software age

MARCH 1970

Conference Countdown

MARCH

23–25 INFO–EXPO–70, Washington, D.C. Contact: Paul Zurkowski, Information Industry Association, 1025 15th St. N.W., Washington, D.C. 20005.

23–26 IEEE International Convention and Exhibition, New York, N.Y. Contact: IEEE, 345 E. 47th St., New York, N.Y. 10017.

25 QUEST—Symposium Exposition of Time-Sharing Systems & Techniques, Los Angeles, Calif. Contact: Merrill Goulding, 4612 W. Jefferson, Los Angeles, Calif. 90016.

APRIL

1– 3 Mathematical Software Symposium, Purdue University. Contact: Prof. John R. Rice, Math Science 428, Purdue University, Lafayette, Ind. 47907.

3 Computer Graphic Workshop, Association for Computer Machinery, Rosslyn, Va. Contact: Spec. Int. Group for Graphics, Box 933, Blair Station, Silver Spring, Md. 20910.

3– 4 Involvement of Computers in Solving Problems in the '70s, Sacramento State College. Contact: Jacquelyn Todd, 3201 Mayer Way, Carmichael, Calif. 95608.

7– 9 Computer Software and Peripherals Show and Conference, Western Region, Los Angeles, Calif. Contact: Show World, Inc., 37 West 39th St., New York, N.Y. 10018.

8–10 Numerical Control Society, 7th Annual Meeting and Technical Conference, Boston, Mass. Contact: NCS, 44 Nassau St., Princeton, N.J. 08540.

29–30 15th Annual DP Conference, Birmingham, Ala. Contact: Univ. of Alabama, Anyan Gordon, CES, P. O. Box 2987, University, Ala. 35486.

MAY

5– 7 S.J.C.C., Atlantic City, N.J. Contact: AFIPS, 210 Summit Ave., Montvale, N.J. 07645.

13–15 Association for Educational Data Systems, 8th Annual National Convention, Miami Beach, Fla. Contact: AEDS, 1201 Sixteenth St., N.W., Washington, D.C. 20036.

29 10th Annual New England Systems Seminar, Newton, Mass. Contact: Thomas F. Cavenaugh, Jr., Keane Assoc., Inc., 36 Washington St., Wellesley, Mass. 02181.

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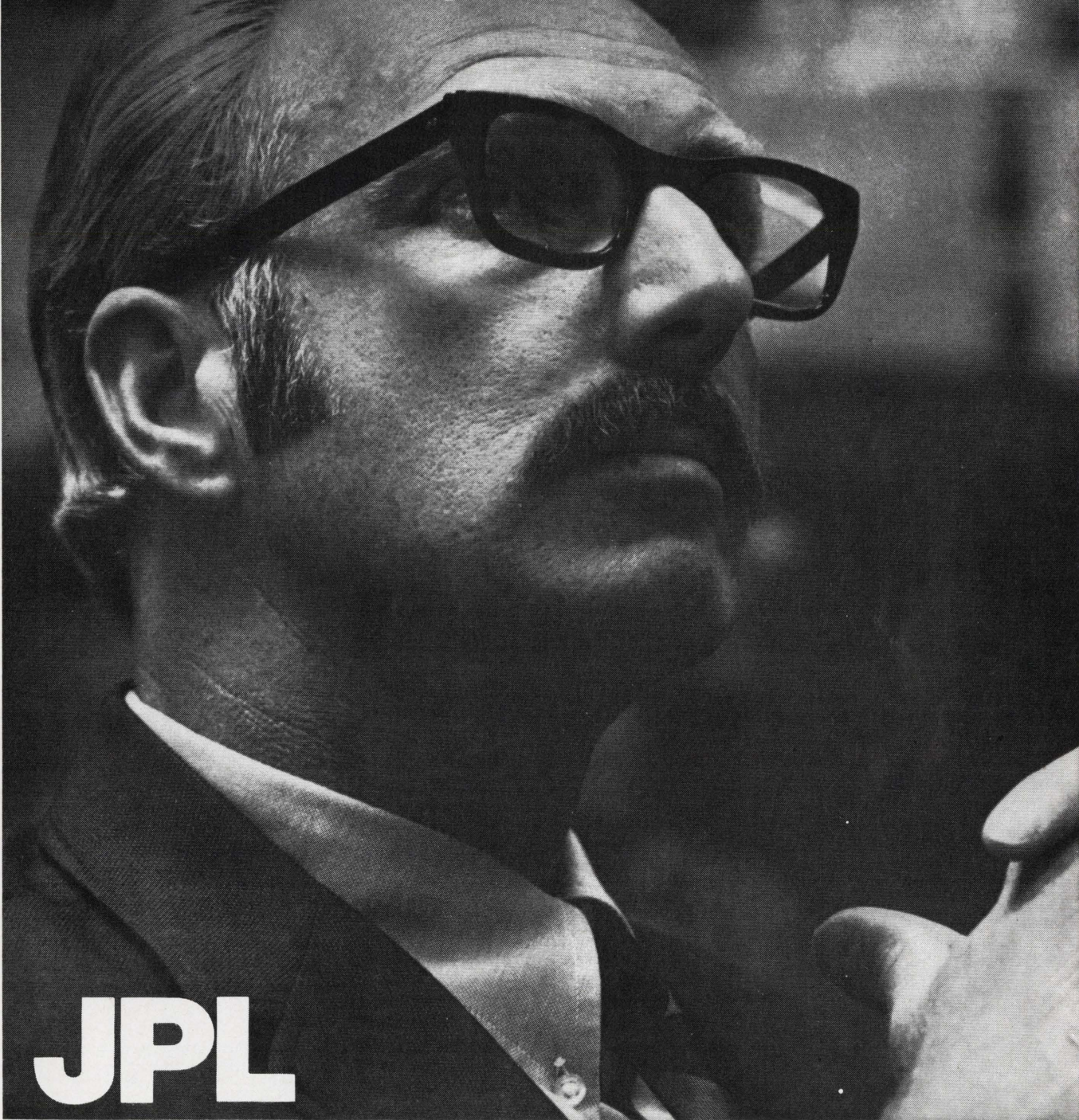
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Problem 23: Automorphic Numbers

An *automorphic number* is a number whose square ends with the given number: 5,6,25,76,376,625,9376.

Automorphic numbers are found in pairs, and only one pair exists within the range of numbers with the same number of digits. For example, 376 and 625 are the only three-digit automorphic numbers. Notice that the sum of corresponding digits (except the last) equals 9. Also, notice that when the first digit is 9 there is no other automorphic number with the same number of digits.

Until a few years ago, the total number of automorphic numbers was 29, and the largest pair had 17 digits. Today, the record is 167 automorphic numbers and they are all included within a pair of numbers 100 digits long. Can you break this record without spending a million dollars in computer time? The sum of $50.00 will be awarded to the first one who breaks this record prior to May 1, 1970. If the record is not broken, five 10-dollar prizes will be awarded to the best five solutions.

Answer to Problem 21: Factorials Revisited

This problem was enjoyed by many. Over 250 solutions have been received and the mail is still coming heavy. The number of non-FORTRAN solutions has increased to the point where the name "XTRAN'S ADVENTURES IN FORTRAN" is no longer appropriate for this column. Suggestions for a new name will be appreciated.

About two thirds of the solutions were in FORTRAN. The shortest FORTRAN solution had 12 statements and the longest had more statements than I could count. The best FORTRAN solutions were submitted by H. W. Stewart of Dayton, New Jersey and W. B. Howard of Los Angeles, California. However, the best solutions were written in SYMBAL, LISP 1.6, APL, STRINC, FORMAC, and MADCAP.

SYMBAL was developed by Dr. Max E. Engeli of Zurich, Switzerland and is now running on a CDC 6600 at the University of Texas. LISP 1.6 was developed at Stanford University. APL as most of you know was developed by IBM and uses Iverson's notation. STRINC is implemented on a PDP-6 at MIT. FORMAC is an IBM language. MADCAP is implemented on the MANIAS II Computer at Los Alamos, New Mexico. Here is the entire MADCAP program:

```
(200 digits) N = 1
for i = 2 to 100: N x i →N
print:N
stop
```

In case you wonder what other languages are available, here is what I found in my mail the last few days: ALGOL, FOCAL, COBOL, TRAC, BASIC, LAP-6, XTRAN, PL/I, STRCOMP, BIICAL, CS-1, BAL, SNOBOL4, COMPASS, AUTOCODER, EASYCODER, CPS, SPS, RPG, INTERCOM, and the WIZARD. What, no OZ?

Computers used ranged all the way from a Friden 5610 to the CDC 6600. Some SNOBOL4 programmers solved this problem the easy way; they simply copied the solution from page 203 of "The SNOBOL4 Programming Language", a Prentice–Hall publication. However, the large number of statements (over 30) indicates that SNOBOL4 is not the language to use for this problem.

Very often, the number of statements reflects the ability of the programmer and not the limitations of the language used. Even though the average PL/I solution was 20 statements, one reader of this column went overboard with over 500 statements.

Several readers computed 1000! and one quit at 2500!. It sure is nice to have that kind of computer time available to you.

P.S. $1000! = 4.02 \times 10^{2567}$ $2500! = 1.6288 \times 10^{7411}$ XTRAN

Winners of Problem 21 Chosen at Random and Receiving $10.00 Each

Barry Poulson, Com-Share, P.O. Box 1588, Ann Arbor, Michigan 48106
D. A. Stevenson, IBM B63/706–1, Poughkeepsie, New York 12602
John V. Andrisan, 2637 E. Walnut Ave., Orange, California 92667
Amy Perlman, General Analytics Corp., 545 Fifth Ave., New York, N.Y.
Leon R. Henry, Colorado Interstate Gas Company, P.O. Box 1087, Colorado Springs, Colorado 80901

$50.00 for submitting the December problem: J. L. Robert Zerby, 908 East Mount Hope, Lansing, Michigan 48910

$50.00 for submitting the February problem: Mario DeNobili, Polytechnic Institute of Brooklyn, c/o Box D, 333 Jay Street, Brooklyn, N.Y. 11201
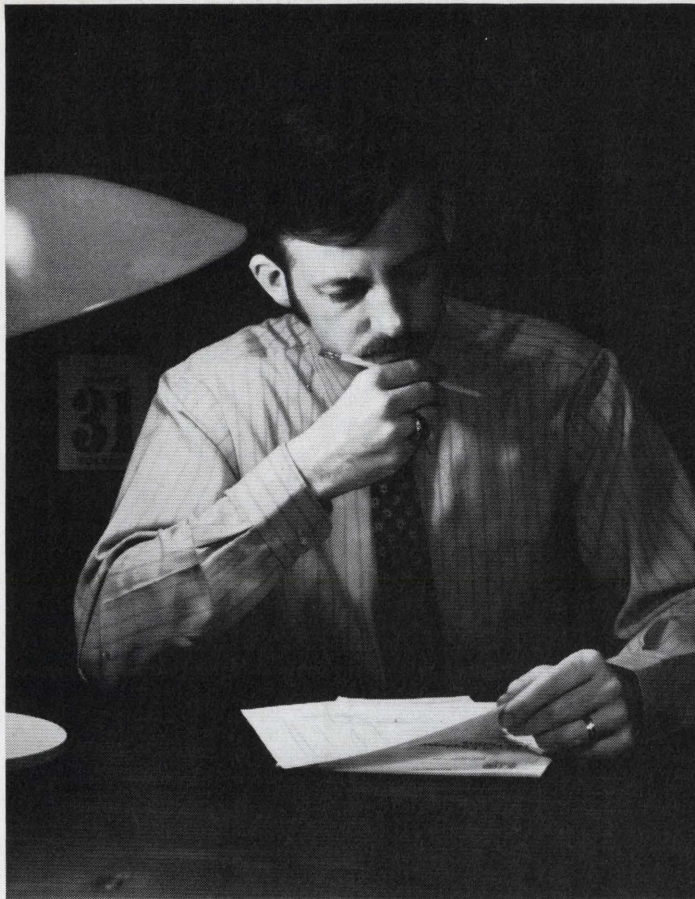
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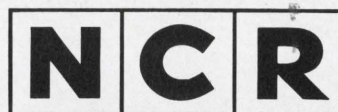
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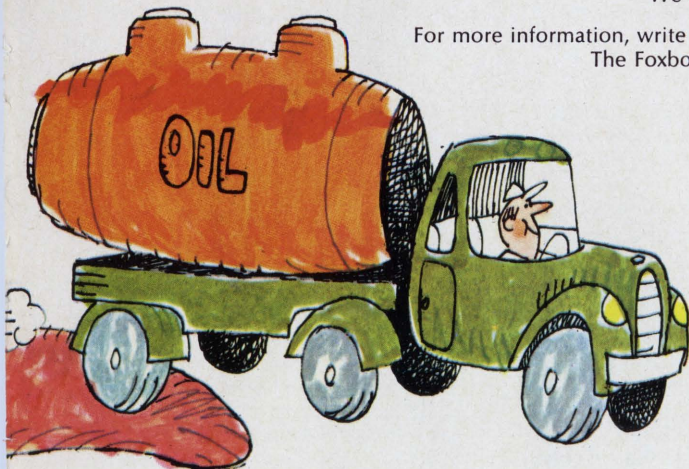
Two Approaches for Measuring the Performances of Time-Sharing Systems

ARNOLD D. KARUSH

System Development Corporation

There are two significantly different approaches that can be used for measuring the performance of time-sharing systems. The "stimulus" approach which conceptualizes the system as a "black box" containing a limited number of known functions, involves applying a controlled set of stimuli to the black box in order to activate its functions, and then observing the results. In the "analytic" approach, probes are inserted into the system to allow the recording of any level of the system's behavior. Both approaches are being developed for, and have been used to measure, System Development Corporation's ADEPT time-sharing system.
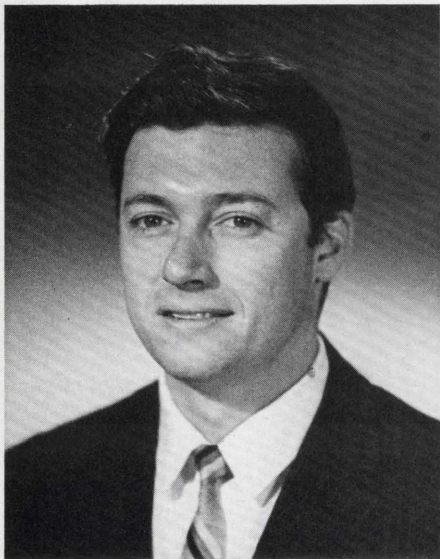
Arnold Karush is a Computer System Specialist at System Development Corporation, Santa Monica, Calif. He directs the corporation's research in time-sharing system measurement and has been involved in systems programming on real-time and time-sharing systems.

The design of time-sharing systems has generally been based on the experience of a few individuals, models whose statistical base is derived from limited samples, and from intuition. Although this type of exploratory development has been a necessary and accepted approach during the early years of time-sharing, it need not—and indeed should not—continue. As time-sharing computer systems become more of a public computer utility, there is an increased responsibility thrust upon the system designers to assure a design which will be of maximum social and economic effectiveness. In order to achieve this goal, theories of time-sharing design must be formulated and verified. These theories can only be based on empirical behavioral descriptions of time-sharing hardware, software and users.

Recently, as demonstrated by the available literature (1–8), there has been a growing realization that the production of newer, larger and more powerful systems should not be the only goal of computer professionals, but that an equally important goal should be the measurement and evaluation of these systems. Although this is a laudable and necessary goal, it is not easily attained due to the tremendous complexity of time-shared systems. Not only is there a large number of variables to be measured, but the mechanisms for measurement are difficult to build and implement. Several criteria and techniques have been suggested (1, 4, 5, 6, 9) for measuring and evaluating time-sharing system performance. However, these approaches have been fragmentary and do not deal with the problem from a unifying viewpoint.

This paper discusses two significantly different approaches to the measurement problem. The "analytical" approach involves the insertion of probes into the system to allow measurement and recording of the system's most subtle behavior. In the "stimulus" approach the system is conceptualized as a "black box" containing a limited number of known functions. This measure-

1. Calingaert, Peter. System Performance Evaluation: Survey and Appraisal, *Comm. ACM*, 10, 1 January 1967, pp. 12–18.
2. Karush, A. D. The Computer System Recording Utility: Application and Theory, SP-3303, System Development Corporation, Santa Monica, California, February 1969.
3. Sackmann, H. *Computers, System Science, and Evolving Society*, John Wiley & Sons, Inc., New York, 1967.
4. Stimler, S. Some Criteria for Time-Sharing System Performance, *Communications of the ACM*, Vol. 12, No. 1, January 1969, pp. 47–53.
5. Yourdon, Edward. An Approach to Measuring a Time-Sharing System, *Datamation*, April 1969, pp. 124–126.

6. Estrin, G., and L. Kleinrock, Measures, Models and Measurements for Time-Shared Computer Utilities, *Proceedings, 1967 ACM National Meeting*, pp. 85–96.
7. Karush, A. D. Benchmark Analysis of Time-Sharing Systems, SP-3347, System Development Corporation, Santa Monica, California, April 1969.
8. Systems Evaluation and Measurement Techniques, a 5-day course presented at UCLA January 27–31, 1969. It is being tentatively scheduled for March 1970.
9. Budd, A. E. A Method for the Evaluation of Software: Executive, Operating or Monitor Systems, Mitre Corporation, September 1967.

ment technique involves applying a controlled set of stimuli to the black box in order to activate its functions and then observing the results. The paper attempts to structure each approach into a generalized functional framework which will allow the techniques and criteria developed for individual systems to be catalogued into a body of knowledge that can be used as an objective guide for additional theoretical and practical development.

Analytic Approach to Time-Sharing System Measurement

Characteristics. The usual manner of obtaining data describing the behavior of a time-sharing system is to embed a recording device within it. This means that software or hardware probes are inserted within the subject system to enable the values of some set of bits to be recorded at specified times without seriously disrupting the system's operation. A survey of several recording implementations was made by the author (2). Cantrell and Ellison (10), and Campbell and Heffner (11) have provided a description of the variety of measurements and analyses that resulted from the recording implementations on the GECOS system. The software analytic technique for an IBM

360 modified operating system for the APOLLO project was detailed by Stanley and Hertel (12).

The analytic approach can be subdivided into four areas of study. Each area will be described, together with examples from the literature.

Instrumentation. The first problem to be solved is data accessibility—that is, it must be possible to access the data and the intra-system relationships before any information on them can be recorded. Instrumentation is defined as the process of making the data accessible. A system may be instrumented by either hardware or software techniques. Each has its advantages and limitations, which are outlined below.

(1) *Hardware Instrumentation:* This involves attaching electronic probes to parts of the computer. The probes are capable of generating a signal upon detection of voltage changes presumably caused by known computer activity. The probes are attached to a hardware device that can logically combine the signals and record their duration and number. Schulman (13) and Apple (14) have reported on

the use of hardware monitors. Such devices are being commercially produced by several firms. The advantage of hardware instrumentation is that it imposes no interference upon the object system. The disadvantage is that only a limited subset of the total system data and relationships is accessible to the probes.

(2) *Software Instrumentation:* This involves modification of the software so that the system's operation may be interrupted at any point to permit access to pertinent data and intra-system relationships. Most computer systems have some form of software instrumentation, although few have developed it extensively. Software probes should be capable of accessing almost all the information within the system. The disadvantage is that it interferes with the system's operation by forcing other activity to cease and by changing the normal stream of events. In order for software instrumentation to be maximally effective, the system must be specifically designed to support it. The author (2) has proposed a set of design principles which should be incorporated into a system for this purpose.

Measurement. Once a system has been instrumented, it is necessary to determine how to utilize this capability in order to provide useful information, that is, to measure the system's performance. One possibility is to allow the instrumentation to collect as much data as it can. This is impractical for all but the simplest implementation, for not only is an overwhelming amount of data produced, but system performance can be excessively degraded due to the recording interference. There are several more practical options.

(1) *Sampling Measurement:* This technique can provide a frequency distribution which describes the activity of a program. According to Cantrell and Ellison (10), "If an executing program is frequently interrupted according to some random or periodic time schedule which is known to be statistically independent of any natural execution pattern in the program, then the frequency with which the interrupt location falls within a particular instruction sequence is proportional to the total time spent by the program in executing that instruction sequence." The clock interrupt feature of the computer is used to control the sampling rate. Cantrell and Ellison (10) discuss this in detail. This tech-

10. Cantrell, H. N., and A. L. Ellison, Multiprogramming System Performance Measurement and Analysis, *Proceedings, 1968 Spring Joint Computer Conference*, Thompson Book Company, Washington, D.C., pp. 213–221.
11. Campbell, D. J., and W. J. Heffner, Measurement and Analysis of Large Operating System During System Development, *Proceedings, 1968 Fall Joint Computer Conference*, Thompson Book Company, Washington, D.C., pp. 903–914.

12. Stanley, W. I., and H. F. Hertel, Statistics Gathering and Simulation for the APOLLO Real-Time Operating System, *IBM Systems Journal*, No. 2, 1968, pp. 85–102.
13. Schulman, F. D. Hardware Measurement Device for IBM System/360 Time-Sharing Evaluation, *Proceedings, ACM 22nd National Conference, 1967*, Thompson Book Company, Washington, D.C., pp. 103–109.
14. Apple, C. T. The Program Monitor— A Device for Program Performance Measurement, *Proceedings, ACM 20th National Conference, 1965*, Spartan Books, Washington, D.C., pp. 66–75.

nique is very useful in selecting areas of a large program for analysis and improvement.

(2) *Trace Measurement:* Interest is often focused upon the sequential behavior of some portion of the system. That is, the analyst is concerned with the identification and *order* of the events which occurred in satisfying a system function. In this case, the instrumentation may be used for selecting just those behavioral elements that were active at a specified time or logical instance. An example of this is to be found in SDC's ADEPT time-sharing System (Kennedy, 16, Linde, et al., 15). The system is instrumented with a security trace capability to identify and record those user/software events that could compromise the security of the data files (Weissman, 17). It results in a time-oriented listing of the selected events with sufficient data being collected about each event to enable a determination of security flaws or violations. Trace measurement is particularly suited to debugging and the analysis of intra-system behavior.

(3) *Accounting Measurement:* A frequently required measure of time-sharing systems is a summary of resource utilization. Often this is considered to be accounting information. Typical summaries are amount of CPU time, volume of file storage, size of programs and amount of terminal time. To provide accounting information, the instrumentation is used for recognizing the initiation and termination of an event (for time information) and the amount that certain resources are used (for volume information). Accounting measurement is closely related to hardware instrumentation, for this type of instrumentation is typically utilized for measuring the amount of time that an I/O channel is of time that an I/O channel is used or to count the occurrences of interrupts. Accounting measure-

ment finds its most frequent application in determining the amount of resources purchased by a user.

(4) *Logical Measurement:* Logical measurement involves the use of instrumentation to access data bases. The purpose is to select for further evaluation a subset of a data base as a function of the content, description or environment of that data base. One use for this is program self monitoring. As discussed by the author (18), errors and problems with both the input and processing of a data base can often be uncovered by program self-checking features. Another use for logical measurement is in debugging a program. Knowing the data that was input to a program and being able to assess the result of the program's processing allows rapid verification of the program's operation.

(5) *Playback Measurement:* The ability to recreate a system or subsystem's operation for iterative study and experimentation is a valuable technique that has received little attention. It involves recording all the input to the system or subsystem together with time tags, and then rerunning the component of interest with the recorded input substituted for the real input. Variations in system inputs, the operational program or both constitute controlled experiments against the standard provided by the original run. This technique was successfully used in the SAGE air defense system and has been well described by Sackman (3). Playback measurement is actually the selection of the total significant environment for a system or subsystem. This environment includes the initial state (conditions) at the beginning of the measurement period and all time-tagged input during that period.

Recording. The recording component of the analytic approach to time-sharing system measurement deals with the problem of transferring the data selected by the measurement criteria out of the computer memory and onto a secondary storage device. This is a significant problem due to the large volume of data selected for analysis by most measurement criteria. The problem is only minor in the case of accounting measurement where summaries may be accumulated and stored in core memory.

There are several techniques known to the author for reducing the data volume and/or time required for recording. (Refer to the author's review of the literature on recording (2).)

(1) *Data Compression:* The data can often be compressed to reduce its volume. This is accomplished, for instance, by converting EBCDIC encoded numbers to their binary or hexadecimal equivalents, by utilizing codes to designate frequently observed conditions or values, and by packing the data to eliminate unused or nonessential bits. The disadvantage of this is the CPU time required for doing the compression.

(2) *Pre-analysis:* It may be possible to analyze some of the data prior to removing it from core. For instance, instead of recording the begin and end times for an event, the interval alone may be computed and recorded. The tradeoff with this method is less useful data and additional CPU time.

(3) *Selection:* Recording for measurement that involves large blocks of data bases may be made less costly by examining the selected data base blocks for null or unnecessary entries. These entries may be deleted and the remaining data repacked. Again, CPU time must be made available for this.

(4) *Interleaving:* In the design of many time-sharing systems there is frequently a period of dead time— for instance, when the first few pages of a program are being swapped into core. During such periods, the CPU and/or an I/O channel may be available for manipulating and writing the selected data onto a secondary storage device.

Reduction. Once the data selected for measurement have been recorded, it must be sent to a reduction component to make it legible and meaningful to the human analyst. At the very least, the data should be listed in an English language equivalent to its binary encoding. Many types of listings can be produced such as time sequenced, event sequenced, changed values, summary counts, graphs and histograms. The purpose of the reduction function is to allow the analyst to acquire a feeling for the characteristics of the data, to evaluate the adequacy and validity of the instrumentation, measurement and recording components, to perform some cursory analysis and to plan for a thorough analysis (e.g., statistical) of the data. Several examples of reduction have been described in the GECOS papers (10, 11).

15. Linde, R., C. Weissman and C. Fox. The ADEPT-50 Time-Sharing System, SP-3344, System Development Corporation, Santa Monica, California, 1969.
16. Kennedy, P. R. User's Guide for the ADEPT-50 Executive Time-Sharing System, TM-3881/000/01, System Development Corporation, Santa Monica, California, June 1968.
17. Weissman, C. Security Controls in the ADEPT-50 Time-Sharing System, SP-3342, System Development Corporation, Santa Monica, California, April 1969.

18. Karush, A. D. Program Quality Assurance, *Datamation,* Vol. 14, No. 10, October 1968, pp. 61–66.

Applications

There are several distinct areas of investigation which can be supported by the analytic techniques of measurement.

(1) *Program and Hardware Analysis:* An understanding of a single program's behavior or the actual use of a hardware device may be obtained from the analytic method. Inefficiencies or errors may be detected by the sampling, accounting and logical measurements. Hardware instrumentation is particularly suited to analysis of I/O device usage.

(2) *Supervisor Analysis:* The stochastic behavior exhibited by the system and its interpretation in terms of the supervisor or executive function may be elucidated with the aid of trace and accounting types of measurement.

(3) *System Analysis:* This area is concerned with understanding to what degree and in what manner the man-machine-software complex has affected its environment. Tracing, accounting and logical measurements may be used to answer these questions. Some problems that can be investigated are the relative costs and efficiencies of different modes of computer usage, and the security problem of unauthorized access to data bases.

(4) *System Research:* There are two paths that can be followed for system research. The first is modeling or simulation. This requires the stochastic interpretation of the sampling, tracing and accounting measurement in order to formulate and test models of time-sharing system behavior. The second path involves controlled experimentation directly upon the time-sharing system itself. To accomplish this, the playback form of measurement is required to permit repeated system runs with the same input and only controlled changes to the system.

Analytic Techniques as Applied to the Adept Time-Sharing System

There have been two software implementations in System Development Corporation's ADEPT time-sharing system (15, 16) that utilizes the trace measurement concept. One is designed to detect certain basic events of the executive. These events are I/O interrupts, service (SVC) interrupts, scheduler initiation, swapper initiation and object program initiation. Characteristics of the interrupts and times of initiation are also collected. The measurements must be made very frequently and thus the probing, measuring and recording techniques had to be de-

signed to minimize interference to the executive. This is accomplished by using a portion of page 0 (this page can be addressed without the use of a base register) as the primary recording buffer. At the points where the software probes are inserted, code is included to store the data directly into the buffer rather than calling upon a common subroutine. These techniques result in a cost of 35–70 microseconds to measure and collect the data for an interrupt; it is about twice that amount for the initiation events. Prior to the scheduler being entered, data from the primary recording buffer is moved to a larger secondary buffer. Every 6–9 seconds, the secondary buffer's contents are transferred to drum, the fastest I/O device available to ADEPT, at an average cost of 10 ms. About once an hour, the contents of the drums are transferred to a disc file, resulting in a slight reduction in service to the time-sharing users for a short period of time. The reduction component produces a time-oriented listing of all recorded data, plus summaries and distributions of the events.

The second software instrumentation was implemented to provide a record of user, terminal and file activity (17). This is used for determining whether classified files have been compromised and the extent of the compromise. The instrumentation differs from the previous one in that code is inserted into key programs to call a common re-entrant subroutine. The call parameters contain the measures which are to be recorded. The recording subroutine collects the data into a buffer; when the buffer is full, it is written onto a disc file. This recording function is much more costly to operate than the previous one, since it is subroutinized and must be swapped into core. However, the infrequency with which it is called (about 5 times per minute) results in only a small percentage increase in system overhead. The data reduction consists of a time-oriented listing of the events.

A hardware instrumentation approach has also been used in analyzing the ADEPT system. An IBM hardware monitor was attached to the computer to perform accounting measures. The data for such measures as channel usage, amount of time spent in the supervisor state, number of I/O interrupts, and number of SVC interrupts were recorded. The probes consisted of nothing more than detectors and amplifiers hooked onto various parts of the machine's circuitry. The data was recorded in incremental or time-interval counters. Reduction of the data was a minor function and consisted of percentage computations.

(To be concluded in a coming issue of S/A)

Proprietary Software Products

JOSEPH T. HOOTMAN

Each proprietary computer program represents in and of itself a new business venture, and it should be treated accordingly. Thus, any decision to develop a proprietary software product should be preceded by exhaustive cost and revenue forecasting.

Cost forecasts must account for the technical effort involved, personnel and their fringe benefits, and the computer time required to develop the product. In addition, marketing costs must be forecast, taking into account marketing strategy, advertising and public relations costs, and costs of sales, such as commissions and other sales remuneration. Support costs must also be included. The over-all cost forecast must extend throughout for the life of the program.

Revenue forecasts must take into account the method of selling to be used in disseminating the proprietary programs to the market. Options available include direct sale of the package itself, leasing of the package, some type of an "as-used" method, or any combination of these approaches. Revenue forecasts must also account for the pricing strategy initially adopted and/or as modified throughout the useful life of the product. Finally, revenue forecasts must take into account the market itself. Who are the users? What are their alternatives? What competitive software programs are available?

After forecasts of both costs and revenue have been prepared, a forecast of cash flow is needed to indicate the amount of investment required, the break-even point, and the rate of return on the investment.

Though the merit inherent in various types of forecasts should appear obvious, many individuals or organizations set about developing proprietary software programs without, in fact, approaching the project as a business venture. Failure to go through the steps of determining what the eventual rate of return on the investment will be prompts mistakes. Thoroughgoing preanalysis and forecasts of all factors involved can form the basis for an intelligent approach to the development and marketing of new applications programs and systems software.

Guidelines for Standards

When those of us in the industry address ourselves to the subject of proprietary software packages, several topics generally come up for discussion. The first of these is the subject of standards, which in the context of this paper include (1) definitions; (2) documentation; and (3) the dissemination of information regarding the programs themselves. To build an adequate base for this new segment of the computer industry—the proprietary software segment—I propose these general guidelines:

First, some rational level of semantics should be evolved to describe what a program does; and we should diligently avoid the use of industry buzzwords or the coining of new terminology.

Second, some rational form of adequately summarizing program descriptions should be adopted. I'm suggesting standardized specification sheets that enable users to learn quickly and simply what a program is all about and what system and in what language it was developed.

Third, information regarding available programs should become readily and widely accessible. To broaden the market for a proprietary program to its fullest potential, advertising and other means of disseminating information about the availability of developed programs should come into play.

If these are, in fact, standards, whose responsibility or function is it to develop them or to lay the ground rules for developing them? My answer is that nobody need be responsible. No formal program should be adopted; no responsibility should be assigned, for the development of these standards. In my opinion, the marketplace should be allowed to work its normal course.

The marketplace will sooner or later select the technique, the documentation form, the semantics, and the type of specification sheet that works best and meets the users' needs most effectively. Other forms will be weeded out. Services and new businesses will doubtless be formed to accommodate these requirements. Some of them already exist. Two primary examples are (1) publications that, for a fee, carry editorial descriptions of what applications programs are available or in which advertising can be placed

Author Joseph T. Hootman, President of Remote Computing Corporation, at work.

> **"Where are the market areas for newly developed proprietary software packages? Where are the opportunities for new companies, established software companies, and computer users to develop new programs? Nobody has asked those questions, and I would suggest that nobody should right now. My understanding is that that's *proprietary* information."**
>
> **Joseph T. Hootman**

and (2) software brokerage firms that locate and market available applications programs. It appears completely logical to me that these functions should be performed by and in the marketplace, and I see no justification at this time for any industry or government intervention to establish standards in this general area.

Technological Development

The second topic we should address ourselves to is the area of technological development of software itself. It is difficult at best to look ahead into the future—into the '70s—to specify what events will transpire in software development. Certain patterns are becoming obvious, however, and should be mentioned. I see four areas in which activity should increase significantly:

1. The use of generator-type techniques to develop applications software—as differentiated, of course, from systems software where generator techniques have been used consistently for a number of years.
2. Tied in to the generator concept, but of a slightly different nature, is the technique of allowing hooks and hangers to be placed in these programs so that user's own code and logical links to other proprietary packages can be quickly and easily tied to allow proprietary programs to be combined.
3. The use of computer utilities to develop proprietary software.
4. Finally, something that has been traditionally true won't change during the '70s: need for documentation of proprietary packages will increase, and more automated documentation is obviously coming. The need for adequate documentation is going to be more and more critical in the '70s and, particularly, as these needs relate to the marketing effort for these programs.

Business Relations

A third major topic to be discussed is business relations as they pertain to the evolution of this segment of the computer industry.

As I suggested above, we must begin to consider the development and marketing of proprietary software as a business venture in the truest sense. Companies that are now developing proprietary packages—the software firms —and even certain computer users must take the lead in approaching this as a business market area. Vendors of proprietary software must exert considerable effort to develop and protect this industry segment. Marketing practices and marketing organizations must evolve. While neither a commodities exchange nor a securities exchange is required, the analogy should be apparent.

Another aspect of business relations relates to the need for developing certain standard approaches to contractual agreements between the buyers and sellers of proprietary software. Before these approaches become standardized, litigation seems certain to come about. Litigation is, in fact, often an essential step in establishing the contractual rights and responsibilities of all parties. We need not necessarily shy away from litigation, and we must recognize that it will happen. Parenthetically I would suggest that, in this regard, the patent laws and copyright laws are virtually useless. Contracts afford very practical and realistic solutions to many of the problems presented in protecting the rights and responsibilities of all who develop, sell, lease, and use proprietary software packages.

The marketplace will reward the capable and the conscientious—those who offer a "good deal," those who honestly represent the product, those who price it fairly, those who offer proper contracts, and those who provide adequate service and support over the long haul. Some trauma will be evidenced in building this industry segment. A few "fast-buck" artists may intrude. An occasional business will fail. These events are merely part of the learning process, somewhat paralleling what has happened in the timesharing industry as it has evolved over the past three years.

Marketing Approaches

I must admit to my considerable interest in the marketing of proprietary computer programs. Now I want to amplify my earlier comments regarding the three ways of selling these products.

The first marketing method, you will remember, is through the outright sale of the source and object program to an end user; the second is to lease the source and/or object program; and the third is to market both on some kind of a measured-use basis.

The main objective is to maximize the rate of return on the investment; the solution, obviously, is to sell the same product many, many times over. To the software company, the computer user, or programming staff, this means nobody shopping continuously for a better "deal"; this means no one-time sales of programming effort; this means no copying or leaks of the program outside and around so that it can be misused or given away. These factors relate to contract problems and suggest that the usage basis may well be the best means of maximizing revenues.

Certain advantages are indeed obvious: the usage basis is easier to sell, and no significant capital investment is required of the user. In addition, the usage basis offers at least some means of protection in that the source program need not be provided—only the object program. Some problems in copying and leakage are thereby avoided. Further, the usage basis means that the author has a continuing relationship with the user. From the user's point of view, this relationship assures continued maintenance and support. From the author's point of view, it may provide modification revenue and additional application revenue. It may also provide leads and referrals not otherwise available.

Strongest Argument for Usage Basis

In my opinion, the strongest argument for the usage basis is that it forces the developer to adopt the point of view of "what promises the greatest potential over the longest period of time." Of course, this perspective assumes that the product will be kept viable over a long period of time to assure a truly significant rate of return on the investment.

An obvious disadvantage of the usage basis of marketing is that the cash flow—particularly the initial front-end cash flow—is extremely limited. That can be a problem for a small company.

Assuming that we agree that the usage basis has some merit for certain companies, programs, and situations, how do we sell on a usage basis? The answer depends on who's selling and who's buying. If we're selling to an end user with his own computer, we can evolve techniques of putting a meter in the program, then allow the user to put the program on his system. A contractual obligation and some honesty on the user's part are required here. As an alternative approach, the program developer can acquire his own computer and offer a service as a computer utility or a service bureau, or he can acquire block time on some system. Parenthetically again, I would suggest that many computers have some future applicability here—particularly low-cost computer systems dedicated to specialized applications.
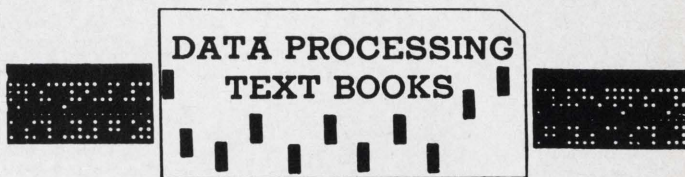
Alternative Approaches

Finally, of course, and I obviously have an axe to grind (or a cause to espouse) in a way: the best way to market programs on a usage basis is through a computer utility. One approach is to arrange a wholesale/retail situation in which the program developer buys time at a wholesale rate from the utility and, in effect, sells that time with his application program at retail. A second approach is to make the program available to the computer utility on a royalty basis. A third approach is a franchise arrangement. ("Franchising" seems to be a very hot word to a lot of people in our industry today.) Finally, of course, there is the joint venture route.

If the wholesale/retail approach is selected, the developer can buy computer time at wholesale and sell it at the same rate that the utility would have sold it. His gross profit then is essentially the difference between the utility rate and his retail charge. He is then dependent, of course, upon the utility's pricing structure, which may not be desirable. Alternatively, the developer can use the utility's standard rates plus some kind of a markup—such as a one-time charge or some percentage factor times the utility rate for his program. Or he can set up and retail his product at his own price at his own rates. The latter approach requires that the computer utility provide very accurate logging data and accounting information to the program developer. That data isn't always available.

Under the royalty approach, the utility itself markets the program and then pays the developer a royalty based upon the usage. The utility can charge the customer in different ways, of course, or can use their standard rates. They can or should also provide a one-time charge and a periodic charge, if appropriate, such as a monthly minimum or something of that nature. They should be able to provide varying forms of incremental pricing wherein a program that uses either heavy cpu or I/O time can be charged for accordingly. The utility should be able to charge based upon some multiple of any form of incremental pricing—300 percent of the cpu rate, for example. Finally, the utility should be able to provide a unit tally that can be multiplied by some price—40¢ per check or $3.00 per equation or 01.00 per FORTRAN statement or some similar approach.

The royalty paid to the program developer should not impose a penalty that forces the utility to sell below standard rates. If that happens, the arrangement will not prove attractive. By the same token, the utility should be encouraged to charge more than standard rates for a high quality product; and the royalty paid to the author should reflect the profit in the program development.

If these different pricing techniques or some combination of them are used, the utility should retain the right to vary the royalty percentage based upon whichever tech-

nique applies. For instance, they may wish to give the program developer 100 percent of a one-time charge, 50 percent of the monthly minimum, 50 percent of a 300 percent markup on cpu time, etc.

Royalties are, of course, always subject to negotiation and to contractual agreements. I have experienced some interesting discussions with program developers in this area. In implementing our royalty plan, I will be the first to admit that it always hasn't been easy to work out arrangements.

Another approach to marketing on a usage basis is the franchise route. While this is basically a royalty approach, a key difference is that a considerable amount of technical and/or marketing support with documentation, maintenance, etc. is provided over an extended period, which is not necessarily available on a royalty basis. The utility still does all the selling, but the developer plays an important role by providing continuing support for the computer utility's marketing and technical efforts. A one-time charge or a monthly minimum usage can also be associated with the franchise approach. While I draw no analogies here to fried chicken outlets or pizza palaces, those are franchise approaches, too; and I think that you can visualize the type of support that the franchisor provides to the franchisee.

Joint Venture Approach

A final approach, of course, is the joint venture; and I can't begin to comment on how this concept could be structured. The sky is the limit! It can vary all the way from a handshake up to the formation of a jointly owned new corporation. Certainly I think that many software companies are going to be actively considering joint ventures with computer utilities for the marketing of new proprietary software packages.

The key point here, in terms of marketing of these proprietary programs, is that the computer utility provides the distribution and marketing vehicle, which until now hasn't really been available for proprietary programs. It can provide some very adequate means of protection, marketing support, and even technical support to the program developer. In that sense, there is a very direct analogy to the function a book publisher performs for an author; and that system has worked extremely well for many years. Accordingly, I would suggest that computer utilities will become "publishers" of program authors' "works" during the '70s.

Interdisciplinary Implications

Several questions arise concerning interdisciplinary implications: What about the hardware? What about the problems of the influence of software and proprietary packages on hardware development? What about the problems of hardware evolution? What happens to significant investments in proprietary software when radical changes are made in bringing on new hardware systems?

Let me point out first that we do need better hardware. And we do need a continuing and greatly enhanced interrelationship between software—both systems and applications—and hardware. We certainly need better storage devices. While we're getting many, many more terminal devices—as is evidenced by the number of terminal-device exhibitors at computer conferences—we're not yet getting as many oriented toward specific applications as will become available during the '70s.

To those of you developing software packages for proprietary use, I offer four suggestions:

First of all, think about on-line systems and tying terminals into applications software—special-purpose terminals perhaps even provided by the program developer.

Second, whenever it is possible, write your programs in a higher-level language. I recognize here that there is a considerable interest in microprogramming and the use of Read Only memories and that these things can make proprietary programs very machine-dependent, which is generally to be avoided.

Third, wherever practicable, use a well known, well utilized compiler, generator, or problem-oriented language in the development of your package.
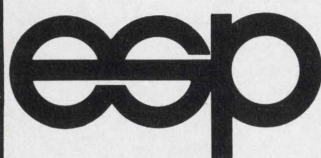
Finally, strive for independence from hardware configurations not only because of what may happen downstream but because if you have developed a program that is absolutely 360-dependent and somebody wants to put that on a machine like, for example, a Univac 491, the conversion problems can be considerable; and you may lose a darn good customer.

FORTRAN Loop Detecting Trace

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A computer dictionary[11] defines a loop as ". . . the repetitious execution of a series of instructions caused by having the last instruction in the series return the machine to the first instruction in the same series." A fatal loop may be defined as a loop which is endless. A fatal loop is normally terminated by operator intervention or by exceeding a pre-defined time limit.

Loop detection and analysis of the cause of looping is largely a function of the analytical prowess of the programmer and his knowledge of the inner workings of the program in which the fatal loop occurs. The detection of loops requires more than a knowledge of the input and output of a program; it demands knowledge of the step-by-step path the program actually takes. This information on the dynamic flow of a program may be thought of as TRACE information, be it stored in the programmer's head or on the printed page as a result of a software aid to debugging. Loop detection is then a facet of the larger problem of tracing.

Although programmatic loop detection is occasionally written into a program,[6] generalized loop detection which requires no pre-planning by the using programmer is largely ignored.

The advent of the closed shop and higher computer execution speeds has all but eliminated the practice of sitting at the console and running a program a single instruction at a time. The promise of highly flexible interactive terminals is not yet a reality for the vast majority of batch-oriented users. The options which remain seem to be either the use of a trace program or the scratching of one's head.

Manufacturer-Supplied Traces

Most computer manufacturers provide some type of software trace for all but the smallest machines in their line. Trace is an ill-defined name given to a wide variety of techniques, all of which record, in some fashion, the path actually taken by the program being traced. TRACES may be classified as low-level (assembler or machine code) or high-level (FORTRAN).

Low-Level Traces. Most trace programs operate on the machine code level and are of the interpretive execution type or the "SNAP" print type. Some are assembler options[1, 2] while others are selectable at the time of loading a relocatable object deck.[2, 3] At least one trace utilizes hardware interrupt features[3] while most are exclusively software.

An excellent example of the interpretive execution type of trace is provided by Knuth,[6] while the Control Data Corporation 3600 trace[3] is an example of a low-level trace which is similar to the ubiquitous "SNAP" or snapshot debugging print. All low-level traces share the limitations of being highly machine dependent, with their usefulness inversely proportional to the speed of their machines. The high speed of large-scale machines precludes the use of a low-level trace to print all operations; the output of such a trace must be limited. On the other hand, limiting the output of a trace obscures the details of execution.

Fortran-Level Traces. Several manufacturers have acknowledged the desirability of debugging in source language by implementing FORTRAN compile options which print names of programs and statement numbers during execution.[4, 5] The chief objection to these programming aids is the vol-
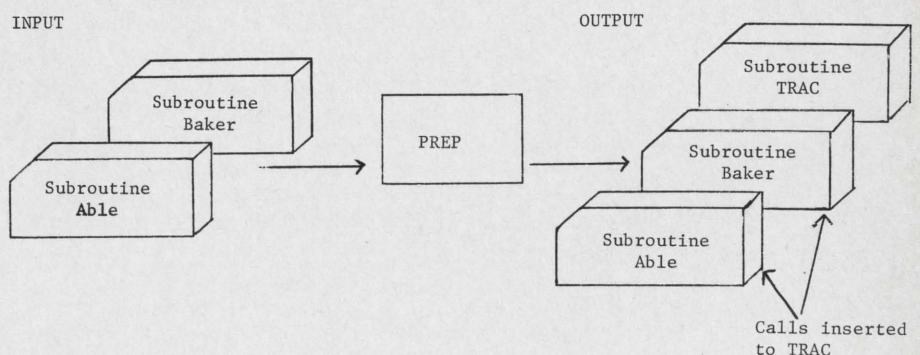

Figure 1. Overview of PREP Routine

Figure 2 (flowchart)

```
                    ENTER
                      ↓
            ROUTE ON TYPE OF CALL
TYPE 1,                          TYPE 2,
ROUTINE                          STATEMENT NUMBER
NAME                                   ↓
                                   IS
-SAVE NAME                       A LOOP IN   ──yes──┐
-FLUSH CIR.        f             PROGRESS           │
 BUFFER TO          l               ?               ↓
 PRINT BUFFER        u            no               IS
                      s            ↓            NEW ITEM
                       h      -PLACE NEW    no  EXPECTED
                              ITEM IN    ←───── ITEM OF THE
-TRANSFER                     CIRCULAR   -FLUSH  LOOP
 ROUTINE                      BUFFER     CIR. BUF.  ?
 NAME TO                                 -ADD NEW      yes
 PRINT          add    flush & add  ITEM              ↓
 BUFFER                                          -BUMP
                  ╭─────╮                         EXPECTED
                  │ CIRCULAR │                     ITEM CTR.
                  │ BUFFER   │                    -BUMP
                  ╰─────╯                          LOOP CTR.
                                                   IF
                                                   REQUIRED
                                                     ↓
                                                 -STOP IF
                                                  LOOP IS
                                                  FATAL

   NAME,N,N,N(N,N,N=N)N,N   DBUG      PRINT BUFFER

        WHEN PRINT
        BUFFER IS
        FULL, PRINT
        IT

   NAME,N,N,N(N,N,N=N)N,N,N,N,N,N,N  DBUG    USING ROUNTINE'S
                                             PRINTED OUTPUT
```
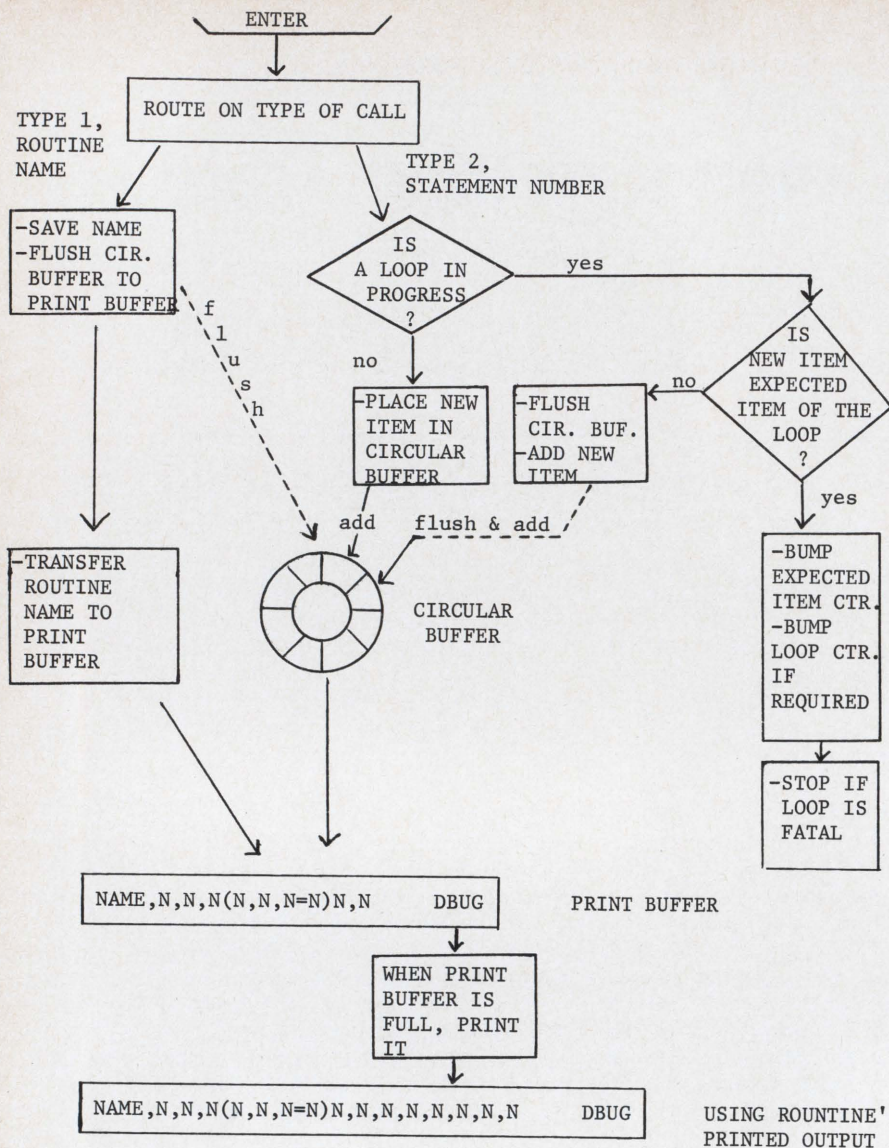
Figure 2. Overview of DBUG Routine

ume of output they generate. An entire line is printed for each event (enter/return program, execute statement number). Given a machine which executes at high speed and a program which is sufficiently large, the programmer is faced with the decision of either generating a mountain of printed output or severely limiting the range of code to be traced.

Need for FORTRAN Trace

The Information Systems Laboratory (ISL) at Michigan State University is engaged in research in machine independent information systems which has resulted in the development of the Basic Indexing and Retrieval Systems (BIRS).[9, 10] BIRS is a collection of approximately 150 FORTRAN programs, subroutines, and functions, and is distributed nationally at cost to many installations which use the computers of a variety of manufacturers.

The problems of debugging, of indoctrinating programmers, and of documenting BIRS, coupled with the restriction of a modest project staff has led to the use of a trace called TRAC which traces the execution of FORTRAN programs and is itself written in FORTRAN. Because this diagnostic tool is designed to be machine-independent, it may be easily implemented on a variety of computers. TRAC processing may be divided into pre-compile time processing and run-time processing.

Pre-Compile Processor. Pre-compile processing is performed by six subrou-

tines, known collectively as **PREP**, which read FORTRAN source, analyze it, and output source with calls which pass routine names and statement numbers to SUBROUTINE TRAC. In addition, PREP outputs SUBROUTINE TRAC itself, in FORTRAN. (Figure 1) The output of PREP is compiled and run in the usual manner.

Run-Time Processing. As the user routine executes, it makes calls which define calling routine statement numbers to the TRAC SUBROUTINE (Figure 2). TRAC compares each statement number to the statement numbers in a circular buffer (FIFO). If not found, it is added to the circular buffer. If the circular buffer is full, it passes its first-in statement number to the print buffer. If the most recent statement number is found in the circular buffer, the possibility of a loop is acknowledged by setting an integer variable "LOOP" to 1 and flushing the circular buffer (to the print buffer) up to the occurrence of the statement number found. The statement number of the next call to TRAC will be checked to see if it is the next expected statement number in the circular buffer.

In this manner, a statement number or a pattern of statement numbers which repeat themselves is counted. If the count reaches fifty thousand, the pattern is declared to be fatal and the TRAC routine issues a fatal loop message with statement number traceback information and executes a STOP.

A pattern of statement numbers which is broken before the fifty thousandth execution of the loop is passed to the print buffer together with the loop count and is printed in a compressed format.

Example: Figure 3 gives an example of TRAC Print under the following circumstances. SUBROUTINE ABLE is entered and executes statement numbers 1, 2, 3, and 4 and then calls SUBROUTINE BAKER which executes its statement numbers 101, 102, and 103. At this point BAKER loops 47 times through statement numbers 104, 105, and 106, and then continues on to statement number 107 and returns to ABLE which executes statement numbers 5, 6, and 7. ABLE then enters a fatal loop between statement numbers 8 and 9, which causes an error message and stop. Note that all print generated by TRAC is labeled "TRAC" to distinguish it from user print.

Figure 3

ABLE 1,2,3,4,BAKER 101,102,103(104,105,106=47)107,ABLE 5,6,7	TRAC
FATAL LOOP DETECTED IN ABLE	TRAC
50000 EXECUTIONS OF THE FOLLOWING STATEMENT NUMBERS	TRAC
8	TRAC
9	TRAC

Conclusions

FORTRAN source language tracing is useful and practical, especially on large, complex systems which are capable of being implemented on many different types of machines. A trace using standard data at one installation should produce printed output identical to that of another installation which has the computer of another manufacturer.

The same standard data trace print may be used in documentation to give other programmers a detailed look at the inner workings of a complex system.

Loop detection is an unusual feature of TRAC which is an especially useful tool for working with a machine which one does not know intimately. Finally, the trend in software is toward higher-level languages. Debugging aids should ideally be programmed in the language of the systems they serve.

Additional information on TRAC may be obtained from J. W. Simmons, Information Systems Laboratory, 311 Computer Center, Michigan State University, East Lansing, Michigan 48823. (517–353–7284)

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2. *CDC 3600 Drum Scope Manual,* Control Data Corporation, Palo Alto, California, 1966.
3. *CDC 6500 Scope 3.0 Manual,* Control Data Corporation, Palo Alto, California, 1968.
4. *Honeywell Fortran Compiler H Manual,* Honeywell, Inc., Electronic Data Processing Division, Wellesley Hills, Massachusetts, 1967.
5. *IBM System 360,* Fortran IV Language..
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10. Vinsonhaler, J.F. and Hafterson, J. M. (Editors), *Technical Manual for the Basic Indexing and Retrieval System, Appendix I, BIRS 2.5,* College of Education, Michigan State University, East Lansing, Michigan, 1969.
11. Sippl, Charles J., *Computer Dictionary and Handbook,* Howard W. Sams and Co., Inc., Indianapolis, Indiana, 1966.

financial currents

Executive Computer Systems, Inc., Oak Brook, Ill., announced the acquisition of the business and assets of *Occidental Computer Corp.,* Riverside, Calif.

Ronald P. Fox, President of Executive Computer Systems, Inc. stated that, "the acquisition of Occidental Computer will allow Executive Computer Systems, Inc. to expand its market penetration to the Western Region of the United States and to offer a total range of our services through the Occidental Division." Capabilities offered through the Occidental Division of Executive Computer Systems are: buying, selling and leasing of computer equipment, systems design and implementation, processing service in the medical and publication field through their Information Center, site selection and facility construction, personnel procurement, and executive education.

M&M Computer Industries, Inc., Orange, Calif., has been formed as a Delaware Corporation with 2,000,000 shares of stock, to develop and produce a line of digital communications and computer systems products. The first product to be introduced is a remote batch terminal which includes many standard features such as auto-answering for dial-up lines, automatic turn-around, multiple record transmission, horizontal format control, EBCDIC transparency and multipoint line control for which other manufacturers charge extra, according to company officials. Frederick J. McKee is President of M&M Computer Industries, Inc.

KBM Data Systems, Inc., Atlanta based computer service company, has acquired *Computer Controls Corp.* of Miami, KPM President and Board Chairman William J. Kettle, Jr. announced. With the exchange of a combination of stock and convertable debentures, KBM added to its rapidly expanding company all the CCC assets and customers. Kettle stated important assets included an additional Honeywell 2200 computer system and an inventory control system now used extensively by business and industry.

W. L. Jacobs, Vice President and Director of Operations, added that the first result of the acquisition will be the rapid expansion of KBM's Information Systems Division, which provides a wide range of on-line, real-time computer related services in the fields of systems analysis and design as well as computer programming and facilities management for business data processing on a national basis. A company offering diversified services, KBM also has perfected and begun nationwide operation during the past year of an on-line, real-time computer information system for stockbrokers.

International Business Machines Corp., Armonk, N.Y., and *Keuffel & Esser Co.,* Morristown, N.J., have announced the signing of an agreement under which K&E will acquire certain assets of IBM in the microfilm products area. The products, previously manufactured and marketed by IBM, include diazo and thermal micro copiers, document and micro viewers, and related parts and supplies. IBM discontinued this portion of its microfilm products line in 1969, and a previous announcement was made that IBM had entered into negotiations with K&E for the sale of these assets.

Keuffel & Esser Co. has manufactured and marketed microfilm cameras, viewers, processors, and related equipment and supplies to the engineering/industrial field for over a decade. "The addition of the IBM product line," said Alfred E. Busch, K&E President, "will broaden the company's marketing base in the microfilm area and make us eligible to pursue applications beyond engineering."

Tymshare, Inc., Palo Alto, Calif., and *Dial-Data, Inc.,* Newton, Mass., have agreed in principle to merge, subject to approval by shareholders, it was announced jointly by T. J. O'Rourke, President of Tymshare and L. C. Clapp, President of Dial-Data.

"The merger between these privately held companies," according to O'Rourke, "will result in the third largest time sharing company in the country, ranking just behind General Electric's and IBM's time sharing subsidiaries." In the combined organization, Clapp will be named Executive Vice President and a Director of Tymshare, Inc. O'Rourke will continue as President and Chief Executive Officer.

Dial-Data operates computing centers in Boston, New York and Washington and has additional sales offices in Hartford, Conn. and St. Petersburg, Fla., and is a major user of XDS 940 time sharing computers, identical to those in use by Tymshare at its computing centers in Cupertino and Inglewood, Calif. and Englewood Cliffs, N.J.

TRAVCOM, Inc., a wholly-owned computer services subsidiary of the Travelers Corp., Hartford, Conn., has purchased the assets of *Computer Power, Inc.,* Philadelphia, according to an announcement from Roger C. Wilkins, Travelers president.

Formed in June 1968, Computer Power, Inc. has been active in the development and implementation of computer-based accounting and record-keeping services for small and medium sized businesses. The CPI systems for billing, inventory control, accounts receivable, accounts payable, and payroll utilize a typewriter-like terminal in the customer's office linked by telephone line to an IBM 360 computer.

CPI's services will be extended throughout TRAVCOM's data center network as a key element in a national expansion plan, according to Wilkins. "Computer Power's product development and unique skills will enhance our objective to provide a total data processing capability to the small business market," he added.

TRAVCOM currently operates data centers in Hartford, Conn., Cincinnati and Columbus, Ohio, Louisville, Ky., Portland and Eugene, Ore., and Seattle, Wash. and plans to devote increased attention to its municipal data systems currently being offered only in Connecticut.

Computing and Software, Inc., has announced the acquisition of *The Title Insurance Company of Idaho* (TI) in exchange for an undisclosed number of shares of common stock. Headquartered in Boise, Idaho, TI specializes in research, sale, and guarantee of information pertaining to property ownership and rights. It operates 18 offices in six northwestern states where current records are maintained of practically all properties in the immediate regions. The company has been an innovator in the development and operational use of microfilm systems for retrieval of property information from data files.

Computing and Software, Inc. is a recognized industry leader in the management and operation of computing centers and their application in the

field of specialized information exchanges. The firm also engages in computer software development, sale of computer-related marketing and financial services, data processing training courses, and manufactures components for the computer peripheral equipment market.

The *Barry Wright Corp.* (AMEX), Watertown, Mass., has announced acquisition of the *Wassell Organization,* Westport, Conn., for an undisclosed amount of stock. Wassell will be operated as part of the parent company's expanding VISIrecord Division headquartered in Copiague, L.I. According to Paul S. Nevin, VISIrecord Division president, Wassell's physical operation, with present executive management and staff personnel will remain at Westport. Both companies have been leading innovators in their respective specialties in the visible business systems field.

Barry Wright Corp. is a group of autonomously operated divisions and subsidiaries covering industrial, computer accessory and business system markets, each leaders in their respective specialty fields.

Eric Knutsen Assoc., Inc., a new computer services company, offers management consulting, systems design, and custom software services. Specialties include factory monitoring, control systems for continuous and batch processes, communications oriented systems, and project management services.

The company is also engaged in the development and acquisition of new products. Offices are in New York City and Yorktown Heights, N.Y. Eric Knutsen, founder, was formerly with Graphic Sciences, Inc. as Associate Director of the Information Services Division and Director of Computer Leasing.

Data Network Corp. (OTC), New York, has announced an agreement in principle to acquire *Logistic Distro Data,* Inc., New York, and its subsidiary, *LDD Computer Services Inc.* The transaction will involve an undisclosed amount of stock.

Logistic Distro Data is engaged in computer and software services in the New York metropolitan area. The company's equipment includes an IBM 360/65 computer with a million K of core. Logistic Distro Data owns 20 per cent of Distribution Services, Inc., Washington, D.C., in a joint venture with Control Data Corp., GATX, Schriever and McKee Assoc., Inc. and Strobel and Rongved.

Announcing the agreement, John J. Callanan, president of Data Network, said, "It is our intent to build a nationwide computer services network. Our recent merger with Computer Sharing,

Inc., and our forthcoming acquisition of Logistic Distro Data, are major steps toward attaining that goal." Callanan noted that the present management of Logistic Distro Data would be retained.

Data Network Corp. offers computer services to commercial and scientific markets, including specialized proprietary software applications, time-sharing service and support service.

Delta Data Systems has announced the formation of a special Bank Services Group to concentrate specifically on providing a variety of services to the nation's banking community. The group is composed of experienced banking specialists. It will operate within Delta's Facility Management Division, and is headed by Robert J. Vitacco.

Computer Industries, Inc., Sherman Oaks, Calif., was recently acquired by *University Computing Co.,* Dallas. Computer Industries was previously a publicly held subsidiary of UCC. Under the new Organization Graphic Systems Division is part of the Computer Products Group of University Computing Co., which includes: Computer Instrumentation Ltd., Computer Leasing Co., Data Communication Systems Division, Datel Division, Government Systems Division and System Support Division.

Graphic Systems Division will remain headquartered in Van Nuys, Calif., and will continue to provide products and services for the computer graphic field. The present product line includes Microfilm Printer/Plotter Systems. Digital Incremental Plotting Systems and Input Data Reduction Systems.

Cecil M. Benadom, President of *Beneficial Finance Co.,* Miami, has announced plans for the installation of a data processing network linking nearly 1,700 loan offices in the corporate system to the organization's computer center. The new computerized communications system, BENCOM, will be the most extensive data processing network in the consumer finance industry.

The nationwide system will connect two IBM System/360 Model 65 computers in Morristown, N.J., to communications terminals in the affiliated Beneficial offices throughout the U.S. and Canada.

Facility Management and Support, Inc. has been organized in the Chicago area by a group of former EDS systems engineers. The primary purpose of FMS is to provide professional data processing facility management. FMS also provides operations, programming and systems design support.

Datacraft's Master Plan:

organize the world 24 bits at a time!
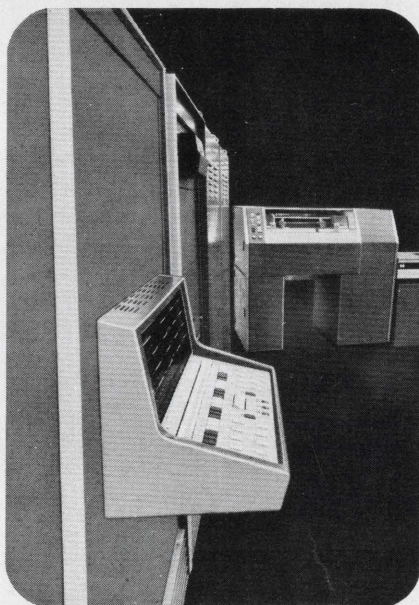
Datacraft is now delivering the fastest 24-bit general purpose Digital Computer available today. Our DC 6024 overshadows many 32-bit machines that limp along behind fancy gingerbread control panels. We take advantage of the simplicity of our 24-bit CPU design and our superspeed memory to run circles around several of our larger cousins, both price-wise and throughput-wise.

Datacraft's DC 6024 is the computer with 600 NSEC full cycle time. This is the processor with 120 generic types of hard-wired instructions and more than 500 operation codes. Ours is the CPU that can give you up to 72 levels of priority interrupt and the capa-bility to handle up to 448 different I/O units. With a transfer rate of 40 bits per microsecond, you'll be kept plenty busy feeding our DC 6024.

Datacraft is in full production of DC 6024 Digital Computers, and your deliveries can begin 60 days from date of order. Price for the basic unit, without main frame options, is $53,900.

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(24 bits at a time).
Tomorrow Someplace Else
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For more information, circle No. 7 on the Reader Service Card

new products

PERIPHERAL DYNAMICS AN-NOUNCES C300 SERIES CARD READERS . . . Peripheral Dynamics, Inc. has announced its first product—the C300 Series Card Readers that stress low-cost, medium-speed and high reliability. PDI's C301 table model and C302 rack-mounted card reader can operate with either a general purpose computer or remote terminal. PDI is a subsidiary of Systems Engineering Laboratories, Inc. and will market the card readers to Systems and on an OEM basis to other computer manufacturers.

Standard features of the C300 series include card feed stop, motor shut down in case of a card jam, and an attention light that tells the operator when the output hopper is full, the input hopper empty or if there is a no-pick condition—the card not being transferred to the read station. Only
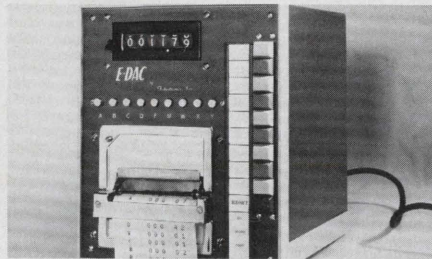
three illuminated controls are required: power on–off, card feed start with operator attention light, and card feed halt. Optional features include a read station light/dark check for each card feed, line drivers for signal transmission over 30 feet and provision for 50 HZ operation.

IBM 360 DOS OVERLAY HANDLER FLEXIBLE . . . Computer Systems Research announces an IBM 360 DOS Overlay Handler that provides the flexibility of OS/360 and requires only 500 bytes of main storage. Traditionally, changes to DOS overlay structures have necessitated recompilation of the calling program and in some cases changes to the actual program logic. With the Overlay Handler on duty, one need only re-specify the relative location of the phases to the DOS linkage editor and re-linkedit them. The Overlay Handler does the rest.

E–DAC—AN AUTOMATIC TIME STUDY SYSTEM . . . The low cost E–DAC system eliminates reading a stopwatch, writing down times, calcu-

lating and classifying data, and analyzing results. E–DAC automatically keeps track of the time; at the completion of each event the Industrial Engineer, the time study technician, or even the operator being studied just pushes the coded event button. The elemental time and the event are then printed on paper tape.

A complete computer analysis and data bank service compiles and stores the data and prepares a summary report, automating Industrial Engineering and time studies.

CINCINNATI MILLING AN-NOUNCES TWO MINICOMPUTER MODELS . . . One of the world's largest numerical control producers has entered the real-time digital computer field with two low-cost, microprogrammable models. Of the two minicomputers introduced by Cincinnati Milling Machine Co., one is specifically designed for dedicated applications and the other for general purpose operations.

The dedicated model, the CIP/2000, is a microprogrammable unit with read-only memory designed for all types of dedicated applications. The second is the CIP/2100, a general purpose, microprogrammed adaptation of the 2000 with magnetic-core memory which can be programmed by software. The 2000 offers superior price/performance ratio, adaptability for unique and changing systems requirements, minimal customers hardware design (input–ouput interfaces are available), and assured program security.

With the CIP/2100, the microprogram (firmware) converts the basic system into a software programmable, general-purpose computer. The programs are stored in the core memory and instructions are interpreted by microprogram sub-routines in the read-only memory.

AUDITRONIC 770 COMPACT IN-TRODUCED . . . Olivetti Underwood Corp. has announced the introduction into the New York Metropolitan area market of the Auditronic 770 compact computer, consisting of a central processing unit, an alphanumeric and control keyboard, and a mobile print unit. Among modular peripherals designed for the Auditronic 770, are units for an auxiliary memory, magnetic ledger cards, paper tape punch and reader, edged punchcard punch and reader, and online transmission control. Each can be added after the system is installed.

According to Gianluigi Gabetti, president of Olivetti Underwood, the new unit is the first in a series of Olivetti compact computers which places the company firmly in a $500 million dollar per year market.

The Auditronic can be used effectively in a large variety of commercial applications in both small and large companies; for the small company as a complete system of management information, and for the large company as a method for decentralized data processing. The Auditronic 770 is designed as a stand-alone system or as a real-time terminal.

The key to the effectiveness of the

Auditronic 770 is an exclusive magnetic tape cartridge similar to tape decks used on large computers. With two cartridges, the memory capacity is 74,000 characters. The completely interchangeable cartridges are self-contained and unaffected by environmental conditions.

NEW PLOTTING SYSTEM SPEEDS TIME SHARING . . .

The TSP-212, a fast unitized plotting system has just been introduced by Time Share Peripherals Corp., Wilton, Conn. The TSP-212 combines the field-proven TSP-12 Plotter with a specially-designed Honeywell X–Y Recorder. The company claims that the TSP-212 speeds and economizes time-sharing EDP wherever graphics are useful.

The new system connects directly to Teletypes, IBM 2741's, and most other terminals. A single-cable connector accomplishes interface through data set or coupler. Operator-oriented controls are all positioned on the front panel. Plot sizes up to 10 X 15" are continuously adjustable through an "absolute plot dimension" pushbutton facility. The unit utilizes modern, low-maintenance, solid-state electronics. Sub-routines in BASIC and FORTRAN, accommodated by most time-share systems, are supplied, or are available in public libraries of time-share services. These routines are useable with many computers not having full code-set output capabilities.

POTTER INTRODUCES AUTOMATIC TAPE TRANSPORT . . .

The Potter Instrument Co., Inc., Plainview, N. Y., has announced the introduction of a fully automatic threading and loading single-capstan tape transport. The AT-1082 has been designed for use with the highest performance computer systems and is capable of bi-directional tape speeds to 150 ips.

The AT-1082 features field-proven vacuum column tape buffering, precision edge guidance for reliable tape control, and industry compatible read/write operations at packing densities to 800 bpi NRZ-1 and 1600 bpi Phase Encoded. The elimination of mechanical adjustments and the incorporation of advanced electronic circuitry makes the AT-1082 the simplest, most reliable tape transport in the industry.

"CONTROL DEVICES" ARE SOFTWARE IN NEW INDUSTRIAL CONTROLLER . . .

Modicon Corp. has recently introduced a new industrial controller which is actually a small digital computer made to perform sequencing, counting, relay logic, and timing functions by its software control modules. The control functions the Controller performs are determined by the control modules loaded into its memory. The control modules are handled as if they were hardware; no computer language programming is required by the user. Designated the Model 084 Controller, it consists of 1000 words of core memory, a central processor, input–output registers and signal conditioning equipment.

The control modules—basic programs enabling the Model 084 Controller, it consists of 1000 words of core memory, a central processor, input–output registers and signal conditioning equipment.

The control modules—basic programs enabling the Model 084 Controller to perform common control functions such as sequencing, logic, timing and counting—are loaded at the factory into the Controller's memory. At his plant the user "builds" his control system through a detachable programming panel. The user does not
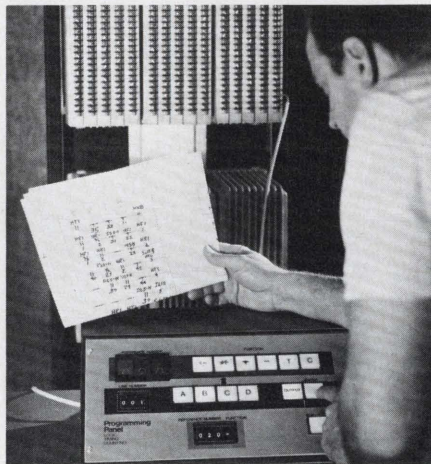
need to be familiar with computer programming. He uses only the basic control technology already familiar to him. For instance, one of the Control Modules—the Logic Module—draws heavily on the techniques used in the electrical elementary diagram: the ladder arrangement, line numbers, and the same symbols.

ELECTRONIC CONVERTER PROVIDES INSTANT REPLAY . . .

Preparing programs for tape operated numerical control machines is a slow and costly manual operation that appears on its way out for some operations. It may soon be replaced by an electronic code converter which employs IBM cards and a memory to provide an instant replay capability to N/C units.

A prototype of the unit, which measures 15 V 28 X 13" has been developed by Radiation Inc., Florida-based aerospace subsidiary of Harris–Intertype Corp., Cleveland. Although marketing plans are still unresolved, the firm is enthusiastic about the capabilities of the machine.

VICTOR EXPANDS CRT CALCULATOR LINE . . .

Positive and negative products, quotients and sums are accumulated in the memory register of
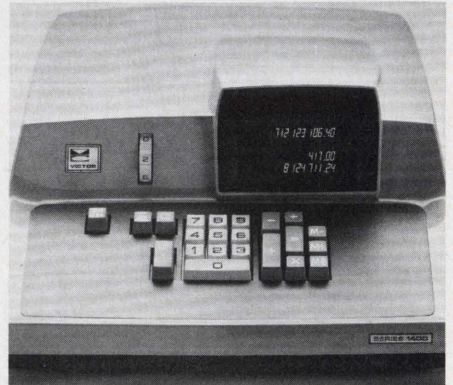
a new cathode ray tube electronic calculator introduced this month by Victor Comptometer Corp. The 14-321 is the second and lowest priced model of the Victor Series 1400 line. The visible accumulating memory provides an automatic grand total of negative and positive extensions.

Accumulations in the memory can be transferred to the working register for further calculations, eliminating manual re-entry. Each register has 14-digit capacity. The large digits appear on a non-glare display for easy reading. A simplified round-off decimal system permits selective round-off up to six places.

OPTICAL PAGE READING SYSTEM CAN PROCESS OFF-LINE . . .

One of the practical features of a new optical page-reading or journal tape-reading system introduced by Farrington is that you don't have to put it "on-line" into a data processing system to digitize the data it reads. The Farrington OCR (Optical Character Reader) reads information either typed or printed, edits and formats it, and then produced a magnetic tape output of digital data. This output can then be fed to a computer.

The system takes the place of key-punching, keytape, key-disc, etc., and with proper forms design, can eliminate any rekeying of the data. The Farrington 3030 Page Reader is also faster, with a reading speed of 400 characters per second. (A similar model, the 4040, reads journal tapes from cash register and addising machines at a rate of 2,000 characters per second.)

INTRODUCE HOME STUDY COURSE IN COMPUTER PROGRAMMING . . . A new home study course, including all the instruction a person with no previous training needs for employment as a computer programmer, has been introduced by CREI, Home Study Division, McGraw–Hill Book Co. This course will be particularly useful as a means of upgrading computer operators and other personnel to cope with the continuing shortage of programmers.

Content was determined through consultation with specialists in computer programming and data processing. Concentrating on COBOL, the course gives the student opportunities to write actual programs in that language. When submitted, these programs are run through an IBM 360 System at the CREI Computer Center and returned with comments from an instructor.

LITERATURE DESCRIBES SCORE . . . New literature is now available from Atlantic Software Inc. describing improved and additional capabilities in the SCORE Cobol Program Generator, reporting and file management system.

New capabilities such as: multiple input and output file handling, automatic matching of Master and Detail files, execution time Date retrieval, inserting own-COBOL-code without having to punch, interpret, or figure-out the logic of the generated program, are just a few of the new items, described in the current SCORE booklet.

SCORE was created to relieve programmers of the burden of coding the clerical COBOL functions usually required in most programs, so that they might concentrate on the unique and creative part of a problem. SCORE orders and installations now total over 90. Operational configurations include the IBM 360 OS and DOS, Honeywell 200 Series, RCA Spectra 70, Burroughs 5500, and Univac 1108.

NEW PLOTTING SERVICE AVAILABLE . . . Axicom Systems, Inc., Paramus, N. J., offers a high-speed, remote, interactive plotting service in addition to the range of computer service already available from the company. The plotting service, called AXI-PLOT, will make it possible for Axicom's Univax 1108, EXEC 8 Operating System to command plotters at remote locations via Axicom's recently announced 30-character-per-second communications network.

The AXI-PLOT system utilizes the newly-developed Houston Instrument PTC-4 (patent pending) plotter controller; a COMPLOT® Dp-1 (11″) or

COMPLOT DP-3 (21″) plotter; a CTC Datapoint 3300 visual display, or other Teletype compatible device; and an acoustical coupler.

Using the CRT, or some equivalent device, the user can build, edit or execute programs stored on the drums of the Axicom computer (the drums have a storage capacity of 132-million characters each). The system output may then be routed to the plotter at a rate of from 300 to 700 increments per second. This rate is approximately 100 per cent faster than that of other remote plotter systems in current use. This faster rate will substantially reduce necessary communications time, thereby reducing costs to the user.

new applications

NEW CODE FOR OUTER SPACE . . . Information about the sun, the planets, and the strange phenomena of outer space may soon be speeding its way back to earth in the form of a new code developed at the University of Notre Dame. The first probe slated by the National Aeronautics and Space Administration (NASA) officials to use the new code is the IMP, or Interplanetary Monitoring Platform, scheduled for a 1971 launch.

IMP will be launched into an orbit about half-way between earth and the moon, and will send back information about energetic particles coming from the sun, in the form of the new "non-systematic, convolutional code" developed by Dr. James L. Massey, professor of electrical engineering, with the support of NASA. His code is also appropriate for probes like Mariner, which photographed Mars and Pioneer, which will survey the sun.

Massey's code is not designed to keep the information secret, but rather to be highly accurate under the difficult conditions of deep space. In addition, it requires a minimum of computer hardware, and allows engineers to scan information from the complex code before it enters the lengthy decoding process.

Messages traveling across the vast expanse of space can become garbled by the background radiation, or "noise," Massey explained. This noise produces the familiar static in sound transmission and blur in pictures received from deep space probes, and can so garble messages that they become useless.

The technique of coding helps spread the burden of information, allowing a computer to salvage much data that is lost through noise, Massey said. In systematic codes, radio pulses representing a bit of information are accompanied by "parity bits," or pulses which give information about wide sections of the code. A computer decoding the message can often piece lost sections of information together, using the parity bits.

Massey's new non-systematic code spreads the burden of information even more thinly, reducing the importance of each pulse and improving accuracy. The code consists only of parity bits, and contains no pulses representing the information itself. The philosophy behind the code's improved performance might be compared to the problem of solving a picture puzzle with 10 percent of the cardboard missing. Obviously it would be easier to figure out what the picture must be if a nick were missing from each piece, than if an entire section of the puzzle were gone.

In fact, Massey's code outperforms the best systematic codes known. In 1000 trials, the code performed perfectly over simulated noise conditions, while the best systematic code produced 87 decoding errors. Massey expects such trials to win many doubting scientists to his side. "Some are quite uneasy about entrusting valuable data to a code with no hard information," he explained. Information theory, the new science of communicating with computers, had long predicted that a non-systematic code like Massey's would be more accurate than the systematic codes now used.

SELECT PATIENTS FOR KIDNEY TRANSPLANTS . . . A computer communications network that will determine within seconds the patients most suitable for kidney transplants among those available in the southeastern United States is being planned in
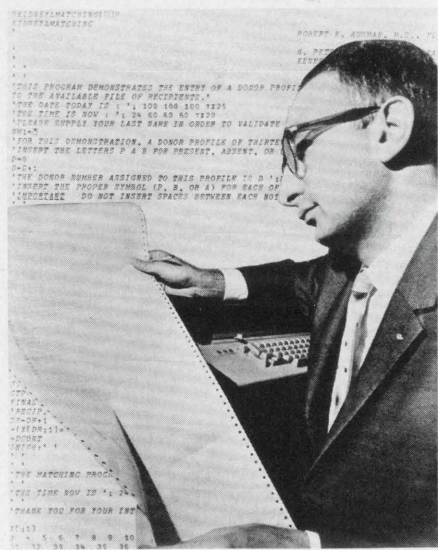
Tampa by Florida physicians and GT&E Data Services Corp.

The initial phase of the network was placed in operation early in February when facilities in Tampa and Miami were linked by conventional telephone lines with a GT&E Data Services' computer in Bayside, N. Y. The computer network ultimately is expected to serve approximately 15 hospitals and medical centers in 12 southeastern states.

In the matching process, 13 key chemical aspects of a potential recipient's body tissue that have been typed by physicians are compared with those of the kidney donor. A precise match-up of these chemical characteristics—called "antigens"—reduces the possibility of the body rejecting the foreign kidney following the transplant operation. When the new computer–communications system becomes operational, the antigen information on all patients available for kidney transplants at the participating hospitals and medical centers will be transmitted to the computer for storage in its memory bank.

The same antigen data on a kidney donor would then be transmitted to the computer by the appropriate physician when the donor becomes available, and the computer would provide the physician almost instantly with a list of candidates having the closest tissue match.

Because the computer instructions were written in a simplified language physicians at the participating hospitals will not require specialized training to communicate with the computer. Called APL (A Programming Language), the recently developed language that is utilized enables the computer to "talk" with the physicians in conventional English rather than the mathematical codes that have been used traditionally.

CONTROL SYSTEM IN SOUTH AFRICA . . . The first power generating station computer system to be installed in the Republic of South Africa has been commissioned at the Camden Power Station of South Africa's Electricity Supply Commission (Escom).

The system, a Control Data 1700 computer and a large array of analog and digital interface equipment is designed to monitor operation of generating unit number eight, the last to be commissioned in this, Escom's largest and most modern station.

COMPUTER HELP TO ARCHITECTS . . . Practical use of computers and other machines to save time and improve design will be demonstrated by The American Institute of Architects in four cities. "We will show how computations that would take weeks

and weeks to complete" with a man's brain can be quickly resolved by a machine, freeing the designer to consider many alternatives which will result in a better building, explained Thomas S. Fife, Dallas, consultant to the AIA Professional Development Program.

"Practical Computer Applications in Architecture" will offer four sessions, each lasting one-and-one-half days, in Boston on March 6. The same sessions to be given later in Chicago, San Francisco and Atlanta in May, August and October.

EDP SYSTEM MAY GENERATE TAX MILLIONS . . . State Revenue Commissioner James O. Mathis recently introduced an electronic system that may generate millions of dollars of additional revenue for Indiana next year. Mathis said the newly installed system represents an advanced approach in fiscal control. It supplies specialists with tax records that are a matter of hours old. Previously, months might have passed before some tax accounts were updated.

"Using this system," Mathis said, "we know on a day-to-day basis whether the state's approximately 180,-000 businesses are up-to-date with their tax payments. Lost revenue from late or uncollected returns can cost each state millions of dollars a year."
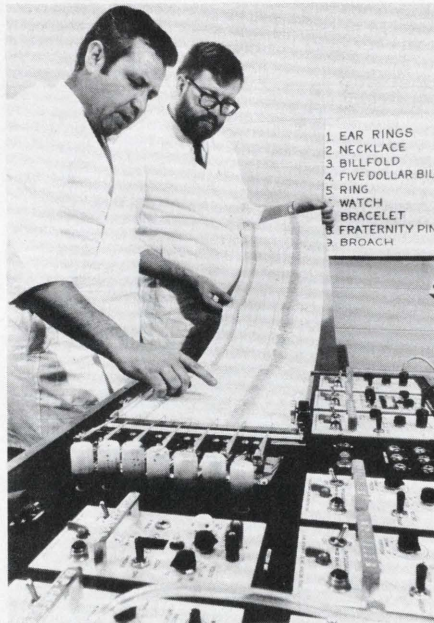
The speed and accuracy of the Indiana system is achieved through use of two IBM computers, linked to approximately 30 TV-like computer terminals. The IBM 2260 visual display stations significantly speed the entry and retrieval of computer-stored records. Thirty more terminals will be installed by next January.

TRACK USE OF OVER 1,000 DRUGS . . . A computerized system for stocking more than 1,000 drugs and intravenous solutions is helping pharmacists and doctors improve patient care at Shadyside Hospital in Pittsburgh. Shadyside, a 373-bed private institution, uses an IBM System/360 to more efficiently order, stock and track drugs, and to assure their availability at all times. Officials say it saves up to 80 man-hours in the hospital pharmacy monthly. Much of this saving is realized in computer-printing of lengthy drug purchase orders containing names like succinylcholine chloride and chloramphenical palmitate.

Under the computerized system, cards are punched for each drug or intravenous solution in stock. As drugs go into use, the cards are placed in an "activity drawer." When a drug is re-ordered, the in-use cards are sent to the computer room where a printout is produced on the System/360 Model 20. In the printout is data on: quan-

ity of the particular drugs used, balance on hand, percent of drugs on hand compared with percent used, and identity and quantity of drugs to be ordered.

LIE DETECTOR RESEARCH BY COMPUTER . . . Lie detector tests may be made more accurate because of computer-based research at Delta College, University Center, Mich. Prof. William Yankee, academic dean of the college and a nationally known polygraph expert, is using an IBM computer to more accurately analyze factors he feels are critical in determining deception by a polygraph test subject.

1 EAR RINGS
2 NECKLACE
3 BILLFOLD
4 FIVE DOLLAR BILL
5 RING
6 WATCH
7 BRACELET
8 FRATERNITY PIN
9 BROACH

His project is based on the belief that changes in heart rate, pulse amplitude, diastolic and systolic blood pressure, breathing patterns and the skin's resistance to electricity can be evaluated and measured on the computer. "Polygraph test results now only are as reliable as the operator of the machine," Yankee said. "We hope to develop formulas to cut errors in human evaluation. We believe combining or isolating the factors with which we wish to deal will reduce the margin for error."

Examiners ask a series of controlled questions, and a student responds negatively to each. In this manner, when a veiled question concerning the crime is posed, a lie will result. Following the student polygraph tests, results from an accompanying graph are converted to numerical values. The polygraph chart is broken into question zones, or specific reaction areas, into which each question falls. Numbers are also assigned each activity on the chart. The resulting data is transferred to work sheets and punched into cards for computer processing.

The IBM System/360 Model 40 correlates each question zone with every other zone, and comes up with an index for each zone. Researchers interpret the printed-out data to determine the zone in which the deception took place.

"Our current research takes advantage of the computer's ability to mathematicaly manipulate hand-quantified data having to do with deception criteria," Yankee said. "Soon, we hope to begin testing out the reliability and vailidity of the criteria as interpreted in our present tests. This should permit us to draw very definite conclusions regarding the value of the polygraph to business and law enforcement agencies."

COMPUTER METER-READER STUDIED . . . A computer could read your electric, water, or gas meter automatically through your telephone line without ringing the phone or preceptibly tying up the line. To test such a system, trials involving up to 150 homes at Holmdel, N. J., will be started in a month or two by Bell Telephone Laboratories. More extensive trials will be held in other locations during 1970.

Automatic meter reading requires some special equipment in the home, telephone central office, and utility company office. Whether new equipment and techniques will permit this to be done on a broad scale with sufficient economy is being studied by Bell Labs, research and development unit of the Bell System.

COMPUTERIZE "SEW-IT-YOUR-SELF" PATTERNS . . . After more than a century of producing "sew-it-yourself" apparel patterns by hand, Butterick Co., Inc., N. Y., has installed a computerized pattern grading system developed by California Computer Products, Inc. This is the first "turn-key" installation of the patented Cal-Comp system, which automatically produces patterns in all sizes of an apparel line from the designer's original pattern, according to Lester L. Kilpatrick, CalComp president.

DIAGNOSTIC TESTS . . . Opening of a unique Biomedical Screening Center, equipped to perform basic medical diagnostic tests rapidly and accurately, was recently announced by Martin Kaplan, president of Biometric Systems, Inc., Jericho, N. Y., the parent company.

With the cooperation of life insurance companies, the Center expects to concentrate upon physical examination of insurance applicants. All functions are under the supervision of qualified physicians, with laboratory testing carried out by trained medical technicians.

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(Procedures and Practices)

COST . . . . There is no charge for computer programs listed in SOFTWARE AGE.

PUBLISHED . . . . . The listings will be published in the first available monthly issue of the magazine.

All listings will be re-published in semi-annual summary issues of SOFTWARE AGE during the months of the S.J.C.C. and F.J.C.C.

BROKERAGE . . . . SOFTWARE AGE does not broker computer programs nor act as an agent. As an unbiased third party, SOFTWARE AGE is acting, solely, as a pipe-line of communications between buyers and sellers of computer programs.

EVALUATION . . . . SOFTWARE AGE does not compare or evaluate computer programs. The degree of seller on-site support and the extent of buyer capability virtually make the evaluation of any program meaningless.

REQUIREMENTS . . . A prerequisite for any listing is that it be documented or supported to the extent of being operable by the buyer.

ANONYMITY . . . . A cross-coded reference number will be assigned to any program whose originator wishes to remain anonymous. Buyer inquiries will be forwarded to the originator. If the originator still prefers anonymity, buyer will be notified by SOFTWARE AGE.

GROUPING . . . . . Listings will be grouped according to key-word, title, mainframe application and compatability, industry, etc. As listings grow, more categories and definitions will be added.

software age

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MADISON, WISCONSIN 53701

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(REVERSE MUST BE COMPLETED)

New Listing ☐
Revised Listing ☐
Program Wanted ☐
Broker Wanted ☐

This program is: Utility ☐ Systems ☐ Scientific ☐ Applications ☐ Engineering ☐ Management ☐ Other ☐

Title: | Number of Programs (if more than one)

Description: (Use reverse side if necessary)

Hardware Configuration:

Programming Language: | Documentation Provided:

On-Site Support/Debugging Available? Yes ☐ No ☐ Hours | Guaranteed? Yes ☐ No ☐

Patent No. Copyrighted? Yes ☐ No ☐ | Number of Programs Distributed

Check Here for Cross-Coded Reference ————————→☐← ———————— Check Here for Cross-Coded Reference

(REVERSE MUST BE COMPLETED)

This program is: For Sale ☐ Lease ☐ Franchise ☐ | Price:

Name and Address of Program Owner _____

Individual Contact _____ Title _____

Firm _____ Industry _____

Street Address _____

City, State and Zip _____ Tel: (_____) _____
                                                                        (A.C.)   (Number)

| Additional Description (continued) | | Additional Listing Forms Required _____ |

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This program is: For Sale ☐ Lease ☐ Franchise ☐ | Price:

Name and Address of Program Owner _____

Individual Contact _____ Title _____

Firm _____ Industry _____

Street Address _____

City, State and Zip _____ Tel: (_____) _____
                                                                        (A.C.)   (Number)

| Additional Description (continued) | | Additional Listing Forms Required _____ |

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FINANCIAL

INVESTMENT AND BORROWING

CERTIFICATES OF DEPOSIT $7,000

1099s, any denomination, any number of days, option of check or accrual on interest, any number of C/D's per client.

360 32K 3—2311 2540 1403, ALP

Jack Gates
Financial Systems Consultants
915 South Clinton Street
Ft. Wayne, Ind. 46802

B0101

TIME PASSBOOK SAVINGS $4,500

Any interest percentage, daily posting and accruing option.

360 32K 3—2311 2540 1403, ALP

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Financial Systems Consultants
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Ft. Wayne, Ind. 46802

B0102

SAVINGS SYSTEM PACKAGE   N/A

"No Passbook" Savings Application Interest Compounded Quarterly, Statement Printed Quarterly.

H-200 Basic Configuration, 4 Tapes, COBOL

M. M. Marietta, Vice President or
E. W. Bauman, Programmer
International Computer Bureau
9th Floor, 321 St. Charles Avenue
New Orleans, La. 70130

B0103

COMMERCIAL LOAN ACCOUNTING $7,500

Commercial loan system complete down to cash flow. Reports by customer, branch, officer, and collateral.

360 32K 3—2311 2540 1403, ALP

Jack Gates
Financial Systems Consultants
915 South Clinton
Ft. Wayne, Ind. 46802

B0104

MORTGAGE SERVICING PACKAGE   N/A

The system consists of 92 reports, of these 31 are daily; 14 are weekly; 17 are cut-off; 25 monthly; and 5 annual. Typical processing time for 72,000 accounts is 90 minutes without name and address printout, without a trial balance (45 minutes more with a trial balance). Some specific features of the package are:

1. Multiple payments, prepayments, and curtailments are accepted.
2. Late charges are computed and applied if due.
3. Service fee, 2031, escrow and interest are recorded as required.
4. Miscellaneous payments can be applied.
5. Payoffs are processed and proper codes are automatically generated. Miscellaneous fee on payoffs are also processed.
6. Closing codes can be changed to freeze an account for various purposes.
7. Sales can be processed if a loan is delinquent or prepaid.
8. Short first payments and split interest sales are easily processed.
9. Sales can be reversed.
10. Disbursements are processed daily against all open accounts.
11. Duplicate disbursements from an account cannot be processed through the system.
12. Overdrawn escrow accounts are covered automatically with funds transferred from the corporate accounts.
13. Changes to accounts are processed daily. An edit and consistency check is made on these changes.
14. The system supports branch reporting for delinquency reports, collection reports, trial balances, etc.
15. Single debit reporting is supported for multiple cutoff dates.
16. Escrow analysis is done monthly. Changes in escrow payments go into effect automatically.
17. The escrow clearance account contained in the system has met the approval of two FNMA offices as well as many large investors.

360/30 or 40 65K 3—2311 or 2314, 2 Tapes 2540 CR-P, and 1403, COBOL, RPG for Report Programs

D. N. Panaccio
Scientific Resources Corporation
Commerce and Enterprise Drives
Montgomeryville, Pa.

B0105

MORTGAGE SUMMARIZATION PROGRAM $160

Program receives mortgage amount, interest rate, length, and starting date. It then calculates monthly payment. It next prints a monthly summarization through the life of the mortgage showing the amount applied toward interest and reduction of the outstanding amount. It then prints a yearly summarization showing the amounts paid toward interest and principal reduction during each year of the mortgage. Has been used by banks and Savings & Loans Associations as a service to customers and prospects.

360—32K, COBOL

Richard A. Katzman
EDP and Business Consultant
102 Harrison Drive
New Cumberland, Pa. 17070

B0106

BANKING OPERATIONS

DEMAND DEPOSIT ACCOUNTING SYSTEM   N/A

A DDA system developed by banking/data processing people. Entry can be MICR or punched card. Provides: interface to inquiry file, interface to Overdraft Banking System, automatic transfer of funds, float control and analysis, service charge calculation and account analysis and audit confirmations. Produces 31 reports with emphasis on management information and exception reporting.

360 64K DOS 2311 Disk and Tape, COBOL

D. N. Panaccio
Scientific Resources Corporation
Commerce and Enterprise Drives
Montgomeryville, Pa. 18936

B0107

INSUFFICIENT FUND REPORT TO SUPPORT IBM DDA PACKAGE $500

This program is designed to look at each individual check as it is presented. This check will be paid if the current balance on file will cover it. This program will produce an insufficient fund notice, an overdraft notice (if the account has an overdraft limit or is coded a 'pay all'), or both for an account if the overdraft limit is exceeded. Under the IBM DDA package, if the total amount of checks for the day creates a negative balance, then either all or none of the checks are accepted. BOS or DOS. 2314 version available May 1, 1970.

360/30 32K, 2540 or 1442, 3—2311, 1403, BAL

Jim Smith, Sales Representative
Union National Bank
Public Square
Springfield, Mo. 65805

B0108

CHECK RECONCILIATION $1,000

Two (2) different check reconciliation systems both using MICR. One system punches cleared check data into cards so cleared checks can be matched against a master list of issued

checks. The other system lists all cleared checks along with the number of the outstanding checks. Extremely valuable for large volume accounts. BOS or DOS. 2314 version available May 1, 1970.

360/30 32K, 2540 or 1442, 2311, BAL

Jim Smith, Sales Representative
Union National Bank
Public Square
Springfield, Mo. 65805
B0109

MULTI-PROOF & TRANSIT $6,750

Accepts both MICR and card input, provides proof listings, cash letters, cash letter recaps, and captures all on-us items, including float information, as input to IBM 360 DDA system. Features checkpoint restart, flexible sort patterns, and card entry of off-line items.

360/30 32K, 3—2311, 1442 or 2540, 1419, BAL

Jim Smith, Sales Representative
Union National Bank
Public Square
Springfield, Mo. 65805
B0110

COST ACCOUNTING, BANK $2,500

System to give timely and accurate reporting of expenses and income on both departmental and company levels. Designed to facilitate the accounting of intra-company, as well as external, expenses and income. Programs are written in 360 BAL. BOS or DOS. 2314 version available May 1, 1970.

360/30 32K, 2540 or 1442, 2311 BOS or DOS, BAL

Jim Smith, Sales Representative
Union National Bank
Public Square
Springfield, Mo. 65805
B0111

TAXES

COMPLETELY AUTOMATED INCOME TAX SOFTWARE SYSTEM   N/A

A computerized income tax software system developed for 1969 state and federal individual income tax processing. The programs included in this software system accept any amount and/or variety of 1969 tax information, perform the necessary computations, output the results on official 1969 state and federal tax forms and generate supplementary information sheets as needed. Computer input forms were designed especially for quick and easy preparation of the required individuals income tax information. This software system comes complete with input forms, output forms, and documentation.

FORTRAN

Bud Coling
Budco Engineering Company
2650 Dalemead Street
Torrance, Calif. 90505
B0112

GENERAL ACCOUNTING

"TAP" THE ACCOUNTING SYSTEM $35,000

The basic TAP system provides accounts receivable, accounts payable, general ledger accounting with budget comparisons, sales analysis and check reconciliation. A computer services organization may offer their customers one or more TAP applications which suit their immediate needs and easily add other TAP applications at a later date if they so desire.

The system was designed specifically as a highly generalized program for banks and computer services organizations. It has significant advantages in that it allows such organizations to efficiently and profitably offer total computer services to a wide range of both large and small businesses using one system.

TAP features a one-pass multi-company file, with specific company information, data tables, alternate processing procedures and reports controlled by special input parameters. A highly versatile report generator integral to the system greatly simplifies and facilitates the exact satisfaction of nearly every customer report requirement.

360/30, 65K and RCA Spectra 70, BAL

Cullinane Corporation
60 State Street
Boston, Mass. 02109
B0113

EMPLOYEE TIME ACCOUNTING $1,250

This system keeps track of employee time and maintains a work in process and accounts receivable file. Employee time records, expenses, cash receipts, adjustments, etc. are posted to the client master file and a work in process activity journal is produced. A time and charges list by employee is produced and the accounts receivable file is printed and aged. DOS. 2314 version available May 1, 1970.

360/30 32K, 2540 or 1442, 3—2311, 1403, ALC/COBOL/RPG

Jim Smith, Sales Representative
Union National Bank
Public Square
Springfield, Mo. 65805
B0114

ACCOUNTS PAYABLE $6,000

Features include (1) improved input verification and control, (2) effective control of monetary obligations, (3) cash requirements projections, (4) automatic payment following approval, (5) management information and control reports, (6) variable account coding of obligations and expenditures, (7) positive automatic and manual controls, (8) single or multiple company processing, and (9) interfaces with other accounting functions. Detailed functions of the Accounts Payable program include:

1. Complete editing of input data with printed explanations of rejected data.
2. Modules for determining and reporting cash requirements through a selected future date.
3. Printing of checks and statements following approval, together with a complete cash disbursement report.
4. A report of all outstanding commitments.
5. Weekly and monthly cost distribution reports with five levels of cost distribution summaries.
6. Listings of active vendors with their mailing addresses.
7. Invoice trial balance reporting.
8. Expedient facilities for maintaining and updating vendor names and addresses, commitment and distribution.
9. Control and balance totals for a complete audit trial of the system.
10. Supply of data to interface with Cost Accounting and General Ledger Systems.

360 65K minimum of 4 Tape of Disc Drives, COBOL DOS or OS

David E. Weisberg
URS Data Sciences Company
1700 South El Camino Real
San Mateo, Calif. 94402
B0115

ACCOUNTING APPLICATIONS PACKAGE   N/A

Designed for use by public accountants to produce balance sheets and income statements, summary of activities. Current as well as year-to-date totals are both printed and stored in memory. Package was developed as an entire accounting system, and contains programs to produce trial balances, quarterly and annual summaries.

GE-265, BASIC+

Robert J. McHugh,
Sales Manager, Computer Systems
Graphic Controls Corporation
189 Van Rensselaer Street
Buffalo, N.Y. 14210
B0116

GENERAL LEDGER ACCOUNTING SYSTEM (C.P.A.) $2,500

Provides a complete book of journals, file maintenance, statement of income and balance sheet. Flexibility to fit the accountant's needs for variable account numbers, account descriptions and report arrangements. This multi-customer system was designed and is presently being run under the direction of a certified public accounting firm. BOS or DOS. 2134 version available May 1, 1970.

360/30 32K, 2540 or 1442, 2311, BAL

Jim Smith, Sales Representative
Union National Bank
Public Square
Springfield, Mo. 65805
B0117

ACCOUNTANT'S/ACCOUNTING PACKAGE   N/A

Various applications packages, involving several combinations, for internal use by firms having PDP8 computers, including real-time dedicated systems, using a 1401 simulator, for use in foreground or background processing, depending on the capacity and configuration of the DEC equipment.

All PDP 8 Series; Application Programs are in 1401 Languages

Stanley G. King
1510 Merkley Avenue
West Sacramento, Calif. 95691
B0118

HOSPACT (HOSPITAL PATIENT ACCOUNTING SYSTEM)   N/A

The hospital is provided with all relevant facts about patients from admission to final payment. Provides instant access to detailed patient profiles as well as a daily overview of all pertinent financial bedcount data. Provision for Medicare, multiple insurance company involvement, patient transfers, and daily, weekly and monthly reports are built into the system. In addition, HOSPACT incorporates a flexibiity factor allowing it to interface with individual needs of specific hospitals.

Any computer with a COBOL Compiler, COBOL

Howard Bromberg,
Executive Vice President
Information Management Incorporated
447 Battery Street
San Francisco, Calif. 94111
B0119

GENERAL BUSINESS SERVICES

SALES LEAD AND INFORMATION SYSTEM (SLAIS) $3,500

SLAIS is designed for the salesman in the field. This system uses a simple English language format for recording information use-

ful to the field sales personnel in following up leads and recording all sales/customer actions. Many reports are obtained from the common data base including FOLLOW-UPS, ACTIONS, Sales analysis by both salesman and department, etc.

360 DOS or SPECTRA TDOS, BAL or COBOL

Donald E. Killmer
Elliott Data Systems
224 East 38th Street
New York, N.Y. 10016

B0120

PROCTOR MODULE I   **$3,500**

RESOURCE MANAGEMENT TOOL-PROCTOR provides management with factual information on which to base decisions. STANDARDIZATION - PROCTOR provides a standard method of measuring project progress based upon results. JUSTIFICATION - PROCTOR reports have proved extremely valuable for justifying additional resources. HISTORY-PROCTOR reports provide a useful history. Project progress is fully documented. DEFINITION-PROCTOR forces formal project definition. EVALUATION-PROCTOR provides assignment status reports which measure individual and team efforts. FUNCTION REPORTING-PROCTOR provides a means of time reporting by project. CHANGES-PROCTOR was designed with a system definition changes considered normal practice. SAVINGS-PROCTOR takes less time to prepare than progress reports. GUIDANCE-PROCTOR provides reports to staff as well as management. Staff reports furnish guidance to staff members. FLEXIBILITY-PROCTOR will generate as much or as little information as desired by management. INDEPENDENT-PROCTOR system is easy and simple. Personnel training can be accomplished within a short period of time. DESIGN-PROCTOR was designed with a modular concept, the system can be implemented in stages as the user requires the additional information.

16K COBOL Compiler Disk or Tape, COBOL

Ray R. Rogers
Rodger, Rogers and Kirkman
2110 K Street
Sacramento, Calif. 95816

B0121

GRAPHS AND PLOTS

FIRST QUADRANT SEMI-LOG
CALCOMP PLOTTER   Free

Permits Automatic plotting of a semi-log curve.

IBM 7094 and UNIVAC 1108, MAD

Dr. M. D. Abrams
Dept. of Electrical Engineering
University of Maryland
College Park, Md. 20742

B0122

CALCOMP   Free

Subroutine written in FORTRAN to provide tape for off line plotter.

IBM 7094 and UNIVAC 1108, FORTRAN

Dr. M. D. Abrams
Dept. of Electrical Engineering
University of Maryland
College Park, Md. 20742

B0123

EZPLT   Free

Permits automatic plotting of a curve specified by two vectors.

IBM 7094 and UNIVAC 1108, MAD

Dr. M. D. Abrams
Dept. of Electrical Engineering
University of Maryland
College Park, Md. 20742

B0124

PLOTTING PACKAGES FOR 3-D
APPLICATIONS   N/A

(1) 3-D surface plotting with hidden line elimination. (2) Planar or 3-D contouring. (3) 3-D architectural plotting with hidden line elimination.

Tape and Plotter, FORTRAN IV

Harvey N. Lerman
921 Thistle Lane
Maitland, Fla. 32751

B0125

SPEEDPLOT II $750

This program automatically screens and plots data in 8½ x 11 ins. format on a line printer. Up to six curves per plot with individual plotting symbols and curve titles may be printed. Each plot is identified separately. X and Y axis scale values, limits, and labels are all variable. Plot point values may be plotted directly from input data, or can be calculated using stored formulae. A data screening capability is provided since only significant values falling within the X and Y axis scale limits are plotted, whereas all data is separately tabulated.

IBM 360, COBOL

Manager, Software Marketing
Pacific Software Services Co.
P.O. Box 432
Bellflower, Calif. 90706

B0126

PRINTER PLOT $100

PRINTER PLOT produces graphs and plots on any line printer or teletype to the user's specifications. With a single subroutine call the user can produce single plots, X/Y plots, frequency distribution plots, etc. Both axes are labeled to user specs and have logically graduated increments and graduations printed on each axis. Grids, axes, overlays, cumulative overlays and other features may be specified on each call.

Any configuration with a Printer or Teletype, FORTRAN IV (Entirely)

SYCOM Computer Systems
344 South Division
Ann Arbor, Mich. 48108

B0127

MATHPAK $450

MATHPAK allows the user to enter a FORTRAN-like equation with constants and parameters to be varied, and to receive a listing and one or more graphs of the equation's input and output. This easy-to-run program includes the graph package. No programming is required to use MATHPAK.

Any configuration, FORTRAN IV (Entirely)

PRS Associates
344 South Division, #420
Ann Arbor, Mich. 48108

B0128

GRAFPAK $200

GRAFPAK is a coordinated subroutine package which produces graphs on any line printer or teletypewriter. With a single subroutine call the user can produce X/Y plots, frequency distributions, single plots, etc. Both axes are labeled and logically incremented graduations are printed along each axis. Grids, overlays, cumulative plots and other features may be specified when calling the package.

Any configuration with Line Printer or Tele-typewriter, FORTRAN IV (Entirely)

Phillip R. Schlesinger
PRS Associates
344 South Division, #420
Ann Arbor, Mich. 48108

B0129

DIGITAL FILTER DESIGN $6,000

A digital filter design program for designing lowpass, bandpass, bandstop and highpass digital filters from either prototype designs included in the program or from externally specified designs. Prototype designs available are: Butterworth, Bessel, transitional, Chebyshev I, Chebyshev II and elliptic. Recursive digital designs, which result from application of a z-transformation, are in either parallel or series realization. Frequency and time response evaluations may be obtained in either printed or plotted form. Z-transformations available are: standard z-transform, matched z-transform, or bilinear z-transform.

40K Word Storage, FORTRAN IV

Dr. Roger M. Golden
Technology Service Corporation
225 Santa Monica Boulevard
Santa Monica, Calif. 90401

B0130

CONTOUR   N/A

Automatic contour mapping for gridded or random spaced data. Plotter independent output with plotter format written for SC-4020, PRINTER, GERBER, CALCOMP.

360—200 K, FORTRAN

C. D. Smith, G. Masaki, T. Walsh
Wolf R&D Corporation
6801 Kenilworth Avenue
Riverdale, Md. 20840

B0131

INSURANCE

HEALTH AND WELFARE GROUP
INSURANCE SYSTEM $4,000

Non-hourly, multi-plan, group insurance billing, balance, delinquency, accounting and eligibility system. Calculates and pays out commission or sales credit to brokers. Handles special one-time-only policy and/or employer fees. Calculates and re bills overs/shorts to employers. Adaptable to union fund accounting (incl. pension) and/or H & W administration.

Card-oriented, COBOL

Norman R. Hansen
465 Edwards Street
Crockett, Calif. 94525

B0132

INVENTORY

INVENTORY MANAGEMENT
SIMULATOR $650

IMS will simulate up to 52 periods of data with 12 periods of history data. Forecasting options are exponential smoothing, trend, or moving average. Ordering options are fixed, order point, or service point. Economic Order Quantity options are fixed or dynamic. A graph is created after each simulation showing on-hand quantity, demand quantity, and forecast quantity for each period.

Honeywell 120, 16K, COBOL

James M. Beirbach
Fail-Safe Systems
2130 Winchester Drive, Suite No. 1
Indianapolis, Ind. 46227

B0133

IN PROCESSING INVENTORY
REPORTING $5,000

Complete inprocess inventory package using card input. System provides ability for up to ten sequential operation tracking with adjustment program for special tracking of inventory. Production reports relieve prior operations to reflect new inventory status. Costing program included at no additional charge, if desired.

H-200 4 Tape 16K, COBOL D

Edward J. Weigand
Hoover Ball Bearing
Showalter Drive
Georgetown, Ky. 40324

B0134

MANAGEMENT SCIENCE/
OPERATIONS RESEARCH

SYSTEM FP/70   N/A

Financial Programming for the 1970's is a software package for use by the financial analyst, corporate planner, or economist for financial programming, which includes planning, modeling, and budgeting. The system can prepare divisional financial plans and consolidate them into corporate plans. The system provides the financial analyst with the ability to specify the type, structure, and format of financial reports. FP/70 performs totalling and sub-totalling automatically and provides the necessary tools for financial modeling.

Standard financial procedures, ranging from a simple "balance forward" operation to a more involved "discounted cash flow" calculation, are also provided by the FP/70 System. The FP/70 System information base consists of tables whose columns represent time periods and whose rows represent planning elements. The method of data entry is patterned after common accounting procedures, so it is easy to learn and use. A complete file updating mechanism is included.

IBM 360/30 (65K bytes), IBM 360/40—65, XDS Sigma 7 (48K Words) and Others, FORTRAN IV

H. S. Epstein
Bonner & Moore Associates, Inc.
1133 Avenue of The Americas
New York, N.Y. 10036

B0135

MERGER/ACQUISITION ANALYSIS $10,000

Time sharing computer model.

Comshare Time Sharing System, FORTRAN IV

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0136

BUY/LEASE ANALYSIS $1,000

Time sharing computer model to determine the financial and operating advantage of leasing versus buying equipment, land, buildings, etc.

FASTCOMP Time Sharing System, BASIC

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0137

PROFIT SHARING PLAN MODEL $1,000

Time Sharing computer model to determine the employee benefits and company cost of a proposed or existing profit sharing plan.

FASTCOMP Time Sharing System, BASIC

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0138

REAL ESTATE INVESTMENT
ANALYSIS $10,000

Time sharing computer model to evaluate the profitability of a real investment. Uses the discounted cash flow return on investment based on the key variables of income and expense projections, equity and debt assumptions, depreciation, income tax and market value appreciation.

Comshare Time Sharing System, FORTRAN IV

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0139

TRANSPORTATION/DISTRIBUTION
MODEL $4,000

Time sharing computer model for minimizing the cost or maximizing the profit for the standard transportation LP problem, i.e., shipping a number of units of product from a set of sources to a set of destinations.

Comshare Time Sharing System, FORTRAN IV

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0140

COMPUTER TIME ESTIMATING
MODEL $2,000

Time sharing computer model for estimating the run time of a business data processing application (e.g., payroll, sales analysis, etc.) that is to be programmed in DOS—COBOL for any IBM 360 configuration.

FASTCOMP Time Sharing System, BASIC

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0141

COMPUTER PROJECT DEVELOPMENT
COST ESTIMATING $2,000

Time sharing computer model for estimating the cost and manpower to design and implement a business data processing application (e.g., payroll, sales anaylsis, etc.) for any program to be written in a higher level language like COBOL.

FASTCOMP Time Sharing System, BASIC

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0142

SCHEDULE $3,200

The package consists of a number of different programs designated to solve scheduling and resource allocation problems, constrained by resource limitations. A variety of techniques are employed, such as binary integer programming, dynamic programming, probabilistic and heuristic methods. Various techniques utilized in the package can be chosen at the user's option. The programs are applicable in a variety of areas, such as industrial production and manpower scheduling, capital budgeting and many others. At present the program has been experimented with about 50 resources types, 50 activities over 52 time—units. These dimensions can easily be extended by the user.

FORTRAN IV

Dr. D. Tabak, Dr. R. W. Thomas,
J. S. Clark
Wolf R&D Corporation
6801 Kenilworth Avenue
Riverdale, Md. 20840

B0143

OPTEV $100

OPTEV is a three-part package to aid DP managers in testing and evaluating prospective or staff operators. Part one consists of a comprehensive written test covering system/360 and DOS fundamentals. Part Two is a listing of routine manual functions every operator must perform. Part Three is a DOS job stream to test the operators ability to handle the routine of a 360/DOS environment. The OPTEV package is applicable to all DOS installations with special options included for those with tape drives and or multiprogramming.

360/25, 30, 40, ALC (DOS only)

D. Jay Edwards
D. Jay Edwards & Associates, Inc.
1106 Cedrus Way
Potomac, Md. 20854

B0144

STATISTICAL ANALYSIS PACKAGE $10 up

This is a collection of statistical analysis programs and subroutines and a master program which allows the user to perform one or many data analysis functions and tests. Available tests include correlated and uncorrelated t-tests, Fischer t-tests, Pearson r, rank r, biserial r, data description, mean, median, mode, standard deviation, interquartile ranges, Q's, sumsq, cross-tab tests, subset tests and many others. Detailed description on request. Entire package or single subroutines may be purchased.

Any configuration, FORTRAN IV (Entirely)

SYCOM Computer Systems
344 South Division
Ann Arbor, Mich. 48108

B0145

MANUFACTURING

INDUSTRIAL INFORMATION'S BILL OF MATERIAL PROCESSOR $25,000

The primary function of IIBMP is the creation, the maintenance and the retrieval of a product data information base. Upon demand, the system will provide single or multi-level bill explosion of part population; by assembly and by project (gross or net). The system will further supply an indented parts list of each assembly completed with scheduling information. Adaptability to user supplied systems such as order entry, production control, WIP cost accounting is pro-

vided in either Fortran or COBOL.

John J. Rooney
Industrial Information, Inc.
500 Office Building, Executive Drive
Fort Washington, Pa. 19034

B0146

CRP—CRITICAL PATH METHOD N/A

Project scheduling and estimating package.

PDP-10, FORTRAN

Dr. Eamonn McQuade,
Mgr. Systems Programming—Computer Graphic Controls Corporation
189 Van Rensselaer Street
Buffalo, N. Y. 14210

B0147

PAYROLL AND BENEFITS

PAYROLL (HOURLY-SALARY) 1130 $4,800

A Salary and Hourly Payroll System for single and/or multiple location users with up to 1,000 employees per location. The System includes complete Audit and Control methods and provisions for Labor Distribution, Union Considerations, State & Local Taxes, Deduction Registers, Personnel Information, Variable Check Formats, 941A, W-2 and Employee Mailing Labels.

Complete Documentation is provided in the form of System Guides for Manual and EDP Operations. All Data Entry and Maintenance Requirements are covered.

The System can be User installed or CSC will provide installation under either of two (2) options: 1. User Assistance, 2. Total Implementation.

1130 PK/1 Disk or up/1132 or 1403, FORTRAN IV & ASSEMBLER/DISK MONITER

R. B. Polhemus, Director of Marketing
D. J. DeCrane, President
Computer Systems Company, Inc.
1470 St. Charles Avenue
Cleveland, Ohio 44107

B0148

PAYROLL REGISTER $500

From a three card input that included employee master, current earnings, and year to date: This program will calculate and punch into current earnings the federal, FICA, Indiana State, and a standard percentage deduction on a weekly basis. A maximum of six other standard deductions can be deducted from employees gross pay to arrive at net pay which is punched into current earnings. Year to date figures such as gross, federal FICA, and state is updated each week and punched into a new YTD card. This information can then be easily used for quarter and year end reports. Automatic check numbering is also included. Program can break on control for sub-totals to print on bottom of page. This plus other identi-

fying information is neatly printed to become the complete payroll register. This program is easily adaptable to most hourly or salary payrolls.

360/20 MFCM 120 Print Positions, RPG

Mark Whitlock
7505 Southfield Drive
Indianapolis, Ind. 46227

B0149

MULTI-COMPANY MULTI-PAY
PAYROLL SYSTEM $4,000

Complete Payroll and Employer accounting system. Handles a variety of pay, deduction, and all tax situations. Complete labor distribution. Monthy/annually $200 extra. Will customize input formats and check printing to your needs, free.

4-tape and Reader, Printer, Some punching, COBOL

Norman R. Hansen
465 Edwards Street
Crockett, Calif. 94525

B0150

AUTOMATIC PAYROLL SYSTEM $5,000

A complete payroll system including registers, checks, deduction register, YTD, 941A, W-2 and job distribution.

360 32K 3–2311 2540 1403, ALP

Jack Gates
Financial Systems Consultants
915 South Clinton
Ft. Wayne, Ind. 46802

B0151

PAYROLL $1,000

Payroll system is card oriented for computer servicing a number of payrolls. Programs include current and YTD payroll registers,

labor distribution as well as check writing feature. Employee can have rates and time in up to 4 departments.

NCR 615 16K, COBOL

George R. Kuhn
TBA Educational Information
Processing Center
NMC Technical Institute
715 East Front Street
Traverse City, Mich. 49684

B0152

PAYROLL SYSTEM
(COMPREHENSIVE) $7,500

Complete multi-company payroll system. Handles weekly, bi-weekly, semi-monthly, and monthly payrolls. Handles hourly and salary employees (with multi-pay rates), with provisions for three different other wages. Handles nine deductions in addition to federal, state, and city taxes. Complete current and year-to-date information for each individual. System is complete with 941, W-2, labor distribution and additional personnel reports. DOS. 2314 version available May 1, 1970.

360/30 32K, 2540 or 1442, 2311, COBOL and BAL

Jim Smith, Sales Representative
Union National Bank
Public Square
Springfield, Mo. 65805

B0153

EXECUTIVE COMPENSATION
PLANNING MODEL $10,000

Time sharing computer model to analyze and compare alternative bonus plans for specific executives. Provides the financial value to the executive and cost to the company for the 4 most common executive incentive bonus plans; current cash, deferred cash, deferred stock and restricted stock.

Comshare Time Sharing System, FORTRAN IV

George Malanga
Business Strategies, Inc.
101 Park Avenue
New York, N.Y. 10017

B0154

PERSONNEL

SKILLS INVENTORY PERSONNEL
SYSTEM $3,800

SKILLS INVENTORY is a personnel inventory system for the storage and selective reporting of experience, education, and other employee parameters. The basic file contains Social Security number, descriptive data, and coded data. The codes can be automatically converted to equivalent descriptions when

retrieved and reported. Input format is flexible. Retrieval is by selection cards specifying conditions and logical combinations of conditions to be met. Up to 35 independent retrieval requests may be run at one time. Three reports are produced: an occurrence count vs. selection criteria, list of Social Security numbers for selected personnel, and an optional report(s) which the user defines and a non-programmer may specify by a simple report generator included in the system; formats for up to 100 different reports may be stored. The system is sufficiently generalized to find use for many other similar applications, such as real estate matching, price and product directories, library systems, and other data file management retrieval.

360/30 65K, COBAL, BAL

Cullinane Corporation
60 State Street
Boston, Mass. 02109

B0155

PRINTING

SUBSCRIPTION FULFILLMENT SYSTEM $9,800

Designed to satisfy both publisher and ABC requirements. This system will update either weekly or monthly publications. Parameterized input allows policy flexibility in areas of renewal promotion, collection billing, arrears service and servicing back copies. Files are maintained in computer generated match code sequence with domestic subscribers in zip code sequence. Extensive accounts receivable, circulation and ABC statistical reporting is generated.

360–30, 45K, 1–2311, 4–2400's, 1–2540, 1–1403, BAL, COBOL

William E. Clark,
Director, Commercial Applications
North American Computer Corporation
(NACOM)
5026 Herzel Place
Beltsville, Md. 20705

B0156

PHOTO TYPESETTING N/A

Automatic Phototypesetting for books, parts lists, manuals, catalogs and directories processed by magnetic tape drive. Page negatives furnished with or without original handmade illustrations (or your strip in pictures) and decorative (analog) computer-generated graphic images to your programmed rules.

P. A. Toma
P. A. TOMA
20268 Old Colony Road
Dearborn Heights, Mich. 48127

B0157

COMPUTER AUTOMATED MAILING SYSTEM (CAMSII) $3,000

System contains file generation and update capabilities, produces 3–5 lines 4-up labels and generates one-up or two-up personalized letters. Edit program isolates name and address elements, inserts proper punctuation, handles state abbreviations and formats output to the letter writing programs in upper and lower case. Personalized letter writing programs include variable insertion, automatic hyphenation and other personalization capabilities. System and procedures are thoroughly documented.

360–30, 32K, 1–2311, 2–4 2400's, 1–2540, 1–1403, BAL, DOS

William E. Clark
North American Computer Corporation (NACOM)
5026 Herzel Place
Beltsville, Md. 20705
B0158

PERSONALIZED REPETITIOUS LETTER WRITING PROGRAM $400

Program receives constant parts of a letter one time; includes sender address, salutation, date, letter body, and signatory. It then prints the same letter to all recipients included on name/address file. Name personalization is provided in salutation. Both name and geographical personalization is provided in letter body by means of signal characters. The name and geographical personalization can be inserted anywhere in the letter body since the program automatically reformats to take care of the varying lengths of surnames, cities and states.

360 32K, COBOL

Richard A. Katzman
EDP and Business Consultant
102 Harrison Drive
New Cumberland, Pa. 17070
B0159

U 100—ADDRESS LABEL PRINTING $150

The program prints 4" x 1½" address labels from free form card input; one card per label. Form positioning loop, input checking and external sort keys are provided. One, two or three up versions are available.

360/30 32K, COBOL

Dewain L. Delp
Uhalu Dancers,
Computer Applications Division
521 Spring Street
San Jose, Calif. 95110
B0160

SALES

SALES ANALYSIS $450

A four card input that includes, a customer name master, a current month sales card, a current year-to-date card, and previous year-to-date card. This program will total and print by product within customer, within sales territory. A three column comparison can be made between current month, current YTD and previous YTD sales, with a final total at the end of each sales territory. A final total by product will also print at the end of each sales territory. New current year-to-date cards will be summarized and updated as information prints.

360/20 MFCM 120 Print Positions, RPG

Marc Whitlock
7505 Southfield Drive
Indianapolis, Ind. 46227
B0161

STATISTICAL

MURS (MACHINE UTILIZATION REPORTING SYSTEM) $3,000

The DOS MURS, an extension of IBM's 360 Disk Operating System provides an automatic accounting of all programs run under DOS on a 360. MURS accounts for all program executions in each partition, whether run in batch mode or in single program initiation mode.

Included in the machine utilization record created for each program at Wait time, Supervisor time, and Problem Partition time. A unique time capturing method accumulates Supervisor time separately for each program based on the partition being serviced. MURS provides a Daily Log of all program executions and four Production and Testing Summary Reports.

360—DOS

Eugene D. Gilsenan
Webster Computer Corporation
1 Padanaram Road
Danbury, Conn. 06810

B0162

SMS/360—CPE (CONFIGURATION & PROGRAM EFFICIENCY) $12,500

This program provides SMS/360-PPE and SMS/360 CUE data over a single program running in an OS–PCP environment. No changes are required to software or hardware to use.
NOTE: Purchase of this product is equivalent to purchase of both SMS/360 PPE and CUE.

360, Two Output Data Sets, OS-PCP, 128K

W. J. Brian, Marketing Division Manager
Boole & Babbage, Inc.
1121 San Antonio Road
Palo Alto, Calif. 94303

B0163

SMS/360—CUE (CONFIGURATION UTILIZATION EFFICIENCY) $7,500

This program measures the use of CPU, channels, peripherals, disk and data cell arm movements, and type 3 and 4 transient SVC loads. This data permits an analysis and determination of the overall efficiency of the 360 configuration in an OS–MFT or MVT environment. No changes to program or system are required.

360, 128K, One output tape; OS (MFT or MVT)

W. J. Brian, Marketing Division Manager
Boole & Babbage, Inc.
1121 San Antonio Road
Palo Alto, Calif. 94303

B0164

SMS/360—DPPE (DOS PROBLEM PROGRAM EFFICIENCY) $6,000

This program measures the efficiency of programs running under a DOS environment. It provides a histogram of usage of each portion of the program, provides information needed to establish efficient coding standards in any language, and provides other statistics of interest. No changes to the program or system required. It is used with either development or normal production runs.

360, 32K, DOS, One Output Data Set

W. J. Brian
Boole & Babbage, Inc.
1121 San Antonio Road
Palto Alto, Calif. 94303

B0165

SMS/360—PPE PROBLEM PROGRAM EFFICIENCY $7,500

This program measures the efficiency of programs running under an OS environment. It provides a histogram of usage of each portion of the program, the I/O-Compute ratios, and other statistics of interest. No changes to the program or system are required. It is used with either development of normal production programs.

360, 128K, One Output Data Set OS

W. J. Brian
Boole & Babbage, Inc.
1121 San Antonio Road
Palo Alto, Calif. 94303

B0166

ALLSTAT $8,500

ALLSTAT permits a non-programmer to use a wide range of statistical analyses routines. A time-sharing interface will permit it to run on a time-shared system.

360/30 DOS and up, 64K, FORTRAN, BAL

Charles B. Wang
PDA Systems, Inc.
12 East 86th Street
New York, N.Y. 10028

B0167

UNCLASSIFIED

MEDICAL DIAGNOSTIC GAME   N/A

Diagnostic game designed to strengthen ability of medical students/practitioners in diagnosis. Before correct diagnosis is accepted, the participant must follow procedure to arrive at that diagnosis.

GE-265 and PDP-10, FORTRAN

Mrs. Barbara Hartenstein
Computer Systems Division
Graphic Controls Corporation
189 Van Rensselaer Street
Buffalo, N.Y. 14210

B0168

CAVEAT (COMPUTER ASSISTED VEHICLE FOR EVALUATION & TRAINING)   N/A

Computerized system for development of courses to be presented to students on an interactive remote basis. Elements are 1) Author Language, 2) Compiler, 3) Executive run program. All programs except executive, written in standard COBOL for conversion purposes.

360/40 and up, COBAL, BAL

Herbert S. Lunenfeld
Inter-Active Computing, Inc.
900 S. Washington St.
Falls Church, Va. 22046

B0169

TELNETE (TELEPHONE NETWORK EVALUATOR) $9,000

TELNETE reduces INWARD WATS customers' telephone costs by finding the most efficient network configuration, providing accessibility to all areas of the country, and producing a breakdown of the customer's telephone expenses.

IBM, RCA, CDC, UNIVAC, Honeywell, FORTRAN IV

Jerald Greenberg
Worldwide Computer Services Inc.
280 North Central Park Ave.
Hartsdale, N.Y.

B0170

UNIAPT $35,000

UNIAPT is an APT compatible n/c tape preparation system for all 3 axis and some 4 axis work. Includes hardware and software.

PDP-81, APT

J. Hayes
United Computing
802 Torrance Boulevard
Redondo Beach, Calif. 90277

B0171

PACER   N/A

Chemical Process Simulation or Design System used for performing mass and/or energy and/or dollar balances on a chemical plant, and for plant optimization.

PDP-10 and GE-265, FORTRAN

Dr. Eamonn McQuade
Computer Systems Division
Graphic Controls Corporation
189 Van Rensselaer Street
Buffalo, N.Y. 14210

B0172

PLASTIC EXTRUSION   N/A

A computerized mathematical model which permits design of plasticating extruders by prediction of performance under various sets of operating conditions.

PDP-10, FORTRAN IV

W. C. Dunham
Computer Systems Division
Graphic Controls Corporation
189 Van Rensselaer Street
Buffalo, N.Y. 14210

B0173

TRANPLAN (TRANsportation PLANning System)   N/A

TRANPLAN is a single integrated system which aids traffic engineers and urban planners to determine the character of existing transportation networks, to predict the consequences of future growth upon such networks and to test the behavior of suggested modifications or expansions to such networks. The TRANPLAN System allows:

• Networks of up to 8,000 nodes (up to 3,000 centroids)
• Up to five independent link-group designators
• Automatic iteration
• Incremental loading in up to ten steps with capacity constraint during assignment

CDC 3600 65K, FORTRAN/COMPASS

Robert O. Young
CDC Data Service Division
4550 West 77th Street
Minneapolis, Minn. 55435

B0174

SCHOOL GRADE REPORTING $1,200

Programs accept student grades and class citizenship marks, prints grade cards, graded class lists, class grade analysis, student honor roll and close ranking, plus failure lists.

NCR 615 16K, COBOL

George R. Kuhn
TBA   Educational Information
Processing Center
NMC Technical Institute
715 East Front Street
Traverse City, Mich. 49684

B0175

BOWLING SECRETARY $150

The program was designed to completely remove the tedious task of bookkeeping which bowling secretaries have. This program verifies scores, prints out a weekly statistical sheet, shows standings, season highs, weekly highs, next week's schedule, individual performance and more. The program is equipped for up to 14 teams. Minimum keypunching is required, no sorting or collating, and the program is the only run required. Memory positions required vary on how many teams are in the league. (6 teams require 16K while 14 teams require 22K) The prime market for this program would be to a Service Bureau or to the individual bowling leagues.

Honeywell or IBM, COBOL

John Meinhardt
275 E. Broad Street
Columbus, Ohio 43215

B0176

NETSET   N/A

Network Synthesis and Evaluation Technique for the design of minimum cost communications networks.

PDP-10, FORTRAN

Andrew Danver III
Digital Systems Corporation
P.O. Box 986
Hanover, N. H. 03755

B0177

BLACKJACK   N/A

An extremely sophisticated blackjack playing robot utilizing a console typewriter. Virtually all features of the game are incorporated.

FORTRAN

Ernest T. Trigg
Physics International Company
2700 Merced Street
San Leandro, Calif. 94577

B0178

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better books

by Dennie Van Tassel

THE BOMB AND THE COMPUTER: A Crucial History of War Games. By Andrew Wilson. Delacorte Press, 750 Third Avenue, New York, N. Y. 10017. 218 pages. 1968. $5.95.

The earliest record of war games comes from China where the game Wei-Hai (which means encirclement) was played before 3000 B.C. The game is similar to the modern Japanese game of Go and was played on a stylized mapboard with different colored stones, and the player who succeeded in outflanking his opponent won. A more current version of war games was adopted by the Prussian army as a system of tabletop maneuvers to try out new tactics. Today's war games are usually played with the aid of computers. One recent game played by the Defense Department took three years to prepare and five months to play the over 160,000 instructions, which were given.

Computers can be used to calculate what losses would be and even to add an element of randomness to each action. As early as 1900 there has been a steady flow of literature and information which enables the game players to give a probability to a combat situation. Not too surprising, the best war games were played during WWII where tactics could be tested out in the game room and their results used and analyzed in battle.

Air and Sea wars are easier to simulate because of their high dependence on mechanization. Land wars have a high dependence on quantities such as courage, military skill, morale, and fatigue, and thus are difficult to quantify.

Andrew Wilson believes that computerized war games are useful for simulation to test different variables, such as fire power, optimum gun caliber or range, armor thickness, and logistics, but he feels there are several dangers involved with many war games. One danger is that an officer can be mesmerized by his own theoretical creation, or games can be deliberately *bent* to support preconceived military policies. Wilson also provides examples of these failings in the Japanese in WWII and the U. S. in Vietnam. Wilson points out that if a variable such as political stability can not be quantified it is usually ignored. The author strongly doubts the ability to simulate nuclear wars because as he macabrely points out, with an all-out nuclear war, the laws of probability may be irreverent—"the first mushroom cloud and the troops may just run like hell."

The book is quite interesting and the author quite obviously recognizes the limitations of computers. Andrew Wilson is the Defense and Aviation Correspondent for the LONDON OBSERVOR. He was given special access to Pentagon and British Sources to write this book.

COMPUTER DATA DISPLAYS. By Samuel Davis. Prentice–Hall, Inc. Englewood Cliffs, New Jersey, 07632. 416 pages. 1969. $15.00.

THE SUCCESSFUL COMPUTER SYSTEM. By Joseph Orlicky. McGraw–Hill Book Co. 330 W. 42nd Street. New York, N. Y. 10036. 226 pages. 1969. $9.95.

TELECOMMUNICATIONS AND THE COMPUTER. By James Martin. Prentice–Hall, Inc. Englewood Cliffs, New Jersey, 07632. 416 pages. 1969. $15.00.

COMPUTER MAPPING AND DATA PRESENTATION. AD-688-672. $3.00. Order from: Clearinghouse, U.S. Dept. of Commerce, Springfield, Va. 22151

AN ANNOTATED BIBLIOGRAPHY OF BIOMEDICAL COMPUTER APPLICATIONS. PB-184-225. $3.00. Order from: Clearinghouse, U. S. Dept. of Commerce, Springfield, Va. 22151.

USA STANDARD COBOL. 436 pages. $6.50. Order from: USA Standards Institute, 10 E. 40th Street, New York, N. Y. 10016.

HOW TO BUILD A WORKING COMPUTER. By Edward Alcosser, James P. Phillips, and Allan Wolk. Hayden Book Company, 116 West 14th Street, New York, N. Y. 10011. 176 pages. $3.95.

COMPUTERIZED LIBRARY CATALOGS: Their Growth, Cost, and Utility. By J. L. Dolby, V. J. Forsyth, and H. L. Resnikoff. M.I.T. Press, 50 Ames Street, Cambridge, Mass. 164 pages. 1969. $10.00.

GRAPH THEORY. By Frank Harvey. Addison Wesley Publishing Company, Inc. Reading, Mass. 01867. 274 pages. 1969. $12.50.

COMPUTER, SYSTEMS, AND PROFITS. By Paul T. Smith. American Management Association, 135 West 50th Street, New York, N. Y. 10021. 1969. $9.00.

COMPUTER PROPHETS. By J. M. Rosenberg. Macmillan Company, 866 Third Avenue, New York, N. Y. 10022. 1969. $5.95.

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