	-	-	-	-	-
Plainview, N.Y.							
Radio Corp. of America (R)	RCA 301	$7000	2/61	635		C	
Cherry Hill, N.J.	RCA 3301	$17,000	7/64	75		C	
	RCA 501	$14,000	6/59	96		X	
	RCA 601	$35,000	11/62	3		X	
	Spectra 70/15	$4500	9/65	160		125	
	Spectra 70/25	$6500	9/65	85		57	
	Spectra 70/35	$10,400	1/67	52		135	
	Spectra 70/45	$22,000	11/65	80		107	
	Spectra 70/46	$34,400	-	0		C	
	Spectra 70/55	$34,300	11/66	5	1190E	14	420 E
Raytheon (R)	250	$1200	12/60	175		X	
Santa Ana, Calif.	440	$3500	3/64	20		X	
	520	$3200	10/65	27		0	
	703	(S)	10/67	15	237	40	40
Scientific Control Corp. (R)	650	$500	5/66	25		5	
Dallas, Tex.	655	$1800	10/66	14		26	
	660	$2000	10/65	4		0	
	670	$2600	5/66	1		0	
	6700	$30,000	10/67	0	44	1	32
Scientific Data Syst., Inc. (N)	SDS-92	$1500	4/65	120 E		10 E	
Santa Monica, Calif.	SDS-910	$2000	8/62	225 E		25 E	
	SDS-920	$2900	9/62	200 E		20	

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Scientific Data Syst. (cont.)	SDS-925	$3000	12/64	C		C	
	SDS-930	$3400	6/64	225 E		30	
	SDS-940	$10,000	4/66	C		C	
	SDS-9300	$7000	11/64	C		C	
	Sigma 2	$1000	12/66	55 E		160	
	Sigma 5	$6000	8/67	C		50	
	Sigma 7	$12,000	12/66	C	980 E	C	360 E
Standard Computer Corp. (N)	IC 4000	$9000	7/68	0		2 E	
Los Angeles, Calif.	IC 6000	$10,000-$22,000	5/67	7	7	12 E	14 E
Systems Engineering Labs (R)	SEL 810	$1000	9/65	24		X	
Ft. Lauderdale, Fla.	SEL 810A	$900	8/66	52		35	
	SEL 810B	?	-	0		8	
	SEL 840	$1400	11/65	4		X	
	SEL 840A	$1400	8/66	20		29	
	SEL 840 MP	?	1/68	1	101	6	78
UNIVAC, Div. of Sperry Rand (R)	I & II	$25,000	3/51 & 11/57	23		X	
New York, N.Y.	III	$20,000	8/62	67		X	
	File Computers	$15,000	8/56	13		X	
	Solid-State 80 I, II, 90, I, II & Step	$8000	8/58	222		X	
	418	$11,000	6/63	118		33	
	490 Series	$35,000	12/61	190		30	
	1004	$1900	2/63	3200		20	
	1005	$2400	4/66	960		140	
	1050	$8000	9/63	285		16	
	1100 Series (except 1107 & 1108)	$35,000	12/50	9		X	
	1107	$55,000	10/62	33		X	
	1108	$65,000	9/65	80		75	
	9200	$1500	6/67	110		900	
	9300	$3400	7/67	30		650	
	LARC	$135,000	5/60	2	5340 E	X	1860 E
Varian Data Machines (R)	620	$900	11/65	75		0	
Newport Beach, Calif.	620i	$500	6/67	94	169	384	384
			I. U.S. Manufacturers, TOTAL ——		59,500 E		25,300 E
II. Non-United States Manufacturers							
A/S Regnecentralen (R)	GIER	$2300-$7500	12/60	36		2	
Copenhagen, Denmark	RC 4000	$3000-$20,000	6/67	1	37	1	3
Elbit Computers Ltd. (R)	Elbit-100	$4900 (S)	10/67	6	6	33	33
Haifa, Israel							
G.E.C. Computers & Automation Ltd. (R)	90-2	-	10/65	5		C	
	90-10	-	8/66	1		C	
Wembley, Middlesex, England	90-20	-		0		C	
	90-25	-	7/66	2		1	
	90-30	-	10/65	1		1	
	90-40	-		0		C	
	90-300	-	11/66	1		1	
	S-2	-	1/68	1		0	
	S-5	-		0		C	
	S-7	-		0		C	
	GEC-TRW130	-	12/64	2		X	
	GEC-TRW330	-	3/63	7	20	X	3
International Computers and	1901 to 1909	$4000-$27,000	12/64-12/66	631		388	
Tabulators Ltd. (R)	1200/1/2	-	-/55	62		3	
London, England	1300/1/2	$3500	-/62	195		16	
	1300	$5200	7/62	114		4	
	1100/1	-	-/60	22		1	
	2400	-	12/61	4		0	
	Atlas 1 & 2	$70,000	-/62	5		1	
	Orion 1 & 2	$40,000	1/63	17		0	
	Sirius	-	-/61	22		0	
	Mercury	-	-/57	19		0	
	Pegasus 1 & 2	-	-/56	33	1124	0	413
The Marconi Co., Ltd.	Myriad I	£36,000-£66,000	3/66	22		23	
Chelmsford, Essex, England	Myriad II	£22,000-£42,500	10/67	0	22	12	35
N.V. Philips' Computer Industrie	P1000	?	6/68	0	0	5 E	5 E
Apeldoorn, Netherlands							
Saab Aktiebolag (R)	DATASAAB D21	$5000-$14,000	12/62	30		3	
Linkoping, Sweden	DATASAAB D22	$8000-$60,000	5/68	0	30	8	11
Union of Soviet Socialist	BESM 4	-	-	C		C	
Republics	BESM 6	-	-	C		C	
	MINSK 2	-	-	C		C	
	MINSK 22	-	-	C		C	
	MIR	-	-	C		C	
	NAIRI	-	-	C		C	
	ONEGA 1	-	-	C		C	
	ONEGA 2	-	-	C		C	
	URAL 11/14/16 and others	-	-	C		C	
					2000 E		500 E
			II. Non-U.S. Manufacturers, TOTAL ——		3200 E		1000 E
			Combined, TOTAL ——		62,700 E		26,300 E

BOOKS AND OTHER PUBLICATIONS

Neil Macdonald
Assistant Editor
Computers and Automation

We publish here citations and brief reviews of books and other publications which have a significant relation to computers, data processing, and automation, and which have come to our attention. We shall be glad to report other information in future lists if a review copy is sent to us. The plan of each entry is: author or editor / title / publisher or issuer / date, hardbound or softbound, number of pages, price or its equivalent / comments. If you write to a publisher or issuer, we would appreciate your mentioning *Computers and Automation.*

Reviews

Lee, John A. N. / The Anatomy of a Compiler / Reinhold Publishing Corp., 430 Park Ave., New York, N.Y. 10022 / 1967, hardcover, 275 pp., $13.75

A compiler is a program-making routine, which produces specific programs for particular problems. The author seeks to show that the task of compiler writing is little more than that required to write an oversize program for the solution of a problem in a field foreign to the implementer. There are nine chapters: "Introduction," "The Formal Definition of Language," "The Reason for a Grammar, "SYMTAB — The Symbol Table and Associated Routines," "Control Statements," "Input/Output and Format," "Polish String Notation," "The ASCAN Generator," and "Compiling within a Subprogram." There is no glossary. The book is hard to understand and is written in esoteric language.

Marcus, Mitchell P. / Switching Circuits for Engineers / Prentice-Hall, Inc., Publishers, Englewood Cliffs, N.J. / 1967, hardbound 338 pp., $12.00

This is a second edition, with continued emphasis on practical aspects, and has been revised to include more problems and their solutions, an extended bibliography, and an extension of tabular method to multi-output networks. Chapters include: "Boolean Algebra," "Special Forms of Boolean Expressions," "Logical Circuits," "Electronic Logic Blocks," "Contact Networks," "Tabular Method of Simplification," "Map Method of Simplification," "Trees — Relay and Electronic," "Symmetric Functions," "Reiterative Networks," "Number Systems; Adders," "Codes, Error Detection, Error Correction," 5 chapters on Sequential Circuits; and 2 chapters on Pulse-Input Sequential Circuits.

Liebelt, Paul B. / An Introduction to Optimal Estimation / Addison-Wesley Publishing Co. Inc., Reading, Mass. 01867 / 1967, hardbound, 273 pp., $11.75

This book is concerned with optimal ways to deduce information from data and is directed at the college senior or graduate. Chapters include: Linear Algebra; Elementary Concepts of Probability Theory; Linear Estimation Theory; Continuous Dynamic System Estimation. It has: an Appendix, Transition Matrices from Coefficient Equations; an answer section; an index; and a bibliography.

This book is in the area of statistics and probability, and is advanced and mathematical.

Louden, Robert K. / Programming the IBM 1130 and 1800 / Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632 / 1967, hardbound, 433 pp., $10.50

This is a programming textbook, containing sufficient material to satisfy the requirements of a one-semester course at the first-year or second-year college level. "FORTRAN" is presented as the primary programming language for both the 1130 and the 1800.

"The organization of this book differs from many previous texts on programming in that FORTRAN is presented as the primary programming language for both the IBM 1130 and the IBM 1800. The increased flexibility of the FORTRAN language as used on the 1130 and 1800 and the high-speed compilers developed for these systems have relegated symbolic and machine language programming to the role of secondary languages, used primarily to handle the small percentage of programs for which Fortran is still not suited."

Among the 15 chapters are: "Programming Concepts," "FORTRAN," "Running, Debugging, and Documenting a Program," "Disk Storage and Monitor Operation," "Symbolic Assembly Language Programming" and "The 1800 Time-Sharing Executive System." The book has 8 appendices and an index.

This is an interesting, substantial, and probably authoritative book, written by the Current Products Analysis Manager of IBM Corporation.

Harper, R. J. / Data Processing Managers / Lyon Grant and Green, London / 1967, paperbound, 88 pp., 21 s. net.

"Data Processing Managers" is a study of the roles and characteristics of thirty Data Processing Managers. The study was carried out in 1966 at the Research Department of the Administrative Staff College.

Hemmerle, William J. / Statistical Computations on a Digital Computer / Blaisdell Publishing Co., 275 Wyman St., Waltham, Mass. 02154 / 1967, hardcover, 230 pp., $?

This book is directed towards advanced undergraduates and beginning graduates. "A basic knowledge of computer programming is assumed." This book has five chapters: Chapter 1, "Numerical Methods of Approximation, Interpolation, and Integration;" Chapter 2, "Monte Carlo Procedures;" Chapter 3, "Multiple-Regression Computations;" Chapter 4, "Computation and Application of Characteristic Roots and Vectors;" Chapter 5, "Analysis-Of-Variance Computations." This book is based on a first-year graduate course taught by the author at Iowa State University.

Stark, Peter A. / Digital Computer Programming / The Macmillan Co., 866 Third Ave., New York, N.Y. 10022 / 1967, hardcover, 526 pp., $9.95

This textbook for programmers is divided into 5 sections: Section I, "General Computer Organization;" Section II, "Machine Language Programming" Section III, "Symbolic Programming" Section IV, "Programming and Mathematical Techniques" and Section V, "Problem Oriented Languages," which uses FORTRAN IV as an example.

Kahn, Herman, and Anthony J. Weiner / "The Year 2000: A Framework for Speculation for the Next 33 Years" / Macmillan Co., 866 Third Ave., New York, N.Y. 10022 / 1967, hardbound, 431 pp., $9.95

A comprehensive and imaginative picture of the shape of the future. There are ten chapters in the book: 1. "Change and Continuity"; 2. "Comments on Science and Technology"; 3. "Some 'Surprise Free' Economic Projections. . . ."; 4. "Postindustrial Society in the Standard World"; 5. "International Politics . . . "; 6. "Some Canonical Variations. . . ."; 7. "Some Possibilities for Nuclear Wars"; 8. "Other Twenty-First Century Nightmares"; 9. "International System"; 10. "Policy Research and Social Change." Contains: Short Contents; Detailed Contents; no bibliography as such; Name Index; Subject Index.

A thought-provoking book — but of course, systematic guessing rather than reliable prediction.

Davis, Philip J., and Philip Rabinowitz / Numerical Integration / Blaisdell Publ. Co., 275 Wyman St., Waltham, Mass. 02154 / 1967, hardbound, 230 pp., $?

This book presents numerical integration for use in the classroom and in the computation laboratory. Chapters include: Approximate Integration Over a Finite Interval; Approximate Integration Over Infinite Intervals; Error Analysis; Approximate Integration in Two or More Dimensions; Automatic Integration. It also has: two appendices; three bibliographies; and an index.

NEW PATENTS

Raymond R. Skolnick
Patent Manager
Ford Instrument Co.
Div. of Sperry Rand Corp.
Long Island City, N.Y. 11101

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

January 30, 1968

3,366,931 / John A. Githens, Morris Township, Morris County, N.J. / Bell Telephone Lab., Inc., New York, N.Y., a corporation of New York / Information storage system.

February 6, 1968

3,368,205 / Robert D. Hunter, Wayland, Mass., and Robert A. Perine and John E. Wilhite, Phoenix, Ariz. / General Electric Co., a corporation of New York / Control apparatus in a data processing system.

3,368,206 / Edwin W. Herron, Scottsdale, Ariz., Robert D. Hunter, Wayland, Mass., and John E. Wilhite, Phoenix, Arizona / General Electric Company, a corporation of New York / Information shift apparatus in a data processing system.

February 13, 1968

3,369,221 / Walter R. Lethin, Canton, and Louis G. Oliari, Brockton, Mass. / Honeywell Inc., a corporation of Delaware / Information handling apparatus.

3,369,224 / Rex H. Blumberg, Hyde Park, N. Y., / International Business Machines Corporation, New York, N. Y., a corporation of New York / Cryogenic thin film apparatus.

3,369,225 / Harrison W. Fuller, Needham, Mass. / Laboratory for Electronics, Inc., Boston, Mass., a corporation of Delaware / Thin film shift register.

3,369,226 / Roy W. Reach, Jr., Sudbury, Mass. / Honeywell Inc., a corporation of Delaware / Digital data storage and transfer circuitry.

3,369,227 / Thomas A. Boissevain, Bedford, Mass. / Laboratory for Electronics, Inc., Boston, Mass., a corporation of Delaware / Flexible disc magnetic storage device.

February 20, 1968

3,370,159 / Laurence E. Fogarty and Robert M. Howe, Ann Arbor, Mich. / Applied Dynamics, Inc., Ann Arbor, Mich., a corporation of Michigan / Analog computer apparatus for repetitive type operation.

3,370,177 / Dwight W. Doss, Phoenix, Ariz., and John W. Bremer, Sunnyvale, Calif. / General Electric Company, a corporation of New York / Cryoelectric shift register.

3,370,178 / Robert L. Risberg, Milwaukee, Wis. / Cutler-Hammer, Inc., Milwaukee, Wis., a corporation of Delaware / Pulse registering and shifting system of the modified ring counter type.

3,370,180 / Phillip C. Halverson, Fullerton, and Howard G. Preston, Whittier, Calif. / Brite-Lite Corporation of America, Phoenix, Ariz., a corporation of Delaware / Decimal storage apparatus employing transistor monostable multivibrator.

3,370,277 / Jan Van Goethem, Antwerp, Belgium / International Standard Electric Corporation, New York, N. Y., a corporation of Delaware / Information storage device.

3,370,280 / Andrew C. Tickle, Stevenage, England / International Computers and Tabulators Limited / Information shifting registers.

3,370,290 / Heinz Mertel, Hohenschaftlarn, and Hartmut Gebhardt, Grosshesselohe, Germany / Siemens Aktiengesellschaft, a corporation of Germany / Means for converting a first information into an unequivocal second information.

February 27, 1968

3,370,790 / Arnold Schonfeld, Levittown, and Marvin Jacoby, Fort Washington, Pa. / Sperry Rand Corporation, New York, N. Y., a corporation of Delaware / Fluid shift.

3,371,218 / Louis A. Russell, Poughkeepsie, N. Y. / International Business Machines Corporation, New York, N. Y., a corporation of New York / Magnetic switching devices.

3,371,221 / Giichi Onuma and Takaomi Kurokouchi, Tokyo, Japan / Tokyo Shibaura Electric Co., Ltd., Kawasaki-shi, Japan, a corporation of Japan / Shift register using cascaded nor circuits with forward feed from preceding to succeeding stages.

3,371,329 / David G. Adler, Drexel Hill, and Raymond J. Stankiewicz, Philadelphia, Pa. / Sperry Rand Corporation, New York, N.Y., a corporation of Delaware / Air bearing magnetic memory device.

ADVERTISING INDEX

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

Big Computer Quiz. Part 2:

1. The PDP-10 has 365 separate instructions (35 floating point and 130 test and compare instructions among them). Because it is a logically complete instruction set, programs are easier to write, use fewer instructions and run faster than programs for competitive systems. System/360 has _____instruction, and Sigma 7 has just_____.

2. DIGITAL'S PDP-10 is a time-sharing system that can do more than just conversational time sharing. It can: time-share an array of terminals in a conversational mode, time-share high data rate input from high-energy physics instrumentation and analog computers involved in hybrid simulation, and batch process — all at the same time. Is there any other system in the PDP-10's price range that can do the same?_____

3. Pushdown stacks provide a convenient means of last-in first-out processing of information under direct hardware control. PDP-10 allows both data and program status information to be stored in the same pushdown list. Does System 360?_____. Sigma 7?_____. Any other computer?_____.

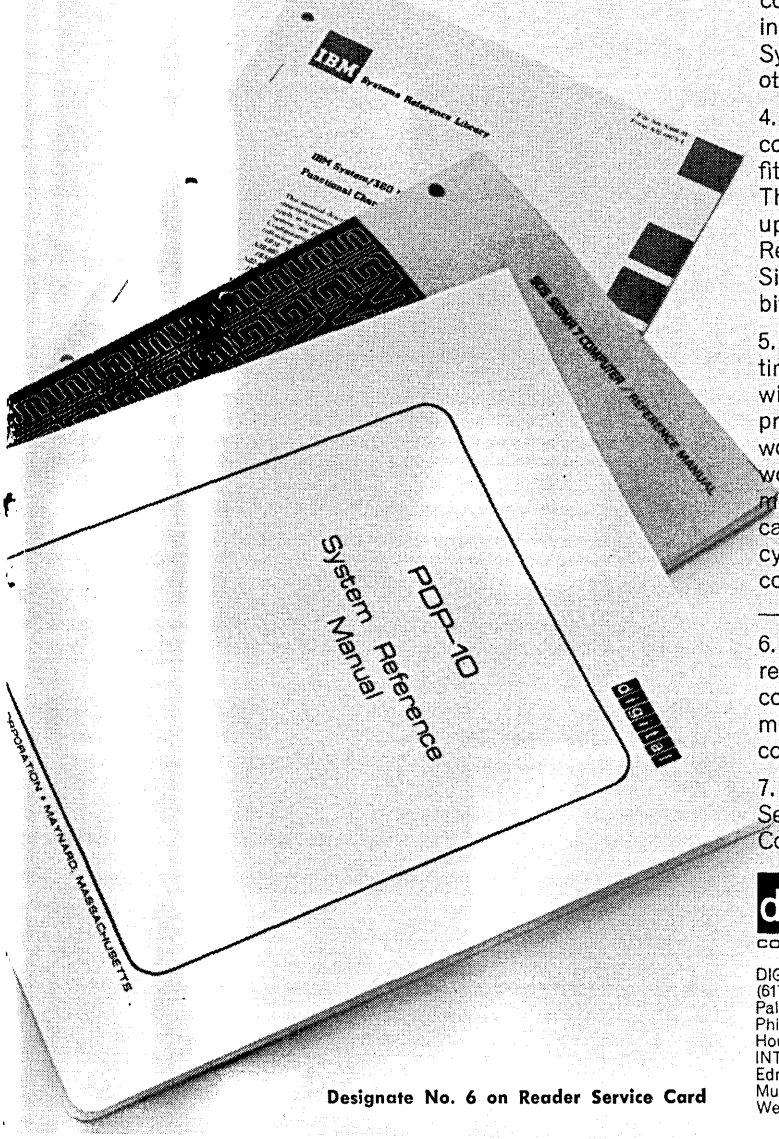
4. Byte sizes have become a great convenience — for the computer manufacturer. But real-time input data sometimes fits the preset byte size, sometimes must be reformatted. The PDP-10 has a flexible byte. Any number of bits you want, up to the full 36 bit word size, can be your byte size. Reformatting is simply not necessary. Whereas both the Sigma 7 and the System 360 are locked into a_____ bit byte.

5. High speed I/O channels are essential in real-time and time-sharing operations to insure that peak transfer rates will not overrun channel capabilities. PDP-10's I/O processor has a maximum throughput rate of 200,000 36 bit words per second. Selector channels can transfer a million words per second. And because of the asynchronous memory structure of the PDP-10, multiple selector channels can operate simultaneously without stealing processor cycles. Can Sigma 7, System 360 — or indeed, any other comparably priced computer — match these speeds?

_____.

6. PDP-10 provides a complete ASA FORTRAN IV compiler requiring only 9K of memory. In numerous benchmarks, the code produced by this compiler will require up to 50% less memory than the PDP-10's nearest competitor. Could any competitor make a similar statement?_____.

7. Would you like a reprint of Part 1 of the Quiz? Send responses to Department A, Digital Equipment Corporation, Maynard, Mass. 01754.



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INTERNATIONAL, Carleton Place and Toronto, Ont. • Montreal, Quebec • Edmonton, Alberta, Canada • Reading and Manchester, England • Paris, France • Munich and Cologne, Germany • Oslo, Norway • Stockholm, Sweden • Sydney and West Perth, Australia • Modules distributed also through Allied Radio

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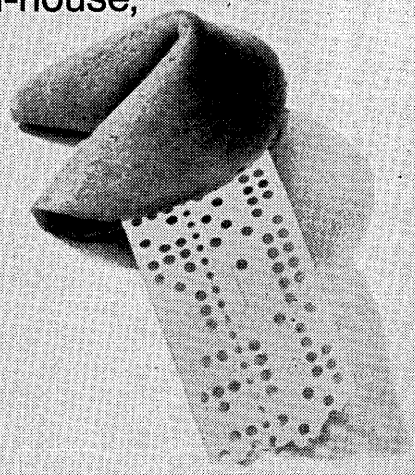

All HP software is delivered with your computer. Fully documented. Not only three high-level programming languages, but an Assembler, a Basic Control System and utility routines. Even a special Data Acquisition Executive.

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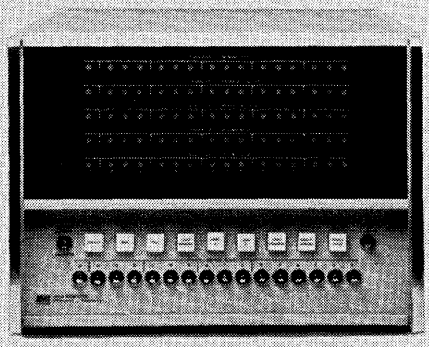
For more information about HP computers and our proved software, call your local HP field engineer. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 54 Route des Acacias, Geneva.



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