software age

MAY 1969

C4 38128&LACR5983 M
MRS RUTH W LACEY
ST TECH INST/MEMPHIS
5983 MACON COVE
MEMPHIS TN 38128

Sounds obvious, doesn't it? But in too many companies it just isn't so . . . there's no real room for an innovative person —and his company—to grow. The Honeywell Man is **expected** to contribute. That's why in 10 years time, Honeywell **has grown;** from 200 to more than 10,000 people. Honeywell is large enough to have the facilities a technical specialist might want or need, but is small enough that everyone can make his achievements known. That's another rare thing about Honeywell—it's true. Honeywell is looking for people who want to get involved, who will contribute in the following areas:

SOFTWARE SPECIALISTS

☐ Advanced Data Management Concepts
☐ Interactive Operating System Design
☐ Advanced Communications Controller Design ☐ Computer Aided Instruction
☐ Advanced Compiler Design Technology
☐ Formal Language and Syntactic Analysis

Please forward your resume to Mr. Stephen Edmonds.

The Other Computer Company:

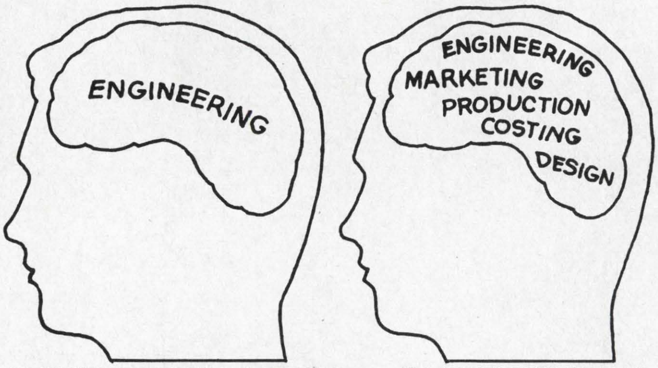
Honeywell

200 Smith Street, Dept. SA-5 Waltham, Massachusetts 02154

Opportunities exist in other Honeywell Divisions. Send resumes to F. E. Laing, Honeywell, Minneapolis, Minnesota 55408. An Equal Opportunity Employer.

LIBRARY
STATE TECHNICAL INSTITUTE
AT MEMPHIS

Ordinary engineers have their place. Elsewhere.



ORDINARY ENGINEERS OUR ENGINEERS

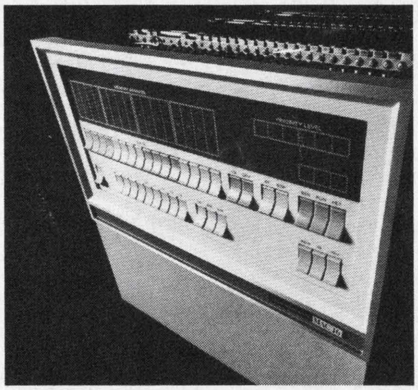
Ordinary engineers are the guys who sit in somebody's bullpen and slave away on a tiny part of some immense project. Doing the same kind of thing. Over and over, without ever really knowing what their contribution amounts to.

We go about things a little differently. And we think that's the reason we've become a leader in computer memories.

Our technique is to let engineers get involved in as many different activities as they can handle. Technical proposals, design, development, costing, production, marketing, planning—you name it, our engineers get involved in it. And the involvement leads to commitment. It's worked out beautifully.

As a result we have a busy and extremely interested engineering staff. And the finest line of memory systems and stacks and interconnect circuitry on the market.

It should surprise no one to learn that we're growing at a healthy clip. Just recently, we introduced our new digital Multi-Application Computer—MAC 16—and that's going to accelerate our growth.



So, we need more engineers. Good minds. Good technical backgrounds. And the desire to get involved.

We pay well. And, because of our continuing growth, we offer rapid advancement.

If you're interested in us and you've got an M.E. or E.E. and E.D.P. hardware or software experience, let's get together.

Write to me—E. A. Gage—at 6201 E. Randolph Street, Los Angeles, California 90022. Better still, call collect. (213) 722-6810. Naturally, we're an equal opportunity employer.

LOCKHEED ELECTRONICS COMPANY

LEC Data Products Division • A Division of Lockheed Aircraft Corporation

BUSINESS SYSTEMS ANALYSTS AND PROGRAMMERS

Junior and senior level positions available for systems analysts and programmers who have several years' experience in any of the following areas: engineering specifications, bills of material, engineering change control, inventory control, production planning, quality control, cost determination, cost control, payroll, accounting.
Prefer degree in business or related disciplines and experience in multi-programming, direct-access storage, disc files or large-storage media and thorough knowledge of COBOL.

Programmers • Engineers

NCR Los Angeles offers you fourth-generation opportunity today

SYSTEMS ANALYST ENGINEERS

Junior and senior level positions available for ENGINEERS, ANALYSTS and PROGRAMMERS who have several years' experience in any of the following areas:

Systems analysis and evaluation of business systems. Selected applicants will determine and participate in the establishment of either small processor systems or a large multi-processing system.

Study and development of on-line systems in business data communication environment.

Evaluation of multi-programming, multi-processor time sharing systems using simulation techniques.

SOFTWARE PROGRAMMERS

To design, code, de-bug and document operating systems software or on-line executive software modules. Prefer degree in business or a science discipline and/or experience in systems programming.

NOW INTERVIEWING

Interviews are now being held for these positions, all of which are currently open. To schedule an appointment in your area or in Boston during the Spring Joint Computer Conference, May 14-16, please send a detailed resume, including salary history, to Jerry Hill at the address below.

NCR®

The National Cash Register Company
ELECTRONICS DIVISION
2873 West El Segundo Boulevard,
Hawthorne, California 90250
An equal opportunity employer

LIBRARY
STATE TECHNICAL INSTITUTE
AT MEMPHIS

software age

MAY, 1969 Vol. 3–No. 5

Copyright 1969, PRESS–TECH, Inc.

CONTENTS **PAGE**

Publisher — David W. French
Managing Editor — Jean S. Logan
Advertising Manager — John F. Neiman
Traffic Manager — Betsy Pavkovich
Business and Circulation — Elspeth Daly
Resume Control — Anne Wildeman

Circulation of this issue more than **127,000**

COVER—Self-portrait of a computer's magnetic tape drive. Art furnished by Greyhound Computer Corporation.

SOFTWARE AGE is published monthly by PRESS–TECH, Inc.
2211 Fordem Avenue, Madison, Wisconsin 53701
Phone: (608) 249–0128 or (800) 356–8141

Subscription free to qualified readers. Others, $10/yr. Individual copies, $1. Foreign subscriptions, $15/yr.

For change of address please return your address label from the magazine.

Main Sales Office: David W. French or John F. Neiman, 2211 Fordem Avenue, ***Madison, Wis.***—Telephone (608) 249–0128 or (800) 356–8141.

New York, N.Y.: Telephone (212) 697–5356.

Los Angeles, Calif.: Richard Faust, 9800 S. Sepulveda Boulevard—Telephone (213) 776–0100.

San Francisco, Calif.: Ernesto Montano, 595 Buckingham Way, Suite 226—Telephone (415) 731–8240.

Philadelphia, Pa.: Richard D. Clemmer, 27 Acoma Lane, Collegeville, Pa.—Telephone (215) 489–9141.

Boston, Mass.: Telephone (617) 542–1466.

Controlled circulation postage paid at Madison, Wis.

ASSIGNMENT: DESIGN OR PROGRAM A COMPLETE ORDER ENTRY SYSTEM ON LINE TO A 360/65

How does that grab you !?

If that assignment brought a glint to your eye, read on. There are more. *Like designing or programming a data base for over 300,000 parts . . . or mathematical and simulation models of VTOL aircraft . . . or software in support of a real-time data acquisition and reduction system, airborne computers or a major retrieval system for technical data.* We could go on, but that will give you the idea.

If this is the kind of career excitement you relish, maybe you should get involved with us. Get involved with far-out programs that will hone your abilities to a fine edge. You'd be joining an innovative group dedicated to producing the most advanced VTOL aircraft—high-speed TurboTrains—and high-performance marine vehicles. *And the computer systems to support them.*

Your tools will be bright and shiny. Our inventory includes UNIVAC 1108's and IBM 360's with graphics and teleprocessing.

If you're ready for new maturity, we want to talk careers with you. We have exceptional assignments at all levels of experience for: **Programmers and Analysts in both Commercial and Scientific fields.**

Send your resume in confidence, stating salary requirements, to:

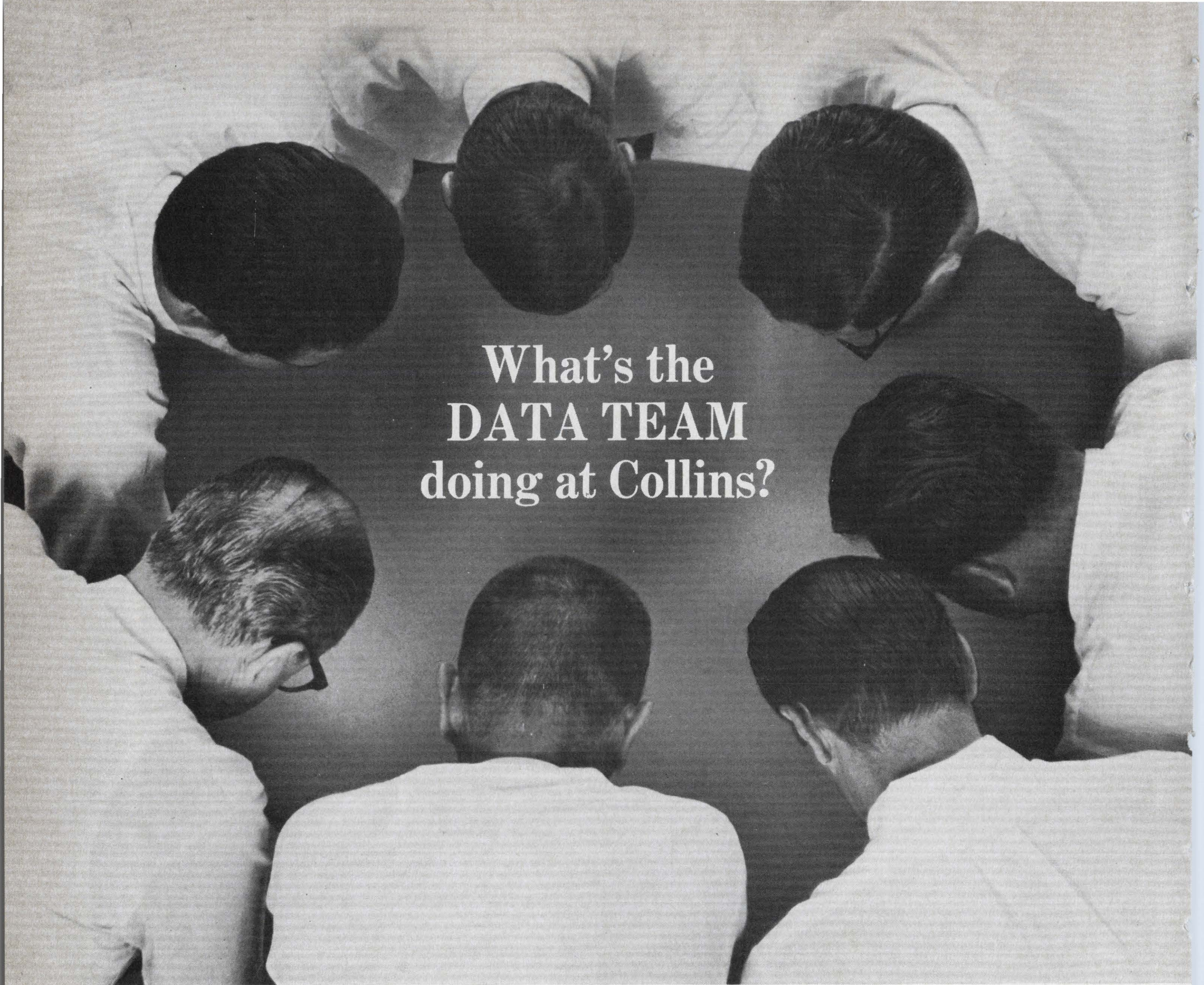
MR. LEO J. SHALVOY, PROFESSIONAL EMPLOYMENT.

Sikorsky Aircraft

DIVISION OF UNITED AIRCRAFT CORPORATION

STRATFORD, CONNECTICUT

An Equal Opportunity Employer



Working with Collins' new C-System, the first completely integrated system with virtually unlimited expansion capability.

The C-System is creating exceptional career opportunities for: Programmers, Hardware Diagnostic Programmers, Circuit Design Engineers, Memory Design Engineers, Digital Systems Engineers, Digital Systems Analysts, Logic Design Engineers, Mechanical Engineers, Data Systems Analysts and Applied-Systems Analysts/Programmers.

In addition, other individuals with up to 3 years experience and a degree in electrical or mechanical engineering, physics, mathematics, or other physical sciences will find an outstanding opportunity to learn and progress rapidly in the data field, even without previous data experience.

Collins data systems are used by airlines and railroads to process and transmit hundreds of thousands of messages a day. They provide computer control of earth stations for satellite communications, permit digital control of communication/navigation systems in airliners and military aircraft, and combine communication, computation and control functions in single systems for large business and military operations.

If you are interested in joining the Collins data team – and benefiting from the creative environment and career opportunities offered by Collins – send your resume in confidence to Manager of Professional Employment, Dept. 102, Collins Radio Company, Dallas, Texas 75207; Cedar Rapids, Iowa 52406, or Newport Beach, California 92663.

COLLINS

an equal opportunity employer

The computer industry is going time-sharing, and the world leader has the hot jobs

Information Systems

World Leader In Computer Time-Sharing Careers

VISIT OUR BOOTH
SJCC-BOSTON
MAY 14-16

Don't miss this one

WRITE:

W. J. Regan
Information Service Department
General Electric Company
7735 Old Georgetown Road
Bethesda, Maryland 20014

CUSTOMER APPLICATION SPECIALISTS to assist time-sharing users with specific software problems and to develop new time-sharing applications. A chance for you to get into one of today's booming businesses and help make it grow. Openings exist at 25 District Sales Offices from coast to coast, so choose where you want to live and grow. Your background should include a college degree (BS or BA) plus programming experience in BASIC, FORTRAN, machine, or assembly language on a large computer. Systems knowledge is also desired.

SYSTEMS ENGINEERS
for assignments in time-sharing systems engineering, terminal integration, communications and networking analysis. Background should include MS plus ten years' experience (or equivalent), with at least five years with a major computer-based information system. Specialized knowledge is required in terminal development, human factors engineering, data communications, central computer system engineering, system interface development, cost effectiveness and reliability analysis, or operations research.

DIGITAL EQUIPMENT AND COMMUNICATIONS ENGINEERS
for assignments in time-sharing system engineering covering computer and communication equipment terminals. Background should include applicable experience in computer systems or related equipment.

SYSTEMS ANALYSTS
for creative, analytical assignments in programs and operating systems. Meet customer needs with long-range ideas. Prepare logical flow diagrams, instructions, and test data to verify programs. Get to the root of businesses' planning problems. You need a minimum of two to three years' experience in programming or software systems design, practical experience in real-time and monitoring systems, plus a BS in math, engineering, computer sciences, or the equivalent.

PROGRAMMERS
a strong interest in assembly language, FORTRAN, and real-time programming is desired. Considerable latitude is yours to develop programs for new time-sharing systems for all phases of business, industrial, and educational applications. Develop programs from defined concepts and specifications. Positions require a creative bent and one to four years' experience in time-sharing or other computer system programming. 238-09

GENERAL ELECTRIC

An Equal Opportunity Employer (m/f)

X-Raying A Programming System

Roderick C. Billups and Louis Gordon


Billups

Billups and Gordon are presently associated with development of the documentation approach to the internal logic of programming systems for IBM, Systems Development Division, Poughkeepsie, N. Y. They both were members of IBM's first Publication Planning Group, begun in 1965.

Billups has a B.A. in mathematics from the University of Vermont. He joined IBM in 1963, and has participated in documentation support for the 1410/7010, and OS/360 programming systems.

Gordon holds a B.S.E.E. in electrical engineering from Georgia Institute of Technology. He joined IBM in 1954, and was field supervisor for maintenance of a large EDP installation, and has worked with documentation programs in internal logic as a program writer/analyst.


Gordon

Introduction

A diagnostician in the field of medicine, though knowing full well what the various parts of the body do, and that each part is made of millions of individual cells, must still use x-rays to penetrate the skin and see how the functional combinations of cells—muscles, nerves, vessels, bones—operate to determine which needs his attention. Similarly, a diagnostician in the field of programming systems needs a tool to penetrate the mass of detailed code, in order to expose the internal operations of the programming system (reflected in the manipulation of such things as tables, control blocks, queues, and lists). Given this tool the diagnostician can enter the "inner domain" with a confidence born of better understanding, and determine where remedial action is best applied. This paper describes the development of a documentation approach that provides such a tool.

To describe the documentation approach in its relation to system maintenance, we consider (1) a statement of the problem (2) requirements for improved documentation methods (3) the rationale supporting the new documentation approach (4) the key ingredient of the documentation approach, i.e., the method of operation (5) interrelation of information and (6) how the new approach satisfies the documentation requirements of support personnel.

Statement of the Problem

In an extensive study of the documentation needs of support personnel responsible for maintaining programming systems, the following requirements were identified:

1. Diagnostic Assistance: Support personnel must be able to isolate problem sources in *many* programming systems. Internal logic documentation must show how these programming systems operate and interact internally so that decisions can be made quickly as to what area(s) require further investigation.
2. Recall Mechanisms: Support personnel are frequently involved with programming systems with which they have had no contact for a long time. Internal logic documentation should therefore be able to quickly refresh their memory on the internal operations of a given programming system.
3. Detailed Descriptions: Support personnel often must analyze main storage dumps when trouble shooting and, at this time, need detailed information about the various tables, control blocks, and communication/work areas in the programming system.
4. Tie-in to Program Listings: Support personnel often refer to program listings for the sequence of machine instructions used to accomplish a given operation. Internal logic documentation should establish the correct sequence of code, explain how it relates to the overall operation, and further explain what tables, control blocks, and other areas are involved.
5. Time: Support personnel use internal logic documentation mainly in trouble shooting programming systems. In such cases, time is almost always critical.

Why Improvements Were Needed

In the past, when programs were fairly simple, complete operations could be brought into the main storage of the computer and executed as an entity. As a result, the documentors of the programming systems fell into the trap of deciding that the resultant physical product—the actual machine code in the program listing—reflected the program logic. They came to rely on the program listing as the logical basis for the development of the necessary documentation. That is, the documentors came to stress the way code is broken into segments and to relate what goes on within those segments. They tried to discuss function/operation to some extent, but became more and more dependent on what the various instructions in a given segment of code were doing and how the instructions were tied together to accomplish some specific function/operation.

As programming grew more sophisticated and complex, the ever-present storage restrictions grew more binding. Complete operations in many cases could no longer be brought into main storage at one time. (See Figure 1). Programmers, in their desire for more efficient program performance, used the main storage available after the storage requirements of the main function had been met, as a place to unload bits and pieces of other functions. This meant that one physical load (a major program segment) often contained pieces of many different functions. Because the documentation was developed around these program segments rather than around function or operation, the program logic was buried deep by a disjointed presentation.

Rationale for Method of Operation

A study of the requirements for improving internal logic documentation resulted in the conclusion that even though the documentation must show the structuring of a program into its coded segments, it must not obscure the underlying logic to the extent that support personnel would be unable to understand *why* certain things happen.

It appeared that the most logical step was to develop internal logic documentation in a manner paralleling the natural development of the programming system itself. Developed on this basis the documentation would, it was believed, definitely enhance understanding of the total internal logic.

In the development of any programming system, the first requirement is to determine objectives that are to be accomplished. Only then can the actual planning of the programming project get underway. Programmers must consider the types of input to be handled and the outputs necessary to attain the overall objectives of the system.

To get from the specified inputs to the desired outputs (see Figure 2), certain functional operations—such as reading in and processing the contents of control cards—must be performed. Because these func-

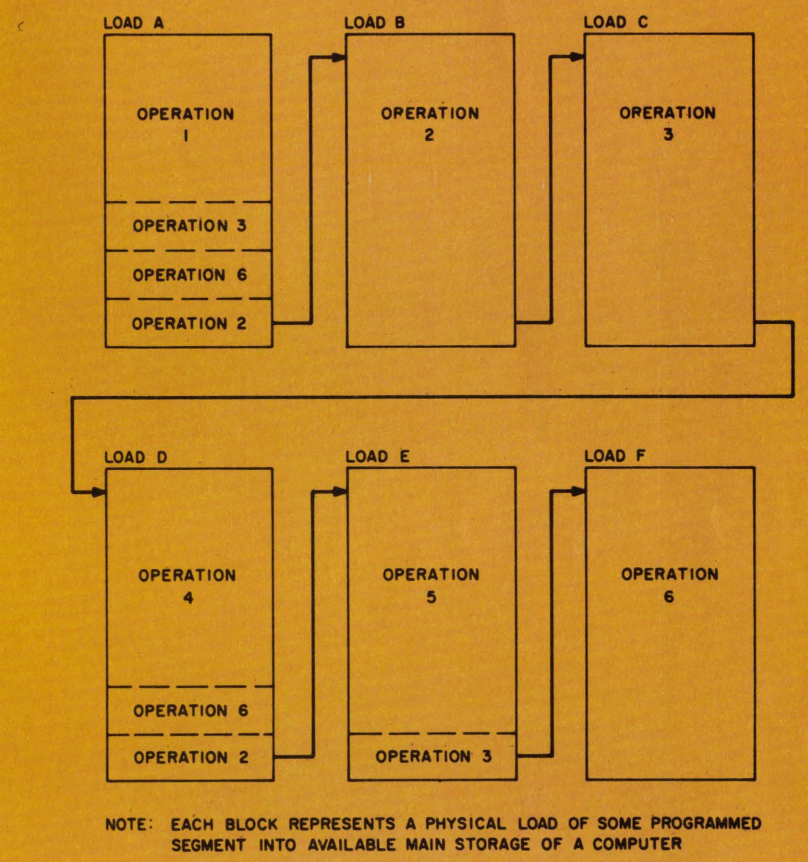


Figure 1

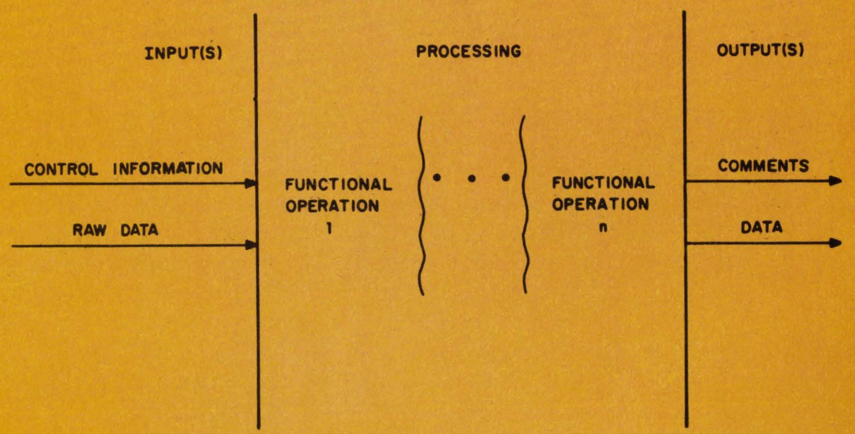


Figure 2

tional operations form the basis of development for the programming project, the programmers must consider the operations that are to be involved as early as possible in the project.

A question that must be asked is: "Do programmers—knowing merely what operations are needed—immediately start writing the code that will allow them to run their program on the computer?" The answer is "No."

If not code, what is it then that programmers work with at this time? The answer is tables, control blocks, work areas, queues, and communication areas. Programmers create and use these *data areas* to control and to record the input data or control information as it is being processed through the required functional operations. The result of these endeavors is the "Method of Operation" for the programming system. Realization of this fact is the key that allows understanding of programming systems, and is the base on which the documentation approach is built.

Method of Operation

What the various data areas are, the role they play, what they contain, and how they interact as the input is being processed through the various functional operations toward the desired output, form the rationale for understanding the internal logic of a programming system and, in fact, represent its "Method of Operation."

To resolve the documentation needs of the support personnel, documentation on the internal logic of a programming system must reveal this "Method of Operation." Operation diagrams—x-ray photographs of a programming system—should be developed to picture the uses and relationships of the data areas that the programmers establish in their programming system. For example, when a programmer designs the way the input to his programming system is to be processed (see Figure 3), he will want a defined part of his input brought into a work area (Input Work Buffer) where he can determine the type of input he has, perform some processing on it, and then place that modified input into some temporary storage area (Section List)—a form of the various data areas mentioned previously. Assuming that the programmer refers to this particular operation as "read-in," he now has determined, using specified data areas and designating the function of each area, how the input (either data or control information) will be brought in and processed.

At the beginning of a programming project, the programmer has a fairly good idea of what functions the various data areas should fulfill, but he probably will not have defined the format that the entries into these data areas will take. As ideas firm up, format definitions become more and more specific.

In any case, various data areas that result from the initial read-in operation will serve as input to a subsequent functional operation. Accordingly, the contents will again be modified and returned to the same or some other data area, or will be used and then discarded.

In understanding what happens to the input data or control information as it is processed through the various data areas (or in understanding what is referred to as the method of operation), a maintenance person understands the real logic of a particular programming system. He not only knows what is happening to the data or control information, but understands *why* things are happening. For example he sees why (as shown in Figure 4) a particular format is needed at this stage in the processing, where critical points in the processing occur, how the various data areas interact to fulfill a given function, and where the data areas are originated, modified, or deleted.

Extending the Documentation Approach

Understanding the method of operation is the key to understanding the total program logic. However, for the same reason that the programmer cannot stop the programming project at this point if he wants a product that will run on a computer, the documentor cannot stop if the support personnel responsible for maintenance of that product are to have the proper documentation tool to do the job. In the same way that the programmer's design must be coded so that such things as the input to his program can be read into the computer, an additional section of documentation must show how the program is broken into its segments, what segment of code performs what function, how control flows from one segment of code into another, and what program segments are in main storage at any given time.

Interrelation of Information

In the same way that the programmer must relate function to code, the documentor must relate information concerning the method of operation to information about segments of code, that is, the organization of the code or programming system.

Assume that the programmer is prepared to start writing code. Logically, he starts at the beginning of an operation and determines that he must write code to implement each step within that operation. Assume also for the read-in operation in Figure 3, that the programmer writes code to allow the computer to read a certain amount of input into the work area. In the process, he gives that sequence of code a symbolic name (in this case, READIN). Similarly for the rest of the steps, such names establish a tie-in of (1) the steps of an operation as depicted with operation diagrams in the method of operation documentation with (2) the actual code written to implement those steps. In this way, the documentation about method of operation is related to associated documentation about program organization.

But, what if the support person wants to determine what part some symbolically named segment of code plays in its associated functional operation, how it interacts with other segments of code, and what its inputs and outputs are supposed to be? He does not want to search through all the operation diagrams to find the symbolic name in question. This is a situation where a way is needed to show how the code is broken into program segments to allow it to be loaded into main storage, how control flows from one such segment to the next, and what names are given to the various segments. For this, the traditional flowcharts suffice.

From a maintenance point of view, knowing which program segment has control is useful and often necessary information, but ordinarily is not sufficient to pinpoint the source of a problem. In itself, this type of information does not allow the use of solid deductive reasoning

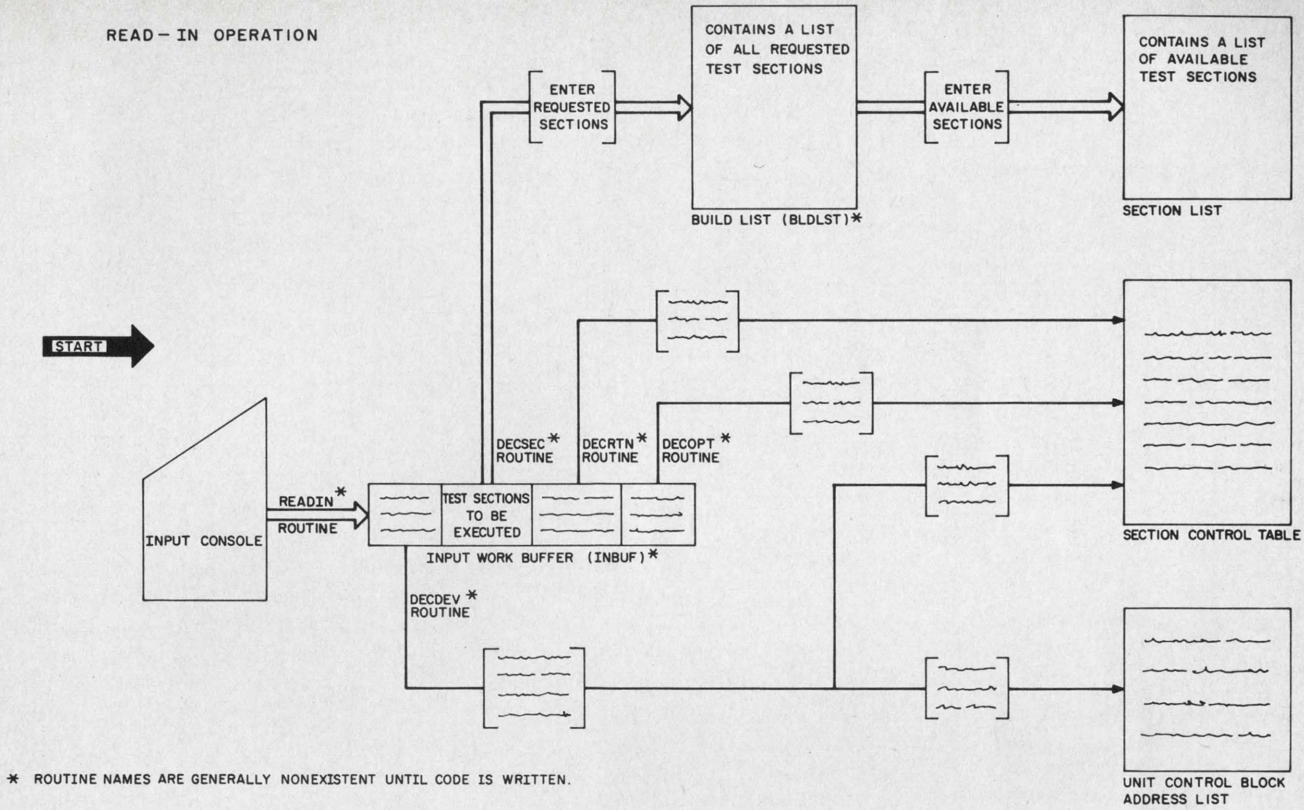


Figure 3

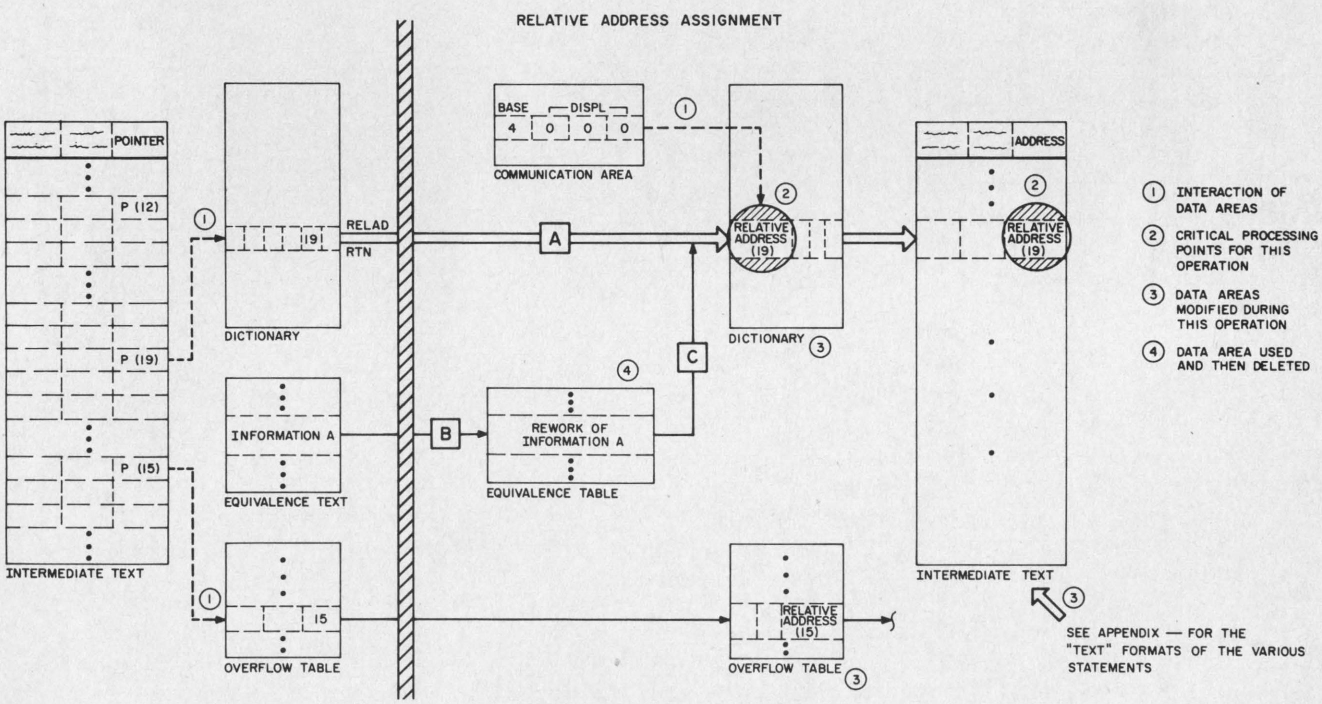


Figure 4


Programmers and systems analysts...
Univac: Where you can help make the world a little bit better
The problem of air traffic over New York City is a big one.
But the FAA, with the help of Univac, is doing something to ease the problem. Now the FAA, with the assistance of Univac, has made it possible to consolidate the work of three separate New York air traffic control rooms into one common center. Which means more effective, more efficient use of air space than ever before.
But the people who are proudest of this new control center aren't FAA people. They are the 26 Univac programmers and systems analysts who spent 15 months writing the programs that make this center possible.
You see, we understand that working on an open-ended program is almost as bad as working on no program at all. And that working on an important problem like air traffic is the most rewarding work of all.
So here at Univac, we don't give you busy work. We keep you busy with meaningful work. And instead of just marking time, you'll make a real contribution. And we give you new responsibilities as fast as you can handle them.
If all this sounds like the kind of company you've been looking for, take a look at the Univac job opportunities listed on the following page.
SPERRY RAND
UNIVAC
An Equal Opportunity Employer M/F

based on understanding how this program segment fits into the scheme of the functional operation. This information is correlated with the operation diagrams by putting the name of the functional operation with which this segment is associated, right on the flowchart. Now a two-way flow is established for referencing information—from method of operation to program organization, and vice versa.

It is important to note here that for maintenance work on programming systems, any one piece of information usually is not sufficient; rather, a correlation or relation of different types of information is needed to give a complete picture. In addition to that already discussed, another time saving technique is the use of a *directory* to relate information (see Figure 5).

With the information available in the method of operation and program organization sections of documentation, there should be no difficulty in locating a specific section of coding in the program listing.

Various manufacturers may have different means for distributing the program listings, and they must compensate in their documentation for associated pecularities that make finding information in the listings difficult. For example, IBM uses Microfiche as its distribution medium. In its documentation, therefore, it has become necessary to provide additional information in the directory just mentioned to identify the Microfiche cards which contain the various segments of the program listing.

With regard to relating information, one further item remains to be addressed: the detailed layouts of the data areas required by the program. Historically, these detailed layouts have been provided in documentation of internal logic. The layouts show general formats of the contents, usage of (and reasons for) specific fields, and the displacement of the various fields from the beginning of the data area.

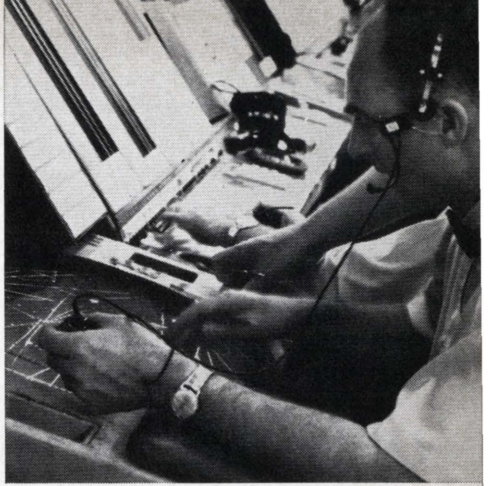
When main storage dumps are taken at the time a problem occurs, such detailed layouts are essential in analyzing the dumps. Equally important is the requirement that support personnel attempting to analyze the problem know where the data areas fit into the scheme of things at the time a particular operation is being fulfilled. This type of understanding allows that person to use his own reasoning along with his understanding of the program logic and organization (or structure) to achieve a quick solution to the problem at hand.

This relationship is easily statified by expanding the scope of the directory to include data areas (e.g., SECLST in Figure 5). By scanning this directory, the operation(s) with which the data area is associated can be found. It is then only a matter of reviewing the diagrams associated with the operation, remembering that these diagrams are developed around the interaction of the various data areas. If necessary, the associated flowchart can also be determined.

DIRECTORY

SYMBOLIC NAME	DESCRIPTION	OPERATION	CHART ID
DECDEV	DECODE DEVICE ROUTINE	READ-IN	AC
DECSEC	DECODE SECTIONS ROUTINE	READ-IN	AB
DECOPT	DECODE OPTIONS ROUTINE	READ-IN	AE
SECCNT	SECTION COUNTER ROUTINE	TEST CONTROL	CD
⋮	⋮	⋮	⋮
SECLST	*SECTION LIST*	*READ-IN*	*AB*

Figure 5


Programmers and systems analysts....

Join the winning team in computer technology

Sophisticated defense and aero space assignments.
Mr. R. K. Patterson
Univac Employment Manager
Federal Systems Division, Dept. SA59
2750 West 7th Blvd.
St. Paul, Minn. 55116

Openings in all levels of programming for Navy ASW programs.
Mr. John Spearing
Univac Site Manager, Dept. SA59
P.O. Box 147
Warminster, Pa. 18974

Openings in all levels for programmers and analysts: Maintenance and diagnostics, radar systems, systems simulation, data reduction and scientific applications.
Mr. W. A. Galle
Univac Employment Manager, Dept. SA59
36 State Highway 10
Hanover, New Jersey 07936

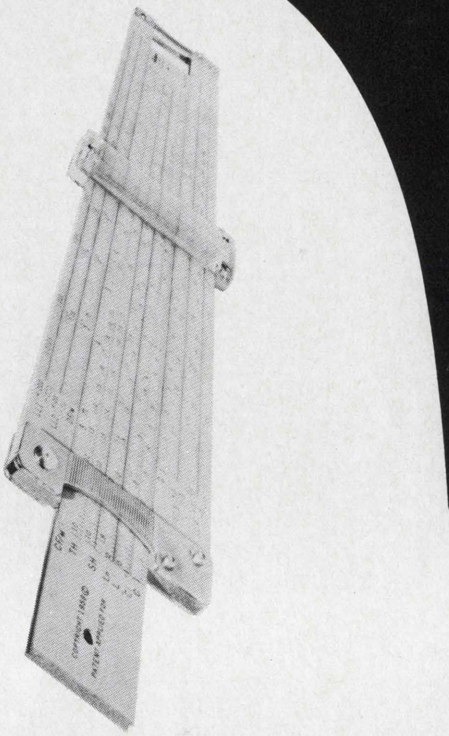
Major computer systems development in St. Paul, Minnesota.
Mr. W. R. Short
Univac Employment Manager
Data Processing Division, Dept. SA59
2276 Highcrest Drive
Roseville, Minn. 55113

Systems programmers and systems analysts with airlines applications or communications experience on major systems.
Mr. H. M. Daubenspeck
Staffing Specialist
Univac
Division Sperry Rand Canada Ltd., Dept. SA59
250 Bloor Street East
Toronto 5, Ontario

Design of compilers, translators, interpreters and assemblers for medium and major systems.
Mr. L. G. Holliday
Univac Employment Manager
Data Processing Division, Dept. SA59
P.O. Box 8100
Philadelphia, Pa. 19101

Systems analysts and sales representatives for branch assignments throughout the United States.
Mr. John Shelsy
Univac Employment Supervisor
Data Processing Division, Dept. SA59
P.O. Box 8100
Philadelphia, Pa. 19101

SPERRY RAND UNIVAC



Math Modelers
Scientific Programmers...

Do you measure up?

If you are an **Electronic** and/or **Simulation Specialist,** you're invited to "measure" your talents against our needs. We'd like to tell you about our exciting new simulation programs in military aircraft & spacecraft, commercial jetliners and railroad trains.

Send us your resume today. Write Mr. G. C. Goerlitz, Professional Employment, Conductron Corporation, P.O. Box 426, St. Charles (near St. Louis), Mo. 63301.

CONDUCTRON CORPORATION

An equal opportunity employer

Satisfying the Documentation Needs of Support Personnel

The documentation approach, built around the method of operation, was developed to satisfy the documentation needs of support personnel in the area of programming systems' internal logic. To show how the documentation approach satisfies those needs, the following five points are addressed in the same order as presented at the beginning of this paper.

1. *Diagnostic Assistance:* Referring again to the diagram in Figure 4, it is well to recall that each functional operation has an input, performs some processing, and produces a result or an output. Briefly stated, a logical progression exists from the input to the output, and the interaction of the various data areas (as the input data or control information is being processed) can be determined. Associated with this processing is the corresponding symbolic name of the coded segment that actually executes a given step in the operation within the computer (e.g., RELAD routine in Figure 4).

The information given in such diagrams allows support personnel to analyze inputs and outputs of various processes, the effect of one step on another in an operation, the effect an entire operation has on another operation, the critical processing points, the interaction of data areas, and the code that is involved.

Also, if the programming system has the facility to provide main storage dumps at designated points, an excellent checkpoint can be developed by incorporating in the documentation (most likely in an appendix) the *exact* contents of the various data areas that constitute for a given program the output of each functional operation. This information allows the storage dump contents to be compared with the exact data area formats in an appendix. If some particular piece of data does not match its counterpart in the output of a given operation, a check of this same data can be made with the output of the preceding operation(s). The trouble is thus isolated to the operation in which the data first appears incorrect. With the diagram for that operation, support personnel can

Don't judge the entire systems programming field by where you're working.

It always has been. And it always will be. That's because we realize that the strength of any company is no greater than the manpower it employs.

At RCA, the emphasis is on opportunity. And challenge. We'll give you a variety of projects to work on, an important say in hardware design, and above all, people to work with who believe in themselves as well as their work.

Write to us if you've had experience in language processors, operating systems, utility systems or communications systems.

We also have openings in Sales, Field Systems Support, Product Planning and Engineering.

Contact Mr. T. A. Beckett, Dept. SW-12, RCA Information Systems Division, Bldg. 202-1, Cherry Hill, New Jersey 08101. We are an equal opportunity employer.

RCA

Programmers/Analysts:

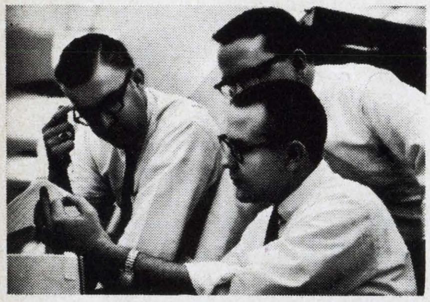
Give IBM a hand and we'll try to make it a free one.

If predictable thinking were what we wanted, we'd just program it. But what we're looking for are imagination and ingenuity. If you have these qualities, and you qualify for a job with IBM, you can be sure you'll get to use them.

Immediate openings.

There are openings for Programmers/Analysts at IBM Endicott, N.Y.

You'd design, program, test, and install application programs for our new Manufacturing Information Systems. These systems will aid manufacturing and production planning functions at all IBM facilities.



IBM programmers and systems analysts work in small teams on an IBM System/360.

You will be involved with real-time and on-line processing applications, using IBM System/360 programming.

A Bachelor's degree and at least a year's experience are required. You should have a knowledge of basic assembler language and large-scale computer concepts.

Grow with IBM.

Today's major growth industry is information handling and control. And IBM is a leader in that field. Our job is to help IBM improve its manufacturing and production planning functions by applying information handling and control techniques.

If you're a problem-solver who wants a personal sense of achievement for your hard work in a growth company, consider IBM.

Call or write.

Jerry Hinkley is the man to talk to. Call him at (607) 755-2855, collect. Or write him at IBM Corporation, Dept. CE1012, 1701 North Street, Endicott, N.Y. 13760.

An Equal Opportunity Employer

IBM®

use the information to pinpoint the problem more accurately.

Another aid in isolating a problem area is the technique of cross-referencing information among the various sections of documentation. In tracking down a problem, support personnel can get to a certain point—for example, in the method of operation discussion—and find that still more information is needed about the relationship between the particular code involved and how it fits into the flow of control in the programming system. The documentation is so organized that it allows the particular segment of code involved to be pinpointed within the program organization discussion.

2. *Recall Mechanisms:* An operation diagram, as illustrated in Figure 4, serves as an efficient recall mechanism, because support personnel can use the diagrams to quickly refresh their minds as to what the functional operations are, what the inputs to each operation are, how these inputs are processed through the operation, and what output is produced by the operation. As support personnel review this process, they may not remember what goes on within a certain step of the operation. The diagrams provide them with a reference point (e.g., reference point A in Figure 4) to that particular topic in the narrative text, which supports the diagram. This approach is considerably faster than trying to read words only.

3. *Detailed Descriptions:* This documentation approach incorporates the required detailed layouts of data areas, such as tables, control blocks, queues, and communication areas.

4. *Tie-in to Program Listings:* This documentation approach incorporates a means of getting to a specific sequence of code in the program listing.

5. *Time:* The most important requirement for support personnel maintaining programming systems is to perform their job in the least amount of time. This need for the reduction in time was a prime consideration as the scheme for organizing and presenting the information in the documentation was devised and developed. ■

Don't Leave Boston...

till you call Jack Callahan at

426-2000

And arrange to visit for a few minutes at our Suite in the Statler-Hilton Hotel.

You don't need a resume. Just come as you are. We've got some facts and figures we're sure you will find interesting.

If you need more incentive, glance at some of the opportunities listed below. These openings are with the most sophisticated growth company in the computer industry.

COMPILER PRODUCTS TO 18K

B.A. in Math or Computer Science preferred. Three to five years experience with medium to large scale 3rd generation computer systems. Languages: ASSEMBLY, COBOL and FORTRAN. Extensive experience in conversational compilers, record manager (I/O) and systems programming.

Don't forget to pick up your free, vest pocket, magnetized Chess Set.

PRODUCT MANAGEMENT TO 18K

Five plus years of experience in the Aerospace or the Education and Training industry with large scale computing systems. Extensive experience in user problems and utilization of computer system in the solution of customer requirements.

FIELD SUPPORT TO 15K

B.A. in Math or Computer Science preferred. Three to five years experience in business data processing. Knowledge of Scope 3 operating system preferred. Languages: ASSEMBLY, COBOL. Previous customer relations experience preferred.

DATA MANAGEMENT PRODUCTS TO 18K

B.A. in Library Science or Computer Science preferred. Two to three years experience with large computer systems. Languages: COGENT, MARK IV, ADEPT 50, ASSEMBLY. Extensive experience in data management procedures library, stand-alone utilities, teleprocessing operating system modification, data management system design.

EXTENDED CORE STORAGE DESIGN TO 20K

Five or more years experience in operating systems design on large computer systems. Extensive design experience at the exec, monitor or master control panel level. Experience should be in a multiprogramming, multiprocessors environment.

EXTENDED CORE STORAGE DEV. TO 15K

B.A. in Computer Science or Math preferred. Three to five years experience with large computer systems. Languages: ASSEMBLY, ALGOL, NELIAC, FORTRAN. Extensive experience in operating systems design in PC & CP code, direct I/O experience at the device level for a new operating system.

If it is more convenient, you may deposit your resume in the Callahan Lock Box at the Software Age Resume Center in the Statler-Hilton Hotel—May 14th to 16th.

SOFTWARE REVIEW & DISTRIBUTION TO 18K

B.A. in Math or Computer Science preferred. Three to five years experience in software quality assurance of compilers, sorts, and operating systems. Languages: ASSEMBLY, COBOL. Extensive experience in system design analysis and testing for a time sharing system.

Callahan Center For Computer Personnel

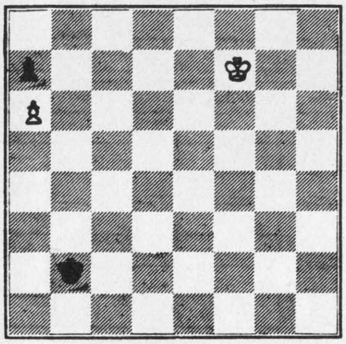
SUITE 414 BOULEVARD BUILDING **Phone 215-561-1950**
1819 JFK BOULEVARD **PHILADELPHIA, PA. 19103**

CHECKMATE

by
GEORGE N. VASSILAKIS
TRW SYSTEMS GROUP

Problem 9

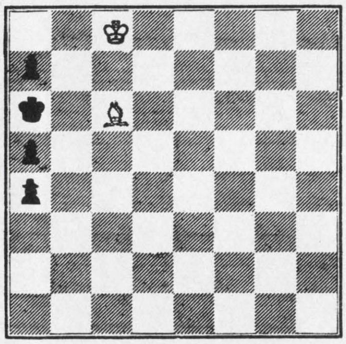
MAISELIS 1921



White to play and win

Problem 10

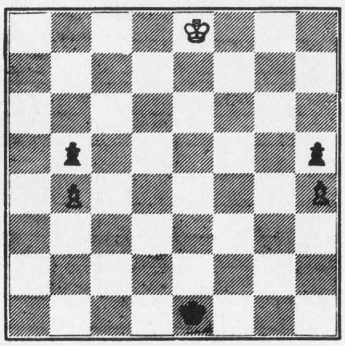
SACHODAKIN 1932



White to play and win

Problem 11

GRIGORIEV 1929



White to play and win

THE END GAME

A good opening is always important in chess, and it does not take much effort to memorize several variations of your favored openings and play the first few moves by the book. Of course, you can afford to take chances in the opening and there is always hope that you will be able to recover the ground that is initially lost if you have a bad opening.

In the-end-game you can not afford to take chances. Every move is critical and in many games the sequence of moves is of paramount importance. Many games end in a draw because a player fails to recognize a clear-cut victory, or recognizes a victory and hastily proceeds with the wrong sequence of moves.

The basic objective in the-end-game is to promote a pawn and make it a queen. Problem 9 illustrates that a straight line is not always the shortest distance between two points. Problem 10 illustrates the power of a bishop if it is used wisely. Problem 11 illustrates the pressure the white king can exert on the black king even though they are separated by the length of the board.

IS THERE A DOCTOR IN THE HOUSE?

How would you feel if you call your doctor in the middle of the night and you are told he is playing chess in Venice, Italy. Of course, if you are a patient of Dr. Anthony Saidy of Los Angeles, you probably know that your doctor is also one of the top ten players in the United States and has an overriding ambition to gain an international title, for which he practically had to go to Europe.

Dr. Saidy and Pal Benko spent several months in Europe recently making the rounds of chess tournaments. Benko of course is already an established international grandmaster and playing tournament chess is the practice of his profession.

After a number of attempts, Dr. Saidy finally made it in the third annual grandmasters tournament in Venice. He is now an established international master and will probably go back to Europe next year to fight for the title of grandmaster. GOOD LUCK DOCTOR!

Here is a game in which Dr. Saidy trapped his opponent's bishop and finished with a win.

	SAIDY (USA) (White)	**TALAI (Italy) (Black)**		**SAIDY (White)**	**TALAI (Black)**
1	P–Q4	N–KB3	21	QxR	Q–N3
2	P–QB4	P–K3	22	Q–B3	N–K4
3	N–QB3	B–N5	23	P–QN4	BxBP
4	P–K3	P–B4	24	R–KB	B–K6
5	KN–K2	PxP	25	R–K	B–B7
6	PxP	O–O	26	R–K2	B–N8
7	P–QR3	B–K2	27	P–KR4	K–B
8	P–Q5	PxP	28	N–R3	Q–N4
9	PxP	R–K	29	NxB	QxPch
10	P–KN3	B–B4	30	N–B3	R–K
11	B–R3	P–Q3	31	Q–K3	P–B4
12	BxB	QxB	32	R–Q2	Q–B3
13	O–O	Q–N5	33	Q–B3	Q–K5
14	K–N2	QN–Q2	34	R–KB2	R–K2
15	P–R3	Q–QB5	35	Q–Q4	Q–B3
16	P–N3	Q–R3	36	P–N5	QxP
17	B–N2	N–K5	37	QxQP	NxN
18	NxN	RxN	38	B–B6	N–K8ch
19	N–B4	P–KN3	39	K–R3	Resigns
20	R–K	RxR			

Solutions to last month's problems appear on page 37.

WHERE THE ACTION IS!

Informatics Career Opportunities in Washington, D.C., New York area

Immediate Positions Available:

Studies and Systems Design

Development of large scale management information systems from concept through implementation. These systems are being developed for important financial and social economic projects for the government and financial community.

Communications

Large scale message switching experience is desired with some systems programming experience for work on highly sophisticated systems.

OS/360

Knowledge of OS/360 and the ability to interface CRT displays with OS/360 is desired. Will participate in either Informatics proprietary software projects, or on our display-oriented communications and control systems.

Large Scale Information Retrieval Systems

Design and implementation experience on several large scale systems is desired.

Who Are We?

Informatics is an independent software firm, specializing in the design, analysis, programming and implementation of computer-based systems for government and industry. We're 7 years old, have annual sales of approximately $14 million and have over 1,000 employees located in the U.S. and 2 European offices. Professional atmosphere is a way of life at Informatics, not an occasional happening.

Who Are We Interested In?

Just like everyone else, we're interested in high quality programmers at any stage of their careers. We prefer 3 or more years of programming experience with online systems and/or scientific programming, but if you're a sharp newcomer with only a year or so of experience we may have just the opportunity for you to grow with.

Visit the Informatics hospitality suite at the Ritz Carlton at the SJCC, May 14 and 15, or send resume to:

Personnel Manager
Informatics Inc.
4720 Montgomery Lane
Bethesda, Maryland 20014
(301) 654–9190

MARK iV needs systems engineers and marketing representatives for:

the best-selling software product on the market. Informatics' MARK IV File Management Systems are now operative in almost 200 installations around the world. And we're growing bigger every day. Needless to say, the opportunities and rewards have never been brighter.

MARK IV, a general purpose file management system, works with anybody's 360. It's a proven system—takes just about seven minutes to put it on a computer. Then it's ready to summarize, print, create files from various sources, sort, sequence, group, select, read, update, and so on. Without programming.

The problem is, we have more business than we can handle. We need help. And ground floor opportunities are available right now. So, if you're a college graduate, have experience on System/360 as a system engineer, or if you have hardware or software sales experience, know System/360 and are looking for professional and financial gain, why not drop a copy of your resume in our lockbox at the SOFTWARE AGE Resume Center during the SJCC?

Or, write or call collect to:

C. Gordon Utt, Informatics Inc.,
5430 Van Nuys Boulevard, Sherman Oaks,
California 91401 (213) 783–7500.

CAREERS IN:* *Systems Programming . . . Commercial Programming . . . Design/Development . . . Terminal Engineering . . . Computer and Teletype Maintenance . . . Marketing and Technical Representation.

LEASCO's
new
"RESPONSE"
Time-Sharing System

Leasco Systems and Research Corporation has now committed more than 50 million dollars to the success of its nationwide "RESPONSE" Time-Sharing System, creating exceptional career opportunities in all the areas below. Many positions are at Leasco's headquarters in suburban Washington, D. C.; others are in Boston, Philadelphia, Chicago, Detroit, Cleveland, and other cities.

SYSTEMS PROGRAMMING—
Requires full OS or DOS experience with IBM 360 computers and background in implementation/design of any of the following: HASP, JCL, CATALOG PROCEDURES, MULTICONFIGURATION SYSGEN, BTAM, QTAM, DATA MANAGEMENT SYSTEMS.

COMMERCIAL PROGRAMMING—
Requires expertise in procedural languages, heavy experience in analysis/design of financial and accounting systems, solid background in data processing, incl. disk file techniques, checkpoint and restart facilities at the user level.

DESIGN/DEVELOPMENT—
Requires design and development experience in any of the following: compilers, executive systems, operating systems, communications handlers, data acquisition systems, data management.

COMMUNICATIONS TERMINAL ENGINEERING—
Requires BS and experience in design of communications terminals for time-sharing plus experience with CRT's hard copy devices, and/or interfacing.

COMPUTER MAINTENANCE—
Requires 2 or more years experience in maintaining 2nd and 3rd generation computers, disk storage drives and controllers, drum memory units and magnetic tape units. Excellent supervisory potential.

TELETYPE MAINTENANCE—
Requires 2 or more years experience in maintaining Model 33 Teletypes. Good supervisory and management potential.

MARKETING—
Requires 2 or more years sales experience in accounting machines, desk-size computers or related business equipment. Time-sharing sales background helpful; should be familiar with commercial and scientific programming from sales standpoint.

TECHNICAL REPS—
To provide marketing support. Must have at least 2 years of EDP experience, and background in: applications development systems programming, source language debugging and/or customer instruction.

For complete information about these positions, their excellent salaries and benefits and exceptional growth potential, please send your resume in confidence to: Mr. Oliver Bright.

LEASCO
SYSTEMS & RESEARCH CORPORATION

4833 Rugby Avenue, Bethesda, Maryland 20014
An equal opportunity employer

better books

by Dennie Van Tassel

COMPUTERS IN THE SERVICE OF MEDICINE edited by Gordon McLachlan and Richard Shegog. Volume 1. Oxford University Press. 1968. $3.50.

This book contains twelve articles that focus on computers for medical use. Half of the articles discuss the processing of hospital records, and the other half with the handling of medical tests. None of the articles will appear technical to computing people who have some experience in the medical profession.

Some of the subjects covered in the first half of the book are the following: Introducing a computer to a hospital, Electronic processing of hospital records; Identification of patients and their records. The second half of the book discusses the use of a computer-based system for handling of clinical data, electrocardiogram interpretation, clinical biochemistry data, drug monitoring, and drug prescribing.

This book should not be considered an elementary text and probably will be read by few in its entirety but a reader can pick and choose the articles of interest without any lost of continutity. The book does contain a great deal of information and is a very valuable reference book.

PROGRAMMING SYSTEMS AND LANGUAGES edited by Saul Rosen. New York: McGraw–Hill Book Company. 1967. 730 pages. $12.50.

Programming Systems and Languages is a colection of articles which appeared in computer journals, and which, in the opinion of the editor, Saul Rosen, is tutorial, and offers something of interest to every software expert but will offer little to any layman. Many of the articles are concerned with describing the major programming languages and giving some historial information about the languages.

The book is divided into five parts each having many separate sections. Part 1 is a brief historical survey of the development of programming languages. Part 2 contains articles on the four major programming languages: FORTAN, COBOL, ALGOL, PL/1. These articles mainly describe the languages and give a little historical information. Part 3 covers translators and compilers for languages—mainly of the type discussed in Part 2. The best-known of the list processing and symbol manipulation languages are covered in Part 4. Operating systems, starting with the old batch processers and proceeding up to the recent time-sharing systems are covered in the last part of the book.

GAME THEORY by Guillermo Owen. Philadelphia: W. B. Saunders Company. 228 pages, 1968, $9.00.

Game Theory is a theoretical text on games. This book will be of interest only to people that have a definite serious interest in the subject of games. This is not to say the book is difficult to read, because it is not. While the book is written from a mathematical point of view, the author states that the book is designed for college undergraduates. Elementary probability theory, some calculus, and some abstract measure theory are necessary for understanding this book. The author includes a few pages on convex theory and functions for readers who are unfamiliar with these two subjects.

Basically the book is divided into two sections, two-person game theory and n-person game theory. Some of the topics, but by no means all, discussed are: zero-sum games, linear programming, infinite games, utility theory, and general sum games.

BUSINESS INTELLIGENCE AND ESPIONAGE, edited by Richard M. Green, Jr. Homewood, Illinois: Dow Jones–Irwin, Inc. 312 pages, $12.95.

This book is a general introduction to the field of business intelligence. Not only is the more glamorous area of industrial espionage discussed, but also the field of business intelligence is explained. Business intelligence includes collecting information for news releases, stockholder reports, letters of inquiry, discussions with customers and friends, and reading scientific papers. The book covers both how to gain and prevent business intelligence. A good deal of the book is devoted to discussion of the available sources of business information, which are often overlooked. One chapter of the book covers the building of an automatic information system for business intelligence and although the article is rather short because of the uniqueness of the problem, some valuable information is given.

TIME-SHARING
TELE-PROCESSING
TIME-SHARING SALES
DATA COMMUNICATIONS

REAL-TIME
LOGIC DESIGNERS
DATA MANAGEMENT
MESSAGE SWITCHING

$10,000–$25,000

If you are looking for an opportunity to further your professional career with an International Firm that is a leader in Software Development and is destined to become one of the leaders in Time-Sharing Systems, your chance is now. We are currently recruiting on an exclusive basis for

Programmers **Systems Analysts**
Systems Engineers **Systems Management**

to staff this newly created Division of their Suburban Washington, D. C. location. Openings exist at all levels, from Junior Programmers with minimum experience to Director level.

Other openings exist in Operations Research, Command and Control, War Gaming, Simulation, Mathematical Analysis and Transportation Analysis. Investigate these opportunities by calling 301/657–3510 (collect) or submit your resume in confidence. Our client assumes all costs relating to interviewing, relocation and employment fees.

DAVIES ASSOCIATES, INC.

7315 Wisconsin Avenue Bethesda, Maryland 20014

It's free. The new 1969 Edition.

Our National Computer Salary Survey and Career Planning Guide

The all new 1969 Edition of Source Edp's Computer Salary Survey and Career Planning Guide is now available. This comprehensive 20-page report contains up-to-the-minute information vital to every computer professional. Subjects include:

- The annual Source Edp Survey of Computer Salaries broken down by 28 separate levels of professional and managerial classifications ranging up to $75,000.
- A comprehensive analysis of current trends in computer employment opportunities.
- For the first time, a study of information processing development within major industrial classifications including user and non-user industries.
- For the first time, an examination of the techniques and strategy in career planning.

All of this information has been compiled and edited by the people at Source Edp—the largest nationwide recruiting firm devoted solely to the computer field. To receive your free copy of the 1969 Edition of Source Edp's Computer Salary Survey and Career Planning Guide, circle the reader inquiry card. Or, to speed delivery, write directly to the Source Edp office nearest you.

source edp

Atlanta—William S. Barnett, 11 Corporate Square (404) 634-5127
Chicago—David B. Grimes, 100 S. Wacker Drive (312) 782-0857
Dallas—Paul K. Dittmer, 7701 Stemmons Freeway (214) 638-4080
Detroit—Charles C. Walther, 2990 West Grand Blvd. (313) 871-5210
Los Angeles—Wayne G. Emigh, 3470 Wilshire Blvd. (213) 386-5500
Minneapolis—Fred L. Anderson, 801 Nicollet Mall (612) 332-8735
New York—Edward R. Golden, 1414 Ave. of the Americas (212) 752-8260
San Francisco—Richard O. Clark, 111 Pine Street (415) 434-2410

Client companies assume our charges

For more information, circle No. 1 on the Reader Service Card

A COMPUTER CAREER IS *NO* LAUGHING MATTER!

Today change is the norm in every phase of life. Computer professionals in particular cannot afford to stagnate. Career obsolescence in the EDP field can quickly grow into a big problem for those who do not keep up with the state of the art.

Management Scientists, Inc. is a leading consultant firm devoted exclusively to computer career planning. Our professional staff knows the market coast-to-coast. Send your resume or call and we will give you creative assistance in finding the right career position. Our clients assume all fees.

At present we are recruiting for these talented professionals:

- **BUSINESS/SCIENTIFIC PROGRAMMING**
- **TIME SHARING/REAL-TIME**
- **SOFTWARE DEVELOPMENT**
- **SYSTEMS DESIGN**
- **OPERATIONS RESEARCH**
- **SYSTEMS ENGINEERING**
- **MARKETING/SALES**
- **TECHNICAL SUPPORT**

Management Scientists, Inc.

101 Park Avenue, New York, N. Y. 10017 — Dept. SA-5/69
(212) 532–7710

Career Planners: DATA PROCESSING & MANAGEMENT SCIENCES

THE IMPACT OF COMPUTERS ON MANAGEMENT, edited by Charles A. Myers. Cambridge: the M.I.T. Press. 1967, 310 pages, $10.00.

It is probably safe to say that today no business firm is unaffected by computers, even a small business often fills out order forms which are processed by a computer and has its bookkeeping done at a computer service bureau. This book discusses the present and future impact of computers on management organization and the nature of managerial work.

The volume is a collection of papers which was presented for a research conference convened by the Industrial Relations Section of the Alfred R. Sloan School of Management at the Massachusetts Institute of Technology in 1966. The majority of the papers are written by academic scholars who have studied the effects of computers in business organizations.

Here are some of the central themes that were discussed and the conclusions: Information technology has centralized control in organizations. This centralization includes routine tasks such as accounting, production, and supply management. Is centralization a necessary result of computerization? One conclusion was that organizations that choose the path of centralization at the expense of individual initiative and creativity may not be able to reverse themselves and will probably lose out competitively to more enlightened forms of organization.

What is the significance of centralization of the data-processing function? Even though the data-processing function is often "neutral" in the sense that it is not attached to another functional area such as accounting or finance it is unlikely that one can continue to hold title to the computer without assuming and using the effective power that it confers. One rather amusing discovery was system people often tend to design a system for the benefit of the programmers and not for the purposes to which the company is devoted.

Several not too surprising conclusions were drawn on the changing nature of managerial work under computerization. Computers take over much of the middle management routine work and leave time for managers to deal with unstructural jobs that were not getting done before because these managers were too busy. Man-machine inter-action systems, using time-sharing computer technology, will become increasingly important to higher management levels. Top management will also become more research and systems oriented and will increasingly come from positions with these backgrounds.

The book does not cover the technical aspect of information science, but instead concentrates on the impact of information technology. Too often this aspect is ignored and great effort is expended in the technical section and little or no energy is spent on the people aspect even though it is usually the latter that may cause the failure of the system.

GAME PLAYING WITH COMPUTERS by Donald D. Spencer. New York: Spartan Books. 1968, 441 pages, $12.95.

Most programmers like to program and play games on computers.

Fee Paid
$10,000
to
$40,000

SYSTEMS
and
PROGRAMMING
SPECIALISTS

MIS Managers • Systems Managers • Systems Analysts • Programmers Analysts • Programmers

(212) MU 2-8600
F-O-R-T-U-N-E
Personnel Agency, Inc.
505 Fifth Ave.
New York, N.Y. 10017

U.S. CAREER RECRUITERS
LAFAYETTE BLDG. SUITE 427
55 SOUTH FIFTH STREET
PHILADELPHIA, PENNA. 19106
PHONE (215) MA 7-8414

WE AT U. S. CAREER RECRUITERS ARE EXTREMELY PROUD TO ANNOUNCE THE ADDITION OF OUR NEW COMPUTERIZED RETRIEVAL SYSTEM. IT IS OUR PLEASURE TO EXTEND TO OUR TWENTY-THOUSAND ACCOUNTS FROM COAST TO COAST A BETTER SERVICE. DUE TO THE GREAT MANY JOB OPENINGS THAT WE HAVE LISTED IN THE AREAS OF DATA PROCESSING, ENGINEERING AND DRAFTING, IT BECAME NECESSARY TO UTILIZE A MORE EFFICIENT SYSTEM. WHETHER YOU, THE READER, REPRESENT A FIRM SEEKING NEW EMPLOYEES, OR YOU ARE AN INDIVIDUAL SEEKING A BETTER WORKING OPPORTUNITY, THEN YOU CANNOT AFFORD NOT TO INQUIRE ABOUT OUR SERVICE. LET OUR KNOWLEDGE AND OUR MANY AVAILABLE CONTACTS DO THE SEARCHING FOR YOU.

INSTANT INPUT
NAME ____________ PHONE ____________
ADDRESS ________________________
CITY __________ STATE ______ ZIP ______
PRESENT POSITION __________ SALARY ________
GEOGRAPHIC PREF. ________ REQ'D SALARY ________

Let our national retrieval system convert your Instant Input to immediate Feed Back.

Let us evaluate your qualifications against all orders in our system. Positions are located in all areas of the country.

Fill out and mail this card today with resume if available.

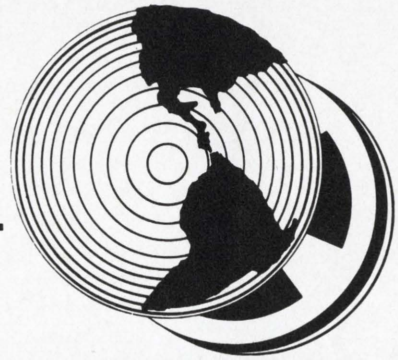
No cost or obligation. All replies strictly confidential.

W. S. McNICHOLS

FOX-MORRIS ASSOCIATES
Personnel Consultants

Suite 1608, PanAm Bldg., New York, N.Y. 10017
1500 Chestnut Street, Philadelphia, Penna. 19102

The new big Software jobs are in control systems — at Foxboro!



If you really want responsibility, involvement, and "hands-on" programming experience, join the team of professionals at Foxboro who are setting the pace in new process control systems.

Foxboro has a total systems capability and responsibility for designing, building and installing digital and analog control systems for customers throughout the world. Our world-wide installations control processes that produce PVC (polyvinyl chloride), gasoline, liquefied natural gases, cement, paper, food and a wide range of other products. They utilize single, dual and triple computer configurations.

The complexity, size and diversity of existing projects and experimental programs now underway at Foxboro's suburban Boston headquarters are greater than at any other time in our 60 year history. And the opportunities for professional and personal rewards are greater too.

Applications Programmers

Several new positions exist requiring varying levels of experience. Creative application programmers are sought who are capable of taking complete responsibility for bringing process control systems' software from their introductory stages of design through to full real time simulation testing and installation. Experience is required in one or more of the following areas: Real Time Executives and/or Real Time Input-Output, Time Sharing, Batch Control, DDC, Setpoint Control and Multilevel Programming.

Software Systems Design

Senior Programmers are sought to work in a creative environment, developing a new generation of digital technology. Development programs encompass advanced Real Time Systems, Computer-based CRT Display Systems and Man-Machine Communications. A degree is required, with a minimum of 3 years' programming experience in leading development efforts in operating systems, languages and communication, and control software development. Successful candidates will be responsible for all phases of program designing, coding, checkout and documentation.

Interested individuals should forward their resume or a detailed letter to Mr. Tom Bryant, Professional Placement Office, The Foxboro Company, Dept. SA5, Neponset Avenue, Foxboro, Mass. 02035. Foxboro is an equal opportunity employer.

FOXBORO®

This is evident since computerized game playing may be found to some degree at almost every computer installation. Game playing is not wasteful, since information gained from programming computers to play games is directly transferable to other areas of scientific and business programming.

This book discusses more than 70 games, puzzles, and mathematical recreations that may be programmed for a digital computer. Many of the more simple games have complete programs, including flow charts, provided for use. The games are programmed in either FORTRAN or BASIC. Some of the FORTRAN games or puzzles which are programmed are magic square, prime number, binary games, pick-a-number, 4-by-4 puzzles, Blackjack, counterfeit coin, checkers and kings.

Programmed games in BASIC include Sieve of Eratosthenes, magic square, prime numbers puzzles.

Most of the more complicated games, such as checkers, chess, Keno, are just discussed and suggestions are given (some with flow charts) as to how to program the games. The book offers quite a few programmed simple games, but much of the book is filled with just descriptions of games instead of actual programs. But the book is still sure to stimulate much interest around the computer room, and the cover itself is no less exciting.

COMPUTER SELECTION by Edward O. Joslin. Reading, Massachusetts: Addison–Wesley Publishing Company, Inc. 1968, 172 pages, $7.95.

Often when the time comes to select a new computer it is too easy to select Number One or the manufacturer of your old computer. In the past, one reason for not changing manufacturer is that one would have had to reprogram everything and this was too expensive. Now, however, that standard programming languages (COBOL and FORTRAN) are widely in use, this factor is becoming less of a problem.

This book is an attempt to overcome the second problem; that is, the problem of evaluating several new systems. Many times installed computer systems have not lived up to their expectations simply because the proper system was not selected for the jobs to be done.

By going through a formal computer selection the customer gains several advantages. He is forced to evaluate his own present and future use of computers. When calling for bids the company exposes its problems to several top system analysts of the venders. As a result of some exceptionally good systems work by a vender, a system may be proposed, which was overlooked by the user. In today's competitive computer market it is quite possible that the user will end up with a cheaper and more suitable computer by going through a formal selection phase even if the user ends up with the same manufacturer.

Here are some of the topics discussed: Specifications for Computer Systems; Techniques of Evaluating Proposals; Methods of Procuring Computer Systems; Preparation for Validation and Adjustments; A Selection Example. The book is well written and should be read by anyone considering replacing his present computer system.

CONVERSATIONAL COMPUTERS by William Orr. New York: John Wiley & Sons. 1969. 227 pages. $8.95.

PROGRAMMERS—ENGINEERS

Washington, D.C. • New York • New Jersey • New England • Philadelphia • Chicago • Minnesota • Texas • Ohio • Florida • Arizona • California • Southeast Asia

If you have a B.S., M.S. or Ph.D. and you are experienced or interested in any of the following, contact us immediately for free career counseling and an objective analysis of your position in today's market.

PROGRAMMERS
- Management Info Systems
- Information Retrieval
- Command & Control
- Aerospace Applications
- Real Time/On Line
- Systems Simulation
- Software Development
- Communications

SYSTEMS ENGINEERS
- Reliability Analysis
- Digital Computer Systems
- Digital Logic Design
- Digital Circuit Design
- Digital Communications
- Systems Integration
- Soft Ware Analysis
- Oceanography

Salaries range from $8,200 to $25,000. Our client companies assume all fees. Forward resume in confidence, or call (collect): Mr. Martin E. Sheridan (Area Code 703) 524–7660.

SHERIDAN ASSOCIATES INC.
1901 North Fort Myer Dr., Suite 1010, Arlington, Virginia 22209
(Just over the Potomac from Washington, D. C.)
Personnel Consultants to the Computer Industry
Write for application and wage/salary survey.

For more information, circle No. 2 on the Reader Service Card

We have been placing B.S., M.S. & Ph.D.

SCIENTIFIC PROGRAMMERS

in **FEE PAID** positions throughout the U.S. since 1959 through our **PERSONALIZED SERVICE.**

Over 1000 client companies rely on us to provide carefully screened, technical referrals. We are staffed by experienced graduate engineers . . .

WORKING FULL TIME FOR YOU!

SEND RESUME TODAY
(if none, **SEND COUPON** for confidential application)

Name__________

Address__________

City______ State______

ATOMIC PERSONNEL, INC.
Suite F-2, 1518 Walnut St.
Philadelphia, Pa. 19102

AN EMPLOYMENT AGENCY FOR ALL TECHNICAL FIELDS

everything about VIZ(A)FICHE™ SYSTEM is extraordinary

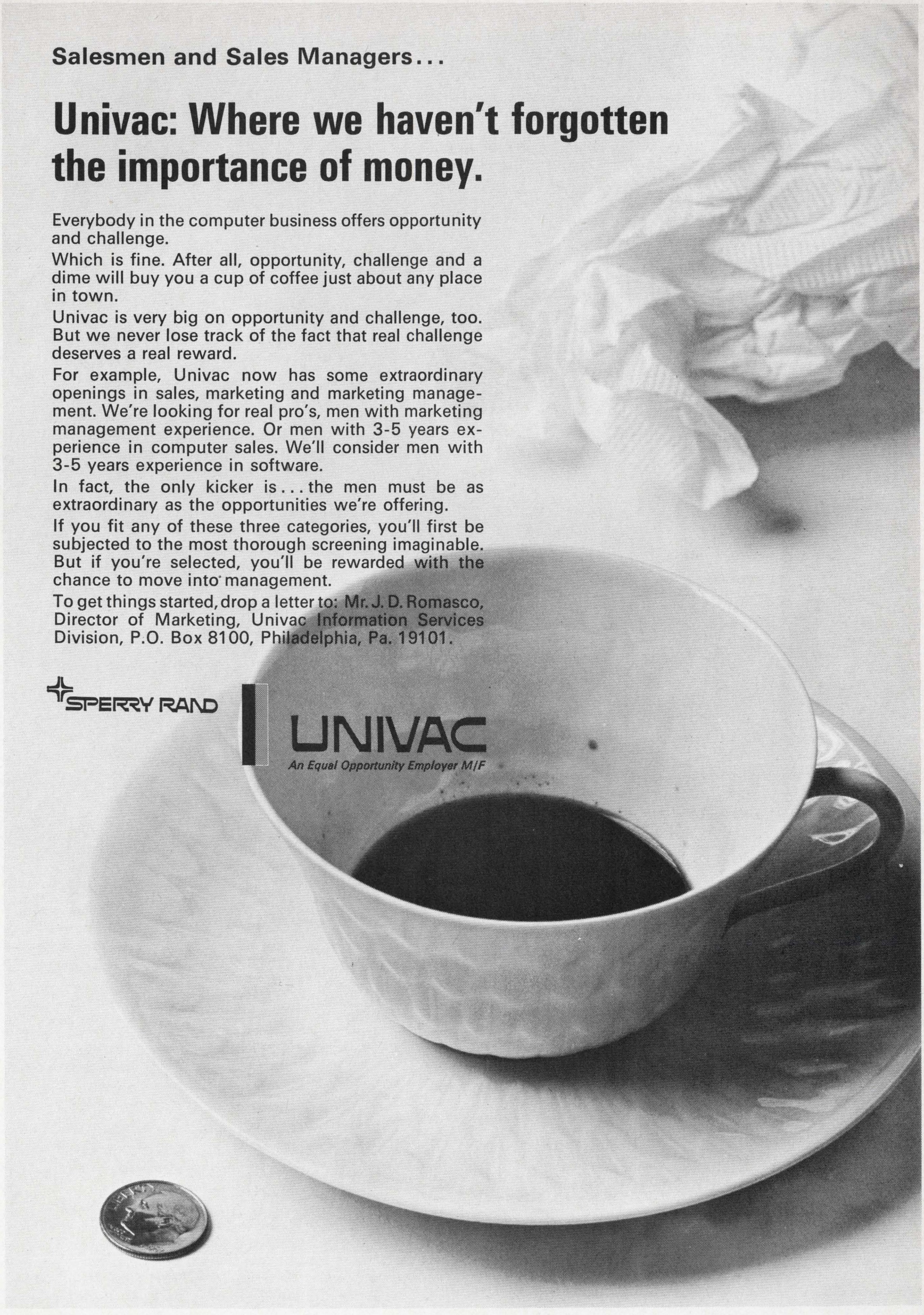
FOR STORAGE AND RETRIEVAL OF MICROFICHE, APERTURE AND TAB CARDS

A new, ultra convenient, patented system for storage and retrieval of microfiche, aperture and data tab cards, sets new industry standards of portability, visibility and retrievability in the housing of photographic miniaturized information.
Write for catalog sheet on VIZ-A-FICHETM SYSTEM.

84 Hudson Avenue,
Brooklyn, N. Y. 11201

Standard
BOORUM & PEASE

For more information, circle No. 3 on the Reader Service Card


Salesmen and Sales Managers...
Univac: Where we haven't forgotten the importance of money.
Everybody in the computer business offers opportunity and challenge.
Which is fine. After all, opportunity, challenge and a dime will buy you a cup of coffee just about any place in town.
Univac is very big on opportunity and challenge, too. But we never lose track of the fact that real challenge deserves a real reward.
For example, Univac now has some extraordinary openings in sales, marketing and marketing management. We're looking for real pro's, men with marketing management experience. Or men with 3-5 years experience in computer sales. We'll consider men with 3-5 years experience in software.
In fact, the only kicker is... the men must be as extraordinary as the opportunities we're offering.
If you fit any of these three categories, you'll first be subjected to the most thorough screening imaginable. But if you're selected, you'll be rewarded with the chance to move into management.
To get things started, drop a letter to: Mr. J. D. Romasco, Director of Marketing, Univac Information Services Division, P.O. Box 8100, Philadelphia, Pa. 19101.
SPERRY RAND
UNIVAC
An Equal Opportunity Employer M/F

Our computer can take off vertically, fly at Mach 2, and navigate under water.

Want to ride with us?

Our IBM 7090-360/30/40 computer facility provides operations research analysis and prediction, information retrieval, and systems simulation in support of our work on ASW fire control techniques, advanced torpedo design, underwater acoustics, acoustic imaging, oceanographic communication studies, and missile systems integration and management.

Commercial programmers will develop systems dealing with military hardware design and installation, equipment maintenance, manpower selection and assignment, parts cataloging, and other logistical support functions. Prefer Bachelor's degree with 1 or more years experience in programming the 360, with particular emphasis on use of COBOL under OS mode. Applicants with experience on other computers or different software configurations will be given consideration based on their applicable knowledge and level of proficiency.

Please send your resume to Mr. Harvey Weisberg, Employment Manager.

Vitro
LABORATORIES

14000 Georgia Avenue • Silver Spring, Maryland 20910
(Suburb of Washington, D. C.)

a subsidiary of Automation Industries, Inc.

An equal opportunity employer M&F

Mankind had several hundred years to get accustomed to the automobile. First there was the sled, then the wagon, later on the wagon was hooked up to animals. During the nineteenth century steam power was added and in the present century the internal-combustion engine brought about the development of the personal passenger car.

In contrast mankind has had only 20 years to become accustomed to personal computers and according to William Orp, personal computers will have an effect on all of us that will be at least as profound as the effect of personal passenger cars.

Conversational computers will come as no surprise to the computer profession but it is doubtful if the general public is aware of their potentialities or ready for the cultural shock they are about to experience. This book is an attempt to introduce conversational computers to the intelligent curious non-specialist. The book will also be of interest to the specialist. A wide range of present uses of conversational computers are discussed, but voice conversation is not discussed, because according to William Orr, the state of the art permits only the grossest of speculation now and for several years to come.

The subjects covered are: Problem-Solving Modes; Instructional Modes; Retrieval and Query Modes; Graphical Conversational Modes; Toward the Computer Utility; and Psychological and Social Implications.

In the past rigid demands of production programming, together with high computer costs and unacceptable time lags, combined to inhibit the free play of imaginative human intelligence when it is tied to a computer system in the conventional manner. Conversational computers, with their advantage of instant response and mass information systems promise to eliminate much of the past restraints of clerical feasibility, high cost, and information hunting, and allow man to concentrate on digesting information at his top most intellectual ability. Whether man is ready for this or not, the possibility is at hand. ■

Suggestions for book reviews and requests for further information should be addressed to: Book Review Editor, Software Age, *2211 Fordem Avenue, Madison, Wisconsin 53701.*

Talked to an ex-Itek programmer lately?

We don't believe it.

Ex-Itek programmers aren't non-existent, but they are rare. Itek has an enviably low turnover of programming personnel.

Some reasons for this low turnover are apparent even after a brief visit with us. The new construction now underway and the activity within our personnel department are obvious signs of continuing growth. The minimum use of executive titles and a healthy disregard for organization charts imply, correctly, that here is a company of professionals who respect each other's ability.

Perhaps the basic reason for the scarcity of ex-Itek programmers is the kind of work being done here — challenging, absorbing work which recognizes and demands the fullest contribution by each individual. For example:

Ken (M.S., E.E.) is developing an algebraic symbol manipulation language

Frank (Ph.D., C.E.) is solving a 10,000 square matrix in structural analyses

Jim K. (working on B.S.) is writing machine-independent code in a meta-language. Mike is helping Jim.

Dick F. (M.S., Physics) is generating prize-winning plots on our CalComp Zip-mode plotter while studying image enhancement

Norm (M.S., Meteor.) is developing a multi-band spectral simulation system

Ray R. (B.S., Aero.) is working on scanner-computer integration

Ron G. (M.B.A.) is writing an information-retrieval system

George N. (B.S., E.E.) is describing a numerical control language — Stan (B.S., Ed.) and Tony (B.S., Physics) are helping George

Randy D. (M.S., M.E.) is simulating optical systems to compute production tolerances

Ed C. (B.S., Math) is writing a process-control real-time monitor system. Ted (B.S.) is helping Ed.

Russ (working on B.S.) is solving thermal and thermal-structural problems

__________________ is working on interactive time-sharing for our 131K (words) CDC 3500 Computer System

__________________ is writing a process-control language for optical scanners

__________________ is developing a process-control language simulator for the CDC 3500

__________________ is generating a complex integration package

__________________ is writing programs for computer-generated holograms

__________________ is analyzing optical systems in dynamic environments

If you can fill any of the blanks or can help in any of the other areas, see us at the Sheraton Boston Hotel during the Spring Joint Computer Conference. If you can't make it, drop a resume in strictest confidence or call Mr. Ed Mulkern, (617) 236-2030.

Itek Corporation
optical systems division
THIRD AVENUE, BLDG. 12, DEPT. SA-5
BURLINGTON, MASSACHUSETTS 01803

Itek

An Equal Opportunity Employer

new products

Four additional **main storage sizes**—up to double the present memory capacity—have been announced for the IBM System/360 Model 65 multiprocessing system.

The new storage sizes range from 1,310,720 to 2,097,152 bytes. Present storage capacities range from 524,288 to 1,048,576 bytes.

The multiprocessor combines two Model 65s which operate under one control program. They share storage and peripheral units. The Model 65s may run as a single multiprocessing system or as separate stand-alone systems with up to one million bytes of storage each.

For more information, circle No. 9 on the Reader Service Card

A new printout system, the Clevite 4800, has been developed by the Clevite Corporation. The electrostatic hard copy printer for computer systems provides accurate printouts—including charts and drawings—as quickly as the computer supplies them. The machine can simultaneously handle alphanumerics and graphics—"anything the computer can generate".

The electrographic recorder produces hard copy readout of computer solutions in less than one second for each 8½" x 11" page. Through its "unique" matrix system, the Clevite 4800 delivers 4,800 alphanumeric lines per minute or 412,000 characters a minute. The printer reproduces signals from any source of digital input or data transmission by telemetry, radio microwave and/or land line. Further features of the printer include: distortion free alphanumerics and graphics, and immediate dry and permanent copy.

For more information, circle No. 10 on the Reader Service Card

* * *

Computer scientists at Illinois Institute of Technology, Chicago, have developed a system for communicating with a computer in three foreign languages, Spanish, French and German, from inexpensive remote teletypewriter terminals.

The three corresponding computer languages are known as **SPANTRAN, GAULTRAN, and DEUTRAN.** They employ translated words and sentences from the IITRAN system, a language developed at IIT, designed for communicating with computers during high school and college classroom computer use.

These new languages should prove valuable to students in other countries studying at the college, high school and even the elementary school level who cannot speak or write English, since the commands are given and received in the students' native language. This eliminates the need to learn the English language before learning to use a computer.

The new system can be adapted to any language which uses letters of the English alphabet. In the event that a translation is desired into a language using letters not found in the English alphabet, a simple adjustment can be made in the type fonts of the printing mechanism.

For more information, circle No. 11 on the Reader Service Card

* * *

Daedalus Computer Products, Inc. has announced a new **Digital Intercoupler Model 210.**

The Intercoupler is a versatile integrated circuit unit for coupling electronic instrument outputs to peripheral equipment such as Teletype equipment, card punches, incremental mag tape recorders, printers and line printers and typewriters. There are also optional features which enable the Model 210 to be used simultaneously to drive two output devices such as a paper and card punch, or a paper punch and digital printer.

Daedalus' 210 Digital Intercoupler is capable of receiving coded data from standard measuring equipment—DVMs, counters, scalers, timers—and translates

Professional

PROGRAMMERS — ENGINEERS — SENIOR SCIENTISTS

Nationwide • International

Computer Careers Incorporated offers a truly unique service on a nationwide basis to the professional **programmer, engineer, or senior scientist** seeking personal advancement and career growth. Our professional staff is qualified by reason of **actual working experience** in **your field** to know and understand your background and to best serve your personal and career interests.
Our carefully selected clients are outstanding leaders in the computer industry and directly related fields of industrial activity. Current openings include a wide range of assignments in the fields of digital hardware design, systems analysis and programming on a variety of software, management systems, scientific and commercial applications. May we suggest that you forward a confidential summary of your background and career objectives today, or contact Mr. Edward MacLaren at 301-654-9225 for additional information. Client organizations assume payment of all fees.

COMPUTER CAREERS INCORPORATED

Suite 503—4720 Montgomery Lane—Bethesda, Maryland 20014
(A suburb of Washington, D. C.)

CONSULTANTS TO THE COMPUTER INDUSTRY

EDP-SYSTEMS

WE SPECIALIZE IN CAREER CORRECTION

ARE YOU ''UNDERED''?

UNDER . . . PAID or UNDER THE WRONG BOSS . . . UNDER THE WRONG CLIMATE or UNDER PROMOTED
UNDER UTILIZED or UNDER THE WRONG HOURS . . . UNDER THE WRONG POLICIES . . . or just "UNDERED"?
FOR "OVERING" . . . CALL WA 3-2640

LAWRENCE PERSONNEL

1015 Chestnut, Philadelphia, Pennsylvania 19107

FEE PAID BY CLIENT COMPANIES • NO CONTRACTS • ALWAYS CONFIDENTIAL

A message for **Sr. communications/real-time message switching programmers** who'd like to switch into an environment where a management position in real-time is more than a possibility: ITT. More specifically, ITT Defense Communications.

Why? Because here, programmers aren't just programmers. They're full-fledged members of our technical staff, enjoying all the privileges (and equality) the title implies. Teaming with equally-expert specialists in other disciplines. With equal visibility (and promotion potential) to management.

In short, at ITT Defense Communications, we don't see programming as a support function.

Looking at it in a day-to-day sense, it means we encourage programmers to get into hardware as a matter of policy. To follow the systems analyst route, in depth.

Right now we have openings for Senior Members of our Technical Staff. Candidates should have a degree plus 6 years' experience including at least 2 years in real-time message switching. Should be familiar with medium to large scale computers in the communications field. Knowledge of COBOL and JOVIAL in compiler development is a plus.

Planning to attend the SJCC in Boston May 14-16? Then drop your resume in our box at the Software Age resume center at the Statler Hilton Hotel. Or forward your resume to Mr. John J. McMahon, ITT Defense Communications, 492 River Road, Nutley, New Jersey 07110.

DEFENSE COMMUNICATIONS ITT

A plans for progress equal opportunity employer (m/f)

CAREER MEMO

To the Computer Professional

Does your present position lack pride of accomplishment? . . . If so, it is time for a change. Professional Opportunities presently exist in:

- SOFTWARE DEVELOPMENT
- SYSTEMS DESIGN
- PROGRAMMING
- REAL TIME SYSTEMS
- TIME SHARING
- MANA. INFO SYSTEMS
- ENGINEERING
- MATHEMATICS
- OPERATIONS RESEARCH

Your confidential inquiry is welcome. Call or write, Robert L. Keilholtz or Donald Wayne,

EVERETT KELLEY ASSOCIATES, INC.
Suite 1300—121 S. Broad St.
Philadelphia, Pa. 19107
215—KI 6–5240

Placement of Computer Professionals since BINAC.

NATIONAL EMPLOYMENT ASSOCIATION SERVICE MEMBER

STORED BUT NOT RETRIEVED?

If you think your resume has been lost in the memory banks, it's time to talk to Taurus. Taurus Associates utilizes the latest information storage retrieval techniques to assist its trained personnel counselors in finding the position and the salary to match your technical and managerial skills. Your resume will receive prompt, professional handling, and *you pay no fee.*

- Specialists in software design
- Information storage and retrieval
- Real-time application
- Operations research
- Urban planning
- Econometrics
- Behavioral sciences

Write Alan S. Linden, Vice President, or Call Collect 703/548–2103.

TAURUS ASSOCIATES
300 North Lee Street
Alexandria, Virginia 22314

An Equal Opportunity Employer

the data into a computer compatible form to drive the readout devices.

The Intercoupler can be rack mounted and stands 5¼" high, 19" wide and 17" deep. Typical operating speeds range from 10 characters per second to 100 characters (depending on the output device).

For more information, circle No. 12 on the Reader Service Card

* * *

Deibold Inc. announces the development of a **Data Safe** for the storage of magnetic tapes, disk packs, sensitive cartridges, micro-fiche, and EDP media. The Diebold Data Safe is a pressure-sealed, sleek-lined vault designed to protect and secure information that may have been collected over several years. It offers maximum security against fire and moisture with an allowable heat limit of 150° F.

An inner repository "floats" within the outer safe on a bed of insulating foam so that it won't touch the exterior walls. A pressure locking mechanism seals the insulated inner doors from heat and moisture. The outer wall is protected by a heavy wall of Monolite insulation, a material which leaves no space for heat to penetrate.

The safe has received labels of approval from the Underwriter's Laboratory and the Safe Manufacturer's National Association. It is available in two sizes with a variety of locking features.

For more information, circle No. 13 on the Reader Service Card

Synergistic Software Systems, Inc., of Houston, Texas, has announced the availability of **"FILEMAKE"**, a new program debugging and testing aid. This pretested software package gives application programmers the ability to automatically generate validating test data while reducing machine usage and program checkout time.

FILEMAKE validation is accomplished by using data subsets instead of entire "live" files. This feature saves machine time, provides a more thorough check-out of program logic, and saves programmer time by automatically isolating erroneous routines.

FILEMAKE is compatible with FORTRAN, COBOL, PL/I or ALC under DOS/OS, and allows specification of either fixed or variable length records, automatic data generation at the field level, controlled record repetition and reusable record structure. It requires 24 K bytes.

For more information, circle No. 14 on the Reader Service Card

* * *

LOGIC CORPORATION has announced the development of test equipment for use by programmers. The **Software Timing Checkout Unit** Model 1700 is offered to programmers designing real-time operating systems. It permits a complete statistical analysis of any program, routine or sub-routine. Time is measured in intervals of one microsecond up to ten milliseconds. The longest time that can be measured is 9.999 seconds.

The device measures five critical parameters: actual time period, longest time period to date, shortest time period to date, number of times the High Limit

Programmers— We know where you can find a better job.

Work in the most dynamic EDP community in the country where the nation's top companies are hungrily looking for skilled programmers. Like you.

Personal and professional growth is rapid. Salaries are high and the diversification of opportunities is unsurpassed.

We know, because Drew is New York's leading EDP placement specialist. We work closely with over 300 national companies headquartered here who have exciting programming and systems openings. Applications programmers, systems programmers, software programmers—are the people these companies need. Drew has been chosen to supply them with the necessary talent.

Send us your resume and we'll give you the inside story on all of these openings.

Do it today. This could be the start of bigger and better things.

DREW
Personnel Placement Center
160 Broadway, New York, New York 10038
Phone (212) 964-8150

Do You Know the Computer's Role in the Business World?

The applicant we seek has a sound knowledge of the computer applications field and applications programming, a general knowledge of business management functions, and would be excited about an active role in the development of a new management control system.

A college degree, plus experience in PERT and CPM, either as a designer or a user, is desireable. Documentation and the ability to prepare manuals are key requirements for this position.

For an interview and/or further information send resumé, including salary requirements to:

Mr. R. J. Nehring
UNIVAC
Dept. SA P.O. Box 8100
Philadelphia, Pa. 19101

SPERRY RAND UNIVAC

An Equal Opportunity Employer M/F

NCR

CENTURY SERIES

Dayton, Ohio

SOFTWARE DEVELOPMENT PROGRAMMERS: Will be involved in the creation of realtime, online major projects for commercial institutions. Involves the design of complete packaged software systems for various input/output routines. Experience in machine language or large file computer programming desirable. The software must be fully expansible to provide for any operating requirements of modern computer applications.

EDP PROGRAMMING WRITERS: Prepare technical manuals and sales material on new or modified systems, devices, equipment or installations. The material is to be used primarily by Customer Service Technicians and Field Personnel for training, reference, education and maintenance. Degree plus 2–3 years' experience in EDP writing.

APPLIED PROGRAMMING DEVELOPMENT: Programmers and systems analysts experienced in commercial, industrial, financial or retail applications programming. Positions involve working on 3rd generation equipment. Minimum of 2 years' programming or systems experience.

COMPETITIVE PRODUCT EVALUATION: This position requires preparation of written reports concerning the capabilities of competitive computer hardware and software; technical sales assistance by phone, mail or in person to the NCR field Marketing force and analysis of the computer marketplace of the future and development of strategies to take advantage of the market. An ideal background will include from 3 to 6 years' experience either directly in the evaluation area or in working with various types of computers; the ability to perceive salient features of computer systems and relate them to NCR products.

MANAGEMENT SCIENCES: Experienced Fortran programmer interested in the challenge of designing and implementing new Fortran compliers for conversational and realtime systems.

FOOD DISTRIBUTION ANALYSIS: Responsibilities would include the development of systems for use on the Century Series, with the results of total management information systems for food distribution industry. Experience in the area of food distribution is necessary. EDP background is desired but not required for consideration. Limited amount of travel.

PRODUCT PLANNING SPECIALIST: Will carry responsibility for design of realtime, online terminal systems for retail industry. Complete systems planning and development. Requirements include a background in software and a basic knowledge and understanding of hardware.

MARKETING PLANNING SPECIALIST: NCR's new CENTURY SERIES of Computers employ the latest state of the art in design, software development and aggressive marketing strategy. If you are experienced in marketing, marketing planning, or systems analysis and design with magnetic file computers, exciting challenges and rewards can be yours. NCR is growing rapidly and you can enjoy abundant opportunities to grow with it in preparing and implementing further marketing plans for already released and about to be released CENTURY Computer products.

SOFTWARE ENGINEER: Will carry responsibility for assisting in the formulation, specification, and evaluation of new NCR systems and equipment. This will also include the complete development, preparation and evaluation of software.

Reply in confidence to:

Mr. Ronald L. Lauterbach
Executive & Professional Placement
The National Cash Register Company
Main & K Streets
Dayton, Ohio 45409

AN EQUAL OPPORTUNITY EMPLOYER (M/F)

What do you want most?

- ☐ Respect
- ☐ Title
- ☐ Money
- ☐ Location
- ☐ Challenge
- ☐ Security
- ☐ Opportunity
- ☐ Fringes

Our nationwide survey in the Financial & EDP field revealed that employment desires were in the order listed above.

We can assist in finding exactly what you want in Financial or EDP employment. That's all we handle... we're the largest specialized source.

Fees Paid By Management

DISTRICT MANAGER Major Software Co.	$30,000
CORPORATE DIRECTOR M.I. Engineering/Construction Firm	30,000
MGR. SYSTEMS & PROCEDURES Quality Pharmaceutical	25,000
MGR. TELEPROCESSING SYSTEMS Strong Communications Exp.	20,000
EDP MARKETING REP. EDP/Software Services	20,000
MANAGER SYSTEMS Heavy EDP Experience	18,000
MANAGER PROGRAMMING Strong 3rd Generation Exp.	18,000
PROJECT MANAGER Feasibility/Sys. Design	18,000
SYSTEMS PROGRAMMER Compilers/Execs.	18,000
MGR. METHODS & PROCED. Dynamic Retail Co.	18,000
SCIENTIFIC PROGRAMMER Quantitative Background	17,000
SR. O/R ANALYST Mgmt. Sciences Group	17,000
PROGRAMMER/REAL TIME World-Wide Service Co.	17,000
EDP MANAGER Strong Conversion Exp.	15,000
SR. SYSTEMS ANALYST Major University	13,000
O/R ANALYST FORTRAN/LINEAR Prog.	13,000
PROGRAMMERS COBAL/BAL/PL 1	13,000
EDP INSTRUCTOR Knl. Programming	13,000
SYSTEMS ANALYST Expd. Brokerage	12,500
FORMS MANAGER Corporate Responsibility	12,000

Mail resume to your nearest R-H office.

ROBERT HALF PERSONNEL AGENCIES

Atlanta: 235 Peachtree St., NE	(404) 688-2300
Baltimore: One Charles Center	(301) 837-0313
Boston: 140 Federal St.	(617) 423-6440
Chicago: 333 N. Michigan Ave.	(312) 782-6930
Cincinnati: 606 Terrace Hilton	(513) 621-7711
Cleveland: 1367 East 6th St.	(216) 621-0670
Dallas: 1170 Hartford Bldg.	(214) 742-9171
Detroit: 1114 Guardian Bldg.	(313) 961-5430
Garden City, N.Y. 585 Stewart Ave.	(516) 248-1234
Hartford, Conn: 75 Pearl St.	(203) 278-7170
Los Angeles: 3600 Wilshire Blvd.	(213) 381-7974
Miami: 1107 Northeast Airlines Bldg.	(305) 377-8728
Minneapolis: 822 Marquette Ave.	(612) 336-8636
New York: 330 Madison Ave.	(212) 986-1300
Newark: 1180 Raymond Blvd.	(201) 623-3661
Philadelphia: 2 Penn Center	(215) 568-4580
Pittsburgh: 429 Forbes Ave.	(412) 471-5946
Portland, Ore: 610 S.W. Alder St.	(503) 222-9778
St. Louis: 1015 Locust St.	(314) 231-0114
San Francisco: 111 Pine St.	(415) 434-1900
Stamford, Conn: 111 Prospect St.	(203) 325-4158

World's Largest Financial & EDP Personnel Specialists.

has been exceeded, number of times the Low Limit has been exceeded.

With these five parameters, the true performance of a real-time program can be accurately predicted under all possible input conditions. Connection to the computer under test is simple. An internal quartz crystal clock guarantees high accuracy.

For more information, circle No. 15 on the Reader Service Card

* * *

The Model 520 Display/Keyboard and the Model 724 Control Unit are the first in a series of **data terminal systems** announced by Computer Consoles, Inc. These units, together with an optional printer attachment, local storage magnetic tape unit, and standard magnetic tape, provide a unique combination for handling computer input, output and terminal display requirements.

The system may be operated locally as an independent information handling unit or as a data terminal system when connected to a proximate or remote data processing facility via cabling or transmission lines.

The 520 Display has a 14-inch CRT with 11.25" x 5.75" viewing area. Twelve lines with 80 character positions per line give up to 960 flicker-free characters per display.

The solid state detachable 520 Keyboard contains positions for 26 alphabetic, 10 numeric and 23 punctuation and special characters. A single or continuous advance multidirectional Cursor Control provides operator guidance during the insertion, shifting or deleting of a character(s), line or entire display.

When the system functions as a data input unit, verification of keyboard data entry may be employed by entering data a second time. This data is automatically compared with the first and verified.

The Model 724 Control Unit contains a 960 character buffer core storage and logic for keyboard or data processing facility instructions, and an additional 240 character buffer for the printer. For data communications a 202 C Data Set or equivalent may be used. Transmission rate is 1200 baud. Code is 7 level ASCII.

For more information, circle No. 16 on the Reader Service Card

* * *

A new disk storage drive, the **ISS 701** has been placed on the market by Information Storage Systems, Inc. of Cupertino, California.

The minimum access time of the ISS 701 is 10ms., the average access time is 30ms., the maximum access time is 60ms., and the start up time is 15 seconds. The ISS 701 is said to have high reliability due to the use of an electromagnetic actuator and an electronic positioning control system. Also, electronics have been substituted for the least reliable mechanical parts, reducing particle generation and head-to-disk interference.

The 701 utilizes the IBM 1316 disc pack (or equivalent) as the storage medium and each pack has a storage capacity disk of 7.25 million bytes. Furthermore the 701 has a speed of 2,400 rpm, has 10 heads, and has 10 disk surfaces with a data transfer rate of 156,000 bytes per second. The operating environment for the machine is 60–90° F and 8–80% relative humidity.

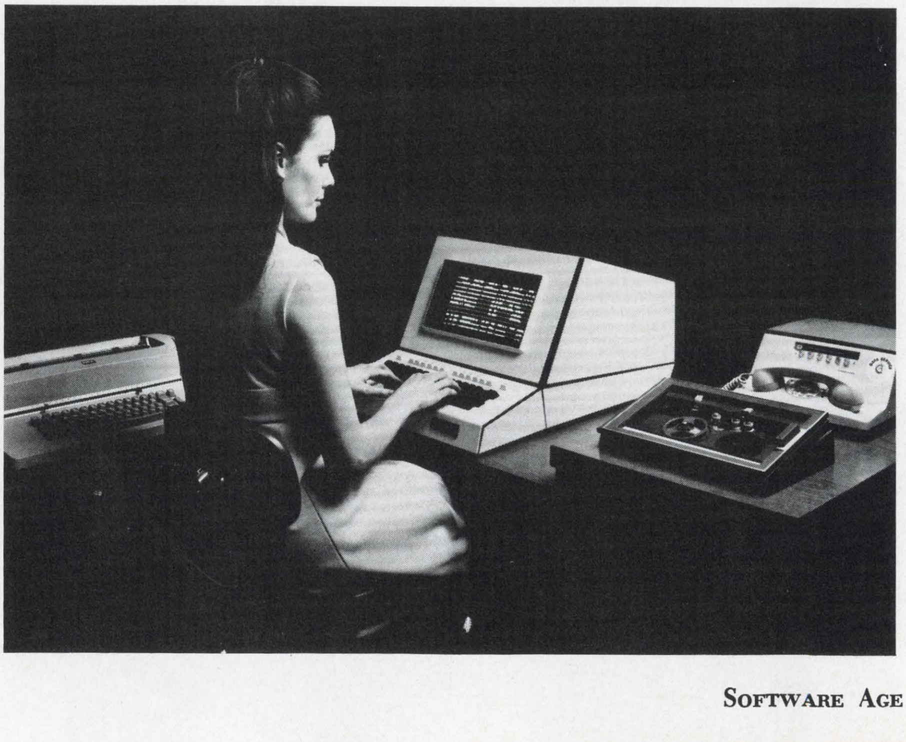
For more information, circle No. 17 on the Reader Service Card

* * *

A multimillion byte core memory plug compatible with IBM 360/50, 65 or 75 has been announced by the Los Angeles based Data Products Division of Lockheed Electronics Company.

The memory cycle time is 3.2 microseconds with an access time of 2.0 microseconds or less. The memory capacities are one-half, one and two million bytes for system 360 models. An additional feature of the Lockheed CM-300-LCS bulk memory plug is the provision that has been made for future expansion. A version for the IBM 360/67 time-share system is also planned.

For more information, circle No. 18 on the Reader Service Card



TROUBLE-TRAN PRESENTS XTRAN'S ADVENTURES IN FORTRAN

By GEORGE N. VASSILAKIS

Send your ANSWER to the problems posed here in each issue to:

TROUBLE-TRAN EDITOR

software age

P. O. Box 2076

2211 Fordem Ave., Madison, Wis. 53701

You can also profit by submitting PROBLEMS for this feature. If your problem is FORTRAN programming is selected for use in this feature, you will receive ---------- **$25.00**

TROUBLE-TRAN's Objectives:

1 To have fun.
2 To promote USA Standard FORTRAN by pointing out differences and inconsistencies of existing FORTRAN Compilers.
3 To alert programmers to the physical limitations of hardware.

Contest Rules:

1 The best answer (best explanation) bearing the earliest postmark wins -- **$25.00**
2 The second best answer with the earliest postmark will net the reader submitting it ---------------------- **$15.00**

PROBLEM OF THE MONTH

Submitted by Robert A. Howell

```
      DØ 100 I = 1,20
      If(I.NE.1.ØR.I.NE.3.ØR.I.NE.5) GØ TØ 100
      WRITE(6,101) I
  101 FØRMAT(5H I = ,I1)
  100 CØNTINUE
       WRITE(6,101) I
      STØP
      END
```

What values of I will be printed?

ANSWER TO LAST MONTH'S PROBLEM

The difficulty with this problem was that at execution time we would try to execute the statement 200 GØ TØ (101,102,101,102,101),K with K equal to —5.

Here is another area where FORTRAN compilers should do a little more to help the programmer. The most logical thing to do is to test the value of K and give a diagnostic if K is outside its range.

This problem was run on three different systems and here are the results:

CDC–6600

The following diagnostic was given at execution time:

ERROR, COMPUTED OR ASSIGNED GO TO STATEMENT

IBM–7094

The FORTRAN Compiler generates coding to test K for greater than 5 but not for less than 1. It uses an index register and the XEC instruction for branching to the various branch points. When XEC was executed with a —5 for K, it went back five instructions and executed the statement GO TO 400, which preceded the computed GO TO. Statement 400 was an arithmetic IF which in turn sent the program to statement 402 and printed the message given in FORMAT 8.

IBM–360

This compiler tests K and if it is outside its range it assumes K = 1 and executes the program without giving a diagnostic. If you try to complain you may be told that it is your responsibility to read (AND MEMORIZE) the manual, which clearly states that the compiler assumes K = 1 when K is outside its range. Of course, in a complicated problem you could have the wrong answers and never know that the index of a computed GO TO was outside its range.

P.S. If you feel that all compilers should generate coding to give better diagnostics at execution time please write to this editor so that you can be counted.

XTRAN

How to keep up-to-date in the swiftly changing computer world

In computer science, the fastest growing technology of our time, last year's knowledge can seem fifty years out of date. But the excitement and rewards of keeping up are great.
The question is, how? Thousands of executives, EDP managers, programmers and technicians have discovered the answer in The Library of Computer and Information Sciences.
Each month, this highly specialized and valuable book club screens hundreds of books, chooses only the most significant—essential reference books, important books on managerial techniques, programming, software, hardware, theory. Each represents the best and most advanced thinking in its subject. All are offered to you at discounts of up to 40% (sometimes more). For each four books you buy, you are entitled to your choice of a free bonus book. There is no better time-and-money saving way to get the books you *must* have to keep current—and to keep ahead in your field. With this special introductory offer, you have everything to gain by acting *now*.

70720. THE PROGRAMMER'S ALGOL. *Charles Philip Lecht.* Complete guide to ALGOL. Bridges gap between too-theoretical presentations and the needs of the practicing programmer. **$8.95**

56140. INTRODUCTION TO OPERATIONS RESEARCH. *Frederick S. Hillier and Gerald J. Lieberman.* Comprehensive survey of the basic technology and techniques of operations research, with emphasis on motivation and simplicity of explanation. **$14.75**

81870. SYSTEMS ANALYSIS: A DIAGNOSTIC APPROACH. *Van Court Hare, Jr.* A major work on a new discipline. Contains progressively more difficult examples and problems. Ideal for self-instruction. **$12.50**

39940. COMPUTERS, SYSTEM SCIENCE, AND EVOLVING SOCIETY: The Challenge of Man-Machine Digital Systems. *Harold Sackman.* A big, 638-page volume that takes a close look at the computer revolution: its origins and historical development, its potential for scientific planning and control of human affairs. **$14.50**

70710. PROGRAMMING: An Introduction to Computer Languages and Techniques. *Ward Douglas Maurer.* A remarkably lucid presentation of the *basic techniques of programming.* Describes operations of various manufacturers computers. **$11.50**

70350. AN INTRODUCTION TO PROBABILITY THEORY AND ITS APPLICATIONS — VOL. I. *William Feller.* A self-contained introductory course in probability theory. **$10.95**

39990. COMPUTER MODELING AND SIMULATION. *Francis F. Martin.* Lucid introduction to this powerful new technique. Discusses the practical and potential applications, the advantages, who should use it, and the criteria to apply. Clear and beautifully reasoned. **$12.95**

56300. INTRODUCTION TO COMPUTING. *T. E. Hull.* Highly useful new guide to algorithms, stored-program computers and programming techniques. Focuses on FORTRAN IV. **$10.60**

42060. DEVELOPING COMPUTER-BASED INFORMATION SYSTEMS. *Perry E. Rosove.* Comprehensive study of the new information technology. Examines development of systems. **$14.95**

42170. DIGITAL COMPUTER SYSTEM PRINCIPLES. *Herbert Hellerman.* A unified and authoritative overview of digital computer systems, many of which are common to programming, machine design, and problem description. **$13.50**

42370. DISPLAY SYSTEMS ENGINEERING. *Edited by H. R. Luxenberg and R.L. Kuehn.* Thorough exploration of the devices and systems of recording and displaying computer based information. Develops theoretical foundations and discusses their technological applications. Many illustrations and diagrams. **$16.50**

70790. PROGRAMMING SYSTEMS AND LANGUAGES. *Edited by Saul Rosen.* Outstanding review of computer software. Brings together the most authoritative articles on history of programming systems. **$12.50**

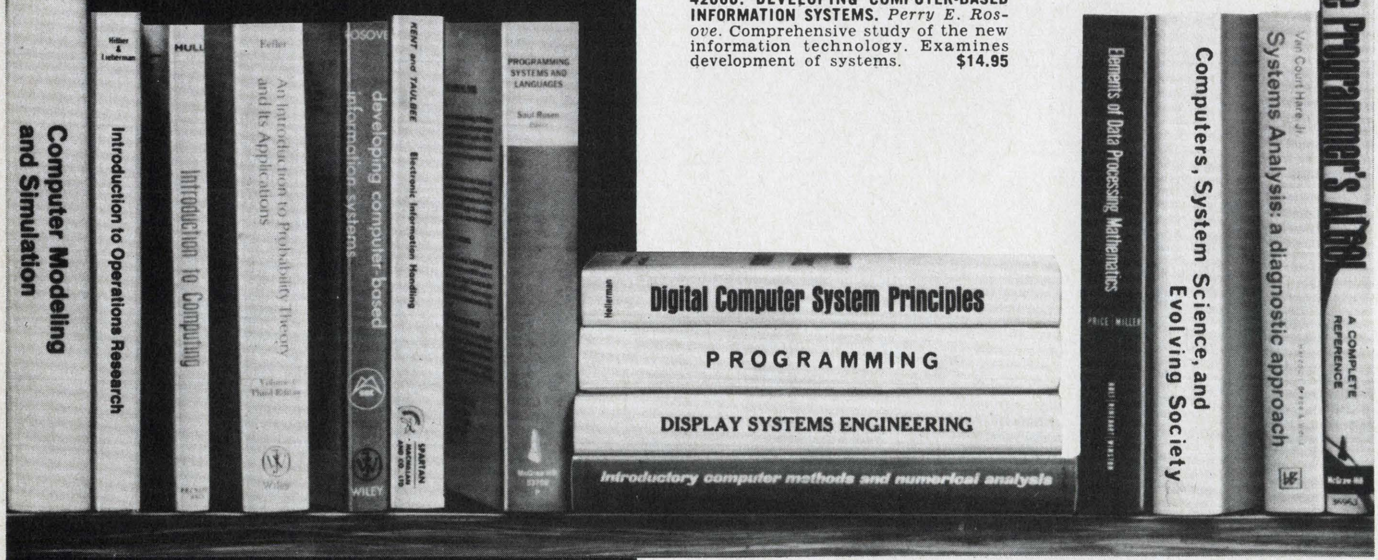
56490. INTRODUCTION TO COMPUTATIONAL LINGUISTICS. *David G. Hays.* An ideal volume for self-tuition. Book covers three levels—computational, linguistic and the level of the myriad of applications now or soon-to-be available. **$9.75**

41660. ELEMENTS OF DATA PROCESSING MATHEMATICS. *Wilson T. Price and Merlin Miller:* Enables readers with minimal math background to become proficient in math needed for understanding automatic data processing and computer programming. **$10.50**

44100. ELECTRONIC INFORMATION HANDLING. *Edited by Allen Kent and Orrin E. Taulbee.* Comprehensive overview of total information handling and retrieval. Includes interpreting signals and numerical information. **$11.00**

56410. INTRODUCTORY COMPUTER METHODS AND NUMERICAL ANALYSIS. *Ralph H. Pennington.* Covers most commonly used methods of modern analysis, stressing those of proven value in computer solution of science and engineering problems. **$9.25**

(Retail prices shown)



Special Introductory Offer:

Take any 3 (values to $46.20) for only $1.00 each

with a short trial membership in

The Library of Computer and Information Sciences

TRIAL MEMBERSHIP APPLICATION

The Library of Computer and Information Sciences
Front and Brown Streets, Riverside, N. J. 08075

Please enroll me as a Trial Member, and send the three books whose numbers I've filled in below. Bill me only $1.00 each, plus shipping. If I am not delighted, I will return the books within 10 days, and my membership will be cancelled. As a Trial Member, I need accept as few as 3 more Selections during the next 12 months, *always* at reduced Member's Prices, plus shipping. I understand that savings range up to 40%, and occasionally even more. Each month I will receive advance reviews describing forthcoming Selections, along with convenient form for requesting Alternate Selections or no book at all. For every 4 Selections purchased, I may choose a *free Bonus* Book. (This introductory offer counts as the First Selection).

Three Books—all for only $1.00 each *(write in numbers):*

________ ________ ________

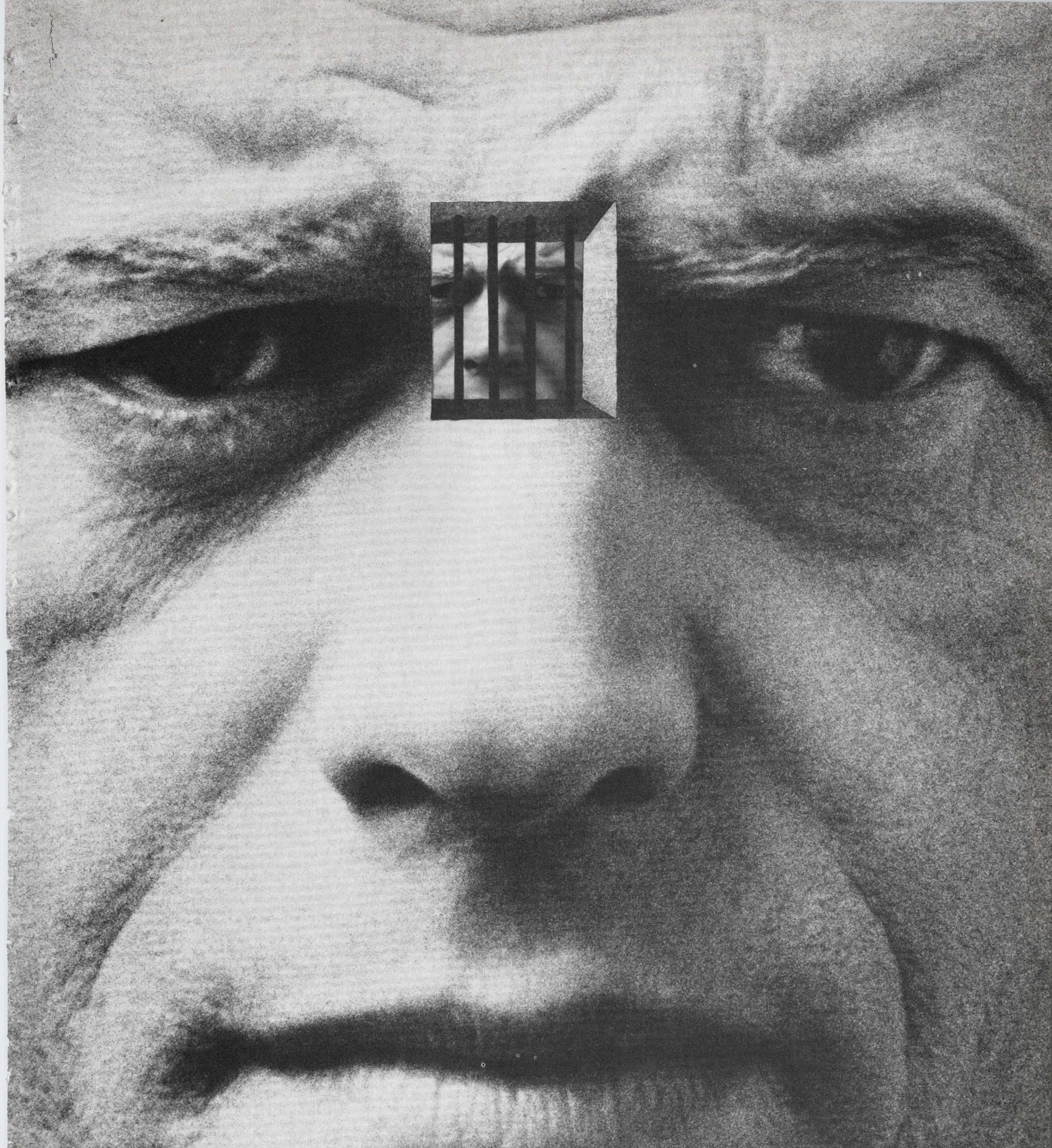
NAME..

ADDRESS...

CITY............................STATE...........ZIP CODE..........

Offer good in Continental U.S. and Canada only.
Prices slightly higher in Canada. 7-685

For more information, circle No. 4 on the Reader Service Card



If you're unhappy in your job, it's your own fault.

Well, it's not a bad job, you keep telling yourself. Puts the bread on the table. And yet . . .

And yet it's a big, exciting world beyond that self-constructed prison of yours. A world rich with possibilities for computer men.

And you know this.

But you don't do anything about it.

Contact us. The heads of this employment agency were computer men when the field wore diapers. They speak your language. They know the people. Their friends tell them where the jobs are.

Programmers, operators, analysts, consultants . . . no matter what EDP specialty you're interested in . . . they know someone who wants your talent.

Kick the apathy, why don't you. Today. Right now. If you're in prison . . . and we know the people who can get you out . . . what can you possibly lose by talking to us?

Fee paid. Call us collect . . . at either of our offices. Or send your résumé to:

DATA-TECH Specialists in computer people.
CHERRY HILL, N.J. 08034—Suite 515, One Cherry Hill. Call (215) 923-5690 or (609) 667-6446. Ask for Paul Donaldson.

market place where you can reach 127,000 programmers, mathematicians, analysts and EDP managers.

CLASSIFIED ADS in software age

CLASSIFIED ADVERTISING

Non-Display Classified: For firms or individuals offering commercial products or services, 75¢ per word (including name and address). Minimum order $7.50. For Blind Ad Service, an additional $10.00. For "Positions Wanted" Ads, 55¢ per word (including name and address). No minimum. **Payment must accompany copy** except when ads are placed by accredited advertising agencies. Frequency discounts: 5% for 6 months; 10% for 12 months paid in advance.

Display Classified: One inch by one column, $70.00. Column width 2¼". Photographs accepted for an additional $20.00. Advertiser to supply all photo, art, cuts, or camera ready copy.

General Information: One inch display Help Wanted and Employment Services ads **will be** accepted in the classified section. Employment ads ⅛ page or more will appear run of book, will be keyed to the resume form in back of publication, and will qualify to free daily resume service.

Closing Date: 1st of preceding month (for example, May issue closes April 1st).

Send order and remittance to: Classified Dept., SOFTWARE AGE, P. O. Box 2076, 2211 Fordem Avenue, Madison, Wisconsin 53701.

software age

P. O. Box 2076 • 2211 Fordem Ave. • Madison, Wis. 53701

CLASSIFIED ADVERTISING ORDER FORM

Please refer to the above information for complete data concerning terms, frequency discounts, closing dates, etc. Cash with order.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

______Words { @ 55¢ (Reader Rate) / @ 75¢ (Commercial Rate) } = $______

______Include Photograph @ $20.00 additional (**Display Ads Only**)

☐ Run Ad Blind $10.00 Insert______time(s) Total Enclosed $______

NAME______

ADDRESS______

CITY______ STATE______ ZIP______

Signature______

WORD COUNT: Include name and address. Name of city (Des Moines) or of state (New York) counts as one word each. Zone or Zip Code numbers not counted. (Publisher reserves right to omit Zip Code if space does not permit.) Count each abbreviation, initial, single figure or group of figures or letters as a word. Symbols such as 35mm, COD, PO, AC, etc., count as one word. Hyphenated words count as two words.

SA-5

The Classified Ad Department

HELP WANTED

PART TIME PROGRAMMERS/ANALYSTS with COBOL experience in such areas as management information systems, inventory control, accounting, personnel, or general manufacturing or information retrieval applications. Degree not necessary. All work will be corresponded through the mail on high contract rates. Send brief resume to Box SA-501, Software Age, P. O. Box 2076, 2211 Fordem Ave., Madison, Wis. 53701.

NEW AND GROWING JUNIOR COLLEGE 90 miles southwest of Chicago needs data processing instructor in two-year curriculum which trains programmers and programmer-analysts. Prefer Master's Degree and recent business or industrial experience. Bachelor's Degree and experience acceptable. Previous teaching experience not necessary. Salary to $16,000. Benefits include paid hospital and medical insurance, excellent retirement system, academic and cultural advantages of college community. Will join four-man staff in department. Contact Dr. John Hawse, Director of Tech.—Voc. Education, Illinois Valley Community College, Route 1, Oglesby, Illinois 61348.

EMPLOYMENT AND SEARCH COMPANIES

PROGRAMMERS **360 COBOL**
Jrs. $8-10M, Srs. $16-22M, Intermediates $10-15M
Contact R. Lowy who has had 10 yrs. exp. in programming & systems. We specialize in data processing placements. Resume not necessary. Co. pays entire agency fee plus travel expenses.
ERIN EXECUTIVE AGENCY
132 W. 34 St., New York, N. Y. 10001
Phone: (212) 594–8296

DATA PROCESSING POSITIONS IN THE SOUTHWEST
Contact:
DATA PROCESSING CAREERS
Richard Kemmerly, Suite 1109, Stemmons Towers West, Dallas, Texas 75207. 214/637–6360.

SYSTEMS DESIGNERS, Programmers, Analysts, Hardware and Software Development, Sales and Marketing. Business and/or scientific background. The Pittsburgh area has many K Fee Paid openings for challenge and opportunity. LIKEN Employment Service, Gateway #4, Pittsburgh, Pa. 15222. An Employment Agency.

POSITION WANTED

TRAINEE POSITION: Programming sought by travel specialist. Degree. Write Gabel, 530 Briar, Far Rockaway, New York 11691.

PROFESSIONAL SERVICES

CONSULTANT: Excellent experience designing, programming, debugging and documenting commercial applications. Hourly or job basis. Box 11-H, 272 First Ave., N.Y.C. 10009.

PROGRAMS converted to GE265 time share systems. Engineer will fix price any conversion and checkout. Send run from any machine to Compsultants, Box 1016, Huntsville, Alabama 35807. 205/539–7640.

EDP RESUMES: Eight page guide on how to write a successful job resume plus 5 sample resumes on EDP Personnel. Send $3.00 to K & H Associates, 4 Cobbles East, Elmira, N. Y. 14905.

CONSULTANT: Convert Autocoder to Cobol. Design program document commercial applications. Box 1501, Sunnyvale Calif. 94086.

RESUMES: $4.90 PER PAGE. IBM retyped and 100 copies professionally printed. Fast! Flairprint, 8 West 45th, New York City 10036 (YU6–9114).

CROSS-CORRELATION Confusion? Orthogonalize your data! Write for free information D2N4, 335 Pine Hill Road, Mill Valley, Calif. 94941.

PRODUCTS

ADD / SUBTRACT 6-DIGIT HEXADECIMALS in seconds with 100% accuracy. The pocket HEXADDER, $15. Free brochure from HEXCO, Dept. SA, P. O. Box 55588, Houston, Texas 77055.

CHECKMATE

(Continued from page 18)

Solution to Problem 7:

1 R–N1,P–R6; 2 R(N)–K1,K–N5; 3 R(K1)–K4 mate **or** P–Q6; 2 R(K)–N5,K–K5; 3 R(N1)–N4 mate

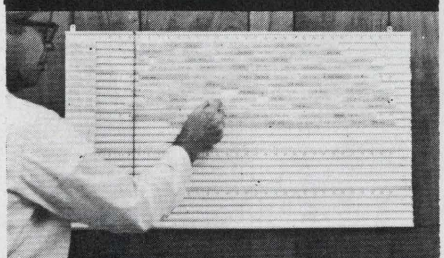
Solution to Problem 8:

1 Q–N1 threats 2 Q–R7ch,K–N5; 3 N–Q5 mate

1 Q–N1,K–R6; 2 Q–R1ch,K–N5; 3 N–R6 mate **or** K–N5; 2 N–Q5ch,K–R6; 3 Q–R1 mate **or** K–R5; 3 Q–R7 mate **or** B–B4; 2 QxB,P–N5; 3 Q–R7 mate **or** B–N5; 2 Q–Q4 etc.

VISU-TROL SOLVES SCHEDULING PROBLEMS

- Permits Easy Schedule Changes
- Shows Available Open Time Slots
- Expands Horizontally and/or Vertically with Additional Units



SEE AT-A-GLANCE

VISU-TROL™ SHOWS SCHEDULE OF:
- COMPUTER TIME • MANPOWER
- MACHINE LOAD • BUDGETS
- TRAINING SCHEDULES
- JOB ORDERS
- MATERIALS

$49.49
COMPLETE
including basic supplies

FREE: Complete System Brochure-Write Dept.SA-5

W (203) - 227-4111
WASSELL ORGANIZATION, INC.
25 Sylvan Road South, Westport, Conn. 06880
Wassell Systems Canada Ltd., Toronto

For more information, circle No. 5 on the Reader Service Card

A buck well spent on a Springmaid sheet

At Springs Mills, we believe "A buck is well spent on data processing"

Springs Mills' Data Processing Organization is located in Piedmont South Carolina, just 40 miles south of Charlotte, North Carolina — the hub of the Carolinas. Our EDP facilities support Springs' 20 plants in the Carolinas, as well as the Sales offices in New York City.

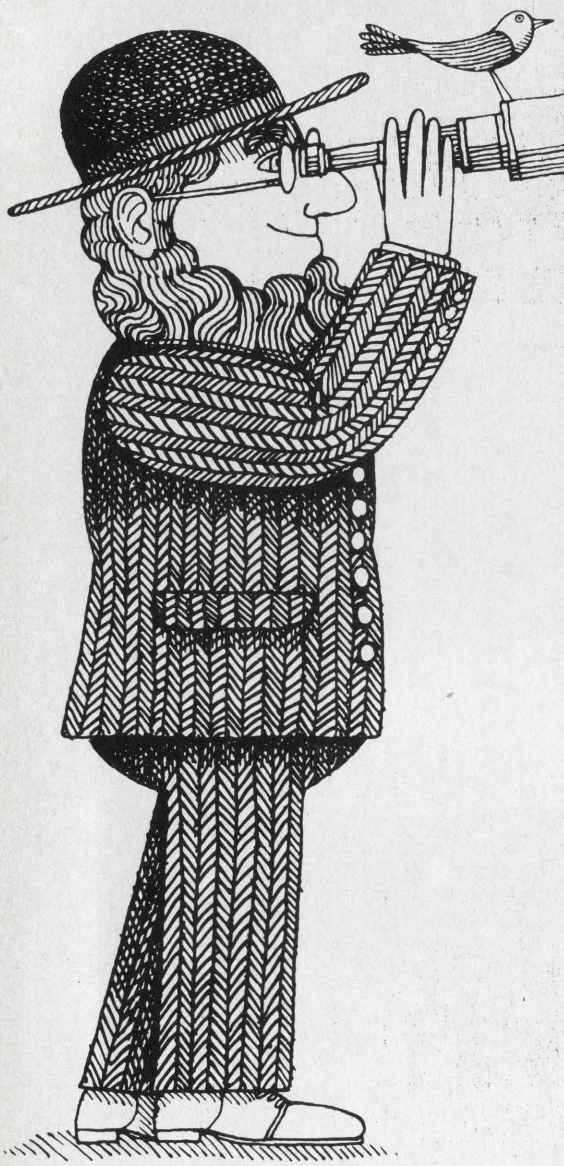
BUSINESS SYSTEMS ANALYSTS
Positions available for systems analysts with several years' experience in inventory control, production planning, quality control, cost control or financial analysis. Prefer degree in business or related field and experience in multiprogramming, direct-access storage device systems.

SYSTEMS PROGRAMMERS
Positions available for systems programmers who have a degree and at least one year's systems programming experience. Ideally, the candidates will know S/360 Assembly Language, COBOL, and will have worked with S/360 Operating Systems under MFT-2.

APPLICATIONS PROGRAMMERS
Several immediate assignments exist for applications programmers with 3rd generation programming experience. A college degree plus thorough knowledge of a high level programming language is the optimum requirement.

Springs Mills, Inc. SPRINGMAID FABRICS

If you want to see if there's a spot for you at Springs, send a resumé to Richard Russ, Manager of Recruiting, Executive Office Building, Fort Mill, S. C. 29715. Springs is an equal opportunity employer.



...A LOT OF COMPANIES ARE LOOKING FOR PROGRAMMERS.

at

LEEDS & NORTHRUP COMPANY

We're Looking for People

(are you one?)

It's simple, really. At Leeds & Northrup, we look upon our programmers as people first and programmers second. This is important — because the varied group of men and women who make up our Systems Programming section must work with many just as varied groups of people on the solution of a wide variety of problems. Customers, Systems personnel, Engineers from many diverse disciplines.

Our programmers are people working with people — and they represent the fastest growing group (doubling in size each year for the past three years) in a dynamic, fast growing company deeply involved in the application of large computer systems to the automation of industrial processes. Their work is seldom routine, never dull, always challenging — and as diverse as the problems we are called upon to solve.

Does this sound like you?

We Are Engaged in:

SOFTWARE DEVELOPMENT

—Real-time Executive Systems
—Time Sharing
—Language Development
—On-Line Compilers
And More

APPLICATION PROGRAMMING

—Direct Digital Control
—Systems for Steel Mills, Electric Power Networks, Steam Plants, Cement Plants, Chemical Processes, etc.
—Multi-Processor Systems
And More

WE OFFER BOTH MANAGEMENT AND TECHNICAL OPPORTUNITIES

LEEDS & NORTHRUP
SUMNEYTOWN PIKE
NORTH WALES, PA. 19454
An Equal Opportunity Employer

We need Programmers . . . with a degree in engineering, science or math . . . a minimum of one year of programming experience . . . three to six years of experience for senior positions . . . your experience should include real-time systems, executive system development and scientific programming . . . you must have the desire and ability to create.

Excellent starting salary, full company benefits, an intellectually stimulating working atmosphere and a picturesque, suburban Philadelphia setting are just some of the reasons you will enjoy growing with us here at Leeds & Northrup. We're people, too.

Our programmer managers will be at the SJCC in Boston—If you are going to be there call S. D. Davis, Jr. at the Statler-Hilton, 426-2000, for an interview appointment or leave your resume at the Software Age Resume Center in the Statler-Hilton Hotel and he will contact you at your Hotel. If you do not attend the SJCC then send him your resume c/o Leeds & Northrup Company, Dept. P-10, Sumneytown Pike, North Wales, Pennsylvania 19454.

As the size of systems grows, the implementation time grows and is laden with revisions. As the complexity of the system grows, the processing algorithms frequently become analysis and research efforts. The system design then becomes highly fluid and dependent upon these R&D outcomes. Management and the working analysts need some unit of systems design effort that can be scheduled, designed, and documented for independent evaluation. The Software Module can be designed and documented in just this fashion. In this form, the module can be the means of coordinating the various programs at an installation into something like a cybernetic whole. This paper addresses the problem of module design in a systems design context, including documentation and the management problems of visible progress, political priority and education.

Software Modulization

Part II

By Donald Ventner Mathusz

4.0 Module Design

The basic concept of a module involves a distinct processing function which is viewed as a closed system. The I/O passing over the boundaries of this system is rigorously defined in information content, allowable character sets and range; and field sizes and order per information block(s). The system design then consists of a net describing the modules as nodes and information flows between nodes. The concept easily enlarges to include material flows and sensors, exogenous inputs such as economic indexes and control loops with management intervention.

In the simplest case, one algorithmic function becomes a module. Whether this should be done constitutes a judgment decision influenced by available skills, scheduling and algorithm simplicity. In general, functions should be combined if they combine easily to produce one single parametric output. For example, if one algorithm is valid for one range of inputs but another must be looked to for output over the remainder of the input range, these two would generally be likely candidates for combining.

Separation of modules occurs naturally when outputs are transferred from core to cards or tape, or a time phasing occurs such as a forecast based on actual previous forecast error. Size and logic complexity should also be considered in breaking up systems into processing modules. About 100 to 200 Fortran or Cobol statements including subroutines are enough for most revisions programmers to cope with effectively. If the processing logic is complex, it would be well to decrease this size. Program complexity is difficult to define, and so best evaluated by the management and systems people who must live with the system. Another point of natural separation is an algorithm requiring R&D. Here, we can isolate the effect of its development from the remaining easier portions of the system by designing it as an individual module. This facilitates the scheduling of manpower skills, i.e., we can keep our novice programmer busy on the defined programs while our mathematicians and operation researchers attack the R&D.

4.1 Heterogeneous Modules Interface Control

When several diverse installations follow modulization, they may still have significant problems in merging their modules for the common good. We will assume high order machine free languages were used in module packages as described in this paper. The problem that still remains is heterogeneous modules, i.e., modules with incompatible intermodule information transfers in field size, arrangements, precision et al.

One solution approach that can be used is to write a set of buffer subroutines, preferably disk filed for use by the main line. They may be indexed by two numbers, the module output number and module input number. If no buffer were needed, i.e. the intermodules data flows are homogeneous, the reference could be to a common non-active dummy subroutine via a table.

When a heterogeneous data flow buffer subroutine is called by the main line, its function is to either transform, select or stop data flows such that only homogeneous data is processed. Some of the programmed decisions might be:

programmers • analysts

GROW

NATIONWIDE POSITIONS
FROM $7,000 TO $25,000
ALL FEE PAID

- SOFTWARE DEVELOPMENT
- SCIENTIFIC PROGRAMMING
- REAL TIMES SYSTEMS
- BUSINESS SYSTEMS
- COMMERCIAL PROGRAMMING
- MANAGEMENT INFO SYSTEMS

Send resume, in confidence, with present salary and geographic preference.

FREE: CAREER OPPORTUNITIES BULLETIN
For a complete listing of outstanding positions with national companies circle subscriber reader card using home address only. No obligation.

La Salle Associates
DEPT. A
719 N. 25th STREET, PHILA., PA. 19130

For more information, circle No. 6 on the Reader Service Card

ANALYSTS
PROGRAMMERS
LOCKHEED

has immediate positions available at our facility in Hyattsville, Maryland (suburban Washington, D. C.) which offers a challenging aerospace environment and outstanding company benefits. Two or more years' experience (a degree is desirable) in any of the following:

- TELEMETRY DATA REDUCTION
- AUTOMATIC LOGISTICS SYSTEMS
- STATUS MONITORING, TESTING AND PERFORMANCE EVALUATION OF COMPLEX REAL TIME COMPUTER SYSTEMS
- NETWORK SCHEDULING

Please forward your resume in confidence to Mr. H. F. Fey, Engineering Service Division, LOCKHEED ELECTRONICS COMPANY, U. S. Highway 22, Plainfield, New Jersey

LEC

an equal opportunity employer

(a) Transform the data flow to homogeneity if possible and record alterations.
(b) Select the data which is homogeneous and flag operator, and print decisions concerning rejected data, e.g., values outside of permissible range.
(c) Flag the operator via real time upon problem status, and allow operator to make decisions in questionable cases.

The displays given the operator via scope, console typeout or other can be standardized along the module documentation lines listed in 4.0. The display routines are, of course, subroutines callable through the main line on a priority basis.

5.0 Module Documentation

We require two levels of documentation to keep our system in order. The higher level follows the system design net, where every node denotes a module. This master system design plan then can serve as an index of access to the documentation of the individual module nodes. The nodes (modules) will be numbered and these numbers will connect the documentation between system and module plans. The cover sheet on the module documentation serves as its identification and index to other module or system interfaces.

The detail of the system software must always be clear and easily accessible to the working programmers and systems people to achieve the shortest revision time. When these people (perhaps new to the system) must spend as much time studying the program to make revisions as the original programming took, I think we can all agree we have a real problem.

The final important execution of this concept is the documentation of the module. This should follow a standard format and be executed while the programming is in progress and as each decision is made. The document's completion should

Data Specifications: 1 2 3 4 5

Element

Data Flow No.	Name	"I" Input, "O" Output	Field Size-Positions	Format Reference	"A" Alpha, "B" Binary, "D" Del.	Variate Range—Low	Variate Range—High	"D" Discrete, "C" Continuous	Code Ref. Set No.	"C" Card, "T" Tape, "D" Disk	Label Ref. Tape/Disk	Tape Channel: No.	Tape Density	Disk Reserve Ref. No.	Data Age Validity	Other Reference No.
1																
2																
3																

Table 1.

Superior Positions for Superior People

The present shortage of qualified individuals has caused several leading companies in the Chicago area to offer as much as $16K to Programmers, $22K to Systems Analysts, $25K to Salesmen, and $30K to EDP Executives. We know where the best opportunities are located. If you are contemplating a move in the near future, let one of our IBM-trained professionals go to work for you. Write to Bill Leinbach, an ex-IBM Systems Engineer, or complete the confidential inquiry form in this magazine. If you want to develop a new resume, circle our number on the reader service card and we will send you a Sample Resume with our compliments.

ACP
AMERICAN COMPUTER PERSONNEL, INC.
430 N. MICHIGAN AVENUE • CHICAGO, ILLINOIS 60611
(312) 729-0610
Management Consultants • All Fees Paid by Client Companies

For more information, circle No. 7 on the Reader Service Card

be the milestone ending the programming activity associated with any particular module.

There are several devices which can be used to keep the actual writing time of the analyst down, e.g., checkoff matrices. The remainder of this paper will be used to show a suggested format for the documentation.

5.1 Cover Sheet—System Interface

The cover sheet should be used to identify this module's place in the total system mix of the installation.

Item	*Comments*
a) System Name	Descriptive of System's Function
b) Module Function Name and Number	Descriptive of Module's Function within the system
c) Language Specifications	Include Level and Complier Revision Specifications
d) Machine & Peripheries requirements	Machine name, Core size, disks, tapes et al. actually required to operate this module
e) Input Source List	This list names each input to module by name and lists the system and module by names and numbers that it comes from. This includes non-EDP sources.
f) Output Sink List	This list names each output and the corresponding user or user system and module by name and number.

5.2 Exogenous Module Data Flow

The next section is concerned with specifying fully the exogenous and endogenous information flows of the module listed in *e* and *f* above. Much of this can be set up in a matrix format as shown below in *Table 1.*

Some Data Specifications need more detail than can be contained in a matrix such as *Table 1.* The numbers at the head of the columns reference this kind of situation. An explanation of this with a suggested format for their elaboration is given below.

Element	*Specification*	
1	1	This item would reference an actual format layout sheet showing the arrangement of fields required in the data flow.
2	1	Etc.
3	1	
1	2	This item indexes a code reference set. This is, if letters or numbers, etc., are used to denote categories of information, their definition is done here in a list format.
2	2	Etc.
1	3	The label reference notation is used to identify the actual labels, headers and trailers required in tape and disk operations.
2	3	Etc.
1	4	The disk reserve numbers denote the specific areas upon the disk that are reserved for this information.
2	4	Etc.
1	5	Other detailed requirements may have to be spelled out in a format requirement needing more room than that supplied by the matrix. For example, report format samples could be included here.

COMPUTER PROFESSIONALS:
"HOWARD LEVIN IS PROBABLY THE WORLD'S BEST QUALIFIED* EDP EMPLOYMENT AGENT"

*MBA, Personnel management; 5 years industrial personnel experience for a major electronics and computer firm; 5 years hands-on computer programming and systems analysis experience; Director and placement counsellor for RSVP SERVICES since 1966.

His personal services are *free* and *convenient*. Why settle for less?

SERVING
PHILADELPHIA, NEW JERSEY, NEW YORK
CALL COLLECT: N.J. (609) 667-4488
PHILA. (215) 922-3993

(24 HOUR LIVE ANSWERING SERVICE)
or send resume or rough notes of objective, salary, education, and experience to:
RSVP
HOWARD LEVIN
Director, Dept. S
RSVP SERVICES
ONE CHERRY HILL MALL (Suite 714)
CHERRY HILL, N.J., 08034

Recruitment, Selection, Vocational Training, Placement for Computer Oriented Companies

Lawrence Radiation Laboratory, with over 5700 employees, is located in the San Francisco Bay Area and is engaged in virtually all phases of nuclear research and development. Openings now exist for:

ADMINISTRATIVE PROBLEM PROGRAMMER

Work as a member of a team responsible for identifying, defining, and fulfilling the administrative information requirements of the laboratory. A working knowledge of COBOL desirable.

COMPUTER SYSTEMS ANALYST

Participate in the development of a third generation-oriented Management Information System using the latest hardware and software development. We are currently working on the accounting, supply, and personnel portions of this system. Experience with COBOL and disk operating systems desirable.

Opportunity exists for rapid personal and professional growth. Independent thinking and creativity are prerequisites. Minimum of BA or BS, preferably in business, accounting, or economics.

For more information, please submit your resume to Mr. John Gloekler, Personnel Department, P. O. Box 808, (65–59), Livermore, Calif. 94550.

Lawrence Radiation Laboratory
UNIVERSITY of CALIFORNIA

An Equal Opportunity Employer
U. S. Citizenship Required

PROGRAMMERS

BOLD CHALLENGES IN DATA PROCESSING!

The name of the game is "Do a better job—faster!" We play it all the time at the Army Air Force Exchange Service—the civilian organization which serves the Armed Forces personnel through "PX" and "BX" outlets—where we seek more and better EDP information to improve our performance in retailing!

If you enjoy a challenge, and the opportunity to show what you can do with excellent equipment and professional associates, *your route to success may be with us!* We need:

COMPUTER PROGRAMMERS

You'd be writing specific programs to organize and process our management information by the most rapid and meaningful methods.

Our EDP division is fully equipped with 360 MOD 20/30/40 Disk/Tape/Card systems using ALC or COBOL, and staffed with real professionals who know how to use them!

$9,000–$10,000

You'll need a degree in computer science or its equivalent, plus at least one year of 360 experience.

In addition to a good starting salary, you'll receive outstanding fringe benefits, including life insurance, family coverage in our hospital–medical–surgical plan, liberal vacations, sick leave, retirement programs, and opportunity for advancement and promotion throughout our worldwide network. We try to promote from within—so you have an opportunity for great personal growth!

Relocation expenses will be paid.

If you qualify, AIRMAIL your resume, which *must include* SALARIES EARNED, to:

MR. M. W. CARTER
DEPT. 5-S

ARMY AIR FORCE EXCHANGE SERVICE

3911 Walton Walker Blvd.
Dallas, Texas 75222

(You will be contacted within two weeks.)

Equal Opportunity Employer

5.3 Endogenous Module Data Flow

The next area of definition is that of the internal data flows. This may be considered less critical in the sense that these internal flows are controlled wholly by the programming within the module itself. A suggested format for these is given below.

a) *List Definition:* This list uses the actual program name symbols and then defines the information content.

b) *Parameters and Constants:* This is a list by name and definition of values used in the module which are fixed and have some physical or legal meaning.

c) *Subroutines:* This list contains all the subroutines, and an explanation of the function should be given here.

d) *Algorithms:* This names and describes the function of all algorithms used in the module together with the assumption(s) involved.

e) *Where used matrix:* This matrix shows the location of any of the above items within the module.

5.4 Revision Documentation

The next group of information needs is related to revisions. This includes the revision history, program listings and sample example problems and core dumps if relevant.

a) Compiling time estimates.

b) Program listing.

c) Sample problem and running time.

d) Important key logic statements or other notes for the revision programmer.

e) Revision History: Each revision should be noted by date, authority and any notes relevant to it. If tables or other lists are affected, this should be so annotated on them with date, revision number and initials of the revision programmer. In some cases it may be better to add a new sheet. When this is done it should be marked as to its status just as the above changes and the old sheets kept for history but stamped obsolete.

SYSTEMS ANALYSTS AND PROGRAMMERS

Have you investigated the challenge and financial rewards of association with the Computer Services Division of

CDI

Our Computer applications organization provides both business and scientific data processing services at every level. Opportunities are nationwide and offer extremely attractive compensation.

We invite your resume
Or Call R. N. Cherwinski
(215) 569–2200
for further details.

CDI COMPUTER SERVICES

Div. of Comprehensive Designers, Inc.
Department SA-3
#4 Penn Center Plaza
Philadelphia, Pennsylvania 19103

An Equal Opportunity Employer

!

PROGRAMMERS SYSTEMS ANALYSTS

Nationwide

With the recent introduction of Time-Sharing to our unique Total Information Market Evaluation Systems (TIMES) Input, Inc. through our staff of trained consultants is able to bring the complex and ever-changing computer community into remarkable focus. In the development stage for nearly a year and now fully implemented TIMES can lock in the myriad complexities of your specific career requirements with a speed and accuracy unparalleled in the field.

Fields covered include digital hardware design, systems analysis and programming of software, management information systems, and a variety of sophisticated scientific and commercial applications. We welcome your inquiries. Contact Mr. Lincoln Bouvé or Mr. James Linker at 202/298–7510 for additional information or submit resume in confidence. Client companies assume all fees.

input, inc.

815 connecticut avenue, n. w.
washington, d. c. 20006
e.o.e./mf suite 1200

6.0 Summary of Module Uses

The problems and solutions discussed in this paper are not unique. The software module is used more or less by many systems analysts and systems designers. What this paper contributes is an analysis of the full range of usefulness of this concept from revision programming to management control. Below we itemize the particular points presented in this paper.

a) Vehicle of implementing system parts for Visible Progress.

b) Vehicle of implementing system parts for Political Priority.

c) Vehicle of implementing system parts for management information and education.

d) Scheduling Unit of independent work and management control.

e) Vehicle of implementing system parts for Cost/Profit Priority Analysis.

f) Basis for a master systems design toward a total system goal.

g) Basis for a standard documentation.

h) Basis for revision programmer's quick access to the system.

Bibliography

Very little seems to have been written about computer systems documentation as it affects the organization and management policy or how it is affected by the mode of system design in use. There are of course very specific bulletins about flow charting et al. generated by hardware manufacturers. There seems little point in listing these. A few papers and books bear on portions of this discussion, and so are listed here.

1. Bennett, Degan, Spiegel, Editors, *Military Information Systems.* Praegor, 1964.
2. Martin, James, *Programming Real-Time Computer Systems,* Ch. 26, pp. 334–345. Prentice-Hall, 1965.
3. Povlack, S. L., *The Role of Data Input in ADP Systems,* RAND, RM2681, December 1960.
4. Van Horn, R. L., *Systematic Methods for Programming Simplification,* RAND, P2447, September 1961. ■

EDP

- Programmers
- Analysts
- D. P. Management

CLIENT COMPANIES ASSUME OUR FEE

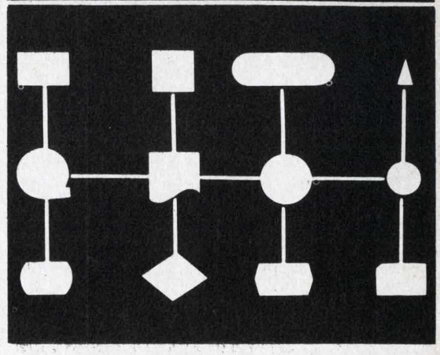
Fast, Efficient, confidential service to individuals seeking new positions in the field of data processing. Call, write or visit one of our offices. Data Processing Placement since 1959.

Computer Personnel Agency, Inc.

LORNE EVJE
12 Geary Street
San Francisco, Calif. 94108
Phone: 982–0840

NATIONWIDE DATA PROCESSING OPPORTUNITIES

PERT–PROGRAMMING



MAGNETIC SYMBOLS

Reduce Work and Speed Operations for

- SYSTEMS ANALYSTS
- PROGRAMMERS
- METHODS SPECIALISTS

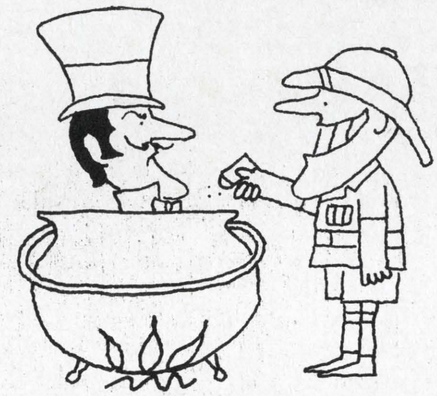
MINUTEMAN Magnetic Symbols provide fast, simple and highly visual means of handling PERT, flow charts, diagramming and scheduling problems. Made of sturdy Vinyl "write-on" plastic, in colors. Symbols are easily marked with grease pencil and wiped off. Last indefinitely. The ultimate in convenience, efficiency and economy.

Write for FREE catalog on the most modern and flexible visual programming and scheduling systems.

MAGNETIC AIDS, INC.
11 WEST 42nd STREET, NEW YORK 36, N. Y.

For more information, circle No. 8 on the Reader Service Card

How to handle a head hunter



The trick is to turn the interview to your advantage. To wit: what are *his* qualifications for assessing and marketing your own? Is *he* willing to discuss his own education and experience? Can he talk intelligently in the entire realm of edp? Does he know of all the various opportunities in terms of geography and potential?

We welcome this kind of trial by fire. Moreover, we can promise some interesting answers. Our prime function is providing a full range of services to the edp community. Part of the "package" is head hunting *on* a high level. We know the better openings—the kind you probably wouldn't hear about otherwise.

If you'd like to tap in, we'd like to hear from you.

DMS

Data Management Services, Inc.
1515 Locust Street, Philadelphia, Pennsylvania 19102 • 215-546-0901
31 Lewis Street, Hartford, Conn. 06103 • 203-246-7481
8 W. 40th Street, New York, N.Y. 10018 • 212-736-5600
55 William Street, Wellesley, Mass. 02181 • 617-237-3220

We've got a new Programming Laboratory

Our rapid expansion made Hughes a leader in real-time software systems. Now it makes possible 118 unusual career opportunities.

We're busy in software development in many areas: Tactical Control, Air Defense, Military Management Information, Radar Control, Weapons Control, and Intelligence.

Our customers are the U.S. Air Force, Navy and Army, and the governments of Switzerland, Japan, and the NATO nations.

Hughes software people are Analysts, Programmers, System Engineers, and Test Engineers. Our software products include operational programs, operating systems, utility programs, and all required test and diagnostic programs.

Few companies can offer this total involvement in all phases of real-time system development.

Interested? If you have real-time systems experience, please airmail your resume (in confidence) to: Mr. R. S. Roth at the address below. We promise an early response.

Attending the SJCC? Call us at (617)-482-0205 or visit us at the Somerset Hotel during the Spring Joint Computer Conference (May 14-16) to discuss your future with members of our Staff.

HUGHES
HUGHES AIRCRAFT COMPANY

Now we need 118 more programmers.

Hughes Ground Systems Group

P.O. Box 3310A, Fullerton, Calif. 92634
U.S. citizenship is required • An equal opportunity employer—M & F