DATAMATION® 75

June

NEW PERSPECTIVES ON SOFTWARE

Also: studies in small-scale computing, China's computers, and software reliability...

Introducing Model 9100. The fastest Series 9000 yet.

If you've gotten the impression, through our ads, that our Series 9000 synchronous tape transports are the best you can buy — you're right. If you think we're stopping there — you're wrong.

Now we're offering our Model 9100 vacuum column tape transport. Model 9100 vacuum column reduces tape wear and greatly improves recording accuracy. It's fast, it's very, very quiet, and it's built with features found only on top-of-the-line transports — features such as our capacitive tape detection system. Unlike competitive models with photocells or calibrated vacuum holes, Model 9100 utilizes a mylar diaphragm as a variable capacitor to control tape position. This means servo mechanism tape stretch is minimized, wear reduced, and jitter is eliminated.

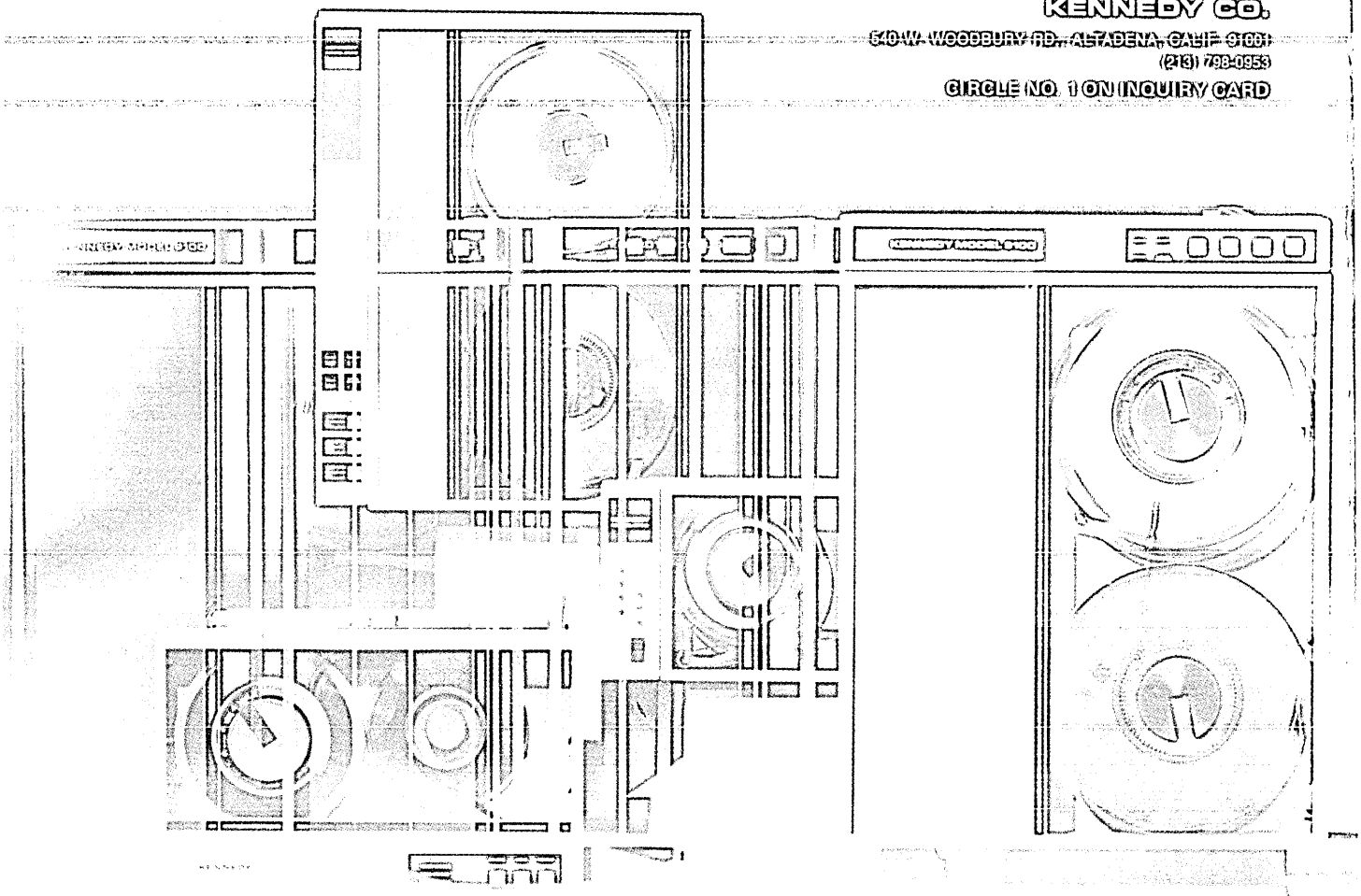
Model 9100 has a standard tape speed of 75 ips with speeds of 25 to 75 ips available. The data transfer rates are 60 Khz at 800 bpi, 120 Khz at 1600 bpi, or 60/120 Khz at 800/1600 bpi; or 7 track dual density using 200/556 or 556/800 bpi densities.

Aside from these competition-busting numbers, Model 9100 has all the great features of our proven 9000 Series: Threshold Scanning, Marginal Skew Check, and a built-in front-accessible off-line test panel.

Model 9100 is more than just a new product — it's part of the finest tape transport series ever built — Series 9000. When you have that kind of reputation to uphold, you build a better machine. We just did with Model 9100.

KENNEDY CO.
540 W. WOODBURY RD., ALTADENA, CALIF. 91001
(213) 798-0953

CIRCLE NO. 1 ON INQUIRY CARD



During the past year, we increased sales 500%. It was easy. Our only competition was IBM.

We're Business Systems Technology, Inc. Although we're still not a giant in the industry, we've just spent the last two years successfully competing against one of the biggest and toughest. IBM.

During that time, we became the largest add-on memory company in the world in number of installations. And we grew 500% compared to this time last year. All that during a bad economy.

The computer that's an arena.

Actually, we had a little help from IBM. They created the computer that created the marketplace: the System/3.

It's a great computer. In fact, it's the country's most popular, and still fastest growing, small business computer.

Which brings us to why we're here. BST was founded on the concept of making a great computer even better. Better from an economy standpoint. Better from a thruput standpoint. Better in terms of responsiveness to the customer. The three areas that IBM is the most vulnerable. And the three areas that BST is the strongest.

How to tie-up a giant.

Very carefully, rope by rope. First we started with the core memory. We offered the System/3 user identical memory for 30% less than IBM, with 1-week upgrades, and flexible month-to-month rental programs.

Then we introduced the first plug-compatible, high-speed disc drive for a System/3. It has the 5445 beat on every major point. Faster access time. Superior state-of-the-art mechanics with fewer moving parts. And a typical annual savings of $4,000.

Faster, lower-cost Line Printers.

The latest rope we've thrown over IBM is our new series of line printers. We give you 400 and 750 lpm for less than what IBM charges for 200 and 465. (Sorry, IBM, looks like we did it again.)

If you would like to know how BST peripheral products can reduce your System/3 costs while increasing your System/3 performance, just contact us. We'll give you full details on the whole BST story, including names of BST users in your area.

How to become a giant.

Very carefully, product by product. We're currently developing new peripherals that will continue to help S/3 users get more out of their system for less money. We'll be letting you know about them as soon as they're ready.

We've expanded our sales force 50% again (we just finished increasing it 50% a few months ago). And we're moving to a much larger plant to help accommodate our growth.

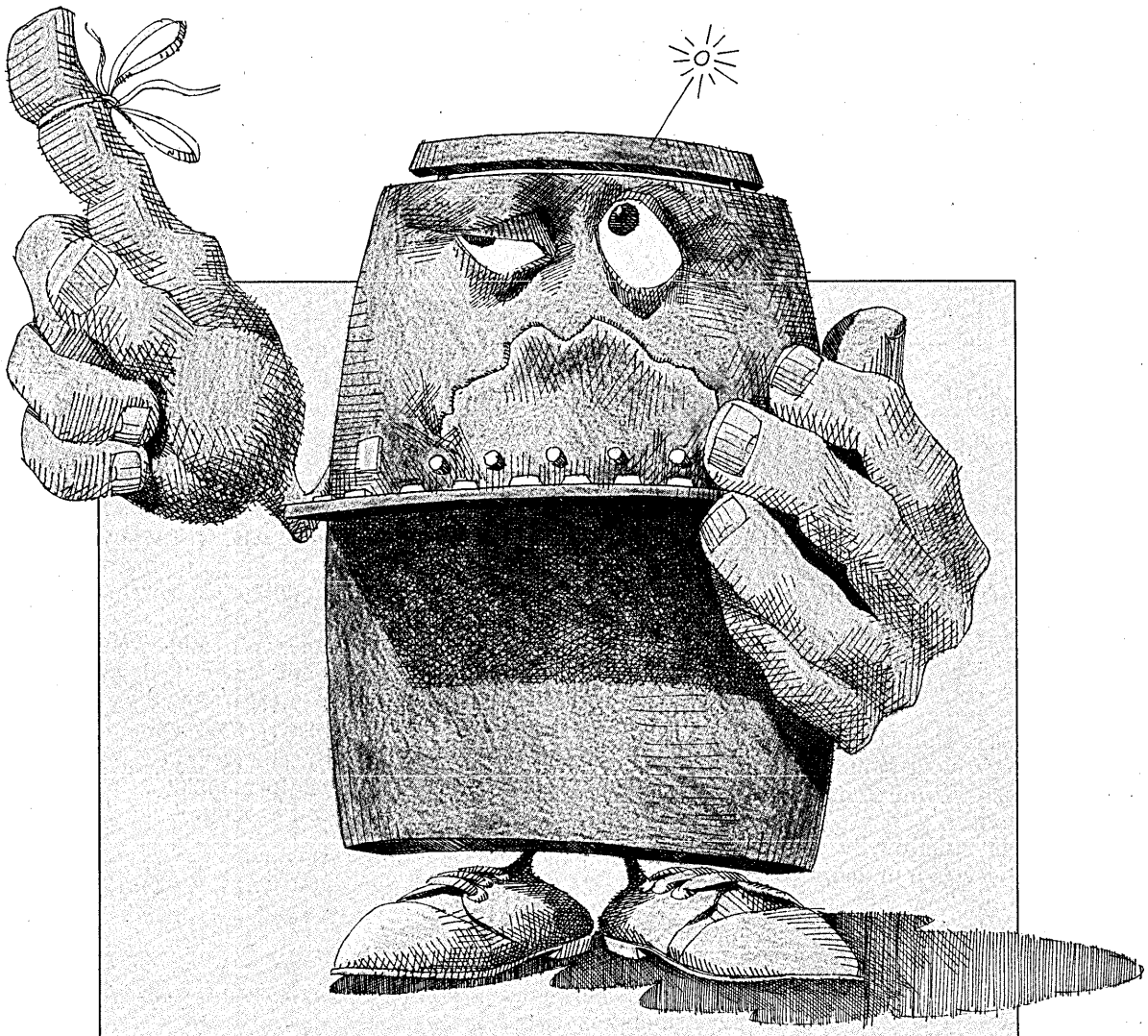
All of which goes to show, if you want to become a successful giant, never lie down.

BUSINESS SYSTEMS TECHNOLOGY, 1215 West Katella Avenue, Orange, California 92667, (714) 997-1450, Toll Free: (800) 854-3111.

System/3 is a great computer. We make it better.

BST

CIRCLE 18 ON READER CARD



Itel has the cure for absent-minded computers.

Monolithic Main Memory.

Not only does it remember more than IBM's design can, but it remembers more for less. On the 360/22 up through most 370 models.

On the 370/158, for example, Itel Monolithic Memory can increase your main memory capacity a full 100%—from four megabytes to eight megabytes.

Looking for other ways to improve your computer's memory? Then look into Itel's 7330 Disk Drive Subsystem for 360/50, 360/65 and all 370 systems. It's a compact, waist-high unit that handles massive data bases up to 3,200,000,000 bytes. With an average access time of just 27 milliseconds.

At Itel, we couldn't have acquired over a billion dollars in IBM computer leasing experience without solving at least a few of your problems.

Your financial alternative.

ITEL
CORPORATION
DATA PRODUCTS GROUP

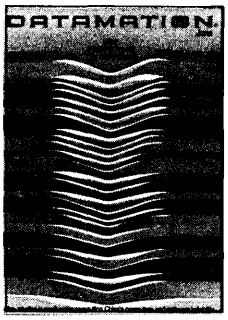
One Embarcadero Center, San Francisco, California 94111, Phone (415) 983-0000

CIRCLE 55 ON READER CARD

DATAMATION 75®

VOLUME 21 NUMBER 6 This issue 133,750 copies JUNE 1975

FEATURES



New Perspectives on Software
Is the biggest problem with software the fact that it is difficult and expensive to produce? That it is disordered and unreliable? That its basic principles are not understood? Or are all these different views of the same problem?

NEWS IN PERSPECTIVE

DEPARTMENTS

ABOUT THE COVER
Reflecting our new perspectives on software is Alexandra Lapidus' untitled soft canvas. More of Alexandra's work appears elsewhere in this issue. Her painted canvases were most recently shown at Art Fabrics Gallery in Los Angeles. Photography by Andy Cominos

DATAMATION

EDITORIAL STAFF

Editor	John L. Kirkley
Articles Editor	Richard A. McLaughlin
International Editor	Angeline Pantages
European Editor	Nancy Foy
Communications Editor	Phil Hirsch
Industry Editor	W. David Gardner
Products Editor	Michael Cashman
Source Data Editor	Daniel P. Schlosky
Calendar Editor	Gloria Tidstrand
News Editor	Tom McCusker
Bureau Managers	
San Francisco	Edward K. Yasaki
Los Angeles	Edith D. Myers
Washington, D.C.	Phil Hirsch, Pamela Evans
New York	Angeline Pantages
New England	W. David Gardner
Correspondents	
Minneapolis	James K. Johnson
Southwest	Robert F. Alexander
Australia	Frederick A. Bland
Editorial Advisor	Robert L. Patrick
Technical Advisor	Lowell Amdahl
Contributing Editors	Paul Armer, Howard Bromberg, Philip H. Dorn, Louis B. Marienthal, Ray W. Sanders, Milton R. Wessel, F. G. Withington

EDITORIAL OFFICES
Headquarters: 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Phone (213) 559-5111. **Eastern:** 35 Mason St., Greenwich, CT 06830, (203) 661-5400. Lakeside Office Park, 599 North Avenue, Wakefield, Mass. 01880, (617) 246-2121, 9805 Singleton Dr., Bethesda, MD 20034, (301) 530-7271. **Southwestern:** 2711 Cedar Springs, Dallas, TX 75201, (214) 744-0161. **Western:** 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **Foreign:** 8 Pellerin Rd., London N. 16; (01) 249-1177; 64/90 Blues Point Rd., McMahons Point, NSW 2060, Australia.

GRAPHIC DESIGN & PRODUCTION

Art & Production Director	Cleve Marie Boutell
Advertising Production Manager	Marilee Pitman
Production Assistant	Alberta R. Martin

CIRCULATION
35 Mason Street, Greenwich, CT 06830

Circulation Manager	Suzanne A. Ryan
Marketing Research Manager	Deborah Dwelley
Publisher	James M. Morris
Assistant Publisher	F. Douglas De Carlo

Circulation audited by Business Publications Audit BPA

Member ☆ABP American Business Press, Inc.

tp

DATAMATION is published monthly on or about the first day of every month by Technical Publishing Company, 1301 South Grove Ave., Barrington, Illinois 60010; Arthur L. Rice, Jr., Chairman of the Board; James B. Tafel, President; Gardner F. Landon, Executive Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, CT 06830, (203) 661-5400. Editorial offices, 1801 S. La Cienega Blvd., Los Angeles, CA 90035. 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 $24; $40 Air Mail annually in the U.S. and Canada. Reduced rate for qualified students, $14. Foreign subscriptions are available for £16.80 or for the equivalent of $40 U.S. in most West European currencies. Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulations paid at Columbus, OH and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000. Greenwich, CT 06830.

Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Beslow Associates, Inc.

THE DP MONSTER

BECOMES A PUSSYCAT WITH AUTOFLOW® II

As the processing of business data has evolved, the volume and complexity of application systems have grown at a faster rate than the means to control them. The data processing monster has been tamed at over 2000 locations with ADR's AUTOFLOW® II. Here's what you can do with its new and enhanced facilities:

Automatically generate high-level system charts and reports reflecting the scope of system activity by producing a graphic panorama of job flow with ASC (Automated System Charter). **ASC**	Automate the preparation, composition, production and, most importantly, maintenance of textual documentation with ETC (Extended Text Compositor). **ETC**
Examine and report on the characteristics of any number of input programs across program boundaries within the context of their functional interaction as a total system with CPA (Cross-Program Auditor). **CPA**	Produce extensive cross-referenced listings, summary analyses, and graphic charts focusing on various aspects of program activity and logic with MAP (Module Analysis Processors). **MAP**

These combined facilities of AUTOFLOW® II can accelerate your entire development cycle, while enhancing your programmers' overall performance. In short, AUTOFLOW® II provides:

- Comprehensive management review facilities.
- Organized development disciplines.
- Well-defined directions for all development tasks.
- Improved productivity.
- Enhanced ongoing system reliability.

For more information on AUTOFLOW® II, send the coupon or contact any ADR office.

APPLIED DATA RESEARCH, INC.
Software Products Division
Route 206 Center, Princeton, New Jersey 08540
Telephone: (609) 924-9100

☐ Please send information on AUTOFLOW® II

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone _____

Computer Configuration _____

I am also interested in:
☐ The LIBRARIAN® for security & protection
☐ ROSCOE™ for on-line program development
☐ MetaCOBOL® for increased productivity
☐ SAM™ for planning through simulation
☐ PI SORT 2™ for faster sorting

APPLIED DATA RESEARCH THE SOFTWARE BUILDERS®

ADR software products: in use at over 4,500 installations worldwide.

U.S. offices in Boston (617) 245-9540, Chicago (312) 775-9855, Cleveland (216) 228-0880, Houston (713) 526-3188, Los Angeles (213) 826-5527, New York (212) 986-4050, Pittsburgh (412) 885-2822, Princeton (609) 924-9100, Washington (703) 281-2011.

Foreign offices in Australia, Austria, Belgium, Brazil, Canada, Denmark, England, Finland, France, Israel, Italy, Japan, Korea, Mexico, Netherlands, New Zealand, Norway, Philippines, Puerto Rico, Republic of South Africa, Singapore, Spain, Sweden, Switzerland, Taiwan, Thailand, West Germany.

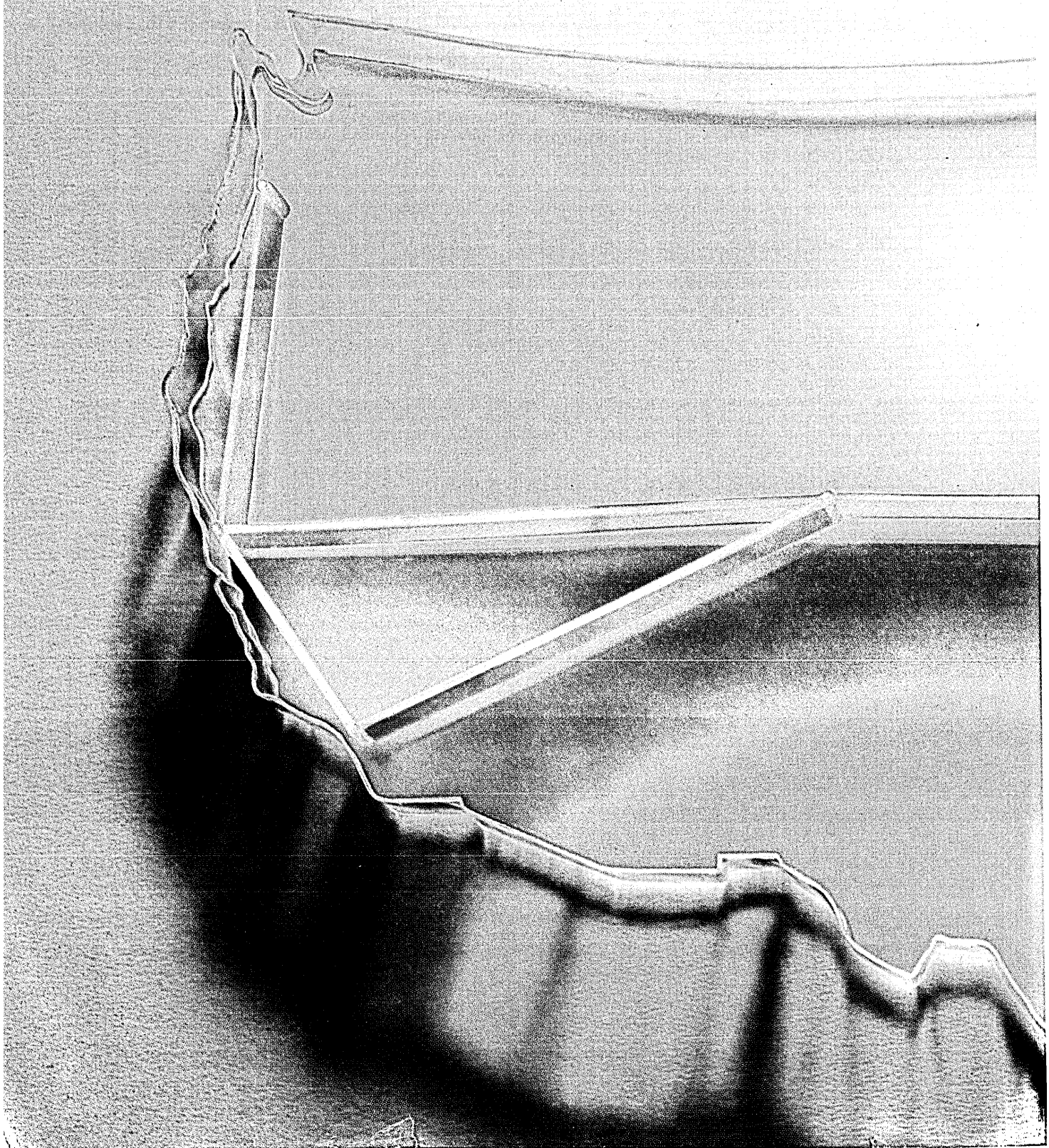
Now computers can talk to each other

The Bell System Introduces

Two-station and multi-station private-line service is now available between Boston, Chicago, New York, Philadelphia and Washington. The system will be expanded to 19 other cities this year, and we hope to serve many more metropolitan areas in the near future.

The Bell System's new Dataphone Digital Service offers you end-to-end, full duplex transmission of data at synchronous speeds of 2400, 4800, 9600 and 56,000 bits per second.

You save because: More economical digital service units replace modems. Digital transmission improves error-free



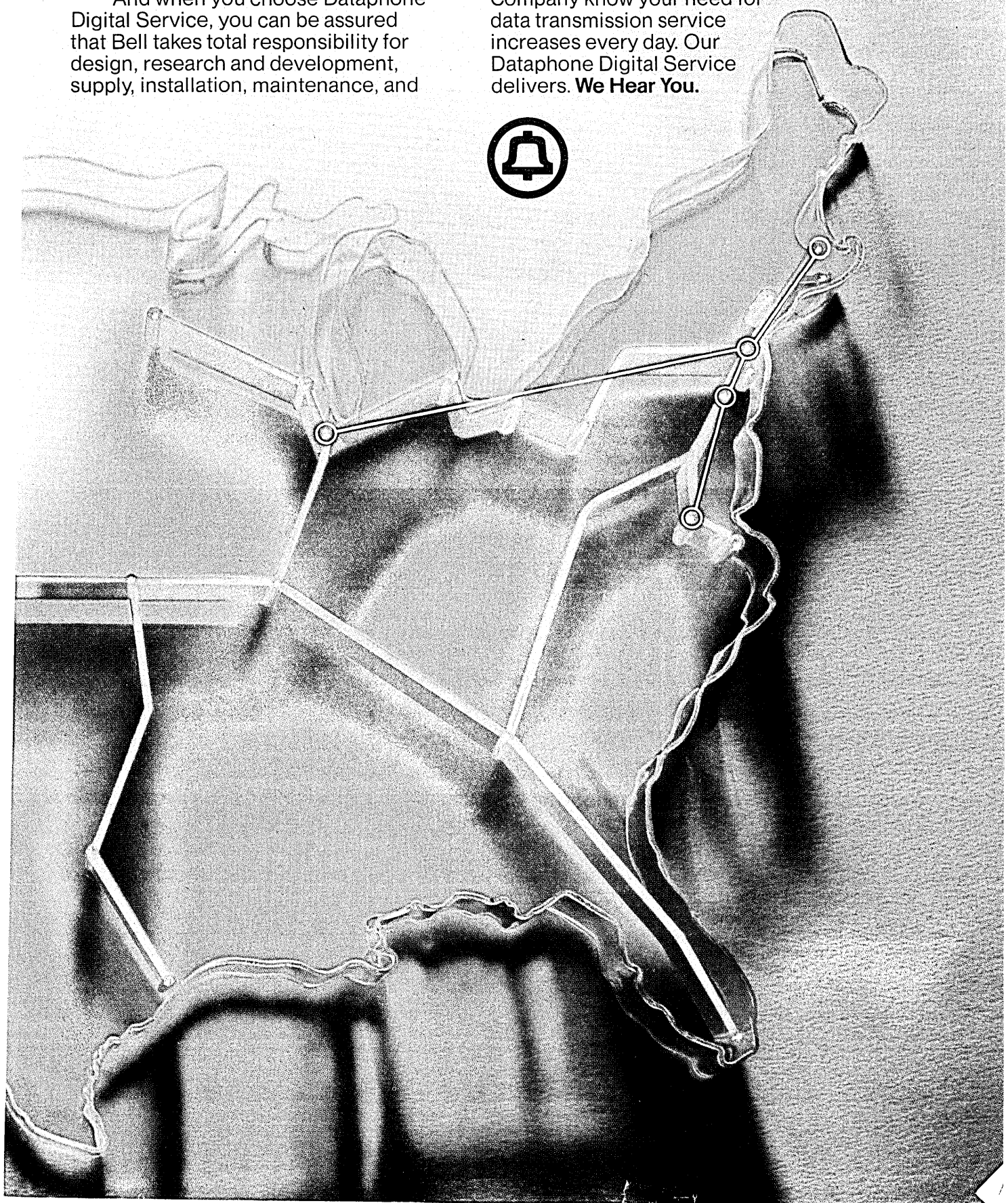
more accurately and for a lot less money.

Dataphone® Digital Service.

performance. New diagnostic features and automatic switching of network standby equipment reduce downtime.

And when you choose Dataphone Digital Service, you can be assured that Bell takes total responsibility for design, research and development, supply, installation, maintenance, and transmission—100%.

Your Bell Account Representative has all the details. AT&T and your Bell Company know your need for data transmission service increases every day. Our Dataphone Digital Service delivers. **We Hear You.**

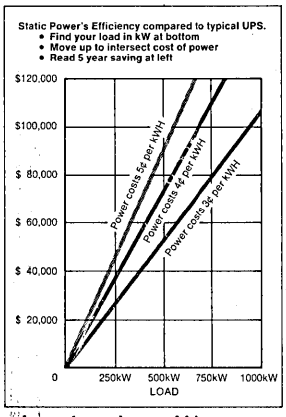


A UPS is your computer's best insurance policy.

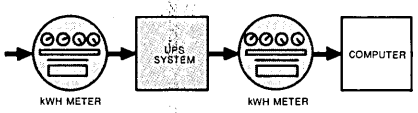
Ours pays the highest dividends.

All Uninterruptible Power Systems (UPS) provide great savings by increasing your computer's uptime and reducing output errors. Static Power's UPS also offers a number of important dividends.

1 Ours is a real meter miser



UPS systems cost about the same, initially. Ours, however, has the highest efficiency — 88%. This will save thousands in utility costs. Calculate your savings using the chart. We measure our efficiency with kilowatt hour meters like the utilities. Specify



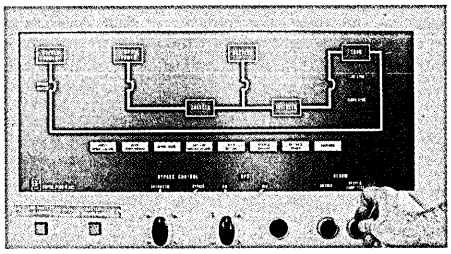
this simple, fool-proof test before you buy. Also, an efficient, cool running UPS requires less air conditioning — 11 tons less for a 500kW system. No doubt about it. Our UPS saves you more money.

2 Costs less to install

Since our input power factor is near unity we can use smaller wiring and switchgear, which materially reduces installation costs. Also, lagging power factor wastes electricity. Another important cost saving from Static Power.

3 Easy to operate and understand

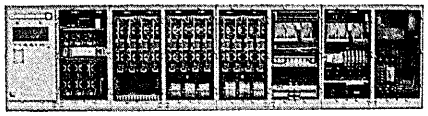
Some UPS systems are incredibly complex to operate. Ours is incredibly simple. A back lighted graphic display



continuously monitors the system. Visual alarms provide instant alert or switchover. Two simple error-proof controls operate the system. No chance of inadvertently crashing your computer.

4 Obvious high quality — inside and out

Don't buy a UPS without carefully checking the construction. People who see ours comment on the exceptional quality. We planned it that way. After all, the UPS you purchase should save you money for many, many years.



5 Around the clock service

Our system seldom fails. But if it should, we'll get you back on the air fast. Our 24 hour red alert phone

assures prompt response from a skilled regional service engineer. Also, plug-in modularity makes servicing simple and fast.

6 Proven experience

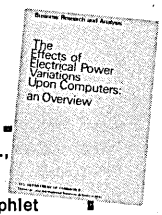
Ask our customers. They include First National Bank of Arizona, Washington — Moscow Hotline, Itel, Bechtel Corp., Boeing Computer Services, New England Mutual Life, Atomic Energy Commission, Ramada Inns, Ralph M. Parsons, National Bureau of Standards, Control Data, Union Carbide, the FBI, National Cash Register . . . to name a few.

Find out how much it's costing you not to have a UPS. This Dept. of Commerce book will help.

We know a UPS can save you money. Our views are confirmed in a Dept. of Commerce pamphlet entitled "The Effects of Electrical Power Variations on Computers: An Overview."

We'll send it to you

FREE



Mail to: Static Power, 3800 Campus Dr., Newport Beach, Ca 92660

☐ Send free Dept. of Commerce pamphlet

☐ I have an immediate need. Please phone

_____ phone number

☐ Possible future need. Contact me in

_____ month

☐ No hurry but contact me

Name _____

Title _____

Company _____

Dept. _____

Address _____

City _____ State/Zip _____

STATIC POWER INC.

THE COMPUTER POWER PEOPLE

A Subsidiary of The Gates Rubber Company

3800 CAMPUS DRIVE • NEWPORT BEACH, CALIFORNIA 92660 • (714) 546-4731 • TWX 910-595-1983

letters

Letters on restructuring IBM can be found in the feature, "IBM and the Structure of the Industry," elsewhere in this issue.

For whom Ma Bell tolls

I disagree with Mr. Hohri's statement on four-wire costs ("MCI's Microwave Service," April, p. 48). For five years, we have been charged a two-wire rate on our four-wire circuits. Early this year we were informed by our Bell Systems representative that the four-wire circuits have been incorrectly billed from the beginning, and, effective May 1, would be billed at the new rate—approximately double the old one.

These circuits are run within an "exchange area" as defined by Bell. Anywhere within this area, a four-wire circuit costs about $11. However, the rates go up sharply for extending Bell's facilities, for instance, tying to a microwave facility. In fact, a one and one-half mile circuit costs around $80/month.

Is our experience inconsistent, or is it due to differences in Bell's tariffs? I find the tariffs in our case anticompetitive and possible only because Bell is a monopoly.

W. P. ESTES
Manager/User Services
University Computer Center
New Mexico State University
Las Cruces, New Mexico

Mr. Hohri replies: Intrastate rates are determined by the local telephone company. I should have specified Illinois Bell Telephone Co. In Illinois there is no (and will be no) additional line cost for four-wire data circuits as against two-wire. However pricing is quite different in New Mexico.

I should also correct the 10% additional charge for four-wire interstate rates. There is now no additional charge with AT&T's new high-low service.

CDP just a trophy?

Please extend my compliments to George Palmer for his recent Forum article concerning the professionalism of computer programming (April, p. 171).

I have been connected with dp for the past five years, two years as a programmer, yet my current salary is less than that of a supermarket clerk. And judging from your latest salary survey, my case is not an exception.

As far as the dp certificate is concerned, it strikes me as odd that a "profession" concerned with critical standards and up-to-the-minute information can be as diverse and slow to react as it is. The idea to reform the certificate has been around for as long as I can remember, but no one has done anything beyond the idea stage. I would like to see a summit meeting of representatives from each of the major dp associations to prepare a list of requirements and a test for a certificate that a programmer would be proud to receive. And with enough acceptance by the industry, the certificate would turn into a necessity rather than a trophy.

DAVE GUIDOS
El Segundo, California

Declaring independence for data

Robert M. Curtice in "Data Independence in Data Base Systems" (April, p. 65) compared the DBMS features and said that "the ability to reorder the sequence of fields . . . is not a real functional difference but rather an aesthetic one." We at software ag take issue with that statement.

One measure of the degree of data independence provided by a DBMS is the amount of information the user must possess about the physical data base. His ability to specify the sequence of fields as desired—not as they are stored in the data base—is one of

Programmers and plumbers

I thoroughly enjoyed George Palmer's excellent Forum, "Programming: The Profession That Isn't" (April, p. 171), concerning the lack of professional recognition of programmers. I would also like to add a few remarks on the subject which may be of interest.

I am an engineer with an M.S. in electronics and 20 years of practical experience. Despite the fact that the field of electrical engineering can perhaps boast more degreed or even licensed individuals than can programming, it is a widely publicized fact that engineers too have not been accorded the professional recognition they purportedly deserve.

It is also rather sobering to observe that the multitude of engineering societies in existence today have not by one iota improved the professional status of engineers. It seems that the reformistic approaches offered to programmers in Mr. Palmer's Forum have already been tried in electrical engineering and were found to be of little efficacy.

But what is then the elusive difference between lawyers and doctors, on the one hand, and programmers and engineers, on the other? I believe that the fundamental difference, briefly mentioned but not sufficiently elaborated on in the Forum, is the fact that a professional ". . . sells his customers a product he produces right in his office: his services." That is, in the majority of cases, a doctor or lawyer, or even a plumber, is self-employed. The structure of his work permits him to complete a job alone and deliver a finished "product."

On the other hand, the world does not abound in programming or engineering projects where a single professional could handle a complete job on his own from order to delivery, including administration, price quotations, marketing, systems or specifications analysis, design, implementation, and documentation. And whenever job complexity and tight time schedules require teamwork, the value of the individual gets diluted. Hence programmers and engineers are "a dime a dozen," can be "stockpiled," "surplused," and generally handled like so many machine parts.

In those few cases when a programmer or engineer sets himself up in business as the sole proprietor and worker, the business must eventually grow and expand its personnel base, or it cannot remain viable in today's business world—which perpetuates the problem.

About 10 years ago, I heard a lecture in which it was stated that, at least in electronics hardware design, the future will see the demise of the engineering profession as it is known today. It was predicted that the advent of modern semiconductor technology will cause irreversible shifts of emphasis from electronics engineers to high-level Ph.D.-type semiconductor physicists on the one hand, and to lower-level technical personnel on the other hand, in charge of drawing and making the masks, turning the knobs on the furnaces, and writing design automation programs for circuit, logic, and testing —all of which used to be the domain of engineers.

At that time, I refused to believe this possibility. Alas, however, the predicted restructuring has already begun to take place. I have unwittingly but actually become one of such "lower-level" technical personnel, called programmers in better circles.

Now it seems that I must really be having a problem in trying to sort out whether I am a "professional" or not. The fact, however, that I have to work on a team (whether as a programmer or an engineer) has already decided that I cannot be one, even though I fulfill all the necessary qualifications of a "professional" mentioned in your article.

S. SMITH
Vienna, Austria

letters

the key features in separating the user's logical "view" of the data from the data as physically stored in the data base.

Lines of code, and thus personnel time, can be reduced as data independence is increased. In addition, the impact of a change in the data base (e.g., new fields, new files, etc.) on production programs can be significantly reduced by increased data independence.

Thanks should go to Mr. Curtice for a very good discussion of one of the most important criteria on which a DBMS decision should be based. The description of the data independence provided by ADABAS is both accurate and complete. Articles such as his help "clear the smoke" over an area in which very little has been published.

THOMAS R. BERRISFORD
Manager, Market Development
software ag
Reston, Virginia

Lost: one large country

In reading the April issue, I discovered a small oversight, namely your omission of the northern half of the North American continent.

The news item, "A Warning for the Metric Eccentrics," pp. 125-126, ignores the fact of Canada's existence. Canada is not a metric country, except for temperature, which just started April 1, 1975. It seems doubtful that the item in question would have excluded us on that basis.

As a point of information, when did Mexico go metric?

LAWRENCE J. MAZLACK
Assistant Professor
Department of Computing and
Information Science
University of Guelph
Guelph, Ontario, Canada

Canada, according to the U.S. Dept. of Commerce, is committed to using the metric system and is now, as reader Mazlack notes, using it for temperature. Mexico is listed as having used the metric system since before World War II.

Prognosis negative on hospital dp

Considering the complexity of the hospital-medical dp field, I found Edward Yasaki's news story in the March issue ("Wide Variety of Computer Based Systems Available to Hospitals," p. 115) an interesting thumbnail sketch of certain state of the art aspects. However, the descriptions and projections related to peer review, i.e. PSRO dp needs, demonstrate either an appalling lack of knowledge in this area by those interviewed, or a vested interest in frightening every hospital in the country into purchasing or installing "very responsive computer system(s)."

(The "new federal regulations" referred to in the article are not PSRO regulations—they are new Medicare/Medicaid requirements which apply to conditions of participation in the program by hospitals and nursing homes.)

The suggestion that automated audits of acute hospital care involving clinical elements—i.e. "did he need the x-ray and all those blood tests?"—are feasible in the average hospital setting, grossly overestimates the state of the art of proceduralized medicine. These elements of diagnostic and therapeutic process are still largely judgmental aspects of medical care (and should perhaps remain that way).

I would concede that there may be minor applications of computer technology which could be implemented as additions to existing in-house systems or out-of-the-hospital services in support of PSRO requirements, but they will certainly not cost justify the introduction of computer systems where they do not presently exist.

RICHARD C. JAMIESON
Vice President, Information Services
Hospital Research and Educational
Trust of New Jersey
Princeton, New Jersey

The fool and the criminal

Tom Gilb's laws of unreliability (March, p. 81) may seem theoretical and of no practical use to some readers. But unless we consider their implications and determine our professional responsibilities in these areas, someone may run off with the store while we are "bit-fiddling" and discussing more "practical" matters.

Mr. Gilb's third law states: "The only real difference between the fool and the criminal who attacks a system is that the fool attacks unpredictably and on a broader front." I believe there is another difference. Solving the "unpredictable fool" problems would also eliminate a large number of potential criminals who accidentally find a system loophole or error which allows manipulation. . . .

However, the premeditated criminal act which is conceived and planned before execution—and is not developed by trial-and-error or accidentally stumbled upon—must be detected in a different manner. By substituting the words "criminal actions" for the word "errors," I derive the following corollary to Gilb's seventh law: "Unpredictable criminal actions are infinite in variety, in contrast to detectable criminal actions, which by definition are limited." If this corollary is true, it will not be fruitful to try to catalog all possible criminal techniques. The emphasis will have to shift from preventing all criminal actions to limiting the maximum possible rewards obtainable through these actions. And in conjunction with this effort we must raise the cost of criminal entry into a system to be high in relation to the maximum possible reward for successful entry.

J. P. KELLY
Shawnee, Kansas

Mnemonic combo's

It is the *combination* of the mnemonic name for a data item with the "structured symbol" that conveys the "contextual intelligence" that Richard Butterworth ("Structured Symbols," April, p. 79) is seeking. I agree that MOVE PAYNO OF I302 TO PAYNO OF S302 can be meaningful (given the supporting documentation), but I think he will agree that MOVE S413A TO S413B is not. That is why he states that items within records must be given mnemonic names.

I assert that in addition to structured symbols procedures must also be given mnemonic names (perhaps concatenated with the prefix and number he describes). PERFORM B2127-COMPARE-MASTERS is infinitely more readable than PERFORM B2127. Programs need not read like novels, but they are meant to be read primarily by people (and only occasionally by a compiler). A statement like PERFORM B2127 *forces* the human reader to examine procedure B2127 even if it is irrelevant to his line of thought while reading the invoking procedure. This has been the strongest argument for the elimination of unrestricted GOTO's from our control structures. Let's not forget that meaningfulness involves knowing not only "which procedure will execute next" but also "what it does."

MARTHA J. CICHELLI
Systems Programmer
Pennsylvania Power &
Light Company
Allentown, Pennsylvania

. . . programmers often do not use much care in selecting mnemonic labels, misleading Mr. Butterworth to believe that there is no advantage in them. A carefully chosen mnemonic label can add a great deal to the readability of a program.

However, one need not choose between mnemonic labels and the sort of coded labels which he recommends but may combine the two, using the coded label as a prefix to the mnemonic label. I have been doing this for years with success.

BOB TAYLOR
Taylor Computer Services
Chamblee, Georgia

□

Other disk products may look like the ATHANA brand...

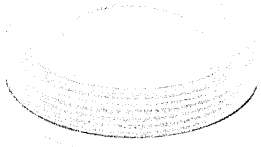
SERIES 50 (5440 Style)

SERIES 25 (2315 Style)

ATHANA DISK CARTRIDGES are available with 8, 12, 14, 16, 20, 24, 32, or 48 Sectors and are verified at 100 or 200 TPI for either 1100 or 2200 BPI depending on the system requirement.

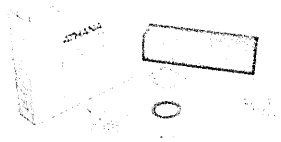
SERIES 36 (3336 Style)

SERIES 26 (2316 Style)



SERIES 16 (1316 Style)

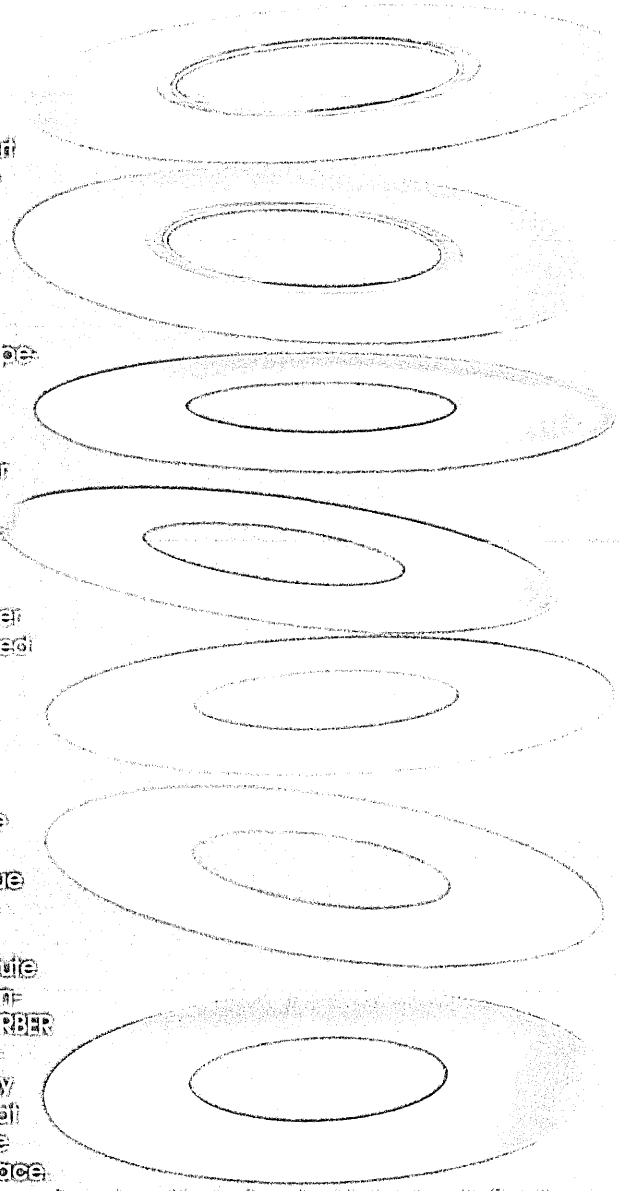
ATHANA DISK PACKS can be manufactured in any sectoring specification required by the user system. Our type 16 contains 1100 BPI disks tested at 100 TPI. The ARBER series 26 may contain 1100, 2200, or 4040 BPI disks and are tested at single or dual density depending on the computer system product demands. Series 36 products may be ordered at low (192 TPI) or high (370 TPI) testing density for a 4040 BPI coating density. This product series is factory recorded with both servo track and initialization unless otherwise specified by the purchaser.



SERIES 47 (3740 Style)

ATHANA DISKETTES are available for use on all systems utilizing this general style of media. Testing density, sectoring, and physical construction may vary depending on the equipment requirements. Factory initialization is available in IBM format.

But that's where the comparisons ends



The single most important part of any disk pack or cartridge is the coated aluminum substrate. It's manufacturing tolerances are measured within mere millionths of an inch.

Most disk product failures, especially those pertaining to loss of memory, can be traced to poor production methods.

FACT: No other manufacturer in the disk products industry presently meets the rigid production and process standards of ARBER INDUSTRIES.

ARBER'S requirement for higher aluminum purity and controlled heat treatment eliminates potentially damaging "aluminum memory warp" with out resulting in negative effects on either the molecular structure or desirable positive properties of the aluminum disk substrate. ARBER'S unique grinding and polishing technique, is completed in graduating steps to give an absolute mirror-like perfection to the finished aluminum substrate. ARBER does not stock finished aluminum substrates. Instead, they are held vertically in racks that allow nothing to contaminate or damage the polished surface.

All substrates are continually monitored and tested under high intensity lighting to eliminate all imperfect material along the way. The polished disk is processed through a series of washes, conformal coatings, and finally a sonic tank bath prior to the application of ARBER'S unique magnetic oxide coating. The applied coating is actually tapered to within 5 millionths of an inch. An incredible engineering achievement! So successful is this process, that the coating requires only polishing before assembly. It is not necessary to BURNISH high spots that cause residual noise. ARBER'S exclusive polishing technique leaves absolutely no high spots and the ATHANA brand disk products, produced by ARBER INDUSTRIES, have little or no residual noise. The disk delivered to our assembly department is the finest in the world. You're probably wondering how we can afford to compete with such an extensive manufacturing cycle... The simple fact is we can't afford not to. Write or call us today (213) 775-3741 for information about our products or distributorships. You can't afford not to!

ARBER process control techniques demand standards far in excess of normal specifications. The consistency of reliability and durability throughout our entire product line is unexcelled in the industry. ARBER disk products are tried and proven performers.

ARBER disk products are available in all of the various sectoring, track testing density (TPI), and coating density (BPI) configurations which are required by computer and disk file manufacturers. This ARBER manufacturing capability serves to extend our compatibility to any computer system which utilizes a removable disk and/or diskette product.

ATHANA

ARBER INDUSTRIES INTERNATIONAL
655 MULLIN AVENUE • TORRANCE, CALIF. 90501
TELEPHONE (213) 775-3741 • TELEX 69-1502 • Call Back ARBER USA

CIRCLE 100 ON READER CARD

Tektronix cuts the wait for 19″ Graphics.

And cuts $900 off hard copier costs.

Two special deliveries: rapid turn-around on 4014-1 orders, and a better hard copier for 20% less.

In more ways than one, Tektronix' 4014-1 Graphic Computer Terminal is one of the biggest draws in graphics. At 19″, it displays up to three times the normal data load. In popularity, the performance-proved 4014-1 was outdrawing our production capacity.

Now 4014-1 production has been geared up to assure rapid turn-around between order and arrival.

The size, speed and interactivity of the 4014-1 lops days off data processing. At $9995,* it's easily the lowest-priced terminal of its kind in the industry.

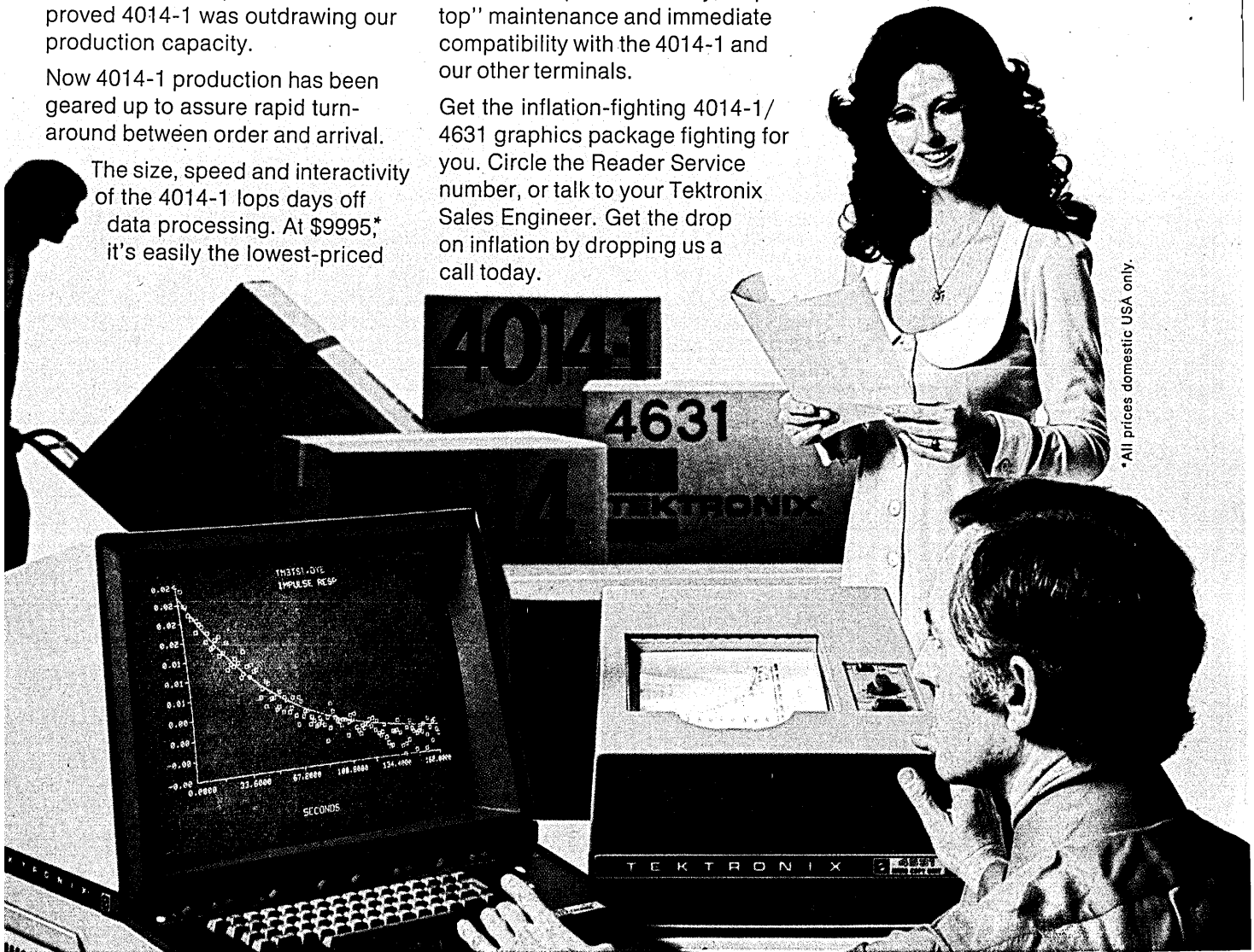
And now, the low-cost 4631 comes to the big screen. You can save 20% with the latest development in low-cost hard copy units. Our new 4631 delivers greater reliability and more capabilities than ever before. Its $3895 price includes simplified circuitry, "flip-top" maintenance and immediate compatibility with the 4014-1 and our other terminals.

Get the inflation-fighting 4014-1/4631 graphics package fighting for you. Circle the Reader Service number, or talk to your Tektronix Sales Engineer. Get the drop on inflation by dropping us a call today.

Tektronix, Inc.
Information Display Division
P. O. Box 500
Beaverton, Oregon 97077

TEKTRONIX®

CIRCLE 61 ON READER CARD



*All prices domestic USA only.

people

FROM AEROSPACE TO GOVERNMENT: "IT'S GREAT"

When Robert A. Best was considering leaving a position as director of data centers for three aerospace divisions of Martin-Marietta, to accept one as director of Los Angeles County's Data Processing department, friends asked him three questions.

"Why would you want to leave a company you've been with for 20 years and a job with which you're comfortable and content? Why would you want to work in government? Why would you want to move to Los Angeles?"

Best took the Los Angeles job and, after two months on it, had pretty good answers to all three questions.

He admits he was comfortable and content at Martin-Marietta but, "I was in the skies four days a week," traveling between the three data centers he directed, in Denver, Baltimore, and Orlando. Orlando was particularly difficult, he said, because "you couldn't get there from Denver, directly anyway." Although his main office was in Maryland, Best lived in Denver.

And he felt the opportunities to do systems development were limited at Martin-Marietta. He sees county government offering almost unlimited opportunities for new applications. In aerospace, he said, new development was virtually limited to the scientific/engineering side. He admits to some satisfying accomplishments there like having developed a real-time system to help the Skylab astronauts keep track of the 40,000 items in their orbiting laboratory for three months.

As for working in a government environment, Best thinks "it's great." The Los Angeles County Board of Supervisors meets every Tuesday and, for each meeting, any department head can put anything he wants to on the agenda. "They take some action on every item, even if it's deferral and if it is they usually act on it the next week. The system is deliberate, it's formal, and it works. It's like working directly for a board of directors in industry might be."

And he likes living in Los Angeles. He feels its scenery compares favorably with that of the Denver area. In mid-April he moved into a new home in Malaga Cove on the Palos Verdes peninsula, one of Los Angeles county's most scenic spots. He also likes the cultural opportunities offered by the city of Los Angeles' Music Center complex. "There's no end of things to do here."

Last but not least, he's finally got an outlet for what he studied in college. He was a sociology major at Franklin Marshall College in Lancaster, Pa. One of the things he likes most about the L.A. county job is that "the work we do impacts such a great number of citizens."

Best describes himself as a "work oriented person," which might explain why a sociology major ended up in data processing. While in high school and college, he worked part time and summers at Martin-Marietta in various capacities. "As a senior in college I was a riveter and I loved it." As a straight-A student in college, he received scholarship offers for advanced study during his senior year but decided, "I want to go to work."

So he went to work for Martin-Marietta as an industrial engineer. Later, having made a name for himself as a cost-cutter, he moved into finance and there became demanding of the data processing department for the kinds of reports he wanted and was asked to join the department. He ended up running it. He learned dp in "on the job training."

One of his main objectives in his new job is "to upgrade the technical capability of this department." Toward this end, his budget for fiscal 1975-76, beginning July 1 and now being considered for approval by the Board of Supervisors, includes hiring of a number of "key technical specialists" with expertise in hardware selection and evaluation, data base management, operating systems selection and evaluation, minicomputers, teleprocessing, remote job entry, and systems development project direction. He hopes to reverse a country trend toward a dependency on outside dp consultants. "I would like most development work to be done in-house and to rely on outside consultants only when a schedule can't be met by my staff or when a particular consultant has a preeminent role in a particular application."

Best said he's made a commitment to L.A. county to stay on the job awhile. The county's data processing department hasn't had a long-staying director yet. It was six years old last April 1 and had been leaderless for six months following a stormy controversy involving civil service exam favoritism which led to the resignation of Best's predecessor, Tom Kidwell. And Kidwell's predecessor, Gordon Milliman, the department's first head, stayed only three years. Maybe Best will change the pattern. After all, with more than 20 years in his only other job, he could hardly be called a job hopper.

ROBERT A. BEST
The answers to three questions

FROM GERMANY TO CALIFORNIA FOR DIEBOLD

Large computer users in Europe are as sophisticated as their counterparts in the U.S. "I think there's no big difference any more between the States and Europe," says Gunther Leue, former president of Diebold Deutschland, the West German subsidiary of the Diebold Group, and now, back in the U.S., as Diebold's director, business planning. Some of these users in Germany, he adds, have great ideas and rather sophisticated systems in mind that can't be implemented because of the lack—or extreme expense—of data communications facilities.

Leue blames this on the monopoly position held by the Deutsche Bundespost, a government agency with total communications control, which has managed to keep from the German market many communications services that have been available in the U.S. for years. Further, communications rates are often three to four times higher than in the U.S. On the plus side, however, is the fact that Germany is a small country with a good postal system, so it is possible to mail something in the evening and have it delivered the next morning in most cities.

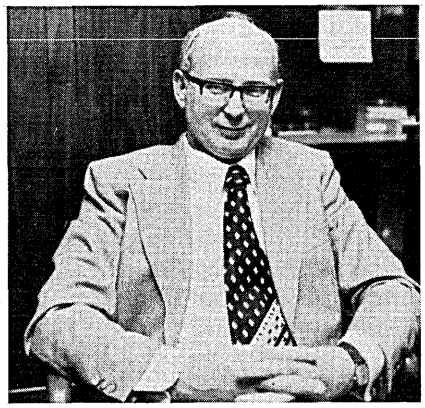
Leue (last name rhymes with Chloe), after being in ill health for a

people

year, is semiretired at age 51, which an acquaintance says "means he works only a 12-hour day." The Leues recently sold their home on the outskirts of Frankfurt and purchased one in Carmel Valley, Calif., just inland from Monterey. But they still maintain a home near Frankfurt for use during trips back to Germany.

The Germans are experiencing a recession the likes of which they haven't seen in more than 20 years, says Leue. A nation that has prided itself on having less than 1% on the jobless roles, now has more than 5% unemployed. Among computer users, he says, managements are taking a closer look at dp budgets and ways to pare expenditures. This can be a healthy thing if it brings about a reexamination of the basics, a search for high-payoff applications, even the use of performance measurement techniques. Most mainframe manufacturers, including IBM and Univac, have curtailed hiring, while others had to effect layoffs.

Leue, who has a habit of punctuating his sentences with a laugh or chuckle, says he would like to devote his time now to improving the flow of information between the U.S. and Europe. He cites the contrast between American manufacturing firms that, although still in their infancy, will often expand their sales efforts to overseas markets, whereas German companies are slow in doing likewise in an even larger market here.



GUNTHER LEUE
Semiretirement means 12 hours a day

Similarly, the Germans continue to be dependent on American technology. But while American components and subassemblies are incorporated into the systems of Germany's Nixdorf, the other major mainframer, Siemens, is still trying to do its own thing in its joint effort with Unidata.

Leue sees a need to counsel German firms, keeping them apprised of the state of the American market and technology. He will be doing this in his new job while also assisting American firms, especially those on the West Coast, to enter markets in Europe.

Leue entered the computer business in 1953 with Remington Rand, installing, programming, and maintaining the Univac 409 calculator, which hit the European market before IBM's 604. It was followed in '55 by the Univac 1, installed in a service bureau in Frankfurt. Next came the Univac Calculating Tabulator, which was introduced in Europe 18 months earlier than its debut in the U.S. as the Univac Solid-State computer. He came to the U.S. in 1965 to serve for two years as head of the International Div. of Univac's marketing effort, returning after that to Germany as deputy general manager.

He joined Diebold, Germany in 1968 when it was a nine-year-old company with a dozen employees, and built it in three years to 50 people.

COMPUTERS AND THE COURTS

Jack R. Buchanan finds working on the application of computers to legal processes to be "intellectually stimulating and socially relevant."

Buchanan, 32, assistant professor in the Computer Science Dept. and Graduate School of Industrial Administration, Carnegie-Mellon Univ., was one of two persons named for the 1975-76 Judicial Fellows Program. He will serve for a year with the U.S. Supreme Court and the Federal Judicial Center to aid in modernizing the administration of the federal courts. He is the first computer scientist to be named a fellow in the program which, in the words of Supreme Court Chief Justice Warren E. Burger, is directed "toward attracting young people who will make contributions to judicial modernization during and after their year as fellows." Earlier fellows were political scientists and/or attorneys. The fellow named to serve with Buchanan is Paul R. Baier, assistant professor of law at Louisiana State Univ.

Buchanan and Baier were selected in a nationwide competition in which entrants were judged by a commission headed by retired Associate Supreme Court Justice Tom C. Clark.

Among the 10 finalists in the competition, Buchanan said, there were "several" computer scientists. He attributes this to the fact that the Supreme Court and the Federal Judicial Center have begun to realize "the importance of judicial administration and the need for computer based support systems."

All 10 finalists spent two days in Washington for a final round of interviews and a reception. Buchanan was particularly impressed by the fact that Chief Justice Burger "gave us a one hour briefing in his chambers."

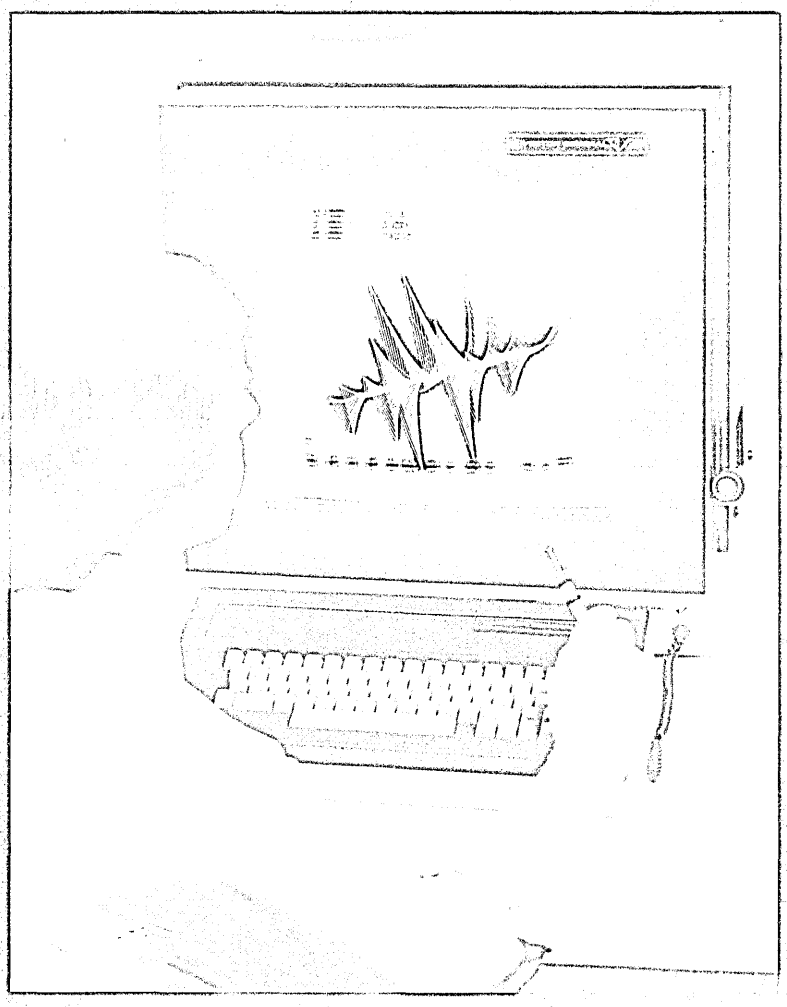
JACK R. BUCHANAN
". . . and socially relevant"

Buchanan will be responsible for research and development of computer systems to help automate judicial administration and also will serve as project manager for the Courtran project of the Federal Judicial Center, research and development arm of the federal courts. This project involves development of a data base system for all federal courts from which "a host of systems can run." Eventually, said Buchanan, these will include scheduling. "In the near term will be case flow analysis."

A Carnegie-Mellon faculty member since 1972, he also has served as a research assistant at The Artificial Intelligence Laboratory at Stanford Univ. and as a consultant on computer research for IBM at Los Gatos, Calif. He earned B.S. and M.S. degrees at the Univ. of Utah, and a Ph.D. in computer science at Stanford.

Buchanan has been interested in the application of computers to the legal process "for a number of years" and has been actively involved for the past two as a consultant for law firms on the acquisition and analysis of data in computer files to be used in litigation, and for the federal courts on design of an automated accounting system for fund control. When his year as a Judicial Fellow is up, he said, he will return to Carnegie-Mellon and hopes to continue as a consultant to the federal judicial system. □

Quick! Name the company whose Graphics Software lets you program your Application instead of your Terminal.



Powerful Software. When combined with our family of direct-writing Interactive Graphics terminals, it takes the strain out of your applications programming.

A few brief examples. With FDP, our FORTRAN Drawing Package, you can create and control displays in two or three dimensions from existing FORTRAN programs without worrying about refresh rates, scale registers, device controls, or other terminal quirks.

And with FMP, a graphics File Management Package, you can store and retrieve FDP-formatted objects and drawings from disk memory.

Using EDIT-D, a sophisticated editor that runs on DOS, you can insert, delete, and modify source programs and data files, perform character-string searches, and merge files.

Our Graphics Software. Powerful, easy to use, and available today. Why not contact us now for the full picture on how you can start concentrating on your application . . . and stop worrying about how to display it.

VECTOR GENERAL

Interactive Graphics. Our only business.

21300 Oxnard Street • Woodland Hills, California 91364 • Phone (213) 346-3410 • TWX 910-494-2764

CIRCLE 57 ON READER CARD

BASF has it. Why wait?

Now you can get the 3348, or "Winchester," Data Module, with all the quality and error-free performance that the name BASF implies . . . and at a competitive price.

The "Winchester" Data Module is a completely self-contained unit, incorporating heads, spindle, and recording surfaces in a protective factory-sealed pack. You've heard of the advantages of this new technology . . . complete security from environmental contamination, improved high-density storage, and incredibly fast access. Now you can enjoy this premium performance without paying a premium price.

Here are the facts, in brief:

- Complete compatibility with 3340 drives
- BASF-guaranteed Zero-Error performance.
- Now available in two configurations. . . . The 1335 Module, with 35 million-byte capacity , and the 1370 Module, with 70 million-byte capacity
- Our 1370F Module, with fixed head and quicker access, will be available later.

For complete details on the BASF "Winchester" Data Module, write: BASF Systems, Crosby Drive, Bedford, MA 01730, or call our nearest regional office . . . in **Los Angeles,** (213) 386-7023; in **Chicago,** (312) 343-6618; and **Clifton, NJ** (201) 473-8424.

You're already paying for BASF quality. . .you might as well have it.

BASF

CIRCLE 12 ON READER CARD

LOOK AHEAD

AS THE TRIAL BEGINS, AN HISTORICAL PERSPECTIVE

While the Justice Dept.'s trial against IBM got off to a contentious start---the opposing lawyers accused each other of "professional misconduct" and the judge hearing the case was sharply critical of the opening presentations of both sides---there was new controversy about the actual filing of the case. Eugene V. Rostow of Yale Univ., a former high official in the administration of President Lyndon Johnson, told a seminar at Harvard Univ. that antitrust complaints against both AT&T and IBM were brought to the President at the end of his administration and that LBJ "authorized" the IBM suit. Rostow's claim, however, was criticized as "absolutely false" by Ramsey Clark, who, as U.S. Attorney General at the time the IBM case was filed, said that neither the IBM case nor the AT&T case went to LBJ and, in fact, was never even discussed with the President by the Justice Dept. Clark told Datamation that the IBM case had "crystallized" in 1969 and that the AT&T case hadn't. He added that he felt it would "politicize" the matter if the case were brought to the White House, so it wasn't.

The feeling as the trial started was that the IBM-Justice Dept. case would either be settled this summer or continue for several months---at least until after the 1976 national elections. If it goes its full course with a lengthy trial and then appeals, the case could likely stretch into the early 1980s.

DISTRIBUTED PROCESSING PROLIFERATES

Digital Equipment Corp. may not know it, but at least one of the largest and most sophisticated banking users in the country thinks the kind of minicomputers DEC makes represents the wave of the future in data processing. The First National City Bank (FNCB) of New York has already installed a few PDP-11/45s and in the coming months there should be room for scores more like them. Eager mini-makers, possibly overenthusiastic, see as many as 300 mini-based systems being installed at the bank and at its various subsidiaries as the gospel of distributed processing proliferates.

Like all mini-makers, DEC is not famed for its quickness in the dp commercial area, and the bank had to seek out DEC. The FNCB is taking a hard look at Data General's Eclipse line and already has Interdata equipment installed, so it's clear the user won't be locked into one vendor.

All this could bode ill for the traditional edp equipment makers---the bank has IBM and Burroughs equipment chiefly---and if other banking and financial services institutions follow suit, we may see a new way of life develop as the idea of distributed processing really catches on. The bank's largest current supplier, IBM, may rescue its big equipment---just in the nick of time---with its System/32, which intrigues the bank's dp staff. ECS Info Systems, Inc., of Lexington, Mass., assisted in presenting the mini distributed processing network idea to the bank and ECS' president, John Crawford, says the whole idea of distributed processing using minis in an edp environment is hitting with much more force than had been thought possible at this point in time.

A LASER FACSIMILE MACHINE NEXT YEAR

A Santa Clara, Calif., facsimile systems company, Dacom, Inc., hopes sometime next year to market a laserized facsimile machine based on a device recently developed at Bell Telephone Laboratories (May, p. 146). It transmits an 8-1/2x11" page of text in 10 seconds over a 50 kbs digital channel. Initially, Dacom's device will output microfilm images. Afterward, if sufficient demand develops, hardcopy printing capability will be added.

THE FLOPPY MARKET: ENTER WITH CAUTION

The floppy disc drive market is becoming good for those who are in it, but bad for those thinking of entering. That conclusion by Cipher Data Products of San Diego made it decide this spring to abandon a floppy system it had been working on for nine months. William W. Otterson, president of the Computer Machinery Corp. subsidiary, says price competition is so severe, it would have to sell 5,000 drives a year to realize the revenue now generated from 1,000 tape drives. The company, which has installed some 5,000 tape drives and

LOOK AHEAD

6,000 cassette systems, abandoned the floppy development in favor of a hard disc system it will begin offering early next year. The fixed and removable devices will have storage capacities of 2.5 to 80 megabytes on 100 to 400 track-per-inch discs. A hard disc development also is underway at Kennedy Co., Altadena, Calif., but the company hasn't decided on an introduction date. (Kennedy recently landed a $3.5 million order from Digital Equipment Corp. for its 9000 series tape transports and is understood to be producing them at a rate of 75 a month.)

Meantime, Control Data this spring captured three-to-five years' orders for 50,000 of its 9400 series floppy disc systems from Data General, Honeywell and a third unnamed major mainframer. CDC, which expects to produce 4,000 of the units this year, also is close to closing orders with three overseas prospects. At the National Computer Conference, CalComp announced a $2.5 million order for its Trident floppy system from minicomputer maker General Automation. "We're not saying how many units we'll deliver," said a spokesman, "because then you'd know the price." That's the way it is in this fiercely competitive infant market.

IBM REFINING SDLC SCHEME

IBM may be getting ready to change the error correction scheme originally included in its SDLC protocol. Known generically as the "go back N blocks" system, it permits seven message blocks to be sent before the first one has to be acknowledged. If any of the blocks are not received correctly, however, that group of bits, plus all the following ones have to be re-transmitted. An alternative approach is to transmit only the erroneous block. This approach is known as "selective repeat Automatic Repeat Request (ARQ)." It has been proposed as an amendment to the HDLC protocol now gestating within ISO, and an IBM source reports that his company has developed, but not yet implemented, such a scheme.

THEIR KIND OF PLACE

For an investment of $350 which bought them 16 hours of computing (IBM 370/168) and printing time and of the time and effort it took eight groups in eight cars to make deliveries to 98 McDonald's hamburger stores in Southern California, some California Inst. of Technology students are $10,000 richer. They won about one-third of the major prizes in a contest sponsored by the owners of Southern California McDonald's restaurants by submitting 1.1 million entries generated in the names of 26 different students by a simple computer program. Contest rules permitted entering "as many times as you want" and did not specify that the entries be handwritten. It's presumed McDonald's will be more strict next time around since the chain awarded duplicate prizes in a second drawing for every prize won by the students. Dave Novikoff, 21-year-old senior, said the students would split their winnings between student housing improvements and charities in the Pasadena area. His fellow perpetrators were Steve Klein, 20, a junior, and 19-year-old sophomore Barry Megval.

BURROUGHS STRIKE LINGERS ON AND ON AND...

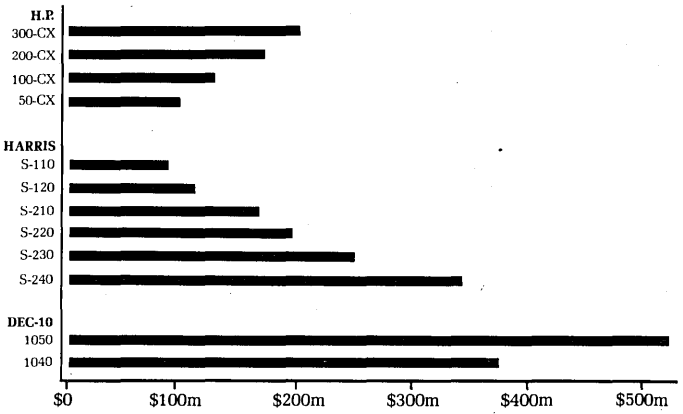
Those 185 Burroughs customer engineers who went out on strike against the corporation's New York financial branch last August (October '74, p. 125) were still at it last month and the end did not appear to be in sight. "We've had no sincere collective bargaining," said John Crowley of Local #3 of the International Brotherhood of Electrical Engineers, which is attempting to negotiate a contract for the ce's. So far, said Crowley, the only thing Burroughs has agreed to is an antidiscrimination clause, a standard clause in any union contract and one which is usually agreed to at the outset of negotiations. "in this case it took 30 weeks." Meanwhile, the strike has spread. Where picketing in its early stages had been restricted to Burroughs' facilities, it has been expanded to user installations. Crowley said some 40 sites in the New York, New Jersey, Long Island area served by the branch are being picketed 24 hours a day. And in March the IBEW picketed the Burroughs annual meeting in Detroit with a handful of New Yorkers helped out by "a sister local in Detroit."

(Continued on page 129)

Now HARRIS Virtual Memory Systems give you a choice

If you are looking at computer systems today, you're looking for economical initial cost, the best price/performance you can get, and room for your growth tomorrow. That's exactly what the new HARRIS family of computer systems delivers. We've packaged some of the most powerful computer hardware and some of the hardest working software into six systems that give you low cost, high performance computer processing. Each delivers transactional and batch processing capabilities that surpass what HP 3000 and DECsystem 10 offer at higher costs.

Let's compare apples to apples:

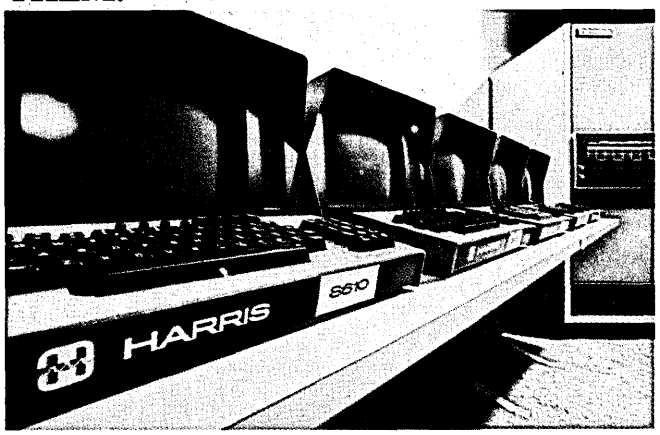


The above graph represents equally configured systems comparisons based upon currently available published information.

SIX SYSTEMS: Virtual memory all the way.

We've named our systems, S110, S120, S210, S220, S230 and S240. They're expandable systems, upward compatible, each with our powerful field-proven virtual memory operating system, VULCAN. And they all talk FORTRAN IV, COBOL, RPGII, and EXTENDED BASIC. Remote Job Entry to large host processors is available.

PACKAGED FOR HOW YOU USE THEM.



Another unique approach to our systems packaging concerns *you.* We package our systems for how you need to communicate with them. That's a universal need from application to application, from industry to industry. How do you want to talk to your system? Real time? Interactively? Multi-batch? In any combination and concurrently? Tell us how and we'll show you the package *you* want.

SUPPORT

Single source responsibility—another big benefit of packaged systems. We train your people, we service the system, and we maintain it. We built the operating system and we know how to keep it working for you.

Each of the new HARRIS Virtual Memory systems is a complete package. From dependable hardware to field-proven software to responsive support.

Now you have a choice. Let HARRIS show you how easy it is to make the right one. Write Harris Computer Systems, 1200 Gateway Drive, Fort Lauderdale, Florida 33309.

HARRIS

COMMUNICATIONS AND INFORMATION HANDLING

CIRCLE 42 ON READER CARD

calendar

AUGUST

3rd Int'l. Conference on Computer Communication, Aug. 3-6, Toronto. Sponsored by the International Council for Computer Communication (ICCC), and hosted by the Trans Canada Telephone System, the meeting will be attended by more than 1,000 communication system specialists and users of communications services. The ICCC-76 theme is "Advancement Through Resource Sharing." Fees: $75 before July 1, $85 after. Contact: Kenneth B. Harris, ICCC-76, P.O. Box 365, Station A, Ottawa, Canada KIN 8V3.

7th Annual Meeting, National Assn. for State Information Systems, Aug. 4-6, Laconia, New Hampshire. Growth of the dp manager, governors' policies, security, budgets, and computer performance evaluation are some of the topics to be discussed by information systems coordinators and administrators. Fees: $65, NASIS members and government agency representatives; $130, others; $35, social registration. Contact: Ms. Sandy Humston, NASIS, P.O. Box 11910, Lexington, Ky. 40511, (606) 252-2291.

Symposium on the Simulation of Computer Systems, Aug. 12-14, Boulder. The National Bureau of Standards and the SIGSIM of the Association for Computing Machinery (ACM) cosponsor this meeting, which will feature technical papers, tutorials, and discussion/workshops. Fees: $60, NBS, ACM, SIGSIM members; $75, nonmembers; $25, students. Contact: John Caron, FEDSIM/NA, Washington, D.C. 20330.

Worldcomp 75, Int'l. Exhibition, Aug. 25-30, Bucharest, Romania. The impressive Palace of the Republic will house this first event of its kind in Eastern Europe, an exhibition of computers, automation equipment, and computer peripherals. Under the sponsorship of the World Organisation of General Systems & Cybernetics and dubbed the "Window Into the World," the exhibition will attract delegates from 59 countries, including China, Iran, some Arab countries, Eastern Europe, and the West. Information: Dr. J. Rose, WOGSC, c/o College of Technology, Blackburn BB2, 1LH, Lancs., England.

2nd USA-Japan Computer Conference, August 26-28, Tokyo. The program will stress applications of pattern recognitions and image processing, artificial intelligence and its uses, and computer graphics. Sponsored by AFIPS and IPSJ, fees are: $83, members, advance; $100, nonmembers; $17, students; $35, social registration. Special travel packages are available. Contact: AFIPS, 210 Summit Ave., Montvale, N.J., (800) 631-7070, toll-free.

SEPTEMBER

2nd Int'l. Exhibition, Equipment & Appliances for Mechanization of Designing, Technical and Office Work, Sept. 2-16, Moscow. Nearly 300 exhibits are expected to attract thousands of visitors from Eastern and Western Europe, the U.S., and Japan, with the latest in business equipment, including computers and related products. This exposition is sponsored by the Russian Chamber of Commerce and Industry in cooperation with the U.S. Dept. of Commerce. Contact: Dr. Richard S. White, Welt Int'l. Corp., 180 N. Michigan Ave., Chicago, Ill. 60601, (312) 332-0558.

7th IFIP Conference on Optimization Techniques, Sept. 8-14, Nice. The conference, subtitled "Modelling and Optimization in the Service of Man," will highlight problems in transportation, climate control, food production, water resources, and population dynamics. Contact: Madame Danielle Arnus, Secretariat de Monsieur CEA, Univ. of Nice, Parc Valrose, 06034 Nice Cedex, France.

1st Nat'l. Conference, Software Engineering, Sept. 11-12, Washington, D.C. Papers will be presented on software methodology (specification and design techniques, program validation, top-down and modular design criteria), and applications (structured programming, program testing, reliability analyses) at this meeting sponsored by the IEEE Computer Society and the National Bureau of Standards for programmers and systems designers. Fees: $20, members; $25, nonmembers; $15, registrants at Compcon Fall '75, which precedes the conference. Contact: Software Engineering, P.O. Box 439, Silver Spring, Md. 20901.

MUMPS Users' Group Meeting, Sept. 17-19, Washington, D.C. Hospitals, clinics, and general business users of the system will have a workshop Sept. 17 on programming in MUMPS, followed by two days of applications discussions. Fees: $50, one-day workshop; $25, Sept. 18 & 19. Contact: Dr. Joan Zimmerman, Biomedical Computer Laboratory, 700 S. Euclid Ave., St. Louis, Mo. 63110, (314) 454-3364.

CALL FOR PAPERS

3rd Annual Symposium on Computer Architecture, Jan. 19-21, 1976, Clearwater, Fla. Original papers on "novel and recent developments in all aspects relating to computer architecture" are invited by the sponsors, ACM and the Computer Society of IEEE, in cooperation with the Univ. of South Florida. Four copies of the manuscript (not to exceed 20 double spaced typed pages), and one copy of the abstract should be submitted by Aug. 1, to Prof. Daniel P. Siewiorek, Carnegie-Mellon Univ., Pittsburgh, Pa. 15213, (412) 621-2600, ext. 177.

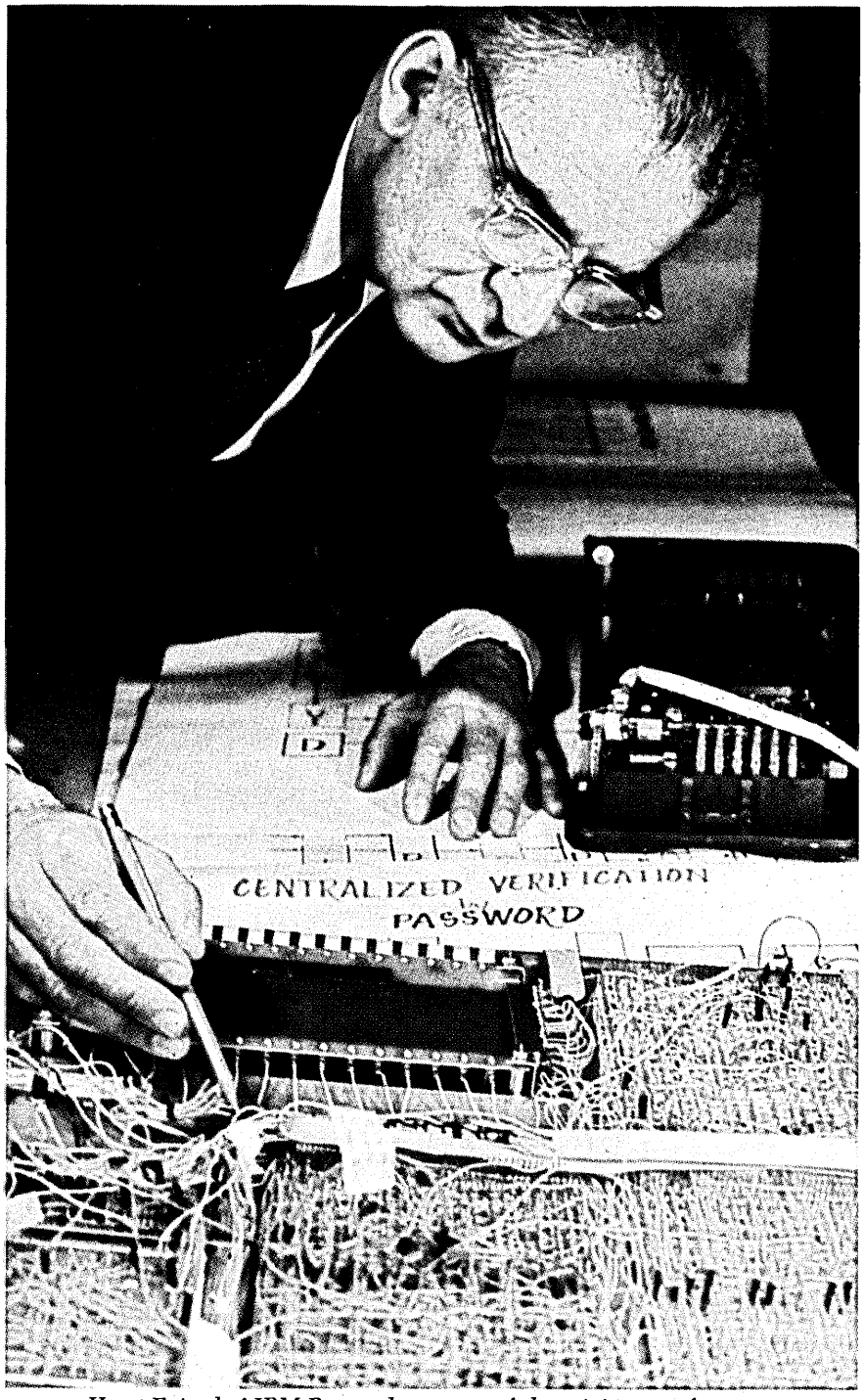
ON THE AGENDA . . .

Info 75, Sept. 8-11, New York. **Data Communications** and Peripheral Equipment Exhibition, Oct. 20-23, Paris; and **Systems '75,** Oct. 27-31, Munich; contact U.S. Dept. of Commerce. **38th Annual Meeting,** American Society for Information Science, Oct. 26-30, Boston. **8th Nat'l. Data** Processing Congress, Sao Paulo, Oct. 27-31. **National Microfilm** Assn., Oct. 28-31, New Orleans.

Conferences are generally listed only once. Please check recent issues of DATAMATION for additional meetings scheduled during these months.

DP Dialogue

Notes and observations from IBM which may prove of interest to data processing professionals.



Horst Feistel of IBM Research was one of the originators of an IBM electronic enciphering device used for data security. He is shown at IBM's Thomas J. Watson Research Laboratory at Yorktown Heights, N.Y.

Cryptography and Data Security

The need for data security is possibly as old as human civilization. Hieroglyphics employing cryptography —literally "hidden writing"—were inscribed as far back as the 18th Century B.C. In the India of the 4th Century B.C., ambassadors to foreign courts were explicitly advised to practice "the decipherment of secret writings."

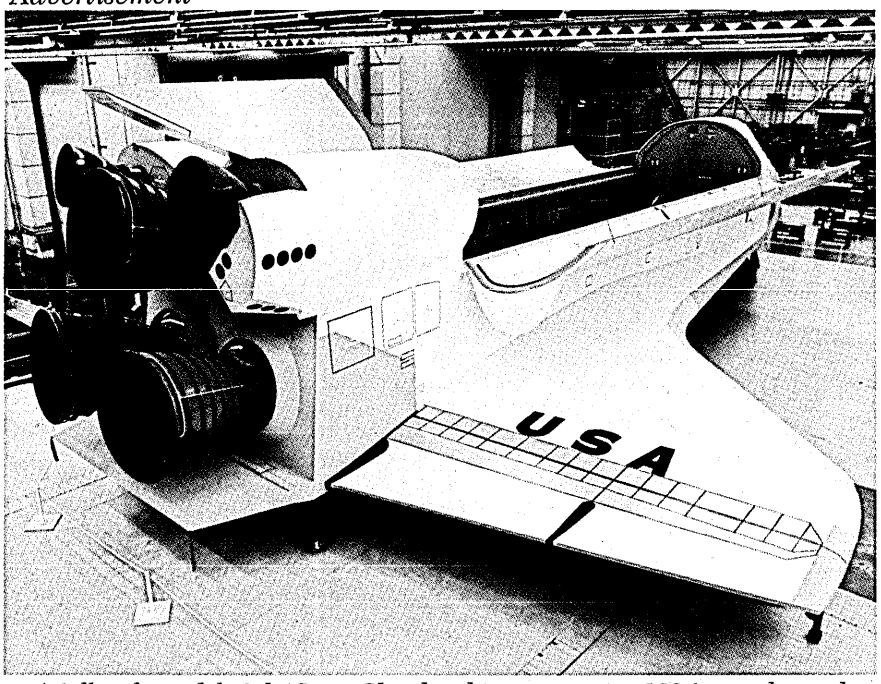
Today cryptography is one of numerous techniques used to insure the security of computer operations. It offers some unique advantages in preserving data integrity and in authenticating the legitimate origin of any command to the computer. This is particularly true where communications lines connecting terminals and computer centers are exposed to alteration of message traffic.

An example of such a situation is the use of IBM's 3614 Consumer Transaction Facility. This terminal is capable of dispensing cash to authorized customers of a bank at any hour of the day or night. Such a terminal, part of the IBM 3600 Finance Communication System, may be miles away from the bank's central computer. Yet the system is extremely secure.

One reason is that the 3600 employs sophisticated electronic techniques to automatically encipher sensitive data, providing protection during transmission over the telephone lines.

How does computer cryptography work? Most ciphers assign substitute characters for alphabetic letters and numerals in the "clear text." Any simple one-for-one alphabetic substitution, however, can easily be broken by frequency analysis. If the letter Q occurs more frequently than any other in a fairly long cipher text, it's highly likely that the cipher Q stands for E, the most frequently-occurring letter in English—

(Continued on next page)



A full scale model of the Space Shuttle orbiter, measuring 122 feet end to end, developed by Rockwell International in Downey, California. Computer simulations played a major role in the Shuttle's design.

From Space Shuttles to Microelectronics

Determining the best re-entry path for a 200,000 pound vehicle approaching earth at more than 12,000 miles per hour . . . Modifying the layout of a tiny microelectronic device to allow for changes in logic capability.

Those are a sample of the kinds of design challenges encountered by engineers at various divisions of Rockwell International Corporation.

At the Microelectronic Device Division, Bob Larsen (right) and Gerry Lozano verify a set of color masks which represent photoplates used to manufacture microelectronic devices.

To help solve their design questions, engineers at Rockwell are using an online computer capability called the Time Sharing Option. With TSO, many engineers can use terminals located in their own divisions and communicate directly with Rockwell's four IBM System/370 Model 168 computers in Downey, California. An engineer can receive a response to his inquiry within a few seconds, almost as if the computer were dedicated totally to him.

Simulating Flight Conditions

"Interactive computing under TSO has significantly reduced the time needed to develop and debug many of the computer programs needed to simulate the U.S. Space Shuttle's in-flight conditions," says Dr. Joseph F. Gloudeman, director of Management Systems Engineering and Computing Services for the company's Space Division.

"We have also been able to take better advantage of the Continuous System Modeling Program (CSMP), which allows us to simulate a wide range of flight characteristics," adds Ray Brown, manager of engineering applications. "It has proved to be an extremely valuable tool.

"For example, CSMP helps us determine the best angle for the Shuttle's re-entry. That calculation involves a wide variety of data such as the heat caused by atmospheric drag, orbital velocity, and aerodynamic characteristics," explains Brown. "An engineer sitting at a terminal can change any one of these variables and determine almost immediately the impact of the change on vehicle performance."

Completed designs are stored online in a different data base organized under the Information Management System (IMS). Other vital information, such as material and parts in inventory, production in progress and costs, is also stored online.

IMS, TSO and CSMP are all IBM program offerings.

"If we have to modify a design for a part which happens to be in production, we can go to a terminal, locate the part by typing in its identification number, and integrate the new specifications immediately," explains Al Barnett, manager of systems development.

Designing Microelectronics

At the Microelectronic Device Division, Bob Larsen, manager of computer-aided design, tells a similar story: "Rockwell programs, written in Assembly and PL/1 languages and developed under TSO, simulate device logic, perform circuit analysis, evaluate nodal speed-noise problems, and even produce our preliminary design layouts.

"Interactive computing keeps our engineers completely involved in the design process, allows them to correct errors on the spot, and evaluate more design alternatives in greater detail."

IBM

Cryptography...

(Continued from preceding page)

and so on. Obviously, simple ciphers won't do for computer use.

What does do the job is an IBM enciphering device which works with the 3614 and uses the computer as its decoding counterpart. Basic to its operation is its use of binary digits—the 0's and 1's of computer language—into which all English characters are converted for computer use.

The device then puts the binary digits of a message through a remarkable series of alterations and substitutions. The effect is to eradicate any telltale combination of digits which, repeated even once in a cipher, might betray a word pattern to a keen-eyed analyst.

Will cryptography find other and wider computer applications? It's quite likely, considering the advanced state of the art. As the need for data security grows, cryptography may find increasingly widespread use. **IBM**

Solving Musical Mysteries by Computer

Plagiarism didn't concern sixteenth-century Italian song writers. They didn't think twice about borrowing each other's best tunes. And nobody minded.

That's the way it was back then. But today, musicologists want to trace precisely who borrowed what from whom. And the computer is helping them do this, just as it is helping them in many other kinds of musical research.

The two scores below show how an obscure musician, Nicola Broca, borrowed a melody from a better-known composer, Josquin des Prés. Nicola even went so far as to twist Josquin's words, and turn a sacred song into a ditty of disappointed love. Out of some 40,000 different tunes, the IBM System/370 Model 158 at the State University of New York in Binghamton selected these two, because they had such similar melodic form. Dr. Harry Lincoln, Chairman of the Department of Music, was then able to compare the printouts of the opening themes, scrutinize publication dates and trace the borrowing.

Musicologists like Dr. Lincoln have to cope with such a vast repertory they just couldn't tackle much research of this kind without computer help. Of course, they must have a way to put a musical score into computer-readable form. And that's why so many musicologists today are using a coding system called DARMS.

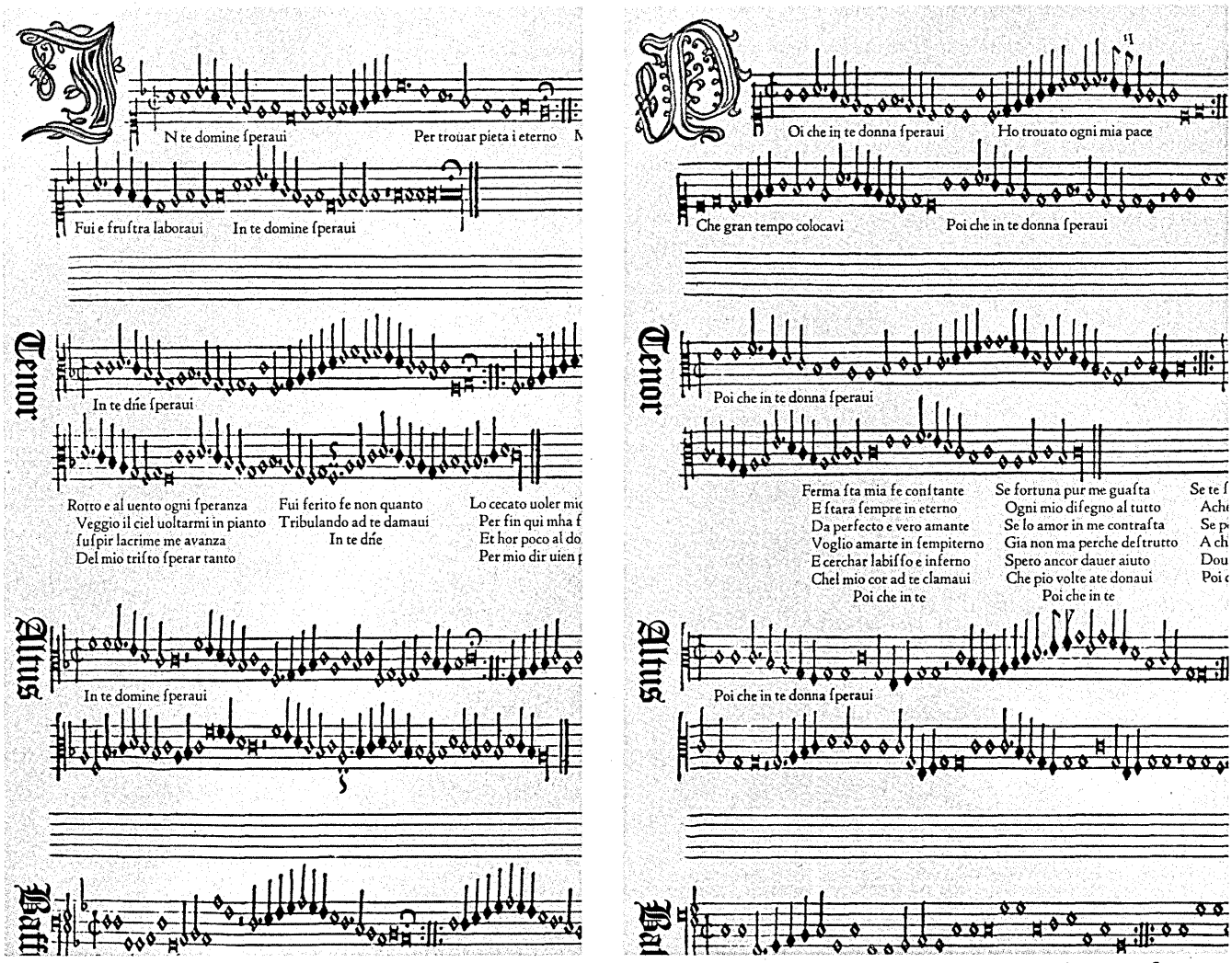
DARMS, Digital Alternate Representation of Musical Scores, was developed by Stefan Bauer-Mengelberg, a visiting professor at Binghamton who is also a staff member at the IBM Systems Research Institute. He says, "Now a musicologist can take any piece of music in standard notation and transcribe it into a code for entry into a computer."

Since musicologists have a way to tell the computer precisely what a composer has scored, they can now process a formidable volume of data. In fact, in many universities today music departments are among the biggest computer users.

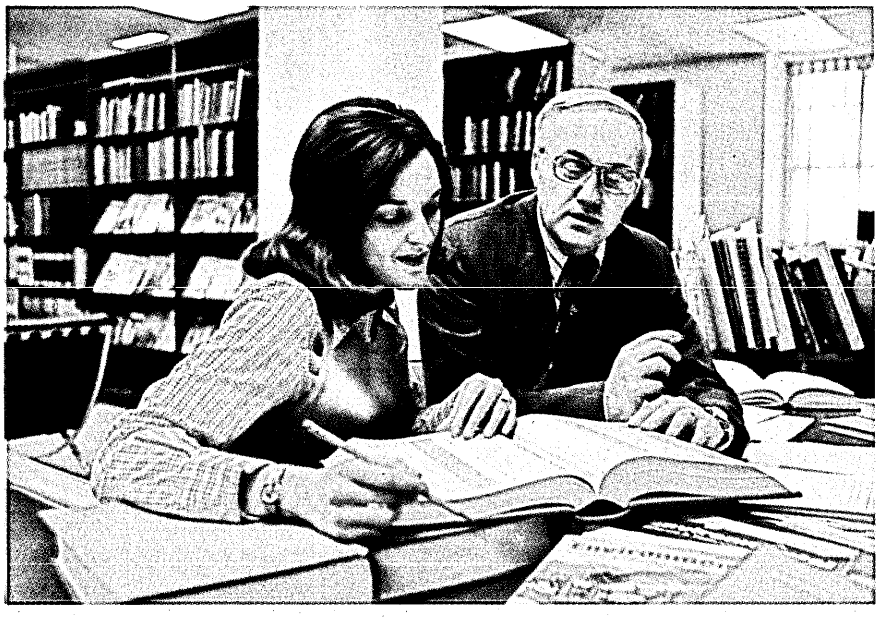
With DARMS as their tool, musicologists can develop programs to analyze a composer's use of harmony, rhythm and counterpoint. With this knowledge they can develop a theory about his style, and study how it evolved. They can even attempt to determine when Bach, for example, composed a particular work.

"Once you know enough about composers' stylistic techniques," says Bauer-Mengelberg, "much music that was once dubbed 'anonymous', or was wrongly attributed, can be ascribed to the right composer. This is especially important in early music, where title pages from folios are often lost."

Looking to the future, Bauer-Mengelberg speaks of how the computer could be used to print musical scores: "Now that a way has been found to make music machine-readable, we hope the day is not far off when we will be able to use the computer in the preparation of master plates for music printing." **IBM**



Two songs. Two composers. Similar melodies. The computer helps solve the mystery: who borrowed from whom.

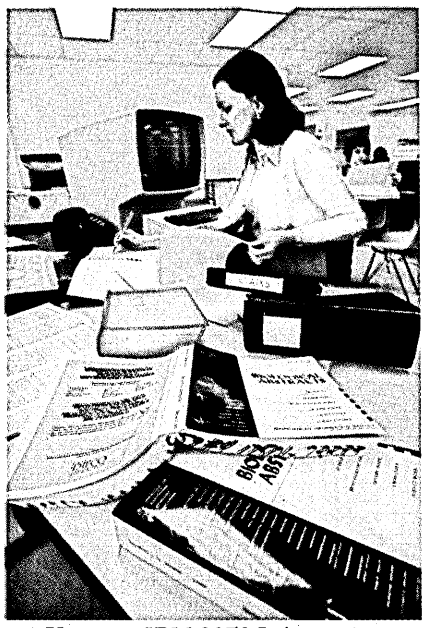


Information Specialist Kay Durkin and H. Edward Kennedy, Acting Executive Director of BIOSIS, discuss terminology to be used for an online search strategy using STAIRS.

STAIRS Steps Up Information Retrieval

Thousands of academic and trade journals are published in the life sciences each year. Hundreds of thousands of papers are presented by scientists and doctors at symposia all over the world. Given that volume of new information, locating facts to solve a specific problem in biology could be a staggering task. Manual library searches would take weeks.

A non-profit organization in Philadelphia known as BioScience Information Service of Biological Abstracts (BIOSIS) has been able to simplify the search task with the help of an IBM computer. Founded in 1926, BIOSIS is now one of the largest abstracting and indexing services for the biological and bio-medical sciences in the world.



Using an IBM 3270 Information Display System, Kay Durkin formulates a STAIRS search strategy.

Its major product, *Biological Abstracts,* is a semi-monthly publication which summarizes research studies originally printed in over 8,000 primary journals. Subscribers include university and institutional libraries, industrial clients and research centers in over 120 countries.

To answer specific questions posed by research scientists, BIOSIS offers a customized computer search of its data base. All information for the current year is entered into an IBM System/370 Model 145 running under OS/VS1 with CICS. Using an IBM Program Product called STAIRS/VS (Storage and Information Retrieval System), one of BIOSIS's nine information specialists can formulate a simple retrieval within minutes.

A Typical Search

To conduct a typical search—such as the effects of thermal pollution on micro-organisms—the information specialist first selects one of six simple commands built into STAIRS. By typing in the command along with words representing the original question into an IBM 3270 terminal, the specialist will be able to see immediately if his strategy has resulted in a bibliography of relevant items.

If the strategist feels the first retrieval effort is too general, he may refine the strategy to yield more specific references. One example would be to ask for the phrase "thermal pollution" in contrast to the words "thermal" and "pollution."

Other commands enable inquiries to be "ranked" so that cited documents will be listed in order of relevance, "selected" on the basis of certain quantifiable relationships (greater than, less than, equal to) or "saved"—in which both the strategy sequence and descriptive words are stored for future retrievals.

Once the specialist completes the strategy for the current year, it can be used for past years as well. The result of this search is a bibliography of references printed by the computer for use by the client.

Instant Strategies

"STAIRS has given us the ability to formulate search strategies instantly," says Kay Durkin, Planning Officer in information retrieval. "It helps us to use an open-ended vocabulary so that we don't have to check long lists of established key words. As a result, we can determine the parameters of our searches much more precisely."

"We can teach our staff the rudiments of STAIRS in a few hours," adds Data Processing Manager John Thomas. "It is an extremely well-written, general-purpose program, adaptable to any organization which needs to retrieve information quickly."

Dr. H. Edward Kennedy, acting director of BIOSIS, comments on future trends in information processing: "We feel that many printed publications will someday be replaced by new forms of technology like microfiche and magnetic tape. Some libraries have already started to automate, and services like ours will become increasingly dependent on computer-based retrieval systems."

DP Dialogue appears regularly in these pages. As its name suggests, we hope DP Dialogue will be a two-way medium for DP professionals. We'd like to hear from you. Just write: Editor, DP Dialogue, IBM Data Processing Division, White Plains, N.Y. 10604.

75-3

IBM®
Data Processing Division

source data

SOURCE DATA provides information on books, courses, references, reports, periodicals, and vendor publications.

books

Management Information Systems: Conceptual Foundations, Structure, and Development

by Gordon B. Davis
McGraw-Hill, 1974
482 pp. $13.95

Information Systems for Modern Management

by Robert G. Murdick & Joel E. Ross
2nd ed., Prentice-Hall, 1975
672 pp. $14.50

These are introductory textbooks to the subject of management information systems. Both are new and written by veterans. Their comparison then affords an interesting view of the state of the art, of what is known about the relationship between computers and management well enough to be formalized in a textbook. Both books cover almost exactly the same subject matter, which implies that a state of sufficient maturity has been reached in MIS for any two teacher-authors to arrive at similar conclusions about content. Not that the two books are the same, however—they aim at different levels of student maturity and background.

Davis writes for students of high intellectual caliber and extensive background. Though he tries to avoid material which would make mathematical background or computer experience necessary, a reader nevertheless would have trouble without some of both. Davis' introductions to information theory and decision models require a moderate mathematical background to follow, and his discussion of data base subsystems (for example) would be difficult to understand fully without some computer familiarity.

Murdick and Ross write for a more average level of students (the vocabulary and grammar are simpler) and require less background. They devote six chapters to introducing computers, programming, and basic data processing techniques, doing so at ample length (though without fully covering the subject—operating systems are not mentioned at all). Murdick and Ross also provide a wealth of examples and cases both scattered through the book and added as a special section at the end; Davis has few examples and no cases. (Davis suggests in his preface that the instructor provide his own cases).

Apart from this difference in level, the books are similar. Both are well illustrated, and show a healthy understanding of the roles of people in information systems and the difficulty of applying theoretical techniques to the messy real world.

Both books discuss information system design and implementation, and say useful things about controls, cost-benefit analysis and the like. They agree that the MIS topic includes an extensive degree of computer-related knowledge and skills. They also present a summary of classical organization theory (Murdick and Ross assert that "the systems approach provides a total theory of organization" while Davis takes no sides; but anyhow both provide an overview of the field).

Both books discuss management methods, at different levels of abstraction (e.g. operating, tactical, and strategic) and via different approaches, paying attention to the behavior of people in organizations. Both present brief summaries of decision theory, speaking of decision trees, the value of information, and the like.

Both define the best-known techniques of operations research and the building of mathematical models, tending to present shopping lists of definitions rather than establishing comprehension of the applicability and limitations of the techniques.

Finally, both speak of the future: of evolutionary development of MIS, and of implications for organizations and people. But neither book pulls it all together. Both present brief introductions to a variety of topics, widely different in theoretical level, derived from a mix of empirical and formal sources, and with varying degrees of specific job applicability. The only thing all the subjects have in common is that they are concerned with organizations, and that an abstraction called information can be related to them all. A student, after taking a course based on either of the books, might well end up asking the question he started with: "What is MIS all about?"

This is not meant as a criticism of the books. Both are very competently done, and at their differing levels of sophistication they do an admirable job of covering so much material so briefly. Rather, this is an indictment of the state of maturity of MIS as an organized, coherent body of concepts and knowledge. It isn't there yet, and it's debatable whether it ever will be. But maybe it doesn't matter. Psychiatry is a useful profession, even though (like the picture of MIS presented in these books) it's a mixture of highly specific technical subject matter and imprecisely related empirical and conceptual abstractions. Perhaps MIS will be a useful field even if it doesn't come together either, but some proponents will be disappointed.

—**Frederick G. Withington**

Mr. Withington, a senior staff member of Arthur D. Little, Inc., is also a contributing editor of DATAMATION.

Computer Applications and Techniques in Clinical Medicine

by Herbert R. Ludwig
Wiley & Sons, 1974
317 pp. $16.95

This book proposes to explain how computer technology is used in clinical medicine; how to set up information systems, files, and records; and how to retrieve and analyze specific parameters of patient records. It is also a very detailed and well-documented description of Dr. Ludwig's own research, with actual program code found in the book's appendices.

Among the topics covered in the book's 11 chapters are interactive file-oriented language for medical applications; highly specialized systems such as detailed bone marrow reporting and a cancer file that allows flexible interaction between medical researchers and a large data base; and designs for an interactive information system in the medical environment. Also discussed is work being done at the Stanford Univ. Medical Center, such as setting up an automated transfusion center and SPIRES (Stanford Public Information Retrieval System).

By giving technical insight into very specific problem areas, this book will be of value to professionals involved in similar types of applications.

—**Marion J. Ball**

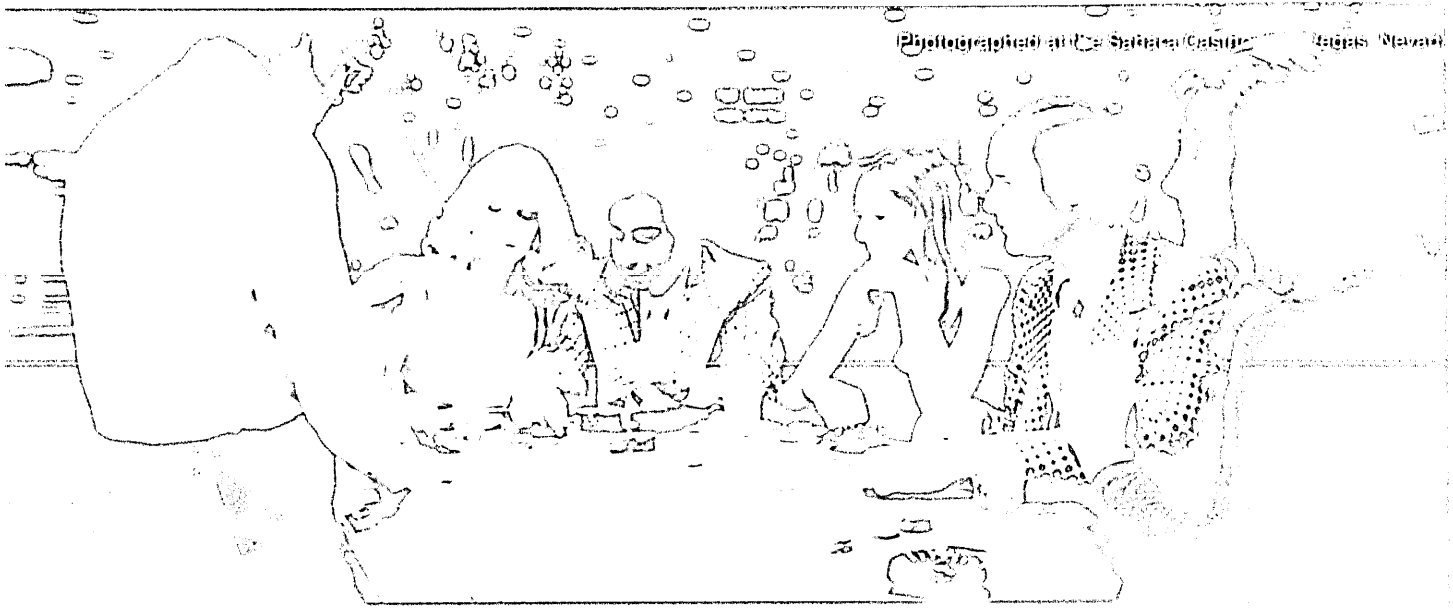
Dr. Ball is director of the health sciences center computer systems and management group, and an associate professor of biometrics, at Temple Univ., Philadelphia.

BOOK BRIEFS . . .

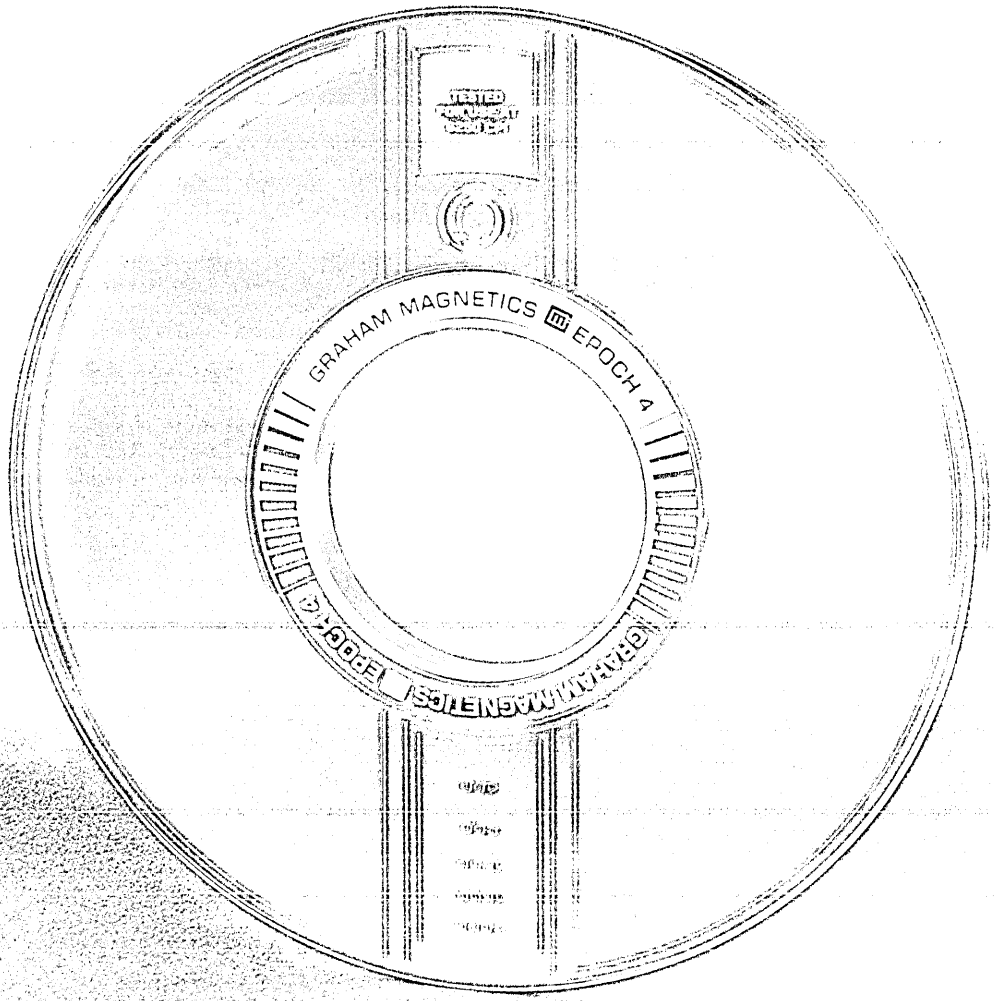
Computers and the Social Environment

by Fred Gruenberger
Wiley & Sons, 1975
164 pp. $9.95

Written in a clear, understandable style, this book helps the nontechnical person understand the impact of computer technology on society. Early photos and sample problems illustrate chapters on what computing is and how a computer works, and there is a timely section on computers and the invasion of privacy.



Running a computer operation shouldn't be a game of chance.



source data

Top-Down Structured Programming Techniques

by Clement L. McGowan and John R. Kelly
Petrocelli Books, 1975
288 pp. $14.95

Beginning with a description of structured programming, this text goes on to present guidelines and techniques to the programmer on the use of the top-down approach. The chief programmer team concept is also covered. This book uses PL/1 for most of its illustrations, plus COBOL, FORTRAN, and 360 assembly language where applicable.

Dictionary of Data Processing

by Jeff Maynard
The Butterworth Group, 88 Kingsway, London, 1975
269 pp. £3.90 (approx. $9.50)

This book aims at cutting through the buzzwords and jargon of the industry to define terminology for the layman, computer user, and dp manager alike. Useful appendices list common acronyms and abbreviations, codes, flowchart symbols, and American and British standards. Apparently the terms "microcomputer" and "microprocessor" are too new for the book, but the terms which are included are clearly defined. Some other terms, like "pipeline processor" may have been omitted as "Americanisms."

Enough Fortran

by Thomas A. Boyle
Technical Directions, Inc.,
Box 2221, West Lafayette, Ind. 47906, (1974)
80 pp. $2.95

This FORTRAN programming text comes complete with an unusual branched program achievement test which can be taken at any time during the course. Test sheets may be graded by an instructor or by the publisher. In the latter case, a machine analysis of the grades is returned, along with study suggestions. Machine processing for four tests is included in the price, making it a real bargain. Software for scoring the tests will be made available to schools wishing to adopt the test for a nominal reproduction fee.

Contracting for Computing, Vol. II

EDUCOM
Box 364, Princeton, N.J. 08540 (1975)
148 pp. $15

This appears to be a useful book; it contains an outline of contracts for software package purchases and for custom software agreements. Its format is mostly example after example of contract clause discussion followed by the text of sample provisions and occasionally by penalty or remedy clauses. Using the checklists included, whole contracts can be constructed. The ma-

(Continued on page 152)

reports & references

Selecting a Computer

With the decreasing cost of minicomputers, and with these machines being "independent of professionals," many small and medium sized companies can now cost-justify an in-house computer. To aid the businessman in purchasing his first computer, or in adding to or changing his system, this vendor offers an 11-page report, *Decision Criteria for Selecting a Business Computer System.*

Topics include developing a functional specification; evaluating bidders, hardware, programmers, and software houses; selecting operating systems and programming languages; and maintenance considerations. ADL SYSTEMS INC., Englewood Cliffs, N.J.

FOR COPY CIRCLE 200 ON READER CARD

World Electronics Markets

Germany is the world's largest market for electronic components after the U.S. and Japan. France's electronics industry output was $3.5 billion in 1972, and is expanding at 15-20% per year. Sales in Mexico were $18.7 million in 1971, $25.6 million in 1973, and are expected to reach over $40 million in 1977. These and other interesting facts about the rapidly expanding foreign electronics industries, prodded by the mushrooming demand for electronic end-products, can be found in the 160-page Commerce Dept. report, *Global Market Survey: Electronic Components.*

This useful book contains an overview of the world market, 19 specific country market surveys (with vital statistics), information on U.S. Government assistance to exporters, and a schedule of trade promotional events. Price: $2.30, Superintendent of Documents, U.S. GOVERNMENT PRINTING OFFICE, Wash. D.C. 20402.

EFTS Facts Digest

Close to a hundred pages of annotated bibliography on electronic funds transfer systems, *A Digest of EFTS Thinking Today,* has been produced by the ABA. A "one-of-a-kind publication," this digest selects and analyzes the growing amount of literature in the field. Price: $10. AMERICAN BANKERS ASSOC., 1120 Conn. Ave., N.W., Wash. D.C. 20036.

Multiplexors

The 24-page report, *All About Data Communications Multiplexors,* explains communications multiplexing and surveys 61 products of 30 vendors. To help in assessing the applicability of multiplexing techniques and in selecting suitable equipment, the report analyzes users' experience and presents detailed comparison charts of available multiplexors. Price: $10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

Computer Reports

A number of useful dp reports are summarized in the NTIS *Weekly Government Abstracts: Computers, Control & Information Theory.* These low-priced government publications report on work performed at places such as the Naval Research Lab in Washington, D.C., Aerospace Corp., and the Rand Corp. Some titles are *Programmable Calculator - Minicomputer Tradeoffs* by Kingsley P. Thompson (AD/A-003 456/1WC $3.75); *A Structured Approach to Modeling Computer Systems* by D. J. Reifer (AD/A-004 075/8WC $3.25); *Can Software Benefit from Hardware Reliability Experience?* by H. Hecht (AD/A-004 076/6WC $3.25); and *Experience in Designing a Data Retrieval Capability for a Large Data Base* by L. H. Heiser (AD-786 712/OWC $3.25). NATIONAL TECHNICAL INFORMATION SERVICE, U.S. Dept. of Commerce, 5285 Port Royal Road, Springfield, Va. 22161.

Communications Notebook

The *Auerbach Data Communications Notebook* is a new one-volume reference updated monthly that provides perspective on industry changes, analyzes products and services, presents system design guidelines for the user's most cost-effective applications, presents search and specification charts covering over 1,200 devices, and provides a useful "Call Auerbach Service" for users to obtain additional information directly from Auerbach analysts.

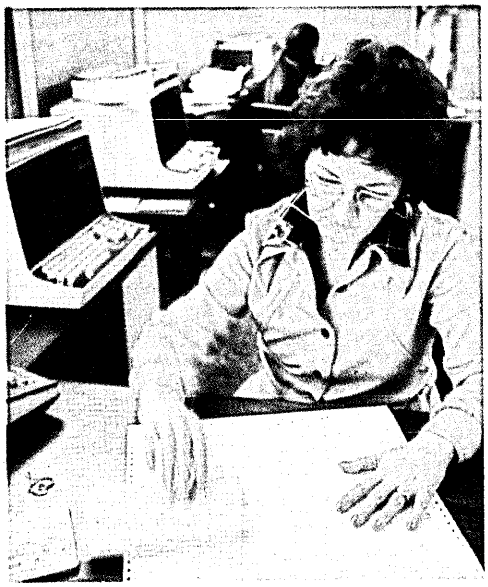
In addition, subscriptions include the *Auerbach Reporter,* a monthly technology analysis service on current happenings in dp (usually $25/year), and the monthly *Auerbach Subscriber Newsletter,* which reviews Notebook updates as well as other dp developments noted in the complete Auerbach reports. Yearly subscription is $190. AUERBACH PUBLISHERS, INC., 121 N. Broad St., Philadelphia, Pa. 19107.

Market Surveys

By 1984 a projected 1½ million keyboards will be installed for data entry purposes at computer sites in Europe —with 37% at remote sites—according to a 180-page report, *The Batch Data Entry Market in Europe.* The study includes descriptions of products; market profile and sales forecast; a user survey of data entry costs, cur-

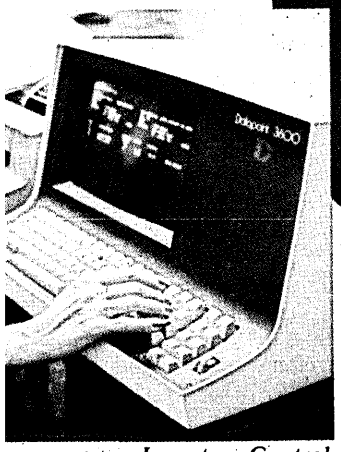
For your total business

Accounts Payable



General Ledger

Under Datashare control
- *The Datapoint 5500*
- *300 lpm printer*
- *2 large disk units*



Inventory Control

Accounts Receivable

Sales Order Entry

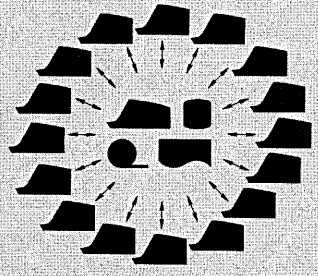
data processing needs: Datapoint's New, Expanded Datashare System

- ***Datapoint 5500 Central Processor/Mass Storage Disk Units***
- ***Datapoint 3600 Remote Terminal/Hardcopy Terminal Printers***
- ***Datashare III***

The new Datashare system, from Datapoint, builds on the success of the initial Datashare based on the Datapoint 2200 processor. The concept remains the same—a compact central computer with associated peripherals providing the people who need it most compute power at remote work stations for a variety of business data entry and processing needs—but capacity for work throughput and diversity of applications have expanded greatly with the new version. For businesses whose workload has outgrown both available equipment and available budget, Datashare represents a real breakthrough. Nowhere else can you get such a total business data processing capability at such a modest cost. Let's take a closer look at these new elements and what they can do for you.

The Datapoint 5500—a compact but powerful business processor that incorporates the very latest integrated circuit technology. Physically the same size as the Datapoint 2200 and 1100, the 5500 offers 64K high-speed internal memory and an advanced processor architecture with a wide variety of printers, tape units and disk systems (see list). It can supply up to 16 work stations simultaneously with compute power. In one typewriter-sized unit the 5500 provides the basis for an independent "computer utility" operation (even while it serves optionally as a highly efficient data communications link to a central computer complex.) Fully compatible with software created for the Datapoint 1100 and 2200 systems.

The new Datashare—supporting up to 16 remote work stations



Each remote unit may be equipped with a printer unit for hard copy capability.

The Datapoint 3600—a low-cost video terminal with upper case/lower case capability, a unit designed for efficient satellite use with a Datashare configuration. (Datashare also works efficiently with other Datapoint units such as the 1100 and 2200 and all TTY-compatible terminals.) The optional 120 CPS belt printer serves as a hard copy outlet for work stations where printer information is desirable.

Datashare III—the enhanced master control system that extends Datashare capability to 16 remote stations, allows users at these stations access to the expanded number of peripheral units that may be associated with the 5500. Version III offers greatly improved file creation and handling capability, including advanced file protection/security and virtual memory techniques.

Additional Datashare components have been added but the Datashare philosophy remains the same—to provide the business user a low-cost, highly productive way to disperse a powerful data entry and data processing capability among departments and field offices. Either as an independent system or as part of a larger computer/communications network, the new, expanded Datashare is available now to help your organization. For further information contact the Datapoint sales office nearest you or write or call Datapoint Corporation, attention: Marketing Department, 9725 Datapoint Drive, San Antonio, Texas 78284 (512) 690-7151.

Datashare Central Processors and Peripherals

Processors
Datapoint 2200 with 16K memory
Datapoint 5500 with up to 64K memory

Data storage
Cartridge disk (2.4 mil. char. storage on replaceable disks), 4 max. 2.4-9.6 mil. char. storage on 2200 or 5500
Mass storage disk 20-40 mil. char. storage on 2200
25-200 mil. char. storage on 5500

System Printers:
300 LPM Drum Printer
60-120 LPM Matrix Printer
60-120 LPM Belt Printer
30-60 CPS High quality print servo printer

Communications to terminals
Direct wire, 1200 Baud
Leased line, 1200 Baud
Dial up, 300 Baud

Card Reader
300 cpm

Magnetic tape drives
556,800 and 1600 bpi
7 and 9 track

Cassette tapes
Integral to 2200 and 5500 processors

User terminals
Datastation 3600 terminal
Datapoint 1100 intelligent terminal
Any TTY-compatible terminal

Terminal printers
120 cps Belt Printer
Any Datapoint/System printer used with Datapoint 1100 and 2200

DATAPOINT CORPORATION

The leader in dispersed data processing

Home Office: 9725 Datapoint Drive, San Antonio, Texas 78284 (512) 690-7151 • **Sales Offices:** Atlanta/(404) 458-6423 • Austin/(512) 452-9424 • Baton Rouge/(504) 926-3700 • Boston/(617) 890-0440 • Chicago (312) 454-0990 • Cincinnati/(513) 481-2600 • Cleveland/(216) 831-0550 • Dallas/(214) 661-5536 • Denver/(303) 770-3921 • Des Moines/(515) 225-9070 • Detroit/(313) 478-6070 • Greensboro/(919) 299-8401 • Hartford/(203) 677-4551 • Honolulu/(808) 524-3719 • Houston/(713) 688-5791 • Kansas City/(913) 321-5802 • Los Angeles/(213) 645-5400 • Milwaukee/(414) 453-1425 • Minneapolis/(612) 854-4054 • Nashville/(615) 885-3014 • Union, N.J./(201) 964-8761 • New York/(212) 736-3701 • Orlando/(305) 896-1940 • Philadelphia/(215) 667-9477 • Phoenix/(602) 265-3909 • Pittsburgh/(412) 931-3663 • Portland/(503) 761-2250 • Salt Lake City/(801) 487-8201 • San Diego/(714) 460-2020 • San Francisco/(415) 968-7020 • Seattle/(206) 455-2044 • Stamford/(203) 359-4175 • St. Louis/(314) 291-1430 • Tulsa/(918) 664-2295 • Washington, D.C./(703) 790-0555 • **International:** TRW/Datacom—International/Los Angeles, California, TELEX 691286 (213) 475-6777 • Sydney, Australia/(2) 922-3100 • Vienna, Austria/0222/36 21 41 • Brussels/3762030 • Rio de Janeiro, Brazil/222-4611 • Copenhagen/(01) 965-366 • Guayaquil, Ecuador/394844 • London/(1) 903-6261 • Helsinki/90-661 991 • Paris/(1) 657-13-31 • Hanover Germany/(0511) 634-011 • Rotterdam/(10) 216244 • Hong Kong/(526) 4111 • Tel Aviv, Israel/(03) 410565 • Milan/316 333 • Tokyo/264 6131 • Beirut/348 340/1/2 • Kuala Lumpur, Malaysia/73901 • Oslo/153490 • Makati Rizal, The Philippines/877294 • Singapore 92765 • Tehran, Iran/8538857 • Johannesburg/724 9301 • Stockholm/(8) 188295 • Lyss/Byrne/(32) 844240 • Taipei, Taiwan/(361) 7241

source data

rent equipment and installations, future plans, and brand preferences; and a survey of U.S. and European manufacturers' plans for servicing the European markets.

Another study, a 255-page report *The Data Communications Equipment Market,* predicts a real annual growth rate of 15% in the data communications equipment installed base during the next 10 years, with a 22% expansion in each of the next three years. The study covers major trends, provides forecasts through 1985, and evaluates specific products: modems (six types), multiplexors (two types), communications processors (five types), acoustic couplers, minicomputers for data communications, and other relevant equipment. In addition, changes in the regulatory environment and their impact are covered, as are projections of data service revenues and capital requirements, and possible moves by AT&T and IBM.

The price for the first report is $495; for the second, $595. FROST & SULLIVAN, INC., New York, N.Y.

FOR DATA CIRCLE 201 ON READER CARD

Software Quality Spec

A 6-page *Military Specification Software Quality Assurance Program Requirements,* developed by the U.S. Army Computer Systems Command at Fort Belvoir, Va., can aid contractors in developing software for government agencies. The specification—MIL-S 52779(AD), 5 April 1974—establishes the minimum quality assurance requirements, and presents guidelines for early agreement with the contractor in developing the software. NAVAL PUBLICATIONS AND FORMS CENTER, Philadelphia, Pa.

FOR COPY CIRCLE 202 ON READER CARD

vendor literature

Disc Pack/Cartridge

An 8-page handbook describes the most effective methods for cleaning, care, inspection, handling, and storage of disc packs and cartridges. Other topics include processing new packs and cartridges, detection of trouble conditions, and recording levels. COMPUTERLINK CORP., Burlington, Mass.

FOR COPY CIRCLE 203 ON READER CARD

Time Saver

ARF is a new interactive learning system for RPG II AUTO REPORT, a language refinement that this vendor claims can reduce or eliminate six time-consuming tasks. The tasks are laying out report formats on printer spacing charts, coding and keying file and input descriptions, coding and keying calculation subroutines used before, coding total accumulations, coding report print positions to fit the format of the spacing charts, and modifying report formats to meet new user requests by redoing some of the above. GROUP/3, Canoga Park, Calif.

FOR DATA CIRCLE 204 ON READER CARD

Data Entry Systems

The Network Approach to Data Entry is a brochure that describes this vendor's systems (Models 2400, 1200, 2300, and 4400). Covered are data entry, data collection, data communications, data manipulation, document processing, and user programming. The network approach refers to each system being compatible with the others, with interchangeable media; each capable of working with the others, with common languages; and each conveniently compatible with the major mainframes. MOHAWK DATA SCIENCES CORP., Utica, N.Y.

FOR COPY CIRCLE 205 ON READER CARD

Supply Catalog

This vendor's line of film and fabric computer print ribbons, spirit and offset duplicating masters, and other dp supply items are described in a 12-page catalog. COLUMBIA RIBBON & CARBON MFG. CO., INC., Glen Cove, N.Y.

FOR COPY CIRCLE 207 ON READER CARD

Circuit Design Kit

An enlarged and updated handbook accompanies an expanded Monochip design kit, making it easier and faster, according to this vendor, for the electronic engineer to design his own custom monolithic integrated circuit. The kit consists of extensive data on the Monochip integrated components, circuit design examples, layout sheets, and some 65 integrated transistors for breadboarding. Price: $39. INTERDESIGN, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 208 ON READER CARD

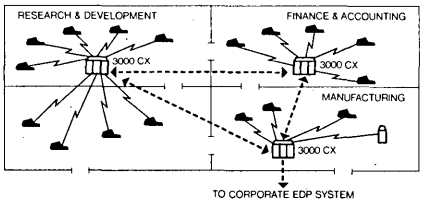
Microfiche Duplicators

The step by step operation of the Bruning OP-47 and OP-48 microfiche duplicators, each capable of producing more than 900 cut-to-size fiche per hour, is explained in a 6-page brochure. The entire duplicating process is self-contained in this OP series of high-speed thermal microfiche duplicators. Also described is Bruning's OP-88 fiche collator that automatically produces collated or separated sets of microfiche. Bruning Div., ADDRESSOGRAPH MULTIGRAPH CORP., Schaumburg, Ill.

FOR COPY CIRCLE 212 ON READER CARD

Mini DataCenters

A 12-page brochure, *HP 3000CX Mini DataCenters,* describes this vendor's data centers which consist of four interactive minicomputer systems with a common operating system that features spooling, virtual memory, and a communications subsystem. The operating system also offers data base management software and concurrent access to multiple interactive terminals and batch devices. The HP 3000CX can be used in dedicated or general purpose environments, or integrated into networks of interconnected Mini DataCenters and large central computing systems. HEWLETT-PACKARD CO., Palo Alto, Calif.



FOR COPY CIRCLE 206 ON READER CARD

32-Bit Minicomputers

The SEL 32 Series, a hierarchy of microprogrammed computer systems, is described in a 20-page brochure. The modular series features a virtual machine concept, "extremely fast bus construction," established software, and 32-bit computing power in a minicomputer. SYSTEMS ENGINEERING LABORATORIES, INC., Fort Lauderdale, Fla.

FOR COPY CIRCLE 209 ON READER CARD

Microfilm Camera

The SRM Microimagery Recording System, with camera reduction ratios of 24:1, 34:1, 44:1, and 51:1, is described in a 6-page brochure. Among the features available are sequential numerical imprinting, on-film blip-coding for faster retrieval, inkless endorsing/imprinting, and unique selectron exposure control. BELL & HOWELL, Chicago, Ill.

FOR COPY CIRCLE 210 ON READER CARD

APL*Plus

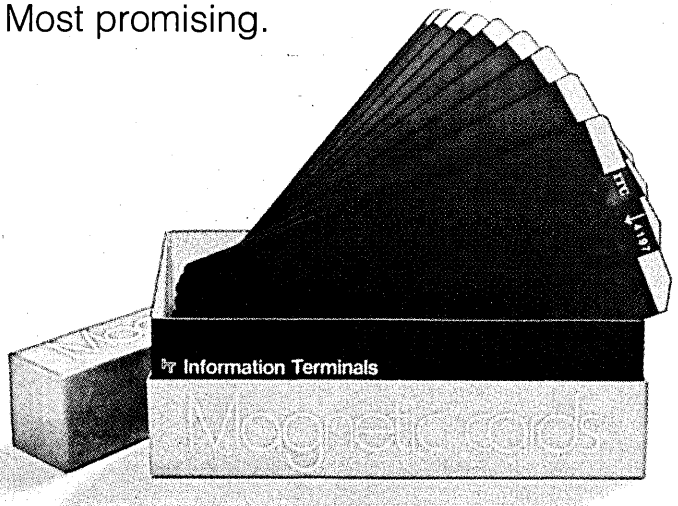
*APL*Plus Service . . . "the new tool"* is a brochure describing this vendor's APL*Plus Service time-sharing system, its hardware and communications network, and typical proprietary application packages. SCIENTIFIC TIME SHARING CORP., Bethesda, Md.

FOR COPY CIRCLE 211 ON READER CARD

(Continued on page 154)

How we got ahead of the pack in data storage media.

Six short years ago, we weren't number one in digital cassettes. ☐ We weren't industry innovators in floppy disks. ☐ We weren't first in certified word processing cassettes. ☐ Fact is. We weren't. Period. But then a lot can happen in six short years. ☐ Our first digital cassettes were winners. So much so that they set the standards (ANSI and ECMA) against which the performance of all other cassettes are measured. ☐ Comforting, but not enough. ☐ So, with a little help from a friend named Gus we found and filled still another customer need—certified flexible disks. Certified flexible disks with the same stringent dedication to quality as our data cassettes. ☐ And then we became the first company to introduce the "flippy", the world's first two-sided, double-capacity flexible disk initialized on both sides. ☐ Even more comforting but still not enough. ☐ We've just announced a line of magnetic cards for the growing world of word processing. ☐ So despite the fact that we're number one in digital cassettes and word processing cassettes ... and the innovators in floppy/flippy disks, we're still seeking new opportunities for our expertise. ☐ The next six years? Most promising.



Information Terminals Corporation
323 Soquel Way, Sunnyvale, CA 94086
(408) 245-4400

Gentlemen:

Send me more information about:
☐ Data cassettes ☐ Floppy/flippy disks
☐ Word processing cassettes ☐ Magnetic cards
☐ Don't send, just call me.

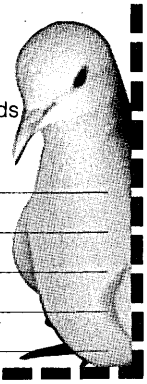
Name _____

Title _____

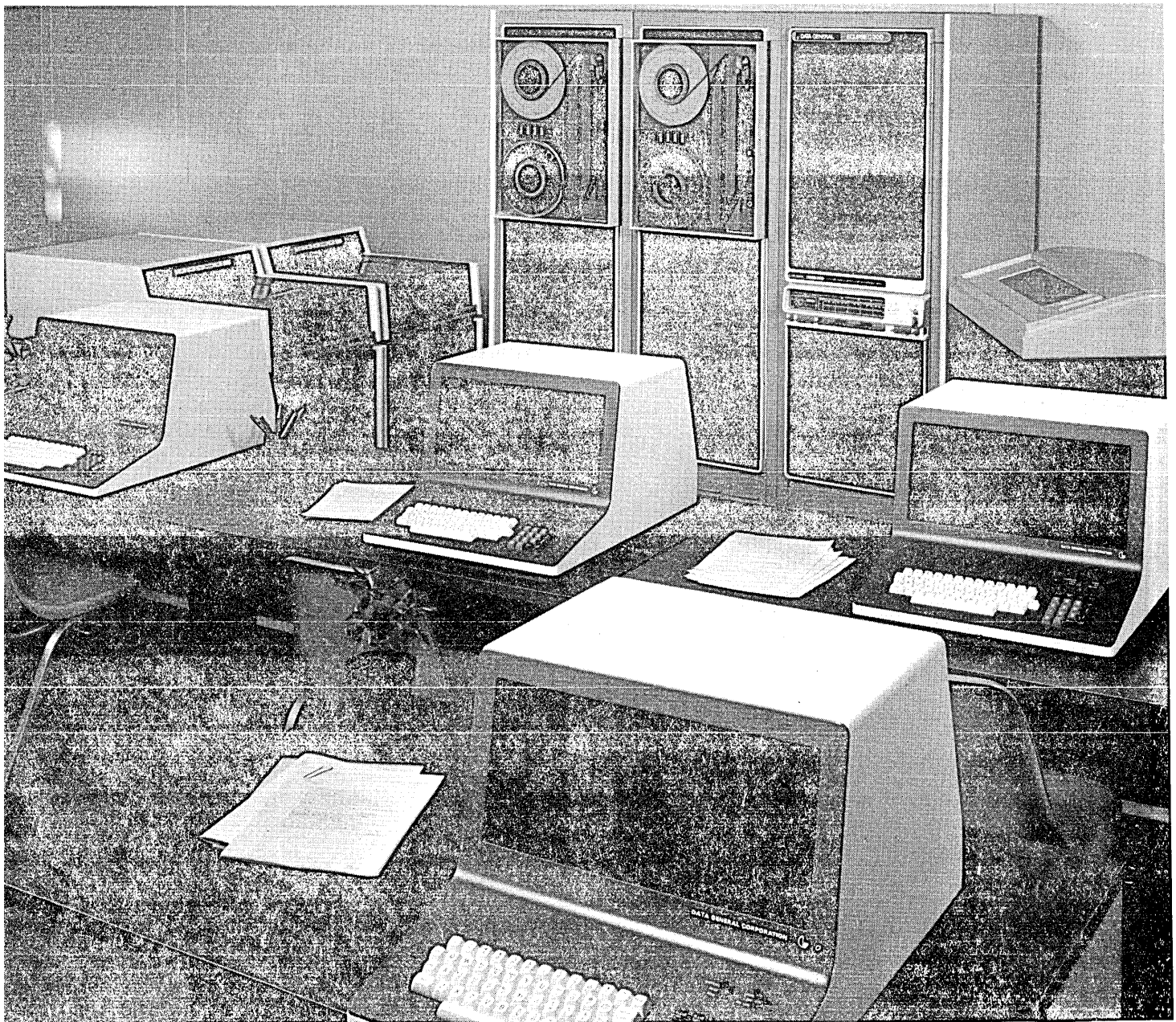
Company _____

Address _____

City _____ State _____ Zip _____



Who'd dare introduce a data system with FORTRAN?



Only a company with a data system that has so much you won't care what its high level language is called.

Data General is the company. And the data system is the Eclipse™ C/300.

Eclipse C/300 is an on-line, multiterminal, interactive data system that extends and complements your present large computer system. A system you can actually afford to use for dedicated operational support.

It has a data base-oriented file system called INFOS™ that has all the conventional access methods: SAM, RAM, ISAM. Plus an unconventional method called DBAM (Data Base Access Method).

DBAM has such advanced features as data base inversion, dynamic space management, hierarchical key specification, partial records, generic and approximate keys, and relative position processing.

INFOS works with our Mapped Real-time Disc Operating System (MRDOS) which supports dual operations such as multiterminal on-line activity at the same time as batch processing or direct communication to other computers.

Our new, easy-to-use RPG II generates planned and unplanned reports.

You also get our re-entrant multitasking FORTRAN with full INFOS data manipulation capabilities that make it ideal for on-line multiterminal environments.

And to communicate with your 360/370, our multileaving, interleaving HASP emulates IBM's remote job entry workstation.

The computer is the state-of-the art Eclipse C/300. The one with 256K byte memory capacity, a comprehensive commercial instruction set, optional Error Checking and Correction (ERCC) that automatically corrects errors in main memory, and support for a mammoth 700 megabytes of on-line storage.

Yet a 96K byte Eclipse C/300 computer with ten million bytes of disc, line printer, 60K CPS tape drive, 2 CRT's and a synchronous communication adapter plus INFOS, RPG II, FORTRAN, MRDOS, Sort and Merge, HASP and utilities costs less than $80,000.

Which is a language anyone should be able to understand.

D

☐ Send me the Eclipse C/300 brochure.
☐ Send me a sales engineer.
☐ Send me the brochure that shows how small computers can be dedicated to operational support.

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

TELEPHONE NUMBER _____

DataGeneral

Data General Corporation, Southboro, Massachusetts 01772: (617) 485-9100. Data General (Canada) Ltd., Ontario, Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361/Sydney(02) 908-1366.

Put your company on Europe's newest, most central business campus

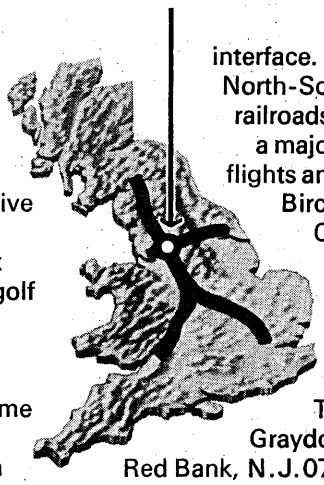
Is yours the kind of company that likes to be, needs to be adjacent to the technological institutions and research centers of the U.S.?

Then in Europe your operation calls for Crossover at Warrington, England.

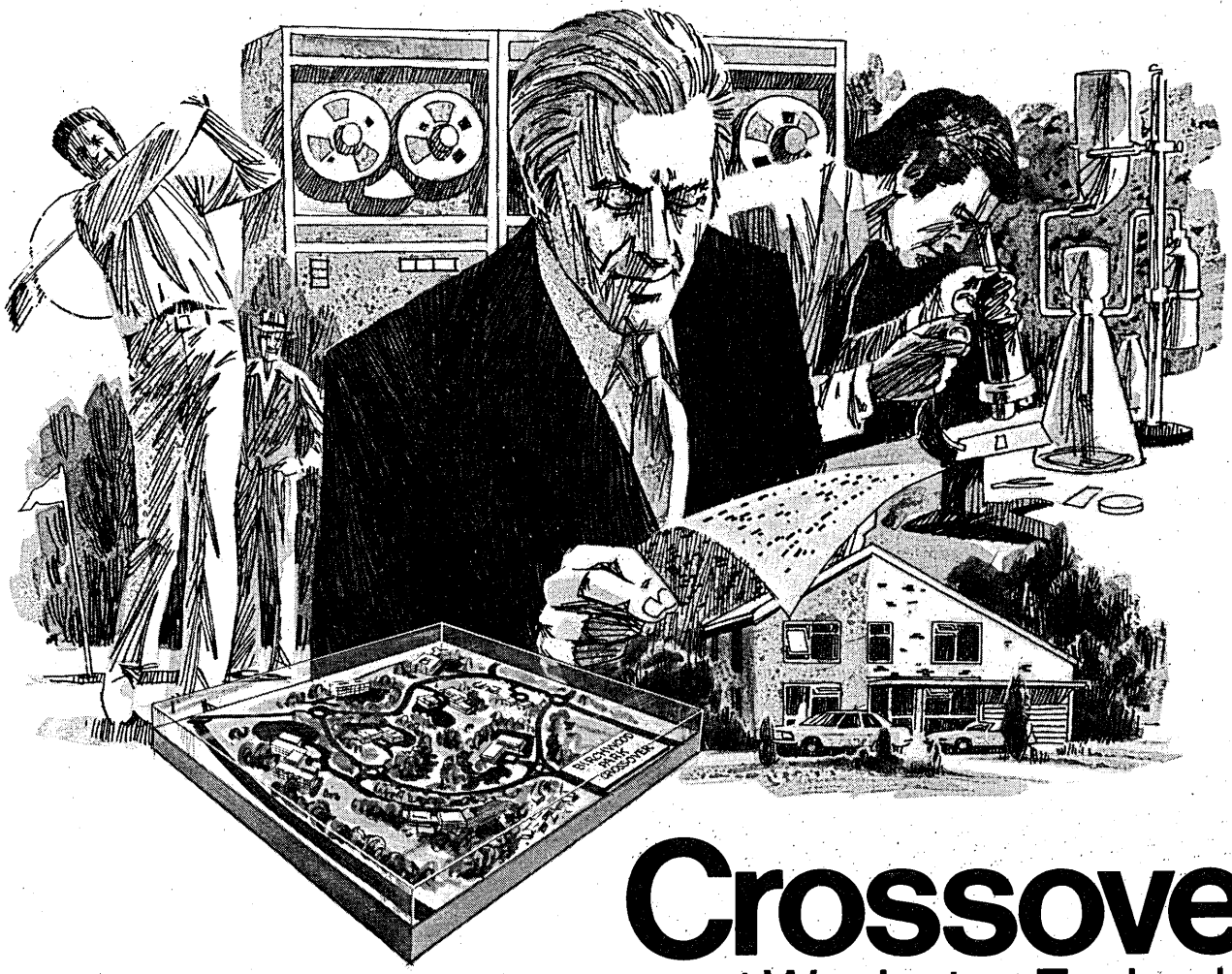
Here is Britain's purpose designed administrative campus.

Your new prestige offices or research complex are located in landscaped parkland with its own golf course, luxury hotel, conference center and executive homes.

Even more important, you will be at the heart of Britain's technology based universities and some of the world's leading research based industries. Crossover is also the country's key transportation interface. It is at the intersection of the main North-South and East-West freeways and railroads, served by two deep-water ports and a major international airport with direct U.S. flights and comprehensive inter-European links.



Birchwood Campus is only part of the Crossover story. Hear it in full from Brian Standivan, Chief Estates Officer, Warrington New Town Development Corporation, P.O. Box 49, Warrington, England WA1 1SR. Tel: Warrington (0925) 36551. Telex: 627225 or contact R. J. Graydon of Graydon Associates Inc., P.O. Box 566, Red Bank, N.J. 07701. Tel: (201) 741 2690. Telex 132449.



Crossover
at Warrington, England

NEW!

A terminal system that fits your desk *and* your pocketbook

TEC's compact, low-cost terminal/printer/diskette system outperforms those selling for a lot more. Here's why:

The Terminal

- MINI-TEC® DATA-SCREEN® terminal displays 80 characters per line in a 12- or 24-line format (960 or 1,920 characters) and operates in both interactive and block modes
- Serial asynchronous interfaces are RS-232-C, TTL or 20/60 mA current loop
- Includes cursor positioning by CPU and cursor address readout to the computer, field tab, message blink, protected data, plus a full complement of keyboard cursor controls
- Terminal is 12¼" wide × 14" deep × 12⅜" high; keyboard is 11¼"W × 7½"D × 2⅝"H
- Low as $1,495 each in lots of one; substantial discounts for larger quantities

The Printer

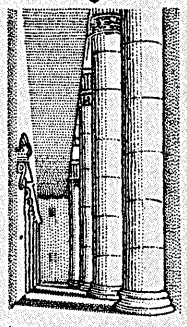
- MINI-PRINT™ Data-Printer has speed of 100 characters per second
- Prints full 80 × 24 screen (1,920 characters) in just 18 seconds
- Small paper size (8½" × 5") enables two printed pages to be photocopied at the same time to save filing space and copying costs . . . 230' paper roll allows printout of 325 pages
- 10⅛" wide × 13¾" deep × 6" high
- Only $1,350 each in lots of one, plus $150 for hard copy adapter; lower quantity prices

The Diskette

- DISCO-TEC™ Memory System uses standard IBM floppy diskette media and is plug-compatible with *all* serial asynchronous RS-232-C equipment
- Addresses *100 times faster* than cassettes . . . capable of 3,850 different addresses
- Includes two I/O ports, each with independently selectable baud rates from 110 to 9600
- Storage capacity of 308,600 characters
- Automatic record stepping for cassette emulation
- Full 8-bit ASCII decoding ability
- 12¼" wide × 15½" deep × 12¼" high
- Just $3,295 each in lots of one; substantial savings on larger quantities

MINI-TEC®, DATA-SCREEN®, MINI-PRINT™, and DISCO-TEC™, TEC, Incorporated

TEC®



Stability, Age and Beauty

TEC, Incorporated 9800 NORTH ORACLE ROAD • TUCSON, ARIZONA USA 85704 • (602) 297-1111

At last. A system that puts transaction processing first. DECcomm 600.

Until now, transaction processing has been a secondary feature of most computer application systems.

Well, thanks to Digital, all that's changed.

Because now you can get a system that puts real-time transaction processing right where you want it.

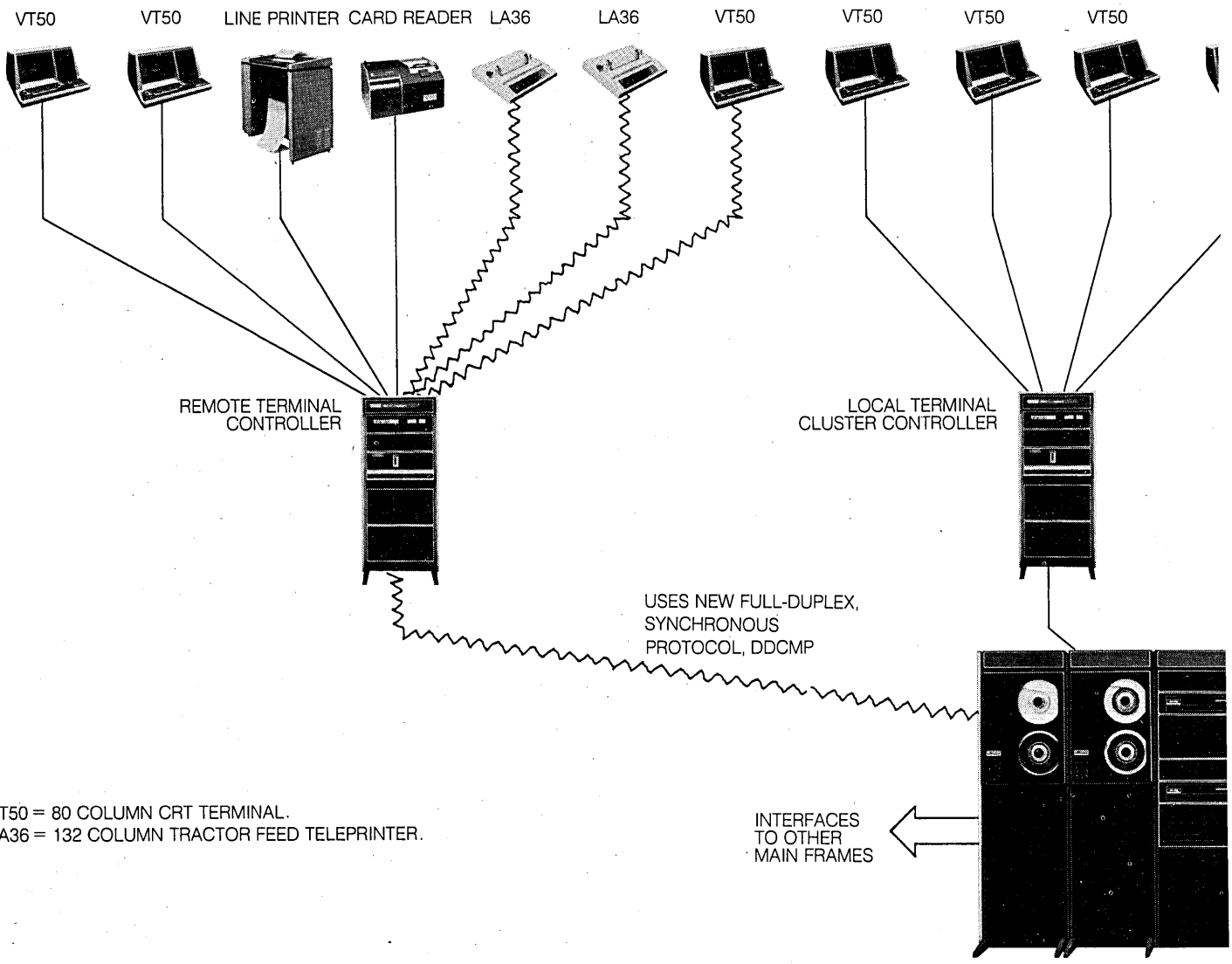
Up front.

Where it can handle transactions from many terminals: CRT's, teleprinters, line printers, card readers, you-name-it. All of which can be mixed and matched anyway you want—whether local or remote—for high-volume, communications intense applications like the backroom of a bank, credit checking, insurance claims processing, remote order entry, distributed inventory control, reservation systems, etc.

We did it by extending the power of our real-time, data based RSX-11D system with a comprehensive hardware/software communications package.

DECcomm 600 uses a multiprocessor technique. Now communications interrupt processing time that would be required of RSX-11D is handled by a second processor, a concentrator, using a communications executive to maximize throughput.

Handling all the communications for RSX-11D frees it to do what it does best—real-time, interactive, and batch processing. Simultaneously. Whenever and



VT50 = 80 COLUMN CRT TERMINAL.
LA36 = 132 COLUMN TRACTOR FEED TELEPRINTER.

wherever your transactions initiate, they're processed fast through applications programs using FORTRAN or MACRO. Plus COBOL for batch processing.

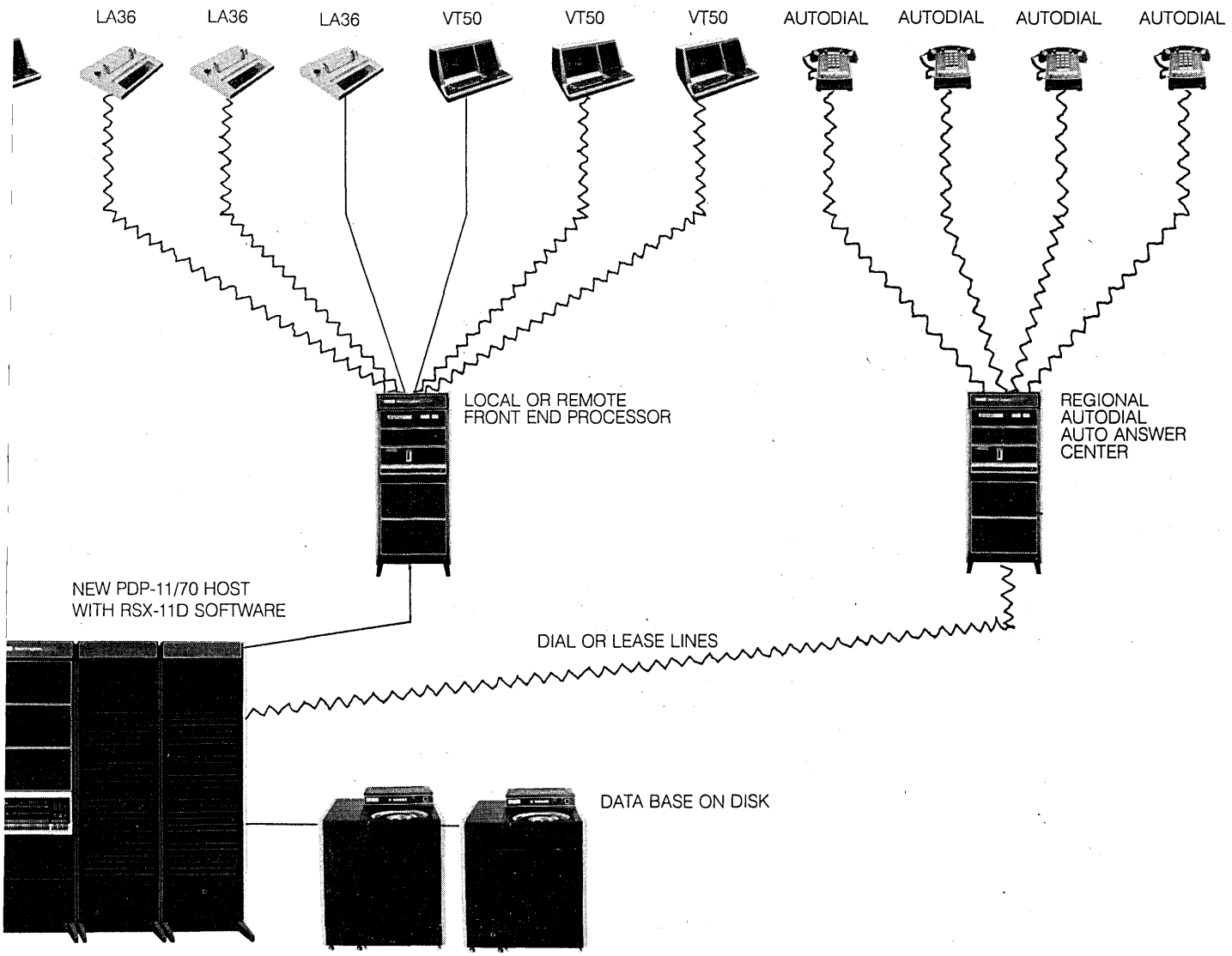
Up to four concentrators can be located anywhere in your transaction processing network for control of local or remote terminal clusters, remote batch entry or regional dial-up activity, and much more. DECcomm-600 is transparent to applications software, so programs are written as if terminals were connected directly to the host system.

Handling transaction processing with Digital minicomputer technology optimizes applications throughput. And our complete systems, terminals included, offer direct cost savings in the bargain.

For a system that puts transaction processing first, contact your Digital representative first. Or write Digital Equipment Corporation, DECcomm Group, Maynard, MA 01754. Or call (617) 897-5111.

European headquarters: 81 route de l'Aire, 1211 Geneva 26. Tel: 42 79 50. Digital Equipment of Canada Ltd.

digital



Key enter OCR and MICR rejects while scanning...

as simply as this!

No document to study. No field to search. As the 4400 System scanner encounters a document with a non-machine readable character, the video image of that character, and *only* that character is displayed at the CRT/keystation. The operator merely keys whatever character(s) is displayed, instantly correcting and releasing the record as the document passes through the scanner. This Video Correct mode of operation prevents all but a few documents from being rejected and eliminates the costly re-entry procedures that have long plagued OCR and particularly MICR processing operations.

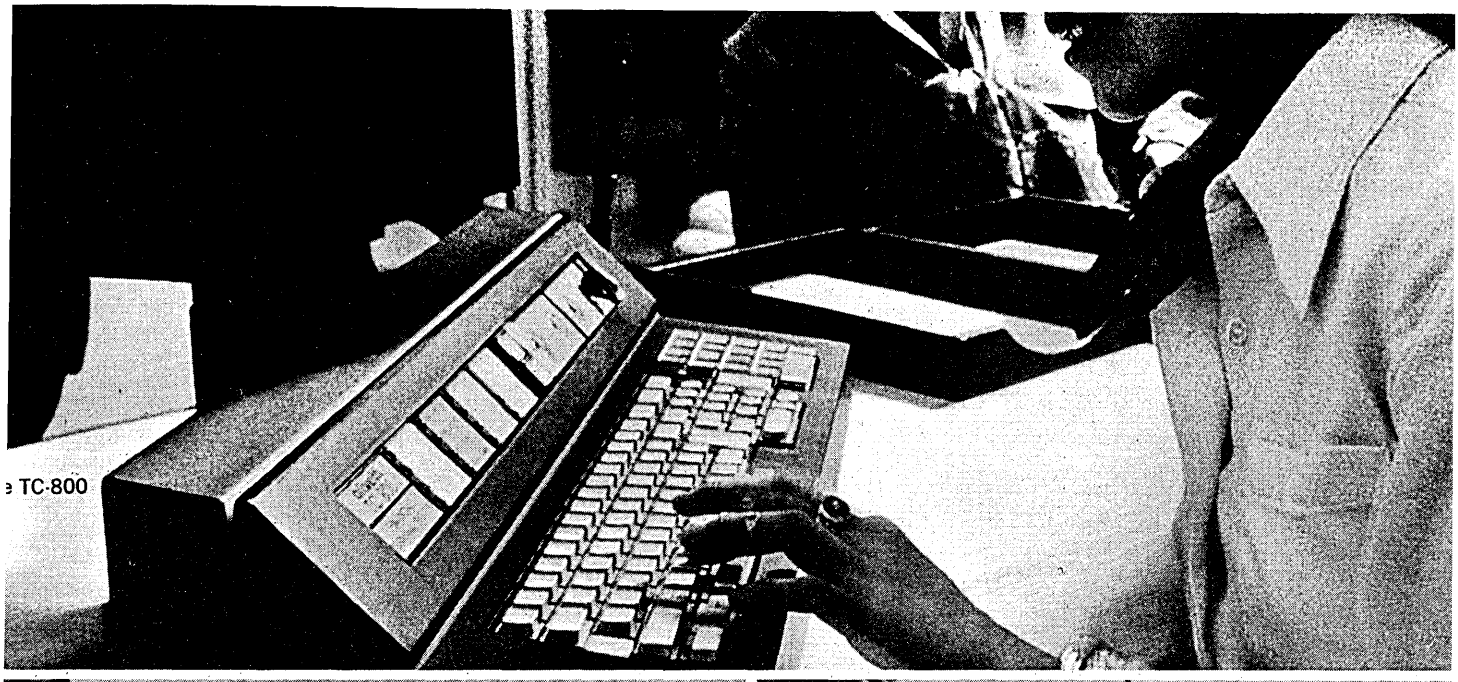
Additional 4400 KeyScan® System advantages:

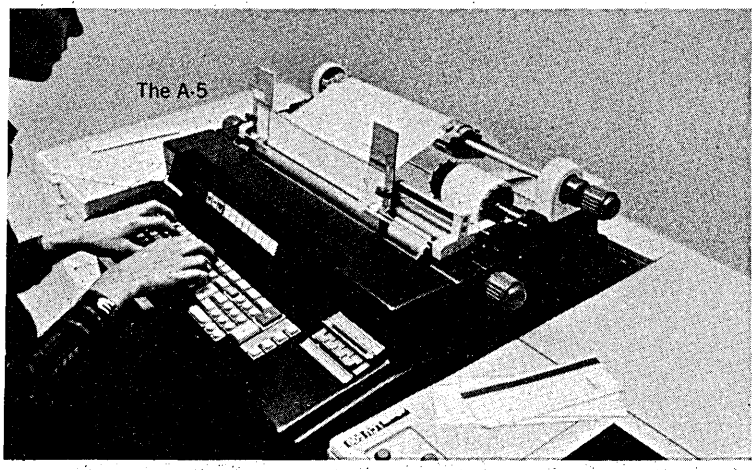
- Key Correct—simple key entry of data from rejected documents. Just as in Video Correct, there's never a need to key scanned data. Key Correct only those characters depicted by question mark and cursor.
- MICR/OCR compare feature—dual read system for cross-check scanning of MICR documents reduces rejects and eliminates mis-reads and substitutions.
- SKIL—comprehensive Scan Key Input Language for any keying and scanning application. An RPG II compiler is available for report generation and specialized applications.

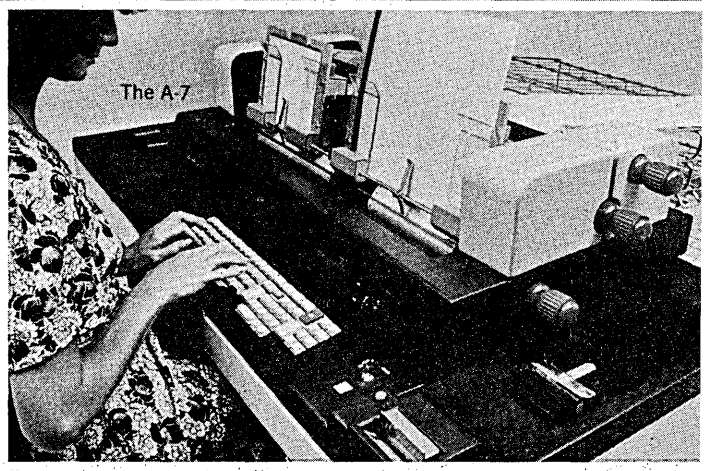
Let us show you how the 4400 System has solved reject re-entry problems for banks, insurance, retail, manufacturing, and utility companies. Our new literature describes how the Cummins KeyScan System with its powerful 4400 Processor has the hardware, software, and systems flexibility to meet your data entry needs off-line at the lowest possible cost. Send for it today! Write: Cummins-Allison Corp., 800 Waukegan Road, Glenview, IL 60025.

Send for our new literature today!

CUMMINS
CUMMINS-ALLISON CORP.







One thing all our minicomputer systems have in common is uncommon modularity.

Our A-5 accounting system and our A-7 minicomputer as well as our TC-800 financial terminal all feature a degree of modularity that's nothing short of incredible in distributed data processing.

In each case, only the minimum basic components need be purchased. Then, as requirements increase, new modules, or peripherals, can be added on. This all but ends the expensive procedure of trading up to new and more expensive equipment while taking a painful loss on the old.

Of course, the advantages of our systems don't end with modularity.

Our A-5, for example, is designed and priced to ease small businesses into computerization.

Our A-7 minicomputer is ideal for diverse users, from wholesalers and distributors to funded organizations such as school boards and municipalities.

And our TC-800 financial terminal features its own memory. So no matter what happens to any of the computers it's tied into, the TC-800 can keep operating in an off-line mode as if nothing happened.

Is it any wonder that Olivetti is considered the most innovative maker of minicomputer systems in the world today?

olivetti

OLIVETTI CORPORATION OF AMERICA
500 PARK AVE., NEW YORK CITY 10022
ATTN: Systems Marketing

Okay,
Olivetti—send me more information on your distributed data processing systems.

NAME _____

TITLE _____

COMPANY _____

TYPE OF BUSINESS _____

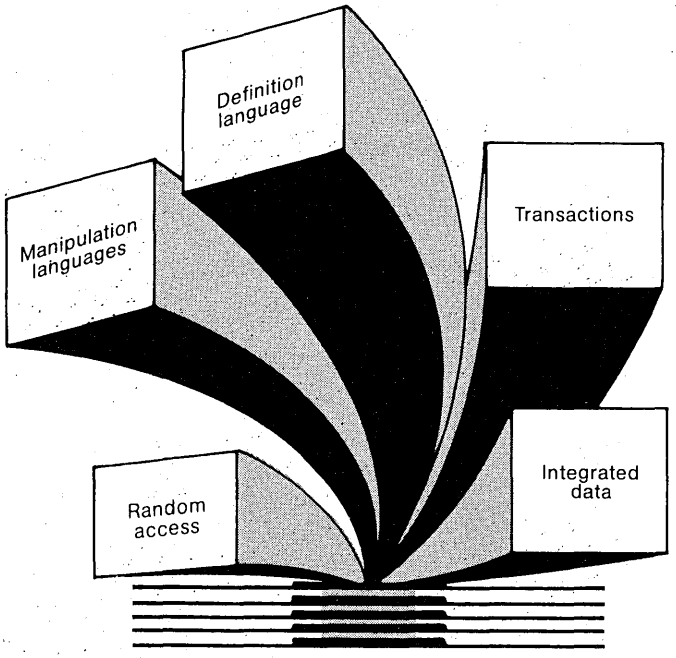
ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE NUMBER _____

CIRCLE 30 ON READER CARD

Varian's answer to data base management is TOTAL.



Total in every sense of the word.

The combination of Varian's V-70 computer system and CINCOM's Total gives you the same network structure data base and random access approach to data base management that's supplied on the large IBM, Honeywell and NCR.

Both for as little as $70,000.

The V-70 with Total is the only such package in this price range.

V-70 with Total features logical data sets on nodes with direct accessing paths connecting them. It lets you throw out separate cross reference and linkage files. You get direct mapping of data base logical entries. Redundant data is completely eliminated. The results? Up to two and a half times faster data accessing.

The V-70 Total system is also versatile. You can run both batch jobs and/or line processing functions. And, your data base is portable. Open ended for easy modification and growth.

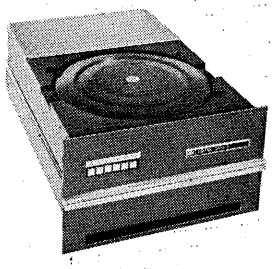
If you've wanted to convert to a Total data base management system, but stopped because what you saw was either too expensive or wasn't total, check out the Varian V-70 with Total.

Call your local Varian office. Or write Varian Data Machines, 2722 Michelson Drive, Irvine, CA 92664, (714) 833-2400.

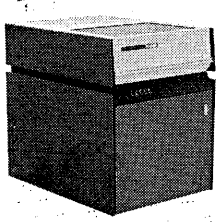
varian data machines

OEM buyers:
Ask Control Data
for increased cartridge disk drive capacity.

We have it.



9427 H CDD
12 MB capacity standard,
6 MB or 3 MB optional
200 or 100 TPI
Average access 35 ms
Data Rate: 312 K bytes/sec.



9747 DSU with Cartridge Disk Drive interface
60 MB capacity
Industry standard 11 high pack
Average access 35 mc
Data Rate: 312 K bytes/sec.

21 OEM offices, in 11 countries, specializing in service to the mini OEM.

Call (612) 830-5624 or return coupon.

Bruce Bergman, Product Sales Manager
Control Data Corporation, Dept. D-65
7801 Computer Ave. So., Minneapolis, MN 55435
Please send information on your Cartridge Disk Drives.

NAME _____ TITLE _____

COMPANY _____ ADDRESS _____

CITY _____

STATE _____ ZIP _____ PHONE _____

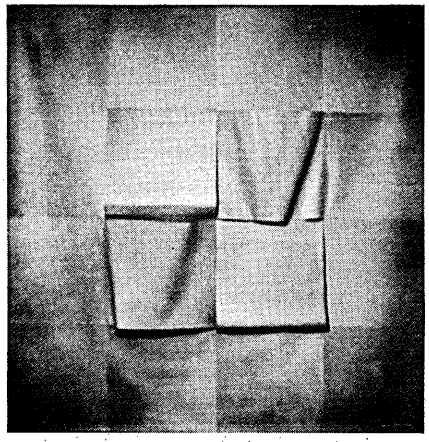
CONTROL DATA CORPORATION
The Total Services Company

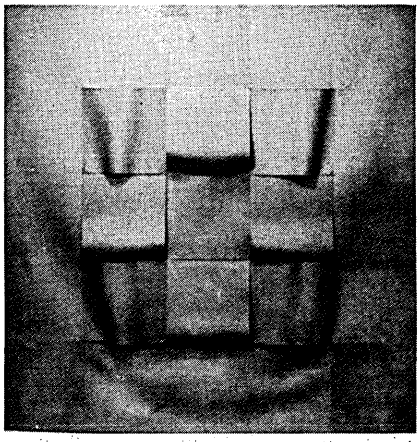
Genasys

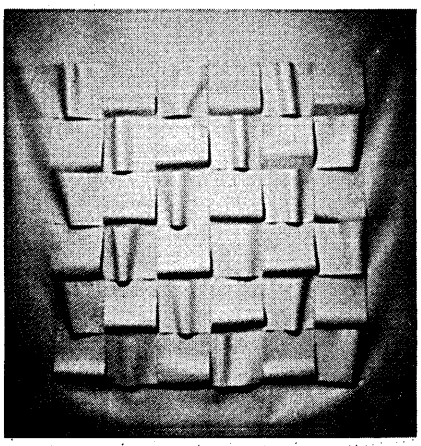
Using A System Generator

by Sheldon Lite

Such a high degree of commonality exists between commercial applications that entire programs, including their associated files and print routines, can be generated through macro calls.







Organized fire protection didn't come to the rural parts of Los Angeles County until July 1, 1920. And then it wasn't much. When a brush fire was reported, for instance, men and hand tools were gathered from downtown L.A., loaded into rented trucks and sent to the fire. The men were usually "gathered" from Skid Row.

Things have changed. The Los Angeles County Forester and Fire Warden Department is now responsible for fire control and rescue operations in 2,161 square miles of county land, roughly half of the total area of Los Angeles County. It serves 37 cities from 130 fire stations, some as many as 75 miles apart. Its jurisdiction covers everything from forest to brushlands to a small craft marina to 30- and 40-story high rises.

Fire!

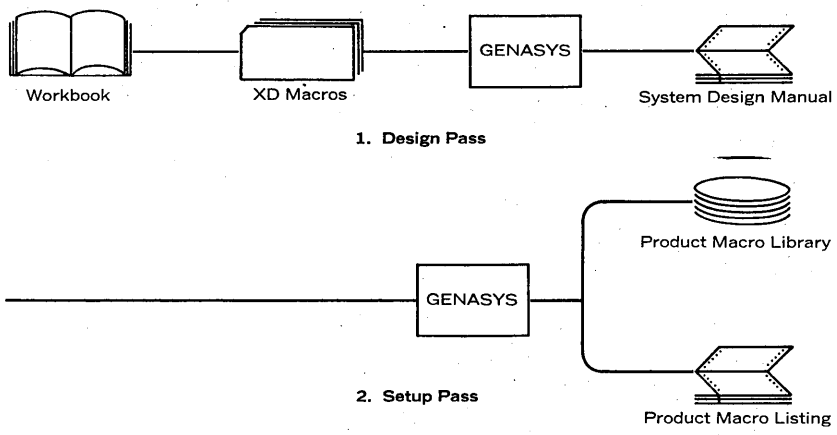
The department responds to more than 80,000 emergency calls per year. For each call, two or more reports are generated. And that's where one of the department's major data processing problems begins.

The department isn't unique in having huge data collection and reporting requirements. But it is certainly unique in the way the dp staff chose to solve those problems, for instead of writing all the file update, input validation, and report programs required, the already overloaded dp staff chose to use an automatic program generator. This is the story of why, and how, and how well it worked.

First, the problem

When a call is received by a dispatcher, whether for a rescue, for a fire, an accident, for downed electric wires, or other incident, the dispatcher completes a Response ticket. The ticket, which contains the day and time, the address where the incident took place and the equipment sent to the scene, begins the flow of paperwork. In the case of a large fire, the ticket may contain a great deal of information regarding additional units

HOW THE GENERATOR WORKS



GENASYS was constructed to exploit the very high degree of commonality that exists between commercial applications. It has as its base a library of 300 general system-definition macros. Using the macro expansion phase of the IBM Assembler, these macros are modified by input parameters to produce a tailored text stream—the "text" may be documentation, file definitions, PL/1 or COBOL statements—and the stream is run through post-generation programs to produce the final source code.

The process begins with a programmer's workbook which contains the definitions of files, inputs, reports, and programs. A skeletal set of "XD" or design level macros are keyed from the book and run through the system to produce a System Design Manual, which contains, among other things, dummy reports

assigned, and in the rush it may be filled out incorrectly.

The tickets are collected, and the data keyed through an IBM 2741 terminal operating under IBM's Administrative Terminal System on a 370/158.

Depending on the incident, fire department personnel at the scene may fill out a Fire Incident report, a Resources Used report, a short-form Incident/Resources report, a Rescue Incident report, and in the event of civilian or department casualties, a State Fire Casualty report for each fatality. Other reports we handle include the Fire Investigation Report, an Inspection Data report, and reports for business licenses and permits.

All of these are in the form of optically readable pages of various sizes. (See Fig. 1 for an example.) After collection they find their way to an Optical Scanning Corp. model 17 reader, which is interfaced with a Sycor 340 terminal. The terminal and scanner create card image records on cassette tape for transmission to the 158s. Since the communications software involved is IBM's HASP II, which only accepts an 80-char record from a terminal, sometimes two records are built for the larger forms. In these cases the records are tied together by report numbers.

The monthly volume of reporting is quite high. There are approximately 7,500 ATS-keyed Dispatch Tickets plus the following scanned reports:

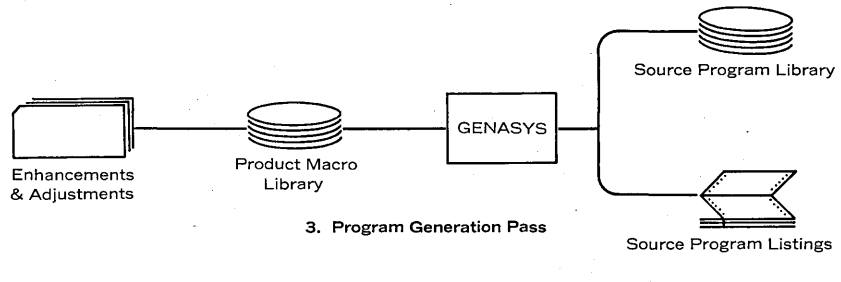
fire incident reports	500
resources used reports	500
incident/resource forms	3,000
investigation reports	100
rescue reports	4,000
inspection reports	1,500

Thus the total number of pieces of paper handled each month for reporting runs over 17,000.

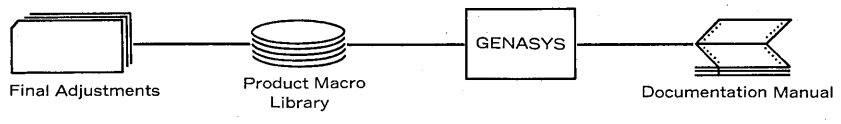
Programs were required to edit the input, match the Dispatch Response tickets with the incident reports, build and update files, and list the output. In addition, the department needed to respond to inquiries from its own management, from other governmental agencies, from insurance companies, and from the general public.

The rate of inquiries has only been a few per week, so it was decided they'd be handled in batch mode. Simple inquiries have been for things such as 'the number of building fires in a certain city where a single-family dwelling was damaged to an extent over $1,000.' A more complicated inquiry, for an insurance company, was to report the number of building fires resulting from three unique sets of circumstances for each fire station.

The dp staff was asked to produce a Fire Incident Reporting System to handle the normal reporting and the inquiries, plus all the input and file manipulation. A study suggested the project would require three and one-half man-years of final design and programming work, and would extend over more than one calendar year. When an outside vendor, International Computer Trading Corp., of San Francisco, offered to do eight of the ten programs required in 15 working days on a fixed-fee basis, we couldn't help but investigate. We investigated, ran some simple test jobs, contracted for the project, and a few months later had in hand the programs and documentation we contracted for. In some respects we got more than we asked for.



3. Program Generation Pass



4. Documentation Pass

and narrative descriptions of the programs.

The second pass uses the same basic set of XD macros to generate a library of "product" macros. (A product macro more or less completely defines a program, report, or file.)

Once the product macros have been checked by the user, enhancements and adjustments are made to the macro library, the system is cycled again, and a source program library is produced.

Finally, the system is cycled a last time with the product macro library to generate the documentation manual, which is complete down to the key-punching instruments.

A new kind of solution

The vendor knew no magic incantations, but owned a proprietary software generation system called GENASYS. The working hypothesis in GENASYS is that there exists a high degree of commonality among commercial applications which can be exploited to automate the production of code once processing and output specifications are defined. Using the generator service, the County's job was to be one of clarifying what the contents of files should be and okaying dummy report formats, until the point where the programs and documentation were turned over for testing.

The resulting system contains 10 COBOL programs. County personnel wrote the first two, which process the raw input data. The first of these is FRTRANS (see Fig. 2). It edits incoming transactions for reasonableness and for unrecognizable characters, then produces an exception listing.

The second County produced program is FRONTEND. Its monthly assignment is to sort the transactions, edit them, concatenate those records originating in longer reports but constrained to 80-char by the input devices, and eliminate duplicates.

The following programs were left to GENASYS:

FRXAA: to sort and reformat the Dispatch Response ticket transaction file and the report transaction file, including generating sort keys. It has about 2,500 lines of code.

FRXAM: to match the Fire Incident and Rescue transactions with Dispatch transactions for the same incident and build an indexed sequential master file. Run twice a month (once to find exceptions), the program contains about 4,500 lines of code.

FRXMA: to build a backup for the Master file. About 2,500 lines.

FRXAP: to extract data from the Master file for fire statistics reports. About 3,200 lines.

FRXCB: (about 5,600 lines) to read the file produced by FRXAP and print the following reports:

- activity report by city
- summary of activity by station by action taken vs. type of incident
- summary of incidents by station
- incidents processed by dispatch centers
- number of fires by property classification vs. act or omission vs.

type of material ignited.

FRXNA: to produce the file for previous year-to-date figures needed in the above reports. About 1,200 lines.

FRXBA: to convert the data in the Master file to a format required by the State of California for the State's reporting purposes. About 1,900 lines.

FRXCM: the inquiry support program. About 4,400 lines.

There was no reason, by the way, that GENASYS could not have produced all 10 programs. It just worked out this way since we had started work on two of them prior to contracting with ICT.

How it works

As the GENASYS approach to systems development is based on both top-down design and top-down implementation, the first concern in using it is with the external aspects of the system being generated. After we agreed with the vendor about the overall flow of data and procedures, a flowchart was prepared (by hand), files and reports were defined, and programs were identified by type (capture and verify, update, report, or "other").

Also in keeping with top-down design, the first iteration through the GENASYS system can be with skeletal information about reports and files and programs. GENASYS produces output on a comparable level. If programs are identified only in sketchy form, the program description produced will also be rough, perhaps only a definition of the program name and text lines describing its purpose.

The process of generating a system with GENASYS is a process of continually refining the program, file, and report specifications until the output generated looks like the final solution the user seeks.

Another way of looking at the system is as a hierarchical set of macros and super macros, all of which are tailored through the use of input parameters.

The first pass through the generators produces a skeletal output known as the system design manual. The programmer feeding the generators describes reports, for example, using design level macros prefaced by "XD." "XDRPT" begins a report definition. Parameters for it include title, descriptive narrative, frequency of report generation, control break fields and page limits. The XDRPTA macro specifies constant data appearing in a print line. Through the use of seven types of macros, all reports are thus defined.

The printed output from GENASYS for reports is not much different from report generators. The secret is that the data required for the report has also been captured, by name.

GENASYS treats programs and files much like reports. To the system, code seems to look just like text. So a macro like XDFILE begins the definition of a file, and its parameters describe key fields, record and block sizes, etc. And XDPGM begins the definition of a program. (But usually for the first pass only a narrative description of the program is entered.)

Once the design manual has been prepared, showing report formats, file layouts, and program flow, the user is brought back into the loop. Changes are made. Specifications for processing are tied down better. Mistakes are caught.

The second pass through the generators, using the now refined specifications, results in the building of a library of "product" macros, which define reports and files and programs. This permits a given report or file to be stored once and called into any program of which it is to be a part.

Product macros are composed of "XX" level macros and option control statements. The XX level macros may either be structure generating statements—statements which call deeper macro definitions which in turn generate major sections of the final target programs—or detail generators which look much like COBOL shorthand.

The option control statements control much of the processing. For instance, a product macro defining a file contains all the code necessary to generate both a GET or a PUT routine for using that file. The option control statement determines which is turned on and which bypassed.

At the end of the second pass, the setup stage, GENASYS has thus converted the design code to a library of product macros incorporating, according to specifications, all of the default logic forming the major part of every

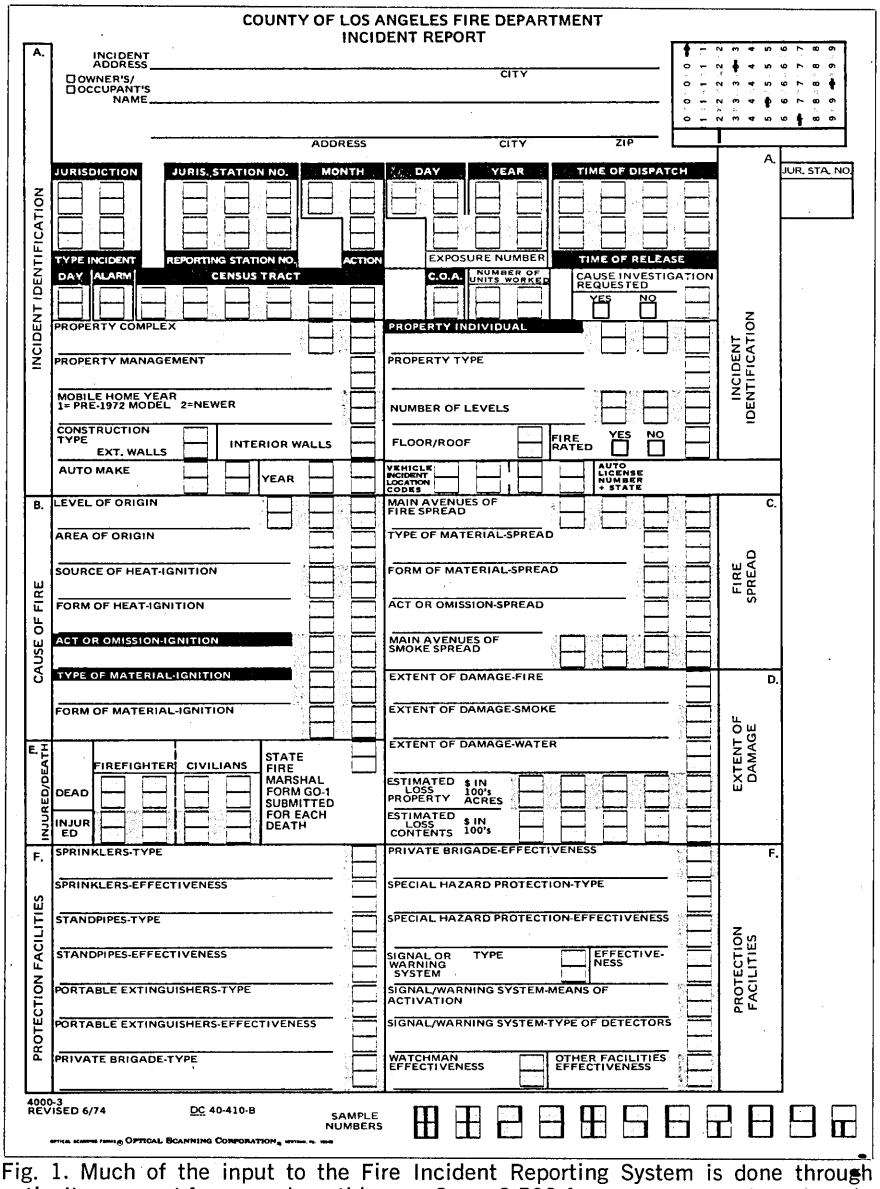


Fig. 1. Much of the input to the Fire Incident Reporting System is done through optically scanned forms such as this one. Some 9,500 forms are scanned per month, and another 7,500 entered through terminals. Both kinds often need extensive editing.

program.

Again the user gets involved. Changes and refinements are made, and the last automated processing is done.

The results are not, at least for us were not, turnkey code. Some hand polishing was done by the vendor's personnel and some by our own. For example, the completed FRXAA transaction sort program has 2,513 lines of code; 75 lines were added to the generated code and 300 lines deleted. The added code was to convert a field containing a decimal point into a packed numeric field. Code which initialized all numeric fields to zero was deleted, since the optical scanning made it unnecessary.

From FRXAM's 4,561 lines, 350 were added and 250 deleted. Again the deleted code was for zeroing the output Master. The code added was for input validation, which turned out to be more complicated then originally anticipated (and originally specified).

As a broad estimate, the code was about 90% right for what we needed. The changes and additions we made primarily resulted from errors in specifications or from misunderstandings on the vendor's part. Very little was done by hand, at least by us, simply because GENASYS "couldn't do it."

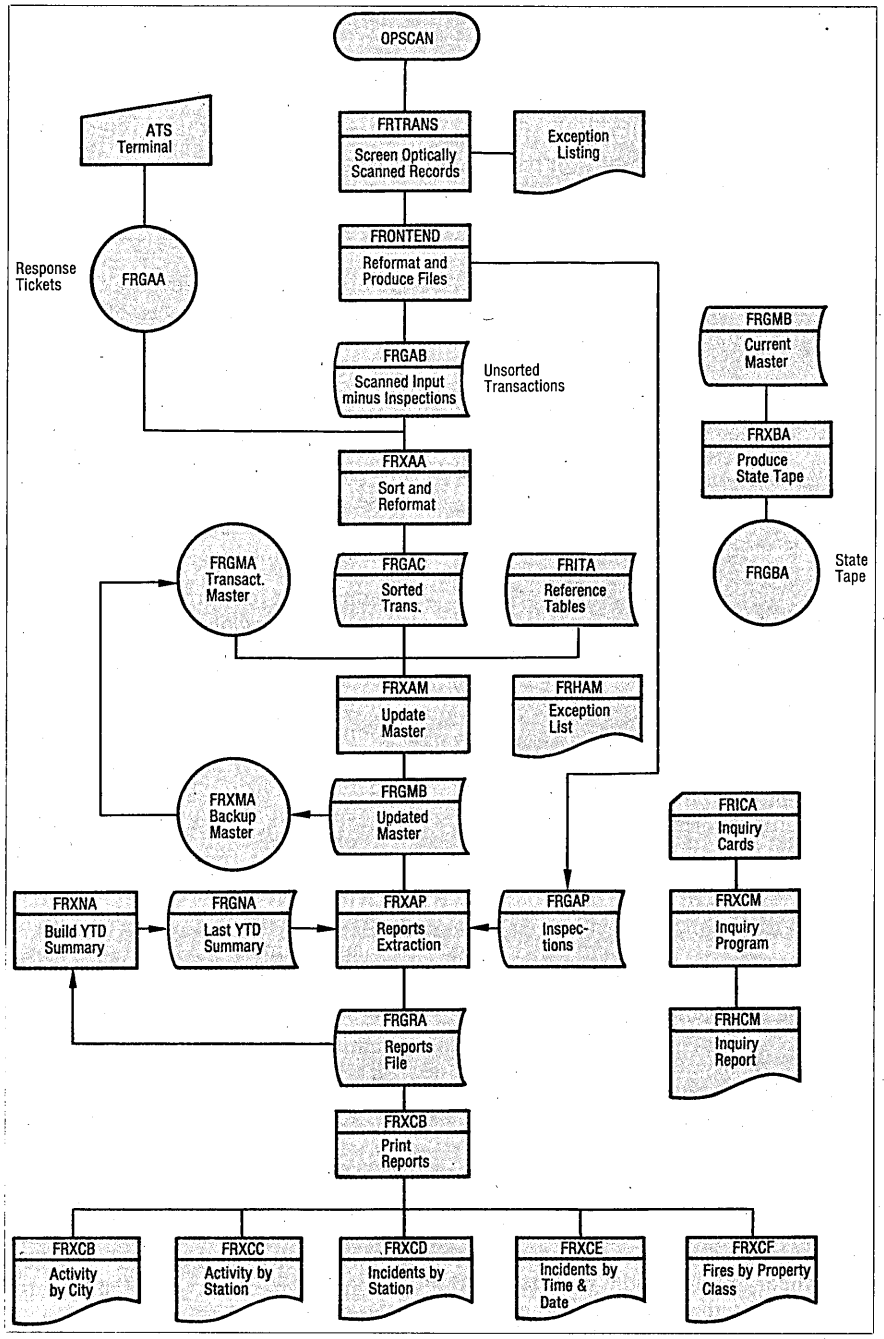


Fig. 2. Eight of the ten programs in the Fire Incident Reporting System were generated rather than coded. In addition, the generators produced the file and report formats, saving Los Angeles County's dp staff an estimated three and one-quarter man-years overall. The code generated performed some functions which were not required, but was otherwise true to the specifications. The resulting programs contain more than 26,000 statements and were turned over, complete with documentation, to the user for testing after only 35 working days.

$9,000 and 35 work days later

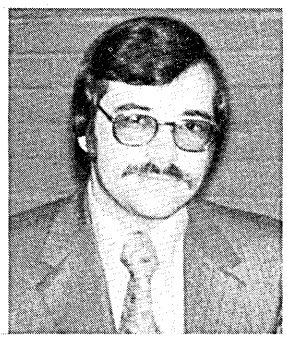
In the end, the system was not completed and tested within the 15 work days quoted. One reason for this was that the County computer was sometimes down when ICT personnel needed it. Another reason, candidly, was that the use of GENASYS condensed the planning period from a calendar year to a few months, and we simply couldn't keep pace. And of course there were County changes in specifications as we went along.

The project took 35 work days spread out over four months, and resulted in tested code which was documented right down to keypunch instructions. (Yes, the keypunch instructions are part of the generated output.)

The costs were moderate. ICT charges $600 per "module" generated. (A module is a chargeable file, report, or program. Not all items are charged for, however; variations on reports and sort programs, for instance, are often excluded.) By ICT's counts, there are only five files, seven reports, and three programs in our system, so our charge was $9,000. The County's investment in people time during the project was about four man-months.

As a result of our experiment, other local agencies such as the City of Los Angeles, the Department of Water and Power, and various school districts are examining GENASYS.

GENASYS does in fact reduce the labor intensiveness of developing new applications. And that's what it's all about in nearly every dp installation. People were the critical resource back in 1920 when the department started, too, but back then the solution was easier. Still, we are three and one-quarter man-years ahead with our Fire Incident Reporting System, and that's refreshing. □



Mr. Lite is a dp supervisor with Los Angeles County. During the past 10 years he has held dp positions in several county departments, including Welfare and Justice, and is presently responsible for the Fire Incident Reporting System.

Software Physics

by Kenneth W. Kolence

As a departure from standard Datamation policy, this article on theory is presented as a first attempt to move performance measurement from the black arts toward the sciences.

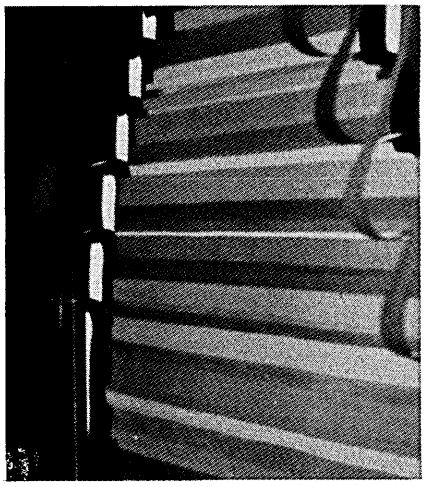
Measuring, comparing, and forecasting computer performance are acts which have thus far been more closely related to the black arts than to any "computer science." Although we have been able to measure quantitative properties of workloads and workload components since the late '60s, we have lacked a theory to bring meaning to the measurements. Software physics is the first example of such a theory.

Before the subject's title frightens away the practitioners, let me suggest that understanding the theory will lead to being able: (1) to define a standard job for an installation, throughput, and benchmarks; (2) to measure equipment productivity and cost per unit work; and (3) to better forecast workloads, schedule machine usage, and compare the performances of different hardware configurations. Just as an example, the theory shows that some of our attempts at balancing workloads have led to optimizing the wrong things.

Software physics starts with the bold assumption that the fundamental concepts of the natural sciences are wholly applicable to the problems of computer measurement. It is this assumption which leads to the use of the word *physics*. Proving or disproving this assumption is not easy. Actually, the validity or nonvalidity of the assumption is a philosophical matter which is not even worth pursuing unless the resultant theory is broadly successful in all areas dependent on the use of computer measurements.

Fortunately, the initial results of software physics have been strikingly successful and so the assumption may continue to be used.

There are three basic criteria which any theory must satisfy to be acceptable at the same level as the theories of natural physics. In fact, many accepted and useful theories outside of natural physics satisfy only the first criterion, but only those of the natural physics solidly satisfy all three. The criteria are:



1. A theory must simplify and unify a diverse set of empirical observations.

2. A theory must quantitatively predict the empirically observed values of known phenomena.

3. A theory must predict the existence of and the quantitative values of hitherto unobserved phenomena.

Many useful theories, such as Darwin's theory of evolution, meet the first criterion and that portion of the third which predicts the existence, but not the quantitative value, of hitherto unobserved phenomena. The theories of Economics partially, but not wholly, fulfill these criteria. In this article, the emphasis is on those aspects of the software physics theory which meet the first criteria. However, a few of the major predictive aspects of the software physics theory will be presented.

Software physics had its basic inception in the problem of unifying and explaining the meaning of all the commonly used measures of computing systems usage. A partial list of these measures—which we shall refer to as *common measures*—might include the following:

- number of jobs processed
- throughput (jobs per unit time)
- benchmarks (real and synthetic)
- central processor seconds
- number of I/O actions (tape or disc)
- number of messages (terminals)
- print lines
- percent utilization
  - central processors
  - channels
  - control units
  - peripheral devices
- execution time
- elapsed time

The initial problem of software physics was to find a minimum set of quantitative properties from which

a) all common measures could be derived, thus explaining and unifying these measures, and

b) effective methods could be developed for determining capacity usage, developing workload forecasts, determining equipment requirements, establishing dp costs and charges, providing scheduling methods, etc., thus meeting criteria 2 and 3.

The definitions

The initial attempt at a theory of software physics used Newton's three laws as a starting point. This failed.

The second attempt started with the fundamental physical concepts of

energy and physical systems. *Energy* was recognized as the capacity to cause a change in state of some system, and *work* was recognized as being done on a system when a change in state occurred. From this, the initial useful definition of software physics was eventually developed:

A processor does one unit of software work on a storage medium when one byte of that storage medium is altered.

Work is measured in units of work, not bytes. The definition in the above form assumes a byte as the standard unit of storage medium, but bits, characters, and words can be equated to work as well, e.g., a processor does one-eighth of a unit of work when one bit of storage medium is altered.

The definition as given implies no software work is done when a processor transfers a byte to a storage medium if that storage medium already is in the physical state representing the byte transferred. That is, storing blanks in a word containing blanks would not result in software work since no change in state occurs. Since the instrumentation required to determine if software work is actually done would be prohibitive, an approximation is used for most all practical purposes. The approximation is equivalent to the definition:

A processor performs one unit of software work on a storage medium when one byte is transferred to that storage medium.

The energy available from a processor is the capacity of that processor to change bytes of storage media. The property *time* must be introduced, since processor energy in this sense is available at a given rate per unit of time. In physics, the equivalent concept is *power*. The capacity of a processor to alter storage is the power of that processor. The rate at which work is actually performed on the storage medium is the *power usage* of that storage medium.

For a given processor and storage medium we can express the relationships by means of the diagram of Fig. 1.

The distinction between energy and work is exactly the distinction made in natural physics: energy expenditure is not accompanied by some desired form of work unless the appropriate state change occurs.

In natural physics, the concept of state change involves physical systems. In software physics, the physical systems are storage devices or media. A program or any other unit of software can be considered to be in existence within a computing system when storage has been placed in states which correspond to the instructions and data required to execute that program. The storage that has been used for this purpose is called the *storage realization* of the software. It is simply the number of bytes by storage type that are used to represent the instructions and data. This corresponds in the natural physics to physical existence, including both mass and spatial extent.

Storage realization, energy/work, and time are assumed to be the only fundamental properties of software physics. Using these three properties and the appropriate definitions of the physical systems of interest, it is possible to derive expressions for, and therefore the meaning of, all the common measures of computing systems use. This satisfies the first criterion for a theory. It also appears these properties can be used to construct accurate

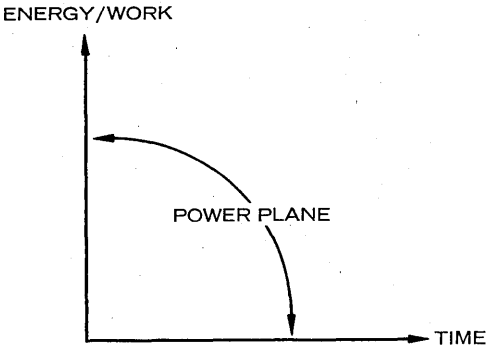


Fig. 1.

methods of predicting workload usage, calculating the capacity of a configuration, and to provide other predictive capabilities of interest.

The relationships of the three basic properties of software physics may be illustrated as in Fig. 2.

The property software work is of basic interest when measurements of actual usage are of concern. Software

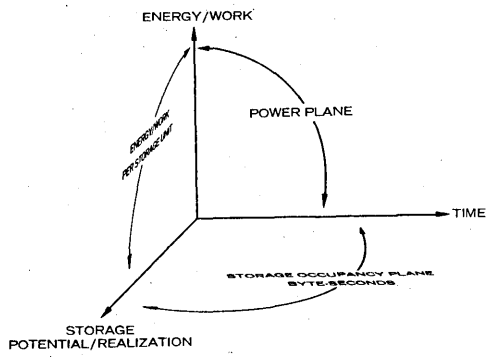


Fig. 2.

energy, the parallel concept, is used when discussing the potential for work, i.e., the capacity of a configuration. In the remainder of this article, the primary concern is with software work, not software energy.

Two basic postulates of software physics are that the software work performed by a given unit of software operating on a given set of data is independent of (a) the multiprocessing environment, and (b) the configuration into which a given set of computing equipment is connected.

Within certain constraints, software work is also independent of the exact devices making up the equipment set of the configuration. Thus, a workload can be characterized in terms of software work in a basically machine independent fashion. This is of great importance to almost all of the applications of software physics, i.e., workload forecasting, costing and charging, configuration design, performance improvement, etc. It is also used to interpret the common performance measures, in conjunction with the other two basic software physics properties.

The first step in most applications of software physics is to formulate the processor work in terms of the variables actually measured. For central processors, the most commonly measured variable of use is *cpu seconds*. This can be done by first measuring, with a hardware monitor, the *average cpu power*. This equals the average number of memory bytes accessed per cpu second, and is relatively stable for a given workload.

$$\bar{P} = \textit{Average cpu power} = \frac{\textit{cpu software work}}{\textit{cpu seconds}}$$

If P is assumed constant, we can convert cpu seconds to cpu software work by the equation:

$$\textit{cpu software work} = \bar{P} \bullet \textit{cpu seconds}.$$

For I/O processors, the software work done equals the number of bytes read or written. For example, for printer devices we have:

$$\textit{printer software work} = \textit{(lines printed)}\ \textit{(characters per print line)}$$

For tape or disc devices, the software work can be expressed exactly or as an approximation using an average block length. The exact equation is:

$$\textit{software work} = \textit{(\#I/O actions per data set)} \times \textit{(block length of data set)}$$

The approximation equation is:

$$\textit{software work} = \textit{(\#I/O actions per device)} \times \textit{(average block length of device data sets)}$$

For a given unit of software (application, job, job step, etc.) we can characterize the processor work by means of a software work vector. Each element of the vector corresponds to

the work done by a given type of processor. For example, the following lists a set of equipment types and shows the corresponding software work vector.

Equipment Type	S.W. Vector
central processor	W_1
tapes	W_2
discs	W_3
terminals	W_4
printers	W_5
card reader/ punches	W_6

The total work done by a given unit of software work equals the sum of the vector elements, i.e.,

$$W_t = W_1 + W_2 + W_3 + W_4 + W_5 + W_6$$

If we divide each element of the software work vector by the total work W_t, we have what can be called a *software work unit vector,* since the total of the elements now equals one. The elements of this unit vector represent the relative proportions of work required of each equipment type by the unit of software. That is, the software work unit vector characterizes the workload component for which it has been obtained.

Alone and in combination with the software physics property *time,* software work can be used to explain and derive formulas for the common performance measures. Generally, two types of time are differentiated in practice: execution time and elapsed time. In software physics, this distinction is partially eliminated by the definition:

A system (configuration or software) is in execution if any of its subsystems is in execution.

Under this definition, the elapsed time of a full computing system is the same as the execution time of the system. The elapsed time of a unit of software is composed of the time the software is in execution, either cpu or I/O, plus a total delay time. The delay time represents the time during which the unit of software was capable of being executed but was not for some reason.

Explaining the old measures

The most commonly used measures in the field of computer performance measurement are generally some form of *percent utilization.* Using the concepts of software work and time, it is easy to show that the percent utilization of a device can be interpreted as the *effective power factor.* That is, *percent utilization* reflects the proportion of power used to the power available from the configuration. The variable *(1 − % utilization)* can be shown to represent the *power loss* due to some delay D.

Power loss due to a delay D is defined as:

$$\frac{\textit{(Power without delay)} - \textit{(power with delay)}}{\textit{(power without delay)}}$$

In software physics,

$$\textit{Power without delay} = \frac{\textit{software work}}{\textit{execution time}} = \frac{W_t}{Tx}$$

$$\textit{Power with delay} = \frac{\textit{software work}}{\textit{execution + delay time}} = \frac{W}{Tx + D}$$

Therefore power loss due to delay D

$$= \frac{D}{Tx + D}$$

$$\textit{Percent utilization} = \frac{Tx}{Tx + D}$$

Therefore $(1 - \%\ \textit{utilization}) = 1 -$

$$\frac{Tx}{Tx + D} = \frac{D}{Tx + D}$$

The reason percent cpu utilization is more useful than percent channel utilization is that cpu power is essentially constant whereas channel power varies with the device type in execution, the block length being read, and other configuration properties.

The common measures—*cpu second, number of I/O actions (EXCPs), number of print lines, etc.*—are all seen to be proportionate to software work from the equations given earlier. Indeed, these common measures are invariant in the same way as software work because of this relationship.

The *number of jobs processed* can be converted to software work terms by direct use of the software work vector. Either the work per equipment type can be measured directly, or obtained by simply adding up the work of each job in each vector element position. If desired, the *standard installation job* can be characterized, so that the number of jobs can be re-expressed in terms of *number of standard jobs.* The standard installation job is represented simply by the total software work vector for all jobs divided by the number of such jobs.

The measure *throughput,* or jobs per unit time, can easily be seen to represent the average power used from the configuration. If the total work W_t is used, and T_e represents the configuration execution (elapsed) time, then the average power usage equals $W_t \div T_e$. If the software work vector is used rather than W_t, then one obtains the average power used per equipment type. Other manipulations of the vector provide such variables as *standard job power* and permit direct comparisons of throughput rates between installations.

Benchmarks can be seen to simply represent the software work vector for a given workload. Synthetic benchmarks are an attempt to properly approximate the same software work vector. In either event, the ratio of software power achieved on two different configurations represents the power usage obtainable on one configuration relative to another. For example, let

$\rightarrow$
$W(L)$ = *software work vector for workload L*
$Tx(L,a)$ = *execution time of workload L on configuration a*
$Tx(L,b)$ = *execution time of workload L on configuration b*

Characterizing an Installation's Standard Job

1. Select a workload or set of sub-workloads for which Standard Jobs are to be characterized. Examples of sub-workloads may be: test workload, batch workload, and on-line workload.

2. Measure, over an adequate period, the total work in each equipment class performed for the workload of interest. This gives the software work vector of the workload:

$$\text{software work vector} = \begin{Bmatrix} \text{cpu work,} \\ \text{disc work, } \ldots \end{Bmatrix}$$

3. Divide by the number of jobs represented in the workload to get the average software work per job, W (standard).

4. Divide each software work vector element by the total software work in the workload. This gives the unit vector showing the relative amount of the total work done by each equipment class:

$$\left\{ \text{standard job unit vector} = \frac{\text{cpu work}}{\text{total work}}, \frac{\text{disc work}}{\text{total work}}, \ldots \right\}$$

5. The standard job is then characterized by the average work per job and the unit vector.

Then

$$P(L,a) = \frac{1}{Tx(L,a)} \bullet \vec{W}(L)$$

$$P(L,b) = \frac{1}{Tx(L,b)} \bullet \vec{W}(L)$$

The ratio: $P(L,a) \div P(L,b) = \frac{Tx(L,b)}{Tx(L,a)}$

That is, the power of configuration *a* relative to the power of configuration *b* for a given benchmark is equal to the execution time of a given workload on *b* compared to the execution time of the same workload on *a*.

Practical uses

Software physics is of interest only to the extent it provides methods of solving practical problems facing the work-a-day installation. Although this article is at best an incomplete sketch of the full theory, several important practical uses based on what has been covered are worth mentioning.

The question of how to consistently measure *dp equipment productivity* has long eluded the grasp of those charged with the responsibility of selecting and justifying computer equipment acquisition. Productivity is classically measured by the *cost per unit of work*; a decrease in this unit cost represents an increase in productivity. Quite clearly, one can use software work as the basis of a complete dp costing and charging methodology.

The *unit cost of computing,* the measure of equipment productivity, is easily calculated from the software work unit vector. One needs only to multiply each element of the vector by the rate for the corresponding equipment class. The sum of these products represents the cost of performing a single typical unit of software work within the installation. As such, it represents the equipment productivity of the installation.

The software work unit vector has other important applications in addition to its use in a productivity index. One of these is to the problem of *workload forecasting*. For a given workload, application, or similar unit of software, the software work unit vector is a stable descriptor. The total software work is independent of the configuration, and not affected by simple equipment substitution, e.g., replacing a 370/145 by a 370/155 central processor. Thus, trends based on total software work are reliable forecasts, and can easily be converted to software work by equipment class by use of the unit vector characterizing the workload.

Forecasts can also be prepared by users in the units most natural for them, and converted to software work forecasts by equipment class. For example, a payroll application can be characterized in terms of a software work vector representing the work required to generate a single paycheck. This vector, called a *Natural Forecast Unit (NFU)* vector, represents a conversion function between the natural user method of forecasting his computer requirements (e.g., paychecks to be prepared) and the software work by equipment class form of forecast. This same vector can be used to calculate a cost and charge per paycheck, a rate form generally preferred by dp users over rates per cpu second and per I/O action.

Equipment planning and configuration design procedures also require workload forecasts. Here the question is: *at what rate can the configuration deliver power to the workload?* While full resolution of this question requires concepts not introduced in this article, at least one important point can be covered.

In attempting to balance an I/O configuration to a workload, the normal approach is to strive to keep all channels equally busy. The channel utilization is measured at the channel device itself. As such, it only represents the time the channel box is busy, and this time varies with the characteristics of the control units and peripherals attached to the channel. For example, the channel box is busy during the entire I/O time of a tape drive, but only during data transmission from an IBM 3330 disc system. The channel box active time is thus an inappropriate measure to equalize when balancing channel activity.

Clearly, the channel I/O power calculated using system execution time (total elapsed time) is the proper *balance* measure. The measure of primary interest however is *total I/O power* (total I/O work divided by elapsed time). This should be maximized first. Channel balancing activity should not degrade the total I/O power value, but seek to distribute it equally.

Several other practical applications of software physics can only be mentioned here. Scheduling, especially batch production scheduling, can be done more effectively if the software work vectors of each workload component are known. The best schedule is one in which each element of the sum of the software work vectors does not exceed the capacity available from the corresponding equipment class. Performance improvement activity results can be quantified either in terms of increased power usage or a reduction in the software work required to perform a given function. Peak loads in different equipment classes can be identified by a constant maximum power level over time.

The applications of software physics mentioned here are but examples of the practical uses of these concepts. Their importance lies not only in their usefulness to every installation, but in the overall consistency of approach and data provided by software physics. Work is continuing on defining and reducing these applications to a software engineering level of definition. The current results as given in references 1 and 2 are at such a level, and give great hope that software physics is indeed a practical and useful theory.

References & bibliography

1. Kolence, K. W. *EDP Facility Accounting: Implementation.* Bank Administration Institute, 303 S. Northwest Highway, Park Ridge, Ill. 60068, 1975.
2. Kolence, K. W *The Meaning of Computer Measurements, An Introduction to Software Physics.* Institute for Software Engineering, P.O. Box 637, Palo Alto, Calif., 94301, 1975.
3. Kolence, K. W. *Measurement and Software Physics,* Proceedings of Guide 30, 1970.
4. Margenau, Henry *The Nature of Physical Reality.* McGraw Hill, 1950.
5. Kolence, K. W. *A Theory for Computer Measurement.* The Atomic Energy Commission Scientific Computer Information Exchange Meeting. May 1973.
6. Kolence, K. W. *Software Physics and Computer Performance Measurement,* Proceedings of the ACM 25th National Conference. August 1972.
7. Johnson, R. *Some Steps Toward an Information System Performance Theory,* Performance Evaluation Review, Vol. 1, No. 3, Sept. 1972.
8. Rozwadowski, R. T. *A Measure for the Quantity of Computation,* Proceedings of the 1st Annual ACM SIGME Symposium on Measurement and Evaluation, Feb. 1973.
9. Hellerman, L. *A Measure of Computational Work,* IEEE Transactions on Computers, May 1972. □

Mr. Kolence has been in the dp field since 1955, when his assignment in the Navy was as the head of maintenance and operations of a Univac I located in Washington, D.C. He has since held positions in programming and software design at RCA, North American Aviation, and Control Data Corp. He was founder and president of Boole & Babbage, Inc., a Sunnyvale, Calif., firm specializing in the sale and use of software monitors (of Kolence's design), and has been an independent consultant since 1971.

Making The Move To Structured Programming

by Edward Yourdon

The best way to ensure that people will resist the change is to try to implement all the new techniques at one time.

The most common objection to structured programming takes the form, "Gosh, it sounds great and we'd like to do it, but. . . ." More specific attacks have been leveled against the PERFORM statement and other forms of subroutine calls, against nested IF statements, and against the elimination of GOTO statements. A more subtle and powerful form of attack is this: "Oh, you're just talking about modular programming; we've been doing that for ten years!"

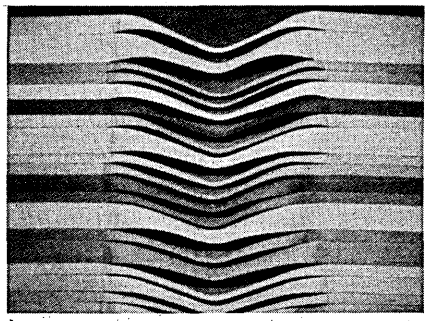
For structured programming to have the proper opportunity to show its strengths and not be rejected outright by an organization, consideration should be given to these questions:

1. What will the specific objections be? Are there any potential disadvantages that may be experienced as a result of using the techniques?
2. Which of the techniques should be attempted first, assuming that you cannot use them all? For example, should you attempt to use structured programming first, and then try top-down design on a later project?
3. What kind of programming project should you begin with as an experiment to demonstrate the benefits of the structured programming techniques?
4. How should you evaluate the success of the experiment?

Common objections

It would be unrealistic to assume that structured programming, top-down design, chief programmer teams, structured walkthroughs (one programmer explains his code to others), program librarians, and structured design would be accepted without argument in any organization. Here are some of the more common objections:

1. Many managers and programmers point out that the structured programming techniques are primarily intended for new development projects; for maintenance of existing unstructured programs, they seem to be of limited use (though the librarian concept and the structured walkthrough concept would still be quite useful). This point is basically valid, though it is usually possible to add new



sections of code in a top-down structured manner, e.g., when completely new features are being added to a system at the request of a user.

This problem may be solved eventually with the aid of "structuring engines" that will automatically convert unstructured logic into structured form; while such an "engine" cannot magically transform "bad" code into "good" code, it will at least foster some standardization.

2. Some managers point out that their programming projects are typically too small to require a team of programmers; therefore, they argue, they don't need any of the new "programming productivity" techniques. Since most managers apparently are not prepared to fire most of their mediocre programmers and replace them with one highly competent chief programmer, we must accept this objection as a fairly valid one—but only for the chief programmer team concept.

There is no reason why the existing programmers in the organization, even working by themselves, could not use structured programming and top-down design.

3. Still other managers object to the cost of training their programmers in the techniques of structured programming. This training exercise is admittedly nontrivial, though it depends on the programmer's experience. (Junior programmers learn the techniques more easily than senior programmers; the author's group trained 120 programmers in an Australian government agency prior to beginning our payroll project, and of the 20 who scored at the top of the class, eight were novice programmers with less than six months experience.)

Ease of training also depends on the programming language; the techniques are generally easiest in PL/1, reasonably easy in COBOL, and more difficult in FORTRAN and assembly language. In general, we found that programmers require three to five days of classroom training to learn the techniques, and approximately one month of programming (when they are at least as productive as they were previously) to become comfortable with the new techniques. The investment in training is thus relatively small compared to the benefits that were discussed in the preceding section.

4. The manager often has to overcome technical objections raised by the programmers; these objections most frequently come from senior programmers, many of whom are now project leaders, who still fondly recall the "good old days" of the 1401 and the 650. The common programmer-oriented objections are: it is awkward and inconvenient at first; the programming language is inadequate for the strict discipline imposed by structured programming; it is not obvious that the new approach will actually reap the benefits discussed above; and finally, there is a concern that the top-down structured approach will lead to tremendously inefficient programs.

The awkwardness and inconvenience is largely a matter of training. The question of language adequacy can be a relevant one, and one answer might be to convince the programmers (and their managers!) to begin using PL/1 and the other ALGOL-like languages in preference to the primitive COBOL-like and FORTRAN-like languages.

The objection about efficiency can only be answered by appealing to the programmer's common sense: the battle for efficiency is generally won or lost at the system or program design level (e.g., by making sure the system is running on an efficient hardware configuration, and that it isn't doing things it wasn't intended to do), and not at the bit-fiddling level (i.e., where the programmer "wastes" a microsecond or two indulging in a subroutine call).

Obviously, there are some exceptions to this, in some real-time systems, for example; but as Professor Bill Wulf of Carnegie-Mellon Univ. points out, "More computing sins are committed in the name of efficiency (without necessarily achieving it) than for any other single reason—including blind stupidity."

5. In addition to programmer retraining costs, many managers object to the cost of developing new standards to conform to the new programming techniques. Some organizations may have only recently finished developing standards for testing—and they tend to be "bottom-up" standards, in direct contrast to the top-down methodology currently being advocated. While the cost of developing new standards may well be substantial, it is difficult to think of any way of avoiding it. Indeed, even if structured programming had not appeared on the scene, surely some new techniques would eventually appear, forcing the voluminous standards manuals to be rewritten . . . it seems to be an inevitable fact of life.

This may be an academic point, but I know of one large bank and one insurance company that have apparently rejected structured programming for this reason alone—all of which seems rather sad.

6. Some managers have expressed the fear that the structured programming concepts might not work (or that their programmers might not be sufficiently familiar with the new techniques) on a significant project whose failure would have disastrous consequences. There is a very simple solution to this problem: if you have not tried structured programming before, you probably should not use a critical project as a "guinea pig."

I have seen three projects in early 1975 fail in their attempt to use various aspects of structured programming. One midwestern company used top-down testing at the program level, but then integrated the programs in a bottom-up fashion to build a system—and they couldn't understand why the "top-down" approach had failed to give them miraculous results.

Another company in New England made an unsuccessful attempt at using the program librarian concept, but it appears that the librarian was a secretary who was required to spend six hours a day typing envelopes and the other two hours supporting the program team.

Still another programming project failed in its attempt to use the chief programmer concept. In apparent ignorance of the whole philosophy of the concept, their chief programmer did not write any code during the entire project!

7. Some managers are concerned that they may not be able to see the benefits of the new techniques. This is often because they have no statistics to compare their current techniques with the new ones. To be more blunt, many organizations have no idea how many lines of debugged code their programmers generate each day, nor how many test shots the average programmer requires before he delivers his program to the user. Nor have they any idea how many residual bugs are found in programs that have been delivered to the user. Thus, one of the first results of structured programming may be an unpleasant awareness of just how bad things are; while this may well be unpleasant, it can also be a healthy shock.

The lack of statistical evidence has been used as a reason for not using structured programming; it usually takes the form of: "Oh, well, I'm pretty sure our programmers are above average anyway, so we don't need to use these new techniques."

Sometimes the problem is more blatantly political: when management does find out how bad the programming productivity currently is, they try very hard to cover it up to avoid the obvious accusation that they have been doing their job poorly for the past several years. A battle of precisely this sort is going on in one of the larger dp organizations in Detroit, where one of the people on the research staff has made some rather interesting studies based on a sample of 100,000 PL/1 statements: the average module size was 900 statements (so much for small, independent modules!); only four statements were DO-WHILE statements (so much for the assumption that all PL/1 programmers instinctively know about the three basic forms of structured coding); in a substantial number of the programs, none of the IF statements had an ELSE clause; and various other statistics suggest that the programmers have been writing "rat's-nest" code for the past several years.

8. There is an interesting variation on the preceding objection: some managers worry that the structured programming techniques may improve the productivity of their programmers by only 10% instead of the five-fold improvement generally advertised. Of course, this may be because the programmers were already following an informal semi-structured, semi-top-down approach.

Nevertheless, some managers worry that they (and presumably their programmers as well) will be judged incompetent if they experience less than a five-fold improvement! One hardly knows what to say about this head-in-the-sand objection, except the obvious point that a 10% improvement in productivity (with commensurate improvements in software reliability and maintenance) is better than no improvement at all!

9. Finally, some managers suggest that the fanfare and publicity associated with structured programming may be a disguised form of the Hawthorne effect—i.e., the programmers are more productive because they know they are being observed. It is hard to believe that any manager who has the slightest familiarity with programming would believe this, though perhaps that is the problem—many dp managers are about as familiar with programming as they are with the theory of relativity.

Even if the Hawthorne effect were relevant, so what? Why fight it? On the Australian payroll project, I was criticized for giving the programmers tee-shirts that had the word "superprogrammer" emblazoned on the front. Some people felt this was an "unfair" method of attempting to increase their productivity! But if it contributed to a five-fold improvement in programming productivity, it was worth it!

Picking the right combination

As mentioned earlier, some organizations are concerned about the difficulty of implementing all of the new programming techniques simultaneously. In most such discussions, four major techniques are considered: structured programming, top-down implementation, chief programmer teams (with structured walkthroughs), and the program librarian. In even the most progressive organization, it can be difficult to implement all of these techniques at the same time; other organizations feel that some of the techniques are simply not applicable for their programming projects.

It is important to emphasize that while the four techniques are usually used together, they do not have to be. It is possible to use structured programming without top-down implementation, or top-down implementation without structured programming. Similarly, it is possible to use the chief programmer approach without using the librarian concept, or vice versa. And it is possible to use the chief programmer concept and the librarian concept without using structured programming or top-down design.

While each of the concepts can be used separately, some of them are almost inevitably joined with others. If an organization decides to use the chief programmer team approach, it almost always uses the librarian and some form of structured walkthroughs; on the other hand, I have seen several projects where the librarian concept was used without the chief program-

mer team concept. Similarly, if structured programming is used, top-down design is also used; conversely, if an organization decides to use top-down design and top-down testing, it is possible that they may elect not to use structured programming (this seems especially true in COBOL shops that have been brainwashed for years to avoid nested IF statements).

It is difficult to make any general suggestions about the order in which the techniques should be implemented in a typical organization. Perhaps the most important point to recognize is that a sharp distinction can be made between the technical concepts of structured programming, top-down implementation, and structured design, and between the organizational concepts of chief programmer teams, structured walkthroughs, and program librarians. One should choose the combination of techniques that will give the greatest improvement for the least effort.

The librarian concept can usually be implemented fairly easily, since it does not affect the user and does not require any major retraining on the part of the programmers (though it does get them to change their attitudes: "Whaddya mean I can't type my own program into the time-sharing terminal? So what if I can only type two words a minute?"). On the other hand, it does require some standards to be developed for proper use of the librarian, as well as some training for the librarian; and it does cause some problems for organizations that find they have no budgets, no "job titles," and no place in the organization chart for the librarian. Except in government agencies and some other large bureaucratic organizations I have visited recently, these are usually minor problems.

Top-down design, structured programming, and the chief programmer concept tend to have a larger impact on an organization, and should be implemented with more care. Structured programming generally implies "GOTO-less" programming (or at least less GOTO programming), which is a jolt to many experienced programmers. The chief programmer team approach usually includes the concept of structured walkthroughs which suggests that each programmer should make a formal presentation of his code to all of the programmers on the team for their review and criticism. This too is a jolt to the average programmer (as a programmer at Shell Oil in London said, "Reading someone else's program is like reading their personal mail—it's an invasion of privacy in which civilized people simply do not indulge").

Top-down design and top-down testing are a bit easier for the programmer to swallow, but they can cause severe management disruptions in some cases. They imply, for example, that a computer is available for testing at an early stage in the project (in contrast to the common management policy of not supplying machine time until the final stages of the project).

None of these problems is insurmountable; indeed, many organizations have implemented all of the techniques simultaneously without experiencing any major catastrophes. Nevertheless, the cautious manager may wish to begin with only one new idea at a time; specific conditions within the organization will usually dictate which technique is to be implemented first.

A good pilot project

In some organizations, the techniques of structured programming and top-down design, after some experience with them, are considered "intuitively obvious" to managers and programmers alike. Once exposed to the concepts, everyone begins using the techniques without any significant prodding. Many organizations start using structured programming with a great deal of trepidation; in most cases, this is done by using the techniques on an "experimental" project.

This leads to an obvious question: what kind of project should be used as an experiment? Experience with several organizations during the past two years suggests the following:

1. *The project should be visible.* If the experiment is an academic project that nobody will use, then nobody will care about the results. The project should be a "real" one—one that users will use, and one whose results people will care about. Indeed, this is one of the reasons the New York Times project had such a profound impact upon IBM and the rest of the industry—it was real.

2. *The project should be nontrivial.* One of the keystones of the "structured" approach is its attempt to break complex tasks into simpler ones. By working with less complex program components, the programmer is less likely to make mistakes, and he is more likely to produce something that can be maintained. However, if the program is already quite trivial (e.g., less than 100 lines of code), the improvement in productivity and maintenance will not be as obvious. The experimental project should be at least six man-months in duration.

3. *The project should be noncritical.* There are enough problems in becoming familiar with structured programming and top-down implementation in a relatively small project; there is no point in putting additional pressure on the programmers by forcing them to use the techniques on a critical project—one whose failure will have disastrous consequences in the organization.

On the other hand, if management and programmers agree that the techniques are "intuitively obvious" and feel relatively comfortable with the techniques (a more and more common occurrence, considering that most programmers now graduating with a B.S. in Computer Science have had a healthy exposure to structured programming), then there should be no danger.

There is the case of an organization that was faced with an "impossible" project and in desperation used it as a pilot structured programming project. The Australian Taxation Dept. (roughly equivalent to the IRS) was urged in 1973 to adopt structured programming, top-down design, chief programmer teams, and program librarians to assist in a project involving conversion of machines, conversion of languages, and redesign of major existing systems within a timeframe that would otherwise have been considered impossible. The results were highly successful.

Evaluating the experiment

Clearly, the object of an experiment is to gain information for future reference: a structured programming experiment should give the organization valuable information about the usefulness of the techniques for future projects. From the discussion in the previous sections, we see that there are several statistics the project manager should try to capture; most of these can be gathered by answering the following questions:

a. Was the project finished on schedule? How accurate were the estimates for milestones during the project? At various stages during the project, was it possible to estimate accurately the amount of coding remaining to be done?

b. How productive were the programmers? In particular, how many debugged statements per day were they able to produce? Also, how did the programmers distribute their working time during the project (some tentative results from an experiment at Aetna Life & Casualty suggest that slightly under 6% of the programmer's time was spent on code reviews and walkthroughs, which seems to squelch the common complaint that these things take too much time).

c. How efficient were the resulting programs? This may be difficult to judge unless the program is a redesigned version of an earlier (presum-

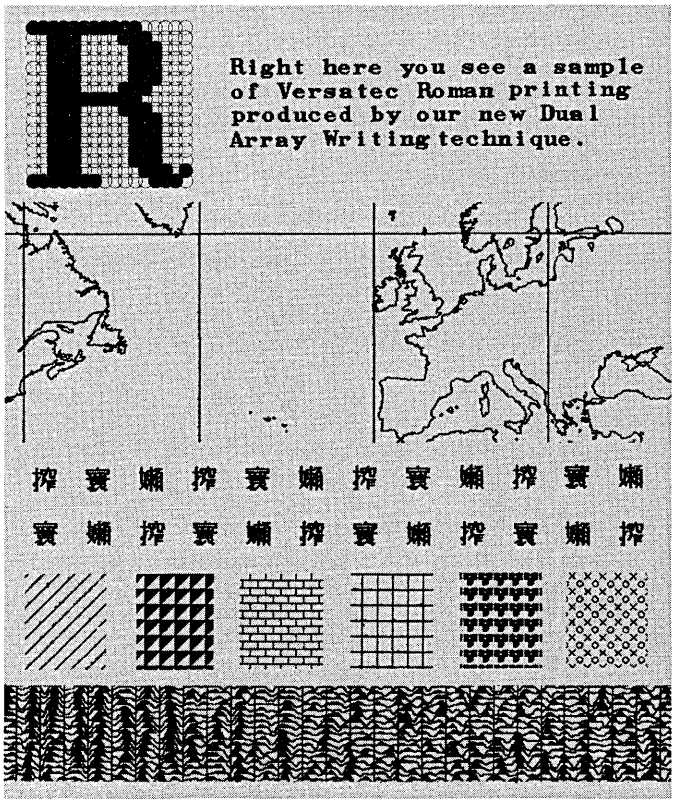
We've made electrostatic writing beautiful.

In 1971 Versatec introduced the first 500 LPM printer/plotter for under $8,000.

"Beautiful," said the computer programmer.

"Beautiful," said the OEM.

"Not so beautiful," said critics who didn't like the 7 x 9 dot matrix, 100 dots per inch printout that put "spots" before their eyes.



In 1973 Versatec turned a corner with high resolution printout: 160 dots per inch. And then—in 1974—we found a way to make the writing bolder, blacker, and even more beautiful at 200 dots per inch.

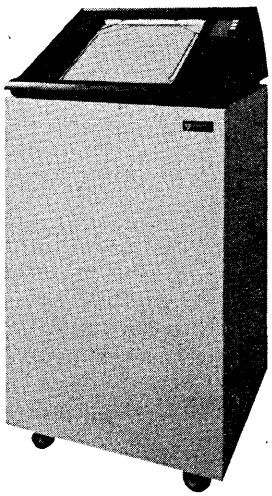
We call our new technique high resolution Dual Array Writing. It gets rid of the "dot look" by overlapping the dots. Samples are shown above.

600 LPM printers are now $4,500.

All this is part of a very handsome package. Our printer prices start at just $4,500, and printer/plotters at $5,900. Our Universal Versaplot Software is the most powerful ever designed for electrostatic plotting and starts at just $900.

We have controllers for over 30 computers.

Now add the fact that Versatec has the broadest product line in electrostatics, the highest resolutions (160 and 200 points per inch), and the largest installed base—more than 2,500 units operating world wide.



It's a beautiful story all around. For details concerning on-line or off-line operation on *your* computer system contact Versatec, Inc., 2805 Bowers Avenue, Santa Clara, California 95051.

Or phone (408) 988-2800.
TWX 910-338-0243.

VERSATEC

The leader in electrostatic writing.

MAKING THE MOVE

ably unstructured) program. However, the manager and/or the programmers should be able to make some qualitative judgments about the presence or absence of substantial overhead in the final program.

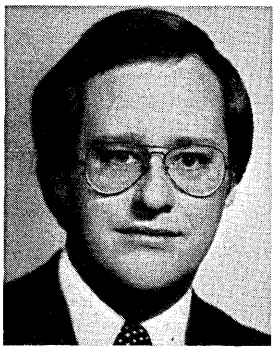
d. How much test time was required for the project? Specifically, was the test time distributed fairly evenly throughout the project?

e. What was the ratio of development costs to maintenance costs? Is it significantly better or worse than other "unstructured" projects within the organization?

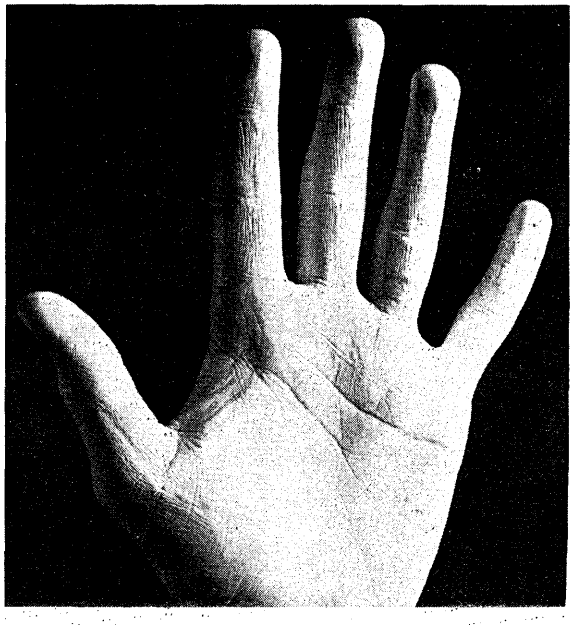
f. How effective were the structured walkthroughs? Roughly how many bugs were found per man-hour of walkthrough, and roughly how long would it have taken the original programmer to find those bugs? More important, how many of the bugs would have remained unnoticed until the program began running in production?

I find that a reviewing audience can easily spot five to six bugs in a 200 statement program within 15 minutes. It is important to recognize that the programmer who wrote the code was usually convinced that his code was correct, and his test data would usually be a self-serving attempt to confirm that feeling.

g. How many bugs were discovered during user acceptance testing? How many bugs were discovered after several months of production? How does this compare with other "normal" programs in the organization? □



Mr. Yourdon, president of Yourdon inc., has consulted and lectured on program design and on-line computer systems in the U.S., Canada, Europe, and Australia. He began his career at Digital Equipment Corp., where he developed assemblers, FORTRAN IV Executives, and math libraries for various machines. At General Electric, he developed an operating system for a hospital information system on the GE-435. He has authored several books and numerous articles, and is currently completing a two-volume series, "Advanced Programming Techniques."



Your search for the best financial control software just came to a halt.

You've just found it. The UCC Financial Control System. The best financial control software you'll find. There are over 103 reasons why:

First, it's the most complete system of its type. It features

• A single financial data base • Full general ledger accounting • Budget preparation and review • Responsibility reporting • Cost allocation and profit center reporting • Product costing • Statistical accumulation and reporting • Automated systems interface • Flexible reporting • Easy to use report writer • Foreign currency accounting.

Second, fourth generation design with a single master file affords easier installation and maximum operational efficiency/reliability. It allows user control with a minimum of EDP intervention. Documentation is outstanding.

Third, it's backed by the long-term maintenance and reliable support of one of the largest and most advanced computer services companies in the world—UCC.

The other 100 plus reasons are the satisfied users of UCC FCS. They're the best possible reasons why you should check out the UCC Financial Control System today.

☐ Please send me more information:
☐ Have someone call me about:
The UCC Financial Control System.

Name_____
Title_____
Company_____
Address_____
City/State/Zip_____
Telephone_____

Mail to UCC Financial Software
P. O. Box 47911
Dallas, Texas 75247
Or call Richard Streller
(214) 637-5010

When you have the best people, you have the best product.

UCC
UNIVERSITY COMPUTING COMPANY
7200 Stemmons Freeway P. O. Box 47911 Dallas, Texas 75247
A Wyly Company

LIVING IN A SHOI BEEN SO BAD IF THI INSTALLED A RUSCARD

WOULDN'T HAVE
OLD WOMAN HAD
SECURITY SYSTEM.

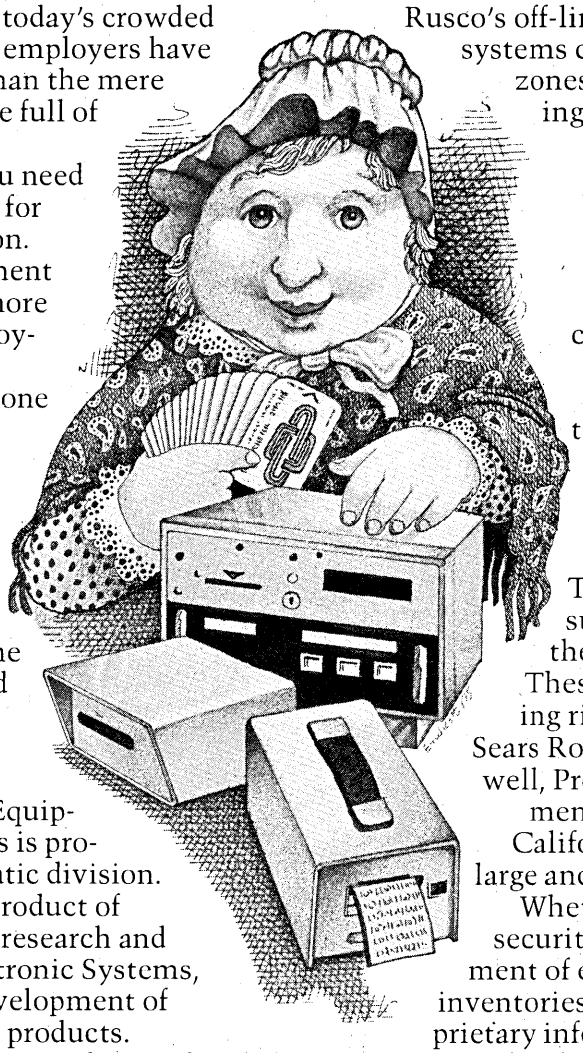
Employers now face many of the same problems as the old woman who lived in an over-populated shoe. But in today's crowded offices, plants and factories, employers have much more to watch over than the mere comings and goings of a shoe full of children.

Today, more than ever, you need positive security protection for your business or organization. Because of inflation, equipment has become costlier, ideas more valuable. Increased unemployment is creating a rise in thievery. Employee crime alone is increasing as much as 20 percent each year.

But, how do you control who goes where and when at specific times of the day and days of the week? The answer is a Ruscard access control system. It utilizes the cryptically-encoded Ruscard to control the movement of personnel, as well as outsiders, through all points of access including elevators. Equipment to secure parking areas is provided by Rusco's Park-O-Matic division.

Ruscard systems are the product of nearly a decade of intensive research and development by Rusco Electronic Systems, the pioneer and leader in development of sophisticated access control products.

The same size and shape as an ordinary plastic credit card, the Ruscard defies duplication and doubles as a photo I.D. badge, compatible with Polaroid and other I.D. systems. In tandem with Rusco's off-line and on-line hardware, these systems control over-lapping time shift zones and provide complex mastering capabilities and an automatic print-out of all activities with date, time of day, access point, I.D. number and status level. The Ruscard works like a key and it thinks like a computer, thus providing a capability to collect and store either fixed or variable data for such applications as automated payroll; time and attendance reporting; and the monitoring of various functions such as fire, intrusion, temperature, etc. throughout a facility.



The cost of a Ruscard system is surprisingly low, even less than the annual expense of one guard. These security systems are operating right now at major facilities for Sears Roebuck, Bank of Tokyo, Honeywell, Procter & Gamble, Texas Instruments, the University of Southern California, and other organizations, large and small, throughout the world.

Whether your organization needs a security system to control the movement of employees, to protect valuable inventories, expensive equipment or proprietary information, don't be like the old woman in the shoe—give the boot to your security problems with a Ruscard Security System.

RUSCO
ELECTRONIC SYSTEMS

For further information, call or write:
B. Martin, Rusco Electronic Systems
P.O. Box 2848D, Pasadena, California 91105
Call toll free: (800) 423-4194
In California, call direct or collect (213) 682-3601

Rusco Electronic Systems is a division of Rusco Industries, Inc., an American Stock Exchange Company.

First in Japan
First in the U.S.A.

And we're first in scanner installations worldwide!

Optical Scanning Corporation has installed 285 scanners in Japan and more than 1,500 in the United States.

Take steps now to reduce those crushing data entry costs by getting all the facts about our unique family of low-cost character and mark reading systems.

We'd welcome the opportunity to work with you to choose the one you need to reduce your costs. Average monthly rentals range from $250 to $2,000. Write or call collect today. You'll find there finally is a better way with OpScan systems.

Optical Scanning Corporation

Nationwide sales and service—

World leader in scanner installations

From pencil to computer—

Optical Scanning Corporation
Box 6 Newtown, PA 18940
(215) 968-4611

Name _____
Company _____
City _____
State _____ Zip _____

TASK/MASTER
the standard of excellence in telecommunications monitors

ease of installation

TASK/MASTER can be generated and operational in hours. Simplified specification of the operating system to be used, programming languages, terminal support required, and system options insures a smooth and easy initial installation. Expert TSI personnel train your staff on-site and guarantee a rapid successful system implementation.

In a recent survey of ninety telecommunication monitor users TASK/MASTER ranked ahead of CICS, ENVIRON/I, and INTERCOMM in ease of installation.

ease of application programming

TASK/MASTER allows direct and simple interfaces from COBOL, PL/I, FORTRAN, and Assembler applications. Application programmers can be trained to write efficient on-line programs *in hours*. Any level of IBM compiler can be used, without modification. Unlike CICS, no preprocessing of high-level language programs is required, further simplifying application creation, testing, and maintenance.

Not unexpectedly, in a recent user survey nearly two times as many INTERCOMM users and three times as many CICS users felt their system restricted the application programmer as did TASK/MASTER users.

resource management

TASK/MASTER's basic architecture and technical facilities allow significant resource savings. Survey after survey and installation after installation have shown that TASK/MASTER can be generated to run in 10%-50% *less* storage (including real storage required in a virtual environment) for any specific user requirement than can any competitive approach.

TASK/MASTER also saves on other system resources, including CPU overhead, disk space, and master terminal costs.

features

TASK/MASTER provides features totally unmatched in any competitive package. Among these are:

- a complete message queuing mechanism, including automatic disk overflow, station-by-station control, queue protection, and duplicate message suppression in the event of system failure and restart
- true terminal independence which makes device control characteristics transparent to application programs and is far more powerful and easier to use than any other message mapping facility
- file protection allowing automatic recreation of databases after system or file loss
- a general interface to *any* database management system, including TOTAL, DL/I, ADABAS, DBOMP, IDMS and others
- automatic application restart in the event of a system failure *without* duplicate file updating due to message reprocessing
- terminal support which covers the widest choice of IBM and non-IBM devices in the industry

vendor support

TSI's support for TASK/MASTER users is the best in the industry. Once again using the DATAPRO survey as a reference monitor users rank our support for TASK/MASTER well ahead of CICS, INTERCOMM, and ENVIRON/I.

In an independent users study approximately 85% of TASK/MASTER users felt the technical support provided with the package was good versus less than 65% of the INTERCOMM users and only half the CICS users. Why? Possibly because of the four vendors involved, we are committed *exclusively* to excellence in on-line systems and have built a Customer Service organization committed to that single goal.

cost

Although the other advantages on this page translate into cost savings many times the price of the monitor itself, TASK/MASTER is *also* the lowest cost package on an out-of-pocket basis. TASK/MASTER's low price includes all installation support and education services.

performance

Whatever your environment — DOS, DOS/VS, OS, or OS/VS — TASK/MASTER will perform better than any alternative you could choose.

Surveys have consistently placed TASK/MASTER at the head of the field in overall system performance considerations. In a VS environment, TASK/MASTER has over two years of demonstrated capabilities running in a fully virtual mode; an unmatched record with equally unmatched results in scores of VS shops.

user satisfaction

In the final analysis the overall satisfaction of existing users is possibly the most critical factor in selecting a monitor. In survey after survey TASK/MASTER users have expressed the highest level of satisfaction with their system. DATAPRO's results were once again typical: when compared against the other monitors on the basis of overall satisfaction TASK/MASTER came out ahead of the field by a significant margin.

In 175 installations around the world, TASK/MASTER is establishing new standards for simplicity of use, reliability, performance, and user acceptance. Any or all of these users are our best advertisement.

convinced?

If not or if you want details, please use the coupon to enroll in a TASK/MASTER seminar or to request product literature. There is no charge for attending a seminar.

Location	Date	Location	Date	Location	Date
St. Louis	6/4	San Francisco	7/1	Boston	7/30
Dallas	6/11	Chicago	7/1	Cleveland	7/31
New York	6/11	Pittsburgh	7/9	Cincinnati	8/6
Indianapolis	6/18	New York	7/16	Washington D.C.	8/13
Toronto	6/25	Detroit	7/23	Chicago	8/20
Los Angeles	6/27	Minneapolis	7/24	Dallas	8/27

turnkey systems inc.
one eleven east avenue, norwalk, connecticut 06851
203-853-2884 Telex 964351

☐ Please enroll _____ people in the TASK/MASTER seminar in _____ (CITY) on _____ (DATE)

☐ Please send more information on TASK/MASTER.

☐ Please call _____

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____

CPU _____ Terminals _____

Small Computers For Small Businesses

by Louis B. Marienthal, Contributing Editor

Sometimes stashed away in stockrooms, usually given little more attention than the office copier, they do their jobs without the "support" of dp professionals, complicated operating systems, or expensive applications software.

Historically, as computing equipment has become available at progressively lower prices, data processing techniques have been passed down from bigger users to smaller ones. Now something new is happening at the low end of the scale. We might be seeing a major turn in the history of the industry.

Many small businesses are installing small scale computer configurations which are based on minicomputers. The businesses are new users, employing the equipment in new ways, often without the help of on-site data processing professionals. Further, most of the equipment is being made by companies other than IBM and its traditional competitors, and much of it is being marketed and installed by independent dealers or middlemen.

Defining small scale

The small scale configurations in question can be defined by the following criteria:

- The equipment has a relatively low price, with an upper limit of about $120,000. Often it runs less than half that amount.
- The primary mode of data entry is through a crt or hardcopy terminal, as opposed to punched cards.
- The primary file storage is disc, as opposed to ledger cards.

These criteria form an arbitrary definition that deliberately excludes the System 3/Model 10, Honeywell 2000, Burroughs 1700, etc. These latter systems are inexpensive enough, but they normally employ punched cards as the primary input medium. The application designs on these systems are typically scaled down versions of conventional designs that might run on IBM 360/370 hardware or that might have run on earlier IBM 1400/7000 hardware. The mini-scale business systems, as defined, create a break with this tradition of application design.

The minis have brought a whole new stratum of small users into the data processing market, partly because they cost less to install and to operate than equipment with conventional application designs. There are three key elements in this cost reduction:

1. Small new manufacturers using new marketing techniques have been able to deliver hardware at relatively low prices.
2. Crt data entry is more cost-effective than keypunching, and sometimes data entry can be eliminated as a discrete step or company cost center.
3. The data processing department can be smaller and sometimes can be eliminated.

Of the vendors described in the case histories presented here, only Singer would have been recognized four years ago as a supplier of business data processing equipment. Much of the equipment is being manufactured by small new companies. These brand x vendors have no large rental base to protect, no requirement to provide continuity to existing installations, no compunctions against buying major system components from other manufacturers, and no rules against giving special discounts to middlemen who assume much of the burden of sales and installation support. The story is a classic case of competitive free enterprise delivering more for less to the buyer.

There is a sense of *déjà vu* about the new vendors selling to first-time users. Some of the vendors have been selling multiple units to other electronic companies on an oem basis, that is, without support. Other vendors have been selling to technical users—laboratories and engineering firms. All are surprised at the support required when the equipment is used for business applications.

In some cases the computers are being used for business applications more or less as an afterthought; this auxiliary use of computers for business was common in the late '50s. The pattern is nearly 20 years old. But now the new first-time users are smaller, easier to manage, and more receptive to new methods; and there are middlemen available to help both vendor and user.

This article contains several case histories of these first-time users. While only a handful are presented—many more installations were visited—they were selected because they are very typical installations, typical in their applications, in their lack of trained dp staff members, and in the offhand way they treat the computer as another office machine.

The system dealer

The case histories refer to several middlemen—companies that buy hardware and sell hardware/software systems to end-users. The company names are not well known, and there is also no standard generic name for the class of companies. They are important links in the chain of marketing computer hardware and software, however, and perform all or some of the following functions:

- buy major system components from several manufacturers
- cable components together and run systems tests
- develop or buy application packages
- sell hardware and software to end-users
- design and write tailored software
- contract for turnkey systems

Manufacturers call these companies "oem's" because they are given an oem discount, but they do not manufacture systems or system components out of parts like circuits and keyboards. "System retailer" would aptly describe their function, but "system dealer" is gradually becoming the common term.

Whatever their title, these middlemen are simplifying the installation and implementation of computer sys-

tems for first-time users. The systems, in turn, make it possible for the user to simplify data entry procedures, dp support organizations, and applications development.

Avoiding keypunching

Data entry via terminal is an extremely important factor in the use of minis in small businesses. In the installations described here, crt's were used more than hardcopy terminals. Crt data entry involves: (1) computer prompting of the operator, (2) computer edit checks on transaction data, (3) computer checks against master-record data, (4) computer display of master-record data and (5) sight verification.

In every installation examined where crt data entry replaced key punching, crt entry was superior—cheaper with fewer errors. In two companies, minis were installed *because* crt data entry was available as an alternative to keypunching.

With crt's, the function of data entry can be pushed back to the source of data so that the steps of document preparation, edit, keypunch, and verify can be combined. The dull grind of punching meaningless numbers is eliminated as a discrete job function. Where data entry becomes an auxiliary element in some bigger job, using the crt can almost be fun.

When the people entering data are aware of the *meaning* of the information—for instance, an accounts receivable clerk entering cash receipts—then the accuracy of the input is increased. When the people entering data are those who recall the information and use it in their jobs—such as an order-processing clerk entering orders and using the computer record as an open-order file—then accuracy initiates a feedback that promotes greater accuracy.

Whenever data entry is pushed back to the source of data, there is considerable system simplification. The whole cycle of transaction journals, error reports, and resubmitted transactions can be cut back to the control of file access and the accumulation of transaction totals.

Keypunching does yield more characters per clerk-hour than crt data entry, but this narrowly defines data entry as machine translation and operators as eye/finger machines. If data entry is broadly defined as putting *accurate* and *organized* data into computer storage, then the fallacy of suboptimizing "characters per hour" is exposed.

The minis combine the advantages of key-to-disc recording with master-record validation. This validation allows data entry to be an auxiliary function of those using the data; this means that data entry may be eliminated as a discrete function and as a cost center within the dp department, and that total user costs may be significantly reduced.

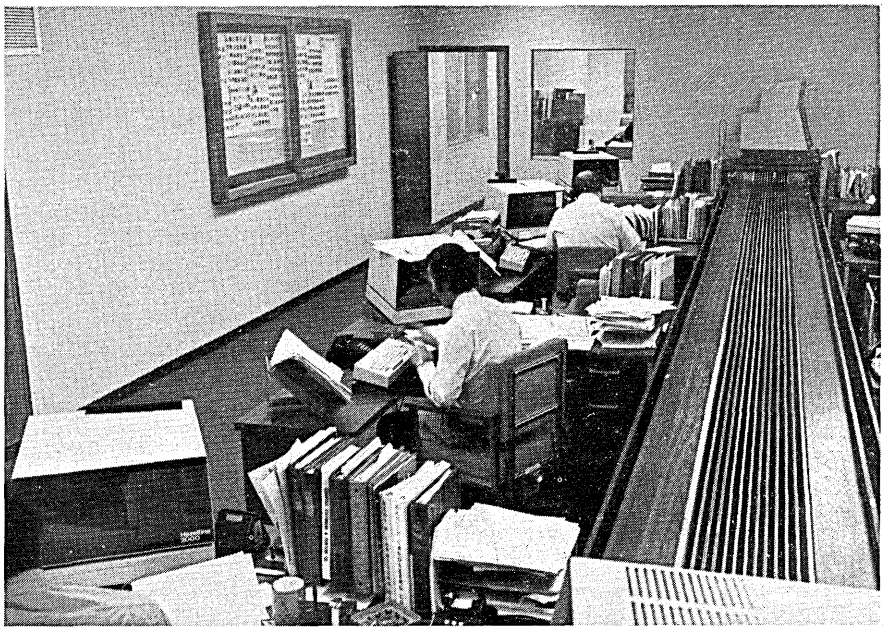
Some resistance to this may be expected. In large or medium scale installations, dp managers control four kinds of functions: systems programming, applications programming, computer operations, and data entry. With mini systems, users frequently purchase programming from outside sources and can set up "computer operations" as an auxiliary task for the office manager. That takes care of three of the four functions. When data entry is pushed back to the source of transaction and eliminated as a separate job, the entire department, dp manager and all, disappears from an organization chart. As evidence of these trends, four of the five companies described in the case histories bought applications software outside, and only two dp professionals were employed by all five companies together. Further, the cases include only two recognizable "dp departments" and only one titled dp manager.

Simplifying software

For the installations described, applications software was surprisingly inexpensive, too. Packages for order entry, billing, and accounts receivable were purchased for under $10,000. No doubt in some cases the user's low cost came from a money-losing sale by hardware vendor or system dealer. Still, applications software for minis is being produced at lower cost than for larger conventional equipment. It seems as if applications programming for minis starts fresh without all of the overhead built up over the years at traditional installations. Many factors are involved:

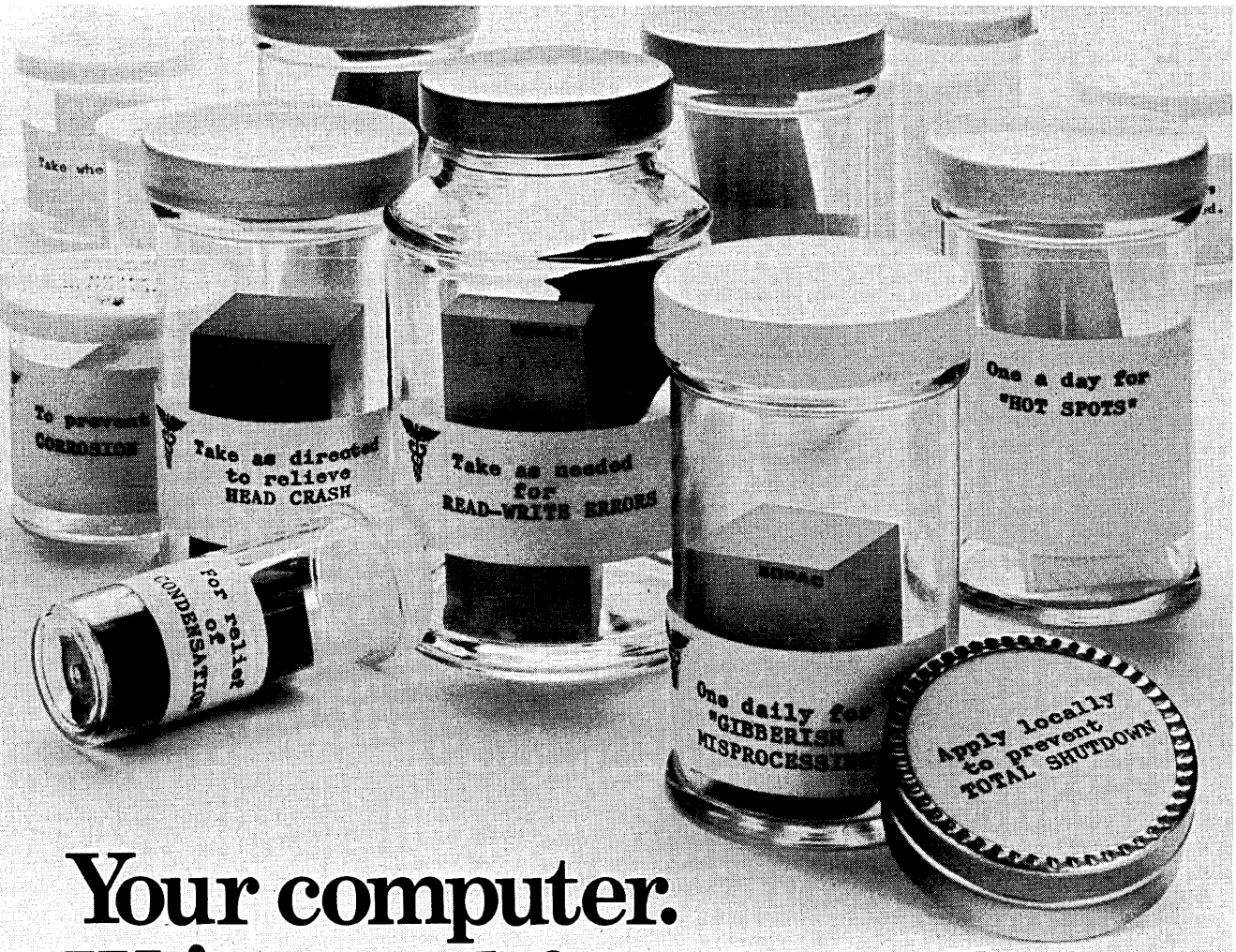
1. When a system dealer creates the software, his analysis/programming personnel frequently have genuine experience with the equipment, application, and/or industry.
2. With or without a dealer, one, two, or (rarely) three people will work on a given application. The administrative problems of big hierarchical teams do not exist.
3. The system functions are broken down into simple terminal-oriented functions. There are no long job streams where one program depends on the next; each more or less stands alone.
4. There is considerable opportunity for system simplification in the elimination of input reports (transaction journals and error reports), and there are few problems with resubmitted errors and transfers of transactions from one master record to another.
5. Significantly, the programming is done via the crt's. A programmer's output may be increased by a factor of between three and twelve when interactive crt access to a computer is provided.
6. Minis are easier to operate than traditional computers; hands-on debugging is efficient and economically feasible.
7. Minis do not come with several yards of operating system manuals. Programmers are able to spend more time on the applications and less on the software.

The operating systems are certainly simpler than those found on traditional equipment, too. They require a minimum of memory and seem easy to use.



All photos by Duke Buniff

At Kent H. Lansberg Company, order administrators use Hazeltine crt's tied to a Hewlett-Packard 2100 to call up customer master records, inventory records, etc. The conveyor belt carries the paperwork.



Your computer. We're good for what ails it.

One of the main causes of computer downtime has nothing at all to do with the way your computer is built.

It's the environment your computer has to work in. If it's too humid, too dry, too warm, too cool, or too dirty, no computer will put up with it for long.

The result can be anything from gibberish to total shutdown — and this can cost a fortune!

More often than not, the trouble begins with an environmental system that has been designed to keep people comfortable but that can't keep either the people *or* the computer comfortable.

The problem can easily be prevented by creating and maintaining a precise, controlled environment for optimum computer operation.

The technology to achieve that precise environment does not exist with comfort air conditioning.

It does with *process cooling.*

Specifically, EDPAC Process Cooling Systems.

To learn more about remedying your own computer room climate control problems, fill out the prescription below. We'll rush you a copy of "Process Cooling for the Data Center Environment." And the name of your EDPAC specialist.

Rx

Please rush me your prescription for computer room climate ills. And the name of my nearest EDPAC specialist.

Name_____

Title_____

Company_____

Address_____

_____

Phone_____

D-65

EDPAC

Old Cuthbert Rd. at Deer Rd.
Cherry Hill, New Jersey 08034

EDPAC is a product of AC Manufacturing Company

Part of this advantage is very likely because the hardware and software are both relatively new and because the vendor does not have to maintain all the awkward features of yesterday's product line.

With traditional equipment, operating systems add cost for systems programmers on the payroll, for computer time spent installing new releases, and for computer cycles executed on operating system programs. Minis save in all these areas, and the result is lower cost to the end user.

The trend is to bundling

Relatively limited software and range of applications are typical of most installations, but there are ambitious exceptions. The Microdata "Reality" system is a pre-packaged combination of hardware, firmware, and software designed to implement an on-line transaction-oriented information system. Similarly, the Hewlett-Packard "Image/2000" is a data base management system, designed for businesses, that may be combined with management/280, an on-line sales order system. These examples are priced as packages in the range of $60-80,000 including a minimum configuration of hardware.

Microdata's Reality, described in one of the case histories (Contempo Casuals), might signal a new trend. The system includes a plan for defining and storing data plus a high level language called ENGLISH that handles the retrieving, sequencing, and formatting of report data. The firmware provides: (1) a virtual memory operating system, (2) control of terminal I/O operations, and (3) software architecture tailored to the storage and processing of variable-length records and fields. With many functions assumed by the firmware, the operating system monitor requires only about 4KB of memory.

The best alternative

The new small business systems have made it possible for the small business to have an in-house system at the price of service bureau processing. In fact, the machines cost little more than batch terminals. Even with low priced, low speed terminals, it is difficult to buy much business data processing from a time-sharing service bureau for $2,000-3,000 per month, and this is the price range of mini configurations on a five year lease-purchase contract (before maintenance).

Time-sharing is neither cheap nor easy for business data processing. The storage charges quickly add up—either for on-line files or for mounting tapes. Also, because many users are on-line simultaneously, operations are a bit more complex with time-sharing than with minis. Overall, clerks handle minis better than time-sharing.

No doubt, time-sharing and big computers in general are superior to minis for a wide range of tasks, such as sorting historical files and running long statistical reports, but the case studies show that minis yield a cost/benefit breakthrough for small businesses.

I believe that any small business first-time user who buys a traditional configuration is making a terrible blunder. There may be excellent reasons for not throwing out a medium scale computer that works well, but I can see no excuse, in 1975, for installing at a virgin site any junior version of a standard medium scale computer.

Five small scale business system case histories are printed below. Each includes a brief description of the company environment and the system installed. Obviously in this small sample, no one case can be typical of all equipment, vendors, or industries.

The selection of cases was first determined by the definition of a mini system as noted above: low price, terminal entry, and disc storage. Also, the cases are all from Los Angeles, which is one of the three or four areas in the country where users have a full-range choice of equipment and services. Some of the equipment described might not be available everywhere. On the other hand, there is no case history of an IBM installation because at the time of writing deliveries of System/32 and System/3 Model 8 have not yet begun in the area.

And finally, the selection was limited by vendor referral, which means that the cases are all relatively happy. Obviously, there are horror stories that could be told, but the point of this survey is to tell what **can** be accomplished with minis. Vendors made the introductions, supplied price information, and sometimes added details about system design. But that ended it. Vendors did not participate in the interviews; the users supplied all of the essential facts.

CONTEMPO CASUALS

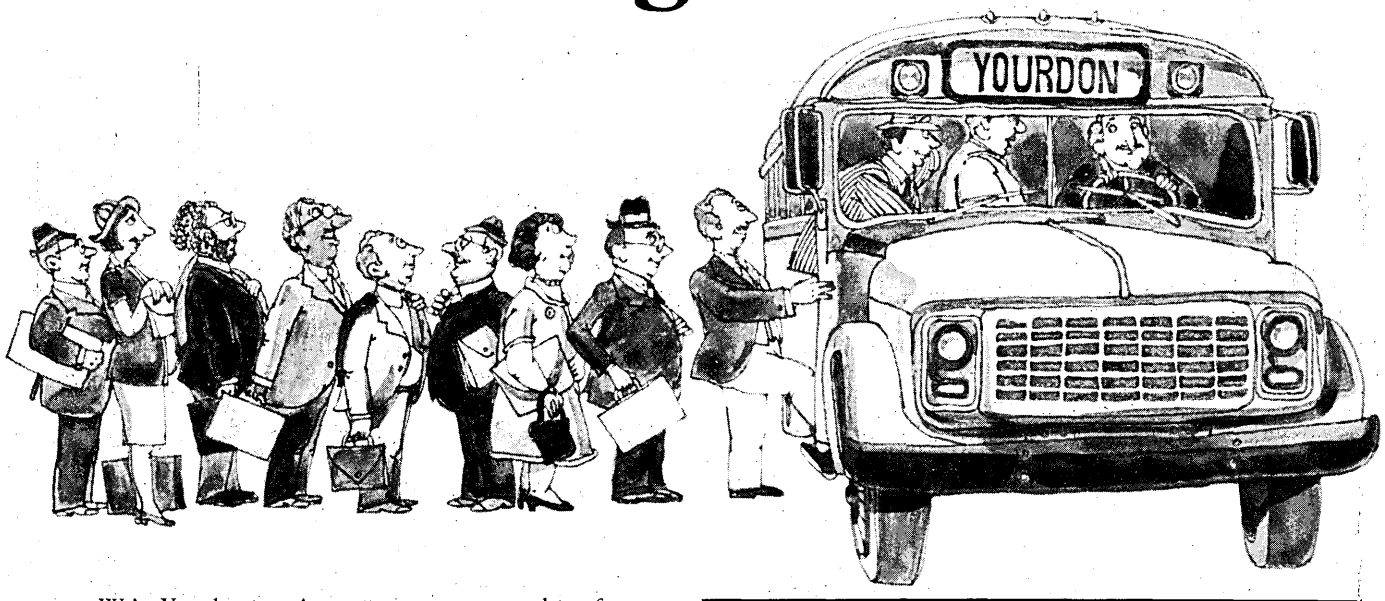
The surprise installation in this survey is the Microdata "Reality" system installed at Contempo Casuals of Van Nuys, Calif. Contempo is a chain of 16 retail stores operating in Southern California.

The stores sell sportswear to young women, concentrating on the latest fashion modern look at moderate prices. The total sales volume for the chain is less than $10 million. The number of stock keeping units (SKUs) is relatively high—15,000 on hand and another 15,000 on order. (An SKU is a single style-color-size.) In this fast-moving business, the quantity of any SKU at a store is typically one, and sales volume depends on good stock control, fast reorder, and efficient replenishment to the stores.

The executives, buyers, and computer have offices in front of a warehouse in Van Nuys. The warehouse is not used to store merchandise; it is instead a transshipping point where merchandise is received from vendors and then split into lots for shipment to each store. Nothing is supposed to be in the warehouse for more than three days, and during this period a Contempo Casuals label is sewn into every garment.

At Contempo Casuals' receiving dock, vendors' shipping papers are matched with order records through a crt and the receipt of shipment is recorded.

Now you can go to school where IBM goes to school.



We're Yourdon inc. A young computer consulting firm located in New York. We're the people who train the people who train the people.

In the past several months we've taught dozens of people from IBM and other large corporations. The subjects of our Seminars include: Structured Design, Structured Programming, Structured Cobol, Data Base Structure & Design (a complete list of upcoming seminars is given below).

These courses represent the state of the art today. And they're taught by people who *are* the state of the art.

Yourdon's Seminar Instructors include:

Ed Yourdon (naturally) — the foremost authority in America today on Structured Programming. Author of "Design of On-Line Computer Systems" and the soon to be published, "Program Structure & Design." Founder and President of Yourdon inc.

Larry Constantine — considered *the* leading authority in the area of Structured Design. Co-author of the seminal work, "Structured Design" in the IBM Systems Journal. Incidentally, "Structured Design" is only the second article ever published by an outsider in the Journal.

Bill Plauger — authority on minicomputers and microprocessors. Co-author of the "Elements of Programming Style."

These are just three of our Seminar Instructors. We have others. All with backgrounds that would make your mouth water.

Our client list reads like a Who's Who of American Business: RCA, GE, Xerox, AT&T, Sperry Rand, Polaroid, Borden, Dupont, Bell Telephone Labs, Pfizer, Merrill Lynch, Honeywell, DEC, Burroughs and the aforementioned little guy, IBM.

The critical raves given to Yourdon inc. by many of the people who work for these clients brings a corporate blush to our face. We'd put them in the ad but you'd accuse us of bragging.

What's the reason for our success? Talent? Yes. But we also believe that "hard work never killed a man." Or a woman. (Ed Yourdon averages a 90-hour week.) It's paid off for us. And it pays off for you. We're convinced that Yourdon Seminars are the very best seminars being offered to EDP professionals today. Bar none. We've heard that time and time again from the most reliable source in the world. The people who've already taken them.

And now, here's your chance to be one of those people.

Yourdon Seminar Schedule

DATA BASE SERIES

Data Base Structure & Design
June 18-20 Washington, D.C.
June 23-25 Los Angeles

Data Base Concepts For Management
June 26-27 Los Angeles
July 14-15 Washington, D.C.

The Data Base Administrator
July 16-17 Washington, D.C.

Computer Privacy & Security
June 16-17 Washington, D.C.

PROGRAMMING SERIES

Structured Programming
June 19-20 Washington, D.C.

Rational Fortran
June 19-20 New York City

How To Teach Structured Cobol
July 24-25 Washington, D.C.

Structured Design
June 16-18 Washington, D.C.

Structured Design/ Programming Workshop
June 2-6 Columbus, Ohio
July 14-18 Boston

Techniques of Systems Programming
July 14-18 Washington, D.C.

Structured Testing
July 17-18 Chicago

SYSTEMS SERIES

Teleprocessing Systems Design
June 25-27 San Francisco

Systems Performance Evaluation
July 14-15 Washington, D.C.

MANAGEMENT SERIES

The Management & Politics of Structured Programming
July 24-25 Washington, D.C.

EDP Project Management
July 16-18 Washington, D.C.

System Design & Analysis for the EDP User
June 9-11 Washington, D.C.

Standards & Documentation: A Systematic Approach
July 14-17 Washington, D.C.

Managing DP Installations
July 21-23 Washington, D.C.

Yourdon inc.

1133 Avenue of the Americas, Suite 3830, New York, N.Y. 10036
(212) 575-0572

Please send me 56-page book listing Seminars and information about Yourdon inc.

Name_____

Company_____

Address_____

City_____ State_____ Zip_____

Phone_____

We're the people who train the people who train the people.

Consistent labeling, young-look image, warehouse distribution, and computer are all part of the business plan developed by Wil Friedman, who founded Contempo in 1959. He wanted a change from selling used mining machinery in Salt Lake City, and he feels that lack of retail experience was an important factor in the success of the business—if you are inexperienced, you have no bad habits to unlearn.

Looking ahead, without knowing of what failed in the past, Wil Friedman used service bureau computers for several years. Reliable unit control—keeping track of SKUs on order and at each location—was never achieved. The volume and potential for error were too great, and the computer reports were neither on time nor accurate. But the computer was never entirely dropped, and the company was always working to improve methods, which is how Wil Friedman met Jack Hill, who was then selling Sweda point-of-sale recorders but left to start up Retail Oriented Computer Systems (ROCS), a mini system dealership.

While Contempo Casuals is ROCS' only customer so far, ROCS is organized to buy equipment at oem prices and sell turnkey systems to retail business. The installation at Contempo is the result of a lengthy survey and study of minicomputer equipment by Hill and his associates. They selected the equipment, put the configuration together, and wrote the application-oriented programs. ROCS continues on site as facility manager, but this job will gradually diminish.

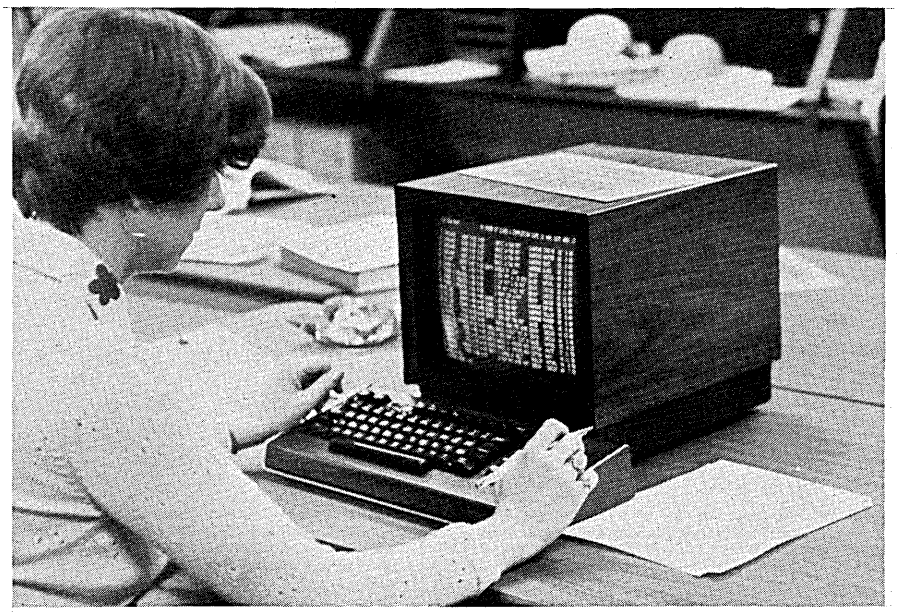
The functions of the computer system parallel the operations of the company. The starting event is the entry of an order on a crt in the buyer's office. This job is performed by a data-entry clerk who works for the buyers, and it is the only job essentially dedicated to the computer system. The buyers' clerk also enters setup information about new vendors.

The next event is the receipt of merchandise. At the receiving dock merchandise is unpacked, and the vendor's shipping papers are collected by the receiving clerk. He calls up the image of the order on his crt, checks to see if the shipment matches the order, and records the actual receiving. From the terminal, he orders a 3-part receiver to be printed on a 21-column printer that sits near the crt. One part is for accounting, one stays with the merchandise, and one goes to the buyer along with a sample garment.

The buyer checks the receiving on her crt, and because of the exceptions, either accepts or rejects the order by entering a code on the terminal.

If the order is accepted, it must be split into lots for the stores. The job is a joint project between a warehouse foreman and the computer. A suggested split is displayed by the computer on still another crt. The foreman either accepts the suggestion or modifies it. When the display is okay, he orders another 21-column printer to print the split. From this point on, the merchandise is located in the stores' inventory records maintained by the computer.

At present, merchandise tickets are prepared from the receiver. In the near future, specially modified 21-column printers will be installed, and the tickets will be printed upon command in parallel with the splitting operation.



Contempo's buyer checks the merchandise received with the record of the order and either accepts or rejects the shipment by entering a single code at her terminal.

The sales at the stores are rung up on Sweda point-of-sale recorders. These devices have considerable logic to validate the sequence and completeness of the transaction as entered by the sales clerk; they also can reject impossible stock numbers.

Each Sweda stores the retail sales data on a cassette tape. The cassettes are delivered to the warehouse every day, and the details of the retail transactions are read into the computer. The computer prints a night report analysis for the accounting department and, most important, posts the merchandise sales to the stores' inventory records.

The computer prints summary analyses for the buyers of slow sellers and fast sellers. The buyers have available, on crt's located in the buying office, a complete history of any style in detail that traces the item from original order through the split and finally to retail sales and the balance on hand at each store. The buyers are equipped to reorder quickly and to order transfers of merchandise from one store to another.

The computer also makes summary analyses of purchases and profitability by vendor, and of sales of various merchandise classes by store. System functions are now being extended into accounting, starting with accounts payable.

The equipment installed is a Microdata "Reality" system. The hardware consists of a 64KB Microdata processor, 25MB disc, magnetic tape, 660cps printer, and 24 I/O ports that serve 18 crts, four Anadex 21-column printers, and two datasets. The tape is used for file backup. In the near future two more ports will be added to serve the special ticket printers.

The "Reality" system is a hardware-software package that includes a plan for defining and storing data plus a high level language called ENGLISH that handles the retrieving, sequencing, and formatting of report data.

Jack Hill and the ROCS people designed the system at Contempo Casuals and programmed the specific input routines, edits, and output formats. Some of the programs were written in BASIC and some in assembly language, but extensive use has been made of ENGLISH for reports.

Contempo Casuals president Wil Friedman is delighted with his system. Looking back on his experience with service bureaus, he is especially impressed with the ability of the system to produce new reports on demand; in his words, "If it's in there, you can get the information out any damn way you want it."

This impressive quote was recorded

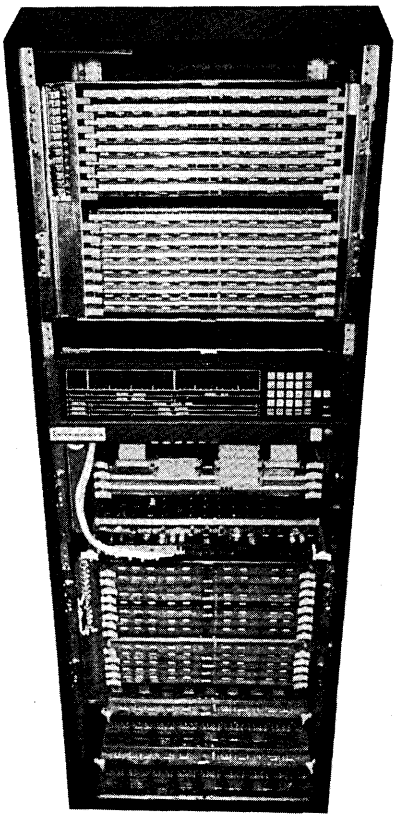
INTRODUCING THE WORLD'S FIRST

MEGA

THE INTERDATA 8/32–UNMATCHED LEVELS OF PERFORMANCE IN A MINICOMPUTER SYSTEM.

MEGAMINI ARCHITECTURE: AN ABUNDANCE OF SHEER POWER.

Interdata's new 8/32 Megamini has performance characteristics found only on large scale computers. Like direct addressing to one million bytes. Full 32-bit hardware with performance enhancers such as dual instruction look-ahead stacks, multiple register sets, interleaved 32-bit memory, and fast floating-point hardware. What our 8/32 Megamini means to you is an unequalled combination of power, flexibility, and reliability in a compact package. All at a price that's fully competitive.



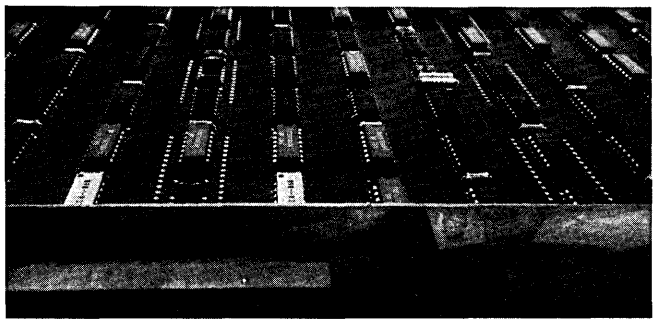
The 8/32 MEGAMINI – with a full Megabyte.

MEGAMINI SOFTWARE: POWERFUL, FLEXIBLE, EASY-TO-USE.

Today's hardware must be designed to ease your software effort. You shouldn't have to spend a lot of expensive programming time trying to figure out how to get around minicomputer hardware limitations. With the 8/32 Megamini you don't – because there are none.

For example. The direct addressing capability of the 8/32 Megamini allows you to build programs and data arrays in any size up to the amount of memory you have – no more 64K limits.

It also means we can give you versatile and powerful software to help lower the cost of building your system. Software with a multi-tasking operating system, OS/32MT, with unique multi-user



Multi-Wire Technology – a key to MEGAMINI performance.

Interdata and Megamini are trademarks of Interdata, Inc.

MINI.™

COMPARE: THE INTERDATA 8/32 MEGAMINI VS. THE-LESS-THAN-MEGAMINI COMPETITION.

	INTERDATA 8/32	XEROX 550	IBM 370/158	DEC 11/70	DG Eclipse
WORD LENGTH	32 bits	32 bits	32 bits	16 bits	16 bits
INSTRUCTION TIMES (Register to Memory)					
Integer Add	1.25	1.8	.9	1.8	2.5
Multiply	3.54	6.2	2.0	3.9	8.8
Divide	5.8	14.4	9.9	8.3	11.2
Floating Point Add	2.3	6.1	2.4	8.25	5.5
Multiply	3.0	9.1	2.3	11.25	7.2
Divide	5.35	23.3	8.9	12.25	7.9
HARDWARE I/O	Yes	Yes	Yes	No	No
MAX. DMA RATE/SECOND	6MB	4MB	6.7MB	4MB	2MB
DIRECT ADDRESSING RANGE	1MB	1MB	16MB	64KB	64KB
GENERAL PURPOSE REGISTERS	2 stacks 16 each*	4 stacks 16 each	1 stack 16 each	2 stacks 8 each	1 stack 4 each
PRICING (Basic Configuration)					
CPU + 128KB Memory	$51,900	$128,700	N/A	$54,600	$32,500
CPU + 1048KB Memory	$179,400	$478,700	$1,905,700	$163,800	N/A

*(6 Additional Stacks Optional)

All prices shown are U.S. list only.

program development capabilities. Software that has an optimizing macro assembler, MACRO CAL. And software with a sophisticated telecommunications access package, ITAM, that allows you to treat remote communications terminals and computers as if they were simply local devices.

Now, with all of this available, you can concentrate your efforts on the real problem at hand – your application.

THE MEGAMINI: NOT JUST A COMPUTER – BUT A SYSTEM.

The Interdata 8/32 Megamini gives you a full range of peripherals, software and advanced features to choose from in tailoring your system: 166MB disc systems, fast line printers, 1600 BPI tapes and graphic CRT's. Plus software modules like FORTRAN, BASIC, EDIT, AIDS and many more.

FOR MORE MEGADATA, CLIP AND MAIL.

Interdata, Inc., Oceanport, N.J. 07757

☐ All that power sounds marvelous. Send me more information on the Interdata 8/32 Megamini.

☐ You may have hit on the solution to my megaproblem. Have a representative call me.

Name_____ Title_____

Company_____

Address_____

City_____ State____ Zip_____

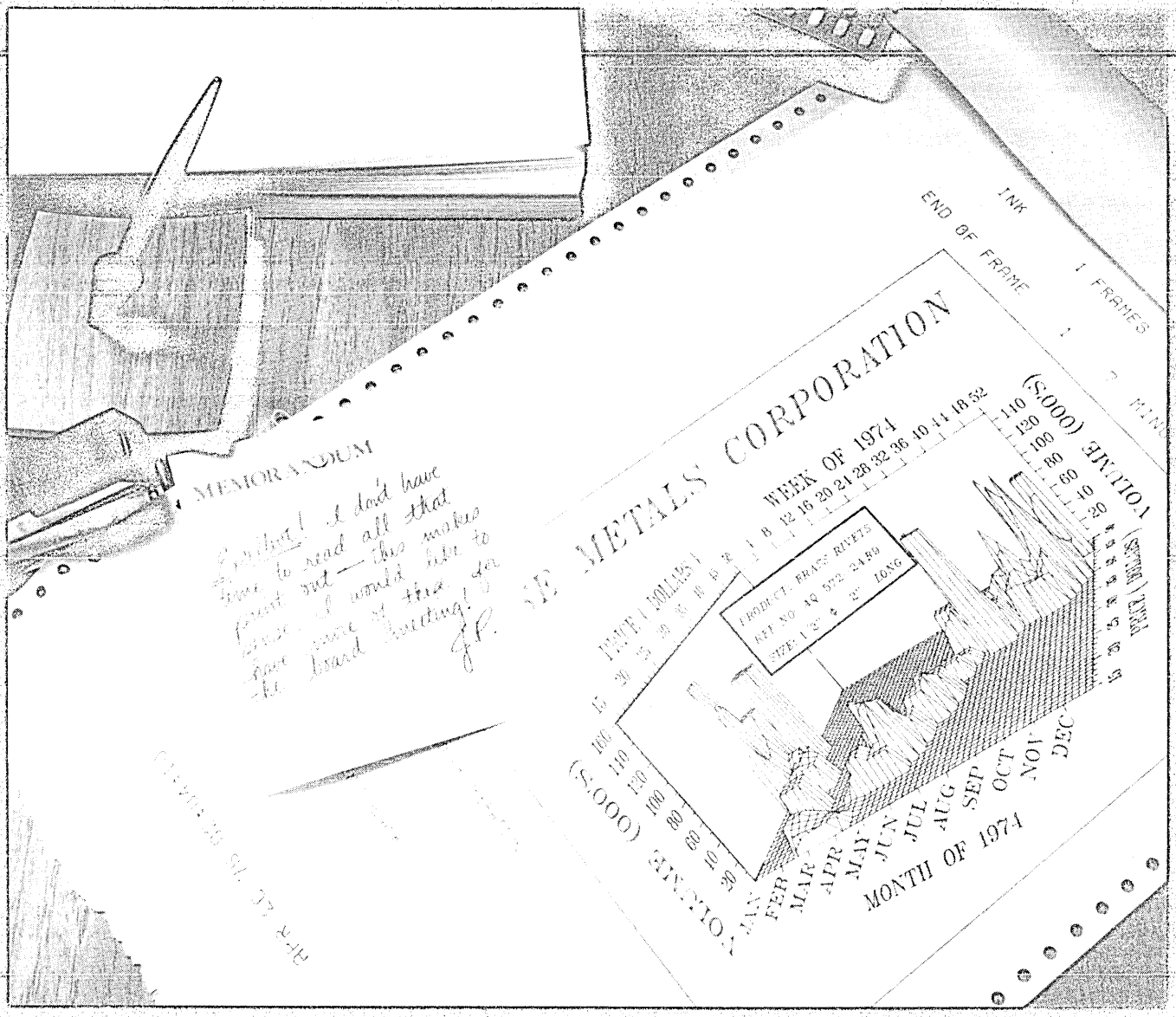
Telephone_____

INTERDATA®

Subsidiary of Perkin-Elmer

Oceanport, N.J. 07757. (201) 229-4040 Data 6/75

DISSPLA Software Pays For Itself In 6 To 12 Months.



Then It Pays For A Lot Of Other Things.

DISSPLA

Display Integrated Software System and Plotting LAnguage

A proprietary software product of ISSCO

For more information call Sunny Harris (714) 565-8098 or (714) 272-5606
Or write

ISSCO

Integrated Software Systems Corporation

P.O. Box 9906, San Diego, California 92109

In Europe contact: Repko bv, van Blankenburgstraat 58, The Hague, Holland, Telephone 070-608425

Machine and Device Independent Graphics

CIRCLE 22 ON READER CARD

in Jack Hill's office. Friedman had come in with two reports about vendors that he wanted combined. One was a complete analysis of intra-company relationships of divisions of the same company that sell to Contempo Casuals under different names; the other was a list of payment terms. The combination of the two reports was accomplished by dropping the four right-hand columns on the intra-company analysis.

Wil Friedman's whole attitude was one of absolute assurance that Jack Hill would be able to revise the report specifications and produce the new report within a few minutes. It was as if he had made some changes to a piece of correspondence and was waiting while his secretary retyped the letter.

SAFARILAND

Safariland is a manufacturer of leather items for policemen and sportsmen. The company makes gun holsters, belts with bullet loops, and cases for handcuffs; and it acts as distributor for related specialty items like heavy-duty flashlights. Sales in 1974 were about $3 million, and the business is growing rapidly. The company installed a Singer System Ten in early 1974 to replace nothing more complicated than ballpoint pens and preprinted forms.

There are about 4,000 possible varieties of holsters. An item is defined by its basic style, the gun to be held, color and finish, and left/right hand. For computer purposes, the holsters are not assigned unique stock numbers; instead, the item ordered is defined with a series of descriptive codes that refer to the variables in the product. Each holster is shrunk-fit to a model of the gun specified in the purchase order, but holsters can be brought part way through the manufacturing cycle and held as work in process just prior to the shrink fit.

The computer system records new orders (about 500 lines per day), prints invoices, maintains accounts receivable, and keeps track of the inventory of finished goods. The orders are in house for about two weeks on the average, and the computer reports the open orders as obligations against inventory.

The equipment consists of a Singer 30KB processor, 8MB disc, 2 crt's, and a 110 lpm printer. The hardware cost $39,500 and the software $8,500. The package for order-entry, billing, accounts receivable, and inventory is the only one now installed, but Safariland also bought the packages for accounts payable, general ledger, and payroll. Safariland chose System Ten because Singer offered direct crt data entry and inquiry access (no punched cards), well documented application packages, and a relatively modest price.

Since the System Ten is the first data processing system installed at Safariland, the company was able to develop its new mechanized procedures with the Singer packages in mind. But the system certainly did not install itself. About 10 weeks elapsed from delivery to going on the air. The Singer systems representative, Helen Uitermark, spent about six weeks on the job.

After installation, Uitermark was hired as director of administration, reporting to the general manager. Her job involves all kinds of systems, accounting, and office services as well as the computer. She is the one who fixes problems with the computer and makes minor modifications in the programs, but she spends only a small proportion of time on data processing.

Two operators enter all data. While the cash receipts and customer orders come precoded, the operators do validate the coding as part of the entry procedures. Their jobs are not comparable to typical keypunch operators.

Safariland is halfway between a conventional data processing user and one of the minisystem users that dispense with a formal dp organization. It seems likely that in the future the computer will be further integrated into the general office procedures, functionally and organizationally.

KIENER COMPANY

The Kiener Co. is a plumbing distributor that carries about 4,000 inventory items and sells to about 700 wholesalers in the Western states. Kiener handles about 20 lines of products which don't compete with each other. Other distributors have corresponding lines from other manufacturers. Since many items can be ordered from specifications, the distributors must compete on the basis of service—which means having stock on hand and available to the customers. Finite space and the cost of money limit the size of the inventory, but customers soon go elsewhere if their orders cannot be filled.

The need for accurate inventory control created the interest in computers, but any system for inventory also had to prepare shipping tickets, invoices, maintain accounts receivable ledgers, and produce a sales journal for accounting control. The billing volume, 300-500 lines per day, is not large in comparison to the size of the inventory, but the usual complications of price selection must be solved to produce invoices. And item identifications are a problem—particularly for keypunching—since they are often common industry terms that are nonnumeric and follow no consistent format from one product line to another.

Kiener stores inventory for its manufacturers as well as on its account, and the company also acts as commissioned sales representative for some items. While its size cannot be measured exactly, the equivalent sales volume is just under $10 million. The size of the office force does not reflect the dollar activity. There are only five administrative or clerical employees. In investigating alternatives to manual billing and manual posting of inventory records, one constraint was the desire not to add staff professionals to the payroll.

In 1971 Kiener tried to use large scale Burroughs equipment via terminal. The service was offered by a group of undercapitalized refugees from RCA who formed their own company and set up a B5500 to operate on-line and remote-batch business systems. There were too few people around to solve problems with the phone lines and software, and Kiener abandoned the system about the time the group's company folded. But when things worked, the basic strategy was affirmed. An on-line computer system that could be purchased at reasonable cost would solve the inventory-control problem and produce accurate billings, assuming more reliable operation.

Joe Cabral, the computer analyst that had served Kiener, moved on to Qantel Corp. where he worked for a year on the installation of a system in Armstrong Pacific, a multi-branch electrical equipment distributor.

During late 1972, Cabral helped sell Qantel equipment to Kiener. With the advantage of being able to start over with a system that had once been operational on the B5500, and with the techniques borrowed from Armstrong Pacific, only about 10 man-weeks were required to install a Qantel system at Kiener.

The system went on the air in May 1973. The equipment consists of a 12KB processor, 7.6MB disc, small tape drive, console typewriter, 100 lpm printer, and crt. Inventory and customer master records and open orders are stored on disc. The tape is used for system backup and for a journal of transactions between file dumps. The system cost approximately $45,000 including $6,000 for software which was explicitly defined and priced in the purchase contract.

There are no dp people employed. The billing clerk is the computer operator; she wrote an elegant operating manual, but her backup is the office manager. While the general manager, the office manager, and the billing

clerk all went to programming school, this was an exercise in self-improvement. All programs in use are part of the purchased software. If program modifications or extensions are ever implemented, Kiener will buy them from Joe Cabral, who has since left Qantel and is now free-lancing.

Some orders are billed on the computer from handwritten shipping tickets, and some are recorded on the computer prior to picking. When the warehouse picks items for shipment from a computer-printed form, the results—shipped, cancelled, or back-ordered—are entered in a separate billing operation where the image of the order is called to the crt for updating. If everything on an order is shipped, only one key entry is required to invoice the order. The procedure requires very little time.

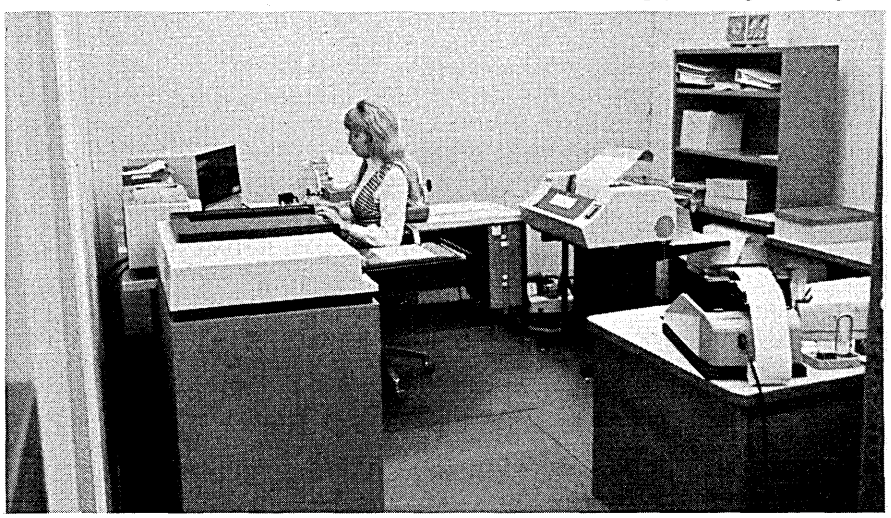
Entering new orders, either to produce picking tickets or completed invoices, involves calling up the customer master record for each order and the inventory master record for each line. The forms are displayed, and the billing clerk verifies her own work after each order or invoice page is completed and before it is temporarily loaded onto disc. The work proceeds at about 400 lines per hour counting verification and the separate step of printing forms from data loaded onto disc.

At the end of billing for a day, the system prints an invoice register and posts accounts receivable. The invoice register is both a management report and an accounting record. It includes the cost and gross profit of each invoice and all totals necessary for the sales journal entry.

Cash is posted to accounts receivable on a daily basis. Open items in each customer ledger are called to the crt and payments are applied directly to them. Statements and an open-item aging are produced two or three days after the end of each month. Since many wholesalers pay by statement, the computer system has improved cash flow by cutting out seven to ten extra days that were formerly required to prepare statements.

The inventory records are posted while warehouse picking tickets and/or billings are being entered. Receipts into the warehouse are batched and entered once a day. A complete inventory list is prepared weekly, but accurate inventory balances are available upon inquiry any time on the crt. The manual card file has been effectively mechanized.

The computer is in use for only about three hours a day. Having idle time does not imply having too large a computer since the speed of the equipment is nicely matched to the operator's working pace. A slower and cheaper computer, if available, might waste the time of a key employee. (Note the criteria emphasized for machine selection.) The system has eliminated one clerical position, thereby paying for itself. Further reductions from the small staff at Kiener are hardly likely.



Keiner's whole dp department sits in one corner of the office; the woman shown entering orders represents 20% of the office force and the entire dp staff.

The system as installed still works today. There has been neither additional investment nor functional modification since May 1973. George Murton Jr., the general manager, knew what he wanted and he bought it. He looks upon the system as he would a bookkeeping machine. There is no concern about using the capacity of equipment; system extensions can be considered when there is time for study and when the payoff is obvious.

The installation may not be ideal from the viewpoint of the data processing professional, but in a larger company the functions performed at Kiener would be proudly advertised as integrated data processing. The system certainly fulfills the objectives set at Kiener, and by any business-oriented criteria the system is outstandingly successful.

COMMUNICATION MFG. CO.

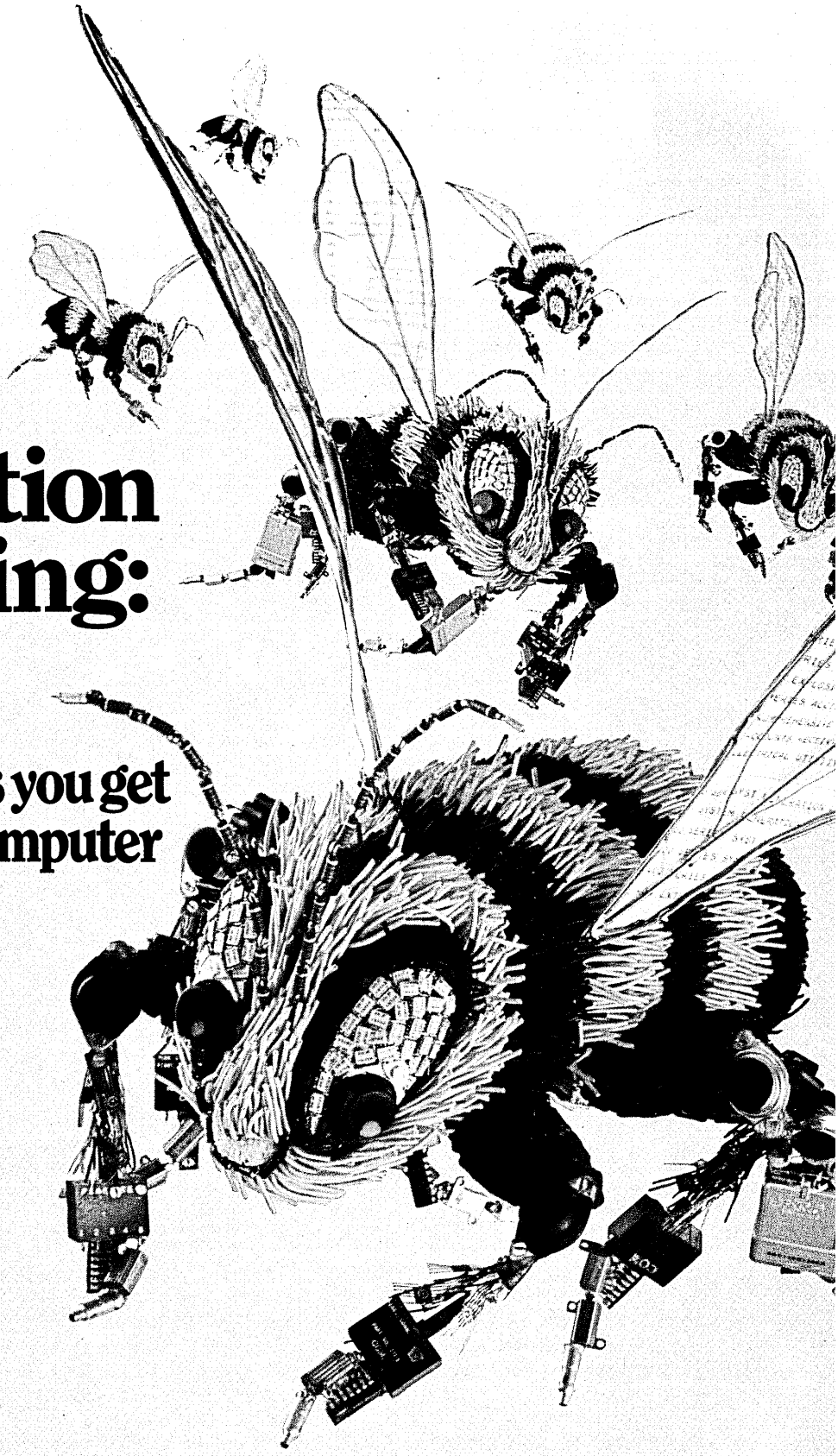
Communication Mfg. Co. supplies tools and test equipment to the telephone industry. It was founded in 1958 and now has an annual sales volume of about $6 million. The company offers about 800 different products including simple tools and canvas carrying cases, voice frequency repeaters, and electronic test equipment that incorporates digital logic. Unit prices range from $2 to $25,000.

The company employs many ex-telephone company people who can think up products that would have been useful in their old jobs. The company picks up on ideas and does its own development with its own R&D budget. Some of the items in the line are simple and were inexpensive to bring out, but the newer digital test equipment required substantial investment. Management expects that future company expansion will come from the expensive technical products that are relatively complicated to design and to build. The company employs 30 engineers compared to only 60 production people.

In the early '70s, CMC experienced a surge of growth and began to run into problems of production planning and control. Production cycles lengthened, and inventories of raw material and finished goods grew rapidly. The decision was made to install a "management information system" (words used at CMC) to solve the problems, and someone from outside the computer business was given the implementation responsibility.

The computer operations manager at CMC is Wendell Boucher, whose previous experience with computers was as an engineer and manager using mostly GE time-sharing. He was the one to recommend that a computer be installed.

From the start the conception of the problem was generalized—the need for information to coordinate various departments of the company during the full cycle of planning, production, and shipment. Boucher considered time-sharing an absolute requirement and the original design assumed crt's or hardcopy terminals in engineering, purchasing, material control, and the production stock room. He dismissed an interim batch system as a complete waste of time and effort. The overall



Transaction Processing:

One of the ways Honeywell helps you get data into your computer faster, store it more efficiently, and make it easier to get to.

...A major trend in interactive processing

Interactive processing—putting those who need accurate and timely data in direct contact with the computer—has grown rapidly in recent years. So have the benefits.

- People who are far away from the central information system have direct access to its processing power.
- Managers receive more timely and more accurate data for making decisions.
- Employees can easily and quickly interface with the computer and its stored data in their day-to-day work.

There are three modes of interactive processing: remote job entry, time sharing and transaction processing. We've been describing them for years as the "interactive dimensions" of Honeywell's General Comprehensive Operating Supervisor (GCOS).

Honeywell's GCOS makes it possible to use any or all of these dimensions concurrently.

Of the three, transaction processing is the newest. Today it's a proven form of processing that's easy to implement in virtually any information processing environment.

Now, more and more computer users are turning to transaction processing to help cut costs and increase productivity. As a result, transaction processing is rapidly becoming a primary processing mode.

Non-technical people can use transaction processing.

Through simple-to-use terminals that don't require computer experience, employees access a remote information processor and data base. Transaction processing offers the information each person needs to carry out a specific activity. And in turn, the information entered through the terminal is used to keep the data base current.

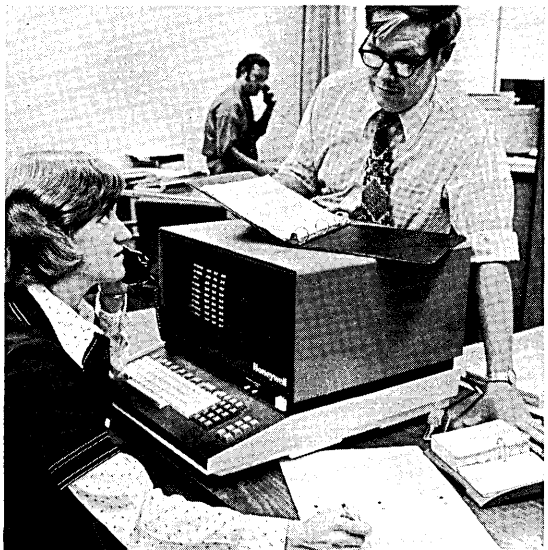
The desired result is increased productivity. The person at the terminal has the information to do a better job... to close a sale, to provide a service, to speed up a routine job and reduce paperwork. And there is increased productivity in data processing as well. Many input preparation and file updating steps may be eliminated.

Transaction processing is where information network technology is headed. In the next ten years, it will make one of the most significant contributions to business efficiency.

But since today is no time to be experimenting with untried techniques, you'll be glad to learn that Honeywell has had years of experience in all the areas that make up a transaction processing capability.

A bank teller in a remote branch keys in a customer deposit and immediately updates the customer's account in the central information file.

A sales administrator enters an order into a terminal for a salesman, and, while the customer is waiting, the computer confirms inventory, checks credit, orders shipment, and initiates the billing process, all in a matter of seconds.



A purchasing agent, meeting with his buyers, queries a computer via a terminal for up-to-the-minute status of pending orders to help arrive at an optimum quantity for a buying decision.

A Working System

The nucleus of Honeywell's transaction processing systems is the executive and message management software.

One such system is Honeywell's Transaction Driven System (TDS). In combination with other interactive processing dimensions, TDS is being used in many businesses today.

When someone needs information, he asks for it at the terminal. TDS manages the request—sending it through the processing, data base access, and communications steps—and responds with the information.

To do all this efficiently takes an integrated software system. In doing the job, TDS interfaces with other key GCOS software components:

- Honeywell's GCOS executive software controls the operation of TDS within a multidimensional environment. It takes advantage of the power of Honeywell's Series 60 Level 66 large scale systems, allowing transaction processing to go ahead concurrently with local batch and other processing.
- The Network Processing Supervisor (NPS) residing in a DATANET Front-End Network Processor handles all the communication line disciplines between the terminal and the information processor. NPS allows configurations ranging from a few to more than a thousand terminals connected at one time with up to four network processors.
- Integrated Data Store (I-D-S) is Honeywell's advanced data base management system. It is used as a subset within TDS to provide immediate access to the data base, while providing data protection.

How TDS Works

TDS prestores processing routines and calls them out when a transaction arrives.

These routines (called Transaction Processing Routines, or TPRs) can be written and modified by a programmer, using I-D-S COBOL and simple TDS statements. TPRs can be shared between transactions and thereby provide more effective use of memory.

A transaction begins when data is received in the form of an input message. TDS activates the appropriate routine on the basis of a key contained within the data.

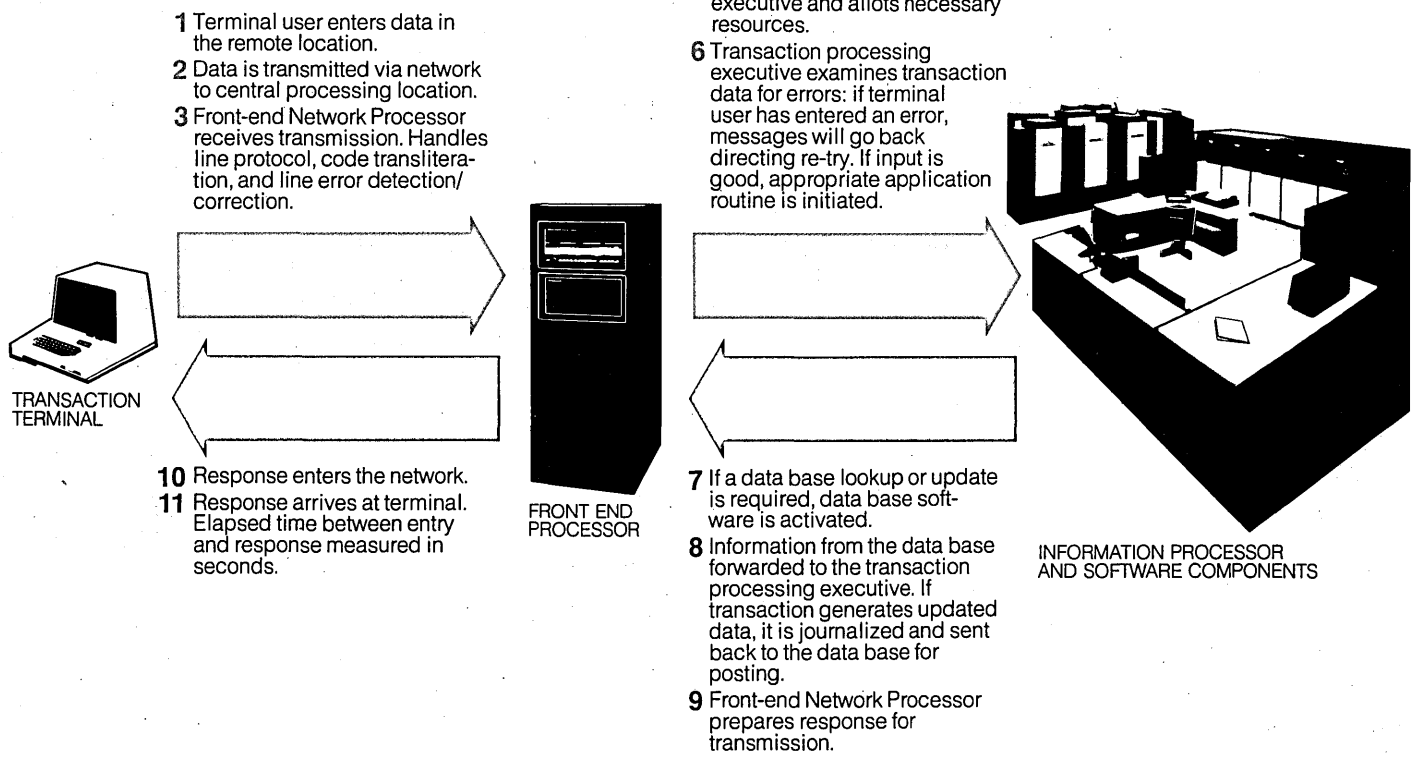
The TPR carries out calculations or retrievals or updates, and responds with the information requested.

Concurrent Access

One consideration in a transaction processing system is how to manage different users accessing the same data base.

TDS solves this with a lock-out at the record level. This means that only one user can access a record at one time, but the rest of the file is accessible to other users so that the data base can serve many users at once.

Step-by-step activities in transaction processing.



Integrity

Honeywell's transaction processing system has many features to maintain integritv.

The first level of error detection takes place at the terminal. If the operator sees that an error has been entered, it can be corrected immediately, before transmission.

If a faulty transmission occurs, because of a line problem or any mechanical reason, NPS automatically retries the transmission.

When TDS receives a transmission from NPS, it checks the data for validity. If there is an error—such as an invalid key word—TDS will reply with error messages until the input is corrected.

TDS also journalizes all input on a separate file. This way, TDS can restart any transaction that encounters difficulty, without having the message entered again.

For rapid recovery of the data base, updating data from transactions is also journalized.

Availability

A system that's there when it's needed is essential to a business that depends on the transaction processing dimension for its daily operation. TDS has proven reliability in all key elements of an interactive system: the operating system, the network software, and data base management software.

The availability of Honeywell's Level 66 and DATANET hardware—the efficient use of network resources provided by GCOS, NPS, and TDS—the extensive automatic recovery and restart features of TDS—all help to make sure that processing is available.

These capabilities make information processing power available to people unfamiliar with computers. Through simple-to-use terminals, these people are now able to initiate processing and data base retrieval, and the activities are performed online, at a rate fast enough to satisfy the needs of any business environment.

CIRCLE 6 ON READER CARD

The Other Computer Company: **Honeywell**

Honeywell Information Systems
200 Smith Street (MS 061), Waltham, Massachusetts 02154

I'm interested in Transaction Processing. Tell me more.

Name: _____

Title: _____

Company: _____

Address: _____

City: _____ State: _____

Zip: _____ Phone: _____

computer system design is intended to serve the company now and into the future.

The system to be installed had to support time-sharing and be expandable. There was no room in the company for a data processing operations department. It also had to be general purpose—for engineering calculations and for data processing. The company was spending about $2,000 per month on technical calculations, and this cost had to be absorbed by the new computer. The vendor had to be successful and stable. The operating system and programming languages had to be flexible, but there was no need for application packages. These were the criteria —along with reasonable cost.

After a survey of about three weeks, Boucher chose Digital Equipment Corp. and the PDP-11. The only problem was availability, but in May 1973 DEC had a cancellation and managed to deliver a PDP-11/45 in four months. The configuration consists of a 96KB processor, 7.5MB disc, 165 cps printer, magnetic tape, paper tape reader and punch, five crt's, three hardcopy terminals, and an optical mark-sense card reader. Not all of the gear is supplied by DEC. The total purchase cost of the equipment plus some of the major supplies is $112,000.

The magnetic tape is used to dump the files every night, and it serves as a link to an IBM 360 next door that prints long reports and mailing lists at modest cost. The paper tape equipment serves as a link to wire-wrap machinery; a very successful system was written by a CMC engineer to produce the paper tape control for the wire-wrap machines. The optical mark-card reader reads production reports made out directly by the production people.

The mailing list and wire-wrap applications are more or less standalone applications. Future projects will relate to the main line of the information system: order entry, invoicing, accounts receivable, and accounts payable. Some future extensions will depend on the installation of additional disc.

Several modules of the overall management information system are now working: inventory definition, inventory transactions, work in process, purchase orders, and product structure. Not all files are complete; in particular, the product structure file will require many months before all data is under control of the computer. Along with the implementation of these new computer systems, many basic company policies and procedures had to be changed; for instance, the definition of product needed to be changed and the stock numbering system had to be revised.

Wendell Boucher is responsible for the basic strategy, system design, and some part of the programming. He has a full-time assistant with computer experience with CDC, a user, and Basic IV in that order. The original plan was to use FORTRAN for some batch mode processing, but all programming to date has been in DEC's BASIC-Plus.

The modules installed thus far work successfully without any central operational control by the dp department. The people in purchasing are responsible for the purchase order data in the system. The people in material control are responsible for inventory transactions. And the people in engineering are learning to be responsible for the item descriptions and the product structure file. Boucher and his assistant define the formats of the files, set the rules on who can do what to the files, and guide the overall security of the system.

The engineers at Communication Manufacturing are learning to control the engineering data file. The department's secretary enters product-structure records onto the file as part of a standard product development cycle.

PHOTO ENGINEERING CORPORATION

Photo Engineering Corp. provides photographic services to hospitals located all over the United States and in Puerto Rico, Guam, and several foreign countries. The business includes developing clinical photographs and identification photos of hospital employees and the preparation of training films, but its major revenues are derived from pictures of newborn babies.

A mother signs up for pictures while in the maternity ward. The various sizes are essentially for the piano, wallet, or locket. The nurse in charge of the newborn nursery wheels the baby under the camera (fixed to a mobile stand and prefocused) and snaps four or five pictures. When the roll is finished, the cartridge film pack is sent to California for processing. The company has no employees working at any hospital site.

Photo Engineering uses a Basic IV computer to keep track of orders in production, price orders, print return-payment forms, and addresses on shipping envelopes, maintain accounts receivable, print statements to hospitals and commission checks, and keep track of cameras. They also use the computer for accounts payable, payroll, and general ledger.

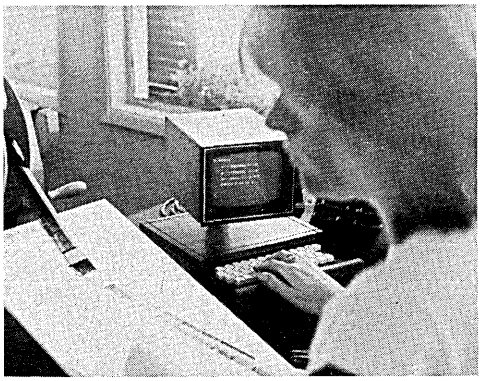
Considering only baby pictures, more than 1,000 orders are processed daily. The data for each order includes the name and address, the assortment of sizes ordered, the hospital, and the production-register number assigned to the film cartridge. Clerks record about 50 characters per order on a crt at a rate of about 125 orders per hour, each. The computer makes a number of edit checks during entry, prices the order, and calculates the postage.

Each strip of developed negatives is examined against a light screen. During this process, the quality control clerk calls the orders for the strip to a crt, using the production-register number as the key. The clerk verifies that the pictures belong to the orders and selects the best negative for each order. She also records any problems with the film strip that might be corrected with a camera exchange or by retraining hospital personnel.

The fact that a negative has been selected to fill an order is recorded by the clerk at the light screen. The selection code signals the computer to print the shipping envelopes, in a sequence that will match the prints as they are released from production. The hand-

stuffing of the prints into the envelopes works like a collating process.

When the payments are received from the post office, about two-thirds include the return-payment document that was printed by computer as part of the shipping envelope. Most other payments can be identified by name or at least hospital and city. The clerk who posts the payments, using another crt, uses whatever record key is available—register number, name, or dollars. The computer routines for searching by name and/or hospital are very well developed. In the month-end run after the posting of payments, the statements are printed, the commission



A quality control clerk at Photo Engineering matches negatives with customer orders displayed on a crt. She selects the best negative and records her selection as part of a computer stored instruction to the production department.

check is printed, and the record of the paid order is purged.

The company tried a service bureau for the receivables and statements, but they were never happy with the delays in the processing and the reprocessing of errors. The next step was an electronic bookkeeping machine that suffered from excessive downtime. When the volume outgrew one bookkeeping machine, the decision was made to avoid a second bookkeeping machine and to look for a new method of processing.

While one might expect photo developing to be highly mechanized, the integration of the data processing into the steps of production and mailing is every man's dream of a computer gone right! Frederic Arnold, who with his brother Robert Arnold founded the company 17 years ago, traces the success of the computer to the gradual evolution of computer systems, to good luck, and to Robert's son Dana—not necessarily in that order.

In 1970 Dana Arnold graduated from UCLA and went to work for the company on a full-time basis. He had no direct experience with computers, but he did know Photo Engineering from years of part-time work in the production departments.

In 1972 Dana made a four-month survey of computer equipment that included Basic IV because of its radio and billboard advertisements. After some trouble finding the telephone number, he visited the sales offices, saw crt entry, and heard a price that was in the right range.

The Arnolds did some research on Basic IV and discovered the company had been in business for about eight months. They were referred to an installed customer, and this reference was terrible—a long report of delays and arguments. But they were quoted an attractive price, $28,000 for hardware plus $4,000 for software, and they thought that they could do a better job of defining their problem than the reference installation. The plan for processing as presented by Basic IV seemed right for Photo Engineering.

Basic IV nearly blew the order with the low original bid that later was revised up to $38,000 for hardware plus $5,000 for software. The Arnolds were conscious of the dangers of a low-ball first price, but they counted the original quote as an honest mistake, ordered a Basic IV, and stayed with their decision.

The equipment was delivered in December 1972, and the first statements were printed in January 1973. There were lots of problems, but the order-tracking and accounts receivable systems have been successfully rewritten over the past two years. The packages for accounts payable and payroll were first used more or less as delivered, but these have also been modified and patched over the past two years. The revisions of Basic IV software have been installed as released; these progressively improved the efficiency of the terminals. Dana Arnold gives full marks to Basic IV for improvements in general software and for specific support to Photo Engineering.

Most of the changes in applications programs were made by Dana Arnold, who turned out to be a natural programmer. This ex-history major is now in full charge of matters relating to the computer and office procedures. He is now training a very recent college graduate to take over the details of programming. Continuity of systems is probably wrapped up in Dana. But since he is an owner's son, the risk is minimal.

Many of the people working in the office are part-time employees and full-time students at a nearby community college. They are delighted with their introduction to a business office. The jobs are fun, entering and recalling data on crt's, and the atmosphere is almost like college, complete with patio for lunch. The computer has surely paid for itself handsomely in reduced payrolls, and it provides an extra dividend in the form of a happy office.

The processing load is heavy. Each of the orders processed creates at least three transactions: entering the order, screening the film, and posting payment. Other kinds of orders have their own processing routines. Since January 1973, the company's volume has doubled, and the computer systems have flexibly expanded to keep pace. The Arnolds are all very pleased with their computer system.

While many changes have been made in programs to improve efficiency, the equipment installed has more than doubled. The company now has one of the largest Basic IV installations in the Los Angeles area. (The equipment consists of a 64KB processor, 12.6MB disc, four standard crt's, two executive crt's, 165cps printer, and 200 lpm printer. The configuration would cost about $112,000 at current prices.)

According to a company spokesman at Basic IV, an average installation includes less than $45,000 in hardware. And their policies regarding software have changed greatly since Photo Engineering paid $5,000 for packages more or less tailored to the site. Software now costs from $5,000 to $12,000 depending on the number of packages purchased. They are all supposed to be usable as is, but the order-entry and billing package always requires some tailoring, and Basic IV recommends selected software houses in each city to do this work at fees set by agreement between the customer and the software house. □

Presently an independent consultant working in Los Angeles, Mr. Marienthal began working in data processing in 1956 on the Univac I. He has worked for ElectroData Corp., with John Diebold, Inc. in both New York and London, and for 10 years was the manager of dp consulting in the Los Angeles office of Peat, Marwick, Mitchell & Co. He's been associated with Datamation for eight years.

OUR SHORT DROPS COULD BE A WHOLE LOT CHEAPER THAN YOUR LONG HAULS.

If you're thinking of expanding your communications network, then a Cable & Wireless leased circuit system is what you need. If you're already running a leased circuit there's more than a chance that if you let us look it over, we could make it a lot more cost-effective.

And, if you're a company whose major interests are in the Far East or the Middle East we could *certainly* save you money.

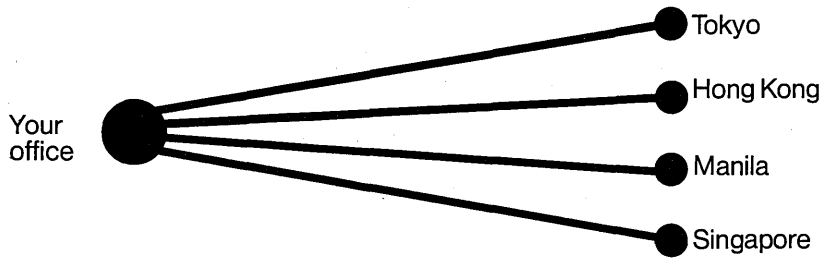
Cable & Wireless have the computer-switching centres which can pick up your messages and transmit them more cheaply.

Our switching centre in Hong Kong, for instance, means that your traffic can be passed through there and routed on by a 'short drop' to, say, Tokyo and Manila at a tremendous saving in cost against a 'long-haul' system direct from your head office.

Similarly, our switching centre in Bahrain can cut your costs in the Middle East.

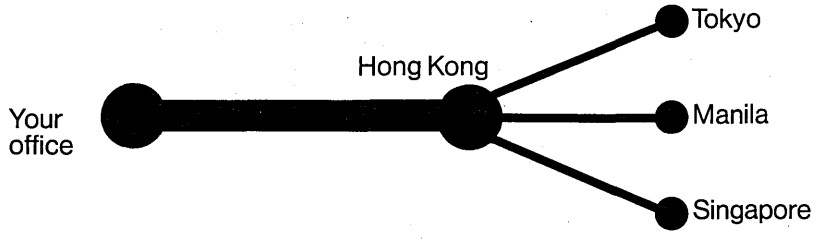
But there's a lot more to it than that, and we'd like to explain it to you.

If you think you'd like to listen, contact us at the address below. We'll send you literature, or have someone call.



THE LONG HAUL.

This system could be costing you much more than it need!



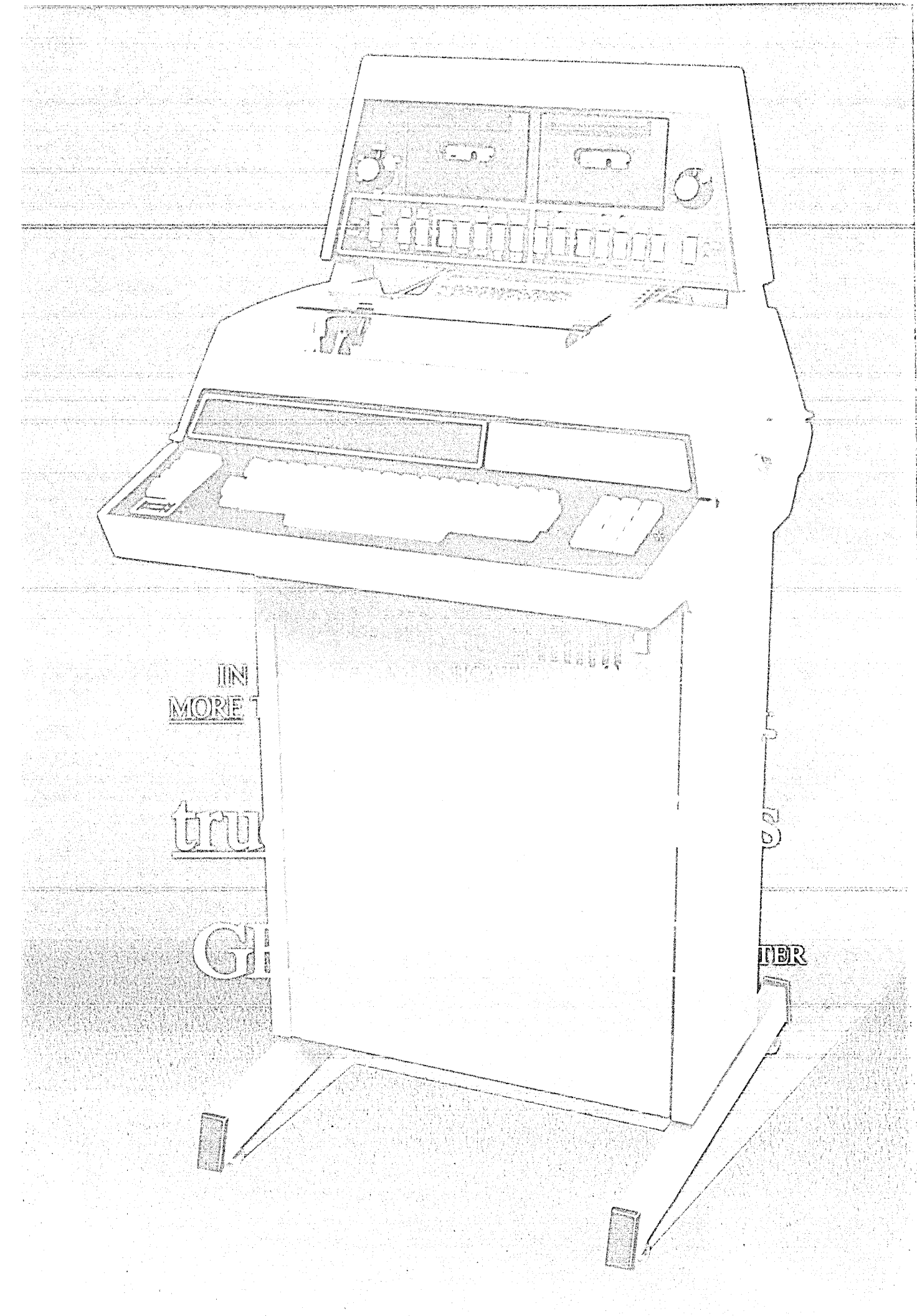
THE SHORT DROP.

A Cable & Wireless leased circuit using short drops like this could cost you much less than you think!

CABLE & WIRELESS

Keeps you in touch with the world.

Cable & Wireless, International Commercial Dept., Mercury House, Theobalds Road, London WC1X 8RX. Tel: 01-242 4433. Telex: 23181.



TermiNet 30 printers — the most powerful and versatile 30 CPS teleprinters for the money available today

- **Over 85 Strappable Functions** — Offers wide range flexibility. Plug replaceable with Teletype 33 and TermiNet 300 printer at selectable speed. Provides compatibility with your protocol and interfacing requirements.
- **Interfaces** — 20/60 milliamp current, RS 232C, EIA hardwired, closed loop serial and closed loop parallel with READY, BUSY loop.
- **Internal Modems** — 300 Baud Originate Only or Auto Answer, 1200 Baud manual or Auto Answer, and Reverse Channel supervision.
- **External Modems** — GE acoustic couplers, 103, 113A, and 202 modems with full data set control.
- **Unattended Operation** — Permits after-hour operation for lower line costs and increased equipment utilization. Status Feedback assures output data is actually printed.
- **Human Engineering Features Like:**
  - **Rear Loading Paper** — Allows complete freedom for operator's feet (unlike front loading paper).
  - **Status Lights** — READY CONDITION, INTERRUPT, PAPER OUT, MOTOR ON, and POWER ON.
  - **Automatic Carriage Return with Line Feed Switch** — Saves unnecessary keystrokes.
  - **Adjustable End-of-Line Warning** — Pre-positional which self-rings automatically to allow various paper widths.
  - **Print Position Indicator** — Tells you exactly where the next character will be printed.
  - **Copy Holder, Telephone Shelf and Forms Accumulation Shelves** — Adds convenience and efficiency.
- **Vertical Format Unit** — Improves throughput, provides vertical tabbing up to 14", and keeps your forms synchronized.
- **Full Parity** — Avoids misleading data by printing a unique (parity) symbol for characters received in error.
- **Ribbon Cartridge** — Fast, simple, and clean with 5 times longer ribbon life.
- **Compact 132 Column Printout** — Gives you 8½" x 11" paper convenience, excellent legibility, 33⅓% paper savings, and you'll eliminate a trip to the reduction duplicator.
- **Numeric Cluster** — Easier and faster entry of numerical data.
- **International Configurations** — 50/60 Hertz voltages for offshore application and includes ECMA keyboards.
- **High Speed 1200 Baud Communication with Line Control**

To be a true communications teleprinter the following cost-saving flexibilities must be included: It's got to be easily adaptable to meet a variety of communication interfacing; It's got to operate unattended; It's got to be human engineered to perform efficiently. And, it should be backed by years of experience in hundreds of communication teleprinter applications and supported by an international service organization.

GE offers you this kind of flexibility. On the right, four new options are further evidence that TermiNet 30 printers are the most powerful and versatile teleprinters for the money available today.

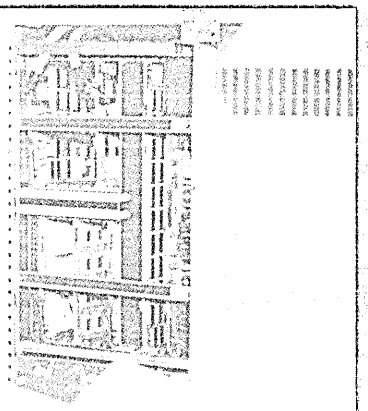
For more information write General Electric Co., Section 794-16, Data Communication Products Dept., Waynesboro, Va. 22980

For your special kind of needs - a special kind of printer

GENERAL ELECTRIC

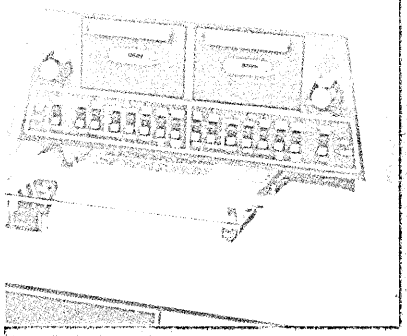
CIRCLE 73 ON READER CARD

Four new powerful options



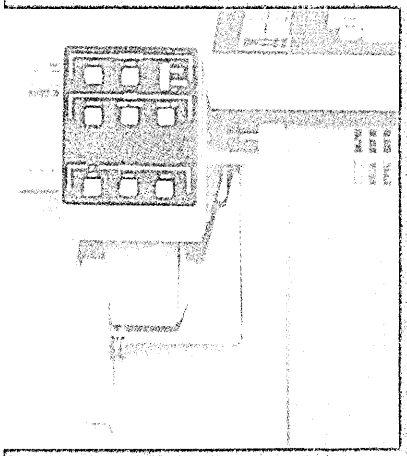
1 TERMINET 9600 COMMUNICATION CONTROLLER

This enhancement adds new power to the TermiNet 30 printer — buffered communication, remote batch, and new generation system applications. Network efficiency is increased through higher speed transmission and reduced line costs, operator effectiveness is improved through editing, prompting and error-free data capability. The TermiNet 9600 Communicator Controller is pre-programmed to emulate other commonly used terminals.



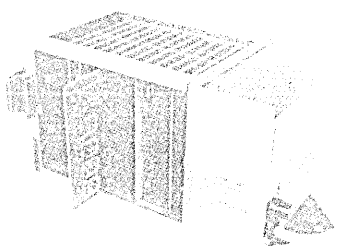
2 MAGNETIC TAPE

This single or dual cassette accessory is bridge-mounted to save space and offer operator convenience. It adds versatility, high-speed data transfer, and off-line processing to the TermiNet 30 printer. Block recording, editing, search mode and transparency mode with transmission and reception speeds up to 1200 baud make it possible to reduce line costs, improve accuracy and increase efficiency.



3 PAPER TAPE

For those applications where paper tape inputs and outputs are required. This paper tape accessory has the same high performance system proven on the TermiNet 300 and 1200 printers.



4 MODEMS

Choice of TWX/DDP Selectable — one machine for TWX plus dial-up, private line time-sharing and general purpose use.
Dual Modem — selectable integral 103 and 202 data sources.
Data Set Switch — Switchable external 103 and 202 data sets.

Special message for 900 about-to-be DEC buyers.

For you 900 or so persons who are planning to buy a DEC system in the next two years, we heartily endorse your judgment. We have, in fact, three DEC system 10's in-house. But if you contact us now, before you close your deal, you have an excellent chance to improve your DEC system cost and operating picture.

The Grumman Printer Controller will tie an IBM 1403 printer into your DEC system in place of the DEC printer. The IBM 1403 has unsurpassed machine reliability and print quality (no wavy printouts). Remember, the 1403 has a proven record in thousands of installations.

Now consider your investment: You can rent, lease or buy both the printer and the controller, which gives you the opportunity to conserve cash and retain system flexibility. In all probability, you will start up your DEC system at significantly lower cost.

There are no hidden tricks in this proposition. Others have already taken advantage of it. For full information, including costs, call your nearest Grumman Data Systems products representative. Or write Joe McDonough, Grumman Data Systems Corporation, 45 Crossways Park Drive, Woodbury, New York 11797, (516) 575-3034.

Grumman Data Systems

New England	Eastern	Southeast	Southwest	Midwest	Western
Robert Barbary	Joe McDonough	Thomas Raymonds	Joe McDonough	Stephen Foley	Joseph Corvi
(617) 545-1345	(516) 575-3034	(703) 569-2448	(516) 575-3034	(216) 656-3150	(213) 322-6990

Products and services that lower the cost of computing.

China's Computer Industry

by Bohdan O. Szuprowicz

Starting with the manufacture of copies of Soviet machines, the Chinese have developed their own designs and entered the third generation.

A third generation Chinese-built computer, which only last August saw its final checkout completed in its Peking manufacturing facility, by mid-October already found its way to the Canton Trade Fair and was showing its capabilities to the world at large. With its octal console lights blinking, the system was programmed to reproduce the well known revolutionary tune of People's Republic of China "The East is Red." Having asserted its unmistakable origins and orientation, the DJS-18 computer also rewarded crowds of intensely curious Chinese admirers with elaborate computer artwork performed on a Chinese-made plotter.

The DJS-18 is the latest in third generation Chinese computers which have been announced and demonstrated to the Western world in an increasingly rapid succession ever since six American scientists visited China in 1972 and reported the existence of models 111, C2, and 709.

Soon after that visit, John K. Kuss, a Canadian computer scientist from Simon Fraser Univ. Computing Center in Vancouver, was touring China on a reciprocal exchange visit and reported seeing the DJS-17 process control and scientific applications computer, which was built in Canton, and also appeared to be of third generation vintage.

About the same time two third generation process control computers in initial production at the Shanghai Radio Factory Number 3 were identified. These are known as the TQ-3 and TQ-11 machines and are rated at 80,000 and 50,000 operations per second respectively.

On January 25, 1974, the Chinese themselves took an unprecedented initiative by announcing in their press the completion of the first Chinese integrated circuit computer, which was designed to operate at 1 million operations per second.

This announcement appeared in a Chinese publication called *Wu-Hsien-Tien* in Peking and identified the new computer as a model DJS-11 with 130K words of 48-bit memory. This relatively large storage is claimed to consist of four core memory units of 32K words each equipped with independent controls.

The DJS-11 is also said to be capable of multiprogramming and has a look-ahead control feature using some of its fast registers. It is replacing analog computers being used for seismic data analysis. It is also being readied as the main system for operation of a 24-hour weather forecasting bureau.

During the Fall 1974 Canton Trade Fair, the DJS-18 made its debut with a full complement of peripherals including tape drives, line printers, terminals, paper tape readers, and even a plotter. (The Chinese politely but firmly refused to show an IC panel for the 18, though, saying that they would have been very happy to but unfortunately no "spare parts" were available for inspection.) Some of the other exhibits in the Electronics Section included semiconductors, components, and even integrated circuits.

The story of the development of the computer industry within China is a much more difficult one to discover than is possible from a few days visit to Canton, Peking, or Shanghai. Nevertheless as a result of continuing research which involves Canadian, European, and Japanese sources, we can piece together a chronology of the developments in the Chinese computer industry.

Starting with Soviet aid

The much professed Chinese objectives of "self-reliance," "relevance," "collectivism," and "distributed competence" result in industrial development policies whereby each geographical and economic area must be capable of its own research, development and production, and the developing Chinese computer industry appears to be no exception. While initial efforts to build computers started at the Univ. of Peking, with the formation of the Inst. of Computational Techniques in 1956, these soon were spread to several major centers. By 1959 additional institutes involved in computer design and use came into being in Shanghai, Shenyang, Tsinan, and Chengtu, and

The Chinese caption indicates that this integrated circuit computer has a speed of 1 million operations per second. Though the model number is not given, this is thought to be the DLS-11, manufactured at the Electronic Instrument Plant of Peking Univ. (The devices just in front of the tape drives are paper tape units.)

computer courses were taught at most of the large universities.

During that period substantial Soviet assistance was available to the Chinese and the first Chinese-built "August 1st" computer, modelled after the Soviet URAL-1, was completed in 1958 in Peking. There are reports that Soviet specialists provided basic design information and the Chinese built their first computer on that basis even before the Soviet URAL-1 was itself completed.

Soviet aid ended in 1960 but the fledgling Chinese computer industry appears not to have been disrupted too much, and continued to put into production its own version of another Soviet computer known as the M-3. This became the DJS-1 and first saw the light of day about 1962, to be followed by still another Soviet design, the BESM-2, which ended up as the DJS-2 in China and went into production in 1963.

By 1964 the Chinese computer designers began to incorporate some semiconductor components in a very much improved version of yet another Soviet computer, the M-20, which represented at that time a major advance of the state of the art in China.

The first fully transistorized second generation computer was also unveiled in 1964 in Peking. Known as the DJS-21, it is believed to still be in use today. During all that time China also built several analog computers; some were even sold abroad and displayed at exhibitions in foreign countries such as the one in Cairo in 1965.

The first time a Chinese computer was officially shown to the Westerners was at the Fall 1968 Canton Trade Fair. The machine was the DJS-7. It was soon followed by DJS-6, a second generation machine capable of 100,000 operations per second. The DJS-6 was exhibited at several Canton Trade Fairs and at a number of foreign exhibitions including one in France and Canada during 1972.

Tsinghua Polytechnic Univ. of Peking, regarded as the MIT of China, played a pioneering role in development of technological innovation. Its automatic control department made analog computers as early as 1959. Subsequently Peking, Shanghai, and Tientsin universities also developed their own computer manufacturing capabilities.

Converting radio factories

According to an assessment of a report of the Joint Economic Committee to the Congress of the United States, most of the digital computers are manufactured in two major plants in Peking. The Peking Wire Communications Equipment Plant employs 5,000 and makes the DJS series of computers among other products. The Radio Plant Number 3 is estimated to have a work force of at least 1,000 and is manufacturing at least one model of a second generation machine.

Other manufacturing factories involved in computer production are the Shanghai Radio Factory Number 3, Peking Inst. of Computing Technology, and Shanghai Computing Research Inst., as well as the electronic plant in Canton which manufactures the DJS-17 process control computers.

The weakest aspect of Chinese computer manufacture, which seems to be a common ailment among many latecomers to this industry, is the lack of viable peripherals and other I/O devices. At present there are no discs in use except for a few units recently sold with a Honeywell Bull HIS 61/60 computer at the French Trade Fair in Peking.

Head-per-track drums observed in China are physically large for their capacities of 60,000 words. Line printers which are operating at 600 lpm speeds use Roman characters, as do the keyboard terminals seen at the Canton Trade Fair with the DJS-18. The DJS-18 terminals print 60 characters per line, and have a 60 character keyboard (only six of which are Chinese characters, the rest Roman). The plotter also shown with that cpu is a flat-bed device using 24 inch wide roll paper.

The Chinese do not appear to use punched cards and much of the original input data is prepared on paper tape. Magnetic tape drives appear to compare most favorably with Western and Eastern equivalents of the second generation era. They are certainly quite adequate for the computers on which they are used.

Linear programming for the masses

ALGOL-60 is the most popular computer language according to most reports and it is interesting to note that this is also a most popular language in Eastern Europe and the Soviet Union, even after the introduction of the Soviet RIAD computer line which is in many cases program compatible with the IBM 360 series.

Perhaps the most intriguing aspect of the computerization in China occurred in 1960 when a unique campaign called "Yun Ch'ou Hsuem" was under way. Meaning "Science of Operations and Programming" this campaign relied on mathematicians and university students who were instructed

CHRONOLOGY OF CHINESE COMPUTER DEVELOPMENTS

1956	Establishment of the Institute of Computing Techniques at the Academy of Sciences in Peking
1958	First Chinese-built computer "AUGUST 1" unveiled in Peking
1959	Intention to build Soviet M-3 and BESM machines announced
1959	First experimental models of Soviet digital and analog computers reproduced in China
1959	Computer research institutes established in Shanghai, Tsinan, Shenyang and Chengtu
1959	Computer development under way at universities of Peking, Shanghai, Nanching, Shonyang and Shantung
1960	"Yun Ch'ou Hsuem" national Operations and Programming campaign under way at end of "Great Leap Forward"
1962	Manufacture of DJS-1 copy of Soviet M-3 computer begins
1962	Withdrawal of Soviet assistance to China
1963	Manufacture of DJS-2 version of Soviet BESM-2 begins
1964	First use of some semiconductor components in production of a much improved version of Soviet M-20 computer
1964	First large fully transistorized computer constructed
1965	Chinese analog computers displayed at Cairo exhibition
1965	British ARCH 1000 process control computer installed in China
1965	Rumored attempts by China to obtain an IBM STRETCH computer by way of France for use in its nuclear program
1966	British ELLIOTT 803 installed at medical research institute
1966	DJS-21 solid state computer exhibited in Peking
1967	British ICL 1903 and ICL 1905 installed in China
1968	DJS-7 computer exhibited at Canton Trade Fair for first time
1970	DJS-6 computer shown at Canton Trade Fair for first time
1970	Development and use of Chinese integrated circuits and the construction of the Model 111 computer
1972	DJS-6 computer shown in Paris and Toronto
1972	American scientists, visiting China see Models 111, C2 and 709
1973	DJS-17 revealed to Canadian scientist visiting Canton
1974	Honeywell Bull sells HIS 61/60 computer to China after French exhibition in Peking. CII also sells IRIS 50 computer
1974	DJS-18 computer displayed at Canton Trade Fair first time

to impart the basic principles of linear programming and use of computation to the working masses in all walks of life.

Chinese reports from those days indicate that as many as 300,000 workers, peasants and technicians were instructed in linear programming techniques and a further 8,000,000 people were exposed to various training courses on the merits of computer oriented mathematics. The program came to an abrupt halt at some time in the early '60s but it is unclear either what its objectives were at the outset or why it was so abruptly discontinued.

The peripherals on this 920K operations/sec IC machine all differ from those shown in other photographs. This installation is thought to be in Shanghai.

The author is shown at the console of the DJS-18 in Canton. A third generation machine, it's rated at 150,000 operations/sec, and supports a 65K (48 bit words) 2-usec core memory. Just to his right are paper tape drives and the plotter.

CHINESE DIGITAL COMPUTERS

Model	Year	Memory	Operations/Sec.	Remarks
AUGUST 1	1958	—	5,000*	Similar to URAL-1
DJS-1	1962	2K	1,800	Copy of Soviet M-3 (1953)
DJS-2	1963	2K to 4K	10,000	Modelled after BESM-2 (1959)
Unidentified	1964	4K to 16K	50,000	Improved Soviet M-20 (1960)
109C	1965	32K (48 bits)	115,000	6 usec cycle time
Unidentified	1965	1K to 2K	10,000	Vacuum tube design
Unidentified	1965	—	6,000	Solid state design
DJS-7	1965	4K (21 bits)	3,000	Small ferrite core
DJS-6	1966	16K to 32K (48 bits)	100,000	Shown in France and Canada in 1972
DJS-21	1966	4K	60,000	Solid state, ferrite core
C2	1968	8K (32 bits)	25,000	Solid state
111	1970	32K (48 bits)	180,000	Integrated circuits
709	1971	32K (48 bits)	110,000	Integrated circuits, C2 expansion
TQ-3	?	8K (24 bits)	80,000	IC process control machine
TQ-11	?	16K (36 bits)	50,000	IC process control machine
DJS-17	1973	8K (24 bits)	100,000	Made in Canton
DJS-11	1974	130K (48 bits)	1,000,000	IC, semiconductor, thick film
Unidentified	?	—	920,000	IC, scientific, see photo
Unidentified	?	—	1,000,000	IC, scientific, see photo
DJS-18	1974	65K (48 bits)	150,000	IC, built in Peking, see photo

*Speed of the early Soviet URAL-2 on which the AUGUST 1 was patterned

Chinese computer scientists now show a much more intelligent approach to the development of the computer industry and computer use. During 1973 a group of 14 computer specialists visited several U.S. companies and universities. They chose to see large machines, state of the art technology, and large applications at the most sophisticated level. Their tour under the leadership of Yen Pei-Lin, Director of the Inst. of Computing Technology in Peking at the Academy of Sciences, included such well known computer manufacturers as DEC, Honeywell, IBM, CDC, Univac, Texas Instruments, Hewlett-Packard, and Xerox. Among others they also visited the Chase Manhattan Bank, Bolt Beranek and Newman, American Airlines, Bell Laboratories, The 3M Co., Stanford Research Inst., and Fairchild Camera and Instrument—clearly a cross section of leading American computer industry suppliers and users.

Trade and non-trade missions

Since 1973 the Electronic Industries Assn. has tried to arrange for an American trade mission to Peking. After a number of false starts, the mission has been scheduled for this summer, probably July 27.

A similar event attempted by the East-West Trade Expansion Council of Washington, which was to be a 10 day exhibition of American computer hardware, also never materialized. In both cases the Chinese did not consider it worthwhile to allow the event to take place. They base their refusal to have a trade mission or exhibition on the grounds that most American manufacturers would not be able to obtain export permits for much of the electronic equipment that China would like to buy, and as a result such events would be useless.

In the meantime Canadian, French, British, and other European countries continue to organize trade exhibitions in China during which computer manufacturers try to interest the Chinese in Western computers. But the actual results seem to be rather spotty and inconclusive so far.

While Honeywell Bull and CII sold their display computers during a French Trade Fair in Peking last July, the Canadians did not have any such luck when they took 3 Nova 1200 minicomputers manufactured by Datagen of Canada Ltd. to their Peking Trade Fair in 1972. Not only did they bring the Novas back, they discovered that the Chinese already were quite familiar with their mini, having purchased a licensed version made by Nippon Minicomputer Co. in Japan —and at a better price at that. But

Everybody knows what tomorrow's computer system will be like.

It will serve all kinds of commercial and scientific users (local and remote batch, time-sharing, real-time, transaction processing) concurrently and interactively with no discernible delays.

It will handle a great variety of unscheduled jobs in the most efficient, cost/effective way possible.

It will be able to manage a very large shared data base.

It will allow each kind of user to communicate with it in the simplest and easiest language suited to his task and his level of expertise, and it will let programmers develop and debug on-line, then immediately put their completed programs into production.

It will automatically keep track of priorities, shifting them about as deadlines approach or if real-time urgencies preempt segments of the system.

It will have self-scheduling hardware to dramatically reduce software overhead and speed up execution.

It will have a control processor to manage the entire system, another processor dedicated to computing, and multiple processors for input/output.

It will have an operating system that is completely transparent to the user and which will see to it that all units are kept as busy as the workload demands, up to nearly 100% system efficiency.

It will have independent memory management with virtual addressing.

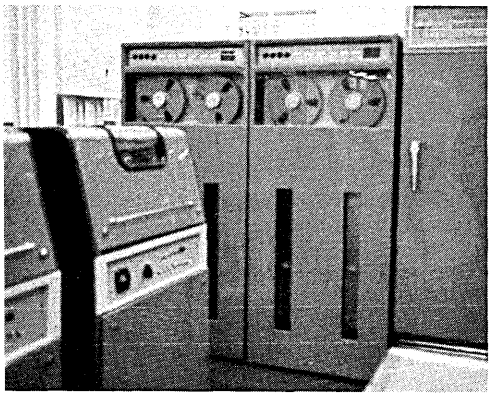
It will converse with other manufacturers' computers and with intelligent remote terminals.

It will have close to 100% availability, diagnosing and isolating its own ailments and working around them until they are corrected.

It will be modular so that capacity can be precisely fitted to current needs and can later be expanded simply by adding more units under the control of the original operating system.

they failed to discover who uses it beyond the fact that the user is a physics research institute somewhere in China.

On the other hand, a French firm, Compagnie Generale de Geophysique (CGG), sold to China a complete data processing center to be used for coordinating oilfield developments. The center is equipped with two CDC CYBER 172 computers and the whole contract is worth about $7 million. CDC-France, which will be supplying the machines, is also committed to train Chinese technicians in France.



These tape drives and printers were attached to the DJS-18 in Canton. The drives use 1-inch tape and record at 25 bits per millimeter. The printers use Roman characters and output at about 600 lpm, with a print quality roughly comparable to American units of the early '60s.

This development must have prompted Control Data representatives to show up at the Canton Trade Fair last Fall, but it is almost impossible to say that China is suddenly showing interest in the products of a particular computer manufacturer. What is probably much more appropriate is to realize that specific plants or turnkey projects which can be put to productive use immediately will be of interest to China in the short term, regardless of whose computers will make them run.

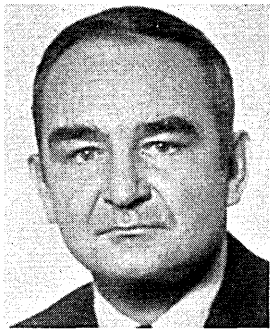
Nevertheless, with increasingly larger amounts of oil to sell, China is in a good position today to generate any additional foreign exchange it needs to purchase Western Equipment. And it is probably Japan, if anyone, that could become a large supplier of computers to China. Japan's computer industry is strong on the manufacturing side but weak in service and support of its exports. China on the other hand is an ideal customer, since she neither requires nor desires the normal computer sale support beyond the initial training of its technicians.

Japan is also already China's largest trade partner and, lacking its own oil resources, it is doubling oil imports from China every year. Later this year Kokubosoku (The International Trade Promotion Assn. of Japan) is planning to hold a Japanese Electronic and Measuring Instrument Exhibition in Shanghai which will include computers, peripherals and communications devices clearly without any fear of possible export controls if sales are made to China.

Although China is exhibiting its computers at the Canton Trade Fairs and even took the DJS-6 model on the road to Paris and Toronto in 1972, the country is unlikely to present any competition to other computer manufacturers at this time. The display of the latest Chinese made computers is probably designed more to demonstrate China's achievements in electronics rather than to generate any actual sales (although there are indications that China supplied a few computers to Albania and North Vietnam, possibly even to North Korea and Pakistan).

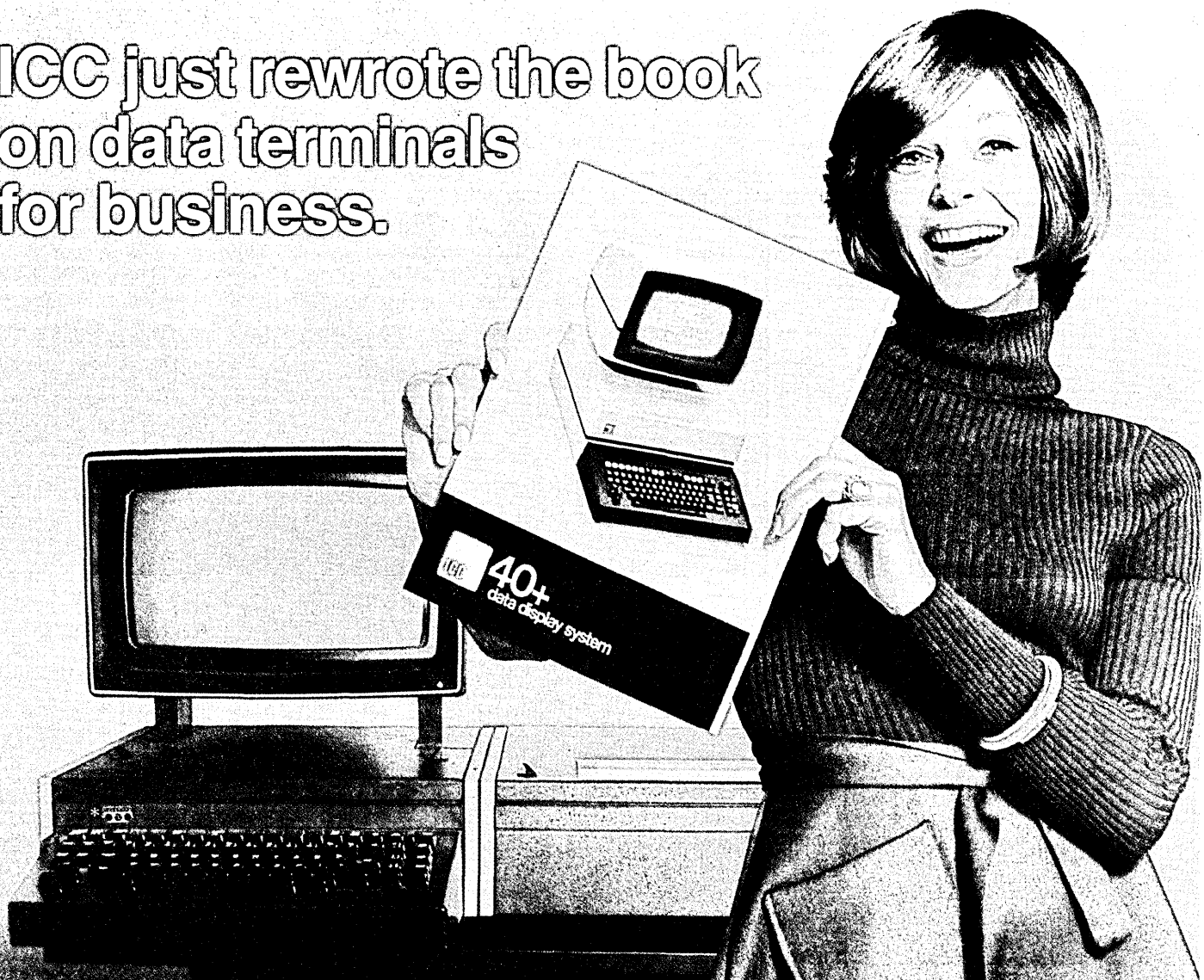
The demand for computers within China is probably sufficiently large to absorb all of domestic production, but large labor resources give China unique flexibility in this respect. It is impossible even to estimate the potential for computer production and use in China without a more detailed study of China's developing industries and their planned priorities.

Many questions remain to be answered, even 'when will the most populous nation in the world allow its citizens to own and operate private automobiles?" The market forces such decisions might unleash throughout the globe are yet to be understood. □



Mr. Szuprowicz is president of 21st Century Research, an independent market research organization currently involved in preparing a multi-client study on high technology markets in the People's Republic of China during 1976-1980. Previously a vice president and research director of High Technology West, a Los Angeles investment research firm, he has also held management, marketing, and engineering positions at IBM, CEIR-Control Data, Computer Usage, Boeing, Canadair, Convair, and others.

ICC just rewrote the book on data terminals for business.



Finally, big things are happening to data terminal systems for business applications. And, why not? Business users have been neglected long enough, operating with outdated equipment that pecks away at your growing load of data traffic. Now, that you have a choice of advanced equipment from leading manufacturers — don't go only part of the way.

ICC developed the 40+ Data Display System *specifically* to meet today's business communications needs, with plenty of capacity for the future. What about system features? It takes our 12-page brochure to describe them all. Price? Competitive. Delivery? We're building them now. Customer support? Ask any ICC modem user.

There are other terminals with "40" in their name. Check them out first. Then find out why ICC rewrote the book. We'll rush you a copy.

ICC

International Communications Corporation
8600 N.W. 41st Street, Miami, Florida 33166 Telephone (305) 592-7654
In Europe: RACAL-MILGO LIMITED Reading, Berks, England

a milgo company

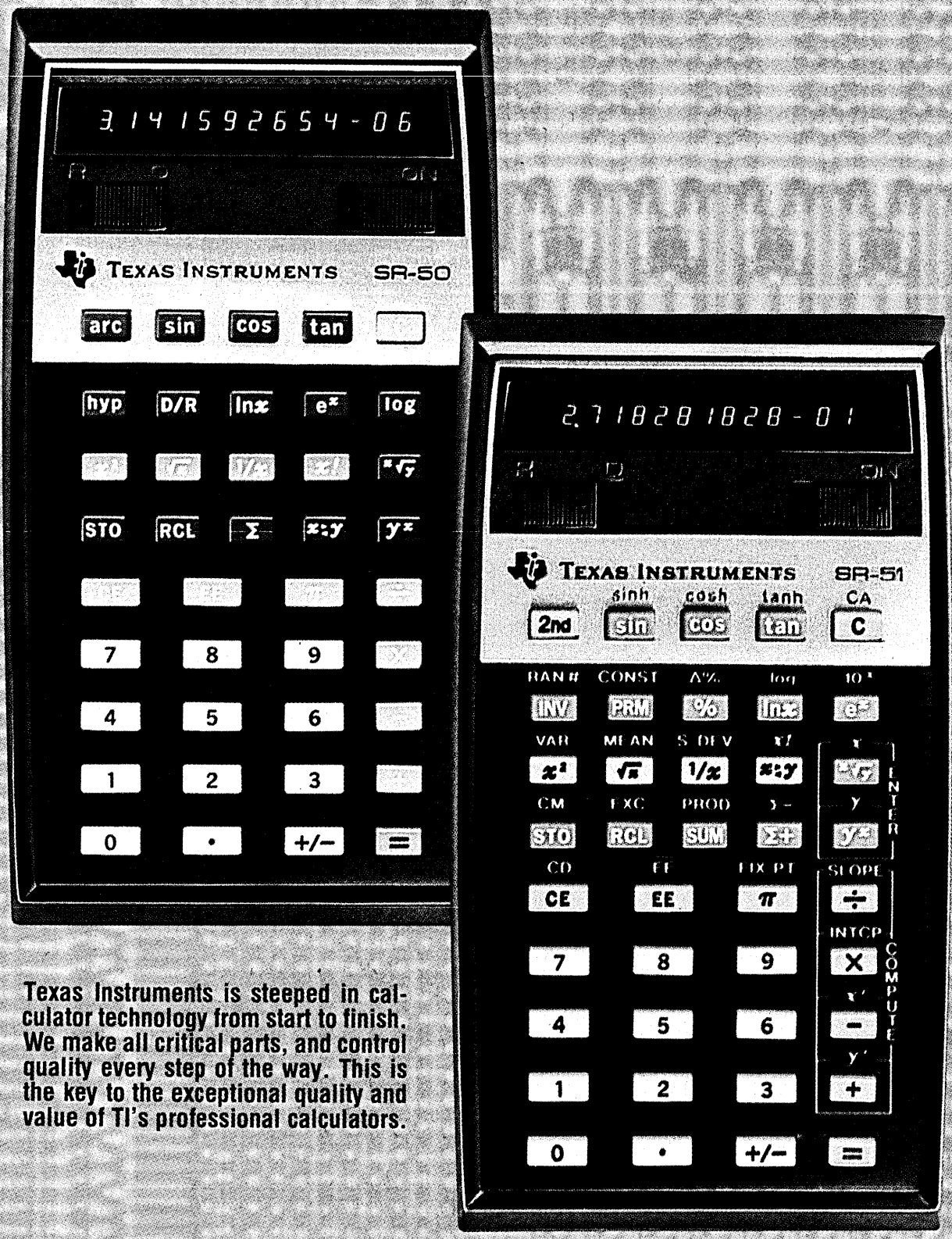
Regional Sales Offices: Eastern (212) 687-5040; Southeastern (404) 996-6327; D.C. (202) 296-4940; Central (312) 298-7150; Western (213) 641-3961

member of IDCMA

* A trademark of Teletype Corp.

CIRCLE 64 ON READER CARD

The SR-50. The SR-51.



Texas Instruments is steeped in calculator technology from start to finish. We make all critical parts, and control quality every step of the way. This is the key to the exceptional quality and value of TI's professional calculators.

Capability. Quality. Value.

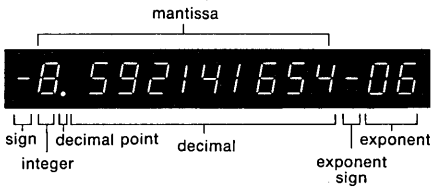
The technological achievement under the keyboard is still the reason TI's professional calculators offer so much quality and math power for the money.

Engineer. Scientist. Businessman. Student. If you're doing more than basic mathematics in your field, consider an SR-50 or SR-51 from Texas Instruments.

Both deliver answers you can trust – quickly and efficiently – to problems ranging from simple arithmetic to highly complex calculations. You don't have to learn special entry methods or difficult-to-master key sequences. There's a better way – TI's algebraic entry system lets you key your problem just the way you would say it. Naturally. You don't worry about losing data in stacks, or keeping track of what is in each stack, or remembering if the stack is full. The way you learned math is the way it's done. On both the SR-50 and SR-51 – you can command tremendous math power with confidence – from the beginning. Power and accuracy you can really put to work.

Answers are calculated to 13 significant digits, rounded off and displayed to 10. And for maximum accuracy, all 13 are held inside for subsequent calculations.

Scientific notation is automatic when you need it. For numbers as large as $\pm 9.999999999 \times 10^{99}$. Or as small as $\pm 1. \times 10^{-99}$.



For a closer look at real math power, delve into the list. You'll see for yourself the SR-50 is a lot of calculator for the dollar. And the SR-51 does everything the 50 does and a lot more: Mean, variance and standard deviation. Linear regression. Percent and percent difference. Has a random number generator. And, offers 20 preprogrammed conversions and inverses.

Quality – it's built in right from the start. Texas Instruments designs and manufactures every critical component. From high-purity silicon semiconductor materials to integrated circuits to light-emitting-diode displays to circuit boards to keyboards. So, we design-in and control quality – not just monitor it – at every level: Materials. Components. The complete system.

FUNCTION	SR-51	SR-50
Log, lnx	yes	yes
Trig (sin, cos, tan, INV)	yes	yes
Hyperbolic (sinh, cosh, tanh, INV)	yes	yes
Degree-radian conversion	yes	yes
Deg/rad mode selection switch	yes	yes
Decimal degrees to deg.min.sec.	yes	no
Polar-rectangular conversion	yes	no
y^x	yes	yes
e^x	yes	yes
10^x	yes	no
x^2	yes	yes
$\sqrt{x}$	yes	yes
$\sqrt[x]{y}$	yes	yes
1/x	yes	yes
x!	yes	yes
Exchange x with y	yes	yes
Exchange x with memory	yes	no
% and Δ %	yes	no
Mean, variance and standard deviation	yes	no
Linear regression	yes	no
Trend line analysis	yes	no
Slope and intercept	yes	no
Store and sum to memory	yes	yes
Recall from memory	yes	yes
Product to memory	yes	no
Random number generator	yes	no
Automatic permutation	yes	no
Preprogrammed conversions	20	1
Digits accuracy	13	13
Algebraic notation (sum of products)	yes	yes
Memories	3	1
Fixed decimal option	yes	no
Keys	40	40
Second function key	yes	no
Constant mode operation	yes	no

To assure you reliable performance, every calculator is subjected to severe environmental and reliability testing prior to release to production. In production, every one is thoroughly tested, then "burned-in", then thoroughly tested again. If there's any problem, we want to find it before it gets to you.

Inside, steel machine screws anchor all important structural elements – plastic welds and glue fastenings aren't good enough. A double-tough Mylar* barrier keeps dust and moisture from getting under the keyboard. The case is high-strength, injection-molded plastic designed to take a beating. It's a quality calculator. And you know it as soon as you get your hands on one. The heft and solid feel tells you it's a fine-quality instrument even before you press a key.

The SR-50 and SR-51 are human engineered, too, for maximum comfort and efficiency. For a hand or a desktop. Keys have positive-action, tactile feedback. And the bright, wide-angle displays are easy to read at your desk or on the go. Slim. Compact. Light. In your briefcase or on your belt, you'll hardly notice just 8.3 ounces.

Technological leadership and quality craftsmanship are why Texas Instruments can offer so much value at such low prices: $109.95 for the SR-50. $179.95 for the SR-51.

20 Preprogrammed Conversions

FROM	TO
mils	microns
inches	centimeters
feet	meters
yards	meters
miles	kilometers
miles	nautical miles
acres	square feet
fluid ounces	cubic centimeters
fluid ounces	liters
gallons	liters
ounces	grams
pounds	kilograms
short ton	metric ton
BTU	calories, gram
degrees	gradients
degrees	radians
°Fahrenheit	°Celsius
deg.min.sec.	decimal degrees
polar	rectangular
voltage ratio	decibels

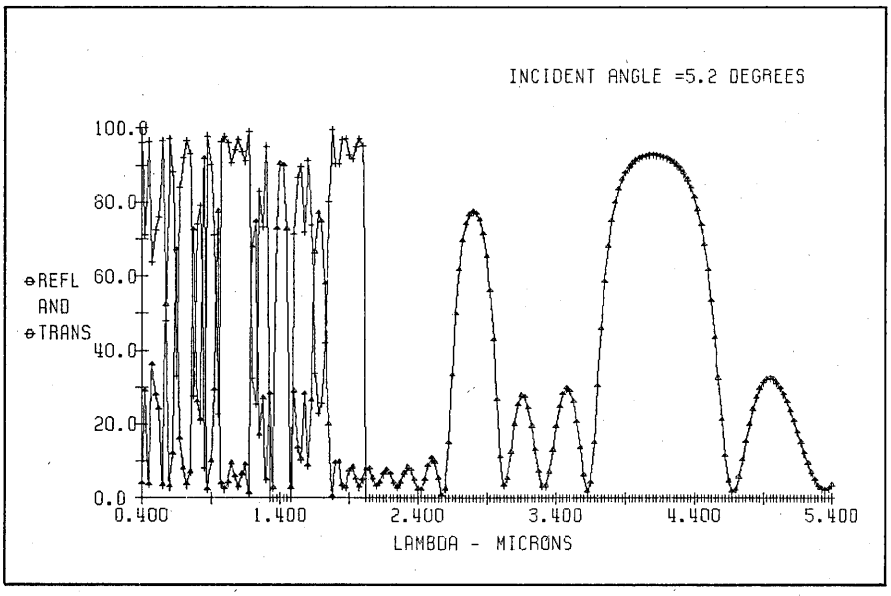
See them at your nearest TI calculator retailer. Or, send for our new fact-filled color brochure. It details the outstanding capability of both the SR-50 and SR-51 with full feature descriptions, sample problems, entry-method considerations and more. Circle the reader service number. Or write, Texas Instruments, M/S358, P.O. Box 22013, Dallas, Texas 75222

TEXAS INSTRUMENTS
INCORPORATED

82051

*Trademark of DuPont

CIRCLE 104 ON READER CARD



By the time your drum plotter turns this out, a Gould printer/plotter can turn it out 400 times.

If what you're looking for is higher plotting speed and lower plotting cost, we've got something that can give you both. And something else besides.

A Gould electrostatic printer/plotter. The one that makes your old drum plotter remarkably underproductive. The one that gives you a useful printing capability in the bargain. A Gould plotter is so fast, it can turn out this plot in only 2 seconds—versus an average 13½ minutes for your old drum plotter.

And what gives that Gould plotter its blinding speed is its direct on-line operation to your computer. Whether it's the PDP-8/E, PDP-9, PDP-11, PDP-15, HP2100, Nova/Supernova, H316/516, Raytheon 704, UNIVAC 1108, IBM 360/370, CDC 3000/6000, Interdata 70 and more.

In addition to output speeds up to 400 times faster, a Gould printer/plotter gives you a lower unit cost, as well as lower paper cost. Better-looking output, since there's no ink to smudge, clog or run out of. Few moving parts for quiet operation, high reliability. Software that's upward compatible with the leading drum plotter. Without any sacrifice in mainframe CPU time.

And, in addition to everything else, it gives you an alphanumeric printing capability that also lets you compile management reports at speeds up to 3000 lines per minute.

Users will tell you that a Gould electrostatic printer/plotter makes their computer-aided design system truly interactive since output of modified data for verification can be quickly obtained. And by producing hardcopy output in a matter of seconds—instead of the many minutes it can take with older methods—time savings are maximized.

This all adds up to the best printing/plotting hardware and software available anywhere. And it's backed by Gould's own factory trained service technicians.

To learn more about Gould electrostatic printer/plotters—get in touch with Gould Inc., Instrument Systems Division, 3631 Perkins Ave., Cleveland, Ohio 44114 U.S.A., or Kouterveldstraat 13, B 1920, Diegem, Belgium.

The engineering test data illustrated above was generated on a Gould 5000, on-line to an IBM 370, by Itek Corporation, Lexington, Mass.

GOULD

CIRCLE 41 ON READER CARD

International Conference On Reliable Software

Software stars from Russia, Poland, Germany, England, the U.S. and elsewhere meet to grapple with the industry's most difficult problem.

Nearly 900 people gathered at the International Hotel in Los Angeles April 21-23 to hear a "Who's Who" of computing wrestle with the question of software reliability: what is it? why don't we have it? what can we do to get it?

The time was divided about equally between joint sessions, devoted mostly to tutorials and state of the art summaries, and to parallel sessions devoted to papers in such areas as program verification, language effects, software specification, program analysis and design, programming management, reliability estimation, formal testing, case studies, security, operating systems, error data, social and legal aspects, constructive methods, and fault tolerance.

Reaction to the meeting was generally favorable. Some people said they had learned specifics that they would put into practice immediately. Many were pleased to see at least that some progress had been made on a definition of the subject and an agreement on its importance. A few reported that although they hadn't learned too much new, they were relieved to learn that they hadn't been missing anything important. As usual, the hallway conversations and the chance to meet people were among the prime benefits.

It is hard to estimate the long-range effect of a meeting like this one. It surely helped to solidify understanding of the subject among those present, but the attendees did not include very many working-level FORTRAN and COBOL programmers. If software reliability in the broad base of applications is to be improved, there will have to be a diffusion of ideas across the communication gap between theoreticians and practitioners. But the estimate was that the gap between theory and practice is no wider in our field than in others, and is nothing to be very worried about. The good ideas do get into use.

The conference was sponsored by the Assn. for Computing Machinery, the IEEE Computer Society, the IEEE Group on Reliability, the U.S. National Bureau of Standards, and the U.S. National Science Foundation. (The 567-page volume of proceedings is available at $25—$18.75 to ACM and IEEE members—from the Assn. for Computing Machinery, 1133 Avenue of the Americas, New York, New York 10036, or the IEEE Computer Society, 5855 Naples Plaza Suite 301, Long Beach, California 90803.)

Co-chairmen were Martin L. Shooman, Polytechnic Inst. of New York, and Raymond T. Yeh, Univ. of Texas. Co-program chairmen were Barry W. Boehm, TRW Systems, and C.A.R. Hoare, The Queen's Univ., Belfast, U.K.

The quotes that follow were some of the ones that I found most stimulating. Some of them are paraphrased slightly to make them meaningful in the absence of the discussion that preceded them. They are a personal sample; I made no attempt to cover all the parallel sessions, but simply followed my own interests. The subject of program verification (proofs of correctness), in particular, is underemphasized here compared with the attention given it in the papers.

In final defense of the selection, it should be said that some people have worthwhile ideas and express them well, whereas others have worthwhile ideas and express them *very* well.

RUTH M. DAVIS, Director, Inst. for Computer Sciences and Technology, National Bureau of Standards. Keynote Speaker

It is amazing to see how much progress has been made in the past 25 years. . . . In the past we had to begin by *defining* "software"; now the problem is that the term is still being used for a field so diverse. . . .

W. W. ROYCE, Space Applications Corp.

The most difficult problem in engineering today is getting the mistakes out of software. If you don't share that view, you don't know how difficult your job is.

DAVID L. PARNAS, Techhische Hochschule, Darmstadt, Germany

In this paper we make a strong distinction between "reliability" and "correctness" . . . if a piece of software meets its specification, it is correct—if it does not, it is incorrect. Reliability, in contrast, is a statistical measure relating a system to the pattern of demands we make upon it. We consider a system to be highly reliable if it is highly probable that, when we demand a service from the system, it will perform to our satisfaction.

The assumptions which software modules are allowed to make about each other define the interfaces between them. A bad structure is one in which interface assumptions are likely to be false. Modules should be designed to be mutually suspicious.

W. M. TURSKI, Inst. of Mathematical Machines, Poland

Reliability rests not in a *thing*, but in a thing *and a process*. The ordinary wrench was pretty well "proven correct" over decades of use—but its uselessness in space flight showed us the implicit assumption of the existence of a gravity field. So much for correctness proofs.

C.A.R. HOARE, The Queen's Univ., Belfast, U.K.

The most widely accepted and practiced method for the design and documentation of computer programs is the flow chart. But more recently, the disadvantages of flow charts have become apparent. . . .

A picture is not worth a thousand words when the picture requires a thousand pages of paper and when the most important things in the picture are words.

RALPH L. LONDON, Univ. of Southern California

Testing is really more than 50% of the cost of programming, but after that point we stop calling it "testing" and rename it "maintenance."

ANDREI P. ERSHOV, Academy of Sciences, USSR

We understand by reliability the combined satisfaction of the following conditions:

Conformity: The system does not require special restrictions and conditions which conflict with the modes of operation and the general throughput provided by the hardware configuration and operating system.

Correctness: errors and operational failures in the system must be rare events which do not affect a user's continuing feeling of comfort and satisfaction.

Helpfulness: the system reaction to a user's mistake must contain some suggestions of its nature and, when possible, hints about its correction.

Responsiveness: the information required by the previous paragraph has to be available as a reaction to any physically possible input to the system; each interaction has to advance the user along the path to ultimate success.

Convenience: in typical situations, when the user is certain and confident of his goal, the system does not require unnecessary, unnatural, "ritual" actions on his part.

GERALD M. WEINBERG, Consultant

Once upon a time there was a utility billing program in which a rate appeared twice, a few pages apart, as a program literal. When the company was granted a rate increase, a maintenance programmer changed only one of the occurrences of the rate literal. After 14 months of observing that revenues had not gone up as much as predicted, the error was found; about

$600,000 of revenue had been lost. The company fired the maintenance programmer. Of course, they should have fired the programmer who wrote the program that way in the first place, but by now he was the manager of programming. Moral: programs should be designed so that one *functional* change results in one and only one *program* change.

I am fascinated to see representatives of organizations as different as the U. S. Navy and the USSR Academy of Sciences accepting a rate of one error per 20 lines of supposedly finished code as "normal." Programming accuracy will not greatly improve until we raise our expectations.

I have actually talked to people who said, during the coding phase of a project, "We can't afford the time to do the coding right, because we know debugging is coming up and we always get behind schedule in debugging." This supports the contention that if debugging is the process of taking errors out, then coding is the process of putting them in. It also supports the description of debugging as the point when you can no longer pretend you are on schedule.

When a new programming technology is introduced in a shop, 10% of the people will accept it at once. A middle 80% will respond to a presentation that shows them opportunities for personal growth combined with benefits to the organization. The remaining 10% will resist—especially the idea of working in teams—and perhaps should be encouraged to find some other line of work.

NIKLAUS WIRTH, Federal Inst. of Technology (ETH), Zurich, Switzerland

It has been said that things like stepwise refinement and structured programming are just new names for what the best programmers were doing all along. To a large extent this is true. But those best programmers of earlier years were generally not able to translate their techniques into methods usable by ordinary programmers to improve *their* work. The new formulations make it possible to do exactly that.

WILLIAM A. WULF, Carnegie-Mellon Univ.

In a related area, telephone engineers have learned that effort put into improving coverage (the ability to recover from a component failure) has much greater payoff in improved system reliability than the same effort put into improving component reliability. This point cannot be overstressed—*it's much more important to be able to recover from failures than to prevent them.*

HARLAN D. MILLS, IBM Corp.

Redeeming social value will force development of reliable software, as people choose the reliable products even though they cost more.

Latent capabilities often don't show themselves until technological factors lead the way. For example, a century ago it would have seemed incredible to think of writing 120 words per minute without looking at your fingers. Now a top typist does it every day, even though human finger dexterity hasn't changed at all.

It's the same way with programming. Most people can't imagine writing 10,000 lines of code without an error—but some day it will be routine.

A correct program is one that does what the *programmer* intends it to do. A reliable program is one that does what the *user* intends it to do.

I have found that when I am having trouble proving a program correct, I am better off rewriting the program than struggling to complete the proof. A program should be no more complex than the problem it solves.

GRACE MURRAY HOPPER, U.S. Navy

The Navy taught me that in writing policies you not only state the policy, but explain the reasons for it. Then, if the person carrying out the policy has to make decisions on his own (as when communications are lost), he'll know what you were trying to accomplish with the policy.

We need to do that in dealing with people who write software, explaining what we are trying to accomplish with reliability goals.

F. TERRY BAKER, IBM Corp.

Some people seem to think that when you start doing structured programming you can stop thinking. This is not so. There are guidelines of good practice, but one must always be aware of the reasons behind them and the possibility that in occasional situations the guidelines will not apply. I write GO TOs now and then.

BRIAN RANDELL, Univ. of Newcastle upon Tyne, U.K.

We must inculcate in programmers a disgust for complexity and a pride in simplicity.

EDSGER W. DIJKSTRA, Burroughs Corp.

Programming is in the process of changing from a craft into a science. One must expect the craftsmen to be uncomfortable. Such phenomena as uninformed criticism of proofs of program correctness are the rear guard skirmishes of a dying craft.

FREDERICK P. BROOKS, Univ. of North Carolina

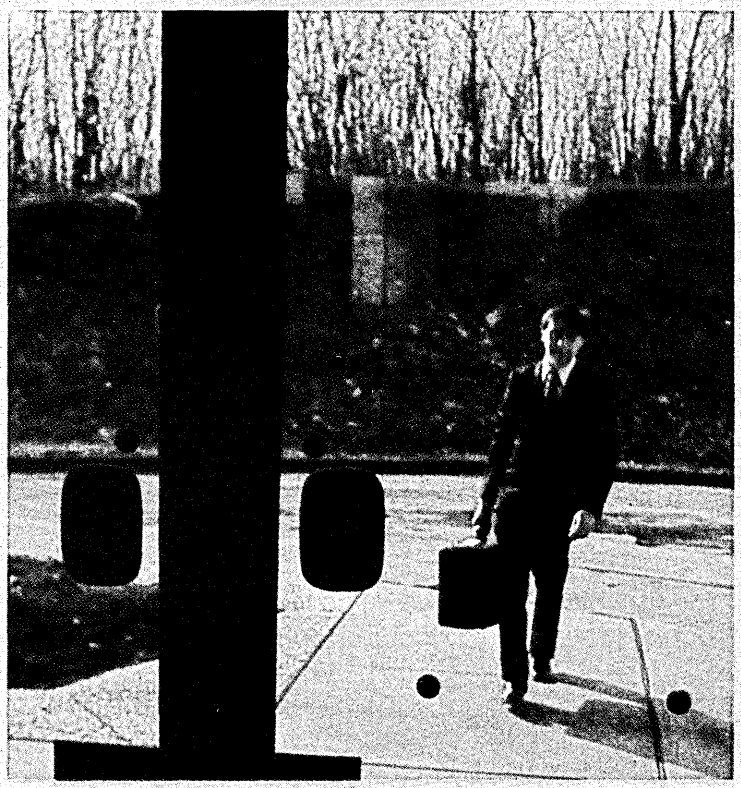
One reason software reliability is a problem is that as we gain new skills, we attempt more difficult tasks. We will always be attempting things just within or just beyond our grasp, and therefore we will always be on the hairy edge of complexity, courting disaster, sometimes failing and sometimes succeeding.

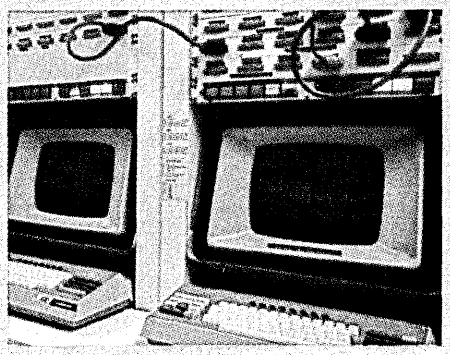
—Daniel D. McCracken

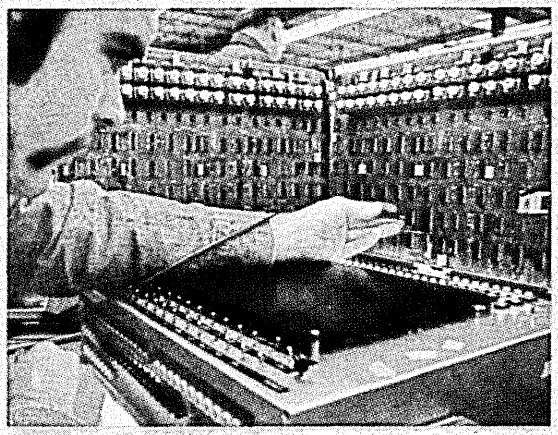
Mr. McCracken is the author of numerous texts and articles on programming, especially on programming in FORTRAN.

Maintenance *Plus*
Software Support *Plus*
Quality Control:

INCOTERM® Customer Service.







We care for our own.
It starts with the way INCOTERM intelligent terminal products are put together. We only use components and technologies that have been fully proven by a solid record of reliability. Then every part and every system is tested and retested by the toughest quality standards and controls in the business. Finally, our grueling "burn-in" process smokes out trouble at the source.

Because "intelligent" means "programmable," INCOTERM backs its products with the kind of software support that gives the most power to the most users. In banking. In travel and transportation. In insurance. In hospitals. In law enforcement and licensing. In communications.

Then there's the INCOTERM dedicated maintenance team—backed by our worldwide distribution system and logistics depots—operating out of major cities throughout the United States and abroad. Wherever the problem may occur—in hardware, software, line, interface or printer—an INCOTERM man-on-the-spot can find it and fix it. Off-line diagnosis greatly reduces expensive CPU time. Highly modular construction speeds the replacement of parts. And dedicated maintenance means that when something *does* go wrong, we get there fast.

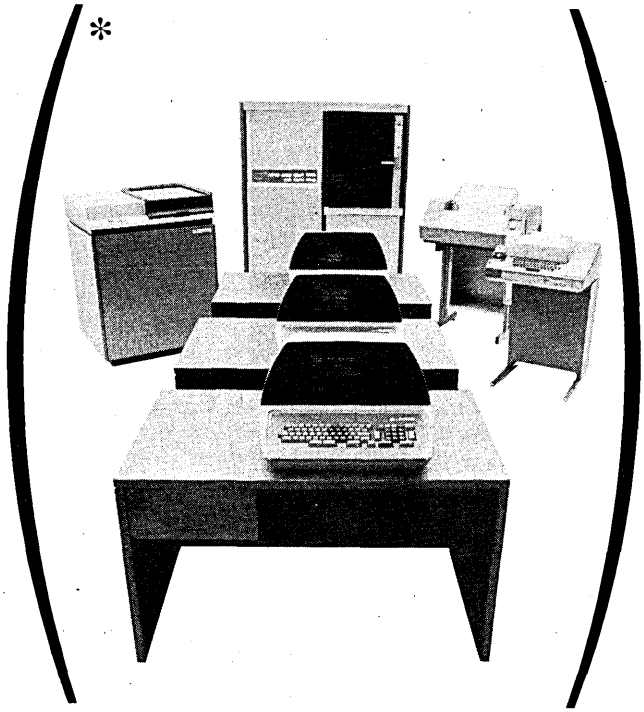
All told, more than a third of all our people are committed full-time to customer support. We mean it when we say we take care of our own. Our own products. Our own users.

INCOTERM: More Power To Your Terminal.

INCOTERM® CORPORATION

6 Strathmore Road
Natick, Massachusetts 01760
(617) 655-6100

GREAT COMPUTER SECRETS*



We've been so busy developing our powerful GCS 2100 system, we've never taken the time to tell enough people what a great system it is.

How efficient it is (average of 80% reduction in errors — 35% to 85% faster document handling). How reliable it is (less than 1% downtime). How simple it is (operator training time less than 8 hours). Or how economical it is (10% to 40% savings in data preparation costs).

And our competitors have loved us for keeping it such a secret!

The GCS 2100 is a complete data entry system: it lets you collect and edit data at the source (data is actually edited while it is being keyed); store the data on disc; then transfer the clean data to an output media like magnetic tape. (Data already on tape or cards can be re-submitted to the GCS 2100 for editing, reformatting, etc.)

The GCS 2100 can interface up to thirty-two telephone lines. Card readers. Medium and high speed line printers. Four-tape drives. Four fixed or moving head discs.

All on a single system.

The GCS 2100 provides extensive I/O functions so you can transfer data to and from disc storage and other I/O devices.

The GCS 2100 can accommodate up to 64 local or remote terminals: local terminals can be located up to 2500 ft. from the system's CPU. You get faster, more accurate data entry for functions like payroll, shipping, receiving and manufacturing, because the person most familiar with the data does the keying.

The GCS 2100 also offers data entry from remote terminals (it can handle up to five remote terminals over one dedicated telephone line).

A Programmable Extension Package (PEP) extends the power and the flexibility of the 2100 system: up to 255 PEP tables provide capabilities like automatic data insertions; range and value checks; table look-ups; logical tests; character expansion; and data dependent format switching.

These tables are not job assigned, so they can be used on several different jobs.

A library of over 100 special edits is also available. (If there isn't an edit for your needs, we can design one.)

The GCS 2100 also provides up to 99 format levels per job; up to 255 balance accumulators; variable length record and blocking factors; and up to 255 jobs stored in the system.

GCS 2100 Peripherals: GCS DataTone — data entry via Touch-Tone® telephones. GCS Data Tel — remote batch communications.

For more Great Computer Secrets, contact Agent 2100 at General Computer Systems, Inc., 16600 Dooley Road, Addison, Texas 75001. (800)527-2568 toll free. In Texas (214) 233-5800.

GCS 2100
general computer/systems inc.

Symposium on Structured Programming in Cobol

The dominant theme at the CODASYL Structured COBOL Conference* was that COBOL *can* survive in the world of structured programming. (There were boos and hisses whenever PL/1 was mentioned.) It was agreed that structured programming can be accomplished in existing COBOL, though fairly strict standards will be required to prevent programmers from reverting to their previous unstructured style. Most conference attendees agreed that education remains a major problem, since the average COBOL programmer has had little or no exposure to rigorous, formal programming methodologies. However, there was a general feeling that some enhancements to the language would greatly facilitate structured programming, and some specific language changes were proposed to the Program Language Committee of CODASYL.

Jitze Couperus of Control Data made perhaps the most modest proposal of the day by recommending a CASE structure that would be invoked by a statement like PERFORM PROCEDURE-NAME (I). He claimed that the idea occurred to him in the bathtub one morning and was therefore not very well researched, but everyone agreed that it was the most thorough and most detailed proposal made during the day, and had the greatest chance of being approved quickly by CODASYL. Nancy Goguen of Bell Labs recommended a number of additional changes to the PERFORM verb that would facilitate the DO-WHILE and CASE structures while still retaining the style and flavor of present-day COBOL. The most ambitious proposal was made by Charles McComas of Data General, who recommended the addition of BEGIN and END statements to delimit block structures, the introduction of PROCEDURE to replace paragraphs and sections, and the introduction of the DO verb to replace PERFORM.

Another group of speakers commented on their experiences with structured programming in "present-day" COBOL. Janet McConnell of General Electric, Richard Weiland of the Illinois Inst. of Technology, and Svend Ryge of Kaiser-Permanente agreed that standards must be established to restrict the use of GOTO statements (without necessarily eliminating them altogether), to restrict nested IF statements, and to simulate CASE structures. They also stressed the importance of good documentation and good design as a prerequisite to writing structured code.

Ms. McConnell and Mr. Weiland also stressed the importance of education. Mr. Weiland confirmed a general feeling held by conference attendees that structured programming could be taught fairly easily to new programmers, while Ms. McConnell confirmed that experienced programmers do not always grasp the concepts of structured programming easily. (This author concurs. In fact, I've found most COBOL programmers have an abysmal ignorance of PERFORM, PERFORM-UNTIL, and nested IFs, and therefore find it quite difficult to adapt to structured programming.)

The meeting closed with a short tutorial on the politics of standards committees, led jointly (and occasionally chaotically) by Ron Hamm (chairman of the PLC committee of CODASYL) and Jitze Couperus, head of the American National Standards Institute's X3J4 Committee on ANS COBOL. The impression left upon most conference attendees was that the standards committees were a "rat's-nest" so complex that it was amazing that anything ever got accomplished. In particular, it is not expected that structured programming will be reflected in any new versions of ANS COBOL or CODASYL COBOL (which are not necessarily the same thing) until at least 1978 or 1979. In the meantime, it appears that we will have to live with the limitations of existing COBOL.

—Edward Yourdon

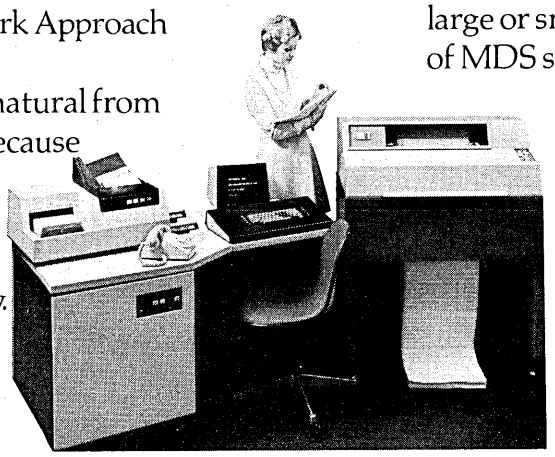
Mr. Yourdon is president of Yourdon, inc., a consulting firm which also offers classes on topics like structured programming. A prolific author, he was also one of the conference participants.

*The precise name of the conference was "Symposium on Structured Programming in COBOL —Future and Present. Sponsored by the Programming Language Committee (PLC) of CODASYL, the meeting was hosted by Computer Sciences Corp. and held in Los Angeles on April 7.

Mohawk Data. A Network Approach to data entry.

The Network Approach to data entry.

It's really a natural from Mohawk Data. Because we're recognized everywhere as a very powerful force in data entry.



Today, that includes all forms of data gathering and preparation. Including communications.

Our gear spans the broad reach from stand-alone terminals through sophisticated key-to-disk. And from document preparation to data collection networks and systems.

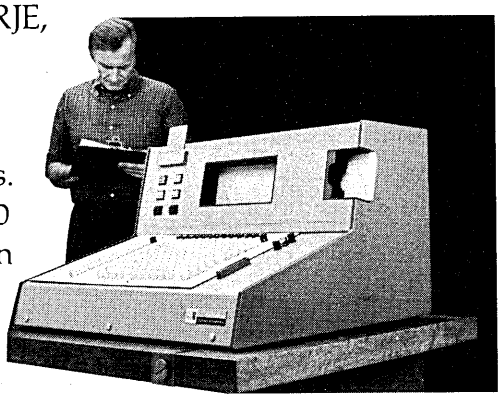
Which means we can look at your data entry problems in their totality. And offer an objective solution.

In fact, the data entry needs of all your EDP locations—central, remote, large or small—can be met by a single network of MDS systems.

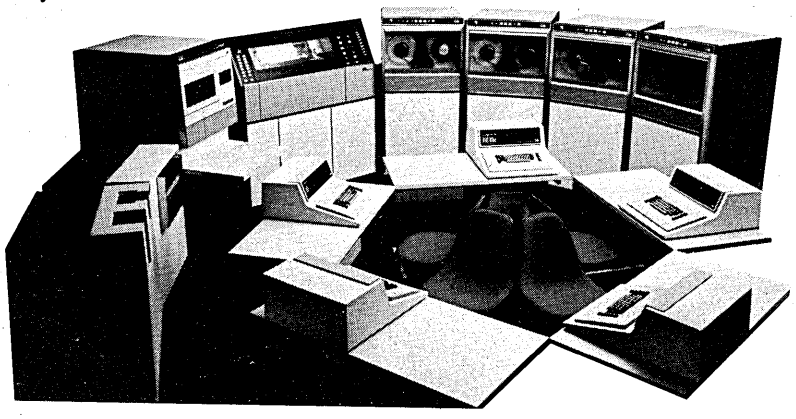
The Network Approach.

Each system compatible with the others, with interchangeable media. Each capable of working with the others, with common languages. Each conveniently compatible with the major mainframes.

The Network Approach. It works. Our new 2300 terminal and document processing systems. Our 2400 with key-to-disk, RJE, conversion, printing and concurrent combinations. And our 4400 data collection system.



To find out more, call an MDS representative now about our Network Approach to data entry. Or write for our descriptive brochure. Mohawk Data Sciences Corp., Utica, New York 13503. 315-792-2424



MDS®

Mohawk Data Sciences

IBM and the structure of the industry

In this, the third installment of comment on the structure of the industry, four more viewpoints are expressed—again all different. Each has something to offer. And their divergence of opinion underscores the complexity of the issues and the fact that an easy answer may be very hard to come by indeed.

Let the Buyer Beware—of Himself

It's almost hilarious to read through DATAMATION, and every other trade publication, and note the anguished cries from both users and IBM competitors. Break up IBM! Unfair! Etc., etc., etc. Apparently the concept of free enterprise in the data processing industry is not very strong.

To the best of my knowledge, IBM uses neither force nor coercion to market its products. I've not yet heard of a rental or purchase agreement signed at the point of an IBM salesman's gun. Yet every time the IBM colossus burps out a new product, we (the users) are there panting to sign up for the "new" hardware or software. We accept error-ridden operating systems and inefficient telecommunications hardware and software—because we're afraid not to! We're afraid that our competitors' computer will be 100 milliseconds faster than our machine; we're afraid that IBM will stop supporting OS Release, 21. N; etc., etc.

For people operating in an environment governed by the rules of logic, we are most illogical in our approach to selection of hardware and software. We profess a belief in the abilities of IBM's competitors—but we continue to buy IBM hardware and software. We boast of our in-house software staffs—but we install every new IBM software release as soon as possible after announcement. Good grief! We have no one to blame but ourselves!

What if we, as users, took a "hard line" on the following:

1. Demanded competitive bids only for all hardware—this has been an effective method for government in lowering costs and assuring quality.
2. Refused to accept an operating system except as a finished product. Or rental credits on those releases which lead up to a finished product.
3. Refused to accept an IBM CE's Code 20 as the basis for the beginning of hardware rental; rental and/or purchase funds to non-IBM vendors commence once the system is accepted. Why shouldn't this guideline apply to IBM?

IBM is very sensitive to market pressures from its customers. Unless we, as users, are willing to put pressure on IBM to change, then we should just shut our mouths and go on giving our equipment and software orders to IBM.

Asking the federal government to intervene on our behalf is an indication of our unwillingness to cope with, or support, the free enterprise system. It's also one more step towards total governmental control of our lives. I'd much prefer the fractious environment of the industry today, than a nationalized industry tomorrow.

—Robert J. Michael

Mr. Michael is a senior telecommunications analyst with Montgomery Ward corporate telecommunications.

A Shared Technology

For many years now, our industry has discussed many alternatives that have been offered as a "solution to the IBM problem." They have ranged from total breakup to simply updating the 1956 consent decree. Generally speaking, the solutions have dealt with the obvious, e.g., reduction of the purchase to rental multipliers, segmentation of some of IBM's basic strengths such as spinning off the maintenance group, direct regulation by the federal government, etc. Most of these solutions ignore the fact that a totally free marketplace (many thousands of companies openly competing within a defined market with relatively common offerings) and a monopoly-dominated market (the IBM-dominated computer industry) have one very important characteristic in common—stability. Halfway measures such as the breakup of IBM into a dozen or so companies would most likely contribute to an extremely unstable market situation for many years while the process of competition establishes an oligopolistic market or, the more unlikely of the two, a free market.

There's a second major point that seems to be ignored in the many discussions. They do not attack IBM's major strength—the most important source of its continuing domination of the data processing industry—IBM's enormous annual investment in technology, production processes and new products. It is often said that IBM is seldom the technology leader in our industry. I believe that to be true but it's seldom far behind and when, in fact, it is out of step with the rest of the industry, it is because of market control motivation not technology limitations.

IBM's ability to dwarf competitive efforts in technology areas springs from its *relative* market share, an important point that receives little emphasis in the debate over the philosophical question of IBM's share of market. In the classic industry model, there is typically an oligarchy comprised of four or five companies of which the second place company's revenues are approximately 70% of the industry leader, the third place company's are 70% of the second-place company's, etc. e.g., the U.S. automobile industry. In the dp industry, we have a rather unique situation where the second, third, and fourth contenders are almost equal in size and individually represent only 10 to 12% of IBM's revenues.

Consider the two major sources of improvements in cost effectiveness, given competent management:

1. The "learning curve" effect of cost reduction as a result of cumulative volume production over a number of years.
2. The ability to increase cost effectiveness of technology through reinvestment in research and development.

Couple the foregoing points with the fact that our industry's technology is advancing at a very high rate, and therefore the economic life is relatively short, it is then apparent that the company that can afford to invest and stay current, or in the case of IBM, establish technology and product trends, will have a very strong position, other factors being equal. It is also clear that IBM is manufacturing equipment at a rate of eight to ten times that of its nearest competitor and it has the incentive and capability to reinvest like percentages in technology and its offshoots.

The foregoing combination of factors, together with its many other strengths (financial, marketing, etc.) enable IBM to return roughly 30% after tax on net assets employed while its competitors languish in the 5 to 12% range. A reduction (through price decrease) by IBM to the 20% level, which is more typical of leaders in other industries (and which might be the direct result of a forced IBM breakup), would force competition into a position where the returns were considerably below their cost of capital.

In view of the foregoing, I suggest to our industry that we push for a consent decree that would contain as its central theme the obligation on the part of IBM to share technology and production advancements with the entire industry as soon as a process is proven and, furthermore, to provide clear indication as to the adaptation of the proven processes in the form of new products (both hardware and software) at the time that the program is committed within IBM, which is generally two or three years prior to product introduction. It is appropriate that IBM be paid a reasonable license fee for such disclosure and subsequent use by a competitor, which I believe many competitors would be willing to pay.

The foregoing recommendation would permit a scenario where there would be a gradual development of competition,

IBM and the industry

along relatively common lines, thereby permitting the growth of competition while retaining reasonable stability in the marketplace. It would further provide a higher level of benefit to the user through improved price/performance and expanded choice of alternatives. **—Ryal R. Poppa**

Mr. Poppa is the president and chief executive officer of Pertec Corporation.

Creating a Corporate Conscience

When the trade press discusses IBM, particularly in an antitrust context, the emphasis is upon the effect of the company on its competitors. Not often mentioned are the facts that (according to the 1974 Annual Report) IBM has over 292,000 employees (some 160,000 in the U.S.) and over 589,000 stockholders. Each of these is dependent to some degree for his or her livelihood on the success of IBM as a company. And that success is also of considerable importance to those who supply IBM with products and services, as it is to the balance of payments and the prestige of the United States.

The practices in which IBM has engaged may or may not violate the antitrust laws as they are presently structured. Certainly some individuals within the company have acted in ways that are not admirable—the trade press has reported on certain salesmen's efforts over the years under apparent undue pressure. These activities can be expected in any organization with so many employees and so much economic power. And such practices would be used by the others if they had the economic clout.

Whether IBM as a company should be restructured is a matter now being debated by many wiser than I. Whether the antitrust laws should be revised is a matter now before Congress.

But whether IBM, by virtue of its size and influence alone should have to meet a higher standard of performance, vis a vis its competitors and the public, is a matter that should concern the industry and IBM management.

Does a company with vast resources, hundreds of thousands of employees, hundreds of thousands of stockholders, have a duty to act in some way like a government? Should it weigh in each of its corporate actions not only the needs of its own personnel, stockholders, customers and suppliers, but the interests of the public at large? The law, as I understand it, does not now require this. But perhaps it should.

It may be, as you suggest, that a consent decree will come. Those who fashion this court judgment might wish to consider a novel requirement: that an internal ombudsman appointed by and responsible to the court (or by and to an independent commission) be empowered to examine the activities of IBM on a continuing basis, to ensure that the public interest as well as the private interests were being served. Alternatively this might be done through non-IBM directors selected perhaps by management, perhaps by an independent source and approved by the Court after approval by the Justice Dept. These individuals would be empowered to ask any questions, investigate anything to do with the company, sit in on committee meetings, and generally be the corporate conscience. Limitations on their powers would come from the appointing authority, who would be available to IBM for relief against overzealousness.

Whether these suggestions are practical is a matter for discussion. But they are one possibility that might help the industry. **—Robert P. Bigelow**

Mr. Bigelow is the editor of **Computer Law Service, Computer Law and Tax Report,** and **Law Office Economics and Management.**

OEM from IBM

I have read most of the schemes that have been put forth to break up IBM and therefore reestablish competition in the dp marketplace.

In my admittedly oversimplified way, I feel IBM can be left intact and competition will flourish if IBM is edicted to do just two things:

1. Sell equipment to the oem/non end user market at 30% off published end user prices.
2. Provide end users the ability to purchase all returned IBM rental equipment at a sales price not to exceed current book value.

The first item would enable leasing companies and systems manufacturers the viable option of using selected IBM system components in systems marketed under their brand name. As an example, HIS might elect to avoid the costly development of 6250 bpi magnetic tape drives and use those available from IBM. This option is available now, but at end user prices, which is financially unacceptable if the system is to be competitively priced in the market.

Access to IBM system components at reduced prices would go a long way toward eliminating multiple industry development programs that are costly to the systems supplier and ultimately to the end user.

The second item would legitimize the used equipment market and provide end users with low-cost alternatives to increasing systems performance.

This proposal would not lessen IBM's industry worldwide cost/volume manufacturing dominance; in fact it could conceivably act to increase its manufacturing volumes through becoming a source of supply to others. This proposal would however lessen IBM market control in two ways:

1. Effectively places a lid on new equipment prices to end users by making used equipment available at depreciated book value.
2. Spreads industry revenues and profits by providing non end users with a source of equipment at attractive prices, thus permitting them to profitably compete for business against IBM in the open end user market. **—Charles L. Roark**

Mr. Roark characterizes himself as "an active industry participant and observer for more than 15 years."

Next best thing to a raise: NCR Paper business forms.

A business form *can* boost office morale. The form should communicate needed information quickly, efficiently and inexpensively. Carbon and bond forms can smear and smudge on the form which means they sometimes fail to communicate. If the form smears or smudges the people handling the form, it's a time-wasting mess. So switch. Carbonless NCR Paper makes an intense, easy-to-read blue or black image that can't smear or smudge on either forms or people. Rise to the occasion — ask your forms supplier to run your next order on modern NCR Paper.

Nobody else offers a choice deep blue or **black print**

NCR Paper®

Today it makes sense to stretch all your business forms papers — even ours. We have a free poster and booklet with a number of paper-saving and money-saving tips. Write "Paper-Stretchers," P.O. Box 348, Appleton, Wis. 54911.

NCR APPLETON PAPERS DIVISION
GENERAL OFFICES: APPLETON, WISCONSIN 54911

CIRCLE 58 ON READER CARD

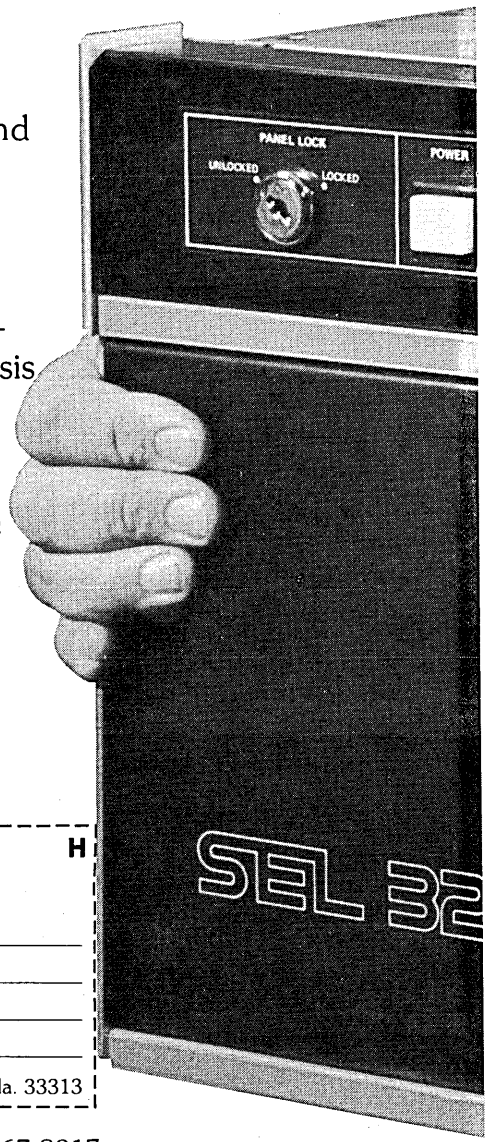
We give you a lot of little, for less.

You don't just get a single minicomputer, you get several. The SEL 32/50 contains a powerful microprogrammed CPU, plus individual input/output microprocessors for each I/O channel.

The SEL 32/50 features a 26.67 million byte per second thruput rate, fast floating-point, and full 32-bit word format. And the system can grow to include up to 16 million bytes of memory.

You get a maximum performance in minimum space—at the right price. $18,000 to OEM's for a Single Chassis SEL 32/50 with 32K bytes of memory. The prices are even better for quantity commitments.

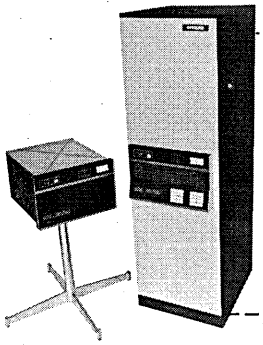
Want to know more about the SEL 32/50? Call, or use the coupon.



SYSTEMS

ENGINEERING LABORATORIES

6901 W. SUNRISE BLVD., FT. LAUDERDALE, FLORIDA 33313, (305) 587-2900



H

☐ SEND ME MORE INFO ☐ CALL ME

☐ I HAVE PRESENT NEED FOR SYSTEM

NAME _____

COMPANY _____ PHONE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

SYSTEMS Engineering Laboratories, 6901 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313

European Inquiries: 85 bis Avenue Albert ler 92 Rueil-Malmaison, France Tel 967-8317

The NCC: Reminiscent of the Late Sixties

Some of the magic from the "Magic Kingdom" of Disneyland must have spilled over into the neighboring Anaheim Convention Center last month.

The third annual National Computer Conference, expected by sponsoring American Federation of Information Processing Societies to draw some 25,000 people, attracted instead 34,226, making it the biggest NCC since the national event was substituted for the semiannual Joint Computer Conferences in 1973. Many thought it also was the best. Queueing at the registration stations rivaled that for Disneyland's popular Matterhorn ride. Some happy exhibitors likened the show to those of the boom years in the late '60s.

It was, as expected, essentially a regional event with most attendees coming from the West. That total attendance reflected some arduous promotion by exhibitors was obvious from the fact exhibitors guest attendance was up from 8,804 last year in Chicago to 21,406 while paid attendance was down from 9,707 to 4,716.

The high turnout in Anaheim had a pleasing effect on two upcoming New York computer shows. More than 500 booth spaces were reserved for the NCC there next June 7-10, according to Donal Meier, general chairman of this year's event. IBM, whose space in the '75 show was in the portion of the exhibit hall farthest from the main entrance and was somewhat overshadowed by a bigger (in structure, not space) Control Data booth across the aisle, had a representative up at 5 a.m. to get a better selection for next year.

Dataproducts Corp., which had pulled out of this year's show last December, was first in line among nonexhibitors. Meier said a representative for next September's Info '75 show in New York sold 100 booth spaces for that show to exhibitors he contacted at the NCC.

Officials at the Dept. of Commerce international booth said, on the conference's third day, that some 400 overseas paid registrants were there and that more than 200 were exhibit only guests. Most numerous were the Japanese but petro dollars were represented by attendees from Saudi Arabia and other oil-rich countries.

Japanese vendors were very much in evidence on the exhibit floor. Their marketing effort was directed at selling to oem's and acquiring distributors. An unfortunate feature of some of these booths was the presence of personnel who professed to speak no English. Many busied themselves with housekeeping (boothkeeping?) when a mildly interested visitor stopped to learn about the products being shown.

Among the newer high technology products brought from Japan were Canon's 4,000 lpm laser printer/plotter and Nippon's replacement for IBM's Winchester disc.

Other crowd-drawing products at the NCC included McDonnell Douglas' audio response system, the first computer product announced by the firm, and Control Data's mass storage system, a competitor for IBM's 3850. The Control Data unit was down for awhile on the show's first day causing a booth staffer to quip: "We're demonstrating its maintainability."

Among the missing at the '75 NCC were small business systems (except IBM's System/32 and one Japanese entrant) and word processing systems.

This could be different next year. Next year's program will focus on the economics of running a computer installation and also will cater to the interests of smaller businesses that do not use computers. IBM's Stanley Winkler, program chairman, and Carl Hammer of Univac, conference chairman, said they've identified "between 100,000 and 130,000" businesses in the New York City area who are potential users of small computers. They are thinking of a separate display of entry level computer systems and a program of tutorials for these persons.

Soft on software

Software firms, mostly absent this year, could come on stronger next year. Software ag, marketer of the ADABAS data base system, was very happy with the turnout at its booth. Both John Maguire of Software ag and Jim Case of Dylakor Computer Systems are involved in efforts to attract more software firms to the next show.

Neil Gorchow of Sperry Univac, a conference luncheon speaker, made a case for software involvement. "Clearly, the limiting factor for applications development, which is directly related to the continued growth of this industry, is the 'software dinosaur'," he said.

A session on "Programming as an Act of Communication" pointed up what might be one of the "dinosaur's" more serious problems. Panel members found themselves in semantic quicksand, groping for differences and distinctions for such terms as "programming," "communications," and "data processing."

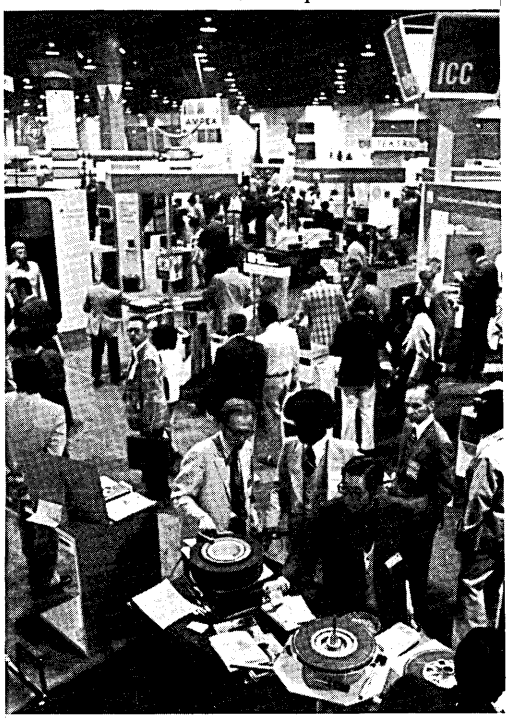
Other arguments came up in other sessions. In one, it seemed that the entire U.S. Navy was taking on Daniel D. McCracken and Control Data Corp.'s Jitze Couperus with the Navy arguing that COBOL has become too bulky to be a reasonable language. Stated McCracken: "COBOL is a whole lot better to use in structured programming than generally realized." He promised a book on the subject by February.

The viability of FORTRAN was debated in another session. But, when a questioner from the floor wondered how long FORTRAN would be around panelist Ben Wegbreit, of Xerox' Palo Alto Research Center, resignedly answered, "Ah. . . . FORTRAN will be around until the end of time . . . "

The future

There was much talk of the future. Gorchow's topic was "Industry Looks to the Future." He looked to such things as "more forgiving systems," data processing people learning "business-ese", and a marriage of computers to communications which will lead to more communications networks and a strengthening of distributed processing.

There was a whole series of sessions on the future. In one, two speakers from



IBM, Poughkeepsie, N.Y., said intelligent terminals hooked to tomorrow's large scale computers will deliver data processing capabilities at a cost "somewhere in the range of the cost of telephone service."

Without indicating when this might come about, Bernard J. Greenblott and Mu Y. Hsiao envisioned a future system whose processing power of 10 million instructions per second would support a billion bits of main memory and a trillion bits of archival storage, packaged in a single unit. They likened this to 10 four-megabyte 370/158s lashed together with more than 2,000 reels of tape on-line. Advances in LSI technology that would push semiconductor storage capacities well beyond today's 8K chip capacities would be a factor in making this possible, they said.

(IBM lawyers sought to have the paper removed from the printed proceedings but were too late for the printing deadline. AFIPS attached a mimeographed note to the proceedings that said, "The projected conclusions . . . were those of the authors . . . and do not reflect any particular product development.")

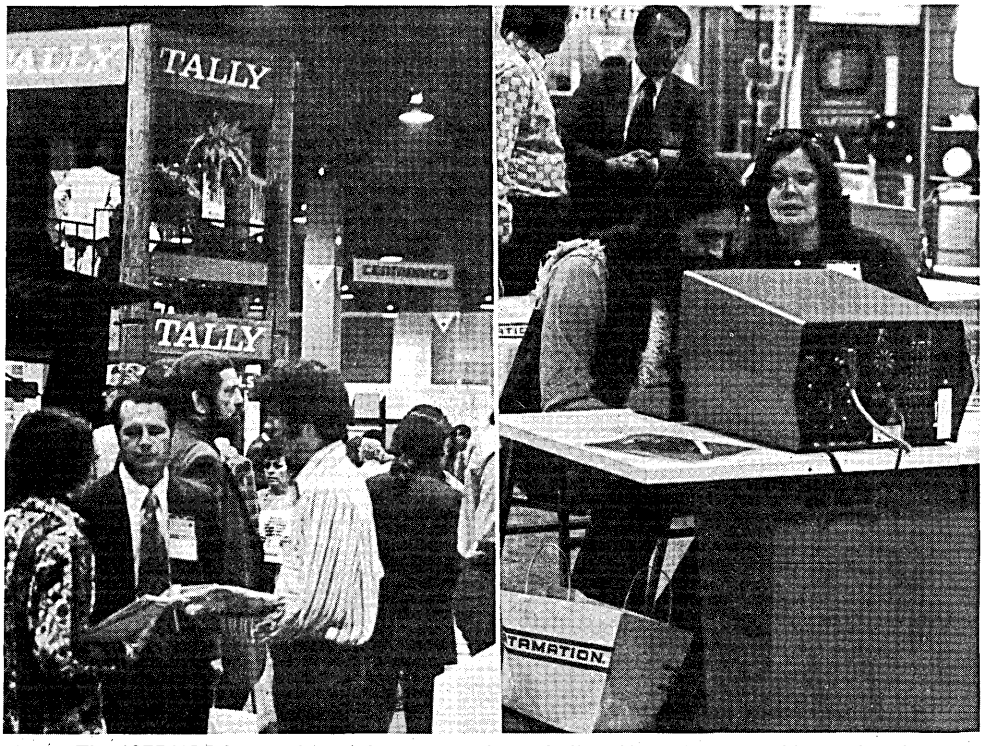
Concern for the future was demonstrated by a turnout of some 1,000 to an evening session on "Data Processing displacing people. He advocated creation of a national computer job bank to match availability of skills and jobs. "The computer is here to serve man. We're not here to serve the computer."

Keynoter Jay Forrester, Alfred P. Sloan School of Management, MIT, had a challenge for the future. In a speech described by some as "highly pessimistic," delivered to an overflow audience, Forrester placed the challenge of tackling today's economic and social problems squarely in the hands of the data processing professionals. He called for individual commitments.

"Past short-term solutions, oriented to an economy operating with abundant resources, are no longer appropriate to today's socio-economic system—a system equal in complexity to at least a 2000 order highly non-linear differential equation," he said. "And yet, we are trying to solve the problems of behavior within that system by editorials, by inspection, by debate in Congress, without any real analysis of the dynamic interactions within that system."

Issues of today

Some of these interactions are the issues of today; issues such as privacy, certification, security, electronic funds



The 1975 NCC featured multiple story booths and offered lots of opportunities for hands-on inspection.

in 1980-1985." Among other things, they heard Mort Bernstein, System Development Corp., predict that, at current growth rates in computer power and computer applications, by 1985 the world will need 80,000 times the programmer productivity it now realizes.

A different kind of concern was expressed by Bob Jensen, United Auto Workers, who worries about computers transfer, and antitrust. All were discussed at the NCC.

A session on data security and personal privacy packed one of the convention center's larger halls and, when panelists finished their presentations, members of the audience rushed to line up behind aisle microphones to ask questions.

Willis Ware of The Rand Corp., chairman of the committee that produced the HEW report on privacy, was concerned that words from that report had "been lifted directly to become draft legislation" in Congress. He was referring to HB 1984 which, unlike the already enacted Privacy Act of 1974, would affect the private sector. His committee, Ware said, was not concerned with targeting in on the private sector but rather on the federal government in the large, on HEW in particular, and to a lesser extent on state governments. He lauded creation by the 1974 Act of a Privacy Commission which he hoped would be allowed time to take a careful look at the private sector before the states "become hurried if not rushed" into legislation.

Carole Parsons of the Domestic Council on Privacy told the session she had been authorized to "assure you there will be at least one nationally recognized, highly regarded data processing expert on the (Privacy) commission." Ware has been mentioned as a logical contender.

William Fenwick, an attorney, addressed the privacy session from the perspective of "the guy to whom it's being done." He warned against "the romanticism of privacy," the loose definitions of such terms as personal information and information systems and the difficulties in compliance with not only the federal legislation but legislation which is pending or enacted in 39 states and at least one city. "Even individuals are affected. If you have a Christmas card list or a collection of business cards, that's personal information."

Fenwick warned that the people drafting the legislation don't know what it is they're going to regulate. This warning was taken up in a session on Law and the Future by attorney Susan Nycum. "In the minds of data processors," she said, "is the notion that legislators have thought it all through. Not true. The idea of privacy is very hot. There is a race to get on this bandwagon. They (legislators) would welcome someone pointing out the technical absurdities."

The issue of certification also came up in the Law and the Future session. There was discussion of the possibility of malpractice charges being brought against data processors as with lawyers and doctors. A questioner in the audience wondered who would be liable and who should be certified, the data processor or his company. Said attorney Bob Bigelow: "Both."

Certification and licensing of data processing practitioners are issues which have generated considerable debate in the trade press, but they attracted only 150 to a session on the subject. Consensus of the speakers and the audience seemed to be one of little urgency, although a doctor in the audience voiced

his profession's hesitancy to rely on data processing in issues involving patient care. "In my field, dp mistakes can sometimes be fatal," said William T. Blessum who said he is a data processing practitioner as well as a medical doctor.

Gary Casper, treasurer-elect of the Society of Certified Data Processors, sitting in for the SCDP president Kenniston W. Lord, Jr., said he was "surprised and frightened" at the way state legislatures jumped on the issue of licensing dp practitioners.

Electronic funds transfer, another area subject to legislation, packed an NCC session room. Barry Wessler, Telenet Communications Corp., characterized EFT as having "exciting elements" and "potential for good or evil." It is up to the computer and banking professions, he said, whether it will be good or evil.

B. Ray Traweek, National BankAmericard Inc., session chairman, said in response to questions that he doesn't think there's any chance of any legislation creating a moratorium on EFT developments in the next five years."

Antitrust

Interest in the issue of antitrust must have been concentrated in New York where the IBM-Justice trial was beginning during NCC week. A session on Antitrust and Regulatory Aspects drew a meager attendance. Session chairman F. Sherwood Lewis, Sanders Assoc., warned dp users: "It's easy to get the impression that the battles are being fought on Olympus . . . and have very little to do with dp users . . . The continuing results of regulatory and antitrust processes are going to dictate the technology available to you as users and what the marketplace is going to look like."

Apparently right now it looks different to different people. In a session on Future Directions in Medical Computing, G. Octo Barnett said there are a lot of used-car salesmen in the computing industry. In answer to a question about what it will take to get people in the medical industry to accept computer systems, Dr. Barnett, of Massachusetts General Hospital, said that while the medical field is very tradition-bound and conservative, it wisely has rejected systems that, in retrospect, should have been rejected. He added that it will be difficult to get innovative things accepted, but if the technology can be shown to improve health care delivery, it will be accepted.

A day long series of sessions on Health Care and Computers drew local medical doctors to the NCC on Wednesday to mingle with the crowds of computerniks, vendors, and students. Aisles were packed through the final day and everyone looked happy.

Perhaps most happy was Neil Kleinman of Electronic Memories & Magnetics who won a refurbished SDS 910 computer given away by Valcomp, the maintenance branch of Tymshare. Probably least happy was Convention Center official, Dick Benson, whose 2,200-plus parking spaces weren't enough for the crowd.

And then there was the IBM representative who wished "the Justice Dept. could be here to see what the competition is doing." □

(This article was written by Edith Myers with reports from Michael Cashman, John Kirkley, Tom McCusker, Richard McLaughlin, Dan Schlosky, Sarah Spitz and Edward K. Yasaki).

Pioneer Day—"A Time to Remember"

"There's a time to laugh, a time to weep," the old adage goes. To that sequence Herman Goldstine, leadoff speaker for NCC's Pioneer Day, added "a time to remember."

Mostly it was a time to remember John von Neumann, the man most often credited with the invention of the stored program computer.

A group of some 100-plus—small as this year's NCC sessions went—was

treated to a lesson in computer history given by the men who made some of it.

Goldstine, as leadoff speaker, had the privilege of telling the first von Neumann story. Stories about the man, his total recall and ability to do complex calculations in his head are so well known, he chose to tell of one of the times von Neumann was fooled.

He told of a hard-working young mathematician faced with a series of difficult calculations in the pre-computer era, who had worked all night with a calculator to do four cases of a math problem. Exhausted and frustrated by the number of cases yet to be done, he took his problem to Goldstine, who mentioned it to von Neumann.

"Jiggling his keys, his eyes in the air, his mouth slightly open, von Neumann went into his typical 'computing mode'," Goldstine said. The young mathematician was awed as von Neumann proceeded to duplicate, to four figures, the calculations he had taken eight hours to do to three-figure accuracy the night before. When von Neumann was halfway into the fourth case, the young mathematician blurted out the answer he had gotten.

von Neumann was taken aback. Goldstine said he let him fret for the better part of the day before telling him how the mathematician had known the answer.

von Neumann is credited with recognizing that programs and data could be stored in the same medium, making self-altering programs possible. He saw that a stored program computer could be built with three major components a memory, an arithmetic logic unit, and a controller. It was to build such a machine that the Princeton project was started.

The machine had a parallel arithmetic feature that was new. "There was no great confidence that all of the parts the parallel arithmetic required could be made to operate simultaneously," said Julian Bigelow, a project member. "It was clear to all of us that this apparatus could generate large amounts of hash if something went wrong."

Things went right. The machine ran the first time it was turned on. It was used as a test bed for various kinds of peripherals, including drums and sensitized-paper printers. Fast, for its time, it could do additions at the blinding rate of one every 70 microseconds. And it was the direct progenitor of the ORDVAC, the Illiac, the JOHNNIAC, and many others.

It's something to remember. □

The Rules Unclear; The Game Goes On

While state and federal regulatory bodies debate the how's, why's, and whether-or-not's of Electronic Funds Transfer (EFT), banks and other financial institutions are going ahead and doing it.

They're doing it at different rates of speed. The National Automated Clearing House Assn., which came into being last June to facilitate interregional paperless money transfers, started with four members and today has 20. But the latest clearing house association to go operational, the Mid-Atlantic Clearing House Assn., which started up April 1, had yet to process a transaction by mid-May. And the grandaddy of them all, the California Automated Clearing House Assn., had reached 20,000 transactions a month, a drop in the bucket for that state.

Savings & Loans seem to be moving a bit faster. Possibly spurred by John Dean's First Federal Savings and Loan Assn. of Lincoln, Neb., many are implementing, or planning to implement, remote stations in supermarkets or other non-banking locations (Feb., p. 81). In this they are abetted by a recent Nebraska Supreme Court victory won by Dean's S&L and Hinky Dinky supermarkets in which the bank has installed remote terminals. The Nebraska court ruled that Hinky Dinky was not engaging in banking by operating terminals through which store customers could make deposits to and withdrawals from their savings accounts at Dean's First Federal.

Another assist came from the Federal Home Loan Bank Board, which regulates most thrift institutions and has been granting applications to a number which wanted to do what Nebraska's First Federal is doing.

He draws a crowd

At an Operations and Automation meeting of the prestigious American Bankers Assn. in May of 1974, "Hinky Dinky" was like a red flag. At a similar meeting last month, John Dean (Hinky Dinky's John Dean, not Watergate's) was a featured and crowd drawing speaker. The commercial bankers were listening, maybe even hoping to emulate him as they'd been urged to do a year earlier by Dale Reistad, EFT pioneer and president of Payment Systems, Inc.

The banking industry is possibly the most regulated in the U.S. There's the Comptroller of the Currency which lords it over all 4,713 national banks. The Federal Reserve Board has a say over 1,069 state-chartered Fed-member banks and also regulates all 1,700 bank holding companies whether federal or state-chartered, and sets reserve requirements for all 5,782 state and national member banks. The Federal Deposit Insurance Corp. has power over the 8,448 insured, state chartered banks that are not Fed members in addition to 320 insured mutual savings banks. The Federal Home Loan Bank Board is the power looked to by most thrifts. And then there are 50 state banking agencies that have something to say about the activities of 9,518 state-chartered banks. And all of these agencies are concerned about EFT and the what's where's how's, etc.

Good and bad guys

Where will it lead? That question was asked during a session at the 1975 ABA National Operations and Automation Conference in Bal Harbour, Fla. last month. Paul Glaser, senior vice president, First National City Bank, and president, Transaction Technology Inc., a CitiBank affiliate, foresees a combining of forces of smaller financial institutions with the larger or among themselves in EFT activities. Jay Welman, executive vice president of The First National Bank of Minneapolis feels current EFT activities, both practical and philosophical/regulatory, could lead in the next 10 years to less distinction between types of institutions than exists now and to two classes, retail—the good guys—and corporate—the bad guys.

RICHARD D. HILL
. . . on shadow and substance

Donald Baker, Deputy Asst. Attorney General, Dept. of Justice, said he couldn't predict because "political processes are too episodic."

Baker, who leaves Justice in July to return to teaching at Cornell Univ., and who has been mentioned as a possible candidate for chairman of the yet-to-be-named National Commission on Electronic Funds Transfer created by Congress last August, was one of few at the May ABA conference to defend the need for and purpose of the ephemeral EFT Commission. Where others were predicting things like: "It'll never happen;" "If it does occur it'll be an examiner after the fact;" and, as conference keynoter Richard D. Hill, Chairman of The First National Bank of Boston and Chairman of ABA's Payment Systems Policy, said, "it will be a committee recommending things which will long since have happened," Baker asked: "Do you see a better forum? The questions existing today aren't going to go away. I see the commission as having a very live role. I think the White House is looking for people with knowledge."

Keynoter Hill, the ABA's nominee to the yet-to-be appointed EFT Commission, is an EFT mover, a believer that commercial banks should be "the leaders in the brave new world of instant data communications."

Allen H. Lipis, Director of Payment Systems Research Program, Payment Systems, Inc., Atlanta, Ga., had this reaction to the proposed EFT Commission: "It could be stillborn. I see people there with no understanding of EFTS."

Talk hurts too

Vendors of equipment for the potentially lucrative EFT market have similar fears. Their concern matches that of the bankers on such government considerations as the EFT Commission and a two year moratorium as proposed by bills currently before Congress. In fact, the vendors' concern on moratorium bills seems to exceed that of the bankers. Said one, "Talking about a moratorium almost creates one. Customers are deferring orders, waiting to see what will happen."

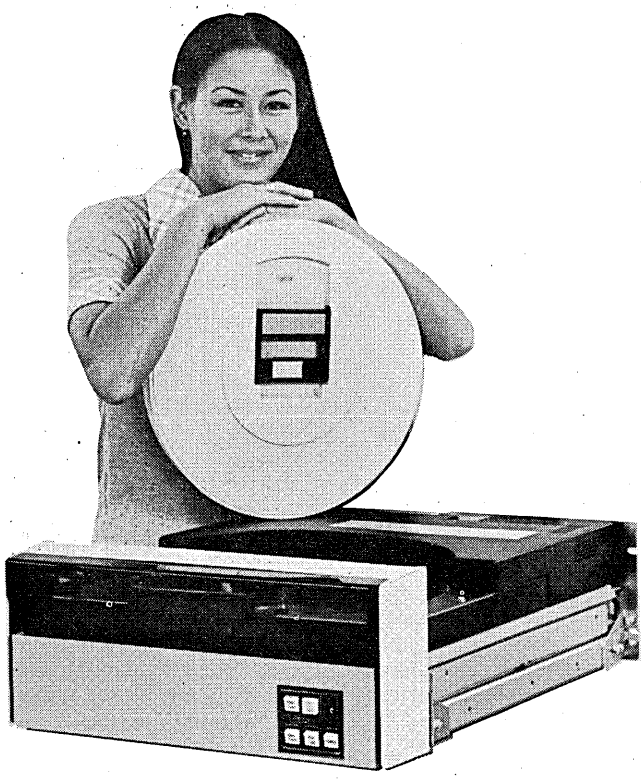
Bob Cady, program manager, AmCat, for Addressograph-Multigraph Corp., fears an EFT Commission which lacks a member knowledgeable in the basics of EFT technology. "Somebody like Dale Reistad would be ideal."

A-M's AmCat terminals figure prominently in a number of EFT experiments, particularly in connection with supermarkets and retailers. Cady feels such government proposals as the moratorium bills and the EFT commission amounts to "fomenting non-progress." A-M, which began it's AmCat program in 1973 and has some 3,000 terminals ordered and from 15 to 1,800 installed, is behind its projections, Cady said, because the government "has stymied good solid technical progress."

Few involved with EFT, whether vendor or participant, are happy with the legislative/regulatory/legal hassle surrounding the movement. The outspoken Welman, whose First National Bank of Minneapolis is a leader of the Upper

NEW! WANGCO's 4400 bpi Series-T/44

25 megabytes of storage in a low-cost cartridge disc drive!



WANGCO introduces *4400 bpi,* 200 tpi in the 5440-type Series-T, using the newly-established standard cartridge for 4400 bpi recording density.

Here is a new generation of cost/performance for a broad range of OEM applications and systems.

Using a new spindle-drive system and simplified voice-coil positioner, WANGCO is paving the way to greater reliability, reduced maintenance and lower cost of ownership. Cartridge disc drive storage is doubled in this new drive, making WANGCO's disc drive performance spectrum the broadest available.

Series F, T and N disc drives having 100 and 200 tpi performance capabilities, with data densities up to 2200 bpi, provide disc drive capacities from 1.25 to 12.5 megabytes.

Like its predecessors, the WANGCO 4400 bpi 25-megabyte Series-T/44 fits into a 24-inch deep rack, and requires only 7.75 inches of vertical space. Like the Series F and T, it operates from virtually any power source in the world, requiring less than 400 watts.

Phone or write for Series-T/44 data package.

WANGCO

SETTING THE PACE IN PERIPHERALS

5404 Jandy Place, Los Angeles, Calif. 90066
(213) 390-8081

In Europe: WANGCO Incorporated, The Lodge, 362 Cranford Lane, Harlington, Middlesex, England. Telephone 897-0202.
Offices in France, Germany, Sweden, Switzerland, Australia, Brazil, Canada, Israel, Japan and South Africa.

Midwest Automated Clearing House Assn. (UMACHA), admitted, in response to a question at the ABA conference that UMACHA is looking into the possibility of withdrawing from the Federal Reserve Board of Minneapolis "just in case."

Welman was critical of the Fed earlier in the conference. "The Federal Reserve Board appears to be presiding over a wake for our industry, at the expense of our industry and to the benefit of Savings & Loans, credit unions and other thrift organizations."

He pointed out that Atlanta (Ga.) had asked the Fed to participate in a switch demonstration pilot and the Fed has said no. "Then the FHLBB (Federal Home Loan Bank Board), a federally funded trade association, agreed to pay the cost of the program and make it available to some of its banks (S&L's)."

Welman's criticism of the Fed was taken up by Lipis who said "the Board of Governors (of the Federal Reserve Board) needs to make up its mind whether or not it's in the payments mechanism at all. Where other bodies can make decisions in weeks or months it takes the Fed a year."

Justice's Baker defended the Fed. "It's a matter of Gresham's Law. To what extent do you want to spend public funds to put forward what essentially is a private sector service?"

The Comptroller of the Currency's revision of his December 1974 ruling that customer bank communication terminals (CBCT's) are not branches, which set a 50 mile limit from the home banking office for CBCT's not shared (see related story) was announced during the ABA conference and drew mixed reactions. There was little concern with the sharing aspect and many attendees seemed to feel sharing (of CBCT's by various financial institutions) is inevitable but there was considerable concern about the 50 mile limit. Both Welman and Baker called the limit "unfortunate." They agreed the "limit should be set by the marketplace."

Lipis called the comptroller's ruling, with or without the revision, "an exciting and competitive development" particularly for banks covered by the ruling and located in states which don't allow branch banking.

Comptroller Adds 50 Mile Limit

Geographical restrictions have been added to the Comptroller of the Currency's December ruling which permits national banks to install customer bank communication terminals (CBCT's) in remote locations such as retail stores and shopping malls, after they file a 30 day advance written notice with his office.

A national bank now is required to limit the geographic area in which it can install a CBCT to a 50 mile radius of its home office or any branch. The 50 mile limit is waived if the terminal is available for sharing or interchange with other financial institutions.

Opposition to the December ruling was voiced by Meyer Eisenberg, of Lawler, Kent & Eisenberg, attorneys for the Independent Bankers Assn. of America. IBAA has filed suit against the comptroller in the U.S. District Court for the District of Columbia, seeking to declare the ruling "null and void."

Eisenberg says the comptroller's ruling creates a legal inequality between national and state banks because it does not treat CBCT's as bank branches within the meaning of the National Bank Act. National banks, under the comptroller's ruling, can install CBCT's with 30 days notice, while state banks must treat CBCT's as branches and follow more complicated rules for establishing them because most state regulatory agencies consider CBCT's to be branches.

The IBAA has "never taken the position that it is opposed to the development of CBCT's as such, or the EFT system," said Eisenberg. "The IBAA is saying that what it is opposed to is doing it under a system of legal inequality."

IBAA's suit against the comptroller alleges that CBCT's should be subject to the same restrictions on their authorization, establishment, and operation as bank branches; that the comptroller's ruling is contrary to the provisions of the National Bank Act; that the ruling will effectively destroy the competitive equality of state and federal banks; and that state banks suing with IBAA will suffer "substantial, immediate, and irreparable" injury if the ruling is allowed to stand. The suit also charges that the "blanket" authority given by the ruling to national banks to establish CBCT's without prior approval or subsequent regulation by the comptroller "creates a dangerous system of unregulated banking."

The suit claims the granting of permission to national banks to establish CBCT's without limit as to number, function or geographical reach ignores the Congressional Act creating a National Commission on Electronic Funds Transfer and is in direct conflict with Congressional intent that the entire EFT area be carefully studied and the projected effects weighed and evaluated before approval is given for the establishment of such units.

IBAA also has filed a motion which seeks a preliminary injunction to prevent the comptroller from further implementing the ruling until the suit has been settled. The motion says the Administrative Procedure Act was violated. Hearings held by the comptroller in the spring, says IBAA, did not meet the Act's provisions because, although oral and written presentations were permitted, no provisions were made for questioning or examination of witnesses by interested parties.

The motion also says state legislatures are being urged to pass legislation allowing state banks to establish CBCT's. It claims the comptroller's ruling has "created a climate of great urgency and concern in many states" and "is forcing state legislatures to reluctantly consider passing emergency legislation to protect their state banks."

—P.E.

All the equipment

For vendors of automated teller terminals, the ruling bodes well and there was more of such equipment at this year's conference than in any past year. In fact there was more of everything for banking automation than ever before with a record of 150 exhibitors up from 66 the year before. Prime attractors were the unmanned terminals and teller terminals, those to assist in-bank tellers.

In the exhibit area, most of the unmanned teller terminals were giving out funny-money. But not Mosler's. They were dispensing real cash. Hitch was, while attendees were allowed to keep the funny-money, Mosler wasn't as liberal with it's real cash.

A newcomer in the automated, unmanned teller area, was Bank Computer Network Corp., Chicago, with its "Instacash" which doesn't use a card, only a keyed in PIN (personal identification number) and which operates via a microprocessor and is mobile, which the company says appeals to company credit unions which like to "roll it into the cafeteria at lunch time."

Automated teller stations were not the only things at the show. Control Data Corp., in one of the exhibit's largest booths, introduced its Data 979 bank entry subsystem for check processing which can work with both CDC and IBM host computers.

Datasaab Systems, Inc. had a booth and something better. The firm took

Introducing Sycor's intelli

Our new 500,000 character, dual flexible disk option offers Sycor 250 users the best of two worlds: the storage capabilities of a batch terminal with the inquiry/response features of an on-line terminal.

An on-line/batch terminal.

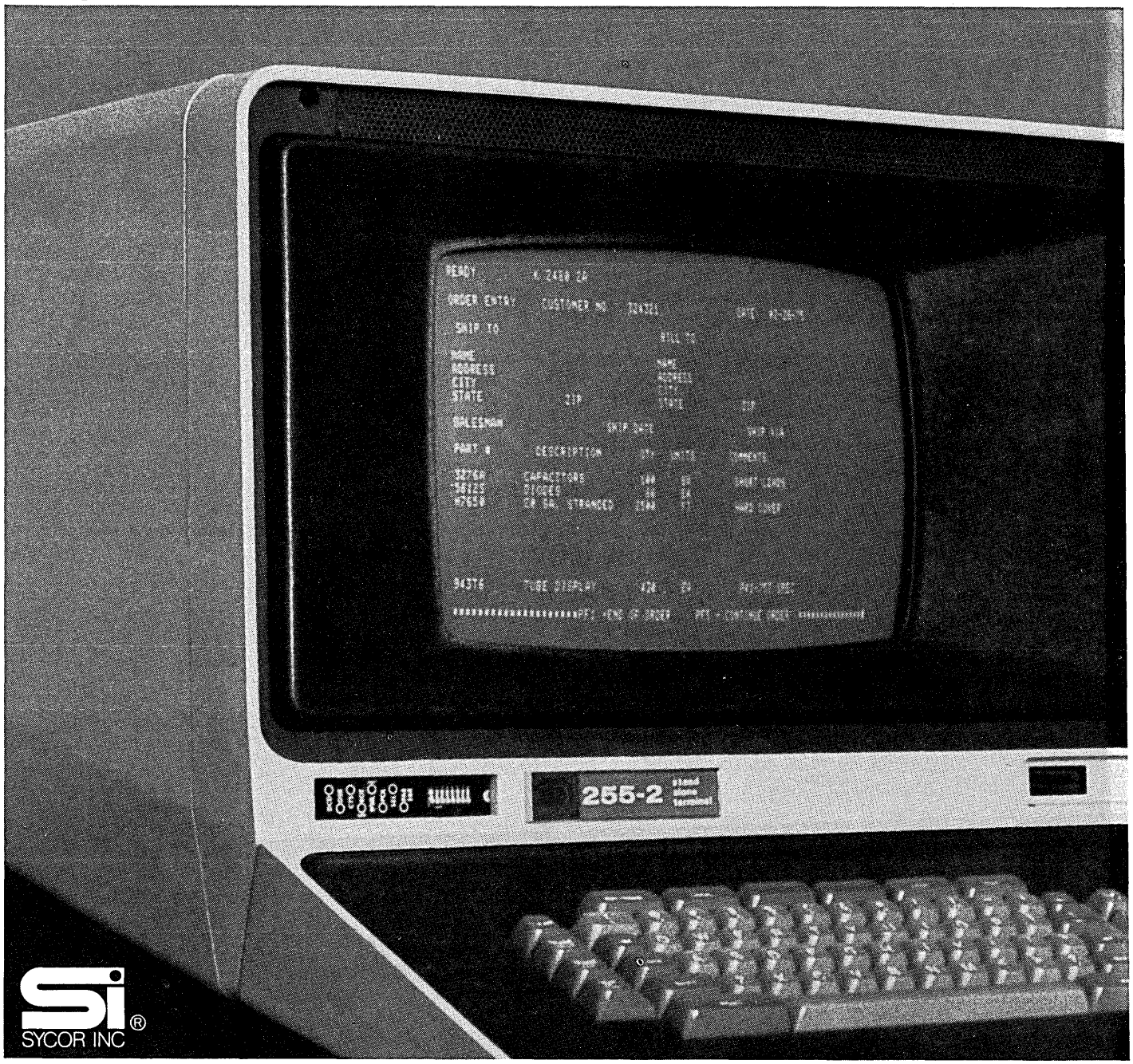
Use the Sycor 250 like a batch terminal. Store non-critical data on the diskettes during the day and transmit it to the CPU in batches. Data can be processed at night and sent back, unattended, to the diskette for printing the following morning. And the system lets you continue entering data even during computer or line outages.

Store formats and programs locally.

For inquiry/response applications, you can store an unlimited number of formats right at the site, instead of being on-line all the time to the CPU. So you leave the line free for more critical traffic.

Or you can store your own program locally. Using ou Sycor 250's simple, yet sophisticated FIL language, you can cut line time further by catching operator erro on the spot—instead of at the CPU.

All of which means that you end up using that expensive communications network more efficiently. S



CORPORATE OFFICES: Ann Arbor, Michigan 48104 (313) 971-0900. DISTRICT SALES OFFICES: Atlanta (404) 455-3070 • Boston (617) 890-7290 • Chicago (312) 297-5200 • Cleveland (216) 741-4840 • Columbus (614) 888-8657 • Dallas (214) 521-6710 • Denver (303) 458-0794 • Detroit (313) 355-5770 • Greensboro, N.C. (919) 274-2964 • Hartford (203) 529-1100 • Houston (713) 785-2953 • Indianapolis (317) 784-6779 • Kansas City,

gent "3270" BATCH terminal.

/ou can install more terminals per line, and maybe :ven install fewer lines.

Remember the intelligence.

Of course, none of this would be possible without he high level of intelligence that we've built into every lisplay. Each display station has its own microprocessor ınd up to 8K of random access memory for range :hecking, equal-comparison, arithmetic)perations and a variety of other tasks.

And, when it comes to service, our terminals are)acked by a staff of 400 field engineers who serve more than 1,750 North American cities from 95 Sycor service centers.

For more information, call your Sycor representative today. He'll tell you all about our intelligent on-line terminal that leads an interesting double life.

SYCOR

Mo. (816) 842-7799 • Los Angeles (213) 640-0120 • Miami (305) 592-1533 • Milwaukee (414) 257-3780 • Minneapolis (612) 854-2309 • New York (212) 371-9050 • Philadelphia (609) 665-1170 • Pittsburgh (412) 922-3350 • Portland, Ore. (503) 227-5672 • San Francisco (415) 349-6626 • St. Louis (314) 878-0090 • Washington (703) 527-0200. **SERVICE CENTERS IN 95 CITIES. CANADA:** Sycor International Ltd., Toronto (416) 429-0883.

groups of show goers into downtown Miami to see the newest installation of its on-line banking system at Southeast First National Bank. The bank's system includes 11 terminals connected to two Datasaab D-5/20 minicomputers each of which is linked to a Burroughs 4700 and an IBM 370/145.

Such things are the substance of EFT, substance referred to by conference keynoter Hill in an opening anecdote about a traveler who hired a camel on a very hot day, stopped to rest at a place where only shade was offered by the camel, got into an argument with the camel's owner as to whether he had hired the shadow as well as the camel, only to see the camel gallop off as the argument ensued.

—Edith Myers

Privacy

Computer Professionals Help Kill Information System in California

An unusual alliance of computer professionals and a unique civil liberties advocate organization has managed to halt the implementation of a Juvenile Information System in the Santa Clara, Calif., Probation Dept. A mere two days before it was to be placed-on-line, the group convinced the county board of supervisors to kill the measure last April 8 in a vote of 5-0.

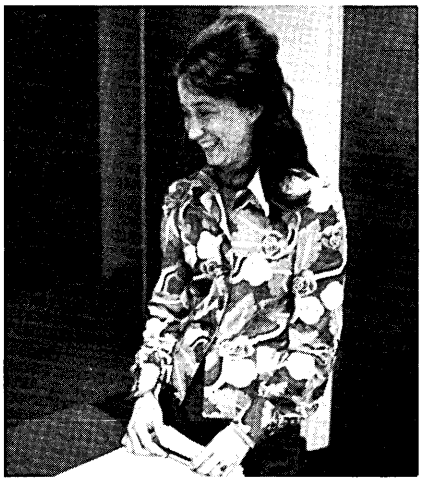
Carol Guddal, an ex-programmer at System Development Corp. and now a technical writer for Hewlett-Packard in Cupertino, lent her technical expertise to the cause. She says, "I found that a lot of people caring (about something) make a difference, and I didn't think that condition existed anymore in this country."

The proposed JIS, which had been in development for two years under a grant from the federal Law Enforcement Assistance Administration, was to centralize the files of juveniles that now are scattered in manual files among the police departments in the county, as well as in the Sheriff's and Probation departments. Each agency, then, was to have access to the data from terminals, which means the policeman on the beat would also be able to get to the information.

A central issue, however, was the inclusion of the names of juveniles who are not delinquent, have never committed a crime, and are not accused of one. These so-called predelinquents might be truants, runaways, or incorrigibles beyond the control of their parents or school authorities. Many of them, unfortunately, are referred to the police, "from our point of view in part because there was no other alternative in our community, not necessarily because they had characteristics of predelinquency, whatever those may be." says a prominent legislative advocate Dorothy Ellenburg. To give them records and place their names in the computer files would be tantamount to labelling them as asocial kids, she says, when their problems may not be of their own doing. And yet with JIS this information would be instantly accessible by policemen on their beats. "We thought that was an inappropriate use of data, that the disposition of the police officer should be based on information about the present situation, not on data from the past."

Thirty volunteered

Ellenburg is director of the Council for Community Action Planning Inc. (CCAP) in San Jose, the organization that led the nine-month fight against the implementation of JIS. She says more than 30 professionals from computer companies in the area volunteered their help in the analysis of the proposed system, alerting her to the capabilities and ramifications of computer usage.



DOROTHY ELLENBURG
Kids can't be denied due process

The objection of Ellenburg to this use of data on children is rebutted by the Probation Dept. A spokesman cites the hypothetical instance of a child caught shoplifting and subsequently booked. Had the apprehending officer been able to gain access to that child's files, assuming the kid had one, it might be learned that the child was from a poor family and needed food, or was a neglected child who could be placed in a home (unfortunately called a shelter), rather than be booked. This information, instantly accessible, could be beneficial to these so-called predelinquents.

Both the department and Ellenburg stress that the Probation Dept. by state law must come in contact with these youth. And the department would like to avoid the stigma that attaches to a child whose record is maintained by Probation. But there is no social agency to turn them over to. Adds Ellenburg, "Part of the reason the justice system has intervened as much as it has is because of the vacuum in alternatives. They don't know what else to do."

In addition to objections over the inclusion of these names, CCAP also learned of the lack of security measures in JIS, and of the planned proliferation of terminals in the county. There would be at least one in each local police department, the sheriff's office, district attorney and public defender, and three in the probation department—perhaps at 15 using agencies. Guddal says the system would know which terminal was making an inquiry but wouldn't know who was at that terminal.

"We also learned that there would be printouts, not just displays on screens," says Ellenburg, almost as though she had been working with computers for a number of years. Further there was no regulation governing the use of hard copies. CCAP asked that the use of printouts be regulated, but the response was that the department couldn't tell local jurisdictions what they can do with information that currently is in their manual files. And yet proponents said eventually there would be no manual files. "Clearly we would have had both, the computer files and the manual files," says Ellenburg.

CAROL GUDDAL
Computer systems are not toys

Another reason advanced for using a computer was to help in the planning function and in the management of resources, so that there would be comparable data. "We found, however, that each police jurisdiction was going to have its own criteria as to which young person's information it would input to the system, when it would be purged, and its own policies with regard to man-

ual files," Ellenburg continues. With these inconsistencies, CCAP saw no value in planning. She says there was no provision for an external audit of the system, no provision for a log of accesses to it. And although a youngster or his parent could ask to see what records were being kept on him, the form to be filled in to gain this access stated that the applicant understood he could see only a portion of his file, that portions might not be shown to him. Further, information in the file would have nothing to do with guilt or innocence, indicating only that the person had suffered a contact with the police. They asked whether information would be expunged if the police had made an error. No, that was up to the local jurisdiction.

The Probation spokesman takes exception to the lack of security measures. She says with each access there was to be a record of the person at the terminal, of who asked for the information, and what information was being accessed. Additionally there were policies and procedures for punishing anyone who abused the system. "So we did have several safeguards in the system that are not typical of computer systems today," the spokesman adds.

Guddal of Hewlett-Packard says she was shocked by the lack of security measures. "One of the things I kept looking for were hardwired codes in the terminals that would inform the computer which terminals were active and under what conditions. I couldn't get any information on any kind of hardwired security." Software security measures, she adds, "were negligible." And there was no limit to making copies of master records or the transfer of data to other media, which then could be moved to other locations.

"We tried to have changes made to make it more secure," Carol continues. "But it became apparent that the incorporation of changes would be as expensive as the original design effort. And the county was not certain it could implement changes to the basic design."

Ellenburg, who last year was named San Jose Woman of the Year by the local Mercury-News newspaper group, adds that CCAP's prime concern was not the records of law violators, but rather of people who had committed no crime, had not been alleged to have committed any crime, and the denial of due process to those kids.

In this context, CCAP learned that the county must send personally identifying information about juveniles to the state's bureau of criminal statistics. The bureau may need data about caseloads and types of cases being handled at the local level, Ellenburg says, but it doesn't need personal identifiers for any of these stated purposes. Thus CCAP, in its role as a legislative advocate, is working to develop legislation that would forbid personal identifications from being submitted to the state.

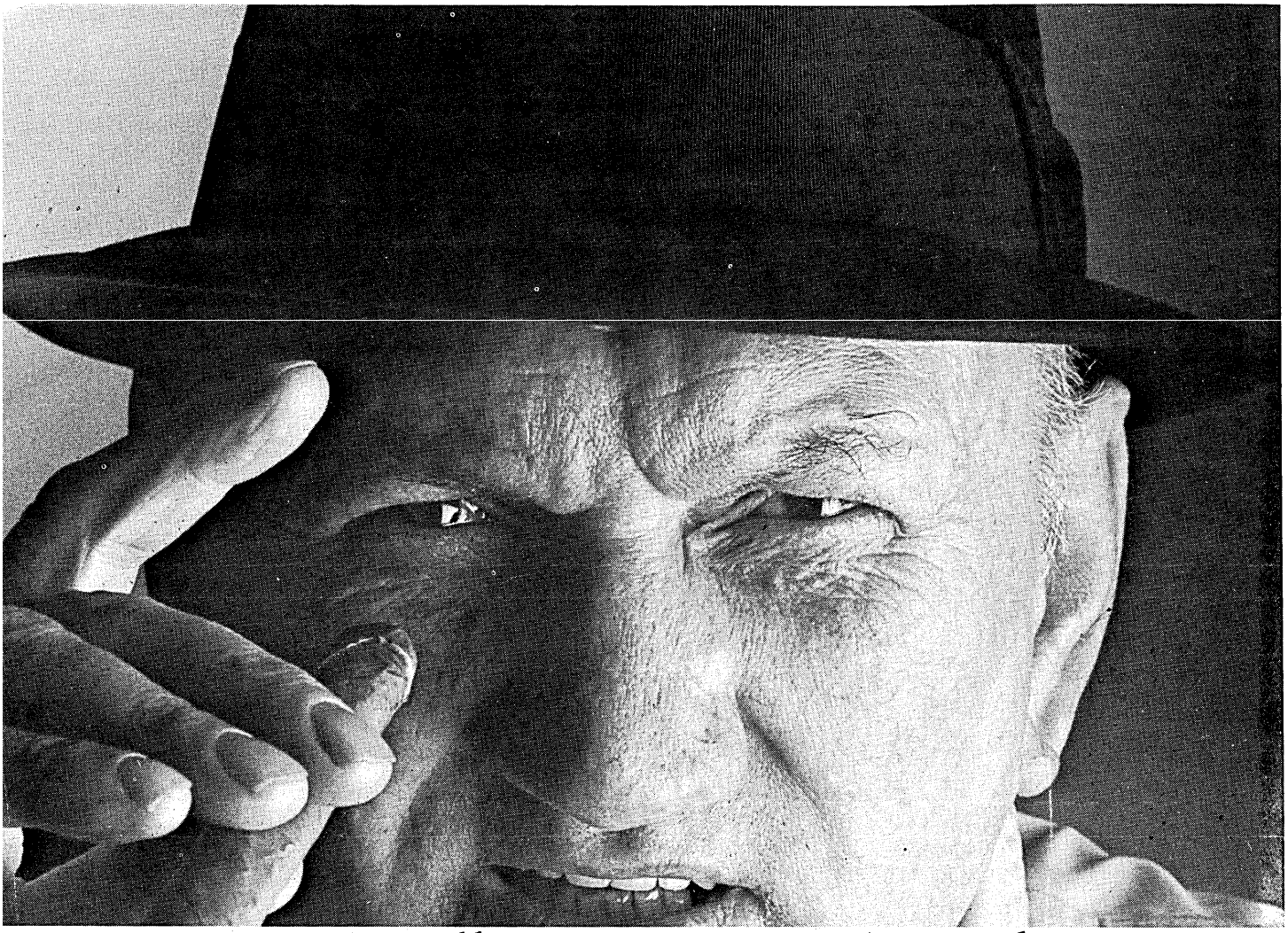
Another byproduct of the effort by CCAP was the establishment of a data confidentiality commission in the county. This group is to investigate the extent to which confidentiality is maintained on the more than three million individual records compiled by the county government on its citizens. It would cover both manual and computerized files, look into information sharing, and the implications of computerization.

"It's easy to become isolated from the use of these systems after they've been shipped out the door," says HP's Guddal. "You're isolated from the users by several levels. I personally have been very guilty of this. I'm not so sure that I'll be guilty of it any more. . . I never realized how profoundly a computer system can influence a community. They are not toys."

—Edward K. Yasaki

Two Bills Aimed at Criminal Data Banks

Two similar bills which aim to regulate the maintenance and dissemination of criminal justice records, including those in computerized data banks, have been



"Sure, my Bully's a competitive terminal. But where's the competition?"

Being the Bully's manager is no picnic, lemme tell ya.

Look. I got a terrific TTY terminal here, ready to take on everybody and his brother and all of a sudden, it's Philly-on-Saturday-night.

Sure, I've seen a lot of tough-talking terminal ads. A couple even put up a good front. But show me one terminal that'll even climb in the ring with my boy these days.

Can't blame 'em though. A blow-by-blow of the Bully's last fight'd be enough to turn any terminal chicken.

The bell sounded.

We opened with a left hook (tabbing, line and character insert/delete).

A hard right to the jaw (black characters on white background, upper and lower case character display).

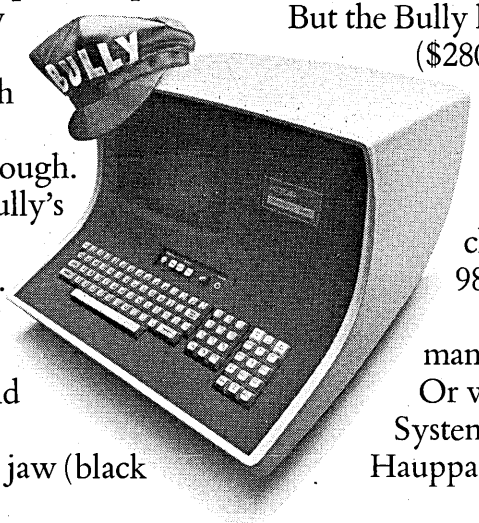
A quick left jab (protected formatting, graphics, and function keys).

Then, the old uppercut (2 peripheral ports, current loop as well as EIA interface).

The ref wanted to stop the fight. But the Bully landed a roundhouse punch ($2800 price tag with OEM discounts of over 30%) that made the decision unnecessary.

The winnah and still champeen, ADDS Consul 980, the Bully!

Call me, the Bully's manager, at (516) 231-5400. Or write Applied Digital Data Systems, 100 Marcus Blvd., Hauppauge, N.Y.



ADDS

news in perspective

introduced in the Senate by Sen. John Tunney. The senator said he is "not wedded to every provision of either bill" although he does endorse the basic framework of both.

Sen. Tunney said, as he became chairman of the Senate Subcommittee on Constitutional Rights, he recognized that "one of the highest priorities of the subcommittee would be the consideration of criminal justice data banks legislation." The bills Tunney has submitted are based on legislation introduced last year: one bill was introduced by Sen. Sam Ervin; the other by Sen. Roman Hruska on behalf of the Dept. of Justice. Hearings were held in March 1974, but neither bill passed. During the intervening year the subcommittee and the Dept. of Justice refined the two pieces of legislation.

Several days of hearings on the new bills will be scheduled in the near future, Tunney noted, adding that he hopes from them will come the language necessary for a consensus "which protects the rights and reputations of innocent individuals whose names appear on law enforcement records and at the same time ensures the efficient administration of justice."

S1427, based on last year's Ervin bill and almost twice its size (64 pages), seeks to prevent those outside the law enforcement community, such as credit bureaus, employers and similar organizations, from obtaining information on individuals who were arrested but not convicted. The Justice bill, S1428, would allow such access if it is authorized by federal or state statute, or executive order.

S1427 provides that criminal justice information is to be used for the most part within the criminal justice community. Conviction records may generally be exchanged freely within that community but corrections and release information can only be disseminated to other criminal justice agencies and to the subject if permitted by statute or court rule. With certain restrictions, criminal justice information can be used by researchers who seek statistical information for research purposes.

Another section of the bill limits access to criminal justice information by categories other than name. A court order would have to be obtained by investigators before they could gain access to a criminal justice data bank by offense, such as ordering a printout on all individuals charged with first degree burglary with certain physical descriptions.

One of the bill's provisions is based on a suggestion contained in the Report of the Secretary's Advisory Committee on Automated Personal Data Systems of the Dept. of Health, Education and Welfare. Annual public notice of every automated information system covered by the bill is required, informing of the existence of the system, the type of information it collects and disseminates and its purpose. Public notice must also be given for every new and expanded system before such systems become operational so that interested parties may comment.

A Criminal Justice Information System Board, which would be formed as directed by the bill, would have the authority to determine the extent to which the national criminal justice information system could operate its own telecommunications system, or rely on existing systems such as the National Law Enforcement Telecommunications System (NLETS). The bill seeks to use existing state based organizations such as NLETS to avert an "over-concentration of powers and responsibility" in the federal government.

The board would be responsible for administering and enforcing provisions of the bill. It could make regulations, issue orders prohibiting the exchange of

criminal justice information with criminal justice agencies which have not satisfied the act's requirements and supervise the installation and operation of criminal justice data banks operated by the federal government.

Written agreement

S1428 contains many provisions similar to those found in S1427. It also includes, however, a section which deals only with automated systems. The section requires that exchanges between agencies by means of dp equipment be governed by a formal written agreement specifying security arrangements to protect the information.

This act also contains specific authorization for Immigration and Naturalization Service and the State Dept. to obtain criminal justice information necessary to enforce immigration laws. S1427 does not include that. Similar authorization is provided by S1428 for the Treasury Dept.'s Bureau of Alcohol, Tobacco and Firearms, Custom Services, the Internal Revenue Service and Office of Foreign Assets Control. The Drug Enforcement Administration is given authorization to disseminate criminal record information to registered drug manufacturers.

New this year for S1428 is the Commission on Criminal Justice Information. The Commission is essentially a reporting service, and unlike 1427's board, can't issue regulations, make rules or have an ombudsman function.

Both bills have the title "Criminal Justice Information Control and Protection of Privacy Act of 1975." Both require operators of criminal justice information systems to maintain complete and accurate records; to seal or purge records if the subject has not been re-arrested in specified periods and to provide access and challenge privileges to information system subjects. These are similar to provisions in last year's bills.

Tunney introduced the two bills at the same time that the FBI published a controversial plan to engage in limited message switching of National Crime Information Center (NCIC) messages over the NCIC telecommunications network. Last October a battle surfaced between the FBI and state police agencies to see who would provide telecommunications services to law enforcement agencies throughout the country. The FBI wanted to acquire its own switch and interface it with NLETS, the state-run network dedicated to administrative traffic.

Deputy Atty. Gen. Harold Tyler Jr., in announcing the FBI's plan, said it would decentralize the operation of the computerized history file, a part of NCIC, into four separate categories. One category would involve individuals arrested in only one state, a category which states might find unpalatable and many fear would lead to a FBI takeover of NLETS. The plan has been submitted to Congressional committees, executive branch officials, and governmental agencies for comment. If it is approved, it will become effective Sept. 15 at an estimated cost of more than $420,000 per year.

In a letter to Atty. Gen. Edward Levi, Tunney said the plan is felt by many to be "tantamount to an unconstitutional intrusion upon state police. powers and would be a major stride toward the creation of a national police agency." He said it is "highly inappropriate and premature" for the FBI to circulate at this time a plan that "in effect calls for the FBI itself to assume control over criminal justice message switching." Tunney said the Justice Dept. should refrain from making this decision before the subject is considered by the Senate Judiciary Committee or the enactment by Congress of criminal justice data legislation. To date, Levi has not replied.

—Pamela Evans

Guess Who's Coming to Unidata—Maybe?

Death for the Unidata partnership and new life for Honeywell and Compagnie Internationale pour l'Informatique. This is what most think will happen if the proposed merger between Honeywell Bull and France's national computer company, CII, is consummated this fall.

The announcement of the agreement in principle finally came May 12, after the wildest set of rumors, protests and power plays ever to hit the European computer scene. Honeywell Information Systems Inc.(HISI), looking for ways to fill its dwindling debt-laden coffers and expand its markets, finally accomplished what it started more than two years ago. At that time majority-owned subsidiary, Honeywell Bull, began making noises that no European computer partnership could succeed without a strong international leader like itself. At that time, the new partnership between CII, Germany's Siemens and Holland's Philips was just being formulated under the name Unidata. The governments of each company were in no mood to listen to any American overtures.

But the new French government under Giscard D'Estaing was. The opposing factions were shunted aside. D'Estaing and the new Minister of Industry and Research, Michel D'Ornano were willing to listen to any deal in which France and French industry had majority ownership and a direct line to bigger world markets and American technology. So Honeywell signed up for 47% interest, 19% less than what it had in what will seldom be called Compagnie Internationale pour l'Informatique-Honeywell Bull or CII-HB. It combines: 15,000 HB people and 5,000 of the 8,800 CII employees; $523 million in HB revenues and $150 million in CII revenue. The minicomputer and military operations of CII, about $60 million in sales, go over to CII parent company Compagnie Generale de l'Electricite (CGE).

"New Life"

What Honeywell Information Systems Inc. gets out of this, the "new life", comes in several forms. It picks up $60 million in cash for selling that 19% interest. The CII-HB combine is assured of a French government subsidy that French minister Michel D'Ornano put at 1.2 billion francs, about $270 million, over the next four years. The French government as a user has promised new business for the combine that has everyone guessing; one source put the value of this at $400–600 million; another source said $900 million over four years. Still another said the government promised 60% of all new computer business would go to CII-HB, and didn't know if any promises included government-controlled enterprises. That's a good question, if you consider that the five or six biggest nationalized companies, highly independent computer buyers, pay IBM $14 million in monthly rental.

Word also is that all French industry is expecting government pressure to "buy CII-HB" via such ploys as tax breaks for the good and some form of "tariff" for not listening..

HISI's financial reports should begin to look good late in 1975, various Wall Street and Honeywell sources tell us. In 1974, HISI took a bath as its profits declined to $53 million from $75 million in 1973. Company debts swelled to $260 million and much of that came from Honeywell Bull; just how much isn't known since the annual report is late.

By the end of 1975, HISI will not have to count HB's debt if the merger goes through, since the assets and liabilities of a minority-held company are not considered in its reports. Too, HISI should show $10–12 million in profits on the sale of the 19% ownership and some earnings, maybe, from the new combine (47% of earnings). Honeywell anticipates that HISI's earnings will stay "at least at the same level" as when it held 66% of Honeywell Bull. This

news in perspective

doesn't necessarily mean that the new CII-HB will make a profit (the French government says within four years), just that Honeywell's computer operations won't be *less* profitable. And while Honeywell is busy readjusting its books for the new arrangement, it also will begin reaping benefits for the recent plant closings and 3300 layoffs; by 1975 end, the plant sales and closings and the severance pay will be completed. With the exception of the French government business, this doesn't mean that Honeywell has captured vast new markets or that the Honeywell Bull debt has gone away. But it will have more money, more opportunities and things will *look* better.

What percentage?

HISI also looks good because the French agreed to the formation of a non-French holding company in either Brussels or Switzerland for the Honeywell Bull holdings outside France. Honeywell spokesmen couldn't say who would own what percentage of this company, but what it means is this: Should the French government change hands and decide to nationalize CII-HB, all it could nationalize is the French plants and the French installations. This could make U.S. users of the HIS level 64 systems a little antsy, since France is the prime manufacturer of this system. Honeywell is, however, planning to manufacture the 64 in the U.S. but for now only as a second source (after France reaches a certain volume of production).

In return for this concession, Honeywell reportedly has agreed that should it go out of the computer business or violate the agreement with the French interests, France has the right to nationalize CII-HB.

The holding company outside France could be the organization Honeywell or Honeywell and the French interests will use to combine with other European partners. Does this mean Unidata?

Modifying statements

The French government, the new combine, Siemens have all made some mollifying statements about "continuing collaboration." It's possible. Anything appears to be possible after the events of the last several months. However, Michel Barré, president of CII, resigned in protest over the merger. Last fall, he favored a single management in Unidata and seemed to accept the inevitability of an actual merger among the computer interests of the partner companies, CII, Siemens, and Philips.

CII, apparently, never was actually brought into the negotiations. They were instead conducted by the French government (primarily Michel D'Ornano), CGE (3.5 billion holding company that is part owner of CII), Compagnie Machines Bull (holding company owning 36% of Honeywell Bull), and the Honeywell American and French executives. The German government intervened when the announcement appeared imminent in April; German ministers publicly indicated that the Unidata agreement would be over if CII merged with HB because the two lines were not compatible, Unidata's being IBM-compatible. Siemens spokesmen were saying the merger would never go through and indicated that they would "never" drop the Unidata line in favor of Honeywell's.

Well, the new CII-HB unified line will be "based on" the HIS series 60. Some of the CII line will continue to be produced, although no one could tell us if this included the Unidata 7.740 system, which CII has the responsibility for producing. In fact, a source said CII was not ready for production and that until 1976, Siemens would fill the 7.740 orders with stripped-down 7.750 systems. Pending the deliveries of the 7000 line, Siemens has reportedly done CII sales no good in Germany. A Diebold

Deutschland census showed that CII German installations actually had dropped by two in 1974.

We hear that Siemens plans to begin negotiations with the new CII-HB interests this month. But Siemens and Univac have been talking—an open secret—for more than a year. ICL continues to make noises about collaborating with Unidata. All of them talk about needing a bigger share of the world market to survive profitably.

"The Iron Law"

Justification for merger is put down by Honeywell Bull in a document titled, "The Iron Law of the EDP Market." It shows that only those major manufacturers with 10–15% of the world market (Honeywell has 9.8%) can survive. To reach that size, most competitors would have to grow faster than the market is now, which is 15% per year. What is required is access to all markets, particularly the U.S. (55% of total market value), and merger.

Regardless of whether the Unidata partners "collaborate," Unidata systems have been developed, sold and delivered. Siemens says there are 500 orders for the Unidata 7000 line and more than 600 for the smaller Unidata 300 system developed by Philips. Philips itself is committing more than 250 million guilders a year for the next three years to its minicomputer and Unidata business computer developments. Both those partners indicated that a single management (rather than management by committee as is now done) and perhaps merger with a headquarters in Brussels had been considered.

Honeywell has already found out how much in profits must be sacrificed to grow rapidly. It is now in the merger stages. Its new joint peripheral company venture with Control Data will bring in more money to Honeywell than it has garnered before, even though it owns only 30%. The CII venture will bring Honeywell a larger percentage of the French market. But the French market is only 1.8% of the world market; even if CII-HB captured it all, that would barely be enough to meet Honeywell's premise for success.

While we wait to find out whether this merger goes through this fall and just what the agreement finally says, we can now begin to speculate on who else Honeywell would like to team up with. Is there a HoneyUni(data)vac in your future?

—Angeline Pantages

Stanley Gill

The computer profession lost one of its pioneers in April when Stanley Gill died after a brief illness in his home outside London at the age of 49.

Professor Gill, a former president of the British Computer Society, entered the computer field in 1947 at the National Physical Laboratory. He earned his Ph.D. at Cambridge Univ. under Maurice Wilkes in the era of the EDSAC —Electronic Delay Storage Automatic Calculator—and went on to publish with Wilkes and Wheeler in 1951 the first book about the principles of programming.

This was followed by the work by which most engineers know him today, the transformation of the Runge-Kutta process into the Runge-Kutta-Gill digital solution of ordinary differential equations.

After spending 18 months in the U.S. in 1953-54 as a lecturer at MIT and the Univ. of Illinois, he returned to England to work nine years at Ferranti, where his 1958 paper on parallel processing influenced the development of such pioneering multiprocessors as the Orion and Atlas. He later founded the center for computing and automation at London's Imperial College. In 1970 he ventured into the commercial world for a stint as chairman of Software Sciences Holdings, declaring that "most of the large companies in this (software) field are American-owned and unless steps are taken soon to put our native industry onto a sound footing, it will cease

You know you've arrived when IBM enters your market.

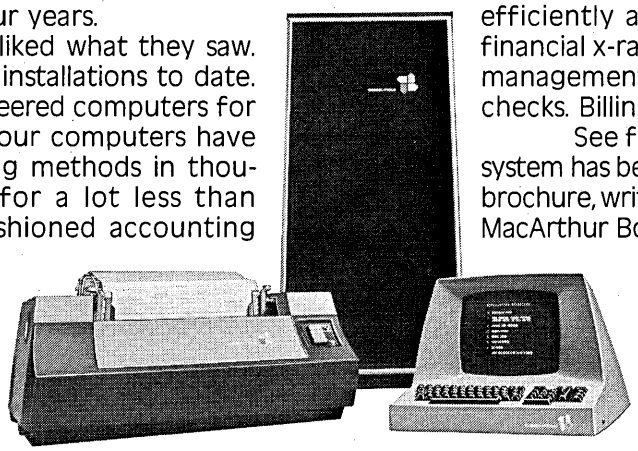
When the industry giant decides there's money to be made in the small business computer field, you know they've been watching the success of Basic/Four® over the last four years.

We think they liked what they saw. Over 1,500 Basic/Four installations to date.

Basic/Four pioneered computers for small business. Basic/Four computers have modernized accounting methods in thousands of businesses for a lot less than the expensive, old-fashioned accounting machines, service bureaus, or manual entry methods.

The Basic/Four Business Computer not only handles all accounting and bookkeeping jobs more efficiently and inexpensively, but gives a financial x-ray of the business. Like sales and management reports. Instantaneous credit checks. Billing. Inventory control.

See for yourself why the Basic/Four system has been so successful. For a complete brochure, write Basic/Four Corporation, 18552 MacArthur Boulevard, Irvine, California 92707.



basic / four corporation®

A Subsidiary of Management Assistance Inc. (MAI)

SEATTLE · SAN FRANCISCO · LOS ANGELES · ORANGE CO. · SAN DIEGO · PHOENIX · MINN./ST. PAUL · ST. LOUIS · CHICAGO · INDIANAPOLIS · CLEVELAND · BOSTON · HARTFORD · N.Y. · N.J. · BALTIMORE · WASHINGTON · PHILA. · ATLANTA · MIAMI · VANCOUVER · TORONTO · MONTREAL · OTTAWA · MEXICO CITY · PARIS · LONDON · BRUSSELS · FRANKFURT · HAMBURG · STUTTGART · DUSSELDORF · MUNICH · ZURICH · AMSTERDAM · VIENNA · MADRID · COSTA RICA · SAN JUAN · CARACAS · PANAMA · NICARAGUA · SANTIAGO · MANILA

STANLEY GILL

to exist except as a trans-Atlantic satellite."

He left two years later and at the time of his death had been a senior member of PA Management Consultants.

"The British computing profession and the international community have lost a valuable contributor," said Richard I. Tanaka, president of the International Federation of Information Processing (IFIP). Gill was the U.K. representative to the IFIP data communications committee. "About a year ago, Stan and I discussed IFIP's activities in data communications," said Tanaka, senior vice president at California Computer Products, Anaheim, Calif. "I expressed my hopes for what might be accomplished. He promised to help. He remembered that promise, perhaps better than I. For he wrote to me in March, less than a month before he died, expressing his regret that he could not then fulfill that promise because of illness—an illness whose criticality he never mentioned."

Gill was one of the founding fathers of the British Computer Society, set up its programming languages committee, then served as president in 1967-68. From 1965 to 1972 he chaired the data processing standards committee of the British Standards Institute. He was an advisor to several U.K. government ministries, as well as an Honorary Fellow of the BCS.

Gill was also one of the founding fathers—and the de facto chairman—of the informal Real Time Club, a group of outspoken participants in the U.K. industry that meets once a month for dinner and argument. "We always argued a little more quietly and fruitfully when Stan was in the chair," one member says. "He was one of the industry's balance wheels. Like many other groups in British computing, we will miss him."

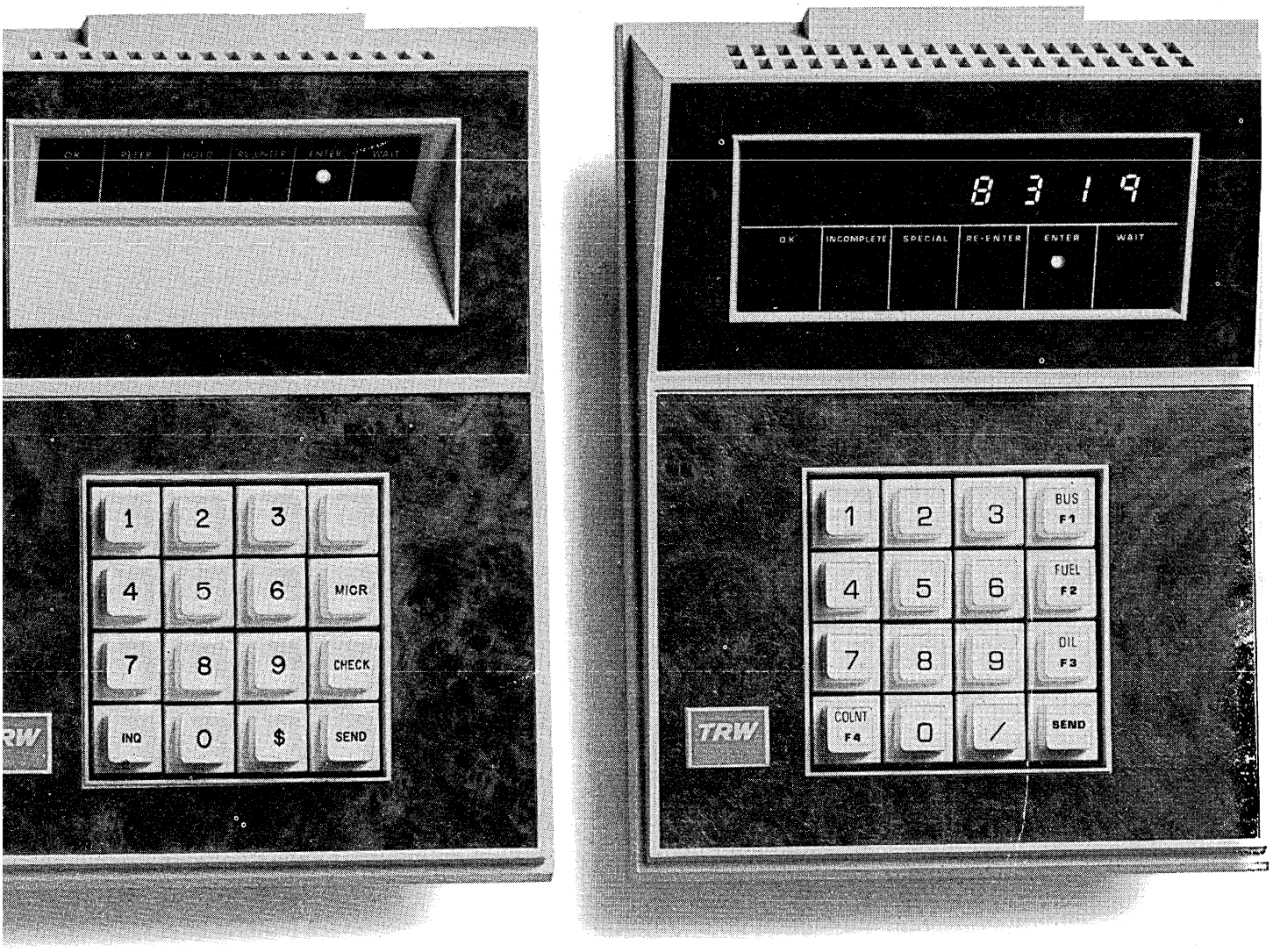
Communications

Direct Connection Due in Some States

Independent suppliers of modems, data terminals and other ancillary terminals soon may be able to connect their devices to the telephone dial-up network without the use of protective connecting arrangements that are supplied by the telephone company.

A program adopted in April by the California Public Utilities Commission to certify such devices is considered likely to be the model for similar certification plans in at least three other states. And the Federal Communications Commission's Joint Board—an advisory group composed of state and federal regulatory commissioners—has recommended establishment of a certification/direct connection program somewhat similar to the California plan.

Both the California and FCC plans, though, face some delay. In California, where the program was due to start last May 12, Phonetele, Inc., an interconnect manufacturer, filed a petition for review which may delay its startup until



Beat high costs in data

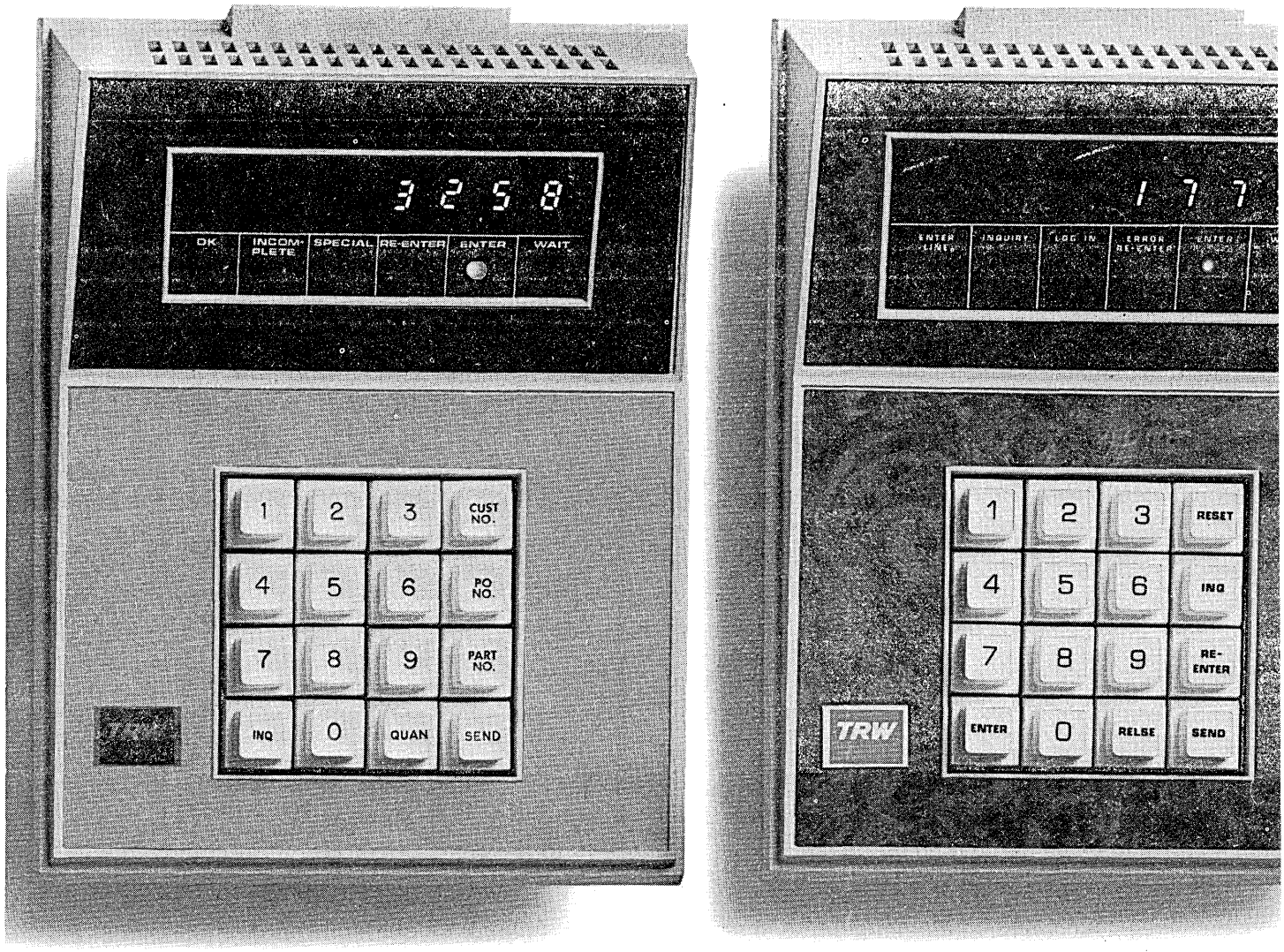
With four or more you'll save a bundle.

Digidata™ universal digital input/output terminals clobber the cost barriers on the front end of data communications systems. With four or more terminals and controller, the savings really are dramatic.

The more you use the less they cost. Rapid, reliable, versatile and ready to ship in volume.

There are already 65,000 of these remarkable little work horses on the job in credit authorization, order entry, inventory control, a statewide banking network, medical data systems and a multitude of applications where alpha would only be gilding the lily.

We're compatible. Okay, so there are places where alpha adds up, but don't use alphanumeric, print-out or CRT terminals where you don't need them. We'll mix with alphanumeric or any other RS-232C terminals as long as they're ASCII pollable. IBM line



I/O. Buy the numbers.

discipline is also available. With Digidata in your terminals mix, you're big dollars ahead.

Entry and response. The simplest Digidata format—up there on the left—handles data entry, inquiry/response, and update of central files. Three response lights can be custom labelled for any application you need. In the more complex Digidata terminals, four or eight digits move from right to left, always displaying the last digits entered. They display numeric responses as well as status.

Numbers you can live with. The most attractive part of the Digidata story is in the cost. For sixteen terminals, with controller, the average OEM price is under $400. In a major system, with 256 terminals on a single controller, average OEM cost per terminal can drop as low as $206.

Numbers to work with. Bit rates from 300 to 4800 bps; 64 character buffer; power 105-125 VAC at 60 Hz standard—100-240 VAC at 50 Hz optional. Simple two wire connections hook up all terminals within 3000 feet of the controller.

The number to call. (213) 535-3703 will connect you directly to TRW Digidata Marketing. Or send in the coupon for complete descriptive literature packet and follow-up. TRW Data Systems, 12911 Simms Avenue, Hawthorne, California 90250.

TRW DATA SYSTEMS

TRW Data Systems
Digidata Marketing
12911 Simms Avenue
Hawthorne, California 90250
(213) 535-3703

☐ My application is for _____
☐ My potential need is approximately _____ terminals.
☐ My need is immediate.
☐ My need is for information only.

Name _____
Company _____
Street _____
City _____
State _____ Zip _____
Phone _____

CIRCLE 36 ON READER CARD

July. And it's expected that AT&T may try to kill the FCC plan by going to court. A small army of AT&T lawyers has been striving to prevent such programs for the past seven years.

Late in 1968, shortly after the FCC issued its celebrated Carterfone Decision—requiring the phone company to let dial-up customers use independently-made modems and voice terminal devices—called data access arrangements (DAAs) in the case of data terminals—and were also allowed to bar anyone else from supplying them. Ever since then, independent manufacturers have been contending that the protective connecting arrangement is unnecessary, gives the carriers an unfair market advantage by increasing costs to the user of independently-made terminal equipment, and imposes design limits, particularly on data terminals.

The FCC, since the beginning of 1969, has been investigating one of these complaints—the need for extra protection. But until April, the chief result of its labors was a mountain of legal briefs, counter briefs, and counter-counter briefs submitted by the protagonists.

There's a good chance the California plan on its own will be implemented in other states, says one close observer of the controversy, Calvin Jackson, of Communication Certification Laboratories, Salt Lake City, Utah, a testing and engineering firm. The California commission has "one of the best technical staffs in the country," Jackson says. "Other states lean heavily on its judgment." Utah, New York and Illinois may be the next states to adopt a certification/direct connection scheme, since their commissions are already considering similar proposals.

Although the Phonetele petition for review prevents implementation of the California plan in that state at the moment, a source close to the CPUC thought it would be denied.

In that case, Bob Feiner, Phonetele's president, will go back to the state supreme court. He wouldn't prevent start-up of the plan authorized last month, but he could persuade the court to order a further lowering of the present interconnection barrier.

One of Feiner's objections is that the CPUC plan doesn't allow independently-made "non-ancillary devices"—such as switchboards and telephones—to be certified and connected directly. He also objects to the "access line test units" included in the California plan— an objection which other vendors share.

The test unit consists essentially of a relay, mounted at the customer-carrier interface. It would enable a telephone company technician at the central office to remotely disconnect a terminal for a short time—a matter of milliseconds, according to one engineer—and test the access line alone. The test is to determine whether impaired service was due to the telephone company's line or the customer's independently-made terminal.

"Costly deterrent"

The California PUC authorized the state's phone companies to file tariffs covering use of these test units in conjunction with "certified" equipment—

IBM Seeks Changes In Calif. Ruling

IBM is contending that in any certification of terminals program, the manufacturer of the terminal should be allowed to do the certification.

In a "petition for rehearing," filed with the California Public Utilities Commission concerning its program to certify independently-supplied terminals for connection to the dial-up network, IBM claims that "terminal equipment manufacturers are competent to certify the equipment which they manufacturer." It says the PUC's study established "substantial evidence" of this fact and it recommends amending the order to provide that a certifying engineer will not be disqualified if he is an employee of the company which manufactures the certified equipment, so long as he gives the commission an affidavit demonstrating, to its satisfaction, that he will render an independent judgment.

It also asked for the addition of language to the order stating that "interconnection of customer provided equipment with the telephone network under standards and requirements promulgated by the FCC shall automatically be deemed to comply with this commission's requirements." It explained that "compliance with a multiplicity of state regulatory procedures would operate to defeat the very purpose of a liberalized program of interconnection, which is the objective of these proceedings." □

meaning that phone company-provided terminals won't need the test unit, and their users won't have to pay the related charges. Feiner, in his complaint, said the access line test units "can be a costly competitive deterrent in the same way protective connecting arrangements have been. They can also be used as an instrument of utility harrassment."

Shortly after the CPUC order was announced, distributors of interconnect equipment west of the Mississippi gathered in San Francisco, primarily to discuss formation of a trade association. But reportedly one of the other topics discussed was the installation of ancillary equipment, once it has been certified by California, in other states. The aim would be to create a situation where the other states must either allow direct connection, on the strength of California's okay, set up their own programs, or force disconnection of the device. A state that chose the option would face the prospect of a court suit in which the chances of winning probably wouldn't be very great.

—Phil Hirsch

News in Perspective
BENCHMARKS . . .

A Loss for IBM? The Army will seek competitive bids for three IBM 360/65 systems following IBM's agreement to terminate its controversial contract on the Project Alpha logistics system. Alpha began in 1967 with three prototype systems, purchased under the Federal Supply Schedule. In 1973, according to the Army, the original contract was "amended" to cover the lease-with-option-to-purchase under the Federal Supply Schedule. IBM stands to lose $17.1 million in the termination, including $8.1 million for three canceled 360/65s and $9 million in penalties that the company has agreed to forgo.

IBM Seeks a New Venture: IBM hoped by June 16 to exercise an option to enter the electro-optical instrument business by acquiring some assets of Neotec, a Silver Springs, Md. manufacturer of analytical instruments. IBM paid $50,000 for the option to acquire the struggling company's instruments that are used to measure the characteristics of grain, produce and other products. Neotec, which has lost more than $700,000 in each of its last two fiscal years, would be paid $5 million by IBM. As part of the deal, more than 100 employees would be transferred to IBM.

Reduced Losses: Memorex finally has had a positive cash flow. Robert C. Wilson, president of the beleaguered Santa Clara, Calif. peripherals and computer memory manufacturer, told stockholders at an annual meeting that the company has changed from "a big small company to a small big company." Specifically, the firm had revenues of $217.6 million in fiscal '74 ending Dec. 31, a 23% jump over the $177 million the year before, and had a loss of $9 million, down from $119 million in '73. Wilson predicted that 1975 would be a profitable year for Memorex.

Salaries Up: The economy may be down but starting salaries for data processing personnel is at an all-time high according to the Robert Half Personnel Agencies, financial and edp employment agency. The Half agency analyzed position requests received by 48 offices. The data processing categories covered programmers, systems analysts, operations managers and computer operators. The study showed a programmer-analyst working with a large installation can expect a salary range of $15,000 to $18,000, an 11.6% jump over 1974. Data processing managers, the study indicated, will find a range of $15,000 to $20,000. Computer operators will find starting salaries the same as last year, said the Half agency.

Potter Pays the Price of Competition: In recent years peripherals maker Potter Instrument Co., Plainview, N.Y., found it increasingly expensive to compete with giant IBM. To meet the competition, the company slashed rental rates on the one hand and paid soaring interest rates to keep its lease base alive. When its 1974 fiscal year ended last June 30, the company found it had lost nearly $27 million in three years. Last spring, efforts to refinance its $23 million-plus debt failed and the company closed its operations and filed for court protection under Chapter XI of the federal Bankruptcy Act. Potter officials expressed confidence that it would work its way out of its trouble but, meantime, it was dickering in late spring with Raytheon Service Co. to take over its installed base of equipment. And one of its creditors—Management Assistance, Inc.—which was owed $1.3 million from the days that it used to distribute Potter tape drives decided to write the entire amount off on its second quarter report.

Facsimile Service: The communications carrier MCI was due this month to introduce a sub-minute facsimile service, priced at $100 to $150 a month (plus 75 to 20 or 25 cents a page, depending on volume). It would use the Rapidfax 100 terminal which transmits an 8½ x 11 inch page of text in 40 seconds over a voicegrade circuit. Users would have the option of transmitting or hand-carrying their material to an MCI central office and have it sent via broadband to the MCI terminal in the recipient city. Overnight delivery may be priced at 25 cents a page; a priority message during the day, $2.50 per page. □

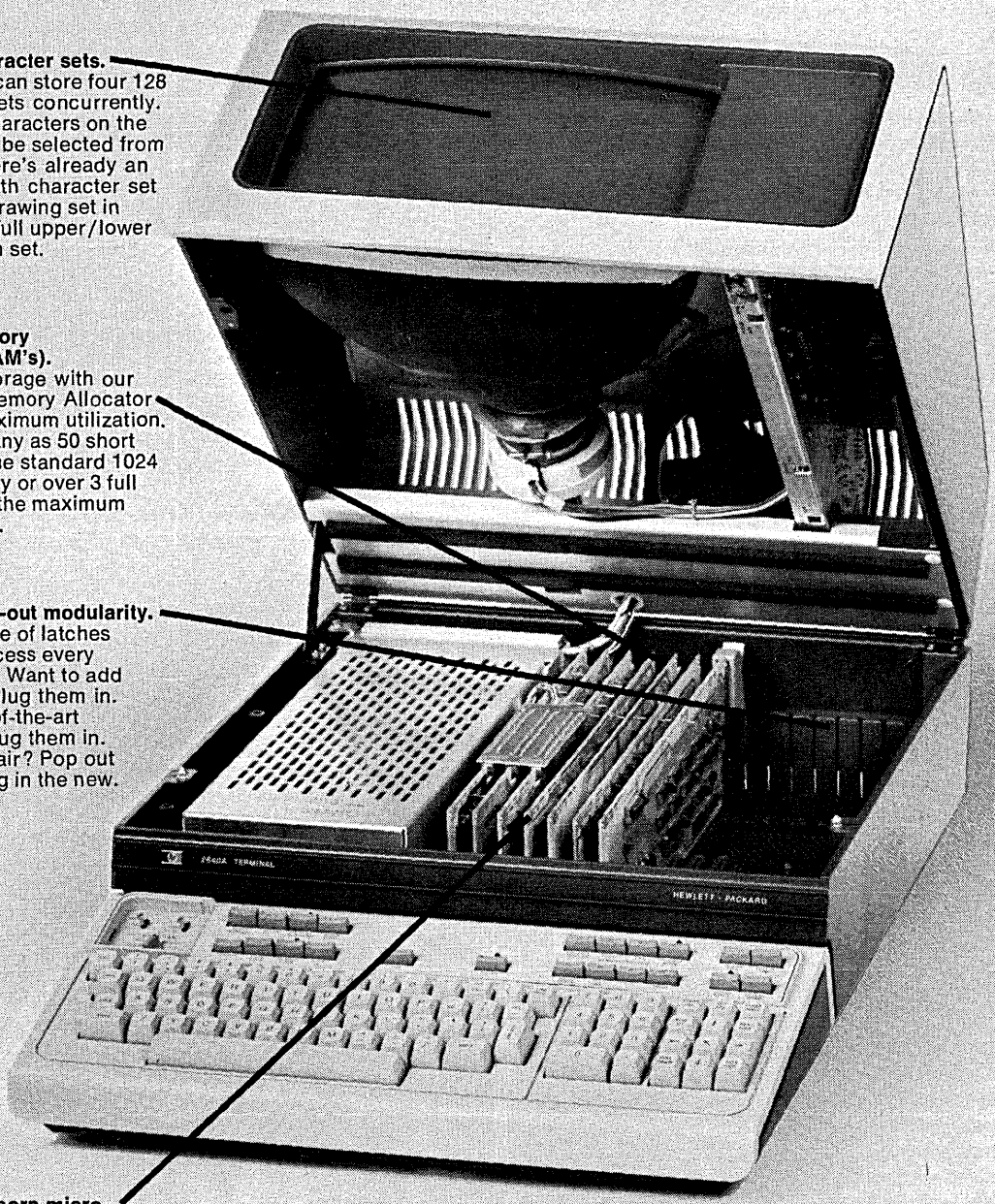
"Good news, Miss Morgan . . . your keypunch machine will be here tomorrow . . ."

Now Hewlett-Packard next terminal an open

Plug-in character sets.
The 2640A can store four 128 character sets concurrently. Adjacent characters on the display can be selected from any set. There's already an optional math character set and a line drawing set in addition to full upper/lower case Roman set.

Smart memory (with 4K RAM's).
Efficient storage with our Dynamic Memory Allocator assures maximum utilization. Store as many as 50 short lines with the standard 1024 byte memory or over 3 full pages with the maximum 8K memory.

Pop-in, pop-out modularity.
Flip a couple of latches and you access every component. Want to add features? Plug them in. New state-of-the-art options? Plug them in. Need a repair? Pop out the old. Plug in the new.



Computer-born microprocessor technology controls the show.
An on-board microprocessor supervises memory allocation, data communication, keyboard scanning and display control.

makes selecting your and shut case.

Inspect its features. At $2640* you won't find another terminal that comes close. Inside or out. HP's 2640A. The terminal that grows with your system. It's from Hewlett-Packard. Come and get them.

A display that *people* like. Precise. Crisp, with 9 x 15 dot character cell. Character curves are smoothed by dot shifting. The 5" x 10" screen shows characters in their proper 2 x 1 aspect ratio. All sorts of options, such as inverse video, underlining, half bright, blinking, because a picture's worth a thousand words.

Why wait on us? Self-test. Press the TEST key and the 2640A agreeably tests itself and gives you a go/no-go indication. Or load our diagnostic test program into your computer for complete, element-by-element check out of the entire unit.

Characters or blocks. You choose. Operate character-by-character or flip a switch and operate a line or page at a time. Text can be composed and edited locally allowing user verification before tranmission to the CPU. Editing and CPU connect time are slashed by user-oriented features such as character or line insert and delete; programmable protected fields; and off-screen storage with scrolling. Plus, eight special keys for user-defined functions.

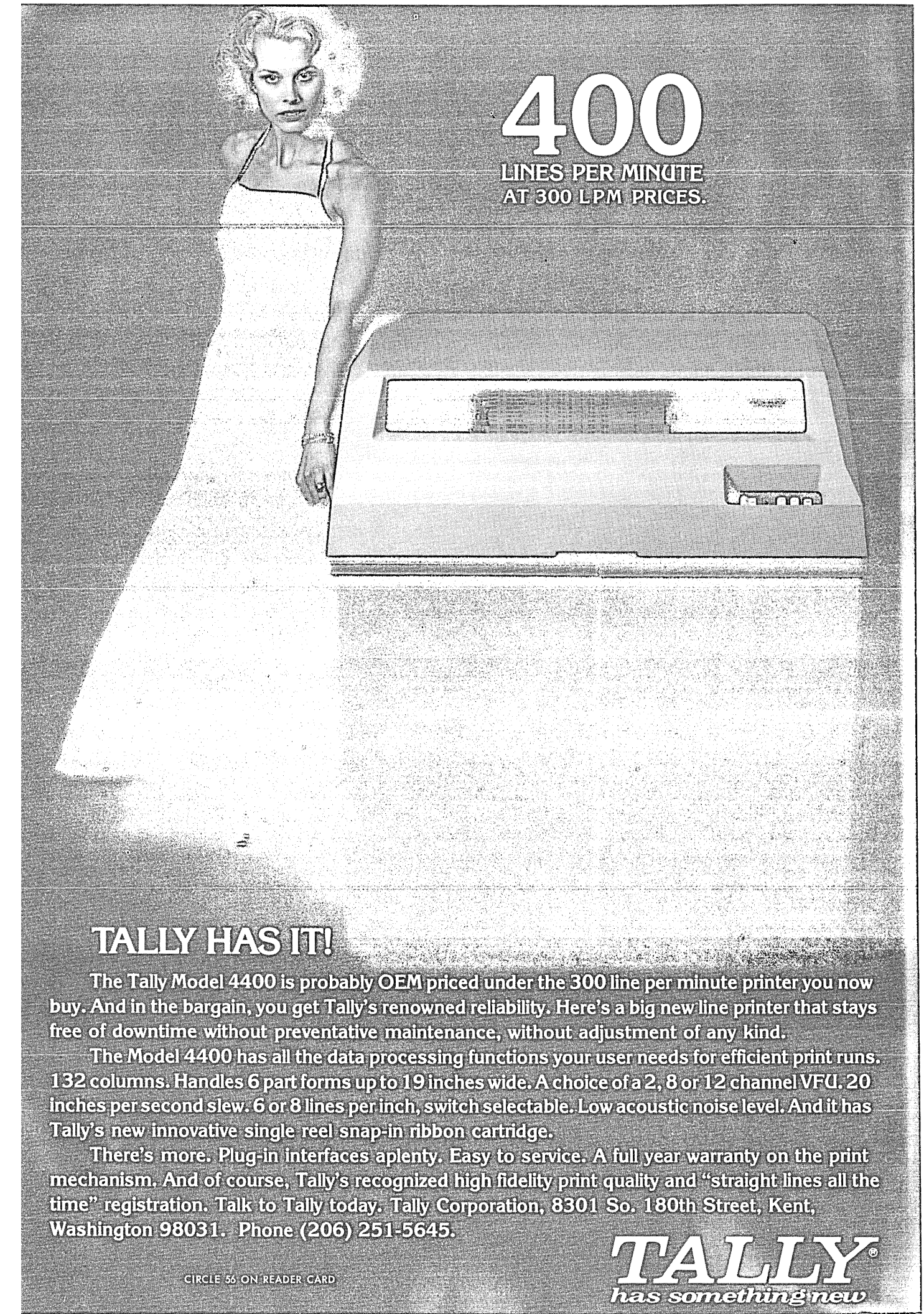
HP terminals. They work for a living.

HEWLETT hp PACKARD

Sales and service from 172 offices in 65 countries.
1501 Page Mill Road, Palo Alto, California 94304

*Domestic USA price in quantities of six.

22430A



400

LINES PER MINUTE
AT 300 LPM PRICES.

TALLY HAS IT!

The Tally Model 4400 is probably OEM priced under the 300 line per minute printer you now buy. And in the bargain, you get Tally's renowned reliability. Here's a big new line printer that stays free of downtime without preventative maintenance, without adjustment of any kind.

The Model 4400 has all the data processing functions your user needs for efficient print runs. 132 columns. Handles 6 part forms up to 19 inches wide. A choice of a 2, 8 or 12 channel VFU. 20 inches per second slew. 6 or 8 lines per inch, switch selectable. Low acoustic noise level. And it has Tally's new innovative single reel snap-in ribbon cartridge.

There's more. Plug-in interfaces aplenty. Easy to service. A full year warranty on the print mechanism. And of course, Tally's recognized high fidelity print quality and "straight lines all the time" registration. Talk to Tally today. Tally Corporation, 8301 So. 180th Street, Kent, Washington 98031. Phone (206) 251-5645.

CIRCLE 56 ON READER CARD

TALLY®
has something new

LOOK AHEAD

(Continued from page 18)

A GOOD RECOVERY

General Automation may not have been hit all that hard by its disastrous effort with its silicon-on-sapphire (SOS) processors. The company has been considering plugging that low-end gap with machines that utilize Intel and Synertek chips. Furthermore, a big machine utilizing virtual storage---one that is roughly equivalent to DEC's 11/45 and Data General's Eclipse---may be announced late this summer. Another faster machine--equivalent to DEC's 11/70--is on the drawing board and could be announced next year.

Meantime, Bank of America has placed a large order with General Automation for minicomputer-based transaction processing applications. The bank won't confirm, but it's understood that 10 or more clusters of GA SPC 16 minicomputers may be installed soon in a distributed processing scheme. (See related story on page 17.) Each of the clusters contains four GA machines, two for message handling and two for processing transactions against a data base. The bank's alternative to the distributed processing approach was understood to be duplexed 360/65s.

INTERCONNECT PETITIONS DENIED

California's Public Utilities Commission has reestablished an interim certification/direct connection program for independently-made modems and other ancillary devices. It had been suspended earlier when petitions for reconsideration were filed by IBM and Phonetele (see p. 121). The commission denied both petitions but, at the same time, modified the original certification/direct connection order. It dropped a provision allowing the carriers to provide, at an extra charge to "foreign attachment" users, an access line test unit; another provision permitting use of AT&T's authorized protective connecting module (APCM) in lieu of a protective connecting arrangement, was also rescinded.

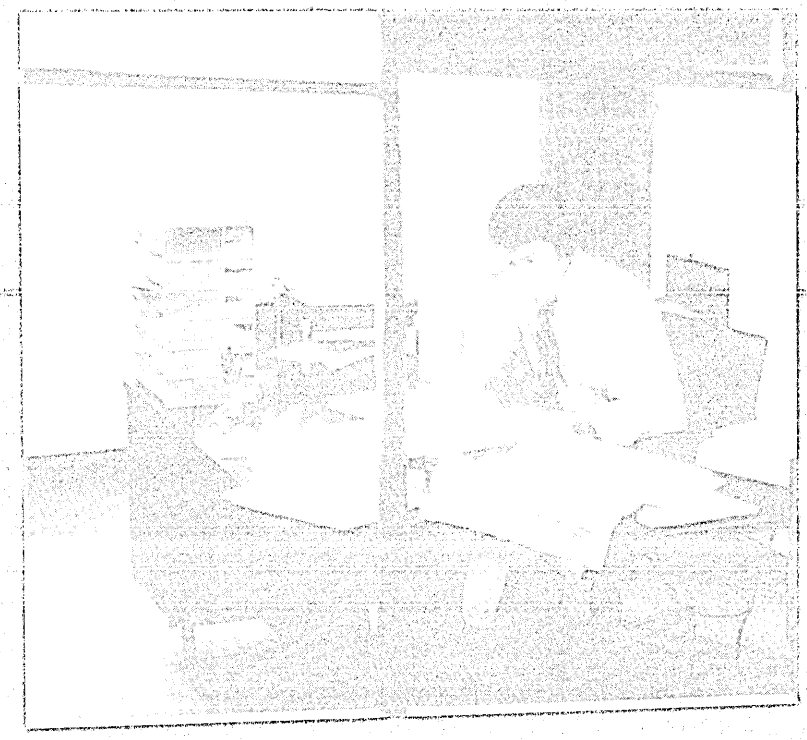
THE PIONEER WAS AT WORK THAT DAY

While oldtimers were reminiscing at the National Computer Conference of their work with Dr. John von Neumann (p. 104), Dr. J.V. Atanasoff, whose late 1930s computing machine was the precursor to the ENIAC, spent the day hard at work on his latest project, which, if successful, will go a long way toward obsoleting a key aspect of computing. The retired theoretical physicist who has been a successful inventor, entrepreneur, World War II military scientist, businessman and architect, has been developing and refining an advanced alphabet--his major project over the last decade.

One area of Atanasoff's work emphasizes alphabets that would be machine readable which, of course, could spell the end to optical character recognition. The 72-year-old Atanasoff's work with alphabets is admittedly esoteric but the Frederick, Md., scientist feels in many ways it is more important than his pioneering work with computing machines.

RUMORS AND RAW RANDOM DATA

IBM is not the only edp mainframe firm with a laser printer. Burroughs has one under development in Belgium. But the firm must work out overheating problems before the printer will be announced. We hear, though, that Burroughs may be close to announcing a System/32-like machine...IBM salesmen usually know little about what Armonk holds for the future, but some IBM sales types are giving some customers the feeling there may be another price increase in the wind. IBM seems to be in need of getting its earnings up and a price increase would no doubt help. So would a new wrinkle to IBM's TLP that would encourage more outright purchases of equipment...What Do You Do In Your Spare Time Dept.? In its private antitrust suit against IBM, Sanders Assoc. asked IBM for pertinent information from its Data Processing Div. over a 10-year period. The answer the IBM attorneys fired back: "Active files, approximately 906,054,000 pages; inactive files, approximately 421,660,000 pages." That, in a nutshell, is why antitrust cases take years to conclude. Sanders may be sorry it asked...Shades of the 370: Many System/3 users are trading down to the System/32...At the NCC, IBM representatives showed up at 5:30 a.m. to be first in line to sign for exhibit space at next year's conference--a 2,000 sq. ft. booth in what is considered the choicest location in New York's coliseum.



Proven 35% more effective relief of billing headaches.

Entrex Key-to-Disk

"Since we upgraded to the Entrex data entry and pre-processing system, we get more work out faster and *at less cost* than we ever did before..."*

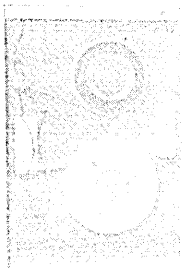
"We checked them all... only the Entrex data entry and pre-processing system has the power we need to capture daily billing, bookkeeping and insurance data for 150 physicians and enter daily transactions for five banks... plus the source data collection we need to provide clinics with 24-hour turnaround," says Charles Lamb.

"There's nothing like it for getting cleaner data into the mainframe fast. We've reduced our error rate from 100 errors per batch to two – saving countless pages of edit runs on the computer, and cutting mainframe edit time by 66%.

"Best of all, the Entrex system was installed, accepted by my operators, and running in less than a week. Since then our total productivity is up 35% over punched cards."

With Entrex you get the most advanced and comprehensive software ever written. And greater control over your data before it goes to the computer.

Yet all this power may *cost much less* than the system you have now. Find out. Ask for a demonstration. Or send for our latest literature.



*Charles L. Lamb, Senior Vice President/Valley View Computing Systems (a subsidiary of Valley View Investment Co., Inc.), Overland Park, Kansas

Atlanta, GA 404-934-6391 • Baltimore, MD, 301-997-3510 • Boston, MA, 617-273-0480 • Charlotte, NC, 704-568-3510 • Chicago, IL, 312-782-5417 • Columbus, OH, 614-451-1088 • Dallas, TX, 214-630-3843 • Denver, CO, 303-770-1030 • Detroit, MI, 313-355-0108 Hartford, CT, 203-563-8866 • Houston, TX, 713-467-3718 • Indianapolis, IN, 317-352-1739 • Kansas City, MO, 816-531-1931 • Los Angeles, CA, 213-870-1960 • Louisville, KY, 812-288-1169 • Madison, WI, 608-221-1545 • Miami, FL, 305-446-4544 • New York, NY, 212-682-2131 • Oklahoma City, OK, 918-858-0572 • Philadelphia, PA, 215-265-2270 • San Francisco, CA, 415-692-5551 • Springfield, IL, 217-789-1709 • Toronto, Ontario

ENTREX

168 Middlesex Turnpike
Burlington, Mass. 01803. 617-273-0480

hardware

Off-line

Four examples of "fallacies of intuition" relating to computer performance were given at a recent meeting of the Los Angeles Chapter of ACM's Special Interest Group on Measurement and Evaluation by Mr. Gary Carlson of Brigham Young Univ.'s computing center.

1. Cpu's become much busier as the load of processing increases. While printers might become 10-15% busier, the cpu may be only 2-4% busier.

2. If you reduce disc access time by 50%, terminal response time increases proportionally. False, says Mr. Carlson. Cpu non-interruptible processing accounts for 54% of the response delay, the terminal controller another 20%, and miscellaneous causes about 3%.

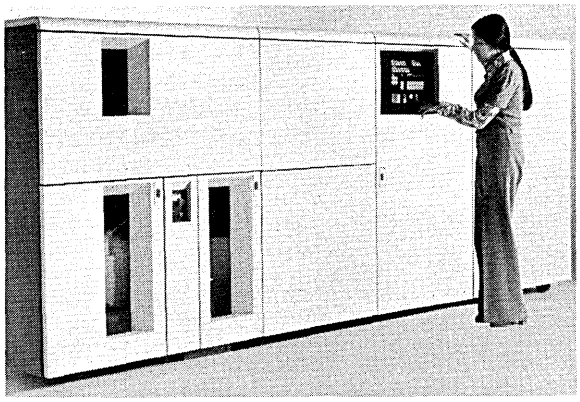
3. Dual-density disc drives suffer from arm contention problems because there are half as many arms for the same amount of storage area. False, again. Arm contention is only 1-3%, even when the two most heavily used packs are placed together on one dual-density drive. Thus, Mr. Carlson recommends the switch to dual-density drives be governed by cost/byte ratios.

4. Large core storage, such as the LCS used on many IBM systems doesn't affect cpu performance. False. Asynchronous core causes cpu inhibit during which time the system meter runs, the accounting time runs, the wait light is out, but no instructions are executed.

Another possible use for microprocessors: to provide artificial hearing for tens of thousands of deaf persons who cannot be helped by conventional hearing aids. A DEC PDP-8 has been in a joint project of the Univ. of Utah and the Ear Institute of Los Angeles to give a subject, deaf from infancy, the ability to sense "sounds" from the computer and differentiate them from simple vibrations.

The 3800 laser printing system shown in these pages is by no means IBM's only use of the exotic light phenomenon. IBM researchers have also discovered a method of using very short laser pulses (2-6 nsec) to form microscopic electrical connections on fully processed integrated circuit chips. The technique can be used to repair defective chips and to change general-purpose chips into customized units.

product spotlight



Laser Printer

IBM is shedding its image as a follower in the introduction of high-technology products. The 3800 printing subsystem merges a very advanced laser printing mechanism with more conventional electrophotography to yield a print speed of up to 13,360 lpm, roughly six times as fast as the firm's next fastest product, the 3211.

The 3800 is IBM's first non-impact printer of any kind. Further, it is not directly related to the company's office copier products, at least not in the way the Xerox 1200 is.

Like an office copier, the 3800 uses a rotating drum to electrically charge paper, and fuses a toner to the charged paper. Unlike copiers, the system has a sheet of photoconductive material over the surface of the drum, and this sheet is advanced from time to time by the operator, unrolling from a spool *inside* the drum.

Characters are formed in an 18x24 dot matrix by a laser beam which is bounced off a spinning, mirrored surface; 24 scans are required to print a line. The technology yields speeds of 45,000 characters/sec, so a box of single-part continuous forms feeds through in less than 20 minutes.

Regular pin-fed forms are used, but only one copy can be printed at a time. Salesmen will initially have to overcome the apparent inefficiency of running four passes to get four copies, but they will be able to argue that the load imposed on the cpu is trivial and that at least all deleaving and decollating operations are skipped.

The 3800 uses the same fan-folded stock as other printers, in sizes from 14⅞ x 11 down to 3½ x 6½ inches. Printing can be at six lines/inch or eight, and with character sizes for 10, 12, or 15 per inch (136, 163, or 204 characters per line). Among other things, this allows for reducing full size printer forms to 8½x11 pages.

Eighteen character sets are standard —including upper and lower cases, OCR A, and OCR B—and any four can be used simultaneously. The character sets are stored on a floppy disc in the controller, and users are able to design more fonts as desired. Format characters for forms ruling are already included. More complicated forms, with shadings or logos, etc., are done with a forms overlay—flashing an image on the photoconductive surface before the text is added using a full-size negative.

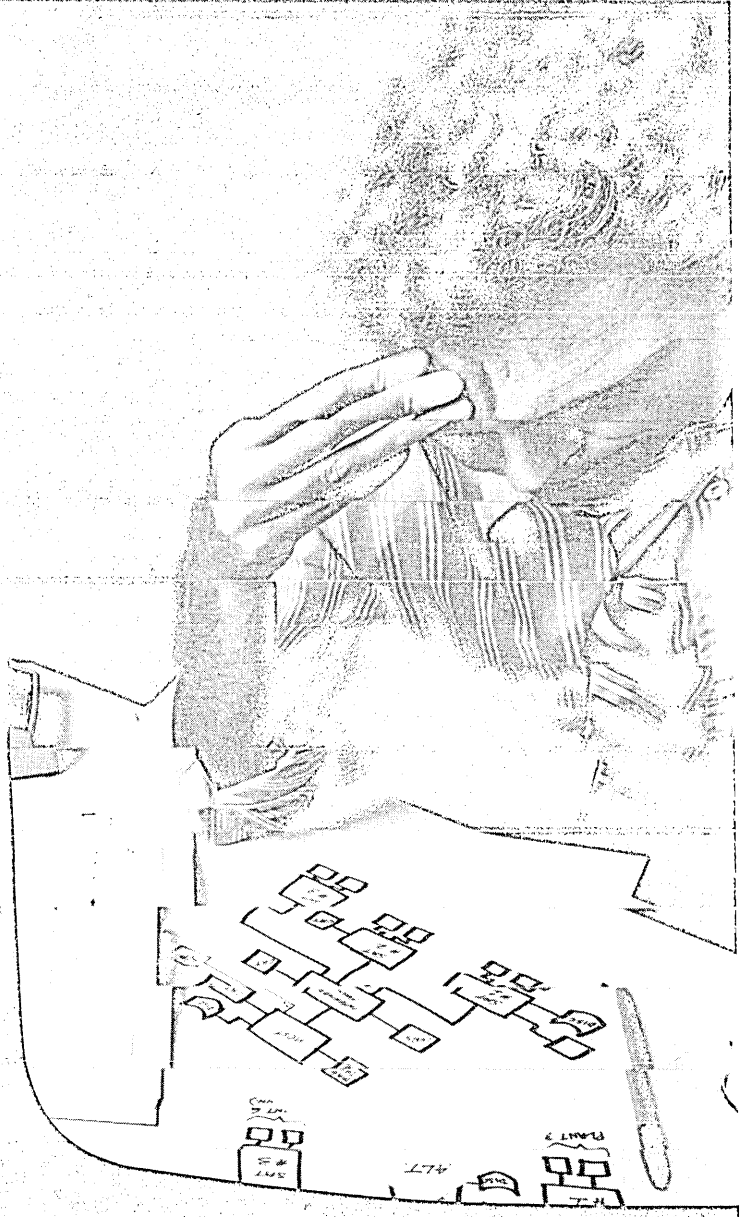
The printer subsystem is large and looks something like a passenger train car (IBM has chosen to round off the corners in its design). Adding to the imposing size is the fact that each printer requires its own controller.

The systems hook up to 370/145s and larger machines running under vs/1 or vs/2. (There is no physical reason 135s could not use them; the restriction was a marketing decision.) They can be attached to a dedicated selector channel, but a block multiplexor is suggested: although the effective transmission rate is only 8KB or so, the controller actually accepts a line or two of print data at a time in burst rates of more like 200KB until its 54KB buffer is full, then relaxes.

JCL commands allow substituting the 3800 for other printers without program changes, but nonstandard functions like special character sets can be accessed only through Assembler, FORTRAN, COBOL, BASIC, and PL/1 so far. No other special software has been announced, even though the device looks like a natural for plotting.

Under the 24-month extended term plan, the basic monthly charge for the system is $6,250. Rental is $7,344. The purchase price is tagged at $310,000 plus $445/month for basic maintenance. On top of all those figures, an additional $2.30 per 1,000 feet of

NETWORK



MAXNET CLEARS THE PICTURE.

Maybe there was a time when you could control your plants or labs with independent minicomputers. Or with one big stand-alone machine. But now, things have grown beyond that.

What you really need is to share the work among several computers, tied together in an efficient distributed processing network.

But until now, setting up a distributed network had its difficulties. Finding the right compatible high-performance hardware. And a software system that really works, to tie it all together.

To clear up the confusion, we developed an operating system we call MAXNET. A standardized set of software that allows any number of MODCOMP computers to be linked together. So they can work together. Sharing the load.

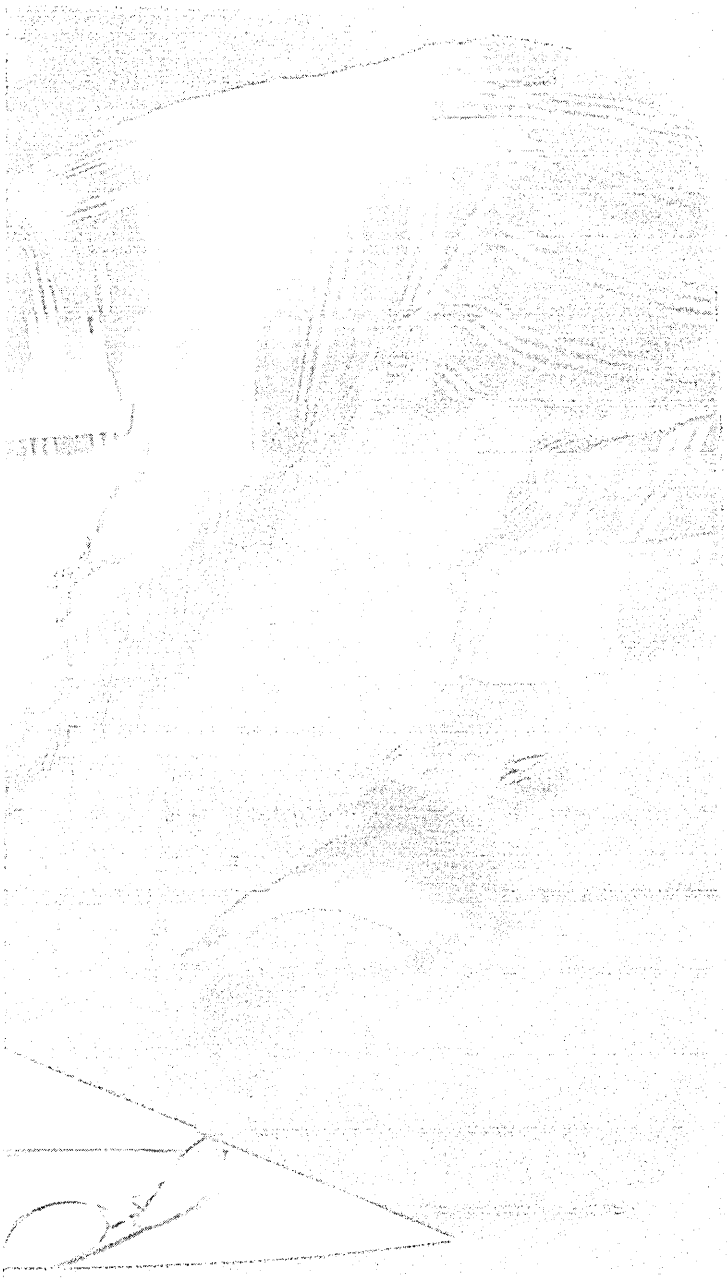
With this kind of system you'll get faster response. Because each computer in the network has fewer jobs to do.

You'll get better reliability. Because if one computer shuts down, it doesn't shut down the whole system.

And since high-cost signal cables between your processes and a central computer are replaced by inexpensive communications lines, the money you save can often pay for the satellite computers.

Programmers at the host computer can compile programs for any or all the computers in the network. And when they're through compiling, editing, and debugging a program, they can load it directly down to the satellite. Whether it is next door or a thousand miles away. With

MODCOMP SALES OFFICES ALBUQUERQUE NM / ATLANTA GA / BOSTON MA / CHICAGO IL / CINCINNATI OH / DALLAS TX / DENVER CO / DETROIT MI
HOUSTON TX / HUNTSVILLE AL / INDIANAPOLIS IN / KANSAS CITY KS / LOS ANGELES CA / MINNEAPOLIS MN / MONTREAL QN / NEW YORK NY



no need for an operator at the remote site.

MAXNET does away with duplication of expensive peripherals. Because while operators at satellite computers have complete local control of their own processes, they also have immediate access to all the resources of the entire network, including the host's mass storage files and fast line printers.

If data or programs stored elsewhere in the network are needed, all it takes is a simple FORTRAN request at the satellite terminal. MAXNET does the rest.

MAXNET eliminates the need for redundant software at remote plants. But if an engineer or scientist stationed at a satellite wants to compile his own program, no problem. He calls down language processors from the host. Compiles and edits the program on his own satellite computer. And sends his listing or plots back to the host for printing.

MAXNET lets you put together any kind of network system you need. And get it running. Now. Buy only what you need now. Add on later, without costly and time-consuming reprogramming.

We've been delivering MAXNET software for the past year. And some two dozen of our network systems are now out there working, in various types of industrial plants and scientific laboratories.

To find out more about how MODCOMP clears the network picture, send for the MAXNET brochure. Modular Computer Systems, 1650 West McNab Road, Ft. Lauderdale, FL 33309/Phone (305) 974-1380. European Headquarters: 103 Mytchett Road, Mytchett, Surrey, England/Phone (0252) 514251

MODCOMP

Orlando, FL · Philadelphia, PA · Houston, TX · San Jose, CA · Seattle, WA · Toronto, ON · Washington, DC · International offices in Netherlands, Scotland, France, Australia, West Germany, Norway, Japan

CIRCLE 26 ON READER CARD

Expand Your PDP-11 Family Memory Capabilities Today. Order Cal Data's Computer Products...

OEM PLUG COMPATIBILITY

PDP-11/05

through

PDP-11/45

Cal Data offers you these compatible PDP-11 Memory Expander products:

- Increased memory speeds—all on one board
  - 8K by 16K—675 NS*
  - (425 Interleave Mode)
  - 16K by 16K—850 NS*
  - (450 Interleave Mode)
  - *No charge option for increase from 28K to 31K
- Memory Addressing Extender from 28K to 128K
- Large or small Memory Mounting Units

These highly reliable Cal Data products are in wide spread use today and are backed up with over 200 world-wide field service outlets maintaining DATA 100 remote terminals, peripheral equipment and the ODEC family of line printers. Call our OEM regional offices now for details on their low cost and immediate availability.

We care more about our customers because we are one.

DATA 100 CORPORATION

Boston—(617) 848-6100 • Minneapolis—(612) 941-6500 • San Francisco—(415) 574-1812

hardware

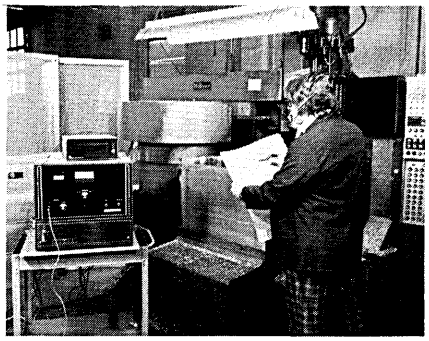
forms processed is charged as a supplemental maintenance fee. Buyers will also have to pay for replacing the photoconductor surface about every nine months, IBM claims, but the price for that has not been published. Also, the price for an overlay for preprinted forms is $190 from IBM; kits are available for installations with their own photo labs ($495 for 10 forms).

The IBM 1403 line printer has been the workhorse of dp shops for about 15 years. Remember it was first seen on the 1401. And its derivatives like the 3211 use basically the same technology. Looks like many of those familiar faces will get to retire after shipments of the 3800 begin in July of next year. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 216 ON READER CARD

Voice Programming

Hold on to your hats. It is now possible to program automatic machines by speaking commands to them, at least in the highly structured field of numerical



control machines. Fresh from the development of a supermarket checkout system that could understand any clerk's voice pattern, this firm has come up with a technique that enables factory personnel with little or no programming experience to quickly prepare a fully verified, punched paper tape program for automatic machine tools. The programmer simply speaks into a microphone each programming command in sequence, using normal English words. The VNC-100 then automatically "decodes" the information into a machine-compatible format. It's estimated that this technique could cut programming time and costs by 30-80%.

An electronic display in the system instantly flashes each command given for a positive verification or correction and even displays the next entry required. The system, complete with software, a standard postprocessor package, operator and programming manuals, is priced at $20,300 for single units. THRESHOLD TECHNOLOGY INC., Cinnaminson, N.J.

FOR DATA CIRCLE 217 ON READER CARD

Charge-coupled Device

There has been a lot of talk about charge-coupled devices, but it appears that they will start showing up in products sooner than most of us thought. CCD's, as they are commonly referred to, store data by recirculating data bits through shift registers. This particularly lends them toward replacement of rotating memories, and the venerable old drum will probably be the CCD's first victim.

Intel has announced the 2416 CCD serial memory, a single silicon chip in a standard 18-pin memory circuit package less than an inch long. This chip is an array of 64 shift registers, each 256 bits long, complete with I/O control logic similar to a random access memory. The density of the Intel product is the key to its probable success: conventional shift registers store only about 2K bits per package compared to the 16K of the new 2416. Bulk memories with a system storage density of at least a megabit per circuit board can now be built relatively cost effectively. Designers can organize the 2416s to any logical length desired, and transfer rates are impressive because bits can be pulled in parallel.

hardware

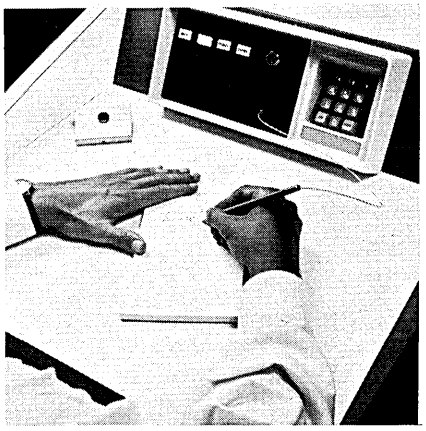
Serial transfer rates per 2416 are greater than 2 megabits per second, and maximum access time to any of the 16,384 bits on the chip is less than 200 usec, and less than 100 usec on average. Chips are priced at approximately $55 each for 100-999 units depending on whether 18-pin or 22-pin orientations are desired. INTEL CORP., Santa Clara, Calif.

FOR DATA CIRCLE 218 ON READER CARD

Identity Verification

This firm may have hit on the ultimate idea in identity verification techniques, surpassing even signature verification, which a forger can fool. The Signac signature access control system relies on pressure patterns made in signing one's name, something that studies purportedly show cannot be duplicated. At least these studies have convinced the Air Force security section at Hanscomb AFB near Boston, Mass., which is assigned the task of evaluating security equipment and techniques for all branches of the armed forces.

The commercial version of the Signac will consist of a microprocessor and four access stations and be priced at $32K. The equipment has been demonstrated quietly in the east using an Interdata minicomputer, with the terminals linked over an RS232 interface, but that will be modified for third quarter delivery schedules. The user who is to qualify for admittance must "enroll" in the system, entering an assigned identification number on the keyboard and then signing his or her name several times with a special ball point pen. Signature data is transmitted to the microprocessor, which



can hold as many as 1,000 names. Signature data are then compared against previously acquired signatures. If the two match—within allowable tolerances—the person can be fairly well assumed to be who he or she claims to be. A sophisticated algorithm in the microprocessor does all the comparisons on the signatures in only a couple of microseconds. SENTRACON SYSTEMS, Westwood, Mass.

FOR DATA CIRCLE 219 ON READER CARD

PDP-11 Memories

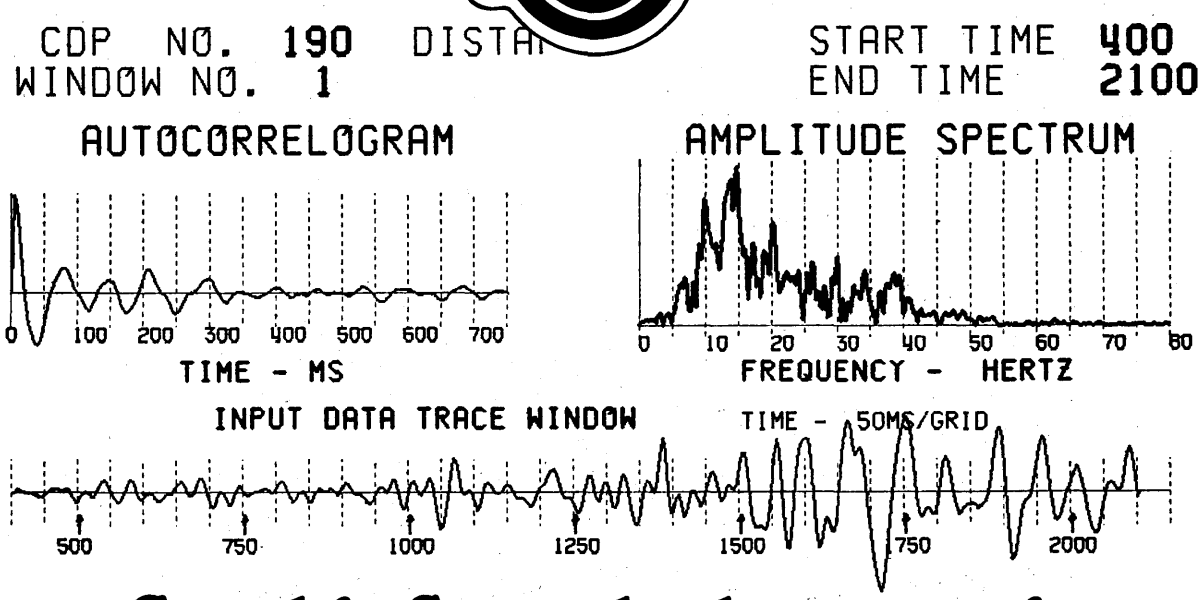
The FasBus 11 Memory is billed as being plug compatible with the high-speed bus (Fastbus) of DEC's PDP-11/45 and 11/50 models, but improving performance on the systems by roughly 20%. The system is field expandable in 4K increments to 32K words within the space set aside for the DEC MS11 high-speed memory in the 11/45 class computer. A controller is used with each 16K of memory. The FasBus memory provides byte parity generation and checking and is said to be software transparent with all DEC-supplied packages. A 16K module of FasBus 11 memory, including controller and power supply, is $10,500. CAMBRIDGE MEMORIES, INC., Bedford, Mass.

FOR DATA CIRCLE 234 ON READER CARD

Word Processing Hard Copy

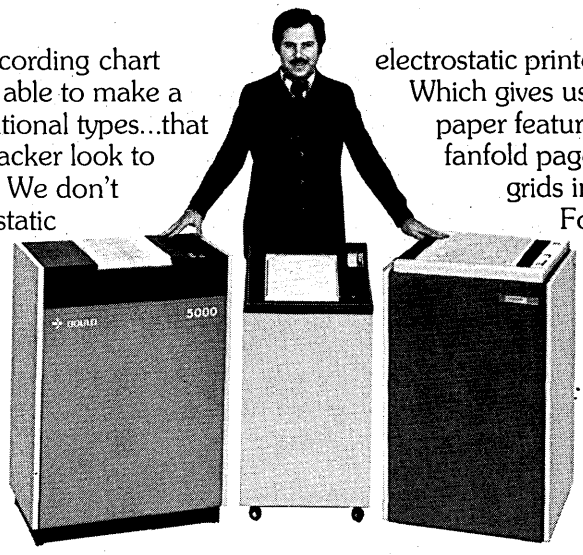
Users of Redactron or Remington word processing systems can now obtain a cassette driven hard copy unit capable of generating electrostatic hard copies of drafts, reports, and office records at the rate of 500+ characters per second. The Quick-Writer 3

NO SQUINT!



Graphic Controls electrostatic paper reads easier.

NO WONDER. We're in the recording chart business. Period. We *should* be able to make a paper that's whiter than conventional types...that just naturally gives a sharper, blacker look to letters, numbers, dots and lines. We don't spend a minute making electrostatic instruments. Just easy reading roll and fanfold paper—in both report and translucent grades—that fits all GOULD, VARIAN and VERSATEC electrostatic printer/plotters.



Which gives us time to develop electrostatic paper features that no one else has. Like fanfold page numbering. And pre-printed grids in your color choice.

For more information—or a sample to make your own reading test—write or call Ray Newstead, Industrial Marketing Manager. Phone: (716) 853-7500, Ext. 352.

And fits all three.

RECORDING CHART DIVISION
GRAPHIC CONTROLS CORPORATION
189 VAN RENSSELAER STREET, BUFFALO, NEW YORK 14210

CIRCLE 54 ON READER CARD

hardware

is a variation of the manufacturer's successful line of electrostatic printer/plotters with a cassette drive built in. Controls on the cassette drive allow operators to produce up to 99 copies, collate multiple copies, all automatically. The approximate cost per page is 2¢.

Character sets are available in American Standard (four versions) and Legal (three versions). The machine uses 8½ x 11" fan-fold or 8½" roll paper. Font styles available are Roman and Courier. Admittedly for high volume office applications, the Quick-Writer 3 is priced at $9,700. VERSATEC, Cupertino, Calif.

FOR DATA CIRCLE 235 ON READER CARD

APL Terminal

The series 3900 Teleray provides both the APL and full ASCII character sets complete with true APL overstrike and underlining capability. It can also be used as an upper-case tty replacement. The 3900 operates scroll-up, with bottom-line data entry and cursor controls. Other standard features include the 15-inch diagonal monitor, 24 lines of 80 characters or 24 lines of 40 "wide" characters, asynchronous, character oriented transmission, dual baud rates up to 9,600, and RS232, current loop, and TTL interfaces. Optional features include printer output, composite video output, numeric keypad, detachable keyboard and receive only models, and ASCII mode overstrike. The 3900 is priced at $2,490 and is currently in production. RESEARCH INC., Minneapolis, Minn.

FOR DATA CIRCLE 220 ON READER CARD

First-time dp User System

If Wang Laboratories only captures one percent of the estimated 700,000 small business and public organizations who could cost justify its first dp system, it would be a good piece of change. And it probably will, as the approach makes sense. Rather than supply a system with standardized software packages that must be wrestled

with to fit individual idiosyncrasies, the firm will rely on a network of 150 software companies that have been designing custom software for its systems for five years. The vendor will be responsible for all systems software, utility routines, file management programs, and selected packaged systems and programs.

Three computers make up the new offering, the WCS/10, 20, and 30. Memory is split between up to 42.5K bytes of ROM, and 32K bytes of main memory. A large capacity video display is integrated into the design. Each system supports up to 11 peripherals, with auxiliary storage consisting of cassette and disc peripherals, depending on the model selected. The BASIC programming language is supported. The minimum system is cheaper than a lot of automobiles (ideal sales slogan: save gas, buy a computer system instead!). You can get a 4K RAM system, with 24K of support ROM, 1K display, and single cassette unit for $5,700. The RAM portion of the memory is field expandable up to the 32K limit. Deliveries are underway. WANG LABORATORIES, INC., Tewksbury, Mass.

FOR DATA CIRCLE 221 ON READER CARD

Multiprocessor Sigma

For only about $312K, current Xerox Sigma 9 users can considerably enhance the performance of their systems

The first stand-alone file management system that really stands alone.

The Inforex System 5000.

Here at last is a free standing file management system that lets you automate any file without tying up your mainframe computer.

It's a mini-based system that can be installed and put to work with no programming, no special site preparation, and no significant change in record format.

It's so flexible, it can store any size or type of file.

So simple, anyone can learn to use it in a matter of hours.

And so fast, a typical record can be retrieved in one to three seconds.

As many as 32 operators can use the system at the same time. Remotely through a telephone connection. Or locally up to 3000 feet away.

All information is displayed on a large screen for easy updating and review. And a hard copy printout is available in seconds at the press of a key.

System 5000 will store up to a million records—plenty of capacity for most applications. And there are literally hundreds of applications. So it can be used far beyond the original needs. Many users have already discovered applications we never even thought of.

And like all Inforex systems, System 5000 is extremely reliable. But we back it up anyway. With one of the best, most extensive field service organizations in the business.

For more information on this unique new system, mail us the coupon or write us a note on your letterhead. You'll see why no other system available today offers the price/performance advantages that System 5000 does.

The Inforex System 5000 for file management. Once you've seen it, you'll wonder how anyone managed without it.

INFOREX

Inforex / Dept. 322 / 21 North Ave. / Burlington, Mass. 01803

☐ I'd like more information.
☐ I'd like to see a demonstration.
☐ Keep me updated on Inforex systems and capabilities.

Name _____

Title _____

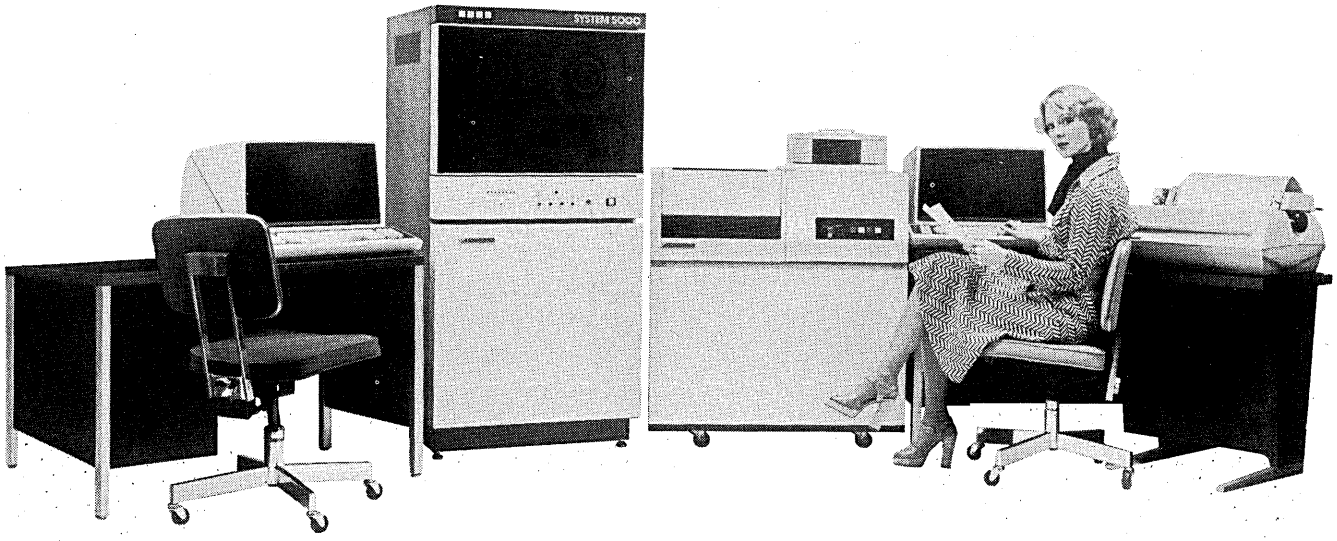
Organization _____

Address _____

City _____ State _____ Zip _____

Telephone _____

Offices in major cities throughout the United States, Canada, and Europe. Distributors worldwide. D-6



WHO GIVES YOU THE MOST CARGO LIFT, TO THE MOST PLACES, MOST OFTEN?

UNITED, THAT'S WHO.

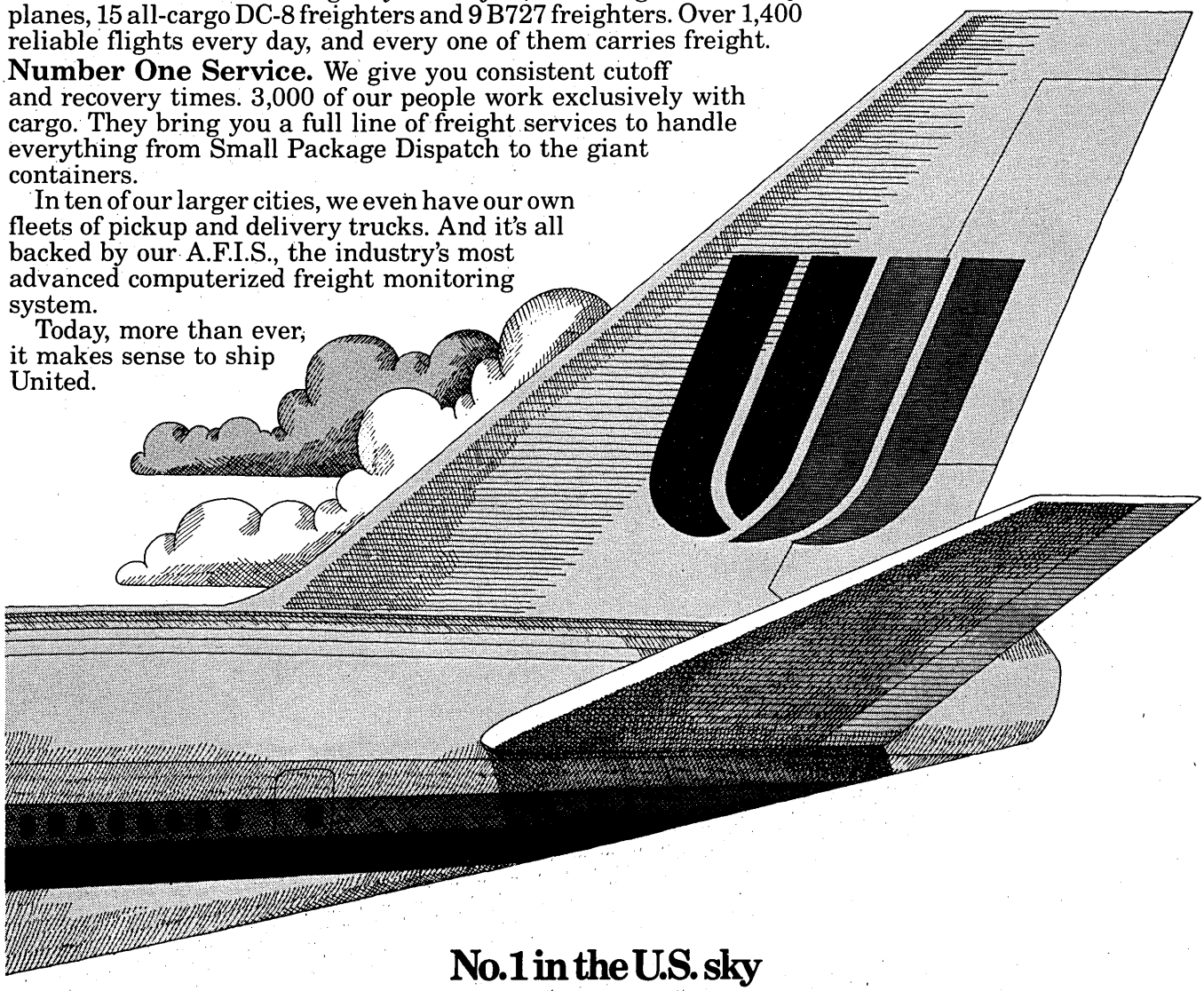
Number One System. No other U.S. airline gives you as large a system as United's. We serve 113 cities. Every major manufacturing, commercial, industrial and agricultural center. Every major market. Every major gateway. All-cargo service to 19 cities, widebody service to 21 cities.

Number One Fleet. We give you 359 jets, including 44 widebody planes, 15 all-cargo DC-8 freighters and 9 B727 freighters. Over 1,400 reliable flights every day, and every one of them carries freight.

Number One Service. We give you consistent cutoff and recovery times. 3,000 of our people work exclusively with cargo. They bring you a full line of freight services to handle everything from Small Package Dispatch to the giant containers.

In ten of our larger cities, we even have our own fleets of pickup and delivery trucks. And it's all backed by our A.F.I.S., the industry's most advanced computerized freight monitoring system.

Today, more than ever, it makes sense to ship United.



No. 1 in the U.S. sky

UNITED AIRLINES CARGO

This is an ad for Xerox computers.
(But not from Xerox.)

It's from Telefile Computer Products. And we've taken this space for two reasons:

First, we're a Xerox computer user and like the others, we *believe* in the mainframe. Price/performance is second to none.

Secondly, we're selfish. We manufacture and market fully compatible disk systems, main memory and other peripherals for Xerox computer users. So every new Xerox system sold represents an opportunity for us.

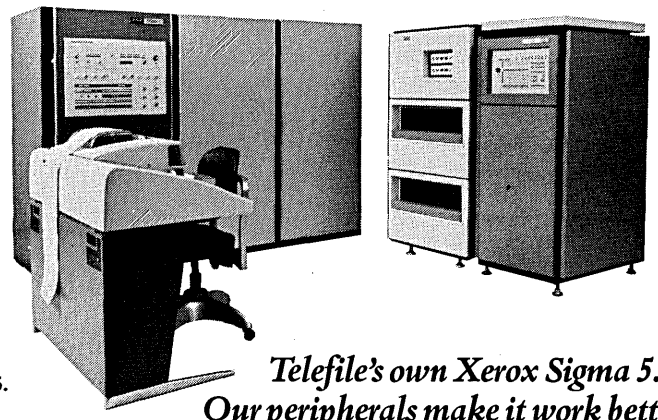
If you don't have a Xerox computer now, look into one. System architecture is remarkably advanced and in such tune with the software that users claim the computers deliver up to 95 percent of capacity. Unheard-of efficiency.

Tying the package together are two state-of-the-art operating systems: Control Program-Five (CP-V) and Control Program-R, for Real-time (CP-R). CP-V provides simultaneous access five ways: real-time, time-sharing, multi-programmed batch, remote batch, and transaction processing in any combination. CP-R is ideal for more dedicated engineering, scientific or real-time applications.

If you *do* have a Xerox computer now, look at the advantages you can have with Telefile's new generation of peripherals: Total hardware compatibility. Software transparency. Fast delivery. Lower cost. Better features. Strong back-up support.

Take it from Telefile, buy a Xerox computer. Then save by outfitting it with Telefile peripherals. Who knows, maybe next time they'll run an ad for us.

Telefile Computer Products, Inc., 17131 Daimler St., Irvine, CA 92705.



Telefile's own Xerox Sigma 5. Our peripherals make it work better and last longer.

Compliments of a friend.

hardware

by adding a second cpu. Since Sigma designs all treat memory as another peripheral, additional processors, up to a total of four, may be appended. Some guidelines are offered to help decide whether opting for an additional processor is warranted. Xerox conservatively states that if you have four resident programs, that's about right for a single cpu. As you approach eight resident programs, you have a busy system and could probably use the throughput improvement of the second processor. Figure four resident programs per processor, making allowances for program priorities, etc. Operation of the system with additional cpu's is totally transparent to the user, says Xerox, and requires only about 2K words of additional memory to support a fully expanded system.

An additional benefit of multiprocessing is the ability of the system to carry on even if one of the processors fails, and that is what Xerox calls fail-over capability. One cpu is designated the primary processor and handles I/O operations, schedules and executes user programs. All other cpu's are secondary processors and execute assigned user programs tasks. If the primary, or a secondary processor fails, the system remains on the air. Deliveries begin in the last quarter of the year. XEROX CORP., El Segundo, Calif.

FOR DATA CIRCLE 222 ON READER CARD

Small-biz System

In pitching the new 62/40 to current and potential IBM System/3 users, Honeywell will be able to wield some impressive arguments: greater I/O capability, greater communications capability, faster memory speed and greater capacity than its adversary. If that doesn't prove to be sufficient, throw in multiprogramming and 96-column card support, and it might get tempting. The 62/40 has been in Europe for the last 14 months, but the S/3 compatibility, and a new program called Liberator/3 are new wrinkles. The Liberator/3 module takes S/3 RPG II code and converts it so it will work in Honeywell cpu's. No program or file conversion operations are necessary, say its authors.

Processors are offered with memories ranging from 56 to 96K bytes of MOS memory, with 1 usec access for two bytes. Additional features include memory protection features, 140 mnemonic instructions, six I/O channels and an aggregate data transfer rate of 837K bytes/second—impressive for a system of this size. A complete complement of peripherals and software packages is offered. A minimum configuration with 57K of memory, system console/keyboard printer, magnetic tape unit, 11.6 megabytes of disc storage, 400 lpm printer, and 300 cpm reader sells for $108,250 or rents for $2,327 on a five-year contract. HONEYWELL, INC., Waltham, Mass.

FOR DATA CIRCLE 223 ON READER CARD

S/3 Model 15 Enhancements

The "big" System/3 is getting even bigger. Additional memory complements have been announced (160K, 192K, 224K, and 256K, roughly double the maximum memory size on the one-time large-scale 7094!), as have cardless computing thanks to the addition of the 3741 data entry station, and remote job entry capability. The Multileaving remote job entry work station (MRJE/WS) provides the model 15 with RJE software support to a 360 or 370 computer operating under HASP, OS/VS1 or OS/VS2. Program, data, and job control transmission compatibility with models 6, 8, and 10 have been retained.

The remote job entry capability, for which there is no charge, will be available in September, the 3741 hookup a month later. A C model cpu with 256K of memory can be purchased for $149,500 or leased for $3,710. IBM GENERAL SYSTEMS DIV., Atlanta, Ga.

FOR DATA CIRCLE 224 ON READER CARD □

If your big computer can't give somebody what he wants, give him a computer that can.

It's hard for one computer to be all things to all people.

So if your big computer can't do what somebody wants done, get a small computer to do the job.

A Data General computer.

At Lowe's Companies (a group of 130 building material stores) the central computer knew the current prices and stock levels of the 7,000 items in stock at each store. But the salesmen didn't.

So Lowe's data processing management put Data General computers in their stores to give the salesmen all the information they needed. Our computers cost a third less than the IBM 370 it would have taken to do the job. And ours do the job better.

At the end of every day, our computers automatically report to the computer center in the home office. And by the beginning of the next day, the central computer sends each store the latest prices and new stock information.

Data General computers not only make order-taking easier and more accurate, they also cut the time needed to take an order by 30% and reduce inventory carrying costs, pricing errors, and bad debt losses.

RCA Records put our computers in the hands of their operating management so they could do order processing and inventory control without getting caught up in the complications of a big computer.

One of the largest banks in the Northeast put a Data General computer in their trust department to give their portfolio officers access to vital investment information in their large IBM computer. And our computer does the job for much less than it cost for the large computer to do it alone.

So instead of giving people reasons why your big computer can't do something, write for our brochure, "The Sensible Way to Use Computers."

Then when somebody starts complaining about your computer, you'll know enough to tell him where to go.

DAT-675

NAME _____

TITLE _____

FIRM _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Data General, Dept.G, Route 9, Southboro, Mass. 01772 (617) 485-9100. Data General (Canada) Ltd., Ontario, Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361/Sydney (02) 908-1366.

Data General

CIRCLE 59 ON READER CARD

If You Are Transmitting Data Over The Dial Telephone Network... You May Be Embarrassed To Discover How Much Time And Money You Could Be Saving With...

Datadial™...

The Nation's First Digital Switched Dial-up Service!

Ten retail outlets might call their corporate computer to make credit verification...as many times as 30 calls per day, per store. Each call lasts an average of 15 seconds and the average distance from each store to the computer is 100 miles. The old way to send this data is very costly. The new way isn't.

Monthly Usage Charge*

New Datadial	$ 66.00
DDD	$ 2706.00
WATS (FBD)	$ 453.75

*All services require additional charges (where applicable) for access lines, data sets, speed variables and special features.

Datadial is the nation's first digital switched dial-up service.
When you dial-up with Datadial, you have instant connectivity via the best, high speed, high quality digital circuit obtainable today...with virtually error-free performance. There isn't any faster, cheaper way to send your data.
Write or call: DATRAN, Data Transmission Company, 7200 N. Stemmons, Suite 300, Dallas, Texas 75247, (214) 634-7390

The Switch Is On!

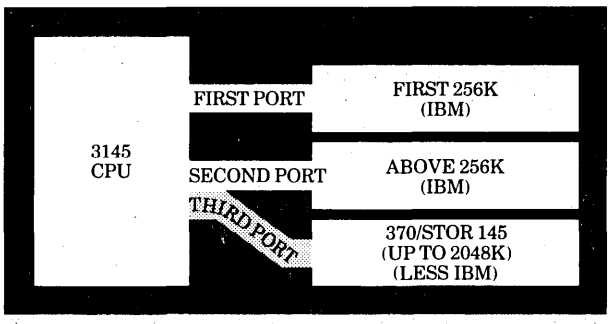
DATRAN

See Us at AFCEA in
Washington, D.C., June 3-5
Booth 225

Progress Report:

370/STOR 145

ITS UNIQUE THIRD-PORT NOW LETS YOU ADD ON TOP OF ANY AMOUNT OF RESIDENT 3145 MEMORY.



Most 3145 users have been stuck with high-cost IBM memory. Their processor has only two memory ports – one to handle the first 256K, the other to handle additional memory. That means low-cost independent memory had no place to attach, except with major wiring changes to the CPU. The result: only IBM memory could be used. But no more. Cambridge designed – and IBM approved – a totally transparent "third-port" memory that permits *any* 3145 processor to add *any* amount of 370/STOR 145 memory, regardless of the amount of resident IBM memory. No messy installation. No fear of incompatibility. Just plug in any amount you need.

And, with 370/STOR 145, you get more memory protection, more memory back-up, and more additional features than *anyone* else offers. Features such as highest memory addressing, no console file tampering, and super reliability.

CAMBRIDGE.

A good place to put your information.

Cambridge Memories, Inc. 12 Crosby Drive, Bedford, Mass. 01730 (617) 271-6400

Contact our sales offices for further information: Boston (617) 271-6400 • Hartford (203) 633-8714 • Westport, Conn. (203) 227-7027 • Philadelphia (215) 295-1186 • Cleveland (216) 842-2808 • Columbus, O. (614) 459-0154 • Atlanta (404) 252-1382 • San Francisco (415) 692-4806 • New York City (201) 871-0110 • Rochester (716) 637-2229 • Chicago (312) 449-5260 • Detroit (313) 557-4080 • Washington, D.C. (703) 683-5323 • Dallas (214) 231-4804 • Los Angeles (213) 595-1845 • Charlotte, N.C. (704) 568-1787 • St. Louis, Mo. (314) 569-0171 • Minneapolis (612) 831-1311
Subsidiary: Cambridge Memories GmbH, 6078 Neu Isenburg, West Germany 06102-36092.

software & services

Updates

The Financial Accounting Standards Board has issued a detailed interpretation of when software costs are deemed part of a company's R&D costs. The standards board has previously ruled that outlays on research and development should be charged off as incurred, rather than deferred and charged off only as income materialized from selling the resulting products. Only what it actually costs a company for its R&D on totally new or much improved products can be included.

A West Coast Working Group has been formed to try to attack the problems encountered by users of structured Fortran. The first meeting in February addressed itself to the following three questions:

1. What changes need to be made to make Fortran amenable to structured programming?
2. How do we write structured programs using Fortran as it exists today?
3. How do we make Fortran more modular? The group recommended to the ANSI Fortran language committee that a standard set of language constructions be mechanized initially by a precompiler to structure programs using Fortran as it exists today. The committee is in a data gathering stage and can be contacted through Loren Meissner, Lawrence Berkeley Laboratory, Univ. of Calif., Berkeley, Calif. 94720.

Editors Get Arrows Dept. It should be made clear that no cause and effect relationship exists in the April issue story (p. 151) regarding Pansophic Systems' products and the desire of the Navajo Tribe of Window Rock, Ariz. to switch mainframe vendors.

What do the Schlitz Brewery, the Federal Reserve Board, Exxon Corp., and the Physics Division at Argonne National Laboratory have in common? They are all users of a little known but rapidly growing language called Speakeasy. The language has not been well publicized but is already in use at more than 50 universities, laboratories and companies of all sizes. Its working vocabulary consists of more than 450 words, including matrix algebra and most of the operations scientists need in day to day calculations. For information, contact the Argonne National Laboratory Speakeasy Center, Argonne, Ill. 60439.

Disc Contents Analysis

DISKPLAY is a small (20K byte) program IBM DOS and DOS/VS users can utilize to map the contents of disc packs in order to show their organization. The structure of the disc is listed in index or table of contents columnar form and by producing a graphic picture of the pack that shows how cylinders and tracks are used and for what purpose. DISKPLAY creates and prints a listing of all files on the pack; graphically prints the relative size and relationship of each file; indicates the unused portions of indexed sequential extents by printing a slash through each identified track; shows the unassigned areas of each disc; how much space is being used; prints a list of defective tracks; and indicates unused areas within sequential files. DISKPLAY can be used with DOS/360, release 25 and above on IBM 2311, 2314, 3330, or 3340 or equivalent packs. The program is priced at $495 and is available on a 30-day free trial basis. BOOLE & BABBAGE, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 226 ON READER CARD

Real-time Monitor

Many, if not most, minicomputers still wind up in manufacturing or other environments that require a real-time response operating system, and DEC has extended the system requirements for such a monitor to an even smaller level with its announcement of RSX-11S. The "S" might stand for small, for the new coding is a core-only subset of the RSX-11M operating system. Since the new sibling doesn't require a drum, it is qualified for severe environment duty where the peripheral could conceivably become too contaminated (with heat, dust, or other undesirable properties) to operate. Program development for RSX-11S must be performed on a host PDP-11 system operating under RSX-11M version 2. The minimum RSX-11S configuration includes a processor with 8K words of memory, real-time clock, a hardware loader, and program loading device that can be a tape cassette, paper tape reader, a DECtape drive, or a magnetic tape drive. RSX-11S is licensed at $1,200 with full software support, or $600 without support. Deliveries begin in the fall. DIGITAL EQUIP-

software spotlight

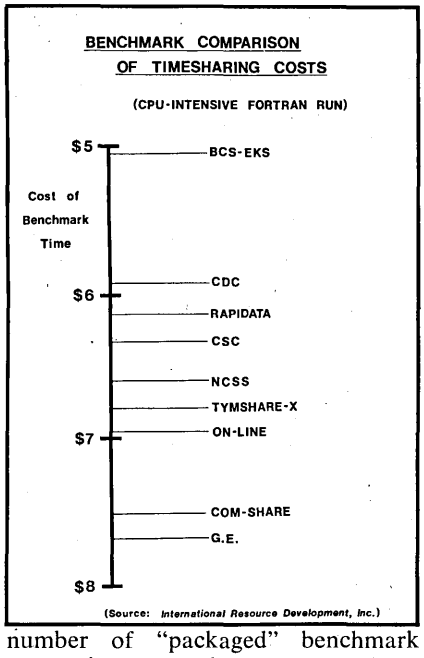
Benchmark Comparisons

Comparing the performance of rival time-sharing services is a new service offered by this vendor and is bound to produce interesting results, particularly for large-scale users. The service enables detailed comparisons of benchmark programs to be made on the basis of seven significant variables, providing the capability to select the optimum vendor for a particular program. Computer-time cost reductions of more than 40% are possible based on initial results of the service.

Currently, 12 major vendor services can be accessed for benchmark purposes, and plans include the addition of several other vendors. In general, the entire benchmark process can be accomplished in less than two weeks. Costs depend upon the length of the program, but a typical recent benchmark comparison, performed for a user who wished to compare present costs with those of other services, cost approximately $3K.

Also being developed by the firm is a number of "packaged" benchmark comparisons. Each report analyzes price/performance, response times, prime vs. non-prime time, actual job accounting statistics, user core limitations, documentation, and each vendor's version of public languages. These reports are priced at $60 each, or $600 for the whole series of 12. INTERNATIONAL RESOURCE DEVELOPMENT INC., New Canaan, Conn.

FOR DATA CIRCLE 225 ON READER CARD



software & services

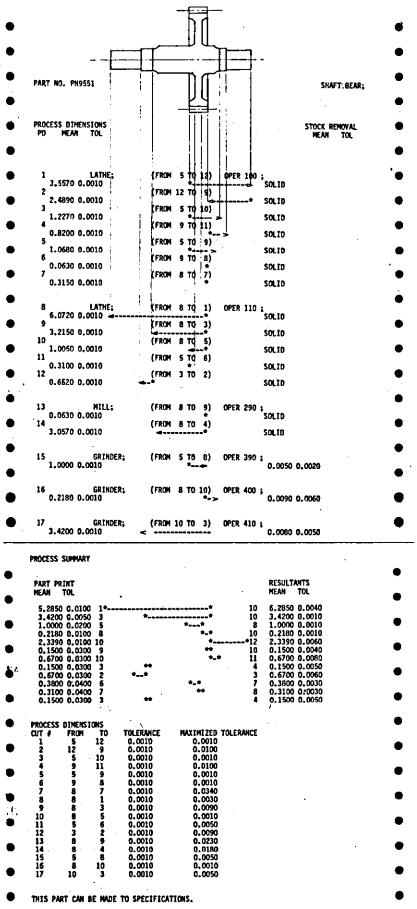
MENT CORP., Maynard, Mass.
FOR DATA CIRCLE 231 ON READER CARD

NCR Linear Programming

Such applications as fuel refining, investment planning, facility analysis, and production planning are expected to make use of this linear programming package, which runs on any Century 200 or larger system with at least 64K of memory. The MAGEN/NCR package is designed for use by non-computer personnel. Users need only supply the variable data, the requirements that must be met, and simple algebraic formulas which show how the variables are related. The system's matrix generator arranges the data in proper format and, using linear optimization techniques, determines the proper combination of elements needed to arrive at the desired solution. The report writer then produces reports on the solution in the format and content desired. The programming system is coded in NEAT/3 and is priced at $15K or $385/monthly. NCR CORP., Dayton, Ohio.
FOR DATA CIRCLE 227 ON READER CARD

Tolerance Charting

A program to calculate manufacturing tolerances is billed as cutting the cost of other methods by 50% and requiring only one-tenth the time. The computer calculates which dimensions might have their tolerances increased (which may permit use of less costly machining or stock), or which dimensions may be too loose or too tight to



make the part within the overall specs. The FORTRAN program even suggests which dimensions need be changed in order to produce the part. The firm will generate tolerance charts for customers or provide details of the program method under a licensing agreement.

The chart shown required four hours of compute time to generate, or about $300. Estimated costs for manually generating it are $600 and a week's time. SYSTEM ASSOCIATES, INC., Troy, Mich.
FOR DATA CIRCLE 233 ON READER CARD

Mini Structured Programming

ASGOL is billed as having the power of ALGOL, the efficiency of assembly language, and the ease of use of PL/1, which should attract the attention of many Data General Nova users. The package looks like a good one—for one thing, assembler language routines can be imbedded in programs without restrictions by ASGOL, which makes it possible to tightly pack the memory of

info 75

The Conference/Exposition for people who use and manage information systems

New York Coliseum, Sept. 8-11, 1975

If your job responsibilities are in sales, production, finance, administration—if you are using, or planning to use, information systems, INFO 75 is for you. And, of course, if you are an EDP manager or a systems analyst, INFO 75 is your show. The whole thrust of INFO 75 is how corporate managers and EDP managers can work together in developing new and useful information systems.

This year's INFO will be even bigger and better than last year's. You'll see information-crammed exhibits sponsored by over 150 leading companies. You'll have over 100 conference sessions from which to choose, complete series of sessions on Manufacturing, Retailing, Banking, Insurance, Hospital Administration, Transportation, Electric Utilities, Administrative Management, and EDP Management and Technology.

The emphasis at both the conference and exposition will be on *applications*—cost control... production control...inventory control...sales analysis...sales forecasting...order processing ...records management...you name it...there are literally 10,000 applications packages available at the exposition, more than 2,000 applications experts ready to help you develop new systems to increase efficiency, improve profitability.

Don't miss it! Send coupon today for registration cards and complete conference program.

CLAPP & POLIAK, INC.
Exposition Management
245 Park Avenue
New York, New York 10017

Please send_____registration cards for me and my associates.

Please send_____copies of the Conference Program.

Name_____

Title_____

Company_____

Address_____

City_____ State_____ Zip_____

D1

software & services

the small mini. Only a 12K Nova RDOS or Xebec XDOS operating system configuration is required. Other features include reentrant coding, loop constructs WHILE DO, DO UNTIL FOR, THRU, Case statements, IF THEN ELSE statements, block structuring, bit manipulation, arrays, assignment statements, recursive procedure calls, arithmetic and Boolean expressions, and others. The system is priced at $2K. MDB SYSTEMS, INC., Orange, Calif.

FOR DATA CIRCLE 228 ON READER CARD

DOS To VS Conversion

Batch application programs running under IBM's DOS operating system can be automatically converted for operation under OS/VS with a program called DOSTOVS. The technique can automatically perform up to 95% of the conversion effort and assist programmers in handling the remaining portion say its developers at Envirotech Corp., Salt Lake City, Utah. The firm also estimates that DOSTOVS enabled it to convert DOS programs to OS/VS in one-third the time required by manual programming methods.

After loading DOSTOVS, the user enters into the computer current DOS programming statements written in JCL and either COBOL, RPG, or Sort/Merge. A report is then produced containing side-by-side listings of the DOS input and the equivalent OS/VS programming statements. The report also alerts programmers to conversions that require additional code. DOSTOVS operates on 370 models 135 through 168 running under OS/MFT, OS/MVT, OS/VS1, OS/VS2, or VM/370. A reader/punch, line printer, and 2314 or 3330 disc file is also required. The IBM Installed User Program is available for a single use charge of $3,665. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 229 ON READER CARD

Selective Printing

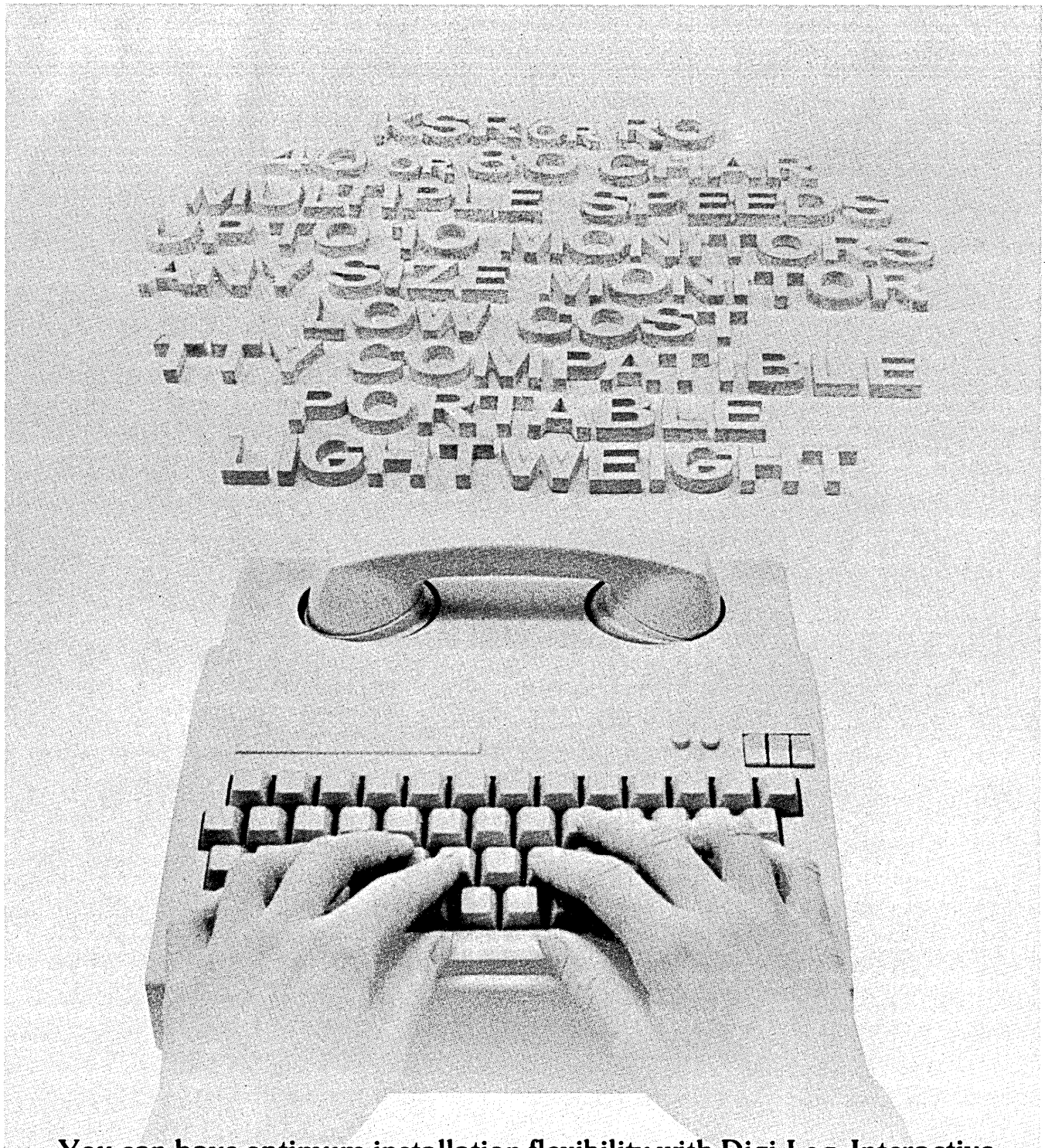
The Selective Print Utility is a debugging aid for use on IBM 360 and 370 systems operating under the VS or OS operating systems. The utility can read QSAM, QISAM, and BDAM data sets and print out all records meeting any combination of up to 15 conditions that include LESS THAN, EQUAL, GREATER THAN, NOT LESS THAN, NOT EQUAL, and NOT GREATER THAN connected by either AND or OR statements. Packed decimal, hexadecimal, and character field types can be read and printed in the same run. A two week free trial is offered. If you like the package, $300 includes MMISPU and a year's support. MMI SOFTWARE, Wichita, Kan.

FOR DATA CIRCLE 230 ON READER CARD

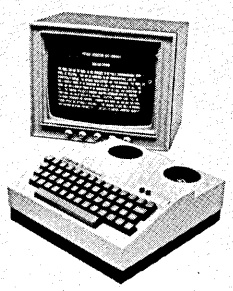
CICS Option

The popular Panvalet source program maintenance/security system can now be interfaced to IBM's Customer Information Control System (CICS) to function as an inquiry system for data sets and directory information as well as a scheduling system for submitting batch updates to the operating system. In the input mode, the terminal user can retrieve data sets from the Panvalet library for inclusion in the input batch job stream. A validation mode is used to perform error checking of Panvalet control cards before being spooled to the batch job stream. The display operation mode is used to show display directory entries individually, in groups, or the complete directory. For voluminous data, a program function key allows the terminal user to page forward through data set statements or directory entries. The Panvalet CICS option is priced at $1,800 for a perpetual license with maintenance after the first year of $360. There is a large Panvalet users' group, monthly newsletter, etc. PANSOPHIC SYSTEMS INC., Oak Brook, Ill.

FOR DATA CIRCLE 236 ON READER CARD □



You can have optimum installation flexibility with Digi-Log Interactive CRT Terminals. Control unit, keyboard, and optional acoustic coupler are all contained in one small, inexpensive package. Video monitors can be independently positioned for maximum operator convenience.



DIGI - LOG SYSTEMS, INC.

Babylon Road
Horsham, Pa 19044
215 672-0800

source data

(Continued from page 29)

BOOKS . . .

terial seems to be presented at a layman's level and easy to use. (For members of the Interuniversity Communications Council, the price is $7.50.)

Principles of Systems Programming

by Robert M. Graham
Wiley & Sons, 1975
422 pp. $16.95

Practical experience in programming and coding in a compiler language is required for the reader to benefit from this textbook, an introduction to systems programming. Detailed examples and exercises are included; the three major sections cover assemblers and loading, compilers, and operating systems.

A Manager's Guide to Computer Timesharing

by Timothy P. Haidinger and Dana R. Richardson
Wiley & Sons, 1975
182 pp. $9.95

Another in Wiley's Manager's Guide Series, designed to keep managers and administrators abreast of technological changes that affect business and industry, this guide explains the basic elements, applications, and costs of timesharing. The only flaw? The very useful directory of time-sharing suppliers omitted several dozen companies; the publisher has agreed to supply a corrected and updated list to anyone who purchases the book.

Encyclopedia of Computer Science and Technology, Vol. 1: Abstract to Amplifiers

Jack Belzer, Albert G. Holzman, & Allen Kent, eds.
Marcel Dekker, Inc., 270 Madison Ave., New York, N.Y., 1975
497 pp. $60 (15% discount on all volumes)

Planned to contain 2,000 articles in more than 10,000 pages in about 15 volumes, this reference work is aimed at both newcomers and specialists among programmers, systems analysts, hardware specialists, engineers, operations researchers, and mathematicians. Accordingly, the articles vary from highly technical in-depth treatments—*Abstract Algebra* is textbook length (102 pages)—to more general overviews, e.g., *Airline Reservation Systems*. Each article is written by an expert in that field and contains an extensive bibliography.

People-Oriented Computer Systems: The Computer in Crisis

by Edward A. Tomeski & Harold Lazarus
Van Nostrand Reinhold Co., 1975
300 pp. $13.95

Intended for managers and, in fact, anyone dealing with computers, this book presents a humanistic approach to a general discussion of computers and their use. A central theme of the book is "the neglect of the human element in computer systems." Topics such as organizational structure, personnel, MIS, social issues, etc. are discussed, and this book may well complement a more technically oriented text in introductory computer classes.

What to Do After You Hit Return

by Bob Albrecht, et. al.
People's Computer Company, P. O. Box 310 Menlo Park, Calif. 94025 (1975)
158 pp. $6.95 (paperback)

The authors believe that games can be used effectively to help develop decision-making and problem-solving

WHAT TO DO AFTER YOU HIT RETURN

or

P.C.C.'s First Book of Computer Games

skills, and have compiled this oversize newsprint catalogue, subtitled "PCC's First Book of Computer Games." Written in BASIC, the games range from simple word and number games like "hangman," to simulations, like refighting the "second battle at Bull Run."

Audit & Control of Computer Systems

by Elise G. Jancura
Petrocelli Books, 1975
355 pp. $13.95

Aimed at the public accountant and internal auditor, this book explains "how to perform an effective audit and evaluation of a computerized information system." Illustrations and examples are included.

PL/I in Easy Stages

by J. S. Roper
Dickenson Publ. Co., 16561 Ventura Blvd., Encino, Calif. 1975
239 pp. $8.95 (paperback)

This programmed text uses a conventional presentation-followed-by-exam format for student-paced learning. The text presumes the presence of an advisor, and sometimes asks simple-minded questions, but seems to be complete and easy to use.

What's new in printers? Ask Centronics.

Just because you need a faster printer doesn't mean you have to leave the family.

Our speeds are way up. But our prices aren't. And when you select products from the Centronics family, you get the extra advantages of proven reliability, printer compatibility, and commonality of parts.

Our new Model 104 printer delivers 200 lines per minute. Which is more full 132-column lines per minute for the money than any other printer in our family.

The low price includes a quiet, fully-enclosed design. Clean, consistent high quality printing. A choice of over 20 foreign language character sets. Special character sets. Boldface characters on command. Automatic on-off motor control. Exclusive off-line self-test switch. LSI electronics. Optional upper/lower case printing. And much, much more. All this—plus the best warranty in the business.

For reliability proven in tens of thousands of installations, and for optimum price/performance, look to Centronics. You'll find the biggest selection of printers anywhere. With a broad range of computer interfaces and communications adapters. Plus features and options available nowhere else.

High-volume production assures prompt delivery. Service and parts always available through a network of field service offices. Call our nearest office for full information. Centronics Data Computer Corp., Hudson, New Hampshire 03051. Tel: (603) 883-0111.

Eastern Region: Burlington, Mass., (617) 272-8545
Central Region: Kettering, Ohio, (513) 294-0070
Western Region: Santa Ana, Calif., (714) 979-6650
Centronics Data Computer (Canada) Ltd.: Mississauga, Ont.
Centronics of Puerto Rico, Inc.: Dorado, P.R., (809) 796-1881
Centronics International Corp.: Brussels, Belgium 02-762-3572

CENTRONICS®

CENTRONICS/the largest and fastest-growing family of medium-speed printers

source data

(Continued from page 32)

VENDOR LITERATURE

Software Library

This company's software library to support its Naked Milli, Naked Mini, and MegaByter minicomputers, is described in an 8-page brochure. Detailed descriptions of operating systems, high-level languages, assemblers, loaders, editors, utilities, arithmetic libraries, I/O drivers, and diagnostics are included. COMPUTER AUTOMATION, INC., Irvine, Calif.

FOR COPY CIRCLE 214 ON READER CARD

courses

International Summer School

Program Analysis and Optimization is the subject of a five-day seminar to be held August 25-29 in Israel. Sponsored by Technion (Israel Inst. of Technology) and IBM Israel Scientific Center, the seminar will feature speakers from IBM, the Courant Inst., and the Weizmann Inst. Topics include program optimization, control and data flow analysis, program diagnosis and verification, interprocedural analysis, SETL and its implications, and more. Registration fee: $150. Prof. J. Raviv, IBM ISRAEL SCIENTIFIC CENTER, Technion City, Haifa, Israel.

Microprocessor Technology

Training centers with programs specializing in the use of microprocessors and minicomputers have been set up in Miami, Dallas, and Santa Clara, Calif., with centers in Chicago and Boston to be opened later this year. The courses include microprocessor fundamentals, applications of microprocessors, advanced programming, and microprogramming. Each course lasts four days, with an optional fifth day for further lab work and consultation. Class size is limited to 16, with two students to each lab station. Tuition: $395. NATIONAL SEMICONDUCTOR CORP., Santa Clara, Calif.

FOR DATA CIRCLE 215 ON READER CARD

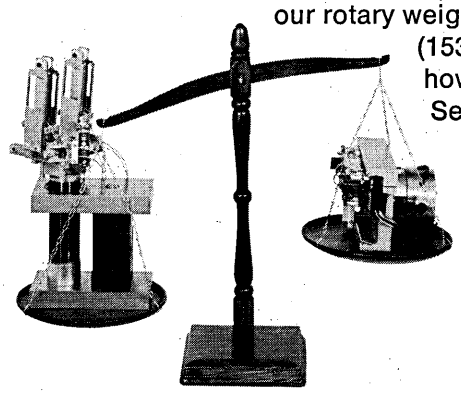
Computer Science Institute

The Fifth Annual Summer Institute in Computer Science on UC's Santa Cruz campus will feature one to two week intensive courses from July 7 through August 8. The six courses offered are on operating systems, structured programming, compiler construction, data base management, modern computer architecture, and using microcomputers. UNIV. OF CALIFORNIA EXTENSION, Santa Cruz, Calif. 95064. □

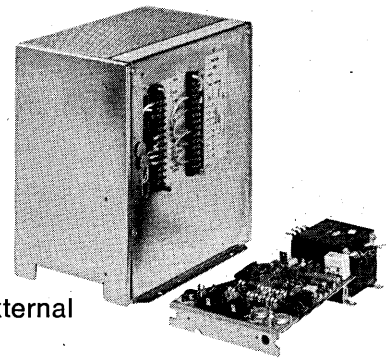
Actuators are the guts of any disc drive. Compare iomec's rotary against the world's voice coils.

Think about what our rotary actuator does for a disc drive. It's the actuator's size, weight, power, position accuracy and reliability that dictate the drive's design parameters. That's why we designed a rotary to replace our old voice coil actuator.

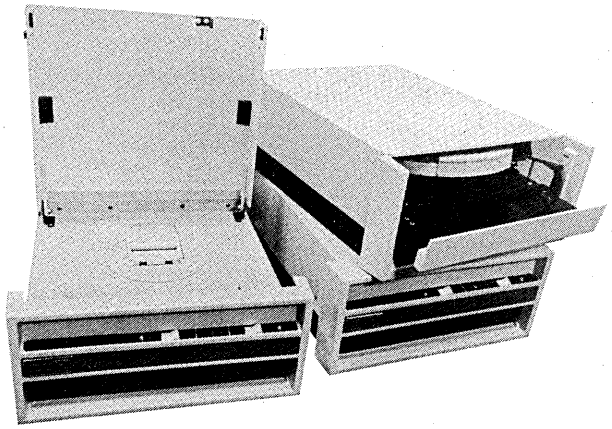
Voice coils can weigh 25 pounds (384 cu.in.), but our rotary weighs 7.5 pounds (153 cu.in.). That's how we got our Series 3000 disc drives down to 65 pounds, including integral power supply, and 8.7"x19"x22" dimensions.



Power? It effects heat, cooling air, user costs, and reliability. Here's a contrast you can't ignore: rotary 40 watts and voice coil 140 watts—steady state. Drive operational comparisons are: rotary drives 150 watts, and voice coil drives up to 600 watts. That explains why some companies need external power supplies.



As you might have guessed, drive manufacturers don't like to be compared to Iomec. It's not just our actuator, but all the Series 3000 features, including: 100-200 tpi, 6-12 Mbyte, front loader, top loader, and dual fixed disc models, all with 90% parts commonality.



If you buy disc drives, call our Director of Marketing, Terry Sweet, (408) 246-2950. He has a detailed comparison chart, a plane ticket, and a rotary actuator in his briefcase. Call Terry and compare—just once.

iomec inc
3300 Scott Boulevard
Santa Clara, CA 95050

iomec inc

UCC doesn't make computers. UCC makes computers work harder. With software that can help you and your shop improve productivity and get the job done. UCC: the leader in operating software.

UCC ONE **The case for Tape Management Software** was never stronger. Tape management snarls are the biggest thieves of processing efficiency and productivity. UCC ONE eliminates costly manual labeling, logging and controlling. It eliminates the expensive mistakes they breed. UCC ONE manages your tapes, protects valuable data from loss or destruction, and provides real-time tape status. And, if you're considering MSS, effective tape management will be required before the conversion to insure trouble-free changeover and continued operation. Case closed.

UCC TWO **There are two ways to convert to OS.** One is drastic and disruptive. The other is UCC TWO. You can avoid the nightmare of rewriting old programs while you're designing new ones. You can avoid the confusion, the down time and the sudden expense. With UCC TWO, it's business as usual. You continue to use your DOS programs, without reprogramming. No relPLing from system to system. You can plan the conversion to fit your work schedule, instead of the other way around. In fact, you can spread the job, and the costs, over months. Pay as you go. The choice is yours: Chaos. Or UCC TWO.

UCC SIX **Say goodbye to PDS compression.** Our newest software package, UCC SIX, eliminates PDS compression because it automatically inventories and controls your PDS disc space. Now, you can avoid ABENDS and "dump and restore" operations caused by exhausted PDS disc space. You can save the programmer and machine time normally needed for compression. And, you can save on your disc investment since UCC SIX utilizes PDS disc space more efficiently. Say hello to a new friend. UCC SIX.

UCC TEN **If your DBMS is laying eggs, get them all in one basket.** With UCC TEN, you can get all the benefits you expected and needed from a data base management system—but probably aren't getting. UCC TEN is an automated, centralized source of all the data...about the data. When used in conjunction with IMS, UCC TEN manages the data base environment. Because it controls data base definitions, provides powerful cross reference features, automatically generates IMS control statements and facilitates new systems designs. Having a DBM system is one thing, but getting it all together is another. You need UCC TEN.

UCC FIFTEEN **Restarting in a matter of seconds is now a matter of fact.** UCC FIFTEEN takes the time out of restarting because you don't have to restart at the beginning. Instead, you restart at the proper job step. The OS catalog is corrected. Unnecessary direct access data sets are automatically deleted. And GDG biases are properly altered for rerun. Manual errors that often occur when a job is restarted are eliminated. With UCC FIFTEEN, the problems of starting all over...are all over.

UCC
UNIVERSITY COMPUTING COMPANY
7200 Stemmons Freeway • P.O. Box 47911 • Dallas, Texas 75247
A Wyly Company

DX980...the operable system

from Texas Instruments

The most powerful operating system for a minicomputer is also one of the easiest to use. Why? Check these features... "cookbook" job control language, sophisticated file management for three file types, 400-megabyte disc capacity...and more!

DX980 general-purpose operating system supports TI's Model 980 series minicomputers in various applications including batch processing, interactive terminal processing and real-time applications... simultaneously or each one individually.

System Description

DX980 features a modular organization. General executive functions are included in the nucleus, while specialized functions are embodied in the subsystems.

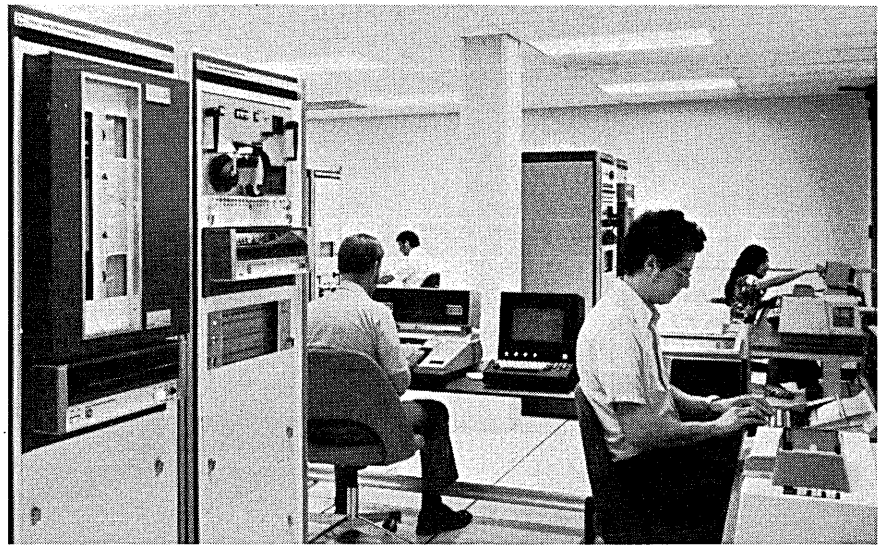
With this arrangement DX980 can efficiently manage multijob, multitask, memory, and I/O functions... all concurrently. In addition, the system contains a sophisticated file management feature for handling linked sequential, relative record, and key indexed files.

Another important feature of DX980 is system resource management, which includes dynamic memory allocation.

These features combined make DX980 ideal for multiprogramming applications using Fortran IV or assembly language for any number of large arithmetic operations.

Supporting Software

For such applications, supporting software includes a Fortran IV compiler; SAPG, a two-pass assembler; and DXOLE, an overlay link editor, in addition to a number of utility modules.



Hardware

The hardware configuration needed for these requirements is designed around a TI Model 980 series minicomputer with supporting peripherals. A general-purpose system capable of interactive terminal processing and batch processing could include four TI Model 912 Video Display Terminals, a moving-head disc with 2.28 million bytes of storage, a TI Model 979 magnetic tape drive, a 980B computer with 48K 16-bit words of error-correcting MOS memory, a "Silent 700*" Model 733 ASR Data Terminal, a 132-column medium duty line printer, a 300-cpm card reader... and, of course, DX980 operating system. This configuration enables users to have a $65,500 minicomputer system that can support tasks normally assigned to computer systems costing $100,000 or more.

This just may be the best bargain you have come across for your application. To find out more, contact the sales office nearest you. Or write Texas Instruments Incorporated, P.O. Box 1444, M/S 784, Houston, Texas 77001. Or call (512) 258-5121, Computer Systems Marketing.

Improving man's effectiveness through electronics

Arlington, Va. (703) 527-2800 • Atlanta, Ga. (404) 458-7791 • Boston, Mass. (617) 890-7400 • Chicago, Ill. (312) 671-0300 • Clark, N.J. (201) 574-9800 • Cleveland, Oh. (216) 464-2990 • Dallas, Tx. (214) 238-5318 • Dayton, Oh. (513) 253-6128 • Denver, Co. (303) 751-1780 • Detroit, Mich. (313) 353-0830 • Houston, Tx. (713) 777-1623 • Minneapolis, Minn. (612) 835-5711 • Orange, Ca. (714) 547-9221 • Orlando, Fla. (305) 644-3535 • San Francisco, Ca. (415) 392-0229 • Sunnyvale, Ca. (408) 732-1840 • Amstelveen, Holland 020-456256 • Bedford, England 58701 • Beirut, Lebanon 353188/353189 • Cheshire, England 061 442-8448 • Copenhagen, Denmark (01) 917400 • Essen, Germany 02141/20916 • Frankfurt, Germany 0611/39 9061 • Freising, Germany 08161/801 • Milano, Italy 683034 & 6899215 • Quebec, Canada (313) 353-0830 • Paris, France (1) 630-2343 • Slough, England 33411 • Stockholm, Sweden 62 71 59/62 71 65 • Sydney, S. Australia 831-2555 • Ontario, Canada (313) 353-0830 • Tokyo, Japan 402-6181

TEXAS INSTRUMENTS
INCORPORATED

*Trademark of Texas Instruments

advertisers' index

What Would You Call an Easy-to-Use, Low Cost, Portable, Flexible, Time-Saving, Four Channel Test Instrument?

Most people would call it unbelievable.

We call it the Bell & Howell® Datagraph Model 5-144, probably the most convenient test instrument you'll ever use.

With a frequency response of up to 10,000 Hz, the Model 5-144 records both analog and digital data with equal ease.

Four channels are available for viewing simultaneous events, such as timing sequences or multiple, inter-related functions.

The Model 5-144 contains all electronics needed to record information. There's no need to make special cables or calculate complicated damping networks. Just plug in your scope probes and record your data.

And after you've captured that data, the Model 5-144 provides a hard-copy for further examination.

In fact, think of it as a scope with a screen 200 feet wide.

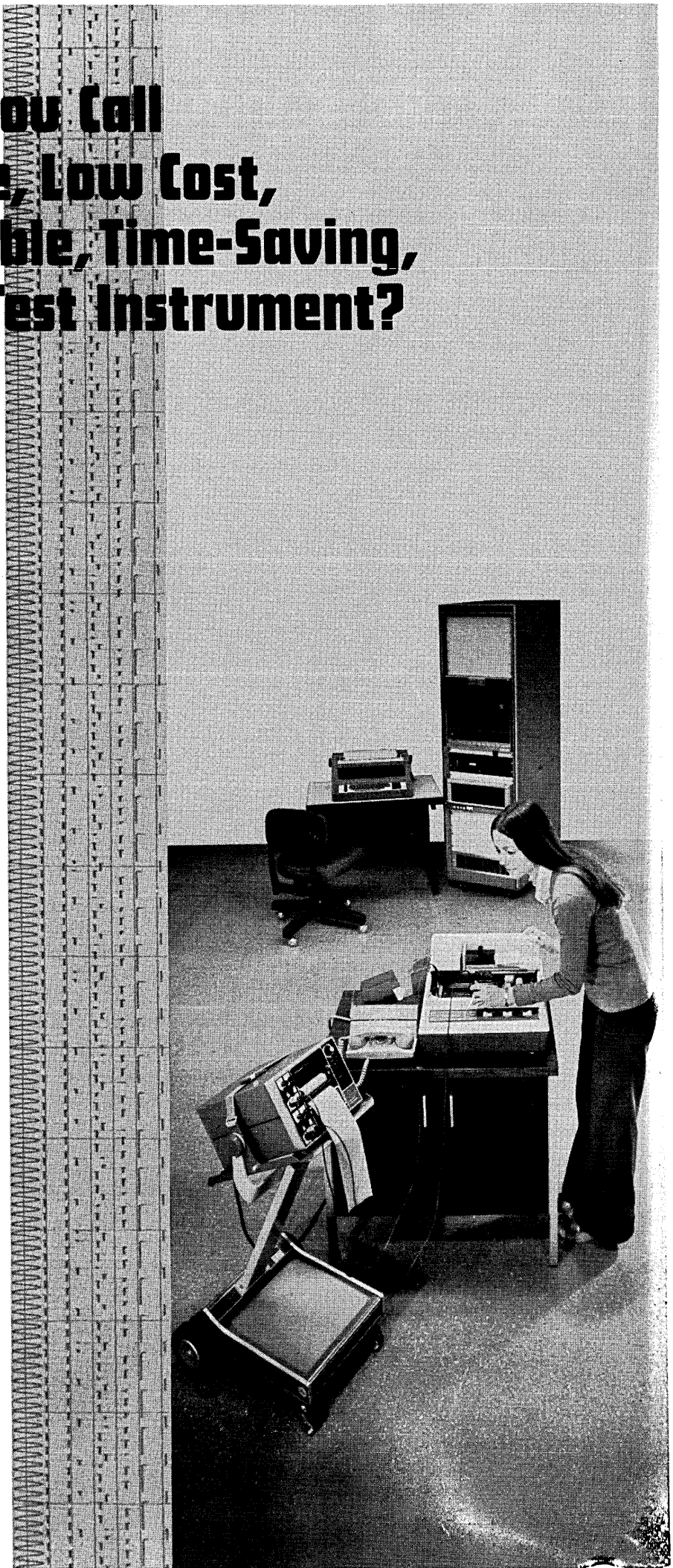
Other user features include trace polarity reversal, ac or dc coupling, and three selectable timing reference line spacings.

Two choices of gridlines and ten recording speeds are also available.

Total weight for all of this capability is only 34 pounds.

For more information or a demonstration, circle the appropriate reader service number below or write the CEC Division of Bell & Howell.

The Datagraph Model 5-144 will make a believer out of you.



CEC DIVISION

360 Sierra Madre Villa, Pasadena, California 91109

BELL & HOWELL

(In Canada: Ontario)

CIRCLE 28 ON READER CARD

advertisers' index

†European Insert Advertisers

The Hewlett-Packard 3000 is a minicomputer?

"The 3000 a minicomputer? I think calling the 3000 a mini is an abomination!"

When we asked Mr. Thomas Harbron, Director of the Computing Center, Anderson College, Anderson, Indiana, what he thought about the HP 3000, he had some very interesting things to say:

"We're using the 3000 for administrative processing, academic work and some commercial work. We have 27 terminals and we selected the 3000 because we wanted a system that would provide us with remote access and would do general purpose types of things from the terminals. The 3000 allows us to do many different things at different terminals. In fact, it does everything we expected it to do and was the only machine we could find in its price class that would. I'd recommend the 3000 to others. It's a powerful and versatile machine. And it's cost effective as well. It's half the price of anything that comes close to it."

"I don't think that Hewlett-Packard ought to call the 3000 a minicomputer. It is a complete medium-sized system."

That's what the EDP center manager of an aircraft manufacturer said about the 3000. He also had this to say:

"One primary reason we bought the 3000 was to collect and analyze radar development data. The problem is that we have to collect data fast enough, pipe it to a computer, analyze it, and then make the necessary instrument adjustments. HP's 3000CX was the answer. We also bought it for its interactive capability. Very significantly, in our acoustics department we had to have the ability to turn around data analysis fast. The 3000 has been a real cost saving computer for us. For the last two years I was the entire staff for the 3000. Not a great deal of detailed knowledge of the system is necessary. Technicians can use it without much training. I'm very much sold on the 3000. And it's definitely a complete system—not a minicomputer."

"It allowed us to run eight times the volume at a third the cost. No minicomputer could do that!"

The above statement was made by the corporate banking division EDP manager of a major California bank. He also said:

"We've had the 3000 for over nine months. A year ago we were on a time-sharing system and the cost became prohibitive. We contacted six different companies to look over and bid on a proposal that defined our needs. HP was the only one that could handle our total application of management information for the Corporate Banking Division. The 3000 is not just a mini—it's much more. We're constantly amazing people here with what we can do. It's not hard to operate, not hard to cope with. But our favorite topic is that we're paying less than one third of what we were paying and running four times the volume. And this year, we'll double our volume again. That's eight times greater and less than one third the cost.

That's really productivity!"

"We found the only thing mini about the 3000 was its price."

When we asked the EDP center manager of another major manufacturing company about the 3000, that was what he had to say. He also had this to say:

"Our computer needs include both scientific and commercial applications. We were phasing out our teleprocessing terminal and our Environmental Monitoring Division's computer. So we started looking. We spent several months studying computer systems, and rated them on speed, versatility and ease of operation. The result of our study showed that the HP 3000 provided these requirements and had the best cost/performance ratio. We didn't fully realize the potential of the 3000 until we started programming it. We have experienced a significant cost savings in the seven months we've had the 3000 and we expect a greater savings in the months ahead. We really like the interactive CRT for programming and data input. Being a multi-programming system we can have many users on at the same time. The power and speed of the 3000 is equal to a large machine. It's no mini. Calling it the Mini DataCenter is more accurate. I'd definitely recommend the 3000 to other potential users. In fact, we already have. We feel they would be money ahead."

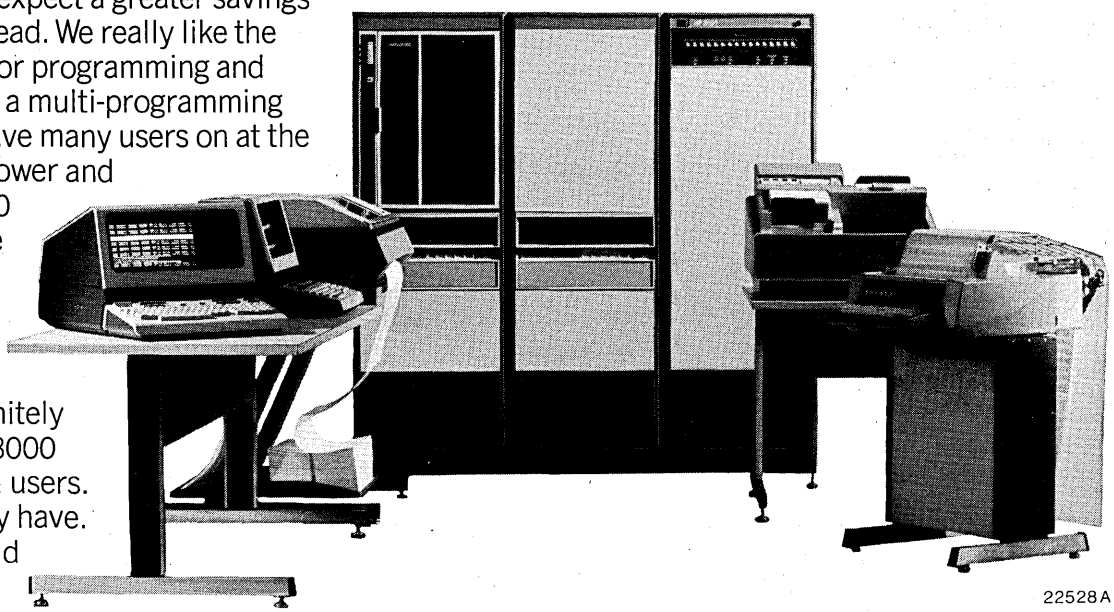
We're glad these and other users of the HP 3000CX set us straight. We called it a minicomputer because we built it with the state-of-the-art technology that lets us sell it for a minicomputer price. From now on we'll call it a Mini DataCenter.

We want you to get the whole story. Write us and we will mail you a copy of our HP 3000CX Mini DataCenter booklet. We know you'll find it interesting, informative, and maybe a bit surprising.

HP Mini DataCenters. They work for a living.

HEWLETT hp PACKARD

Sales and service from 172 offices in 65 countries.
1501 Page Mill Road, Palo Alto, California 94304

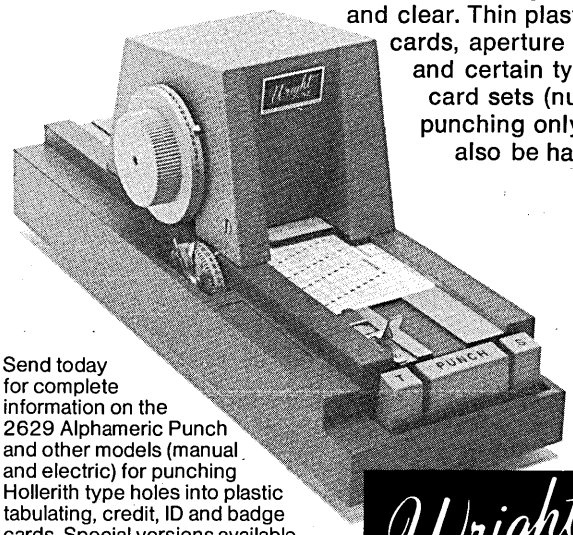


22528A

NEW PORTABLE PRINTING KEY PUNCH

Completely mechanical data recorder punches and prints simultaneously. Model 2629 Alphameric Printing Key Punch encodes the full IBM 029/129 character set: 26 letters, 10 numerics and 27 symbols. Card automatically advances after every punch stroke.

Punch has six adjustable tab stops for automatic programming of spacing. Upper case printing is sharp and clear. Thin plastic tab cards, aperture cards, and certain types of card sets (numeric punching only) can also be handled.



Send today for complete information on the 2629 Alphameric Punch and other models (manual and electric) for punching Hollerith type holes into plastic tabulating, credit, ID and badge cards. Special versions available. Rental programs available in US and Canada. Dealer and OEM inquiries invited.

Wright LINE
MEDIA MANAGEMENT SYSTEMS

160 GOLD STAR BOULEVARD, WORCESTER, MASSACHUSETTS 01606
A DIVISION OF BARRY WRIGHT CORPORATION

CIRCLE 62 ON READER CARD

WHAT IS YOUR TRUE WORTH?

FREE JOB OPPORTUNITIES BULLETIN

Cadillac Associates represents the nation's largest and most respected professional placement service. Our close relationship with the nation's finest firms generates continuous career opportunity information and allows us to confidentially present your qualifications to those at "decision-making" levels.

Our bulletin, published quarterly, listing available opportunities in the Systems & Data Processing field is available free of charge and will be mailed to your home upon your request.

For your free bulletin, without any obligation, circle reader service card #115. Please USE HOME ADDRESS ONLY!

FREE CONFIDENTIAL PLACEMENT SERVICE

If you desire immediate assistance in locating an opportunity consistent with your objectives (professional/financial/geographic), *CALL OR WRITE TODAY.* A member of our staff of SYSTEMS & EDP SPECIALISTS will reach you by telephone to discuss your objectives and how we might help you satisfy them. A resume, or some details of background, will be appreciated.

Remember: Our client firms are located from coast to coast and assume all expenses (agency fee, interviewing & relocation).

E. W. MOORE
Executive Vice President
CADILLAC ASSOCIATES, INC.*
32 West Randolph St. Chicago, Ill. 60601
Financial 6-9400

*"Where More Executives Find Their Positions Than Anywhere Else in The World."

CIRCLE 115 ON READER CARD

PROGRAMMERS AND ANALYSTS

Free Employment Service

Serving Northeast, Southeast and Midwest U.S.

- Scientific and commercial applications
- Software development and systems programming
- Telecommunications
- Control systems
- Computer engineering
- Computer marketing and support

Call or send resume or rough notes of objectives, salary, location restrictions, education and experience (including computers, models, operating systems and languages) to either one of our locations. Or check the reader service card for a free sample resume. We will answer all correspondence from U.S. citizens and permanent residents and will guarantee our best efforts in a professional and ethical manner to all qualified applicants that we think we can help. Our client companies pay all of our fees.

RSVP

RSVP SERVICES, Dept. M
Suite 700, One Cherry Hill Mall
Cherry Hill, New Jersey 08034
(609) 667-4488

RSVP SERVICES, Dept. M
Suite 300, Dublin Hall
1777 Walton Road
Blue Bell, Penna. 19422
(215) 629-0595

RSVP SERVICES

Employment Agency for Computer Professionals

CIRCLE 112 ON READER CARD

CONFIDENTIAL...
FEE PAID OPPORTUNITIES?

Romac has them.

Romac professionals bring the "right people" together in Data Processing, Accounting and Banking. Our 14 Romac partners have experience at IBM, Honeywell and many national accounting firms. They'll offer you... more options.

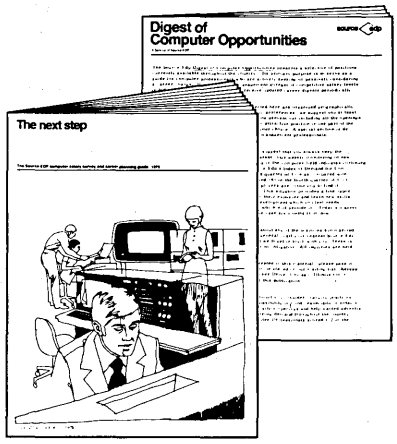
Always in confidence, Always fee paid

ROMAC

& ASSOCIATES/Personnel Consultants

Contact Romac & Associates, President H. B. Dunn at 125 High St., Boston, Ma., 02110, for transmission to our network Partners in Manchester, Portland, Hartford, New Haven, Stamford, Rhode Island, Buffalo, Rochester, Syracuse, Chestnut Hill, Ma., Boston, Washington, D.C., Charlotte and Atlanta.

Is Your Salary Keeping Pace With Inflation?



Do you know how much money your colleagues make for doing the work you do? Do you know which computing skills are most lucrative? Do you know how to get a better position?

Source Edp does. And we'll share what we know with you. Our ninth annual salary survey and career planning guide, "The Next Step," compiles salary data received from over 15,000 computer professionals. We add to that advice developed over our thirteen years of computer recruiting experience: danger signals that mean you should start looking for a new position, mistakes to avoid, strategy in career planning. You'll also receive the "Digest of Computer Opportunities," our periodic supplement listing positions available right now in every part of the country.

Source Edp is the largest nationwide recruiting firm devoted exclusively to computer professionals. We offer "The Next Step" as a service to people like you. Fill out the reader reply card and we'll send you one absolutely free. Or write:

Source Edp
Corporate Headquarters
100 South Wacker Drive
Chicago, Illinois 60606

source edp

REGIONAL OFFICES:

ATLANTA	404/634-5127
CHICAGO	312/782-0857
CLEVELAND	216/771-2070
DALLAS	214/638-4080
DETROIT	313/352-6520
HOUSTON	713/626-8705
IRVINE, CA	714/833-1730
KANSAS CITY	816/474-3393
LOS ANGELES	213/386-5500
MINNEAPOLIS	612/544-3600
NEW YORK	212/682-1160
NEW ORLEANS	504/523-2576
NORTHFIELD, IL	312/446-8395
OAK BROOK, IL	312/323-8980
PALO ALTO	415/328-7155
PHILADELPHIA	215/665-1717
SAN FRANCISCO	415/434-2410
ST. LOUIS	314/862-3800
UNION, NJ	201/687-8700

CIRCLE 110 ON READER CARD

tpc Technical Publishing Company

Arthur L. Rice, Jr., Chairman of the Board
James B. Tafel, President
Gardner F. Landon, Exec. Vice President
Calverd F. Jacobson, Financial Vice President and Treasurer
Thomas A. Reynolds, Jr., Secretary
M. Jay Turner, Jr., Director of Circulation
Paul C. Jarvis, Director of Information Services

Advertising Offices

Eastern District Managers
A. Treat Walker,
Warren A. Tibbetts: Greenwich, Ct. 06830
35 Mason St. (203) 661-5400

New England District Manager & Vice President
Warren A. Tibbetts: Manchester, N.H. 03104
112 W. Haven Rd.
(603) 625-9498

Midwest District Manager
John M. Gleason: Chicago, Ill. 60606
205 W. Wacker Drive
(312) 346-1026

Western Manager and Senior Vice President
Hamilton S. Styron: Los Angeles, Calif. 90035
1801 S. La Cienega Blvd.
(213) 559-5111

District Manager
Alan Bolté, Jr.: Los Angeles, Calif. 90035
1801 S. La Cienega Blvd.
(213) 559-5111

Western District Manager
James E. Filiatrault: Mountain View, CA 94043
2680 Bayshore Frontage Rd.
Suite 101
(415) 965-8222

U.K., Scandinavia, Benelux
Intergroup Communications, Inc.
Wallace K. Ponder, European Director
Paul D. Dimmock, Regional Manager
31 Lyncroft Avenue
Pinner, Middx. HA5 1JU
England
Tel: (01) 868 9289
Cables: PACOM, Pinner

Germany, Austria, Eastern Europe
Fritz Taeuber
Solteauer Strasse 85
D-314 Lueneburg
Germany
Tel: (0 41 31) 3 19 34

France, Switzerland, Italy, Spain
Gerard Lasfargues
32 rue Desbordes Valmores
75016 Paris
France
Tel: (1) 288 90 22

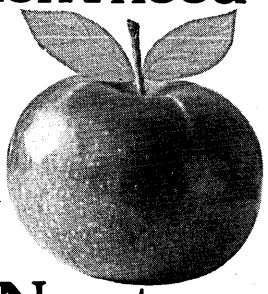
Japan
Shigeru Kobayashi
Japan Advertising Communications, Inc.
New Ginza Building
3-13 Ginza 7-chome
Chuo-ku, Tokyo 104, Japan
Tel. (03) 571-8748

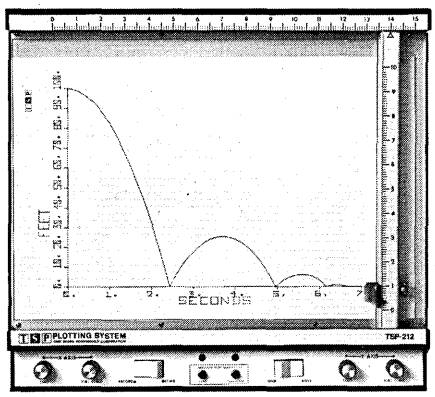
Other tpc Magazines

Plant Engineering — *Pollution Engineering*
Power Engineering — *Purchasing World*
Research/Development — *Consulting Engineer*

Beat the Big One...
Heart Attack
Give Heart Fund

You don't need a hit on the head like Newton



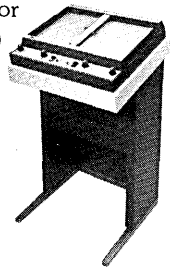


get the picture with a TSP Plotter!

The fastest, low cost plotter available!

Compatible with most computers and terminals, TSP plotters come complete with sub-routines to aid in preparing programs for your particular requirements. Compression of absolute position data into only 3 characters per point for full ASCII data or 4 characters per point for EBCDEC or partial ASCII means high-speed plotting at a price you can afford. TSP plotters are available in pedestal or table-top models.

Find out why major computer users in industry, education and government have long insisted on TSP plotting systems! Write today for full details or call (203) 743-7624 for immediate assistance.



TSP

TIME SHARE PERIPHERALS CORP.
Route 6, Bethel, CT 06801

CIRCLE 76 ON READER CARD

If you can think of a reason to advertise someplace else, we'll give you five reasons not to.

We're not saying there aren't good reasons for advertising somewhere besides DATAMATION. In fact, we'll give you one.

Suppose a sales opportunity opens up unexpectedly and you need to respond quickly with an ad. Placing it in the weekly newspapers in our field might just give you the flexibility you need.

But you'd still have a problem. Coverage.

Many of the people you want to sell would probably never see your ad. Because the closest these publications come to reaching the market DATAMATION covers is 30%. You'd end up spending almost as much in these publications as you would in DATAMATION and reach a lot fewer buyers.

But you don't depend on special situation ads to build your business. It's the regular advertising you do year after year that makes the difference. 12 ads a year in DATAMATION put you in front of all your customers every issue. The same 12 ads in the weekly publications put you in 12 issues but not in the other 40. It's hard to get your buyer's attention when you don't advertise regularly.

So you don't think we've made a statement we can't back up, here are four more reasons why DATAMATION is the best place for you to advertise:

- EDP professionals like it best. (The major reader studies say so.)
- Advertisers like it the best. (The total advertising pages DATAMATION carries say so.)
- Ads in DATAMATION produce the most and the best sales leads. (Advertisers say so.)
- Many of your customers and prospects read DATAMATION exclusively. (They say so.)

There are actually more than five reasons why DATAMATION is the best place for you to advertise. But we'll save them until you think you have a good reason to advertise somewhere else.

Technical Publishing Company

DATAMATION®

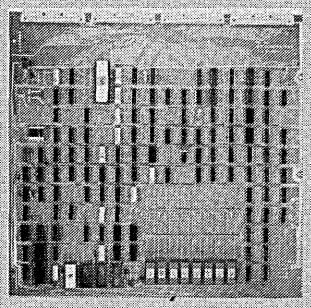
First in market coverage—worldwide.

Applied Data Communications
announces

- **A NEW Product Concept**
- **A NEW Microcomputer Family of Products**
- **Cost Effective Systems Based Upon Mini-Peripherals and Microprocessor Technology**

Microcomputer Series 70

Prices
1 $1300
100 949
500 740



Model 70-101

Includes

- Intel 8080
- 4K bytes RAM expandable to 16K
- 1K bytes reprogrammable ROM expandable to 4K
- Terminal Controller - TTY or CRT
- Peripheral controller - floppy disk

Options

- Operator console
- Enclosure
- Software - μ- DOS™
- Controllers for: RS232, Tape Cartridge, Line Printer, Tape Drives, PROM Programmer, General Purpose I/O, Real Time Clock

Intelligent Peripherals Series 62

Prices
62-161 1 $4600
50 3545
62-142 1 $4900
50 3775

Model 62-161

Includes

- Microcomputer
- 1K bytes PROM
- 4K bytes RAM
- Cartridge tape or floppy disk
- Operator console, enclosure
- Terminal controller - CRT or TTY
- ROM bootstrap
- Utility software, editor, assembler

Model 62-142

Custom Microcomputer Systems Series 70

The Series 70 System is provided to customer needs, including operating software, application software, peripherals.

Priced from $9,000

APPLIED DATA COMMUNICATIONS

1509 East McFadden Avenue
Santa Ana, California 92705
Telephone: (714) 547-6954

Also
- Floppy disk systems
- 3M tape cartridge systems
- Program leading systems

EDP SEARCH

WHY IS FOX-MORRIS THE FIRST CHOICE OF EDP PROFESSIONALS?

A recognized staff of professional experts offering LOCAL, REGIONAL & NATIONAL COVERAGE through our direct branches as well as coast to coast coverage through our 75 member firms of National Personnel Consultants, Inc.

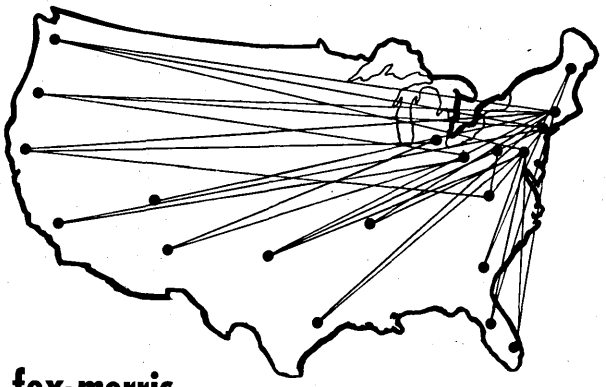
Completely confidential service geared to your career objectives.

Unparalleled contacts with industry based on years of successful results.

Professional resume evaluation and career guidance.

Client companies assume all employment costs—including interview expense, relocation (if necessary) and search fee.

SEND RESUME DIRECT, OR CIRCLE NUMBER BELOW ON READER CARD.



fox-morris personnel consultants

Philadelphia: (215) 561-6300, 1500 Chestnut St., Philadelphia, Pa. 19102
New York: (212) 697-1820, 633 Third Ave., New York, N.Y. 10017
Pittsburgh: (412) 232-0410, 6 Gateway Center, Pittsburgh, Pa. 15222
Wilmington: (302) 654-4465, 2005 Concord Pike, P.O. Box 7017, Del. 19803
Princeton: (609) 452-8135, P.O. Box 2063, U.S. Rt. 1, Princeton, N.J. 08540
Baltimore: (301) 296-4500, 409 Washington Ave., Baltimore, Md. 21204
Charlotte: (704) 375-9151, 1415 East Blvd., Charlotte, N.C. 28203
Atlanta: (404) 321-3888, 2200 Century Pkwy., N.E., Atlanta, Ga. 30345

CIRCLE 117 ON READER CARD

Even Webster's Knows About QUEST

QUEST (kwest). v. 1. To make a search; to go on a quest.

QUEST SYSTEMS, INC. n. 1. A corporation founded in 1968. 2. The largest professional recruitment firm in the U.S. functioning solely in the computer sciences; its client companies pay all employment fees, interviewing and relocation expenses. Quest is known for its deep personal commitment to relate to each candidate as an individual with individual goals. 3. Its professional staff averages over 6 years of experience in EDP recruiting (additionally, staff members have direct hands-on experience in programming, systems, hardware sales, etc.) 4. Quest is presently searching for programmers and analysts (commercial, scientific, systems software) for over 3,500 client companies in the U.S. *Quest has openings in over 700 U.S. towns and cities.* 5. Methodology — see Questsystem.

QUESTSYSTEM (kwest sis'tem). n. 1. Discussing with an individual what he would like to be doing in light of what he has been doing. 2. Analyzing the realities of his objectives as they relate to the current job marketplace. 3. Contacting client companies and other Quest staff personnel to identify positions of possible interest. 4. Introducing the job candidate to his prospective employers by providing complete details to each about the other, ensuring the efficacious use of everyone's time. 5. Arranging interviews. 6. If employment offers are extended, Quest assists in evaluating the responsibilities, compensation and opportunities (and relates those to the initially stated objectives). The Questsystem has been working for thousands of professionals at no expense, whatsoever. Ask your friends of their past dealings with Quest. Then, put the Questsystem to work for you. For additional information on this subject, please inquire directly to Quest Systems, Inc. (All inquiries/resumes received will be responded to immediately and in confidence.)

QUEST SYSTEMS INC®
6400 Goldsboro Road
Washington, D. C. 20034 (301) 229-4200
Baltimore: (301) 265-1177 • Philadelphia: (215) 667-3322

CIRCLE 111 ON READER CARD

Experienced EDP Analyst/Programmers, compute the advantages of working at Aramco.

Since starting operations in Saudi Arabia in 1933, Aramco has grown to be one of the largest oil companies in the world. EDP Analyst/Programmers are needed to support plans for continued growth. Installation includes two 370/158s under OS/VS-2, going to 370/158 MP with MVS.

Opportunities For Qualified EDP Analyst/Programmers

Analyst/Programmer — Payroll: To participate in the development and maintenance of major applications in payroll, as well as tax and benefits programs. A college degree is required. Three years COBOL or PL/1 experience in commercial programming, preferably in payroll systems.

Analyst/Programmer — Information Systems: To participate in the development of information systems. A college degree plus a minimum of three years COBOL and/or PL/1 programming experience is required. IMS application experience would be useful.

Analyst/Programmer — Engineering: Responsibilities include the development and programming of applications in the engineering and scientific areas. A degree in Engineering (preferably Electrical) or Physical Science is required, and a minimum of three years of FORTRAN or PL/1 experience is desired.

Systems Programmers: Responsibilities include the generation and maintenance of the operating system, and the evaluation, installation, and support of software products, and technical support for application Analysts/Programmers. Aramco also has a requirement for analysts with experience in IMS internals, including error analysis. Three years EDP experience including one year of OS/360-370 programming, is necessary. A degree in Computer Science, Physical Science, Engineering, or Mathematics will fulfill the educational requirement.

Jobs in Saudi Arabia mean top money, and more.

Aramco offers top salary, plus liberal savings plans, and insurance benefits.

In addition, you'll get overseas allowances and an annual 6-week paid vacation with plane tickets to the U. S. and back for you and your family.

Do Americans like Saudi Arabia?

Life in Saudi Arabia is comparable to a small U. S. town. There are excellent schools, houses, hospitals, and recreational facilities.

Plus, you'll have a great chance to travel.

Americans like living in Saudi Arabia so much, they stay an average of 12 years.

Let's get together.

You'll want to know a lot more about Aramco and what it's like to live overseas, so let's get together. Send us your resume and salary history, but please don't call; we'll get in touch with you.

Employment Supervisor
ARAMCO SERVICES COMPANY
1100 Milam/Houston, Texas 77002

CIRCLE 116 ON READER CARD

the forum

COUNTERING CODASYL CRITICS

CODASYL replies to two forums in the November, 1974 issue: "An Open Letter on COBOL Standards" by David A. Nelson, and "CODASYL Has Failed COBOL" by Kenneth P. Seidel.

There is a continuing, and seemingly widespread, public misconception of the precise roles played by CODASYL, ANSI, and other organizations connected with COBOL. Publication of the new ANSI/COBOL 1974 Standard has sparked a spat of ill-conceived, ill-timed, and generally ill-directed allegations concerning the activities of CODASYL and ANSI.

At the inaugural meeting of the Conference on Data Systems Languages (CODASYL) at the Pentagon in 1959, the main objective agreed to was to develop a computer language "independent of any make or model of computer, open ended, and stated in both English notation and a narrative form."

CODASYL is still the prime controlling body for COBOL specification and improvements. The committee within CODASYL solely responsible for COBOL is the Programming Language Committee (PLC). As with all CODASYL's activities, PLC is an unfunded organization, so that the full expenses of participants are paid by their member organizations.

Although PLC through its voting members has the sole power to modify the specifications to COBOL, any interested member of the public is encouraged to submit ideas for improvements to the language.

Any language in a changing environment is subject to constant modifications of both syntax and vocabulary; associated as it is with a relatively new and rapidly developing technical environment, COBOL is particularly prone to change. One major problem is how best to meet new specification requirements without unduly invalidating or disrupting the countless programs already in use—while at the same time trying to minimize the ever growing list of reserved words which all programmers are forced to contend with. Such disruptive changes are kept to a minimum; but it proves either impracticable, or even impossible on occasions, to avoid some changes of this nature.

As an indication of the requirements for change, the number of proposals received annually during the last five years (1970-74) have equalled 182, 169, 160, 245 and 115 respectively. The high point of 245 in 1973 was largely attributable to the overall interest shown in the projected addition of Data (Base) Manipulation Language specifications.

Being unfunded, CODASYL also has to seek outside support to prepare, print and distribute periodic editions and updates of the CODASYL COBOL *Journal of Development* (JOD) (now totalling over 400 pages in length). Current page changes to specifications, which result from proposals passed at each meeting, must also be published periodically for insertion in the JOD. For several years after CODASYL's inception, the printing and distribution was undertaken by the U.S. Department of Defense, while U.S. Steel Corp. produced the necessary page changes. Commencing with the fifth edition (1968), the JOD has been produced by the Canadian Government, which also undertook to handle the page changes in 1970.

Constant liaison is maintained by PLC with the American

the forum

National Standards Institute (ANSI), the European Computer Manufacturer's Association (ECMA), and the Japanese Institute for Standards (JIS). A selected number of copies of minutes, journals, and page change sets are sent regularly to each of these organizations. They in turn submit a fair proportion of proposals of their own for PLC deliberation. Both ANSI and JIS publish standardized versions of COBOL specifications based on CODASYL's JOD contents; and both these organizations have agreed to conform to CODASYL specifications within their standards, or subsets thereof.

Thus, although it is not generally understood, all COBOL standards are, in the last analysis, tuned to CODASYL PLC specifications, and hence these form the basis for most compilers. However the inclusion or omission, plus the precise placement of any portion of the specifications within defined "modules" or specific "levels" of the U.S. Standard, is the prerogative of ANSI.

COBOL compilers for U.S. built computers are constrained to adhere to such specifications by virtue of legislative measures passed by the U.S. Government. However, there is nothing to prevent any compiler from "jumping the gun" on the latest ANSI specifications, since all the more important U.S. manufacturers as well as some software organizations hold membership on PLC and are thus immediately aware of pending changes. For example, although both Data (Base) Description and Data (Base) Manipulation Language specifications have not yet been fully agreed to by CODASYL (let alone embodied in an ANSI Standard), several U.S. manufacturers have already implemented and released "advanced" versions of COBOL data base specifications based on the presently existent CODASYL "Final Draft Specifications."

In addition any manufacturer can embody within his own COBOL compiler features which take particular advantage of that machine's logic or architecture. These embellishments are referred to by CODASYL as "unilateral" (i.e., restricted to one party only) extensions to the language. While use of "unilateral extensions" on the part of COBOL programmers may tend to lessen their task or improve their program's effectiveness for that particular equipment or installation, it should be noted that "current gains" may well be more than offset by "future losses," since the true machine independence or compatibility of the resultant program must suffer to some extent.

CODASYL COBOL specifications as embodied in the latest version of the *Journal of Development* (preferably updated by the addition of loose leaf sets of page changes) make the COBOL programmer aware not only of the specifications currently "standard" and fully compatible, but also of the "shape of things to come."

CODASYL's PLC welcomes constructive criticism; but such criticism can only be "constructive" if it is both positive in nature and properly timed.*

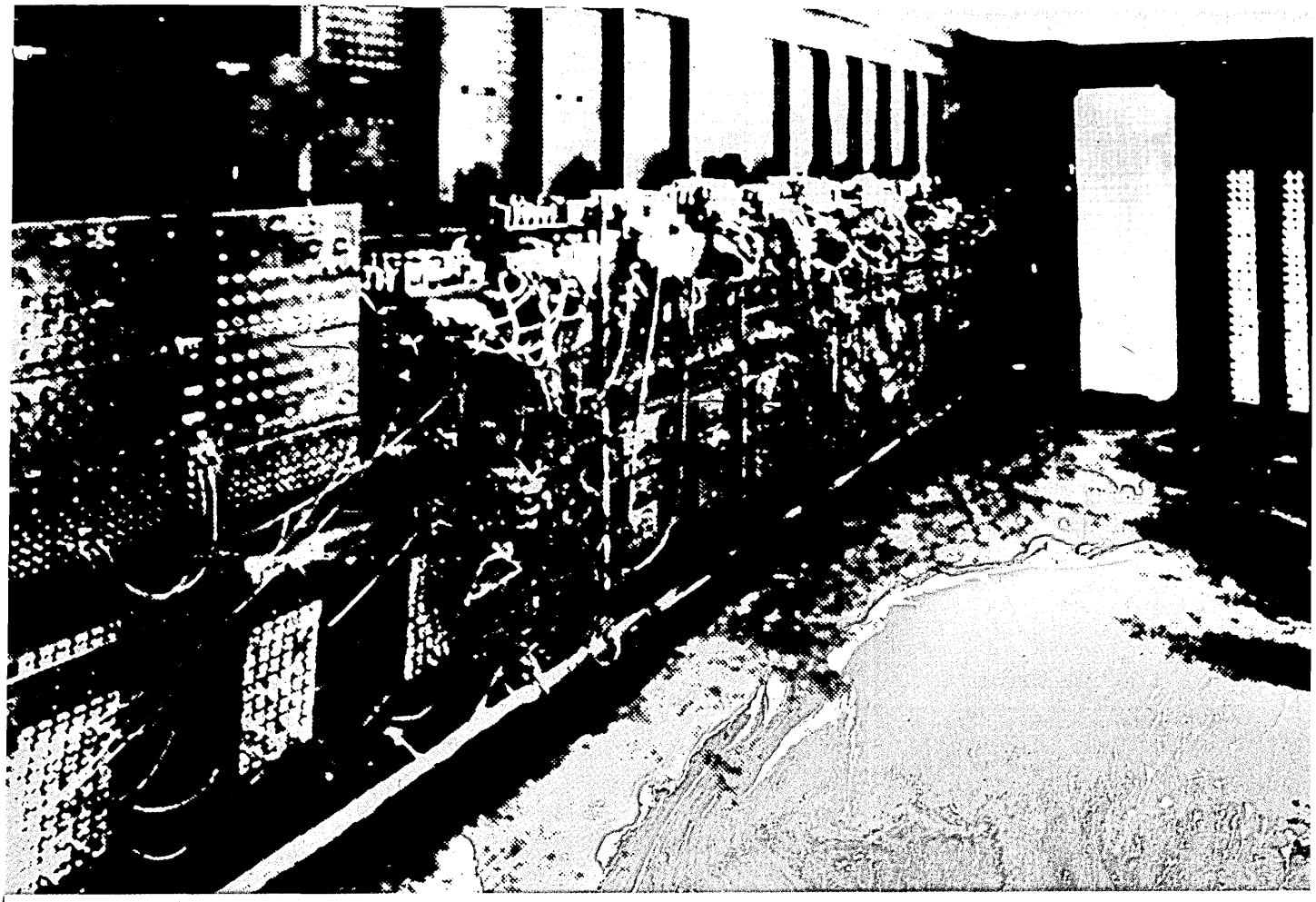
There is no advantage to be gained in castigating the contents of a Standard once it has been officially published. For this reason, the various CODASYL publications mentioned above are issued on a continuing basis, and ANSI has invariably preceded issuing its official Standard with a draft publication purely for the purpose of soliciting prior public comment.

—R. E. Blasius

Mr. Blasius has been the Canadian Government Representative on the CODASYL Programming Language Committee since 1966.

*Interested readers with constructive criticism (working papers, proposals, or general queries) are invited to write to: The Secretary, CODASYL Programming Language Committee, P.O. Box 124, Monroeville, Pa. 15146

Inquiries concerning Codasyl (COBOL) publications should be addressed to: R. E. Blasius, Canadian Government Representative, CODASYL Programming Language Committee, R1232, Lord Elgin Plaza, 66 Slater Street, Ottawa, Ontario, Canada, K1A OT5

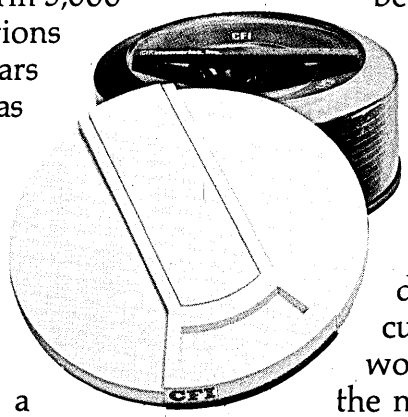


The first electronic digital computer was bigger than the average house and weighed 30 tons.

It had a memory capacity of 20 ten-digit numbers.

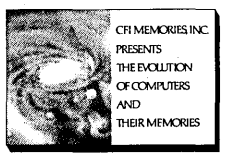
The ENIAC computer was built in 1946. With its 18,000 vacuum tubes and 130,000 watts of power, it could perform 5,000 additions or 300 multiplications per second. Within a few years its limited memory capacity was improved. And, eventually computers became even faster and a lot smaller.

In 1956 magnetic disks were introduced for computer memories. The 305 RAMAC, with an array of 50 disks, each 24 inches in diameter, had a capacity of 5 million characters. Today, a CFI 5440 cartridge has twice that capacity. And it's 150 times smaller.



Removable disk packs and cartridges – because of their compactness, security and economy – have dominated computer memories for more than a decade. Experts agree that these rotating memory devices will be with us for at least another decade.

CFI Memories, Inc. supplies disk packs and cartridges for the current generation of computers, while working with OEM's on products for the next. Write or call for current information on all our products. CFI Memories will help you keep up with the times.



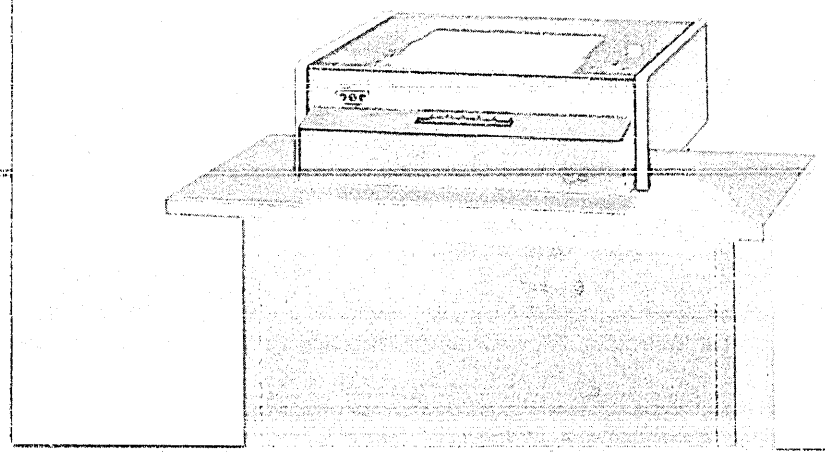
We would like to share with you this beautiful limited edition book. Write on your letterhead for a free copy.

CFImemories, inc

A LENCOR COMP

305 CRESCENT WAY · ANAHEIM, CALIFORNIA 92801 · TEL: 800/854-3290, 714/776-8571

CIRCLE 83 ON READER CARD



You can pay more for a printer. But you can't buy more of a printer.

The printer we developed for the Teletype® model 40 data terminal system isn't merely good. It's outstanding.

Even though it has an operating speed exceeding 300 lpm, mechanical wear is less than you'd find on a conventional teleprinter operating at only 110 char/sec. That's because of its revolutionary design.

That design is also what makes our printer such an outstanding buy on a price/performance basis. Solid-state customized circuitry delivers not only reliability, but compactness and low power requirements. Another important benefit is built-in self-diagnostics—so that if something should go wrong, it can be found quickly and repaired with a minimum of downtime.

The model 40 printer provides clear, crisp impact printing of full characters and is available in two versions. The friction feed version uses standard, inexpensive roll paper. And the adjustable tractor-feed version accommodates multiple copy forms of various widths and lengths.

Other features include character sets that can easily be changed, an optional 1,000 character buffer, printed parity error indication, plus much more.

Sure, you could spend more for a printer. But then, why would you want to?

For complete technical data, please contact our Sales Headquarters at 5555 Touhy Avenue, Skokie, Illinois 60076. Or call TERMINAL CENTRAL at (312) 982-2000.

TELETYPE

Teletype is a trademark registered in the United States Patent Office.

The Teletype model 40 printer.

CIRCLE 9 ON READER CARD