DATAMATION 70®

November 1

FJCC
November 17 - 19

Take a close look at the big three in small computers.

At Varian, we consider the 620 series as a kind of computer molecule, bonded by the same standard software: FORTRAN IV, MOS, BASIC, RPG, and others. This 620 family also offers the largest line of peripherals available in the industry.

620/i: one of the most popular ever built — over 1300 sold worldwide — this systems-oriented digital computer features ease of interface and programing, full array of options required in today's multi-application environment and up to 32,768 words of memory, 16- or 18-bits.

R-620/i: a ruggedized version of the 620/i, it's a general-purpose computer that's designed to withstand environmental extremes. For truck, shipboard, or other military/industrial applications. The 620/i's large software library works with the R-620/i.

620/f: latest in the series, the 620/f has a 750-nsec cycle time, meaning it executes 2½ times faster than the 620/i. It is 100% upward compatible from the 620/i And, this new computer also uses the 620/i's field-proven software.

The 620 series gives you three more good reasons for talking to the big company in small computers.

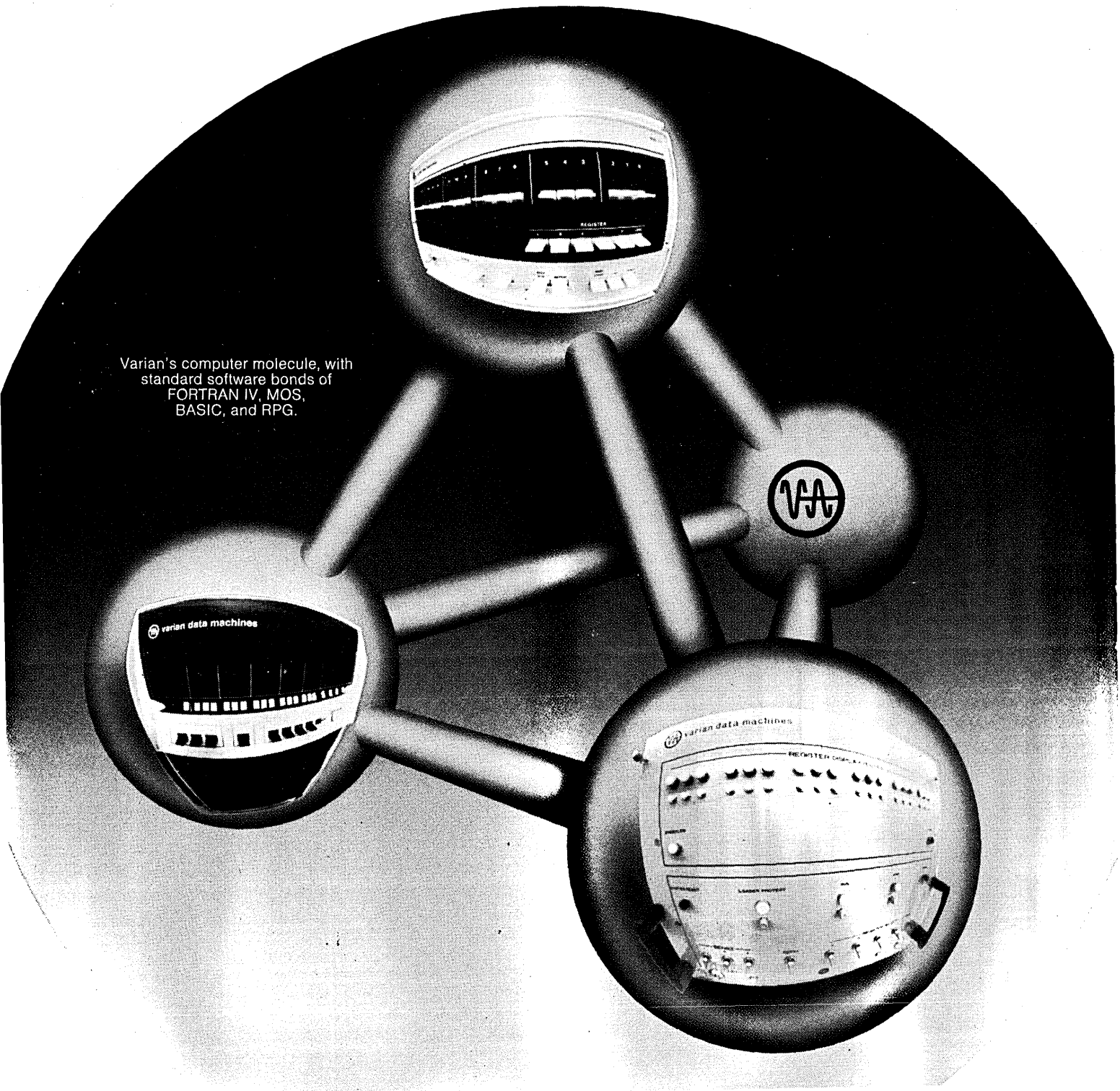
U. S. Sales Offices: Downey, San Diego, San Francisco, Calif.; Washington, D.C.; Atlanta, Ga.; Chicago, Ill.; Waltham, Mass.; Ann Arbor, Mich.; Albuquerque, N. Mex.; New Rochelle, Syracuse, N.Y.; Fort Washington, Pa.; Dallas, Houston, Tex. Other offices worldwide.

Varian Data Machines, a Varian subsidiary, 2722 Michelson Dr., Irvine, Calif. 92664. Telephone 714/833-2400.

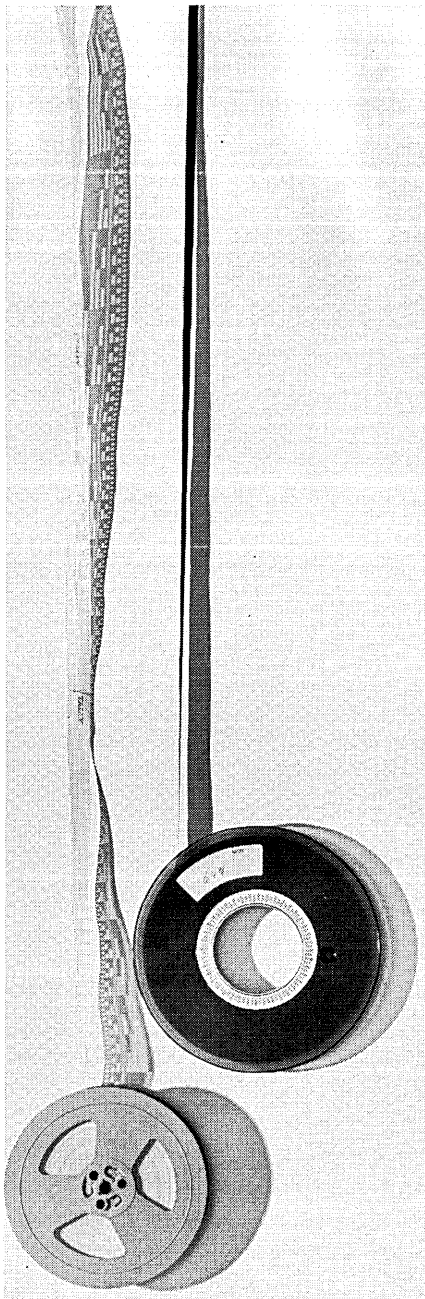
varian data machines

The Big Company in Small Computers

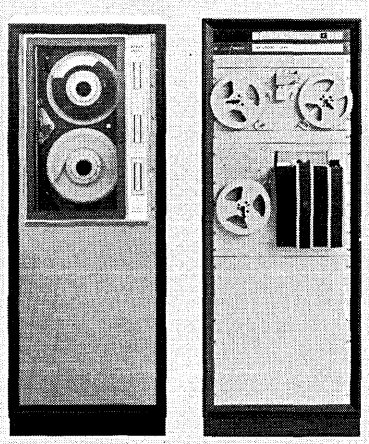
CIRCLE 1 ON READER CARD



Varian's computer molecule, with standard software bonds of FORTRAN IV, MOS, BASIC, and RPG.



Computer compatibility, a hang-up we understand



To move bits by the billions between your offices, Tally's computer communicators are your answer.

To gather remote batch data and put it into your CPU in the easiest way imaginable, consider the Tally System 4031. This efficient magnetic tape data terminal receives your incoming data on computer compatible ½" tape, 9 track or 7 track. Full error control routines during transmission are standard.

To increase the efficiency of your system, the 4031 offers you code conversion between terminals during transmission. Now, the 4031 can help you solve your 2400 or 4800 Baud requirements too. If your CPU likes paper tape input, the Tally System 311 is the most versatile perforated tape data station ever offered. Standard features include automatic error control, unattended answer capability, and off-line tape editing or duplication.

So if you are responsible for the movement of bits by the billions, we invite your inquiry. The informed Tallyman from your nearest regional office will be glad to help you.

Please address Tally Corporation, 8301 South 180th Street, Kent, Washington 98031. Phone (206) 251-5500.

Regional offices:

Atlanta: 3785 Northeast Expressway, Atlanta, Georgia 30340. (404) 457-1624.

Chicago: 33 North Addison Road, Addison, Illinois 60101. (312) 279-9200.

Los Angeles: 501 N. Golden Circle Drive, Santa Ana, Calif. 92705. (714) 542-1196.

New York: 45 North Village Avenue, Rockville Centre, Long Island, N.Y. 11570. (516) 678-4220.

San Francisco: 420 Market Street, 94111. (415) 989-5375.

England: Tally, Ltd., Tally House, 7 Cremyll Road, Reading RG1 8NQ, Berkshire. Reading 580-142.

TALLY®

See the new Tally line at FJCC, Houston

"With seven 2314's on line to a 360 time-sharing system, BASF disk-packs give the reliability essential to our business"

W. Porter Stone, president of U.S. Time-Sharing, Inc., one of the country's fastest growing and most unique computer service organizations, tells us why his company is now using BASF Disk-Packs exclusively.

"Time is a very perishable commodity to both U.S. Time-Sharing and our customers. Lost time costs us both thousands of dollars per hour which neither of us can tolerate. Due to our extremely heavy disk-access traffic, the overriding reason for switching to BASF disks was reliability. As we look into the future this need for reliability will only increase as we move on to the System/360 models 85 and 195".

Mr. Stone is one of many EDP professionals who are determining, on the job, (in this case with a coupled System/360 50/65 installation) that BASF Disk-Packs actually do offer substantial long-term advantages over other units. Reason? Very simply, greater care and precision in assembly and coating for better performance and surface characteristics.

For example: BASF Disk-Pack surfaces are 41.2% smoother than accepted industry specifications. In addition, they are tough enough to withstand three times the head loading called for under normal use requirements.

Find out more about BASF's RISK-FREE Disks. Write for free data on the Model 100 (IBM 2315 compatible), Model 600 (IBM 1316 compatible) and Model 1100 (IBM 2316 compatible) Disk-Packs.

BASF

BASF SYSTEMS INC
Crosby Drive,
Bedford, Massachusetts

CIRCLE 8 ON READER CARD

W. Porter Stone,
president of
U.S. Time-Sharing, Inc.

DATAMATION 70®

NOVEMBER 1, 1970
volume 16 number 14

departments

Letters to the Editor 9
Look Ahead 17
Perspective 47
News Scene 86
Hardware 101
Software 109
Washington Report 121
People 122
Index to Advertisers 124

MANAGEMENT

22 CALL/360 Costs

Suppose you decide to open a time-sharing service bureau and offer CALL/360; how long would it be before you show a profit?

GENERAL

29 Brand X

A user's story of what can go wrong when equipment is purchased from an unknown vendor—and the user fails to take adequate precautions to protect himself.

41 Fading Species

Like the California Condor, the world's first commercial computers and their first-generation successors—the Univac I's and II's—are drifting towards extinction.

53 Fall Joint Computer Conference

Conference particulars and session summaries focus on the conference portion of the big show in Houston. Additional coverage including a preview of exhibits will be carried in the Nov. 15 issue.

81 SIDS Symposium

A conference report.

TECHNICAL

32 ANSI COBOL

It's been two years since the American National Standards Institute COBOL was officially adopted. Some releases have been made and others are expected next year. Thus it's time to take a look at what conversion will involve and how the pain can be reduced.

COMMENTARY

47 Perspective

IBM introduces the 370/145 to compete with its own 40s and 50s, and what had seemed a mildly evolutionary 370 line has become innovative, indeed . . . A look at vote count trouble spots and how they plan to make things count in the November general election.

About the Cover

Our solarized picture puzzle by photographer Richard Ley will clue in sharp readers on where to find FJCC this time around.

NOVEMBER 1, 1970
volume 16 number 14

DATAMATION®

This issue 115,601 copies

EDITOR

ROBERT B. FOREST

EDITORIAL STAFF

Managing Editor EDWARD K. YASAKI

Senior Associate Editors WILLIAM J. ROLPH, TOM McCUSKER

Special Features Editor ANGELINE PANTAGES

Associate Editors AUBREY DAHL, RICHARD A. McLAUGHLIN, EDITH D. MYERS, JOHN T. WATERHOUSE

Copy Editor JANET EYLER

Assistant Editors ANNE WILKS, MICHAEL WILLIAM CASHMAN

Eastern Editors JOHN WESSLER, F. BARRY NELSON

New England Editor W. DAVID GARDNER

Washington Editor PHIL HIRSCH

Midwestern Editor LAWRENCE RAGAN

European Editor PEARCE WRIGHT

Australian Editor FREDERICK A. BLAND

Contributing Editors HOWARD BROMBERG, ROBERT V. HEAD, PHILIP H. DORN, LOUIS B. MARIENTHAL, DANIEL D. McCRACKEN, F. G. WITHINGTON, PAUL ARMER, ROBERT P. BIGELOW

Editorial Adviser ROBERT L. PATRICK

Technical Consultant LOWELL AMDAHL

EDITORIAL OFFICES

HEADQUARTERS: 94 S. Los Robles Ave., Pasadena, Calif. 91101, Phone: (213) 681-8486; **EASTERN:** 35 Mason St., Greenwich, Conn. 06830, (203) 661-5400; **NEW ENGLAND:** 19 Marlborough St., Boston, Mass. 02116, (617) 267-9414; **WASHINGTON:** 9805 Singleton Dr., Bethesda, Md. 20034, (301) 365-8671; **MIDWESTERN:** 407 S. Dearborn St., Chicago, Ill. 60605, (312) 922-8245. **FOREIGN:** 65, Hill Road, Chelmsford, Essex, England; 322, Park Regis, Park St., Sydney, NSW 2000, Australia.

GRAPHIC DESIGN AND PRODUCTION

Art & Production Director CLEVE MARIE BOUTELL

Production Manager MARILEE PITMAN

Production Assistants GLORIA CASTAGNA, LOUISE T. O'CONNOR

CIRCULATION
35 Mason Street
Greenwich, Conn. 06830

Director of Circulation FRANK De CARLO

Circulation Manager MAE VAN RENNES

Marketing Research Director DOUGLAS DeCARLO

PUBLISHER
GARDNER F. LANDON

ASSISTANT PUBLISHER
JAMES M. MORRIS

DATAMATION is published twice monthly on or about the first and fifteenth day of every month by Thompson Division, Technical Publishing Company, 1301 South Grove Ave., Barrington, Illinois 60010; Arthur L. Rice Jr., President; Gardner F. Landon, Executive Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, Conn. 06830 (203) 661-5400. Editorial offices, 94 So. Los Robles Avenue, Pasadena, California 91101. Published at Chicago, Ill.

DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $25 annually in the U.S. and Canada. Reduced rate for qualified students. Foreign subscriptions are on a paid basis only at a rate of $38 annually. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, O. and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000, Greenwich, Conn. 06830.
Copyright 1970, Technical Publishing Company.
Microfilm copies of DATAMATION may be obtained from University Microfilms, Inc., 313 No. First St., Ann Arbor, Michigan.

Printed by Beslow Associates, Inc.

BPA Circulation audited by Business Publications Audit

Member, American Business Press, Inc. ABP

Input **MetaCOBOL**	Output **COBOL**

`PRINT BODY BY 2.`	`WRITE BODY AFTER ADVANCING 2 LINES.`
	`MOVE SPACES TO BODY.`
	`ADD 2 TO LINE-COUNT.`
	`IF LINE-COUNT IS GREATER THAN 56`
	`  PERFORM PAGE-HEADING-ROUTINE`
	`  MOVE ZEROS TO LINE-COUNT.`

`CLEAR WORK-RECORD.`	`MOVE SPACES TO WORK-RECORD.`
	`MOVE ZEROS TO AMOUNT OF WORK-RECORD.`
	`MOVE ZEROS TO HOURS OF WORK-RECORD.`
	`MOVE ZEROS TO RATE OF WORK-RECORD.`

`CANJOB THREE.`	`ENTER LINKAGE.`
	`CALL 'CANJOB' USING THREE.`
	`ENTER COBOL.`
	`STOP RUN.`

`INPUT-FROM CARDS-IN`
`  INTO CARD-IN.`
	`OPEN INPUT CARDS-IN.`
	`PERFORM ZZ-INIT-ZZ.`
	`GO TO ZZ-OPEN-ZZ.`
	`ZZ-READ-ZZ.`
	`IF ZZ-LR-ZZ = 'N' CLOSE CARDS-IN STOP RUN.`
	`READ CARDS-IN AT END MOVE 'N' TO ZZ-LR-ZZ.`
	`GO TO ZZ-BREAK-ON-ZZ.`

`LISEZ LA-CARTE,`
`  A LA FIN ALLEZ A SORTIE.`
`MULTIPLIEZ LES-HEURES PAR LE-TAUX`
`  POUR DONNER LE-SALAIRE.`
`DEPLACEZ PIERRE A COLETTE.`
	`READ LA-CARTE,`
	`  AT END GO TO SORTIE.`
	`MULTIPLY LES-HEURES BY LE-TAUX`
	`  GIVING LE-SALAIRE.`
	`MOVE PIERRE TO COLETTE.`

`01  TRAN-SORT-KEY.  02 SEQ-KEY.`
`03  ACCT.  04 ACCT-KEY.`
`05  ACCT-NO P=X(10).`
	`01  TRAN-SORT-KEY.`
	`02  SEQ-KEY.`
	`03  ACCT.`
	`04  ACCT-KEY.`
	`05  ACCT-NO  PICTURE IS X(10).`

MetaCOBOL™

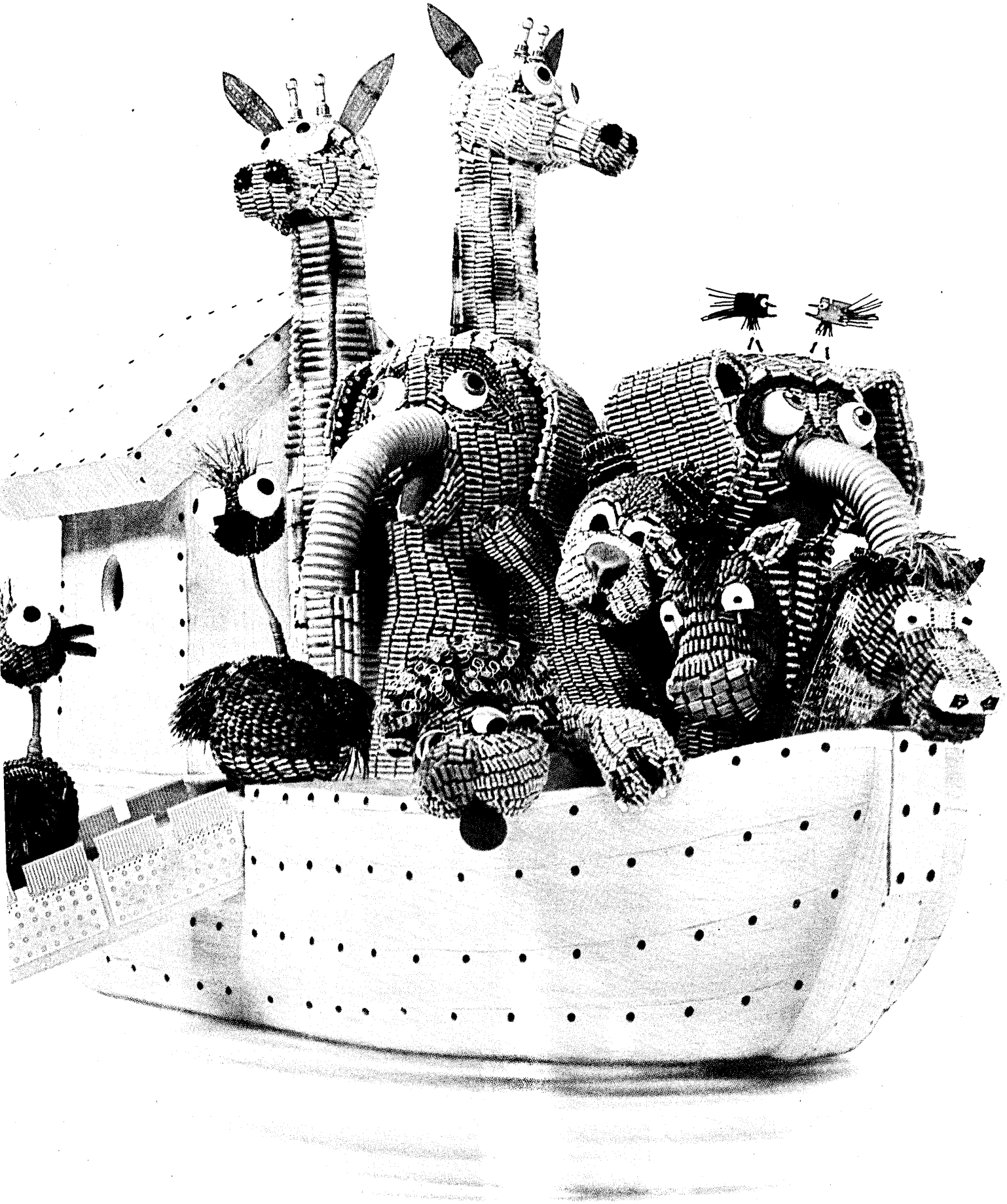
A macro statement facility designed for peaceful coexistence with COBOL

The limitations of COBOL are well-known to anyone who works extensively with it. Rigid syntax; the frequent need for an excessive number of statements and for repetition of information common to many COBOL statements; and the general inflexibility which too often consumes valuable time for unproductive purposes, are just some of the undesirable characteristics that have been unavoidable till now.

Over the years ADR has been actively associated with the development and expansion of COBOL language and usage. Now, we have developed the logical and long needed improvement. MetaCOBOL; a unique macro statement facility to give you the best of COBOL plus the means to simplify and expand its use for your specific needs.
Here is how MetaCOBOL will function. It accepts standard COBOL and user-defined statements and transforms them into a standardized format compatible with IBM/360 Level E, Level F, and ANS COBOL. It develops and invokes macro statements embedded in COBOL programs. It abbreviates existing COBOL required words and phrases, defines new verbs, simplifies writing multi-part verbs, eliminates the need for writing extensive data name qualifications.
MetaCOBOL will also produce program listings in easier to read format, define a library of standard macros and abbreviations and help in debugging. It will produce report writing, information retrieval and other generalized programs from simple parameters. It will generate test data and supply output in source form.
In total, MetaCOBOL offers a new flexibility and the opportunity to significantly reduce time and costs in COBOL programming and coding. MetaCOBOL is operational! You can write in MetaCOBOL tomorrow. Contact any ADR office today.

Offices in Atlanta, Boston, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Hartford, Houston, Kansas City, Los Angeles, Miami, Milwaukee, Minneapolis, New York, Philadelphia, Pittsburgh, Rochester, San Francisco, Seattle, St. Louis, Washington. Representatives in Amsterdam, Bruxelles, Geneve, Helsinki, Johannesburg, London, Milano, Oslo, Paris, Santurce, Stockholm, Tokyo.

Applied Data Research, Inc. Route 206 Center, Princeton, N.J. 08540 Tel: 609 921-8550



Honeywell Information Systems Inc., 200 Smith Street, Waltham, Massachusetts 02154

The Honeywell and GE computer get-together. There's something in it for everyone.

Honeywell and General Electric have just combined their computer forces and the business world will never be the same again.

Now we're a single company, offering a complete, across-the-board source of information systems for everyone, everywhere.

A single company with 19 plants in seven countries. And 50,000 people to design, build, sell, and maintain our products and services.

A single company with a broad capability in time-sharing, communications and computer education.

A single company that knows how to make computers work for you. We've already put 10,000 of them to work — in manufacturing, in distribution, in finance, and in hospital applications, as well as in government and the military.

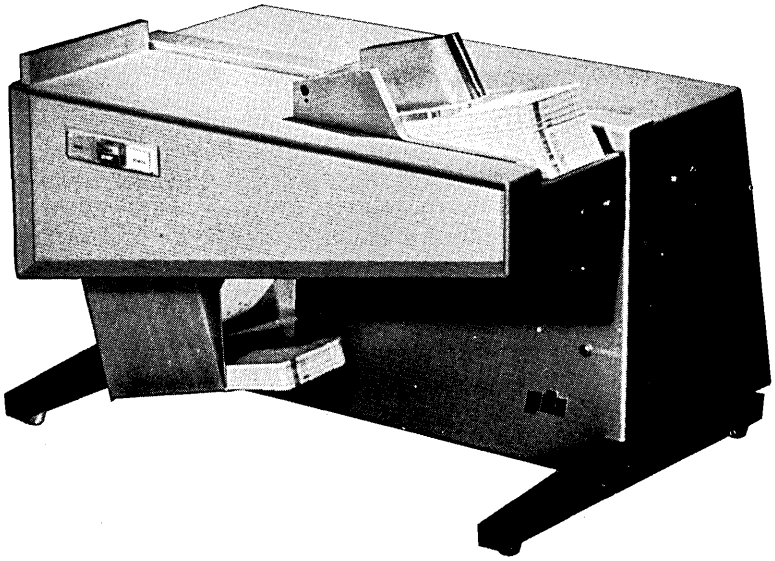
Man for man, dollar for dollar, system for system, we offer the computer user more than any other computer company afloat.

The Other Computer Company:

Honeywell

CIRCLE 22 ON READER CARD

It reads 300 cards per minute, is dirt cheap, remarkably dependable, easy to maintain, and has interfacing for everything but the air-conditioner.



It's the sort of thing you'd expect from the people who call themselves "the mini-peripheral company."

So is our 600 card-per-minute reader. Like the C300 shown here, it's designed to be reliable. When it does need service, just about anybody can do it (although we'll probably volunteer).

Both are made in rack-mount and table-top models, and with our interfaces, are plug-compatible with almost any system on the market.

They can save you an awful lot of time, trouble, and most important, money.

We'll start you off with a production unit to prove it. Just ask.

PERIPHERAL DYNAMICS INC.
the mini-peripheral company

1030 W. Germantown Pike / Norristown, Pa. 19401 / (215) 539-5500

CIRCLE 73 ON READER CARD

LETTERS

Map rap

Sir:
How chi-chi of DATAMATION to "get involved" re "Mapping For Survival" (Sept. 1, p. 59). " . . . the problems that were mentioned time and again as requiring immediate attention were those of urbanized society. Maps can show clearly, for example, that the rich pollute the air and the poor breathe it." Yes, of course, and maps can show that the "life-style" of the poor causes slums while that of the rich does not. Maps can even show in a continuous time series that when blacks move into an area, say Washington, D.C., the crime rate soars, the literacy rate falls, and property values collapse. You see, maps can show just about whatever one wants them to show. Your writer seems to want to use them to advance his ideology; e.g., "The mapping of the distribution . . . of population, segregation, poverty . . . " and, rascally, " 'It is not important to map the world, but to change it.' " Ladee-da.

Since DATAMATION already has an editorial each issue, why not just tell us what's new in mapping and forget the ideological chit-chat.
L. G. HUDGENS
St. Louis, Missouri

How's that? "Mapping for Survival" was a conference report and Mr. Mezei was reporting a conference.

Sourcery

Sir:
The excellent article "Earth Resources" (Aug. 15, p. 25) I find rather frightening. We are told that the scientific and technological community will soon have the capability for detailed survey of earth resources using satellite sensors and large-scale data processing. I am beginning to understand the current trend on the part of the public to discredit the scientific community. It is obvious that a system collecting and digesting resource data is open-ended, whereas a system of resource management must be closed-loop. Closing the loop is a nontechnological problem; it is a political problem that we do not necessarily wish to solve.

Earth resources are largely controlled by self-interested individuals and corporations, and efforts at regional planning are exceedingly difficult. Rational planning on a national or global scale is presently a fantasy, and who wants the kind of regime it would require? Clearly such planning would require as prerequisites survey data and understanding of predictive models, but why undertake the effort just because it may be technologically feasible? Who are the assumed "users"? Whom do they represent? How much are they willing to pay for the data? I'm curious.
ALBERT L. FULLERTON
Lincoln Center, Massachusetts

Why, yes, of course

Sir:
It appears that the State of California (Sept. 1, p. 38) is forgetting the purpose for using computers. It is hoped that the state will not follow the Army in stressing computer utilization.

The main purpose of acquiring computers is to obtain benefits. Increased utilization of a particular computer will often reduce the benefits obtained from this computer.
WARREN G. PREBLE
Chalmette, Louisiana

Breed deeply

Sir:
Mr. Maegerlein's enthusiasm for his different breed ("A Different Breed," Aug. 1, p. 30) marks him as a true believer. However, as with missionaries seeking converts, some of his arguments tend to oversimplify.

In an effort to stump for the system team, our missionary would assign the systems group the role of goal setting on the grounds that this group knows best where the potential lies. Once installed, system extensions and refinements leap to the eye of the analyst (Parkinson's Law?). In his discussion of the benefit of these potentials, a very basic systems concept is violated, that of examining both benefit and cost. While benefits, in terms of creative fulfillment and system expansion, are extolled, little is said about the costs incurred.

Extensions and refinements can go on forever. (In advanced stages does this not become empire building?) The benefits gained must be weighed against the additional costs. And benefits should be measured, not in the immediate terms of the systems group, but in the more encompassing terms of the corporate goal structure.

To use Mr. Maegerlein's analogy, the Green Berets are a very self-reliant group. I would suggest that the corporate environment demands a participating creative effort, not an autonomous band of revolutionaries.
GEORGE WILLIAMS
Amherst, Massachusetts

Patient impatience

Sir:
In the Sept. 15 issue, p. 135, you described a computerized patient history taking system under investigation in Scotland. Such systems have been operational on crt's in this country for over five years (see "A Computer-Based Medical History System," W. Slack, *New England Journal of Medicine*, Jan. 27, 1966). Several systems are now available commercially from a number of companies.
JAN POLISSAR, M.D.
Rockville, Maryland

Text flunked

Sir:
The common problem of distinguishing between milli and micro in the printer's text has struck again, this time in my recent article, "External Control," in the Sept. 1 issue. In the paragraph on p. 48 discussing the time criticality of communications processing, the point was being made that although the character maturity time for a 2400 bps line is approximately 3 milliseconds, simultaneous operation of 15 full-duplex lines, operating at 2400 bps, will allow, on an average, only 100 microseconds or less for the processing prior to the next interrupt for service. This is a significant point.

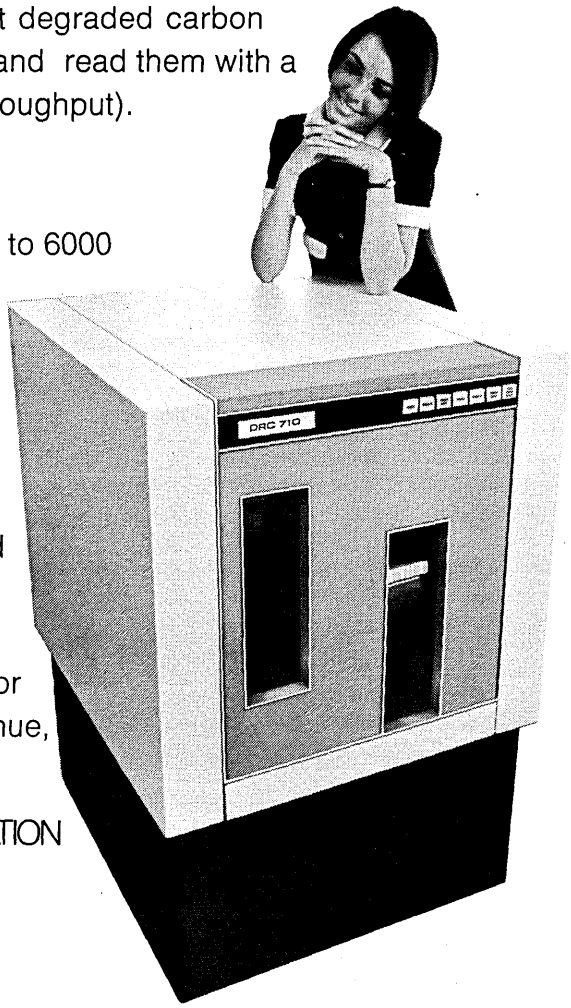
The efficiency of the central processor will suffice significantly as the communications load grows. Primarily, the loss of efficiency is a result of the increased rate of interrupt generation. Although an interrupt rate of 10,000 times per second would not be expected to be maintained over any appreciable period of time, it

When it comes to keypunching, it's no contest.

Your department.

Who says keypunching has to be a mob scene? We've just introduced a new optical scanner/card punch that can handle the work of 10 manual operators and their machines. In a 3x3-foot space. We call it the DRC-710.

This new automatic card punch was designed specifically to read credit card invoices with their inherent degraded carbon characters (and read them with a high rate of throughput).



Our department.

The DRC-710 automatically scans and punches up to 6000 credit card invoices an hour. What does that mean specifically? Well, it means your EDP operation can operate up to 70% more efficiently. You'll eliminate over a half-million manual key-strokes per day. You'll reduce the costly hiring and training of a roomful of keypunch operators, not to mention the significant reduction in cost for personnel, overhead, machines and space.

Put more punch in your department with our new DRC-710. Clear the room for action. For details, call or write: Data Recognition Corporation, 908 Industrial Avenue, Palo Alto, California 94303. Phone (415) 326-4810.

DATA RECOGNITION CORPORATION

does present a short-duration, peak-period problem. The application of a dedicated communications processor, with a much lower cost per cycle factor, is justified under these conditions and presents as a bonus a much simpler program design problem.
R. L. BRENING
San Diego, California

COBOL coped with

Sir:
Peter Vaughn ("Can COBOL Cope," Sept. 1, p. 42) describes the COBOL environment as hostile to modular programming techniques. This hardly applies to the COBOL compilers I am familiar with, such as Honeywell's COBOL D. If a COBOL routine is to be used in several programs, or, more likely, a common file description is to be used several times, the coding is included in the source program library. When the programmer writes his program, a simple COPY statement pulls it in. The same file description can be copied twice in one program by changing the major name and using qualification in all references. To perform a subroutine or string of subroutines, whether they were COPYed or coded individually, the programmer uses PERFORM. If a particular subroutine is to be nonresident in core, the segmentation feature can be used. This again is not dependent on whether the subroutine is COPYed or coded, and can be used freely without regard to how the subroutine is referenced, by a GO TO, a PERFORM, or simply falling through the coding. FORTRAN should be so modular! The number of segments resident at one time can be varied by using the priority numbering scheme and by changing one card (SEGMENT-LIMIT) and recompiling. Programs made modular by the above techniques are much easier to alter since all of the coding is included in the source list.

If the programmer prefers to compile his modules as individual entities, the main routine is also broken up into separate programs. The subsequent calls to program modules, sorts, etc., in the program stream are coded right in the programs so that operationally the system runs from beginning to end without operator intervention. Parameters can be passed from program to program by use of the COMMON-W-STORAGE command.

Frankly, this is more modularity than you really need in business systems. There just aren't that many common routines that can be incorporated without alteration. If two programs are accessing the same file, they are doing different processing. If they are doing essentially similar processing, the file descriptions will be different. It would hardly make sense to describe the master inventory and the payroll master identically so that identical logic could be used to update them! Thus, modularity as Vaughn describes it (external program calls to closed subroutines) has limited usefulness. Other forms of modularity (such as the mainstream-subroutine technique in a single program) are easy to code in COBOL, and the branching of logic in and out of these subroutines is far easier than in, say, FORTRAN.

Of all high-level languages, COBOL is by far the easiest to maintain. This is because the language almost forces good internal documentation.

FORTRAN is a great scientific language. COBOL is the best commercial language. COBOL can cope with the problem, and programmers who approach it without preconceptions can easily cope with COBOL.
JOHN R. CULLERTON, JR.
Prophetstown, Illinois

Key notes

Sir:
Reference your article "Evaluation of Keyboard Data Entry Systems" (June, p. 93) and the letter in the Sept. 1 issue from Bennet A. Landsman.

As Mr. Landsman points out, visual verification is somewhat effective when each character grouping has a recognizable integrity within itself. Words have such integrity; numeric values have not. Thus, the word "entry" to a visual verifier has meaning, but a letter series "entry" does not and can be relatively easy to detect as an error. On the other hand, the value "7314" is no more and no less valid than "8314," so to be meaningful the copy must be read concurrently with the original. To do this requires two people if any acceptable level of "undetected errors" is to be achieved. (Later processing will detect them and cost more for correction than the "cheap" visual verification saved.)

Mr. Landsman points out, further, that batch totaling can reduce need for key verification. Mr. Landsman mentions this is available on "new equipments"—MDS offered such capabilities on the 1104 in 1965. We subscribe to this method if the user subscribes to the warning that batch balancing techniques cannot be absolute because offsetting errors can and do occur.

I have written primarily to mention a relatively new verification technique that MDS has been quietly promoting that has been successfully used in a few locations for a little over two years. Single Operator Responsibility. This technique could not be used prior to the Data-Recorder due to machine limitations.

S.O.R. requires the keyboard operator to enter a record in memory and then, immediately, to key verify that record. Source media is immediately available and least time is lost in going from source to computer input. The operator is now totally responsible for her part of the entire task, and she has a varying set of operations: enter, correct, verify, correct. Keyboarding is at best not a lively job—S.O.R. makes it as varied as is possible.
PAT B. SMITH
Mohawk Data Sciences
Herkimer, New York

Degree-vance

Sir:
Besides introducing your magazine's new look in the July 15 issue, you had an article by Thomas C. White: "The 70's: People." I must compliment you on both items.

Mr. White's article hit a resounding note within me. After four years as a computer technician with a Houston-based oil company, I am returning to a junior college to get a degree that will show my qualification to work in edp.
RON ROEDER
Dallas, Texas ■

North Electric, Fujitsu, Rixon Electronics and GDI are United.

Read all about it.

Now four companies—North Electric, Fujitsu, Rixon Electronics and GDI—are operating under the banner of United Business Communications, Inc., to provide efficient and economical voice and data communication systems from one single source.

Although we opened our doors for business in January, 1970, United Business Communications was really begun two years earlier. That's when we set out to build an alert, fast moving *total* communications organization. A company designed to meet the demands of business communications in the seventies.

At UBC, our *total* communications concept links together communications equipment manufacturers that date back more than 80 years.

North Electric, one of the nation's original manufacturers of telecommunications equipment, provides our advanced line of PBX systems and station apparatus.

Expanding this PBX line is Fujitsu, a major Japanese manufacturer known the world over for its communications equipment.

Rixon Electronics supplies data transmission expertise and equipment like data sets and multiplexers.

Rounding out the new UBC family is GDI, Inc., a manufacturer of computer and terminal peripheral equipment, including card punches, card readers and card transmitters.

Within the framework of UBC, we have painstakingly put together an organization of people with remarkable backgrounds in communications. People who have breathed life into our *total* communications concept.

Today, UBC makes it possible for the business community to take maximum advantage of the most sophisticated, commercially available voice and data communication equipment; to interconnect with the nation's telephone network; and obtain the utmost efficiency and economy in communications.

Total communications from one company, UBC.

Backed by one of the most financially sound corporations in America, United Utilities, Incorporated, a billion dollar corporation and operator of the nation's third largest telephone system.

Providing in-depth systems and applications engineering support.

Expert installation, training and service.

With sales and service offices in principle U.S. cities, Canada and Europe.

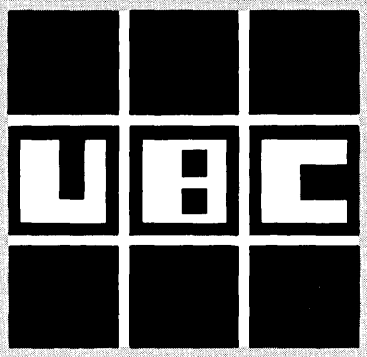
And in making all this available, we take one more important step. We offer you the choice of purchase, rental or lease.

So now you've read all about about it.

There's a lot more to tell so please write if you'd like to hear more. We might be able to solve a voice or data communications problem for you.

But at the very least, you'll know that North Electric, Fujitsu, Rixon Electronics and GDI *are* United—part of UBC—a *total* communications company.

We planned it that way.



United Business Communications, Inc.

Today's fast moving communications need a total communications company.

A subsidiary of
United Utilities Incorporated.

6405 Metcalf Ave.,
Shawnee Mission, Kansas 66202
Telephone (913) 362-5300

Sales and Service offices in: Boston / Baltimore / Chicago / Dallas / Houston / Kansas City / Los Angeles / Miami / New Haven / Pittsburgh / San Francisco / Washington / Toronto, Canada / London, England / and other principal cities.

the real $39 a month CRT terminal from the real real-time people

Somebody promised you a $39 computer terminal. Bunker-Ramo delivers — the 2210.

It breaks the $$$ barrier for on-line terminals at bank teller stations, factory assembly points, hospital wards, credit departments, utilities, warehouses and countless other locations.

The 2210 has all the necessary features: tab, fixed format, skip, computer-call, variable lay-out, conversational mode, plus a special block keyboard for easy operation by non-typists. Interfaces with present data processing systems without costly modifications.

Price includes maintenance by Bunker-Ramo's nationwide field service staff.

Before you install any — or buy more — CRT's, see the 2210 at the Fall Joint Computer Conference. Or write for information.

The real real-time people

THE BUNKER-RAMO CORPORATION
Business & Industry Division
445 Fairfield Avenue, Stamford, Connecticut 06904. Phone: (203) 348-4291

THE PRODUCT

Datamanager Terminal Family (for IBM 360)

THE ADVANTAGES

Start at $710/Month

Full Peripheral Range Including Mag. Tape

Programmable for Local Processing and Remote Batch Entry

Atron introduces its Datamanager family of remote terminals designed and built to perform a dual function... both communications and local data processing. The result: increased efficiency and lower costs.

Want to hear more? Alright, here's more.

360 COMMUNICATIONS

Programmable Datamanager terminals are designed for IBM 360 RJE and HASP compatible remote job entry. A complete range of communication speeds from low speed to TELPAC are available.

PROGRAMMABLE PROCESSING POWER

ATRON terminals offer local computing power for all levels of communication pre and post-processing. Data proofing and editing can be handled before central site computing, minimizing costly connect time and central site usage. File formatting and report generation are completed without the cost and time delays of central site processing.

LOWEST COST TO PERFORMANCE RATIO

Fact. No other terminal manufacturer gives you so much for so little. For example, the Datamanager Remote Terminal shown rents, with maintenance, for $1,850 a month, yet includes:

- 8K bytes memory (expandable to 32K)
- Decimal arithmetic
- 400 CPM card reader
- 300 LPM line printer
- 25 IPS 9-channel magnetic tape unit and controller
- 2780 communications mode operating system

PERIPHERALS FOR TODAY OR TOMORROW

The Datamanager terminal family provides a complete set of peripherals to meet your needs today and also for your future needs. In other words, we're flexible so you can be flexible.

Standard peripherals:

Card Readers — 225 to 1000CPM

Line Printers — 135 to 1250 LPM

Magnetic Tape Units — 7 and 9 channel

Special Requirement Peripherals:

Disc Units — Fixed-head and removable disc

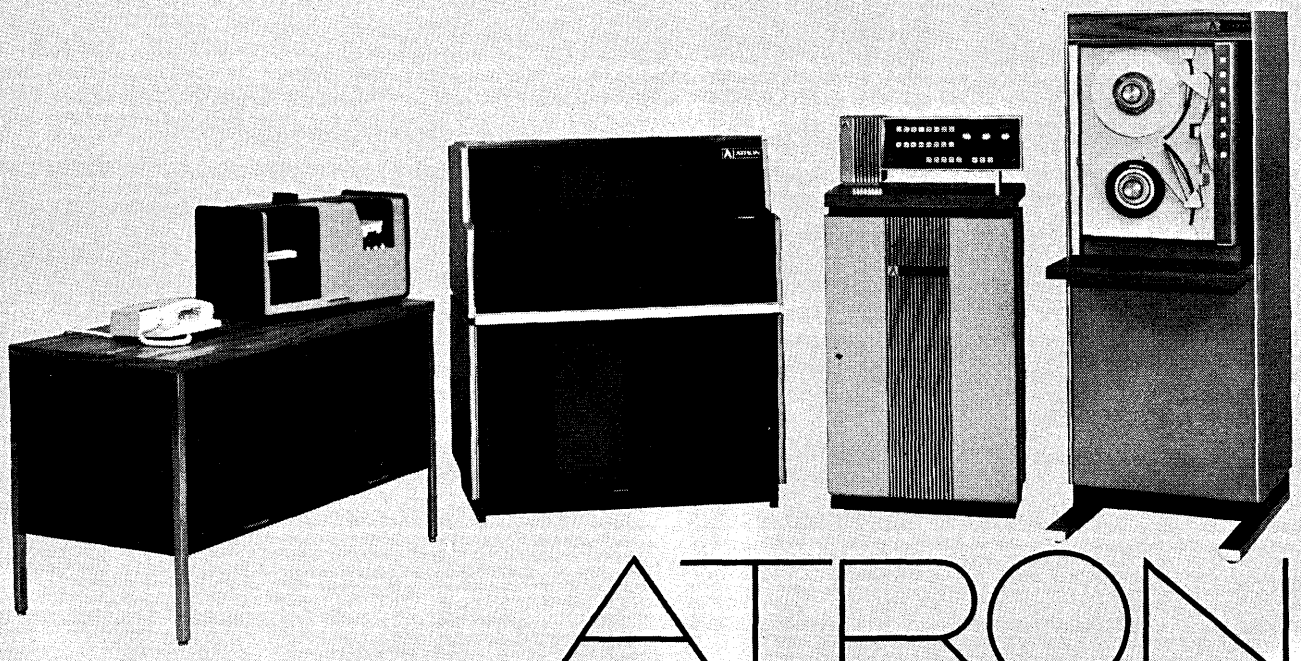
CRT's, Selectric, TTY 33 and 35 Keyboard Printers

DATAMANAGER SOFTWARE

The Datamanager assembler runs on the remote terminal family processor and on the IBM 360. Specialized site processing can be programmed at the site. Standard programs for general distribution to all sites can be done on the central site IBM 360. Utility routines and an RPG fill out the software required for local processing.

Compare cost to performance. You'll buy Atron. If you want more information, write or call us.

THE ATRON DATAMANAGER
It minds your own business



ATRON

(See Us at F.J.C.C. Booth No's. 1620, 1622 & 1624)

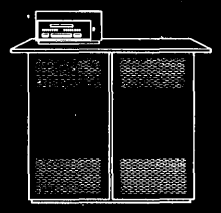
ATRON CORPORATION 1256 Trapp Road, St. Paul, Minnesota 55118 • (612) 454-6150

CIRCLE 29 ON READER CARD

Burroughs new DC 1000 SERIES

Data Communications Systems

*Remote Peripheral Controllers
*Remote Terminal Concentrators



low cost . . . flexible . . . reliable . . . compact, yet expandable . . . internally programed . . . for remote batch processing . . . remote printing . . . remote punching . . . on-line/off-line . . . offering efficient data transmission . . . pre-processing . . . post-processing . . . formatting and reformatting . . . editing and blocking . . . polling . . . line disciplines . . . interface versatility . . .

Burroughs

LOOK AHEAD

FEDS PLAN TIGHTER SOFTWARE CONTROLS

A change in federal software procurement regulations is in the works, aimed at cutting costs. Users would have to get GSA approval before acquiring packages costing over a certain amount; hopefully the agency could then consolidate buys and wangle discounts from vendors. It could also encourage users to share more and buy less. The new regulation will be proposed to an interagency adp advisory group shortly. Approval is expected "about six months later."

The basic idea is endorsed by the Budget Bureau, GAO, and the Brooks Government Operations Subcommittee and apparently is acceptable to most adp users. Once the regulation is implemented, knowledgeable observers believe GSA will do one of the following: centralize the acquisition and maintenance of operating systems, language processors, and utility routines; authorize federal agencies which have particularly effective applications programs to act as consultants to others seeking similar software; develop performance measurement tests for some programs; and inventory lower cost programs to discourage one agency from buying software that another already has.

FULL HOUSE OF CREDITORS GETS VIATRON STRAIGHT...

Boston may be a staid old town, but that poker game Viatron had there with its creditors was worthy of Las Vegas. With the First National Bank of Boston not directly involved, but watching closely with a jackpot, Viatron focused the public spotlight on the negotiations by announcing the proceedings to the press. At one crucial point, three of Viatron's five biggest creditors — said to be Texas Instruments, General Instrument, American Micro-systems, Inc., Fairchild Semiconductor, and Motorola — went along with Viatron's plan to defer payment on past bills. The other two balked.

Meanwhile, those customer testimonials continue to flow in. "We had very good success with the Viatron system," says a dp man at New England Telephone, which has 18 systems installed and is installing 30 more. The customer uses Viatron equipment primarily for data entry applications. The system, he says, is "a financial winner and virtually trouble-free."

...WHILE HOUSE OF CARDS TOPPLES

Computer Applications, Inc., the house that government contracts and contract programming built, finally died due to the disaffection of its creditors. And hundreds were left scrambling for jobs. While its subsidiaries were exempt from the bankruptcy, word was that numerous firms sought to hire away various groups within CAI in hopes that CAI contracts would follow. It created a ticklish legal situation, since receivers in liquidation proceedings have been known to sue if they can prove the contracts (not the people) were wooed away. At writing, NASA, among other agencies, was looking for a caretaker contractor to take over facilities management at the Goddard Institute for Space Studies, operated by CAI since before '63. By the way, the company that offered to buy a majority interest in E.B.S. was Computing and Software. The deal wasn't turned around fast enough.

(Continued on page 18)

SIGNS OF THE TIMES

Reasons given by some of the 59 exhibitors who dropped out of the FJCC this fall: Most blame tight money and budget cuts. Some don't like Houston. One software firm doesn't like this year's restrictions against the show-biz type exhibit. One is shifting its emphasis to overseas shows and several to smaller, vertical shows. A surprise drop-out, University Computing, likes the location, right in its backyard, but not enough to spend money "at this time" (they dropped an estimated $75K at SJCC). Ever-optimistic, Don Cruzen, AFIPS director of exhibits, says 10 new firms signed up "when word got out we had room," and he expects to pick up more.

AEROSPACE FIRM LAUNCHES NEW EFFORT

One aerospace firm that isn't cutting back is Time-Zero Corp., Torrance, Calif., which is diversifying into commercial communications systems and will show off its DCC-90, a programmable concentrator capable of supporting up to 256 terminals, and with considerable foreground processing power, at the Fall Joint. It's based on an Interdata 5 mini. The 200-man firm (up from 85 a year ago), which used to be Marshall Labs until some of its employees bought it in February of last year, recently hired a new president, Robert L. Hengen (23 years with Univac) to help point it in the right computer marketing directions.

Although 75% of the firm's volume ($4-6 million this year) is in deep space telemetry contracts, the company is aiming at the upcoming microwave transmission market, hoping to get a piece of the interface action with its data concentrator. Maybe space was just an interval.

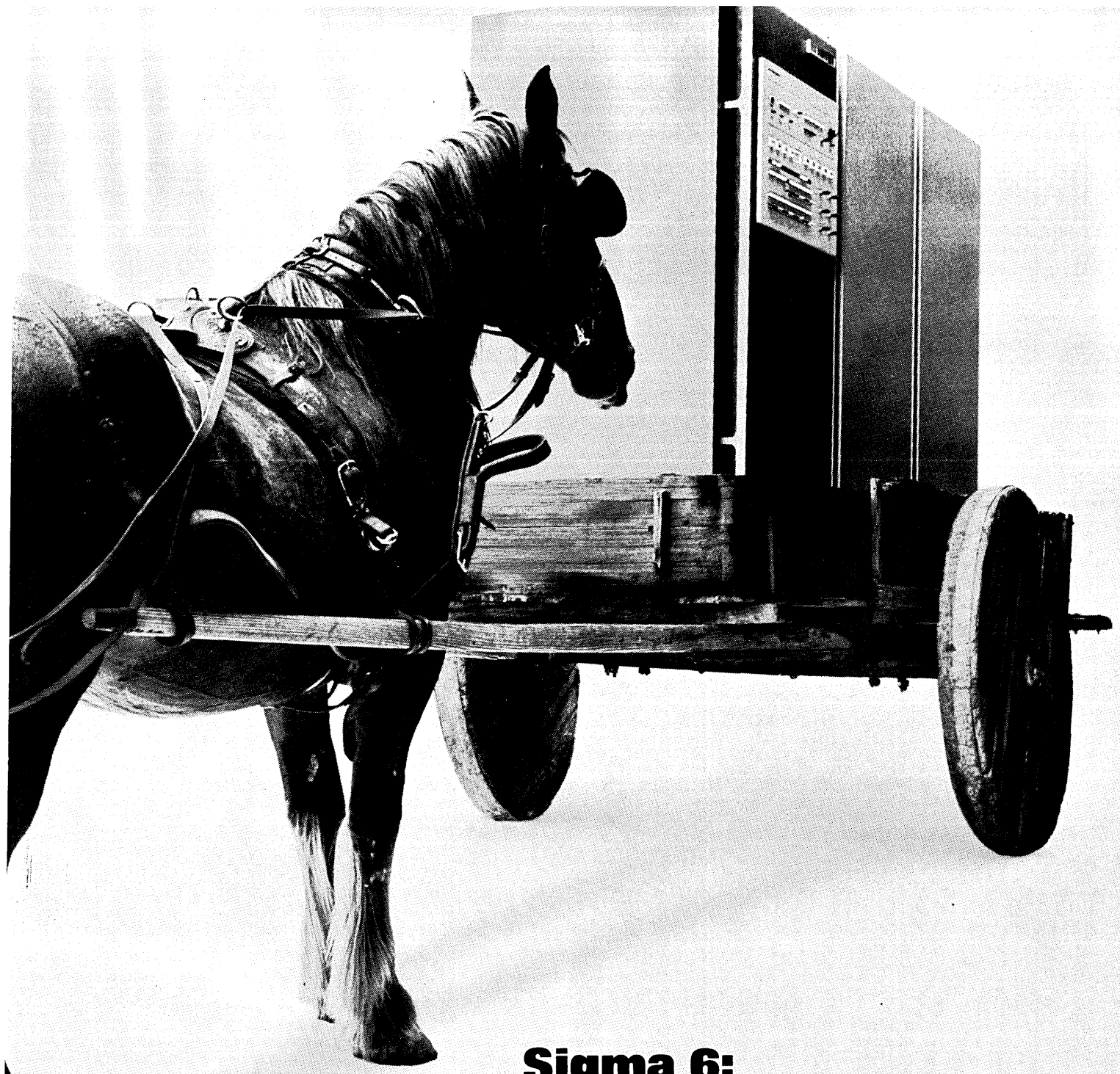
THE PRICE IS THE THING AT DATAGRAPHIX NOWADAYS

In taking itself off the selling block, Stromberg DatagraphiX is counting pennies — customers' pennies. The ailing General Dynamics subsidiary early this fall introduced a lower priced COM recorder system ($50K vs. $60K-140K for earlier systems) and now, we learn, will soon announce a COM fiche reader priced under $175 (vs. the $300 model 1325). Competitors in the low-price viewer market have done everything but "break into the plant" to see how it's done.

DatagraphiX is said to be more excited over the viewer than the recorder. Weighing 18 pounds, it has a 9 x 12-inch viewing area and several high reliability and maintenance features. Two models with magnification to 24 and 42X will be sold when the viewer is announced, sometime around the FJCC, maybe even with a prototype at the Astrohall.

RUMORS AND RAW RANDOM DATA

When multiplying 90 days times $200 to get $18K and RCA's maximum legal liabiilty under its guaranteed conversion contract, experts are less impressed by the innovation. But, says one, "give them a chance to perform. It may turn out to be one of the better deals yet." . . . We hear IBM now expects to install 1,800 System/3s this year, down from the 3,000 of their marketing projection . . . "STUFF" stands for STAR Users Free Forum. Yes, there is now a user group for this unused CDC machine. It's unclear if Livermore's talking to Livermore. We hear there's a second buyer. STAR, probably to be announced before year end, will have a virtual memory and multiple processors, doing a hierarchy of tasks as the 6600.



Sigma 6: first the software, then the computer.

Crazy.

Develop a lot of expensive software packages, put them out in the field, prove them in demanding user environments, then build a computer to run them on.

Who does that?

Us.

Sigma 6 is our business computer. Designed for high-throughput commercial batch work, together with remote job entry, and interactive time sharing.

Sigma 6 uses all the software developed for Sigma 5 and 7. Including operating systems for batch only or concurrent batch and time sharing; powerful Cobol and Fortran compilers; several systems for structuring and manipulating files and large data bases. Plus mathematical and simulation packages.

To run these systems efficiently we gave Sigma 6 byte-string decimal arithmetic (as well as floating point), memory mapping, dual-access memory, an independent input/output processor, and many other high-performance hardware features.

We also gave it an astonishingly low price.

We went into business backwards and came out ahead.

XDS

Xerox Data Systems
El Segundo, California

CIRCLE 45 ON READER CARD

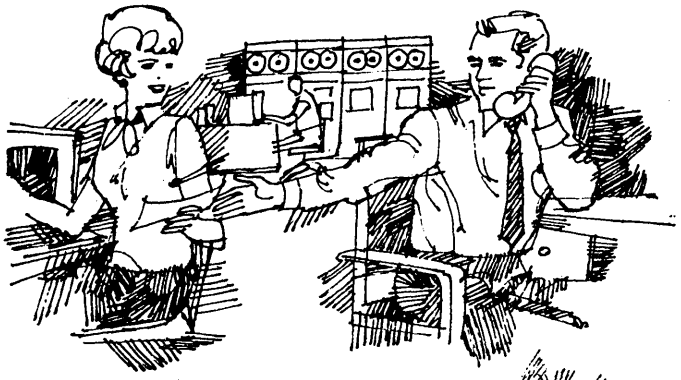
terminal operations controller

T.O.C.S. *starts* with the CDC® 20290 Multistation Controller. This device interfaces directly to the Selector Channel; handles the chores of polling 12 independent ports for inbound data traffic . . . directing outbound messages . . . performing EBCDIC-device code translation.

T.O.C.S.

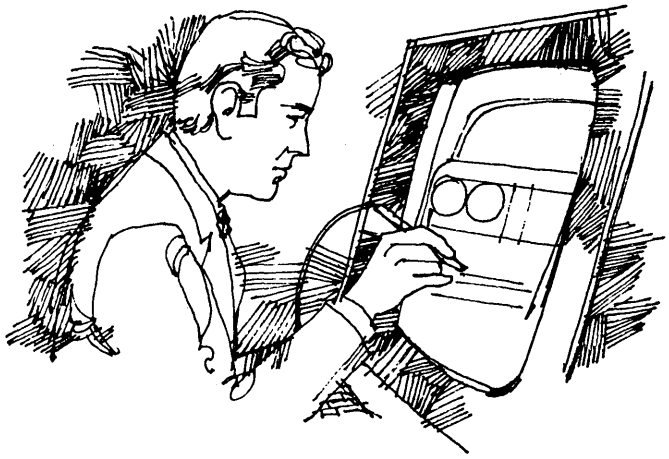
multistation controller

CDC's 20290 Local Controller and 216 Remote Controller will support CRT displays, typewriters, hardcopy recorders and line printers in any combination. Permits the high-volume data entry and retrieval operations demanded by on-line management systems.



graphics subsystem terminals

Control Data can provide a versatile family of remote graphic terminal subsystems. Included among them is CDC's GRID™ which incorporates its own computing capability, and can be remoted from the central site via 201-A or -B, or 301 Modems.

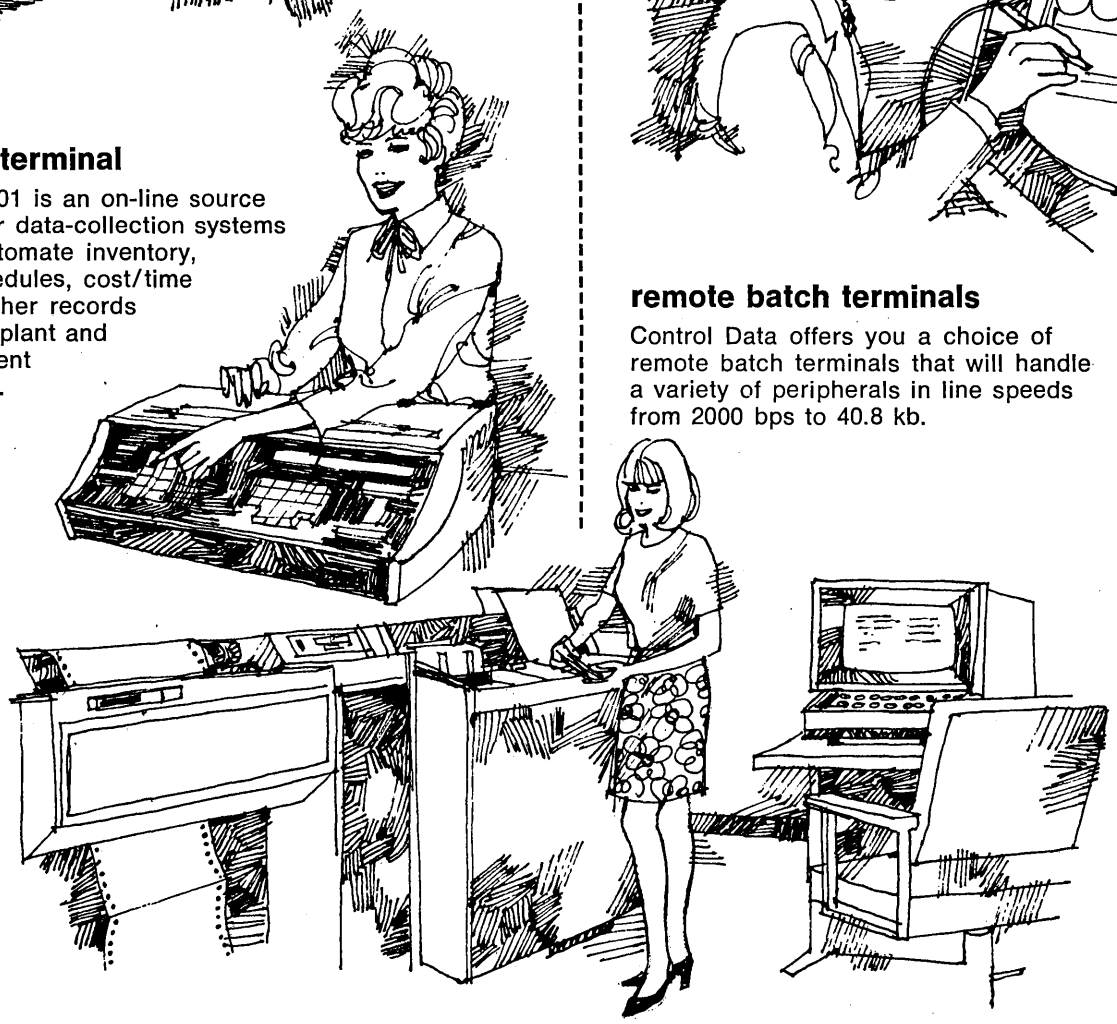


source data terminal

The CDC® SD-101 is an on-line source data terminal for data-collection systems that lets you automate inventory, production, schedules, cost/time reporting and other records needed to keep plant and office management up-to-the-minute.

remote batch terminals

Control Data offers you a choice of remote batch terminals that will handle a variety of peripherals in line speeds from 2000 bps to 40.8 kb.



TERMINAL OPERATIONS CONTROL

...a unique cost-saving way to expand your EDP capability without getting "sold-up" to a bigger CPU

Now — get far more from your existing computer — spare yourself the expense of going to a bigger mainframe. CDC® T.O.C.S. is the versatile new "Terminal Operations Control System" that offers *a simpler, more efficient answer* to controlling local and remote terminals within your communications network *with faster transfer rates throughout!* Compatible with major computer system mainframes including IBM 360, T.O.C.S. actually takes over many routine communications housekeeping chores, clears the way for more profitable use of your central processor.

Speeds communications . . . expands channel capacity

Much of T.O.C.S.' enormous gain in efficiency is due to its versatile multistation display controller that handles functions such as polling for inbound traffic . . . directing outbound messages . . . EBCDIC-code translation . . . and other tasks that would unnecessarily burden your CPU.

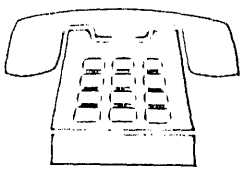
T.O.C.S. software accommodates Control Data's entire family of terminal systems. Handles any combination of single or multistation CRT displays, typewriters, hardcopy recorders, line printers, and communication-line pollers. Supports both local and remote terminals and communication lines . . . regardless of mix or number — right up to practical load limits for the line, channel and your applications software. The controller interfaces directly with the Selector Channel at 59,500 characters per second.

Control Data's cost cutting total-systems approach

T.O.C.S. adds up to one of the most complete lines of *fully operational* terminal-control hardware/software packages available. So you get precisely the system you need . . . at *single-source* savings. Shown here are just a few of the many terminal options available to you.

From the world's most powerful computers, to people-oriented terminal systems, Control Data *means* cost saving efficiency . . . compatibility that only a total systems supplier can provide. CDC has the hardware, the software, everything you need from engineering services to set-up, operator training, documentation and support.

For more information on T.O.C.S. and a copy of our new brochure, "Terminal Operations Control Systems," just call our HOT LINE collect.



HOT LINE 612-884-8195
Or if you prefer, write directly to:
Control Data Corporation
Dept.DA-110, P.O. Box 1980
Minneapolis, Minnesota 55111

CONTROL DATA
CORPORATION

An economic analysis of CALL/360, taking into consideration the associated costs for a bureau offering time-sharing services

CALL/360 Costs

by Edward Yourdon

One of the curious ironies in the computer industry is that IBM once lagged far behind its many competitors in the development of the type of computer service known as time-sharing. General Electric and Xerox Data Systems, to name only two companies, have found it almost impossible to compete with IBM in the standard data processing market, but have been able to make rapid advances in the field of time-sharing. As of mid-1969, approximately 60 independent organizations offered a variety of time-sharing services to scientific and engineering clients, largely on non-IBM computers.

IBM did make an early effort to enter the time-sharing field with its QUIKTRAN system. For a variety of reasons, however, QUIKTRAN did not find the acceptance that the GE-265 or XDS-940 systems enjoyed. Thus, it appeared until recently that IBM had given up in the time-sharing field, affording its many competitors a free hand.

During the past two years, however, IBM has developed, with the significant aid of outside consulting firms, a time-sharing system known as CALL/360. The system was designed to run on the IBM 360/50 configuration, shown in Table 1, which leases for approximately $36,000 per month (including maintenance). The system is interesting from a technical point of view, since it appears capable of servicing more than 100 simultaneous users. At first glance, this suggests a potential revenue of staggering proportions—perhaps twice to three times that of the current time-sharing systems. On the other hand, there are some hidden pitfalls in the CALL/360 system that can be understood only after a careful analysis of costs and marketing considerations.

The purpose of this paper, then, is to present an analysis of the economic possibilities of the CALL/360 system. Two very fundamental assumptions have been made in this analysis:

1. A company acquiring a CALL/360 system would have a dedicated IBM 360/50 computer of its own.
2. Time-sharing services would be offered from 8 a.m. to 8 p.m. with remaining time available for batch processing, maintenance, and accounting.

From these two assumptions, two separate projections have been made: one of the economic aspects of the time-sharing system, and one of the economics of batch processing on the 360/50, as a supplement to time-sharing revenue.

It is anticipated that the major use of the IBM 360/50 would be for time-sharing operations. In order to determine the financial implications of such an operation, one must, of course, establish costs and revenues. Even more important, however, one must clearly establish the assumptions that form the basis for cost and revenue projections. In the case of a time-sharing system, these assumptions are critically important and will be outlined here.

Time-sharing on the 360/50

Technical assumptions. The IBM CALL/360 system was originally released with only the BASIC programming language, but now has FORTRAN, PL/I, and "Extended" BASIC. It is assumed in this analysis that the technical staff of a time-sharing service bureau could, without too much trouble or unusual expense, maintain and improve these languages sufficiently to keep them competitive with most other current time-sharing systems.

Marketing assumptions. Actual experience with several time-sharing systems has shown that an average salesman can generate approximately 2.5 new accounts per month. Since we are assuming that the CALL/360 system will be sold with FORTRAN, BASIC, and PL/I, we may expect the salesman to be in a normal competitive situation. Hence, for this analysis, we will assume that the salesmen will generate 2.5 new customers each month.

It is important to note that assumptions of this type form the basis for the revenue and cost projections which follow. One of the basic purposes of this analysis is to identify the important parameters of revenue and cost, so that the reader can easily change the parameters to reflect his own goals and estimates. Thus, the estimate of 2.5 new accounts per salesman per month may be thought by some to be extremely conservative, despite the fact that it has been found to be true on a variety of GE and XDS systems. What is being established in this analysis, though, is a mechanism which allows *any* estimate of new accounts per month to be inserted.

Revenue and account assumptions. On the assumption that the CALL/360 system would appeal to the

light, conversational, time-sharing user (as opposed to the heavy, computational, remote-batch type of user), we may expect that each account will generate approximately $1,000 per month of revenue. This corresponds to experience on many current systems, on which it is also found that the accounts build their revenue from a minimum of $100 to the maximum of $1,000 over a six-month period. For simplicity, we will assume that each account's revenue grows in a linear fashion.

Another standard rule of thumb in the time-sharing industry is that each line (or "port") on the system can accommodate 2.5 new accounts. Since the CALL/360 system can handle 100 lines (i.e., 100 simultaneous users), we may expect it to be able to handle 250 accounts. There is some reason to believe that this number may be conservative, since the only limiting factor on the number of accounts is the probability of a user getting a busy signal when he attempts to get on the system. Mathematically, it can be shown that this probability drops off rather rapidly as the number of lines increases: that is, if there is a 10% probability that a user will get a busy signal on a system with 50 lines and 125 accounts, there is *less*

Mach. Type	Model/ Feature	Description	Qty	Monthly Rental	Purchase Price	Monthly Maintenance
2050	1	Processing Unit, 512K bytes Multiplexor channel	1	$20,550	$ 950,110	$ 570.00
	6980	1st Selector Channel		720	30,650	26.00
	6981	2nd Selector Channel		720	30,650	26.00
	6982	3rd Selector Channel		720	30,650	26.00
	7920	1052 Adapter		232	10,545	9.00
1052	7	Console Printer	1	65	2,725	17.00
2821	1	Control Unit	1	1,000	45,100	41.00
	8637	Universal Ch. Set Adapter		15	720	3.50
2540	1	Card Read/Punch	1	680	33,950	115.00
1403	2	Printer	1	775	34,000	177.00
	8641	Universal Character Set		10	450	1.75
	4740	Interchangeable Adapter		75	3,125	0.00
2314	1	Direct Access Facility	1	5,410	244,440	615.00
2803	2	Tape Control	1	825	38,900	25.00
	5320	9-track compatibility		237	10,720	28.00
2401	4	Tape Drives	2	790	35,900	148.00
	3741	Dual Density	2	50	2,400	3.50
2703	1	Transmission Control	1	1,495	67,510	95.00
	7505	Start Stop Base		77	3,490	4.50
	4619	IBM Terminal Control Base		20	950	1.25
	4696	IBM Terminal Control I		36	1,575	1.00
	4878	Speed Option 134.5 bps		10	475	1.00
	8055	2741 Break		10	450	1.00
	3205	Data Line Set		77	3,230	17.00
	3206	Line Set Expander		57	2,280	12.00
		TOTAL		$34,656	$1,584,995	$1,964.50

Table 1. System/360 Model 50.

than 10% probability that a user will get a busy signal on a system with 100 lines and 250 accounts. However, the probabilities may go awry if some of the lines are "reserved" (e.g., eight lines for Philadelphia, six for Baltimore, etc.), and it is difficult to arrive at a quantitative statement of the relationship between the number of lines and the number of accounts. For this analysis, then, we will use the rule of thumb—2.5 accounts per line—which has grown out of experience with GE-265, GE-420, XDS-940, and B5500 time-sharing systems.

One should also assume that there will be a certain attrition rate for time-sharing users. Almost any industry has the concept of an average life expectancy for an account, and the time-sharing industry is an extremely fickle one. For this analysis, we will assume that the attrition rate is 5% per month, which seems to correspond to experience in highly competitive areas of the country. The reader may wish to modify this assumption if he can lock his customers into the system by providing a specialized service. At the moment, though, the time-sharing business is highly "transferable," which contributes to the customers' fickleness.

Finally, one should assume that the price structure of the time-sharing industry will gradually change. At the present time, time-sharing is still somewhat of a seller's market, but as new time-sharing companies enter the marketplace, and as rapid technological advances cut the costs of time-sharing equipment (notably in the areas of communication equipment and large-scale file storage), the competition for customers will become more and more intense. In certain areas, such as New York, Washington, and Los Angeles, the competition has already become rather fierce, and it is felt that this will eventually cause a price drop in the marketplace. Accordingly, we have assumed that prices will drop by 5% each 12 months. This assumption seems to have been contradicted by recent price changes by some of the service bureaus, but over the next few years, prices will probably go down.

Sales and support

Loading assumptions. We have already assumed that a salesman can generate 2.5 new accounts per month on the CALL/360 system. Since, in addition, we have assumed that the system can accommodate 250 accounts, it follows that approximately 14 man-years of sales effort is required to fully load the machine. At one extreme, we could allow one salesman to spend 14 years to load the machine; at the other extreme, we would hire 14 salesmen and load the machine in a year.

While the first choice is patently absurd, it is not so obvious that the second extreme is also unrealistic. Good time-sharing salesmen are an extremely rare breed, and it would be difficult, if not impossible, to hire 14 competent men in less than a year or two. For one thing, such a rapid growth in personnel would be dangerously unmanageable for most small or medium-sized service bureaus, and for another, there simply aren't that many good salesmen in an area like New York who can be pried loose from their current jobs on short notice.

Accordingly, we have taken a somewhat more conservative outlook and assumed an initial force of six salesmen. With this sales force, it would take just under three years to load the machine. However, this initial sales force can be increased at the rate of one man every month or so, which is about as fast as most time-sharing service bureaus can locate and hire new salesmen.

Marketing and technical support assumptions. There is obviously more to selling a time-sharing service than merely writing an order. In a highly competitive marketplace, service is likely to be the difference between success and failure. Accordingly, we should include in our analysis of the CALL/360 system a provision for marketing support and technical support.

Let us first discuss the marketing people. Most salesmen feel that it is difficult to maintain more than 15 accounts in the time-sharing business without giving poor service. Thus, while we originally assumed a marketing force of six men, there will come a time when they are overburdened with on-going accounts. To compensate for this we will assume a gradual addition to the marketing staff for the maintenance of current accounts, with the seasoned salesmen presumably beating the bushes for new business.

In addition to the marketing support, the time-sharing business requires a fair amount of technical support. There is usually a sharp distinction between technical support required for new accounts and that required for current or on-going accounts. For new accounts, the technical man must help the customer learn the idiosyncrasies of the CALL/360 system, convert his programs, or help express his application as a computer program. Once the account has been established, however, the technical man is required merely to help clear up problems or misunderstandings with the system. We estimate that each new account will require one intensive session of approximately 0.2 man-months of technical assistance (or approximately four man-days). On-going accounts will require an on-going technical support effort of 0.05 man-months *each* month (or approximately one man-day per month). These assumptions are based on the author's personal experiences and may not be valid in all situations.

Summary of assumptions on CALL/360.

1. Extended BASIC, FORTRAN, and PL/I are available on CALL/360.
2. Salesmen can generate 2.5 new accounts per month.
3. Each account generates $100 revenue in the first month, increasing in a linear fashion to $1,000/month in six months.
4. The CALL/360 system can service 100 simultaneous users and a total of 250 accounts.
5. There will be an attrition rate of 5% per month.
6. Competition will force time-sharing prices to drop at the rate of 5% each year.
7. Time-sharing operations will commence with a sales force of six men, building gradually so that no salesman has to handle more than 15 accounts.
8. Each new account requires 0.2 man-months of technical assistance.
9. Each on-going account requires 0.05 man-months of technical support *each* month.

In addition to the major assumptions that have been outlined above, there are a number of minor

points which we need not discuss at length. For example, we can assume that employees of the time-sharing service bureau will receive a 10% raise each year, and that the service bureau must set aside an amount equal to 10% of the total payroll for social security taxes, insurance benefits, and so forth. Similarly, we can assume that a secretary will be required for every 10 technical people, for every five marketing people, and for every one manager.

These assumptions can easily be gathered into a computer program which can combine revenue assumptions and cost assumptions to provide a profit-and-loss statement for any set of assumptions. The printout in Fig. 1 summarizes revenue, staffing, and cost projections over a four-year period; Fig. 2 shows a detailed breakdown of costs for the first year of operation. As can be seen, a time-sharing system using the CALL/360 configuration, *operating under the previously made assumptions,* will have lost some $2.3 million by the end of its fourth year of operation. Assuming that costs and revenues have leveled off at that point, the system will continue to lose approximately $40,000 per month.

The great advantage of this type of analysis is that it allows the businessman to try different assumptions without actually having to lose $2 million. The computer program which generated Fig. 1 and Fig. 2 was used to investigate the results of hiring more salesmen and increasing the capacity of the system. Unfortunately, none of these approaches seemed to help—the system insisted on losing money.

In any event, there are some obvious truths about the CALL/360 time-sharing system. First, monthly expenditures for equipment are far higher than on many other time-sharing systems (i.e., basic monthly rentals of $18K for the GE-265, $25K for the XDS-940 and $36K for the 360/50). Second, the CALL/360 system has such a large capacity that a very large

CONSOLIDATED FIGURES FOR IBM CALL/360 SYSTEM
ALL MONEY FIGURES IN THOUSANDS OF DOLLARS

ASSUMPTIONS

DEVELOPMENT TIME= 1 MONTH(S)
INITIAL # OF SALESMEN= 6.0
FIRST MONTH REVENUE= 0.1
ATTRITION RATE PER MONTH=.05

CONVERSION TIME= 0 MONTH(S)
ACCOUNTS PER SALESMAN= 2.5
MAXIMUM ACCOUNT REVENUE= 1.0
CREDITS,PERCENTAGE=.05

TEST TIME= 0 MONTH(S)
MAX NUMBER OF LINES=100
BUILDUP PERIOD= 6 MONTH(S)
ACCOUNTS PER LINE= 2.5

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
ACCOUNTS	0.0	15.0	29.3	42.8	55.6	65.4	74.6	83.4	91.7	97.1	104.8	112.0
TOTAL STAFF	13.5	21.9	24.3	29.6	30.5	33.5	34.3	37.2	38.7	40.5	41.2	42.9
TOTAL PAYROLL	16.5	26.1	28.1	33.7	34.8	37.8	38.8	41.7	42.8	45.1	45.9	52.9
TOTAL EQUIP CUST	2.3	39.8	40.5	43.5	44.2	45.9	46.3	48.0	48.4	48.7	50.4	50.8
TOTAL OTHER CUSTS	4.6	14.4	14.6	15.4	15.6	16.4	16.5	17.3	17.4	18.1	18.2	19.0
TOTAL COSTS	23.4	80.2	83.2	92.7	94.5	100.0	101.6	106.9	108.6	111.9	114.5	122.6
REVENUE	0.0	0.0	1.4	4.8	10.0	16.7	24.6	32.5	41.9	50.5	58.2	65.1
PROFIT/LOSS	-23.4	-80.2	-81.8	-87.9	-84.6	-83.3	-77.0	-74.4	-66.6	-61.4	-56.3	-57.5
CASH FLOW	-23.4	-103.6	-185.4	-273.3	-357.8	-441.2	-518.2	-592.6	-659.2	-720.6	-776.9	-834.4

MONTH	13	14	15	16	17	18	19	20	21	22	23	24
ACCOUNTS	118.9	125.5	131.7	137.6	143.2	148.6	156.1	160.8	167.8	171.9	178.3	184.4
TOTAL STAFF	43.5	47.2	47.8	49.3	49.9	52.5	54.1	57.8	58.2	59.6	60.4	63.0
TOTAL PAYROLL	53.7	57.2	57.9	60.2	60.8	63.9	65.1	69.9	70.4	72.8	73.5	84.0
TOTAL EQUIP CUST	51.1	52.7	53.0	53.4	54.8	55.1	55.5	57.0	57.3	57.6	57.9	59.4
TOTAL OTHER CUSTS	19.1	19.8	19.9	20.6	20.7	21.5	21.6	22.3	22.4	23.1	23.2	24.0
TOTAL COSTS	123.9	129.7	130.8	134.2	136.3	140.5	142.1	149.2	150.1	153.5	154.6	167.4
REVENUE	71.6	75.5	81.1	86.4	91.5	96.6	101.4	103.4	107.9	112.4	116.8	121.1
PROFIT/LOSS	-52.4	-54.2	-49.7	-47.8	-44.9	-44.0	-40.8	-45.8	-42.2	-41.0	-37.8	-46.3
CASH FLOW	-886.9	-941.1	-990.9	-1038.6	-1083.5	-1127.5	-1168.2	-1214.1	-1256.2	-1297.3	-1335.1	-1381.4

MONTH	25	26	27	28	29	30	31	32	33	34	35	36
ACCOUNTS	190.2	195.7	200.9	205.8	213.0	217.4	224.0	230.3	236.3	242.0	247.4	250.0
TOTAL STAFF	63.8	65.1	65.8	66.3	69.7	71.4	73.0	74.6	75.2	77.7	78.0	78.0
TOTAL PAYROLL	84.7	87.2	87.8	91.2	92.4	95.0	96.5	99.1	99.8	102.9	103.3	113.6
TOTAL EQUIP CUST	59.7	60.1	61.6	61.9	62.2	62.5	64.0	64.4	64.7	65.2	66.5	66.6
TOTAL OTHER CUSTS	24.0	24.8	24.8	25.6	25.7	26.4	26.5	27.2	27.3	28.1	28.1	28.1
TOTAL COSTS	168.5	172.0	174.2	178.7	180.3	184.0	187.1	190.7	191.8	197.2	197.9	208.3
REVENUE	125.5	126.5	130.6	134.5	138.8	143.0	147.2	147.1	151.1	155.3	159.5	163.7
PROFIT/LOSS	-43.0	-45.5	-43.6	-43.9	-41.5	-40.9	-39.9	-43.6	-40.7	-41.9	-38.4	-44.6
CASH FLOW	-1424.3	-1469.8	-1513.5	-1557.3	-1598.8	-1639.8	-1679.7	-1723.3	-1764.0	-1805.9	-1844.3	-1888.9

MONTH	37	38	39	40	41	42	43	44	45	46	47	48
ACCOUNTS	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0	250.0
TOTAL STAFF	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0	78.0
TOTAL PAYROLL	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6	113.6
TOTAL EQUIP CUST	66.6	66.6	66.6	66.6	66.6	66.6	66.6	66.6	66.6	66.6	66.6	66.6
TOTAL OTHER CUSTS	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1	28.1
TOTAL COSTS	208.3	208.3	208.3	208.3	208.3	208.3	208.3	208.3	208.3	208.3	208.3	208.3
REVENUE	167.5	166.0	168.5	170.4	171.6	172.4	172.6	167.5	167.5	167.5	167.5	167.5
PROFIT/LOSS	-40.8	-42.3	-39.8	-37.9	-36.7	-35.9	-35.7	-40.8	-40.8	-40.8	-40.8	-40.8
CASH FLOW	-1929.8	-1972.1	-2011.9	-2049.8	-2086.5	-2122.3	-2158.2	-2199.0	-2239.7	-2280.5	-2321.3	-2362.1

Fig. 1.

marketing force and technical staff are required to sell and support the time-sharing services on the machine. Coupled with the large equipment costs and relatively low revenue from each customer, this means that a service bureau acquiring a 360/50 stands a good chance of spending more than it receives from each time-sharing customer. As the computer model will confirm, it is not sufficient to simply add more users to the system, in the hope of making a profit.

Lest we paint too black a picture of the CALL/360, it should be pointed out that there are some ways of making money with the system. The reader might consider the effect of the following *different* assumptions, most of which would cause the system to produce a profit:

1. No lowering of prices—in fact, an *increase* in the price structure. Apparently, some time-sharing service bureaus have stumbled onto this approach out of desperation.

2. A marketing approach which attracts the larger customer, so that the maximum revenue from each customer is not $1,000/month, but perhaps $2-3,000. This doubles and triples the revenue and probably cuts down on the technical support and marketing overhead. If all other assumptions are fixed, we can obviously use this computerized approach to calculate the amount of revenue from each customer that we would require to make a "reasonable" profit. This could provide useful input for a marketing strategy or for a calculation of a proper pricing structure.

3. A distinct effort to give better service in an attempt to cut down on the attrition rate of customers. In the model summarized by Fig. 1, about five salesmen are spending full time replacing lost customers by the end of the fourth year. If the system provides a service whereby the users build large data bases, it will be difficult for them to move to different machines; in a problem-solving environment, users will tend to be more fickle, and the attrition rate is naturally higher.

4. A distinct effort to give no service at all in an attempt to eliminate most or all of the junior technical support people and their associated secretaries and managers. As the sophistication of time-sharing users increases, this becomes more and more of a possibility.

5. Hiring many more salesmen in an attempt to load the machine more rapidly. Since it *is* a relatively expensive machine, the early months of operation (during which there are few customers) cause a huge negative cash flow. As our economic model now stands, merely increasing the number of salesmen is not sufficient to cause the system to generate a profit. If we can somehow squeeze more revenue out of each customer, the system may still take a long time to break even. In such a case, increasing the number of salesmen will *worsen* the negative cash position, but will shorten the length of time required to begin making a profit. Thus, with appropriate modifications to our other assumptions, a marketing force of 10 men might require an investment of $750,000 to begin making a profit at the end of four years (hardly an

DETAILED COST AND EMPLOYMENT SCHEDULE

MONTH	1	2	3	4	5	6	7	8	9	10	11	12
ACCOUNTS	0.0	15.0	29.3	42.8	55.6	65.4	74.6	83.4	91.7	97.1	104.8	112.0
SALESMEN	6.0	7.0	7.0	8.0	8.0	9.0	9.0	10.0	10.0	11.0	11.0	12.0
SENIOR TECHNICIANS	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
JUNIOR TECHNICIANS	1.5	6.9	8.3	9.8	10.5	11.5	12.3	13.2	13.7	14.5	15.2	15.9
CLERICAL	3.0	4.0	5.0	7.0	7.0	8.0	8.0	9.0	10.0	10.0	10.0	10.0
MANAGERS	0.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TOTAL STAFF	13.5	21.9	24.3	29.6	30.5	33.5	34.3	37.2	38.7	40.5	41.2	42.9
TOTAL PAYROLL	16.5	26.1	28.1	33.7	34.8	37.6	38.8	41.7	42.8	45.1	45.9	52.9
RENT	3.0	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
MARKETING EXPENSES	2.4	2.8	2.8	3.2	3.2	3.6	3.6	4.0	4.0	4.4	4.4	4.8
TECH SVCS BUDGET	0.7	1.3	1.7	1.9	2.0	2.2	2.3	2.4	2.5	2.6	2.7	2.8
PROMOTIONAL COSTS	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
ACCT.BOOKEEPING	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
FURNITURE	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
UTILITIES	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
INSURANCE	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
CLEANING	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
TAXES	0.1	1.2	1.2	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.5	1.5
MISCELLANEOUS	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
TOTAL OTHER COSTS	4.6	14.4	14.6	15.4	15.6	16.4	16.5	17.3	17.4	18.1	18.2	19.0
EAM.KEYPUNCH	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
TELETYPE	0.7	0.8	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.1
PHONES.DATASETS	1.2	1.2	1.2	3.5	3.5	4.7	4.7	5.8	5.8	5.8	7.1	7.1
COMPUTER COSTS	0.0	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6	36.6
DELIVERY COSTS	0.0	0.4	0.7	1.1	1.4	1.6	1.9	2.1	2.3	2.4	2.6	2.8
SUPPLIES	0.2	0.8	0.9	1.3	1.6	1.8	2.1	2.3	2.5	2.6	2.8	3.0
TOTAL EQUIP COST	2.3	39.9	40.5	43.5	44.2	45.9	46.3	48.0	48.4	48.7	50.4	50.8
TOTAL COSTS	23.4	80.2	83.2	92.7	94.5	100.0	101.6	106.9	108.6	111.9	114.5	122.6

Fig 2.

exciting prospect in these days of planned technological obsolescence); a marketing force of 30 men might require, for the sake of argument, $2,000,000 to begin making a profit in one year.

Batch processing on the 360/50

Estimates of billable hours. The most important parameter in the determination of revenue that the 360/50 could generate is obviously the number of hours that can be billed. Only the naive would assume that all of the time not used for time-sharing activities could be billed to batch-processing customers. Estimates of the potential billable hours may be derived in a number of ways, three of which are outlined below.

1. *First estimate.* Experience with several batch-processing data centers has shown that a fully loaded system can expect to sell a maximum of 350 hours per month. The remaining 378 hours in a calendar month are lost to uneven loading of the machine, idle weekends, down-time, job set-up, maintenance, and other miscellaneous causes. From this, we see that if the machine were available only half the time (as we have assumed for the 360/50 running CALL/360 during the day), we could expect only about 175 hours per month of billable time.

2. *Second estimate.* An alternative estimate of the maximum potential billing is arrived at by dividing a 24-hour day on the 360/50 into three periods:

12 hours—time-sharing
2 hours—preventive maintenance
10 hours—available for batch processing

Hence, one could expect 10/24 of the maximum 350 hours to be billed for batch time. This yields an estimate of

$10/24 \cdot 350 = 150$ billable hours per month.

3. *Third estimate.* Still another estimate of the maximum billing rate on the 360/50 may be made. Allowing two hours per day for preventive maintenance, the hours from 8 p.m. to 6 a.m. are available five days a week. This yields 50 hours per week of billable time, except that it is extremely difficult to sell the time from midnight, Friday, to 6 a.m., Saturday. Hence, we could expect to sell 44 hours per week, except that about 25% of this potential may be expected to be lost to uneven loading, etc. Of the resulting 33 hours, approximately 22 hours would be sold as block time and 11 hours would be sold for short jobs, resulting in only 30 billable hours per week (the set-up time between jobs usually cannot be charged to customers). This yields 130 hours per month, and we might expect to sell an additional 30 to 40 hours per month of weekend time. With this approach, then, we end up with an estimate of 160-170 hours per month of billable batch time.

Revenue projections. For the purposes of this analysis, we will assume an average of 160 hours per month of potential billable batch processing time. It must be remembered, however, that the batch time is not prime time, and that the batch market is often extremely competitive. This analysis assumes that the CALL/360 system is placed in the greater New York area and, while some of the prices may differ in other locales, the competition is likely to be just as fierce. Thus, while we might expect $200/hour for prime-time batch, it is not reasonable to expect as much for second shift, third shift, and weekend time. A survey of the New York market shows that $150/hour for second shift and third shift is reasonable; for weekend time, one can only hope for $115/hour.

Hence, the maximum revenue one might obtain from the sale of batch time on the 360/50 is approximately as follows:

120 hours @ $150/hour = $18,000
40 hours @ $115/hour = $ 4,600
$22,600 per month

For the purposes of revenue projections, a weighted average of $140/hour has been assumed.

Obviously, one cannot expect to attain the maximum potential revenue from the first day the machine is installed in a computer center. However, regardless of the lead time the salesmen are given, it is felt that they will have sold between 20 and 40 hours per month by the time the machine is installed. It is then expected that a "large" user could be sold by the end of the second month after installation, another "large" user by the end of the fourth month, and so forth. For a conservative estimate, we will assume that billing levels off at $20,000 per month after six months.

The growth of revenue from the sale of batch processing time is summarized in Table 2.

Costs associated with batch sales

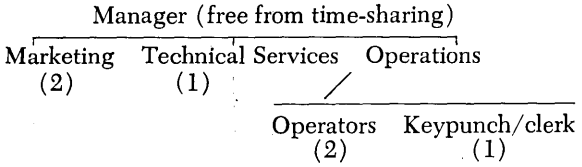
One of the obvious mistakes made in this type of analysis is the assumption that the revenue can be gained without any costs in addition to those incurred by the time-sharing operation. A little thought will show that this is not true: the batch market is substantially different from the time-sharing market, requiring a different kind of marketing expertise; additional computer operators are required if the machine is really going to be kept running three shifts a day; technical support is required to help customers convert from other machines; additional equipment is required for the heavily tape-oriented batch work; and messenger services are often required to carry tapes, cards, and listings from the customer's site to the computer and back.

To realize the revenue projections in Table 2, it is

Month	1	2	3	4	5	6	7	8	9	10	11	12
Hours	20	60	80	120	140	160	160	160	160	160	160	160
Revenue (thousands)	2.8	8.4	11	17	20	22	20	20	20	20	20	20

Table 2. Revenue projections for 360/50 batch.

estimated that the following organizational structure would be required:



Personnel costs. The personnel costs associated with the organizational structure are shown in Table 3.

Equipment costs. In addition to the extra personnel, additional equipment would have to be added to the 360/50 to make it competitive in the batch market. The equipment required, in addition to that required to support the CALL/360 time-sharing system, is shown in Table 4.

The operation of the 360/50 for batch time will cause the machine to be operated in excess of the 176 hours/month allowed by IBM for its normal rental charges. However, many of the hardware components used by the CALL/360 system are not required for the "overtime" use, resulting in a total overtime charge on the machine of approximately $1,500/month.

Other costs. In addition, the two salesmen projected above would require approximately $1,200 per month for traveling expenses, secretarial services, phone calls, general overhead, and so forth. Also, it is anticipated that the operations staff would occasionally be required to work overtime hours for rush jobs. This should cost approximately $600 per month.

Summary of costs. The basic costs of the batch-processing operations may thus be summarized as in Table 5.

The revenue and cost projections for the sale of batch time on the 360/50 are combined in Table 6. From these figures, we see that a negative cash flow could be expected for the first 10 months of operation, and that, with full loading, we could only expect a monthly profit of about $3,400.

The reasons for this disappointing return on investment should be emphasized again. First, the machine is not available for batch processing during the prime hours of the day, thereby reducing the revenue potential. Second, there are personnel costs involved in the offering of batch services that are proportionately greater than the costs of offering batch services on a full-time basis.

As a result, one can conclude that there is little motivation for investing in the batch-processing market. Even worse than the paltry profit is the fact that the cash flow situation aggravates the even larger negative cash flow that can be expected from the time-sharing operation. ■

Type of Personnel	Cost (thousand/month)
Marketing	$2.0
Technical	$1.0
Operations	$2.7
Messenger services	$0.7
	$7.0 (including 10% payroll tax)

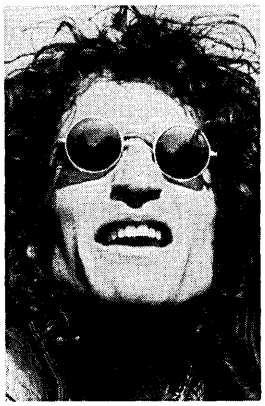
Table 3.

Hardware component	Approximate monthly rental
2311 disc storage drive	$ 590
2841 disc storage control	$ 540
2401 disc magnetic tapes (6)	$5160
	$6290

Table 4.

Items	Monthly cost (thousand of dollars)
Personnel	$ 7.0
Equipment	$ 6.3
Overtime use	$ 1.5
Marketing expenses	$ 1.2
Overtime payroll	$ 0.6
	$16.6 total

Table 5.



Mr. Yourdon is an independent consultant and lecturer ing in the field of time-sharing and on-line systems. He was formerly with E.L.I. Computer Time-Sharing, Inc., GE, and Digital Equipment Corp. He holds a BS in mathematics from MIT.

Month	1	2	3	4	5	6	7	8	9	10	11	12
Billable hours	20	60	80	120	140	160	160	160	160	160	160	160
Revenue (K)	2.8	8.4	11.2	16.8	19.6	22.4	20.0	20.0	20.0	20.0	20.0	20.0
Personnel	6.2	6.2	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Equipment	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
Equipment overtime	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Personnel overtime	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Marketing expenses	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
TOTAL COST	15.8	15.8	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
PROFIT/LOSS	—13.0	— 7.4	— 5.4	0.2	3.0	5.8	3.4	3.4	3.4	3.4	3.4	3.4
CASH FLOW		—20.4	—25.8	—25.6	—22.6	—16.2	—12.8	— 9.4	— 6.0	— 2.6	1.2	4.6

Table 6. Summary of revenue and costs for batch processing.

Take care to check out the product and the vendor before signing the contract

Brand X

One of the pitfalls for users, especially those at smaller installations, is buying equipment on the basis of advertising claims without setting up adequate safeguards. The following saga is based on correspondence and internal memoranda supplied to us by such a customer. The names have been changed—to protect us—but everything else is told as it occurred.

About two years ago we noticed an advertisement presented by the Jerrybuilt Recording Co. in another magazine. You had a similar advertisement in a more recent issue. It featured a new incremental magnetic tape recorder, the Jiffy Mark I, which had advertised specifications similar to their competitors' but on further inquiry had a cost of about $1000 less. On the basis of these advertised specifications and considering the scarcity of funds, we purchased one. This is the story of our subsequent problems with the Mark I, later with a Mark III, and with the company.

In January, 1968, we purchased one Jiffy Mark I incremental magnetic tape recorder from the Jerrybuilt Recording Co. The recorder was shipped in February.

Although a number of months were to pass before we would use the recorder, Mr. Jerry Glitch assured us that he would correct any problems which might arise. Mr. Glitch had established the Jerrybuilt Recording Co. and he went to work for Conglomerate Products, Inc., when his company was acquired by them shortly after our purchase date.

When we first tried to use the recorder in April, 1969, the take-up reel would not turn. We told Mr. Glitch about this and, as indicated in his letter in April, he sent us two substitute printed-circuit cards and a relay for installation in the recorder. (Although we told him about this problem two days after the year-long warranty period had expired, he took care of it as if it were covered by the warranty.)

As soon as these substitute parts had been installed, the first problem was solved but additional problems appeared. For example, there was incorrect parity generation and non-IBM-compatible record gapping. We complained about these problems to Mr. Glitch on April 27, May 6, and May 10. He was very friendly and helpful; he sent us additional substitute parts. However, these problems simply were not solved.

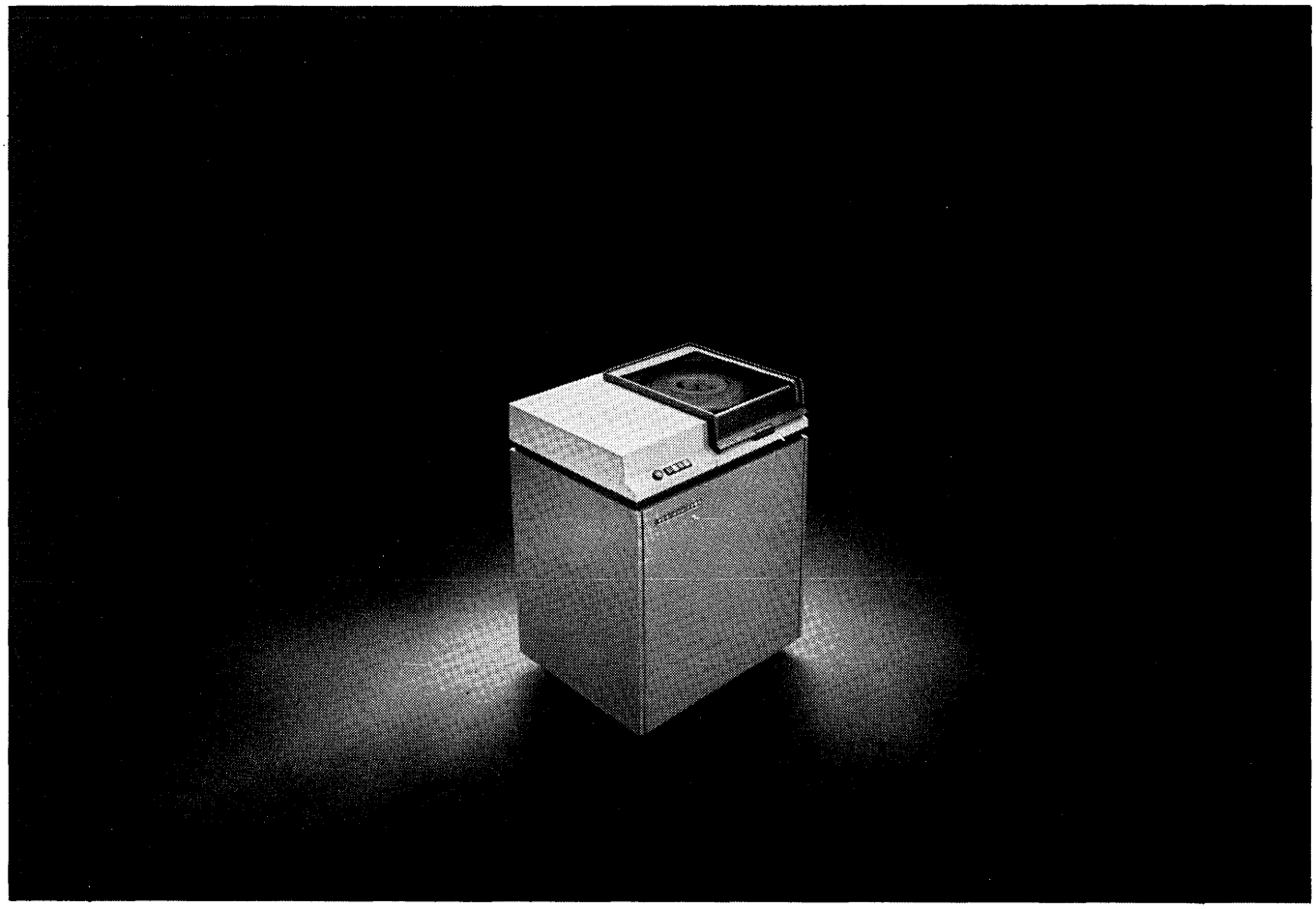
We then complained to the sales manager of Conglomerate Products, Inc., on May 12 and 16. He suggested that we return the Mark I recorder and exchange it for a Mark III—at no cost to us. As the specifications of the Mark III were compatible with our equipment, we agreed to this and returned the Mark I on May 18. The Mark III was shipped to us on June 17.

Similarly, we had problems when we tried to use the Mark III recorder. We complained on Aug. 15, 16, 17, 28, and 30 about such problems as incorrect parity generation, poor servo-control on the take-up reel, and tape skew. On most of these occasions we were given suggestions which we followed in an attempt to get the recorder to operate satisfactorily. None of the attempts was successful so we returned the Mark III for repair on Sept. 6. It was shipped to us again on Sept. 13, with an acknowledgement stating that the repairs were covered by our warranty.

And still we had problems

We still had problems when we tried to use the repaired Mark III recorder. We complained on Sept. 19 and a substitute printed-circuit card was sent for installation in the recorder. This attempt similarly was not successful in getting the recorder to operate satisfactorily.

We then complained to the president of Conglomerate Products, Inc., Egmont Zilch, on Oct. 9. We told him about our numerous complaints, about the fact that the recorder had *never* operated according to advertised specifications, and asked if we could get a refund. He asked that we return the recorder so that he could investigate the situation. We thus returned



It's more than a match for IBM.

CalComp disk memories match up with the IBM 360 perfectly.

But with an average access time of just 30 milliseconds, they're twice as fast as IBM's own disk memories.

And cost considerably less.

For example, our 11-disk CD12 storage facility doubles the access speed of a 2314 for about a third less money. And comes with its own controller.

Likewise, our 6-disk CD1 disk drive replaces the 2311 plug for plug. Saves you plenty. And does the work in much less time.

Actually, the reason we're so much faster turns out to be the same reason we're so much more reliable.

Electromagnetic positioning.

No mechanical pawls, detents or gears to slow things down. Or foul things up.

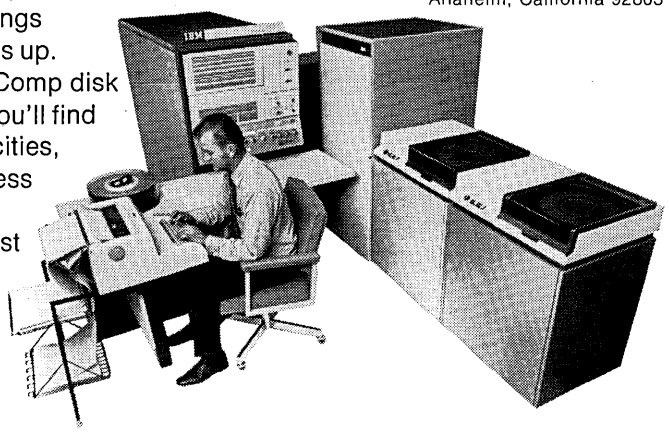
So call your CalComp disk drive man today. You'll find him located in 22 cities, along with matchless CalComp service.

Ask him for a cost and performance comparison.

He'll show you how little it takes to beat IBM.

CALCOMP

California Computer Products, Inc.
Dept. D-11, 2411 W. La Palma Avenue
Anaheim, California 92803



CIRCLE 16 ON READER CARD

the Mark III for the second time.

Mr. Zilch called us back on Oct. 18 and confirmed the various problems which we had experienced with the Mark III. For example, he stated that (1) the edge of the tape resonates at various speeds, (2) the servo-control on the tension arm of the take-up reel does not exert enough pressure on the tape, (3) the surface of the capstan is not uniformly smooth, and (4) the stepping motor does not operate properly at all speeds throughout its speed range. (All of these problems, but especially the last one, contribute to tape skew problems.)

In addition, Mr. Zilch stated that although he would not give a refund, he would return to us within 30 days a rebuilt Mark III recorder. When we asked what would happen at that time if the recorder did not meet its advertised specifications, he said that a refund would be made.

The partial refund

On Dec. 15—about 60 days later—we wrote Mr. Zilch as we had neither received the recorder nor heard anything from him. On Dec. 20 we received a letter from Conglomerate Products, Inc., including a check for the refund, but stating that they were deducting from our purchase price a "20% charge for restocking purposes."

On Dec. 29 we complained to the Better Business Bureau. We stated that we felt the "20% charge for restocking purposes" was unfair—particularly since the president of Conglomerate Products, Inc., admitted that neither of the two tape recorders met their advertised specifications. And, if something does not meet its advertised specifications, how can it be a "stock" item subject to a restocking charge?

On Feb. 4, 1970, the Better Business Bureau replied. They stated that, "The company has indicated to this Bureau its desire or disposition to do nothing further toward an adjustment or settlement of the matter."

Since then we have filed a formal complaint with the state office of the attorney general but have not yet received word of the outcome. Readers should be aware that some states now have consumer protection laws that may apply in such cases as ours.

As a final note, one of our friends called the sales manager of Conglomerate Products, Inc., recently and inquired about the present availability of the Mark III recorder. Our friend was told that none had been manufactured since the end of last year, none were available at present, and it would not be possible to get one—even on a special order.

Thus ends the story of an unhappy user. But to give it more point, we would like to offer the following suggestions on how to avoid getting into a similar bind.

Simple precautions

Experienced users have developed ways to qualify their suppliers. One is to ask for the names of three satisfied customers with whom you can check performance. You should also ask the supplier for the production serial number of the unit you will receive. If it's less than 10, you should be very cautious. If the price of the unit is far below that of comparable units, that's another good reason to be wary. If you learn that you are to get one of the first units, do not buy on price alone.

Make sure that the contract you sign includes provisions for an acceptance test as a condition of the sale. Then you should furnish the manufacturer with the acceptance test specifications 90 days before the delivery date. With an acceptance test required by the contract, it is thus in the supplier's interest to see that the unit passes the test before it is shipped out.

While awaiting delivery, make sure that the interface equipment is ready; it should include facilities that will allow sources of errors to be isolated. The program to be used for reducing the acceptance test data must also be prepared for use when the unit is delivered.

Most large users maintain two suppliers for every type of product. One is an old-line, highly reliable vendor with a good performance and support track record. For the second, they may experiment with new units from various vendors. If a customer had eight working tape units, for example, and a ninth for loading and backup, this unit might be from a prospective second vendor.

In all cases, it is wise to write an acceptance test into the contract. This and interviews with other users are likely to prevent the experiences described by this user. ■

"So, for the near term, gentlemen, I'm afraid all I can suggest is we hang in."

© DATAMATION®

Here's a strategy for easing the conversion problems in adopting the American National Standards Institute COBOL

ANSI COBOL

by Harry T. Hicks, Jr.

The effect of American National Standards Institute's COBOL (ANSI COBOL), officially adopted in August, 1968, is beginning to be seen. IBM recently released DOS and OS versions of a Standard COBOL compiler, and has announced a third, smaller Standard compiler that will be available early in 1971. Availability of Standard COBOL compilers for Univac and GE large-scale equipment has been announced.

These new compilers are based on their predecessors but, because of changes in syntax/function relationships caused by the Standard, they differ enough so that they are incompatible with them. Therefore, ANSI compilers will have one definite effect on COBOL users—they will have to undergo a conversion, perhaps just mental but more probably mental and physical. This article describes a conversion strategy that will assist COBOL organizations in using this conversion to adopt a standard COBOL dialect as their programming language.

ANSI COBOL

The article begins by presenting the background of ANSI COBOL and its benefits to COBOL users. It then discusses the considerations involved in a three-step plan for converting both programmers and programs.

The Standard groups the elements of COBOL into a set of eight modules, each related to a particular function. Each module is divided into two or three levels of increasing sophistication. As shown in Table 1, five of the modules have no elements at their lowest level to simplify the definition of "minimum Standard COBOL." The lowest non-null level of each module represents the elements basic to that particular function. Higher levels include all of the elements in the lower level plus more sophisticated elements and clauses.

Minimum Standard COBOL is defined as the combination of the lowest level of each module. Because five of the eight modules are empty at their lowest level, the minimum becomes the lowest levels of Nucleus, Table Handling and Sequential Access.

The Standard itself comes in two parts: the document and a set of Audit Routines. The document, ANSI X3.23-1968, contains chapters describing the elements of each of the 17 divisions of the Standard and an appendix describing asynchronous processing. The descriptive text is taken from COBOL—*Edition 1965*, modified to fit the organization of the Standard and language changes made during the standardizing process. The Audit Routines, not yet available, will enable their user to test any COBOL compiler for conformity to the Standard.

It is interesting to note that American Standards are not enforced by any official body. Standards are adopted and adhered to voluntarily by those whom they affect; the only enforcement is that of economic and moral suasion (which is not insignificant when the federal government is involved, as it is with COBOL).

Impact of the standard

The organization by the Standard of COBOL into 17 groups of elements provides COBOL users with a "macro" language for discussing COBOL. When anyone mentions "Low Sequential Access," those who are familiar with the Standard generate a mental picture of the set of elements in that group.

This aspect of the Standard is itself quite worthwhile when one considers the prestandardization hodge-podge of elements, but the Standard does much more. It permits the user to make a far more accurate prediction of what language elements will be implemented in future compilers than he previously could. He knows that no future compiler will be "nonstandard" because of the aforementioned governmental interest, and, therefore, that all compilers will contain at least the components of minimum Standard COBOL. He knows, furthermore, that an implementor will always enhance this minimum compiler in steps corresponding to standard structure. For example, if an implementor provides a report writer facility, he will provide at least all of the elements in low Report Writer.

Unfortunately, the accuracy of the user's prediction is diminished somewhat by the fact that there are 2,916 combinations of modules available to the implementor between the minimum and maximum standard. This number will probably be decreased to three by the adoption of the proposed federal government Standard that defines three levels of COBOL as follows:

Level 1: Minimum Standard COBOL, plus low Random Access and Low Segmentation.

Level 2: High Nucleus, mid-Table Handling, high Sequential, high Random Access, low Sort and low Segmentation.

Level 3: Maximum Standard COBOL

Thus, the COBOL user can be fairly certain that future compilers will come in three sizes that have as a minimum, or "floor," the three government levels.

The Standard also holds the promise of standard results. This means that a particular source program should be compiled by two or more COBOL compilers such that the resulting object programs produce identical external results. While this feat has been possible for some time, its performance has so far required a very careful selection of both dialect and computers. The difficulties involved in obtaining standard results arise from both differences in hardware and differences in how implementors have interpreted the COBOL specifications. The former difficulties are likely to remain unresolved at the COBOL level and are the smaller of the two classes. The latter class will be resolved by the future use of the as yet unissued Standard Audit Routines. These routines provide a set of standard results for a large set of COBOL statements and are written so that they can be compiled and run on all anticipated COBOL systems.[1]

NUCLEUS	TABLE HANDLING	SEQUENTIAL ACCESS	RANDOM ACCESS	SORT	REPORT WRITER	SEGMENTATION	LIBRARY
High	High	High	High	High	High	High	High
	Mid		Low	Low	Low	Low	Low
Low	Low	Low	Null	Null	Null	Null	Null

Table 1.

The benefits that accrue to the COBOL user who adheres to a standard dialect of COBOL stem from the broadening of his choice of future computers, compilers and training media. It is clear from the current reaction of COBOL implementors that all future COBOL compilers will have standard "floors." Thus, the user who adopts a standard dialect will be able to transfer his COBOL programs to a new compiler with little trauma, regardless of whether the compiler runs on his present computer or on a new model. This increase in flexibility will serve the user well since one can expect that unbundling will result in the availability of competitive COBOL compilers for the more popular computers of the next generation.

Furthermore, the standardized COBOL user has a wide choice of training methods. Unbundling has forced many COBOL users to evaluate alternative COBOL training methods. Most "off-the-shelf" COBOL training packages teach Standard COBOL and one can safely assume that all those developed in the future will also, leaving the nonstandard user with the choice of paying consulting rates to have his nonstandard features taught or augmenting the Standard classes with in-house training.

Conversion

The advent of Standard compilers means that the COBOL user will have to face some kind of conversion, at least of his programmers and, perhaps, of his programs as well. The latter is true for System/360 users unless they want to risk using an unsupported compiler after October 1971, when IBM withdraws official support of their old compilers.

(Continued on page 34)

1. See Hicks, H., "The Air Force COBOL Compiler Validation System, DATAMATION, August 1969, p. 73.

The difficulty of this conversion will depend on: (1) how far from Standard the user's previous COBOL compiler was, (2) how many non-Standard features he used, and (3) how close to Standard he wants to be after conversion. This article uses the conversion effort awaiting System/360 users as an example and assumes that the user wants to adopt a dialect that is as Standard as is possible, commensurate with his other programming objectives. In other words it is assumed that the COBOL user will make a trade-off study in which he weighs the present and future costs of standardizing against the future cost of conversion if he remains nonstandard.

In order to assist COBOL users in making the transition to ANSI COBOL, a three-phase conversion plan is suggested. The phases are:

1. Convert the programming staff to use ANSI COBOL.
2. Convert existing COBOL programs as required.
3. Select newly available features of ANSI COBOL for addition to the dialect established in phase 1.

Although some users will not have to perform all three activities, all will have to perform at least the first.

Converting the staff

The first step in converting the programming staff is the selection of a subset from the implementor's new Standard COBOL. This subset does not represent the final choice of what dialect the installation will use but, rather, is the transitional dialect and will be enhanced in phase 3. However, the subset selection process should reflect the organization's decision on the extent to which it wishes to adhere to Standard COBOL.

The subset is based on the COBOL dialect currently used. The idea in subsetting is to identify a new dialect that has as nearly as possible a one-to-one relationship to the currently used language. Thus, features available in the current compiler but not used, either through edict or chance, should not be included in the subset.

Perhaps the most important decisions that are made during both subset selection and, later, subset extension involve the choice of whether to include implementor extensions. Extensions are rules, clauses, elements and features that are implemented in a particular COBOL compiler but are not found in ANSI COBOL. (Because of IBM's unique way of identifying extensions in their COBOL manuals, these elements may soon be known as "grey areas.") All compilers have extensions and the reasons for their appearance in any given compiler are as varied as the extensions themselves. The problem with including an extension in your own COBOL dialect is that it may not be implemented in any other COBOL compiler, present or future. Generally, the more extensions one uses, the less transferable are his programs. However, the validity of this rule depends on the background of the particular extension. While a user could avoid using extensions altogether, he can profit by examining those available to him and using those whose background indicates that they will not impede transferability.

Six categories of extensions and the degree to which the use of each category will affect program transferability will be discussed. Although the examples used come from IBM's OS/360 ANSI COBOL, these categories can be found in most, if not all, COBOL compilers.

Two categories can be disposed of immediately, since they will not affect transferability. The first of these consists of extensions that do not appear in the production version of the program; the primary example being Debugging Statements (EXHIBIT, TRACE, ON). Because these statements are removed from source programs after debugging has been completed, they need never be converted. The second innocous group consists of elements that do not affect run time results. Examples of this group are the Sort Registers (SORT-RETURN, etc.), and the source listing format control statements EJECT and SKIP. When converting, statements in this group can simply be eliminated together with any supporting statements.

The third category includes extensions that are valid CODASYL COBOL elements that have not yet been reviewed for standardization.[2] This class exists because of the delay between approval of an element by the CODASYL Programming Language Committee and the consideration of the element for inclusion in ANSI COBOL. The primary examples are the asterisk in column 7 to indicate comments and most of the elements of the subprogram linkage feature (CALL . . . USING, etc.). The use of elements in this category involves some risk since the element may: (1) be modified during the standardization process, (2) be assigned to the highest level of its functional category and thus be less likely of universal implementation or (3) be rejected as a candidate for the standard. The degree of risk associated with any given member of this class is difficult to estimate, but, in general, the older and more widely implemented CODASYL elements are less risky to use.

Extension intentions

The fourth category contains extensions that are particularly difficult to avoid since their intent is to aid the user in converting to the new compiler. These extensions arise because the way in which certain features were implemented in present compilers conflicts with the way they must be implemented in the new Standard compilers. The conflict is ameliorated by providing an extension which embodies the old, nonstandard function defined by new nonstandard syntax. For example, the old IBM System/360 compilers automatically align binary items contrary to the Standard. The new ANSI compilers permit the SYNCHRONIZED clause to be written at the record-name level (an extension to the Standard) to achieve the same result with minimum conversion effort. Similarly, the previous nonstandard implementation of the AFTER ADVANCING feature of WRITE is now available in an extension, WRITE . . . AFTER POSITIONING. Because of their origin, these extensions are most likely to appear in no other compilers, present or future. Thus, they should be avoided, since using them merely postpones (and perhaps intensifies) the agony of conversion.

The fifth category of extensions covers features whose rules have been liberalized. For example, os

2. For a discussion of the roles of CODASYL and ANSI in COBOL development and standardization, see Edelman, Howard, "A Short Guide to the Wonderful World of COBOL," DATAMATION, December 1969, pp. 161-164.

ANSI COBOL permits the programmer to use the DEPENDING option of the OCCURS clause at all three levels of a three dimensional table and to ignore certain restrictions on the ALTER and PERFORM verbs under Segmentation. While such extensions provide somewhat more power to the current implementation, they will probably not be found in the same form, or at all, in other compilers. Thus, they should be avoided when they can be identified. (Identification is no problem for IBM's users because of the grey boxes, but other implementors are often not as careful to identify liberalized rules.)

The last category contains those extensions that are implemented solely to take advantage of hardware or operating system features that are not accessible through Standard COBOL or to provide an extra-COBOL feature for special classes of users. This category includes COMPUTATIONAL-1, 2 (floating-point) and COMPUTATIONAL-3 (packed) definitions, the Sterling Currency feature and the Indexed and Relative direct access methods.

These extensions provide the most difficult decisions because their avoidance often means using the hardware at considerably reduced efficiency or expending a great deal of extra programming effort. Thus, each such extension must be analyzed in terms of the trade off between present use and future transferability. Those whose present value demands their use will simply add another factor to a future conversion.

Once the subset has been determined the next step is the development and teaching of a "differences" class. The objective of this course is the conversion of the programming staff to the use of the new dialect and compiler, rather than instruction in program conversion, which will come later.

Differences between the currently used COBOL dialect and the new one can be identified from a variety of sources. The most obvious is, of course, an element by element, feature by feature comparison of the dialects. This kind of effort will identify syntactical differences—old forms deleted and new forms added—but it will not uncover those elements whose syntax is unchanged but whose function is different in the new compiler. The implementor may be of help in this area, since he may provide a "Language Differences" manual or documentation for a dialect conversion program—or both, as IBM does.[3] Failing this, a Standard Audit Routine can be run against both the old and new compilers and the results compared to identify those elements that function differently.

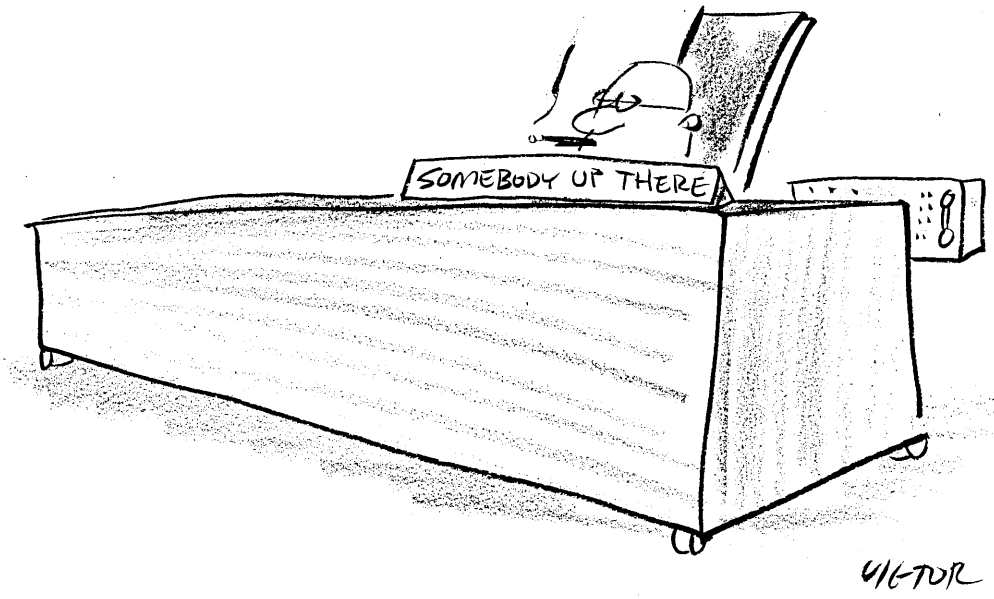
A last source of differences is a "Language Differences" course offered either by the implementor or by a software house. Use of this source trades the cost of discovering the differences and preparing the course for the fixed cost of the training service. Often, the "outside" training course is accompanied by a differences manual which can be a useful adjunct to the implementor's new COBOL reference manual.

Converting the programs

Replacement of each current, nonstandard compiler with a new Standard compiler will probably be accompanied by a cut-off date after which support will be withdrawn from the current compiler. Withdrawal of support means that no maintenance will be performed on the compiler, nor will it be delivered with subsequent versions of the operating system. IBM has announced withdrawal of the current compilers in October 1971, and Univac has announced that the current 1108 compilers will lose support 18 months after their Standard COBOL compiler is released.

Because of the problems involved in maintaining old programs and writing new programs in two different but very similar dialects of COBOL, most organizations will probably decide to convert those of their existing COBOL programs that will outlive the current compiler. This being so, it would seem prudent to convert to the same subset that has been

3. IBM System/360 COBOL Differences, USA Standard COBOL Conversion, C28-6395
IBM System/360 Conversion Aids: COBOL-TO-USA Standard COBOL LANGUAGE Conversion Program, C28-6400



© DATAMATION®

defined for writing new programs for the Standard compiler, but this may not be so easy.

IBM provides a pair of dialect translators, or "Language Conversion Programs," to assist users in converting DOS and OS COBOL to ANSI COBOL. Univac has announced the future availability of a similar program and we suspect that other implementors will do the same when they release Standard compilers. However, if IBM's LCP's are an indication, the use of these programs will result in the converted programs containing a number of extensions—those that were discussed above under category four. If a user has wisely omitted these extensions from his programming subset, their appearance in converted programs will create the dual language problem he was trying to avoid through conversion. Therefore, he must choose between using the "free" conversion program followed by some kind of secondary translation to remove unwanted extensions, and developing or "purchasing" a dialect translator that converts directly to his subset.

New features

The last step in the conversion plan is the most pleasant—selecting one or more of the new ANSI features for addition to the user's subset. The arrival of an ANSI compiler will make available several COBOL features not previously implemented. Because these features are located outside the boundaries of "minimum Standard COBOL" they may not be implemented in all future compilers but because of the present trend toward "maximum Standard COBOL" on the part of the compilers developed by computer manufacturers they will undoubtedly be available on at least one compiler for each computer.

1. *Table handling.* Table handling facilities have been a part of COBOL since its inception, in the form of the OCCURS clause and subscripting. To these have been added an alternative to subscripting called "indexing" and the ability to specify a table look-up via the SEARCH statement. Indexing has the potential to be much more efficient than subscripting; however, this potential can be realized only through careful implementation. This feature enables the programmer to specify a one-to-one relationship between a particular dimension of a table and an "index" that is implementor defined. This index is initialized, incremented or decremented by the SET verb, permitting the COBOL compiler to generate efficient address modification code at the point in the program at which the index is altered rather than when a subscripted expression is encountered in a procedure statement.

The SEARCH statement, together with the KEY option of the OCCURS clause, permits the programmer to search a table in serial or binary fashion. Because the actual procedure to be used in the search is left to the implementor, any hardware feature useful to table look-up can be accessed by this statement.

2. *Sort feature.* This feature permits the programmer to invoke the utility sort program from his COBOL program. If necessary, he can write procedures in COBOL to be executed on each input record prior to its release to the sort and on each output record after its return to the program by the sort.

Aside from saving programmers the trouble of learning how to fill out Sort Control cards, this feature can save I/O time, since records can be released to and/or returned from the Sort one at a time without having to store them on a work file between COBOL program and Sort.

3. *Report writer.* This feature provides a report program generator feature accessible through COBOL. Report Writer enables the programmer to define the physical layout of a report in terms of the types of lines desired (headings, total lines, etc.), and the positioning and source of the data items on each line. From this information, the compiler generates a routine to produce the report defined. This routine is accessed in the Procedure Division by three statements: one to INITIATE the routine, one that is used to GENERATE each line and one to TERMINATE report processing.

Because the routine generated by Report Writer automatically handles such things as page overflow, testing for control breaks, production of total lines and updating total counters, the programmer is spared the task of developing, coding and debugging these routines. The resulting source program is also extremely easy to modify when the report formats are changed, as they so often are.

4. *Segmentation.* The segmentation feature permits the programmer to specify an after-the-fact overlay structure for the Procedure Division of his program. A priority-number associated with each Procedure Division section is used by the compiler to allocate sections among permanent storage, overlayable (roll in, roll out) segments and overlaying (roll-in) segments. Although Segmentation can be used in an emergency to reduce the embarrassment of creating a program too large for its environment, it is better used when the overlay structure is planned prior to the onset of coding.

Summary

The arrival of the ANSI COBOL compilers will require many COBOL users to convert their existing programs. While this conversion might be viewed as a distasteful event, it can be an opportunity to adopt a standard COBOL dialect as the organization's programming language. The adoption of a standard dialect will facilitate current and future programmer training and will make available to the organization a richer choice of future computers and compilers. ■

Mr. Hicks is director of consulting services for Information Management, Inc., and is a member of the American National Standards Institute working group for COBOL standardization. Before joining IMI, he was with Computer Usage Co. and Boeing. He has BS and MA degrees from the Univ. of California at Berkeley.

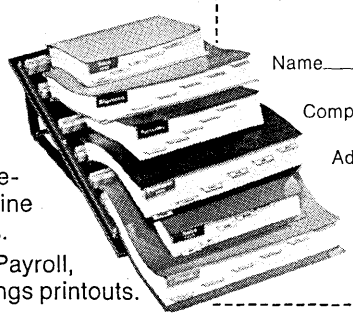
Busy busy, busy EDP Reference Stations are served best by Wilson Jones "Data-Refs"

Wherever people must locate data in bound printouts... wherever high volume reference is the rule and fast retrieval is demanded... Wilson Jones newest Data Processing accessory meets all the requirements with unmatched efficiency and convenience.

Wherever executives... or a department's staff... must have specific, individual facts at their fingertips to make sound judgments, take the proper action, inform others, contribute to decisions, or serve a customer with dispatch, "Data-Refs" outperform any other filing method.

"Data-Refs" are designed to hold six or more Nylon Post Binders—loaded with up to 5,000 "tab" sheets. They are as portable as a typewriter—and, like typewriters—you can put them wherever you need them. On counters, files, desk tops... wherever the demands of your particular operation determine the biggest time-and-step saving locations.

Use them for current Inventory, Production, Payroll, Payables, Receivables, Sales, Credit Standings printouts.



Look into Wilson Jones "Data-Ref" today. Your office products or "tab" supply dealer will give you the facts about it. Or mail the coupon. (Stock No. 19-14B)

WILSON JONES
6150 Touhy Avenue
Chicago, Illinois 60648

RECORD KEEPING WJ ESSENTIALS

Please send me further information about *Data Ref.*

Name_____ Title_____

Company_____

Address_____

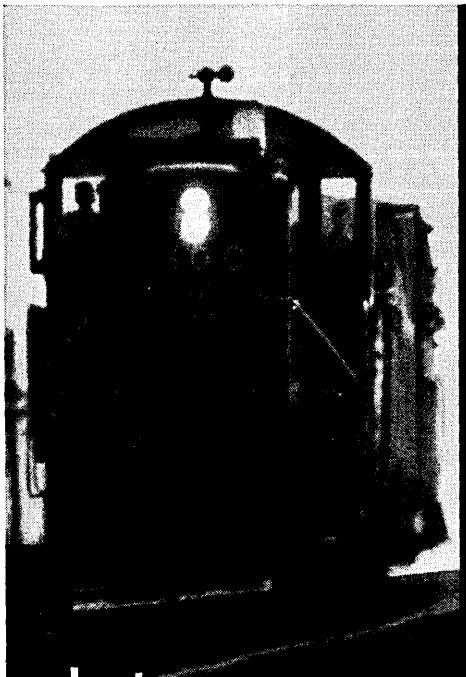
City_____ State_____

ZIP_____

D-11

WILSON JONES

Inventor of the Nylon Post Binder | A Division of Swingline® Inc.



data bits from Teletype

8 million pounds of food moved daily!

When you handle 14,000 food-filled freight cars annually, deal with more than 160 truck carriers to service the daily needs of over 500 retail chain and independent outlets, the need to know takes on staggering proportions.

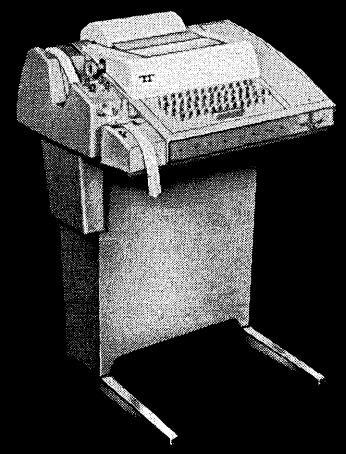
The warehouse that copes with this logistical problem has linked its customers with a computer using Teletype® terminals. Shipping data from processors and food packers is fed into the computer on a daily basis. Retail buyers use Teletype equipment to obtain up-to-the-minute inventory status reports, to place orders and receive concise shipping data. This enables the warehouse to keep track of, and move some 8 million pounds of food every day. Fast, accurate data communications has also helped cut processor billing time down from over a week to twenty-four hours.

time-sharing money saver

There are probably more Teletype 33 sets being used in time-sharing applications than any other data terminal. Because, on a price/performance basis, it is one of the most reliable and economical terminals available.

The model 33 has everything required for preparing programs, getting them into the computer and retrieving information. It communicates in ASCII and operates at 100 words per minute. Its design simplicity makes computer dialog easier for the operator. But, what's really nice, is the price: It's amazingly low for all of its capabilities.

The model 33 line includes options and accessories needed for a variety of time-sharing needs. If you would like to know more about this low-priced terminal line, write for the model 33 brochure.



nine year old squeezes a year into 38 days

A young boy became so fascinated with a Teletype 33 terminal that he completed a whole year's arithmetic program in 38 days. His school is involved in a computer assisted educational program using a remote university computer. The simplicity of the terminal enables the youngest of students to master its operation in a short period of time.

Some subjects included in the program are reading, science and arithmetic. Students receive individual drill and instruction geared to their own level of comprehension. The slower student gets much needed practice at a level which he can achieve. The average student reinforces his grasp of the subject with drill and practice at the terminal. The bright are offered programs that challenge and are limited only by their own abilities. Computer assisted education also enables teachers to find more time for individual student needs.

erasing errors on-line

Teletype has an interesting solid-state device called the Stuntronic™ parity error detector which helps locate and eliminate parity errors. It can be used with Teletype 33, 35, 37, Telespeed™ and Inktronic® terminals.

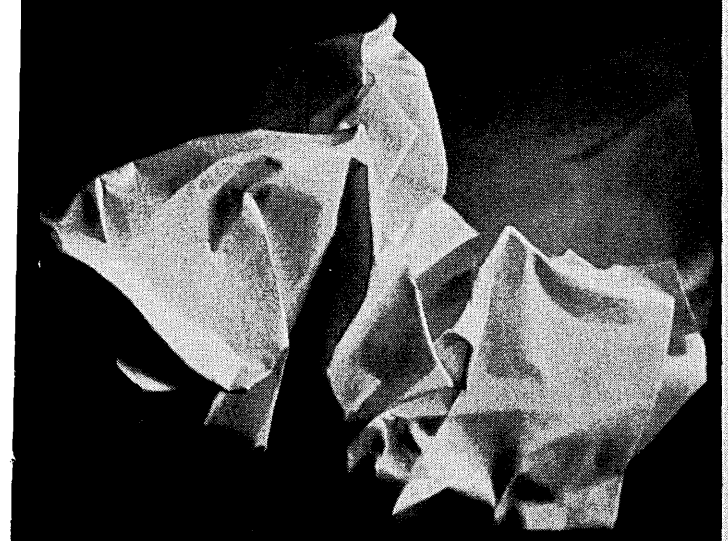
This accessory will accept a signal with up to 45% distortion and regenerate the signal with less than 5% distortion before passing it on to the terminal. Minimizing erroneous print-outs due to distorted signals.

It will also locate individual vertical parity errors and alert the station operator so that corrective action can be taken.

```
HERE IS AN EASY WAY TO SPOT AND      432*
CORREC* ERRORS RECEIVED IN TEXT      5678
OR NUMBER TRANSMI*SION.              90*2
```

With the Stuntronic detector, a preprogrammed substitute character can be used to graphically indicate exactly where an error is on the terminal print-out.

Stuntronic accessories can also count errors, light a signal lamp and generate a line break, notifying the sender of any errors.



recommended reading

Teletype has a number of bulletins on equipment, applications, and case history data. A short description of what is available is contained in: *"How to get answers to your questions about Teletype equipment." Write for your copy.*

Teletype data communication equipment is available in send-receive capabilities of up to 2400 words per minute. Included are hard-copy, magnetic-tape and paper-tape terminals, error control devices, options and accessory equipment to fit most data communication system requirements. For information, write:

TELETYPE CORPORATION
Dept. 81-12, 5555 Touhy Ave., Skokie, Ill. 60076
machines that make data move
Teletype is a trademark registered in the U.S. Pat. Office

Train 'em in house

the way 500 leading companies do-with VAI

Grow your own EDP specialists! Train anyone, anywhere, any time with *VA I Video Assisted Instruction* — "flight-tested" by major airlines and proved most effective by America's largest corporations. Get unlimited use of top instructors on videotape. Learner-controlled pace lets students work at their own rate and learn faster at less cost.

Courses ready now: Computing System Fundamentals • Introduction to S/360 • Computer Concepts for Management • Fundamentals of Programming • COBOL • RPG • ALC • FORTRAN IV • Advanced FORTRAN IV • Systems Analyst Training Program • Tele-processing Systems Concepts • Computer Operator Training — I/O Devices • DOS-Systems Operator Training • Introduction to OS • OS-JCL • Introduction to Operations Research • Simulation • Linear Programming I (for managers & analysts) • Introduction to Accounting • Introduction to Mathematics. 17 new courses coming soon. Write for complete information.

ADVANCED SYSTEMS INCORPORATED

CORPORATE SALES OFFICES:
9575 W. Higgins Road, Rosemont, Ill. 60018
312 / 696-2888

CHICAGO, LOS ANGELES, WASHINGTON, D.C., BOSTON, DALLAS, DETROIT, NEW YORK, SAN FRANCISCO. Opening soon in Atlanta.

Free—
on a cut-and-carry basis—
the computer industry's artifacts

Fading Species

by R. A. McLaughlin, Associate Editor

In August a Los Angeles insurance firm, Pacific Mutual Life Insurance Co., gave away two fully-operational Univac II computers, 24 tape drives, and some peripherals. The reason that the giveaway was significant is that the pair were among the last five Univac II's still in operation, and they were destined for the scrap heap.

Considered reliable, although 15 years old, the II's had been used continuously for general purpose accounting programs and could have continued indefinitely. Still no one came to ask for them except the scrap metal dealers.

Pacific Mutual had been seeking someone to take the machines off its corporate hands since March with no success. One of the reasons for the reluctance of those contacted was that the equipment, located on the fourth floor of Pacific's building, weighed well over 60 tons. That seemed deterrent enough for almost anyone.

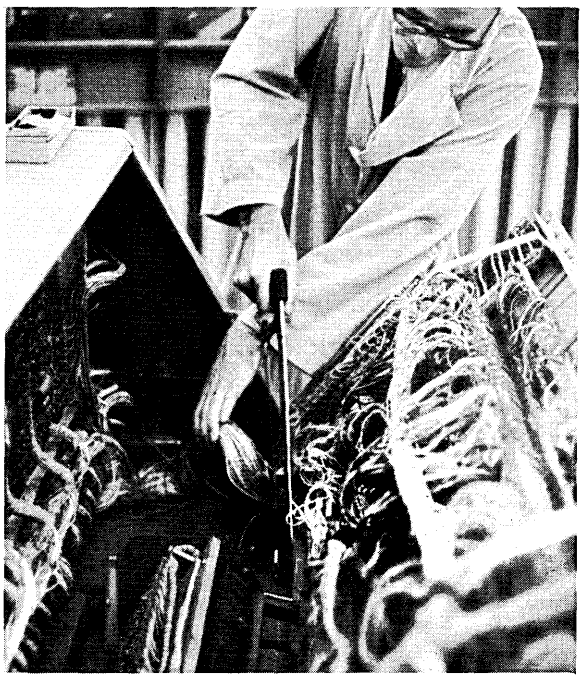
Built in 1958 to replace the six-year-old Univac I, the II's had about 4,000 tubes each, 24,000-character core memories, and a 9-foot-high by 10-foot-wide by 14-foot-long walk-in central processor. They occupied 1,200 feet of floor space each, performed "thousands" of operations per second, and were advertised in 1957 as the only machines that could read, write, and compute simultaneously without extra equipment.

Unlike the Univac I's before them, the II's did not have wood front tape drives, but they did use the same ½-inch metal foil magnetic tapes. The line printers included in the giveaway package were the same as those used on the first 1951 Univac I—good for a then-incredible 600 lpm on alphanumerics when stock, but capable of a true 800 lpm when pushed a little.

Priced at over $1¼ million each originally, the Univac II's are an example of over 100% depreciation. Pacific Mutual had to throw in 4,000 of the metal foil tape reels to get the salvagers, P&T Metals of South El Monte, Calif., to haul the rest of the gear away.

"It took about 10 days for a crew of 15 to cut them up into pieces small enough to fit in the freight elevator," says Paul Sackin, who, along with Ted Rexius, owns and operates P & T Metals. "The hardest part of the operation was the removal of the built-on chilled water cooling system—which weighed over 10 tons when empty—but had to be pumped dry first." It seems that Univac, in learning to build its first machines, had forgotten to solicit the aid of a good plumber. As a result there were no convenient shut-off valves. Plumbing had been a problem in the past too, as one of Pacific's treasurers will attest. He had the office below and, upon occasion, was liberally doused when the plumbing failed.

The treasurer may have been happy to see the machine go, but not all others shared his delight. Certainly some felt that a piece of history was passing



Only four Univac II's still live. They can all be considered to be on Death Row now, and Univac has shown no interest in preserving any of them.

in review, for souvenir hunters swarmed over the machines as they were being hacked apart. First to go were the control panels—one to the president and one to the vice president—then the Univac II emblems.

Of the rest, Ted Rexius said, "There are still a lot of valuable pieces, from a scrap metal viewpoint, in the machines. The trouble is getting it out. There's lots of gold and silver, but it's so thin that it takes too much in labor to get it." So the machines, or the 20 tons or so still left after the tin and other base metals were carted off, still sit in the P&T Metals yard—gold and silver and all—waiting till someone figures the best way to separate the good stuff from the rest. Stacked alongside other junk—boxes of springs, crushed aluminum beer cans, pots and pans—the Univac II's have none of their past glamor and are not even thought valuable enough to put indoors or under wraps.

"When they first put them in," John Thom, Pacific's superintendent of communications services, says, "they had a hole cut in the wall to put the pieces through." Like the Univac I's before them, the II's were actually constructed at the customer site and had to be dismantled and rebuilt if moved. This has been done before, at great expense, but first generation tube equipment is no longer considered valuable enough to warrant the expenditure, so they left in a less dignified manner.

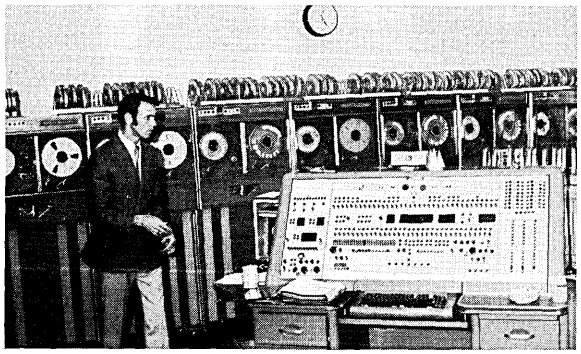
Unexpectedly, however, there was an immediate taker for some of the Univac II's components, which were needed as spare parts for a still-operational Univac II owned by a service bureau in nearby Gardena. Tom Pryor, president of Computer Data Corp., a firm that specializes in services for accountants, has one of the few living Univac II's and has been the recipient of other "remains" in the past. He has the pieces, for instance, of the world's very first computer to be used in a commercial application, a Univac I which was given up by General Electric's installation in Louisville, when it switched over to all-GE computers about four years ago.

Pryor, wary about being called outdated, has a warm spot in his heart for his machine. "We have less down time than we would with a 360," he says, "less than 5%. But our electric bill is pretty high—about $1,000 per month."

The Univac I and Univac II had a walk-in mainframe, and the story is circulated about a mouse that made its home in one, defying all extermination efforts and finally becoming the computer operators' pet. (That's not the mouse we mean in the photo.)

Pryor got his machine second-hand from Pacific Finance in Los Angeles in 1966, and the story that he tells about moving it proves that many people other than himself feel protective about the old tube computers. He tells of how he was allowed to have a wall cut out of the building in which his machine used to reside so that it could be moved to its new site in one piece—an operation never before or since attempted

—and that the owner of the building that was to be cut up was not even the man who was selling the machine, just someone interested in keeping the big beast alive. Somehow his Univac II, serial 26 of 27 Univac claims to have built, survived the moving and



The Univac II, shown here at Computer Data Corp. in Gardena, has 2,000 12-character words of core and reportedly is still more reliable, though admittedly slower, than an IBM 360. This one has logged 558,571 hours.

worked when powered up. The powering up, of course, was not that simple either as a suitable building had to be located (one with a door big enough to take the whole machine at once) and an $80,000 cooling system had to be installed. In all, Pryor figures, the computer cost him $250,000.

Old-world craftsmen

"I don't know how they ever built a second one," Pryor remarked. "You can go inside and you find little hand-carved pieces of wood put in to hold things straight."

"You know," he adds, "at Pacific Mutual no one wanted to turn off their machines. People kept asking each other 'Are you sure you want to do it?' Finally they let the electrician do it."

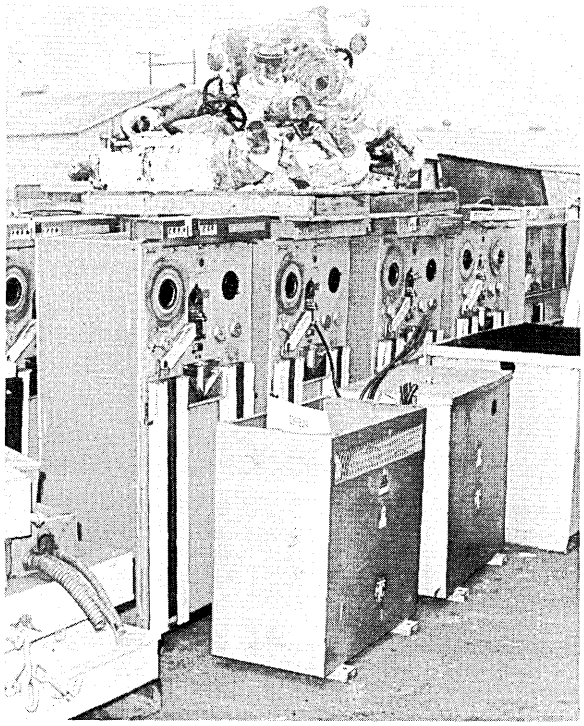
Pryor had said previously that the machine becomes a person after awhile, but near-human or not the Univac II has become an endangered species. Only three more that we know of still exist. Two are at Franklin Life Insurance Co. in Springfield, Ill., one at New York Telephone in New York. They keep going, their owners say, under almost any conditions. Dick Means, Computer Data's production manager, says, "You always know what's happening. It's a complicated machine to learn, worse still to maintain, but once you know it, it's beautiful. The circuitry is about 50% to 75% redundant; the dual arithmetic processors are 100% redundant."

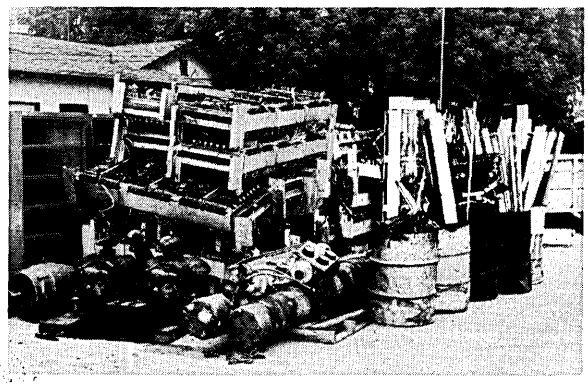
So there are four remaining Univac II's and it does not appear that Univac or any other institution will attempt to save one when they are finally all turned off. In fact, Univac has made no attempt to save even a Univac I for itself. There are portions of Univac I Serial Number 1 now in the Smithsonian, but the last chance to save a complete system—with its 5,000 tubes and mercury tank memory—has just been lost. The last model of the 46 Univac I's built was owned by Life and Casualty Insurance Co. in Nashville. The machine was turned off in late August and all efforts to save it failed.

"It was the most overdesigned piece of equipment ever built," Life and Casualty's manager of operations, Paul Lawson, says. "We can attest to that. When we were remodeling our building, there were jackhammers going outside, the room temperature was 92° and the air conditioning to the machine was off. There was water on the floor and so much dust on the blueprints that it had to be blown off before you could read them. The machine kept running through the whole thing. It was unbelievable."

"Another time," he continues, "I got a call one night that there was water running through the machine from holes in the roof. We turned the power off, and the machine ran again two hours after we powered it back up."

Lawson's machine was priced at $1,259,000 when it came out. He paid $10,000 for it in 1963, then installed it at a cost of $75,000. Now that Life and Casualty is done with it, it has been given away—just like Pacific Mutual's Univac II's. Even unique computer artifacts don't bring much on the scrap metal market. ■





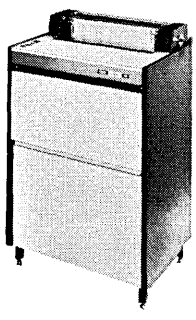
P&T Metals in South El Monte may prove to be the final resting place for the remaining first generation Univac's.

ACCOUNT NAME	N&A CODE	DISTRIBUTOR LOCATION	SLS DIS	DIST CODE
IRS	G11- 02	PARKERSBURG W VA	02	4607
IRS	G11- 02	DENVER COLO	03	502
BU	G11- 02	HOUSTON TEXAS	03	4131

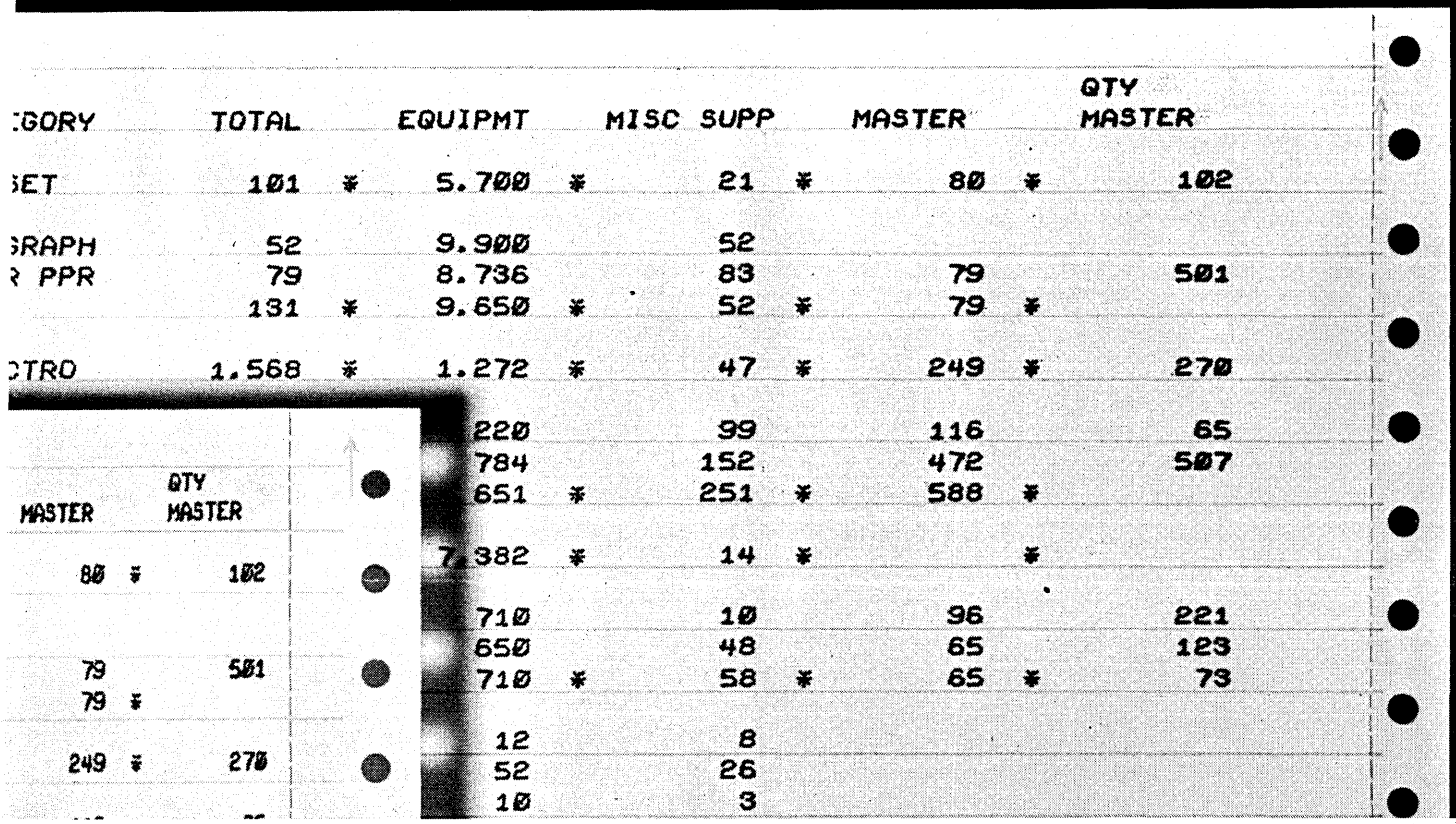
ACCOUNT NAME	N&A CODE	DISTRIBUTOR LOCATION	SLS DIS	DIST CODE	CATEGORY	TOTAL	EQUIPMT	MISC SU
IRS	G11- 02	PARKERSBURG W VA	02	4607	SET	101	5.700	2
IRS	G11- 02	DENVER COLO	03	502	GRAPH	52	9.900	5
					R PPR	79	8.736	8
						131	9.650	5
BU	G11- 02	HOUSTON TEXAS	03	4131	CTRD	1.568	1.272	4

What's it take to print 136

A simple 5-minute adjustment.



CIRCLE 74 ON READER CARD



:GORY	TOTAL	EQUIPMT	MISC SUPP	MASTER	QTY MASTER
;ET	101 *	5.700 *	21 *	80 *	102
;RAPH	52	9.900	52		
? PPR	79	8.736	83	79	501
	131 *	9.650 *	52 *	79 *	
:TRO	1.568 *	1.272 *	47 *	249 *	270
		220	99	116	65
		784	152	472	507
		651 *	251 *	588 *	
		7.382 *	14 *	*	
		710	10	96	221
		650	48	65	123
		710 *	58 *	65 *	73
		12	8		
		52	26		
		10	3		

MASTER	QTY MASTER
80 *	102
79	501
79 *	
249 *	270

columns in just 8-1/2 inches?

And that same adjustment can give you up to 211 columns on 14⅞ inch wide forms.

That's because Videojet® prints a completely new way—with an ink jet. So you can adjust the print density to print 136 columns in just 8½ inches. And it doesn't cost any more.

At its speed of up to 300 characters a second, Videojet prints as fast as your telephone line can deliver data. That makes it an ideal remote computer printer as well as an on-line printer for mini-computer applications.

Videojet is plug to plug interchangeable with IBM 2848/2260 terminals. And it prints on standard fan-folded business forms using ordinary untreated paper.

Now that you've seen what Videojet can do in 8½ inches, wouldn't you like to see more? Videojet. Another product to make information more manageable from A. B. Dick Company, 5700 West Touhy Avenue, Chicago, Illinois 60648.

A·B·DICK®

"A.B.Dick" and "Videojet" are registered trademarks of A.B.Dick Company.

THE FIRST TOTAL, FULL PERFORMANCE, ON-LINE COM SYSTEM FOR AN HONEST $49K.

We call it "MOM." She pays her own way.

MOM, our new Micromation On-Line Microfilmer, pays her own way. Just two small printout applications per month make MOM self-supporting. Your savings in postage and paper alone can absorb her monthly rental rate. The rest is pure gravy.

How full is "full performance"? For openers, MOM is a giant step ahead in resolution and micro-imagery. DatagraphiX' CHARACTRON® Shaped Beam recording sees to this. MOM is a total package. That means everything is standard. Like: ☐ our Universal Camera for recording images on 16mm, 35mm, 105mm ☐ both comic and cine mode sequencing ☐ both roll film and microfiche ☐ a built-in controller and forms projector ☐ 25X and 42X reductions ☐ fully software-supported ☐ direct data conversion from any IBM 360 model 25 and up. And so on.

All for an honest $49,000. Or low leasing if you prefer. A great bargain for a great MOM, or the DatagraphiX 4200, MOM's official title.

It's easy to afford the brightest picture of COM. For more information about COM's MOM, please write or call us.

DatagraphiX

Stromberg DatagraphiX, Inc.,
a General Dynamics subsidiary
P. O. Box 2449, San Diego, Calif. 92112
(714) 283-1038 TWX (910) 335-2058

CIRCLE 41 ON READER CARD

PERSPECTIVE

an interpretive review of significant developments

IBM's 370/145 Uncovered; Interesting Curves Revealed

Sometimes we forget for a while, but eventually even the dullest of us are reminded of IBM's marketing genius. With the announcement of the 370/145, IBM has stunned some of its competition; declared and proven itself to be much more technologically innovative than it had been given credit for; underscored some of the missed significances of the earlier, disappointing 370 series announcement; and perhaps obsoleted one of its more popular machines. All of this was done in the low-keyed and conservative form that has recently become its hallmark, with the result that probably not a single customer was really frightened.

True, the 370/155 and 165 did not look technically innovative. We had seen the cache memory concept already prove itself in the 360/85, and the 360/195. In fact we predicted that it would be important in the 70s (Jan., p. 95, "Hardware, Software Trends: 1969"). But although the cache memory and a few peripherals stood out in the first 370 announcement, the series for the seventies seemed drab. We did not attach enough significance to the cpu retry feature that makes for reliability, the error correction circuitry that makes for accuracy, and the cpu identification hardware that makes for proprietary software sales.

A little more of the sheet has now been pulled aside, and behold! We have the world's first fully semiconductor main memory to wonder at, a disc file subsystem that operates without a separate controller (we wondered aloud at why that hadn't shown up), and a floppy little disc that hides in the console and loads the operating system in when you need it. (We thought it clever when we saw it used for formatting the 3330 disc subsystem but weren't clever enough ourselves to appreciate how much else it might be used for.) We had asked for "variable micrologic" or the ability of the user to define his own instructions; we still don't have it, but we're closer, and some smart systems guy could probably beat the 145 Operating System and get his own macros in.

In addition to these features, the 145 offers four new cpu status registers, "internal operating speeds up to 5 times the Model 40's and up to 11 times the Model 30's," and a maximum data transfer rate of up to five megabytes — which makes it more than six times as fast on I/O as the mod 40. Add to these the option of any of the high-speed peripherals in IBM's stable and a price tag not much over that of the 40. It makes for a real winning package.

The 370/145 also makes big trouble for some of the competition. Control Data's corporate body must have groaned with the announcement of an all-monolithic i.c. main memory — they probably wanted to be the first with that in their Star-like series.

RCA gambled and lost

But CDC might be in really good shape compared to RCA. Remember how RCA made a business for half a decade of building a technically superior IBM 360 called a Spectra? Then, right after the 370 series announcement they reintroduced the Spectra (Oct. 15, p. 66) because they were lulled into thinking IBM was just reintroducing the 360? Now look at the shape they are in. For the next half decade they're going to be selling a 360 against a 370.

RCA gambled against the 370 with what they felt would be somewhat better price/performance augmented by virtual memory and larger core. But while RCA thought that its Model 6 at $1,380,000 would be competing with IBM's $1,801,000 Model 155, the chances are that it won't match the performance of the $1,110,000 Model 145. Surprise! That makes the gamble that much rougher. And RCA has the additional confidence-destroying realization that if virtual memory proves out a winner, IBM can build a stunt box to make it work on a 370 just as they did to make it work on a 360. RCA cannot be faulted for thinking that IBM would not sacrifice the 360/50 and then pricing and designing its models accordingly. Now that firm will have the discomfort of seeing what the 370/135 does to the 2 and 3 also.

Of course there is also the question of how the new 370 will impact IBM's own product line. There are well over 500 360/50s out drawing revenue for the company that are also endangered by the 145; for if the 145 is five times as fast as a 360/40, then by IBM's previously released estimates it is twice as fast as a 50 (because the 50 is billed as a little over twice as fast as a 40). And the price of a 50 is over that of the 145.

There may have been other reasons for dumping the 50 now, however painful. And here the marketing department probably got its collective hands in again. It is no secret that IBM is attempting to move users from DOS to OS. IBM could be using the 145 as sort of a loss leader to move 360/50 DOS users to OS through emulation . . . and thus ease them into bigger machines.

Marketing wins in other ways, too. The high purchase/lease ratio of the 370 line has already taken the fun out of leasing, and integrating the peripheral controllers — as has been done on the 145 for the 2319 disc memory system — takes some of the profit out of building plug-compatible peripherals.

The 2319 itself is no mystery. It is a 2314 that interacts with a controller substitute called an IFA (integrated file adaptor), which is cheaper than a controller, but is built into the cpu so that the file adaptor cannot be sold by the competition. A three-disc drive 2319 (up to eight drives can be attached) rents for $1K/month. The IFA rents for $550/month, making for a $1550 total and a $1600 savings over a similar 2314.

The total rental of a 145 with all eight spindles in the 2319, the IFA, a 2540 reader/punch, a 1403 printer, four tape drives 2450-5, and a 15cps console printer-keyboard would be $23,330; the purchase price would be $1,110,000. That's with 256KB of main memory. (Each 128K over the 256K runs $2880/month.) Maintenance on that configuration would run $2800/month after the year warranty on cpu and memory ran out.

The 145's memory is logically di-

	360/40	370/145	360/50	370/155
CPU				
cycle time	625 nsec	202.5 - 315 nsec	500 nsec	115 nsec
word size	16 bits	32 bits	32 bits	32/64 bits
arithmetic	fixed (16-bit) floating decimal (16- or 32-bit)	fixed (32-bit) floating decimal (32- or 64-bit)	fixed (32-bit) floating decimal (32- or 64-bit)	fixed (32-bit) floating decimal (32-, 64-, or 128-bit)
registers	16 general purpose	16 gp; 4 cpu status	16 general purpose	16 gp; 4 cpu status
MEMORY				
buffer cycle time	N/A	N/A	N/A	115 nsec
buffer size	N/A	N/A	N/A	8,000 bytes
main memory cycle	2.5 usec (2 bytes)	607.5 nsec store (4 bytes)* 540 nsec access (4 bytes)*	2 usec (4 bytes)	2.1 usec (8 bytes)
main memory size	16 KB - 256 KB	112 KB - 512 KB	64 KB - 512 KB	256 KB - 2 MB
I/O				
number of channels	2	2 - 5	3	3 - 6
aggregate data rate	800 KB/sec.	5 MB/sec.	1 MB/sec.	5.8 MB/sec.
PRICE				
"typical" rent (purchase)	$19,350 ($873,000)	$23,330 ($1,110,000)	$29,100 ($1,370,000)	$37,365 ($1,801,110)
		*8 bytes for instructions		

vided into two parts, the user memory and reloadable control store. The RCS is dedicated to the system micrologic, of course, and it requires 32K or more depending on operating options such as which emulation package is to be included. Should power go down the RCS will lose all its instructions since it is built of semiconductor parts rather than cores. IBM has compensated for this with its little disc cartridge drive, which fits under the console. The "floppy disc" has a cartridge less than eight inches in diameter — something like a 45rpm record — and ships its contents into RCS at 33,300 bps. It takes about 45 seconds to load a 32K file, and the loading is initiated by console buttons and switches.

Unfortunately, no exactly similar facility is included to protect or reload the rest of the main memory, which would lose all its data in a power failure too; the user must rely on checkpointing.

The memory problem is not the only flaw to be found either. Not being "innovative" at the user side means that all the emulators are still there for DOS and OS and 1401s and everything, but it also means that JCL and all the old compilers are there too.

Flawed though the offering might be, producing a competitor will be very difficult. A good competitor could come up with more main storage; IBM is still being stingy with only 512K offered. (But that is the marketing group at work again too; if you want more memory, you must buy a bigger machine.)

The fact remains that whoever brings out a challenger will have to spend plenty to do it and will have to use the new technology. The industry has switched from labor intensive to capital intensive as surely as auto making did with Henry Ford, and the phenomenal investments required make it difficult even to be an also-ran.

— R. A. McLaughlin

Burning Issue at Stake in General Election. So Who Counts?

Computers and the social process will be in evidence once more on Nov. 3 as the nation goes to the polls to stand up and be counted on the candidates and issues. It is hoped that this time everything goes smoothly everywhere; that everyone who stands up gets counted; that the inevitability of computerized elections becomes established; and that controversies that have arisen over computers and their competence to count the vote will be at last laid to rest.

Steps, some giant, some small, are being taken to prevent the repetition of the August and June primary snafus that occurred in Detroit, Mich., and in Los Angeles, Fresno, and Orange County in California (90% of the votes cast in the last general election in California were tabulated by computer). Most of the remedial steps are technical and necessary, but the primary primaries problem was, as usual, people, and just how much can be done to alleviate machine inexperience and procedures unfamiliarity will be indicated by the success or lack of it of the November elections.

Detroit's August primary, which saw the city switch from old lever-type voting machines to a punch-card ballot system, was a series of minor debacles that added up to a major one. Test decks were incorrectly punched, and IBM's 50s dutifully came up with one more vote in each precinct than was cast. A three-hour delay in the counting ensued while technicians valiantly looked for a nonexistent programming error and with the decks decidedly not cleared as the source of trouble. When this was straightened out, people problems entered the scene as voters did such novel things as ripping pages out of the pamphlet attached to the voting machine in which they were supposed to slip the punch card ballot and, having done so, assumed they had voted. And they punched holes indicating a preference for both Democratic and Republican candidates, illegal in Detroit and almost anywhere else in a primary. And they didn't punch holes, merely jabbing at them a little, which

left rather vague impressions of their intentions.

In an effort to set things right for November, Datamedia Computer Service, Inc., a Dallas firm that sold the voting machines on option to Detroit and stands to lose the contract should the election go awry, will implement some educative and review procedures covering both voter and machine. A million brochures explaining the voting procedure (don't just jab, keep punching) will be distributed to the citizenry, backed up by television cartoon instruction spots that should enlighten even the most determinedly unenlightened. A school has been started, staffed by 10-15 teachers, to instruct precinct workers in the proper methods of issuing, collecting, packaging, and transporting ballots. And IBM has been contracted to check out the programming and the test decks.

A spokesman for Datamedia was somewhat perturbed at the adverse publicity given the Detroit troubles (perturbation and publicity both understandable) inasmuch as his company had conducted several previous elections in other cities without mishap, and thus, of course, without publicity. He stated that the public, for some reason, is wary of punch cards and hesitates to take a definite poke at them. There is, after all, something final about punching a hole in something.

Primary woes

In Los Angeles, where the woes of the primary were laid on Ray Lee, the registrar of voters (who will retire at the end of the year), the responsibility for running the general election will rest with the county chief administrative officer, Lindon Hollinger, whose qualifications for overseeing a computer election system are on a par with Lee's. However, outside support and advice have been obtained and hopes are high as breaths are held.

The L.A. June primary hangup was people, again, with supplies that didn't arrive on time, erratic ballot delivery to the counting centers, inefficient operator personnel, the nonmailing of some 20,000 sample ballots, and too many observers observing the wrong things in the wrong places. L.A. uses the IBM Votomatic system (which IBM no longer markets), and some criticism was leveled at the registrar for not using IBM personnel in key positions during the primary election operation. Los Angeles officials still do not intend to use any IBM people in the general election, still confident that county employees can do it themselves. However, IBM has a vested interest in the system, and about 16 customer engineers will be on hand on a standby basis just in case anything goes wrong.

In an effort to further pinpoint the reasons for the errors and delays in the primary, L.A. hired an outside systems analysis firm, Economic Research Associates, Los Angeles, to do an investigation and come up with some recommendations. ERA submitted a first report to the board of supervisors less than a month after the primary and filed a second one at the end of July. Among its recommendations were that full documentation of all election preparation and processing procedures should be made; computer operating systems used in election-night processing should be certified; security requirements for access to the main computer room should be tightened; and a complete audit of the existing vote counting programs should be performed.

Implementing the audit recommendation, the board of supervisors has awarded a $25,730 contract to Isaac Associates, Inc., L.A., to provide pre- and post-election audit of all computer programs involved in the system to insure verification of the results. In addition, according to county data processing director Gordon F. Milliman, "the firm will develop and perform tests containing the widest possible variety of valid and invalid data to assure the programs will handle any conceivable problem that may develop during the actual vote counting process."

Too bad it's always the inconceivable problem that crops up. As registrar Lee stated after the primary, "To me, what happened was unbelievable."

Another spokesman for the county stated that "a tremendous amount of testing" is going on, that operator training has been increased, with much more emphasis on "hands on" experience, and that the county would be taking full responsibility for personnel in non technical areas. "Last time, no one was sure just who was supposed to carry tapes from one place to another and we stood around and waited."

So did we all.

Usually unreliable Fresno, which has had its troubles in primaries before (July '68, p. 93), had them again this year (July 15, p. 123) when it couldn't execute a program with 2,400 possible voting combinations and the vote count was delayed for days. The anguish ranged all the way from a dp supervisor taking a voluntary 15% pay cut to a statement by a Fresno member of the board of supervisors that "So what? So we have a little delay."

Fresno has turned now to Boole and Babbage, Inc., Palo Alto, for help in finding out just how to make the thing work. B&B, a software and systems design firm with previous experience as advisors to the State Assembly subcommittee on election procedures, won a competitive bid for the job. It specializes in performance measurement. And Fresno's is one to measure. B&B has made a study of the entire operation (which uses a Honeywell 1200) "to determine that both manual procedures and data processing systems are sufficient to warrant public confidence and also comply with election laws." Let's hope the two aren't mutually exclusive.

Orange County, a large, primarily residential area south of Los Angeles, didn't have any trouble with punch cards because it didn't use them. It uses the Coleman vote counting system, which employs a paper ballot that the voter stamps with a magnetic ink that is then optically scanned during the counting. But it was all too slow in June — "Precinct workers just don't stack the ballots properly" — and the election supervisor resigned; and now the county has decided to supplement the Coleman system with another paper ballot optical scanning system, Cubic Corp.'s Votronic, which also operates in Riverside County and 12 other counties in California. Forty Cubic machines will be placed in four counting centers spotted around the county and there will be more people stacking ballots and that will speed things up. Right?

Perhaps a saver for all the beleaguered vote counters this November will be that the ballots will have many less candidates and issues for the voter to consider. In Los Angeles, there will be only one ballot for all the voters, instead of the five different ballots for the various parties in the primaries. It will be quicker and simpler to count. 00001, 00010, 00011, 00100....

— Aubrey Dahl

Your competitor may be among them.

That's where we're first showing the new CIP/4000 in action.

A computer that *almost* won't let you make a mistake.

A computer that has 30% of its programming done at the factory.

A computer that checks itself and you all the time.

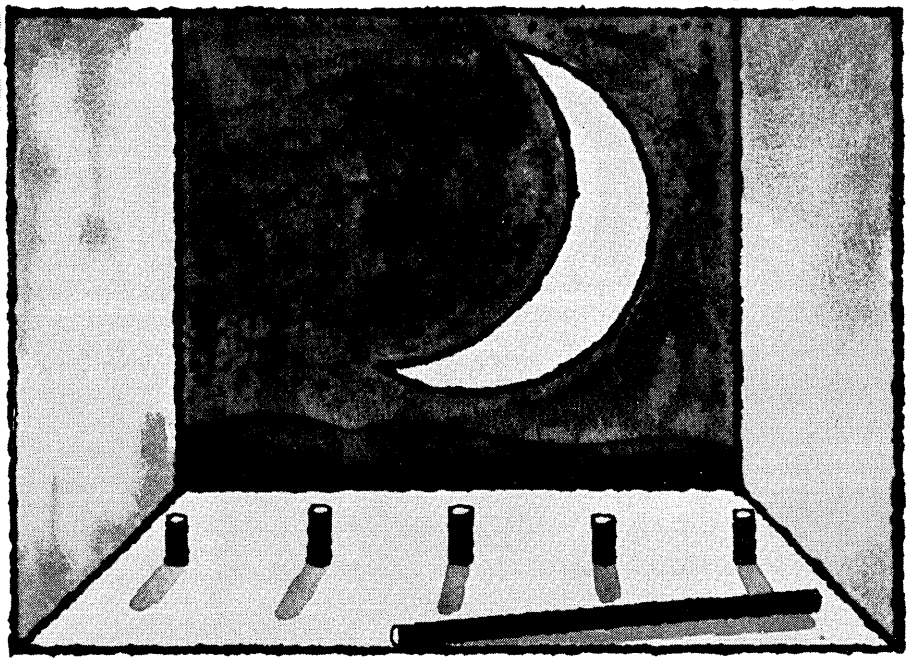
A computer that keeps on working under the worst possible industrial conditions.

And a computer that was designed from the beginning as a real-time controller.

Come and see how it works. Or write Cincinnati Milacron, Dept. R-53, Lebanon, Ohio 45036. For immediate action, call (513) 494-5444.

The CIP/4000 at Booth 2710 FJCC.

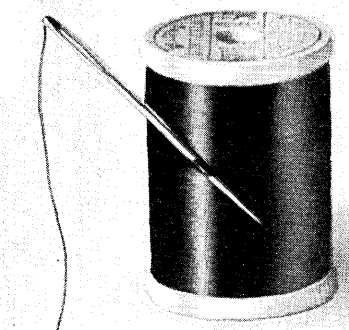
Some people won't let anything stop them from getting to Booth 2710 at the FJCC.



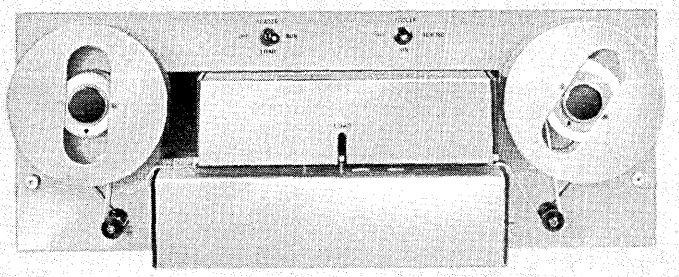
CINCINNATI MILACRON

Machine Tools
Process Controls
Chemicals
Plastics
Plastics Processing Machinery
Abrasives

CIRCLE 36 ON READER CARD



tailor made at standard prices



How do we do it? It's not easy — but with more years of experience than anybody in the business, we've learned to design our input/output products with flexibility.

Whether it's a reader, handler, punch or keyboard, you have a choice of speed, logic levels, reel sizes, or package styles just to mention a few... and *they're at standard prices.* Standard options also mean quick delivery, proven reliability and complete documentation...

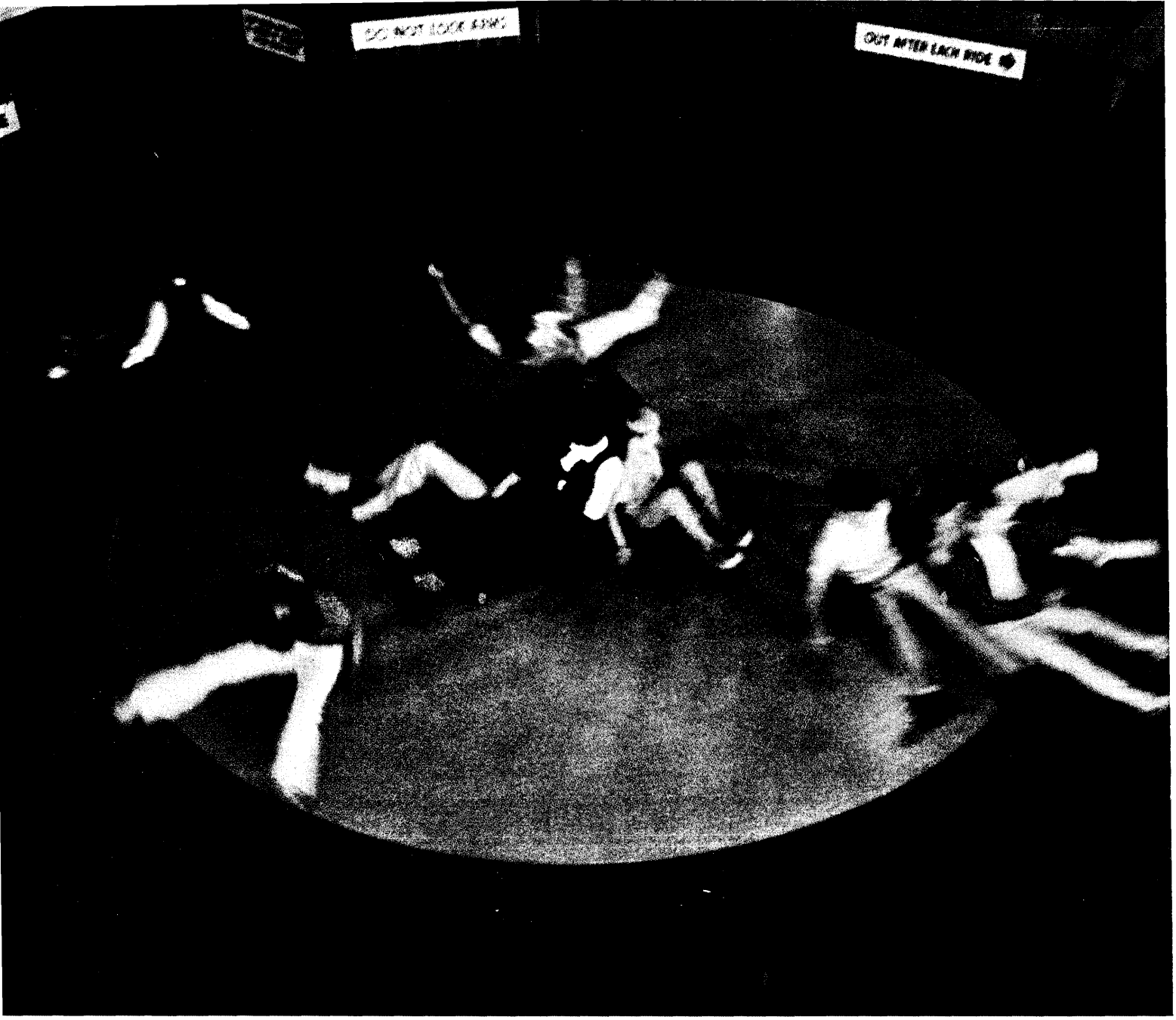
Let's see if we can meet YOUR specific configuration. Contact your nearest Digitronics representative (see EEM or EBG); or write us today: Digitronics Corporation, Albertson, New York 11507 (516) 484-1000.

"Shown above is the 2540 Reader/6012 Handler combination — ideal for applications requiring a compact reading system at speeds to 300 characters/second."

DIGITRONICS CORPORATION

"when every bit counts"

CIRCLE 55 ON READER CARD



Why we don't spin-coat our disc packs.

What happens on the joy wheel at the fun house is just about what happens when you spin-coat a magnetic disc.

Centrifugal force causes the magnetic oxides to fly off randomly in all directions within the coating. It makes them bunch up in some areas. And fail to show up in others. That's why spinning's not good enough for our disc packs.

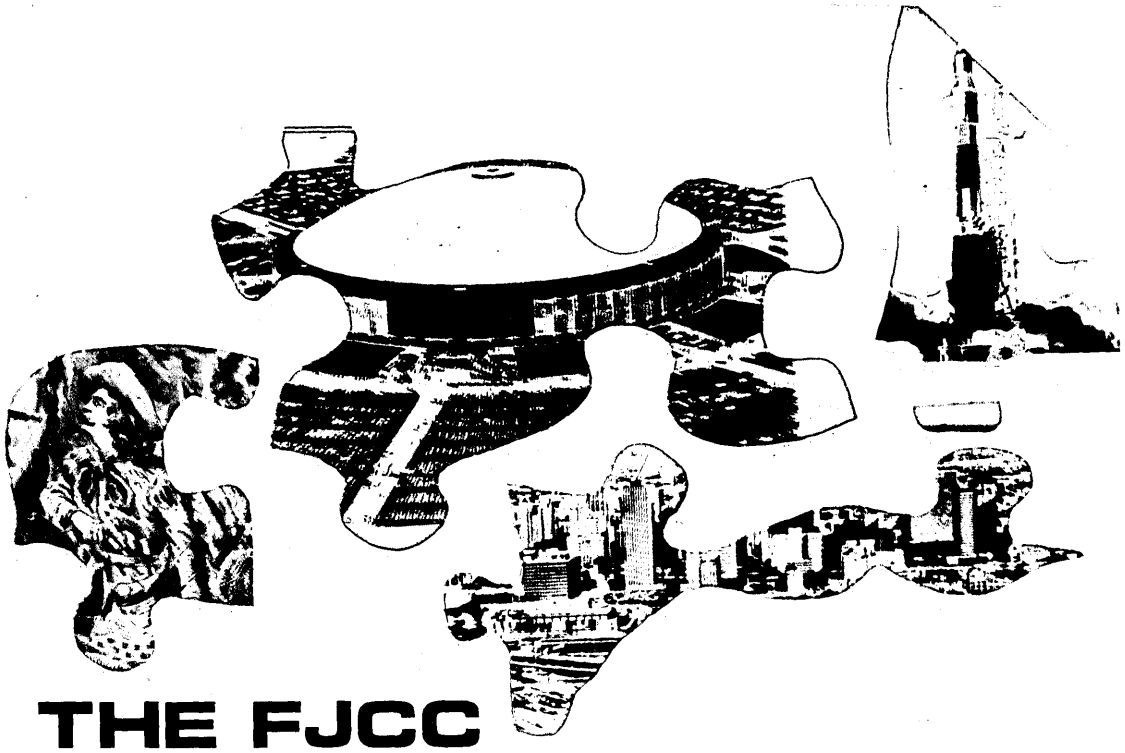
We spray our coating on. Our exclusive process is called Uni-Spray.™

Uni-Spray disperses magnetic particles far more evenly than spin-coating. It makes the coating on our Mark I and Mark VI disc packs thinner, smoother, and more durable than all the others. And it's the prime reason we were able to overcome the problem of soft errors (errors caused by uneven dispersion of magnetic particles or surface discontinuities).

So if you want a precision, long-lasting disc pack with a five-year warranty, don't spin off in all directions. Just ours.

Write for our Uni-Spray brochure. Memorex Corporation, Information Media Group, Computer Products, Memorex Park, Santa Clara, California 95050.

MEMOREX



THE FJCC CONFERENCE PARTICULARS

In the beginning the National Joint Computer Committee created the semi-annual joint computer conference.

That was back in 1951. The American Federation of Information Processing Societies (AFIPS), formed as an outgrowth of the NJCC, took them over in 1961. They've come a long way since then, each billed as bigger and better. This year, with trade shows in general as down as the economy on which they depend, superlatives still are falling thick and fast where the 1970 FJCC is concerned. Especially that word Big. And why not? The FJCC this year is being held in the Big city (Houston) Big state (Texas), Nov. 17-19. This will be the first JCC to be held in the Southwest, and while the steering committee is confidently assuring that "a new geographical area and the best of facilities have brought forth an enthusiastic response from the marketing organizations," the consensus is: "We'll wait and see." However, no one would deny Texas is big and few would argue with another steering committee assurance of "big doings in the big state." And it's a certainty the conference reception this fall will be Texan and, therefore, probably big. Scheduled for 6 p.m., Tuesday the 17th, it is billed as "a real down-home Texas barbecue."

Even the theme this fall is big in scope—Systems and Society—and one of the host state's best known citizens who has become a "big" name as much for his nonindustry exploits as for his accomplishments within, will carry the ball. Ross Perot will deliver the keynote address Tuesday morning, Nov. 17.

Another first this year (and again the effectiveness won't be determinable until all votes are in—after the conference is over) is technical sessions structured after the papers were in. Following the selection of papers, papers were divided into sessions on the basis of content and audience appeal on grounds that this was the best way to come up with sessions and time divisions "that match the material that is available." Session chairmen, chosen after the sessions were structured, did not participate in paper solicitation, selection, or review.

Robert A. Sibley, Jr.
University of Houston
General Chairman

A DATAMATION spot check of session-chairman reaction to this policy showed it was mixed. A sample:

"I believe this is a good practice because one cannot predict the subject areas of the papers until the papers are carefully reviewed for technical content and usefulness. Thus, quality should be the criteria for accepting papers and sessions must be structured after the papers are selected."

"The preselection of papers prior to structuring the sessions results in the presentation of papers which are more representative of the work being done and which are of more uniform quality. The preselection has the disadvantage of not allowing the session chairmen the opportunity to solicit, through personal contact, papers of exceptional merit for their sessions. This disadvantage has been offset for the 1970 FJCC by inviting selected speakers to give presentations on topics of general interest (the Broad Perspective sessions)."

"I feel it is an improvement over previous methods. However, it may need some refinement to prevent good papers being refused simply because there is no session in which they obviously fit."

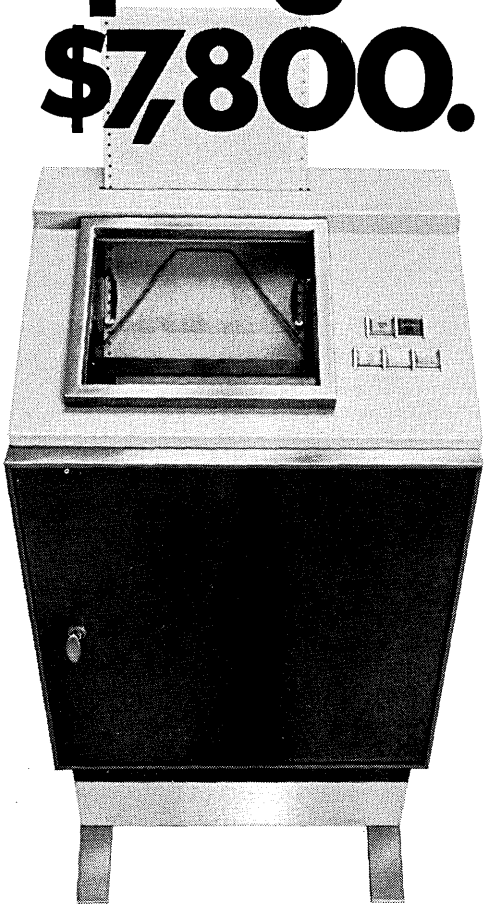
"I recognize both advantages and disadvantages. In total, I prefer the

If your mini-computer is a PDP-8, HP-2116, Varian 620, Honeywell 316, 516, etc.

Just plug us in. $7,800.

Our low-priced Vogue/Shepard 880 Series Printers come equipped with a full 80 column line memory and complete interfacing, including software, connectors, cables and computer interface cards for immediate connection to your mini-computer. All for the price of the printer itself.

What's more all of our 880 Printers incorporate our uniquely designed combination of ink roller reliability and patented, drum-impact, ballistic hammers that gives you six clear copies of data. Five copies more than you get with non-impact printers at no extra cost.



And at $7,800 installed, our 400 lpm printers cost a lot less and do a lot more than any competitive printers around. Without interfacing, complete system is available for only $7,000. Quantity pricing available, of course:

For information about the printers with the extras built-in, write: Shepard Division/Vogue Instrument Corporation, 131st Street at Jamaica Avenue, Richmond Hill, New York • 11418 (212) 641-8800. TWX 710-582-4796

The Vogue/Shepard 880 Series Printers

Don't pay extra for the extras.

CIRCLE 63 ON READER CARD

presented papers to be based on a structured session rather than current policy."

"I would reserve comment until I can see how effectively session chairmen and authors can work together towards developing a unified theme in their sessions. It is quite possible that this challenge to session chairmen to produce an integrated program may stimulate greater interaction among all participants of a session."

The experimental papers-first, session-structuring-second approach will be supplemented this year with a thorough schooling for those presenting papers in the techniques of delivery. A two-day seminar for speakers, "Persuasive Communications Through Effective Presentation Design," will be conducted in Houston Nov. 15 and 16. The first day will cover the development of a firm presentation design technique through eight hours of lecture and discussion. The second eight-hour session will include the delivery by each participant of a five-minute presentation which is video-taped and then evaluated by his fellow speakers.

Broad perspective

Another experiment this fall is a program titled, "A Broad Perspective," a kind of supplementary technical program designed to present "an array of ideas covering the broad perspective of various parts of the computing world." The program is made up of six informal sessions which will not be published or refereed.

In keeping with this, the year of Women's Lib, will be the presentation of the seventh annual Harry Goode Memorial Award to Dr. Grace Murray Hopper. Commander Hopper will be the first woman to receive the award presented in memory of Harry H. Goode, a pioneer computer scientist who was one of the founding fathers of AFIPS.

Lending another dimension will be non-Texan, non-computer-professional, humorist, and satirist Art Buchwald, who will be FJCC conference luncheon speaker. It is hoped he will follow through on the title of his latest book, "Have I Ever Lied to You?" Seems like real Texas-type stuff.

Something new in the Science Theater also is on tap for the 1970 FJCC. Films and video tapes will be supplied by companies or organizations who also will supply a staff member to introduce the program and to participate in a question and answer session. Three presentations were confirmed at this writing: a video tape on the computers and people involved with them by Argonne National Laboratory; a color film on the Manned Spacecraft Center and the computers used to support manned space flights; and a feature film on "Shakey the Robot," to be presented by Stanford Research Institute.

Other departures

The exhibit area will be something of a departure from JCC tradition if guidelines sent out this summer by AFIPS are followed to the letter. The guidelines were designed to maintain "those attributes of the JCC exhibits which are directly relevant to the scientific and educational purposes of the conferences," and included such suggestions as limiting booth staff to technically qualified employees, displaying operating equipment where possible, avoiding exaggerated architectural design, and elimination of "irrelevant souvenirs." Those who cherish the pith hemets they got at SJCC may find the FJCC disappointing.

Dr. Grace Murray Hopper
1970 Goode Memorial Award Winner

Art Buchwald
Luncheon Speaker

Sponsors were looking for some 310 exhibitors to display more than $200 million worth of equipment in 1,000 booths. By Sept. 1, 282 exhibitors had been assigned to 444 booths in the Astrohall, which affords more than 600,000 sq. ft. of exhibit space on one level and is the only trade exhibit facility in the world that can make this claim.

Registrations of an anticipated 40,000 conferees will be taken at the Astrohall, four convention hotels, and at Houston Intercontinental Airport.

Tours, of course, will be part of the conference with this year's biggest attraction in this department described as "an extensive special tour of the NASA Manned Spacecraft Center." Other tour targets are the Texas Medical Center, the IBM Scientific Center, the Texas Transportation Institute, and the Houston Lighting and Power Control Center.

The U.S. Department of Commerce has prepared a special presentation on the subject of Global Marketing in the EDP Hardware and Software fields. Opportunity for discussion will be provided.

The Association for Computing Machinery Special Interest Group on Computer Science Education (SIGCSE) has scheduled a day-long symposium on Monday, Nov. 16, on "Academic Education in Computer Science." Other JCC sponsoring organizations—IEEE Computer Group, Simulation Councils, American Society for Information Science, and Special Libraries Committees—will hold peripheral functions which will be listed in a special folder to be distributed at the conference.

The ladies' program includes such a divergence of activities as a tour of Houston homes, a visit to a Houston shopping center, a fashion show and a tour of the Manned Spacecraft Center.

And for after the conference, if you don't find what you want in Houston, there's nearby Galveston Island "where the pirates used to play." ■

1970 FJCC TECHNICAL SESSIONS AND BROAD PROSPECTIVE PROGRAM AT A GLANCE

		ROOM A ASTROHALL	ROOM B ASTROHALL	ROOM C ASTROHALL	BROAD PERSPECTIVE — GRAND BALLROOM
NOV. 17	TUESDAY AFTERNOON	1. A SPECTRUM OF PROGRAMMING LANGUAGES PAPERS	2. MODERN MEMORY SYSTEMS PAPERS	3. DESIGN FOR RELIABILITY PAPERS	PITFALLS IN AUTOMATION
		4. OPERATING SYSTEMS AND SCHEDULES PAPERS/PANEL	5. AEROSPACE APPLICATIONS PAPERS	6. COMPUTER PROCUREMENT REQUIREMENTS IN RESEARCH AND DEVELOPMENT PAPERS	DATA BASE MANAGEMENT FOR THE UNINTIATED
NOV. 18	WEDNESDAY MORNING	7. MULTI-ACCESS OPERATING SYSTEMS PAPERS	8. ANALYSIS OF INFORMATION RETREIVAL SYSTEMS PAPERS/PANEL	9. COMPUTER-AIDED UNDERGRADUATE INSTRUCTION PAPERS	SYSTEM ARCHITECTURE IN THE LSI ERA
		10. COMPUTERS & COMMUNICATION — A BURGEONING INDUSTRY (PART I) PAPERS	11. COMPUTER-AIDED DESIGN PAPERS	12. INTERFACING COMPUTERS AND EDUCATION PAPERS	MULTIPROGRAMMING SYSTEMS DESIGN & OPERATION — CURRENT AND FUTURE
	WEDNESDAY AFTERNOON	13. COMPUTERS & COMMUNICATION — A BURGEONING INDUSTRY (PART II) PANEL	14. TIME-SHARING SYSTEMS PAPERS/PANEL	15. HYBRID SYSTEMS PAPERS	PEOPLE IN COMPUTING — OR A HUMANIST'S VIEW OF DATA PROCESSING
			16. SIMULATION LANGUAGES AND SYSTEMS PAPERS	17. ART, VICE & GAMES PAPERS	THE PAYOFF FROM SYSTEM'S PERFORMANCE ANALYSIS
NOV. 19	THURSDAY MORNING	18. COMPUTERS IN MANUFACTURING PAPERS	19. AUTOMATA AND SWITCHING PAPERS	20. COMPUTATIONAL EFFICIENCY AND PERFORMANCE PAPERS	
		21. LONG RANGE GOALS OF PROGRAMMING LANGUAGES PANEL	22. THE EFFECTS OF GOVERNMENT REQUIREMENTS ON THE COMPUTER INDUSTRY PANEL	23. TIME-SHARED TEXT AND INFORMATION HANDLING PAPERS	
	AFTERNOON	24. COMMUNICATION AND ON-LINE SYSTEMS PAPERS/PANEL	25. SELECTED COMPUTER SYSTEM ARCHITECTURES PAPERS	26. PROSPECTS FOR ANALOG/HYBRID COMPUTERS PAPERS/PANEL	

THE FJCC SESSIONS

Where possible Datamation has obtained specially written descriptive paragraphs on each session by its chairman. Additional details on all sessions are contained in the official program booklet to be distributed at the show.

(1) A SPECTRUM OF PROGRAMMING LANGUAGES

This session focuses on the use of advanced software techniques. The paper on VULCAN demonstrates the uses of string processing languages in commonly encountered non-numerical problems and describes a modest system designed to solve them. The paper on SWAP describes an assembler with an extremely powerful macro assembler for use on the 360. The assembler is designed to transfer programs from one machine to another via the 360 and features numerous extensions not found in traditional macro processors. The paper on definition mechanisms suggests ways in which programming languages may be tailored to applications as conveniently as assemblers are tailored by a macro processor.

A discussion will follow the presentation. It is hoped that those in attendance will begin to see the importance of providing symbol processing features in programming languages to allow their extension.

—Edward Alvin Feustel
Rice Univ.
Session Chairman

Papers:
SWAP: The Macro Assembler, by M. E. Barton, Bell Telephone Labs.

Dr. Larry E. Axsom
IBM Corp.
Technical Program Chairman

Definitional Mechanisms in Extensible Programming Lauguages, by Philippe Jorrand, OBM Centre Scientifique De Grenoble, Grenoble, France.
VULCAN: A String Handling Language With Dynamic Storage Control, by Edward F. Storm, Syracuse Univ.

(2) MODERN MEMORY SYSTEMS

The state of the art in memories has moved well beyond what appears in most current computer systems. Semiconductor memories, in particular, will allow the computer designer new degrees of freedom in his choice of a basic architecture. His ingenuity will be taxed as much as his technical skills. Cache memories are starting to be used and are an exciting step in the use of fast, small semiconductor memories. As medium-sized and large semiconductor memories become available they will also find their way into new computer systems.

The area of very large, on-line mass storage systems has not received

(Continued on page 61)

if it reads punched paper tape, punched cards, edge punched cards, pin sensing, cards, badges, optical, reflective, key sort, mark sensing, brush and magnetic stripe cards, we have it!

in more models . . . to fulfill more OEM applications . . . to sell faster and more profitably . . . and stay "on-board" longer with less maintenance than any other readers in the industry.

If you think that's something, you should see our punch line.

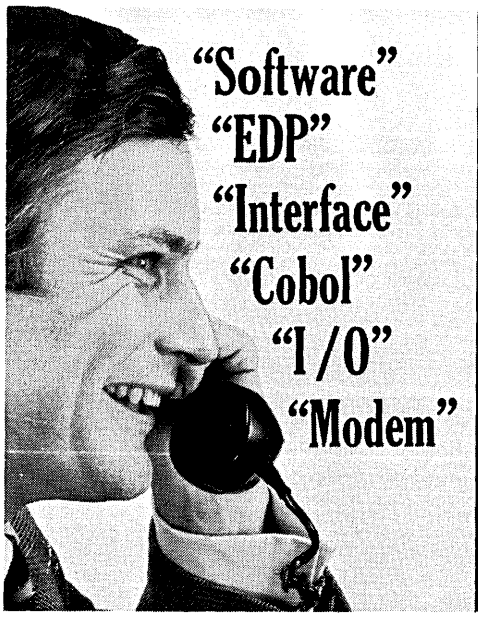
FJCC — BOOTH 1401

For more information
call Frank Misiewicz
OEM Products
(201) 935-2200

LITTON ABS
automated business systems
600 WASHINGTON AVENUE, CARLSTADT, NEW JERSEY 07072

LITTON

DO YOU KNOW THESE MODERN BUSINESS TERMS?



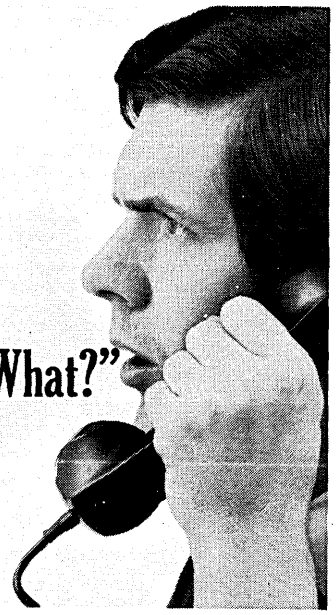
Clear up the mysteries of Electronic Data-Processing in

JUST 6 LESSONS—24 HOURS OF YOUR SPARE TIME

with

"COMPUTER BASICS FOR MANAGEMENT"

A successfully tested home study program from the **American Technological Institute**



The future belongs to the computer oriented executive

Prepare for tomorrow now! Hundreds have learned to understand this modern business tool quickly, easily, at home, the A.T.I. way. You can, too. Enroll, without risk, in **"Computer Basics for Management"** today.

6 easy lessons to full understanding

Without any prior knowledge, by the final lesson you have cleared up the mysteries of EDP, written your own program to prove it and, most important, as a "Computer Oriented Executive," you are ready for tomorrow's opportunities.

You won't master programming

But, in just 24 hours of your spare time you can master the fundamentals of EDP—all aspects, from the major elements and functions of computer systems, through machine and assembly language, to basic programming principles. It's comprehensive, concise, but certainly not a crash course. You study at your own pace, thoroughly mastering one lesson before proceeding to the next.

The most effective way to quick understanding

Through the repetition of hearing—seeing—doing, the Tri-Media Method skillfully combines the major elements of learning to increase your perceptive and retentive ability. The many students tested on campus and TV found Tri-Media the easy way to EDP understanding. So will you!

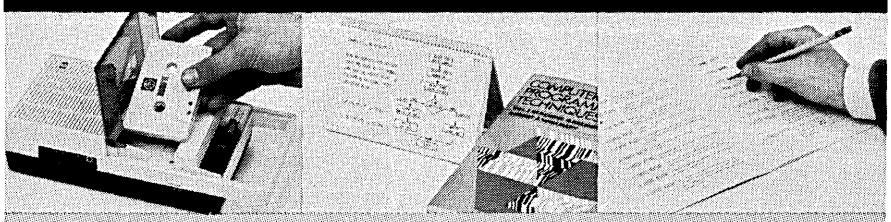
Developed by a task force of experts

A.T.I. is an accredited member of the National Home Study Council, specializing in management training. It was organized by the publishers of "Datamation," the most respected magazine in the computer field. This singular association made possible the selection of outstanding EDP instructors, who perfected and tested this course at a large university.

All course material supplied by A.T.I.

Absolutely no extras! Your complete study package arrives, postage-paid, ready to start. This includes • a standard, fully transistorized, cassette tape player with 4 batteries, which you can use for pleasure, later • 6 cassette taped lectures • an illustrated workbook • flip charts and test books for each lesson • plus an introductory cassette with full instructions on how to proceed.

IT'S SO EASY—THE A.T.I. TRI-MEDIA WAY



YOU HEAR **YOU SEE** **YOU DO**

While you **LISTEN** to the lecture you **LOOK** at accompanying flip charts, clearly illustrating every step as you progress. When instructed, you stop to **RECORD** your newly acquired knowledge in your workbook. This implants it firmly in your mind. If not clear the first time, replay a lesson as often as you like, or repeat portions as you go until you fully grasp every detail. Finally, to avoid any misunderstanding, complete the Test Book for that lesson and mail it to the A.T.I. Grading Center. There, an experienced instructor will personally review your work, returning it promptly with corrections or suggestions clearly noted. **It's that simple . . . but so effective.**

GUARANTEE: Order "Computer Basics for Management" today! Think of it as a risk-free investment in your future—with nothing to lose—everything to gain—and five full days to convince yourself it is all we promised. If not completely satisfied, just return the course material for a full refund. Your total investment: including cassette tape player, all course material and grading—$195. And it's tax deductible in many cases. Charge it to your credit card if you wish, or arrange for company sponsorship if you can. But don't delay! There could be a computer in your path tomorrow.

FREE Datamation Glossary: Enroll right now and receive as a gift the popular "Datamation Glossary"—62 fact-filled pages of data processing terms. It's the last word for anyone who must communicate in modern business. And it's yours FREE, whether or not you decide to keep the course, **if you act at once.** So, fill in the coupon and mail it today.

American Technological Institute
A subsidiary of Technical Publishing Company
Dept. D, 35 Mason Street, Greenwich, Conn. 06830

AMERICAN TECHNOLOGICAL INSTITUTE

SEND IN THIS NO-RISK COUPON TODAY

American Technological Institute
Dept. D, 35 Mason Street, Greenwich, Conn. 06830

Send me "Computer Basics for Management." If I am not completely satisfied within 5 days after receipt, I will return it for a full refund—but I may keep the "Glossary" as a gift.

☐ $195.00 payment enclosed—or charge my Account # _____

☐ Diners Club ☐ American Express ☐ Master Charge

Name _____

Address _____

City _____ State _____ Zip _____

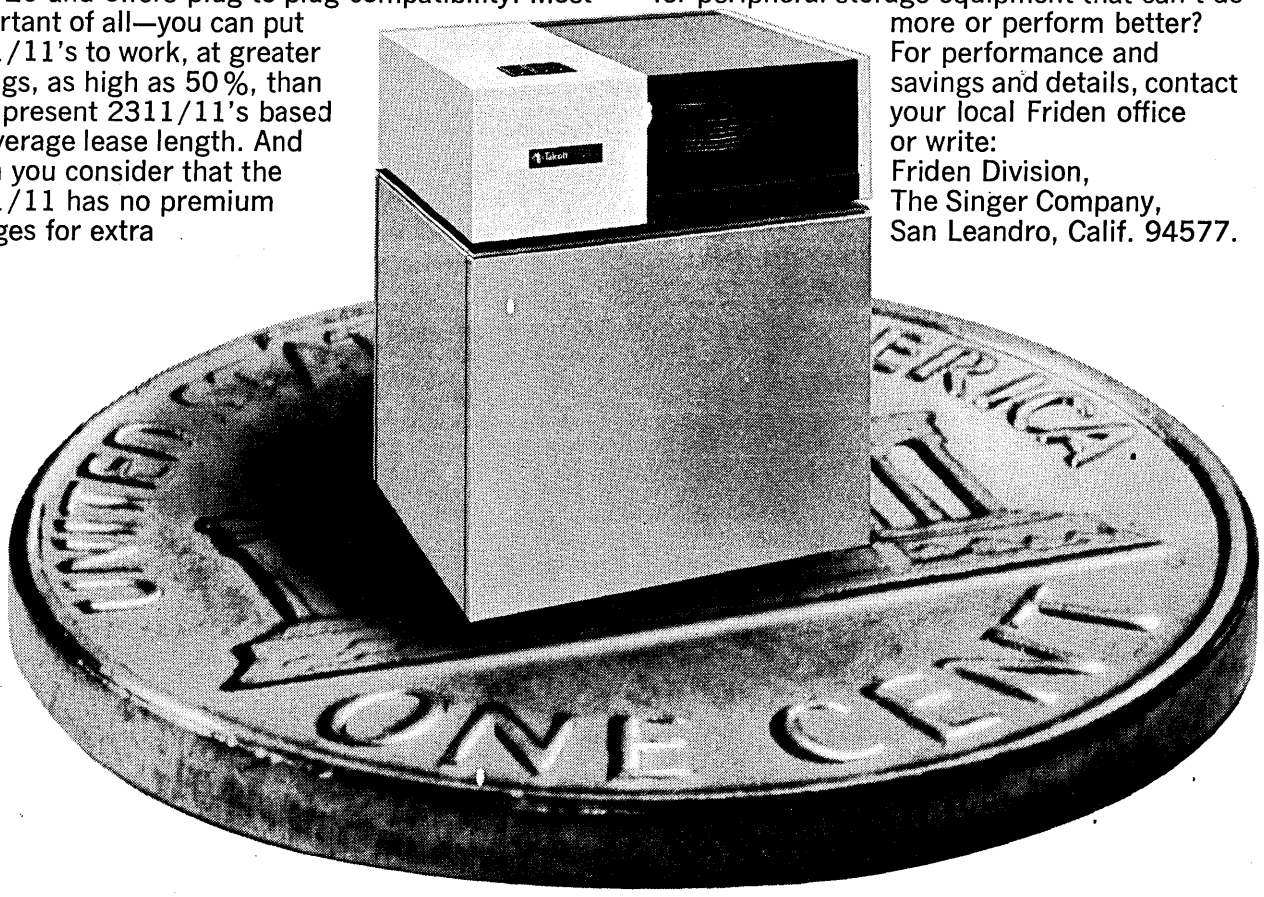
Signature _____

FOR THE 360/20 USERS.

THE NEW 9311/11:

FURTHER PROOF THAT AT TALCOTT EDP STANDS FOR "EVERY DARN PENNY."

Now—the 360/20 systems users can enjoy the same outstanding performance and savings that the 9311 Disc Drive brings to users of larger systems. The 9311/11 matches the capabilities of the 360/20 and offers plug-to-plug compatibility. Most important of all—you can put 9311/11's to work, at greater savings, as high as 50%, than your present 2311/11's based on average lease length. And when you consider that the 9311/11 has no premium charges for extra shift work—the actual savings can be even greater. The 9311/11 is made by the Friden Division of Singer—famous for reliable engineering and service, worldwide. So why pay more for peripheral storage equipment that can't do more or perform better? For performance and savings and details, contact your local Friden office or write:
Friden Division,
The Singer Company,
San Leandro, Calif. 94577.



MANUFACTURED BY
THE SINGER COMPANY–Friden Division

Talcott 9311

TALCOTT COMPUTER LEASING • Division of James Talcott, Inc., 1290 Avenue of the Americas, New York, N.Y. 10019

as much attention as other types of memories. This equipment is usually not even offered by most computer manufacturers. On the other hand, with the advent of both business and technical on-line data base systems, there is more and more need for massive memories. One such storage system is described in a paper in this session.

—L. S. Litman
Shell Development Co.
Session Chairman

Papers:
On Memory System Design, by Robert M. Meade, Cogar Corp.
Design of a Very Large Mass Storage System, by Samuel J. Penny, Lawrence Radiation Laboratory, Univ. of California.
Design of a Mega-Bit Semiconductor Memory System, by C. A. Allen, Cogar Corp.

(3) DESIGN FOR RELIABILITY

Papers:
Optimum Test Patterns for Parity Networks, by Douglas C. Bossen, IBM.
A Method of Test Generation for Fault Location in Combinatorial Logic, by Yoshiaki Koka, Univ. of Illinois.
The Application of Parity Checks to an Arithmetic Controller, Charles P. Disarte, Xerox Data Systems.

(4) OPERATING SYSTEMS AND SCHEDULES

Resource management in modern computer systems is both a crucial and challenging problem. The papers in this session will deal with several topics in this area including scheduling and allocation strategies, system tuning and performance monitoring. A distinguished panel will review the papers.

—Richard R. Muntz
UCLA
Session Chairman

Papers:
Time Sharing for OS, by Allan L. Scherr and David C. Larkin, IBM Corp.
Scheduling in a General Purpose Operating System, by V. A. Abell, S. Rosen and R. E. Wagner, Purdue Univ.
Scheduling TSS/360 for Responsiveness, by Walter J. Doherty, IBM Corp.
SPY—A Program to Monitor OS/360, by R. Sedgewick, R. Stone and J. McDonald, Western Electric Co., Inc.
Panelists:
S. Crocker, UCLA.
P. J. Denning, Princeton Univ.
J. E. Shemer, Xerox Data Systems.

(Continued on page 62)

IF OSCARS WERE GIVEN FOR THE BEST BUSINESS OPPORTUNITIES IN AMERICA

The odds are a certain Colorado based firm would win hands down. You'll be convinced of this when you read *"New Roads to Opportunity and Wealth"* booklet.

It is of special interest to those who are hamstrung by lack of opportunity. If you'd like to be the "boss" as an independent associate and have a modest amount to invest, there may be a great opportunity for you with this organization should you qualify. It deals with a service that commands the field. Its dominance is unquestioned, undisputed, absolute. A free copy of the booklet will be rushed to you on request.

© S.A.I. International, Inc. P.O. Box 22458 Dept.G25 Denver, Colo. 80222 (303) 757-5500

CIRCLE 42 ON READER CARD

Do your programmers know basic systems concepts and applications?

The Basic Systems Course for programmers will do just that, without detracting from their programmer duties.

One hour per day for 25 weeks, your registrant will cover such topics as

- *Systems Writing*
- *Data & Forms*
- *Survey & Analysis*
- *Systems Concepts*
- *Management Process*

Upon completion, he will have an excellent working knowledge of systems concepts, which he will be able to put into practice immediately! Also, The Basic Systems Course for Programmers will help close that ever widening gap between programmer and systems departments.

Put us to the test.
Cost $345, group rates available.

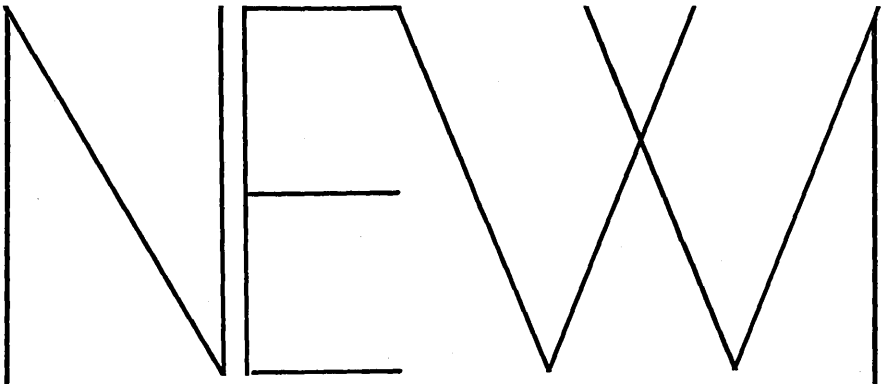
Systemation, Inc., serving over 5,000 companies coast to coast in systems training and consulting.

SEND FOR INFORMATION TODAY!

NAME _____
TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

Dept. No. B-2
SYSTEMATION, INC.
Box 730, Colorado Springs, Colorado 80901

CIRCLE 66 ON READER CARD



FROM VAN NOSTRAND REINHOLD

OPTIMIZATION AND PROBABILITY IN SYSTEMS ENGINEERING
By John Gaylord Rau
This is the first book on operations research that is oriented toward engineering. It provides you with a single reference on the mathematical models used to perform system reliability, maintainability and availability studies. It brings together many topics in applied probability never before presented in one book.

Its new approach integrates optimization techniques and probability concepts as they relate to engineering problems, with emphasis on those which are applicable during the design, development and evaluation of systems. The approach is unique among books in systems engineering. Calculus techniques, linear programming, dynamic programming, reliability theory and queuing theory are just a few of the important topics treated.
416 pages, 6 x 9, $15.00

COMPUTER ARCHITECTURE
By Caxton C. Foster
Here, in a single reference, are virtually all the fundamentals of computer machine design. Both conventional methods and fascinating alternatives are presented in the book's thorough treatment of information representation, elementary switching circuits, moving magnetic memories, paging, virtual memory, microprogramming, and advanced computer architecture. The author pinpoints the problems you will encounter and suggests practical solutions to assist you in your own creative approaches.
240 pages, 6 x 9, $12.50

MANAGEMENT INFORMATION SYSTEMS:
Concepts, Techniques and Applications
By James Jerome O'Brien
One of the biggest problems facing management today is how to use computers effectively to cut costs and increase efficiency. A wealth of answers exist in the experience of others but that experience has been largely unrecorded—until now. Now it's available in this new book—sorted, analyzed and organized in clear, useable order for executives with or without a computer background. Here you will find a clear definition of the concept and components of MIS, the areas in which they can be applied effectively, how, and actual examples of successful applications.
320 pages, 6 x 9, approx. $8.95

FORMS FOR BETTER COMMUNICATION
By Patricia Black Vardaman
Better communication is the unique focus of this book. It presents a proven, practical technique for the design and improvement of business forms to provide better communication both within and outside your organization. Intended for nonspecialists—both managerial and operating personnel—the book uses more than 300 actual examples to show clearly how to translate each concept directly to your operations needs and budget.
264 pages, 6 x 9, $8.95

VNR

VAN NOSTRAND REINHOLD COMPANY
450 West 33rd Street, New York, N.Y. 10001

CIRCLE 60 ON READER CARD

FJCC Sessions . . .

(5) AEROSPACE APPLICATIONS

Papers:
Trajectory Computation, by Kenton S. Day, ESL, Inc.
Hybrid Computer Solutions for Optimal Control of Time Varying Systems with Parameter Uncertainty, by W. Trautwein, Lockheed Missiles and Space Co.
The Economics of Scale in Hybrid Computing, by John B. Campbell, Raytheon Co.
Multi-Variable Function Generation for Flight Simulation, by Sen P. Chew, The Boeing Co.

(6) COMPUTER PROCUREMENT REQUIREMENTS IN RESEARCH AND DEVELOPMENT

The past quarter-century has seen the electronic computer boom like grape-shot into a rainbow of devices and applications; all aglitter, but with no pot of gold at the end (except for, perhaps, the manufacturer). Part of the trouble seems to be in a user knowing what he wants and the rest in getting what he wants. The legal involvement of purchasing, leasing, or otherwise obtaining computer systems has normally been a headache to a prospective user because he could not communicate with the manufacturer in legal terms —then when he finally received his computer system he found he could not communicate with it either because it did not have all the raw capabilities he wanted it to have.

The two papers being presented here will discuss some of the legal aspects of computer system procurement and some preferred developmental areas for computer systems, respectively. It is the goal of this session to present an overview of what can be done, legally, and what is proposed to be done technically to improve the services the user will obtain from his future computer systems.

—James L. Raney
NASA/Manned Spacecraft Center
Session Chairman

Papers:
Role of Computer Specialists in Contracting Computers, by Roy N. Freed, Widett & Kruger.
Selected R & D Requirements in the Computer and Information Sciences, by Mary Elizabeth Stevens, National Bureau of Standards.

(7) MULTIACCESS OPERATING SYSTEMS

Papers:
Development of the Logicon 2+2 System, by Albert L. Dean, Jr., Logicon, Inc.
System Ten: A New Approach to Multiprogramming, by Robert V. Dickinson, The Singer Co., Friden Div.

(8) ANALYSIS OF INFORMATION RETRIEVAL SYSTEMS

The capability for designing and operating large information systems has stimulated the interest in evaluation of system design and operation. Methods for evaluating information systems differ. It is the purpose of this session to explore several different methods of retrieval system analysis and to comment on the effectiveness of the analysis, the nature of the results, and the relationships among methods.

To accomplish this purpose the papers presented in this session deal with the structure of information, models of organization, and parametric studies of retrieval system performance. A critical question in the analysis of any retrieval system is the question of privacy. The privacy issue is also included in a paper surveying both the threats and the countermeasures for information protection. A concrete protection measure is proposed.

—Richard E. Nance
Southern Methodist Univ.
Session Chairman

Papers:
Automatic Design of Data Organization, by William A. McCuskey, Burroughs Corp.
Analysis of a Complex Data Management Access Method, by V. Y. Lum, IBM Research Laboratory.
Analysis of Retrieval Performance for Selected File Organization Technique, by Dr. Arthur J. Collmeyer, Xerox Data Systems.
Fast Infinite-Key Privacy Transformation for Resource-Shaping Systems, by Dr. John M. Carroll, Univ. of Western Ontario.
Panelists:
U. Narayan Bhat, Southern Methodist University.
Herbert R. Koller, American Society for Information Science.
Jack Minker, Univ. of Maryland.
Gerard Salton, Cornell Univ.
Dean H. Vanderbilt, City of Dallas.

(9) COMPUTER ASSISTED UNDERGRADUATE INSTRUCTION

So far the best approach to teaching is to have a well-qualified, inspirational teacher work with a small class. Unfortunately, this seldom happens. Many people conversant with digital computing believe that the teaching process can be helped using computerized methods. Most efforts to date have proven to be less effective than giving a student a book.

The papers in this session are directed toward a more "humanized" response on the part of the computer program employed. They attempt to allow more initiative on the part of

NOW

AT YOUR BOOKSTORE

APL PROGRAMMING AND COMPUTER TECHNIQUES
By Harry Katzan, Jr.
APL is hot. Its suitability for scientific, engineering and business applications . . . its inherent time-sharing capabilities . . . its choice for more and more computer systems have not only contributed to the growing popularity of APL, but also to the critical need for a definitive, practical book on the subject.
Here is that book, the first on the APL terminal system. It meets two important objectives. First, it provides a thorough foundation in the APL language and terminal ssytem. APL fundamentals, arrays, array operations, and topics in programming are presented in separate chapters so you can select just those topics which interest you. Second, it offers a clear introduction to computer techniques and languages for scientists, engineers, analysts and managers—with or without a background in computers. Also included are actual computer printouts, many examples and a clear glossary of APL. This is the first work to give you a complete understanding of Iverson's language as it works with time-sharing to solve simple and complex problems. **336 pages, 6 x 9, $12.00**

APL USER'S GUIDE
By Harry Katzan, Jr.
Companion volume to APL PROGRAMMING AND COMPUTER TECHNIQUES, this handy reference on APL includes approximately 200 computer examples, 25 problem sets with answers for a quick, working knowledge of the APL terminal system. Provides operational procedures and shows you how to write programs for a wide range of applications.
128 pages, 8½ x 11, $5.95

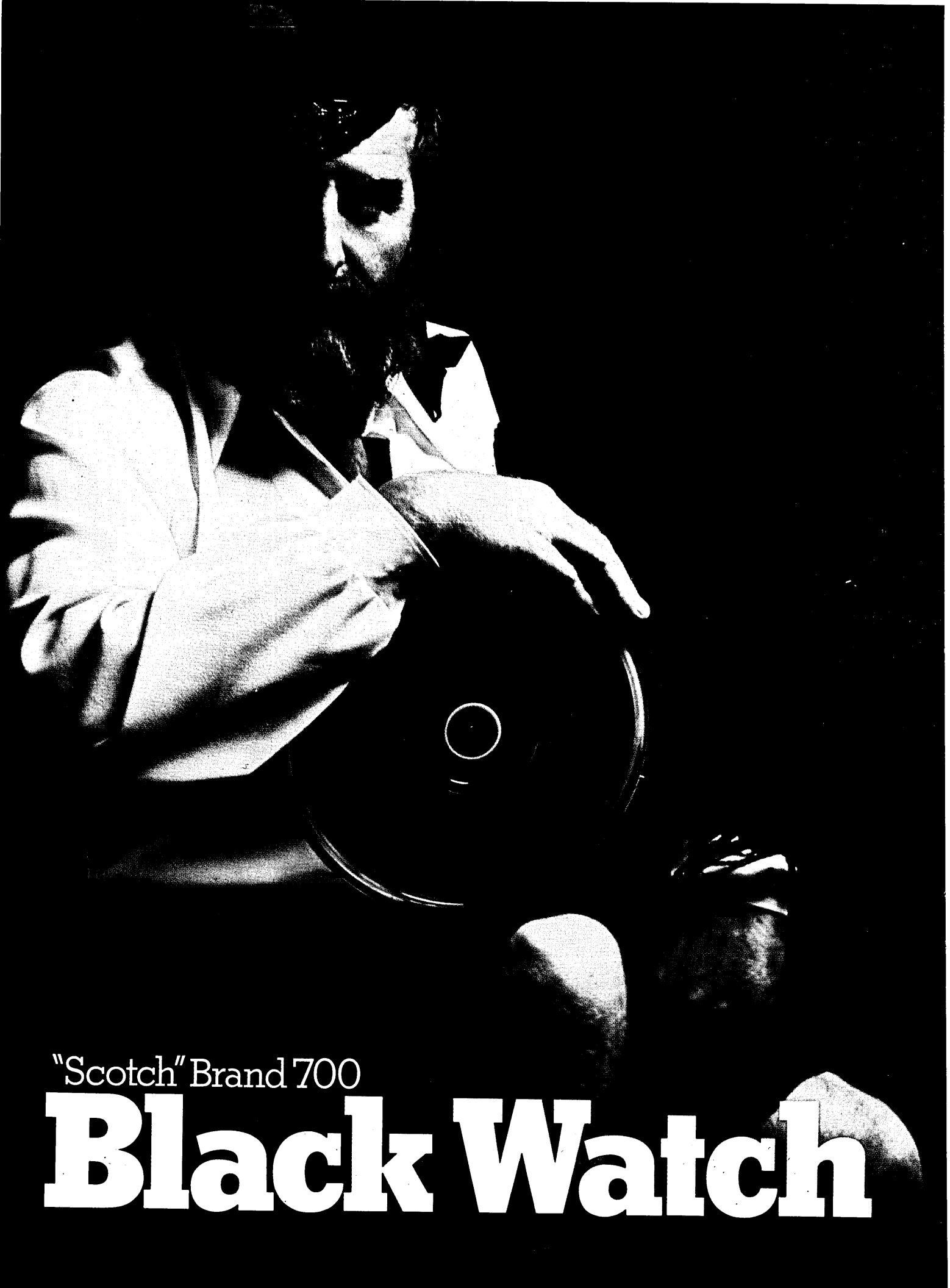
ADVANCED PROGRAMMING: Programming and Operating Systems
By Harry Katzan, Jr.
For programmers, analysts and managers who seek career advancement, this book provides practical advanced treatment of such concepts as assemblers, compilers, and syntactical methods; string manipulation and list processing; computer language; and operating systems.
285 pages, 6 x 9, $13.95

PROJECT MANAGEMENT WITH CPM AND PERT. Second Edition
By Joseph J. Moder and Cecil R. Phillips
To keep you up to date with major developments in the theory and practice of CPM and PERT, here is the Second Edition of this highly acclaimed work. Important new material has been added on alternative networking techniques . . . essential elements of critical path processing from a programmer's viewpoint . . . modern concepts in resource allocation . . . and more. As in the first edition, this book provides a thorough understanding of network based methods used to plan, schedule and control projects within available time and resources. **360 pages, 6 x 9, $14.95**

VNR

VAN NOSTRAND REINHOLD COMPANY
450 West 33rd Street, New York, N.Y. 10001

CIRCLE 61 ON READER CARD



"Scotch" Brand 700

Black Watch

The computer tape that guards itself.

It protects your valuable data.

Now, 3M takes the next step in computer tape. An exclusive new textured backing gives Black Watch a built-in resistance to physical damage in shipping, storage and handling.

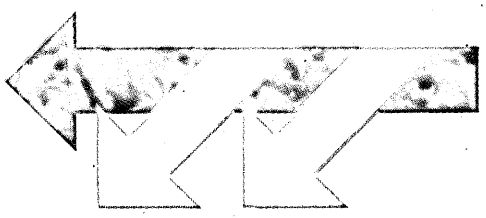
Cinching and edge damage are dramatically reduced.

If the tape shifts, due to temperature change or improper wind tension, the textured backing permits the roll to regain its normal configuration without permanent damage or loss of data.

A new resistance to scratches on the backing helps prevent the redeposit of dropout-causing polyester chips and effectively extends tape life. Where conventional tape was severely scratched after 500 passes, Black Watch showed no significant wear after 2000 passes on the same tape drive.

New protection against dust and airborne contaminants is built in, too. The conductivity of the textured tape backing reduces static attraction of dust and dirt particles. In addition, increased tape compressibility minimizes distortion and damage caused by wound-in debris.

Lower tape skew (a diagonal passage across record heads) means fewer interchangeability problems and fewer reruns.



Want to call out the guard? Ask your 3M representative or write Market Services, Magnetic Products Division, 3M Center, St. Paul, Minn. 55101. Find out how "Scotch" Brand 700 Black Watch computer tape can protect you against loss of time and money.

"SCOTCH" IS A REGISTERED TRADEMARK OF 3M CO.

3M COMPANY The barrier breakers.

FREEDOM NOW

for the large scale Information Retrieval and Display user.

The new Datapoint 3360 terminal for IR&D use and its companion 3364 Controller unit represent Freedom Now for organizations which utilize 16 or more standard terminals in their IR&D networks — Freedom from excessive costs associated with system operation, Freedom from inadequate engineering design and low information throughput and most important Freedom for your central computer system(s) from the nitty gritty of IR&D terminal control and surveillance. Consider:

- The 3364 Controller can direct up to *64* 3360 terminals simultaneously, located either in close physical proximity to the controller or *located remotely.*
- The Datapoint 3360 has a *standard* CRT screen which displays 80 lines of 20 characters-a-line — 1600 characters in a single display, almost double the capacity of the full screen IBM 2260.
- The Datapoint 3360-3364 combination removes a substantial processing load from your central computer system(s). The controller, which is actually an 8k digital computer, comes equipped with software which fully automates addressing, buffering and line control for each terminal (up to 64) under its direction. No longer need your expensive computer be tied down with mundane processing tasks — the 3364 will do the job at a fraction of the cost.
- Finally, the 3360-3364 combination is engineered to interface directly with standard IBM 360 configurations and is totally compatible with IBM OS and DOS.

The Datapoint 3360 and other outstanding Datapoint terminals will be on exhibit at the FJCC, Astrohall Booth 1001.

The Datapoint 3360-3364 combination represents Freedom Now of the most substantial kind for organizations which utilize an extensive IR&D network. We'd like to talk to you about it. For further information contact Computer Terminal Corporation, 9725 Datapoint Drive, San Antonio, Texas 78229 (512) 696-4520, or the sales office nearest you.

Makers of the Datapoint 3300 for time sharing use.

Computer Terminal Corporation

A TEXAS CORPORATION

HOME OFFICE: 9725 Datapoint Drive/San Antonio, Texas 78229/(512) 696-4520 **FIELD OFFICES:** Atlanta, Ga. • Arlington, Va. • Buffalo, N.Y. • Dallas, Texas • Houston, Texas • King of Prussia, Pa. • Los Angeles, Calif. • Minneapolis, Minn. • New York, N.Y. • Pittsburgh, Pa. • San Francisco, Calif. • Southfield, Mich. • Waltham, Mass. • Wilmette, Ill. • Portland, Ore.

CIRCLE 79 ON READER CARD

the student as well as the teaching program.

—Dan D. Drew
Texas A&M Univ.
Session Chairman

Papers:
On-Line Computer Managed Instruction, by J. S. Vierling, Honeywell.
Development of Analog/Hybrid Terminals for Teaching System Dynamics, by D. C. Martin, North Carolina State Univ.
An Undergraduate Level Computer-Based Science Education System, by J. J. Allan III, J. J. Lagowski, and M. T. Muller, The Univ. of Texas.
Computer Tutors That Know What They Teach, by L. Siklossy, Univ. of California.

(10 & 13) COMPUTERS AND COMMUNICATION—A BURGEONING INDUSTRY

Many issues dominate the strong contemporary efforts toward welding computer systems into total information systems. Several of these issues will be examined at this two-part session by a set of seven formal presentations followed by a discussion by a panel of distinguished experts. The speakers and panelists represent the views of a broad cross section of industry and the academic community. The panel discussion will be launched by informal observations from each of the panelists.

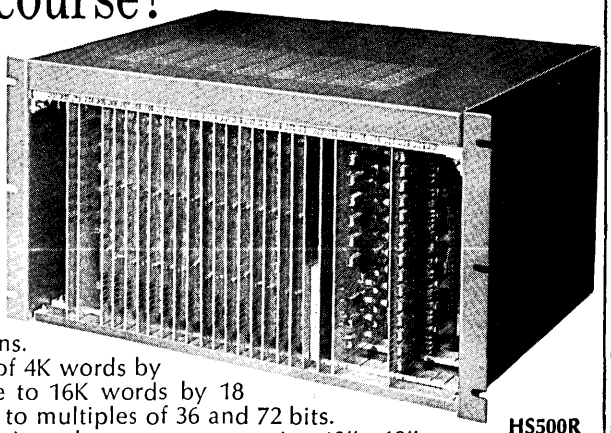
One of the issues to be covered is the desirability of establishing computer networks. Several resource-sharing applications make the desirability quite obvious. There appears to be a trend toward hierarchically structured computer systems netted into a computer network using computers of all sizes. It has been argued that networks of this type will bring extensive management information systems within the state of the art

Another issue is the selection of the communication facilities most suitable for computer networks. This selection is based on complex engineering trade-offs which must be arrived at jointly by the system user, equipment vendor, and the communication provider, each of whom must seek out the equipment and service package that meets requirements at minimum cost. A clearer understanding of these trade-offs is now possible on the basis of the significant experience that is being gathered by several independent computer networks which are operational or in the advanced planning stages.

Among the communication techniques to be discussed in detail is a

What Memory-System Maker Is Speeding Up the Cycle Time— But Holding Down the Price?

Toko. Of course!



HS500R

Beef up your technology with Toko's 500 nanoseconds Memory System without raising your costs.

Now rolling off the production line, Toko's HS500R Memory System offers the following key features:

* Access time of 250ns.
* Memory capacity of 4K words by 18 bits expandable to 16K words by 18 bits, rearrangeable to multiples of 36 and 72 bits.
* Compact, space-saving advantages—measuring 10" x 19" x 13-1/3".

Toko's advanced electronic technology also enables it to provide computer components, such as memory stacks. Contact Toko today for details.

TOKO, INC.
Head Office: 1-17, 2-chome, Higashi-Yukigaya, Ohta-ku, Tokyo, Japan
TOKO N.Y., INC. 350 Fifth Avenue, New York, New York 10001 Tel: 212-565-3767

CIRCLE 83 ON READER CARD

We've built a computer to protect your computer.

To protect the valuable (and often irreplaceable) information contained in your computer and dp center, we designed a computer-like security system. Actually it's a lock, a locksmith, a timelock, a recorder, a burglar alarm, a judge, and a tattle-tale all in one. And here's how it works.

The lock is programmed to be opened by magnetically coded cards (which defy duplication), instead of keys. It can be instantly re-programmed to be opened by a different set of cards (new shift, after hours, jobs, etc.) by simply inserting a different matrix card. It records the time and date of each entry and exit. And it will alert you if a lost, stolen, or voided card is inserted.

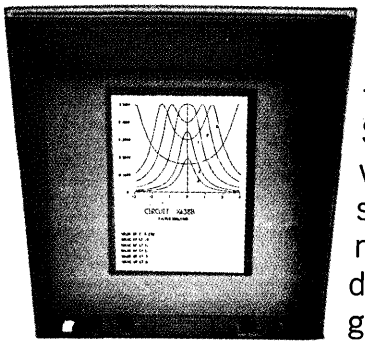
Unlike other security systems that only regulate access to your premise, the Card Key System allows you to regulate and record the activities of your employees. To find out more about the highest form of automated security on the market today, write or call us. After all, who wants an insecure computer?

CARD KEY SYSTEMS
Subsidiary of Liquidonics Industries, Inc.
20339 Nordhoff Street
Chatsworth, California 91311
(213) 882-8111

CIRCLE 88 ON READER CARD

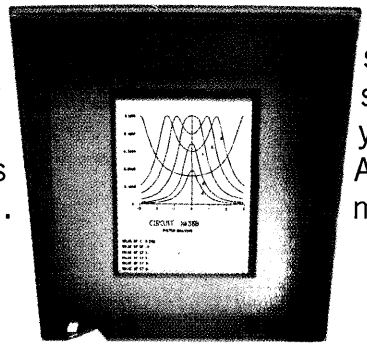
Forgive the long ad, but the more you read the more you'll want to

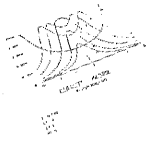
Sorry it's such a long story. But just check out the features of our new CORNING 904™ time sharing computer terminal, and you'll see. It gets more and more interesting as it goes along.



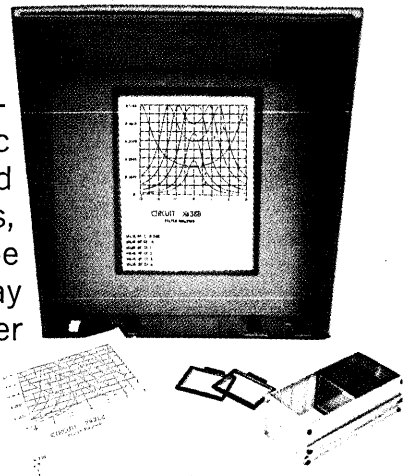
First, it features interactive graphics. So it's an advanced time sharing terminal that can display complex graphs and line drawings as well as alphanumeric data. This lets you make full use of the time you have with your time sharing computer and take full advantage of all its problem solving capabilities.

Second feature, hard copy. Standard 8½" x 11" working copies in less than 15 seconds. From an electrostatic copy unit that's built right into the CORNING 904, not added on. You get the full image that's on the screen—both computer generated and slide generated. (We'll tell you more about this next.) And single or multiple copies cost as little as 3¢ each.



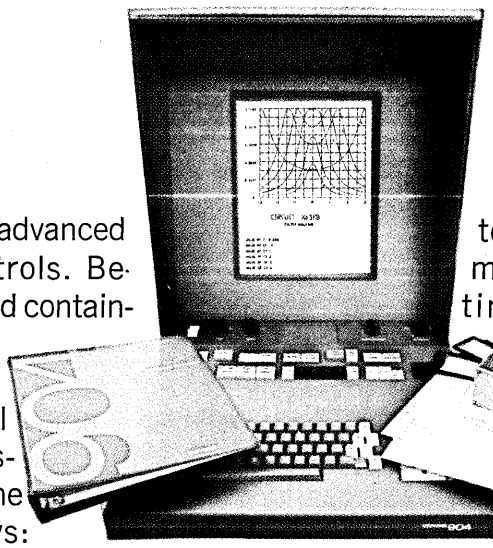


Third, a slide overlay system for superimposing static and computer generated displays. Graph coordinates, forms, and menus may be shown right on the display screen in perfect register with computer generated data. A built-in magazine holds 32 slides that can be randomly accessed. And slide trays are easily interchangeable so you can build your own sets of application slides. And you can make them yourself from hand drawn or printed originals with an accessory Slide Overlay Kit using POLAROID® transparency film.

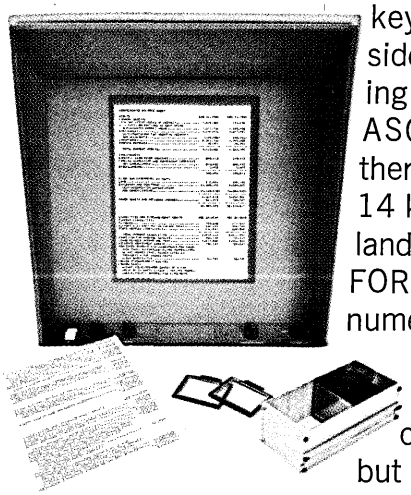


Fourth, it features large screen capacity. How large? How's 4,608 alphanumeric characters spread over 64 lines 72 characters wide sound? That's the same format as a teletype. And for extra columns there's a 90° Character Rotation Mode to achieve a 93 character wide format. And it plots fast too. Twenty inches per second at 300 baud. With a three-speed switch so you can choose your own speeds down to 110 baud. A curve drawing short vector mode is also included.

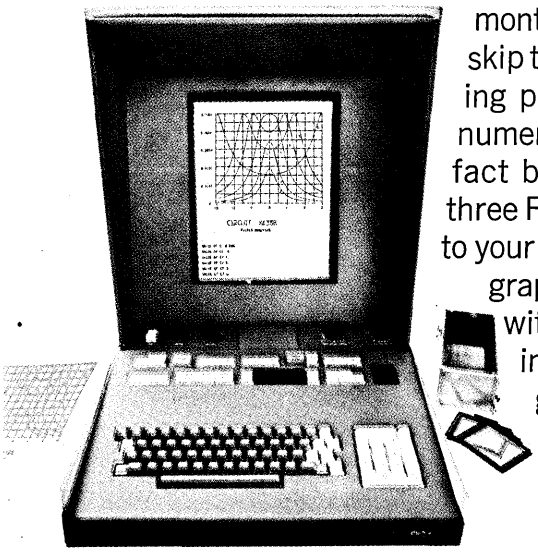
about our new terminal read.



Fifth, is the CORNING 904's advanced keyboard and controls. Besides a main keyboard containing all 128 printable ASCII characters, there's an additional 14 key data entry island. It includes all the FORTRAN input keys: numerals 0 through 9, space, backspace, period, and comma. They're also included on the main keyboard, but we repeat them on the data island keys for one hand data entry.

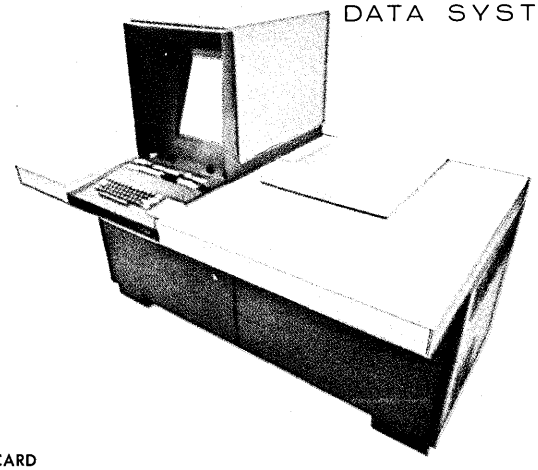


Sixth feature, and most important, its software support package. This is already a full package that includes 57 FORTRAN IV subroutines with more being added every month. Enough to let you skip the tedium of converting programs from alphanumerics to graphics. In fact by adding as few as three FORTRAN statements to your program you can get graphic output complete with scales and labeling. After all, if we're going to give you a terminal like this to make better use of your time, it would be a shame not to have the software ready to go when you are. Which is why we also make sure it's on time sharing company public files where you can use it right now.



There's just one more thing, the price. $19,650. For the entire system, software and all, with delivery within 60 days after order. And you don't even have to buy the Corning 904, we'll lease it to you.

Want to know even more about our new terminal than this long ad was able to tell? Then go ahead and write for full details to: Corning Data Systems, 3900 Electronics Drive, Raleigh, North Carolina 27602. Or call (919) 876-1100. If you're a time sharing user, we'll help you make your time more worthwhile. In fact, just by reading this you already have. **CORNING** DATA SYSTEMS



CIRCLE 18 ON READER CARD

A computerized coin return for your corporate telephone.

You can cut way back on your communications costs with data communications systems using Honeywell Series 16, Series 32, and H112 computers.

For a time-sharing service bureau, Honeywell message concentration systems are slashing telephone line lease costs.

For a huge airline's reservation system, Honeywell computers are cutting terminal response time by 30%.

Many other businesses are using Honeywell computers for communications economy, efficiency, and control.

An inventory control organization, for example. And a credit verification business. And an on-line business management service.

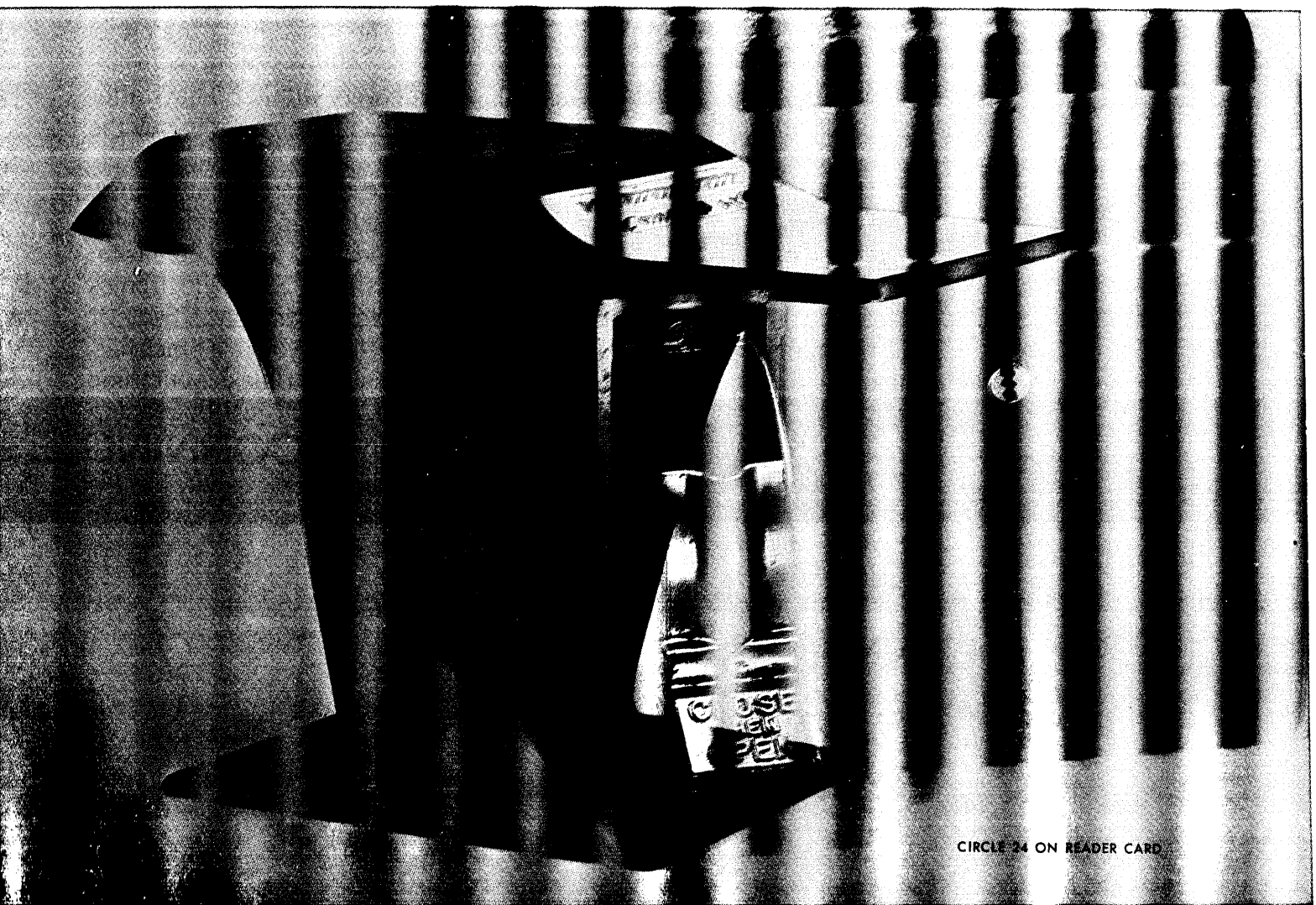
Maybe your company could reduce communications costs, too. With Honeywell data concentration systems. Store and forward message switching systems. Terminal control systems. Or time-sharing systems.

There's one sure way to find out. Write for our new communications capabilities brochure. So you can consider the alternative: Honeywell, Computer Control Division, Framingham, Massachusetts 01701.

The Other Computer Company:

Honeywell

HONEYWELL INTERNATIONAL—Sales and Service offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, U.K. and U.S.A.



CIRCLE 24 ON READER CARD

digital frequency modulation approach that reduces over-sampling penalties of conventional time division multiplexing systems. Also discussed will be a novel form of random-access radio communications developed for use within the Aloha System. It is claimed this access method provides advantages of radio communications over conventional wire communications for interactive users of a large computer system.

A further issue planned for discussion is the implementation of computer-controlled communication networks through which data processing computers communicate. This includes both the hardware configuration and software system for computer-controlled communication, and the firmware structure and software support for the data processing computer that uses this communication network. It also includes the code convention required to facilitate the communication between data processing computers.

Still another issue to be discussed relates to interfacing the population of peripheral devices to computer networks. The development of peripheral devices appears to proceed in two distinct directions: "simplest" lowest-cost devices and "intelligent" sophisticated devices using minicomputer systems. There also appear to be several methods emerging for interconnecting such devices to a data processing computer. The usual method interconnects the devices individually to the computer system; another promising method interfaces the devices through a computer controlled loop multiplexor facility.

The growing interdependence of computers and communications has not only broadened the market potential for telecommunication equipment but has posed several important public policy issues as well. These issues will be explored in detail as to the relationship between the telecommunications equipment market and the U.S. telecommunication policy.

—Reg. A. Kaenel
Bell Telephone Labs
Session Chairman

Papers:

Digital Frequency Modulation as a Technique for Improving Telemetry Sampling Bandwidth Utilization, by G. E. Heyliger, Martin Marietta Corp.

The Aloha System—Another Alternative for Computer Communications, by N. Bramson, Information Sciences Program, Univ. of Hawaii.

The Telecommunication Equipment

If you don't think pictures are the best way to communicate, go home and watch your radio.

No, we don't make TV sets. We make Interactive Graphic Terminals. One big difference? You can talk back to our terminal. Directly. Right on the screen itself using a light-pen, keyboard or a number of accessories. And, most important, any computer can talk to it too. (That's right, *any* computer.) To a computer, our terminal is a high-speed peripheral. To more and more computer owners, it's a fast, economical way to visualize problems in process control, NC programming, computer-aided design and simulation. The price? $19,800 with OEM discounts available. We think we have the best price/performance ratio you can get. Make us prove it to you.

Right now we have interfaces for these computers. CDC 1700; DIGITAL SCIENTIFIC META™ 4; HP2114B, 2115A, 2116B; REDCOR RC 70, RC 77; VARIAN 620/i. If you don't see yours, contact us . . . chances are we're working on it.

VECTOR GENERAL

8399 Topanga Canyon Blvd., Canoga Park, Calif. 91304,
Phone (213) 346-3410

CIRCLE 58 ON READER CARD

Market: Public Policy and the 1970s, by Prof. M. R. Irwin, Whittemore School of Business and Economics, Univ. of New Hampshire.
Communication Based Data Processing in the 1970s, by F. N. Trapnell, T. C. Hudson Assoc., London.
Computer Networks and the Common Carrier, by J. W. O'Byrne, MCA.
Communications Control Systems, by A. E. Lewis, Comcet.
Communication Software Organization, by W. A. Levy, Informatics.
Panelists:
W. N. Vaughn, AT&T.
S. Levine, Bunker Ramo Corp.
F. N. Trapnell, T. C. Hudson Assoc.
J. W. O'Byrne, MCA.
H. S. McDonald, Bell Telphone Labs.
C. B. Newport, Honeywell.
N. Gorchow, Univac.
F. E. Heart, BB&N.
C. R. Blair, IBM.
A. E. Lewis, Comcet.
W. A. Levy, Informatics.

(11) COMPUTER AIDED DESIGN

Although the science fiction concept of robot computers designing other computers has dimmed, computer aided design has steadily grown in stature within the engineering community. Today, foreshortened design schedules and the increasing complexity of new engineering technologies have elevated computer aids to the position of an indispensable necessity. Two areas of high current interest are the organization of design aids software through the use of computer aided design systems and the application of interactive graphics to the machine aids field.

—J. D. Baum
Hughes Aircraft Company
Session Chairman

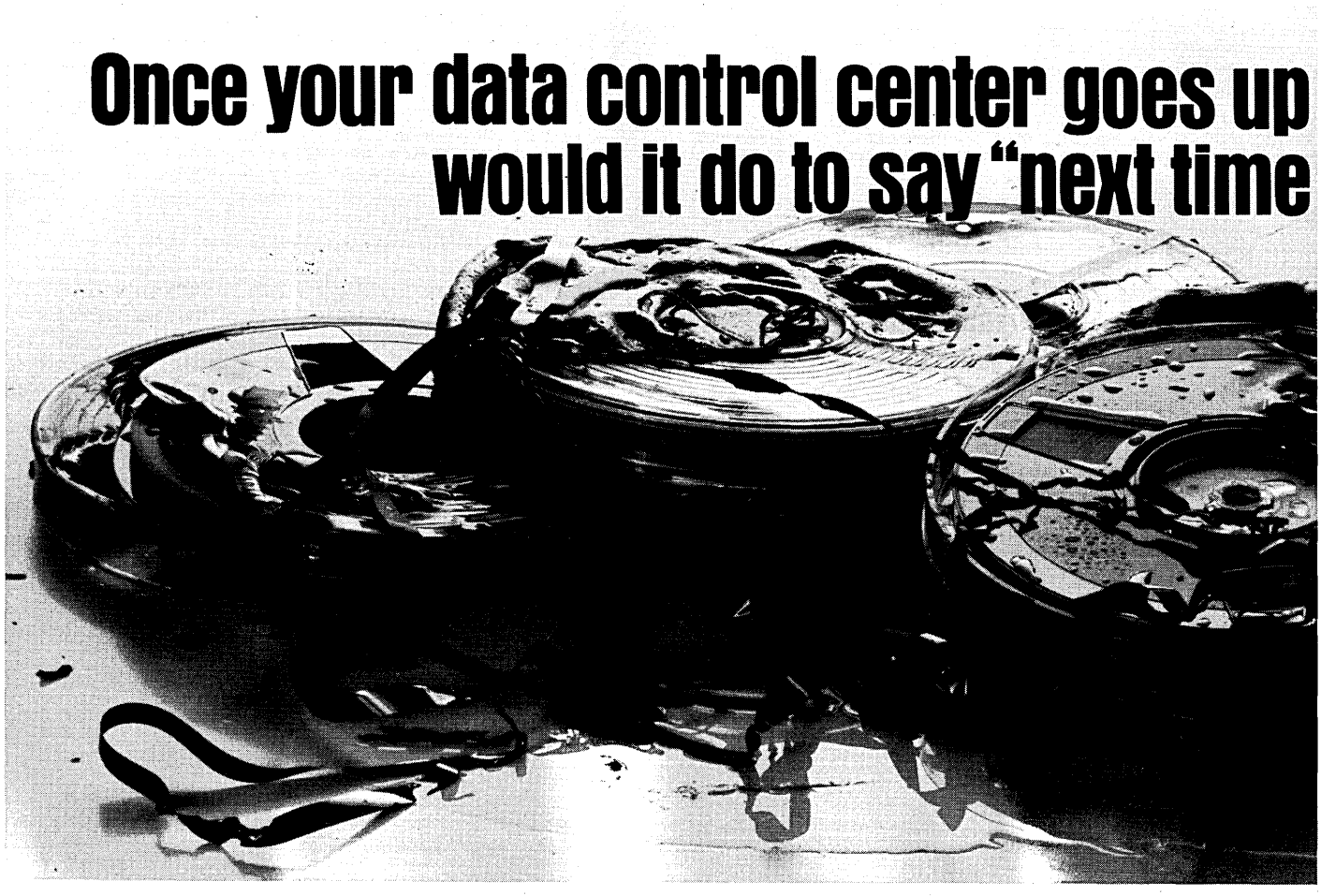
Papers:
Computer Aided System Design, by Peter Bryant et al., IBM Advanced Systems Development Laboratory.
Integrated Computer Aided Design Systems, by Roger C. Hurst, North American Rockwell and Allen B. Rosenstein, UCLA.
Interactive Graphic Consoles: Environment and Software, by Robert L. Beckermeyer, General Motors Research Laboratory.

(12) INTERFACING COMPUTERS AND EDUCATION

Computers are one aspect of an expanding technology that is destined to have a significant impact upon the educational process. To bring about any universal modification in education there must be effective communication and interaction between computer specialists, subject material specialists, educators, school administrators, and public officials. This will not be a simple task because we must face such problems as language barriers, ill-defined or changing objectives, special interest groups, and inadequate methods of evaluation of new methods and programs. The papers presented at this session will focus attention on these problems in the context of computer applications in three diverse areas: training computer programmers from disadvantaged backgrounds, teaching the "art" of computer design to university students, and remediation of mathematical deficiencies of deaf students. The objectives of the programs and how the authors solved their problems will provide a background for group discussion after the formal presentations.

—Dr. Adolph I. Katz
Rutgers Univ.
Session Chairman

Papers:
A Unique Project in Computer Assisted Mathematics, by Rolfe H. Newton, CAI Section, National Technical Institute for the Deaf.
Technical Digital System Design with a Minicomputer, by Prof. Marvin S. Woodfill, Arizona State Univ.
Computer Jobs Through Training (A



Project Report), by Dr. M. Granger Morgan, Univ. of California, San Diego.

(14) SURVEY OF TIME SHARING SYSTEMS

Time sharing has been around for a long time now, and we assume an audience that is aware of the general characteristics of such systems. Most of the audience in the fall of 1970 will have had some experience on one or more such systems and the session is directed toward such an audience. It will start with four brief presentations. Following these, all participants and the chairman will participate as panelists.

—Saul Rosen
Purdue Univ.
Session Chairman

Papers:
Technical and Human Engineering Problems in Connecting Terminals to a Time Sharing System, by J. F. Ossanna, Bell Telephone Labs and J. H. Seltzer, MIT.
Properties of General Purpose Time Sharing Systems and Their Relevance to On-Line Applications, by Daniel S. Diamond and Lee L. Selwyn, Harvard Institute for Social Aspects of Technology.
The Case for Large Scale General Purpose Time Sharing Systems, Professor Bernard A. Galler, Univ. of Michigan.
A Distributed Time Sharing System, by Thomas C. O'Sullivan, Raytheon Corp.

(15) HYBRID SYSTEMS

Papers:
Multi-Programming in a Medium Sized Hybrid Environment, by W. R. Dodds, Bell Helicopter Co.
Binary Floating Point Digital Differential Analyzer, by James L. Eishoff, Pennsylvania State Univ.
Electronic Patching for the Ad4 Hybrid Computer, by Dr. Robert M. Howe, Univ. of Michigan.

(16) SIMULATION LANGUAGES AND SYSTEMS

Papers:
Simulation of a New Wave Form Analysis/Simulation, by John Markel, Computer Research Lab., Univ. of California, Santa Barbara.
Simcon — An Advancement in the Simulation of Physical Systems, by Barry E. Tossman, Johns Hopkins Univ., Applied Physics Lab.
Communication System Simulation Language, by Richard L. Granger, Communications Satellite Corp.
Cyberlogic—A New Concept in Computer Control, by George R. Trimble, Jr., Penta Computer Associates, Inc.
Model for Traffic Simulation and a Language, by Dr. Baxter F. Womack, Univ. of Texas at Austin.

(17) ART, VICE, AND GAMES

From its birth, the digital computer has been consigned to the mundane tasks of number crunching and data manipulation. The computer has generated, at fantastic speeds, immense volumes of data which are very exciting to the computer, but of little interest to humans. This session examines the work of those few enterprising people who have used the computer for purposes normally performed by humans and, therefore, of more immediate interest to humans.

Would you like to define simple cross sections, then massage and manipulate them until you produce an abstract sculpture?

Would you like a bridge partner who never forgets your bidding conventions, never complains about your bad bids or gets upset at your criticism, and never gets distracted by the blonde at the next table?

Do you think the mistakes in your charge accounts and bank statements are due to computer errors? Did you know that some programmers have found easy ways to supplement their incomes—until they were caught?

(Continued on page 75)

in flames, what good we'll install Fenwal?"

The time to prevent the loss of invaluable records or the ability to process data is now. Today. Before a fire wipes out your computer, payrolls, production control or customer orders.

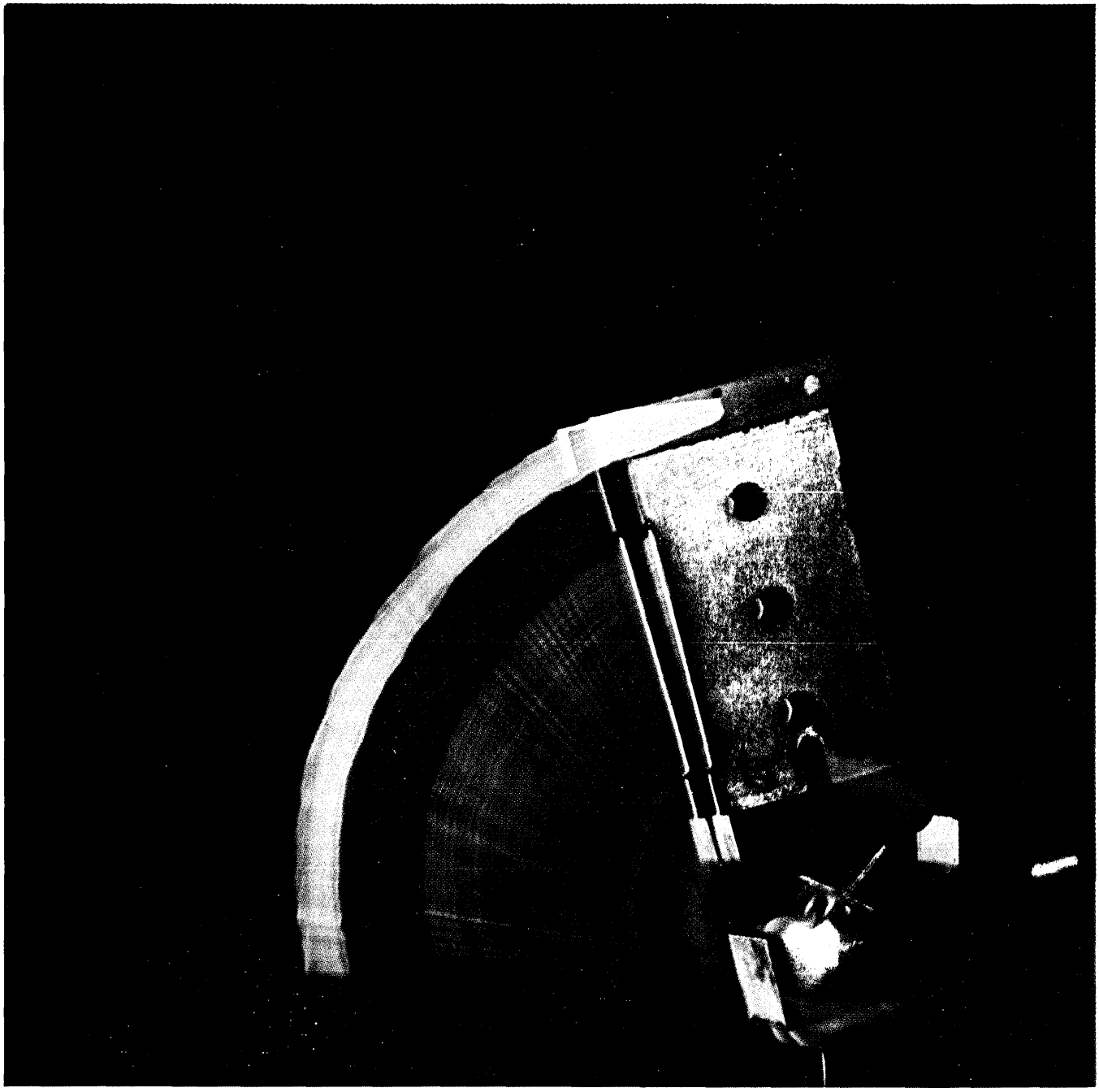
A Fenwal Fire Suppression System prevents just that. Fenwal, the only producer of explosion suppression systems, uses the same high speed technologies to extinguish fires instantly, safely and cleanly.

Using a variety of sensors, a Fenwal Fire Suppression System can detect and extinguish fires long before other systems begin to react to the flames! Instantly, chemical suppressants knock out the blaze without endangering personnel or causing equipment shutdown. Downtime is eliminated, equipment left clean, your records intact, because the entire area is left dry.

Isn't it time you called in Fenwal to look over your plant? Write today for Fenwal brochure "Engineered High Speed Fire Protection Systems." Fenwal Incorporated, Main Street, Ashland, Mass. 01721.

Fenwal®

CIRCLE 35 ON READER CARD



This is the print hammer that clobbers our competition.

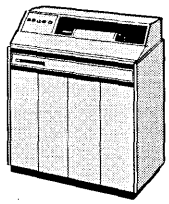
This Mark IV print hammer of ours stands just a little over two inches tall. But it gives our printers the edge in speed, print quality and legibility. We designed the one-piece Mark IV to come out with the straightest, cleanest line in the industry. It does. Of course, mastery of the hammer is only part of our printer story. But it demonstrates our unique ability to anticipate the needs of the EDP market. Big printers. Mini printers. Military printers. We make them all. Our unique friction-free hammers—the Mark I, Mark II and Mark IV—make them better. You could say that our little hammers pack a mighty wallop. Our competitors do. Want to see what else gives our printers the edge? Call the office nearest you, and ask for the details.

DATA PRODUCTS technology gives your computer the edge

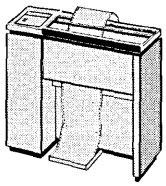
DATA PRODUCTS
OEM marketing 16055 Ventura Blvd., Suite 419, Encino, California 91316

Acton, Massachusetts (617) 263-3961; Bethesda, Maryland (301) 652-8120; Cherry Hill, New Jersey (609) 667-7555; Dallas, Texas (214) 231-2240; Detroit, Michigan (313) 354-5858; Los Altos, California (415) 941-5485; Los Angeles, California (213) 981-9600; Melbourne, Florida (305) 723-0720; Minneapolis, Minnesota (612) 927-8747; Amsterdam, The Netherlands 020-156-297; London, England 01-579-2917; Vienna, Austria 34 53 61, 34 44 16

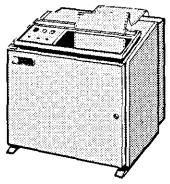
Our complete line of printers...



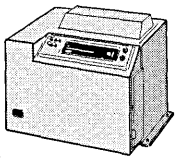
Series 4000 Line Printers
3 models provide speeds of 300, 600, and 1000 lpm. The key to quality EDP, OCR, and letter writing systems.



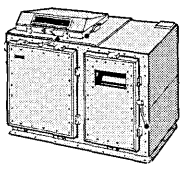
2410 Line Printer
The perfect printer for small to medium-size computers and batch terminals. The ultra-reliable Mk IV hammer and high speed drum provide adaptive print speeds of 256 to 1110 lpm for a full 64 characters.



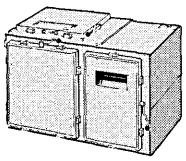
2310 Line Printer
The desk top mini-printer... a high performance, low cost "must" for mini-computers and data terminals. Time shared electronics and the Mk III hammer provide print speeds that vary from 356 to 1110 lpm.



2910 Military Line Printer
A full MIL spec (MIL-E-16400) high speed printer. Shock and vibration-proof, operates in temperatures from 0° to +50°C. Speeds from 356 to 1110 lpm with Mk IV hammer. Desk top design allows top and front access.



4910 Military Line Printer
Meets RFI MIL-I-16910 specs, operates at 0° to +50°C. Vibration-proof 600 lpm performance. Best used where electro-magnetic interference must be eliminated.



RO-280/UYK Military Line Printer
Proven on land and shipboard. 3 Navy computer interfaces. Prints 1000 lpm in variable formats. Performs a complete self test.

DATA PRODUCTS technology gives your computer the edge

DATA PRODUCTS
OEM marketing

16055 Ventura Blvd., Suite 419
Encino, California 91316

FJCC Sessions . . .

The Art, Vice, and Games Session will examine some unusual uses of digital computers and will stimulate the computer professional to look at the potential of computers in a different light.

—Ray Wallace
Lockheed Electronics Company
Session Chairman

Papers:
Music in Computing: A Gathering Force, by A. J. Gabura, Univ. of Toronto.
TRAN2: A Computer Graphics Program to Generate Sculpture, by Robert Mallery, Univ. of Massachusetts.
Computer Crime, by Dennie Van Tassel, Univ. of California.
Realization of a Skillful Bridge Bidding Program, by Anthony I. Wasserman, Univ. of Wisconsin.

(18) COMPUTERS AND MANUFACTURING

The 1970s will see extensive introduction of computers into manufacturing processes of all kinds. The rapidly diminishing cost of memory, computation and control power makes the application of small computers (with or without centralized "host" computer) an economical necessity for any large-volume, complex manufacturing process.

The two papers of this session report on two computerizations of electronic manufacturing. At IBM, a satellite/central computer complex is employed in a variety of configurations to provide efficient implementation of instruction, actuation, recording, and analysis for five basic process categories. This generalized approach provides for ready satellite programming at the engineer level with sophisticated centralized support. The system is interconnected by a unique high-speed channel.

The second paper gives an in-depth analysis of computer utilization and capability in automating device testing and adjustment to sophisticated performance specifications.

The session is expected to attract vigorous audience participation on the separation of the real (practical) from the ideal in the application of computers in many different manufacturing situations.

—Dr. Karl Hinrichs
Lockheed Electronics Co.
Session Chairman

Papers:
Manufacturing Process Control at IBM, by James E. Stuehler, IBM Corp., Systems Manufacturing Div.
Extending Computer-Aided Design into Manufacture, by Lawrence A. O'Neill, Bell Telephone Labs.

(19) EFFECT OF GOVERNMENT CONTROLS IN THE COMPUTING INDUSTRY

Automata theory is often considered to be highly esoteric and devoid of practical application. This session counters that view by presenting three papers showing the utility of the theory in modeling data communications systems and in detecting errors in such systems.

—Robert R. Korfhage
Southern Methodist Univ.
Session Chairman

Papers:
Coding/Decoding for Data Compression and Error Control on Space Communication Links Using Digital Computers, by Dr. Harvey M. Gates, Clarkson College of Technology.
A Strategy for Detecting Faults in Sequential Machines Not Possessing Distinguishing Sequences, by Daniel E. Farmer, Clarkson College of Technology.
Finite State Automation Definition of Data Communication Line Central Procedures, by Dines Bjorner, IBM Corp.

(20) COMPUTATIONAL EFFICIENCY AND PERFORMANCE

Papers:
Minimizing Computing Cost for the Solution of Certain Scientific Problems, by Paul B. Crawford, Texas A&M Univ.
Analytical Techniques for the Statistical Evaluation of Program Running Times, by Dr. Boris Beizer, Data Systems Analysis, Inc.
Instrumenting Computer Systems and Their Programs, by Bertran Bussell, UCLA.

(21) LONG RANGE GOALS OF PROGRAMMING LANGUAGES

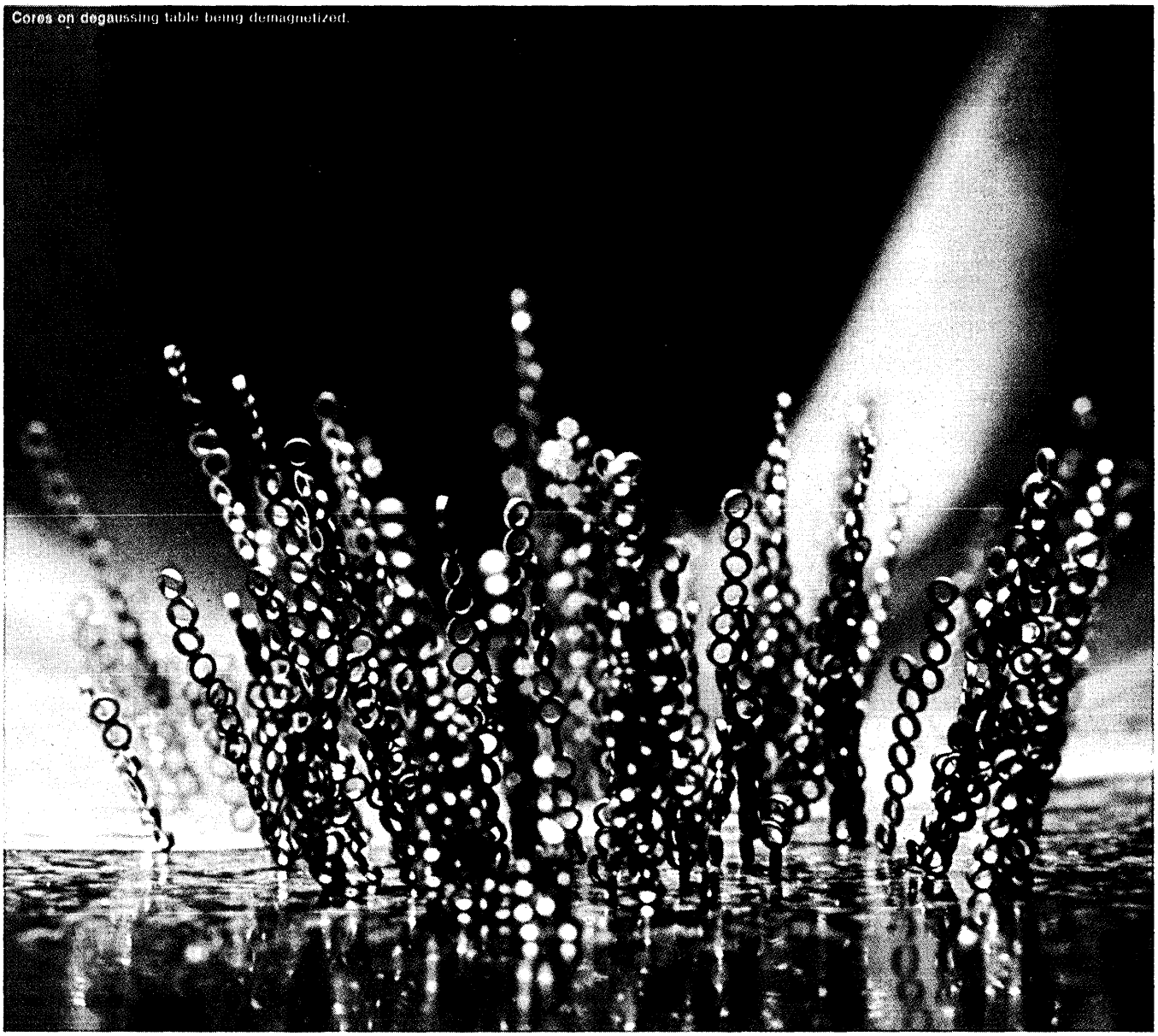
Panelists:
Thomas E. Cheatham, Jr., Computer Associates, Inc.
Jean E. Sammet, IBM.
Thomas B. Steel Jr., consultant.
Peter Wegner, Brown Univ.

(22) EFFECT OF GOVERNMENT REQUIREMENTS IN THE COMPUTING INDUSTRY

Panelists:
Rep. Jack Brooks, Beaumont, Texas.
Dr. Herbert R. J. Grosch, National Bureau of Standards.
Joseph F. Cunningham, Office of Management and Budget, Washington, D.C.

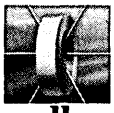
(23) TEXT PROCESSING

Both time sharing and the application of computers to text handling had an initial struggle for recognition as important areas in the computer field. Both are now being seen as ever more valuable properties, and this session will bring them together for appraisal. Two of the papers are concerned with time-shared, special-purpose information organization and retrieval applications, and the



Cores on degaussing table being demagnetized.

The reason our core memories are in big demand is a small matter.



The small matter.

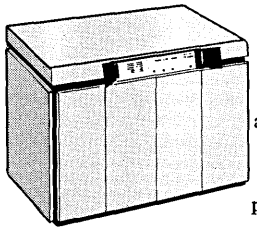
A core memory system is only as reliable as the cores that go into it. When you make 20-million-bit mass memories like our Large Core Store (LCS), you need the highest reliability. So we've invented an exclusive way of making cores uniform in quality, density and size. We have a way of testing every core for mechanical and electrical reliability before it's strung. Quality control all the way. All the way from cores to stacks, and from intermediate systems to the LCS (20,000,000 cores worth of quality...that's no small matter). We'll make a compatible memory for any system you have, or any you have on the board. One with built-in economies. We specialize in specials, so buy only as much memory as you need. Just make your demands.

DATA PRODUCTS technology gives your computer the edge

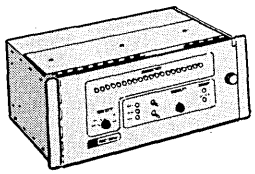
DATA PRODUCTS
OEM marketing 16055 Ventura Blvd., Suite 419, Encino, California 91316

Acton, Massachusetts (617) 263-3961; Bethesda, Maryland (301) 652-8120; Cherry Hill, New Jersey (609) 667-7555; Dallas, Texas (214) 231-2240; Detroit, Michigan (313) 354-5858; Los Altos, California (415) 941-5485; Los Angeles, California (213) 981-9600; Melbourne, Florida (305) 723-0720; Minneapolis, Minnesota (612) 927-8747; Amsterdam, The Netherlands 020-156-297; London, England 01-579-2917; Vienna, Austria 34 53 61, 34 44 16

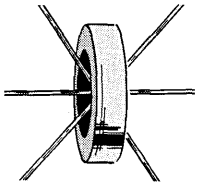
Our core memory systems...



CM 1700 Large Core Store – An advanced high-speed random access mass memory providing up to 20 million bits in either 40 or 80 bit configurations. A 2-wire, 2½D system with 2.0 microsecond cycle time; 1.25 microsecond access time.



Store/33 – Buy only as much memory as you need: 4K x 6 to 16K x 24. A flexible plug-in system with a full choice of cycle times. Built for easy maintenance and field expansion, with 2½D cycle times at 3D cost.



Ferrite Memory Cores – Our exclusive process gives you uniform quality at a greatly reduced price (as little as $2.50/K). Cores are cookie-cut from continuous ferro-plastic tape. A full range of diameters and electrical characteristics.

Remember them for speed and reliability. And for the matter of quality.

DATA PRODUCTS technology gives your computer the edge

DATA PRODUCTS
OEM marketing

16055 Ventura Blvd., Suite 419
Encino, California 91316

FJCC Sessions . . .

third with producing typeset output in a time-shared environment. All promise greater flexibility for these applications than has previously been possible in batch mode.

—Sally Yeates Sedelow
Univ. of Kansas
Session Chairman

Papers:
Shoebox: A Personal File Handling System for Textual Data, by R. S. Glantz, The MITRE Corp.
HELP: A Question Answering System, by Roger Roberts, Univ. of California, Berkeley.
CYPHERTEXT: An Extensible Composing and Typesetting Language, by Charles G. Moore and Ronald P. Mann, The Cyphernetics Corp.
Discussant:
Martin Dillon, Univ. of North Carolina.

(24) COMMUNICATIONS AND ON-LINE SYSTEMS

The paper of Malia and Dickson provides a good overview and survey of management problems during design and implementation of real-time systems. The paper considers the technical and behavioral aspects that concern the user, the manager and the computer manufacturer.

An excellent characterization of real-time computing as an element of managerial decision making is provided by Prokop and Brooks. They show the beneficial effects achieved by the use of computer-driven displays in inventory control applications. The experience of the USC Shock Research Unit in developing a real-time patient monitoring system is highlighted in two papers. One paper considers the software requirements, the design processes and final implementation of the complex patient monitoring and patient file system. The other paper describes a specific application package in this system, namely, the continuous measurements and statistical evaluation of patient data and the alarm generation. The discussion is thorough and very instructive.

Clancy, in his paper, describes the development of a high level language and facilities for task scheduling, storage management and control provided by ECAM in OS/360. The paper emphasizes the software problems and methods particular to a telecommunications environment. Methods which permit direct communications between main memory and the disc controller are described by Spencer. Techniques of obtaining maximum utilization of disc memory are outlined and the results of extensive simulations are lucidly presented.

A panel of distinguished authorities will provide commentaries on relevant issues raised in the papers.

—C. V. Ramoorthy
Univ. of Texas
Session Chairman

Papers:
Management Problems Unique to On-Line Real-Time Systems, by T. C. Malia, IBM and G. W. Dickson, Univ. of Minnesota.
Decision Making With Computer Graphics in an Inventory Control Environment, by J. S. Prokop, Department of Defense, and F. P. Brooks, Jr., Univ. of North Carolina.
Programming in the Medical Real-Time Environment, by N. A. Palley, D. H. Drbeck and J. A. Trotter, Jr., Univ. of Southern California.
Concurrent Statistical Evaluation During Patient Monitoring, by S. T. Sacks, N. A. Palley and H. Shubin, Univ. of Southern California and A. A. Afifi, UCLA.
ECAM-Extended Communication Access Method for OS/360, by G. J. Clancy, Jr., Programming Sciences Corp.
Integration of Rapid Access Disc Memories Into Real-Time Processors, by R. G. Spencer, Bell Laboratories.
Panelists:
Prof. James Browne, Univ. of Texas.
R. Douglas Hunter, Interactive Data Systems.
Dr. George Ludwig, NASA.
Dr. Richard Merwin, Department of Defense.
S. S. Yau, Northwestern Univ.

(25) SELECTED COMPUTER SYSTEMS ARCHITECTURE

Papers:
Associative Capabilities for Mass Storage Through Array Organization, by Arnold M. Peskin, Brookhaven National Laboratories.
Interrupt Processing With Queued Content Addressable Memory, by Jerry D. Erwin, Recognition Equipment Corp.
A Language Oriented Computer Design, by Dr. Clay McFarland, Southern Methodist Univ.

(26) ANALOG/HYBRID COMPUTATION: WHAT IT WAS, WHAT IT IS, WHAT IT MAY BE!

After presentation of the review paper, the panelists will engage in what is hoped will be a lively discussion of the many future paths that may be taken by the analog/hybrid field, especially in the light of their own predictions of future hardware/software developments.

—Arthur I. Rubin
Electronic Associates, Inc.
Session Chairman

Paper:
Hybrid Computation—What It Was, What It Is, What It May Be, by Arthur I. Rubin.
Panelists:
Dr. Granino Korn, Univ. of Arizona.
Dr. Robert Howe, Univ. of Michigan.
Jack Mauceri, North American Rockwell.
Ray Lawrence, NASA, Huntsville.
Dr. Anthony Frederickson, Electronic Associates, Inc. ■

IMLACは萬能選手です.

(wears many hats)

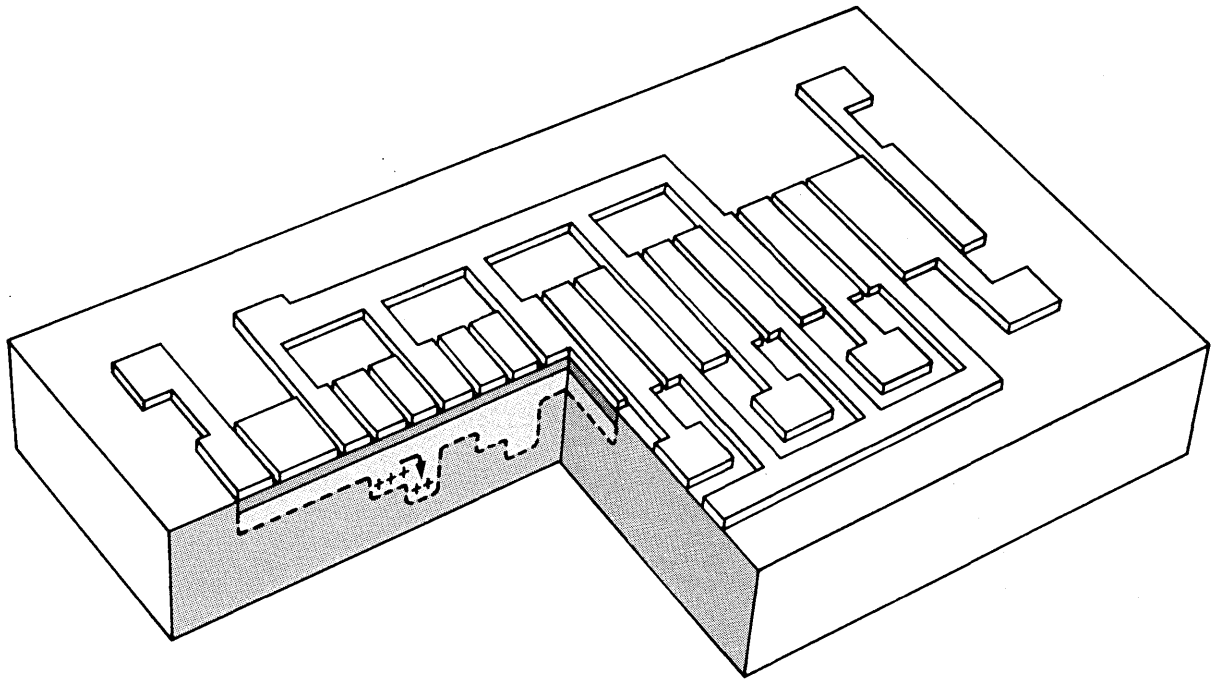
Take off your hat to IMLAC: the terminal display computer with creative capability. If your language is beyond alpha-numerics, you can design your own characters from the keyboard — without programming. You can send, receive, animate, edit and store symbols. Language is just one of IMLAC's research and design applications. Its graphic ability qualifies it for unlimited academic and industrial potential.

For around $10,000 our lexicographer performs most functions of systems costing four times as much. So if you have a spare fez or turban, and need some help with your language — hang your hat on IMLAC. Soon it will speak your language better than you.

IMLAC
PDS-1
DISPLAY
COMPUTER

Write for information.

IMLAC CORPORATION 296 NEWTON STREET, WALTHAM, MASSACHUSETTS 02154 TEL. 617/891-1600



Functional device without junctions

A junctionless semiconductor device that performs complete circuit functions has been invented by Bell Labs scientists Willard Boyle and George Smith. It may replace complex integrated circuits for information storage and other processing.

The new device consists of a layer of semiconductor (silicon) covered by a layer of insulation (silicon dioxide), with a row of closely spaced metal plates on top of the insulation. It operates much like an array of capacitors passing a stored charge—representing a binary information bit—from one capacitor to the next.

If all plates are held at a small negative voltage, the charge (holes) will remain stationary . . . stored in so-called "potential wells" below the plates. If, now, a stronger negative pulse is applied to a plate adjacent to one under which charge is stored, the charge will "spill over" into the deeper potential well thus produced (figure). So, charges can be shifted, plate by plate, along the surface of the semiconductor.

One use is as a shift register. Holes may be created at one end, moved along the semiconductor surface, and detected (read out) at the other end. Charge can be detected through the capacitance change it causes when present under a plate. The basic shift register may be used as part of a recirculating memory or as a delay line.

The new device can also convert images to electrical signals. By projection through a narrow slit, one horizontal strip of the image is focused on the semiconductor. Beneath each plate, this produces charge proportional to brightness. The shifted-out charge stream is an analog of that strip. Successive strips compose a complete image.

The first device was made of silicon. But since junctions are not needed, devices can be made from many semiconductors.

The device is so new that we haven't explored all possible applications. But its simplicity promises high reliability. And the comparatively few steps required to make it will keep costs low. We expect it to have considerable impact on telephony and on other high-volume information systems.

From the Research and Development Unit of the Bell System:

Bell Labs

The stalled printout on the left came from a computer trying to compute and handle a heavy print load at the same time.

On the right, the very same printout is handled off-line by DataPrint.™

An obvious improvement.

DataPrint can do the same for your growing print load. And for far less money than other so-called solutions—like loading up your present system, or using a second-generation computer exclusively for printing.

DataPrint's computer is what makes the system so economical. It's small, easy to program, and designed only for output.

It accepts raw data from magnetic tape and disk. Formats, edits, and further processes it. And drives the best printer you can get—the IBM 1403.

So let your main computer do what it was meant to do. Compute.

And handle your heavy print load with DataPrint. Our latest breakthrough.

CMC

Computer Machinery Corporation

2231 Barrington Avenue, Los Angeles, California 90064 • New York • Washington • Chicago • Detroit • Dallas • San Francisco • Boston • Philadelphia • London • Paris

CIRCLE 40 ON READER CARD

SIDS Symposium

Information Display, Evolution and Advances (IDEA) was the theme of the Society for Information Display's 11th National Symposium held May 26-28 at the New York Statler Hilton. This symposium brought together information display experts from all over the world to participate; papers ranged from matrix displays to projection displays, and from image processing to complete display systems.

In the keynote address, Dr. D. H. Alpert, dean of the Graduate College of the Univ. of Illinois, described the evolution of the PLATO system (Programmed Logic for Automatic Teaching Operations), under development at the Univ. of Illinois for the past 10 years. Its goal is to provide a computer-based education system that will increase the productivity of the educational process.

According to Dr. Alpert, the PLATO program is presently in its third phase of a succession of increasingly sophisticated computer-assisted instruction systems. In one part of the PLATO III work, software-controlled programmed learning techniques were evolved. Another part of the PLATO III development has been the use of the plasma display panel as a computer data output device. The goal for PLATO IV is a computer-based education system using 4,000 student consoles.

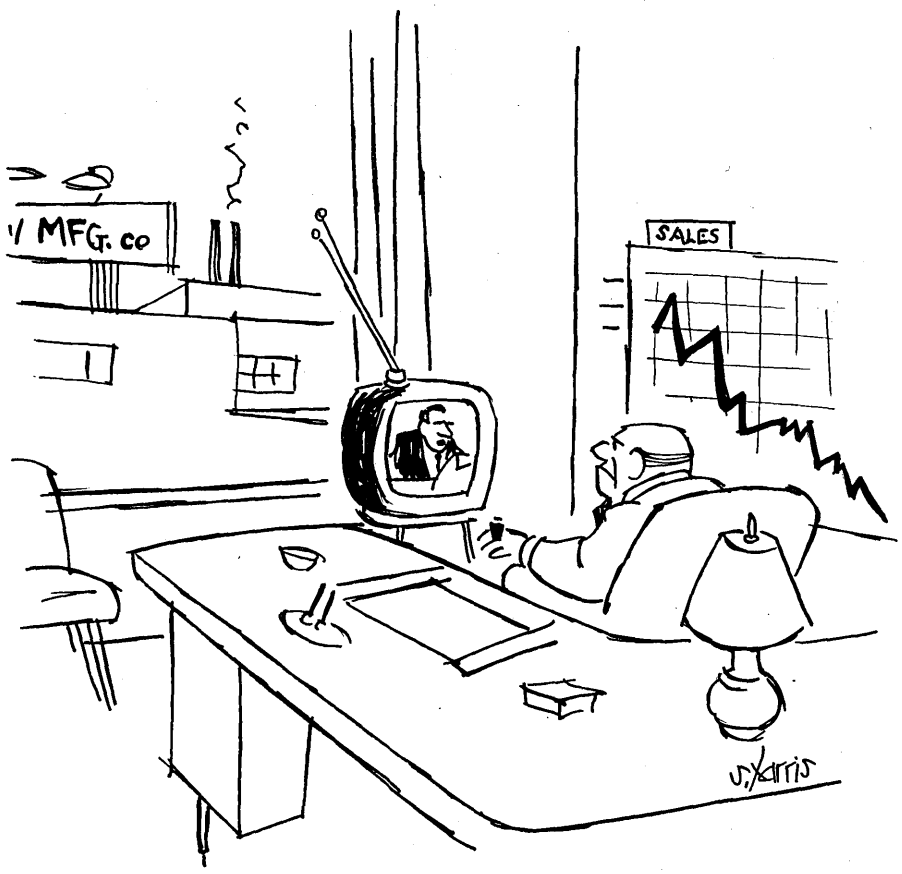
Dr. Alpert said that the student console for PLATO IV will provide graphic display capability with local storage of electronic computer- or student-generated data. Along with the electronic data, provisions will be made for the superposition of up to 256 colored photographic images derived from microform cards. A new feature for PLATO IV will be an audio technique for reading material into PLATO.

Cost target for each of the PLATO IV student consoles is $1800. This does not include the audio system, but does include a 500 x 500 element plasma display panel and a random access photographic image projector. The console will operate in a time-shared mode and will interface with a CDC 6400 cpu via telephone lines. Target date for the implementation of a 200-console PLATO IV system is July 1972.

Picturephones

Luncheon speakers included Dr. G. C. Dacey of Bell Telephone Laboratories and T. H. Nelson of the Nelson Organization, Inc. Dr. Dacey described and demonstrated the use of the Picturephone in an interactive display mode. Using a pushbutton telephone keyboard, Dr. Dacey was able to communicate with a computer at Bell Labs in Holmdel, N.J. Alphanumeric replies were received on a Picturephone set at the Statler-Hilton, with the same data projected on a large screen display. Mr. Nelson, speaking on "Zapp, Shazam, and Zowie; How I Hope to Eliminate Books in the Computer Age," described a menu-type, programmed learning, software system for use in interactive graphic systems.

Banquet speaker Dr. E. E. Piore, vice president, chief scientist, and a member of the board of directors of IBM, talked on "Science and Engineering in the '70s." After introductory remarks in which he cautioned the display industry to avoid "video pollution," he launched an attack on the anti-r&d attitude in the U.S., reflected in a reduction of funds budgeted for research and development in 1970. Not only is the government reducing r&d money because of the attitude of Congress, but according to Dr. Piore, the attitude

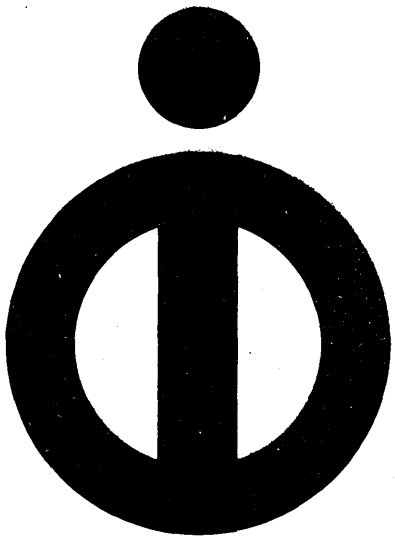


"The Dow-Jones industrial averages are up again today . . . "

© DATAMATION ®

Term-mite

You can see this 20 lb. key-to-cassette video terminal at the FJCC—Booth 3316. It can cut your computer input costs 20, 40 even 60% to pay for itself within a year.



The Term-mite is no bigger than a manual typewriter. No more difficult to operate. It's the first data input device designed to go on any desk. The first data input device priced and manufactured in sufficient quantity to go on every desk.

You can rent the Term-mite for as little as $75 a month. And, we can quote firm delivery dates. You see DID isn't making the Term-mite itself. We've seen too many people in the computer equipment business come up with good ideas and then not be able to deliver. That's why we're having Lear Siegler make the Term-mite for us. This way we know how much it's going to cost us. You know how much it's going to cost you.

If you'd like to learn more about the Term-mite, write DID — **Data Input Devices, Inc.** — Tinkham Industrial Center, Derry, New Hampshire 03038. Or, telephone (603) 434-4551 today.

of young people in this country is also antiscience and antitechnology. These young people, he said, believe our contemporary problems are due to our technological thrust, and that technology, science and engineering are evil. The result of this reversal of attitude toward technology of the 1960s has been a reduction of funds for defense, NASA, and AEC. At the same time, the Department of Housing and Urban Development has more money than it knows what to do with. Dr. Piore said that as a result the U.S. was losing its world leadership in science and technology (e.g., Australia is now assuming the world leadership in radio-astronomy).

Dr. Piore believes that further r&d can help to solve some of our environmental problems. However, this would require the creation of institutions within the government capable of using the creative ability of engineers and scientists. "We of this community have a great deal to contribute, but we have to articulate it and be prepared to use that talent to do the world's work in spite of the pressures that indicate that they are trying to degrade our contributions to society," Dr. Piore concluded.

Four separate panel discussions were held simultaneously on Tuesday evening, May 26. These included: "Will Matrix Displays Replace Cathode Ray Tubes?," "Future Trends in Large Screen Projection Displays," "Color Displays," and "Human Factors: Hard Copy vs. Soft Copy, Keyboards vs. Graphical Input Devices."

Matrix displays

The panel on matrix displays was moderated by Dr. J. J. Brandinger of RCA Laboratories and included representatives from GE, RCA, Univ. of Illinois, Litton Industries, Burroughs Corp. and Tektronix. Matrix displays included the plasma panel, light emitting diodes, liquid crystals, and magneto-optic devices. Characteristics of the matrix displays discussed in detail included brightness, contrast ratio, resolution, efficiency, uniformity, panel size, color, and addressing techniques. There was general agreement that flat panel displays will replace crt's, although no one would predict just when.

Dr. G. J. Chafaris of the Electronics Laboratory of GE, Syracuse, moderated the panel on projection displays. Two types of projection displays were covered: a rapid-update static display and a real-time dynamic display. Dr. Chafaris classified the rapid-update static displays as those that project data stored on photographic or special films. In contrast, real-time dynamic displays include those employing projection crt's, lasers, and light valves.

"Color Displays" was moderated by J. L. Hallett of Sylvania, Needham Heights, Mass. The panel discussed new design considerations in color displays. Potential applications, brightness, flicker, and interface requirements were covered. Color generation devices discussed included the shadow mask crt, and current and voltage sensitive beam penetration tubes.

Brown Univ.'s Andries van Dam moderated the human factors panel discussion of the interaction between the computer and its human users. Purpose of the panel was to examine and evaluate the tools available for man-machine communication in an on-line environment.

One question discussed was the tradeoff between hard copy and soft copy. The panel suggested an alternative—a system that normally provides soft copy with the operator having the option of generating a hard copy as the situation warrants.

The first technical session was devoted to matrix displays. Dr. E. E. Loebner of Hewlett-Packard Laboratories described a 32 x 50 element light emitting diode array that was used to present computer data. Research on a matrix addressed ferroelectric bismuth titanate display was discussed by an RCA Laboratories scientist. "Advision," a color mosaic display system using a matrix of fluorescent lamps and driven by a magnetic tape, was described by a member of Matsushita Electric of Japan. A display using ovonic threshold switches for driving a 6 x 16 element electroluminescent panel was disclosed by Energy Conversion Devices, Inc.

Plasma displays was the subject of the next technical session, conducted by H. G. Slottow of the Univ. of Illinois. A member of Fujitsu Laboratories of Japan described the design of a plasma panel using tritium gas to improve response time. Ray Trogdon disclosed a plasma panel transformer addressing technique that has been used at the Univ. of Illinois. Mr. D. J. Schott of Sperry-Phoenix discussed the use of an external electric probe that could be used with a plasma panel for selective writing and erasure. Burroughs Corp.'s G. E. Holz presented a paper on the primed gas discharge cell which is scanned to provide a visual output. Mr. J. VanDerHeyden of Martin Marietta discussed the use of pressure control with a plasma panel in order to reduce addressing problems.

The technical session on projection displays included light valve and light emitting techniques. Light valve tv projection systems were disclosed by both J. A. Van Raalte and D. H. Pritchard of RCA Laboratories. Members of Zenith Radio Corp. discussed a laser color tv system using acousto-optic interaction. An electro-optic modulator was described by J. Schlafer of GT&E, Bayside, N.Y. A "Fixable Photochromic Process" was presented by S. F. La Forgia of USAECOM, Ft. Monmouth, N.J.

Mental holography

A special invited presentation entitled "From Random-Dot Stereograms to 'Mental Holography' " was delivered by Dr. Bela Julesz of Bell Telephone Laboratories. Specially-prepared slides, a special projection screen, and "Polarized" glasses worn by the audience produced stereographic pictures. In one demonstration by Dr. Julesz, a delay of up to 20 seconds was required by members of the audience before they were able to detect a three-dimensional picture.

"Cathode-Ray Devices" was the subject of another technical session. Members of Tektronix described their direct view storage tube and bistable storage tube scan converter. The LITHOCON single-ended, electrical in/out silicon storage tube was discussed by Princeton Electron Products. D. S. Hills and D. H. Brammall of Rank Electronic Tubes of England presented papers on their MONOCON and ceramic cathode ray tubes. A paper was presented by a member of Thomson-CSF of France describing a small oscilloscope tube.

In the technical session on "Digital Image Processing and Display," the following papers were presented: "An Inner-Raster CRT Photo Generator," "A Low-Cost System for Computer Output of Images," "High Resolution Photographic Scanning Quantization and Reproduction With the Laser Image Processing Scanner (LIPS)," "Data Compression for Image Storage and Transmission," "A Model for Legibility Dependence on Spatial Resolution,"

and "Computer Control and Generation of Multi-Dimensional Displays for Investigation and Modeling of Physiological Systems."

Three papers were delivered in the technical session on "Human Factors." These included: "Televised Graphic Displays for Steep-Approach-to-Landing Research," "Electroluminescent Display Legibility Research and Development," and "The Effects of Symbol Generation Method, Slanting, Dot Matrix Size, and Dot Geometry on Legibility."

"Techniques for Character Generation" included the following papers: "A Solid State Target Monoscope" was described by a Raytheon engineer; it uses electron beam diode switching instead of the conventional secondary emission Monoscope tube. Members of Nippon Electric Co. of Japan disclosed a high speed microfilm printer for Chinese characters. C. R. Corpew of Stromberg DatagraphiX described a new CHARACTRON tube providing higher brightness and improved spot-writing capability.

The final technical session was devoted to display systems. Members of the Boeing Co. of Seattle presented a paper on "Generation of Group Display From Digital TV Format in Near Real Time." A method that can be used to generate and display high-quality alphanumerics on a crt was described by two members of MIT. A facsimile optical printer using a linear array of liquid crystals was disclosed by J. Tults of RCA Laboratories. Mr. R. F. O'Keefe of Pitney-Bowes discussed fluid logic and display devices. "A High-Resolution FPS (Focus Projection and Scanning) Television Camera for Special Applications" was the title of the talk by M. L. Noble of GE-Syracuse. The Alphecon storage tube was described by members of RCA Laboratories. In the final paper, David Rutland of Spatial Data Systems discussed a color television display using a magnetic disc memory.

Total attendance for the three-day symposium was more than 1,000; not bad considering the present economic situation. A Digest of Papers is available by writing to: SID Digest, Society for Information Display, 654 N. Sepulveda Blvd., Los Angeles, Calif. 90049. Price of the digest is $10 to SID members and $15 to nonmembers. Payment should be in check or money order; no billings will be made.

—Samuel Davis

This announcement is neither an offer to sell nor a solicitation of an offer to buy these securities. The offer is made only by the Prospectus.

500,000 Shares

Digital Equipment Corporation

Common Stock
(Par Value $1)

Price $76.50 per Share

Copies of the Prospectus may be obtained in any State only from such of the several Underwriters, including the undersigned, as may lawfully offer the securities in such State.

Lehman Brothers

Blyth & Co., Inc.	Drexel Harriman Ripley Incorporated	duPont Glore Forgan Incorporated
Eastman Dillon, Union Securities & Co.		Goldman, Sachs & Co.
Hornblower & Weeks-Hemphill, Noyes		W. E. Hutton & Co.
Lazard Frères & Co.	Paine, Webber, Jackson & Curtis	Smith, Barney & Co. Incorporated
White, Weld & Co.	Dean Witter & Co. Incorporated	Bache & Co. Incorporated / Paribas Corporation

September 23, 1970.

CIRCLE 15 ON READER CARD

the PlumTree

an outstanding BUSINESS OPPORTUNITY

WHAT IT IS . . . The newest idea yet in giftware shops . . . all wrapped up in the most exciting franchise package of the decade! THE PLUM TREE — an almost limitless array of exotic import gifts from the whole world wide. Arranged in a dazzling spectrum of color and variety. Computer-controlled inventory. Extensive management training. Leasing and location provided by the franchisor.

WHAT IT DOES . . . THE PLUM TREE is brought to you by world famous AAMCO Industries, Inc. with over 500 prospering franchisees. We've proven that success can be made to happen again and again! Customers flock to Plum Tree's prime regional shopping center locations. Then they start looking . . . BROWSING . . . BUYING till your annual gross sales mount six figures high!

WHAT IT CAN DO FOR YOU . . . THE PLUM TREE can earn you a big share of the $2.5 billion giftware industry. With annual sales as much as $300,000 and net profits of about 18%. 12 of our stores in operation are doing it right now. Between now and Christmas 17 more will open.

Get all the facts today! Minimum cash requirement $35,000.

PLUM TREE LOCATIONS AVAILABLE

Cerritos Shopping Center, Los Angeles, Cal.
Merced Mall, Merced, Cal.
Orange Mall, Orange, Cal.
Country Club Plaza, Sacramento, Cal.
Tanforan Park Shopping Center, San Bruno, Cal.
Meriden Square Mall, Meriden, Conn.
Blue Hen Mall, Dover, Del.
Sunshine Mall, Clearwater, Fla.
Westland Mall, Miami, Fla.
Cordova Mall, Pensacola, Fla.
Tallahassee Mall, Tallahassee, Fla.
Columbia Mall, Atlanta, Ga.
Indian Spring Shopping Center, Kansas City, Kans.
Bay State West, Springfield, Mass.
Worcester Center, Worcester, Mass.
North Kent Mall, Grand Rapids, Mich.
Jackson Mall, Jackson, Mich.
Maple Hill Mall, Kalamazoo, Mich.
Nassau Mall, Levittown, N. Y.
Eastview Mall, Rochester, N. Y.
Staten Island Mall, Staten Island, N. Y.
Southern Park Mall, Youngstown, Ohio
Lehigh Valley Mall, Allentown, Pa.
Beaver Valley Mall, Monaco, Pa.
Monroeville Mall, Monroeville, Pa.
Northgate Mall, Chattanooga, Tenn.
Forum 303, Dallas, Tex.
Meyerland Plaza, Houston, Tex.
Tysons Corner Shopping Center, Fairfax, Va.
Cloverleaf Mall, Richmond, Va.

Write, Wire or call collect Area Code (215) 277-4000

THE PLUM TREE, Frank Coleman, Dept. PT 105
408 East Fourth Street, Bridgeport, Pennsylvania 19405

NAME _____ PHONE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

NEWS SCENE

IBM Warily Watches Compatible Competition

IBM would seem comfortably to be weathering the plug-to-plug compatible opposition but certainly is in no position to ignore it.

Recent figures indicate there are between 120,000 and 150,000 IBM mag tape drives installed in the U.S. — against some 6,000 plug-to-plug compatible drives delivered to date by others. A study by Quantum Sciences Corp., now nearing completion, puts IBM deliveries of disc drives at 80,000 model 2311s and 15,000 mod 2314s. And any reading on compatible disc drive installations is obscured by the newness of most suppliers' marketing efforts.

If the extremes of estimations are to be believed, IBM has between 300,000 and 600,000 keypunches under the hands of users. Univac, which thinks the 300,000 figure is more accurate, reports 25,000 of its model 1701 verifier punch (VP) and model 1710 verifier interpreter punch (VIP) have been ordered since introduced in late 1968. About 15,000 of the units have replaced IBM 029s.

The edp operation for the State of Ohio has 48 Telex tape drives and 45 Telex disc drives attached to its eight System/360 computers. And the Navy has contracted for $16 million worth of equipment from five companies that are the front runners in supplying IBM-compatible tape and disc drives.

For the manufacturers it implies a satisfactory present and an optimistic future. The principal commodities are I/O devices, primarily tape and disc drives. Top tape purveyor is Potter Instrument Co. which in a 1969 Diebold Group study had two-thirds of the 3,000 or so units then in operation. Telex is second, and late-starter Ampex is third.

The disc market hierarchy is Memorex, CalComp, and Telex.

Ampex, which will announce a disc drive at the FJCC, puts its tape drive deliveries at about 200 for the six months or so it has been producing the units. It also reports its extended core memory has displaced some 24 of IBM's 2361 large-scale core units.

Telex in its 1970 annual report notes that it holds and has sold a total of $27.85 million worth of lease contracts for tape and disc drives. In the fiscal year ended March 31, CalComp reported $4 million in sales by its Century Data Systems affiliate for its eight-month-old disc drive, prior to the June 30 closing of its fiscal year. It claims a backlog of well over $30 million, although some are not firm commitments.

Memorex, the disc drive mogul, prefers not to enumerate installations or expectations. The less IBM knows, the better for business, is the reasoning.

IBM, all claim, is watching like a hawk. Their conversation also implies that IBM salesmen are running around like chickens trying to keep equipment in operation. While corporate IBM deals with competition by increasing throughput rates and packing densities, and putting out multiperipheral controllers or tucking controllers inside the central processor (see p. 86), salesmen use the persuasion of cuts in second- and third-shift use rates or threats of maintenance difficulties to keep installations IBM-pure.

The independent manufacturers are meeting hardware with hardware and have even become producers of controllers. The customer is, if possible, more mercenary and less scared than the salesman. Unintimidated, they take the "other" peripherals and save money. Timothy Terry, data processing coordinator for the State of Ohio, said the Telex equipment would save $300,000 in rent annually and had resulted in a 15-25% increase in systems throughput. Both points impressed the present administration in Ohio, which is pledged to maintain fiscal integrity. It is election year, and the group that cleared up an $83 million deficit when it took office in 1967 is taking every opportunity to stay in the black.

Lower annual cost and higher throughput are "mathematical truisms" for plug-to-plug compatibles according to A. Alfieri of American Standard Corp., another 360 user. That company is saving $30-40K annually with 10 tape drives and 5 disc drives from Telex.

At CBS, Telex discs were brought in to handle applications that were bound up on IBM drives. Faster response of the Telex units was the main reason, although noted pluses are that maintenance and reliability are better than that of the IBM 2314. The CBS people are talking about eliminating all IBM I/O. They've also brought in Telex tape drives. They have an annual budget of up to $10 million, of which 25-30% goes for peripheral gear.

One piece of advice from the users of plug-to-plug equipment is that each installation retain one of each IBM device being replaced. They come in handy in settling disputes over whose equipment is creating systems problems.

Systems Makes Move into Mini Market

Systems Engineering Laboratories has moved into the minicomputer market and is extending itself into the oem market. The announcement of two processors — System 82 for real-time applications and the System 72 with virtual memory and large disc storage — results from Systems' own recent development effort and its acquisition program.

Sheldon Eglash, president, said the company has doubled its "active" product line, which was the 16-bit 810B and the 32-bit 86 and 88 proces-

SEL president Sheldon Eglash ... "two strong low-end entries."

SEL's 82, 16 bits for $11K.

sors. "We've added two strong low-end entries," he said, "and now can offer three distinct machines (the 82, 72, and 810B) to meet our customers' needs" for minicomputers. No other small computer company outside Digital Equipment Corp. can make that claim, he said.

Marketing of the new 16-bit minis, the Systems-developed 82 and the 72 produced by Multidata, Inc., a pending acquisition, will be oriented to the company's traditional custom systems efforts. Eglash said they will also be the prime vehicles for the company's entry into the oem market.

Systems apparently will devote some marketing muscle to oem-ing its gear, which Eglash notes includes fixed-head discs from the recent acquisition of Computer Peripherals Corp., I/O equipment from subsidiary Peripheral Dynamics, plus an assortment of analog/digital devices and communications items. He also said the minis may be used in the company's Keytran shared-processor key station systems.

The 82 is an $11K, 900-nsec machine built for what Systems terms real-time systems; i.e., production testing, lab analysis, and control systems. Core memory range is 4-16K. Most instructions operate on 16-bit words and execute on one or two passes. The processor also has eight priority interrupt levels with another eight optional, and line interrupts range up to 640.

Standard I/O provides access to 60 peripherals with maximum transfer rates of 20K words/second. Initially, software for the 82 will include only assembler and other standard packages. Eglash said this is sufficient for use in systems and to meet oem demands. Executive routines in the FORTRAN compiler will be available next year.

Multidata, in developing the 72, aimed it toward the mini buyer who wants mass store over processor speed. Bruce Stuart, Multidata co-founder, said this was due to the fact that 20% of the small PDP-8s shipped in 1969 had a small disc attached, and another 20% were field-fitted with similar units. Prime feature of the 72 is its virtual memory capability, which gives core memory characteristics to the disc storage.

The 880-nsec processor will be teamed with fixed-head discs from Computer Peripherals (now called the Systems Peripherals Div. of SEL). System size will range from 32-500K. A 32K system with Teletype console is priced at $18K. The software complement includes assemblers, three operating systems, FORTRAN H and BASIC compilers, debug and editor routines, and a math library.

The 72 can take up to 60 peripherals on a single I/O channel, and priority interrupts can be extended to 384.

Sales expectations for the minis in the fiscal year ending June 30, 1971, are being lumped with those for the 810B, and Eglash rounds them off to $15 million, surprisingly high when compared with all of 1970 revenues. The firm's FY 1970 revenues totaled $21 million, against $17 million in the year ended June 30, 1969; net income was $1.8 million, compared to $1.4 million.

New CDC Time-Sharing Service Is Operational

CDC's new conversational time-sharing service is expected to go into regular operation this month. It consists basically of a Bethesda-based 6400 which is linked to CDC's already-established Cybernet remote-batch data center network. Through the Cybernet interface, CDC will be able to offer t-s services anywhere in the United States.

Prices haven't been publicly announced, but Robert Young, data services division marketing director, says they will be "competitive" with GE and SBC, the nation's leading vendors of time-sharing services. He adds that the charge for connect time won't be "much different" from what Cybernet customers are currently paying ($8/hour). Likewise, storage charges will be approximately the same (.5¢ to 1¢/day/1,280-character data block, depending on number of blocks used). From another source, we learned that the cpu charge will be around 20¢ /second.

CDC has been offering a conversational t-s service based on a GE 420 which the company acquired when it took over CEIR. This service is patronized by about 100 users along the Eastern Seaboard. According to Young, the 6400 is roughly five times faster than the 420. Users of the 420 pay a CPU charge of $2/minute.

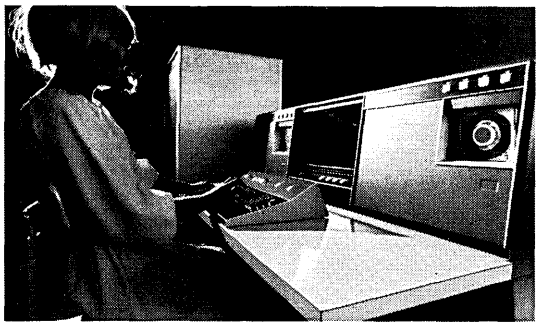
The equipment change is aimed partly at making CDC more competitive with IBM and GE (both offer batch, as well as conversational services), and partly at developing conversational business among remote-batch Cybernet customers. There is "a high degree of compatibility" between the 6400 and 6600, the major workhorse of the Cybernet system. So, "programs can be transferred with minimum modification," says a CDC official.

The new system is called Kronos 6 in-house, but hasn't been publicly baptized yet. Besides using CDC's recently developed Kronos operating system, it will include System 2000, a new data management system. Users will be able to write/run ALGOL, FORTRAN, and BASIC programs on the 6400. Routines written in the latter two languages will be transferrable to the remote-batch 6600 "with a minimum amount of reprogramming, at minimal cost." Users will also be able to get remote-batch service on the 6400 when the job doesn't require a lot of core.

Users will interact with the 6400 through conventional Teletype terminals, connected via dial-up local or short-distance lines and multiplexors to the Cybernet network. This network consists basically of seven 6600s, five 3300s, and the newly installed 6400 in Bethesda, interconnected by leased

(Continued on page 91)

DATA ACTION 1500 EDITOR..



...CORE OF A COMPLETE OFF-LINE SYSTEM, FROM SOURCE DOCUMENTS THROUGH COMPUTER-READY DATA.

Complete off-line data editing, validation, and output tape generation are capabilities of the new 1500 Editor.

Data validation performed by one operator on the Editor eliminates the expense and time involved in manual key verification. Far greater speed and accuracy is achieved.

By taking the validation routine off the main computer, where every second is important, the computer can be used for the more productive projects it was intended for. Computer scheduling is simplified.

The Editor handles all the editing functions performed on the main computer. One easily prepared edit routine is prepared for each input job and stored on tape for use at any time.

Many of the common forms of record editing such as data duplication, field resequencing, batch totals, and use of check digits are carried out.

In addition, the Editor performs complex specialized procedures . . . table look-ups—field comparisons—field content checks—multiple verification—conditional verification . . . and many other critical routines that until now have not been available on any input system.

Data can be keyed in the form it appears on the document; the Editor puts it into the format you need.

Error correction can be made on-line using the CRT display and keyboard. Or a low-speed printer can be used to list exceptions for correction on a data entry unit.

The Editor can be used strictly to validate input data—or it can also output computer-ready data on 7 or 9 track compatible tape.

An efficient, simple system, easy to learn and operate—the Editor has a standard Data Action Inscriber keyboard, identical in layout to keypunch machines.

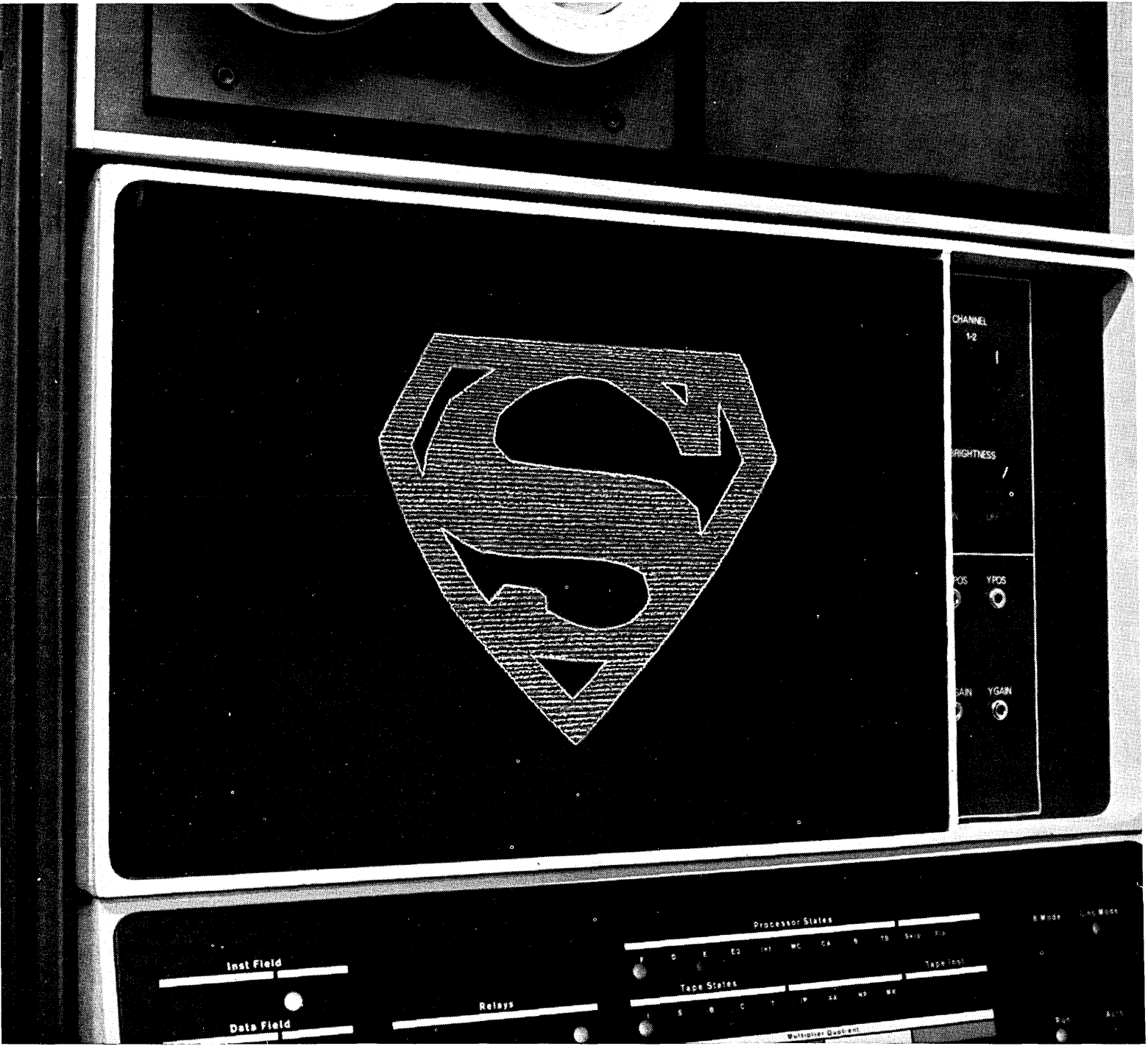
When combined with a Data Action entry unit, the Editor becomes the core of a complete, automatic off-line input system—the most advanced development today in data preparation and input.

For complete information on the Editor and on the Data Action Input System, contact your nearest Data Action sales office.

Or write: DATA ACTION, Dept. A-9070
4445 West 77th St., Minneapolis, Minn. 55435
Phone: 612/920-9200.

DATA ACTION
THE INPUT COMPANY

CIRCLE 65 ON READER CARD



DIGITAL's new black box helps process a signal through the 12-bit PDP-12 with the accuracy of an IBM 360/50, at a speed 100 times faster than software.

It's our FPP-12 floating point processor. With it, you increase the capability of your PDP-12 (or PDP-8) to perform complicated calculations on large blocks of data.

The FPP-12 is a parallel processor. It has its own instruction set and its own assembler; it will directly address up to 32K of memory. The FPP-12 handles two basic numerical formats: three word floating-point and fixed-point double precision. Speed of a floating-point multiply is 28 usec, using only 6.4 usec of memory time, leaving 21.6 usec for other CPU jobs. This level of simultaneity further increases the processing speeds. Accuracy is maintained throughout at seven digits.

Digital Equipment Corporation
Maynard, Mass. 01754 (617) 897-5111

digital

CIRCLE 21 ON READER CARD

voice-grade lines.

The 6400 has 384 I/O ports. CDC expects that by the third quarter of next year "about 250 users" will be on-line.

The program library for the new service consists partly of rewritten 420 programs and partly of 6600 remote-batch programs adapted to conversational-mode use. Some of the latter came from users who assigned marketing rights to CDC in return for royalties. The company expects to acquire additional programs from this same source.

Xerox a Tortoise in Services Market

Xerox Corp. has carefully dipped its big toe into the information services market.

Its new Xerox Computer Services in Marina del Rey, Calif., has begun marketing two time-shared services for small business ($1-20 million gross a year) and municipalities. One is an integrated accounting service (IAS) and the other a utility billing service.

And they're going to wade in very gradually. A firm customer base will be built in the Los Angeles basin before moving out geographically or up to big-company customers. They're careful, too, to assure their market that while the company is new, its service packages are not. They have passed the use test, the company contends, and "our customers are not guinea pigs."

The basis for the IAS offering was acquired from a small Salt Lake City company which had been "using it successfully in that area for two to three years." The utility billing package was acquired by Xerox Corp. with its acquisition of Isaacs-Dobbs Systems, Inc., through which it also got Guy Dobbs, XCS vice-president, technical development, and 25 others.

XCS wants to grow, of course, but they want to go slow and sure. They're operating now with one Sigma 7 but hope to have multiple-computer processing and 10,000 customer terminals installed in the Los Angeles area within a year. Ultimately the company wants to serve every large metropolitan area in the country through "several large centers," but right now it's still "think local."

XCS doesn't see itself in competition with other time-sharing companies because its services are specialized and include programs. It does see itself as "head-on against IBM's System/3" and has approached many firms with System/3s on order. They consider their pricing policy — charge by storage and lines printed — as being ideally suited to small, growing businesses since the charges go up and/or down with business volume.

XCS is new all right, and they consider themselves as part of the "newest and fastest growing segment of the computer industry," but they definitely don't want to be thought of as pioneers. As Dobbs said, "you can always tell a pioneer by the arrows in his back."

Computerized Cashiers: Big Savings . . . Someday

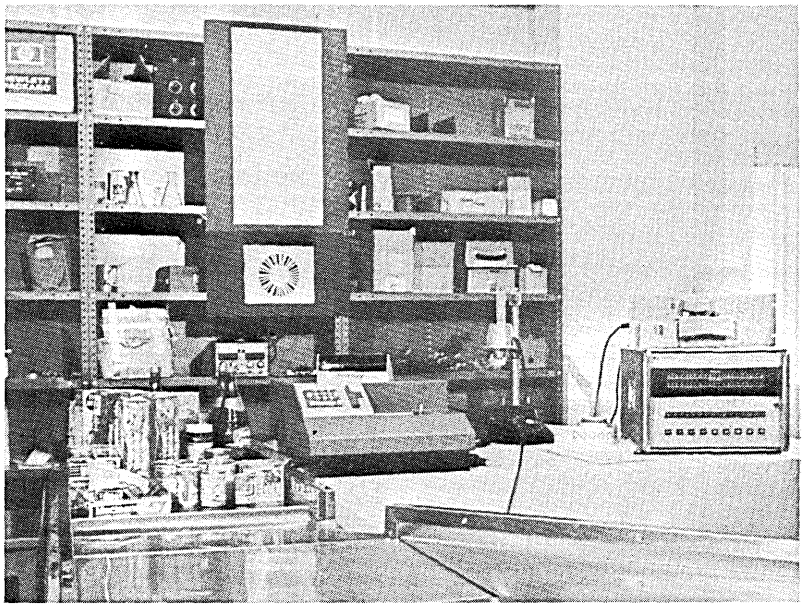
NCR's recent introduction of an automated data acquisition system for retail stores is one of several signs that the computer industry is pregnant with a new market. But the gestation period is likely to be much longer than nine months.

Besides NCR, the following companies have reportedly developed hardware, and in some cases have also installed it on a test basis: Sweda division of Litton Industries; Pitney-Bowes; Ricca Data Systems, Santa Ana, Calif.; Inventory Management Systems, L.A.; RCA; Charecogn Systems, Inc., Natick, Mass.; and IBM. Jewel Tea Co., a Midwestern food chain, has also installed a system, developed largely in-house, at its drug store in Franklin Park, Ill., a Chicago suburb.

Charecogn has one of the more sophisticated systems, and so far is the only one to be blessed by the U.S. Dept. of Agriculture, which has been trying to encourage development of automated checkout operations in food supermarts. A department spokesman expects the first Charecogn system to be installed in a store "within 8-10 months." Charecogn president John Esserian says the site hasn't been selected yet.

A prototype Charecogn system is currently on display at Ag department offices in Hyattsville, Md., outside Washington. The hardware consists essentially of a hand-held optical scanner connected to an 8K Hewlett-Packard 2114B. Also linked to the computer are a tabulator and Mod 33 Teletype. A disc or drum capable of holding about 10 million characters is needed for a commercial installation but hasn't been included in the Hyattsville demo.

The checkout clerk places the scanner atop a specially designed identification label on each food item, and data concerning the type of merchandise, brand, and size is automati-

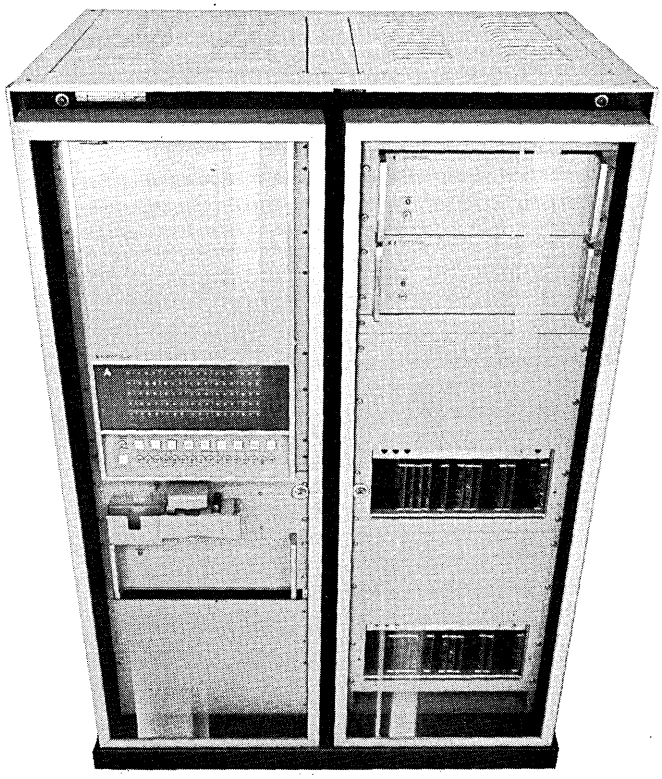


Prototype of Charecogn Systems, Inc., automated data acquisition system for retail stores, on display in offices of the Department of Agriculture.

Just a second.

If you're spending over 4K monthly on time sharing, you can afford this second computer.

Get in-house installation of the CCS 2100 for more dedicated inquiry.



Here's what's in it for you:

A Second System—The CCS 2100 means that you can have real-time computing without slowing down the processing on your main computer system.

Fixed Costs—The CCS 2100 Time Sharing System provides far better cost control than outside service costs which are usually uncontrollable.

Better Performance—The CCS 2100 Time Sharing System will handle up to 16 terminals simultaneously with up to 60 million bytes of on-line data storage. Conversational time sharing, dedicated inquiry or real time business data processing can all be handled well by this efficient system.

Lower Cost—The CCS 2100 costs less to lease or buy out-right than to upgrade your present business computer for communications processing. Unattended operation means no extra operators or maintenance staff. The CCS 2100 runs by itself.

Powerful Library and Software—The CCS 2100 is available with a library of programs, and the powerful Extended BASIC Language. Business packages for inventory reporting, budgeting and cost control are all part of the software package.

Isn't it time you had second thoughts?

BOSTON
235 Wyman Street
Waltham
Massachusetts
02154
617-891-0210

TORONTO, CANADA
48 Yonge Street
Toronto, Ontario
416-366-7643

LONDON, ENGLAND
Northdale House
North Circular Road
London N.W. 10,
England

Expect more from
CONSOLIDATED COMPUTER
makers of the famous Key-Edit

Chicago Cleveland Detroit Los Angeles New York Philadelphia San Francisco Washington, D.C. Ottawa Montreal

cally read into the computer. Here, the related price is retrieved from memory and projected onto a visual display unit above the tabulator. Simultaneously, the price and item identification, plus the price per unit weight or size of the item, are tape-listed by the tabulator.

Store inventory figures are adjusted inside the computer as part of this operation, and at the end of the day, or periodically, the updated inventory balances, item by item, can be printed out by the Teletype (which also acts as an input console for altering data stored inside the computer). Coupling the Teletype acoustically to a phone line gives the supermarket the capability of transmitting orders on-line to a central warehouse.

The label read by the scanner consists of two elements — a numeric identification code and a circular array containing thick and thin radial elements. Up to 100 million different combinations of thick and thin radials are possible, so the system can discriminate among that many different items.

In other systems, such as the one being used by Jewel Tea, price and identification data are input manually; the major innovation is that a computer is used instead of a cash register. Jewel's system, which utilizes a General Automation computer, doesn't do anything more than a conventional register could, but company officials are considering a number of refinements which they decline to talk about.

Jewel's system has been under development for about a year, and for the past eight months a computer has been installed at one of 11 checkout stations inside a Jewel-Osco drug store in Franklin Park. By the first of next year, the other 10 stations are scheduled to be similarly computerized, reports Vernon Schatz, Jewel's vp for information systems.

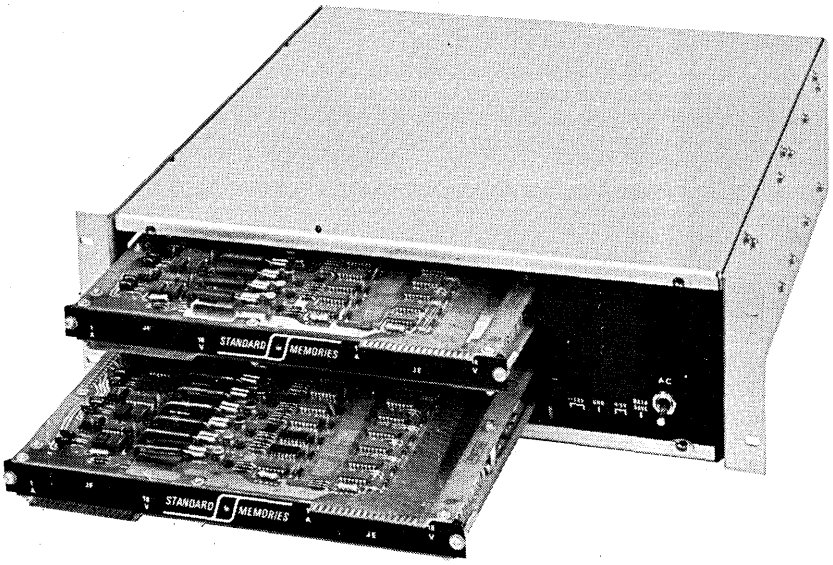
Schatz's attitude toward checkout automation is probably typical of food supermarket executives. He says that Jewel is in the first phase of a seven-phase automation plan. He refuses to be specific about the timing of subsequent phases.

Schatz implies that extension of automation to all stores will take a long time because of the investment in cash registers. He emphasizes that before Jewel will consider abandoning those registers, the cost of automation must be brought down to a point where it is roughly equivalent.

It is instructive to compare his comments with those of automated checkout system developers. Charecogn's John Esserian, for example, told us that his system is intended to be "no more than three times as expensive as a conventional cash register checkout installation" and is meant to pay for itself after a year and a half to two years of operation.

There also seems to be quite a difference of opinion between system developers and their prospective customers about system benefits. The former stress the ability of automation to process grocery orders faster, to eliminate the expense of price-marking each item, and to provide more

ecom® B sets the Standard!



ecom® B is a 900 nanosecond core memory, complete with Address and Data Registers, Byte Control, Data Saver, Multi-Mode Operations . . . Cards Sets, Card Cage, Internal Power for up to 8K. We'll produce 1,000 **ecom® B** Core Memories in 1970. So, our unit price for a complete 4K x 18 System, including power, is only $3,075. You can expand to 8K x 18 by adding another module for only $2,315. And, to use our memory, there are just 3 I/O connectors.

Write or call the Memory People for Technical Bulletin Series 600.

SEE US IN BOOTH No. 3538 at FJCC

STANDARD MEMORIES
INCORPORATED
A Subsidiary of Applied Magnetics Corporation
15130 Ventura Boulevard
Sherman Oaks, California 91403
(213) 788-3010 TWX 910-495-1738

CIRCLE 57 ON READER CARD

detailed inventory statistics. Related to the latter benefit, they add, is better control over pilferage, reduction of backroom inventories, better allocation of shelf space, and reduced spoilage (the system can flag slow-moving perishables in time for the store manager to reduce prices and, hopefully, encourage more sales).

Schatz agrees that automated systems are currently able to capture price and item identification data, but he claims that they are too complicated and too expensive. Regarding inventory statistics, he says they aren't really that important. "A store manager can find out how much he has of a certain item just by looking at the counter or shelf, and to control the store he needs to keep tabs on only a small percentage of the total number of items in stock." Schatz adds that Jewel stores carry little backroom inventory, since they receive daily deliveries from central warehouses and the merchandise is moved directly from the back of the truck to the sales floor.

Could Mrs. Smith's Meat Be Mrs. Jones' Poison?

Are you an impulse eater . . . the kind that hits home in the evening with a sudden yen for Chinese food or . . .?

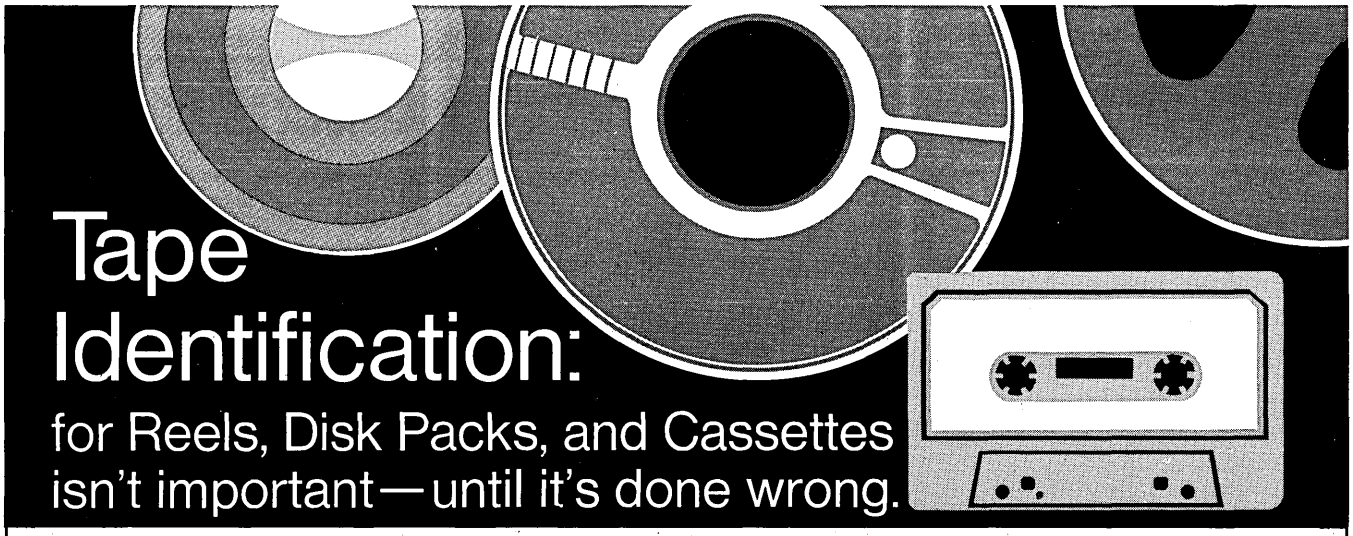
If you are, keep the menu planner of the family away from the latest Hunt-Wesson ads in newspapers and all the top women's magazines. The Fullerton-based tomato sauce and salad oil firm, in a gesture billed as "an exercise in corporate citizenship," would computerize your eating habits. The firm is making available, for the asking, computerized menus for a month. Asking takes the form of filling out coupons available in the newspaper and magazine ads and in all "friendly" neighborhood supermarkets.

The program got under way Aug. 24 and after only 2½ weeks had elicited more than 100,000 coupon responses.

The program purports to come up with "personalized" menus. What this means is that Mrs. Smith with two adults in her family, one child between the ages of 4 and 9, two between the ages of 10 and 15, and one between the ages of 15 and 18 and with a food budget of $50 per week (exclusive of "booze and condiments"), would get a "personalized" letter addressed to Mrs. John Smith, while Mrs. Jones, whose family conformed to the same pattern in every way, would be personally addressed by her own name. Everything else would be the same.

Apparently many menu planners anticipated that the personalized service wouldn't be personal enough (does every child between 10 and 15 have the same tastes, and what about dieters?), and even before the ads hit the media, and more so since, Hunt-Wesson has been deluged with letters outlining "special problems." The company, at this writing, hadn't decided what to do about them, but they were being saved.

Hunt-Wesson is a subsidiary of Norton-Simon Inc., and the computerized menu program is being carried out by another Norton-Simon subsidiary, McCall's Information Services



Tape Identification:
for Reels, Disk Packs, and Cassettes
isn't important—until it's done wrong.

We do it right: You get a pressure sensitive label that says what you want it to say on the *correct* material for the job. A label unaffected by high spin—one that won't come off until you want it to—and then comes off without a trace or stain. Matching tough specifications is routine for us. But in devising identification systems we've worked out solutions to problems you may not even have yet. Try us—if we don't have a solution, we'll find one.

Topflight CORPORATION
Post Office Box 472, York, Pa. 17405
Western Division, Compton, Calif.
and other principal cities

Co. (MISCO). It is being run on a 360/40 in the MISCO Dayton, Ohio, center. The company said it has spent some $2.5 million on the whole program, including compilation of menus and advertising budget, and it expects some return in terms of enhanced corporate image and in extra sales, since its products are food stretchers and are mentioned peripherally in many of the menus and because (it hopes) food market chains will like the promotion and will therefore push Hunt-Wesson products.

The company assures it has no other plans for the information it gets from the coupons than to provide the menus and accompanying recipes and buying tips. But the information is fed into the MISCO computer and there it stays until?

And they have those special problem letters which at this writing hadn't been counted.

Anyone for health food?

Commerce Streamlining Outflow of Information

More data in machine-readable form is likely to gush from the federal government as a result of a recent reorganization at the Dept. of Commerce.

The agency established a National Technical Information Service "to simplify and increase public access to federal publications and data files of interest to the business, scientific, and technical communities." The Clearinghouse for Scientific and Technical Information, a major dispenser of this information until now, has been transferred to the new service and its functions have been "merged with a broader mission for NTIS," said Commerce Secretary Maurice Stans.

He added that information-distribution activities of other Commerce subsidiaries — including the Census Bureau — would gradually be consolidated at NTIS.

Commercial reprocessors of statistical information greeted this news with mixed emotions. Paul Zurkowski, executive director of the Information Industries Association, thought the feds should be "cautious" about broadening their information marketing activities.

He indicated that if NTIS offers statistical compilations tailored to fit individual user needs, it would be doing a job nor performed by IIA members. Another IIA fear is that the feds will offer on-line hookups to government data bases, further reducing the market for commercial information brokers.

The Census Bureau already sells customized statistical tabulations, and the Environmental Science Services Administration provides weather information on-line to commercial users. But, for the moment at least, information brokers haven't been seriously impacted.

Peter Urbach, who was appointed acting director of NTIS, said he has no plans to expand either of these activities at present.

Commercial information brokers are also worried about the copyrighting of federal statistical tabulations and related reports. They suspect that establishment of NTIS may accelerate this copyrighting trend and raise

X-RAY™

Now, for the first time, there's a way to monitor total system performance.

Our new X-RAY enables you to "see inside" your computer system to determine operating efficiency and to pinpoint ways to dramatically improve performance and reduce costs.

X-RAY is a truly unique hardware/software monitoring system which is capable of analyzing all aspects of system performance, specifically including:

- **Configuration Utilization**
- **System Software Overhead**
- **Application Program Efficiency**
- **Program and Data Base Organization**

X-RAY (Execution-Recorder/Analyzer) provides a high resolution, real time signal collection and data reduction facility for a detailed analysis of total system performance, yet creates no operating overhead for your system. Data is collected using passive techniques, partially reduced on line, and then recorded on magnetic tape for post processing by the X-RAY Analyzer.

Detail and summary reports are produced for system configuration usage, operating system overhead, individual problem program execution, and data base activity. Results may also be a source of input to the CASE system simulator for performance predictions.

X-RAY is available under purchase, lease, or service plan. To find out how X-RAY can improve your operations (actually pay for itself many times over), contact us for more information.

APPLIED SYSTEMS
Division of Computer Learning and Systems Corporation
5530 Wisconsin Avenue, Chevy Chase, Maryland 20015
(301) 652-9220

the price of federal data, which is now sold by the government at far less than its commercial value. Information brokers would be directly affected, since much of their input comes from federal data bases.

So far, only the publications of the National Standard Reference Data Service, a constituent of the National Bureau of Standards, have been copyrighted. At press time, NSRDS was reportedly preparing to solicit bids from outsiders interested in selling specified NSRDS publications on an exclusive basis and paying Uncle Sam a royalty on each sale.

Commercial information brokers would be interested in bidding on such a contract, Zurkowski said, only if it covers machine-readable embodiments of each publication. He indicated that the government wants to limit the contractor's rights to just the printed version. An NSRDS source said this question hasn't been resolved. He added that there is strong in-house sentiment for continuing to sell data on tape direct to the user without benefit of a middleman.

Urbach said his group doesn't have any immediate plans to copyright data and negotiate exclusive distribution contracts. "We'll wait and see what happens at NSRDS."

Facilities Management or a Partnership?

Boothe Computer's Texas-born president Paul Williams calls them "pardners" who would abandon their leased 360/30s and move into a 10,000 sq. ft. Wilshire Blvd. "computer resource center" in Los Angeles where a subsidiary, Boothe Resources International, would provide two 40s and a 30 and all associated support services.

Williams last month talked of his plan to provide prospects doing $10-25 million in annual sales with additional computing power which they would find expensive to accomplish on their own because of unbundling.

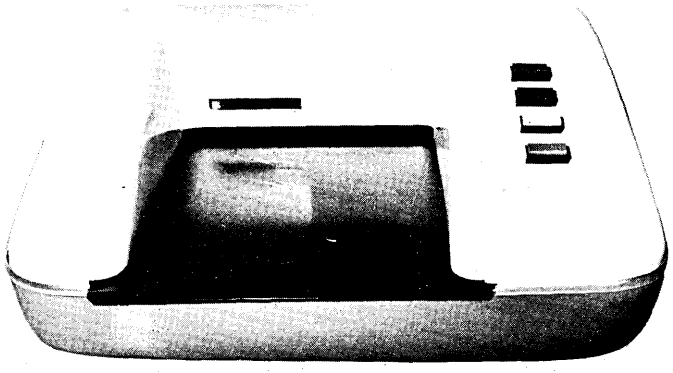
Under his "rebundling" plan, Williams would offer the following to a "pardner" at $14K/mo.: 130 hours on the 30, 20 hours on the 40, access to 80 hours of SE and programming services, plus paper supplies, clerical help, messenger service, Xerox copiers, and a COM recorder, if he wishes to microfilm his output.

Boothe Computer would lease the abandoned equipment to somebody else. More time and services are offered in three other plans ranging up to $25K/mo. The Wilshire Blvd. facility could accommodate seven customers. It has none so far. "This is a new idea and we don't know if it will work," William says. "But we're trying it anyway."

In any case, the center's sales manager Keith Stafford says selling the plan will be easier than offering facilities management, which Boothe also does. The beauty of this plan, Stafford said, is that it doesn't dissolve your dp department. You just move people over to the center (from 3 to 10, depending on which plan you want).

A NEW DIMENSION IN SOURCE DATA AUTOMATION

dataflow optical page reader



The age old problems of manual data preparation such as key punching and verifying have long been accepted as a necessary evil to input man-generated data into an EDP System. The advent of Optical Character Readers (OCR) has opened new horizons in this area; however, the associated prices for OCR equipment has made its availability prohibitive for all but the most affluent of users. The Dataflow Optical Reading System now brings OCR capabilities down to price range compatible with key punching and verifying.

DATATYPE CORPORATION
1050N. W. 163rd Drive, Miami, Fla. 33169 (305) 625-2489

CIRCLE 98 ON READER CARD

State to Hold Hearings on Programmer Licenses

The California State Senate Rules Committee has approved a resolution submitted by the Senate Committee on Business and Professions to investigate the need for licensing of programmers, and an interim hearing was scheduled for October in Los Angeles. The committee, headed by Albert Song (D), invited representatives of hardware and software firms, professional organizations, edp schools, and consultant firms to appear at the hearing, which was the first in what will probably be a protracted series of hearings designed to establish what will be necessary, or if it will be necessary, to license the computer programmer (see Oct. 1, p. 74).

Triggered by a collective legislative exasperation over delays in election results (see Perspective, p.48) and ill-wrought press stories of computer error, the hearings will also attempt to determine just what class of licensing is in order. There are two classes in California: Mandatory, and Title Only. Mandatory, as it implies, means that a person must have a license in order to practice his craft. Title Only means that a programmer, for instance, could practice his craft without a license, but he couldn't call himself a master programmer unless he had a license.

Equating a master programmer with, another for instance, a master plumber doesn't seem to fit the programmer's view of his own professional stance, which, judging from discussions at certain meetings and seminars, is next to cleanliness. The State of California is going to have just as difficult a time as programmers have had in finding out what they are.

NEW COMPANIES

The news about new companies is that there are hardly any lately — at least in this industry. The only two heard of at press time were formed to help run other companies and to help them get money to keep on running. In Evansville, Ind., **Computer & Financial Management Services, Inc.,** will

(Continued on page 98)

NEWS BRIEFS

An Automated Canal?

Computer Sciences Corp. is studying ways to automate traffic control on the Panama Canal, which today is handled much as it was when the 50-mile waterway was opened in 1914. CSC will come up with a number of alternative design concepts for the Panama Canal Co., all aimed at increasing traffic capacity, improving navigational safety, and providing better working conditions for traffic controllers and greater visibility and control of operations for management. The company will select one for which CSC will develop a detailed system design and prepare specifications for the equipment required.

The Lure of Security

There's a lot of talk around of the high cost of computer security, and where there's cost there's a profit to be made. Phoenix-based Graphtek Corp., two-year-old software and systems design firm, is going after the latter. The company has a new division called Dataguard Systems which, as one of its primary functions, performs computer security evaluations and currently is completing its first for "a fair-sized company." It cites as one of the unique features of its studies the fact they help correct problems as they're uncovered rather than waiting until the evaluation is completed. They say they've helped correct 14 specific problems in the course of this first study, which is believed to be the first of its kind. Graphtek thinks it's alone in this field right now but won't be for long.

Raytheon Retaliates

A $2 million lawsuit has been filed by Raytheon Co. against Intersil, Inc., semiconductor manufacturer of Cupertino, Calif., and its memory subsidiary, charging 13 ex-Raytheon employees, including former marketing manager Marshall Cox, who now is exec vp of Intersil, with misappropriating proprietary information and semiconductor technology and boomeranging it against Raytheon. Intersil, a three-year-old, go-getting company (it recently went and got James F. Riley for president away from Corning's semiconductor subsidiary, Signetics, where he had an enviable record of building that company), has gone into producing semiconductor memories in a big way, and expects big returns from it. Intersil's chairman, Dr. Jean Heorni, was one of the original movers at Fairchild Semiconductor.

Johnny Can Read, but How?

A new Computer Laboratory for Instruction in Psychological Research (CLIPR) at the Univ. of Colorado is using an XDS Sigma 3 to study human mental processes. Among other things, the computer will study what goes on in the human mind in the reading process by direct interaction with human test subjects. Statements and questions will be presented to volunteer subjects on crt's, and the volunteers will type their responses on typewriter keyboards. The computer will flash the next question on the screen based on the volunteer's understanding of and response to the previous question.

Computer Census

A firm claiming it has rounded up an authoritative listing of computer installations in the U.S. has begun selling its information after more than a year spent compiling it. Computer Intelligence Corp. is stationed in San Diego, Calif., and is presided over by Walter Chenoweth, a former IBM marketing man from dp headquarters. His company is offering a yearly service, updated every three months, detailing more than 30K computers installed nationally, and those on order, by geographical location, industry classification, system manufacturer or type, and cost. Listings can be on printout, tape, or microfilm, and can be partial or regional, custom suiting and pricing the needs of the clients, of which Chenoweth claims to have 20 already. Compress has taken a small interest in his organization.

"assist in securing private and public financing for area firms," will computerize them, and provide facilities management .... The second company has a more sporting name to go with its Manhattan surroundings — **Gambit Management Strategies, Inc.** Besides regular management consulting, it will offer systems development and set up dp, especially for retailers (it's situated in the garment district) .... **Systematic Data Processing Services, Inc.**, Waltham, Mass., is not really new, because it was originally the New England branch of DPF&G, and will keep the same personnel .... **Phonplex Corp.**, developer of a voice-response computerized communications system, is not really new, having changed its name from the Multiplex Systems division of Instrument Systems Corp., and will still be hq'd in Huntington, N.Y..... **Systems Engineering Laboratories, Inc.**, will be new in Germany, with a subsidiary hq'd at Frankfurt, but not back in Fort Lauderdale.... **International Reservations Corp.**, the Planning Research subsidiary, has agreed to extend itself in a joint venture with the venerable Swiss Hotel Association, covering the cantons from Bern.

GOOD BREEDING SHOWS! THE NEW M-200D, THE COMPLETE HEAD-PER-TRACK DISC MEMORY OUT OF APPLIED MAGNETICS.

THE HOUSE OF QUALITY: Applied Magnetics' 12 years of proven capability in the design and production of high-quality magnetic heads and systems has resulted in a precision Disc Memory with a minimum of moving parts and no complicated electro-mechanical head retraction devices. Rugged construction utilizes precision machined castings.

SELECTIVELY BRED TO BE SMALL IN SIZE, HIGH IN CAPACITY, LOW IN COST AND LONG ON LIFE: The single 12-inch nickel cobalt plated disc that accommodates from 8 to 128 tracks with storage capacity from 265,000 to 6,400,000 bits, the power supply with automatic sequencing, and complete electronics for expansion to full capacity, are housed in a unit using only 8¾ vertical inches of standard RETMA rack space. All rotating components are designed for a 10-year life. And, the new M-200D reflects a reduction of cost per bit over the M-200C.

BORN FROM A COMPUTER: Critical head-to-disc interface relationships have been designed using a mathematical model and a proprietary computer program to assure consistency of flying characteristics of all heads within the memory.

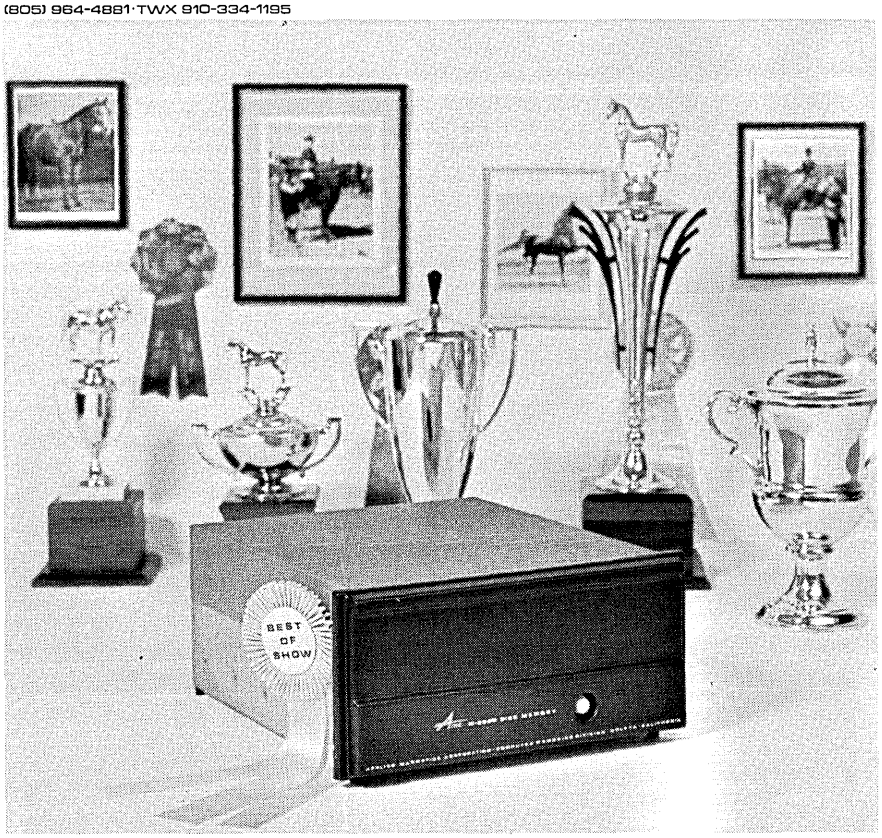
COMPATIBLE WITH ANY FAMILY: The M-200D is compatible with any family of computers, and a unique "O" ring sealed, closed loop filtration and cooling system makes the memory ideal for industrial process control applications.

APPLIED MAGNETICS CORPORATION

AVAILABLE FOR IMMEDIATE DELIVERY: Write or call today for complete information and Technical Bulletin.

Amc

APPLIED MAGNETICS CORPORATION·75 ROBIN HILL ROAD·GOLETA, CALIF. 93017
(805) 964-4881·TWX 910-334-1195



SEE THE NEW 6,400,000 BIT DISC MEMORY SYSTEM AT FJCC BOOTH No. 3538

MERGERS, ACQUISITIONS

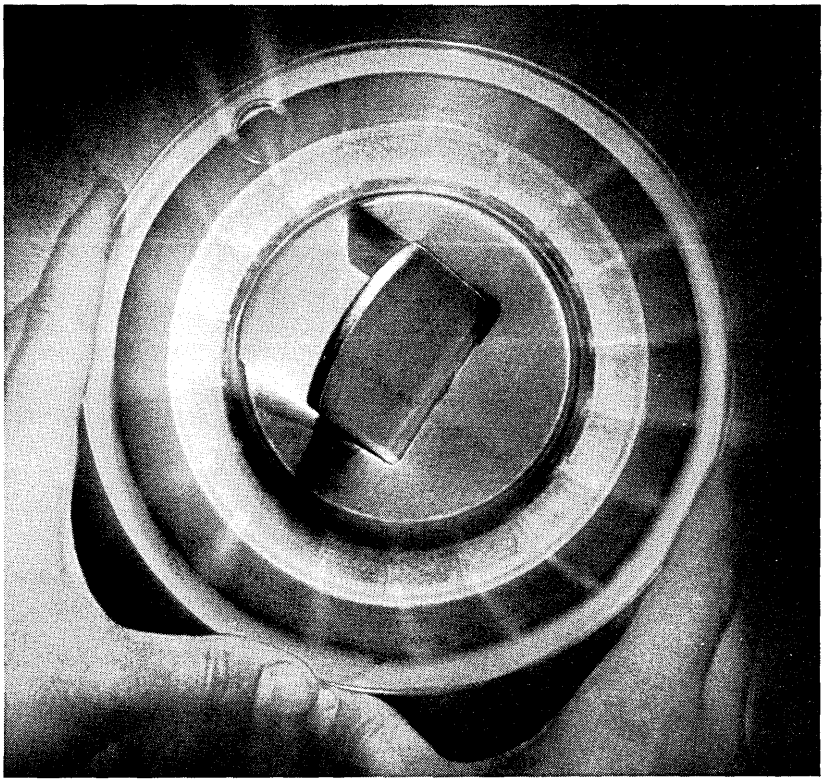
Two companies which could be considered as rivals for an impressive loss record have vowed to get together, mayhap for the mutual advantage of pooling their losses. One of them, **Electronic Associates, Inc.**, West Long Branch, N.J., is much larger than the other, **Computing Efficiency, Inc.**, Hauppauge, N.Y., but they have agreed to an almost equal stock exchange of 1 share for 1.1, respectively. CEI is in computer peripherals and software, more where EAI would like to be now that the government has cut back on use of hybrid computer systems in aerospace efforts. Fortunately or unfortunately, depending on who's looking, CEI has a major contract to supply tape drives to DPF&G, also ailing. Anyway, EAI has been on the merge-verge with three other companies in the last three years, only to draw back from the edge .... Stock is being passed around in Dallas between **Carterfone Communications Corp.** and **Data Automation Co.**, with the former agreeing to buy the latter's half-interest in a subsidiary, **Data Automation Communications Corp.**, for 700,000 shares. The thing is, last year DAC bought a 45% interest in Carterfone, so it's all in the family. DACC leases and services the communications equipment .... In Houston, **Dynamic Computer Systems, Inc.**, has agreed to merge with **Aviation Activities, Inc.**, and initial its name to **DCS, Inc.** It will supply dp services and systems to municipal, pharmaceutical, financial, and medical users .... **Adage, Inc.**, a Boston terminal systems maker, plans to acquire **Computer Displays, Inc.**, of Waltham, which manufactures a graphics display terminal, and thus expand its product line to "the broadest spectrum of graphics systems of any manufacturer in the field." ... Pub-

lisher **Prentice-Hall, Inc.**, has purchased a $1.2 million interest in **COAP Systems, Inc.**, the Bethpage, N.Y. financial systems firm that originated Digitax. P-H will market the income tax return service through its nationwide sales organization .... **Comperipherals, Inc.**, of NYC has combined with a London firm, **Business Computers, Ltd.**, to buy a Canadian dp systems marketeer, **Addo Canada, Ltd.**, of Toronto. Besides their own products, Addo handles Itel and North American Philips .... Dick Brandon announced that **Brandon Applied Systems** was further shedding its printing subsidiaries, **Federated Printing Co., Inc.**, and **Federated Manufacturing Corp.**, selling them back to their original owners to raise about $160,000 .... The marathon acquisition of **Pergamon Press Ltd.** by **Leasco Data Processing Equipment Corp.** is apparently still on the books even after the bad news that Pergamon's audit disclosed it has been a loser for a long time. Robert Maxwell, ex-board chairman of the English company and more lately ex-Labor MP, is fighting on against it .

SHORTLINES

Computer hardware for the hard pressed American Stock Exchange should begin to arrive by next month, but the exchange's Floor-Derived Clearance system for expediting trading data from member firms is not expected to be in operation until the beginning of 1972. Univac, which has been entrusted with the project including joint programming with Amex, already has been working on the system for some months. When functioning, it should handle 10-million-share trading days and peak loads up to 20 million shares with two Univac 494s and two small-scale 9300s .... Motorola Semiconductor Products, Inc., in Phoenix, has undertaken to manufacture the 1K-bit MOS integrated circuit memory of Advanced Memory Systems, reportedly the lowest priced memory on the market. AMS also will continue to make them in Sunnyvale, Calif .... And Electronic Memories in Hawthorne, Calif., has reported receiving what it believes to be the largest order placed to date for large-scale core memories with storage capacities of more than 17 million bits, from the Defense Dept., for $1.2 million .... A VIP customer for the IBM System/370 is Montgomery Ward, which will install Mod 155s and 165s at Chicago hq to help it get more on-line for credit authorization, catalog order input, and shipping operations data .... In the crystal ball department, MOS/LSI sales for 1970 are projected at between $95 to $105 million according to Quantum Sciences Corp., mostly because of calculator circuits .... High Technology West, a monthly research service in L.A., predicts that common carrier revenue will jump from $20 billion this year to $25.5 billion in 1980, with 50% of '80 revenues coming from data communications, as opposed to only 10% now. ■

Boole & Babbage



The Computer Tuner

It may look like tape. But it's a computer tuner.

They're so effective that typical customers improve system performance by 30% to 40% in the first few months. That amounts to yearly savings in the tens of thousands, and, in some cases, hundreds of thousands of dollars.

With savings like that you can hardly afford to be without a computer tuner. Write us for information on how the System Measurement Software products can increase your system's performance. And reduce costs.

Start your savings plan today.

And its tuned computers for over two hundred of the Fortune 500. We call our extensive line of tuner Systems Measurement Software.™ They measure and evaluate system programs and hardware configurations to help you get your jobs through quicker.
With reduced costs. And with no headaches.

Boole & Babbage, 1121 San Antonio Road, Palo Alto, California 94303

Sales Offices: Los Angeles, Ca.; Dallas, Tex.; Oak Brook, Ill.; Detroit, Mich.; Philadelphia, Pa.; Washington, D. C.; Clifton, N. J.

The Measure Men.

When IBM set out to design System/370, we wanted it to have higher performance.

So it was designed with speed inside. (For example, Model 155's internal speed is 3½ to 4 times faster than System/360 Model 50's.)

But to keep up with the performance inside, we had to do the same thing with the system's peripheral equipment.

Like the new 3211 printer.

The 3211 is the most powerful we've ever made.

It actually prints numbers and letters at the incredible rate of 2000 lines a minute.

All of which means with System/370 whatever you've got to get out gets out a lot faster. Whether it's an analysis from your data base. An engineering simulation. Or your inventory.

It's also easy to use the 3211. There are no carriage tapes to change between jobs. A special buffer controls forms skipping. A powered stacker automatically adjusts as the paper stack gets higher. (The 3211 printer will also work with most models of System/360.)

But the new 3211 high-speed printer is only one of the ways System/370 gives you more computing.

There is a new high-speed disk file that can hold up to 800 million bytes of data.

That's three and a half times more information than any file we've ever made.

System/370 has a dramatic range of core sizes to fit your requirements.

It has more channels (Model 165, for example, has 12). So you can get information in and out of the central processing unit that much faster.

It has all this. And more.

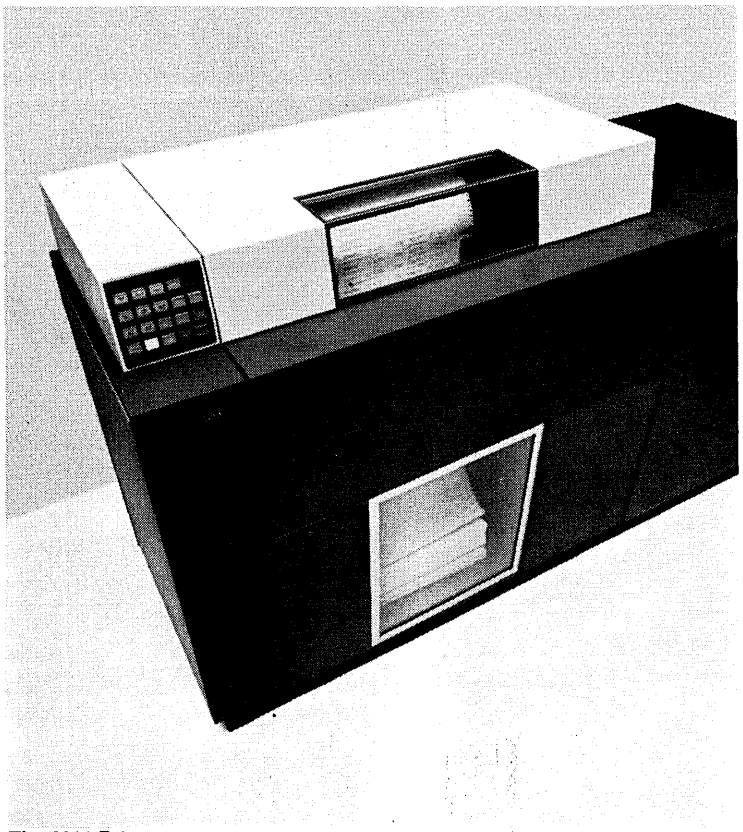
And System/370 is compatible with System/360.

You wouldn't want it any other way.

The 370.

IBM®

Its new printer fires out 2000 lines a minute.



The 3211 Printer

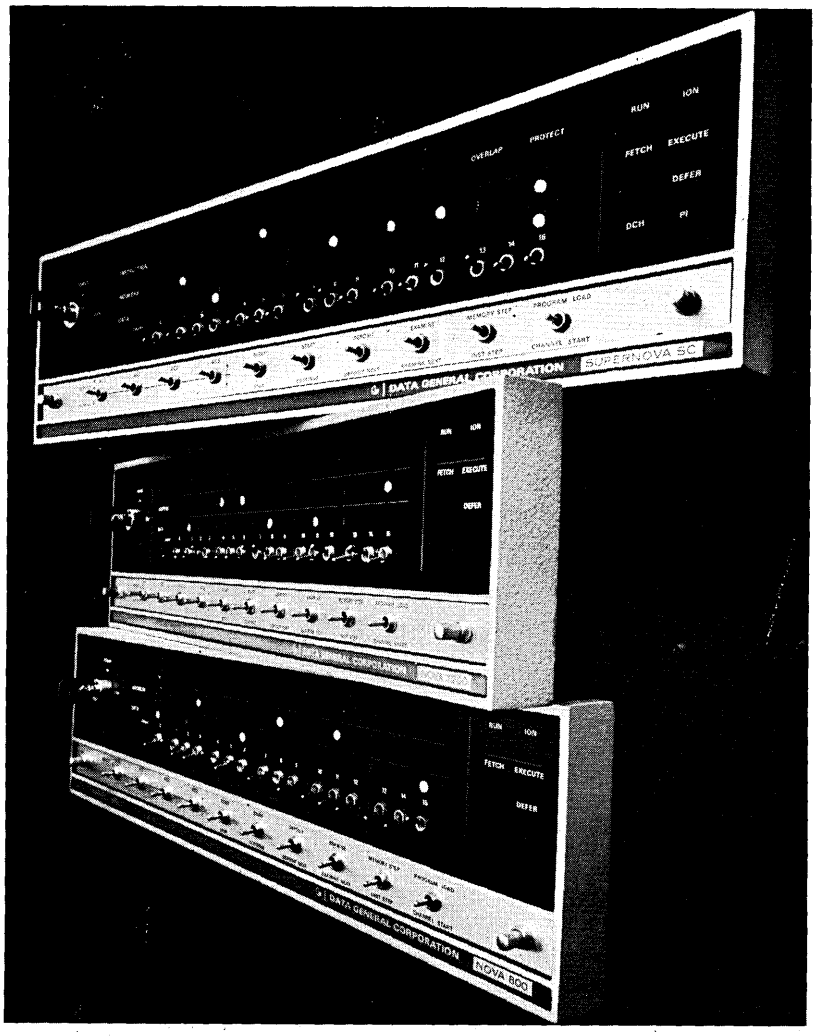
IBM System/370: the computers for the seventies.

Three Novas

Considering that supernovas occur in a galaxy on the average of once every 600 years or so, one would have thought that last year's Supernova announcement by this vendor would be the last one for awhile. The Supernova SC (for semiconductor), one of three announced models, is almost the same Supernova, but we are observing something important on it we haven't seen before. The cpu really hasn't changed much, but the memory is now 300 nsec (up from 800 nsec on the Supernova) using 64 1K-bit chips on each 15-inch-square circuit card. It is possible to get 32 K 16-bit words on a single directly addressable configuration. Semiconductor memories have been included in the manufacturer's other products in the past, but not for main storage.

The other two models derive their model numbers from the cycle time of their standard core memories. The Nova 1200 and 800 get LSI only in their 64-bit 300-nsec scratchpad memories, which are used in the cpu's for implementing the multi-accumulator architecture.

All three machines are software compatible with their predecessors, so one only has to plug in a Nova 1200 and start running old Nova programs 2½ times faster than the Nova—which appeared in January of 1969 as the industry's first MSI mini.



PRODUCT SPOTLIGHT

The vendor expects the Supernova SC and Nova 1200 will open up new markets—the Supernova SC picking up customers in communications, dedicated time-sharing, and on-line file management applications that require very fast speeds, with the Nova 1200 being attractive as a 16-bit machine with a price more typical of 8- and 12-bit machines. The "Buick" of the product line, Nova 800 is considered a logical step up for current owners of Novas and Supernovas . . . machines that will be obsoleted by the new product line, according to the vendor.

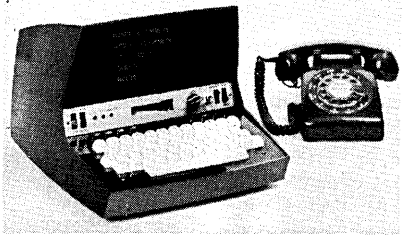
Prices for the three models are based on a configuration consisting of a 4K memory, tty interface, a data channel, and priority interrupt capability. The Supernova SC is priced at $11,950, the Nova 800 at $6950, and the Nova 1200 is scheduled to sell for $5450 in single units. Delivery will be next spring. DATA GENERAL CORP., Southboro, Mass. For information:

CIRCLE 391 ON READER CARD

Key-to-Cassette

It's called the Term-mite because it is small and "eats paper." Actually it is a key-to-cassette stand-alone terminal weighing in at 20 pounds. The unit—prototypes have already rolled off the production lines—will lease for $75 a month a sell for $2700 each, with prices somewhat less in oem quantities.

Consisting of a keyboard, crt display, cassette tape recorder, and control electronics, the portable unit is capable of connecting directly to a pooling unit. A buffering option allows the pooler to handle multiple terminals simultaneously. The keyboard configurations are alphanumeric, numeric, and keypunch.



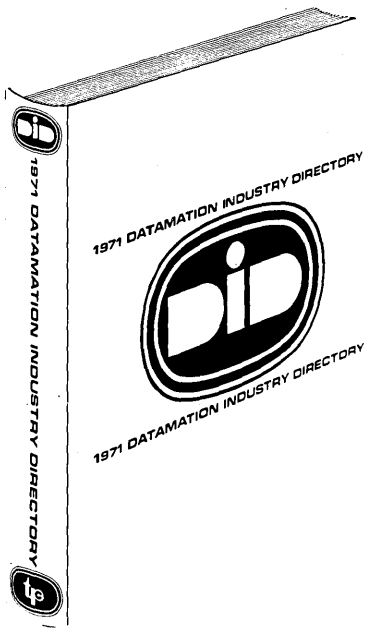
The 5-inch crt screen is capable of displaying up to 100 characters. The tape cassette records up to 15K ASCII characters at 330 bpi, in several colors.

The Term-mite, which will come in several colors, will have program, manual, and automatic operating modes, and its standard program capabilities will be skipping, duplicating, and field definition.

The vendor views the Term-mite as a business machine designed for source data preparation in banking, brokerage, insurance and utility applications, in both field and home offices. Deliveries are scheduled 30 days ARO. DATA INPUT DEVICES, INC., Derry, N.H. For information:

CIRCLE 393 ON READER CARD

(Continued on page 103)



The most comprehensive and authoritative single source of buying information for the entire EDP industry

Want more information? Media and rate information is available to advertisers and their agencies on request. Please contact your local DATAMATION® Sales Office or A. Treat Walker, Datamation Industry Directory, 35 Mason St., Greenwich CT 06830.

Should your product or service be listed in the Directory? If you have not yet received a Questionnaire, contact R. A. McLaughlin, Datamation Industry Directory, 94 So. Los Robles, Pasadena, CA 91101

Document Reader

The Orbit I OCR document reader is aimed at oem's intending to serve smaller scale OCR users who cannot economically justify more expensive equipment. Single units are priced at $21,800, including a document handler, camera, video processing electronics, recognition logic, and electronics for control of the document handler. The oem, of course, must add a suitable output device. The vendor feels it is a natural as a peripheral for key-to-tape systems, for example.

The unit reads a single line with up to 70 numeric characters at 108 cps and up to 130 cards/minute. Type options include ANSI size A, IBM 1428, and Farrington 12F numerics and symbols. Orbit I, equipped with an automatic feed and two stackers, reads documents ranging in size from 4-7.5 inches horizontally and 3-4 inches vertically, .004-.0075 inches thick. An optional read head permits recognition of characters and pencil marks from the same document in the same pass.

Delivery requires about three months ARO. ORBITAL SYSTEMS INC., Moorestown, N. J. For information:

CIRCLE 392 ON READER CARD

Line Printers

Factory-sealed bearings eliminate the need for lubricating these two printers, and clutches and brakes are eliminated through the use of a stepping motor paper drive mechanism. Gears are eliminated because the character belts are directly driven—the belts contain individual characters that snap on and off the belt.

What remains is an 80-column, 150-lpm unit, the Model 801. For use with just about everything from minicomputers to time-sharing systems, it is priced at $6500.

The 132-column, 110-lpm printer is called the Model 1321. Selling at $7900 in single units, it has a full range of 96 upper and lower case characters.

Delivery of the Model 801 is 30 days ARO, while deliveries of the Model 1321 are scheduled to begin in December. ODEC COMPUTER SYSTEMS INC., East Providence, R.I. For information:

CIRCLE 394 ON READER CARD

Commo System

System Seventy is described as one not designed for a specific application. Although it is biased toward use in computer communications networks, the manufacturer's list of applications also includes data collection, remote entry and processing, data retrieval, and front-end data handling and preprocessing.

The system is available in a basic and extended configuration. The basic system is built around the Nova computer and is intended as a communications preprocessor for 360 systems. Extended System Seventy is powered by a Supernova and has the added feature of a swapping disc. The hardware includes 12K (16-bit words) of core, a 128K disc, two magnetic tape drives with controllers, and a Teletype console.

The software is a modular operating system which can be readily altered for specific hardware or applications without affecting user programs. There is also a processor for the manufacturer-developed Data Macro Language (DML). DML is said to resemble BAL. It permits debug of applications logic and produces automatically re-entrant programs.

System Seventy is available as a custom system, and the producer is also preparing application packages. A key-to-tape system using up to 100 of the manufacturer's DD-70 crt terminals is already available.

The hardware for a basic front-end system is $10K, depending on the devices that will plug into it. A "turnkey" system (8K Nova with System/360 interface) is priced at $35K, plus $5K for each communications channel.

Extended System Seventy, hardware and software, is priced at $80K. The DML processor is priced at $25K, and the key-to-tape system is $20K. Delivery schedule for the front-end system is 30-60 days ARO. The key-to-tape package is available 120 days ARO, and the extended system and DML processor will be available next April. MARK COMPUTER SYSTEMS, INC., Garden City, N.Y. For information:

CIRCLE 395 ON READER CARD

(Continued on page 105)

Superbly Engineered

Amazingly Economical

Error-Free Performance

Stand Alone

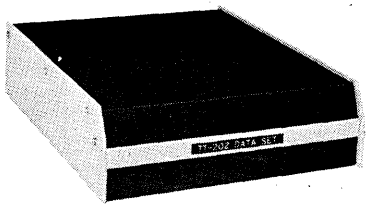
Data Sets

0-2400 BPS

Direct Bell Replacements

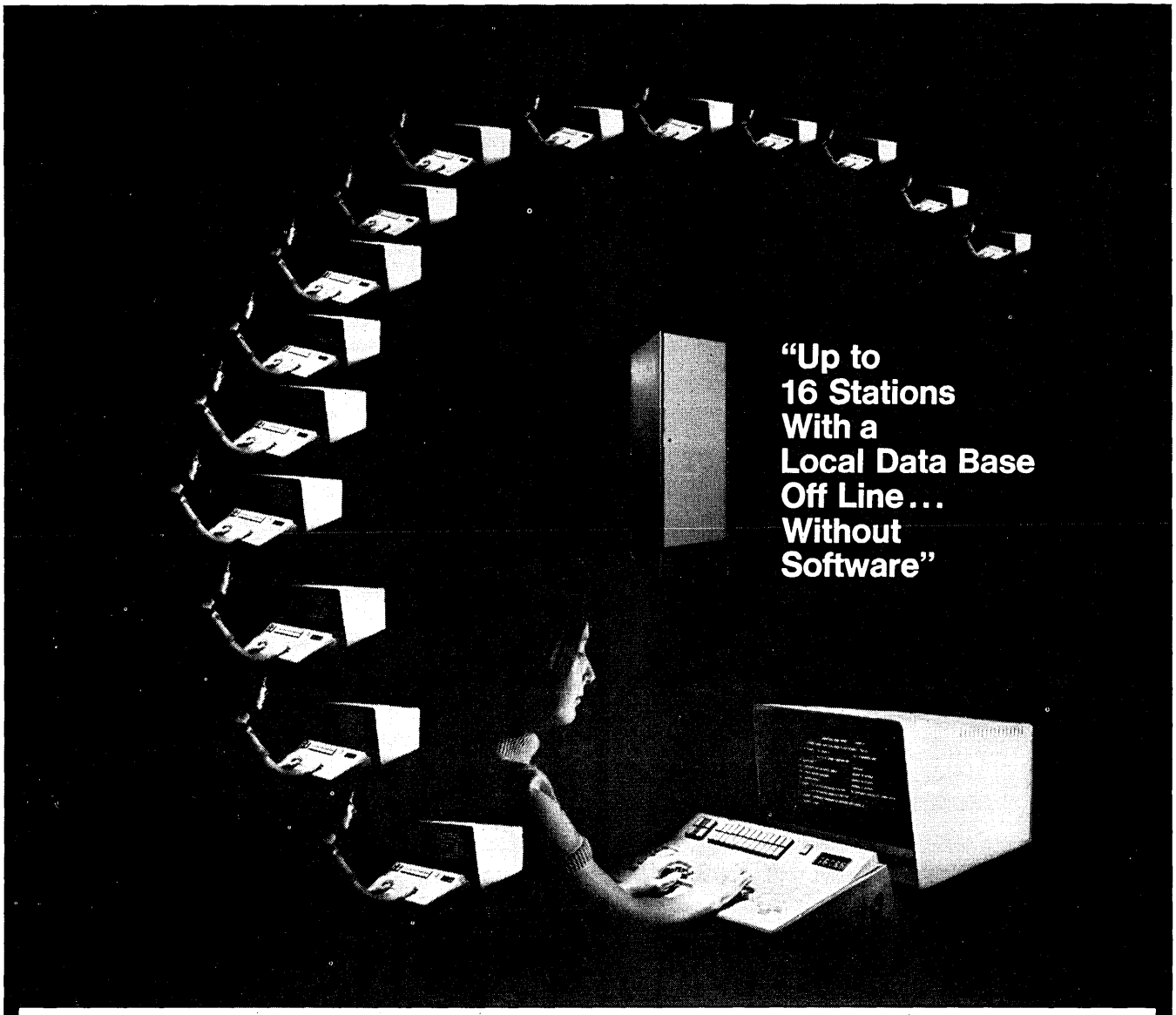
Off-The-Shelf Delivery

Need We Say More?



11810 Parklawn Dr.,
Rockville, Md. 20852
(301) 933-8170
TEL-TECH CORP.
In Canada: Canteltech, Ltd.

CIRCLE 64 ON READER CARD



APPLICATIONS

- **Message Composition and Transmission**
- **Information Dissemination**
- **Message Editing**
- **Data Base Update**

THE BR-700 INFORMATION SYSTEM

. . . is a stand alone, off-line data information display system operating from its own local base . . . Since the BR-700 is a completely self-contained system, the local data base may be accessed, altered, and data refiled without software . . . The controller and the local storage is field expandable to service 16 operator stations . . . Off-line message composition and validation assure error-free transmissions . . . The BR-700 has provisions for communicating with printers, mag tape, modems, computers, and other operator stations of the system . . . Bulk data transfers may be accomplished into and out of the BR-700 storage at high speed when communicating with a central data bank . . . For additional information contact the Bunker-Ramo Marketing Department.

THE BUNKER-RAMO CORPORATION
DEFENSE SYSTEMS DIVISION
31717 LA TIENDA DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91360

Line Printers

These two 5000-lpm electrostatic printers use 640 writing styli to print on specially treated roll or folding paper. The Statos 21 models 2110 (desk top) and 2111 print silently, according to the vendor; no rotating belts or drums are necessary—only the paper moves, at rates up to 10.5 ips while printing text or graphic output.

Options include a paper cutter and tray, pedestal with space for Z-fold paper, and variable forms control allowing printout on any assortment of business forms. This capability is based on ROM and provides any sequence of spaces between lines of type. It also eliminates paper tape loops used in most conventional printers.

First interfaces will be for the vendor's own 620/i, but interfaces are in the works for DEC PDP-8 and 10, and IBM 1130s, 1800s, and the entire 360 line.

A model 2110, for applications requiring off-line printout, is priced at $9950. The model 2111 with a character generator is priced at $13,450. Add $1500 for a 620/i interface. Typical computer configurations will run about $15,300, according to the vendor. The printers are scheduled for delivery next year. VARIAN, Palo Alto, Calif. For information:

CIRCLE 396 ON READER CARD

Commo Front End

There appears to be a relentless effort in the industry to fill whatever voids may exist in the lineup of systems for communications preprocessing. Front End Communications Facility (FCF) is the name of this entry. It is a turnkey ensemble of software and hardware for message manipulation that features store-and-forward capabilities.

The computer for FCF is the Honeywell DDP-316 or -516 with up to 64K of storage. The other essential piece of hardware is bulk storage, either a fixed-head disc or disc packs. Fixed-head storage has an 8.5 msec access time and a capacity range of 98K to 1.6 million 16-bit words. Data is recorded serially in variable record lengths and addressed by byte. A fast access option is available consisting of two of these discs and a controller.

The disc pack units are 2314 compatible with 55 msec access time. Up to four drives (56 million bytes) can be attached to the controller. The low-speed, high-capacity disc is used for the journal feature of FCF. (This is the recording of all messages to maintain a record, and for possible retransmission or off-line processing.)

FCF software is modular and performs such functions as preventing contention between messages for service or storage and handling priority messages, message intercepts, and alarms. Modules can be customized for special requirements.

Among the communications interfaces provided with FCF are: a multiplex unit for up to 128 asynchronous 45 to 180 bps lines, a synchronous single-line controller that provides a character interface to the I/O bus and full-duplex serial interface to the data set for dedicated lines, and an IBM/360 interface that connects FCF to the selector or multiplexor channels.

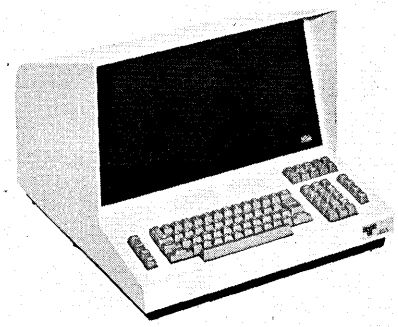
FCF is fully operational and currently available six to nine months ARO. Its basic price is $180K. PROGRAMMING METHODS, INC., New York, N.Y. For information:

CIRCLE 397 ON READER CARD

CRT Terminal

Designated the TC-70, this crt terminal uses the same six-level BCD code and interface as the IBM 2740. Physically, it comprises a Selectric keyboard with added function keys and a 12-inch nonglare screen upon which one-quarter inch alphanumerics are displayed. Split screen can be used as a fixed mode or in combination with full-screen capability.

Storage capacity can be either 512 or 1024 characters, and the refresh rate is 60Hz. Transmission rate is 600 baud. The terminal is available with RS 232-B interface or internal modems compatible with 103 or 202 data sets.



TC-70 has a single unit price of $4490 with reductions for quantity purchases. Delivery is 60 days ARO. TERMINAL COMMUNICATIONS, INC., Raleigh, N.C. For information:

CIRCLE 398 ON READER CARD

Store-and-Forward

Collection and transmission of relatively slow input is the forte of this cassette communications terminal. The 4100 is an incremental recorder that uses a Philips cassette. Maximum tape capacity is 70,000 characters, with a recording rate of 300 steps/second. The I/O rates can range from 110 to 1200 baud. The manufacturer extols its ability to function as an incremental interface for slow-speed operator I/O—Teletype or Flexowriter—or as a selectable-speed asynchronous interface for high-speed transmission. The unit features station-keeping capability to regulate the interfaces which can operate separately or simultaneously.

The base price for the 4100 communications terminal is $1650. Delivery is 30 days ARO. TECHNICAL CONCEPTS, INC., Rochester, N.Y. For information:

CIRCLE 400 ON READER CARD ■

with features like these:

- realtime executive operating system
- *extensive* operations repertoire
- 16 addressable registers
- 7 flexible addressing procedures
- flexible memory (4K to 65K)
- up to 256 true priority interrupts
- up to 256 prioritied DMA ports
- up to 256 buffered I/O channels
- simple I/O interfacing
- I/O word, register, and status transfer
- data chaining
- floating point

it's more than a minicomputer

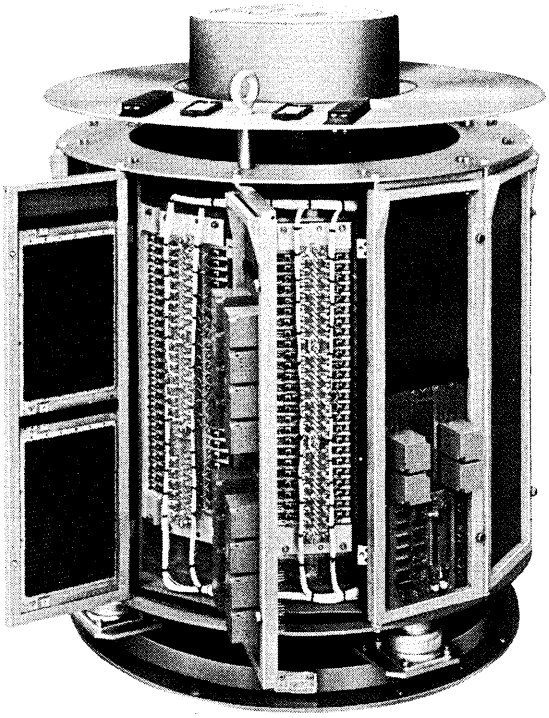
This powerful *mini/max** computer from Infotronics fills the gap between the minicomputers and the "big boys" but has a modest price tag. And the cost of adding peripherals is less for the *mini/max,* too. Get the full story on realtime executive and the *mini/max* by writing Infotronics, 8500 Cameron Road, Austin, Texas 78753 . . . or calling 512-454-3521.

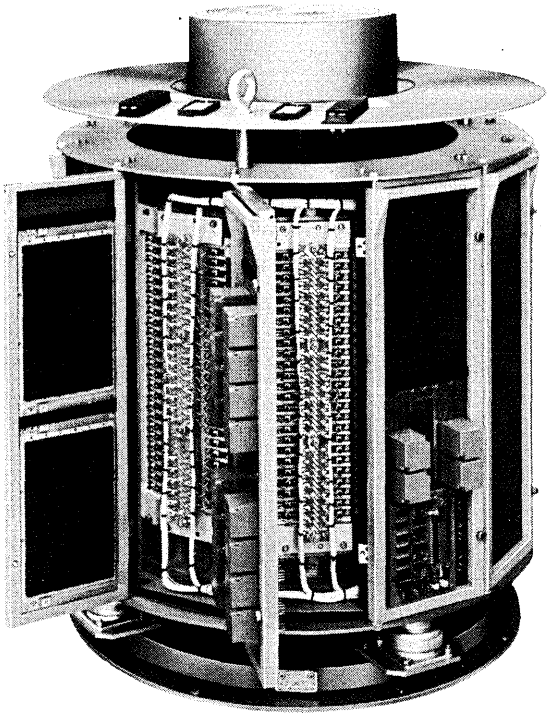
* Trade Name of Infotronics Corp.

INFOTRONICS CORP.

521

See the mini/max in booths 1708 and 1710 at the FJCC
CIRCLE 99 ON READER CARD





SA 7000
DRUM MEMORIES

Our SA 7000 drum memories are fast, with average access rates of 8.7 ms. Single-drum capacities range from 10 million to 150 million bits, with 256, 512, 1024 or 1536 tracks—each with its own read/write flying head. SA 7000's are reliable, too. You can expect less than one error in 10^{11} bits under normal operating conditions. Nor did we forget the human factor. Our drums feature stand-alone design, turntable mounted to give full 360° access to all circuits and checkpoints from the front. And data electronics are part of the package, including a bit serial interface that matches the drum to your controller. Optionally, controller logic can be provided to interface with a central processor. These are just some of the features. They add up to low bit cost and high throughput. Which is what drum memories are all about. At least ours.

SA 8000
DRUM MEMORIES

ditto

except the SA 8000 is twice as fast! Average access: 4.4 milliseconds!!

For more information on the SA 8000 Drum Memory or the SA 7000 Series, just write or call.

SYSTEMATICS/
MAGNE-HEAD DIVISION,
GENERAL INSTRUMENT CORPORATION
13040 So. Cerise Ave., Hawthorne, Calif. 90250.
(213) 679-3377, TWX 910-325-6203.

GENERAL INSTRUMENT

CIRCLE 50 ON READER CARD

Quantor 200

...the second part of Quantor 1·2·3

A unique and complete microfilm information system. It records and develops in one step. It copies and loads cartridges in a second step. And there's more to come.

Quantor Corporation, 10950 North Tantau Ave., Cupertino, California 95014 (408) 253-8310

CIRCLE 91 ON READER CARD

Data Base Communication

Query Language/One is a general-purpose inquiry and report generation language designed to provide convenient English-language access to any Information Management System/360 data base. QL/1 operates in a teleprocessing environment as an IMS Type I program. Report mode and utility functions operate as IMS Type II programs. In an IMS environment where teleprocessing is not supported, the entire QL/1 system can be executed in a Type III region. Approximately 25K bytes are required by the program.

In the query mode, QL/1 provides conversational on-line access to a data bank, enabling the addition, deletion, or modification of information in the bank, the listing of selected information, and the performance of statistical calculations. The number of modifiers is unlimited, so any action taken can be as restricted or as encompassing as desired. The verbal commands are change, delete, display, add, count, and define. In all of these functions unlimited selection criteria using data element names and values is supported with a full set of relational and logical operators.

Operating in report mode, QL/1 provides unlimited control of formatting and content, according to the vendor. QL/1 specifies the report when given simple statements and executes it for any set of specific conditions. Tab settings, pagination and dating, three levels of headings and one footing, upper and lower case reports, variable spacing and paragraph indentation, justification, and centering of the text are all handled by the package. Report mode also contains internal logic control constructs; internal work cells for alphabetic and numeric information; full relational and logical operators in comparison statements; nesting of subreports to any level; inclusion of textual and numeric constants at any point in the report; and full editing capabilities, including spelling, ordinalization, and cardinalization. These can be either hard copy or data display. Complete definition of an IMS/360 data base is provided by a Thesaurus.

Requiring one day for installation, QL/1, including training, documentation, and maintenance, can be purchased for $25K. It can also be leased on a minimum six-month plan with purchase option—depending on contracts this would be approximately $750/month. GENERAL ANALYTICS CORP., Los Angeles, Calif. For information:

CIRCLE 380 ON READER CARD

Printout Expediter

Through placement of multiple control blocks in print lines, PRTFAST reportedly reduces print time for System/360 computers by an average of 25%.

The assembly language program works under DOS or TOS, and with COBOL and BAL programs. Core requirements for one buffer are 240 bytes for the software, 132 bytes for the buffer itself, and 24 bytes for the control information. Offsetting some of this overhead is PRTFAST's elimination of DTF and logical IOCS.

PRTFAST is priced at $1200 for the initial installations, with subsequent orders reducing the price. The developer provides installation assistance, program guides, and taped macro and operation routines. All future modifications will be available to the users free of charge. GDG DATA SYSTEMS, INC., New York, N.Y. For information:

CIRCLE 381 ON READER CARD

PDP-8 Programs

The P-100A package includes RIM (read in mode) and binary loaders, a diagnostic program, an ASCII paper tape to CartriFile utility program, a PAL-III assembler, a DEC editor, an I/O driver subroutine, and a program library generator all on a 25-foot magnetic tape cartidge. Descriptions, operating instructions, and PAL-III assembly listings of all the programs are also part of the package.

The idea behind all of this software support is to get a PDP-8 installation off of paper tape equipment and on to the vendor's CartriFile magnetic tape system. It is claimed that I/O time can be reduced by as much as a factor of four from that required with a paper tape reader and punch.

A 15-word CartriFile RIM loader, which is toggled into the computer to replace paper-tape RIM, is also included in the package price of $250. TRI-DATA CORP., Mountain View, Calif. For information:

CIRCLE 383 ON READER CARD

Library Maintenance

Many installations have so many programs on hand that keeping track of them presents problems—lack of library storage space for documentation and program decks, and difficulty in finding the right program or subroutine for the right application.

CFMS might help alleviate some of that. By placing all of the card files onto a master tape along with a short title, and (if desired) a longer description detailing other information relevant to the file, a potential user can scan titles and descriptions rapidly and even look at source document references and modification history.

The COBOL program consists of an update program, an index report generator, and a retrieval program. CFMS runs under 360 DOS and is priced at $500. RISE, INC., Los Angeles, Calif. For information:

CIRCLE 384 ON READER CARD

FORTRAN Flowcharting

In addition to completely flowcharting FORTRAN programs, HI-FLOW renumbers statements and references so that they are in a more logical sequence, and then produces a new deck or new decks of the generated program. It will also tidy up the coding by deleting all statement numbers that are not referenced.

Written in FORTRAN, the program requires approximately 160K bytes on a 360. HI-FLOW is set up to generate plots on the vendor's own plotting system, but CalComp models, among others, can be used. The manufacturer will also undertake the conversion required to make the program work on whatever plotter an installation wishes.

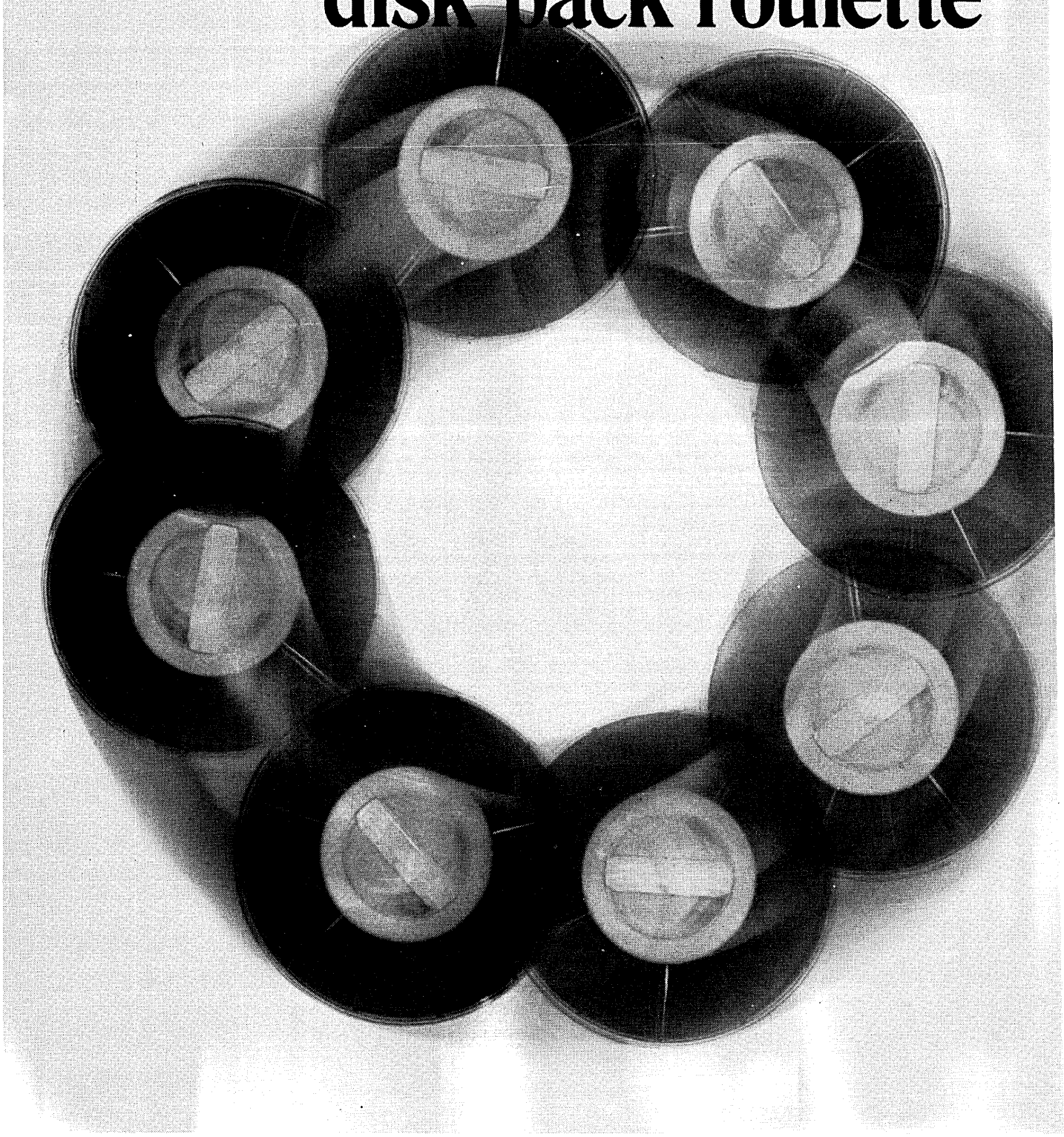
Constraints on the size of a program that can be flowcharted are that the number of referenced statements "should" not exceed 1,000, and the number of actual statement numbers defined should not exceed 1,500. Options to the program include no flowchart, no deck, etc.

Documentation and installation are included in the price of $3800 on a three-year lease. HOUSTON INSTRUMENT, Bellaire, Texas. For information:

CIRCLE 389 ON READER CARD

(Continued on page 113)

There's a game called disk pack roulette

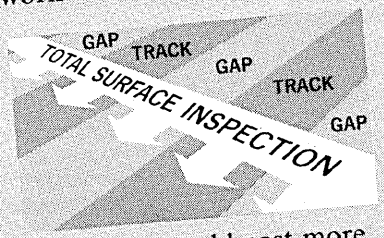


we don't think you should have to play.

Being able to exchange disk packs when something goes wrong is a good idea. *Having* to exchange packs is a bad idea. It means downtime on your system, rescheduling, initializing and creating a file on the new pack. You'll be lucky to get by for $50 worth of time and trouble.

How do you wind up with errors in "error-free" packs? Well, one way is to get a pack from someone who checks the disks just in the narrow track area. *Your* drive, however, may read just a little outside the track. Right over an error no one has seen. Blip.

To keep you from facing that problem, CDC checks the track area, and also checks the area between the tracks. More work on our part. Less worries for you.



We feel so confident about our quality, we're now offering LIFETIME ERROR PROTECTION on all our packs. That means a CDC pack is warranted to remain 100% usable for *as long as you own it.*

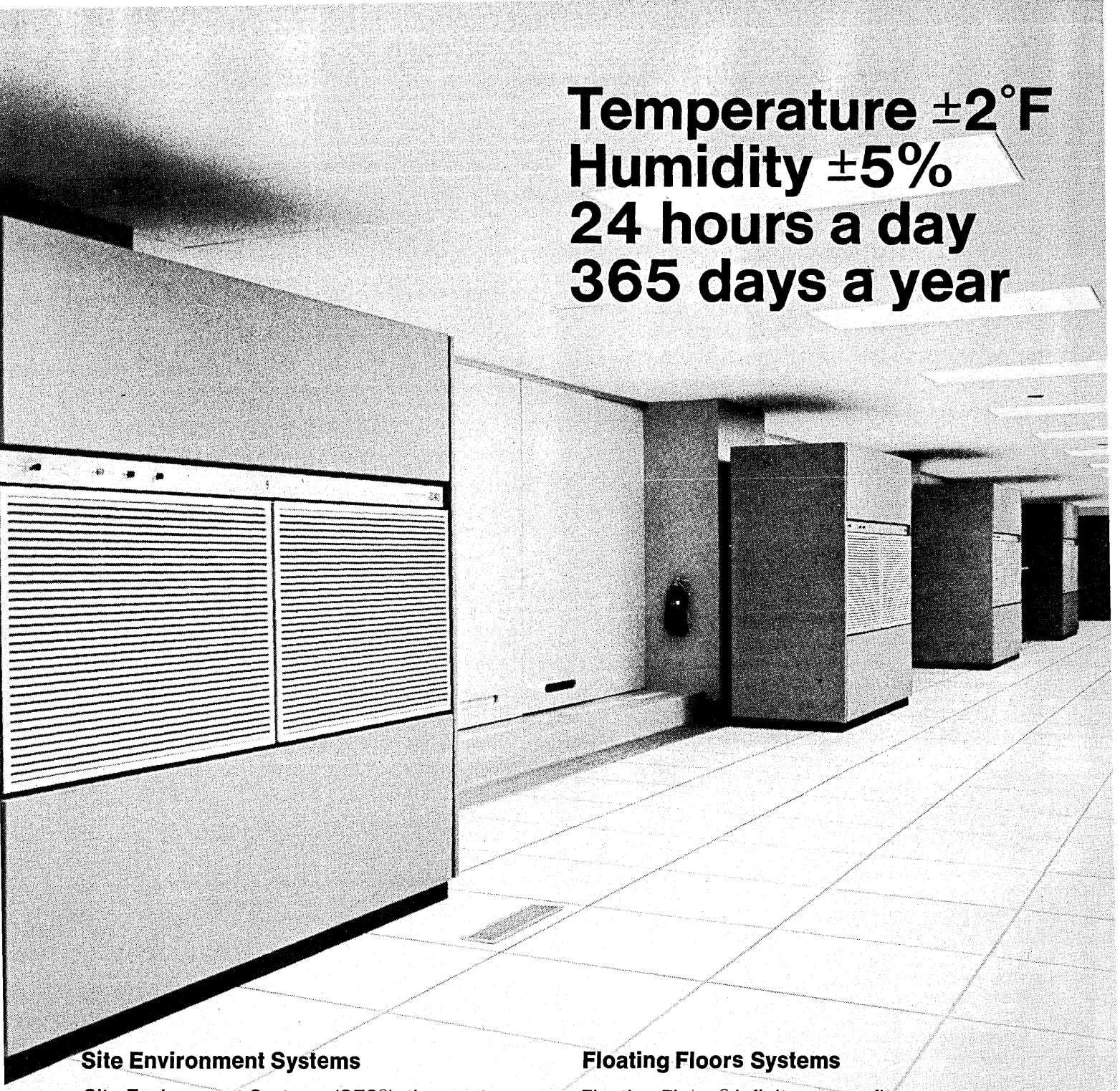
You'd think all that product, service and protection would cost more. It doesn't. Cost is an area where CDC is about the same as everyone else.

You'll see what we mean when you get our free booklet. Call your nearest CDC sales office, circle the number below, or phone us at our main office on our "hot line." Call, collect, (612) 884-8195.

CONTROL DATA CORPORATION

Business Products Operations
Dept. 321
Control Data Corporation
P.O. Box 1980
Minneapolis, Minn. 55111

CIRCLE 44 ON READER CARD



Temperature ±2°F Humidity ±5% 24 hours a day 365 days a year

Site Environment Systems

Site Environment Systems (SES®), the most precise, most reliable packaged environmental control units you can buy, can operate constantly. Dual systems* operate alternately under normal loads, work together should an overload occur. Each unit controls temperatures within ±2° F. with an extra-sensitive thermostat, dual compressors, five rows of cooling coils and reheat coil. A sensitive humidistat holds relative humidity levels within ±5%.

Each unit has a malfunction alarm, filter clog indicator, high temperature alarm, and indicating panel for full, constant monitoring of unit.

SES units are available in 3, 5, 7.5, 10 and 15 ton sizes, in air-cooled and water-cooled models with indoor or outdoor condensers, and in computer matched colors.

Floating Floors Systems

Floating Floors® infinite access floor systems create an air plenum for efficient, duct-free distribution of conditioned air. Strong, corrosion-resistant and completely interchangeable panels are available in die cast aluminum or continuous bonded steel.

Write for our new full color brochure. It contains pictures and specs on the complete line.

FLOATING FLOORS, INC.

Floating Floors, Inc.
Subsidiary of National Lead Company
5400 N. Detroit Avenue/Toledo, Ohio 43612
Telephone (419) 479-0721/TWX 442-1709

*on the 7.5, 10 and 15 ton units

CIRCLE 71 ON READER CARD

COBOLCross-referencing

Cross-referencing in COBOL and assembly language programs running on 360s under DOS is the purpose of CROSS-REF. There is no limit on the number of statements it can cross-reference. It can either cross-reference one program, or take a series of programs and handle them as if they were one large program.

All names are cross-referenced, and an alphabetical list of each data element, procedure, literal and external name is produced, showing every location where each is used. CROSS-REF also references by type—what was used, altered, tested, was a subscript, or was a key for nonsequential access. If part of a program is in a library, the system pulls it off the library and includes it in the cross-reference.

Outputs include flagging of inefficient statements, and CROSS-REF also picks out nonbinary subscripts and shows every arithmetic operation on a display field. Page and line numbers are used to keep references current. If page and line numbers are omitted or out of sequence, CROSS-REF automatically assigns sequence numbers and uses those.

Input can be cards, tape, or disc to obtain output for a printer, tape, or disc. No compiling is necessary, and the only JCL needed is for the sort.

CROSS-REF requires 24K bytes and is priced at $965 for DOS releases 19 and later. NATIONAL COMPUTING INDUSTRIES, Phoenix, Ariz. For information:

CIRCLE 382 ON READER CARD

Flowcharter for Minis

Not only is QUICKFLOW not particular about which machine one drops it in (it's written in FORTRAN), it doesn't even care what language program it may be called on to flowchart. It's all done with special comment cards that the documentation will explain. These comment cards—you may still use your favorite old formats—tell QUICKFLOW where to go.

Source decks are the input to the 7-8K (in 16-bit machines) program, and since few mini owners have access to plotters, the output comes out on the system printer. There is no restriction on the size of the input.

QUICKFLOW is priced at $200, including the documentation. COMPATA, INC., Tarzana, Calif. For information:

CIRCLE 385 ON READER CARD

Payroll

Payroll II is tailored to an individual installation's requirements. In addition to general payroll capabilities, features include expansion of earnings and deduction catagories to accommodate variable combinations to a total of 99, a maximum six-level master file key, a sort key for check sorting, and 10 year-to-date listings on check stubs. Up to 7,992 bytes of storage is available for individual employee files. Social security numbers can be used as primary employee identifiers, and sorting in a different order than the master file is allowed.

Minimum system configuration required for Payroll II is a 128K 360 running DOS. The price of $25K includes up to three man-weeks of installation assistance and an 18-month warranty that is renewable on an annual basis. The program can also be leased. PHI COMPUTER SERVICES, INC., Arlington, Mass. For information:

CIRCLE 386 ON READER CARD

Pert/Cpm Plotting

CPM-PLOT accepts compatible input from a user's PERT-TIME system and generates a plot tape for the vendor's own plotting system (or most other plotters) for network graphing either on- or off-line.

Two versions are available, "activity oriented" and "event oriented." Events are depicted as nodes or blocks. Activities then are the interconnecting lines. Thus a network is formed of both events and activities as plotted against a variable time scale.

The FORTRAN program requires 32K on a 360. It is priced at $6500 on a three-year lease, with an additional installation charge on "unusual" computer configurations. Documentation is included in the package. HOUSTON INSTRUMENT, Bellaire, Texas. For information:

CIRCLE 387 ON READER CARD

Circuit Analysis

For installation on a time-sharing computer, MCAP (Microwave Circuit Analysis Package) is an interactive design tool allowing analysis of transmission lines, lumped elements, sources, two-port S parameters, striplines, and active devices.

Upon entering the circuit description, the engineer can select the type of analysis desired. He can also make circuit modifications or corrections at any point during circuit analysis. His input is checked for errors before analysis is begun—which will save computer time.

After the input is checked, four different analyses are available: 1) nominal solution at a specified frequency; 2) frequency sweep of the network over a selected range; 3) parameter sweep of an element over a selected range; and 4) frequency sweep plus one element's parameter sweep simultaneously over a selected range.

Output is available in the form of tabulated values and/or tty plots. The user specifies which section of the network and what outputs he desires for each chosen section.

The FORTRAN program requires 12K on a PDP-10 and can, of course, be made ready for any other machines that are able to support FORTRAN. MCAP, including documentation and any updates that may occur, is selling for $15K under a license and royalty agreement. SHARED APPLICATIONS INC., Ann Arbor, Mich. For information:

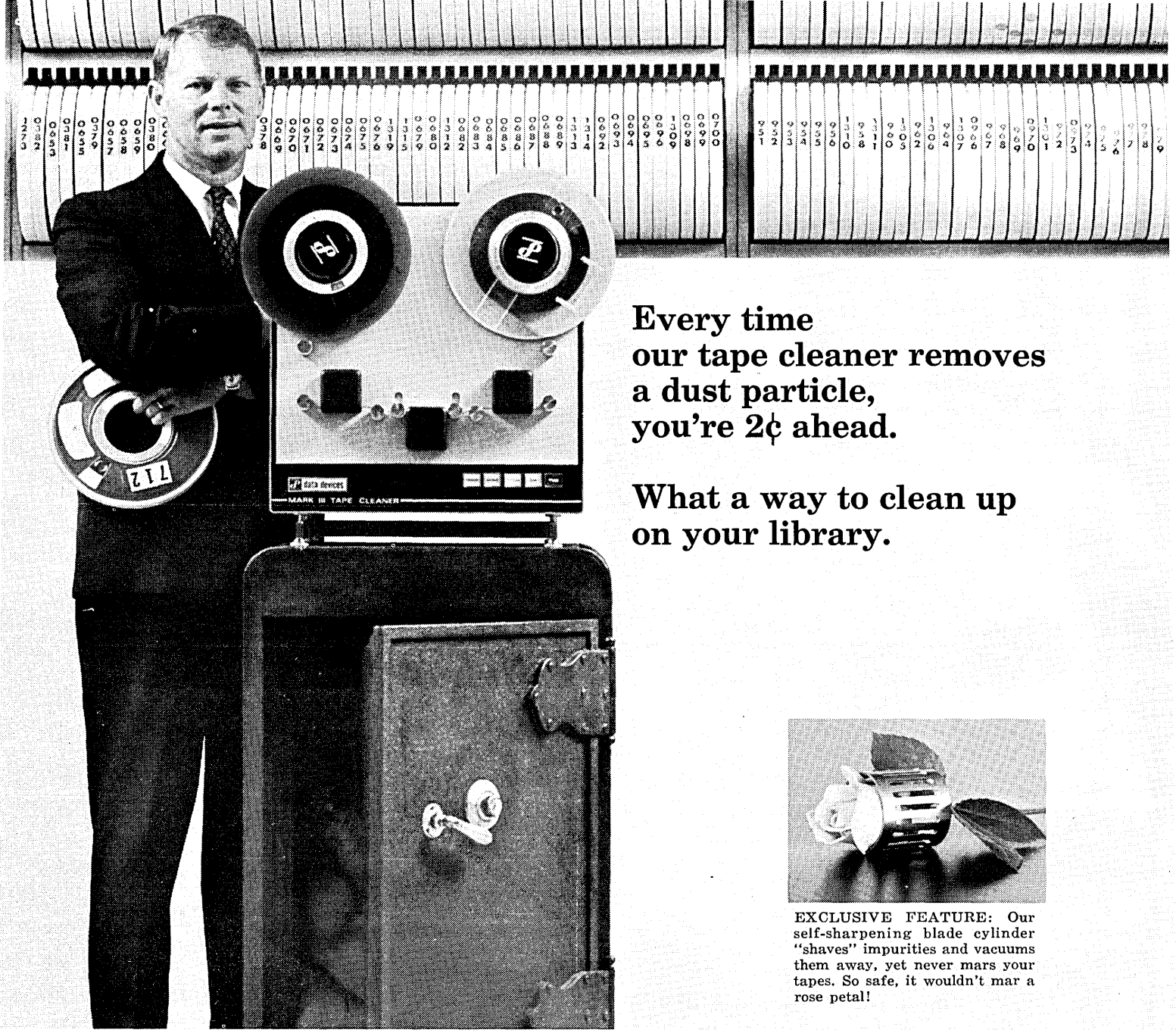
CIRCLE 390 ON READER CARD

File Generation

Automatically generating BCD magnetic tape or disc files from a series of control cards, FILEGEN can generate fixed- or variable-length records, either blocked or unblocked, on multifile reels or multireel files. Subroutines of the program can also be used with assembly language or FORTRAN programs for reading and writing files. All I/O is fully buffered.

Requiring typically 4K bytes on a 360, the program also is available for CDC series 3000 and 6000 machines, and a version for RCA computers will be along shortly. FILEGEN is priced at $950. SYSTEM AUTOMATION CORP., Silver Spring, Md. For information:

CIRCLE 388 ON READER CARD ■



Every time our tape cleaner removes a dust particle, you're 2¢ ahead.

What a way to clean up on your library.

EXCLUSIVE FEATURE: Our self-sharpening blade cylinder "shaves" impurities and vacuums them away, yet never mars your tapes. So safe, it wouldn't mar a rose petal!

There's no way to prevent dust particles and oxide clumps from getting onto your tapes. But there's a way to get them out before they cause errors. Our Mark III tape cleaner provides the way. It also provides the industry with some pretty high standards for reliability. No other tape cleaner has a self-sharpening cylindrical blade and vacuum system. The Mark III does. In one customer's 6,500-reel library, the cleaner removed an average of 30 "write errors" per tape at a savings of 2¢ per error in used computer time. One shift could put 48 tapes through the cleaner, netting the customer a savings of $28.80 a day. At the end of a 22-day work month, the savings amounted to $633.60 for just one shift's work. You know how valuable your tapes are. They're certainly worth a Mark III. Especially when you can lease one for as little as $95 a month. Get the details. Better yet, get a demonstration of how you can clean up on your library. Call Anthony J. Teuber, 213/345-7013.

DATA PRODUCTS technology gives your computer the edge

DATA PRODUCTS
data devices inc 18360 Topham Street, Tarzana, California 91356

Sales Offices: Atlanta 404/634-0101; Chicago 312/654-0997; Los Angeles 213/483-4535; New York 212/532-9511; San Francisco 415/826-5923; Washington, D.C. 301/652-8120

CIRCLE 28 ON READER CARD

Some facts you must know before you choose an online savings and mortgage system.

You've made the decision. You and your management have decided to go *online.* You've decided to forego the expense, effort and headaches involved in developing your own system from scratch. Smart move! You'll save about $275,000 by doing it this way.

Make another smart move! Spend a day with us in St. Louis reviewing the St. Louis OnLine Savings and Mortgage Financial Package. 54 leading banks, savings institutions and service centers have invested in the system because of its proven reliability. Since it was first installed in January, 1967, the FDS Package has become the most widely used online system in the industry. Over 300 financial institutions in 22 states are now being serviced by our package.

The FDS system is comprehensive, flexible and economical. Major functions, features and options include:

Basic Savings/Club/Mortgage Pkg.
2311 or 2314 Disk Support
Card, Tape or MICR Input
1060/2740/1050 Terminal Support
2980 Terminal Support
Multi-Drop Ability
Construction/Home Improvement Loans
Certificates of Deposit
General Ledger
Message Switching
Investor Reporting
Daily Compounding
Name and Address OnLine
And more are on the way!!

Thirty-three highly skilled professionals provide the FDS "total support services" that include installation and training assistance, special modification service and continuing program and documentation maintenance. This unique staff is the key to our reputation for fine customer support and to future innovations that will keep the FDS system in its position of industry leadership.

For the full story, call or write

fds

financial data systems, inc.

6680 Chippewa, St. Louis, Mo. 63109 (314) 832-4150

LINE PRINTER.
$2400.

The Centronics Model 101.
It's economical because of the matrix printing and simple design.
It's practical because of the multiple copies, easy interface and communications options.
Just look at the Model 101 as something that acts like a line printer and costs like a teleprinter.
Centronics Data Computer Corp., Hudson, N.H. 03051

centronics

Because you don't want to spend more than you have to.

FJCC Booth
No. 1308-1310

CIRCLE 67 ON READER CARD

WASHINGTON REPORT

COMMITTEE REJECTS PENTAGON IR&D LIMITS

A House-Senate conference committee on the military authorization bill scrapped the fixed $625 million ceiling on independent research & development, bid & proposal, and other technical efforts that had been proposed in the Senate version. The ceiling would have applied to about 50 major contractors that account for 95% of DOD spending on these technical activities. The Senate also wanted strict rules requiring such basic research to be relevant to military requirements. The conferees deleted the reference to relevancy, instead authorized the Defense Secretary to determine whether "a potential relationship to a military function or operation" exists. Wisconsin Sen. William Proxmire, a key proponent of DOD limits, said the conference committee gave the Secretary a "blank check." The conference bill has now passed Congress.

SENATE BILL WOULD STRENGTHEN GAO PROBES

The Senate GovOps Committee has reported a bill to strengthen the powers of the GAO. Aimed mainly at defense spending, the measure would permit the agency to subpoena contractors' books and records and expand its review and analysis of ongoing R&D and procurement programs. It would change the GAO's name to Office of the Comptroller General. No corresponding bill has been developed in the House.

CAVENEY VS. IBM

IBM is trying to lock out competition, charges Dick Caveney, president of the Computer Peripheral Manufacturers Association. Future IBM systems consolidate the cpu and disc controller, as is already done in the 360/20. "It will virtually prevent" independents from selling their disc drives to IBM customers, Caveney says. Concurrently, he attacked GSA for demanding discounts from independents but not from IBM.

Armonk, as usual, refused to comment. Whit Dodson, who heads GSA's adp procurement activity, says IBM does, in effect, give the government discounts; for example, it offers extended rental credit, defers rental increases, and grants additional warranties on software that are denied to commercial users.

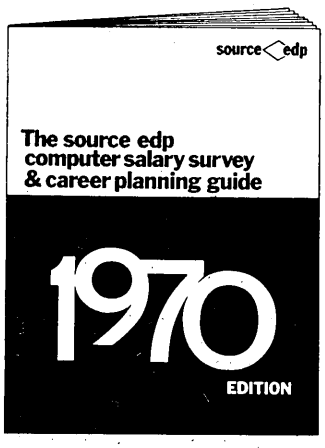
Related development: We hear that IBM, in an effort to head off growing federal interest in independently made peripherals, has offered new, much more favorable terms on several leased systems.

COBOL VALIDATION FOR DOD

An order requiring all COBOL compilers used by the military services to be validated against the ANSI standard seems likely to be issued by DOD early next year. Compilers acquired from contractors as well as those developed in-house would be affected. Later, the requirement probably will be imposed on all federal agencies.

The Navy is the only service that requires validation currently. Commander Grace Hopper, whose office provides the test routines, recently was authorized to maintain and distribute them for all of DOD—an obvious preliminary to making validation mandatory for the other services.

Dynamic 1970 careers. And the salaries they command.



Here is an up-to-the minute report on opportunities for computer professionals including new fields for career advancement on a national and international basis. Plus the techniques and strategy of how and when to change positions. And for how much. (As high as $75,000.)

It's in the all-new 10,000-word 1970 Source EDP Computer Salary Survey and Career Planning Guide. Compiled and edited by the Source EDP Computer experts. To speed delivery of your free copy write or call your nearest Source EDP office. Or circle the reader inquiry card.

source edp

Atlanta—William G. Barnett, 11 Corporate Square 30329, (404) 634-5127
Chicago—Thomas D Walsh, 100 S. Wacker Drive 60606, (312) 782-0857 and 903 Commerce Drive, Oak Brook, Ill. 60521 (312) 323-8980
Dallas—Paul E. Dittmer, 7701 Stemmons Freeway 75247, (214) 638-4080
Detroit—Robert T. Stevens, 24500 Northwestern Highway Southfield, Mich. 48075, (313) 352-6520
Greenwich, Conn.—Edward J. Golden, 9 Benedict Place 06830, (203) 661-3344
Los Angeles—Wayne B. Emigh 3550 Wilshire Blvd. 90005, (213) 386-5500
Minneapolis—Fred N. Anderson, 801 Nicollet Mall 55402, (612) 332-8735
New York—Charles I. Stern, 1414 Avenue of the Americas 10019, (212) 752-8260
Palo Alto—Gordon F. Best, 525 University Ave. 94301, (415) 328-7155
Philadelphia—George P. Ramming, 1700 Market Street 19103, (215) 665-1717
St. Louis—Robert H. Trumbull, Suite 207, 130 S. Bemiston, Clayton, Mo. 63105, (314) 862-3800
San Francisco—Rchard M. Clark, 111 Pine Street 94111, (415) 434-2410
Union, New Jersey—Daniel A. Mickel, 2204 Morris 07083, (201) 687-8700

Affiliates in the United Kingdom.
Client companies assume our charges

CIRCLE 506 ON READER CARD

PEOPLE

Who's left IBM lately? Well, **James M. Taylor,** director of development at the General Systems Div., went to Tracor Data Systems as vp of engineering and product development, after 20 years of varied assignments and transfers with I've Been Moved. His experience includes an overseas stint and responsibility for progress in OCR and small commercial systems. His residence now is Austin, Texas. . . . **Robert M. Beckett** left a post as systems manager for IBM's information display systems to become president of Adage, Inc., Boston assembler of computer systems and graphic displays. He had been in both sales and systems development at IBM, has a Naval Academy-MIT background. . . . IBM in turn is apparently importing some software management people, now that it's selling it like the others, one of whom is **Robert Glaser,** a long-term manager with Computer Usage (which at one time was recruiting IBMers) who ultimately went into independent consulting. He has been taken on as product manager of program products in Systems Development. . . . Another prestigious IBM appointment is that of **Dr. Ralph E. Gomory** as director of research. Previous director **Dr. Arthur G. Anderson** is spending a sabbatical year with the Center for the Study of Democratic Institutions to research "the relationships between industry and the universities and how they might be strengthened." Gomory is an IBM Fellow and Princeton mathematics lecturer. . . . With IBM users, the SHARE group has elected **David Callender** of Aerospace Corp., president, and **T. A. Theberge,** McDonnell Douglas, vp. Outgoing president is DATAMATION contributing editor **Philip Dorn.** . . . **Kendall Wright** has changed presidencies from Invac Corp., a peripherals manufacturer, to Ty-Data, Inc. (formerly Ty-Core, Inc.), another p.m., of Nashua, N.H. "With the new product developments now being launched (by us), I foresee a tremendous opportunity for growth," says he. One of them is a cassette-to-computer-compatible-tape processor. Wright was also a vp at Digitronics. . . . The former marketing vp of ITT, **Raymond LeKashman,** has joined

personnel-ized

FINANCIAL and EDP

In the personnel field, meaningful personalization must be combined with maximum selection . . . that's why we coined the word *personnel-ized.*

Only the large organization can offer a genuine selection, because they have the quantity to select from . . . more positions . . . more people . . . greater *personnel-ization.*

Robert Half is the largest source in the FINANCIAL and DATA PROCESSING placement field . . . where you select the *best* because you select from the *most* . . . where the service is not only personalized, but is *personnel-ized.*

ROBERT HALF
PERSONNEL AGENCIES

R-H

Atlanta: 235 Peachtree St., N.E.	(404) 688-2300
Baltimore: The Quadrangle–Cross Keys	(301) 323-7770
Boston: 140 Federal St.	(617) 423-6440
Charlotte: 907 Baugh Bldg.	(704) 333-5173
Chicago: 333 N. Michigan Ave.	(312) 782-6930
Cincinnati: 606 Terrace Hilton	(513) 621-7711
Cleveland: 1367 E. 6th St.	(216) 621-0670
Dallas: 1170 Hartford Bldg.	(214) 742-9171
Denver: 1612 Court Place	(303) 244-2925
Detroit: 140 Honeywell Center, Southfield	(313) 354-1535
Garden City, N.Y.: 585 Stewart Ave.	(516) 248-1234
Hartford, Conn.: 75 Pearl St.	(203) 278-7170
Houston: 1200 Central Nat'l. Bank Bldg.	(713) 228-0056
Indianapolis: 9 N. Illinois St.	(317) 636-5441
Kansas City: 127 W. 10th St.	(816) 474-4583
Los Angeles: 3600 Wilshire Blvd.	(213) 381-7974
Memphis: 12 S. Main St.	(901) 527-7324
Miami: 1107 Northeast Airlines Bldg.	(305) 377-8728
Milwaukee: The Clark Bldg.	(414) 271-9380
Minneapolis: 822 Marquette Ave.	(612) 336-8636
Newark: 1180 Raymond Blvd.	(201) 623-3661
New York: 330 Madison Ave.	(212) 986-1300
Orange, Cal.: 500 South Main	(714) 835-4103
Philadelphia: 2 Penn Center Plaza	(215) 568-4580
Phoenix: 1517 Del Webb Townehouse	(602) 279-1688
Pittsburgh: Gateway Towers	(412) 471-5946
Portland, Ore.: 610 S.W. Alder St.	(503) 222-9778
Providence: 76 Westminster St.	(401) 274-8700
Rochester: One Marine Midland Plaza	(716) 546-3020
St. Louis: 1015 Locust St.	(314) 231-0114
San Francisco: 111 Pine St.	(415) 434-1900
San Jose: 675 North First St.	(408) 293-9040
Stamford, Conn.: 111 Prospect St.	(203) 325-4158
Washington D.C.: 7316 Wisconsin Ave. N.W.	(301) 654-1850

CIRCLE 507 ON READER CARD

Auerbach Associates, Inc., as exec vp. His impressive background includes presidency of an NYC management consulting firm and a partnership and vice presidency in Booz, Allen & Hamilton, for whom he opened the first European office. . . . Data Industries, Inc., the dp service company that has Louisiana's largest commercial computer and is expanding into other states, has brought in **Brooke H. Duncan,** a New Orleans business leader (bank and public utility director), as board chairman. He is expected to financially strengthen DII, which also offers facilities management, remote entry, and programming/management studies. . . . On Line Computer Corp., Stamford, Conn., says it is glad to get **Louis Feldner** as vp of planning and systems, because "the number of experienced and capable people who can deal both with computers and with classical communications is limited." Feldner was previously data communications consultant to the FCC and Stanford Research Institute, and has worked in medical information systems/marketing. . . . Two senior vp appointments at Data Products Corp., L.A.: **William N. Mozema,** one of the founders, for finance and administration; **Graham Tyson,** also a founder, for operations, including the Systems Div. and

six peripheral equipment divisions spreading as far as Hong Kong. Both were formerly with Ampex. Tyson in turn has promoted **C. Paul Davis** from marketing director to gm of the Systems Div. . . . A former Data Products exec who went off to help found Peripheral Equipment Corp. in the San Fernando Valley, **Stuart Mabon,** has become exec vp of operations. PEC also has a new industrial relations vp, **Bob Barron,** who came from Texas Instruments. . . . **Theodore L. Tolles,** who formerly served as general counsel for Mohawk Data Sciences, is now corporate director of finance for Cogar Corp., Herkimer, N.Y. . . . Signetics Corp., the Sunnyvale, Calif., semiconductor i.c. subsidiary of Corning Glass, has elected **Charles C. Harwood** president, succeeding **James F. Riley,** who resigned to take the presidency of Intersil Inc. . . . **Richard H. Russell** has been named manager of marketing requirements for Computer Sciences Corp.'s Infonet division. . . . Dun & Bradstreet, Inc., has created a new position, that of corporate director of computer applications, which it has given to **Richard F. Hespos,** most recently a partner in Venture Science Associates, NYC computer venture capital firm. ■

SOFTWARE PROCESS CONTROL SPECIALISTS

MINNEAPOLIS LOCATION

Honeywell Corporate Program Center is looking for two Software Process Control Specialists able to solve a variety of computer process control problems.

If you are interested in a position that requires broad application, experience and demands the ability to introduce new methods in a real time process control function, and allows for rapid personal growth, you should consider the positions outlined below:

DIGITAL APPLICATION ENGINEER

This individual will be the CPC Computer Control Specialist responsible for determining requirements for design of control software, computer systems and interface hardware specifically for process control application.

Degree in Engineering or Science required with a minimum of two years experience in design and evaluation of digital systems, including software design for process control functions.

PROCESS CONTROL ENGINEER

Responsibilities will include evaluation and design, preparation of technical proposals, system synthesis and lead contractual efforts for customer process control requirements.

Technical degree and four years experience in process control systems and their design, including software, instrumentation and computer hardware.

Salary for both positions commensurate with qualifications and experience.

Please call collect at 612/332-5200, extension 6535, or submit resume including salary history and requirements in confidence to:

Dennis J. Sharkey
HONEYWELL
2701 Fourth Avenue South
Minneapolis, Minnesota 55408
An Equal Opportunity Employer

CIRCLE 510 ON READER CARD

H. Levin, MBA, Personnel Management, Member of ACM and DPMA

RSVP

EMPLOYMENT AGENCY
for PROGRAMMERS & ANALYSTS
N.Y./N.J./PENNA.

RSVP will provide employment counselling, develop and circulate your resume, at no cost to you. Call or send resume or rough notes of objective, salary, location restrictions, education and experience to either of our offices:

- **HOWARD LEVIN, Director**
  RSVP Services, Dept. M
  Suite 714
  One Cherry Hill Mall
  Cherry Hill, N.J. 08034
  (609) 667-4488

- **BOB RAMSEY, Manager**
  RSVP Services, Dept. M
  Suite 104, Towle Bldg.
  1777 Walton Road
  Blue Bell, Penna. 19422
  (215) 643-5550

RSVP SERVICES
employment agency
for computer professionals

CIRCLE 500 ON READER CARD

corporate career directors, inc. (agency)

Are you an employer looking for that just right man to fill a key position with your firm? Are you an individual seeking new or better employment where your talents can be best utilized or where your goals can be realistically attained? If you can answer yes to either question, read further to see how Corporate Career Directors can be of benefit to you.

We are a licensed employment agency dedicated to one premise and one premise only: that is, finding the right man to fill a specific job vacancy. Our confidential searches are conducted on a nationwide basis. We have several highly trained staffing counselors specializing in various aspects of the EDP field.

For more information as to how Corporate Career Directors can be of assistance to you, feel free to contact our President, Anthony Hattenbach.

corporate career directors, inc. (agency)
3435 wilshire boulevard, suite 2114
los angeles, california 90005
phone (213) 380-1661

CIRCLE 502 ON READER CARD

Use your EDP experience in your own business.

■ Our modern training techniques and proven systems can convert your EDP knowledge into profits in a Wells Recruiting Systems Personnel Office. More than 50% of all our revenues are generated by computer industry placements.

■ Reap the profits, prestige and security that come from helping both individuals and businesses meet their employment needs.

■ Be part of a publicly-owned coast-to-coast organization that can give you a rapid return on your investment.

Minimum requirement $14,300, plus working capital.

Phone collect (212) 964-0211 or mail coupon below.

WELLS RECRUITING SYSTEMS
Wells Management Franchising Corp.
Suite 910
170 Broadway, New York, N.Y. 10038

Gentlemen: I am interested. I want further information.

Name_____ Tel. No._____

Address_____

City_____ State_____ Zip_____

CIRCLE 503 ON READER CARD

ADVERTISERS' INDEX

Advanced Systems, Incorporated 40
American Technological Institute 59, 118
Applied Data Research, Inc. 5
Applied Magnetics Corporation 98
Applied Systems Division of
Computer Learning and Systems Corporation 95
Atron Corporation 15

BASF Systems Inc. 2
Bell Labs 79
Boole & Babbage 99
The Bunker-Ramo Corporation 14, 104
Burroughs 16

California Computer Products, Inc. 30, 126
Card Key Systems 67
Centronics Data Computer Corp. 120
Cincinnati Milacron Company 50
Computer Machinery Corporation 80
Computer Terminal Corporation 66
Consolidated Computer 92
Control Data Corporation 20, 21, 110, 111
Corning Data Systems 68, 69
Corporate Career Directors, Inc. 124

Data Action 88, 89
Data Input Devices 82, 83
Data Products 74, 75, 76, 77
Data Products-Data Devices, Inc. 114
Data Recognition Corporation 10
Datamation Industry Directory 102
DATAMATION Magazine 115
Datatype Corporation 96
A. B. Dick Company 44, 45
Digital Equipment Corporation 90
Digitronics Corporation 51

Fenwal Incorporated 72, 73
Financial Data Systems, Inc. 119
Floating Floors, Inc.
A Subsidiary of National Lead Company 112

Robert Half Personnel Agencies 122
Honeywell 6, 7, 70, 123

IMLAC Corporation 78
IBM 100
Infotronics Corp. 106

Kennedy Co. ..... Cover 3

Lehman Brothers 85
Litton Automated Business Systems 58

Memorex 52

The National Cash Register Company 126

Peripheral Dynamics Inc. 8
The Plum Tree 85

Systems Software Management

For the AEGIS Program at RCA

Don't answer this ad if you like routine assignments.

In fact, the only thing that we make routine is a demand for creative technical solutions on one of the most advanced programs of the 70's. The Navy AEGIS Program.

More specifically . . . we are only interested in talking to you if you can show a demonstrated record of achievement in Systems Software Management—and, this must be coupled with a driving ambition to exceed your past achievements in organization and technical responsibility.

You know if you can meet this level of achievement—if you can, we have a lot to offer.

If you meet our standards you will be moving into a highly competitive environment—the AEGIS Program located in Moorestown, New Jersey, a quiet suburban community just 25 minutes from Philadelphia.

Your background must include experience in real time programming, and test of programs used in Weapon Systems. Experience in general systems software with application to Executive programs, Utility systems, simulation, phased array radar control, correlation and processing of radar data or special programs for interfacing, integration or computer controlled testing. Knowledge of command and control decision logic, man-machine interaction, system checkout and maintenance or training of operational and maintenance personnel would also be helpful. Familiarity with Naval Tactical Data Systems (Equipment and Computer Programs), highly desirable.

A BS or advanced degree with in-depth experience is required.

Write immediately to: Professional Employment, Dept. V-120, RCA Government and Commercial Systems, Marne Highway, Moorestown, New Jersey 08057. We are an equal opportunity employer.

RCA Government and Commercial Systems

CUSTOMER ENGINEERS

Commercial Computer Field

CalComp is the world leader in computer graphics. We were first to develop an incremental digital plotter and have continued to expand our product line with random access memory disc drives, mini-computers, controllers, tape units and automated controls for keypunch.

Positions are available in 41 key cities throughout the U.S. for customer engineers with systems field service experience on large scale commercial computers and all related peripheral equipment.

Be a part of this vigorous growth and realize your maximum potential within your career field. You'll need a minimum of 2 years applicable experience.

Write or send resume to request application and/or further information to:
Dave Elling, Dept. D-2
2411 W. La Palma Ave., Anaheim, Ca. 92803

CALCOMP

CALIFORNIA COMPUTER PRODUCTS, INC.
An equal opportunity employer

CIRCLE 501 ON READER CARD

NCR

ENGINEERING PROJECT LEADER

Our Accounting Terminal Engineering area has a unique opportunity for you to direct a project involved with logic, circuit and magnetic recording design.

You should have a BSEE, experience with solid state logic design, a background in magnetic recording devices, and a leadership capability.

If your background and qualifications match the foregoing and you desire to join a company alive with new ideas, send your resume in strict confidence to:

Mr. Vernon L. Mirre
Executive & Professional Placement, Dept. D-1101
The National Cash Register Company
Main & K Streets
Dayton, Ohio 45409

AN EQUAL OPPORTUNITY EMPLOYER M/F

CIRCLE 508 ON READER CARD

Advertisers' Index...

Quantor Corporation 108

RCA Governmental and Commercial Systems 125
RSVP Services 123

Shepard Division/Vogue Instrument Corporation 54
Source EDP 122
Standard Memories Incorporated 93
Stromberg Datagraphix Inc. 46
S.A.I. International, Inc. 61
Systematics/Magne-Head Division, General Instrument Corporation 107
Systemation, Inc. 61

Talcott Computer Leasing, Division of James Talcott, Inc. 60
Tally Corp. 1
Tel-Tech Corporation 103
Teletype Corporation 38, 39
3M Company 64, 65
Toko, Inc. 67
Topflight Corporation 94

United Business Communications, Inc. 12, 13

Van Nostrand Reinhold Company 62, 63
Varian Data Machines ..... Cover 2
Vector General 71
Viatron Computer Systems Corporation ..... Cover 4

Wells Management Franchising Corp. 124
Wilson Jones, A Division of Swingline Inc. 37

Xerox Data Systems 19

TECHNICAL PUBLISHING COMPANY

Arthur L. Rice, Jr., President
Gardner F. Landon, Exec. Vice President, and President, Thompson Division
James B. Tafel, Exec. Vice President, and President, Technical Division
Calverd F. Jacobson, Financial Vice President
Edwin C. Prouty, Jr., Secretary and Director of Data Processing

ADVERTISING OFFICES

Sales Manager & Vice President
JOHN BRENNAN
205 West Wacker Drive, Chicago, Ill. 60606
(312) FInancial 6-1026

Eastern District Managers
JAMES M. MORRIS
WARREN A. TIBBETTS
IRWIN L. WERFEL
35 Mason Street, Greenwich, Conn. 06830
(203) 661-5400

New England District Manager & Vice President
WARREN A. TIBBETTS
112 West Haven Rd.
Manchester, N.H., 03104 (603) NAtional 5-9498

Midwest District Manager
JOHN M. GLEASON
205 West Wacker Drive, Chicago, Ill. 60606
(312) FInancial 6-1026

Western Manager & Senior Vice President
HAMILTON S. STYRON
94 So. Los Robles Ave.,
Pasadena, Cal. 91101
(213) 681-8486—from Los Angeles

Western District Manager
JAMES E. FILIATRAULT
260 Sheridan Ave.
Palo Alto, Calif. (415) 321-1440

announcing Kennedy System 8000

800 and 1600 cpi—Have it both ways

1600 cpi Phase-Encoded recording

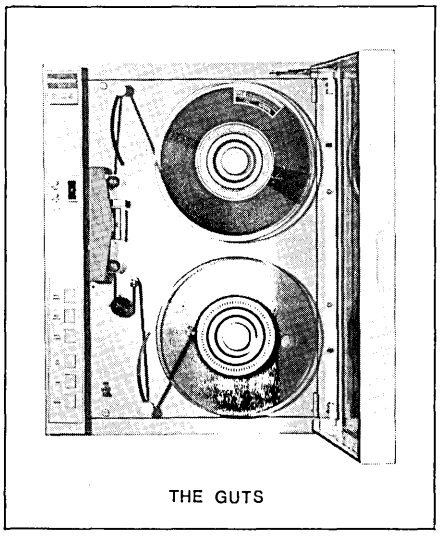
It's coming—and soon. A good system designer, one who does not want his system to be obsolete before it is built, must take PE into consideration.

Current practice in tape transport interface makes addition of 1600 cpi complicated and costly. To solve the problem we've designed a new tape system—System 8000. Carefully planned all the way to the computer.

System 8000 allows you to provide for 1600 cpi operation now with no increase in system cost.

Here is how it works:

Three new tape transports form the heart of the system:



THE GUTS

Model 8108—9-track, 800 cpi NRZ1 Read-After-Write
25 ips (37.5 available) $2500.00*

Model 8109—9-track, 800/1600 cpi NRZ1/PE Read-After-Write, 25 ips (37.5 available) $2800.00*

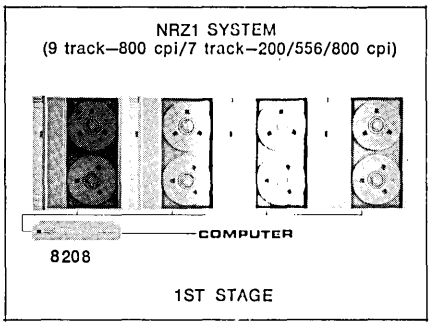
Model 8107—7-track 200/556/800 cpi NRZ1 Read-After-Write, 25 ips (37.5 available) $2500.00*

* (quantities of 100)

8100 series transports all have identical interfaces and can be combined as required.

Let's say present requirements are for NRZ1 only, but with expansion later to include 1600 cpi, PE:

Model 8208 NRZ1 Format Control Unit can handle up to four 8109, 8108, or 8107 transports in any combination. Inputs to 8208 have been arranged to minimize interface complexity. Commands are in the form "Read one record," "Write one record," "Backspace one file," etc. Parity, CRCC generation and error checking are included.

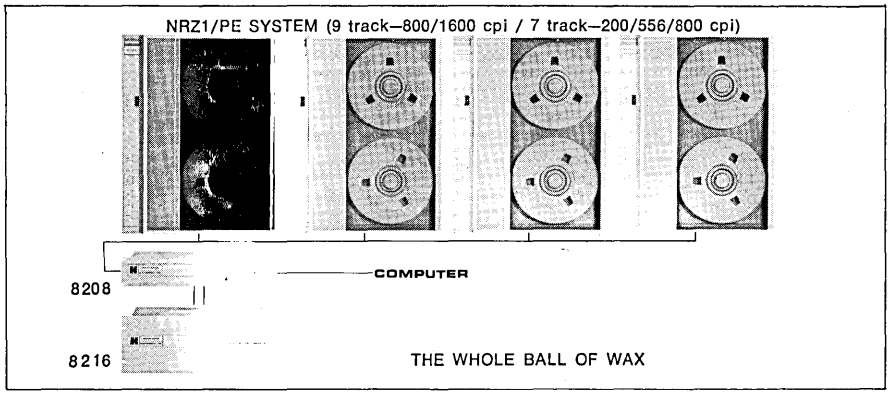


Ready for 1600 cpi?

To convert to NRZ1/PE operation, add Model 8216 PE Format Control unit. No changes in interface are required. Just plug 8216 into 8208 and all model 8109 transports become dual density 1600/800 cpi. Automatic density selection, postamble/preamble generation, error detection, and correction, and deskew register are provided.

Or, perhaps the format control functions can be more economically built into interface. This is possible too—all 8100 series have digital outputs.

We think System 8000 is something special. Why not get the whole story—see your local Kennedy rep or contact the factory.



See System 8000 at FJCC—Booth 3510-12

KENNEDY CO. 540 WEST WOODBURY ROAD, ALTADENA, CALIFORNIA 91001 PHONE: (213) 798-0953

CIRCLE 26 ON READER CARD

THE THIRD IN A SERIES OF SYSTEM 21 REAL-LIFE SUCCESS STORIES

SYSTEM 21 CONTROLS CONTAINERIZATION

Reduces overhead and improves container control for Pacific Far East Lines

Pacific Far East Lines, a large shipping company with home offices in San Francisco, California, specializes in containerized shipping from West Coast ports to ports in the Far East and the Pacific. With approximately 6000 containers in operation throughout their system, and plans to double this number within a year, PFEL was faced with elimination of the headaches involved in keeping track of 6000 plus containers via conventional keypunch techniques. The company decided to put the unique capability of VIATRON'S System 21 Distributed Data Processing concept to work. System 21 allowed PFEL to develop a completely new and more efficient method of container status control.

TELEPROMPTING

Functioning in what Tom Moore, Technical Advisor at PFEL refers to as a teleprompting environment, System 21 replaces a slow, tedious multi-level manual posting and keypunching system.

This is PFEL's term for the Model 2111's automatic Program Sequence Load (PSL) feature. In the PFEL application, PSL is used to automatically call up a series of master records for visual display. The unique aspect is that the PFEL master records for container control data entry are in a question and answer format. This means that the clerk/typist activates the PSL feature and simply answers the questions displayed from the source data. As the clerk answers each master record question, eye-verifies it, and outputs the entry to VIATAPE, the automatic Program Sequence Load feature automatically calls up the next record and so on until the entire sequence is completed and all the necessary container source data is stored on VIATAPE. An added advantage is the 2111's automatic Duplicating feature which permits faster more accurate data entry.

AFTER VIATAPE

Once the input data has been stored on VIATAPE cartridges in PFEL's Container Control Department, the VIATAPE cartridges are placed in the dedicated Model 2111 Data Management Station equipped with a VIATRON Computer Compatible Tape Recorder where they are "spooled-out" to produce error-free computer input data on computer tape. Which in turn is processed on PFEL's large-scale IBM 360 central computer.

Real time container control via System 21 is only part of this story. Four of PFEL's model 2111 Data Management Stations are in use at the Line's pier location, gathering payroll and cargo accounting data *at the source*. Three more, installed in PFEL's home office, prepare computer input data necessary for general ledger work, statistical analyses, and freight bill of lading documentation. Previously, PFEL had utilized an outside service bureau for much of this basic data entry work. Now it is *all* done inside on System 21. Another significant factor in reduction of costs.

VIATRON'S System 21 is increasing efficiency and saving time and money for Pacific Far East Lines. And it can do the same for you. If you'd like to find out how VIATRON'S System 21 Distributed Data Processing concept can start your business moving, contact Viatron Computer Systems Corporation, Dept D-11, Route 62, Bedford, Massachusetts 01730.

VIATRON
COMPUTER SYSTEMS CORPORATION

CIRCLE 3 ON READER CARD