DATAMATION 70®

July 15

the
NEWLOOK
DATAMATION
first
semi monthly issue

PEOPLE:
education
and training

It's new.
It's fast.
It's Varian's 620/i.

Varian Data Machine's new "superfast" computer has a 750-nsec cycle time. That means it executes two and a half times faster than the well known 620/i.

And check these other outstanding features:

- 100% upward compatible from the 620/i.
- All 620/i software executes on the 620/f —you can take advantage of the extremely large library of software field-proven on the more than 1,200 620/i's in worldwide use.
- Fastest I/O in minicomputers.
- Powerful new addressing modes and instructions.
- Read-only memory.
- All 620/i peripherals plus a new low-cost line.

For full details, request the new handbook. The 620/f—another development that keeps us the big company in small computers.

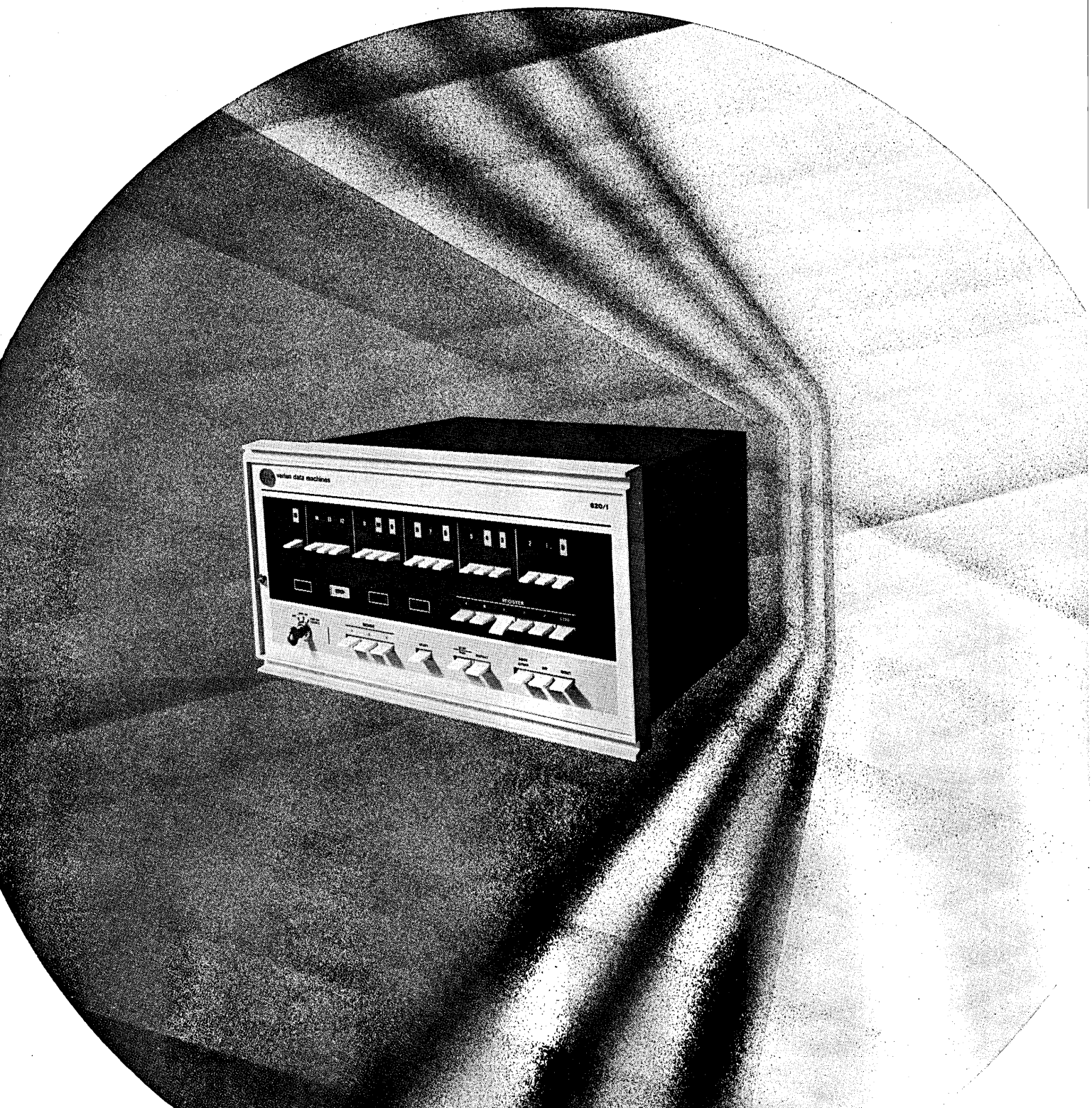
U.S. Sales Offices: Downey, San Diego, San Francisco, Calif.; Washington, D.C.; Atlanta, Ga.; Chicago, Ill.; Waltham, Mass.; Ann Arbor, Mich.; Albuquerque, N. Mex.; New Rochelle, Syracuse, N.Y.; Fort Washington, Pa.; Dallas, Houston, Tex. Other offices worldwide.

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

varian data machines

The Big Company in Small Computers

CIRCLE 1 ON READER CARD



Even in Hungry Horse, Montana, down time doesn't last long with the Tally STC* as near as your phone.

Tally's Seattle Test Center* (STC for short) can diagnose over the phone in 2 minutes or less about 80 per cent of the ills that might occasionally befall your Tally data communications system.

Generally STC can tell your technician or operator exactly how to cure the ailment in just a few moments. STC determines quickly which office in your network is experiencing a malfunction, i.e., transmitting errors or receiving errors.

There is no charge for this unique service to Tally customers. It's as near as your phone and available on a worldwide basis. Additionally, in the realm of preventative maintenance, field service is available at pre-scheduled times. Tally has one of the largest field service forces of any company of its size in the computer industry.

Naturally, the Tally Seattle Test Center uses the very latest test equipment and the best trained personnel to put a quick fix on your problem. If it's the unusual problem that can't be solved over the phone—men, equipment, and parts can be dispatched at once. No matter where you are, in most cases, you'll find a knowledgeable Tally service technician based less than an hour away.

For all the details on the Tally Seattle Test Center, talk to your nearby Tally sales representative. Write or call Tally Corporation, 8301 S. 180th Street, Kent, Washington 98031. Phone (206) 251-5500.

Regional offices:

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

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

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

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

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

England: Tally, Ltd., Tally House, 7 Cremyll Rd., Reading RG 1, 8 NQ, Berkshire. Reading 580-142.

TALLY®

JULY 15, 1970
volume 16 number 7

departments

GENERAL

DATAMATION 70®

This Month's Cover
What form should data processing people take? Unscrambling the image, directing the effort starts with the scope and goals of education and training. Then color them bright. Our design is by Barbara Benson.

JULY 15, 1970
volume 16 number 7

DATAMATION®

This issue 105,612 copies

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

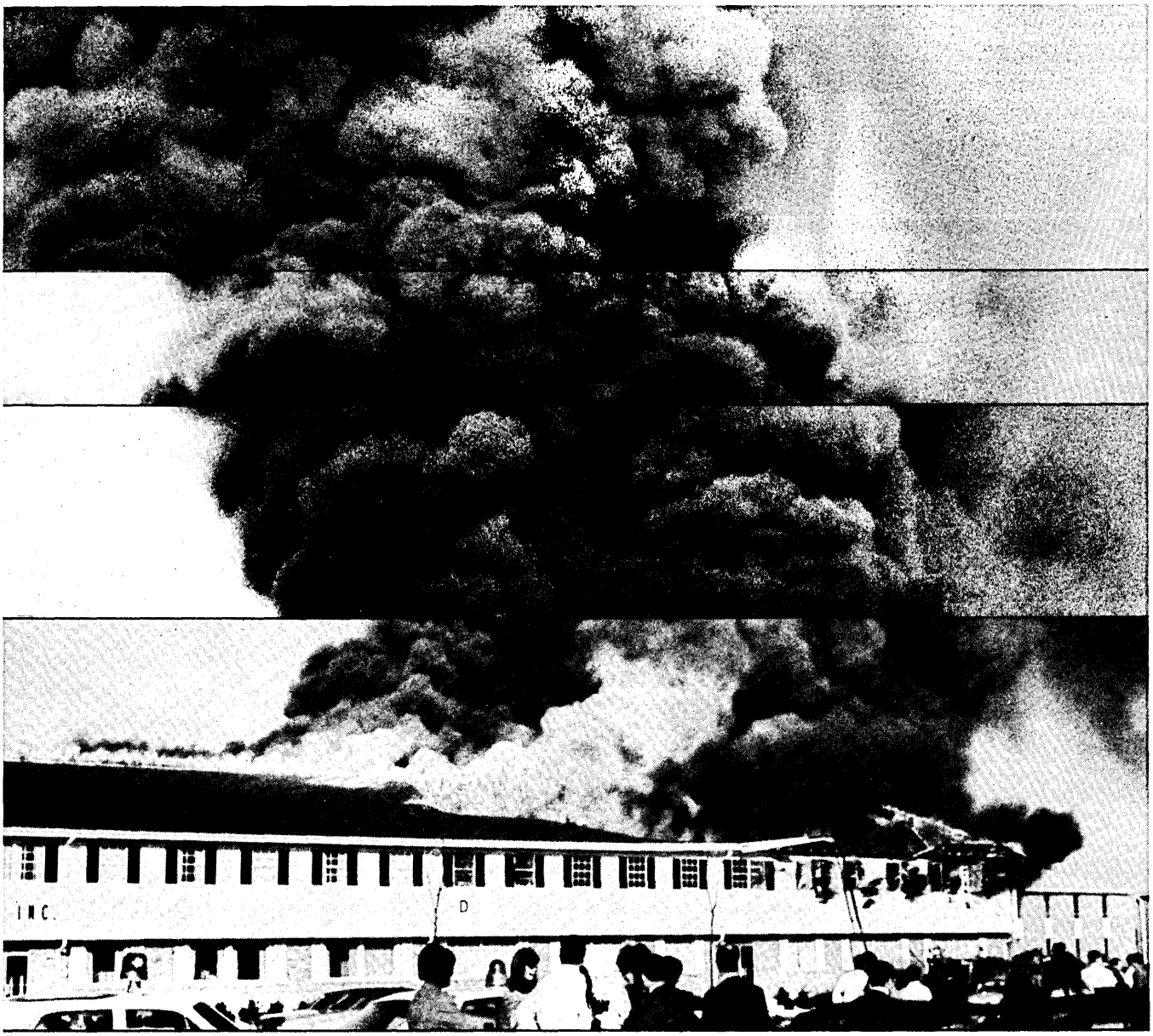
DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $25 annually in the U.S. and Canada. Reduced rate for qualified students.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

Microfilm copies of DATAMATION may be obtained from University Microfilms, Inc., 313 No. First St., Ann Arbor, Michigan.

Printed by Beslow Associates, Inc.

BPA Circulation audited by Business Publications Audit

Member, American Business Press, Inc. ABP

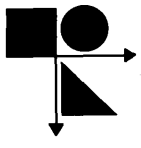


UNPLANNED DEMONSTRATION

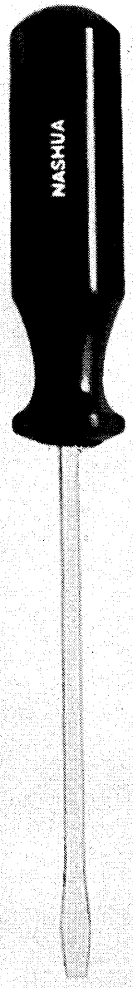
"Get the hell out of here, she's gonna go up!"
And boy, did she go up.
On November 13th, 1969, a single engine plane came in for a landing at Princeton Airport. Suddenly it nosed down and crashed into the ADR offices. Miraculously, no one was hurt.
The quote above came from the pilot of the plane. His prediction was correct. Gasoline splashed over the roof and walls and within seconds flames were roaring across the frame building. The photo above gives you some idea of extent of the fire and destruction. What you cannot see, however, is the remarkable story of what was saved, not lost. ADR came through the crash, fire and flood with 95% of our software libraries intact and operable. Thanks to two of our own proprietary products, Librarian and Autoflow.
We use Librarian as a source program retrieval and maintenance system. All major source programs are stored on tape in the Librarian master files. These tapes were removed from the burning building before they could be harmed. The equivalent of over a quarter of a million cards had been placed on Librarian tapes. It would have taken four 20-drawer file cabinets to hold this many cards. These files could never have been saved. Even though innumerable card decks and vast quantities of printer output were totally destroyed, the work they represented, safely stored on Librarian tapes, was easily rescued. The information on these tapes, including commentary on the historical development of the source programs, enabled our programmers to get back to work in a fraction of the time that would have been necessary without Librarian. Autoflow, our computerized flowcharting and documentation system, was the second hero of our saga.
Autoflow made it possible to immediately regenerate flowcharts lost in the fire. Without Autoflow, manual re-creation would have been needed.
Try to explain what this costs to the fire insurance people. We did it the hard way, but we think our unplanned demonstration proves quite a bit. Not all accidents, mishaps and losses will be as dramatic as ours.
But you never know what will be lost, torn, mishandled or misplaced.
Librarian and Autoflow saved us inestimable time, money and effort. We never used the term before, but both products served as vital "insurance" in continuing our normal operations. But possibly in your business, this aspect is not important. After all, things like accidents and fires only happen to the other guy. For a planned, peaceful demonstration of Autoflow or Librarian, call or write:

Applied Data Research, Inc.

Route 206 Center, Princeton, N.J. 08540
609-921-8550. Offices in principal U.S. and foreign cities.



Sanders total data systems mean hardware, software &...



Among Sanders wares, "anyware" is what separates us from so many of our competitors. Particularly when it comes to service. One of our 40 service locations is close enough to put a Sanders field engineer in your office in (at the very worst) just hours. A man who was trained by us and works for us. Who feels the same responsibility toward customers that we feel.

"Anyware" means experienced systems analysts in each of our 24 sales locations. And systems engineering professionals that can put Sanders hardware and software to work on your data handling problems whatever—and wherever—they are.

And Sanders is growing. We've gone from 22 to 40 service locations in a single year. There'll be more, of course. When we design and sell a system, we want to make sure it keeps going. Otherwise it's "noware."

And that reminds us too much of the competition.

For more information, write or call Mr. Raymond A. Zack, Vice President and General Manager, Sanders Data Systems, Inc., Daniel Webster Highway South, Nashua, N.H. 03060. Tel. (603) 885-4050.

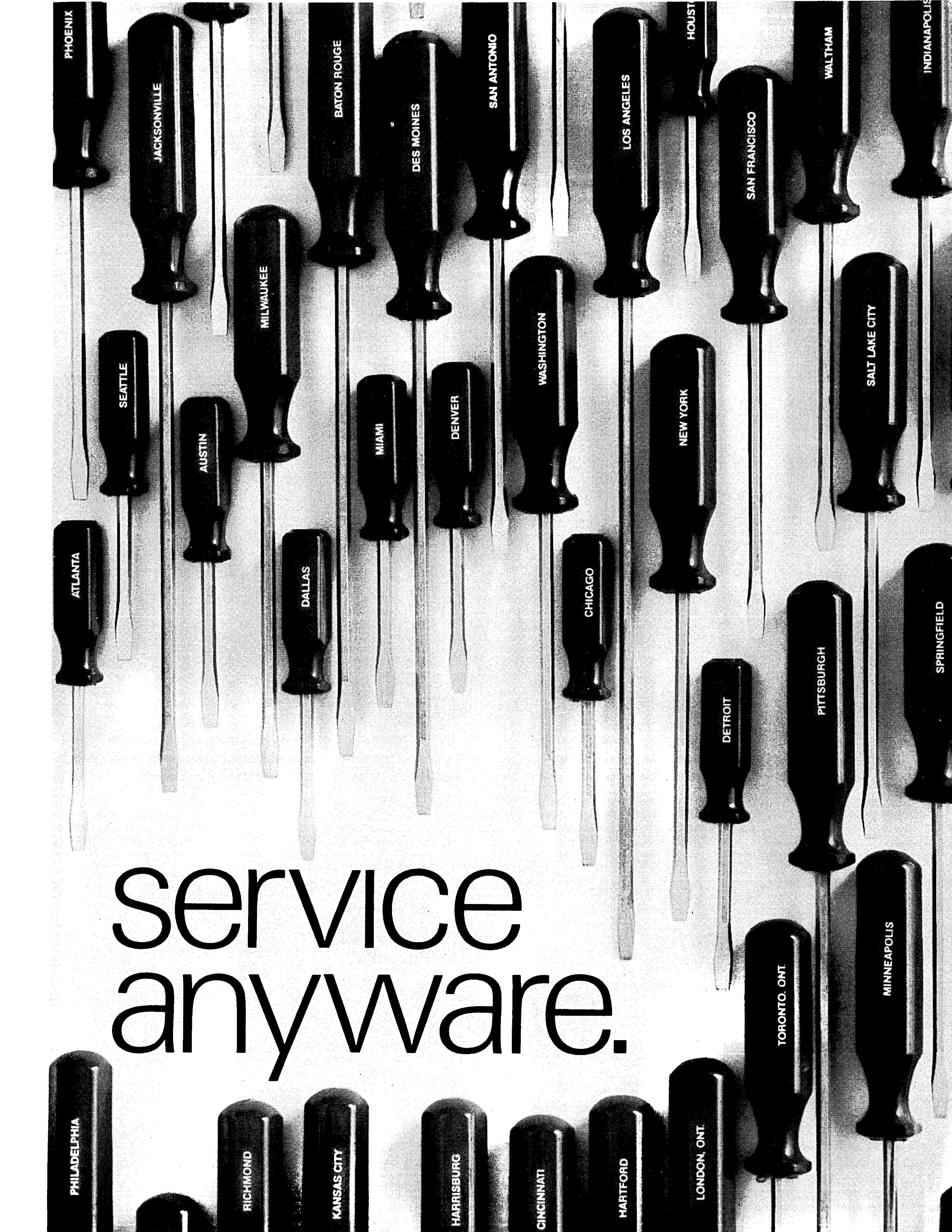
SANDERS DATA SYSTEMS, INC.

*TM Sanders Associates, Inc.

SALES OFFICES: ATLANTA/BOSTON/BUFFALO/CHICAGO/CINCINNATI/CLEVELAND/CORAL GABLES/DALLAS/DENVER/DETROIT/HARTFORD/HOUSTON/LOS ANGELES/MINNEAPOLIS/NEW YORK/PHILADELPHIA/PITTSBURGH/RICHMOND/SAN FRANCISCO/SEATTLE/WASHINGTON, D.C./TORONTO, CANADA AND HITCHIN, HERTS, ENGLAND

Sanders Data Systems, Inc., is a subsidiary of Sanders Associates, Inc., Nashua, New Hampshire.

CIRCLE 26 ON READER CARD


service
anyware.
PHOENIX
JACKSONVILLE
BATON ROUGE
DES MOINES
SAN ANTONIO
LOS ANGELES
SAN FRANCISCO
WALTHAM
MILWAUKEE
WASHINGTON
SALT LAKE CITY
SEATTLE
AUSTIN
MIAMI
DENVER
NEW YORK
ATLANTA
DALLAS
CHICAGO
SPRINGFIELD
PITTSBURGH
DETROIT
MINNEAPOLIS
TORONTO, ONT.
PHILADELPHIA
RICHMOND
KANSAS CITY
HARRISBURG
CINCINNATI
HARTFORD
LONDON, ONT.

If you don't think looks are important, ask your computer to describe Vicky Lane.

The computer is a wonderful invention. But, so is a pretty girl. And no computer description can do her justice until it's interfaced with our 410. Because our 410 shows her face. And that's pretty important when she needs to be identified in a hurry.

A computer can list building specifications, materials costs, and man hours required to put up a skyscraper. Our 410 will show you the blueprint.

A computer can tell you what you want to know and our 410 can show you what you need to see. All in a matter of seconds. And if you want a copy of what you're looking at, you can have it in a few more seconds. It all happens in front of you, via a TV screen.

We're not about to put the computer out of work. Just free it to do work it does best. While saving you time, eliminating errors, and minimizing your active filing space. We're full of more information about the 410. Write us for it. Mosler, Dept. D-7, Information Systems Division, Hamilton, Ohio 45012.

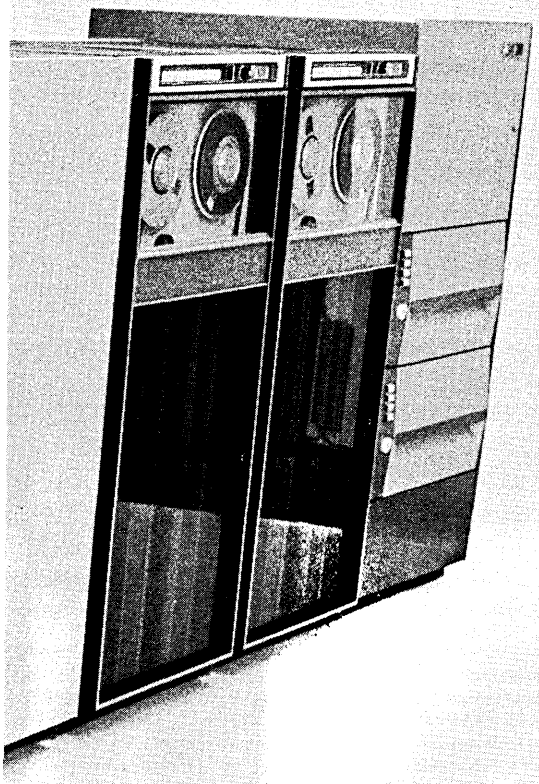
Mosler
An American-Standard Company
Improving systems for security and communications

XDS finally a business

At a price that will get us the business.

CIRCLE 45 ON READER CARD

introduces machine.



Introducing Sigma 6. Sigma 6 is a medium-size, 32-bit general purpose computer for users who want to run a lot of batch, and maybe a 24-user time-sharing system at the same time.

We built it for universities, hospitals, service bureaus, manufacturers, and harassed administrators everywhere who want maximum thruput at a reasonable price.

Sigma 6 comes with decimal arithmetic, byte string handling capability, a hardware memory map, dual memory access, and all the other features that make a business machine good.

It uses proven Sigma software, including a generalized data management system, a file management system which works both in the batch mode and on-line, and a number of application programs.

What's more, it's virtually impossible to outgrow the capabilities of the system, because Sigma 6 can be field-modified to become an even more powerful Sigma. And because the software is compatible, you'll be able to use all the programs you developed for it without modification or conversion.

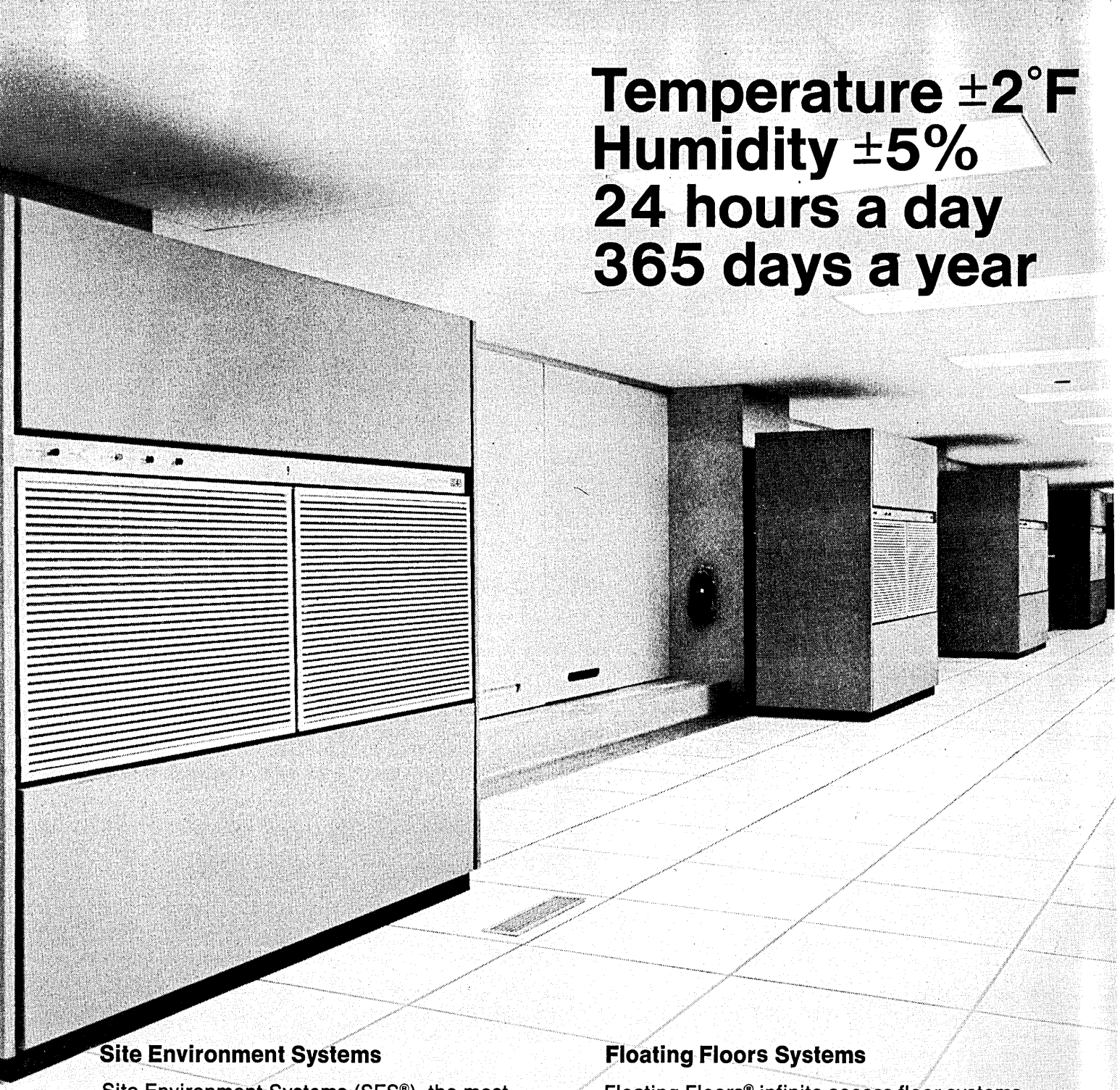
Most important, we priced Sigma 6 very competitively. While exact prices depend on the configuration you select, you'll find that the price of the Sigma 6 is always a full notch under its performance capabilities.

And that's what makes it especially good for business.

XDS

Xerox Data Systems
El Segundo, California

Temperature ±2°F
Humidity ±5%
24 hours a day
365 days a year



Site Environment Systems

Site Environment Systems (SES®), the most precise, most reliable packaged environmental control units you can buy, can operate constantly. Dual systems* operate alternately under normal loads, work together should an overload occur. Each unit controls temperatures within ±2° F. with an extra-sensitive thermostat, dual compressors, five rows of cooling coils and reheat coil. A sensitive humidistat holds relative humidity levels within ±5%.

Each unit has a malfunction alarm, filter clog indicator, high temperature alarm, and indicating panel for full, constant monitoring of unit.

SES units are available in 3, 5, 7.5, 10 and 15 ton sizes, in air-cooled and water-cooled models with indoor or outdoor condensers, and in computer matched colors.

Floating Floors Systems

Floating Floors® infinite access floor systems create an air plenum for efficient, duct-free distribution of conditioned air. Strong, corrosion-resistant and completely interchangeable panels are available in die cast aluminum or continuous bonded steel.

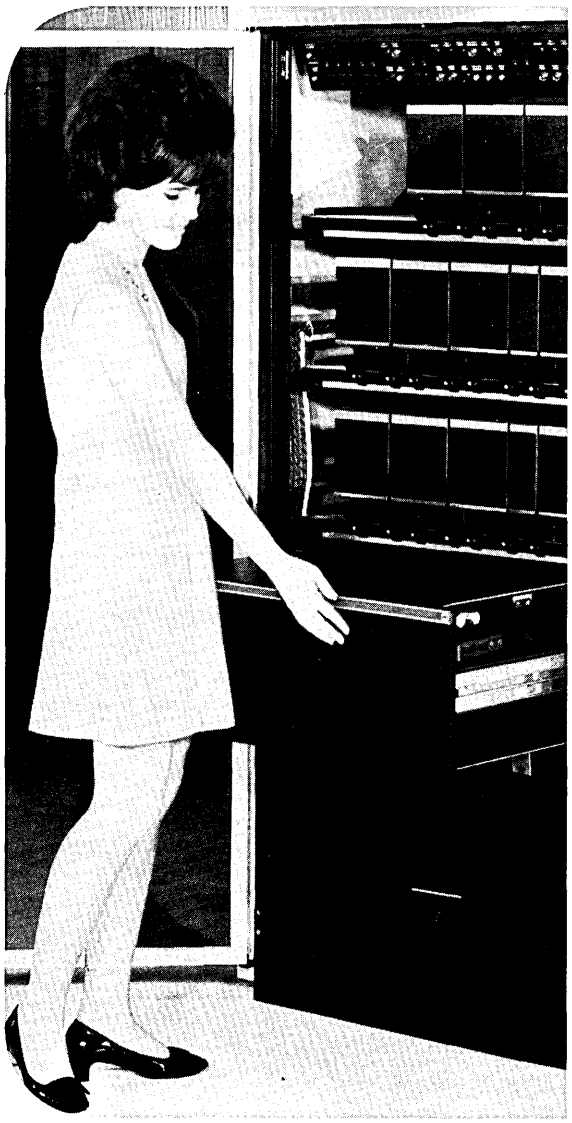
Write for our new full color brochure. It contains pictures and specs on the complete line.

FLOATING FLOORS, INC.

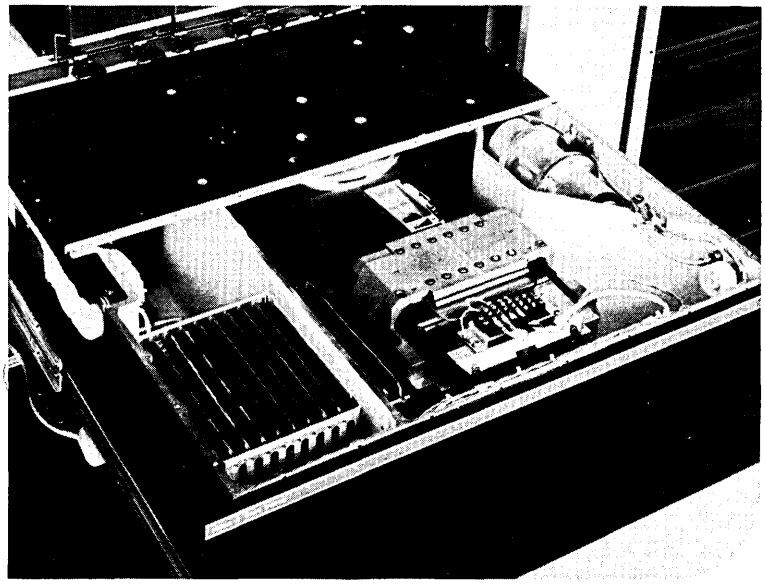
Floating Floors, Inc.
Subsidiary of National Lead Company
5400 N. Detroit Avenue/Toledo, Ohio 43612
Telephone (419) 479-0721/TWX 442-1709

*on the 7.5, 10 and 15 ton units

CIRCLE 147 ON READER CARD



19-ms DISC another example of C-System technology



This 19 millisecond disc file—which is now available to other computer manufacturers on an OEM basis—was designed by Collins especially for the C-System.

The C-System integrates into a single network all communication, computation and control functions of widely dispersed operations, both commercial and military.

The C-System is applicable to many communication/computation/control operations. For example, it monitors projects, solves scientific problems, aids in product design, controls factory machines, collects data, switches messages, monitors aircraft movements—and does all this with a switched network of communication and computer equipment, utilizing a common file or data base.

To meet the stringent reliability and performance requirements of such a system, the new Collins disc unit offers features which cannot be obtained in removable "disc pack" units suitable only for limited batch processing applications. In addition to an average access time of 19 milliseconds, the Collins disc offers the following advantages:

- Factory-sealing of each unit to prevent environmental contamination and to permit reliable operation on a 24 hour/day, 365 day/year on-line basis.
- An electronic—rather than hydraulic—head-positioning servo system requiring no mechanical detents, thus allowing precision head positioning with no degradation due to wear or adjustment tolerances.
- A linear motor featuring a unique flexural suspension system which virtually eliminates friction and wear. The motor is capable of billions of operations.
- Read/write heads which are pneumatically loaded to assure dynamic stability and attendant high levels of record/read integrity.
- A disc spindle which serves as a primary air mover to provide the highly effective filtration system and temperature control required to achieve the reliability level necessary in "real time" systems. No mechanical blowers are required.
- Storage modules of 33.55 million bytes each, up to eight modules per controller in the OEM version, two heads per surface, 16 surfaces, and 128 track positions per head. Data transfer rate is 2.78 million bits per second.

Collins modular approach to maintenance permits the sealed unit to be removed and another inserted in its place in a few minutes. This permits maximum system availability and allows off-line repairs to system modules in a controlled environment.

For more information, contact Collins Radio Company, Dept. 300, Dallas, Texas 75207. Phone: (214) 235-9511.

COLLINS

COMMUNICATION / COMPUTATION / CONTROL

AFTER MONTHS OF SECRECY, RECOGNITION EQUIPMENT REVEALS NEW INPUT SYSTEMS.

In June, Recognition Equipment Incorporated held a press conference. It was followed by a printed announcement in the Wall Street Journal. What they announced is of such importance to the I.U. movement, we're reprinting the most salient points:

"Since 1964, we've solved literally millions of dollars in data processing problems for airlines, credit card organizations, oil companies, European Postal Banks (Giros), the U.S. Army, and a number of state and federal government agencies.

"We met their needs by replacing keypunching and other computer input techniques with optical reading systems: the large Electronic Retina* Computing Reader. And INPUT 2, a lower-priced reading system.

"Still more companies have needed what neither system delivered. Either in price or performance.

"On June 3, we introduced our new product line. It contains everything anybody who uses a computer could ever want. And then some."

NEW READERS

"We introduced INPUT 80—the most flexible, versatile, comprehensive page reading system ever developed. It reads both handprinted and machine printed data 3 to 12 times faster than our present page reader. Comparing our new system to manual input methods is almost ludicrous. What it costs dollars to do manually, it costs pennies to do with INPUT 80.

"We introduced INPUT 3—a new, low-priced optical reader that should meet the needs of every company with systemized control, decentralized operations and input bottleneck. It plugs right into computers like an IBM 360/20 or System 3. Or you can use it for teleprocessing. Monthly rent is about the same as the cost of one or two keypunch stations, but it would take 21 keypunch operators to keep up with it."

MICROFILM

"We introduced INPUT IMAGE—a new, high-speed camera that lets you microfilm documents while they're being read. (We discovered that most customers were microfilming as a separate processing step.)

"And, we introduced OUTPUT IMAGE—a family of four compatible Computer Output Microfilmers with both alphanumeric and graphic capabilities."

For detailed information on these significant achievements in input technology, write: The Input Underground, P.O. Box 5274, Dallas, Texas 75222.

It's not too late to join the Input Underground. Just send us your name and address and we'll send you a membership card and button.

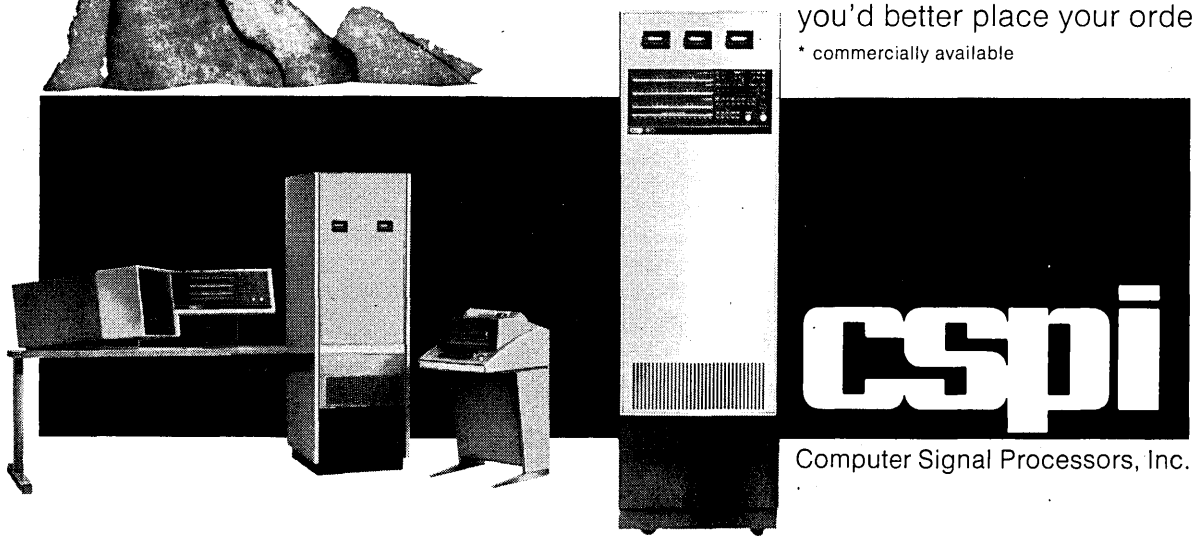
*Electronic Retina is a registered trademark of Recognition Equipment Incorporated.

PUBLISHED AS A PUBLIC SERVICE BY RECOGNITION EQUIPMENT INCORPORATED.

The New CSP-30 is the world's first and only* *wow!* 100-Nanosecond *blow your mind* 3-Million Instructions-Per-Second *incredible* Digital Computer.

This is it, gang. A relatively small *but not too small* 10 MHz, 16-bit, digital computer with combination IC and core memories to give you quasi-stellar speed, along with envious economy and salubrious storage capacity. *Right on!* You say you'd like to handle continuous real-time Fast Fourier Transforms at sampling rates up to about 45 kHz? *Do it!* Do it in the road, or in a truck, or on a boat, or in the air. The basic CSP-30 is just slightly smaller than your kitchen refrigerator and weighs only 450 fun-filled pounds. Price? Grab your hookah and light up, Fred. The CSP-30 sells for around $100,000. *Give or take a few thou.* At that price, you'd better place your order right now.

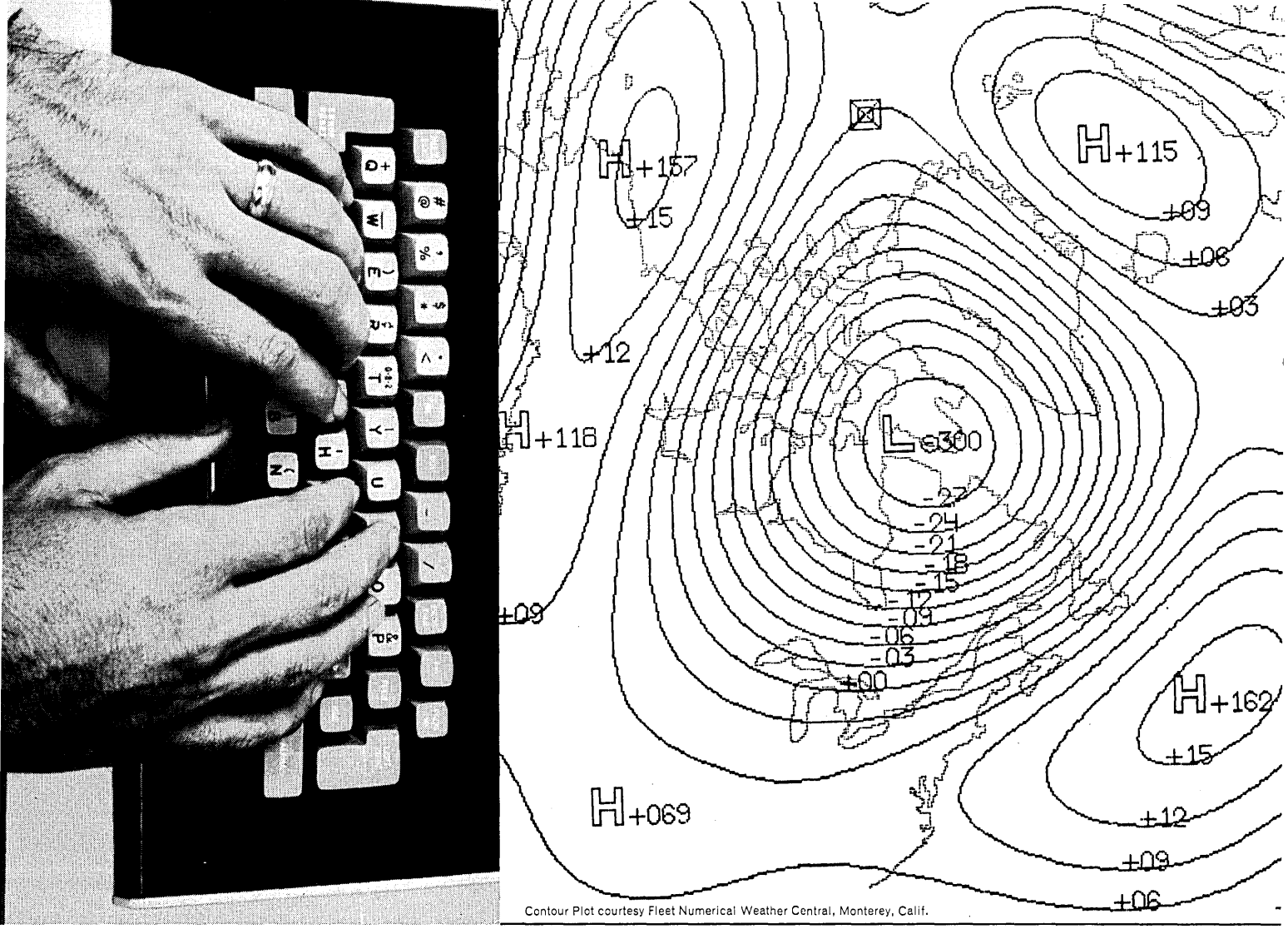
* commercially available



cspi

Computer Signal Processors, Inc.

209 Middlesex Turnpike, Burlington, Massachusetts 01803



Contour Plot courtesy Fleet Numerical Weather Central, Monterey, Calif.

Go from data to plot in 1/5 the time.

Compared with conventional plotters, Statos 5 needs less CPU time. Because our digital printer/plotter requires less sorting and connecting. The job gets done with 20 per cent less core, since the memory isn't forced to hold the whole plot to start plotting. And Statos produces the plot 10 to 15 times faster too.

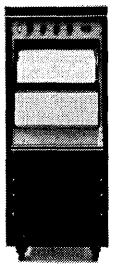
Another time saver. The hardware character generator. If you want a capital H, oriented sideways, just give the plotter 3 commands. The generator does the rest. Or print descriptive text at 30 lines per second.

Complex plots show off our ability. One way: the plotting time is the same for any given size plot regardless of contour density or total line length. Including any number of double width lines.

One more pertinent item. The world isn't all black and white. Depending on individual needs, Statos 5 can deliver gray with a variable dot density that produces up to five shades or an optional Z-axis intensity modulator that delivers up to eight shades of gray. All in precise registration.

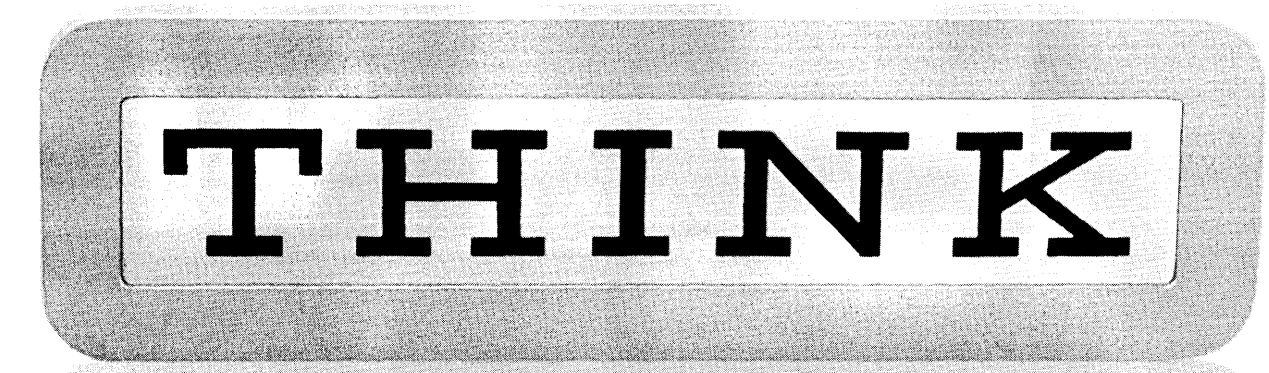
Software? No problem. Choose from several complete packages. In short, any way you program the facts, Statos 5 will save you time.

For the full story on the Statos 5 electrostatic printer/plotter, call or write: 611 Hansen Way, Palo Alto, Calif. 94303. Phone (415) 326-4000.


Statos 5— a great idea whose time has come

varian
graphics and data systems division

CIRCLE 39 ON READER CARD



Think Twice.

Compare the IBM 360/20 with the NCR Century 100.

Compare language ability.

The NCR Century 100 computer offers three languages: COBOL, FORTRAN and NCR's own NEAT/3. The NCR Century has an RPG Translator that easily converts RPG source programs to NEAT/3.

Compare cost performance ratios. The NCR Century 100 computer proves itself to be 23 per cent to 43 per cent more productive than the 360/20 Model 2 or 4, according to an independently conducted benchmark study.

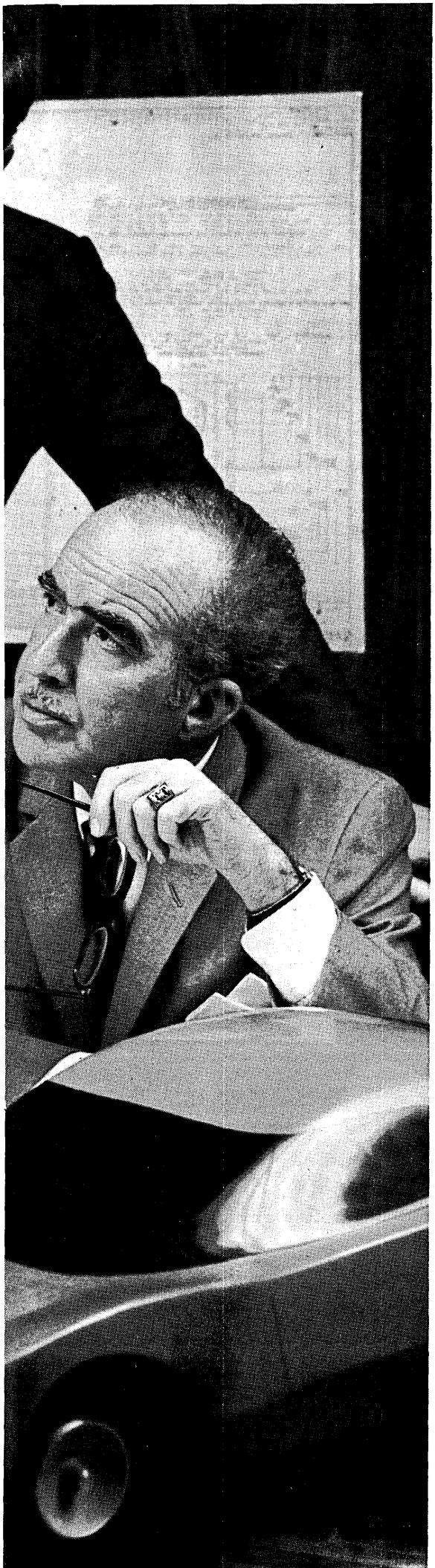
Think about the NCR Century 100.

And to make you even more thoughtful, we'll send you a brochure that details the advantages of the NCR Century 100 computer. Write to NCR, Dayton, Ohio 45409

Think. Think twice. Think NCR.

NCR®
Computers

NCR is proud to be the sponsor of the Space Exploration Exhibit in the United States Pavilion at Expo '70, Osaka, Japan.



Computer downtime could cost this user his share of a multi-billion dollar market.

That's why he depends on Gerber Scientific and Hewlett-Packard.

In the automotive market, being second with a hot new body design just doesn't make it. That's why car manufacturers are turning to computerized drafting systems, like those made by The Gerber Scientific Instrument Company, South Windsor, Connecticut.

The auto industry knows that computers can mean the margin of difference—when they're working. But when they're not, you just might be "last under the checkered flag." That's why trouble-free performance was a key factor in Gerber Scientific's computer selection for its Series 1200 and 700 controls. These drafting systems make it possible to bring fresh new auto design concepts to market in record time. Gerber's systems are also slashing design time and costs in electronics, aircraft, garments, maps and other detailed work that used to take weeks of manual effort.

Sure Gerber Scientific chose our 2114 computer because they knew it could do the job. And was priced right. But more important, they knew they could count on superb reliability —and depend on world-wide HP service and support back-up—if and when needed. We have 141 service centers in the United States and around the world. For an OEM, this can be a very reassuring fact.

There are other reassuring facts about our small computers. Like Direct Memory Access, a feature now available with the new HP 2114B. The DMA option gives you the flexibility to use high-speed peripherals. And it makes possible the acquisition of very high-speed data. Yet this computer's base price is only $8500. If you're looking for something a bit more powerful, try the HP 2116B. It's the heart of our popular time-share, real-time executive and disc operating systems. Cost: $24,000.

Get the full story on computers you can depend on. Call your nearest HP sales office or write to Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

HEWLETT hp PACKARD

DIGITAL COMPUTERS

22942

CIRCLE 68 ON READER CARD

Infonet is as close as the nearest telephone

A freeway in Los Angeles, a stockyard in Chicago, a boutique on Park Avenue: unlikely spots for a data processing terminal? Unlikely, yes. But very possible.

Because if you can get to a telephone, you can get INFONET computer timesharing service — whether your problem is in engineering, statistics, capital investment evaluation or management information.

Why use INFONET? Because our product is a full product — with an interactive BASIC language and high speed Remote Job Entry capability. And there is our customer support — responsive, comprehensive, broad — designed to meet all your data processing needs. Standing behind INFONET is Computer Sciences Corporation — 5,000 people world-wide specializing in the design, development and management of computer-based information systems.

Whatever your data processing problem, isn't it good to know that INFONET's products, service and support for your needs are the finest available? The total resources of the unquestioned leader in the field are as close as your nearest telephone.

Give us a ring.

INFONET
Information Network Division
Computer Sciences Corporation

Home Office —
650 North Sepulveda Blvd.
El Segundo, California 90245
Phone (213) 678-0311

COMPUTER SCIENCES CORPORATION

Offices in New York — Elmsford, N.Y. — Philadelphia — Silver Spring, Md. —
Chicago — Oak Brook, Ill. — Detroit — Los Altos, Calif. — Los Angeles

SHHHHHH!

(There is a new high speed plotter afoot.)

LOUDER!

We said, there is a new high speed plotter afoot that plots any graph, regardless of complexity, on a standard 8½ x 11 page in less than seven seconds. Quietly.
It doesn't cost $18,000. Or $12,000. Or even $8,000.
It costs just $6,500.

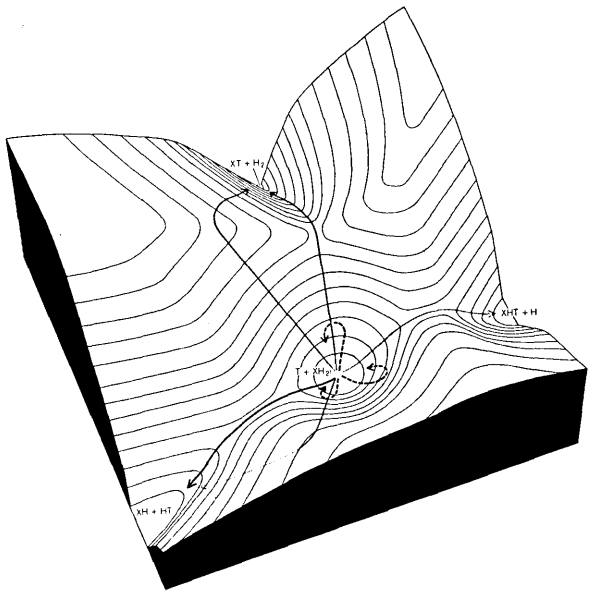
The Matrix 200 is ideally suited to such applications as hard copy output from CRT graphics displays. It gives you graphics output capability for digital computer systems and off-line storage devices.

It is also ideal as a remote graphics hard copy display device in communications applications.

Need a printer/plotter combination? We got. The Matrix 200A can be operated on-line or off-line for alphanumeric printing and graphics — combining the two on a single piece of paper. Printing speed: 600 character lines per minute.

We also have four other printers and plotters. And they all use Versatec's advanced electrostatic writing technique.

We can plot graphics like this . . . fast!



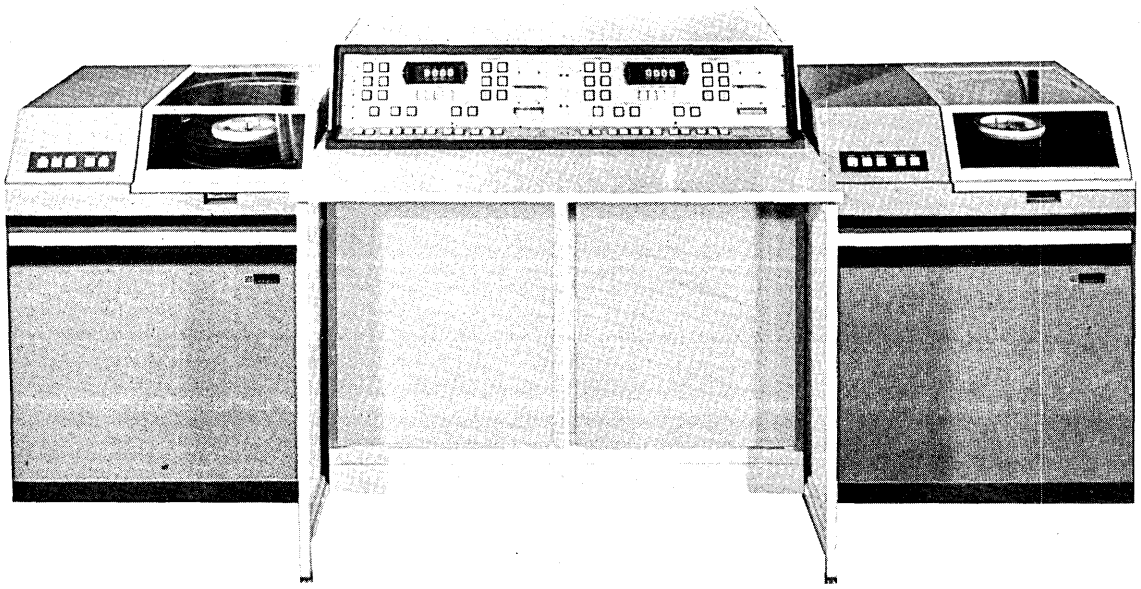
OKAY, LET'S SHOUT!

The name is Matrix Printers/Plotters.
The company is VERSATEC . . .
leading the silent generation.

VERSATEC

10100 Bubb Road, Cupertino, California 95014, (408) 257-9900, TWX 910-338-0243

How Do You KNOW Your Disk Packs Are Error-FREE?



Now you can tell by using this equipment.

Make sure your disk packs will perform "as advertised". Find the magnetic misfits of the disk pack world.

Better than a computer.

At a fraction of the cost.

This advanced electronic Certifier will allow you to find the clumps, voids and scratches which cause errors in 6-high and 11-high packs. It also finds soft errors missed by a conventional computer system. These errors are not consistently detected by a computer.

The testing criteria may be set to the new GSA government standards . . . or yours.

Write for the whole story. Or if your need is urgent phone (405) 848-2633.

INTERSCAN

INTERSCAN, INC.
5200 Belle Isle
Oklahoma City,
Oklahoma 73118

CALENDAR

DATE	EVENT/SPONSOR	LOCATION	CONTACT	COST
Aug. 10-13	AMA Education & Training Conference & Equipment Expo	New York City	American Mgt. Assn. 135 W. 50th St. New York, N.Y. 10020	$100, members $125, others
Aug. 11-14	IFAC Systems Engineering & Computer Control Symposium	Kyoto, Japan	Japan Assn. ACE 14, Kawahara-cho Yoshida, Sakyo-ku Kyoto, Japan	Unknown
Aug. 24-28	IFIP World Conference on Computer Education	Amsterdam, Netherlands	A. Veenhuis 6, Stadhouderskade Amsterdam 13, Neth.	$80
Aug. 25-28	Western Electronic Show & Convention (WESCON)	Los Angeles	Don Larson, WESCON 3600 Wilshire Blvd. Los Angeles, Calif.	$3 registration
Aug. 30-Sept. 2	AIME Computer Electronic & Magnetic Materials Conference	New York City	AIME 345 E. 47th St. New York, N.Y. 10017	Unknown
Aug. 31	ACM Annual Urban Symposium	New York City	P. R. DeCicco Brooklyn Polytechnic 333 Jay St. New York, N.Y. 10017	$28 $13, students $2, late registration
Aug. 31-Sept. 4	AICA-IFIP Conference on Hybrid Computation	Munich, Germany	Dr. Robert Vichnevetsky Electronic Assoc., Inc. P.O. Box 582 Princeton, N.J. 08540	Unknown
Sept. 1-3	ACM 25th National Conference	New York City	Sam Matsa, IBM 410 E. 62nd St. New York, N.Y. 10017	$50, members $75, others
Sept. 14-15	SMIS Annual Conference	Washington, D.C.	Soc. Mgt. Info. Sys. One First Nat'l. Plaza Chicago, Ill. 60670	$150
Sept. 14-16	Canadian IPS Computer Show	Montreal, Canada	Int'l. Trade Shows 481 University Ave. Toronto 2, Canada	Invitation Card or $2 fee
Sept. 14-24	FID Int'l. Congress, Scientific Information	Buenos Aires, Argentina	Int'l. Document. Fed. U.S. Nat'l. Comm., NAS 2101 Constitution Ave. Washington, D.C. 20418	$15 registration
Sept. 17-18	ACM 4th Annual Interface Symposium	Irvine, Calif.	Chuck Paul Univ. of Cal. Ext. Irvine, Calif. 92664	$35, including Univ. housing, facilities
Sept. 20-24	NRMA 12th Annual EDP Conference	Miami, Fla.	NRMA 100 W. 31st St. New York, N.Y. 10001	$125, members $150, others
Oct. 5-8	CBEMA DP Conference	Toronto, Canada	Canada Presentation, Ltd. 74 Victoria St. Toronto 210, Canada	No fee
Oct. 5-9	BETA Computer 70 Int'l. Exhibition	London, England	BETA 109 Kingsway London, W.C.2, England	Unknown
Oct. 11-15	ASIS 33rd Annual Meeting	Philadelphia	Amer. Soc. Info. Sci. 2011 Eye St. Washington, D.C. 20006	$45, members $60, others
Oct. 14-16	AFIP Int'l. Conf., Management Information Systems	Copenhagen, Denmark	Danish EDP Council 1 Vesterbrogade DK1620 Copenhagen V, Denmark	Unknown

data bits from Teletype

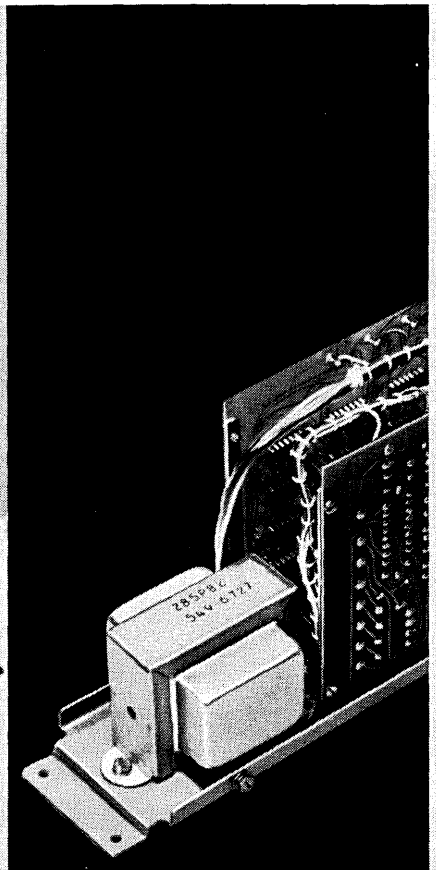
knowing who's going where, when and now!

Maintaining a passenger flight manifest is a vital part of airline operations. And highly complex. One carrier, that deals with hundreds of flights and some 25,000 people daily, recently reduced some of the problems involved by integrating high-speed Teletype® equipment into its system.

Computerized manifest data, compiled in the airline's central office, is sent to departing terminals two hours prior to each flight. It's used in a variety of ways: As a boarding checklist. In computing aircraft weights and balances. For meal details. To meet special requests for wheelchairs, etc.

At the time of departure, "no show" passengers are deleted from the manifest, standby names on board are added, and the list resubmitted via Teletype equipment to central office computer for updating. The computer then generates the "official" manifest and sends it to both departure and arrival terminals involved, at 1050 wpm. The send-receive operation usually is complete before the flight gets into the air.

Teletype's Stuntronic™, electronic selective calling station controllers, also helped reduce computer port requirements of this system by 90%.



keeping a multistation network under control

Teletype has a simple solid-state logic device that provides a truly practical and economical way of establishing automatic control over multi-terminal data systems. The Stuntronic™ station controller is what it's called.

This helpful accessory provides station interface, control, and response for all ASCII compatible Teletype data terminals. Can be used with model 33, model 35, model 37, Telespeed™ and Inktronic® equipment. It will recognize all incoming station signals and respond to its own address characters.

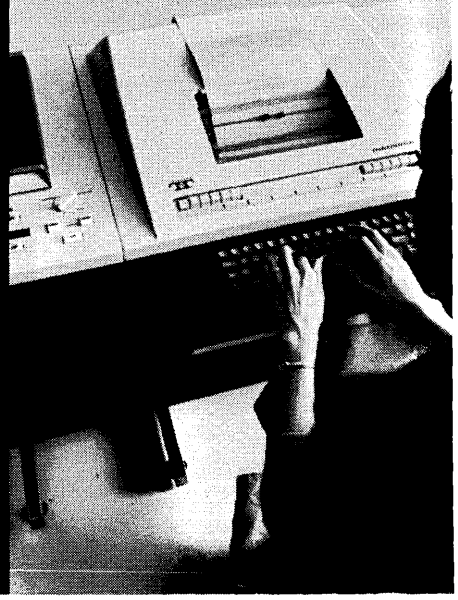
More than 100 different control arrangements are possible with the Stuntronic station controller — including detecting vertical parity errors and establishing computer communication and intra-circuit communication among a variety of system terminals.

total on-line time: divide by twelve

If you have a number of low-speed terminals in your time-sharing system that generate heavy loads of on-line time, it may pay dividends to do the above arithmetic. The Teletype Inktronic terminal is about twelve times faster.

This electronic, solid-state terminal will generate 128 ASCII combinations. Print 93 alphanumerics in upper and lower case. It achieves 1200 wpm printing capability. Charged ink droplets are drawn to the page through a series of electrodes that form the character called for. The ink supply and guidance system has only one moving part. So the Inktronic terminal requires little maintenance. And it's really quiet.

It has more than on-line operational economy, too. Uses ordinary teleprinter paper. And inexpensive ink. Like most equipment in the Teletype line, you won't find a more capable terminal on a price/performance basis.



Welcome to the Graphic Generation

The new GRAPHIC-15 Display System contains a programmable processor and display console with built-in vector generator, character generator, and function box. Mated to the PDP-15 computer, it becomes a graphic system that is highly interactive – yet is but half the price of its nearest competitor.

Field expandable. Fast (¼ inch of vector every μsec). 4,000 flicker-free characters. 8,000 inches of flicker-free vectors. Remotable display. Software ported. Full line of options. And made by the computer company that knows more about big needs and small budgets than anyone.

A work of art. Write.

digital
COMPUTERS · MODULES

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

LETTERS

Demand a recount

Sir:
There is a simple answer to the problems raised in the article "Cheating the Vote-Count Systems" (May, p. 76). Use redundancy techniques. In other words, allow three different groups to process the voting punched cards on their own machines and with their own programs. If one group were Republican, one Democratic, and one made up of third parties and independents, the results should agree or a recount could be called.
F. H. Foy
Torrance, California

Pictured programming

Sir:
In answer to all those skeptics who derided my Advanced Technology Report on "Palindromic Programming" (Dec. '69, p. 123), may I point out the very effective implementation of the concept depicted on page 173 of your May issue.

William A. Bernstein
Kingston, New York

Ed. note: Our faith has never wavered.

The government nose

Sir:
In the May '70 Editor's Readout, Robert B. Forest discussed several of the more outstanding attempts at infringement on our rights to personal privacy and the need for individual assertion of those rights.

Notable by its absence, however, from Mr. Forest's catalogue of governmental and commercial adventures in intimidation is the most flagrant example of the species: the 1970 census. At least (so far as I am aware), California does not threaten legal sanctions for refusal to divulge marital status on driver's license applications, while the Census Bureau says that it may fine or imprison anyone who declines to contribute to their planned demographic data base.

The Census Bureau does sell that data, you know, and requires one item, which is of obvious value to its Madison Avenue customers, that has been excluded, by law, from every other governmental or private form. This item is "race": white, black, red, etc. (I don't know about you, I am of the human race.)

The issue, of course, is not the data itself; even color (most racial distinctions were blurred beyond distinction tens of thousands of years ago) can be obtained by other means. What should concern every citizen is that, in a year of dangers to Constitutional rights, Public Law such-and-such requires us to divulge this information for commercial use, to fold the form in the authorized way, and to write only in the permitted boxes.

Citizens who silently tolerate and cooperate with such depredations upon their personal liberties are guilty of encouraging the government in its current tendency toward casual violation of the guarantees within the Bill of Rights for the sake of administrative convenience and efficiency. The problem of privacy invasion via census, as mentioned by Phil Hirsch and dramatized by Hoffman and Miller in that same issue, is not nearly so great in 1970 as it will be in 1980 if we let these trends continue to their logical, totalitarian conclusions.
James V. Doody, Jr.
Amherst, New York

Brazilian experts

Sir:
I read with amazement Richard Iannuzzo's article called "Data Processing in Brazil" in your May 1970 issue (p. 112). The article is superficial and sophomoric:

In his introductory remarks he states that the article will be factual, and not concerned with sociological or economic influences. At first it seems inconceivable that an article which will deal with "what the future is likely to bring" can ignore the very factors most prominent in the determination of this future. At the end of the article, however, one is glad Mr. Iannuzzo kept his distance since the few times he did approach the subject he floundered.

The emergence of a strong middle class in Brazil, for instance, in its burgeoning industrial and commercial centers, is precisely the reason for the strong and parallel emergence of computers in the country (see the previous article "Computing in South America," by Dr. Boehm). The "absence of a strong middle class" is something less than accurate in today's Brazil, unless Mr. Iannuzzo, in the four months he spent there, never crossed a street, risking his life at the whim of all those middle class vw drivers.

He speaks of service bureaus, yet fails to indicate that most domestic ones started out by being centralized computer facilities for parent companies. He mentions the lack of scientific and sophisticated applications. Sophisticated applications, in general, are developed for sophisticated problems. In a country with an extremely poor road network and/or maintenance, is there any need to apply the classic LP solution to the distribution problem? In a country of leaps and bounds in its economic development, of ever-increasing population (hence, market), of constant dependency on imports of certain raw materials or prime electronic parts, in a country of continuous dominance of demand over supply, what could possibly be the justification for sophisticated inventory or production control systems? In the country which essentially invented the coffee break by inventing coffee, and the easy going life for the heck of it, what is the sense of an automatic and computerized reorder system?

Mr. Iannuzzo mentions ABRACE as the oldest computer organization in Brazil. I am one of the founders. Mostly, ABRACE's purpose was to give the Brazilian public an understanding for computers as something to be used wisely. It also meant to rid the field of incompetence, of phony expertise. Its avowed purpose was to eliminate creators of generalities, of the kind found in Mr. Iannuzzo's piece.
Jean Pierre Grankenhuis
Boston, Massachusetts

(Continued on page 29)

WE TOLD YOU SO.

We're Data General Corporation.

Two years ago, when we first went into business, we told you we had the world's best mini computer, the Nova.

We were right.

Nova turned the mini computer business on its ear. It was the first small computer built on big computer concepts: medium scale integrated circuits, multiple accumulators, 16-bit word length, read-only memory that is interchangeable with core.

The competition has been Nova-chasing ever since.

Meanwhile we have continued to make outrageous claims and make them come true.

We told you we would stay two steps ahead of the competition.

And we introduced Supernova, the world's fastest mini computer, with add time of 300 nanoseconds from read-only memory, 800 nanoseconds from core.

We told you we would become a major influence in the mini computer business in a hurry by delivering in volume. There are already close to 500 Novas and Supernovas installed, and our production rate is rapidly on its way to making us number 2 in the mini computer business.

We told you we would deliver all kinds of options and peripherals: we're shipping Nova and Supernova in expanded configurations with up to 32K core memory, read-only memory, industry compatible mag tape units, a variety of discs, a complete line of A/D and D/A conversion equipment, real-time clocks, communications equipment.

Now we want to tell you about software.

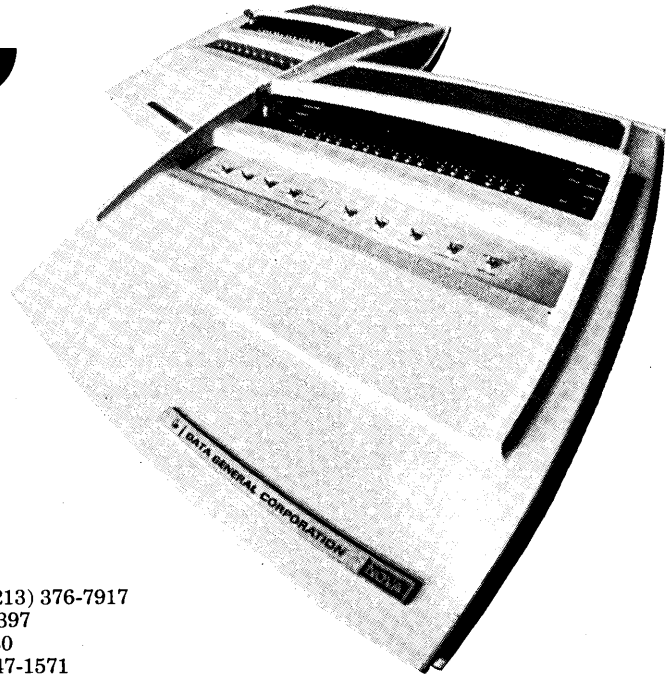
We just introduced the biggest package of mini computer software ever put together in one spot at one time by any mini computer company big or small, old or new. It includes extended ALGOL 60, extended FORTRAN IV, single user and time-sharing BASIC, a Disc Operating System.

This is big computer software, designed specifically for mini computers. It was put together in an integrated effort, not tacked together over several years.

Now it's possible to buy one of the hot computers and get software too.

Believe it. We told you so.

DATA GENERAL



Southboro, Mass. (617) 485-9100
Clark, New Jersey (201) 381-3500
Bryn Mawr, Pa. (215) 527-1630
Orlando, Florida (305) 425-5505
Chicago, Illinois (312) 539-4838
Richardson, Texas (214) 231-4846
Englewood, Colo. (303) 771-0140
Manhattan Beach, Cal. (213) 376-7917
Palo Alto, Cal. (415) 321-9397
Hull, Quebec (819) 770-2030
Montreal, Quebec (514) 747-1571
Toronto, Ontario (416) 447-8000
Vancouver, British Columbia (604) 731-2711

Letters...

Gets our vote

Sir:
Your May, 1970, issue contained two excellent articles, "Cheating the Vote-Count Systems" and "Voting Systems."

This is a most serious business that must not be taken lightly. Your analysis on the subjects is commendable. I hope you will continue to keep your readers posted on the progress and problems pertaining to the application of computers as an aid to the electoral system of our free society.

THOMAS J. BARRY
Brighton, Massachusetts

Game of the name

Sir:
I want to commend you for your Editor's Readout and the collection of related articles in the May issue. I too hope that Dr. Grosch is wrong. I know that I for one am "really interested" in matters of the invasion of privacy, a condition that will probably last until I want some easy credit.

What I would like to say mainly is that I wish you would have told a little more about the friend of yours who "wrote a letter to a publication complaining that his name had been sold to a 'junk mail' house" and "demanded that they knock it off pronto." So what happened?

In my experience, the outcome generally has been that I can say I "wrote a letter to a publication . . . and demanded . . ." That's all. No other results.

You don't make your mailing list available to anyone, do you?

DONALD W. KEARNEY
Martinsburg, West Virginia

Ed. note: No, we do not make our mailing list available to anyone for direct mail advertising. In answer to your other question about our friend, he got essentially the same kind of reply you did. But he's since been advised of another approach. Read on:

Sir:
In reading your editorial "It's Up to You" in the May issue . . . , I felt the same way that (your friend) did and took up the battle. I sent copies of my letter to several friends in the Congress, Bill Proxmire in the Senate, and Jerry Waldie in the House, plus a copy with a personal letter to Mr. Caspar Weinberger, Chairman of the Federal Trade Commission, with whom I have corresponded for several years.

ROBERT KAHN
Robert Kahn and Associates
Lafayette, California

OK, U.K.

Sir:
We would like to ask you to print the following answers to suggestions made in your March News Briefs, "ICL and Barclays combine service bureau operations" (p. 153). It was indicated that the sale to Barclays Bank came about as a result of the impending merger between Barclays' Computer Service facilities and ICSL. And in addition, an implication that the transaction was a political move to placate the U.K. Labour Government, upset at the country's major bank's decision to buy non-U.K. manufactured computers.

The facts show both suggestions to be totally untrue. Barclays have been customers of ICL since September, 1965 (long before any prospective merger was considered).

In addition it should be noted that ICL does business with a significant portion of the U.K. banking industry. All major clearing banks in the U.K. depend on computer tapes produced by the London Clearing Bank. This organization processes all the cheques written in Britain on a very large computer, an ICL 1906E Dual Processor System.

ICL has a successful record with banks in general, and in particular a successful history of installations with Barclays stretching back some five years.

REX BERRY
Public Relations Manager
New York, New York

Library card

Sir:
Mr. Neville Black (Letters, April, '70, p. 39) should take all costs into account. Read only storage (even at 10¢/megabit year) would have to be complemented with substantially costlier alterable storage since a card catalog changes daily. Further, the cost of any storage medium should take into account not just the physical equipment directly involved but the total hardware and software commitment.

For books (now 2¢/megabit year), Mr. Black's optimistic figure is still five times the present outlay, but that is not the real hitch. This would come when you compare retrieval costs in the manual vs. computer system. The book shelves provide nearly random access in parallel to about 200 customers. Compare the rental costs, line charges and computer time of a couple of hundred crt's with sufficient resolution to read comfortable blocks of type (½ page?), forward and back reference to other pages, browsing and scanning.

If you believe advertisers, you can calculate theoretical costs. What I gave was actual costs.

WILLIAM N. LOCKE
Cambridge, Massachusetts

Oll korrect

Sir:
The W. W. McDowell Award is indeed to be presented (May, p. 147) to Frederick P. Brooks, Jr., but your identification of his affiliation as IBM is incorrect. Dr. Brooks has been Professor and Chairman of the Department of Computer and Information Science in the University of North Carolina at Chapel Hill since 1964, and his employment by IBM ceased in 1965.

PROF. PETER CALINGAERT
University of North Carolina
Chapel Hill, North Carolina

Ed. note: Further identification and proper affiliation of Dr. Brooks was made in June News Briefs, p. 191, with the announcement that he also was chosen DPMA's Man of the Year.

Statistician in him

Sir:
The short article on "Getting a Personal Dossier from a Statistical Data Bank," by L. J. Hoffman and W. F. Miller in the May 1970 issue, prompts the statistician-in-me to make the following observations:

1. The ratio of $\#(P_1 \& P_2 \& \ldots \& P_N \& P_0)$ to $\#(P_1 \& P_2 \& \ldots \& P_N)$, which is always between 0 and 1, provides a good estimator of an appropriately-defined "probability" that Mr. X has property P_0—since it increases from 0 to 1 as $\#(P_1 \& P_2 \& \ldots \& P_N \& P_0)$ increases from 0 to $\#(P_1 \& P_2 \& \ldots \& P_N)$.

2. Hence the Hoffman-Miller approach provides "information" about Mr. X, even when $\#(P_1 \& P_2 \& \ldots \& P_N \& P_0)$ is less than $\#(P_1 \& P_2 \& \ldots \& P_N)$—with the "information" increasing as the ratio increases.

ARNOLD GOODMAN
Huntington Beach, California


BIG DONUT DRIVE-IN

Mr. Klemper is in the memory business, too.

For 13 years, Floyd Klemper mixed his dough—and made it—with glazed, coated, sprinkled and plain doughnuts. He claims that once munched (or dunked) they're never forgotten. But just to make sure, he put a hyperthyroid replica of his product on the roof of his shop.

An admirable use of a mnemonic device. And, in all modesty, we do know a good mnemonic device when we see one. Our business is memories. Electronic memories for computers, just as our name says.

We're no slouches when it comes to doughnuts, either. Electronically speaking.

We turn them out by the billions at core manufacturing facilities in the U.S. and abroad. A huge capacity which has grown because selling cores to the computer industry isn't a sideline with us. As a result, we can offer 18-, 20- and 30-mil standard, extended and wide temperature ranges. Our selection includes 20 standard core types, plus customized cores to meet your specific needs.

And with production so great, we're able to keep prices low. On small quantity orders as well as large.

Being big also means being of extra service to you. Not only as a manufacturer, but as a consultant on your particular core problem. We are, in fact, one of the few companies with extensive application engineering capability. So we can provide personalized service to you whenever, wherever needed.

Electronic Memories has been on the job since the early '50s. Through the years we've built up the largest core library in the world—without sacrificing quality for quantity. In addition to highly refined quality control procedures, we conduct continuous on-line process control. This way we monitor production—and keep quality high—every step of the way.

We deliver on schedule, too, even with short lead time. (Years of working on military projects have taught us never to disappoint a General. Or anyone else.)

So, while we admire Mr. Klemper's mnemonic device, we won't copy it. Because once customers try our electronic doughnuts, they come back for more. Without a reminder.

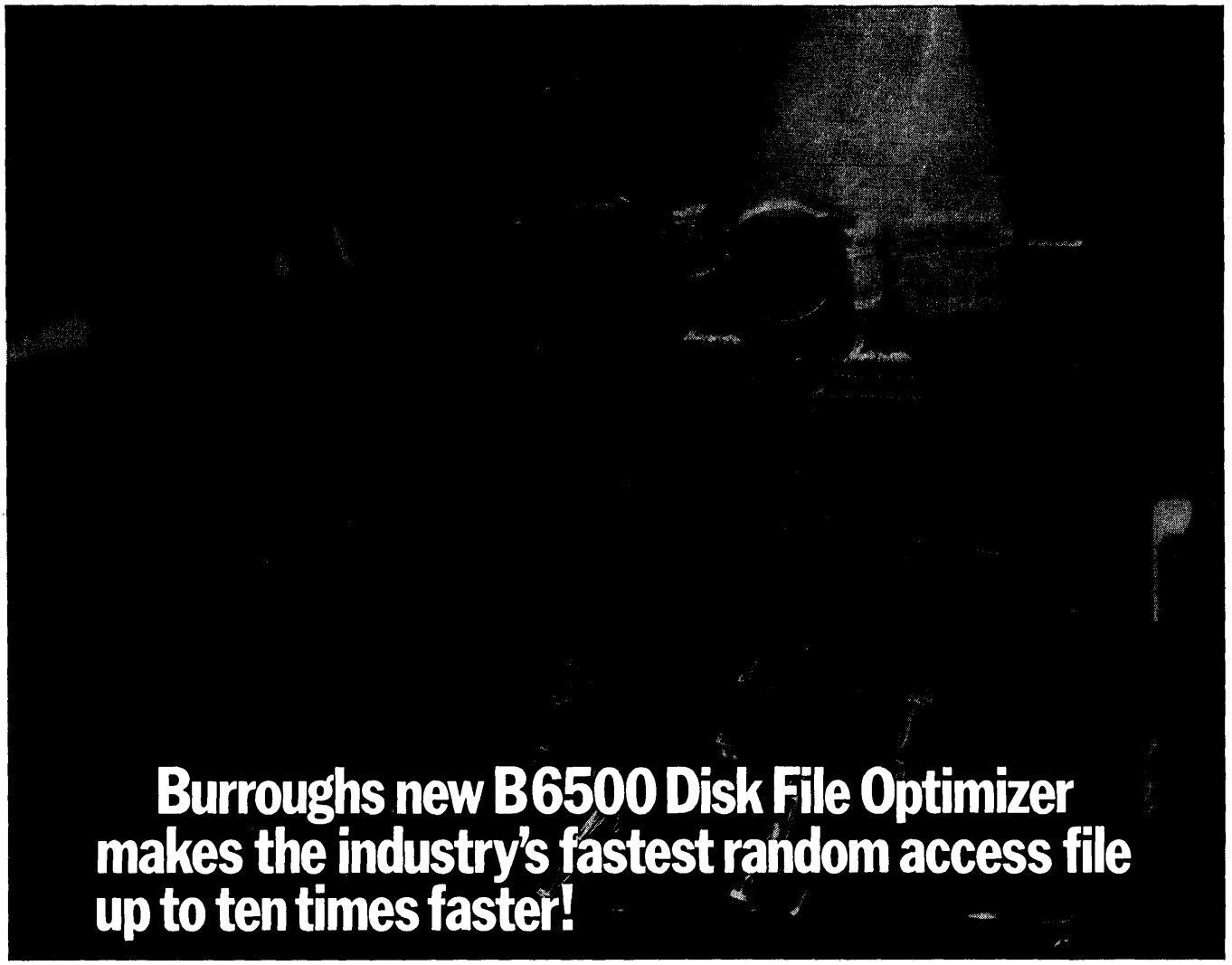
And if by chance you've never done business with us, now is the time to help yourself.

EM

Electronic Memories.
Worth remembering.

Electronic Memories is a division of Electronic Memories & Magnetics Corporation
12621 Chadron Avenue, Hawthorne, California 90250 · Telephone (213) 772-5201

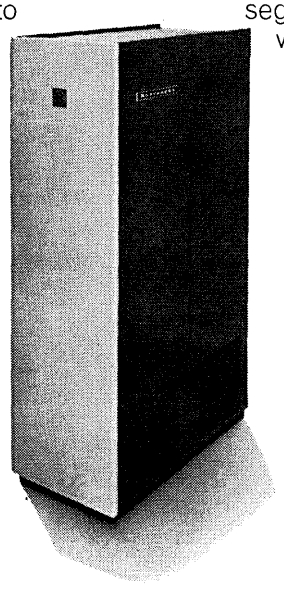
CIRCLE 118 ON READER CARD



Burroughs new B6500 Disk File Optimizer makes the industry's fastest random access file up to ten times faster!

Burroughs head-per-track disk file systems are fast to begin with. Fast enough to make any data segment in the file available in an average of 20 ms, regardless of file size.

Now, consider what happens when you add Burroughs new Disk File Optimizer to your B 6500 system. Depending on the access request pattern, your 20 ms file may deliver average access times of 2 ms, or even better.



The Disk File Optimizer doesn't make the file work harder, just smarter. It takes note of file access requests, checks to see how far away each requested data segment is from its read/write head, then tells the computer what order to follow in servicing the requests.

In this way, many requests can be sandwiched into the same few milliseconds that a single access would otherwise take. The heavier the access request load, the more efficient the file becomes. Without reprograming!

Ask your Burroughs man for the impressive details.

Burroughs BD

LOOK AHEAD

IBM'S NEW SYSTEM 370: THE ART OF SEDUCTION

IBM has begun another great seduction of the user with the introduction of two System 370 computers, two mass stores, a printer and a raft of new (and priced) 360 compiler versions that for the first time provide ASCII code support. Looks like no real conversion problems — yet. But note: IBM did not announce any 370 software. But it will over the next two years, and you'll pay for it, and there will be a new operating system and you'll pay for converting, if you like the idea. So, though your first startup costs (unbundled support services) may be minimal, look out for the second startup.

Right now, you can use your free compilers, although gimmickry is needed to interface with the new (and expected future) peripherals. Under DOS, by the way, no support is yet listed for the big new disc drives, only the printer. It could mean IBM is trying to coax large system users on DOS over to OS — presumably to ease their conversion to the next (shudder) operating system.

The new compiler versions, reasonably priced, offer a clean interface and good new features. IBM is expected to stop adding features beyond spec to free compilers, but free applications programs will probably be upgraded to handle the new devices at no charge.

HONEYWELL GIVES 'EM THE ACS FOR FOURTH

In its fourth generation — due for announcement next year — watch for Honeywell to sacrifice computational speed for gains in pricing and reliability. Bluntly put, there won't be enough exotic technology in the new line to turn on the technical types. For instance, no emitter-coupled logic (ECL) circuits to speak of, just plain old transistor-transistor-logic (TTL), although Honeywell just might be trying to use parallel processing rather than serial processing in a move to increase the speed of the new line.

The name of Honeywell's new line — once called the 3200 Series — keeps changing, but the latest is ACS (Advanced Computer System). Production models won't be seen until '72 with full scale production expected for '73-'75, maybe beyond.

Semiconductor houses that have received development contracts for several circuits for the new line include: Fairchild, Motorola, Texas Instruments, Transitron, Signetics, Raytheon and Sylvania. A relatively new company, Intel, received development contracts for two circuits, a 64-bit scratch pad memory and a 256-bit read only memory. Sources in the semiconductor industry are looking for Honeywell's new Series to be gobbling up one million IC's a week by 1973.

Some cynics have been saying that Honeywell is lagging behind in the design of its new series and

that it needs GE's computer research and development capability to put some zing in the new line. That may be true, but even so, Honeywell just doesn't need a new generation yet, because its Series 200 continues to sell well.

LIFE BEGINS WITH /40

Internally, IBM places the 360/40 at the top of its performance list, the /50 near the bottom, it was said last month at a local meeting. Even the /65 is known for better reliability than the Mod 50. Adding support, a fellow panelist said he averages 1-2 cpu failures/week with his /50, and moans when his /40 is down once in three weeks.

BELL'S BIS: BOTTOMLESS WELL?

Bell's operating companies must be a trifle annoyed that they've spent a reported $50-75 million on the Business Information Systems effort — and still have nothing on the air to show for it.

In '67, Bell put 500 people from around the System on the massive job of developing applications that could be used on any brand of computer operated by its companies. Critics say too many applications-oriented non-computer personnel have managed and populated the effort. One example of resource misallocation: only three people have been working on program transferability — a goal now all but forgotten, as is applications integration.

The main emphasis has gone to the series of pilot applications projects, which have also slipped repeatedly. The real problem is that each package is being developed on one or two systems — and without transferability, the original intent is negated. RCA, by the way, has been dropped from one pilot (white pages automation) and may be from another (trunks record keeping) — leaving IBM the surviving vendor for those developments. It's easy to see, unless things change, any BIS results will give an edge with the 23 Bell firms to the pilot vender. Or the companies which all operate somewhat differently will go their own way again.

NCR ANNOUNCES NEW PRODUCTS OF THE CENTURY

NCR's long-awaited, oft-delayed Century 300 will finally make its debut on Sept. 15, along with the 260 terminal, first of a family of five. The 260, and others reported being readied for announcement later in the year, have no moving parts (thermal impressions) and are in the same cost and size range as Teletype terminals, but offer 10 times the speed.

The 260 is to be followed by the 270 and 280 which feature a "magic wand" that will scan garment tags in stores or passbooks in banks and send the information on-line to the computer. Also to be announced is a low-cost, on-line optical scanning terminal for financial users in the $3500-4K range and the 399 remote batch terminal, competitive with the Burroughs TC-500. Then we'll see the Century 50, a stand-alone mini or remote terminal, an 8K version of the Century 100.

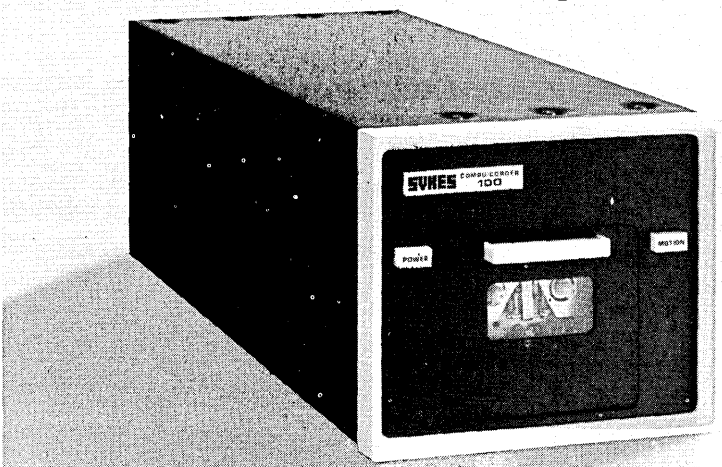
Attention Systems Designers

Would you like the direct access of a disc with the storage capacity of magnetic tape?

Then you should use the Sykes COMPU/CORDER™ 100...
a magnetic tape device that:

- **Provides high speed direct access** to data in both forward and reverse directions at 120 ips. (Made possible by an exclusive, patented tape addressing system.)
- **Enables users to edit,** assemble and manipulate data.
- **Increases the memory** capacity of a mini-computer by an additional 360,000 words *per cassette.* (Average mini-computer memory stores 4K words.)
- **Stores up** to 3,600,000 bits of information on each 300 foot cassette.
- **Offers a unique library system** that allows you to convert existing programs stored on punched paper tape to magnetic tape.
- **Has proven itself** in a wide variety of applications. Ask us.
- **Comes packaged** with software and interfacing.
- **And costs $2,507.50** in lots of 20. Single unit—$2950.00

Ask your Sykes representatives for complete details.
Or mail in the attached coupon.



SYKES™

SYKES DATATRONICS INC.
375 ORCHARD STREET
ROCHESTER, NEW YORK 14606
CIRCLE 77 ON READER CARD

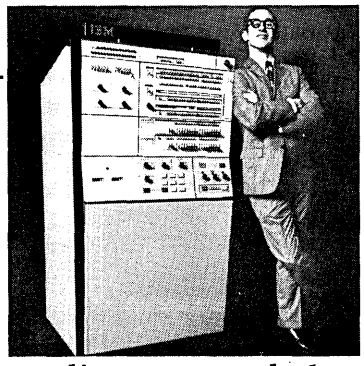
Sykes Datatronics
375 Orchard Street, Rochester, New York 14606

☐ Please send me complete details on the COMPU/CORDER 100
☐ Please have representative call

Name_____
Title_____
Company_____
Address_____
City_____
State_____ Zip_____


• Stores 30 4K programs and directory.
• Average access for any program— 10 seconds.
• Program loading time (assuming 4K) 16 seconds.
SYKES
APPLIED INFORMATION TECHNOLOGY
REMOVE PLUG TO PROTECT
A
CASSETTE NO
6/15/70
Sykes Library Cassette
REMOVE PLUG TO PROTECT
B
SYKES
POWER
MOTION

COMPUTERS CAN BE CONQUERED.



There's really only one way to get full control over the cost and performance of a complex edp operation. You need a computer to help you do it. And since you already have the computer, the only question left is how to get it to handle edp management tasks? In an hour long meeting we can show you how in detail. Our approach lets you use your own computers to diagnose and then solve your edp systems, operations, cost control, scheduling and expansion problems. Our services include everything you'll need to get your new control system up in the shortest time possible—the top level people, computer management software, systems monitoring hardware and training for your staff. Our approach includes SCERT—the dynamic software package that uses computer simulation techniques to quantify alternatives in edp management decision making. And it includes several advanced new tools and techniques and services to provide the full range of assistance that today's computer control crisis calls for. But most important of all, the reliability of our approach is fully proven. Our more than 400 clients in industry and government will attest to that. For details call your local Comress office, or write: Two Research Court, Rockville, Md. 20850. (301) 948-8000. We have the one alternative to the facilities management surrender.

COMRESS
THE CONQUEROR.

EDITOR'S READOUT

The Newlook Datamation

As you have no doubt by now discovered, DATAMATION is now a semimonthly publication.

And we've used the move to a more frequent publication cycle as an excuse to give our magazine a slight facelifting, to make your reading of DATAMATION easier and less time-consuming.

We have, for instance, moved the table of contents closer to the front of the book, and we've grouped the articles on it under the following headings: General, Technical, Management, and Commentary. We hope this will help you more quickly spot those articles of particular interest to you. And in case you're a random reader, the articles themselves are keyed to these headings: a "G," "T," "M," or "C" at the beginning of an article tells you quickly on what level you're reading.

Inside, we've changed to a bolder, crisper typeface on article and department headlines for quicker identification. The news departments have horizontal heads; "catalogue" departments—Hardware, Software and Literature—offer vertical heads in the right-hand margin. And opinion sections—like this one—combine these two approaches.

For quicker reading, we've shortened the lines of type in the articles, and added vertical rules in the news departments as an anchor line. Hardware and software items are displayed in a horizontal setup that we think will make for easier selection and reading.

These essentially surface improvements do not change our continued dedication to provide the best and most complete coverage of our hectically growing industry. In order to provide you with even more comprehensive and timely coverage of the industry's happenings, we've beefed up our staff.

On the news side, we've added Tom McCusker, Edith Myers and Dave Gardner, all top-flight professional trade journalists. Mike Cashman, with seven years of solid edp experience, takes over hardware and software under the direction of Dick McLaughlin. And Angie Pantages—certainly the most charming reporter in the industry—steps up to Special Features Editor. She'll use her experience and insight to develop more staff-written articles on financial, marketing and other nontechnical aspects of industry developments. Another pro, John Waterhouse, joins Bill Rolph to ensure that we continue to offer you timely, useful and interesting articles. And to make sure that our writing maintains the DATAMATION tradition of accuracy and crispness, we've promoted Janet Eyler to Copy Editor.

We hope that these changes will merit the same kind of support and approval that has made producing this magazine such a joy.

Read on.

—R.B.F.

We need to know much more about both demand and supply of computer people before there's hope of the two coming out even.

The 70's: People

by Thomas C. White

The 70's will undoubtedly live up to many of our expectations for the development of superior hardware, software, edp services and data communications networks. However, the impact of these developments on our economy and life-style is not solely a function of advancing technology. It will depend to a great extent on the people who place these innovations into everyday practice. And here the picture is far from clear.

While estimates vary widely, there is at present a significant shortage of properly trained, experienced edp personnel. This persists at many levels, including entry-level positions requiring a minimum of applicable industry or business related-background.

The most widely accepted projections show a doubling of the total need for systems analysts, programmers, and computer operators and associated technicians during the next five years. This is not unreasonable, as the number of installed computers in the U.S. is expected to jump from roughly 60,000 at present to 120,000 by 1975. This suggests an anticipated demand for approximately 50,000 additional men and women each year in each of the three general categories cited.

A significant number of personnel will continue to be drawn from within the existing industry and business manpower pool. However, this source will play a decreasing role in meeting total needs. This stems in part from the increasingly complex demands placed on edp personnel and on such factors as unbundling with its effect on internal training programs.

Many private educational programs offered by mainframe manufacturers, consulting firms, and others will assist in meeting these needs. General economics, however, indicate that these programs will account for only a small fraction of total needs.

As the computer field matures, the major sources of new manpower will be academic institutions and specialized private schools. Unfortunately, many of these institutions at present lack the programs, resources, and facilities to meet projected needs.

There is no one simple solution to meeting the short-term and long-range problems of obtaining required entry level personnel. We not only require such people in large numbers, but they must have a genuine aptitude for computing and proper training keyed to present and projected industry requirements.

This is not to say that there is little we can do. Needed tools are available or can be developed. However, required actions must be based on *cooperative* efforts in (1) analyzing manpower and educational needs, (2) obtaining required data and information, and (3) formulating and implementing "real-world" plans of attack.

Current and projected needs are now of such magnitude that action is mandatory. Added to this is increasing concern relating to the "professionalism," or lack of it, shown by our industry. The ramifications of this concern, e.g., questions relating to public responsibility and consumer protection, should not be minimized or overlooked. The impact of modern edp systems is such that we cannot afford the luxury of delaying prompt action and systematic follow-through. The result of such shirking of responsibility would inevitably lead to public censorship, increased litigation, and governmental regulation.

Cooperative action is essential. At best, we can anticipate only limited results unless we establish a closer working relationship among computer organizations, user firms, state and federal governments, professional bodies involved in data processing, and the academic and educational community at all levels. The alternative is relative inaction, isolated efforts, inadequate planning and needless duplication of effort.

Get together

Admittedly, the problems are great. But our systems, no matter how sophisticated, are not better than the people designing and using them. With this in mind, there are at least three areas where much can be accomplished through concerted, coordinated effort:

1. Valid, comprehensive statistical research pointed to realistically determining our present and future manpower needs and potential resources.

2. Closer cooperation with our universities, colleges, junior colleges and area technical training schools through various forms of assistance pointed towards (1) the establishment of additional degree programs and facilities in the computer sciences and data processing, and (2) the strengthening of existing programs.

3. Constructive action and cooperation with the private edp school sector aimed at determining their legitimate role, improving educational and training standards, curtailing the activities of inadequate schools, and providing employment opportunities for graduates who have been properly trained for entry-level positions.

In the following sections, these three areas will be discussed in some detail. While the role of the profes-

sional society, as illustrated by The American Federation of Information Processing Societies (AFIPS) and its member groups, will be highlighted, it is obvious that they cannot, and should not, attempt to go it alone in devising workable solutions.

As an organization chartered for scientific and educational pursuits, AFIPS has a strong interest and commitment in manpower and training. Specifically, its involvement is based on two major objectives:

1. To better understand the over-all supply and demand picture within the computing field.
2. To do what it can to assure that training given to people is appropriate for jobs available.

Determining over-all needs

If planning for required manpower and related education and training is to be realistic, it must be based on a sound knowledge of our current situation, potential resources, and anticipated growth. This in turn requires in-depth statistical information and projections covering such subjects as hardware, software, manpower requirements at various levels, educational facilities and curricula, corporate hiring policies, and industry entry-level job requirements.

On the surface, there appears to be little shortage of raw data and projections. Hardly a week goes by without at least one reference to a newly developed analysis of industry needs and/or manpower requirements catching our eye. But even where figures cited appear valid, we frequently end up data rich but information poor. All too often we lack requisite background detail on such information and a common data base to work from.

Unfortunately, this problem extends to many efforts undertaken by the federal government or carried out under federal grants. And it has been compounded by the historic unwillingness of many major organizations and groups to make over-all statistical data available, or to reveal its general statistical base so that it may be accurately combined with other data.

There is no need to review the generally available data on installed computers, total manpower, and projected growth rates. However, it is worth noting some current sources:

1. Governmental Groups
   a. Bureau of Labor Statistics
   b. Census Bureau
   c. National Register—NSF
   d. Bureau of the Budget
   e. Office of Education, Bureau of Research
   f. Department of Defense
   g. State governmental studies
2. Professional Groups
   a. Professional society studies, including AFIPS surveys and research projects
   b. Computer Science Project, Southern Regional Education Board
   c. Trade Association Statistical Research
   d. NSF-supported High School Survey (American Institute of Research)
3. Private Groups
   a. Business press surveys
   b. Employer and manufacturer sponsored surveys
   c. Miscellaneous private studies

Considerable data is available at the governmental level but there is no central mechanism to pull this data together, analyze and distill it, establish common definitions and statistical bases, and provide a coordinated procedure for frequent updating. In addition, there are a number of key areas where only sketchy imformation is available.

Much the same is true in the professional and private sectors, complicated by the proprietary nature of some of the data and frequently by a total lack of knowledge of its existence outside of the organization in question.

Faced with this situation, it is critical that we begin now to establish a sound source of information on our field, a common data bank which can be consistently updated to serve as a key tool in our decision making. Without such information, it will be most difficult to properly assess our manpower needs and to provide the academic community and governmental agencies with needed data to serve as the basis for the allocation of required resources.

The alternatives are hardly attractive. For example, will we continue to approximate the number of current computer installations and the size of their staffs, then gauge future manpower needs in certain critical areas by projecting these figures to some future date based on current job descriptions which are often cloudy at best? The possible results of such "guesstimates" are not happy to ponder. Included is the grave risk that we may train thousands of people for the wrong jobs—or, at a minimum, provide only partial training.

Professional societies must assist in determining needs, resources, and required actions. But strong

industry cooperation and support is required. In line with this, AFIPS hopes to initiate three statistical research programs within the next year, providing necessary funding and cooperation can be obtained. These include a proposed survey of edp manpower furnished by sources other than four-year colleges, a program to correlate present statistical data on the information processing field, and a survey of the membership of professional societies.

The first of these is an outgrowth of a pilot study of private edp schools by AFIPS during 1969. It is envisioned as a two-year program to determine quantitatively the manpower requirements for various skill categories for non-four-year-college graduates, and to determine how well the various types of educational institutions are meeting these needs. Specific attention will be paid to private edp schools, two-year colleges, and area technical training schools.

The preliminary plan calls for sampling computer installations across the country to determine present and future staffing needs. Information will be sought on the education and skill levels of present employees and on attitudes towards hiring noncollege graduates as junior programmers. The edp schools and community colleges will also be surveyed to determine the number of graduates they expect to produce to fill the positions outlined by industry. Surveys will also be made of new employees and recent graduates of edp schools and two-year colleges to determine their opinions on the relevance of their training and their success in finding appropriate jobs.

The proposed study of statistical data is aimed at providing a periodic updated summary of basic information for use by industry, government, the academic community, and others who need it. The study will concentrate initially on determining what data has been collected and whether or not it is available—even if under specified terms of confidentiality. Where necessary, small sample surveys may be made to test the validity of gathered data or to fill in gaps. The proposed study will also include considerable information on hardware and software.

If necessary funding can be obtained, these projects may be implemented this fall or early winter.

The third study is a proposed survey of personnel in professional societies and groups serving the computer field and will concentrate largely on AFIPS' membership. It will be an updating and expansion of a similar survey carried out by AFIPS in 1968 and calls for gathering, analysis, and presentation of general personal data, education, employment, professional activities, and salaries.

The past few years have seen growth in the computer-oriented degree programs and facilities offered by our colleges and universities—from associate degree programs to two-year institutions to the PhD programs of our most prestigious universities.

The 1967 report of the President's Science Advisory Committee recommended that 75% of all college students should have a meaningful exposure to the computer. We are still quite a way from that goal. In addition, it will be some time before our colleges and universities can meet industry needs for highly trained edp personnel. However, the outlook is promising.

The total resources of our colleges and universities are enormous. There are more than 2,500 such institutions in the U.S., with about 800 offering the bachelors degree as their highest offering, about 500 which offer the masters degree, and almost 400 which offer doctoral programs. There are approximately 800 institutions which offer two-year programs beyond high school. Of these 2,500 schools more than 1,200 had computers installed by mid-1969, a figure almost double that for 1966.

While we lack accurate current figures on edp curricula and enrollment, we can examine available data for the years 1965 to 1969 and hazard a few guesses as to where we may be in a few years' time.

Perhaps the best source of this information is the Computer Sciences Project of the Southern Regional Education Board in Atlanta, Ga. Under the direction of Dr. John Hamblen, the project is supported by the National Science Foundation and has involved research ranging from capital expenditures and types of hardware to degree programs and enrollment. Dr. Hamblen's report on Computers in Higher Education[1] provides a valuable profile of progress and potential.

In fiscal 1965, institutions of higher learning spent $103 million on computer equipment and its operation for use in research and instruction. An additional $41 million was contributed by computer manufacturers for a total of $144 million.

Estimated figures for fiscal 1969, based on projections made by the institutions during 1967, indicate that our colleges and universities spent approximately $276 million on computer equipment and its operation—almost a three-fold increase. In addition, computer manufacturers are believed to have continued to contribute at the rate of $40-50 million/year.

Student enrollment has grown even more. Estimates for 1964-65 showed approximately 4,300 undergraduate and 1,300 graduate majors in computer science, data processing, information sciences and related programs. In 1966-67, these totals jumped to over 22,000 undergraduates and 5,000 graduate majors, roughly a five-fold increase.

Included in the figures for 1966-67 are approximately 300 institutions offering degree programs in computing. They were staffed by approximately 2200 faculty members in these programs and graduated almost 2800 students during this year: associate—1,300; bachelors—600; masters—700; doctorate—200.

In addition to those taking degree programs, nearly 120,000 undergraduates and 29,000 graduate students received some computer training during 1964-65. The number of students trained in at least one programming language during 1968-69 is believed to have jumped nearly three-fold to approximately 350,000 undergraduates and 81,000 graduate majors.

Turning to degree programs, a total of 226 programs were offered by the fall of 1966 and an additional 331 were planned for implementation between then and the fall of 1969. Those designated as "computer science" accounted for 18% of the going programs and 55% of the planned programs, or 40% of the total of 557 existing and planned programs. Business data processing accounted for 40% of the going programs and 26% of the planned programs. Remaining programs covered some 16 different designations including such areas as information science and com-

1. "Computers in Higher Education", Southern Regional Education Board, Atlanta, Georgia, August 1967.

puter science options in mathematics. It should be noted that an estimated 70% of all undergraduate majors are enrolled in data processing, as opposed to computer science, with the vast majority of these students pursuing associate degree programs at two-year institutions.

An examination of expenditures, distribution of funding, and degree programs for the various institutions offering edp curricula shows a major concentration in the larger universities.

Of the $103 million expended on computing in 1965, approximately 40% came from government agencies in the form of contracts and grants. General institutional funds accounted for 47%. Projections for 1969 show 39% from government sources with the institutions increasing their own expenditures to cover 51%.

However, 78% of the projected expenditures for 1969 were at major institutions granting doctorate degrees and about 80% of the manufacturer's contributions also went to these universities. In addition, approximately 90% of government funding has gone to these schools. Thus about $216 million of the total expenditures of $276 million estimated for higher education in 1969 was spent by these universities.

Institutions offering masters degrees as their highest level accounted for approximately $38 million with about $3 million coming from federal sources. Institutions offering bachelor degrees account for only $5 million, or 2½% of the total, with about $1.5 million from federal sources. Two-year schools spent an estimated $14.5 million with about $3.6 million coming from federal funds and state matching programs.

In terms of programs and enrollment, doctorate level universities offer the vast majority of programs in computer science but only 10 to 12% of all programs in business data processing. More than 60% of all undergraduate computer majors in schools offering at least a four-year program attend these institutions, along with 87% of the graduate majors.

Looking ahead

In examining this data, a number of points become clear. Much of our student population, facilities and funding are concentrated in a relatively few universities and colleges. This is to be expected as we are still in our infancy from an academic point of view. In addition, much of the federal funding has been provided to these major institutions based on national needs for research and development programs, such as those related to defense and space efforts heavily dependent on computer technology.

Computer degree programs will continue to grow and to flourish at these schools. But we have hardly scratched the surface. Institutions offering doctorates account for more than half of all degree programs. On the other hand, colleges offering masters and bachelor degree programs as their highest level account for only 20%. In addition, the majority of our two-year institutions do not yet offer formal programs in computing.

In all probability, our colleges and universities will be able to provide enough computer graduates in the seventies to potentially meet our needs for computer scientists, research and development personnel, and other highly skilled specialists. In addition, we can draw on the thousands of graduates at all levels who combine expertise in related disciplines with some basic training in computing.

Looking to the immediate future, these institutions will probably spend a half billion dollars in 1970-71 for computer equipment and services. It is quite possible this figure will hit the billion-dollar mark in a relatively few years' time.

If recent trends hold true, perhaps 40 to 50,000 undergraduate computer science and data processing majors will be enrolled in 1970-71 together with an additional 10 to 15,000 graduate students. It is also conceivable that these figures could increase to 100,000 undergraduates and 30,000 graduate majors at some point in the seventies. But even a total of 30 to 40,000 graduates per year will not meet all our needs if projected annual requirements for 100,000 additional systems analysts and programmers prove accurate.

Admittedly, much needs to be done in defining job requirements, especially those in business systems analysis and programming. However, an increasing number of companies require or strongly prefer a college degree for positions at the programming level, or higher. Also, a significant number of firms prefer that their computer operators have at least some college education.

According to a study published in September, 1968, by the Office of Education, U.S. Department of Health, Education and Welfare[2], 61% of 353 business data processing managers surveyed preferred that programmers have a college degree. Over 60% indicated that education background was a substantial factor in determining the programmer's chances for promotion.

Recommended action

Much can be accomplished by working more closely with smaller colleges and junior colleges, which have a great potential to fill many of our basic needs. They are also evidencing an increased desire to provide degree programs in these areas.

An illustration of this is the Occupational Education Project of The American Association of Junior Colleges. The project has recently resulted in a publication, "The Computer and The Junior College,"[3] designed to assist these schools in evaluating and implementing computer programs.

In its report, the association acknowledges that "The community college must accept the challenge and help fill the need . . . [for experienced practitioners] . . . through sound technical education programs in business data processing." However, this represents a major undertaking for these institutions as all areas and functions of the college are usually affected by computer utilization—which in turn represents a substantial portion of the school's general operating budget.

Without extensive support from industry and government, many colleges will not be able to support

2. "Curricular Implications of Automated Data Processing for Educational Institutions", Office of Education, Bureau of Research, U.S. Department of Health, Education and Welfare, Final Report, Project No. BR5-0144, September 1968.
3. "The Computer and the Junior College", American Association of Junior Colleges, Washington, D.C., 1969.

such an undertaking. Obviously, there are prime financial needs. But, in addition, there are major needs involving the feasibility and planning stages; evaluation of facilities, equipment and curricula; review of ongoing programs; and assistance in the instruction phase—to name but a few.

In approaching these problems, there are a number of ways in which industry can be of major assistance through individual and collective action. These include:

1. Evaluation of local needs and discussion with colleges in the immediate area.
2. Participation in community and edp advisory committees set up to assist interested schools in determining the feasibility of computer degree programs and to assist in planning, evaluation of vendor proposals, curricula, and staffing.
3. Continued assistance in reviewing ongoing programs and in defining future industry needs.
4. Assistance in the supply of educational materials.
5. Assistance in training instructors through special programs and seminars, summer employment, and related activities.
6. Provision of spare computer time, where needed.
7. Assistance in establishing regional computer centers, where required, to serve a number of educational institutions.
8. And, last but not least, direct or indirect financial assistance, including assistance to schools in obtaining additional outside funding from other sources.

The dividends of such assistance could be enormous. In addition to assisting in meeting manpower needs, properly implemented programs could also be of considerable help in facilitating future programs needed to keep industry employees up to date, as well as making possible expanded edp education at the elementary and secondary school level.

Increasingly, our institutions recognize that undergraduate college education without adequate computing is a deficient education. However, without our direct involvement and support, progress may be agonizingly slow.

Private edp schools

Private edp schools have mushroomed in recent years until today we have roughly 1,000 in operation. However, while up-to-date data on manpower needs and college and university programs may leave something to be desired, there is no comprehensive information available on edp schools. And there is little concrete information from which to make a quality judgment.

Recognizing this data gap, AFIPS undertook a small pilot study[4] last fall to attempt to gain some feeling for the number of students graduating from these schools and the types of courses offered.

A one-page questionnaire was mailed in mid-August to 207 edp schools listed in the telephone directory yellow pages for the 10 largest U.S. metropolitan areas. The questionnaire requested that the schools provide the course name, number of class hours, and estimated number of 1969 graduates in three categories: programmer, computer operator, and "other."

Forty-one responses were obtained and 6% of the questionnaires were returned by postal authorities with the indication that the schools in question were no longer at the listed address. Admittedly a 21% response on such a sampling leaves a great deal to be desired. However, results do provide some general insight—including the fact that almost 80% of the schools declined to reply even though they could omit their name.

The 41 responding schools indicated they expected to produce 15,000 graduates in 1969 in the following areas: programming—7,990; computer operators—1,450; keypunch operators—4,360; all others—1,200. If, as a very rough estimate, these figures are extrapolated to an assumed universe of 500 schools, and if graduates per school are cut in half to take into account the larger schools included in the pilot study, we come up with a projected total of 84,000 graduates per year.

Using these responses as a base, we can further estimate the number of "graduate programmers" as 45,000 or 53% of the total. Corresponding figures for computer operators are 8,000 or approximately 10%.

It appears from these figures that private edp schools probably represent a $100-million-a-year business turning out in sheer numbers enough potential business applications programmers to meet industry needs. However, the general aptitude, level of training, and over-all capabilities of these particular students have sparked much heated debate.

Such schools are regulated—at least theoretically—by local and state requirements and to a lesser extent through voluntary accreditation by the three national organizations approved by the U.S. Commissioner of Education.

Local "regulation" is usually confined to obtaining the necessary license to operate in accordance with general zoning, safety, and health requirements. State regulation and accreditation varies from fairly stringent in several states to none in others.

Accreditation at the national level is carried out on a voluntary basis by the Accrediting Commission for Business Schools (ACBS), The Accrediting Commission of the National Association of Trade and Technical Schools (NATTS), and the Accrediting Commission of the National Home Study Council (NHSC).

Seeking a solution

There is no one simple method for equating the training imparted to qualified individuals by private edp schools to the current and projected needs of industry and commerce. Responsibility lies with all parties in varying degrees.

The schools have the responsibility to properly screen applicants, provide required instruction and facilities, and to maintain an active interface with the edp field.

Employers, in turn, have the responsibility of realistically determining their present and projected future job requirements, adopting sound policies for promotion based on equally sound organizational structuring, implementing such requirements and policies through their personnel departments, and maintaining a constructive dialogue with reputable private edp schools in their area.

4. "A Pilot Study of the Contribution of Private Data Processing Schools to the Manpower Pool of the Information Processing Industry", American Federation of Information Processing Societies, Montvale, N.J., October 1969.

Professional groups, industry associations, and accrediting bodies also have a responsibility to provide general guidelines for the proper operation of these schools, consistent with ethical business practices and the educational needs of the computing field. In line with this, two sets of guidelines were prepared recently by the Association for Computing Machinery (ACM)[5] and the Data Processing Management Association (DPMA)[6]. These sets, developed independently, are intended to assist schools improve standards in training students for entry level positions in programming and related jobs.

As a follow-up to this activity, an informal ad hoc committee was formed last fall to examine current standards and accreditation of private edp schools and to exchange views and information concerning computer education at levels below four-year college programs.

The committee, an outgrowth of an initial exploratory meeting initiated by the Business Equipment Manufacturers Association (BEMA), is concerned with three areas: (1) The preparation of a single, unified set of guidelines setting minimum requirements for edp schools, (2) the fostering of statistical research on manpower in the edp field, and (3) the development and exchange of information on the desired educational background for various entry level positions in computing, keyed to industry's projected needs.

Dr. Bruce Gilchrist, AFIPS' executive director, is chairman of the committee. However, the group does not represent any one organization or vested interest. All major groups with a prime interest in edp education are welcome to join. Participants now include representatives from such organizations as ACM, DPMA, The American Association of Junior Colleges, the three previously mentioned national accrediting bodies, BEMA, the National Commission on Accrediting, the U.S. Office of Education, and The American Vocational Association.

Emphasis at the current time is on preparation of unified guidelines for edp schools. To implement this objective, two subcommittees have been established. One is concentrating on required education standards and related hardware required for hands-on use. These, in turn, will be keyed to "universal" job descriptions and proficiency requirements for entry-level positions with emphasis on business applications programming and computer operations. The second subcommittee will examine existing standards covering business practices and ethical conduct to assure that uniform, realistic standards are required of all schools receiving accreditation.

Achieving uniform standards

Sound, uniform standards for private edp schools, setting forth training requirements based on actual industry needs, represent one of the most constructive steps we can take in the immediate future. There is little likelihood at this time that the schools themselves will form their own association and undertake self-policing. To the contrary, major chains of schools appear to favor outside assistance in the development of educational standards and tests.

Executives of Automation Institute and Electronic Computer Programming Institute (ECPI) have carried this a step further. Leon Cooper, director of Control Data Institute of San Fernando Valley in Los Angeles, endorses the concept of a common set of guidelines.[7] He also recommends that each of the 50 states adopt these guidelines as minimum requirements for edp schools.

Mr. Cooper suggests that new schools be licensed on a conditional basis for a period of at least six months in order to give state authorities the opportunity to evaluate the school's capabilities, performance, and financial resources. Further licensing would follow on a year-to-year basis. Then, once a school has been in operation for two years, Mr. Cooper recommends it be required to apply, and be approved for accreditation, by either NATTS or ACBS. In addition, he suggests periodic on-the-scene management audits of the schools by state representatives.

Addressing the same problem from a different viewpoint, Sidney Davis, president of ECPI, has proposed a uniform, nationwide proficiency examination for all entry-level programmers. Commenting that too many people responsible for hiring cannot be objective in interviewing programmers lacking a college degree, he sees such a test as one objective technique for measuring competence of job applicants regardless of their background. He also recommends that the examination be developed by a representative group of manufacturers, users, employers, and educators and that it be administered by an independent body.

The over-all view

One of the most serious problems facing the properly managed, ethical schools is acceptance by industry and business of their programming graduates. Here, a reappraisal may be required.

Is it critical that all entry level business applications programmers have a college degree? If the answer is "no," but we are not satisfied with edp school graduates, what must the schools do to rectify the problem? Can they conceivably do it with present curricula and resources? And, equally important, what do we believe our minimum requirements will be three to five years from now?

Weeding out the poor schools is only part of the problem. If we give tacit approval to the better schools, encourage them to improve their standards and adopt recognized accreditation but then turn their better graduates away as a matter of policy we will have committed a disservice to our profession.

Certainly there is a need to weed out the disreputable schools. The flagrant abuses of a few and the inadequate training provided by others is damaging all concerned.

A recent survey conducted by AFIPS and the National Better Business Bureau indicates that the public is not content. Of 57 urban areas surveyed, 11 reported serious public dissatisfaction with private edp schools—although in a number of cases a relative-

5. "Policy Statement: Guidelines for Data Processing Schools", Association for Computing Machinery, New York, May 1969.

6. "Guidelines for the Operation of Private Data Processing Educational Institutions", Data Processing Management Association, Park Ridge, Illinois, 1969.

7. "Private EDP Schools: The Positive Picture", Data Processing Digest, Los Angeles, California, February 1970.

ly few schools were believed responsible. However, when specific questions were asked, most areas reported some serious problems. Among the most prevalent complaints were: misleading advertising, admission of unqualified students, financial instability, inadequate tuition refund policies, inadequate training, and graduates unable to find employment in positions they were trained for.

On the other side of the coin, there are strong indications that the better schools can be of considerable assistance to helping to meet edp manpower needs. However, each school, even those belonging to major chains, must be evaluated individually. There are no present yardsticks, including accreditation, which can be substituted for our own objective analysis and judgment.

Recent information and data provided by two diverse edp training programs in Los Angeles give an indication of positive results that can be accomplished. These are The Control Data Institute schools in the Los Angeles area and that city's Urban League Data Processing Training Center.

According to Leon Cooper of The San Fernando Valley Control Data Institute, his school shows a cumulative placement record of over 90%. This covers 317 students graduated since the school's formation in 1966. Reported figures for 1969 indicated 110 placements for 120 available graduates. While we lack figures on total enrollment and enrollment by type of course, Mr. Cooper provided some data on cumulative placements: 121 graduates have been placed as systems analysts, programmers, and junior programmers. This is, of course, but one school in a particular geographic area. Data provided by Mr. Cooper on the five Control Data Institutes in the Los Angeles area provides a student profile which may or may not be typical of other urban areas. For example, reported data on over 400 students indicate that about 70% already had previous education or training beyond high school. A considerable number indicated some college education or training while in the military.

The Urban League program presents an entirely different concept. Thus far, it has established a success story which deserves careful consideration as a measure of what can be accomplished through rigorous training methods.

The Data Processing Training Center was established in September, 1968, to undertake a program directed to individuals of all races who are unemployed or underemployed but who possess the necessary aptitude and who are willing to adhere to the center's demanding training schedule.

The center currently offers a four-week course in keypunching, a six-week course in computer operations and a 12-week course in COBOL programming. Screening is selective and hours are long. Only 10% of those who apply and are tested meet entrance requirements.

By February of this year, according to data provided by the center, 88% of all graduates had been placed, many with top companies. Of these 165 graduates, all were hired for the job they were trained for. In programming, excluding a class recently graduated, placement runs well over 90%. Of 34 programmers placed, 32 have been successful as programmers, one has gone into an unrelated business on his own, and one was terminated because of poor attendance.

It is apparent that private edp training does have the potential to help meet many of our needs. However, we need higher standards, sound accreditation as opposed to regimentation, a certain measure of state control, some measurements of proficiency, and increased dialogue among industry, business, the professional groups, and the schools themselves.

Many thousands of individuals are currently looking into these schools and selecting one for enrollment. We all have a responsibility to foster sound, realistic education at this level. At a minimum, industry and business, together with professional groups, can take constructive action at the local, state, and national levels to promote the exchange of information and ideas leading to improved standards. In view of our current manpower shortages, it would also serve a less than purely altruistic purpose.

At the local level, computer oganizations and major employers of edp personnel can play an important role. In addition to liaison with edp schools, such efforts might include active cooperation with Better Business Bureaus, Chambers of Commerce, local chapters of professional societies, educational and guidance organizations, state employment service offices, and similar groups.

Summing up

The computer field is in a critical period and this is nowhere more evident than in current manpower needs. However, these needs must be realistically defined and constructive efforts taken to meet them. While we are in very real need of additional trained personnel, we have an enormous responsibility to make sure that the right people are trained for the right jobs, and that these jobs reflect our best estimates of the future needs.

We should all be reminded of Victor Borge's comments on his distant relative who invented the cure for which there was no disease, but who unfortunately later caught the cure and died. We, too, must exercise extreme caution that we do not propose long-term solutions for which there will be no problem. ■

Mr. White is director, public information and educational services, for the American Federation of Information Processing Societies. He was previously public relations director for Mutch Haberman Joyce, Inc., and has also been with the M. W. Kellogg Co., a division of Pullman Inc. He is a graduate chemical engineer.

The development of "building blocks" lists offers a pragmatic approach to the training of PL/I programmers

Learning to use PL/I

by Eldon H. Remy

A programmer creates programs that perform tasks useful in a subject area outside the computer field. He acquires and maintains knowledge of PL/I for the purpose of making himself more productive in that subject area.

Because of the scope and flexibility of PL I, a programmer can spend a great deal of time learning how to use the language and staying current on PL I developments and techniques. If he has convenient access to a specialist in PL/I for help with unusual programming problems, his training needs are greatly reduced. He does not need the extensive training necessary for becoming totally self-sufficient with the language. Only those PL/I facilities (statements, attributes, options, etc.) used in programs of his application area (business, engineering, information retrieval, statistics, etc.) need appear in his programming course. The topics needed for an application area normally account for a small portion of the PL/I language. This minimizes the time and effort required to become and remain an *effective* PL/I programmer.

The role of the specialist

During the three years that PL/I has been used at the Kodak Park Div. of the Eastman Kodak Co., over 500 people have been trained in PL/I. The specialist-programmer concept has played an important role in making this many programmers effective and reasonably efficient users of the computer. The following list shows the typical responsibilities of a specialist. If an organization has two or more specialists they would share the responsibilities.

1. Answer questions and give advice on PL I.
2. Diagnose difficult debugging problems and identify software problems.
3. In addition to knowing how PL I works, have knowledge of what PL I features function best for certain programming tasks.
4. Have knowledge of changes to the language and compiler. Analyze new features and techniques for value in the organization.
5. Develop or assist in the development of PL I techniques needed in the organization.
6. Keep programmers informed on new PL/I subjects and techniques appropriate to their application areas.
7. Play a major role in training. Continually update the contents of the PL/I programming course based upon his consulting experiences. This might occur after consultation with lead programmers.

The activities of the specialist, or specialists, focus the PL I knowledge and experience of the organization on one or several persons who can quickly coordinate and apply the accumulation of such knowledge. This situation has much value because PL I problems, special needs, etc., have a strong tendency to recur in other programs and application areas. The number of specialists and the portion of their time spent on specialist activities vary with characteristics of the organization, such as competence of personnel, amount of PL I activity, diversity of PL I applications, turnover of personnel, etc.

Beginners need direction

Many programming courses consist of the instructor teaching a computer language. The instructor assumes that if the student learns how the statements or instructions of the language function, he also knows how to combine them to perform the desired application task. Our experience shows this assumption to be incorrect for PL I programmer training. The scope and flexibility of the language present so many choices to the beginner that he flounders in indecision. As a beginner, he lacks the experience and knowledge of the compiler necessary to make good choices between alternative PL I facilities. When a programmer trained only in the statements and syntax of the language writes his first program, he tends to build a program around the statements he best remembers. Many times the program consists of the PL I language facilities that caught his fancy or the ones that consumed the most class time. The programmer lacks direction in his choice of PL/I facilities and fits the application to the remembered statements rather than fitting statements to the application.

The programmer's need for more direction in the

selection of PL/I facilities, and the availability of a specialist for assistance with unusual programming problems, play important roles in planning the content of the programming course.

A programming course pertains to a specified application area such as business, engineering, information retrieval, or statistics. This has many advantages because of the interchange between students, the appropriateness of practice problems and examples, and the relevance of topics being discussed. Only those parts of the language used in the application area appear in the course.

Because of PL/I's numerous facilities, an adequate determination of the PL/I needs within an application area requires an organized approach. One approach, called the "building block approach," gives excellent results.

The building block approach creates a list of the components or building blocks found in the programs of an application area. These language-independent topics would appear in a program regardless of the programming language used. The knowledge of PL/I necessary to program the building blocks specifies the PL/I information needed in the course.

To develop a list of building blocks for an application area, a number of existing programs are scanned. The scanner describes the purpose of each part of a program in language-independent terms. The scanning of programs reveals the repetition of certain language-independent topics. The topics that keep reappearing in the scanning of more programs make up the list of building blocks for that application area.

Sample building blocks

A list of building blocks developed for general business applications appears below for illustrative purposes.

1. Organization and specification of data and/or data records.
2. Reading control cards (Fig. 1).
3. Reading files of proven reliability.
4. Reading files of unproven reliability (Fig. 2).
5. Processing data.
   Decision making
   Updating master files
   Expression evaluation: algorithm processing

SAMPLE BUILDING BLOCK FOR READER CONTROL CARDS
(Assuming The IBM F-Level Compiler)

A technique used for reading control cards should meet the following requirements.

1. Convenient format for control cards. 2. Freedom to omit items from control cards if a default value is desired. 3. Documentation of the values read from the control cards.

A data-directed GET statement with the COPY option satisfies these requirements. Variables eligible to receive values from control cards are initialized to default values prior to the execution of the GET statement.

The example at the right illustrates the statements associated with reading control cards.

The control cards for the program represented might look as follows:

First Card: OPTION_A='YES'
Second Card: ITERATIONS=100

After reading the control cards, control passes to the statement labeled PROCESS. CELL_SIZE remains at its default value of .05.

```
SAMPLE:
    PROC OPTIONS (MAIN);
    DCL ITERATIONS INITIAL (50);
    DCL CELL_SIZE INITIAL (.05);
    DCL OPTION_A CHAR (3) INITIAL ('NO');
    ON UNDEFINEDFILE (CONTROL)
      GO TO PROCESS;
    ON ENDFILE (CONTROL) GO TO PROCESS
    GET FILE (CONTROL) DATA (ITERATIONS,
      CELL_SIZE, OPTION_A) COPY;
PROCESS:
                .
                .
                .
        IF OPTION_A='YES' THEN GO TO S12;
                .
                .
                .
S12:
                .
                .
                .
  END SAMPLE;
```

Fig. 1

Data movement and selection
Iterative processing (looping)

6. File control.
7. Use of a group of statements from several points in the program.
8. Use of separately produced portions of a program (subroutines).
9. Sorting.
10. Summarization or totalling.
11. Report writing.
12. Items to be used while testing.
13. Documentation internal to the program.
14. Handling error situations.
15. Segmenting a program to permit overlaying (severe core storage requirements).

This list differs from the list of building blocks for other application areas. An area with a large investment in FORTRAN subroutines will have a building block for adhering to the linkage conventions. An area that computerizes accounting machine functions may have blocks such as sort, collate, tabulate, and list. A statistical applications group will have blocks for the matrix operations of inverse, transpose, and multiplication.

The selection of the PL/I facilities and techniques for programming each building block specifies the PL/I information needed in the programming course for that application area. The selection of facilities should not function as legislation but rather as direction for the programmer, i.e., the method most often used. His continuing education in PL/I (specialist-sponsored seminars, advanced courses, self-study, etc.) and assistance from the specialist will determine where other PL/I methods will better serve the needs of his program. This makes the full capabilities of the language available when needed; thus, exploiting an important advantage of PL/I (broad capabilities). Because of their knowledge of specific programming functions, programmers trained by the building block approach have little difficulty in identifying a function they do not know. In such cases they seek the advice of a specialist.

Although several application areas may have building blocks in common, they do not necessarily use the same PL/I facilities. In a data specification block for example, a highly calculations-oriented application such as engineering may rely heavily on variables with the attribute FLOAT. An application area which must control the number of decimal positions participating in a calculation may use FIXED DECIMAL variables.

The selection of PL/I facilities and techniques for a building block has two steps. The first consists of study and analysis to provisionally select the PL/I

SAMPLE BUILDING BLOCK FOR READING DATA CARDS
(Assuming The IBM F-Level Compiler)

A building block for reading data cards with a preponderance of arithmetic fields should have the following capabilities.

1. Regain program control after a conversion error. **2.** Identify the cards causing errors for later correction. **3.** Handle more than one type of card format.

A GET statement places the card image into a character string. After interrogating the format code, the appropriate GET STRING statement converts the values and assigns them to the variables in the data list. A conversion on-unit, having the scope of only the GET STRING statement, gains control after a conversion error and facilitates the off-line correction of cards.

The example at the right illustrates the statements associated with reading data cards.

```
     DCL IDENT CHAR (9);
     DCL CARD_COUNT FIXED BINARY
       INITIAL (0);
     DCL DATA_CARD CHAR (80);
     DCL COL_21 CHAR (1) DEFINED
       DATA_CARD POS (21);
S1:  CARD_COUNT=CARD_COUNT+1
     GET FILE (SYSIN) EDIT
       (DATA_CARD) (A(80));
     IF COL_21='4' THEN; ELSE GO TO
       OTHER_FORMAT;
     ON CONVERSION BEGIN;
          PUT FILE (SYSPRINT) EDIT
                ('CONV ERROR ON CARD'
                 CARD_COUNT, DATA_CARD)
               (SKIP, A(18), F(5) X(70), A(80));
          GO TO S1;
          END;
     GET STRING (DATA_CARD) EDIT (FIELD_A,
       FIELD_B, IDENT, FIELD_D)
         (2 F(10), A(9), F(8));
     ON CONVERSION SYSTEM;
```

Fig. 2

techniques for each building block. The second consists of a trial period with live programs to verify the selection. The selections are guided by the following criteria.

Needed facility. A selected PL/I facility must provide a capability needed in programming the building block. For example, knowledge of IBM's F-level compiler suggests a need for fixed binary variables as subscripts and as simple counters such as loop controls. In both cases, the variables have integer values so noninteger fixed binary precision does not appear in the course. This eliminates the teaching of an unnecessary topic, but more important, programmers avoid the pitfalls of noninteger fixed binary operations.

Broadest use. If more than one facility performs the same function within a building block, the one with the fewer restrictions will give the best results. Few restrictions makes the facility easier to use and reduces the need for consulting a specialist.

Some facilities have capabilities needed in more than one building block. The selection of facilities with the broadest use, both within a building block and across building blocks, reduces the over-all number of PL/I facilities needed. For example, the format flexibility in reading data cards with a preponderance of arithmetic fields could lead to the selection of edit-directed I/O for that block. Its usefulness in report writing would enhance the selection.

Effect on facilities for other building blocks. The progression from one building block to another for the selection of PL/I facilities and techniques points out the interrelationship between the blocks and the facilities they use. The total collection of PL/I facilities for all the building blocks must logically stand as a coordinated subset of the language.

"Mirror, mirror on the wall, who has the most formidable image of them all?"

Consider, for example, the need for the execution of a set of statements from several points in a program and also the need for the specification of the size of an array after the program starts execution. If the execution of the statements were best done by using an internal procedure, the same facility becomes a logical choice for specifying the size of arrays during program execution. If two GO TO statements and a label variable best meet the first need, the flexibility of the ALLOCATE statement might bring about its selection for the second need, thus, eliminating completely the use of internal procedures.

Ease of learning and ease of using. The evaluation of a facility and technique with regard to this criterion depends greatly upon the trial period with live programs. The amount of consulting and the number of problems arising from the building block determine the desirability of the technique being considered.

Efficiency. If a PL/I facility is implemented in such a way that it performs much less efficiently than an alternative facility, then efficiency warrants consideration in the selection. Generally, the technique selected by the other listed criteria consists of the simpler and more straightforward facilities. Such facilities usually result in efficient methods. A specialist, with his greater knowledge of the compiler, should examine programs with unusually severe efficiency requirements for possible improvements in performance.

Efficiency and knowledge of the compiler plays an important part in the previously mentioned comparison of the two GO TO statements to the calling of an internal procedure.

Attractiveness. The attractiveness of PL/I, especially to the experienced programmer reluctant to change languages, may affect the success of the training program. For this reason, attractiveness may take priority over the first criterion (needed facility).

Programmers with engineering or statistical applications usually like the zero subscript and array operations. Business applications programmers appreciate the LIKE attribute.

Testing and improving

The PL/I facilities and techniques provisionally selected for each building block are subjected to a trial period. Programs developed during the trial period make use of the selected facilities and techniques. Programmers and specialists work together in evaluating the results. A great diversity in programs and programmers adds to the effectiveness of the trial period. If the technique proves difficult to use, or many restrictions to its use exist, or other reasons cause extraneous consultation, the specialist researches another technique for that building block. The techniques must do more than work properly in a laboratory environment. They must withstand the test of mass usage.

The PL/I experience of an organization will increase with time along with its desires for sophistica-

tion and improvements in techniques. Changes in the compiler occur periodically and application needs are changeable. Therefore, the process of selecting PL/I facilities and techniques has an evolutionary and unending nature. The key person in the evolutionary process, the specialist, continually strives to reduce the amount of consulting by improving the techniques taught the programmers. Specialists must feed back into the training program their experiences on new techniques, the weak points of newly trained programmers, etc. *The validity of the PL/I training curriculum and its responsiveness to changing needs depends upon this feedback of information.*

Content of programming course

For students with prior programming experience, especially in statement level languages, the building block approach makes learning to program in PL/I easier because it permits them to relate PL/I programming to their previous experience.

Beginning programmers require much more instruction to bring them to the same level of PL/I programming competence as the students with prior experience. The novices must be taught what the experienced programmers already know. The knowledge that experienced programmers have in common cannot be knowledge of a language per se for they are not necessarily acquainted with a common language. Part of this background pertains to flowcharting, documentation, and the other universally accepted techniques a good programmer uses. A larger share of the differences in backgrounds deals with the language-independent concepts of building blocks and how building blocks go together to make a program. The comprehension of these concepts, some as basic as the concepts of the stored program, permits the student to understand the methods and techniques of programming. Beginning programmers usually lack this knowledge. Building blocks, therefore, make a worthwhile subject for study in themselves.

Programmers must understand the concepts behind looping, data auditing, subroutines, and the other program components. If there is a sort building block in the programmer's application area, he must know why. He must recognize situations that require sorting and know how it affects program design. The teaching of language syntax to students without knowledge of the language-independent concepts to which it relates invites confusion and poor student performance. For example, a student's exposure to the idea of looping should not begin with the syntactical form of the DO statement.

The knowledge of building blocks permits the programmer to design a program by selecting the needed building blocks, combining them into a program, and flowcharting it at the building block level.

The value of the building block concept, however, lies mainly in analyzing what a programmer should know upon completion of the programming course. The process of gradually developing students to the point of successful completion of the course also demands analysis. Every concept, idea, and item of information necessary for the understanding of the topics being discussed becomes a potential stumbling block to the student.

The testing of students during a course reveals that the learning process requires experience from many practice exercises. The students can develop skills in debugging only by running problems on the computer. For this reason, as many of the practice problems as possible are run on the computer. As the practice problems for computer debugging become more difficult, the instructor presents more PL/I debugging techniques. For example, the ideal time for presenting the SUBSCRIPTRANGE prefix comes when the students are debugging a program that uses arrays. The elements of any building block, the debugging or testing building block for example, are taught at the most appropriate times and not necessarily as a building block unit.

Running programs on a computer requires Job Control Language. The instructor can provide each student with the prepunched cards necessary to run the practice problems. If the students will need knowledge of JCL in the future and have no other opportunities to learn it, the programming instructor can add selected JCL topics to his course outline.

Summary

A programmer develops programs for the purpose of doing useful work outside the computer field. He obtains knowledge within the computer field for the purpose of maintaining his productivity in his field of application. The availability of a specialist relieves the programmer of being totally self-sufficient with PL/I. This greatly reduces his need for PL/I knowledge.

To determine the PL/I needs for programmers within an application area, one constructs a list of the typical components or building blocks that exist in the programs of the application area. The knowledge of PL/I necessary to program the building blocks indicates the PL/I information needed in the course.

Beginning programmers must receive training in the basic concepts of programming in addition to the selected PL/I facilities. The study of building blocks as language-independent topics provides a method for presenting this material.

An awareness of potential stumbling blocks to the learning process, numerous practice exercises, and machine debugging experience are necessary for producing effective programmers. ■

Mr. Remy has been with the Kodak Park Div. of the Eastman Kodak Co. since 1960 during which time he has had assignments in a variety of areas within the computer field. In 1966 he coordinated Eastman Kodak's participation in IBM's field test of the F-Level PL/I compiler. He graduated from Ohio University where he majored in geology and mathematics.

System/3 was a new adventure for IBM's education planners, faced with explaining the wonders of edp to small businessmen

S/3 Training

by Gustave H. Rathe, Jr.

Announced in IBM's new marketing environment, System/3 professional education courses are offered for a charge, the first major departure from IBM's previous policy of offering all instruction without charge to users of IBM equipment. (Some courses, such as product and industry seminars, and customer executive seminars on computer concepts, are still offered, by invitation, without charge.)

The education program for System/3 was also the first to be designed with international representation on the design team, and the first to have a fully developed curriculum at the time of product announcement.

The education development group at IBM is made up of two kinds of specialists: the technicians, responsible for understanding the product and the various changes it undergoes during development; and the educators, who plot the actual curriculum. They work with those responsible for developing the product, exchanging ideas and in some cases—System/3 was one—making suggestions for product design changes on the basis of education considerations.

System/3 education presented particular challenges. The system's natural market was primarily the first-time computer user. In earlier courses, even for smaller systems such as the 1130 and the System/360 Model 20, we had always felt able to assume some prior knowledge of the computer on the part of the user.

Not only were the users new, they would be getting relatively advanced equipment, such as disc storage and a relatively large core memory.

We also set ourselves the goal of having a complete System/3 curriculum, planned and integrated in advance, available at product announcement time. We felt that, given the newness of the users to computers, demand for education would begin to grow right after announcement.

The IBM World Trade Corp. took part in development of the curriculum from the very early stages. Representatives of ten European and Asian countries joined the project, to insert overseas requirements directly into design of the course and avoid duplication of effort later. As a result, the identical System/3 course is now being taught in 16 countries—and we consider that the international approach to course design has worked out very well.

Recommendations to improve product design were made, on the basis of experience in teaching earlier small systems, to improve the system's orientation to the user. The suggestions included:

1. Changing the numerical display on the system console from hexadecimal to decimal, thus making it more easily understood by the operator.

2. Designing comprehensive programming capabilities into the RPG II language, so that the typical user would not have to learn assembler techniques.

3. Making the printed interpretation at the top of the 96-column punched card standard, rather than optional as on the 80-column punched card.

An early major step—as in development of all IBM education courses—was development of a series of audience profiles and task analyses. The audience profiles defined and described characteristics of expected typical users—such as age, location, size and type of business, data processing background. The task analyses stated in simple, measurable terms those things the user, at different functional levels, would have to do in relation to the equipment.

Then, from analysis of the expected audience and the tasks, came definition of the customer's education requirements, and decisions on the new program's over-all objectives and on course content to achieve those objectives. This process of analysis was followed for each of the 11 System/3 courses that were established.

Training paths were developed, listing different courses in the curriculum as either optional or recommended for different user functions. (Users are defined by function, rather than position, to make it easier for customers to choose among the courses offered.) For the installation manager, for example, a course in installation control is recommended, while an introduction to System/3, and courses in RPG II programming, are optional. For the programmer, however, the introductory course, a course in System/3 application design, and the RPG II programming courses are all recommended.

Class or home

The System/3 curriculum offers a considerable variety of audio-visual media, to back up the educational objectives. Self-study materials include programmed instruction texts. These can be used at home or office; for an additional charge they can also be used at an IBM study hall, where trained help and other facilities are available to the student.

Films and video tapes are used in conjunction with classroom work. Audio tapes are also available, to be used with the self-study material. These are particularly good for courses that teach manipulative skills, such as use of the data recorder, since they leave both eyes and hands free.

For each course, a decision was made on whether it would be better taught in the classroom or with self-study materials. Some, such as executive classes, are best taught in the classroom. Others, particularly those that require a good deal of drill and practice, lend themselves very well to self-study techniques.

Teaching of RPG II presented special problems: we knew that in a high percentage of cases the students would be completely new to computer operations, yet demand for the course was bound to be high—possibly too high to be accommodated by classroom instruction. The decision was to offer a course of programmed instruction, but precede it by classroom instruction and follow it by classroom and/or workshop activity.

Changing centers

The Basic Systems Centers, now in operation in some 60 major cities across the country, assumed their present form partly in response to System/3 needs.

Over the past few years, IBM support facilities have increasingly been brought to the user. Two cases in point are the Field System Centers, whose functions include that of a clearing house for technical information, and the installation support centers for users of smaller systems. Education facilities, however, remained physically removed from these locations.

In the planning for System/3, with its expected heavy demand for educational services, it became evident that these services would have to be brought much closer to the customer than before. As a result, the Basic Systems Centers, devoted to the smaller IBM systems—System/3; System/360 Model 20; 1130; and punched card equipment—were expanded to include educational services.

These centers, for the first time, house all support facilities under the same roof—including services to which the user can return after his equipment is installed and running.

Educational facilities, classrooms and study halls, are all centrally housed. Most Basic Systems Centers have the full range of audio-visual materials. Workshops are available under the education program: in the programming workshop, for example, students can program problem exercises which they can then process on installed equipment.

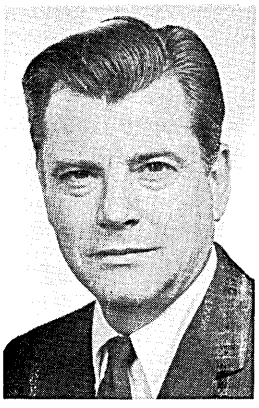
Other support facilities available at the Basic Systems Centers include group workshops, at which small groups of IBM customers can work on installation activities, with the guidance and assistance of computer professionals; pre-installation testing of programs; conversion facilities; and an application service developed specifically for System/3 users to help in the design of major business applications.

In terms of education development, the integrated approach at the Basic Systems Centers provides a rare opportunity to get feedback on the value of the educational program. With education and pre-installation activity conducted under the same roof, we can get a clear indication of just what the customer and his employees have gained from their studies.

Considering these developments, we think that the fees for System/3 courses are reasonable; this is, of course, important since, in a smaller system such as this one, every element of cost could be crucial.

The fee for *System/3 Installation Control for Management,* for example, is $120. *System/3 Application Design,* recommended for both programmers and systems analysts, costs $190. An *RPG II Programming Workshop* costs $200.

The objective behind the Data Processing Division's education activities is the same as it's always been, whether the courses carry a charge or not. This rationale holds that the customer who understands his new equipment, what it can do and how it does it, is in a better position to get a maximum return on his investment—and is therefore a more satisfied customer. ■



Mr. Rathe is director of education for IBM's Data Processing Division. He has been with the company since 1948 and his previous positions there included director of executive development and sales manager for the Federal Systems Division. He has a BS in economics from Loyola Univ.

Learning what the user wants and needs is a business responsibility.

Sales Training

by Charles R. Cole Jr., and Ronald S. Posner

The current economic crunch is partly to blame for the buying apathy among computer users. However, a less recognized but more long-term problem is the "glut" on the market of unusable computer hardware and software systems—unusable due to the vendor's lack of empathy for, and neglect of, his customer's application requirements and problems. IBM's unbundling announcement last year aggravated this situation by encouraging user independence and entry into the market of more underfinanced, understaffed computer companies.

The initial users of computers in the late 50's and early 60's had urgent needs to solve paper jams and improve work flows in such areas as billing, payroll, and inventory accounting. These companies found the vendor (usually IBM) willing and able to work with them to solve their conversion and programming problems. IBM provided their "free" support services to insure a good customer reference base as well as to obtain customer-sponsored software application packages across specific industries, such as insurance, utilities, and banking.

When the System/360 was introduced, buying motives and, thus, vendor-customer orientation shifted. As the computer became a status symbol rather than a problem solver to many users, manufacturers relied less on cost/benefit justifications and more on such vagaries as "total management information systems" and "keeping up with competition's five-year computerization plan" to spread usage around the country. The edp department became the only functional area in the corporation that wasn't treated as a cost center and to which return-on-investment measurements were not applied. Top management was told that computer investments would give them a competitive edge and accrue hidden benefits (never quite defined) for future gains. Management never took the time to investigate what these benefits were, due to the mystique that surrounded the edp function.

However, even during this expansion phase of the middle 60's, vendors took an interest in the customer's applications. Programmers and systems analysts were provided to tailor the user's applications around the general guidelines that had been established and to tie in these applications to the MIS—the panacea for all interrelated corporate reporting and decision-making functions.

The unbundled, cost-conscious 70's

IBM's unbundling changed this rapid but controlled expansion on several fronts. Now, a customer received assistance in the form of education, systems programming, or turnkey application support only by paying by the hour. Faced with the prospect of having to pay for programs and services, items that previously were hidden in the hardware cost, the edp manager tried to put his own technical staff to work in supporting the equipment. Finding his people to be dependent on the vendor, the manager became more receptive to the overtures of inexpensive facilities management outfits and hardware/software firms that offered more "bang for the buck." These small companies, which flourished as a result of unbundling, surrounded IBM equipment with replacement hardware, systems software, and maintenance at less cost. However, the honeymoon enjoyed by these new firms was short, as they did not foresee the down turn in the economy and its effect on the edp manager.

With corporations and institutions finding themselves in a profit squeeze during 1970, the spiraling edp costs have come under close scrutiny as a major profit deterrent. For the first time, top management is taking a close look at why edp costs are so out of line compared to other capital equipment investments. They have been quite surprised to find that hardware and software systems are frequently not relevant to the corporate structure or to the applications area which need attention. As a result, the edp manager (and one or more of his staff) has sometimes been fired for overspending his budget in wrong areas and for building his own empire around inappropriate application areas.

Although a few edp managers were actually incompetent, the majority of them were simply confused and relied on the advice of "expert" computer salesmen, who continually swarmed through their offices. These groups convinced the edp manager that lower cost peripherals and more productive systems software would lower his over-all computing costs and allow him to escape the grasp of IBM. Unfortunately, the salsemen of these small-to-medium firms that proliferated after unbundling frequently didn't take the time to understand the user's problems, and didn't have the technical assistance and maintenance to service the end-user after the sale. Being a one-man marketing department, they had to cover the entire U.S., thus not having time to follow up on existing users.

The small, new firms which opened their doors to get in under the IBM separate pricing services umbrella were typically started by engineers and programmers who felt that they had a better mousetrap. Not being marketeers, they hired fellow engineers or programmers to sell for them or recruited other firms' marginal producers and rejects. (The truly productive salesman rarely changed companies just to be another salesman.) These salesmen, hired by the small firms, were not given any formal training, but were sent out on the road with a canned sales pitch, competitive knock-off points, and IBM's customer list. As a result, all they offered the user was "hot hardware and a handshake."

Sales and marketing training

By neglecting the importance of marketing and by not selling in relation to the customer's utility, these smaller companies and their salesmen have recently found themselves without a customer reference base. Their users are bitter, feeling they were not given a true picture of the firm's capabilities, and prospects are apathetic to new products or services. The sales approaches of these smaller companies have rarely solved the user's problems, but instead compounded them. They have created their own bind by overselling and underselling the industry—a bind that could have been avoided by proper salesman orientation and training. Instead of firing the salesmen for poor performance or for being the harbinger of unhappy users, the root of the problem should have been attacked.

Computer manufacturers and service firms have a responsibiilty that they have not discharged in the training of their salesmen to become more customer oriented. By being trained in the important facets of computer marketing, the management and sales force can learn to be more responsible businessmen.

With the exception of IBM, who can afford to vigorously recruit college graduates and train them for 6-12 months and periodically retrain them, the smaller manufacturers and service groups can only afford to offer a concentrated 1-2 week sales training program. While company and product training should be a part of this program and has an obvious need, sales training is more difficult to present and more ambiguous.

In the user's shoes

Sales and marketing training should strive to differentiate computer companies by the degree of customer orientation among their salesmen and the degree of marketing sensitivity among top management. This cannot be done by lecturing to marketing management and salesmen on how they should improve, but by enabling them, in a case-study framework which simulates the real world, to look at how others market and sell. Courses which stress the "5 Great Rules of Selling" or the "17 Steps to Close and Order" are resented by the attendees. Group case-study discussions and role playing related to actual company products and sales situations—starting with the initial prospect contact through the sale and entire installation cycle of his product or service—allow the salesman to be introspective and re-evaluate his performance versus that of the fictitious case salesman and that of his peers. It's also important that those conducting these workshops have broad marketing and sales management experience, so that the attendees will be able to look to the instructors for guidelines on and what made them successful.

Certain basic topics should be stressed in order to achieve the objectives above:

1. By dissecting why a particular sale is lost by a fictitious fellow salesman, the attendees start to understand the importance of knowing the customer's requirements and application. This case can establish the fact that a computer salesman must sell each and every account three times or he is assured of a loss somewhere along the line: presale before the order is awarded; postsale but preinstallation; and postinstallation. The last area is especially important since 25% of all orders in the computer industry aren't paid.

2. In evaluating an "account profile" of a fictitious salesman's chronology of activity over 4-6 months, the attendees appreciate the importance of proposing the proper system for the customer's requirements and obtaining top management's inputs on the business and its particular problem areas.

3. By playing the role of a prospect who has requested a proposal from his company, the salesman gains an appreciation of user motivations and attitudes. He has to decide what the user feels is important and what should be emphasized in the proposal. This usually shows, in a convincing fashion, that most of the class are "technically centered" and not "customer oriented," and they don't even know it. They start to appreciate the human side of selling in addition to hardware/software trade-offs, price, and other technical features.

4. Finally, by being forced to make decisions, not just as salesmen but at times as if they were manage-

ment, the attendees develop a degree of insight and empathy previously missing but essential to their becoming professional businessmen. This insight is gained by having the salesmen evaluate a weekly activity report of the fictitious salesman.

A by-product of sales training is that management can evaluate a salesman in terms of his performance in front of the customer and his ability to properly represent the company. Management also gains some valuable insights after its first sales training session, such as:

1. 30% of the sales force have been closing 70% of the firm's business.
2. Most of the salesmen have tended to be product centered and not customer oriented, and not interested in meeting the prospect's computing requirements.
3. That the salesmen have been making sales calls at too low a level and have failed to close business because they haven't gotten to the decision makers.
4. That the sales force never had any account strategy plans and have rarely followed up after the machines were installed.

The availability of general sales and marketing training is widespread. Dale Carnegie, Xerox, the AMA, and individual sales "preachers" run institutes and seminars for the general public and for all businesses. This approach is normally aimed at American industry in general, so that the contents and results are not relevant to the problems of the computer industry. The "computer industry" here refers to the manufacturers of computers and peripheral products, software companies, and batch and time-sharing service bureaus.

Resource Computer Corp. has packaged a 3-5 day sales and marketing workshop specifically for the computer industry, using the principles outlined above. We have been successful in conducting these on the premises of the companies, tailoring the marketing education to a computer firm's products and unique sales problems and using instructors who are recognized as successful and authoritative computer salesmen, sales managers, and executives from such computer manufacturers as IBM, CDC and XDS. The client companies can take over the sales workshop after Resource Computer departs and use it for future sales training.

Audio-visuals for follow-up

The initial sales training can focus in and present a company's problem and opportunity areas to a group of salesmen in a central location, usually the home or regional office. However, the remote locations (Canada, overseas, etc.) go unnoticed, and the lack of follow-up training sees the older, professional salesmen drift back to their old habits, and the novice quickly becoming confused and unsure of himself. Also, smaller firms can't afford, in many cases, to take salesmen out of the field for a 1-2 week training session, and others may wish to tailor the training to regional or district sales problems, such as selling to government agencies in Washington, D.C., or to the oil industry in Texas.

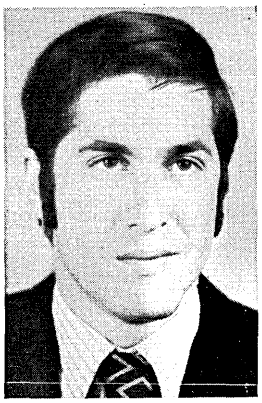
The new technology that has evolved in audio-visual training aids over the last few years allows companies to meet one or more of its specific training objectives remotely and in follow-up. For follow-up purposes, the training sessions can be video-taped for use in their branch offices or at home. IBM and Honeywell edp both have their own video labs for this purpose.

For remote offices and for tailored approaches, slides and films which stress computer sales and marketing training can be used. There are currently some excellent films available on sales training in general, through Dartnell of Chicago. Another aid to sales training is the use of small cassette tape recorders for the home, with the cassette transferable to the car, which will allow a salesman to review his presentation on the way to the sales call.

Conclusion

Computer sales and marketing training is now being implemented by some manufacturers and service firms who realize the marketing problems caused by the lack of the salesman's customer sensitivity and professionalism. Teaching techniques, borrowed from the psychology and business curriculum of universities such as the case method, role-playing, T-groups, and video-assisted instruction, are making this training more meaningful to the marketing professional as well as to the novice. ■

Mr. Cole, one of the founders of Resource Computer Corp. and currently president and chairman of the board, has been involved in executive recruitment, consulting, and sales training for computer manufacturers and service firms. He was formerly vice president of sales at Xerox Data Systems.



Mr. Posner is director of eastern operations for Resource Computer Corp. He previously worked with Xerox Data Systems in various marketing and sales positions. He holds a BS in mathematics from Rensselaer Polytechnic Institute and an MA from Harvard University.

Stop "buying" them, train them ... hard-nosed advice to companies out body-shopping for today's and tomorrow's skills

The People Problem

by J. A. McMurrer and J. R. Parish

Ten years ago there was growing concern among Americans that computers might replace the working man in many situations. Like most fears, this one grew out of unfamiliarity—the inability to identify with the products of this burgeoning industry.

Today, a glance at the help-wanted section of any major newspaper shows how baseless that fear was. In fact, jobs created by the computer industry have, in many areas, become almost too plentiful. Data processing-oriented industries are begging for qualified people, and experts forecast thousands of computer-related job openings during the decade of the 70's.

Why the unfilled openings in this lucrative market?

The key word in today's computer industry talent search is "qualified." The industry demands sophisticated skills from most of its employees. It cannot prosper and grow without these personnel.

Data processing remains an industry in its infancy, an emerging technology, and some areas have grown too rapidly for others to keep pace. The result is the greatest challenge faced by the industry today—a serious shortage of qualified manpower—in effect, a "people problem."

Possibly the most blatant failure of our industry has been its ineffective efforts at communicating with the academic community. Ours is the first major industry in modern history to develop with only limited support from colleges and universities. When an emerging industry needed skilled specialists in the past, it made that need known and the academic sector responded.

But the computer industry has never clearly indicated its growing personnel requirements to the academic community. The result of this inaction has been that most colleges and universities still have not initiated degree programs leading to data processing careers. Those who do offer computer training frequently give the curriculum a scientific orientation, thus ignoring many of the additional skills needed by our industry.

As a result, we conclude that only token assistance will come from the universities in the near future and that the solution must come from within our own industry.

Body shopping

In searching for the solution to our manpower problem, we must be aware of existing practices working to the detriment of personnel objectives.

An obvious problem is the industry's common policy of hiring only experienced personnel. Rarely training the programmer or specialist needed to meet a predictable requirement, edp managers more often turn to the open market. They "buy" an individual whose resume reflects the needed qualifications. These managers have become "headhunters" to such a degree that 50,000 technical positions are open in the industry today.

Why this swing to buying, rather than training, the programmers and others needed to solve our people problem?

Some typical answers are:

1. We inherited the problem, we didn't create it.
2. We are so busy solving problems that we don't have the time to find and train new people.
3. We'd rather not invest in more than the necessary initial training.
4. We have learned that when employees reach a respectable level of knowledge they will be lured away by a competitor.
5. It's difficult to schedule an acceptable training curriculum from the list of courses offered by computer manufacturers.
6. The high cost of thoroughly training personnel often places a "luxury" tag on these efforts.

These philosophies deserve close scrutiny lest they be allowed as excuses to continue buying employees.

The "live one day at a time" philosophy has no

more place in the computer industry than in any other professional activity. The manager must look to the future, for the good of his organization and his staff, and in the interest of his own career.

Many managers overlook the sound, long-range answer in favor of a short-range solution. Inexperienced personnel *can* be made productive within a realistic period of time. A quality training program can be designed to meet the requirements of any data processing environment. The courses needed may vary in length. Costs will vary, depending on the approach taken in designing the program, i.e., site selected, strength of internal education, degree to which standard manufacturing courses apply, contractual services required, amount of computer time available.

The important point is that qualified people *can* be created in a reasonable period of time through proper initiative and investment in training. Honeywell regularly conducts programs for its own entry level personnel, and through the years has found them as productive as experienced employees bought in the marketplace.

The philosophy which asks, "Why train a man well and propel him into an ex-employee status?" denotes weak management. Industrial psychologists tell us that money runs far behind achievement, responsibility, recognition, and growth potential as the dominating factor in employee motivation. Perhaps we should listen to those experts and respond accordingly.

The edp manager faced with buying back an employee to keep him in the organization, after the individual has attained an advanced level of training, is in an unfortunate position. The manager who wisely helps his people to grow through training escapes this dilemma. A satisfied employee can seldom be bought by another company with the standard 10% to 15% salary increase.

"The first quarter figures are in, Mr. Floyd. 749 years of bad luck."

Excuses, excuses

The cry, "The manufacturer is to blame for my education problems. His schedules won't allow comprehensive training in a reasonable length of time," is not a valid one. We have seldom seen a legitimate case of a manager foiled in his attempt to train an employee because of the manufacturer's schedule. When a manager exerts a reasonable effort in terms of flexibility of his own schedule and in travel policies, it is a good bet that his education requests will be met.

The "My gosh, do you realize what it costs me to send one man to a two-week course in . . . " philosophy is a shortsighted one. The true expense is the cost of having an inadequately trained employee in your computer room.

We believe that the potential of the computer has not yet been measured. Its ability to simulate the marketplace, to control inventory, load the factory, forecast sales, and generally help to advance a company is widely acclaimed. We buy or lease it for hundreds of thousands or even millions of dollars. It seems a paradox that we won't invest the final few thousands necessary to properly educate computer people to the level required for reaping dividends from computer dollars.

We feel that the industry must address itself to this problem. By 1972, experts tell us, a quarter of a million more computer-knowledgeable people will be needed. And a large segment of the industry's present work force needs upgrading.

The data processing industry needs a massive injection of new people if it is to grow at predicted rates. We need to mount a unified campaign designed to attract qualified employees. We must sell our industry to qualified people seeking a career. At the same time, we must tear away the shrouds of mystery which, in the eyes of the public, surround computers and the industry.

We would like to believe that the public recognizes that computers are ingenious tools requiring imagination and intelligence for their use. Young people who enter the edp field are often discouraged by the seemingly cold, structured, and passive role played by employees in the industry. These highly motivated people, badly needed by our industry, are too often rejecting edp as a career.

Computer involvement can represent unexcelled career satisfaction. It is a paradox that our industry, having so much to offer, is attracting so few young people.

One solution

Honeywell has addressed itself to the people problem by initiating The Honeywell Institute of Information Sciences (HIIS), tuition-based programs in undergraduate and postgraduate computer education. Students who have completed high school, and those who have limited college training, are admitted to a

nine-month undergraduate program. This course, conducted part-time during mornings or evenings, includes 475 hours of laboratory work, lectures, and case studies. Undergraduate tuition is $1,750. Graduate students pay $1,850 for 12 weeks (480 hours) of concentrated study. Both groups are allowed ample "hands-on" contact with computer equipment.

Entry into either program is conditional upon satisfactory completion of aptitude testing, the same testing which Honeywell uses in selecting its own personnel. This intensive screening has resulted in industry's ready acceptance of graduates of these courses.

The classroom training which Honeywell provides is only a part of this total effort. Equally important is the advertising and promotional campaign which it has mounted. More than 200,000 college students have been exposed to the career potential of computer-related work. This is being done through advertising, direct mail, and personal visits to the campus.

Results have been gratifying. The campaign has ferreted out misconceptions and apprehensions concerning computers and the industry's career fields. Students who might have ruled out edp because of their liberal arts or business administration backgrounds are finding that computers are based in diverse areas of application. The popular idea that mathematical wizardry is required for computer-related work is being debunked.

Honeywell's education programs are examples of what a manufacturer can do to help solve the industry's people problem. Much more, however, is needed. M. A. Longsworth, Jr., a Honeywell executive, recently published an open letter to edp management which emphasized this need. He wrote, "People. That's the problem. Too few people with too little of our industry's resources dedicated to educating them in the effective use of computers." The message is clear. Other manufacturers must advance similar programs. They must present these programs to the public, and they must recruit and train individuals to fill positions throughout our industry.

Some suggestions

Computer users must also take part in this industry campaign. Buying employees must give way to training them. The employee merry-go-round must be stopped. Edp managers must discard disproven manpower philosophies and begin to apply sound management techniques to personnel problems.

Opportunities to train existing employees must be seized. This action will guarantee a productive employee whose knowledge will exceed job requirements. It will provide a challenge, which may be the missing ingredient in an otherwise satisfactory position. It will insure a constant flow of ideas, the vital force of any effective computer operation.

A program designed to provide professional growth should be integrated with formal training. Staff members should be allowed to represent your company in professional societies. Encourage employees to use and contribute to your manufacturer's user group resources. Provide a library and applicable textbooks and absorb the cost of appropriate periodicals.

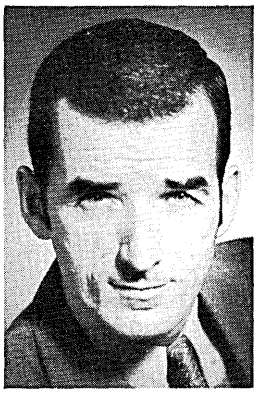
Career patterns and goals for individuals should be developed and assistance in meeting objectives provided. A useful step toward management responsibility might be the assignment of a junior man for counseling and professional guidance purposes. In any environment, an individual's self-esteem can be enhanced by having him instruct fellow employees in subjects in which he has proven capability.

Be aware of future personnel needs. Your present employees will, and, if they sense inaction on your part, their resumes may soon dot the marketplace.

Determine to have one or more trainees in your department at all times. Seek these people within your company. Choose the individual who may be getting stale in his present situation, yet exhibits edp aptitude. Often, after a concentrated training effort, you will have an employee who is excited by the challenges of edp. Incidentally, he may display a degree of loyalty to you and your company unavailable in the experienced fellow you may be tempted to buy from external sources.

Do these recommendations sound expensive? They are aimed at establishing greater stability within your operation and within the industry, and are well worth their cost. A modest reduction of 25% in employee procurement costs would provide sufficient funding.

The challenge to our industry is great and it is immediate. Only through the efforts of both the manufacturer and the user can the challenge of our industry's people problem be successfully met. ■



Mr. McMurrer is manager of marketing support, Honeywell Institute of Information Sciences. He was previously manager of systems and education for Honeywell in Cincinnati. He holds a BS in economics from Boston College.

Mr. Parish is manager of education services in Honeywell's edp division and is responsible for planning and operations at the Honeywell Institute of Information Sciences. He previously served as the division's east central region education manager. He has a BS in mathematics from Michigan State University.

There is surely no more vital skill a manager can have than a firm grasp of how to read a resume, especially between the lines

Resume Reading

by Sylmar Van Nuys

One practical skill that most management training courses and self-help books seem to ignore is the art of resume-reading. That's right, resume-*reading*. There are plenty of aids to resume-writing, lots of do-it-yourself resume kits to start the eager job-hunter on the route to employment Nirvana. But, darn it, no one tells the poor benighted manager how to *read* what the applicant wrote. In some companies there are professional resume readers who screen very carefully what is submitted to them. There the manager has some of the burden lifted from his shoulders. Those professionals guard their art jealously, though. After all, they need jobs too. Many of us operate in organizations that can't afford such luxuries, and even in those that do the arcane jargon in a skillfully written resume may tax the professional beyond his capacity.

Therefore, in the interests of an enlightened management, I have put together this brief guide to How to Read a Resume. It is intended to help the reader cut through to the heart of the matter, to identify the people he won't want to interview and those he will. (Remember in this latter regard that some of the most entertaining people to talk to are the ones nobody would hire in a million years, so if circumstances permit, plan to talk to a few nuts now and then. It's a harmless diversion that serves to remind us that there is another world beyond that inhabited by those dull, competent people everyone would rather rely on.)

Obviously this treatise should someday be supplemented by a companion monograph entitled "How to Listen to a Reference." The author plans a definitive work on that topic.

What is a resume?

As preparation for reading resumes it is important to understand what a resume is, and what is its intended purpose. A resume is a summary of vital data and accomplishments. Since it is composed by someone who is using it to obtain a highly desired goal, it may be assumed to place its subject in the most favorable possible light. Resumes are written only by people who are in excellent health. To be effective a resume must command your attention ("Mortimer J. Bitwhacker—Scholar, Poet, Programmer Extraordinaire") and excite your interest ("Authored Bung's Algorithm for determination of optimum allocation of table functions in a restricted processor, CACM 5:4 (April, 1963) . . ."). To be successful it must stimulate an interview, or at least a telephone call ("Unless I receive by July 14 at least one phone call indicating interest, I am planning self-immolation the following day on the steps of the IBM Regional Headquarters.") Every computer professional knows how to prepare a resume. It is not an innate ability, however, but one learned through practice, which may be the reason *why* every computer professional knows how to do it. Think about it.

Resumes come in all sorts of shapes and lengths. Some of the more effective resumes are couched in letter form ("You may not recognize my name, Mr. Hammond, but you will recognize the name of the company by whom I am now employed . . ."). More common is the outline form peculiar to the *genre*. In a resume neatness counts, and so does grammatical and spelling ability. A tattered, smudged and ungrammatical resume should receive all the loving care accorded an empty beer can.

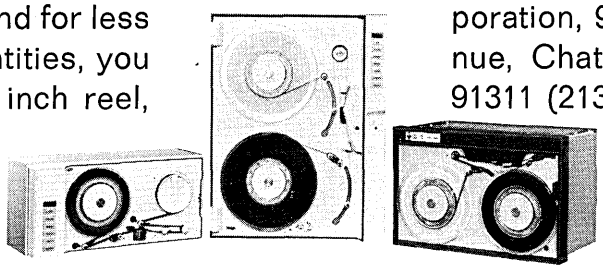
However it is presented, the important area of a resume appears *between* the lines. Only here is found the real reason a person is looking, and the clues to his personality and capabilities. It is important to be able to identify the major types and subtypes through resume analysis, to sort the wheat from the chaff. What follows is a summary guide to resume analysis, with concentration on the pathology of the field.

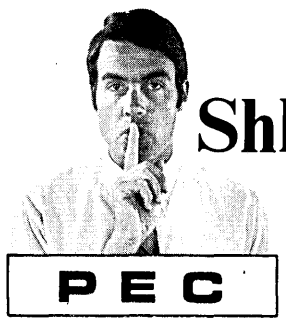
Rightly or wrongly, managers are usually a little bit suspicious of the guy who is in trouble. It may be his

Pssst... don't tell the big guys

But PEC's digital mag tape transports cost less than theirs. And work better.

A lot less. For only $3000 in OEM quantities, you can buy a PEC 10½ inch reel, NRZI synchronous transport. 7 or 9-track with speeds of 25, 18.75, or 12.5ips, and densities of 200, 556, or 800cpi. Or maybe your system needs 1600cpi. Just $3740, in the same OEM quantities. And for less than $2000 in quantities, you can buy a PEC 7 inch reel, NRZI transport. Compare that to the big guys' prices. And PEC transports work a lot better and are built to last longer. With simple and dependable features that give you data reliability. Year after year. For information, just write to Peripheral Equipment Corporation, 9600 Irondale Avenue, Chatsworth, California 91311 (213) 882-0030.





Shhhh...

PEC

CIRCLE 84 ON READER CARD

fault or the organization's. If it is his, he may be a chronic bad actor, or just mismatched in his present position. And if he is mismatched, it may be that he perceives himself differently than the rest of the world—meaning that he will never see himself the way you will view him. Let's start by diagnosing this very common circumstance.

Either in the resume itself or in the accompanying letter, you find reference to a need to make a move by a certain date. ("I am under some pressure to make this important career decision by May 15, although I recognize, of course, that such moves should not be decided lightly. . . .") Unless there are personal factors involved (there rarely are) it will almost invariably happen that the date in question will be exactly two weeks in advance of a significant project deadline. By coincidence, this deadline will call for our hero to complete his design document (or finish checkout of his subsystem or deliver his final test results) and, investigation will probably reveal, he has spent so much time on the market (ponies) (ladies) (dogs) (want ads) that the job didn't get done.

Or . . .

"My present position is highly sensitive. For this reason I respectfully request that you do not contact my present employer at this time. I will be pleased, of course, to supply additional references should our conversations warrant at a later date."

That's obvious. This guy is so close to being fired that he will do almost anything to grab a toehold before he gives his boss the final excuse to can him. His resume doesn't offer a clue as to *why* he is in trouble. Maybe the boss is a schnook, or he is incompetent, or the project is impossible. Interview this one, but find out exactly why the cloak and dagger act.

Or . . .

"In my current assignment I am responsible for interpreting current technology and methodology as applied to the future requirements of the organization."

The guy who writes that will, as an observed statistical fact, have held his "current assignment" an average of 1.7 months, and unless he takes some initiative of his own, will be unemployed after an average of 3.2 months. In other words he has been removed from the line for whatever reason, and is on his way out. Once again, he may be a valuable citizen but not in the eyes of his present employer.

Or . . .

"Although I am presently in marketing, I have been giving serious consideration recently to returning to more technically-oriented activity."

That's too easy. He just turned out to be a lousy salesman. Probably he will be all right as soon as he gets behind a coding sheet again. But—

"Seeks opportunity in marketing or other sales-related activity."

Now, that's a different matter. A technical person to start with, he has decided (1) the big money's in sales, or (2) he's never going to make it in the technical field and sales is the way out. It may be. Take a look, but don't be surprised if the same inability to assess his desires and capabilities originally, when he thought he was a technical person, manifest themselves now, when he thinks he might be a salesman. When someone is operating out of his field it is usually because of a bad decision *he* made, not because circumstances forced him into it.

"Sure we advertised 9½% interest rates. But that was this morning."

He's mad at the boss

Look for this resume to be submitted by the guy with 3-5 years experience. Younger workers are still awed by the fact that there *is* a boss. Older ones are finally *convinced* that there is a boss. In between, there is still the feeling that, since no one can really know enough to *be* a good boss, the whole concept lacks validity. That makes it easy to challenge his authority and to believe, erroneously, that around the corner is that paragon of companies where all bosses combine the best attributes of priest, psychiatrist, technological *wunderkind,* Solomon and Ché Guevara. A good boss is a Messiah, leading His children, and at the same time a medieval champion, jousting with the forces of evil and winning every tourney. A bad boss is the one he has now, who exhibits all of the traits of Mephistopheles, Torquemada and Goofy.

The boss-decrier exhibits several symptoms. The most prominent develops around the theme of self-expression:

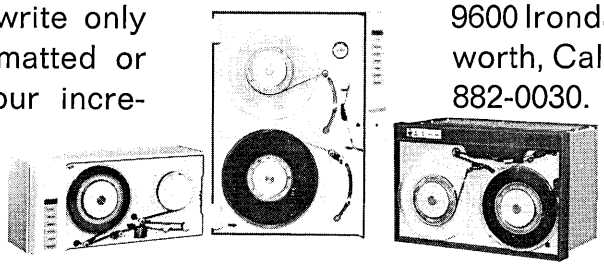
"Position objective: A more challenging assignment with an organizational structure that presents a climate permitting accomplishment."

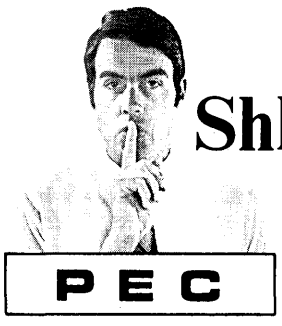
The translation is fairly straightforward. He had what he considered to be a good idea. He presented it to his boss, who for some reason turned it down. He went over the boss's head, and was turned down again. He became overtly critical. Then he was trans-

Pssst... don't tell the big guys

But PEC makes more tape transport models than both of them combined.

Surprised? PEC makes **over** two hundred models in three reel sizes, 7, 8½, and 10½ inch. Choose from tape speeds and densities of 6.25 to 37.5ips at 200, 556, 800 or our new 1600cpi in synchronous versions. In 9-track or 7-track dual density with read-after-write, read/write, write only or read only. Formatted or unformatted. Or our incremental units with asynchronous rates of 0 to 1000 steps per second. PEC offers the industry's most complete line of tape transports. All available from our huge new plant. For more information on PEC transports, write to Peripheral Equipment Corporation, 9600 Irondale Avenue, Chatsworth, California 91311. (213) 882-0030.





Shhhh...

PEC

ferred from Development to Maintenance. At that point he began writing resumes.

Or, to be fair, maybe the organization *doesn't* permit accomplishment. For example, consider the programmer who had a brilliant concept of a chess-playing program. His management turned him down flat. Not being willing to face a future in such an unenlightened organization the programmer split. Neither he nor his boss, the manager of the accounts receivable programming project, ever really understood why. Neither is likely to change.

"I feel that the time has come when I am ready for a more responsible assignment, at a project or section manager level, at least."

This one intends to fight fire with fire. He has suffered under incompetent management, in his opinion, and has decided that even he can do better. Not only that, he has just recognized an intriguing fact of life—managers make more money. Faced with these two compelling thoughts he has offered himself as a sacrifice on the twin altars of Management and Mammon. There is about one chance in ten he can hack it.

The chronic bad actor

Most managers develop a sensitivity to the real bad actor, whether in person or in resume form. There are enough marginal performers, though, to justify reviewing the basic principles of the Bad Actor resume.

One of the most prominent characteristics of the Bad Actor resume is gaposis:

"March, 1963—April, 1965: Systems Analyst, Engineering Section, Lieberman Aircraft Corporation."

January, 1966—September 1968: Programmer, Flight Analysis Section, Havasu National Missile Center."

Where was this guy between April, 1965, and January, 1966? I've gotten some very interesting answers to that question. Some of them may even be true.

"Traveling in Europe."

"Operating my own business."

"Consulting."

"Farming in Nebraska."

"Writing a book." (Never published)

"Going to school."

Now, some people can and have done these things. However, let's be realistic. The hiatus can conceal undesirable circumstances as well, or a period of confusion and disorientation. Beware.

Or . . . an alternate form of gaposis shows up when all the gaps are filled in, but in an odd fashion.

"March, 1963—April, 1965: Systems Analyst, Engineering Section, Lieberman Aircraft Corporation."

"April, 1965—July, 1965: Service Technician, Whale Oil Ice Cream Company."

"August, 1965—December, 1965: Route Salesman, Frank's Fish Emporium."

"January, 1966—September, 1968: Programmer, Flight Analysis Section, Havasu National Programming Center."

Now, were those jobs fixing freezers and peddling fish better than programming? Probably, but very few programmers will admit it. So there must be a reason. Sometimes—rarely—local economic conditions are really to blame. Sometimes family circumstances intervene—it turns out that Frank is Papa, just had a heart attack and someone had to jump in and drive the truck until other arrangements could be made. It is also possible, of course, that once there was a Frank's, but it conveniently went out of business about the time our hero was serving six months for a second drunk driving rap. You get the idea.

The bad actor likely will resist contacting past employers also, although he probably will have recognized that he cannot insulate prospective employers from past ones completely. Thus look for phrases such as "had personality conflict with project manager—suggest asking only for information about technical capabilities." Or possibly a more straightforward approach:

"There were some difficulties in my previous position, some of which must be regarded as my own fault."

The latter examples are not really "don't contacts" —the real hard-luck Charlie is too sophisticated to use that ploy. Instead, by one strategem or another he is trying to soften the impact of what the former employer is going to say. It is interesting to note that about 80% of the time his fears will be ill-founded—his former employer will come up with an innocuous or noncommittal response.

Another symptom of the loser is similar to the distinguishing characteristic of the overly ambitious—job hopping. But where the ambitious tend to be regular in their job-hopping patterns, the bad actors are irregular. They will hop from job to job, but not in regular increments of two years. Instead it will be a year here, two years there, six months here, three months there. If he's honest about putting down his work history, paradoxically there may be some hope for reclamation. Probably not much, though, because these days there are too many who feel that irresponsibility can be expunged by public confessional, which in turn leaves room for further irresponsibility.

The diagnostic characteristic of irresponsibility is evasiveness. Some resume writers are masters of indirection and innuendo.

"My past positions have involved both broad conceptualization and detailed implementation. . . ." In other words everything—or nothing.

"My activities have touched tangentially on areas of management sciences, internal communications and electronic engineering, among others." Meaning: my office was between the operations research analyst and the printed circuit drafting room, right across from the mail room.

"Much of my past effort has been spent in upgrading installed systems." I never could get out of the damned maintenance group.

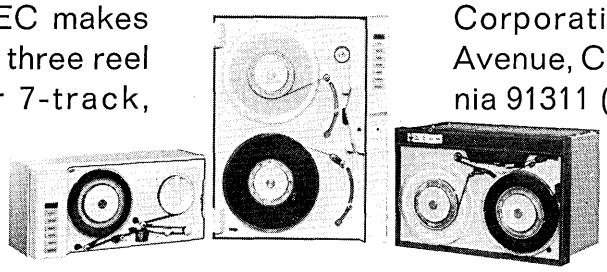
And so it goes, as the evader beclouds and befogs his way through his life story.

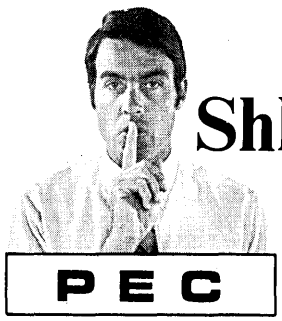
The subject of the bad actor is a bottomless well. But then so is the whole story of resume-reading. The varieties of human foible are endless, and so are the ways and nonways they are committed to paper. Every once in a while, though, one stumbles across a gem that makes the whole thing worthwhile—concise, specific, well-written, complete. It's tempting to fire back an offer letter by return mail. Only thing is—suppose all the guy can *really* do is write resumes? ■

Pssst... don't tell the big guys

But PEC's got something they don't—delivery.

Buying a tape transport is easy. Getting "on time" delivery is something else. Impossible sometimes. To get your transports to you on time, PEC has a huge new plant producing tape transports, so you can get them when you need them. PEC makes over 200 models in three reel sizes. 9-track or 7-track, speeds from 6.25 to 37.5ips and densities from 200 to 1600cpi. In formatted or unformatted models. And you can get them fast, in OEM quantities and prices. For information on PEC transports, write Peripheral Equipment Corporation, 9600 Irondale Avenue, Chatsworth, California 91311 (213) 882-0030.





Shhhh...

PEC

A review of some magnetic recording and reproducing processes — their limitations and practical applications.

More Bits / Inch

by Ralph Auf der Heide

Magnetic recording has been practised at least since 1899 when the application for a patent (No. 661,619) for a "method of recording and reproducing sounds or signals" was filed by Valdemar Poulsen. Digital recording, other than telegraphic code, seems to have been mentioned first in June, 1947, when Engineering Research Associates of St. Paul tested a number of tapes by recording pulse rates up to 20,000 per second, and detailed the use of magnetic tape storage of "numbers in computing machines."

Since that time, efforts have been directed toward larger information capacity, greater accuracy, and higher information rates. Once only used for sound recording, tape is now a primary means of recording any type of signal where the total amount of information is high.

Where recording accuracy is critical, information is stored on magnetic tape in digital form.

The accuracy of data recovery and amount of information on a given length of tape have become more and more important. The recording industry has responded to this challenge by increasing packing density (in bits/inch) and improving error rate. Where early recording practice put 200 parallel characters/inch on tape, and produced one error in 10^5 bits, newer systems allow 1,600 parallel bytes/inch and provide error rates on the order of one in 10^7. The latest developments in serial recording provide capability for 16,000 bits/inch on tape, with error rates less than 1 in 10^9 bits. This increase in capacity and accuracy has been due to improved magnetic tape and magnetic heads, and to increasing sophistication of the methods used to record and recover data.

Reality vs. ideal

A consideration of the limitaions and practical applications of magnetic recording and reproducing processes follows.

An ideal recording method would have a homogenous magnetic medium in perfect contact with a record head. Change in record current would result in magnetic changes on the tape with zero spatial displacement. On playback, the tape would be in perfect contact with the reproduce head, to produce a voltage proportional to the rate of change of magnetization. This voltage would be uncontaminated by noise.

Practically, we find that none of these things happen.

1. Magnetic tape is not a perfect medium.
2. All electronic systems are ultimately limited by noise.
3. Mechanical means of moving tape past a head are not perfect.
4. Magnetic heads fall short of the desired characteristics.

The rate-of-change of magnetization on tape is limited by the amount of tape passing across the head during a given time (pulse crowding). This limitation can be alleviated by reducing the level of magnetization and recording with bias for tighter packing of data.

Record heads do not produce a record field with sharp gradients. Reproduce heads vary in gap width and ability to differential high frequency pulses. This means that there are inherent high frequency losses.

The signals recovered by a reproduce head are not very large, so gaussian or thermal noise becomes a factor. Additional noise is produced by the inhomogeneity of the tape, but this is usually a minor factor.

The major limitation comes about as a result of imperfect contact between heads and tape. Because of mechanical imperfections on the tape and contamination by dust particles, the head and tape are sometimes separated, or the magnetic coating may be damaged, giving similar results—a loss of output while the separation lasts. This loss is proportional to the separation distance and to the frequency of the signal.

Several methods have been developed and are in general use, which attempt to efficiently use magnetic tape for digital data recording. These methods are classed as saturation and nonsaturation (biased) recording, each with its different set of advantages, limitations, and regions of usefulness.

Conventional saturation recording

Saturation recording techniques are the conventional method of recording digital data for computer data storage on magnetic tape. With this method each recorded pulse saturates the oxide of the tape completely and no part of the tape is partially recorded or unrecorded. Each pulse is identified by its magnetic polarity, which is established by the direction of the current flow in the record head. When tape is moving and the record head current direction is rapidly reversed, a series of small magnets, each with opposite north/south polarity, is left on the tape as a permanent record of the current changes.

Various waveforms have been used in digital magnetic recording, beginning with the simplest concept called "return to zero" (RZ).

The flux on the tape left by the current changes in the head are shown in in Fig. 1a. A "one" is represented by a "positive-going" pulse (going north), while a "zero" is represented by a negative (south)-going pulse. This system is redundant, in that two flux transitions are required for each bit of information, and is relatively inefficient because of the amount of tape required for each bit.

Another type of pulse recording is called "return to bias" (RB). Conventionally no flux change occurs for a zero, while a one is represented by a saturation of the tape in one direction and a resumption of the original value. Thus two flux transitions are used to record a one while no change is made for a zero. This type of recording is shown in Fig. 1b.

A still more efficient technique for recording pulses is called "nonreturn to zero" (NRZ). In the standard form of NRZ, recording each change from a zero to a one or vice-versa is indicated by a full flux transition. With this system, a string of ones will show no transition, nor will a string of zeroes. However, a transition will take place each time a one follows a zero or a zero follows a one (Fig. 1c).

This technique is more efficient than either the RZ or RB methods of recording, but has a serious flaw in that, when a flux transition error occurs in the stream of data, all information following that point will be exactly opposite from what it should be, unless a second error in transition occurs, which corrects the

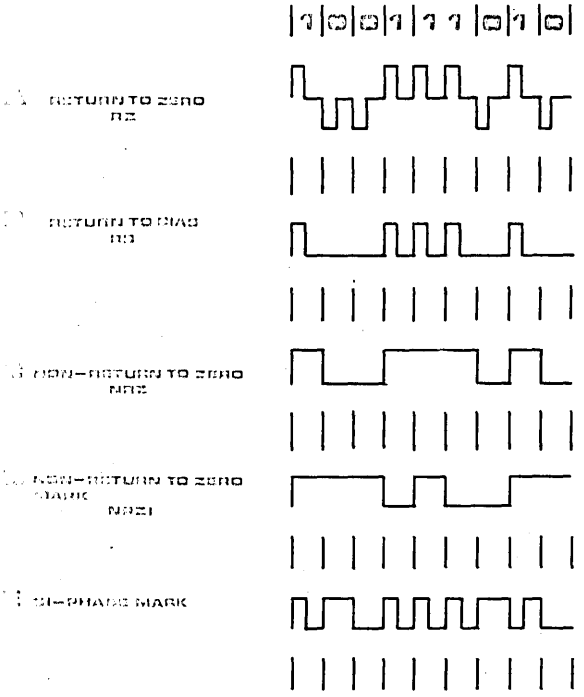


Fig. 1. Saturation recording techniques.

stream of data.

This problem led to the development of NRZI (Fig. 1d) or "non-return to zero mark," which differs from NRZ in having a flux transition for each one, with no transition for a zero. With NRZI, an error is limited to the single bit and does not change the subsequent data. This method is efficient, relatively error-free, and capable of densities up to 1,000 transitions per inch. It represents the bulk of present-day digital recordings used for computers. Both NRZ and NRZI encoding share one common problem which affects data accuracy. In NRZ a long string of ones or zeroes, and in NRZI a long string of zeroes, result in signal pulses of extremely long duration. This can result in inaccurate data during these long periods without change in flux direction.

Other conventions for representing a binary one and zero and NRZ space, bi-phase level, and bi-phase space. Those shown in Fig. 1 are most commonly used.

NRZ or NRZI data require that at least two tracks be used, one for "clock" information to define where each bit cell occurs, the second for data. Computer formats are arranged so that at least one flux transition takes place on one of the 7 or 9 parallel tracks for every bit cell. Thus a clock is provided without assigning a separate track. Many fundamental frequency components are recorded on the data track, depending upon the various combinations of ones and zeros. Head response can only be maximized for a series of ones. During a random string of ones and zeros as encountered in typical data recording, these

frequency variations present wavefronts of nonuniform shape and steepness. This requires that a technique of detection, called peak detection, be used, and moderate fluctuations in signal strength can cause data loss.

Bi-phase recording

In order to overcome the deficiencies discussed above, another saturation recording technique combines the clock and data to provide at least one flux transition for each bit cell, and thus achieves self-clocking on a single track. Various codes, called bi-phase, phase-encoding, Manchester, split-frequency, Harvard, etc., have been used for recording on tape. The bi-phase code is the most useful and reliable for tape recording, although others are used in transmission systems.

Bi-phase mark uses two flux changes per bit cell to represent a one, and one flux change per cell to represent a zero (Fig. 1e).

A first impression would seem to indicate that NRZI recording would be superior to bi-phase for maximum packing density, since fewer flux changes are required per bit cell and the fundamental frequencies are lower. However, certain compensating factors make bi-phase recording more reliable than NRZI for high-bit packing densities.

Only two fundamental frequencies are present in bi-phase recording: the frequency f for zero and 2f for one. With NRZI recording the frequency spectrum is much greater because a string of zeros can result in an output signal approaching dc, while a string of ones will result in a high frequency signal dependent upon tape speed. The narrower bandwidth achieved in bi-phase recording results in improved signal-to-noise ratio. Narrow bandwidth also permits head response to be tailored for maximum output at the two frequencies, and steep wavefronts with sharp zero crossings are obtained. These are easily detected, and reduced susceptibility to drop-outs results from the system's ability to tolerate considerable reduction in signal level before decoding becomes impossible.

In practical systems, the bi-phase recording technique results in almost double the packing density at the same bit accuracy when compared to NRZ Mark recording. Saturation bi-phase recorders can achieve packing densities up to 3,500 bits/inch with error rates below 1 in 10^6 bits. They require more complex electronic circuits, not only for the recording and reproducing process but also for coding and decoding the basic binary data.

Saturation recording at packing densities to 3,000 bpi is widely used for bulk storage of digital data. It is the cheapest method of storing very large quantities of data; it is relatively simple in practice; the magnetic tape is nonvolatile and resusable; and data accuracy is acceptable. New techniques of nonsaturation recording have recently been developed for higher capacity, higher transfer rate, and with better data accuracy. These are expected to supplement rather than supplant the older methods.

Nonsaturation recording

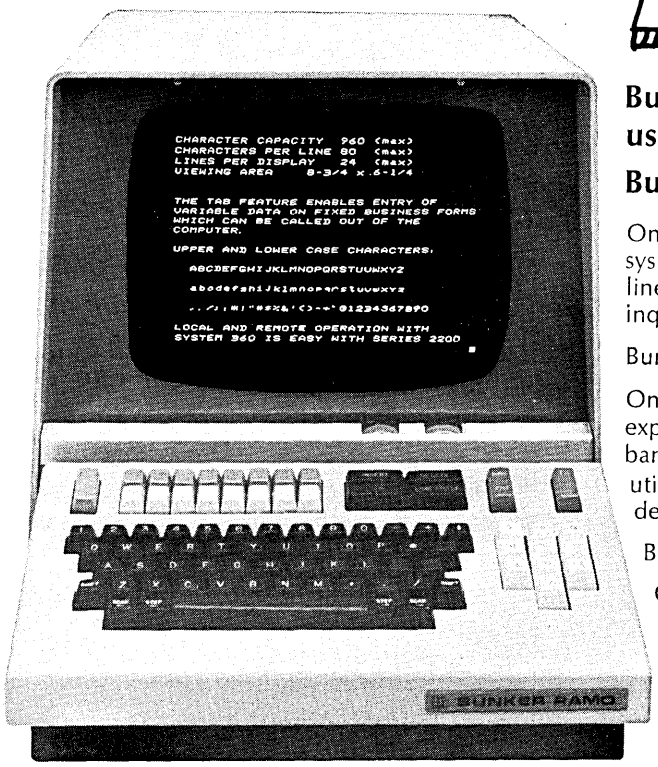
In saturation recording, head current is sufficient to completely magnetize the tape to positive or negative polarity. Carrier modulated recording, on the other hand, depends upon preservation of the amplitude, frequency, and phase angle of the signal for its information content and does not need to saturate the tape. Bi-phase information may be recorded by either saturation or carrier modulation techniques. For standard recording tapes, bit density in saturation recording is limited by the oxide thickness. With a 0.5 mil thick oxide, density is limited to approximately 850 bpi, while with 0.21 mil thick tape approximately 3,000 bpi is possible. Nonsaturation recording is not limited in packing density by tape thickness, and by applying these techniques to bi-phase digital information, certain advantages are obtained over conventional saturation techniques.

To implement the nonsaturation technique, incoming bi-phase is filtered to remove its harmonic content and correct its phase. The corrected, filtered signal is then mixed with a high frequency bias signal, approximately 8 to 10 times the highest fundamental data frequency, and fed through the direct record amplifier to the tape heads. A flat-flux, low-distortion, high-packing density recording is made.

Reproduction takes place with the head output equalized across the desired bandwidth with a low distortion pre-amplifier. This signal is fed to a bandpass filter which limits the passband for improved signal-to-noise and equalizes the signal phase to retain the integrity of the recorded signal. A hard limiter, as conventionally utilized in wideband FM discriminators, detects the zero crossings, and the signal is restored to its original state.

With a dynamic range of approximately 60 dB, minimum susceptibility to dropouts is achieved, and packing densities of up to 16,000 bpi, with a bit error

45 companies had CRT terminals at the Spring Joint Computer Conference.



But only one has 26,000 CRT units in use today.

Bunker-Ramo.

Only one operates and maintains real-time terminal systems along a quarter-million miles of dedicated lines, handling traffic loads of two million computer inquiries per hour.

Bunker-Ramo.

Only one has a systems engineering staff with in-depth experience in on-line/real-time systems for hospitals, banks, brokers, airlines, exchanges, municipalities, utilities, manufacturers and businesses of every description.

Bunker-Ramo.

Only one has a nationwide staff of CRT terminal maintenance experts, achieving uptime records of 99.9% in 600 cities in the U.S.

Bunker-Ramo.

Get the best service for your data-communications dollar—with the one company already doing the job.

The real real-time people.

THE BUNKER-RAMO CORPORATION
Business & Industry Division
447 Fairfield Avenue, Stamford, Connecticut 06904

CIRCLE 97 ON READER CARD

DDC introduces insured reliability

RELIABILITY IS THE RESPONSIBILITY OF THE MANUFACTURER.

Our fixed head storage files are designed with this philosophy in mind. As a result, our products have earned recognition as the industry standard. This reliability is documented by a five year study of 500 field units. The resulting proof of reliability allows us to offer a guarantee that our read/write heads are designed to fly. We call this guarantee "FLIGHT INSURANCE."

FLIGHT INSURANCE POLICY

Cost:	$1 per month per $1000 of purchase price
Includes:	Transportation, labor and parts in the continental United States and Canada
Coverage:	New equipment and *existing* DDC 7300 Series units after passing a routine "flight test"
Term:	Begins with date of shipment and continues for a five year period

Real life cost per bit planning is now a reality.

When you buy fixed head storage files, specify a guaranteed flight plan. Contact

DIGITAL DEVELOPMENT CORPORATION

5575 Kearny Villa Road • San Diego, Calif. 92123 • Phone (714) 278-9920 • TELEX—U.S.: 69-54-30 Overseas: 069-54-30

rate of 1 in 10^8, are attained.

In recorders required to operate under environmental stresses for long unattended periods, a lower bit packing density becomes desirable. A density on the order of 7,000 bits per inch offers ample margin for good reliability and data accuracy.

Errors

Dropouts in digital recording are the principal source of errors in data. These result from such diverse causes as mechanical drive anomalies, long-term head wear, surface irregularities on the magnetic tape, voids in the tape oxide, and foreign particles on the tape surface or imbedded in the oxide—in fact anything that can result in separation of the tape from the heads. In nonsaturation recording, these dropouts show up as the signal-to-noise ratio of the recovered analog information.

To reduce the noise-generated error-rate, the following steps are taken in design and manufacture of the tape recorder.

1. Tape must be protected from contamination.
2. Head and tape must be selected to give the maximum signal output.
3. Transport must handle tape carefully and protect the oxide surface.
4. Reproduce electronics must contribute the minimum amount of noise.
5. Detection techniques must have maximum efficiency.

Care in implementation of these factors can mean the difference between a system signal-to-noise approaching 35 dB, which with no dropouts results in an error rate of less than 1 in 10^{20}, and a 15 dB signal-to-noise ratio where the error rate is closer to 1 in 10^4.

The error rate for any recorder is determined by a combination of the effect of gaussian noise and combined duration and severity of dropouts on the tape, plus the noise in the detector related to the strength of the signal retrieved from the tape. One factor which contributes to this total effect is that when bi-phase recording of a string of zeros at a fundamental frequency, for example, of 5,000 Hz is changed to a string of ones, the fundamental frequency becomes an octave higher because each one has two transitions per bit cell versus one transition for a zero. This results in increased noise and reduced signal level. If dropouts occur during the ones, signal level will be drastically reduced.

High-density recording

Recently developed electronic circuits, employing standard components, have been used at Kinelogic Corp. to record data at 6,000 bits per inch at 30 ips, with an error rate of less than 1 in 10^8. Using the same electronics, and operating at 15 ips, a conventional instrumentation recorder has written and read serial data at 12,000 bits per inch, with an error rate of 1 in 10^6. Standard instrumentation tape and heads were utilized for this demonstration.

NRZI data was converted to a bi-phase signal. This signal was wave-shaped and a 1.5 MHZ bias signal was mixed with it. The combined signal was fed to the write amplifier and written on the tape. When the information was read out, a symmetrical wave form was recieved from the read head, allowing the decoder to decode weak signals with maximum efficiency. RMS signal-to-noise, measured after the filter, was approximately 42 dB at 30 ips, and 26 dB at 15 ips.

The recorded bi-phase signal, reconstructed by the detector, was then amplified and noise limited. A clock signal was derived from the detected bi-phase signal, which used that information to time the decoder. Precise phase relationships are adjusted in the decoder to reduce possible errors resulting from distortion or noise.

As a measure of the sensitivity of the circuits described above, it is possible for a signal reduction of 23 dB to take place at the 6,000-bit density before the occurrence of errors.

In order to examine the results of this high-density recording, badly damaged tape was employed in later studies, because errors were too infrequent in standard tapes to allow frequent detection. Photographs made during these studies show that dropouts must reduce the signal approximately 35 dB before an error is detected. In some cases decoding was successful where dropouts resulted in a signal reduction of more than 40 dB.

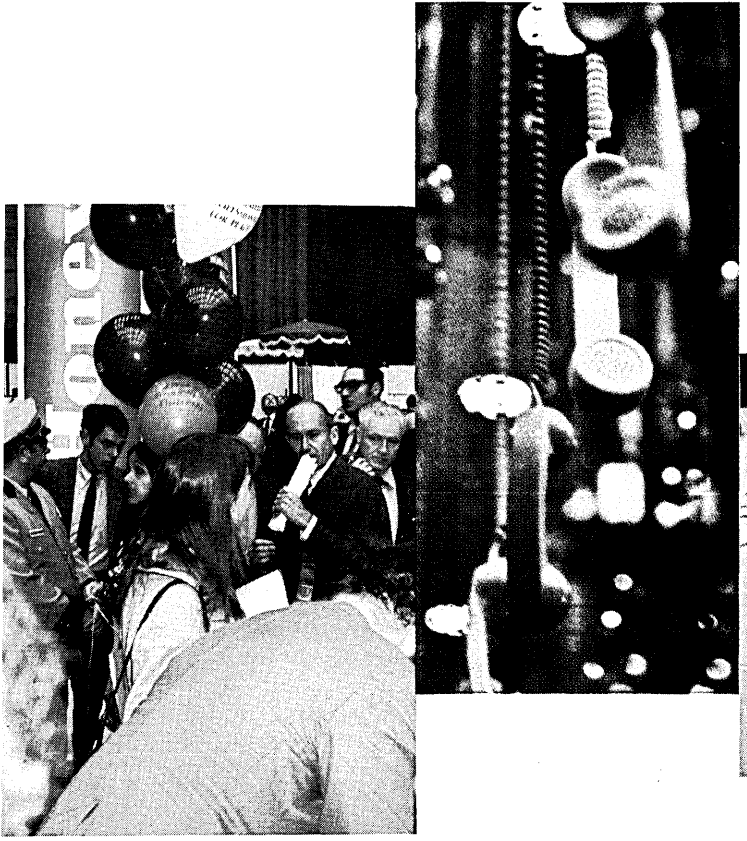
By using heads manufactured to read 12,000 bpi density, more precise adjustment of transport guidance, and utilization of tapes free from damage and contamination, an increase in signal-to-noise of 8 dB can be anticipated. This will result in an error rate too small to measure experimentally.

Conclusion

Modification of present computer industry magnetic tape standards will be resisted in many areas, but pressures for greater information capacity increase. As techniques for higher density recording are improved, new standards will be adopted. Present state-of-the-art allows reliable writing and reading of bit densities of more than 100,000 per inch on half-inch tape.

Present 9-track 1,600 bpi standards result in total density of 14,400 bits per inch. The potential for at least seven-fold increase in tape storage capacity is too attractive to be neglected. ■

Mr. Auf der Heide was until recently a systems engineer for Kinelogic Corp., Pasadena, Calif., where he provided technical liaison between customers in aerospace organizations and the engineering and manufacturing departments. He was previously marketing director for a manufacturer of incremental digital tape recorders and has an extensive background in the marketing of professional, military, and industrial electronic equipment.



At SJCC, some in topics like unbundling and data communications came up

On the Boardwalk

Coming into Atlantic City is something like walking onto a large Monopoly board: you keep watching for names like Park Place and Marvin Gardens. You are met with a little bit of disillusionment, for the players have changed and only the names remain the same. Perhaps when the Parker Brothers game was invented the properties in the city were worth trading, but the hotels look a little shoddy now, a good part of the steel pier has collapsed, and the game just isn't as much fun when the pieces are old.

Like the street names, the carnival atmosphere in the convention hall added to the unreal feeling, and there was a slight memory of brighter days there also. Some may have wondered whether we couldn't go back again to the brashness and enthusiasm of earlier Joint Computer Conferences.

Gone the old flair

Sure, there were hats and buttons and gimmicks, pretty girls on the stands, and even salt water taffy if you wanted it. But the empty seats that ringed the unused spectator section above the convention floor could remind you, if you accidentally looked up from the contrived commotion below, of what the SJCC didn't have.

Missing, for instance, were the products of the large-scale computer manufacturers. Control Data, which had a two-story booth in Las Vegas for the FJCC, was gone. Burroughs wasn't there, but, then, they gave up some time ago. And GE, although we didn't realize it at the time, was only an apparition. In fact, not a single large-scale mainframe was exhibited by IBM, RCA, GE, Univac, or Honeywell. Systems (SEL) and NCR had some of their larger gear, but the NCR machine was down at least part of the time, and the crowds around Systems' booth really came for the styrofoam pith helmets.

There were fewer people too, possibly because it cost sightseers $40 to see inside the big tent this time, rather than the $5 it used to cost for a ticket. Still, there were 28,715 attendees by AFIPS's count, so many that the people who really lived in the city seemed hard to find. The breakdown showed 7,501 paid attendees, of whom 867 were students; plus 1500 admitted on passes, of whom 600 were members of the press; plus 14,034 exhibitor personnel and 5,600 guests of exhibitors. And, mysteriously, there were 80 ladies in attendance, according to AFIPS.

Also missing was some of the industry's earlier confidence in itself. Some of the big vendors like CDC—and probably many of the smaller ones—apparently stayed home because it was too expensive to go now that business isn't so bright and glittery anymore and money is tight. Maybe it was the spectre of a falling market that occupied the seats above the floor.

"Exhibitor personnel"

But the picture was not all bleak. The city that spawned the oldest beauty pageant, the Miss America contest, also kicked off—with some help from Redcor Corp.—a Miss SJCC popularity poll (which, incidentally, was won by a pretty young thing at the Iomec booth who handed out free miniature frisbees). It wasn't an easy contest to judge. There were pretty secretaries-turned-booth-hostesses everywhere, dressed as maids from space, as clowns, as lion-tamers, and sometimes just as pretty girls.

And it was quite a reflection on our values that a Redcor crt display was used for keeping track of the Miss SJCC contest, while an outmoded, horribly confused manual system was used to notify conference attendees of their messages.

Many of the girls were airline stewardesses between flights. They came from pretty girl pools with names like "Wings Unlimited." In addition to giving out frisbees and

pitches on communications gear, they also gave out free records from Versatec (songs with lyrics like, "I am still a bachelor; I live with two modems and a disc and every time they interchange I think of the girl I missed") and even free shoeshines to salesman-approved prospects at the Technitrend booth.

The displays and girls at the exhibit hall were augmented by displays and girls and bars in hospitality suites all over the city, and for a quarter you could ride from one end of the town to the other to see them. It took a little longer to drive to, but the Clary Datacomp "suite" was probably the best of all. It was aboard a 110-foot boat at the marina, and the Datacomp 404 computer there received much less attention than the gleaming woodwork and polished brass of the immaculate floating showcase it was kept in.

Foreign intrigue

Some overseas exhibitors shipped their goods in too. A 1500 sq. ft. stand right in the middle of the main floor proclaimed Great Britain's presence in the person of International Computer Ltd. stand. ICL is the first major European company to take part in a JCC, and announced itself in the local press with all due apologies to Paul Revere who "couldn't be found this time." Also pushing their global marketing effort were Hitachi—with its IBM 2311 and 2314 disc system replacements—and Fujitsu, which advertised a free trip for two to the Orient for the first customer of its 360/30-size Facom 230-25 computer—10 days with expenses and travel paid, through Automation Sciences Inc., Fujitsu's U.S. marketing agent.

Concerned with the Far East on a different level, the Computer Professionals for Peace picketed the Honeywell stand with photos reminiscent of the My Lai massacre and balloons imprinted with the words "HONEYWELL KILLS." The group moved out quickly and quietly once it had made its well-publicized-in-advance point, but Edward Elkind, CPP's co-chairman, said of the sessions, "Obviously the only way to be heard is to interrupt." Elkind had been cut off at the mike, cohorts claimed, after patiently waiting for the question period in the military processor session. His attempts at the social implications session were more successful (see last month's News Scene). The CPP, unlike in past JCC's, had been given space to hand out flyers explaining "Why Honeywell" (because the firm manufactures anti-personnel bombs and is a leading defense contractor) and asking "Do we want a computerized war?"

Dissent even spread to the DATAMATION booth, where some obscenities were used by a would-be subscriber who—not content with our policy of never selling the mailing list—wanted written assurance his name would never be sold.

Sidelights

There were some enjoyable things, though, like The R.E.S.I.S.T.O.R.S.' (Radically Emphatic Students Interested in Science, Technology, and Other Research Studies) first national full-fledged technical session . . . enjoyable, if you didn't mind having a 13-year-old kid give you a full-grown inferiority complex.

And Adolf F. (Sonny) Monosson, president of American Used Computer Corp., a Boston Computer Group company, promoted his wares with a sandwich board. His beat was confined to the boardwalk after an unsuccessful attempt to tour the exhibit floor, the latter allegedly nixed by a vp of one of the firms whose hardware he sells—a man who had earlier failed to disapprove of Monosson's presence in the exhibit area.

Visiting booth after booth was enjoyable for a while, until you kept seeing another minicomputer, another crt terminal, or another modem and it started to feel like a merry-go-round. Probably we are jaded, per-

haps just overwhelmed by the number of products which can be shown in a thousand booths, but no one product stole the show.

There were miles of carpets to follow, and there seemed to be room for everyone who wanted to be there. There were also enough hotel rooms to go around this time. Even AFIPS registration ran smoothly and quickly. And the phone worked too. They will work in Houston, you can be sure, this coming fall. We know because some exhibitors who will be there were called to give their requirements for that show shortly before they left for this one.

Some things didn't run smoothly, though. Electric power on the first day dipped from 115 to 95 volts, causing a power supply to burn out at the Cogar booth.

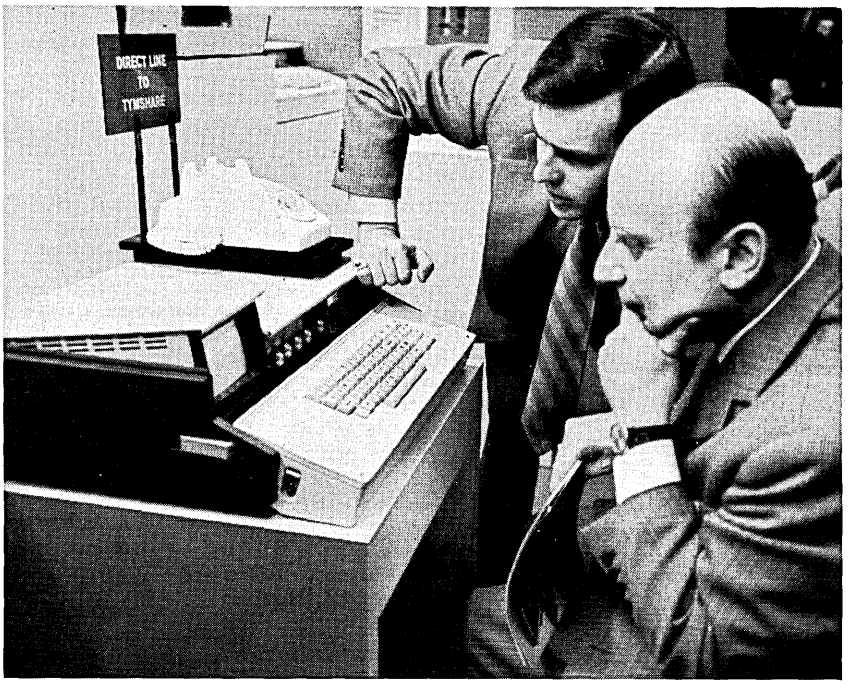
Transmission crisis

A highlight of the SJCC was the keynote address, by Sam Wyly, chairman of the University Computing Co., who said "The number one problem facing us is the bottleneck in data transmission. The absence of reliable, high-speed, low-cost access to computers and data banks has led us to the brink of disaster . . . And, if our industry crisis is not solved, it will lead to a national crisis. For the crisis in data transmission will slow the growth of an economy which is now based on knowledge." Wyly called on AFIPS to establish a special task force to "study the problems of data transmission, to work with existing carriers to overcome it, and to look into alternatives that can be pursued in parallel."

The task force, said Wyly, must "nail down this problem before it nails us." It would serve as a "clearinghouse of information on how severe our communications handicap is, on what is being done, and what needs to be done." Because the UCC subsidiary, Datran, has filed with the government to establish a nationwide digital switching network, Wyly eliminated his firm, as well as others like it and all common carriers, from representation on the task force. These same interest groups would not fund the source either—leaving that to users and manufacturers in the computer industry.

Wyly noted that the telephone companies around the U.S. have a crash program to upgrade their capacity and grade of service, but "crash programs are rarely an economical way to do things, and in these times money is abnormally expensive. So we see the telephone industry in dire straits. And as a nation dependent on good communications, we must forego the natural tendency to criticize and ask instead, "What can we do to help?"

The dilemma, said Wyly, is how to accommodate both voice and digital communication—how to "stretch a voice-oriented plant into a data transmission plant, under pressure, and still charge rates that encourage, rather than inhibit, the national economy."



While conceding the "lion's share of data transmission traffic to the existing carriers," Wyly noted some alternatives. One is his own subsidiary, Datran, an all-digital network. Another, for point-to-point intracompany voice and data transmission, is the special service common carrier, like Microwave Communications Inc. Another is satellite transmission, which is encouraged by the White House and the FCC, but whose high cost of entry "will keep the club small."

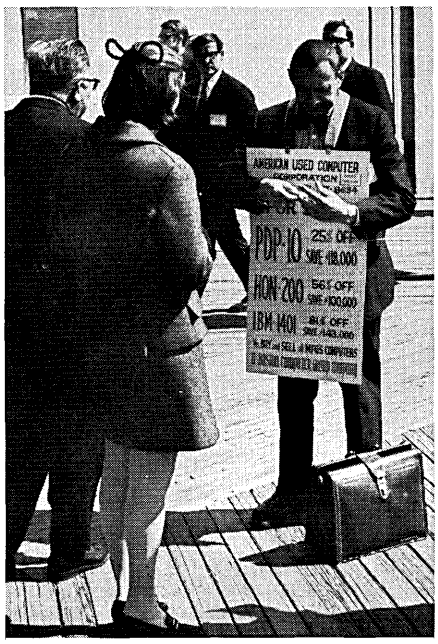
But Wyly emphasized that the industry as a whole must act, and this is where the task force would come in, serving, in effect, as the computer field's watchdog and pressure group.

Wyly's critics maintained that as a keynote speech, his comments were self-serving because of Datran, but as one attendee noted, "when a company puts its head on the block for a project that will cost hundreds of millions of dollars before one dime can come in, there has to be a great deal of conviction and sincerity involved."

Unbundling revisited

The ubiquitous problem of unbundling again came to the fore, this time in a session called "Son of Separate Pricing," which summarized unbundling to date. But the industry will have to wait for a "Grandson of Separate Pricing" in a future JCC to hear discussion of the *actual* impact of unbundling. With about four months' experience in this new environment, the "Son" panel was able to raise more pertinent questions, provide general advice, and make more projections than before. But because of this brief time, plus the timing of the IBM announcement—late in the third generation equipment life—and the economic downtrend, the panel indicated that conclusions were "premature."

Chairman Bob Forest, DATAMATION, led off with the observation that the industry is no more ready for separate pricing now than it was when Control Data introduced that policy 13 years ago, or two years ago when an SJCC panel on this topic agreed that it was the way to go. "The reason I feel we're not ready," he said, "is that I've always viewed giveaway software as a kind of a Linus blanket. Taking it away overnight, even with a big six-month warning, doesn't exactly lead to a



high degree of emotional and mental stability."

In his overview, Les Gottlieb, president of Data Dimensions, Inc., and an ex-IBM executive, called the IBM move "masterful." It "did the job of making everyone slightly surly and really put the screws hard to no one except the customers," who are "the most poorly organized and least able to mutiny." The short-run effects will be an increase of 10-20% in the dp bill for most (an estimate generally agreed to by discussants Philip Dorn and Roy Dickson, both large users).

Unbundling will be a "shot in the arm" for IBM's competition, but IBM will continue to dominate, Gottlieb concluded. "They're good, but they're not *that* good. It's just that most of the manufacturers and most of my colleagues in the dp services are inept."

Gottlieb's talk was followed by discussions of software by David Ferguson, Programmatics; SE services by Dr. Wayne Swift of Computer Sciences Corp.; education by George Ravazzolo of Advanced Systems Inc.; and legal aspects by attorney Robert Bigelow. Five discussants representing users were there to question the panel: Anne Marie Lamb of the Bureau of the Budget, Phil Dorn of Union Carbide, Roy Dickson of Philips Petroleum, Robert Davis of American Express, and Peter Dawson of United Artists.

Discussing education, Ravazzolo noted that because users swamped IBM classrooms in the transition period to get the last of the free education, very little training has been done since unbundling. Although as Dickson later pointed out, education needs are being underestimated, Ravazzolo thought the market would increase in the last half of the year. He put the market for next year at $150-200 million, most of which would go to IBM.

Bigelow's discussion of the legal aspects of unbundling—the suits, the contracts, and the means of software protection—gave rise to a relatively new user need: the lawyer with edp expertise. Bigelow pointed out that there are increasing numbers of young lawyers with edp knowledge entering the field, and more and more edp professionals are obtaining law degrees through night school. Roy Dickson suggested that the user ought to go to an established law firm staffed with such young lawyers rather than hiring and training them himself. All agreed that "nitpicking" on contracts, especially in view of the increasing number of user-vendor suits, has become vital.

Among the comments that best serve to summarize the session is Dorn's that unbundling is a "bloodier conversion" than the second to third generation transition because it is "religious and emotional." And Gottlieb's observations: "The industry is immature. It is obsessed with IBM as Mother. We have to stop blaming IBM and get off our backs."

Program transferability was the grim subject of another session. The consensus was that it isn't possible and won't arrive until hardware becomes a buyer's market. Simply put by Kenneth Barbour of GE, the manufacturer's interest is to get maximum profit, while the user wants to minimize costs. So the manufacturer implements program compatibility where he wants customers to extend present systems or where he seeks converts from other product lines. He doesn't provide it when he wants to develop new markets or protect old equipment in the field.

A possible solution for the user is the use of higher level languages, which Phil Dorn described as "super-

ficially successful" for program transfer. But this is possible only because of standards—COBOL isn't standardized and therefore cannot be used for transfer. And the value of standards is limited because the standardization process doesn't "address real practical needs." Nevertheless, the group saw standards as the one way to improve higher level language compatibility.

The final summation was that the present is bad—current architecture prevents transferability; the future is bleak—more and larger systems may make the '80's worse than the '70's promise to be; and there is no miraculous solution for attaining transferability.

Sixties' setbacks

Six panelists assembled by Sheldon B. Weinberg spent a hilarious three hours dissecting the Lessons (failures) of the Sixties. Asked first to name successes of the '60's, the panel came up with a short list that included IBM; componentry; the time-sharing *concept*; compiler development ("a reconfirmation of Grace Hopper's comment that compilers could be built," noted Charles P. Lecht of Advanced Computer Techniques); minicomputers; and such programs as sorting, payroll and accounting packages. And Ross Perot.

Thomas De Marco of Mandate Systems launched a devastatingly witty description of the concept underprinning leasing, which he termed "an accounting success." H.R.J. Grosch of the National Bureau of Standards cited leasing in his long list of failures in the '60's, calling it "fraudulent from the beginning," which is what De Marco meant. Other failures—"gaucheries, laughable"—mentioned by Grosch included os, time-sharing ("not meant to be fraudulent; it just turned out that way"), and MIS, which comes between leasing and t-s on Grosch's fraud scale. User groups—"SHARE and GUIDE are walking, if not creeping, disasters"—and professional organizations also got high failure marks.

Grosch's comments on professionalism — "We started the decade doubting we were a profession and ended it by confirming it"—drew the ire of several other panelists, with Lecht leading the counterattack. Later, Grosch termed programmers as jerks, which also drew vigorous denial from Lecht. He attacked Grosch's analogy of a programmer to a ground mechanic taking off in a multimillion-dollar jet, claiming it was the man who let him fly it who was the jerk.

De Marco's list of failures included "wanting to convert 56 programs from PL/1 to COBOL" ("That's a success," cried standards-oriented Grosch.) MIS, Tom said, is a conceptual failure, not valid because you can't automate management and have a box run a company. Later, Lecht said that two misconceptions concerning MIS are that you can build one and that one can be delivered. "MIS is not built but grown, not delivered but infused."

Informatics vp Richard Hill's list of failures included computer translation of natural language, large systems in general, failure to manage ourselves, and heuristic programming. De Marco said he thought a lot of large systems fail because people miss "the five-cent solution . . . think in terms of the 80-cent solution." Grosch noted, "To the best of my knowledge, none of the military command and control systems works," but he disagreed that large projects can't be successfully completed. "Look at the 360." Grosch also said large organizations of programmers are bound to be a failure. De Marco: somewhere "another desperate group —hardware men—is meeting right now saying, 'the software guys will pull us out.'"

Introducing the topic of hardware in general and minicomputers in particular, Weinberg wondered about the problem of people watching the wait light on the cpu, then noted that os keeps the wait light off. But Grosch said that if the cpu represented only 30% of hardware costs in the next five years, that still represented a sizable segment of the federal government's $1-billion-a-year investment. "We can't afford not to worry about the wait light." Later, Hill interjected, "If God hadn't intended the cpu to wait, He wouldn't have put a wait light on it."

Until November

And finally the SJCC itself was over. We took home our DATAMATION shopping bags crammed with goodies, just as everyone else did. One thing we're sure to keep—one of the few things—is the red PANIC button from Mechanical Enterprises Inc. Commander Grace Hopper remarked that she hadn't seen one since the Univac I. She seemed awfully pleased with hers and asked only for a fourth generation minicomputer version of the Univac I to hang it on! Maybe that will be at the next show.

On the last day the computer people flowed like a huge wave away from the boardwalk. Within an hour after closing time all the carpeting was rolled up and hauled off, and some of the biggest exhibits were half packed. By morning only a few stragglers remained. For them, the game was over. But as they left, the empty rooms were already filling with the players for the next convention, fresh recruits for yet another round of conventioneering.

No wonder the city looks so old. ■

TIME TO SHARE...WITH TIME TO SPARE

This Datacomp 404 time-sharing system **looks** loaded, but the 404 wasn't the least bit cramped. It could have handled another five interactive terminals plus 8 non-interactive I/O devices, too!

For the terminals, the word "interactive" doesn't apply to just any conversational keyboard, either. With our interactive terminals you can load programs, assign peripherals, and break into the processing sequence at any time.

For the ten terminals in the picture, the integrated work station in the center serves as the operator's console. But then, so could any of the other terminals. And then they can be converted back to interactive T/S terminals with the flick of a switch. This is a **working** system. We even eliminated the control panel — the typewriters work just fine.

There's no fat in the software, either. (The operating system, that is; we didn't ask the girls.) The program fits into a 4K memory module and leaves almost exactly half of the locations for working storage. Expandable to a generous 64K locations if the situation requires, the Datacomp 404 offers the user a growth capability in both hardware and software facilities.

How can you resist it?

Ask for full technical details and prices.

CLARY
DATACOMP
SYSTEMS, INC.

404 JUNIPERO SERRA DRIVE • SAN GABRIEL, CALIFORNIA 91776
TELEPHONE (213) 283-9485 TELEX: 67-4604

SALES REPRESENTATIVES, DEALERS, DISTRIBUTORS: Clary Datacomp is building a national network to market the Datacomp 404 and related computer products. For information, contact Scott Davis, Director of Marketing.

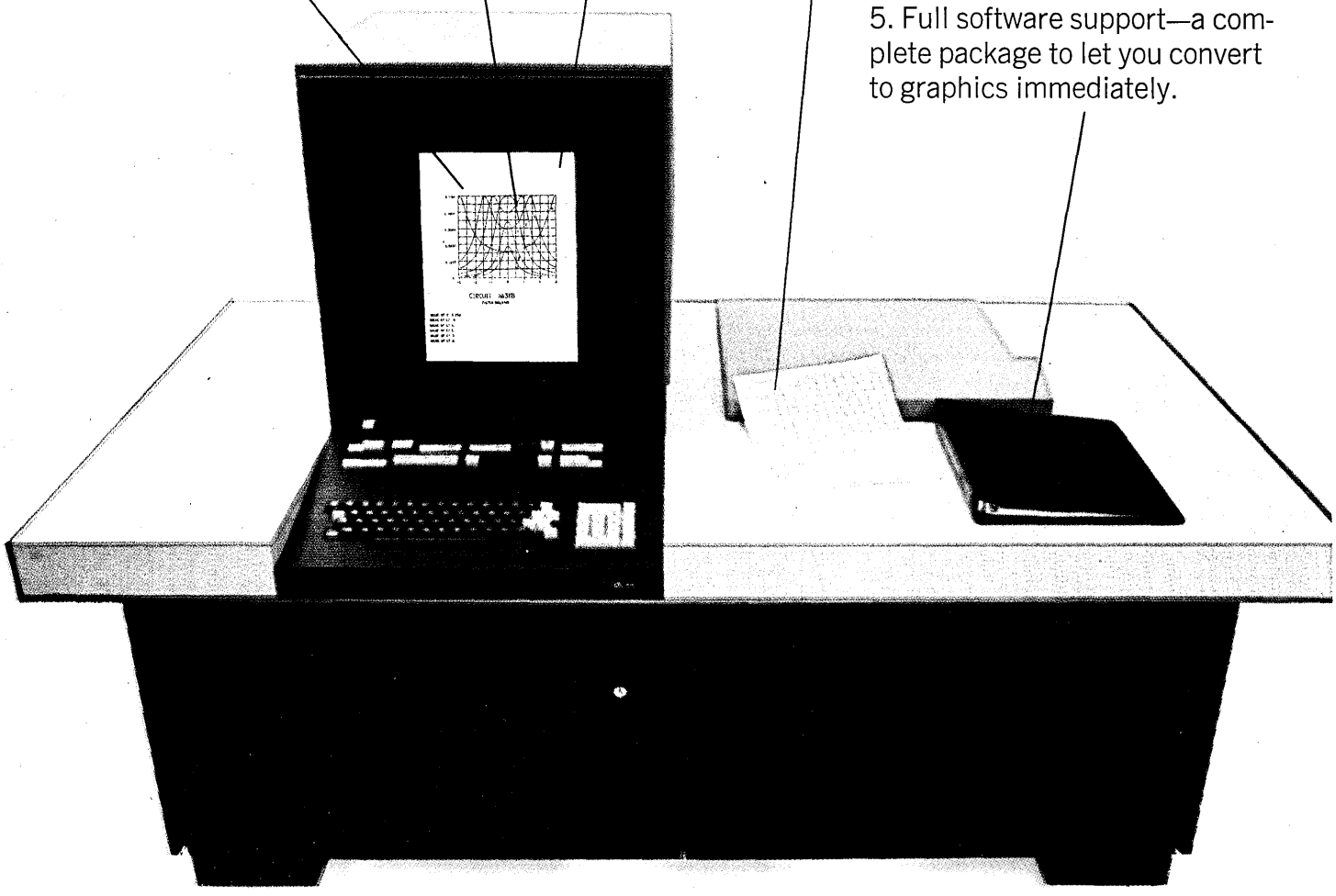
1. Interactive graphics—a time sharing terminal that displays both complex line drawings and alphanumerics.

2. Hard copy—8½" x 11" electrostatic working copies in less than 15 seconds.

3. Slide overlay system—to superimpose graph coordinates, forms, etc. onto the screen and hard copy.

4. Large screen capacity—4,608 alphanumeric characters in a 64-line-deep, 72-character-wide teletype compatible format.

5. Full software support—a complete package to let you convert to graphics immediately.



Giving you a terminal with 5 special features was tough enough.

Giving it to you at this price really hurt.

Now we're not about to try some quick song-and-dance to make twenty thousand dollars seem like peanuts. But just take a look at the CORNING 904™ terminal and see what you get. Like our software, which can get you on line with graphics added to your existing applications the same day you take delivery. And because it's already stored for you in the public files of many time sharing companies, you can save $75.00 a month in storage charges. Or like slide overlay, which can save you $1,000 a year in computer time alone. Or like full page electrostatic hard copy for less than 3¢ a copy.

Suddenly $20,000 isn't all that much. And you don't even have to spend that. You can get the CORNING 904 through your choice of leasing plans. And you get delivery within 60 days.

We're able to give you so much because the CORNING 904 is built around a unique projection system and a photochromic storage CRT developed by Corning Glass Works.

Add up how much extra some of our special features could cost. Then you'll see why we consider our new terminal so painfully low priced.

Oh well, they say 'tis better to give. However, if you feel 'tis just as good to receive, write to Corning Data Systems, 3900 Electronics Drive, Raleigh, North Carolina 27602. Or call (919) 876-1100.

CORNING
DATA SYSTEMS

PERSPECTIVE

an interpretive review of significant developments

Honeywell-GE: Where Will it All End? or Will it?

Possibly the most startling event ever to occur in the computer industry was the noon announcement on May 20 of an agreement in principle by Honeywell and GE to form a new computer company which would include all of the Honeywell computer business and all of GE's except North American time-sharing, process computers, and some communications products (June, p. 49). The new firm, as yet unnamed, would be 81.5% owned by Honeywell, the remainder by GE, and operate as a Honeywell subsidiary. The market shares of 4% for each parent should result in a firm that would fulfill the Honeywell slogan of "the other computer company."

Unlike the last great announcement — that of unbundling — there were almost no advance rumors. Negotiations between the two firms were apparently carried out on a very high level and with all due haste to avoid premature publicity. The effectiveness of the secrecy was dramatically revealed to the Greenwich, Conn., staff of DATAMATION, which had the singular amusement of a visit by a Honeywell public relations man on May 20. He had blissfully ridden a parlor car on the train from Massachusetts, only to stroll into our offices at precisely noon and be greeted with the cry, "Honeywell just bought GE's computer business!" No one was more suprised than he. At lunch, his fortune cookie contained the message, "Nothing so bad that it might not have been worse."

Poor RCA

And at RCA, things were worse: the dream of becoming Number Two by the end of this year was shattered. Only Univac, which is variously estimated to have 5 to 7% of the market, might be able to claim it is still second, which it is known to be in total number of machines installed. In fact, Univac exec vp George Sauter said that, according to Univac "sales projections," it would remain Number Two.

The sale of nearly all of GE's computer interests *except* time-sharing was particularly ironic in light of recent rumors which had alleged that the time-sharing business was for sale. Informed sources say Xerox Data Systems and Greyhound Computer had both conducted negotiations with GE in recent months, presumably toward purchase of the time-sharing operations, but nothing resulted. GE's time-sharing business is said to have operated at a loss the past two years, but has expanded rapidly.

What Honeywell is obtaining, then, is the GE scientific and business computer operations both at home and abroad, and the overseas time-sharing business in Britain and Europe. GE's DataNet terminals and front-end processors will be included in the new company, while the modems and TermiNet terminals manufactured in Lynchburg will remain with GE. Included in the new firm are GE's 66% ownership of Bull-GE in France, its completely owned Italian subsidiary, G.E. Information Systems Italia (partially owned by Olivetti until two years ago), and G.E.I.S. Ltd., a British marketing organization 50% owned by GE, and 25% by Bull-GE. These overseas operations are said to represent the greater part of GE's overall computer business and became profitable this year, although GE's total computer business has never been profitable since its inception in 1956. Estimates of GE's total losses from computers range from $400 million to $1 billion.

The profitability of the new company might not be revealed by Honeywell in the future, as the 81.5% ownership surpasses the 80% required to permit the parent firm to consolidate the subsidiary's sales and earnings on its corporate profit and loss statements.

Falling of stock

The only immediate effect of the agreement was that Honeywell stock fell from 99-3/4 to 73 in the two days following the announcement, threatening to jeopardize the terms of the agreement, which included 1.5 million shares of Honeywell treasury stock. By last month, however, the stock was hovering around 80. GE stock prices seemed virtually unaffected. Honeywell investors apparently feared a dilution of earnings as a result of acquisition of unprofitable GE operations. The immediate good news for GE that it would be ridding itself of a source of continued losses was probably balanced by pessimism for the future at the firm's departure from what might still have become a profitable pursuit. In addition to the approximately $135 million of Honeywell common stock, the agreement called for $110 million in notes from Honeywell, which would bear no interest for the first year.

Although GE computer operations have not been profitable, the firm reports steadily decreasing losses. The Honeywell domestic computer business has been profitable during the last three years, and overseas for two. Differences in accounting practices of the two firms are significant, however, in that GE accounting is considerably more conservative than Honeywell's, such that the financial press claims GE operations might even be profitable if measured by Honeywell yardsticks. Honeywell uses a six-year, straight-line depreciation that shows profits quickly, while GE uses a five-year accelerated depreciation and writes off engineering and r&d expenses, rather than capitalizing them over the life of the products. Both GE practices tend to postpone profits. And GE task groups considering ways to realize savings in the GE operation once it becomes a part of the new company claim they have discovered sufficient cost-cutting potential to attain profitability.

Considered on paper, the prospects for the new venture seem good. Honeywell and GE strengths and weaknesses are largely complementary. While Honeywell has been noted for its outstanding marketing in recent years, GE has been stronger in engineering and product planning, but weak in marketing. Honeywell hardware has been most successful in the medium-scale range, while GE has made significant inroads with large-

(Continued on p. 82)

COMPUTER MATCHING GAME — The GE-Honeywell merger suggests an interesting guessing game as to which products survive the marriage. Some guesses: Out goes the GE 200 line no longer being built, along with the vulnerable 400 line whose lower end loses out in price/performance to the more numerous H200's. Also out are the 420's which we hear are no longer to be sold.

On Honeywell's side, the aging 400, 1400, 800 and 1800 are no longer built, only refurbished and resold. The DDP 124 and multi-processor 324 have been relegated for use in simulators and trainers. Honeywell's 8200 is an unknown, competing as it does with the GE 600 group. The other 200's seem somewhat safe, if stodgy. In their favor, they are character oriented, perform decimal and binary arithmetic and still are acceptably fast.

That leaves the H632, most likely first in a line that still is to be introduced and which may survive the merger. GE's 600 line, made powerful and versatile with its GECOS III operating system, is beginning to sell well, in fact may be largely why Honeywell bought GE's computer department.

One guess for the melded lineup:
GE 53, 55, 58
GE 105, 115, 120, 130
H 316, 416, 516, 1530, 1540, 1648
H 632 and siblings
H 200 — all but the 8200?
GE 615, 625, 635, 655

Associate editor R. A. McLaughlin, who drew up the chart, admits that it's anyone's guess and any number can play; but in all honeymoons, some adjustments will have to be made.

General Electric's Computer Products	Rental "Typical"/Range ($K/month)	Word Size (bits)	Core Cycle/Add Time (usec)	Date 1st Installed	Honeywell's Computer Products	Rental "Typical"/Range ($K/month)	Word Size (bits)	Core Cycle/Add Time (usec)	Date 1st Installed
GE 53	—/.8-1.1	40b	7.9/115	3/69					
55	—/.8-1.6	40b	7.9/115	1/66					
58	—/.9-2.2	40b	7.9/115	9/69					
					H 400	9/6.0-14.0	48b	9.25/111	12/61
					1400	14/10.0-22.0	48b	6.5/78	12/63
					800	22/19.0-35.0	48b	6.0/24	12/60
					1800	35/27.0-60.0	48b	2.0/8	11/63
					H 316	9.7[3]	16b	1.6/3.2	5/69
					416	15.0[3]	16b	.96/1.92	5/67
					516	25.0[3]	16b	.96/1.92	9/66
					DDP 124	2.5/1.9-5.0	24b	1.75/3.5	1/66
					DDP 324	6.4/4.5-11.3	24b	1.75/3.5	7/68
					H 1530	1.8/1.8-2.7	16b	1.6/3.2	—
					1540	1.7/1.0-8.0	16b	1.6/3.2	—
					632	6.2/2.7-18.0	32b	.850/1.7	12/68
					1648	15/12.6-17.0	16b	.96/1.92	—/69
GE 105	1.2/1.2-1.5	8b	7.5/120[1]	6/69					
115	2.2/1.5-5.5	8b	6.5/112	4/66					
120	2.9/2.4-6.0	8b	4.0/68	3/69	H 200/110	2.6/2.4-4.0	6b[4]	4.0/92[5]	8/68
130	4.5/4.4-10.0	8b	2.0/34	12/68	115	3.2/2.5-6.0	6b	2.75/66	6/70
					120	3/1.6-4.5	6b	3/69	2/66
					125	3.5/1.9-6.1	6b	2.5/58	12/67
GE 225	8/2.5-16.0	20b[2]	18/36	4/61	200	6/3.0-10.0	6b	2/48	7/64
235	12/6.0-28.0	20b	6/12	4/64	1200	9.7/5.4-20.0	6b	1.5/35	1/66
245	13/11.0-16.0	20b	3/6	11/68	1250	15.5-20.0	6b	1.5/35	7/68
255	17/15.0-19.0	20b	18/36	10/67	2200	15/5.0-30.0	6b	1.0/25	12/65
265	20/17.0-20.0	20b	6/12	10/65	3200	19/9.3-19.8	6b	1.0/14	2/70
275	23/20.0-25.0	20b	3/6	1/69					
GE 405	6.8/5.1-10.0	24b	8/35	2/68					
410	11/10.5-11.0	24b	6.3/17.8	11/69					
415	7.3/4.8-13.5	24b	5.95/17.8	5/64					
420	23/17.0-20.0	24b	6.3/25.1	6/67					
425	9.6/6.0-20.0	24b	3.9/12	6/64					
430	17/15.5-19.0	24b	4.2/12	6/69					
435	14/8.0-25.0	24b	2.8/9	9/65					
440	25/22.8-27.0	24b	3.5/9.5	7/69	4200	25/22.5-50.0	6b	.75/12	12/67
GE 615	30/28.0-85.0	36b	2/4	3/68					
625	50/31.0-125.0	36b	2/3	4/65					
					8200	36.6/33.0-80.0	48b	.75/1.75	4/68
635	47/35.0-167.0	36b	1/1.9	5/65					
655	80/38.5-80.0	36b	.5/.6	—					

Notes:

[1]Assumes two 5-character fields

[2]20 data bits plus parity

[3]Purchase prices given

[4]6 data bits, 2 punctuation bits, 1 parity bit

[5]Assumes two 5-character fields

scale and small-scale machines. Honeywell marketing ought to be particularly well qualified to exploit the sale of European-made small-scale GE hardware, such as the French GE-58, introduced in the U.S. in February, which is competitive with the IBM System/3.

The new company would offer obvious advantages to users by being larger, providing virtually a complete line of equipment and services, and would have concrete support from its parent firm. Being large — and bundled — worked for IBM, and it should work for the new Honeywell subsidiary. Honeywell has already made marketing grist out of its stubbornly bundled policy, and the larger new company should be able to further exploit the "other company" image.

For the present, GE was quick to assure customers that sales and service would continue uninterrupted during the negotiations toward final agreement.

There were approximately $1.3 billion worth of GE computers in use worldwide last year. About $750 million were on lease, the remainder having been sold outright. This contrasts with IBM's 80:20 lease:sale ratio, and is partially attributable to GE's internal policy of purchasing computers. Since GE is probably the world's second largest industrial user of computers, it presumably owns a great number of its own machines. It should also be a permanent customer for the new company. Honeywell equipment installed is valued at about $1.5 billion. GE computer sales are estimated as $400 million last year, while Honeywell sold $351 million. Overseas installations are said to account for 60% of GE and 20% of Honeywell equipment.

The only risk involved for Honeywell in the new venture is that it may not be able to effectively integrate the GE operations. Honeywell has about 24,000 personnel and GE 25,000 in worldwide computer business; combining such large organizations will create problems of gargantuan proportions. Historically, one can cite Honeywell's acquisition of Computer Control Co. in 1966, and Burroughs' acquisition of ElectroData in 1956 as much smaller ventures which involved many difficulties, though the problems were eventually ironed out. Certainly the economies that Honeywell believes it can effect with the new company must involve personnel reductions. And many GE computer employees are former Honeywell personnel.

The problem of integrating the two firms' computer lines (see the accompanying chart) and coming out with a solid line will come at a particularly inopportune time, since other mainframe makers are expected to be developing their next generation products. So we may expect the new company to be late in debuting its fourth generation; imminent announcements by the two firms are also presumably forestalled.

The possibility that the new company deal could fall through should be of serious concern to GE now that the agreement is public knowledge, as such a failure now would do much to destroy the morale of computer employees and shatter user confidence. This indicates that GE management must have had great confidence that the agreement would be finalized and approved. Reaction among industry observers, however, was less than certain that the new company would be formed.

The successful formation of the new company would probably have a favorable affect on IBM's conflict with the justice Dept., as it should strengthen the competition in the computer industry and thereby decrease pressure to split IBM up. At the same time, the new firm would hardly be a threat to IBM. Things often seem to just naturally go IBM's way, and this may turn out to be another example.

It was a propitious time for GE to leave the computer business. The firm is feeling the effects of the 97-day strike late last year, the national economy is apparently in a recession, and soon the competition would have necessitated that GE invest still more money for the introduction of fourth generation equipment. The GE computer operations are particularly well suited for a marriage with Honeywell's at this time; such a match would not have been as good five years ago, and might not have been so in the future had GE management waited still longer.

Informed sources believe GE will convert its organization structure to a holding company within a year or so, with perhaps seven wholly owned subsidiaries. This would be an extension of the firm's "profit center" orientation to its logical conclusion.

The only immediate sign of reorganization at GE was in its headquarters staff, where long-range planning was separated from daily operations shortly after the new company announcement. GE formed a corporate executive staff and a corporate administrative staff, manned by four senior vice presidents, a new title at GE. Three of the vp's will be involved in long-range planning, and will report to the office of GE Chairman Fred J. Borch and three vice-chairmen. The fourth vp will lead the corporate administrative staff. Long-range planning certainly never called for the sale of GE's computer business.

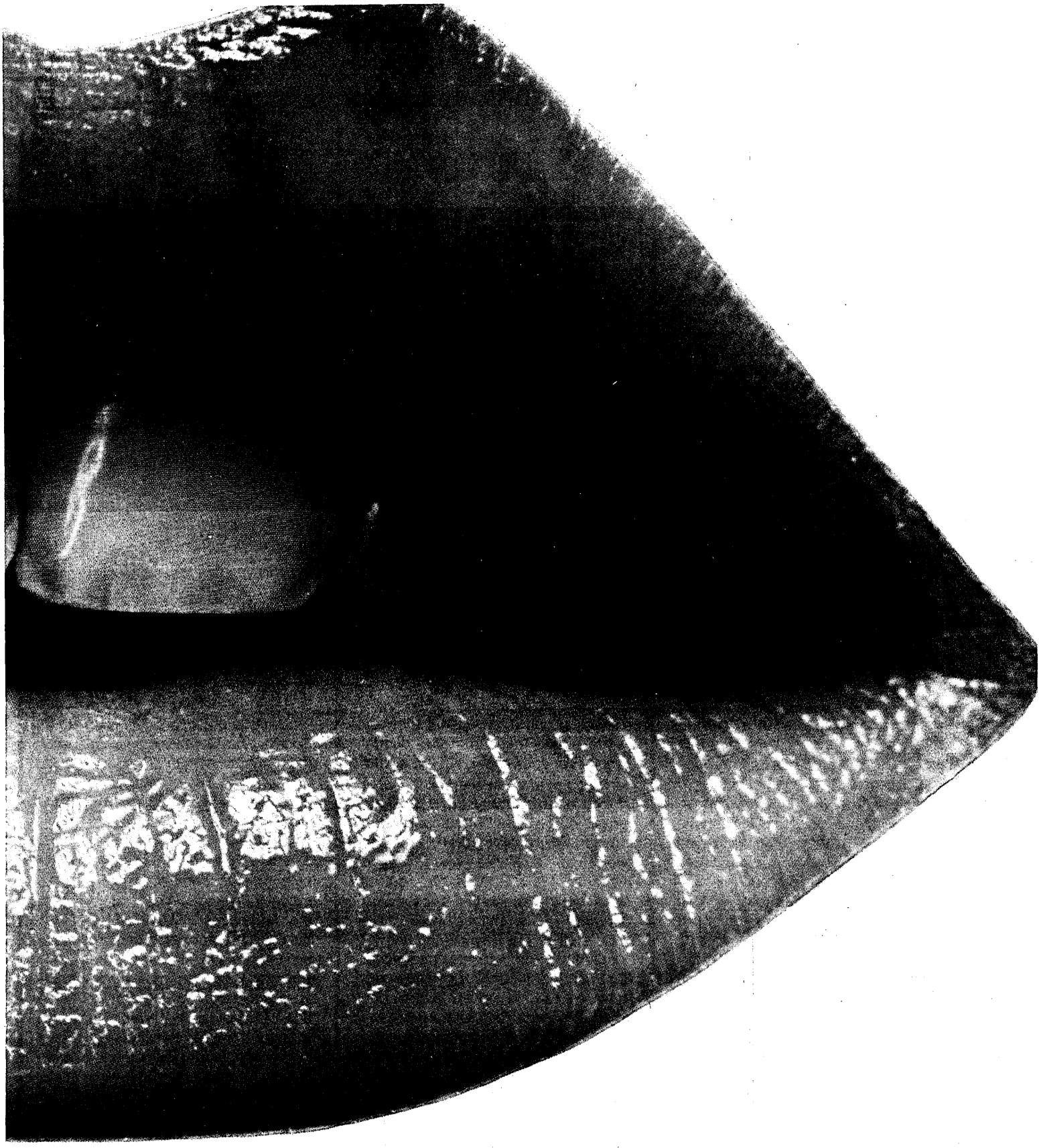
— F. Barry Nelson

Critics Say Big WIMMIX Buy Poorly Planned, Favors IBM

Deputy Defense Secretary Packard placated GE and other nags last month when he finally authorized procurement of 15 to 35 systems for the Worldwide Military Command and Control system; but several critics — including some with administrative or technical responsibilities related to the buy — said it is poorly planned and gives IBM a significant bidding advantage.

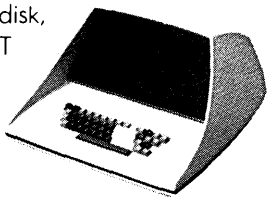
Packard's procurement authorization was announced in a press release and in a letter to WIMMIX participants. The press release said the buy would embrace an unspecified number of Defense Intelligence Agency computing sites, besides those command and control centers operated separately or jointly by the services — thus apparently ending DIA's battle to remain independent. The release also announced that the IBM/360 was being established as a "second standard," and that technical support for the entire network would be provided by a joint technical support activity to be established within the defense communications agency.

The letter, which wasn't generally



We taught our data entry system to speak a new language: Dumb Blond.

If a girl can type, she can enter data on our system. If she can read, she can verify it on the display. To her, it's a typewriter and a nifty little tv screen: (She can be the dumbest blond you can find.) To you, it's a CRT-to-disk data entry validate/verify system, with mag tape output. We call it ENTREX™ 480. It's the fastest system going: built around its own computer and disk, it controls up to 64 individual DATA/SCOPE™ CRT key-stations. Write or call ENTREX., Inc., 113 Hartwell Ave. Lexington, Ma. 02173, (617) 862-7230. **ENTREX**



released, projected the total cost of the buy, to the end of FY '73, at $42 million, "within current fiscal limitations." Translated, this latter phrase probably means "if Congress coughs up that much cash."

Fifteen systems are to be procured between FY '71 and '73, and an optional 20 are obtainable beginning in FY '72. The equipment is supposed to satisfy command and control needs for six years. The letter also says that the buy is aimed "primarily at replacing obsolete equipment and providing additional capacity" and adds that no more sole source procurement of IBM systems will be approved. This apparently means that no new IBM systems will be added to the WIMMIX network unless Armonk wins the upcoming bidding derby, and that sites which now have third generation IBM equipment will not get replacements until other locations are taken care of.

The second standard

A key member of the WIMMIX implementation team says he expects the RFP to be out on the street by August 1. Asked what Packard meant when he made the IBM 360 a "second standard," this source explained that essentially WIMMIX has been divided into two groups of systems. The 16 sites that now have 360's comprise one group, while the 15 to 35 systems comprise the other. Standardization of hardware, software, data codes and formats for each group will proceed independently, assuming that the 15 to 35 new systems are supplied by a non-IBMer.

Although some systems in the latter group will have to interface with some in the former, DOD has "consciously decided" that IBM won't gain any bidding advantage from its present foothold in the WIMMIX network. An already-existing Autodin interface standard will solve part of this problem, our source explained; it permits any of the well-known computer makers to exchange data with the 360.

What about file access and program interchange? Interfaces permitting these types of transfer "will be developed," assuming IBM doesn't win the forthcoming competition.

What about the Pentagon's oft-expressed desire for a single WIMMIX data management system? Here again, it has been "consciously decided" that IBM won't gain an edge. If a non-IBMer comes up with a superior but machine-dependent DMS and goes on to win the buy, efforts will be made to rewrite it to run on the IBM 360, or an interface will be developed allowing the non-IBMer's DMS to talk to NIPS and FFS, the DMS systems now being used at WIMMIX sites with IBM equipment. Likewise, if a software house develops a superior DMS, DOD is willing to invest in whatever modifications are needed to implement the system WIMMIX-wide. But since current budgetary restrictions are likely to continue, DOD may have trouble justifying the admittedly extra costs of acquiring 15 to 35 non-IBM systems. And if a substantial amount of extra money is required to integrate the two groups of systems, IBM is almost certain to complain, on the grounds that government regulations require awarding competitively bid contracts to the vendor offering the lowest *overall* costs.

Vague interfaces

Actually, since many of the applications at individual WIMMIX sites are only vaguely defined, it is doubtful whether anyone knows accurately the kind and amount of interfacing that is going to be required. It is at least possible, if a non-IBMer supplies the 15 to 35 systems, that interfaces won't be available when they're needed. We asked a DOD official what would happen in that case. Answer: "The interchange will be handled off-line, the way it's done now."

Modifying a machine-dependent DMS so that it can work through another make of computer poses additional problems, explains an industry source. Often a whole new operating system must be built for the target machine, which makes trade-offs inevitable.

DOD's plan to use an interface between dissimilar data management systems seems, at first glance, to get around this problem. But no one really knows whether such an interface can be developed within reasonable time/cost restraints. "By not developing the interface before going ahead with the equipment buy," says our source, "DOD is asking for trouble. And if the trouble occurs, the Pentagon will either have to settle for a degraded system or lift IBM's thumb and crawl under it."

Packard coup

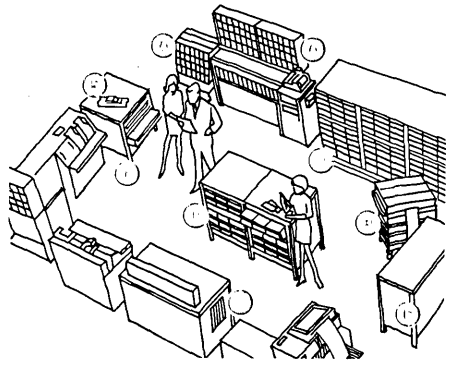
One of Packard's defenders within DOD admits, in effect, that improved management is needed when he says that "we are moving towards greater centralization of authority." There was an echo of this same thought in Packard's press release when he explained why the buy was being reduced from 87 systems, as announced earlier, to 35; partly, it was because DOD "did not want to become committed to a large amount of new automatic data processing equipment before the recommendations of the Blue Ribbon Defense Panel are received."

This was a reference to a group headed by Gilbert Fitzhugh, board chairman of the Metropolitan Life Insurance Co., which President Nixon appointed several months ago to review DOD management policies and practices. Apparently, WIMMIX planners hope the Fitzhugh group will recommend giving more authority to DOD groups outside the chain of command structure, such as the Assistant Secretary of Defense/Controller, and the Directorate for Research and Engineering. The Fitzhugh report is due to be delivered to the President about the time this issue of DATAMATION goes to press. Whatever changes it generates will probably require an extended gestation. Packard recently signed a directive, 5100.4, that authorizes ASD/C to "serve as the DOD focal point for, and prescribe policies, criteria, and procedures governing the buying and development of all automated data systems in the DOD." The aims of this activity, adds the directive, are "exploitation of computer technology, attainment of optimum . . . standardization, elimination of duplication and overlap in automated data systems developmental activities, interchange ... of ADP techniques, computer programs, and ADP management procedures." The Research and Engineering Directorate is supposed to provide ADP design and development criteria, monitor system modifications, and participate with the controller's shop in management review of automated data systems.

— Phil Hirsch

in card systems...

Wright Line Accessories Complete the Picture



In any data processing installation the computer is only part of the picture. Wright Line completes the picture by adding the essential storage and handling accessories that speed throughput and protect vital EDP media.

For complete information on Wright Line accessories for card systems, circle the reader's service number or contact any of Wright Line's more than 80 offices throughout the U. S. and Canada.

1. Card Files and Indexes
2. Cross Access Files
3. Card Tray Trucks
4. Card Handling Equipment
5. Card Punches
6. Card Box, Form and Binder Storage
7. Carriage Tape Holders

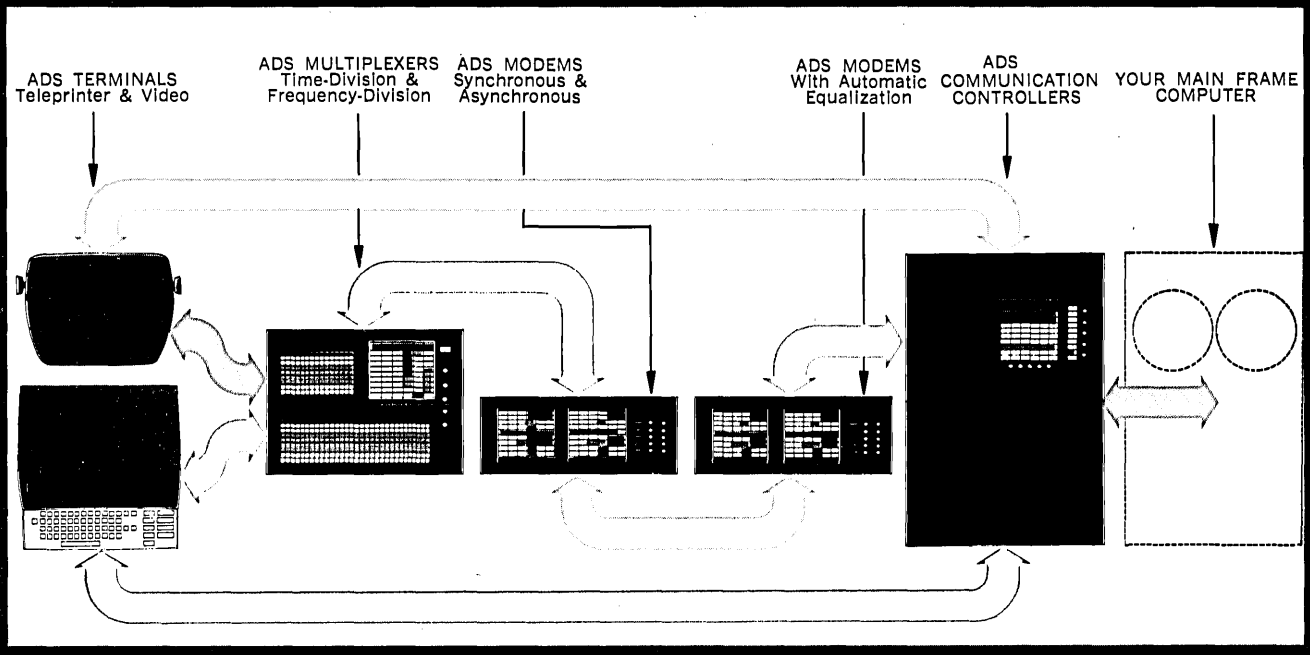
Wright LINE

DATA PROCESSING ACCESSORIES

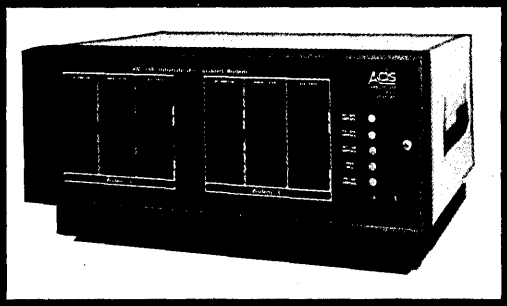
160 GOLD STAR BOULEVARD, WORCESTER, MASSACHUSETTS, 01606
A DIVISION OF BARRY WRIGHT CORPORATION

CIRCLE 108 ON READER CARD

ADS = Total Data Communication Systems



THE ADS-448 MODEM — automatically equalized — operates reliably over private or dial-up lines without fuss and bother — unattended. One of a compatible family of unique, dependable data communication products *system*-designed, built and maintained by ADS, only the modular 448 modem provides data rate splitting (1200, 2000, 2400, 4800 bps), simultaneously transmits and receives at different rates (up to 4800 bps), features front-panel continuous diagnostics, is available *now* to fit into your data network and save you money.



ADS
AMERICAN DATA SYSTEMS
8851 Mason Street, Canoga Park, California 91306
Telephone: (213) 882-0020

DATA MODEMS □ DATA MULTIPLEXERS □ DATA TERMINALS □ DATA SYSTEMS

A trend toward merging of commercial and military computer design is revealed by our survey.

Military cpu's

by Cecil R. Frost

THE INTENT OF THIS SURVEY ARTICLE is to provide a comprehensive list and discussion of militarized and ruggedized computers which are currently being actively marketed. Another purpose is to provide a generally non-military audience with an understanding of the technology which will become rather conventional as commercial manufacturers attempt to produce more reliable computers. The survey includes many computers which use medium and large scale integration (MSI/LSI).

The highlights of the article include the following:

1. **Manufacturers are developing modular tri-service computers to handle wide ranges of applications.**
2. **The trends are toward military computers with commercial architectures and instruction sets.**
3. **DOD budget cutbacks and program delays are forcing aerospace companies to diversify into industrial and quasimilitary markets.**
4. **Distinction between commercial and military computers is expected to diminish.**
5. **MSI and LSI have opened up new markets and applications by reducing size, weight and power.**
6. **Military and quasimilitary computer markets may reach $6 billion by 1975.**

Commercial/military technology

This section describes how commercial architecture and software are influencing military computers. The two are not inseparable in complex hardware systems. The best way to discuss the influence is to provide some examples. The examples will be given in alphabetical order in order to avoid any implied ranking.

Burroughs. The D825 is a militarized version of the commercial B5500 system. The D825 was originally designed for the U.S. Navy and the first system was delivered in 1962. Some of the applications of the D825 include the following: BUIC (Back-Up Interceptor Control); NORAD (North American Air Defense Command): Pershing 1-A missile system; and the F-111 check-out system.

The D825 basically did not attempt to change the state of the art as far as size or circuit technology was concerned. It did bring to the military user a very flexible system which incorporated many still-current features, such as: multiple processors; multiple memory modules; multiple input/output control modules; and a considerable variety of peripherals.

Honeywell. The Computer Control Division came out with the ruggedized DDP-516 in about 1968. The commercial DDP-516 was becoming widely accepted in real-time control and processing applications and the ruggedized version was able to move onto the ship, truck or airplane in a quasimilitary environment. The DDP-516 has compatible relatives using more recent technology (e.g., the DDP-316).

The Aerospace Division took the process one step further and came out with the HDC-601. "The HDC-601 processor is compatible in programming, software, and I/O interface with Honeywell's DDP-516 commercial processor which has been in world-wide use since 1967." The HDC-601 includes MIL-E-5400K, Class IV, in its list of applicable military specifications.

IBM. A dual-processor version of the IBM 4 Pi is now available. "The basic architecture of the System/4 Pi, Model EP Computer as seen by the programmer is identical to that of System/360." The 4 Pi and the S/360-65 dual-processor have many common features. OS/360 is not suitable for military applications but some of the concepts and techniques appear to be pertinent. The 4 Pi uses the S/360 scientific instruction set. Special instructions can be implemented by the addition of new microprograms. In a typical application, either processor can put itself into the supervisory state and assign itself the next task in a common priority-sequenced job queue. This concept permits a single processor to carry out the mission requirements.

RCA. This company is developing a family of military computers called the 200 Series. "Models 180, 185, 200, and 205 are upward compatible with

the RCA Spectra 70-35/44/55 while Models 190, 195, 210, and 215 are fully compatible. This includes both privileged as well as non-privileged instructions. In addition to the Spectra 70 capability the 215 is also compatible with the non-privileged mode of the IBM System/360."

The Model 215 is a multiprocessor with two to four central processors, two to four input-output processors (programmed), and up to eight memory units with up to 32,768 32-bit words (four bytes) in each unit. Each unit has its own independent control and power supply and can perform operations simultaneously with every other unit. The 215 is scheduled for public demonstrations around June or July of this year.

ROLM. The ROLM Corp. obtained a license from Data General Corp. and designed a mil-spec version of the Nova. Although termed the "Rugged Nova," the Rolm 1601 is a military design rather than a ruggedization. Additional features, such as hardware multiply-divide, analog-to-digital and digital-to-analog converters, and peripheral controllers have been added. Memory can be metal-oxide semiconductor (MOS) read-only-memory (ROM) and conventional core up to 32,768 16-bit words. Programs for the 1601 can be developed and debugged on the Nova.

In addition to the aforementioned military computers, Interdata, Lockheed Electronics, Unicomp, and Varian Data Machines are developing or have developed ruggedized versions of their minicomputers. In the case of Interdata and Lockheed Electronics, they have found, by independent laboratory testing, that their computers could satisfy military specifications to a degree which makes them competitors for rugged environments. Unicomp and Varian Data Machines went one step further and deliberately "beefed up" their computers for the quasimilitary applications.

One might ask about the logic behind purchasing a ruggedized machine. One very effective answer is cost. At this point in time, it is less expensive (including programming costs) to ruggedize a commercial minicomputer than to develop a fully-qualified mil-spec computer. Tight DOD budgets are expected to further this practice for those applications which do not have extreme environments.

Some of the reasons military computers are looking more like commercial computers, as far as the programmer is concerned, include circuit technology and the competitive advantage of compatibility. Another reason is the military cadre.

During the mid 1960's, junior officers were getting thorough hands-on training in the programming and use of commercial computers. These officers are now two or three grades higher and are responsible for system design, development, and implementation. Thus the responsible military systems managers of today understand computer technology (sometimes to a point embarrassing to the manufacturers) and know what they want and don't want. The junior officers who left the service and joined commercial manufacturers are also contributing positively as they also remember all too well the early disasters and are more than a little reluctant to propose a system which will turn out to be unsatisfactory.

A brief discussion of circuit technology is in order. The manufacturers would probably be in a state of euphoria if the same MSI and LSI components were used in military, ruggedized, and commercial computers, with the selection criteria based solely on the temperature characteristics of the individual production batches. It is believed that this general trend is already beginning to occur. Since MSI and LSI tend to minimize the number of design engineers required to design a computer, and since there are a limited number of really top-notch design engineers, it appears to be a natural conclusion that the MSI/LSI manufacturers are already contributing to the standardization of design.

The same argument appears to apply to programmers. Fewer programmers are needed if there is compatibility across many machines. Therefore, efficiency would tend to force this commonality. Standard languages (like PL/I, FORTRAN, COBOL and JOVIAL) do contribute toward lower over-all costs. Industry and government probably have similar shortages of highly qualified programmers, thus tending to make language and instruction set commonality the path of least resistance.

Military computer technology

This section discusses some of the computers and circuit technology now undergoing development. Computers discussed in the previous section will not be discussed again.

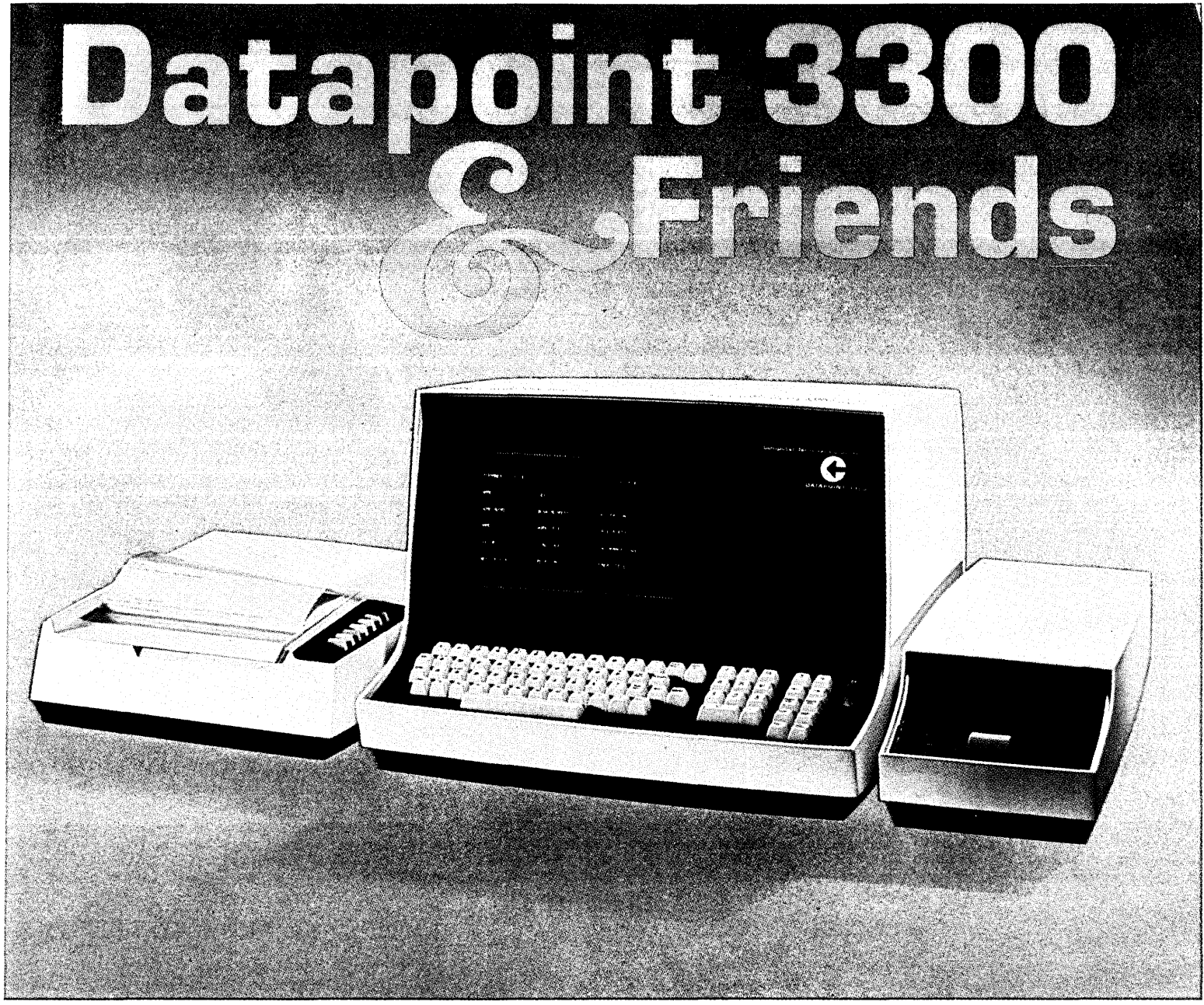
Autonetics. Autonetics has had a model of the D200 series MOS computers operating since August of 1968. The central processor is comprised of 24 MOS/LSI chips using eight different functional packages. The D200-10 series is in development with 16, 24, or 32-bit configurations and faster clock rates. The prototype D200-1 operated at 250 KHZ and later versions operated at 500 KHZ. The D200-1 represents the equivalent of more than 90,000 field-effect transistors (including 4096 words of 24-bit plus sign MOS memory). The operating temperature range is −54° C to +71° C (base plate) and is generally designed for triservice applications.

Bunker-Ramo. Bunker-Ramo, under partial sponsorship of the Air Force, has developed the Model BR-1018 MOS/LSI computer. The chips contain about 500 active elements on a 100 by 100 mil substrate. Each encapsulated package has about 44 leads and dissipates 100-150 milliwatts. The design is based on a "bit slice" partitioning scheme which permits a modular and repetitive architecture which uses four basic packages. The word length is primarily a function of the number of packages. The BR-1018 "bit slice" LSI computer is the follow-on to an experimental IC computer developed in 1964. The characteristics of the BR 1018, in a typical aerospace configuration, are given in the tables.

Control Data. CDC is manufacturing the ALPHA-1, a modular and militarized MSI computer with string processing, trigonometric, floating point, square root, search and other scientific instructions. The ALPHA-1 can accommodate several types of memory. Typical applications include spectrum analysis, detection and pattern recognition, and sonar, radar and seismic data processing.

Hughes. The Hughes H4400 MSI/LSI modular computer system is now in development. It can accommodate up to eight processors, including arithmetic control processors (ACP) and input/output

Datapoint 3300 & Friends



Meet the newest member of the Datapoint Family — the Datapoint 3300P Printer Unit.

The 3300P printer joins with the Datapoint 3300 terminal and the Datapoint 3300T Magnetic Tape Unit to provide time sharing users with an unprecedented capability for high speed, flexible transmission and receipt of data and for off-line data handling and manipulation.

The 3300P features print speeds up to 30 characters per second • accepts incoming data at 110, 150, 220 or 300 BPS • serves up to five Datapoint 3300's • formatted report preparation • thermal printing process • plug-in utilization • light weight • compact • handsome styling • easy maintenance (fewer than 25 moving parts).

Just as important, the 3300P is available now, currently in many field installations in fact, as are the Datapoint 3300 and the 3300T. You can find out more about the new 3300P and the whole Datapoint family by contacting any of the Computer Terminal Corporation offices listed below.

Computer Terminal Corporation

A TEXAS CORPORATION

HOME OFFICE: 9725 Datapoint Drive, San Antonio, Texas 78229, (512) 696-4520

FIELD OFFICES: Arlington, Va., 1815 N. Fort Myer Drive, 22209 (703) 524-6455 / New York, N.Y., 1345 Avenue of the Americas 10019 (212) 541-9205 / Atlanta, Ga., 1655 Tullie Circle N.E. 30329 (404) 631-0806 / Houston, Tex., 2400 W. Loop Building 77027 (713) 626-0010 / Minneapolis, Minn. 7851 Metro Parkway 55420 (612) 727-1344 / Los Angeles, Calif. 3807 Wilshire Blvd. 90005 (213) 380-2497 / San Francisco, Calif. One Maritime 94111 (415) 362-3937

processors, in any combination. The H4400 can accommodate up to 16 8K or 16K memory modules for a maximum of 256K 32-bit words. Communication/-transfer between the processors and memory is handled by a memory/processor switch (MPS). The MPS is said to be able to provide up to eight simultaneous and 16 concurrent paths between processors and memories. The H4400 is designed to meet MIL-E-16400, MIL-E-4158, and MIL-E-5400 and is therefore a triservice computer system.

Litton. The Litton L-3050 MSI computer is an outgrowth of the Army's Tactical Fire Control System (TACFIRE). The L-3050 is a single or multiprocessor computer system. The central processor can address up to 33.5 million words. Input/output can be shared or independent of the cpu's. The central processors have multiprogramming capability with up to 64 independent program levels, with 16 general-purpose registers assigned to each level. The L-3070 is an expanded version of the L-3050 implemented with LSI components. The system is designed for strategic command and control applications.

Singer. The Singer Project Focus is a family of central processors, memories, input/output processors, D/A and A/D converters, and power supplies. The family uses MSI and LSI to achieve high-density components suitable for airborne and aerospace applications. The configuration includes multiprocessors and both programmed and DMA I/O channels in half or full ATR configurations.

Teledyne. The Teledyne Series 20000 computers are designed for space and aeronautical applications and include configurations ranging from a basic inertial navigation computer up to a large-scale avionics system. The series includes a digital differential analyzer (DDA) which can operate independently and in parallel with the general-purpose processor. The computer memory can be a mix of DRO and NDRO in 1K increments up to 16K words.

Texas Instruments. Texas Instruments, under partial sponsorship of the Air Force, has developed the Model 2502 LSI computer. The packaging technology used in this computer has been termed LSI/DRA (discretionary routed array). The actual gates are identical to the series 54/74 TTL/IC gates. The LSI/DRA technology has reduced connections between IC packages by a factor of six. At the same time, the number of encapsulated packages was reduced from 1735 to 34, a reduction factor of 51. The performance characteristics of the TI 2502 are given in the charts. Each LSI package is roughly equivalent to a 200 logic gate array or 2000 discrete components. Several standard wafers are produced and the interchip wiring is calculated by a computer program using logic interconnect data and wafer data. Application reports on the process (Bulletins CA-139, and CB-113) are available from TI.

Univac. The Univac AN/UYK-7 has been developed for general shipboard applications under sponsorship of the Navy. One of its first major uses will be in the Advanced Surface Missile System (ASMS). The AN/-UYK-7 is a highly modular multiprocessor computer designed to accommodate a wide range of applications including radar signal processing, weapons system control, logistics, and command and decision systems. The avionics version of the AN/UYK-7 is the Model 1832. The 1832 was designed for the S-3A airframe (VS A-NEW).

The Univac AN/UYK-8 is the next generation computer which retains compatibility with the CP-808 and CP-642B computers. It has additional instructions to enable it to function as a dual-processor.

"Here's something you didn't count on—83,000 shares of the company stock up my sleeve!"
© DATAMATION ®

Manufacturing technology

During several recent studies which involved commercial minicomputer and peripheral equipment, it was noted that some commercial manufacturers are now using temperature testing of equipment as a standard factory technique for detecting marginal components and assemblies. The basis for this testing is the fact that small manufacturers cannot afford large maintenance staffs and are, therefore, willing to detect the marginal components while the equipment is still in the factory.

This technique is, apparently, not applied by a significant number of the large commercial manufacturers as yet. The author has discussed these problems with several users who declared that the computers had little or no temperature margin, or could not operate during rapid change in temperature, or that the equipment was first tied together in the user's facility and that it sometimes took on the order of months for the manufacturers' field engineers to create a working system out of a set of pieces.

It was noted that many of the managers who were manufacturing minicomputers and performing temperature testing were once employees of aerospace manufacturers who have started their own companies.

There are signs that government budget cuts and program delays are causing aerospace corporations to move into the commercial and industrial markets. One good example of the "natural marketplace" is aircraft navigation systems. The FAA's interest in solving the airspace problem is coinciding with MSI/LSI technology and DOD budget cuts. The market for area navigation systems has been estimated to be between

(Text continues on p. 96. For survey tables on Military CPU's, see pages 91 through 95.)

Survey of Military Computers

Computer Identification	MANUFACTURER	AC Electronics	AC Electronics	AC Electronics	AC Electronics	AMBAC
	MODEL NO.	301	311	341	351	1808
	DESCRIPTION	SP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR
	APPLICATIONS	SRAM MSL Guidance	CAROUSEL IV INS	RT	MARK II Area Nav	LTN-51 INS
	STATUS	PROD	PROD	DEV	DEV	PROD
Physical Char.	TECHNOLOGY	IC	IC, MSI	MSI	MSI	IC, MSI
	MTBF	4600	3500		2400	7000
	SIZE	0.1	0.44	0.12	0.42	0.2
	WEIGHT	5.2	22		22	9 (4K)
	POWER	39	110		120	85
Memories DRO	TYPE	Core	Core	Core	Core	Core
	CYCLE/ACCESS	4.0	2.6	2.5	3.0	3.3
	MIN/MAX, WORD	384, 8	6K/8K, 12	2K/64K, 16	4K/32K, 19	4K/32K, 18
Memories NDRO	TYPE	Core		MOS-IC		Part of Core
	ACCESS TIME	4.0		1.0		
	MIN/MAX, WORD	1664 8 Bits		4K, 16		
Instructions	TOTAL NO.	12	29	16	61	56
	ADD/MULT/DIV	24/40/280	19.5/104/332	5/20/20	6/24/30	6.6/26.4/26.4
	INDEXING	Yes	Yes	Memory	Yes	3 Hardware
	LENGTH	8 or 16	12 or 24	16	19	18
I/O	INTERRUPTS	1	1	1	8	1
	DMA RATE		153	400	100	300
	MUX RATE		50		160	
	OTHER	S, D, A	P, D, A			S
Software	COMPILER	Yes	Yes		Yes	
	SIMULATOR	S/360	S/360		S/360	S/360
	COMPATIBILITY	311, 341, 351	341, 351	351		
	COMMENTS			64K words Total	Also 24 Bit Version	

Computer Identification	MANUFACTURER	Autonetics	Autonetics	Autonetics	Bunker-Ramo	Burroughs
	MODEL NO.	D26J-40	D26J-103	D200-1	BR-1018	D84/233
	DESCRIPTION	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/LAND
	APPLICATIONS	F-111 INS, CONDOR	SRAM GUID (in B-52)	LORAN NAV	RT	PERSHING, F-111 CHKOUT
	STATUS	PROD	PROD	DEV	DEV	PROD
Physical Char.	TECHNOLOGY	IC	IC	MOS LSI	MOS LSI	IC
	MTBF	3200 (est.)	1850	10,000	20,000 (est)	850
	SIZE	0.9	0.9	0.08	0.04	5.25
	WEIGHT	40	50	6	4.5	363 (24K)
	POWER	200	250	10	35	254
Memories DRO	TYPE	Core	Core	Core or IC	Optional	Core
	CYCLE/ACCESS	4.0	3.6	4.0		3.0
	MIN/MAX, WORD	4K/8K, 12	4K/32K, 24	4K/32K, 24		4K/32K, 24
Memories NDRO	TYPE				Plated Wire	
	ACCESS TIME				1.0	
	MIN/MAX, WORD				2K/8K, 18	
Instructions	TOTAL NO.	38	53	35	32	47
	ADD/MULT/DIV	8/18/18	7.2/15.3/30.6	8/108/112	6/28/55	6/23/32
	INDEXING	Memory	7, Memory	3, Hardware	Memory	Yes
	LENGTH	12	24	24	18	24
I/O	INTERRUPTS	4	20	4	1	24
	DMA RATE		50		250	333
	MUX RATE	12	50	250	Option	
	OTHER	D		S, D	S, D, A	
Software	COMPILER					
	SIMULATOR	S/360	S/360			FTN-IV
	COMPATIBILITY					
	COMMENTS	RT Clock, Self Test	RT Clock, Backup Power	Variable Word Length	NDRO has write logic	Multi-Processing

Survey of Military Computers

Computer Identification	MANUFACTURER	Burroughs	CDC	CDC	CDC	CDC
	MODEL NO.	D825	ALPHA-1	449-1	449-2	5100R
	DESCRIPTION	GP/MIL/LAND	GP/MIL/ALL	SP/MIL/AIR	SP/MIL/AIR	GP/MIL/ALL
	APPLICATIONS	BUIC, SAGE, NORAD	Sensor Data Processing	GEMINI Experiment	RT	RT
	STATUS	PROD	DEV	PROD	DEV	PROD
Physical Char.	TECHNOLOGY	IC	MSI	IC	IC	IC
	MTBF				7260	2500
	SIZE		1.1	0.08	0.15	0.9
	WEIGHT		122	8.5	13	40
	POWER		450	5	20	140
Memories DRO	TYPE	Core	Core	Thin Film	Thin Film	Core
	CYCLE/ACCESS	4.0	1.0/0.5	4.0	4.0	2.5/0.75
	MIN/MAX,WORD	4K/64K, 48	16K/128K, 32	256, 24	128/256, 24	4K/64K, 16
Memories NDRO	TYPE		Thin Film	Micro Biax	Micro Biax	
	ACCESS TIME		0.35	4.0	4.0	
	MIN/MAX, WORD		16K/128K, 32	7680, 12	1280/7680, 12	
Instructions	TOTAL NO.		184	38	38	34
	ADD/MULT/DIV	2/48/48	2.0/9.7/19.7	28/604/–	28/604/–	12/26/40
	INDEXING	15, Hardware	16, MSI	2, Memory	2, Memory	Memory
	LENGTH	48	8, 16, or 32	24	24	16
I/O	INTERRUPTS	27 (12)		1	1	2
	DMA RATE		350			333
	MUX RATE	250				55
	OTHER			A	D, Synchro	Std. Peripherals
Software	COMPILER	ALGOL, JOVIAL	ASA FTN			
	SIMULATOR		3300		Yes	3300
	COMPATIBILITY	B5500		449-2	449-1	
	COMMENTS	Militarized B5500	See Text	Internal Battery		RT Clock

Computer Identification	MANUFACTURER	CDC	Honeywell	Honeywell	Honeywell	Honeywell
	MODEL NO.	5400B	DDP-516R	HDC-201	HDC-501	HDC-601
	DESCRIPTION	GP/MIL/AIR	GP/RUG/ALL	SP/MIL/AIR	SP/MIL/AIR	GP/MIL/AIR
	APPLICATIONS	RT	RT	DC-10 Flight Data	AGENA Guidance	Experimental Guidance
	STATUS	PROD	PROD	PROD	PROD	DEV
Physical Char.	TECHNOLOGY	IC	IC	IC	IC	IC
	MTBF		4000	12,000	2600	2500
	SIZE	1.4	30	0.2	0.5	0.7
	WEIGHT	75	400	60	25 (4K)	34
	POWER	289		265	90	170
Memories DRO	TYPE	Core	Core	Optional	Core	Core
	CYCLE/ACCESS	1.0	0.96		2.0/0.65	2.0/0.83
	MIN/MAX,WORD	8K/24K, 24	4K/32K, 16		4K/8K, 20	4K/32K, 16
Memories NDRO	TYPE	Thin Film		IC		Plated Wire
	ACCESS TIME	1.0		0.75		1.0/0.5
	MIN/MAX,WORD	8K/24K, 24		256/8K, 18		8K, 16
Instructions	TOTAL NO.	64	72	33	59	87
	ADD/MULT/DIV	1/9/10	1.92/5.28/10.56	10/104/194	4/24/24	2.4/12.0/14.4
	INDEXING	4, Hardware	1, Hardware		4, Hardware	1, Hardware
	LENGTH	12 or 24	16	12	10 or 20	16
I/O	INTERRUPTS	17	48	2	16	20
	DMA RATE	1000	1000			500
	MUX RATE	250	260	100	250	
	OTHER			S, D	S, D	D
Software	COMPILER		FTN IV			FTN IV
	SIMULATOR	Yes		H-2200		
	COMPATIBILITY		DDP 516			DDP-516
	COMMENTS	Look-Ahead	RT CLOCK	ROM & IC Options		

Computer Identification	MANUFACTURER	Honeywell	Honeywell	Hughes	Hughes	Hughes
	MODEL NO.	HDC-701	HDC-801	HCM-205	HCM-231	H-3118M
	DESCRIPTION	SP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/ALL
	APPLICATIONS	Minuteman III Guidance	X-15 Guidance	RT	RT	NADGE, TSQ-51
	STATUS	DEV	PROD	PROD	DEV	PROD
Physical Char.	TECHNOLOGY	IC	IC	IC	MSI, IC	IC
	MTBF		2000	2000	3000	1000
	SIZE	1.2	1.4	0.8	0.75	16
	WEIGHT	50	70	30	45	800 (16K)
	POWER	270	150	180	300	1500
Memories DRO	TYPE		Core	Core	Core	Core
	CYCLE/ACCESS		2.0	2.0	1.0/0.5	1.8/0.9
	MIN/MAX, WORD		4K/32K, 24	2K/32K, 18	4K/128K, 24	16K/128K, 18
Memories NDRO	TYPE	Plated Wire	Plated Wire		Options	
	ACCESS TIME	0.6	1.0			
	MIN/MAX, WORD	4K/16K, 32	4K/32K, 24			
Instructions	TOTAL NO.	56	89	41	81	60
	ADD/MULT/DIV	2.4/10.8/21.4	4/12/30	4/22/25	2/5.5/15	3.6/6.75/11.25
	INDEXING	3, Memory	6, Hardware	3, HARDWARE	3, HARDWARE	48, Hardware
	LENGTH	16 or 32	24	18	12 or 24	18
I/O	INTERRUPTS	8	32	18	24	18
	DMA RATE		500	250	1000	
	MUX RATE		100	250	500	555
	OTHER	S, D, A, P	D	S, D, P, A		
Software	COMPILER				in development	JOVIAL
	SIMULATOR	S/360, U1108	H-2200	Yes	S/360, Sigma 5, 7	H-330
	COMPATIBILITY			HCM-205A		HM-4118
COMMENTS		Micro-programmable	32K Maximum Memory	Also 24-bit Version	12, 16, 24 or 32 bit words	Dual-Processor RT Clock

Computer Identification	MANUFACTURER	Hughes	Hughes	IBM	IBM	IBM	IBM
	MODEL NO.	HM-4118	H4400	4π/TC-2	4π/CP-2	4π/EP	Advanced 4π
	DESCRIPTION	GP/MIL/ALL	GP/MIL/ALL	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/ALL	GP/MIL/ALL
	APPLICATIONS	407-L, ADAR	Command & Control	A-7 D/E	F-111 NAV & Wpns	Command & Control	Avionics Navigation
	STATUS	PROD	DEV	PROD	PROD	PROD	DEV
Physical Char.	TECHNOLOGY	IC	MSI-LSI	IC	IC	IC	MSI
	MTBF	800		2952	5158	620	1500+
	SIZE	4.8	10	1.1	0.9	4	0.8
	WEIGHT	123 (16K)	350 (32K)	75	50	167 (16K)	50 (16K)
	POWER	2200	1500	300	250	763	250
Memories DRO	TYPE	Core	Core	Core	Core	Core	Core
	CYCLE/ACCESS	1.0/0.5	1.4/0.5	2.5/0.9	2.5/0.9	2.5/0.9	1.0/0.4
	MIN/MAX, WORD	4K/128K, 18	8K/256K, 32	8K/32K, 32	8K/32K, 32	16K/128K, 32	8K/32K, 32
Memories NDRO	TYPE		LSI ROM				
	ACCESS TIME		0.12				
	MIN/MAX, WORD		512/1K, 140				
Instructions	TOTAL NO.	60	167	51	61	72	73
	ADD/MULT/DIV	2.0/3.5/6.25	1.4/6.0/10.5	5/20/21	3.8/11.5/46.3	5/10/20	2/7.5/15
	INDEXING	48, Hardware	16, Hardware	8, Memory	3	16, Hardware	7, Hardware
	LENGTH	18	16 or 32	8 or 16	16 or 32	8, 16, or 32	16 or 32
I/O	INTERRUPTS	18	640 (5)	9	8	6	16
	DMA RATE						1000
	MUX RATE	1000	1200	50	262	400	
	OTHER			S, D, A	D		S
Software	COMPILER	JOVIAL	JOVIAL	ALT		FTN IV	
	SIMULATOR	H-330	CDC-6600	S/360	S/360	S/360	S/360
	COMPATIBILITY	H-3118M				S/360	
COMMENTS		Dual-Processor, RT Clock	Multi-Processor	Self Test	Self Test	Dual-Processor	Symmetrical Multi-Processor

Survey of Military Computers

Computer Identification	MANUFACTURER	Litton	Litton	Litton	Northrop	Northrop
	MODEL NO.	L-304F	L-3050M	L3070	NDC-1060	NDC-1070
	DESCRIPTION	GP/MIL/ALL	GP/MIL/ALL	GP/MIL/ALL	GP/MIL/AIR	GP/MIL/AIR
	APPLICATIONS	HAWKEYE	TACFIRE	Command & Control	C-5 GALAXY	OMEGA NAV
	STATUS	PROD	PROD	DEV	PROD	DEV
Physical Char.	TECHNOLOGY	IC	MSI	LSI	IC	IC
	MTBF	2400	>2000	>2000	3000	3850
	SIZE	0.4	9.5	3.2	0.9	0.61
	WEIGHT	35	450 (32K)	100 (64K)	37	35
	POWER	250	1100		200	200
Memories DRO	TYPE	Core	Core	Post & Film	Core	Core
	CYCLE/ACCESS	1.8/0.8	2.0/0.8	0.5/0.25	2.0/1.0	2.0/1.0
	MIN/MAX, WORD	8K/128K, 32	8K/33M, 32	4K/33M, 32	4K/16K, 28	8K/64K, 16
Memories NDRO	TYPE		Plated Wire			Core Rope
	ACCESS TIME		0.5			0.3
	MIN/MAX, WORD		8K/32K, 32			
Instructions	TOTAL NO.	63	100	103	42	73
	ADD/MULT/DIV	6.6/24/32	3.6/16/16	2/8/8	8/74/138	6/8/–
	INDEXING	7, Memory	7, Hardware	7, Hardware	7, Hardware	16, Hardware
	LENGTH	32	32	32	14 or 28	16 or 32
I/O	INTERRUPTS	64	128 (64)	128 (64)	10	12
	DMA RATE	227	400	500		500
	MUX RATE	432	400	500	100	160
	OTHER	NTDS, S/360	NTDS, S/360	NTDS, S/360	S, D	D
Software	COMPILER	NELIAC	PL/1 Subset	PL/1 Subset	Yes	
	SIMULATOR	S/360	S/360	S/360	S/360	S/360-65
	COMPATIBILITY	L-304 Series	L-3070	L-3050M	NDC-1051A	
COMMENTS		Dual-Processor, 16-bit Operands	Multi-Processor	Multi-Processor		Programmed Macros

Computer Identification	MANUFACTURER	RCA	Rolm	Singer	Singer	Teledyne
	MODEL NO.	215	1601	FOCUS	GPK-20	TDY-214
	DESCRIPTION	GP/MIL/ALL	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR
	APPLICATIONS	Command & Control	RT	AVIONICS	P-3C INS, C-141 INS	F-14 MINC
	STATUS	DEV	PROD	DEV	PROD	PROD
Physical Char.	TECHNOLOGY	IC, MSI	IC	IC, MSI	IC	IC, MSI
	MTBF	420	11,000 (est)	2,000	3,440	
	SIZE	27	0.6	0.5	0.5	0.8
	WEIGHT	875	40 (4K)	30	21.5	4.5 (2K)
	POWER	2200	70	350	82	40
Memories DRO	TYPE	Core	Core	Core	Core	Core
	CYCLE/ACCESS	1.65	2.6/0.9	2.5/1.0	4.0/1.0	3.3
	MIN/MAX, WORD	16K/128K, 32	4K/32K, 16	4K/128K, 32	4K/16K, 10	1K/16K, 20
Memories NDRO	TYPE	Core Rope	MOS ROM	LSI		Core Rope
	ACCESS TIME	0.3		0.05		3.3
	MIN/MAX, WORD	1K, 64	256/8K	256/512, 32		1K/16K, 20
Instructions	TOTAL NO.	153	124	94	31	29
	ADD/MULT/DIV	3.3/7.1/–	5.9/9.7/9.7	2.6/5.8/9.9	10/100/–	7.5/31/39
	INDEXING	Hardware	2, Hardware	Memory or LSI		3, Hardware
	LENGTH	8, 16 or 32	16	16 or 32	20	20
I/O	INTERRUPTS	32 Min	64	64 (16)	1	15
	DMA RATE	500	285	667	250	330
	MUX RATE	400	80	400		
	OTHER	Selector		A	S, D, P Synchro	S, D, P
Software	COMPILER	COBOL, JOVIAL		FTN IV		
	SIMULATOR	Spectra 70, S/360		S/360, U1108	U1108	7094
	COMPATIBILITY	Spectra 70, S/360	NOVA			TDY-300
COMMENTS		Multi-Processor		Multi-Processor	Part of Core Protected	16K Maximum Core

Computer Identification	MANUFACTURER	Teledyne	Teledyne	TI	TI	TI
	MODEL NO.	TDY-300	20,000	2502 T	2540 SB	2550 AB
	DESCRIPTION	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/AIR	GP/MIL/SEA	GP/MIL/AIR
	APPLICATIONS	Improved CENTAUR	IHAS, SCNS, AAFSS, 747	TIPI	SRN-3 NAV.	AVIONICS
	STATUS	PROD	PROD	DEV	PROD	DEV
Physical Char.	TECHNOLOGY	IC	IC, MSI	LSI	IC, MSI	IC, MSI
	MTBF				2000	3000
	SIZE	0.35	0.2	0.37	10	1.21
	WEIGHT	20	12.5	25	250 (32K, Drum)	65
	POWER	63	70	100	475	300
Memories DRO	TYPE	Core	Core	Core	Core	Core
	CYCLE/ACCESS	3.0/1.5	3.3	2.0	2.0/0.8	2.0
	MIN/MAX, WORD	4K/64K, 24	1K/16K, 20	8K/64K, 16	8K/32K, 16	4K/32K, 32
Memories NDRO	TYPE		Core Rope			
	ACCESS TIME		3.3			
	MIN/MAX, WORD		1K/16K, 20			
Instructions	TOTAL NO.	27	29	36	29	78
	ADD/MULT/DIV	6/22.5/40.5	8/32/41	4/10.5/–	4/13.5/13	4/7.5/12.5
	INDEXING	3, Hardware	3, Hardware	4, Hardware	8, Hardware	16, Hardware
	LENGTH	24	20	16	16	16 or 32
I/O	INTERRUPTS	255 (5)	5	12 (3)	16 (16)	22 (22)
	DMA RATE	333	300	500	125	400
	MUX RATE				Option	125
	OTHER	S, D, A	S, D, P, DDA	D, TTY	NTDS, TTY	
Software	COMPILER				FTN	FTN
	SIMULATOR	CDC-6600	7094	S/360	S/360	S/360
	COMPATIBILITY	TDY-300 Series	TDY-300 Series		2550	
COMMENTS		310 is faster version	Dual-Processor		RT Clock, ABN Version Available	RT Clock

Computer Identification	MANUFACTURER	UNICOMP	UNIVAC	UNIVAC	UNIVAC	VARIAN
	MODEL NO.	COMP-16	1832	AN/UYK-7	AN/UYK-8	R-620/i
	DESCRIPTION	GP/RUG/ALL	GP/MIL/AIR	GP/MIL/SHIP	GP/MIL/SHIP	GP/RUG/ALL
	APPLICATIONS	RT	S-3A	RT	RT	NAVY VAST
	STATUS	DEV	PROD	PROD	PROD	PROD
Physical Char.	TECHNOLOGY	IC	MSI	MSI	IC	IC
	MTBF	4500		2000	2000	
	SIZE	2.2	11.9	10.4	8.7	4.9
	WEIGHT	45 (4K)	410	500 (16K)	375 (32K)	61
	POWER	250	2300	2300	1700	350
Memories DRO	TYPE	Core	Core	Core	Core	Core
	CYCLE/ACCESS	0.9/0.4	0.75	1.5/0.75	1.5/0.85	1.8/0.75
	MIN/MAX, WORD	4K/64K, 16	32K/96K, 32	16K/256K, 32	16K/256K, 30	4K/32K, 16
Memories NDRO	TYPE	Core Rope				
	ACCESS TIME	0.4			0.5	
	MIN/MAX, WORD	512/4K, 16			512, 30	
Instructions	TOTAL NO.	29	131	123	107	100
	ADD/MULT/DIV	2.5/13/14	3/9/15	3/9/15	1.5/7.5/14.5	3.6/18/18
	INDEXING	6, Memory	14, Hardware	14, Hardware	7, Hardware	1, Hardware
	LENGTH	16	16 or 32	16 or 32	30	16
I/O	INTERRUPTS	64			16 per Channel	64 (8)
	DMA RATE	1100				200
	MUX RATE		1000	1000	1000	200
	OTHER	S, D, A	NTDS, A-NEW	NTDS, A-NEW	NTDS, A-NEW	
Software	COMPILER	BASIC	CMS-2	CMS-2	JOVIAL	FTN IV
	SIMULATOR					
	COMPATIBILITY	COMP-18	AN/UYK-7	1832	CP-808, CP-642	VDM-620/i
COMMENTS		RT Clock, 18-Bit Version	Multi-Processor	Multi-Processor	Multi-Processor	18-Bit Version

$250 and $500 million over the next five years. There are about 20 major manufacturers contending for this market. Eleven of these manufacturers have their navigation computers included in this survey. There may well be over 6,000 navigation systems sold over the next five years.

Other examples of markets where aerospace computer technology will feel at home in quasimilitary applications include: minisub navigation; unattended process monitoring and control; severe-environment expedition support; seismic surveys; automated factory test equipment; maritime satellite navigation; maritime engine control; meteorological data stations; oceanographic data processing; tracking-radar control and data processing; numerical control; data acquisition; and law enforcement mobile command post.

Circuit technology

The previous topics in this section indicated how people are tending to cause convergence of military and commercial technology. An equally important aspect of the convergence is circuit technology.

The development of metal oxide semiconductors (MOS) for LSI started around 1965 and 1966. Research and development funds moved MOS into experimental form in 1968 and 1969. MOS is now in custom piece and sample production and is expected to top $100 million in sales in 1970. Based on some observations during 1969, shipments will probably lag sales. It appears that MOS will be used in memories and processors in the commercial and quasimilitary computers during 1970. For military computers, MOS will be used principally in memories (there are notable exceptions, however). One manufacturer uses these design guidelines:

Bipolar silicon: high speed; wide temperature performance; higher cost.

MOS: lower speed; lower power; narrower temperature range; lower cost.

Marketing

There are several good reasons why commercial computer manufacturers should keep an eye on the military manufacturers:

1. Most military computers operate over a temperature range of 200°F while many commercial computers can barely operate over a temperature range of 20°F. Large-scale commercial systems with military components should need less expensive air-conditioning systems and less maintenance.

2. Military budgets are tight, DOD program delays are the norm, and profits are negotiated. The military manufacturers are probably gazing fondly at the profit margins and growth rate of the commercial market.

3. The fail-soft requirements of military programs such as A-NEW, ASMS, TACFIRE, etc., have necessitated the development of multiprocessor systems which appear to be more advanced than those being offered commercially. The time-sharing service bureaus could benefit from these capabilities.

Several computer manufacturers, shown in the survey, offer memory options ranging from low to high speed core, NDRO thin film, core-rope, MOS, and bipolar semiconductors. They also offer packaging for each of the military services, for the avionics market, and several alternative packaging configurations for the ruggedized and commercial markets. Thus, several manufacturers are offering interchangeable components and packaging to fit specific applications and budgets. It is apparently going to become very difficult to distinguish between a commercial minicomputer, a ruggedized computer, or a small general-purpose avionics computer.

It appears that the military and ruggedized military computer markets are growing at about the same rate as the commercial market. The services are putting small MSI/LSI computers in more military systems, and the quasimilitary market is growing rapidly. Because it took MSI and LSI to bring the size, weight, power, and cost down to a reasonable point, the military marketplace is behind the commercial market by perhaps two years (as a gross estimate). If the Diebold study (as referenced in the Jan. 5 issue of Electronic News) is used, and a two-year delay in growth is assumed reasonable, then the military and quasimilitary computer system market should be in the order of $20 billion by 1975. If the assumption is also made that the central processors will comprise 30% of the total system cost in 1975 (again according to the Diebold study), then approximately $6 billion will be spent on military and quasimilitary central processors in 1975. This does not appear unreasonable. Several sources have stated that over half of all new military electronic systems will have one or two general-purpose computers, and many new electronic systems will be support-type data processing systems.

Summary

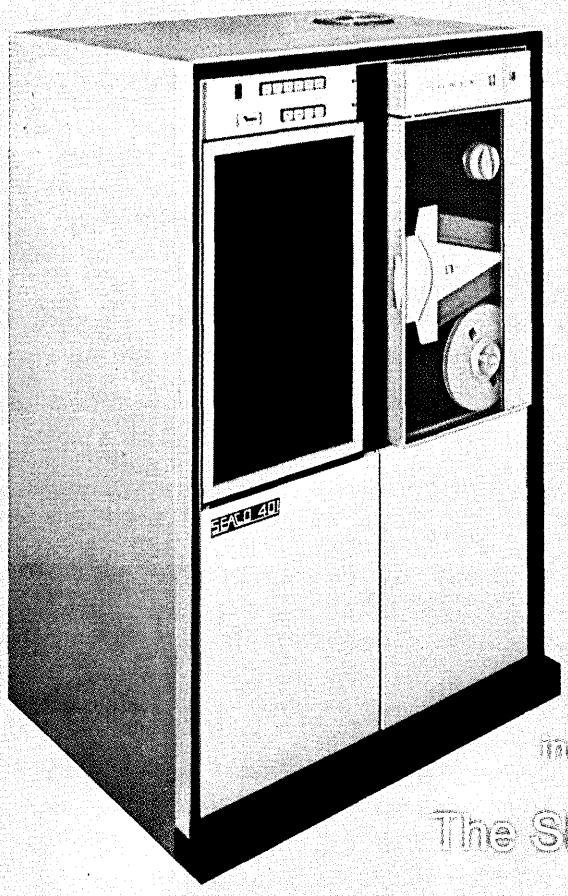
The descriptions in the previous sections indicate that the new aerospace computers have flexibility and capability similar to, or in excess of, the pre-1970 ground-based systems. Further, MSI and LSI are reducing size and weight to the point where large capability multiprocessor, multiprogramming systems are well within airframe weight, size and power requirements. Except for inertial navigation and other specialized applications, there appears to be no technical reason why all three services cannot utilize the computers which will be available in the 1970's.

It was indicated that the manufacturers' circuit technology is tending to standardize architecture and produce multiapplication computers. It appears that DOD budget cutbacks will enhance component and instruction-set commonality in order to maximize computer capability within minimal program budgets. Lastly, aerospace corporations, or their spinoffs, will enter the commercial and ruggedized market areas, thus providing another factor to cause convergence of military and commercial computer technology.

THE SURVEY TABLES

Not all currently available computers are included in this survey, (pages 91 through 95). Some computers were intentionally excluded because of the manufacturer's policies or the classification of DOD programs. Others may have been excluded unintentionally.

(Continued on p. 98)



The
Sensible
COM
Recorder

For under $40,000.
And a wide choice of options . . .
including a microfiche camera.

The SEACO 401

SEACO
Computer-Display Incorporated
2826 West Kinsley Road, Garland, Texas 75040 (214) 271-2481

CIRCLE 67 ON READER CARD

The descriptions of the table terminology and explanation of the entries are as follows:

Manufacturer. This is the name of the original manufacturer of the computer main frame.

Model number. The model number is that which is most often seen in the literature. In the case of a series of models, the model number represents the one which the manufacturer feels will be the one most frequently sold.

Description. The description is broken into three parts. The first part indicates whether the computer is suitable for general-purpose (GP) or special-purpose (SP) applications. (The new big computers are usually GP.) The second part defines whether the computer has been designed to military specifications (MIL) or is a ruggedized (RUG) commercial computer. (The survey tables do not include commercial machines which have undergone military tests.) The third part defines the principal environments, which are: airborne and aerospace (AIR), land mobile and/or transportable (LAND), shipboard (SEA). Some computers (usually the newer ones) are triservice in design and are suitable for all three (ALL) environments. The classification was sometimes difficult because a computer for a satellite is also appropriate for a minisub but probably not for some of the other applications. Therefore applications and environments can get mixed up.

Application. Wherever possible, typical uses of the computer are given. INS appears many places and means inertial navigation system. Where specific applications are unknown, generic terminology is used. Other terms are: navigation—NAV; missile—MSL; satellite—SAT; checkout—CHKOUT; real-time—RT.

Status. Rather than belabor the subject, only PRODUCTION or DEVELOPMENT are used. Development is defined to end when one unit is delivered to the customer.

PHYSICAL CHARACTERISTICS

The memory size, for the stated physical characteristics, is 8192 words (8K) unless otherwise stated.

These definitions are used: IC—less than 12 gates per chip; MSI—12 to 99 gates per chip; LSI—100 or more gates per chip.

MTBF. The manufacturer's quoted mean time between failures is given in hours.

Size. The size is given in cubic feet.

Weight. The weight is given in pounds.

Power. The power is given in watts. Unless otherwise stated the source is assumed to be 115 volts, 400 Hertz.

MEMORIES

The section on memories is split into two subsections: destructive read-out (DRO) and nondestructive read-out (NDRO). The reader should remember that portions of DRO memories can be protected and portions or all of some NDRO memories can be altered with the addition of write electronics. Read-only memories (ROM) are identified as such under NDRO.

Cycle/access time. These times are given in microseconds. If only one number is given, it is the cycle time for DRO and the access time for NDRO.

Min/max, word size. The minimum and maximum amounts of storage are given. K = 1024 words (K in other portions of the charts is the conventional 1000). The word size is given in binary bits and refers to the number of data bits (not including parity).

INSTRUCTIONS

Total number. This is the total number of instructions included in the computer.

Add/mult/div times. These are the add, multiply, and divide times in microseconds. All numbers assume that the hardware arithmetic options (if any) are included. A missing number (usually divide) indicates that this is implemented by a subroutine and there is no hardware divide instruction and associated logic. The timings are for memory-to-register operations (not register to register).

Indexing. The number of index registers is given if limited and the word following indicates whether the indexing is implemented in hardware registers or memory locations.

Length. The length is the size of the instructions in bits.

INPUT-OUTPUT CAPABILITY

Interrupts. The number of separate external and internal interrupts is given. The number of interrupt levels is often given in parentheses.

DMA rate. The direct-memory-access transfer rate is given in thousands of words per second. A DMA channel is defined as a channel which has its own memory address and transfer registers and does not need to interrupt or always stop the cpu to perform an I/O transfer.

Multiplex rate. This is also given in thousands of words per second. A multiplexor channel is defined as a channel which can accommodate many peripheral devices, usually relatively slow devices, and can intermix their I/O requests without cpu intervention for each request.

Other. This other category is for input-output capabilities not specified above. The notations are defined as follows: S—Serial; D—Discrete; A—Analog; P—Pulse.

SOFTWARE

Compiler. Those compilers that are actually implemented on the computer are shown. In cases where there are many compilers, only the most pertinent are indicated.

Simulator. Other computers that have software which can simulate the operation of the military computer are listed. Specifically of interest is the ability to test software, determine core sizing and execution times, determine instruction counts, etc.

Compatibility. Other computers that are software compatible with the military computer are listed.

Assemblers and diagnostics have not been included as all manufacturers provide them.

LIST OF COMPANY ADDRESSES

AC Electronics
Division of GM Corp.
Milwaukee, Wis. 53201
(414) 762-7000

Litton Systems, Inc.
Data Systems Division
8000 Woodley Avenue
Van Nuys, Calif. 91409
(213) 781-8211

(Continued on p. 103)

Bryant develops a line of mini-controllers compatible with leading mini-computers.

A mini-controller for maxi-results.

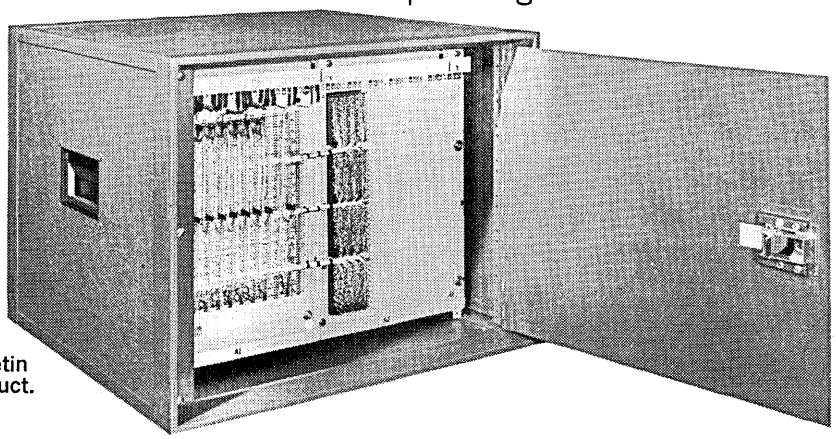
That's the way our new Bryant Series 720 works out. It's a compact, low-cost controller that is instantly compatible with your mini-computer (either the MAC 16 or Interdata 3).

But that's only part of the story. The 720 is instantly expandable from 0.6 million bits to 70 million bits, depending on which of the 8 different Bryant storage memory systems you utilize. Incidentally, only Bryant can offer this wide range of storage expandability.

Hold it, there's more. A fully expanded system can interface two computers with up to eight storage units and two computers can operate off one storage system simultaneously. (And they're available in cabinets or can be rack mounted in your equipment.)

But this is only the beginning. Two more mini-controller systems (compatible with the PDP-8 and SEL-810A mini-computers) will be available later this year. And by 1971, Bryant will have systems to interface with most of the major mini-computers on the market.

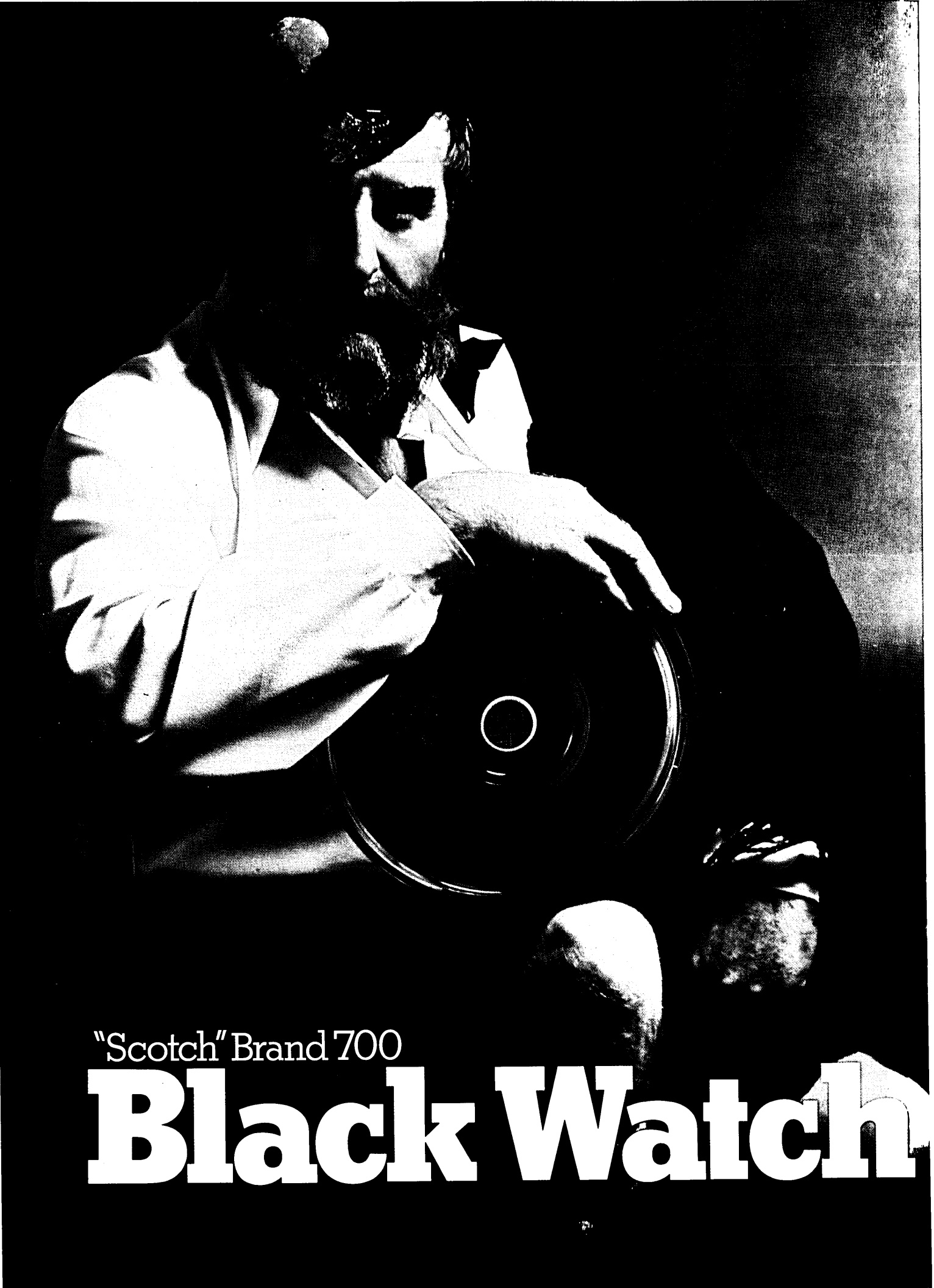
If you're interested in maxi-results, why don't you drop us a line. Bryant Computer Products, 850 Ladd Road, Walled Lake, Michigan 48088.



Watch for next month's Bryant Bulletin and another new Bryant product.

BRYANT COMPUTER PRODUCTS

A UNIT OF XLO® EX-CELL-O CORPORATION


"Scotch" Brand 700
Black Watch

The computer tape that guards itself.

It protects your valuable data.

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

Cinching and edge damage are dramatically reduced.

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

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

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

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

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

3M COMPANY The barrier breakers.

Dick Bray of
NCI Dallas says

"Don't cling too long to the old ways"

"In every generation, there are those who move to the new technology. The new ways of doing things faster and more efficiently.

"And there are those who continue to stay with the old, familiar ways that seem so natural. The ways that were once exciting but are now, by comparison, slow and plodding. Expensive in time, in energy and in money.

"Don't stick with the old computer languages too long. If you do, you may find the industry has passed you by. Simply because others may be able to do the same work far faster, at a far lower cost, and put jobs up and running more quickly.

"Corporate management is becoming aware of these changes in the data processing industry. They are beginning to question costs, work output, efficiency, and response time.

"We urge you to check on WORK TEN. See how different it is from your present methods. Yet how simple it is to learn and use. How it does much of your programming automatically and even generates its own standard narrative documentation. How it speeds systems work, cuts programming time, simplifies program maintenance, and holds DP costs down.

"Drop us a note today for more information on WORK TEN."

NCI

NATIONAL COMPUTING INDUSTRIES
3003 N. CENTRAL, PHOENIX, ARIZONA 85012
TELEPHONE 602: 264-1394

Subsidiary of CONTINENTAL TELEPHONE CORPORATION

An Equal Opportunity Employer

Military Cpu's . . .

AMBAC Industries, Inc.
ARMA Division
900 Old Country Road
Garden City, N.Y.
11530
(516) 742-2000

Autonetics
North American
Rockwell
3370 Miraloma Ave.
Anaheim, Calif. 92803
(714) 632-2511

Bunker-Ramo Corp.
Defense Systems Div.
31717 LaTienda Drive
Westlake Village, Calif.
91360
(213) 889-2211

Burroughs Corp.
Defense, Space and
Special Systems Group
Paoli, Pa. 19301
(215) 644-4400

Control Data Corp.
8100 34th Ave., South
Minneapolis, Minn.
55440
(612) 888-5555

Honeywell, Inc.
Aerospace Div.,
Florida Operations
13350 U.S. Hwy. 19
St. Petersburg, Fla.
33733
(813) 531-4611

Hughes Aircraft Co.
Data Systems Division
Culver City, Calif.
(213) 391-0711

Hughes Aircraft Co.
P.O. Box 3310
Fullerton, Calif. 92634
(714) 871-3232

Interdata
8703 LaTijera Blvd.
Los Angeles, Calif.
90045
(213) 670-8386

IBM
Oswego, N.Y. 13827
(607) 687-2121

Lockheed Electronics
Co., Data Products Div.
6201 E. Randolph St.
Los Angeles, Calif.
90022
(213) 722-6810

Northrop Corp.
Electronics Division
2301 West 120th St.
Hawthorne, Calif.
90250
(213) 757-5181

RCA
Defense Electronics
Products, Aerospace
Systems Division
Burlington, Mass.
01801
(617) 272-4000

Rolm Corp.
10925 N. Wolfe Road
Cupertino, Calif. 95014
(408) 257-6440

Singer
Kearfott Division
1150 McBride Ave.
Little Falls, N.J. 07424
(201) 256-4000

Teledyne Systems Co.
19601 Nordhoff Street
Northridge, Calif.
91324
(213) 886-2211

Texas Instruments, Inc.
P.O. Box 2909
Austin, Texas 78767
(512) 258-5121

UniComp
18219 Parthenia St.
Northridge, Calif.
91324
(213) 886-7722

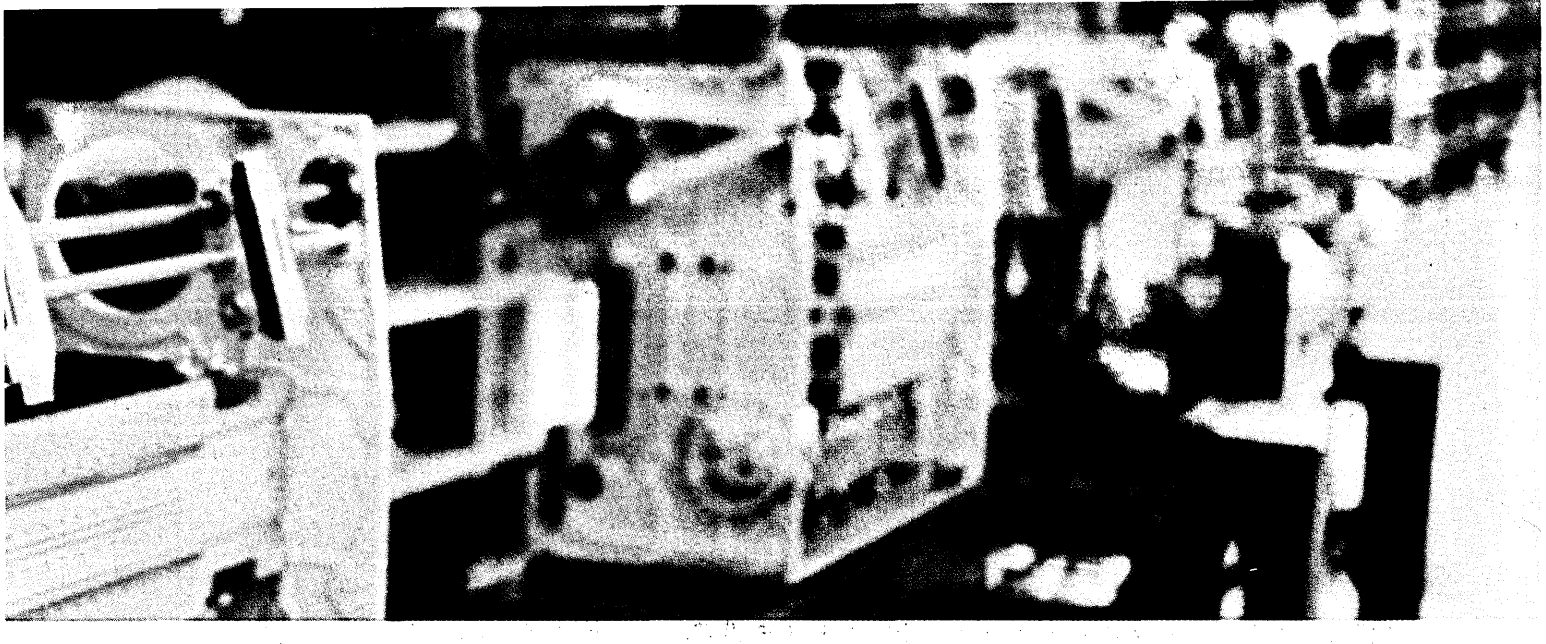
Univac
Federal Systems Div.
Univac Park
St. Paul, Minn. 55116
(612) 456-3032

Varian Data Machines
2722 Michelson Drive
Irvine, Calif. 92664
(714) 833-2400 ■

Mr. Frost is a senior computer systems consultant with Compata, Inc. He has had 14 years' experience in edp, including positions at Computer Sciences Corp., Control Data Corp., and RCA. He is also a part-time instructor at UCLA and has a BSEE from New York University.

"No one made a small, quiet, medium-speed chain printer for $9500. So Mohawk did."

George C. Hohl, OEM Marketing Director, discusses a new product.



"We saw a gap in the printer field. Either you paid a lot of money to get a lot of speed and sophistication, or you could pay a little and get very little in return. We decided to aim our printer somewhere in between.

"Chain printers are mechanically simpler, easier to maintain, less expensive. Their flat face characters give good print characteristics, too.

"Our design requirements were rough. We wanted 300 lines- per-minute with such niceties as easily changeable fonts, and yet we wanted to sell it for less than $10K. It had to be small, and yet we couldn't lose accessibility. The design engineers grumbled, but they made it.

"The changeable font cartridge is great—an operator can quickly switch the font chain—and we're offering fonts from 16 to 128 characters.

"We designed a disposable ribbon cartridge to make ribbon changes quick and clean. Paper handling is enclosed to stay clean, too. And everything that could be modularized, was modularized.

"We considered noise reduction vital—anyone who has worked in a printer room knows why. Well, compared to other printers, you'd hardly know this one was working.

"We're selling the printer for $9500 in OEM quantities, and some variations cost even less. So you get a lot of performance in a very little printer—for very little money."

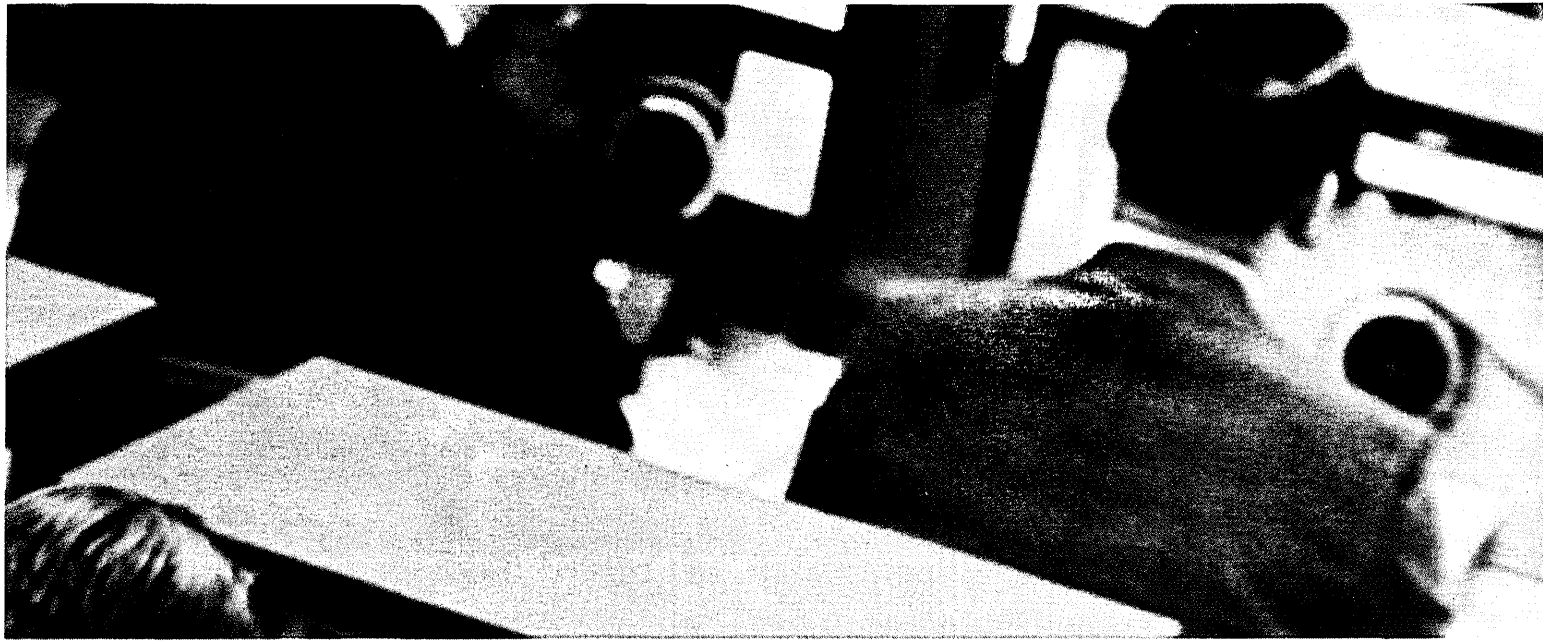
Mohawk Data Sciences Corp.
Herkimer, New York

MDS

OEM MARKETING CENTERS: CORPORATE (315) 867-6475; NORTHEAST (617) 891-5870; SOUTHEAST (404) 631-3443; CENTRAL (312) 298-4141; WEST COAST (213) 685-5165.

"Our salesmen have told people not to buy Mohawk products."

Al Hoge, Vice-President, End-User Marketing, talks service.



"Sometimes we study a prospective client's needs and realize that he can't really use our equipment—or we see that another kind of system is better suited. We tell him to go elsewhere. Because eventually he'll have trouble or find out we misled him, and then how would we look? No, it's better to lose a piece of business than to do bad business.

"I believe a salesman should be able to help a prospective customer design the most effective, sophisticated peripherals system he can use.

"We've developed many of our products from listening to our salesmen. Back in the early days, for example, we had some 900 Data Recorders in the field. Well, our field people had been watching and listening to their customers, and had some suggestions they felt would improve operator performance. It meant developing a completely new backboard module, a major modification, and then retrofitting those 900 machines. Well, we did it, and we did it for free. We figured the machine needed the improvement, and the client shouldn't have to pay for it.

"A year later, those same salesmen came back with more ideas. We had to redesign the backboard module again, and, to make things worse, this job had to be done at our plant here in Herkimer. We had one hell of a logistics problem trying to get all those Data Recorders back in here without crimping our customers' operations. But we did it. And we didn't charge our customers one cent that time either.

"We're in the business to make a living, just like anybody else—we're not playing angel. But the fact is, the most successful companies in this business are the ones that look after their clients—the ones that put service ahead of hardware, even. If that's what it takes to get ahead, then that's the way we do business here."

Mohawk Data Sciences Corp.
Herkimer, New York

MDS

A Conference Report

Computers and Auditing

The interface between computers and auditing was the subject of the *Second Advanced EDP Audit and Control Conference* in New York City, Oct. 2-3, 1969, attended by some 100 computer professionals and edp auditors. Sponsored by Automation Training Center (ATC), it featured speakers from six large public accounting firms: American Airlines, The Bowery Savings Bank, Brandon Applied Systems, Computer Resources Corp., IBM, and ATC. GE's Information Service Dept. put on a time-sharing demonstration on the use of terminals by auditors and programs of interest to them.

The conference is an attempt to provide a meeting place for people doing advanced work on the control and audit of computerized business systems. To permit sufficient changes in the state of the art to develop, conferences are planned at 18-month intervals. The 1969 meeting pointed up that a good deal more state-of-the-art needs to be developed, particularly on the subject of the first day—the control and audit of real-time business systems.

Getting the lethargy out

In his keynote address, Harold Weiss, of ATC, reported that the auditing profession is beginning to emerge from its lethargy regarding edp. There is more computer training of auditors; edp audit specialists are more frequently encountered; audit-oriented software is proliferating; and there is a spate of recent articles and books on computer auditing. We are beginning to encounter systems that are more and more self-controlling and self-auditing, although not 100% so. As the cost of people keeps rising and the cost of computation keeps dropping, this development is inevitable. We are witnessing a number of business organizations embarking upon systems developments of very ambitious scope, great complexity, and which pose considerable potential hazard to the organizations. Management is often unaware of the vulnerability of the organization to these new systems. Can we really adequately control several major business applications concurrently on a real-time basis? Brute force techniques, really sequential techniques, such as batch controls on input, making dual entries from terminals and having the computer compare both inputs, or doing the whole file updating twice, are examples of what is currently being done.

It is apparent that a preventive auditing approach is needed to cope with such systems as well as greater auditor involvement during systems development. High-level management must devote sufficient time to reviewing in advance and in depth proposals for such systems. Mr. Weiss quoted Harry L. Brown in the May, 1969, issue of *Management Accounting:* "In any on-line or real-time environment, the auditor must also be on-line and real-time. He must have inquiry and testing capabilities. He must be given a key to the data cupboard! He is going to be mobile; he is going to do more concurrent auditing; he is going to be trained to perform adequate evaluations of computer systems; and he is going to be a working member of the information team, both in planning and execution."

Mr. Weiss decried the numerous articles and stories appearing on computer fraud, all repeating the same apocryphal and vague horror stories. Very little true computer-based fraud has yet surfaced. The true computer fraud is deception about the benefits and costs of new hardware, software, and systems projects; hidden costs on personnel, documentation; program maintenance, and the like; poor programming and operations, etc. He encouraged qualified auditors to assist dp management in developing good cost accounting systems, in devising bet-

ter control systems, in exposing excessive disaster risk in computer installations, etc. Mr. Weiss concluded with some of the problems facing auditors trying to cope with edp systems: (1) the lack of computer experts in the auditing profession; (2) the secrecy and lack of communication in the auditing field compared to the rapid spread of new ideas, techniques, and experiences among computer professionals; (3) the lack of audit research or control and performance standards to help auditors trying to measure dp performance; (4) the lack of high-level management awareness of the potential role of the auditor in the control of edp, and what resources, skills, salary level, and political support are needed to achieve this role; (5) the too narrow interpretation of the auditor's much-prized independence, at least for the internal audit function.

Kenneth W. Stringer, of Haskins and Sells, discussed "Problems in Auditing Real-Time Systems," primarily from the external auditor's point of view. Real-time systems will not materially change his *objectives*, which are to express an opinion on the financial statements and render other constructive services to his client. The formally accepted auditing *standards* are not likely to be affected much either by real-time business systems. On internal control, for example, the external auditor must study and evaluate the system of internal control in order to determine the scope of the audit. He must probe for possible errors and deficiencies and look for controls to prevent and detect them or note weaknesses which are present in the system. There are standards too on evidential matter on which to base an opinion. The third area, auditing *procedures*, will probably be most affected by real-time systems. The point of entry into the system will be advanced, so the computer will encompass more of the system. There must still be some authorization and approval of transactions, although the form or method of approval may change. The auditor must find out what the system purports to do and then perform tests of compliance to see if the system performs as supposed. There will probably be less inspection of documents and more current observation and testing of the system procedurally. Real-time shouldn't completely eliminate the ability to audit back to a source of a transaction. Real-time poses more po-

tential for improving control rather than weakening it. It will be more difficult for auditors to understand complex system designs.

Donald L. Adams, of Peat, Marwick, Mitchell & Co., presented a case study "Auditing a Real-Time Accounts Receivable System." Most of his firm's clients do not have real-time systems with financial impact except for savings and loan and banking clients, which are heavily controlled, who have good information trails, and whose accounts are readily confirmed independently. However, a large number of clients are planning real-time systems. Auditors have a few years to experiment with audit techniques to deal effectively with such systems. This study is the result of one such experiment initiated by the client's internal audit staff. The client's system included 2 cpus, 8 tape drives, a disc file, 2 data cells, crt display devices, and typewriter inquiry units. Client programs were in COBOL.

Four systems probed

Four senior auditors and a manager from the client and an identical team from Peat, Marwick were used to review four systems on the computer. Approximately 100 hours were spent by each man in self-study of three programmed instruction courses on computing systems fundamentals, introduction to programming, and introduction to COBOL. Approximately 60 hours were then used by each team member to write a significant COBOL program and debug it on the client's computer. Then about 40 hours were spent in live class training on controls, edp auditing, COBOL, utility routines, job control language for DOS, the data processing organization, etc. Teams of two auditors then reviewed four systems to understand them and see where edp audit programs might be appropriate.

One of the system reviews is reported here. Accounts receivable were stored on the data cell. Debits to accounts are recorded each night in a batch mode. Payments and adjustments are entered currently via terminals. The following work plan was completed in about three weeks on the accounts receivable system: (1) Obtain and review system documentation (not current). (2) Duplicate program source decks. (3) Flowchart key programs with AUTOFLOW software. (4) Compare flowchart logic to documentation. (5) Develop test data to validate program logic, including handling of error conditions. (6) With the accounts receivable supervisor create dummy accounts to be used in tests. (7) Enter test transactions through normal job system. (8) Test, by subsequent on-line inquiry, to see if test transactions were properly processed. (9) Review error listings and rejected transactions covering test period. (10) Reverse test transactions to remove from system. (11) Make random selections of incoming charge transactions and on the next business day test via terminal to see if recorded. (12) Randomly select items from file via terminal and trace back to supporting documents. (13) Revise production programs for audit purposes (trial balance and aging) or write special audit programs.

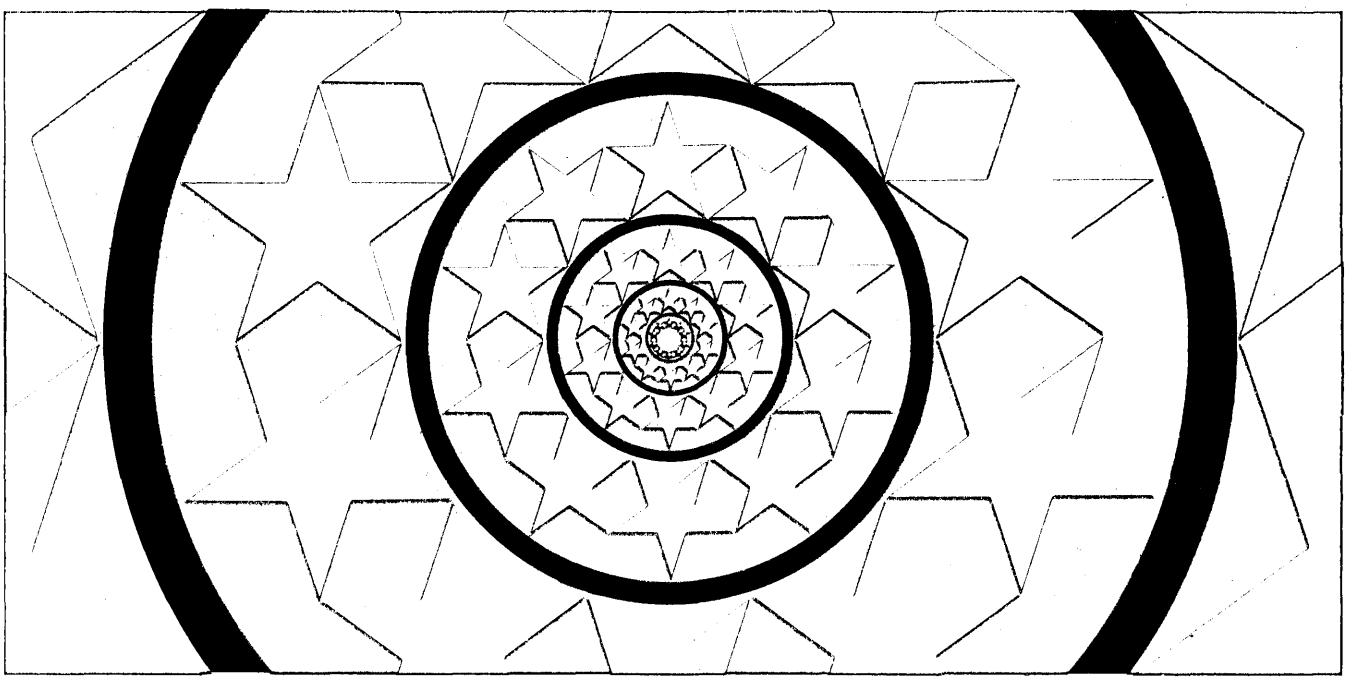
Five minor A/R system errors were discovered. Basic conclusions were: (1) With a modest amount of special training, auditors can cope with computer systems. (2) With imagination and common sense, audit techniques can be applied to real-time systems. (3) Automatic flowcharting software can be very effective. (4) The external auditors expect to work more closely with the internal auditors on such systems and on a more concurrent basis.

Arthur E. Hutt, of The Bowrey Savings Bank, spoke on "Back-Up and Recovery in Real-Time Banking." Despite a large on-line financial application, this system is supported by only one cpu. Terminals can operate in an off-line mode when the system is down. Periodic listings of significant data can be used in emergencies as manual backup. Lines and terminals are arranged to minimize the possibility of branch isolation, e.g., adjacent terminals do not share the same communication lines. The system stays locked to a terminal until a transaction is completed to preclude loss of all or part of a transaction. All data in process is retained on the drum. Each transaction is recorded twice on drums. Every half-hour or so transactions are dumped to magnetic tape. All control data is on drum to enable a "hot restart" in not over one minute. At the end of each day all drums are dumped to tape. Besides on-line processing there is a multiprogrammed batch processing of the same transactions a day later although with greater scope. Drum and tape master files are in the same sequence. If segments of a drum go bad, there is address reassignment available. With a minimum of redundant hardware this system has effectively and reliably serviced a sensitive real-time application.

Robert J. Perez, of American Airlines, discussed the subject of "Control, Fallback, and Recovery in a Real-Time Reservation System." They have two sets of duplexed cpus which can be crisscrossed. They have 14 on-line disc files, with two others for fallback and simulation on one system and six on another. Ten drums and 22 magnetic tape drives are also part of the total system. They were experiencing one power failure a week so they installed a battery system charged from commercial power or auxiliary power in an emergency. When they just used auxiliary power it took 20 minutes to bring disc files up to speed after an 8-second power source switchover. The system is on-line 23½ hours per day, 7 days a week, half-hour daily being used for file dumps. Special people at SABRE headquarters receive complaints from agents on system performance and look for the reasons. A programmer is on duty on each shift to keep the system going and supervise restarts. When the computer goes down, there is subsequently a positive return to the active terminal which retransmits. Diagnostic routines are frequently run during regular processing. Control messages are regularly output. Fallback procedures are cumbersome and not highly accurate. Originally each Passenger Name Record was written on two separate disc files, but they ran out of storage space. Duplicates are now on tape. Files are dumped each night to 28 reels of magnetic tape. Discs and drums have backup, with tape in reserve. Terminals, lines, and data concentrators are set up to minimize vulnerability of the system. There is strong control on program changes.

Donald R. Wood, of Touche Ross, presented a paper on "Auditing an On-Line Distribution Warehouse System" of a client with $500,000,000 in annual sales. In most cases original documents and traditional audit trails have not yet disappeared, but functions and responsibilities change with computer usage. In the past, much of the audit work for this client was performed on a decentralized basis. With the concentration of machine readable data and processing at one point along with structured, documented decision rules,

There is a computer with more than 16,000,000 bytes of directly addressable core memory...64 bytes every 200 ns.



Incredible...you're off your zodiac.

No, I'm right on it...

the computer is called Gemini.

The Gemini Generation is here.

COMPUTER OPERATIONS, INC.
3161 RED HILL AVENUE, COSTA MESA
CALIFORNIA 92627 • AREA 714/549-3051

there is great opportunity for auditing utilizing the computer. There is now more centralized auditing with higher powered people. There is scanning and analysis of records, selection for confirmation and verification, etc., with generalized audit programs utilized. An interesting point raised was that, when one sets up dummy jobs and accounts and permits auditors to enter dummy transactions, who audits the auditors who, conceivably, may cash dummy payroll checks or perpetrate other frauds. UARCO has very convenient and economical forms for computer-printed confirmations.

There followed a lively panel discussion on real-time auditing. Many of the audit groups represented at the meeting were fairly heavily involved during the system design phase, and at least half felt that they had made significant contributions to it. Several systems were described where little detailed hard copy was being retained. Regarding error control, the need to retrain the source was emphasized. File conversion was mentioned as a frequent data processing fiasco and where control is often lacking. It was stated that auditors should take the lead in defining their role re computers. Haskins and Sells has developed a series of decision tables for evaluating internal control.

Stanley D. Halper, of S. D. Leidesdorf & Co., in "Computer Auditing—Practically Speaking" described a very controversial audit approach. His firm regularly audits several thousand computer applications and is itself utilizing almost five shifts of computer time a day for audit purposes. In at least 10% of the applications being audited, they have found that they could not audit without the computer. Their approach is based upon an in-depth involvement with the heart of selected systems, such as those which produce file updating, trial balances, age accounts receivable, etc. They probe the internal and external control points in the system. They review system documentation whenever it exists. Some programs are compared line by line to the documentation. Flowcharting software is used when documentation is inadequate. Client production programs are frequently modified, often in COBOL, for external audit purposes, since most of the desired functions are already in client programs.

They have programmers reporting

to the audit staff, CPAs still controlling the audit. It takes about two years for an average programmer to become proficient at program review. These people usually have multiple-language capability. They pay a premium price for such personnel; a questionnaire was written to help them in such reviews; they make them part of the audit team and provide a path of progression. Many feel like detectives and want to learn accounting. Once a system settles down, they feel they have about three years to recoup the audit investment in analysis and the typically 30 hours needed to modify or create computer audit programs. Some jobs, such as auditing a complex work-in-process inventory, pricing complicated products with an extensive bill of materials explosion, confirming a large-volume accounts payable, would almost be impossible to do without aid of the computer, which at the same time permits huge savings in audit time. An auditor spends 90% of his time making comparisons which a computer can often do. They have found many things by program review that would otherwise be difficult to find—suspense accounts which never print out, options to override in programs such as on inventory costing, etc. They are gradually doing more concurrent auditing.

Dick H. Brandon of Brandon Applied Systems, speaking on "Developing Corporate Control Standards," stated that the objective of data processing was to produce a useful product within cost and time constraints. Standards are required to control and measure data processing, and, since there is no effective standards organization from this point of view and since standards must be at least partially tailored to the particular installation, the work must be painfully done by each user. At least one person should be assigned full time to its development. He outlined the requirements for a data processing standards manual in terms of environment, methodology, and control philosophy.

Richard F. Neuschel, McKinsey & Co., then talked about "How the Auditor Can Help Top Management Optimize Computer Benefits." A top executive can tell you a good deal about all the functions of an organization except, typically, data processing. It is surprising how many dp projects are originated by the dp organization rather than by a user department. There often is no analytical support for system proposals—no cost estimates or projections of anticipated benefits. These proposals should be in a form that higher management is used to working with. Each dp project should be subject to a review and decision process the same as with other capital investments of the organization. Getting low-cost and efficient data processing is not the key management concern about data processing. The main concern should be that the most profitable edp applications go on and successfully. Focus should be on the profitability of the computer as a business investment. There are five key phases to data processing project development: (1) Project identification; (2) project analysis and evaluation; (3) selection of projects; (4) project execution; and (5) post-installation follow-up. Operational auditors can interface with a number of these phases such as reviewing the estimating process, particularly the cost aspects of the various phases.

There is a rapid proliferation of special audit software, and a panel discussion was held on this subject. There are at least a dozen available generalized audit programs by now, and presentations were made on five of them: Haskins and Sells' pioneering Auditape, Alexander Grant's Audassist, Computer Resources' Audit Thru, Touche Ross's Strata, and Peat, Marwick presented design criteria being considered for an audit package. It is apparent that considerable progress is being made in the efficiency and sophistication of these packages, although much room for improvement still exists, such as to facilitate user modification of these packages and to extend their functions. Mr. Weiss pointed out that inadequate use is being made of conventional software by auditors—service and utility routines, generators, file management packages, etc. Audit software is only another tool, primarily for establishing how accurate records are. There is a danger that it will be viewed as a panacea or as a total substitute for the auditor's required computer knowledge.

John H. Mullin, of Price Waterhouse & Co., dealt in his presentation with "Training the Auditor to Deal Effectively with Computers." They have found that basic computer training for auditors doesn't go far enough. There also is rapid obsolescence of computer knowledge. There is a need for computer specialists to be associated with auditors. In five years an auditor will require a thorough knowledge of systems analysis, computer programming, and will need to know a good deal about computer operations. Like the computer professionals, auditors tend not to do as good a job in documenting computer audits as compared to other audits.

The final speaker was Robert H. Courtney, of IBM, who dealt with "Data Security in EDP Systems." Online files are getting huge in some applications. Most high-level managements are not aware of data security problems with such systems. If a system offers effective security, it will usually also provide sufficient privacy. The four fundamentals to explore for data processing security are: (1) user identification; (2) authorization to use the system; (3) audit of system usage; and (4) preservation of system integrity. Verification of human speech patterns, reading thumb prints, and looking at hand geometry have been proposed for direct identification of users. Magnetic stripe identification cards may be good if the user identification is not visually evident on them. Eavesdropping equipment and wire taps are not too practical. In most cases passwords are doing a bad job, as many users forget their numbers and operators give it to them.

Gap is still there

In conclusion, it would appear that the auditing profession is still lagging computer developments by 5 to 10 years, although the sophisticated use of computers for auditing goes back at least to 1955. There are only a few experimental efforts by auditors to cope with the new real-time systems and to develop more sophisticated and efficient audit techniques. Not many internal auditors were on the program despite efforts of the sponsor to involve them. Audit findings are often negative and sensitive, and there is reluctance to report them even with camouflage since they may reflect upon the organization. Some audit staffs are just acquiring computer skills. There are a number of very ambitious internal audit projects in the mill regarding computers, particularly with high technology companies, but it was premature for reports on these. Perhaps, the next conference, scheduled for 1971, will provide feedback on these.

—Harold Weiss

Computer Graphics 70

Computer Graphics 70, held during April at Brunel University in England, featured a pleasant international exposition of hardware and services with a technical conference that starred most of the big names in the graphics field. In some respects, the all-star cast (Grosch, Matsa, Machover, Van Dam, et al) left a hint of suspicion that they hadn't really bothered to say anything new for the occasion. Some of the most useful papers were undoubtedly those that dealt with more mundane tasks.

The use of graphics in publishing came in for considerable attention. The demise of the *Saturday Evening Post* and the slenderizing of several other magazines in the U.S. in recent years gives rise to sharper contrasts between American and British ways.

In the U.S., the commuter gets in his car and listens to his radio, then turns on his TV when he gets home to hear the news of the day. In England, the average commuter, who may live just as far from his office, normally walks, bicycles, or drives to the station, where he buys one or two newspapers and reads as the train or the tube system carries him to work. Thus London supports a dozen major national daily newspapers, though several are vulnerable to an impending printers' strike.

One possible result of this difference, besides letting the Briton draw his own conclusions with less "emotional" involvement in the Marshall McLuhan sense, is that journalism and printing are highly developed arts in the U.K., and major strides in the use of computers for the printing industry will probably take place in London before they become practical in New York.

Patton Steuber, formerly with British Printing Corp., told how BPC uses graphics in a demonstration system to evaluate computer typesetting. The BPC system is an interesting international exercise: software was written by Rocappi Ltd., based on work originally done for the John Perry system in Miami—by an Englishman.

With the BPC system, an editor can use the IBM 2250 on-line graphics terminal to input text, edit it, compose entire pages, then have the result filmset on a Harris-Intertype Fotronic. The system takes a human approach to one of the biggest headaches in typesetting applications—hyphenation. The program breaks a word after the last character that fits—in a nice, economical, simple-minded way. Then the operator points to the character that is supposed to follow the hyphen and makes a light-pen "tick" mark there, carrying on down till up to 20 hyphens are fixed before he inputs them to the computer.

Russia's contribution to the Computer Graphics 70 festivities was a paper by Victor Briabrin, from Moscow's Computing Centre of the Academy of Sciences. Mr. Briabrin discussed a system that used visual displays for on-line text editing.

The Russian system handles up to 24 Teletypes, or 12 Consul typewriters, and four crt terminals. Languages include BESM-6 assembly language, ALGOL 60, CERN FORTRAN, LISP 1.5, SNOBOL-A, and DEBUG.

In the future, Briabrin says, he wants to develop a mechanism for structure display and manipulation. "This approach," he concludes, "would give also a basis for another useful project—the displaying of dynamic program structure in terms that are intimate to the particular user. We consider this work as one that directly leads to man-computer symbiosis."

Holding up the U.S. side, a team from Merlin Systems Corp. described the Meta System they are developing to put programmers on-line with graphic displays, cutting out cards, listings and dumps en route to specialized compiler creation and data management.

The Merlin system includes a syntax compiler, a user-oriented language, a file-handling package, a text editor, and an operating system geared for graphics.

Another contributor was USC researcher Judith Rieniets, who carried modern semantics into a new field with the notion that the latest trend in contemporary art is "art systems" as opposed to "art objects."

On the exhibition side, Time-Sharing Ltd. (British cousin to Bolt, Beranek and Newman) demonstrated the Tektronix on-line crt terminal for the first time. At a neighboring booth Data Dynamics Ltd. introduced two new models in its on-line Cardcom range. The Cardcom 100/1 lets time-sharing terminals draw on punched-card data at source; the Cardcom CR-1 is used for direct link with computers.

Among the bigger exhibitors, Univac advertised the 1557/1558 graphic display ("an innovation in creativity") but showed Teletypes in a demand mode playing management games. Control Data mounted a major though quiet effort, with an ICL label resplendent on its large graphics system. ICL officials are currently negotiating final details for cooperative marketing and manufacturing for at least this product, and perhaps a wider range—top management attitudes in the two companies are surprisingly similar.

Univac joined the Post Office, Ferranti, and Sanders Associates in using the 1108 computer at Scicon (formerly CEIR's London outpost). Sanders and the Post Office demonstrated with the Sanders 620 display, while Ferranti showed its WD-101 model.

Scicon says its system can handle up to 150 remote graphic display users in addition to remote batch terminals. One spokesman, Brian Elson, notes that the trend among current Scicon users is to come up with more and more complex applications.

Marconi-Elliott stressed the Videodata 4000 terminal, introduced last August at Datafair 69. This was the first LSI video terminal in the U.K., and costs British customers a bit less than $5000 per unit. The terminal was also working in the Post Office booth, on-line to a Honeywell 516 at Essex University in Colchester.

Like most British and continental exhibitions, Computer Graphics 70 was a trifle more businesslike and less flamboyant than its U.S. counterpart. Though very few exhibits or products were startling, the availability of near-graphics quality terminals at reasonable prices was noticeable, and many observers noted the likelihood that some of these will be looking for U.S. sponsors in coming months.

—Nancy S. Foy

Sometimes after you spend a lot of money to build a company-wide computer network, all you have is a lot less money

It happens much too often. You expected to link your on-line computer with their terminals in an effective company-wide network and your new system is still inadequate for the task.

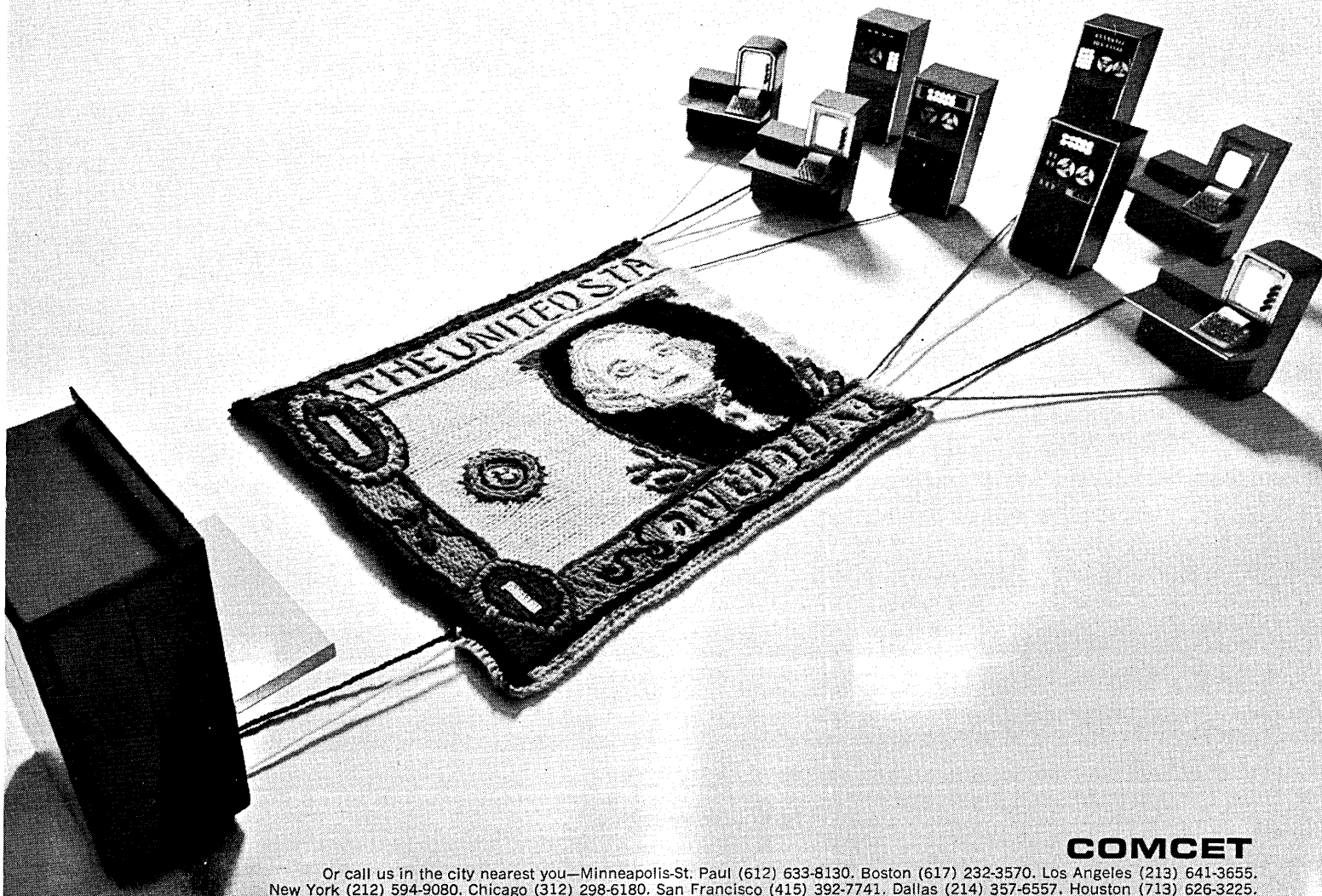
We'll tell you right now, there's another way that not only costs less but completely handles the data communications of a company-wide computer network, efficiently, economically and inventively. And it does it without interfering with the operation of your present large scale IBM 360 system.

It's through the Comcet family of Communications Computers, a breakthrough in the field of data communications. Besides giving you new freedom to choose your terminals on a sensible cost/performance basis, a Comcet System can almost double your computer's available processing capacity and eliminate costly and ineffective conventional termination equipment. In fact, a Comcet System with peripherals can free your computer from its burdensome and expensive communications tasks, altogether. And do it all at lower cost.

Pivotal to our unique solutions to computer-linking your company communications is our singular knowledge of both the parameters and possibilities presented in the data communications field. Knowledge we've gained ever since computers started talking to each other. And knowledge we'd be happy to share with you.

But don't take our word for it. Ask Trans World Airlines, Alcoa and the City and County of San Francisco—who chose Comcet to handle their entire communications processing. Or Wabash Computer Corporation and Computer Network Corporation—two time-sharing companies who installed Comcet Systems to relieve their computer's communications overload. And many others. They checked out the alternatives and then chose Comcet. Why not find out what they found out—what Comcet can do for you that other systems and other firms, can't.

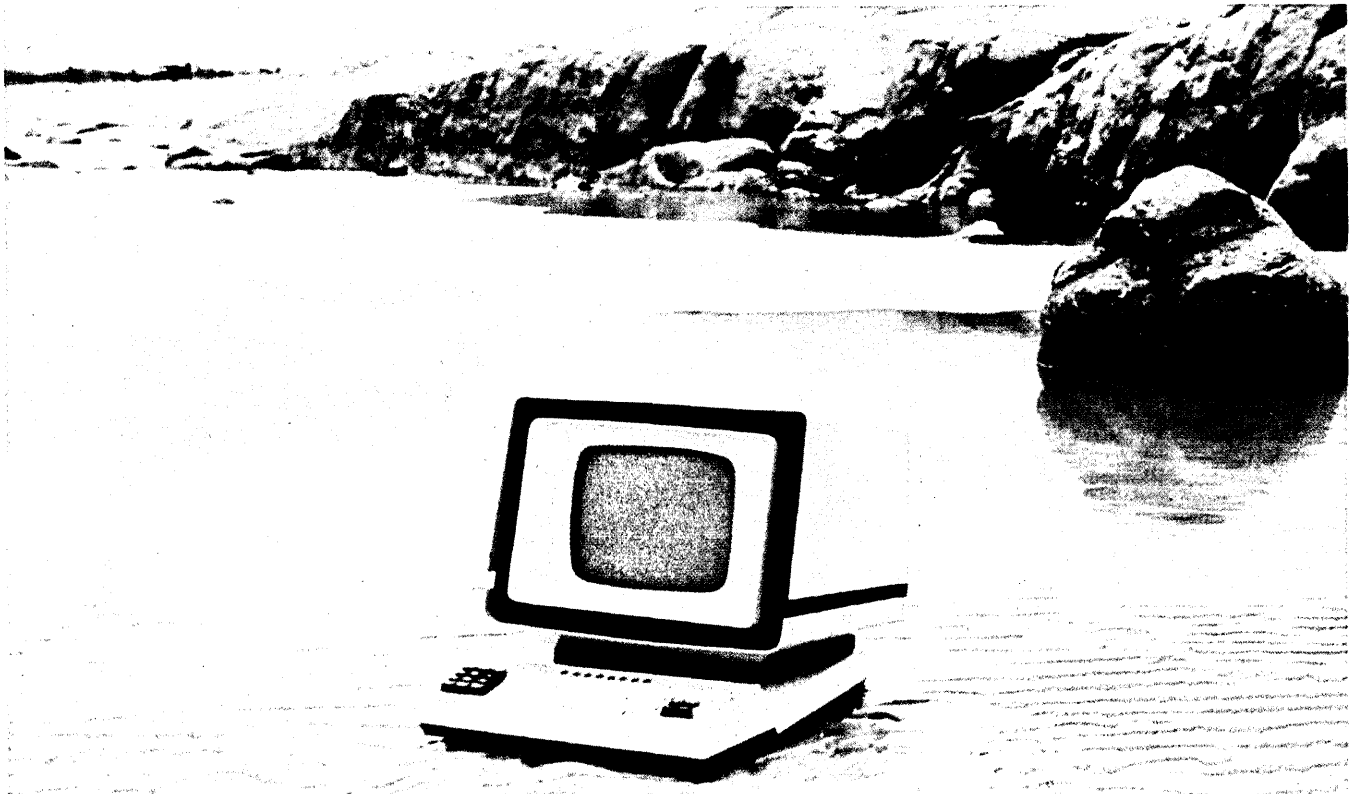
Call or write us. Tell us about your present computer set-up and your goals. Then we'll arrange a meeting to see how Comcet can help you wherever you need help. Comcet, Inc., Two Research Court, Rockville, Md. 20850. Phone (301) 948-8700.



COMCET

Or call us in the city nearest you—Minneapolis-St. Paul (612) 633-8130. Boston (617) 232-3570. Los Angeles (213) 641-3655. New York (212) 594-9080. Chicago (312) 298-6180. San Francisco (415) 392-7741. Dallas (214) 357-6557. Houston (713) 626-3225. Detroit (313) 354-4033. Pittsburgh (412) 232-0223.

CIRCLE 155 ON READER CARD



All things to all men

. . . and to all software.
. . . and to all computer systems.

The first CRT display to contain a stored-program computer, the SPD™ 10/20 introduces a new dimension in compatibility. It can be anything the operator or the system requires. The magnetic core memory stores up to 2048 words and has a 1.6 microsecond cycle time – plus a repertoire of 58 instructions, making it unusually powerful for its size. It changes terminal characteristics as needed.

By validating, verifying and qualifying data – before transmission – SPD 10/20 can increase the performance and economy of your overall system. And it will give your operators a big lift at the same time.

Now in production. There is nothing else like it anywhere.

For further information, contact M.R. Clement, Jr., *Vice President of Marketing*

INCOTERM™ CORPORATION

. . . the international computer terminals people

Marlboro, Massachusetts 01752 (617) 481-2000
Atlanta, Georgia (404) 451-2307

NEWS SCENE

Datran High on Infrared for Telecom Proposal

A data transmission technique that utilizes the infrared rather than the radio frequency spectrum, may be used by Data Transmission Corp., the UCC subsidiary which hopes to offer nationwide telecommunications service at bargain basement rates.

The new system's low cost is a key benefit, says Datran vice president Ed Berg. It seems capable of providing tail loop service for substantially less than parallel microwave and/or cable links. There is a "high probability," he adds, that Datran — if and when licensed by the FCC — will be able to offer service at rates lower than the ones it announced late last year. That schedule promised AT&T data communication customers savings of up to 75%.

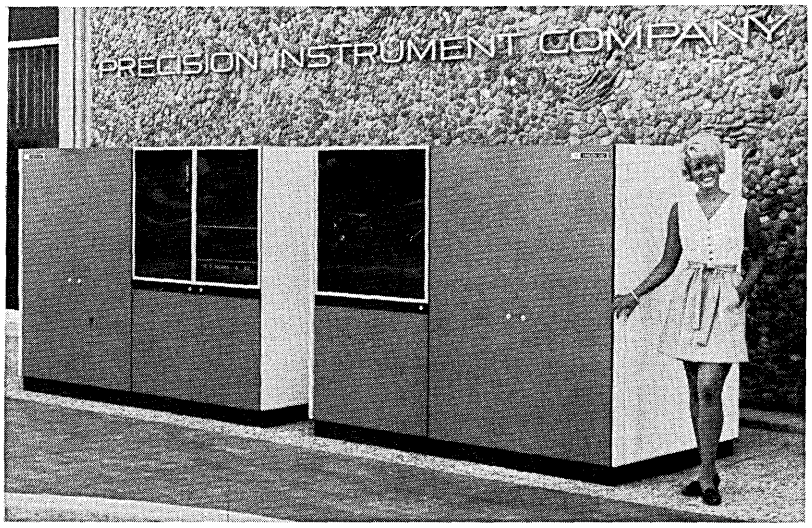
Datran has been testing the new system since early in April, using Optran infrared transceivers manufactured by Computer Transmission Corp., Los Angeles. A gallium-arsenide light-emitting diode linked to a terminal through an interface sends out pulses of infrared light at 250K bps which at the receiving end are converted back into an electronic signal by a photoelectric cell, then fed through an interface to the output terminal.

During one 14-hour period, when data was transmitted continuously at a speed of 4.8K bps, the error total was a negligible 27 bits, all of them involving individual bits rather than bit blocks, and thus easily correctable. Berg says this is typical of the system's performance to date. The transmission path, which can be operated in either full- or half-duplex mode, runs from a 4.8K bps COPE terminal at Datran headquarters in Falls Church, Va., to an Optran unit on the roof, to Optran repeater and receiver units mounted on a building half a mile away, back to another Optran transceiver on the roof of the headquarters building, and from there through a modem to a leased 4K bit telephone line that terminates at an 1108 in East Brunswick, N. J. The AT&T phone link generates more errors than the Optran link, Berg adds with ill-concealed glee.

He adds that similar tests of the Optran system, at the University of Southern California, have produced like results. "They've averaged 3-5 error bits per 100-bit blocks. They've transmitted up to 5,800 blocks without a single error."

The system's signal-noise ratio is far better than telephone, microwave, or cable circuits offer, Berg adds. Basically, this is because the noise is eliminated in the process of converting the signal into light pulses. The re-

(Continued on p. 119)



Trillion Bits (Left) and a Bit of All Right

Precision Instrument Co., Palo Alto, landed a second order for its trillion-bit laser recorder/reader storage system last month and said it will market a smaller 10 billion bit version.

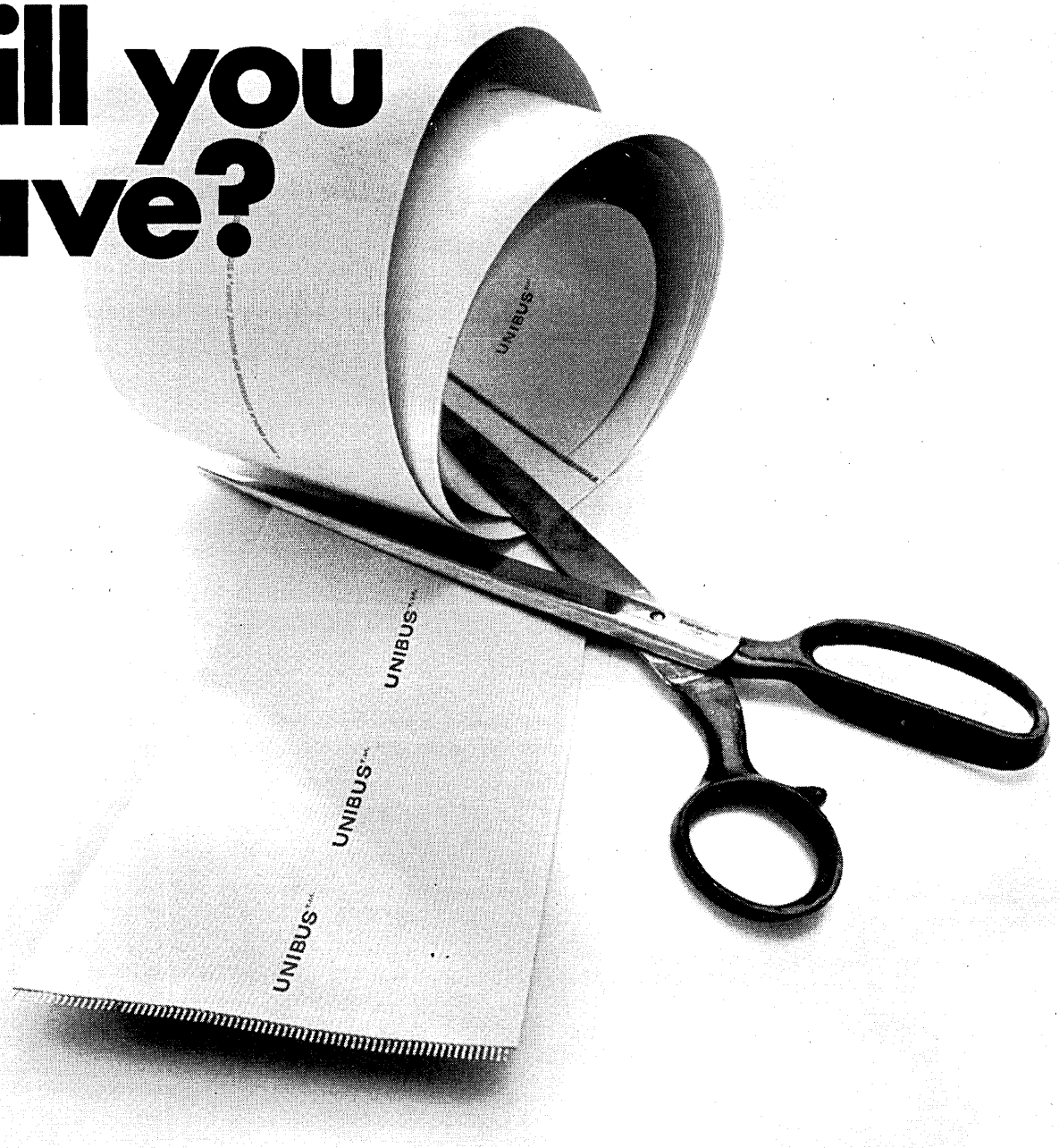
Newest candidate for the trillion-bit UNICON 690-212 is the Univ. of Illinois, which will take delivery in September of 1971 for use in the ILLIAC IV complex. Precision's first customer, Pan American Petroleum Corp., Tulsa, the exploration and producing arm of Standard Oil Co. of Indiana, was to have had the $740,000 system installed in March, but the date has been postponed to September while Pan American awaits delivery of a 360/85 with which UNICON will be used.

Data for UNICON (unidensity coherent light recording) system is recorded permanently on mylar-based tape which is subjected to a laser that burns a metal coating off the tape base in selected spots, leaving 1-micron holes packed 1,000 times more closely than bits on magnetic tape. The strips are mounted on two revolving drums. The data cannot be erased, but the system's software provides for selective addition of data to records stored in the memory.

The system was workable early in 1968, but Precision's president Konrad Schoebel is not discouraged by the modest sales performance or the fact the company reported a loss of $2.1 million over the past two years due to UNICON development costs. He says electro-optical mass storage devices will be the industry standard within a few years.

He thinks the company will have more success with a 10-billion bit storage system which is called the 6314. It is compatible with the IBM 360 line, has the storage capacity of six 2314's and at $360,000 is a quarter of the price. First customer is Boeing's Vertol Div. which will take delivery on a leased 6314 in August of 1971.

How much PDP-11 will you have?



Well, how much do you need? A small, dedicated machine for OEM controlling? A large, multi-user system? Something in between? Or maybe you don't know yet.

Doesn't matter. PDP-11's UNIBUS™ lets you do anything—now or later. First you plug the central processor into the bus, then some memory, then an I/O device. Already you have by far the most powerful minicomputer there is: 400 instructions; 8 general registers; bit, byte, word (16-bits), and multi-word capability; multi-channel DMA; automatic priority interrupts; hardware stacking; re-entrant and relocatable code.

That's the processor. But the UNIBUS is even more interesting, especially in an expanded system. Every device (and that includes memory and the CP) is pluggable, independent, and asynchronous. Devices can communicate directly with devices or with memory. Disk to display, for example. The interfaces are built into the device controls, so when you plug in, you plug in everything. And you can keep plugging in for a long time. UNIBUS is only a few dollars a foot.

PDP-11/20—memory, TTY, and UNIBUS included—is somewhat more. But you can wear one for only $10,800. Quantity discounts available. Delivery now.

digital
COMPUTERS · MODULES
Digital Equipment Corporation
Maynard, Mass. (617) 897-5111

CIRCLE 20 ON READER CARD

sult is that noise generated at the sending end isn't transmitted, and there is no "line noise" as such.

Berg says Optran's circuitry and components are good for "thousands of hours of uninterrupted service," and installing the equipment "requires minimum technical skill."

Datran plans to use this system in cities, to serve clusters of customers. Messages would enter and leave the microwave portion of the system through a strategically placed rooftop microwave antenna. Each customer's premises would be linked to this antenna through a set of Optran, or similar transceivers, which could be shared. At 250K bps — the capacity of a single Optran channel — there is room for 50-plus 4.8K bps terminals, or 1600-plus 150 bps terminals.

"In New York City," according to Berg, "it costs roughly $30K to run a cable from a microwave antenna on one side of a street to a customer on the other side. The cost of doing it with Optran is on the order of $4-5K, and no city permits are required to dig up the street.

Based on the one-unit costs of Optran transceivers and repeaters (about $2K and $4K, respectively), Berg estimates the new system is cheaper than microwave for links of up to about three miles.

Since the infrared spectrum isn't regulated by FCC, Datran wouldn't have to get the commission's blessing to use the new system, at least as things stand today. This could reduce both the cost and complexity of Datran's FCC filings. Also, individual installations would be simpler, in comparison to those using cable tail loops, because the latter generally require local government approval.

A key benefit of the new system is that it doesn't depend on the telephone company.

Historically, Ma Bell has refused to provide tail loop service to competing carriers like Datran and MCI. It has also maintained that agreements covering such service are outside the FCC's regulatory authority. In the MCI case, FCC shot down both of these contentions. But this dictum hasn't been tested yet. And even if forced to comply, AT&T could still drag its feet.

Datran's new system isn't the only method of getting out from under Ma Bell's thumb; short microwave/cable links can also be used. But the existence of still another technique — assuming it works — should make the telephone company more cooperative regarding tail loop service, and the commission more insistent.

The Optran signal can be degraded by heavy smoke, rain, fog, and by sun glare reflected from shiny surfaces. Also, the transmitter and receiver have to be precisely aligned. But many of these difficulties can be reduced to an insignificant level by shielding and careful mounting. Another way to reduce signal degradation is to keep each transmission hop below a mile (half a mile or less is even better). Still another remedy is to develop a more concentrated infrared beam. Datran is now exploring the latter possibility, via a contract with Martin-Marietta in Orlando, Fla.

Most Mini Makers Thrive in Still-Healthy Market

By all standard yardsticks, the minicomputer industry should be suffering from a severe case of claustrophobia. Furthermore, with some 70 firms competing in the volatile industry, the time should be ripe for some fratricidal price cutting. Right?

Wrong, on both counts.

The best indication that the minicomputer industry won't experience a brutal price cutting phase and that there is room in the profit column for many companies is the price tag Digital Equipment Corp. has just placed on its new low-cost 12-bit computer, the PDP/8E. Digital, which is to the minicomputer industry as General Motors is to the auto industry, is charging $4990 for the small control computer. With Teletype and tty interface, a customer could end up paying around $6500 — and that is high enough to insure Digital a tidy profit on the machine and to allow other companies to compete successfully.

There had been fears that Digital would come in with a machine costing much less. Such a move, certain to wreak havoc among Digital's competitors, would undoubtedly have had another unhappy effect: It would have hurt Digital's enviable profit picture.

The point of the matter — and the beauty of the minicomputer industry — is that Digital simply doesn't need extreme low-cost models of small control computers to make sales. And such is the demand for minicomputers that the host of other proven minicomputer companies with reliable machines don't need extremely low-cost machines to make sales either. The demand is there. Thus, there should be no devastating price cutting war, at least not in the foreseeable future.

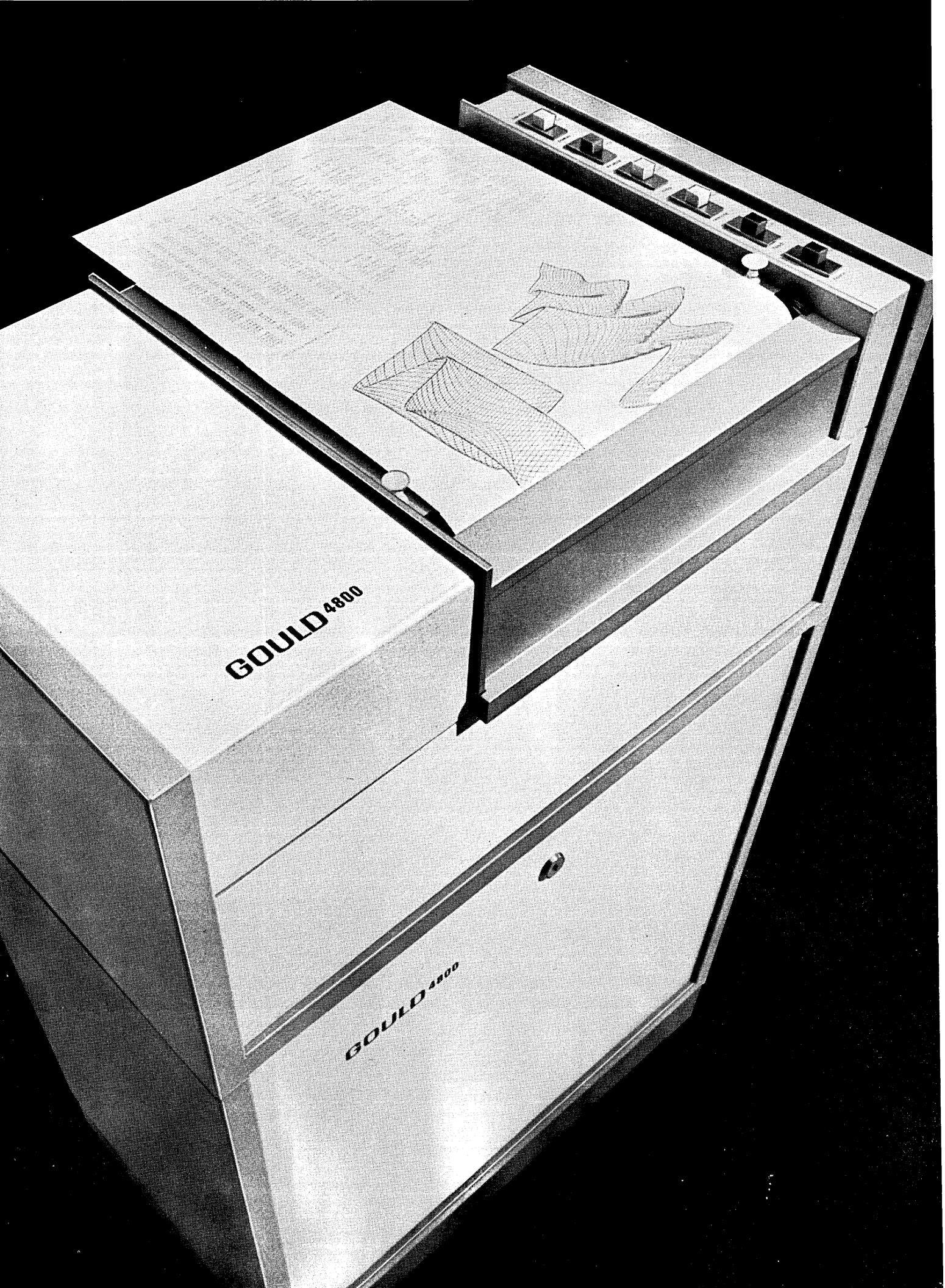
Better still, there is no apparent end in sight to the minicomputer boom. The industry represented about $250 million last year, and by 1974 it should top the $1 billion mark.

The case of Digital is interesting. Already, more than 8,000 PDP/8's have been delivered, and the new model should give the 12-bit line a shot in the arm. Beyond that, Digital reports that more than 30 PDP/11's have been installed and that the 16-bit machines are being pumped out at a rate of 20 a week.

Digital reports that the economic recession is having "only a very marginal effect" on its sales. Digital, however, hasn't been without its financial problems: The company's stock was caught in the plummeting bear market and the firm canceled plans for a $25 million stock offering because of the unfavorable market conditions. But generally, Digital and the others in the top tier of the minicomputer industry are finding that sales and profits aren't too far off from their earlier projections. This, of course, is in direct contrast to most of the large mainframe companies, which have been under more pressure during the current economic slowdown.

Two West Coast manufacturers of minicomputers — Hewlett-Packard and Varian Data Machines — report some softness in sales, but neither was anticipating layoffs. Varian is still looking for a better year in sales and profits than it had last year and the firm is placing more emphasis on developing its end user business. Like other minicomputer manufacturers, Varian is finding that some of its large OEM customers are feeling the financial squeeze, and the result is lagging sales to some OEM'S. By concentrating more on new software, peripherals, and systems, Varian is aiming to move into vertical markets serving more end users.

Another minicomputer manufac-


GOULD 4800
GOULD 4800

This is the fastest printer around.

It also produces both alphanumerics and graphics.

And printout is 132 columns wide on an 11 x 8-1/2 format! The practical continuous speed of the standard line printer is 600 lines per minute. But the new Gould 4800-II will deliver 4800 lines per minute. And it'll produce both alphanumerics and graphics — simultaneously — directly from any source of digital input as data transmission by telemetry, radio microwave, and/or land line.

There's a new character generator, too. With an ultimate capability of three 128 character fonts with dot matrices up to 15 x 15.* And because it has a 132 character buffer, you don't have to burden your computer's memory banks. The input control lines are built-in, too. Which makes it comparatively simple to interface the 4800 with almost any computer you have in mind.

The 4800 provides programmed control for a variety of output forms . . . line and letter spacing, paragraphing, columns and so forth. Plus a convenient capability to translate bit mode input into generalized graphics.

But speed and versatility are just part of our story. Because it's electrostatic, the 4800 is infinitely quieter than line printers. Because it has fewer moving parts, it's more reliable. And because it's a lot simpler, it's priced well below printers that can't come close to the performance.

So there you have it: the Gould 4800 electrostatic hardcopy printer. Isn't it time we talked? Graphics Division, Gould Inc., 3631 Perkins Avenue, Cleveland, Ohio 44114.

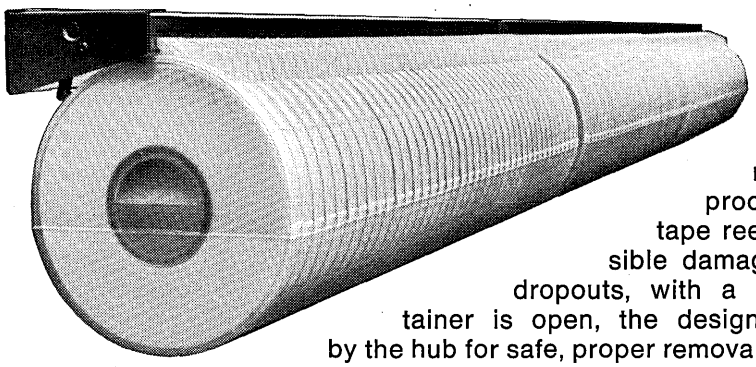
*Supplied standard with unit: One 64 character font with 5 x 7 dot matrix.

GOULD **CLEVITE**

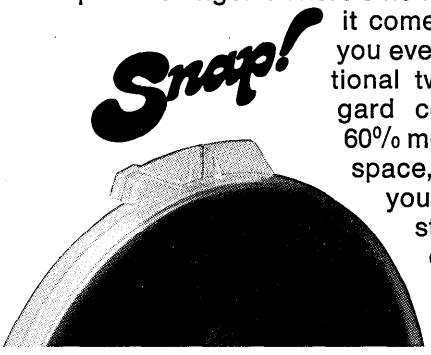
The Gould 4800. The next generation of high-speed printers.

CIRCLE 25 ON READER CARD

Full tape protection in a one-piece container for the price of seals.



That's New Tab Reelgard! Exclusive Reelgard one-piece construction assures the ultimate in safe magnetic tape storage, even if you are using open aperture reels. The hinges, hanging hook and positive Reelgard locking system are molded into a thin 3½", high-impact, shatter-proof polypropylene case. Reelgard keeps magnetic tape reels from resting on their edges, to prevent possible damage to the tape and to eliminate the danger of dropouts, with a molded-in support. When the Reelgard container is open, the design of the container permits grasping the reel by the hub for safe, proper removal of tape. A very tight, positive tongue and groove closure gives added protection against contamination damage. The Reelgard snap-latch opens easily with a snap of the fingers. There's no more fighting fit and suction as in old fashioned two-piece tape cases. When it comes to saving you precious magnetic tape storage space, Reelgard benefits you even further. Compared to conventional two-piece canisters, Tab Reelgard containers can accommodate 60% more magnetic tape in the same space, for half the cost! Whether you are hanging magnetic tape or storing it on shelves, Reelgard combines with proven Tab magnetic tape storage systems to help you store more, safer, in less space. With Tab Unit Spacefinder tape storage systems, new hanging racks are available for Reelgard in either 30" or 42" wide assemblies. If you want closed cabinet storage for your tape, new hanging Reelgard racks or conventional wire racks can be used in Tab Data Media Cabinets. For complete information about new Tab Reelgard tape containers, call your local Tab Products representative. Snap to it! Tab Products Company, 2690 Hanover Street, Palo Alto, California 94304



TAB
PRODUCTS CO.

turer that is placing new emphasis on end users — for much the same reasons as Varian — is the Data General Corp. Data General got a strong foothold in the small control computer market by selling primarily to the OEM market, but now the firm reports its sales are about evenly divided between OEM'S and end users.

"We're finding that the toughest pricing competition is in the OEM area," says one Data General executive. "It's a matter of old-fashioned purchasing agent in-fighting." Data General stands out as the best example of a successful new firm. Just two years old, it has delivered nearly 600 machines and has operated profitably during its last three quarters.

The news from Honeywell's Computer Control Division is also good, as far as its small control computer sales are concerned. The firm has just increased its 1970 production schedule for the H-316 from the mid-100's to about 1,000 and is expecting this year to sell nearly 300 models of its new controller, the H-112.

"We've been upping our projections right along," says a Honeywell man, who touched upon what has been a key to the virtually uninterrupted growth of the minicomputer industry during the current economic recession: Minicomputers are labor saving devices, and labor saving devices are popular items during periods of economic stress.

Who Put the Late in Vote Tabulate?

No matter who won which elections in the California June primary, computers and the people responsible for them took a beating. Large Los Angeles, as usual, was where the greatest consternation occurred (see June, pp. 81-82 for an appraisal of the Los Angeles system), but usually unreliable Fresno also came through, and at last report, they were a week late and still counting. The classic response to that situation was uttered by Wesley Craven, chairman of the Fresno board of supervisors, "So what? So we have a little delay."

Fresno's problem was one of programming counting of the complicated ballot, which had 2,400 possible voting combinations, and a Honeywell high-level systems analyst finally was called in. The last tabulation did not affect any of the results for statewide or national office. So what if they had a little delay.

In Los Angeles, the problems that caused the reporting delays seemed to be those of training lack on the part of clerks trying to implement the IBM Votamatic system, the niggardliness of the board of supervisors in cutting out of the election budget a $25K appropriation for preprinting precinct numbers on the ballots (it had to be done by hand at the precinct level and in many cases, it wasn't), and simple carelessness imaginatively performed.

One election observer from the L.A. County Democratic Central Committee (which refused to certify or verify the conduct of the vote counting procedure) reported that ballots arrived from various precincts in open sacks, tied with a string, in unsealed paper bags, in a Xerox box, in a mail bag, and in plain, brown wrappers.

Another reported seeing "extreme bending of the ballots ... in an effort to loosen the chad from imperfectly punched holes, causing the card readers ... to jam and damage the ballots. In one case a supervisor ... took one of these cards and prodded it with a penpoint to 'see if the voter really ment to vote this hole.' In the computer rooms, many of these fallouts were found under the card readers."

In the Committee's report, there was criticism of the security precautions, the lack of briefing of election observers on procedures, and inasmuch as an extra precinct was discovered in the results from an Assembly district, the logic and accuracy tests, which were deemed to be "invalid and insufficient to test the Votamatic program."

In the uproar following the delayed reporting of results, the board of supervisors hastily nailed Registrar-Recorder Ray Lee as the scapegoat for failing to inform the board of difficulties he was having with the procedure and even held up his pending pay raise. The doughty Lee, however, defended the system as "by far the best there is," and said if L.A. had used paper ballots, it would have taken two weeks to count the results.

So what if there's a delay.

Oh, yes, the board of supervisors made yet another determined move. It named a five-member special committee to investigate the election procedure and report on ways to improve it. Three of the five were on a special committee named by the board to investigate possible fraud in the voting procedure and recently gave the system a clean bill (see again June, pp. 81-82).

If at First You Don't Succeed ...

Another time-sharing firm has bitten the dust and in this case, a whole mouthful ... not a sell-out but a fold up.

InterAccess Corp., Palo Alto, Calif., filed a bankruptcy petition in San Francisco listing debts of $582,-851 and assets of $210,965. The company, formed in 1968 and on-the-air since November of 1969, was 59% owned by Great West International Equities Corp., Calgary, Alberta, Canada, with the remaining 41% divided among company officers, including president Todd Morcott and Arthur W. Dana, Jr., executive vice president.

GWIE was providing the working capital and decided to cut it off. A spokesman for the investment firm, which deals primarily in real estate development, said they tried hard to sell InterAccess but there weren't any takers. GWIE, he said, decided in May to leave the computer field "to the experts." They sold their only other computer companies, Aquila Computer Services Ltd. and Berthiaume, St. Pierre, Theriault and Associates, Inc., in eastern Canada to Computing and Software, Inc., retaining a stock position. They would have liked to have done the same with InterAcess but it didn't work out.

The GWIE spokesman said his company's loss on the time-sharing firm was "minimal" and only amounted to what they had sunk into rent and lease fees for equipment. The InterAccess computer, a 64K CDC 3800, was repossessed by CDC and, at last report, was sitting in a warehouse in Minneapolis.

Morcott conceded InterAccess wasn't profitable at its folding but "it

TIME SHARING Can be a Problem

. . . if you are trying to support too much expensive equipment.

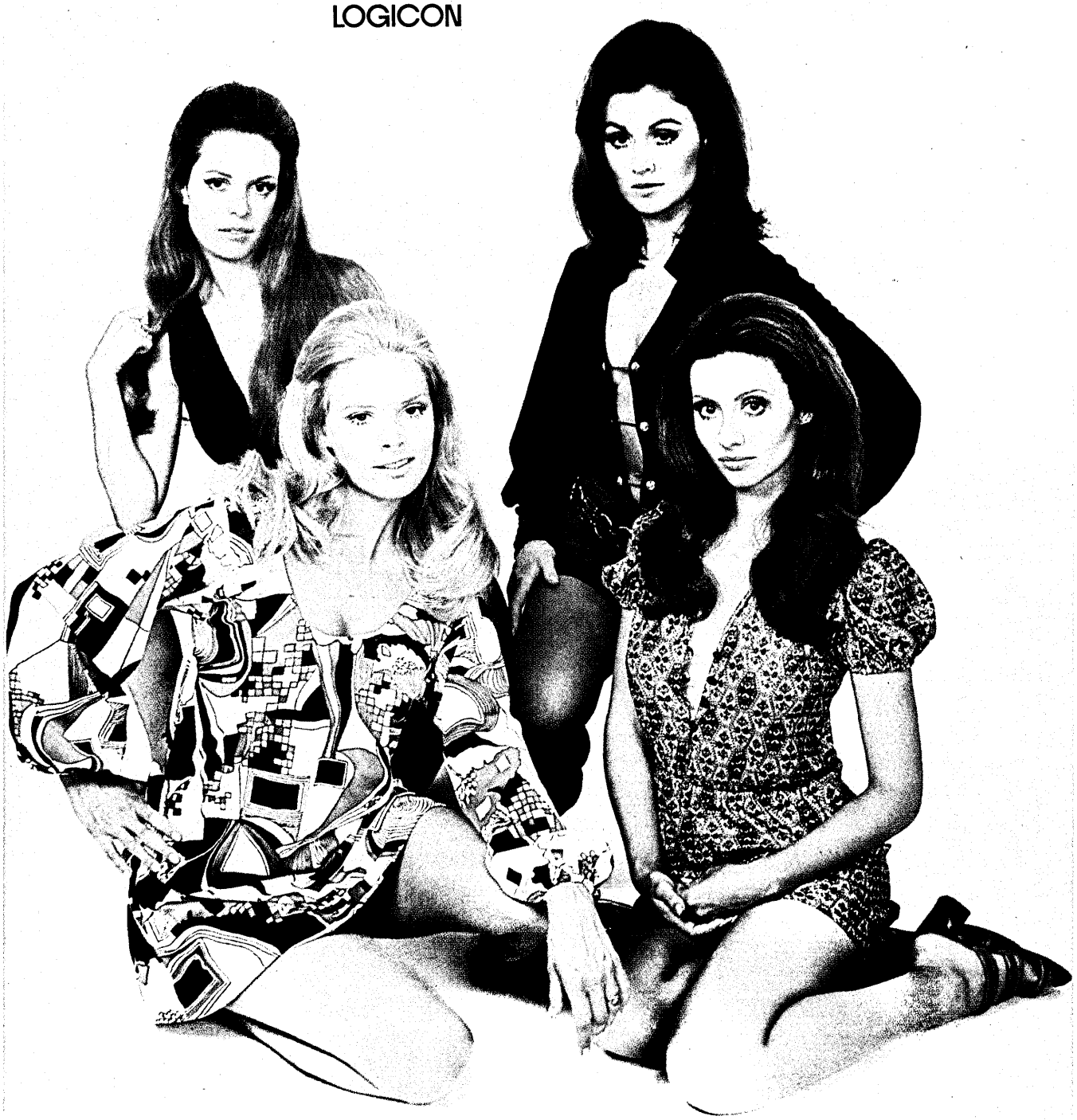
Logicon will be announcing a total hardware/software system, named the **Logicon 2 + 2** for interactive and remote batch processing. Up to 128 simultaneous users for as little as $20,000. per month.

Logicon has been building complex computer systems for over nine years...from missile guidance and control systems to management information systems; and from this foundation of computer expertise comes the **Logicon 2 + 2.**

LOGICON

LOGICON/ 255 West Fifth Street
San Pedro, California 90731
Phone (213) 831-0611

LOGICON'S OTHER OFFICES ARE LOCATED IN SAN DIEGO AND WASHINGTON, D.C.



wasn't expected to be." He said the firm had some 100 customers at the time of its demise and was within "a few months" of turning the profit corner. He still considers the 3800 they were using a good time-sharing machine and their central data file concept a good one. He'd like to start something like it again soon.

SBC Offers "National" T-S

A new time-sharing service, called The National System by Service Bureau Corp., allows organizations with offices spread across the country to share programs and data in a single central computer. It is available now as an addition to Call/360.

Heart of the system is a 360/50 in Cleveland. Subscribers using IBM 2741, Teletype, or other compatible terminals in eight metropolitan areas can tie into the central computer through existing SBC leased lines by dialing local numbers. Cities included are New York, Chicago, Cleveland, Los Angeles, San Francisco, Houston, Philadelphia, and Pittsburgh. Users outside these cities can reach the Cleveland computer by dialing the nearest network access point.

Users can access the system for the normal Call/360 minimum monthly charge of $100 in addition to terminal and local telephone line costs. Standard Call/360 charges apply to cpu and storage usage, while connect time charges will be $13.80 an hour. SBC'S full library of application programs are available on the new system, as well as BASIC, PL/I, and FORTRAN compilers.

Making the Language Fit the Subject ...

Students at California Institute of Technology this fall could be using a computer to work a wide variety of problems in an equally wide variety of subjects, each using his own special purpose high level language in what has been described as Computer Facilitated Instruction.

What could make this possible is a Rapidly Extensible Language System (REL) which has been under development at Caltech for four years. Its developers are Dr. Frederik Thompson, Dr. Bozena Dostert, Dr. Peter Lockemann, and Robert S. Deverill. Dr. Thompson describes REL as, "a total operating system for conversational use of computers ... not time-sharing."

Using REL, a student could work with one of several base languages and create his own special purpose language or "version" to suit a specific course of study and his own special requirements. Thus, said Dr. Thompson, syntactic ambiguity is all but eliminated, since the system disambiguates through context. "In a version built up for use by a shoe store operator, the term alligator would be recognized as applying to shoes."

The system went on the air at Caltech in March for six hours each week on an experimental basis. It is scheduled to be switched to an officially operational basis in midsummer and possibly will go on the air full time in the fall, replacing the college's existing time-sharing system and becoming *the* conversational system for the campus.

The system is operating on a 256K 360/50 using eight 2314 disc drives, sixty 2741 terminals and two 2250's. Dr. Thompson said this system is minimum size for REL.

He said the big difference between REL and other current developments in time-shared, conversational computer systems is in system architecture. A single language processor which accommodates a variety of user languages is tightly coupled to a multiprogramming operating system to permit rapid, conversational extensibility of user languages. The data and the language are a highly integrated user oriented extensible package. In such a package, Dr. Thompson explained, the semantics of the language can be specifically oriented in the context of the associated data.

Basic languages inplemented include a JOSS-like language they call CITRAN, a graphics package, a statistical package and REL English which "usefully" approximates natural English. While there are other projects underway implementing natural English languages, Dr. Thompson said REL English is the first to be implemented on an operating system.

(Continued on p. 126)

DATAMATION's Lawrence Ragan dials himself a stiff ginger ale (we're told) during press demonstration by NCR of a computerized drink mixer called Electra-Bar. A bartender presses a button to call up any of 36 kinds of drinks which gush into a glass within two seconds. The system also writes the guest check, keeps an audit tape and provides an inventory count. NCR says that by cutting down overpouring and spillage, it could save up to $6K a year for a small bar selling 12 quarts a day. The $9,960 system was introduced at National Restaurant Assoc. Show in Chicago. Thirteen have been purchased by McCormick Place, the exhibition hall being built on Chicago's lakefront.

Firm Does Memory Design for Living

There's a company in Santa Ana, Calif., whose prime and only purpose is to design memories — no manufacturing, no marketing, just design — and thus it feels it is not in competition with such established memory houses as Electronic Memories and Standard Memories, which do the whole thing. This company also has no intention of going public and doesn't want to bill more than $1 million a year. "Any more and it's no fun."

Its name is Technology Marketing, Inc., and it was founded in Feb. '69 as something of a spinoff from Microsystems, Inc, (although it is now completely independent) by Bob Lowry, formerly with Varian and Microsystems as director of marketing, who was later joined by George Wells, director of engineering at Electronic Memories. They own the company 50-50, but neither of them boasts a title and they contend that their employees "think *they* own the firm."

TMI is about to introduce its newest product (June Look ahead, pp. 265-267), a 32K by 16 or 18-bit solid state memory that the firm guarantees can be manufactured for around 6/10¢ a bit, including overhead costs. Right to manufacture will be licensed to OEM'S by TMI.

Guarantee is a policy of the company. When it first bids to design a memory, it guarantees the cost of manufacturing in the customer's own shop. If it goes over estimate, TMI absorbs it. Lowry maintains they haven't had to so far.

Another innovative company policy is the method by which it rewards its employees. When a small computer company is in need of a design and doesn't have the money to come up with it, TMI will consider doing the job for a piece of the small company's stock. If done, this piece is then allotted to TMI'S employees on a "purely whimsical basis." This allotment is announced at a TMI employee group meeting, and if anyone is unhappy with his share, he is asked who should get less so that he can get what he thinks he should. No one has yet been unhappy, according to Lowry.

No wonder they think they own the company.

Bell Labs Computer Converts Text to Speech

The latest exciting development at Bell Laboratories is a system that converts text input to synthetic speech. Words input through a Teletype are automatically produced as "nearly natural sounding" synthetic speech.

The experimental work takes advantage of an improved understanding of speech patterns. The computer is provided with mathematical approximations to the shapes and motions the human vocal tract assumes when uttering common sounds and sound sequences. It is also provided with a basic dictionary of work categories and definitions in digital form. Rules of timing, pitch, and stress which people use naturally in everyday conversation are also approximated.

When words are input, the system analyzes the sentence, assigns stress and timing to each word, and finds a phonetic description of each word in the dictionary. Mathematical descriptions of vocal tract motions are then computed, converted to an analog signal, and generated as electrical speech signals which may be heard over a loudspeaker or telephone.

Possible uses of the new technique include the facilitation of storage or quick alteration of large volumes of information in textual form for retrieval requirements such as a doctor desiring the recitation of a page from a medical book, a stock manager seeking information about inventory, or an airline clerk looking for flight information. It may also have potential as an aid for the blind and for programmed instruction.

The system presently operates from in-house time-sharing on a GE-635 in conjunction with a Honeywell DDP-24. At press time, a DDP-516 was being implemented. Primary developer of the system, Dr. Cecil H. Coker, stated that it was still several years away from economic practical application.

Dr. Cecil H. Coker at the console demonstrating a new computerized system for converting printed text into synthetic speech. This is DATAMATION speaking.

Key-to-Disc Confrontation

When two manufacturers show up at the same place, at the same time, with the same stuff, something more than chance is involved. Honeywell wanted to showcase its red, white, and superfine Keyplex System in the L.A. area last June so they chose the Ambassador Hotel. Anyone approaching the exhibit couldn't miss the large ad on an adjacent wall: "Honeywell just had a good idea. Ours." The "Ours" was Computer Machinery Corp., which decided to show its Key-Processing sys-

DE-
INTRO
DUCING

I/O SYSTEMS DIVISION
OF
SANGAMO ELECTRIC COMPANY

The bigger we got, the more we realized we needed a name that tells you what we do. A name to help you identify us and our very special line of computer support equipment.

Come meet the new "us" on the next page.....

tem — even though it has been extant for some 18 months — obtained the room next to Honeywell's to do it, and billed Honeywell as "the other Key Processing Company." (See June, pp. 79-89, for a survey of keypunch replacement equipment.)

Visitors to these exhibits had to note that the Honeywell exhibit was only a mock-up of its new system, and it couldn't really be demonstrated while over at CMC one could "feel the material" — it blinked and purred.

For balance CMC did show something that didn't work: there was this display of a tiger made out of paper — a none-too-subtle reference to Honeywell's present lack of demonstrable equipment. The forces have joined — almost.

California Educator Volunteers Computer

State government in California has its first "Shared Computer Utility," and the state's Department of Education is minus a computer it had had since December 1968.

On May 25, State Superintendant of Public Instruction Max Rafferty volunteered his department's computer for the utility, which became officially operational early this month. The "giveaway" was in line with recommendations by Boole & Babbage, Inc., Palo Alto, Calif., consulting firm hired by the state to seek "alternative solutions" when the department last September asked for $263K of additional funds to keep its computer operation going from March 1 to July 1, end of the fiscal year.

Boole & Babbage came up with several alternative solutions but the one selected by the state's Department of Management Services was removal of the department's Bureau of Systems and Data Processing from department jurisdiction and the setting up of a pilot service center. The bureau, its equipment and personnel were moved only on paper. They now come under the Department of General Services. Heading up the Utility is O. B. McIsaac, formerly with Management Services. Dr. Alvin Grossman who directed the operation for the Department of Education is in charge of a new Bureau of Information Systems within the department, which provides liaison between the department, regional school district data centers and the Utility. The department is the new Utility's first customer but the state Legislature already has directed its use by the Department of Finance and probably will use it for its own data processing. General Services already had a Spectra 75-based service bureau which it will operate completely separate from the new Utility, which will be upgraded continually to accommodate additional state agencies.

The Boole & Babbage report cited lack of procedures for effective cost control and accounting as a major problem in the bureau, as it was operating in the Department of Education, and called this and other problems, "representative of a management philosophy prevalent within the department."

The $263K the department sought in September equaled the amount by which its budget had been cut by the Legislature the preceding year on grounds there was evidence of a lack of productivity, low utilization and poor system planning within the computer operation. The Department was instructed to sell excess machine time to earn back this money but was unable to. William Behnk, Principal Administrative Analyst for the state Legislative Analyst's office, said computer utilization by the bureau was running at 17% in the Spring of 1969 and while it was up some this Spring there still was no evidence of productivity. The Boole & Babbage study noted that only test programs were evaluated because there was no evidence of any programs in production stages.

NEW SERVICES

The name is familiar, but not for computers. Boeing Computer Services division has been initiated by the Seattle, Wash., aerospace company, and is not too definite yet as to just what it will do, except get into "a wide variety of services across the entire present and future spectrum of the marketplace." Specifically mentioned, however, were commercial time sales on both batch and a time-sharing basis, business and scientific programming, consulting, training, total systems management, data base, hybrids and systems simulation. Oh yes, and local, state and national government programs. In any case, Boeing estimates the current market at $5 billion, and is aiming for a slice of it. The division will start with $100 million worth of computer equipment already in-house, plans to use 3,000 employees. . . .

A service described as "second generation" facilities management is being offered by Comserv Corp., a Minneapolis group of specialists. "Currently the switch to a facilities management service is a last resort," says Leo Higgins, Jr., Comserv president. "The head-rolling that accompanies such changeovers is usually all the negative needed to start an equally unsound operation." Comserv's alternative, Dataday Processing, guarantees performance of routine daily duties, while freeing the dp manager to do his thing, creating the new applications and systems needed by his organization. These, too, eventually would be included in Dataday's regimen. Personnel would have the option of operating under Comserv's payroll or remaining on their original company roster to develop programs exclusively for it. Comserv maintains that this would relieve workload frustrations and discourage turnover.

NEW COMPANIES

The Common Market, as far as computers are concerned, is becoming more of a real prospect every day with a push to reduce trade barriers and the necessity of developing new markets — including iron-curtain countries. Proclaiming that it will be able to offer a "multi-national market place" encompassing Europe, the U.K., Canada and the U.S., **Promodata Ltd.** has been launched from a London base, as a group-brokerage dealing in complete systems, units, or unit-clusters. Besides the advantage of an international pricing policy, the company plans to ride on a market growing at a rate of 40% a year, that it predicts will reach $720 million by '75. Managing director is a handsome young (31) New Zealander, Geoff D. Slocombe, who has specialized in operational research. . . . **Infodata Systems, International, Inc.,** has been formed in

INTRO DUCING

TRANSITEL®

COMPUTER SUPPORT SYSTEMS

A BRAND NEW DIVISION
OF
SANGAMO ELECTRIC COMPANY

We have only begun to introduce....

Our new OCR System handles both kinds of turnaround documents: low *or* high incidence of handwritten variable data. We've just added it to our high-performance line of Transitel key-to-tape Data Stations, Poolers, Data Communications Terminals and Line Printers. And even more new products are on the way. All of them built to be nice to people (and they are; operators much prefer working with Transitel equipment).

We're growing—fast. Write Transitel Computer Support Systems, 5155 East 39th Avenue, Denver, Colorado 80207. An equal opportunities employer.

CIRCLE 47 ON READER CARD

Webster, N.Y., to market software and services (including an information and retrieval system called INQUIRE) in Germany, Austria and Switzerland.... The Netherlands has a new joint-venture firm called **Pandata N.V.,** a combination of two Dutch corporations and Gemini Computer Systems, Inc., a Diebold subsidiary, which has set up in Utrecht to software-service the Dutch government's post, telephone and telegraph company. It also plans to provide systems analysis and programming for private industry there.... Computer Machinery Corp.'s KeyProcessing system will be both manufactured and marketed outside Paris by **CMC France S.A.,** presided over by well-known French computer exec Gerard Balayre. The company has started on three orders amounting to $620,000. CMC already has established a similar subsidiary in England.

MERGERS, ACQUISITIONS

Control Data Corp. looked overseas at Israel's computer maker, **Elbit Computers, Ltd.,** saw that it was good, and reached an agreement to buy a controlling interest in it. One of the stipulations is that it buy up the Israeli government's shares in the company, leaving it jointly owned between CDC and **Elron Electronic Industries,** Haifa.... At home, there are more for sale signs up, and many mergers are not so much because of a desire to acquire so much as a desire to relinquish. Levin-Townsend Service Corp., a subsidiary of the hard-pressed computer leasing company, has sold its New York City operation to **Analysis and Programming Corp.,** a service firm with offices in Greenwich, Conn., Chicago, Rockville, Md., and also in N.Y.C. The latter is to be combined with Levin-Townsend's Broadway data center there, to function as a dp support and consulting facility.... Republic Corp., the California manufacturing and services organization, has agreed to sell its subsidiary, **Republic Data Systems Corp.,** to **General Analytics Corp., N.Y.C.,** for 400,000 shares of GAC stock and a note for $2.4 million. RDSC, employing some 140 people and grossing around $2.5 million a year, will continue operations as **General Analytics Data Services.** ... **System Development Corp.** has sold its interest in **Doxiadis Associates, Inc.,** which will now go it alone in Washington, D.C., as **Doxiadis Urban Systems, Inc.,** designing antidotes to megalopolis. SDC also made it clear it will continue with its own urban planning activities.... ... **Boole & Babbage, Inc.,** the systems evaluation firm also in Palo Alto, expects to broaden its measurements technology base with the acquisition of **Pacific Radionics,** of Campbell, which makes interfaces for process control.

NEWS BRIEFS

21 Count Salute

A rather plaintive complaint against IBM, accompanied by references to "repeated meetings on Madison Avenue and correspondence with Mr. Watson personnally," was filed by Computer Graphics Assoc. Inc. at the beginning of June. It ran to 21 counts, mainly contending that IBM's magnetic tape Selectric composer is a powerful and sophisticated computer, and therefore violates the consent decree of 1956. The McLean, Va., computerized typesetting company describes itself as a cottage-industry operation, and "the smallest firm ever to engage IBM in antitrust action." It employs housewives and the handicapped who are willing to put in 100 hours a month of at-home keyboarding, about 70 people, and does composition work for the government printing office. CGAI says that it has been unable to purchase equipment from IBM, even on a cash basis, because Goliath is afraid David has developed more economical ways around its keypunch equipment. IBM has countersued for $15,886.80, exactly. Helmuth Scherer, president of CGAI, says the debt is the other way round, and the past months have been "very trying" because IBM "has done anything and everything to prevent us from functioning properly."

On Leave from Stanford

Computing luminary Paul Armer is taking a year's leave of absence from his post as director of Stanford U.'s computing centers. He'll be located at the Harvard Program on Technology & Society, where he'll write a book on the Paul Principal: people become incompetent at a level at which they once performed competently because they become uneducated for that level.

Key Logic for Redcor

Penta Computer Associates of New York, the ones with the KeyLogic data entry system, have agreed to merge into Redcor Corp., Woodland Hills, Calif., on a pooling of interest basis, for 300,000 shares of stock, plus the incentive of 250,000 more if enough KeyLogics are installed in the next two years. Redcor makes the RC 70 midicomputer, as well as MOS test systems, analog and digital instrumentation. It anticipates some short-term reduction of earnings because of elimination of inter-company sales, but an overall strengthening of its position in the field.

Fore!

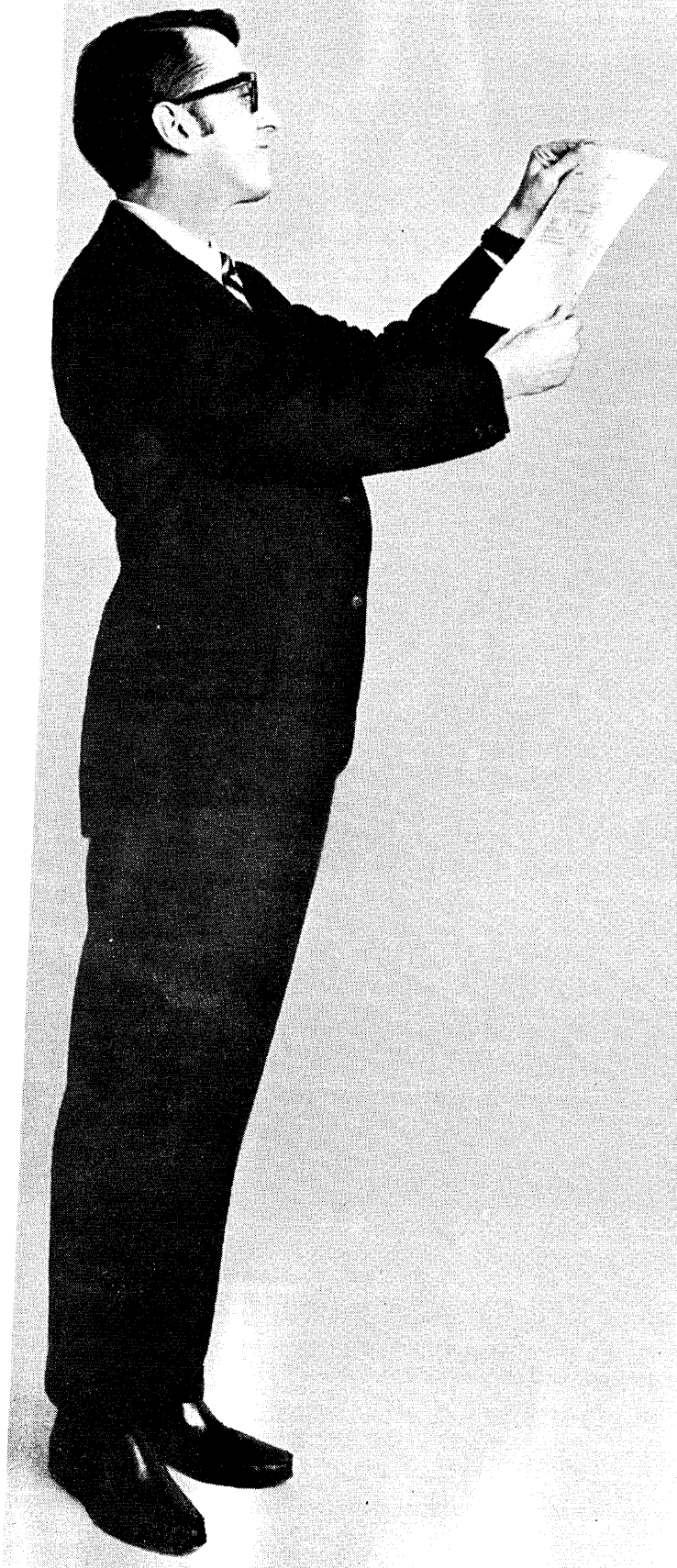
It's going to be PARS for the course at United Airlines, which has signed up for the IBM passenger reservation system after recently discontinuing a $39 million arrangement with Univac for a similar system that kept landing in the rough. The new system will be mounted on two 360/65's initially, and reportedly will involve about $50 million in equipment and support over a period of years.

SHORTLINES

Bull-GE has sold $10.5 million more of its peripherals to Burroughs, after an earlier sale of $10 million in keypunch units. This time the order is for P-112 keypunches and V-126 verifiers, made in the plant at Belfort, France. This plant exports about 90% of its output.... Burroughs has been authorized to go ahead with its B3500 computer deliveries to the Air Force after a fine-tooth-comb review by the DOD, the Air Force and the General Accounting Office. The AF Base Level Data Automation Standardization program (which originally called for 135 B3500's, at $60 million) had been held up after the installation of the 47th computer in January.

Now we give you dry, flat COM printout...

any way you look at it.



Sometimes you want COM printout by the page, at point of need.

Other times you want it in quantity, foot after foot.

Either way there's a Xerox machine that can take your electronically-generated microfilm and give you printout the way it's most useful. Dry and flat. And fast.

For selective printout there's the Xerox microprinter. In 10 seconds it gives you enlargements on plain, untreated paper that you can use and mark up the instant they're made.

You simply select the frame, push a button, and out come your blowups. From any size or kind of microfilm. In magnification ratios of 12x, 16x, 20x or 24x.

The other way we give you printout is the Copyflo II Continuous Printer. It makes sharp, dry positive enlargements at 50 to 60 pages per minute. On ordinary, unsensitized paper, translucent intermediates, or offset master material.

The microprinter and the Copyflo II. Any way you look at it, they're worth looking into.

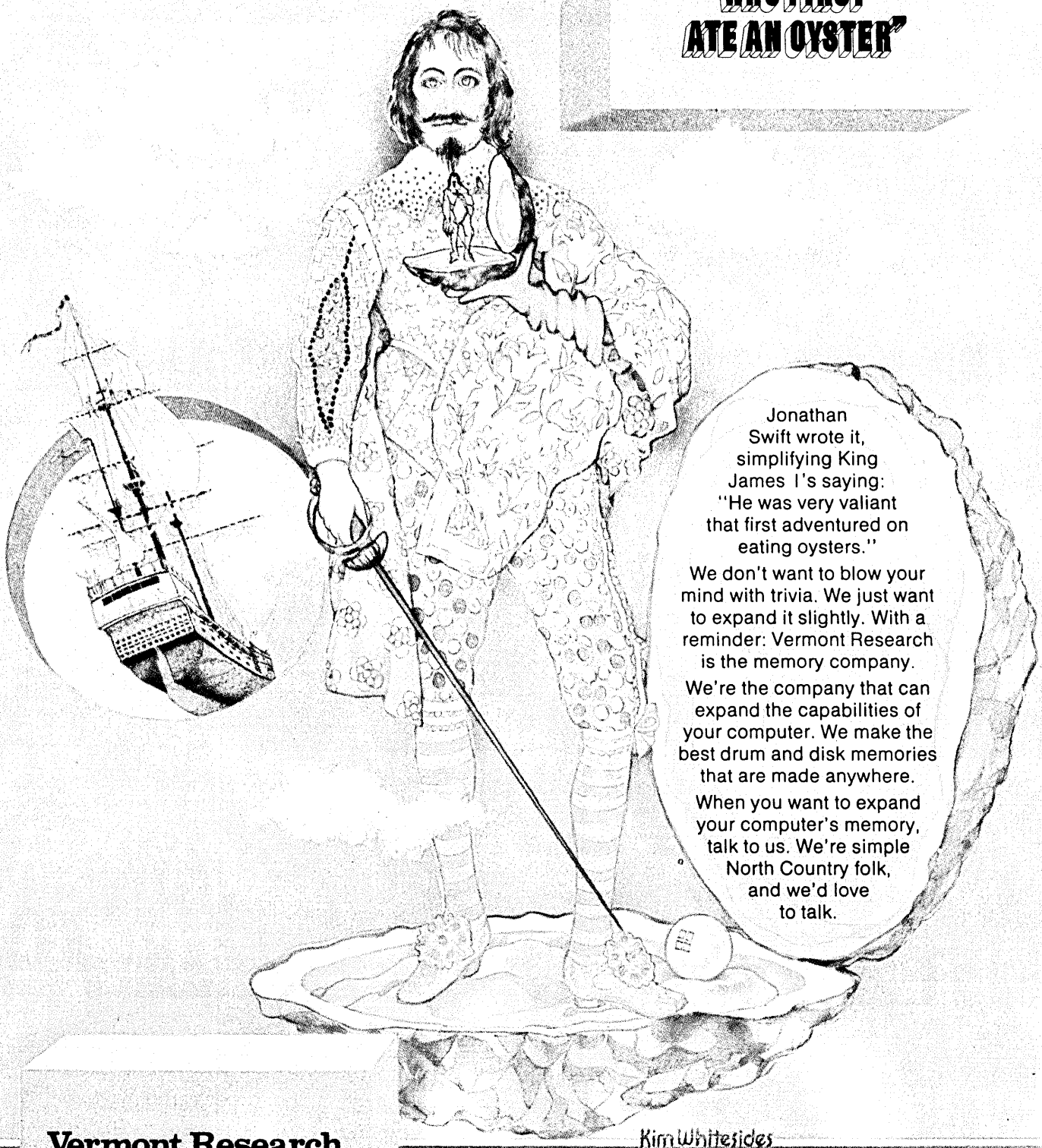
For more information, write Xerox, Dept. MP, Xerox Square, Rochester, New York 14603.

And we'll have one of our product specialists call on you.

XEROX

CIRCLE 98 ON READER CARD

WHO SAID: "HE WAS A BRAVE MAN WHO FIRST ATE AN OYSTER"



Jonathan Swift wrote it, simplifying King James I's saying: "He was very valiant that first adventured on eating oysters."

We don't want to blow your mind with trivia. We just want to expand it slightly. With a reminder: Vermont Research is the memory company.

We're the company that can expand the capabilities of your computer. We make the best drum and disk memories that are made anywhere.

When you want to expand your computer's memory, talk to us. We're simple North Country folk, and we'd love to talk.

Kim Whitesides

Vermont Research
CORPORATION
Precision Park, North Springfield, Vermont 05150
Tel. (802) 886-2256, TWX 710-363-6533
DRUM AND DISK MEMORIES – CONTROLLERS

EXPAND YOUR MEMORY

CIRCLE 124 ON READER CARD

The revolutionary Hetra T/2 terminal.

We thought about performance.
And built a smart terminal. With one-microsecond core. As much as 65K if you need it. And a processor that's completely programmable.

We thought about transmission.
A terminal should be quick. Our's handles 4,800 BPS on voice grade lines.

We thought about speed.
Our card reader is rated at 400 CPM. And we added a printer that runs at 600 LPM.

We thought about price.
And got it down to $33,950 with 8K of core and peripherals.

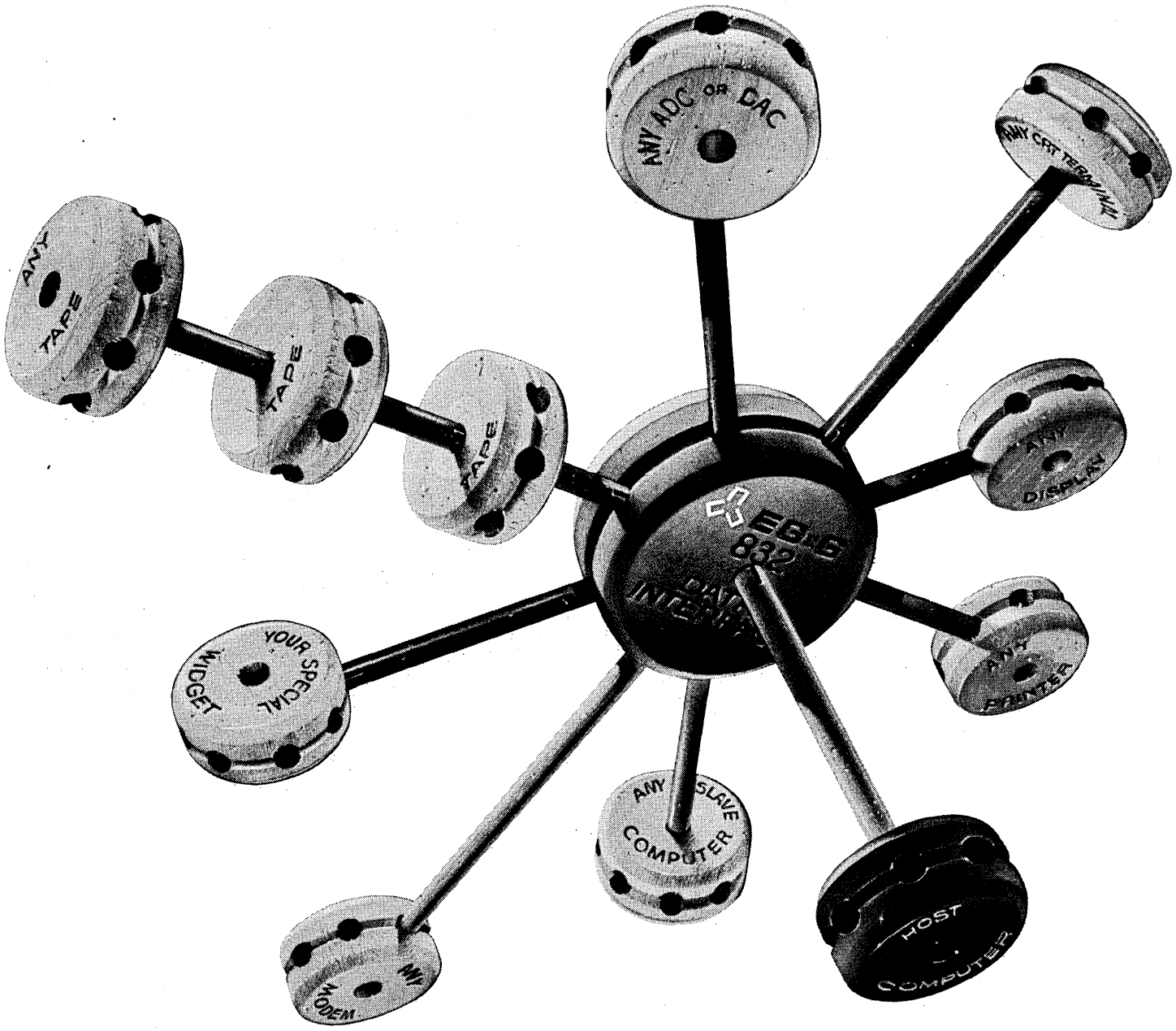
We thought about delivery.
And decided we could get you one in 90 days.

We thought you'd be interested.
Interested enough to dial (305) 723-7731 and get more information on your application.

We think harder.

HETRA P.O. Box 970, Melbourne, Florida 32901 (305) 723-7731

The world's only universally compatible interface for any mini-computer and all peripherals



The new EG&G 832 Data Interface

Now, for the first time, mini-computers and peripherals of all kinds can be interfaced simply, quickly and economically... with one standardized package. It saves you time. It saves you money. It frees your computer for more computing. It is the new EG&G 832 Data Interface.

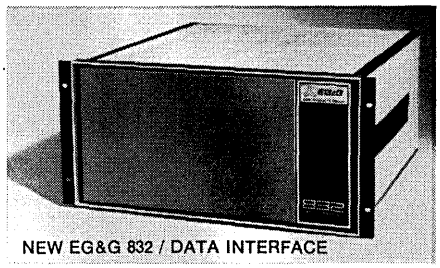
There's nothing like it.

Computer-independent peripheral cards make the difference. Each of a wide selection of plug-in cards handles a different class of peripherals, modems, hardcopy printers, rotating or other mass memories, A-D/D-A converters, displays, satellite computers, or any digital peripheral you can name. Or dream up.

Peripheral-independent computer cards also make the difference. They plug in too.

With the 832 Data Interface, you broaden system component selection and get real time systems on-line faster. Smaller computers become more productive and you get extra computer power for the future.

Configure your next system around the compatible data interface, the new EG&G 832 Data Interface. OEM discounts. For complete details call or write: EG&G Inc., Data Products Group, 36 Congress St., Salem, Massachusetts 01970. Phone: (617) 745-3200.


NEW EG&G 832 / DATA INTERFACE

EG&G
DATA PRODUCTS GROUP

CIRCLE 190 ON READER CARD

Smaller Large Computer

When CDC announces a "smaller" computer, chances are the machine will still be bigger than most others on the market. That is certainly true of the 6200. The machine is smaller than its big brother the 6400 in that it can be configured with fewer peripheral processors and I/O channels, but even at that it is not much detuned.

The cpu runs integer additions at a rate of 1.2 million per second and has a 1 usec core consisting of a minimum of 32K 60-bit words. It comes with a minimum of seven peripheral and control processors—each with 4K 12-bit words themselves, with a minimum of nine 12-bit data channels that run at up to two megacharacters per second each, and with eight operand, eight address, and eight increment registers. That doesn't add up to a small machine.

The marketing philosophy does not require that the 6200 be small in an absolute sense, however, but only that it be small relative to the rest of the 6000 series so that it can act as a door-opener, a starter set for installations that can grow into the bigger machines. In this sense the 6200 ought to work well, for it is instruction-for-instruction compatible with the 6400 and uses all the same software, including the SCOPE operating system which supports BASIC, COBOL, FORTRAN, ALGOL, SORT/MERGE, PERT/TIME and others in batch, conversational, and remote batch processing modes.

In the smallest configuration of the now smallest 6000, the one listed above, the 6200 will run $589,580 before taxes and peripherals, or $12,942 per month. But, the marketing department reminds us, you don't have to stop there. You can build it up to a 64K memory, 10 peripheral processor, 12 channel dragster at $28,652 per month or $1,301,900 on purchase. (Maintenance costs a little extra, ranging from $2,478 to $3,790 monthly.)

Billed as being 75% as fast as a 6400 on compute-bound jobs and 85% as fast on mixed job streams, the 6200 will make its first appearances late this winter. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 339 ON READER CARD

Key to CRT to Disc

The System 480 should be described as a crt-to-disc, data entry-verify-edit system with magnetic tape output, according to the president of the company that is producing it. Physically it is 64 or less crt-keyboard (either typewriter with numeric pad or keypunch) stations linked to a 16K Data General Nova computer, an Iomec Model 1012 11-megabit disc, and a magnetic tape drive.

The input station features a 480-character display with automatic "roll-up." It displays error messages, job status and—in response to the HELP! key—step by step instructions on how to perform specific functions.

Manufacturer supplied software handles entry, backspace/strikeover, key or visual verification, search, insert and delete functions. Over 1,000 program formats can be stored in disc, and temporary formats can be written in core. Another formatting feature is the ability to reformat data being transferred to tape so that it is compatible with any data processing system.

System 480 will be on the market and available during the summer. A 10-terminal configuration can be purchased for $83,000 and will have a rental price of between $1700 and $1800. ENTREX, INC., Lexington, Mass. For information:

CIRCLE 341 ON READER CARD

Communications Controller

First product of this firm is the Dash-11 series of computer controlled data communications systems, which feature capabilities for on-line inquiry with voice response and/or batch communications in one common system. The controller, based on a Varian 620/i minicomputer, can communicate simultaneously with terminals using Touch-Tone pads for voice response, and with other terminals such as crt's, tty's, printers, etc. Both on-line and stand-alone configurations are available, and the system is field expandable from a simple two line configuration with a vocabulary of 32 words to one capable of handling 64 lines and 1024 words. The vendor will provide complete systems including software, interfacing, and terminal selection and procurement. Prices for the dual-line, 32-word Dash-11 start at $42K. Delivery requires five to six months ARO. DASH DATA SYSTEMS, INC., Stamford, Conn. For information:

CIRCLE 351 ON READER CARD

System/3 OCR

This product was named Input 3 because its seller expects it to become the primary means of data input to IBM's System/3 computer. We do not know what IBM thinks about this, but here are the vendor's arguments. Input 3 was built to be inexpensive capable of reading both typed and handwritten alphanumerics, and small. It is not exceptionally fast because speed is still incompatible with low cost in optical character readers, but it can perform at 75 cps on machine printed text and at 30 cps on handwritten information. Also, its use is not limited to System/3, as it can output in the 360 series EBCDIC code as well as the 3's 6-bit BCD.

The machine comes in two versions, one called a small-page reader for taking up to 22 lines of text from documents up to 6x9 inches, and one called a single-line document reader for taking a line at a time on documents of the same size. The page reader runs at 7½ pages per minute (given four lines on a form 5½ inches long) and the document reader goes at 60 documents per minute (6-inch documents).

Input 3 reads handprinted numbers and six special characters, mark sense targets, and OCR A or OCR B alpha, plus IBM 1428 or 1403 fonts. The system is designed to give up on hard letters it cannot read, mark the lines, and return the pages to a reject hopper. It can read pages with slight tears, wrinkles, or staple holes, too. Its vocabulary consists of either just numerics, or one of the alpha fonts, or a combination, depending upon how much the user is willing to up the $950/month ($33K on purchase) price. Deliveries will begin in the fourth quarter of this year. RECOGNITION TERMINALS INC., Rockville, Md. For information:

CIRCLE 344 ON READER CARD

(Continued on p. 140)

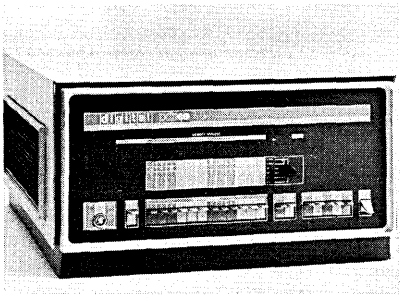
HARDWARE CONTINUED

HARDWARE CONTINUED

The Godson

Ready to take its place in the family by displacing two predecessors is the PDP-8/E, a 12-bit minicomputer which is both faster and cheaper than the PDP-8/I and 8/L that did the groundbreaking for it. The family the "E" joins is a large one, with more than 8,000 members already installed. Undoubtedly the most widely accepted minicomputer series —by an order of magnitude—the 8-line should realize even more sales with a member that goes for $4,990 (without a tty).

The E has a core cycle time of 1.2 usec and performs additions in two cycles, 2.4 usec. In addition to the memory buffer register, instruction register, two switch registers, and memory address register (all of which the older machines have too), a general purpose register has been added. The instruction set has been incremented with the addition of a



byte-swapping command that operates on the right and left halves of the accumulator and six more I/O transfers.

Hardware changes include hard-wired interrupts (eight levels), the replacement of a wire-wrapped back panel with busses (and logic modules are buss-independent), memory increments of 256 words for read/write or read-only memory (starting from 4K and progressing to 32K words), and a hard-wired RIM loader (for bootstrapping).

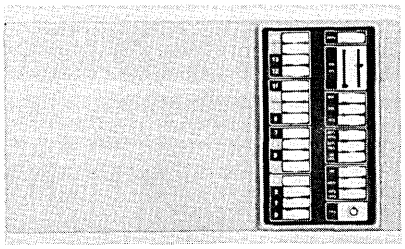
The system is program compatible with earlier models, which makes available to it more than 350 applications programs. Deliveries are slated for November. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 340 ON READER CARD

A different Mini

The front panel of the Omnus-1 minicomputer is different from all other 16-bit computers we have seen. Its rocker switches are reminiscent of an IBM 7090's console, and the builder claims they can be used in the same way. Lights accompany each switch, so a user can interrogate any memory location or register, look at its contents, change them, single-step through his program, manipulate breakpoints, or enter instructions.

The differences don't stop at the front console, either. Although such things as the number of instructions in the repertoire are difficult to measure, for instance, the Omnus-1's claim to over 1,000 (plus variants) seems to be a new record. Partly because of the convenient instruction set, the machine's supplier expects that most of the Omnus-1's placed will be sold by programmers. Given double and triple operand commands like "selected I/O register to/from memory or register" and "register to register plus memory," the program-



mers will at least not lack for a direct way to do something.

Equally important to the architecture is a single bus called the Omni-Buss (we don't know if a pun was intended there) that is shared by the processor, arithmetic unit, four hardware and 2K software registers, the 2K to 32K directly addressable memory, and the I/O controllers. Other features include the ability to handle 16-, 32-, and 48-bit data formats, 16 levels of priority interrupt, a direct memory access channel that can be augmented by a 16 channel multiplexor, optional 200 nsec read only memory (standard memory is the 1.2 usec cycle core variety), optional hardware registers, and scratch pad memory.

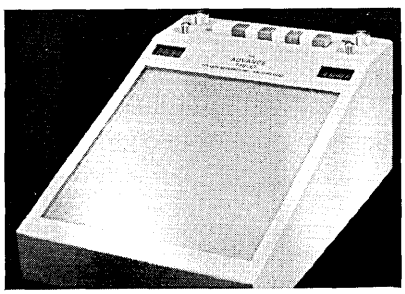
Software includes loaders, diagnostics, a cross assembler with macro features, a two-pass assembler, and arithemetic routines. The price for a model with 2K (16-bit words) of core is given as $5,950, and the first machines are scheduled to come off the line in Sept. OMNICOMP COMPUTER CORP., Santa Ana, Calif. For information:

CIRCLE 343 ON READER CARD

Optical Tablet

Drawing graphics on a crt with a light pen works well, but it's rather awkward for human beings. The approach used by this vendor is much more like drawing on paper: the user draws with the light pen on an optical "tablet," set at a slight angle from horizontal, like an artist's drawing board.

The unit, called the Model 100 Advance Tablet, is designed to feed graphic plots directly to a computer and crt. It features built-in digital position indicators utilizing eight readout tubes. Standard interface provision is for fully decoded digital output for Teletype use, analog voltage, and other computer or display interface accommodations. The plotting speed of 5,000 points per second permits full computer input of arbitrary path or freehand drawings as fast as they are penned.



Beyond the customary uses as a tool for engineering drawings and mathematical graph construction, the firm sees additional markets for the tablet in fulfilling simple data entry needs, such as updating diagnostic records: medical personnel could use the light pen with an overlaid check list form. Price of a single basic unit, including pen, is $1975; reductions are available in quantity. Delivery requires about 60 days ARO. The Model 100 is the first product of a firm previously engaged in electrical engineering consulting and R&D work. ADVANCE RESEARCH, INC., Waltham, Mass. For information:

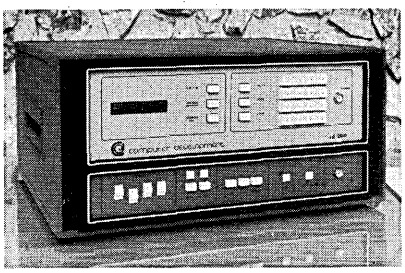
CIRCLE 347 ON READER CARD

Off-Line Tape to Print

Off-line conversion of tape to printout was a frequent second generation operation, and it may be coming back if this vendor has its way. The firm announced a 1200 lpm printer (Jan., p. 200) which it is now selling as part of its new System 1200, consisting of the printer, a Nova minicomputer, and a PEC tape drive. The system can perform such functions as read magnetic tape, check for read errors, print data, arrange data in accordance with desired formats, search files, and monitor components for malfunctions. The mtu handles 9-track, 800 bpi tape, and has dual-gap read/write heads with automatic error checking. Basic price is about $33K, or $1150/mo. on a three-year lease. Delivery requires 90 days ARO. PATH COMPUTER EQUIPMENT, INC., Stamford, Conn. For information:

CIRCLE 342 ON READER CARD

Universal Mini



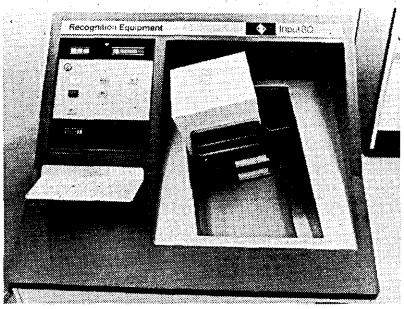
While fashion may take certain "mini's" away from us, it is apparent that computer manufacturers are moving to fill the gap. Latest of the ubiquitous mini's is the cd 200 for data acquisition, industrial process control, and communication systems applications.

The 16-bit computer features a single channel universal bus which allows direct memory access from up to 15 devices. The memory can be made up from several sizes, speeds, and types of storage, with up to 60K directly addressable bytes maximum. Inside the processor are 69 basic instructions, built-in add and subtract (optional multiply and divide), with binary and two's-complement arithmetic. The maximum channel transfer rate is one megabyte to a large assortment of peripherals, including Teletype and paper tape equipment, rotating memories, tape units, line printers, and others.

Available software includes process control monitors, loaders, arithmetic routines, I/O routines, and sorts, as well as general data manipulation routines. Price of the processor alone can be as low as $1695, but a typical 1K system is about $3490. First deliveries are to be in August. COMPUTER DEVELOPMENT CORP., Santa Ana, Calif. For information:

CIRCLE 348 ON READER CARD

Bigger Faster OCR



For those who wish to go faster than the 75 cps allowed by the Input 3, the Input 80 is available. It reads from full size pages (5¾ x 4 to 9 x 14 inches) at rates to 18,000 pages per hour. The 18,000 rate is realized from the 3600 cps basic reading speed when only one line is read per page; when reading full typewritten pages, for instance, the throughput rate falls to 38 per minute.

The 80 can be ordered with the ability to read one font at a time (one of 14 common typefaces), or multiple-font data where the next typeface to be read is always known, or multifont data which can be made up of from 360 character patterns. Handprinted data, composed of numerics and several special characters, can also be discerned by the "Integrated Retina" that makes the whole thing work.

The system's basic single-font reading price is $11,895/month. This goes to $14,550/month with the multiple font (one at a time) feature, and to $17,220/month for the give-it-anything-you've-got multifont reader. Sales prices are around $665,000.

Included in those prices is a Datacraft 24-bit word computer with a 16K (expandable to 32K) 1.0 usec cycle time core memory, and an I/O typewriter. Optional peripherals include up to eight mag tape units and a line printer. RECOGNITION EQUIPMENT INC., Dallas, Texas. For information:

CIRCLE 345 ON READER CARD

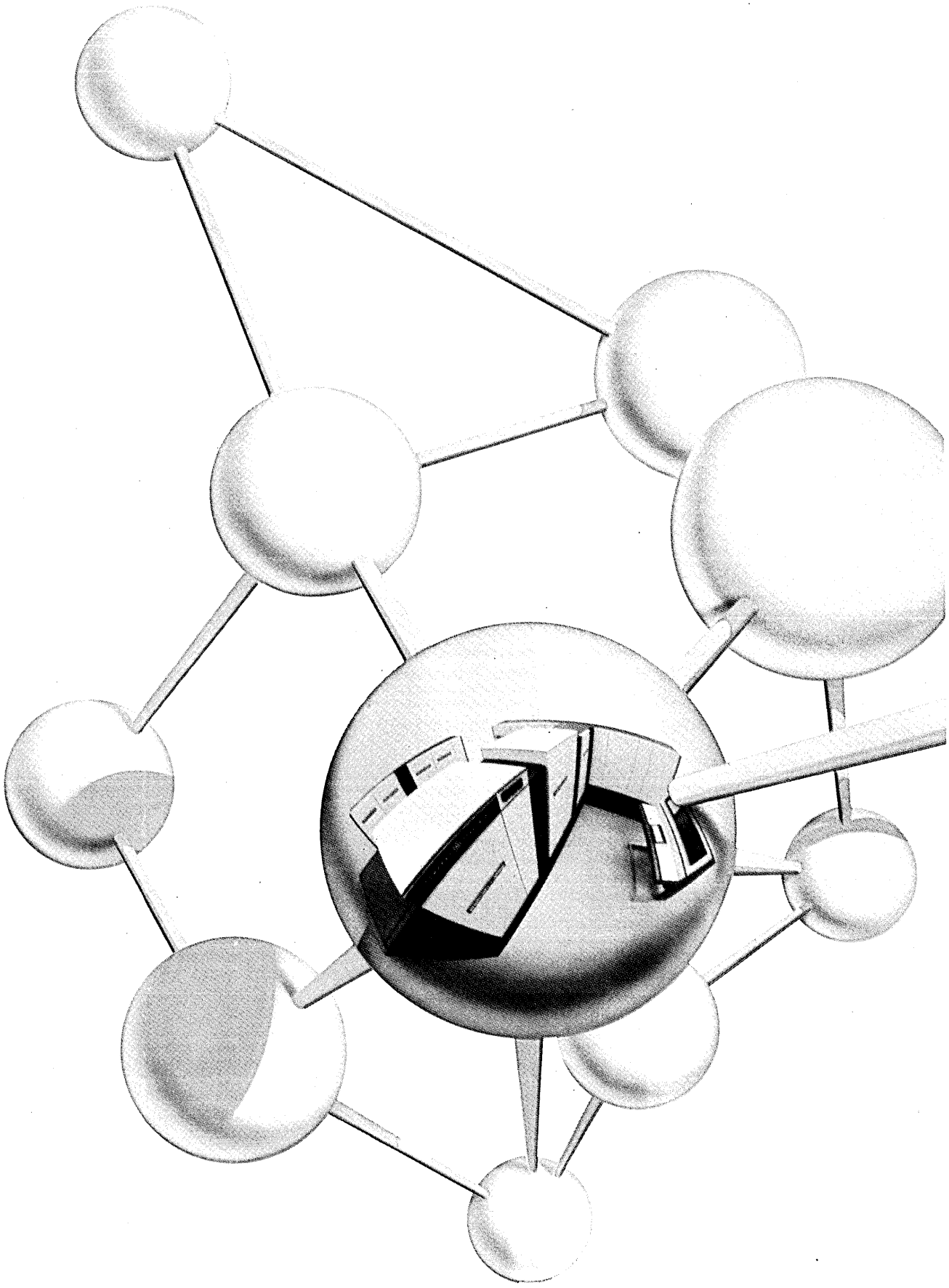
CRT Terminal

The Editerm crt terminal features Teletype compatibility, is contained in a futuristic case, and includes the firm's Model 1000 terminal processor which uses pre-programmed firmware options. The standard Editerm 100 has an 11-inch diagonal screen, displays up to 80 lines of 24 characters using a 5x7 dot matrix, and has a 64 character ASCII set (96 optional). Refresh rate is 60 times per second.

Its interface is serial, EIA RS-232B, up to 9600 baud, or asynchronous up to 3,000 cps, and synchronous up to 2,000,000 cps. Operating modes are on-line, local, full and half duplex, page mode, and roll mode. Its price is under $3K, and delivery 60 days for the basic unit with crt, keyboard, and controller. A plethora of options are available, making the Editerm a compatible substitute for the IBM 2265 Model 2 and 2845 controller, and making it suitable for text editing. These options include lower case display, switch-selectable modem speeds, hard copy drivers, overlapped memory, numeric keyboard, remote monitor station, cassette storage, and 7- or 9-channel tape interface. SYS COMPUTER CORP., Hackensack, N.J. For information:

CIRCLE 353 ON READER CARD

(Continued on P. 144)

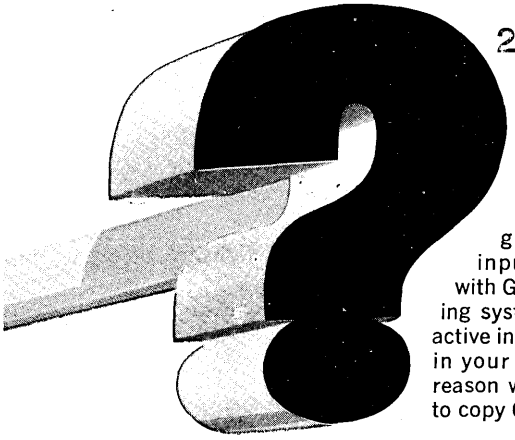


10 questions you should ask about your present operating system ...and about GECOS III

These questions are vital to any user of multiple computer systems . . . anyone struggling to solve the problems of incompatible programs and files . . . any business manager trying to link all his batch, remote access and time-sharing into one common system run from one common data base.

GECOS III* — operating system for General Electric's GE-600 Line of large-scale computers — was first, by years, to meet these problems. And we believe the answers to these ten questions will show you it's still ahead by years.

1. Are you running third generation hardware with a second generation operating system?
"Third generation" means more than just hardware. Operation of a third generation system also demands the capabilities of an operating system like GECOS III — multiprogramming, multiprocessing, three-dimensional concurrent access, and a common data base.



2. Do your $20,000-a-year computer users waste time carrying work to the computer . . . or waiting for results?
They can write and maintain their programs direct from an input/output terminal with GECOS III. One operating system gives them a reactive interface to all software in your system. That's one reason why others are trying to copy GECOS III.

3. Are you adapting your business to your computer? Or your computer to your business?
GECOS III evolved to meet *user* needs. First, it keeps tabs on what your workload is through video system monitoring (VISTA), hard copy monitoring (System Resource Monitor), detailed accounting reports and system simulation. Then, it multiprograms your batch, remote access and time-sharing jobs simultaneously . . . and provides service on demand when you need it.

4. How long does it take to reconfigure your system? All day? Hours? Minutes?
GECOS III adapts itself to any standard configuration. It's truly automatic — the one operating system that matches third-generation software with third-generation hardware.

5. When one module fails, does your system go down?
Not a United System with GECOS III. An on-line test and diagnostic system monitors the central computer's peripherals and communications processors while the system keeps running. Troublesome system modules can be isolated before failure occurs. GE field engineers can then make repairs while the rest of the system runs normally.

6. How many separate file systems do you need to support your business?
Only one central integrated file system with GECOS III. The data base is conveniently accessed by batch, remote batch, or time-sharing programs. You get the flexibility you need to build your own management information system.

7. Can your FORTRAN and COBOL programs talk directly to any remote terminal on the system?
They can with GECOS III's unique remote access capability. Messages are never delayed in centralized message queues. Each message is placed under the complete control of the application system designed to service it.

8. How much does your business pay for time-sharing over and above your normal computer expenses?
GECOS III lets you assign whatever resources you need to support a variable time-sharing load, and to alter those resources dynamically throughout the day. Your users get access to a wide range of time-sharing capabilities . . . plus terminal access to all batch software.

9. Is your system's performance limited by your operators' abilities? Or is the system self-optimizing?
A United System with GECOS III optimizes its own operation by managing system resources and automatically scheduling your work. Your operators get their direction from the system, thus they can help make your operation truly productive.

10. Do you use multiple systems to serve multiple applications?
As a typical example, GECOS III can do all five below simultaneously:

- remote inquiry
- on-line data processing
- batch data processing
- engineering analysis
- text editing

GECOS III is just one of many reasons why a GE United System can help you unite your computers, your people, and your business now. For more information, call your nearest General Electric Information Systems Sales Representative. Or write to General Electric Company, 1 River Road, Schenectady, New York 12305. 290-74A

*GECOS: Trademark of General Electric Co.

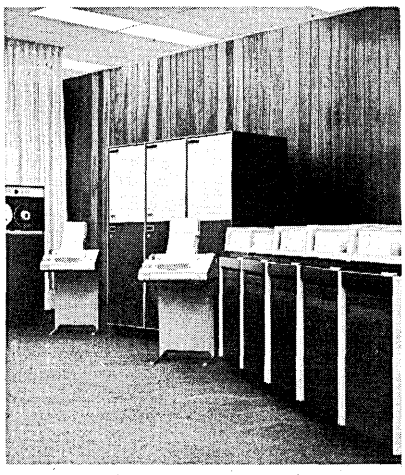
GENERAL ELECTRIC

General Electric Computers: The United Systems of the 70's

Triple-Processor

The DPE-411 Data Processing Elephant is a triple processor time-shared system with COBOL capability for business applications. Its processors are function dedicated. An 8K Devonshire computer handles communications (a second is optional for backup), and two 64K Honeywell 316's take care of application processing and file management.

The DPE-411 can accommodate 200 communications lines and 56 terminals operating simultaneously. The 56 terminal figure is set by the number of on-line applications programs resident on a swapping disc that is associated with the processing computer. The disc can swap 6½ of the 15K byte source coded packages per second. Four batch programs are also on the disc. They come into operation whenever there is idle time on the system.



The file processor can manage index lookup, store allocation and subscriber accounting for up to 500 million characters of data. The storage medium is 2311 type disc drives and up to 24 can be connected to the system. The minimum configuration for the DPE is the three processors, the swapping drum, two disc drives and two tape drives to back-up the communications processor. Software includes the operating system, a COBOL compiler and a command language interpreter, plus the applications packages.

The price for the minimum system is $710,000 and monthly rental runs $14,200. Maintenance is included. First delivery will be in December. TELEFILE COMPUTER CORP., Auburndale, Mass. For information:

CIRCLE 350 ON READER CARD

Multi-Purpose OCR

A combination of features from the manufacturer's earlier machines appears in the 955 OCR system. Purportedly, the best features are its capabilities of reading pages, documents, journal tapes, and handprinting. Added to this are high resolution optics, which permit reading of degraded print, a 750 cps read rate, and multi-font recognition.

The 955 is an off-line system controlled by the SC-1700 computer with 8K of core. Optics are of the matrix matching variety, and output is via a 1.1 usec buffer controller to punched paper tape, disc, Teletype, or magnetic tape. Document feed is automatic from a hopper with 1 to 2 inch paper stack capacity, through the scan station to one of two output stackers.

The system has the full complement of fonts: OCR-A, upper and lower, OCR-C, ISO-B, 1428, 1403, 7B, E13B, 12F, NOF. It can store recognition programs for one full alphanumeric font and two numeric fonts at one time. All fonts are software implemented and are available without charge.

Other software with the 955 system is DRAFT (Document Read and Format Translator), GRASP (Generalized Read and Simulate Program), a keypunch simulator and list processor.

A basic 955 Page and Document Reader system, including 8K computer, mag tape drive, teletypewriter, and maintenance, is $5498 a month. Unbundled pricing puts the hardware at $4331 and Maintenance at $1167. Purchase price is $197,980. Deliveries will begin this month, initially running six to nine months ARO. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 349 ON READER CARD

Graphics Hard Copies

The Model 911 Dataplotter produces page copies of computer graphics in seven seconds, either on- or off-line. It works like an office copier, with push button operation producing dry copy on thermally fixed paper, and records continuous line plots and alphanumeric printing in any size or angular orientation.

Writing is accomplished by precision point and line generation on a 7-inch crt. Maximum imaged area is 7.5x9 inches, with 7.5x7.5 graphic area, and 7.5x1.5 heading area on 8½x11 sheets. Minimum line width is .020 inch.

The off-line unit accepts 9-track, 800 bpi magnetic tape in IBM format. Software is available for tape preparation on the IBM 1130 or any System 360. The unit's price is about $32K. For on-line use, the 911 is provided with interfaces and software for the 1130 or 360 and is priced at $22K. First deliveries begin this fall. ELECTRONIC ASSOCIATES, INC., West Long Branch, N.J. For information:

CIRCLE 355 ON READER CARD

Optical Terminals

This OCR system is for use in remote site applications. It consists of two machines, the Document OCR and either the Data Station or Data Communications terminal. The OCR unit reads typed or printed OCR-A Size 1, Farrington 12F, or IBM 1428 numeric characters from paper or card documents at a speed of 108 cps, for a throughput rate of 75 to 130 documents per minute, depending on the length of the document. Document size is 4 to 7.5 inches horizontally and 3 to 4 inches vertically. Information is written on 7- or 9-channel magnetic tape on the Data Station, or transmitted by the Communications Terminal. Unreadable documents are placed in the reject stacker and are not written on tape; they may later be entered through the keyboard of the Data Station on the same tape reel, preserving batch integrity.

When the system is not in use, the Data Station or Data Communications Terminal may be used for normal functions of entry, verity, search, and data transmission. Price of the system is $29,700 or $660 per month for a three-year lease, including either the Data Station or Communications Terminal. Deliveries begin in November. TRANSITEL COMPUTER SUPPORT SYSTEMS, Denver, Colo. For information:

CIRCLE 352 ON READER CARD

CRT Terminal

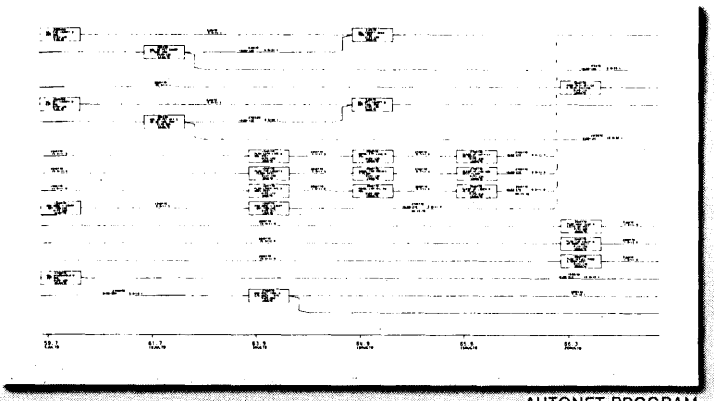
New crt/keyboard terminals just keep coming, and the prices seem to fall consistently. This one, the CT-3000, features ASCII code, 64 alphanumeric and control characters displayed in a 5x7 dot matrix on 10 lines of 40 characters each, with internally addressable page memory. The unit uses standard tv monitors, and can drive up to 10 of them. Editing commands include complete cursor capability, page roll, and repetitive activation of any control or character function. The 3000 is Teletype compatible, and is available optionally with an acoustic coupler. Its price is $2,745, with delivery in six weeks ARO. UNICOM INC., Fairfield, N.J. For information:

CIRCLE 346 ON READER CARD

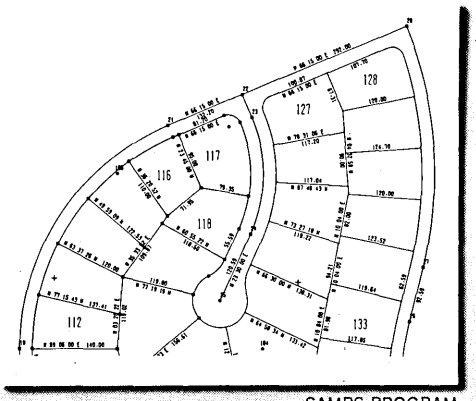
S/360 OS Videotape

This complete video taped System/360 Operating System Education Ceries consists of the following courses: OS Overview (6 lectures), JCL (16 lectures), Utilities (8 lectures), Techniques and Aids (8 lectures), and Dumps (10 lectures). Each lecture is 20-30 minutes in length and is supported by manuals containing outlines, charts, sample problems, and quizzes. The courses are designed for personnel with a basic knowledge of System/360. The series runs $4464, less the required video recorder and monitor, which may be purchased for about $1K or $50/day rental. A free 10-day trial is provided. Courses may be purchased individually at $93 per lecture. CONSULTANTS ASSOCIATED, INC., Wakefield, Mass. For information:

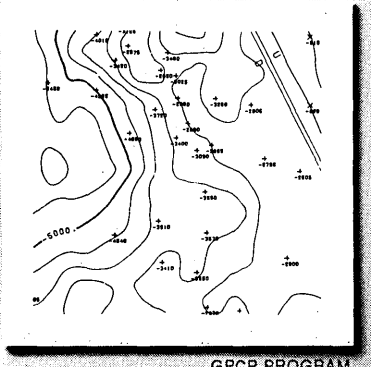
CIRCLE 359 ON READER CARD



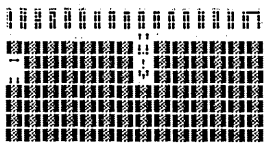
AUTONET PROGRAM



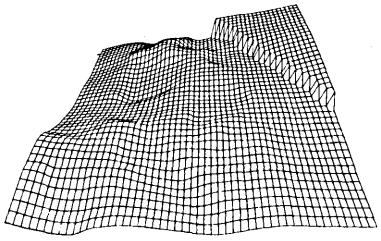
SAMPS PROGRAM



GPCP PROGRAM



MASKGEN PROGRAM



THREE-D PROGRAM

Guess which one of these classic drawings was sketched by an upstart machine.

What can a mere machine draw as well as a human draftsman? Everything you're looking at.

The CPM/PMS network.

The subdivision map.

The contour map.

The integrated circuit mask.

The 3-D perspective map.

The awesome truth is, every drawing on this page was produced automatically by a computer-controlled CalComp plotter.

Using just five of the many CalComp *application software* packages on sale now.

You see, a CalComp plotter today can handle many routine tasks a good draftsman can.

Only better. Faster. And more economically.

To free your draftsman for work that's more important.

In fact, these days you'll find CalComp plotters and software helping draftsmen in every field.

Oil exploration. Geological studies. Oceanographic surveys. And meteorological analysis.

Highway design, bridge design and other civil engineering projects.

Aircraft and spacecraft design and manufacture.

Building and construction.

Even medical research.

CalComp is the leader in computer graphics. With sales service and software support in 34 cities around the world.

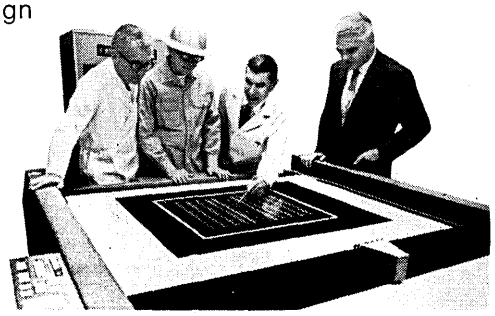
So if you're looking for a simple answer to your drafting problem, call your nearest CalComp man today.

He'll be happy to draw you a picture.

CALCOMP

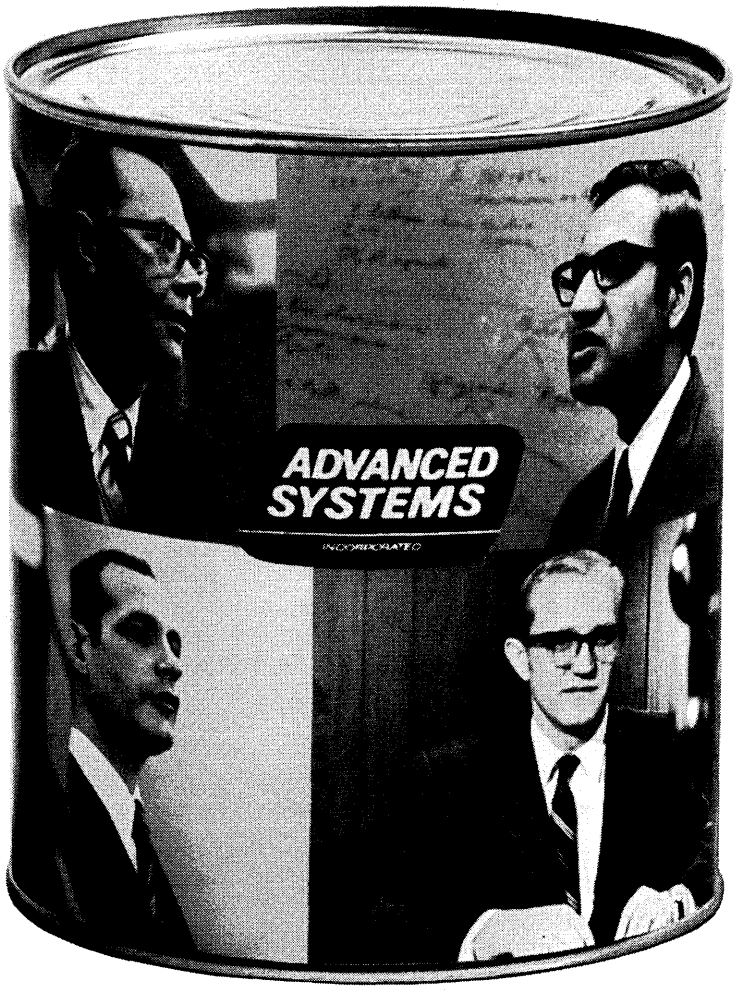
TEACH YOUR COMPUTER TO DRAW.

California Computer Products Inc.,
2411 West La Palma Ave., Dept.D-7
Anaheim, California 92801



We canned the best EDP instructors in the country.

(ALL NEATLY PACKAGED FOR YOU ON VIDEOTAPE)



New Video-Assisted Instruction (VAI)

Now in use by more than 250 top companies—learner-controlled Video Assisted Instruction (VAI) can train one student or your entire staff in data processing, usually in *less time* than older methods and at definitely lower cost. Equipment fits any handy space, provides live-quality instruction at any convenient time. Videotaped lectures by recognized specialists, well-organized student guides and efficient testing let each student learn at his own pace. Write today,

COMPUTER SYSTEMS FUNDAMENTALS
INTRODUCTION TO IBM SYSTEM/360
REPORT PROGRAM GENERATOR • COBOL
ASSEMBLER LANGUAGE CODING
COMPUTER OPERATOR TRAINING
INTRODUCTION TO OS • FORTRAN
INTRODUCTION TO OPERATIONS RESEARCH
TELEPROCESSING SYSTEMS CONCEPTS
COMPUTER CONCEPTS FOR MANAGEMENT
INTRODUCTION TO SIMULATION

CHICAGO • LOS ANGELES
WASHINGTON, D.C.
BOSTON • DALLAS
DETROIT • NEW YORK

Opening soon in
Atlanta, Minneapolis,
Philadelphia, Pittsburgh,
St. Louis and San Francisco.

ADVANCED SYSTEMS INCORPORATED

ADVANCED SYSTEMS Corporate Offices
1100 W. Northwest Hwy., Mt. Prospect, Ill. 60056

Name _____

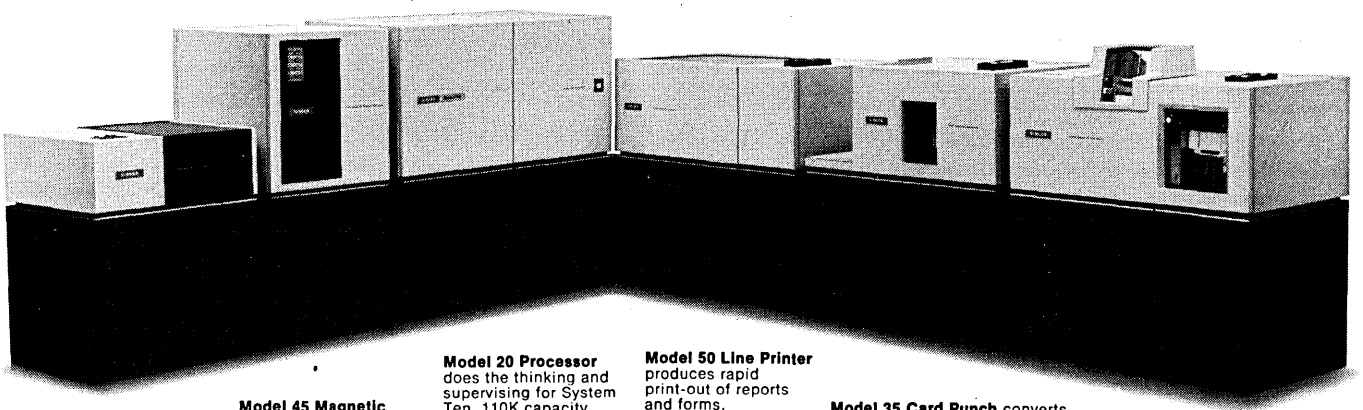
Company _____

Address _____

City _____ State _____ Zip _____

Or Phone 312/394-3443 Info Request JD770

Today Singer announces System Ten:



Model 40 Disc Drive stores large volumes of data for use at any time.

Model 45 Magnetic Tape Drive stores and retrieves information on magnetic tape.

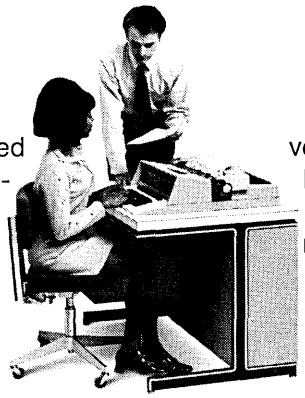
Model 20 Processor does the thinking and supervising for System Ten. 110K capacity.

Model 50 Line Printer produces rapid print-out of reports and forms.

Model 35 Card Punch converts System Ten data into punched cards for storage or additional processing. Model 65 Paper Tape Punch also available.

Model 30 Card Reader reads and transfers information from punched cards into System Ten. Model 60 Paper Tape Reader also available.

So flexible, so economical, it's the computer system of the decade.



Model 70 Workstation

Singer's Friden Division has developed a new kind of data processing system. Designed from the people up. It's so flexible, it fits with the work system you have right now.

Or any you are likely to develop in the next ten years.

Model 70 Workstations like these can be placed anywhere in your factory or office for instant access to System Ten.

We call it System Ten because it does everything that the well-known system does. And has seven other important advantages besides:

1. System Ten can process up to 20 jobs simultaneously. Including batch processing.

2. System Ten allows you to distribute workstations anywhere you need them in your office or plant. Terminals like the three shown can be added simply by connecting two wires.

3. System Ten operates from a common data bank—with up to 100 million characters of storage—accessible to multiple terminal locations.

4. System Ten time-shares without a costly executive software system. Instead it uses hardware.

5. System Ten programming is simple to learn—very few instructions and easy assembler language.

6. System Ten is economical, giving you remarkable cost effectiveness advantages. You can add a new application merely by adding a new terminal.

7. System Ten is modular, flexible, expandable. Designed to work for you today—and in the years ahead.

System Ten also gives you total communications capability. Remote batch processing or remote job entry if you wish.

System Ten is the first computer designed from the people up. The first computer everyone in your company will understand. It works for you. You don't work for it. We people are finally in control. Right?

Deliveries will start in September. Find out about the seven advantages of System Ten, and how it can work for you in the next decade. Call your nearest Friden office. Or write: Friden Division, The Singer Company, San Leandro, California 94577.

Model 70 Workstation

SINGER
FRIDEN DIVISION

Data Compression

The wasted storage space and data element redundancy built into COBOL will come as no surprise to the programmer, but since he so often has resigned himself to the loss as partial payment for the use of the language, he may be surprised to learn that he can cut his storage by about 50%. In some applications, the writer of the DYL-255 data compression and expansion routine claims, storage and processing savings can go as high as 85% with the incorporation of the package, but typically the savings run 45%.

Prime applications for the program —which can also be called in assembly language—are in on-line data retrieval applications where the additional millisecond or two required for record expansion goes unnoticed, in file maintenance, and, interestingly, in print tapes where the 50% to 90% reduction in storage creates no problem since expansion time is buried in printer overhead.

Written for the IBM 360 or RCA Spectra 70, the program requires something less than 3K bytes. It is priced at $4,950. DYLACOR COMPUTER SYSTEMS, INC., Los Angeles, Calif. For information:

CIRCLE 326 ON READER CARD

Large File APL

A new software package enables APL users to accommodate applications requiring data bases of up to 200 million characters. The package is available now to users of the APL PLUS time-sharing service, but will also be available for in-house installation on System/360 Models 40, 44, 50, and 65, at an annual fee of $12K. Files are accessed randomly, with average response time for any terminal about 1 second with 60 terminals active on a 360/50. Any or all of the active terminals can access the same files concurrently. Software interlocks momentarily prohibit access to a record at the instant it is being updated by another terminal.

Thus, it is really a shared file system, and can be used for such applications as airline reservations system, multi-plant inventory control, and other remote access applications where a common data base exists. The package is available as a service on local dial in New York, Philadelphia, Washington, Los Angeles, and Palo Alto. SCIENTIFIC TIME SHARING CORP., Washington, D.C. For information:

CIRCLE 327 ON READER CARD

Management Information

Management information systems are made, not born, but the implementation plan suggested for System 2000 implies, by its nine-month user break-in period, that each installation is a kind of rebirth. Since the implementation phase involves converting files, training people, and just plain experimentation, it is not surprising that it takes that much time. But the lengthy running-in period falsely implies that there is a lot to be learned before the system can be put to use. Not true. Instead, there is a lot to be learned about how each company, with its own particular requirements, can best benefit from MIS in the first place.

Once the files are brought up, data storage and retrieval is effected through a set of English language like commands (for instance, PRINT TENANT NAME, TENANT ADDRESS WHERE LAST PAYMENT LT 06/10/70:) The file definition and creation is not too much more complicated. A Define module allows for naming and describing fields and establishing hierarchical relationships. Multiple occurrences of data elements are allowed, and character strings—such as sets or retrieval commands—may be identified by name only.

A Load module takes free- or fixed-field data and constructs a data base. Each data base is formed in an inverted structure, with literals in two tables, data element names and interrelationships in two others, and hierarchical relationships on yet others. The input information can be in many forms since a high level conversion program is made available as an interpreter for the MIS modules.

There are two more modules, one for Retrieval and one for Updates. These are driven by English commands like the one mentioned above.

So far, System 2000 has been written only for the CDC 6000 series, with portions in assembly language as well as FORTRAN. Conversion to other equipment is expected to come late this year or early in '71. For those without 6000's, the system is offered on a time-shared basis on the vendor's machine. For those with access to their own machine a non-exclusive lease is offered (for service bureaus) and a lease in perpetuity (non-inheritable we presume) for the regular user. Prices for the latter are either a one-time $135,000 or an initial charge of $25,000 and $2,800 per month for four years. MANAGEMENT RESEARCH INTERNATIONAL, INC., Austin, Texas. For information:

CIRCLE 329 ON READER CARD

3-D Plotting

The initial product from this vendor is a package of subroutines for generating three types of three dimensional plots. TRIPLE consists of: (1) SURPLOT for generating surface areas —by now most of us have seen grid plots that almost fool the eye into thinking the plot has three dimensions; (2) CONPLOT for generating contour line maps of a surface; and (3) STEREO for generating left and/or right eye views for 35mm film to really get the full three dimensional effect. Documentation is included for the 2-3K sized FORTRAN package at approximately $1200. COMPUNEX, San Diego, Calif. For information:

CIRCLE 330 ON READER CARD

PL/I Subset

Reduction of compilation time and an increase of user aids for PL/I is the reason for development of this compiler subset, PL/C. The product of a university computing center, it is hoped it will affect the use of PL/I as WATFOR has influenced the use of FORTRAN. (Initially developed for student instruction, WATFOR has had increasing use in industry for program development.)

PL/C includes most of the features of a full PL/I. The compiler is strictly compatible with IBM's PL/I-F. It requires 128K of core with OS and 65K with DOS and can compile over 200 statements a second on a 360/65.

PL/C is currently available. Installation and maintenance is handled by mail. The $1200 price of the compiler — a "one-time distribution charge"— includes a two-year guarantee of maintenance and automatic updating. CORNELL UNIVERSITY, Ithaca, N.Y. For information:

CIRCLE 328 ON READER CARD

(Continued on p. 150)

SOFTWARE

SOFTWARE CONTINUED

Data Retrieval

Environ/1 is a terminal-oriented data retrieval system for DOS or OS/360 installations, ranging from a 32K model 25 to the model 195. It is the initial software offering from a firm that has exclusively marketed hardware in the past, and the developers claim that the system enables a 256K 360/40 to attain the same throughput as a 512K 360/50.

Key to Environ/1 is rapid file maintenance using two new manipulation methods: CISAM (Compressed Index Sequential Access Method), and their own version of ISAM. CISAM can insert 500 250-byte records between two keys on a 2314 ISAM file in 1/20th of the time of IBM's ISAM, while the vendor claims its ISAM is "from three to forty" times faster than the IBM counterpart and is capable of dumping a full 2314 disc pack in two minutes.

Expected applications include police work, computer instructional uses, airline reservation systems—in short, any application where on-line direct data entry is essential.

Other software features include flexible record formatting, assembly language macro instructions in addition to a COBOL subset, performance statistic accumulation, three levels of restart capability, as well as internal paging, which allows virtual memory programming. Conversion from DOS to OS/360 does not require reprogramming with Environ/1.

The system now exists in COBOL and assembly language form for DOS; OS versions will be available in January. After an installation fee of around $5000, license to use Environ/1 is approximately $2500 to $3000 for DOS, and between $3000 to $4000 for OS versions. These costs include all documentation, a one-week training seminar, and one man month of systems engineering. INFORMATION STORAGE SYSTEMS, INC., Cupertino, Calif. For information:

CIRCLE 332 ON READER CARD

Linear Programming

Many business applications, such as optimum selection and blending of raw materials, production forecasting and scheduling, and selection of capital investments, require solving huge problems containing thousands of continuously changing equations. As the capacity of programs designed to solve those problems increases, greater "tuning" flexibility of the mathematical simulation allows them to more accurately reflect the real world.

OPHELIE II and OPHELIE MIXED, two programs developed in Europe and currently widely used over there in petroleum refinery operation, treat problems of 2,500 equations and more, with over 10,000 constraints. The programs, written in COMPASS and a special high level language called simply "L", consist of a matrix generator, a report generator, and a linear programming subsystem and differ in that OPHELIE MIXED handles mixed integer modes while OPHELIE II is restricted to pure integer modes. The manufacturer claims competing systems require up to six times as much time to solve problems one third as large as the OPHELIE twins take.

You will need a Control Data 6000 series computer to run them on, and you will part with approximately $40,000 to $75,000 outright to get them; or, after an installation fee of $5000 to $7500, you have usage rights for $1200 to $2200 a month. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 333 ON READER CARD

Network Optimization

TALK II is primarily a consulting service for the optimization of communications networks for large firms; individual FORTRAN programs used in the system are available for sale, however. The system handles message switching, direct distance dialing, WATS, TELPAK, and CCSA requirements. Capabilities include engineering standards, network design, load analysis, cost estimation, performance evaluation, load balancing, and cost optimization for all common carrier services. As a service, the fee is simply the amount of money the client firm saves on its first month's bill from AT&T following the reconfiguration. SYSTEM ARCHITECTS, INC., Braintree, Mass. For information:

CIRCLE 331 ON READER CARD

Faster Basic

PENNY:BASIC is billed as a highly efficient compiler. The "penny" is derived from the claim that it will compile a 250-card program for 1¢, based on a compile rate of 125,000 cpm on a 360/65 at $300 per hour. Estimated compile rates are 15,875 cpm on a 360/40, and 560,000 cpm for a 360/85. Other features of the compiler are that it is re-entrant, produces efficient and compact code, gives good diagnostics, and uses little core (18K compiler, 4K library, 3-150K work space). PENNY:BASIC is a load-and-go compiler that can be run either in a time-sharing system or for batch processing. It is currently tailored to OS/360, but can be modified by the vendor to run under other systems. Rental price is $150 per month. The language processor is the first product of a one man firm established last January. SCHROEDER ASSOCIATES, Arlington, Mass. For information:

CIRCLE 335 ON READER CARD

Macrocompiler

A version of FASBAL, a macrocompiler for business applications, has been marketed for almost two years to users of Univac 9000 series computers. Now the finishing touches are being applied to a 360/20 form of the language. FASBAL operates under IBM's DPS, and requires about 12K bytes for its own use plus a disc.

The language have over 50 macro declaratives (BEGIN, READ, EDIT, for instance, plus a powerful sounding lookup command), and is based somewhat on COBOL in that the user defines his environment, then his files, etc. However, FASBAL is free-form—the statements can be in any order, print when you feel like it—and is targeted at installations using RPG. It will fit right in, its writers claim, in an RPG site since its op codes look so much like those of the Report Program Generator. On the other hand, FASBAL is reputedly more flexible than RPG, especially in I/O handling and opening and closing files.

The program sells for $2500 in the 360/20 version, and comes with user manuals and installation instructions. COMPUTER ASSISTANCE, INC., West Hartford, Conn. For information:

CIRCLE 334 ON READER CARD

Data Compression

The Ex*Press Data Compression System reduces the amount of peripheral storage required for any type of data base by as much as 80%, according to the vendor. Through a combination of cryptographic, linguistic, and mathematical techniques, the system analyzes each data base and assigns to it a coding structure that reduces the amount of peripheral storage required, while maintaining absolute data base integrity. The package is made up of several modular subsystems, operates on System/360 Models 30 and up (except/44), under either OS or DOS, and handles most types of data structures supported by these operating systems.

The system works by establishing a code structure for each file based upon user supplied specifications. The user, through these specifications, describes the physical and logical attributes of the files that are to be processed. If all of the source statements are correct, Ex*Press then selects the required program modules, compresses and writes the input files, and reads and expands the compressed file. The integration of Ex*Press into an existing application program is accomplished by substituting calls to the Ex*Press system to perform both the I/O functions and the compression and expansion of logical records, while remaining transparent to the applications program. Price is $9500 for the first installation, $4800 for the second, and only $2300 if you need six or more. AGS COMPUTERS, INC., New York, N.Y. For information:

CIRCLE 336 ON READER CARD

Systems Architecture

COST II is a series of programs for optimizing the design of computer systems architecture, including their communications systems, cpu's, and data bases. It is oriented toward large scale IBM, Univac, Burroughs, and Honeywell-8200 hardware with data management software. The system utilizes a library of simulation models and data base design programs offering aid in computer selection, configuration determination, software design, load balancing, identification of resource bottlenecks, throughput analysis, and cost effectiveness. It is expected to be competition for such packages as SCERT and CASE.

One of the new features of COST II is the Weighted Record Analysis Program for data base development. Starting with a users profile that contains a list of data elements, base

quantities related to these elements, and details of all real-time and batch transactions, WRAP helps a system designer formulate optimal data element groupings, logical file organization, and physical record layout. COST II is an extension of COST, a package offered by the firm's predecessor, Interactive Sciences Corp. It is priced for in-house use at about $50K for the first package for a single configuration, and is also available as a service. SYSTEMS ARCHITECTS, INC., Braintree, Mass. For information:

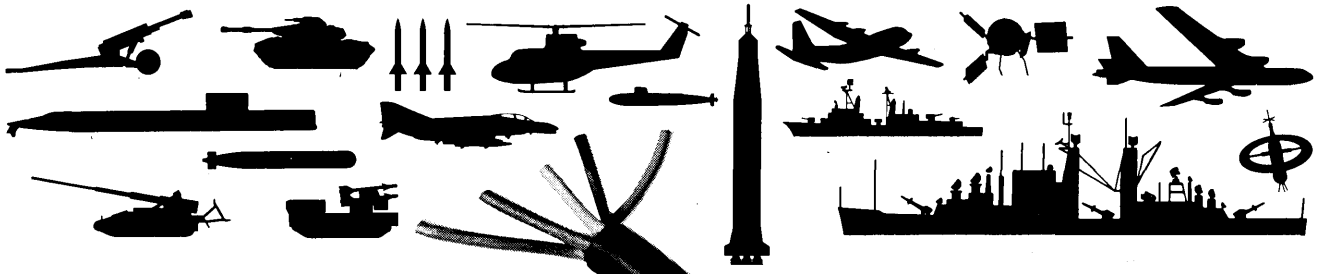
CIRCLE 337 ON READER CARD

File Management Report

UPTIME is a combination file management and report generator intended to solve the problem of the frequent need for prompt generation of one-time or periodic reports that were not anticipated at the time a system was designed. It can also serve as the report writing and file maintenance module for systems now being developed, however. The claim is that UPTIME allows *anyone* to create and update files or to generate reports from master data files using a free-form English language. In addition, it is said to provide a powerful select, compute, output, and maintenance capability.

The UPTIME system consists of three major parts: file maintenance, file directory, and the report generator. The file maintenance and file directory programs are written in BAL; and while the report generator is also written in BAL, the final report program is generated in RPG. The coding time for UPTIME is said to be five times shorter than RPG, however. The program will run under any 360 operating system and requires a minimum of 32K. The price of $3K includes installation, training, and assistance in file cataloguing. AUTOMATED INFORMATION SYSTEMS, INC., Wellesley Hills, Mass. For information:

CIRCLE 486 ON READER CARD



plug in... turn on!

Regardless of your computer application, the BR-1018 is certain to be a strong contender.

The BR-1018 is an advanced state-of-the-art computer utilizing Large Scale Integrated Circuits (LSI) throughout. It features small size (67 cubic inches), light weight (4.5 lbs) high MTBF (20,000 hours), and outstanding overall speed and performance. These features are a direct result of a proprietary micropackaging technology perfected by Bunker-Ramo. This micropackaging technique, which is referred to as Planar Coax, interconnects the entire computer with small constant impedance coaxial lines and eliminates plug in friction type interconnections completely.

The BR-1018 is an 18-bit computer with a 1 MHz clock, 43 basic instructions, short instruction time of 5 microseconds and average multiply and divide times of 33 and 43 microseconds. The basic machine has 2,048 words of plated wire or semiconductor memory expandable to 131,072 words. The I/O is modular and can be easily tailored to any requirement.

If you would like more information on the BR-1018, contact Mr. William G. Garner, Director — Products Marketing. (213) 889-2211.

THE BUNKER-RAMO CORPORATION
DEFENSE SYSTEMS DIVISION
31717 LA TIENDA DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91360

CIRCLE 73 ON READER CARD

How can you determine the best software package for your needs?

Look no further!

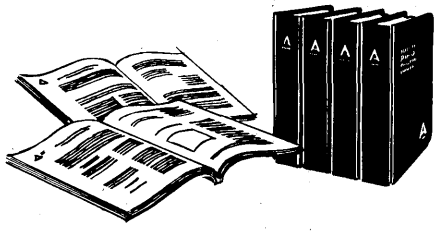
AUERBACH Software Reports is a new reference service updated bi-monthly that answers the computer user's pressing need for quick, accurate information. It's being prepared by AUERBACH's staff of computer analysts with over ten years' experience gathering and publishing first-hand information behind them. It gives you the facts you need to decide whether to develop a software system in-house or buy an existing one. And it enables you to select the right package for *your* application from the more than 3000 software programs now being offered.

Here are the facts you've been looking for, covering over 20 application areas. *Definitional Reports and Comparison Charts* provide hardware requirements, operational characteristics, sources, and even the *cost* for each package! You'll save weeks of frustrating research. And you'll be able to justify your decision in less time than it takes to make a wrong one.

As a complete looseleaf reference service, *AUERBACH Software Reports* will be introduced early in the fall. However, the first two Reports—*Inventory Control* and *Payroll*—are now being published as separately bound editions. If you subscribe now, you'll receive a full year's service beginning in October plus free copies of these and other advance Applications Reports. These 60-120 page Reports are also available individually at $90 each.

Use this coupon to order AUERBACH Software Reports. Sign up for the complete service and get advance Reports FREE!

AUERBACH Info, Inc.
121 North Broad St., Philadelphia, Pa. 19107
Gentlemen:



AUERBACH
First with the last word on computers

☐ Please enter my order for *AUERBACH Software Reports*, at $490 per year, and send me *Inventory Control, Payroll* and other pre-published Reports at no charge.

☐ Please mail me the following individual Reports when ready and bill me $90 each, plus $2 for mailing and handling.*

☐ Inventory Control (available now)
☐ Payroll (available now)
☐ Accounts Receivable
☐ Accounts Payable
☐ General Ledger
☐ Information Retrieval
☐ Flowcharting
☐ File Maintenance
☐ Production Planning & Control

☐ Send me sample pages from current Reports.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____ CITY_____ STATE_____ ZIP_____

Bill me ☐ my company ☐ P.O._____ Check enclosed** ☐ _____
(Please sign)

*Enclose check to save mailing and handling charge. **Pa. residents add 6% sales tax.

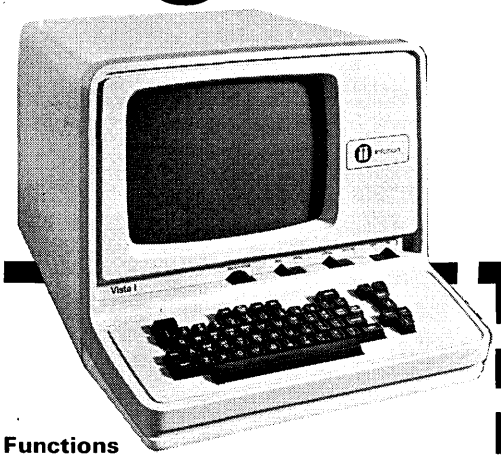
Information and Management Consulting available from AUERBACH Associates, Inc.

If we make you wait... we'll pay the freight.*

Buy or lease our VISTA I alphanumeric display terminal in any model. If we don't ship it to you within 30 days ARO, we'll air freight it—FREE!

So, if you need a CRT terminal that's fast, silent, easy to read . . . that replaces a model 33 or 35 teletype with far more efficiency . . . that's compatible with *any* mini-computer . . . that's a completely self-contained, stand alone unit with keyboard, video presentation, control and refresh electronics—*plus a Data Phone interface and power supply . . . AND, if you want it NOW . . .* JUST MAIL THIS AD.

*** THIS OFFER EXPIRES AUGUST 31, 1970**



Specifications

Model	A	B	C	D
Characters/line	32	32	64	64
Number of lines	10	20	10	20
Character size (nominal)	.15" high, .10" wide			
Line spacing	.45 character height			
Character spacing	.40 character width			
Character format	5 x 7 dot matrix			
Character set	64 character ASCII			
Cursor	Non-destructive Blinking underscore			
Refresh rate	50/60 Hz			
Memory	MOS shift registers			
I/O rate	110-2400 BPS standard; High speed serial or parallel optional			
Communication interface	RS 232C or current loop			
Parallel interface	TTL logic, bit parallel, demand-response control			
Power	125 watts, 110-220 volts, 50/60 Hz			
Size	15" high, 17" wide, 27" long			
Weight	65 pounds			

PRICES	PURCHASE	MONTHLY LEASE*
VISTA 1A	$1,495.00	$ 78.75
VISTA 1B	$1,995.00	$ 97.50
VISTA 1C	$1,995.00	$ 97.50
VISTA 1D	$2,495.00	$116.25

*** Includes maintenance for 3 year lease plan.**

Command Functions

- Cursor control — up, down, right, left, home
- Start blink, stop blink
- Erase screen

Interfaces

The standard interfaces allow connection to modems up to 2400 baud. Available as options are serial or parallel data interfaces up to 800 characters/second synchronous, or up to 1500 characters/second in a demand-response mode.

Operating Modes

I/O — Full duplex or ½ duplex
Format — Roll or page

Options

- Hard copy output
- Magnetic tape input and output
- Card or badge reader input
- High speed data transmission up to 1500 character/sec.

SALES TERMS

Terms of sale for the company's products are net 30. Shipment will be made FOB Burlington, Mass., prepaid, best way unless otherwise specified by the customer.

WARRANTY

Ninety days warranty on parts and service. Twelve months on parts manufactured by Infoton. Manufacturer's warranty on all other parts (no less than ninety days or more than twelve months).

YES! **I want to ☐ lease ☐ purchase the following VISTA I CRT terminals within 30 days ARO. I understand that if I have to wait . . . *you'll* pay the freight, air freight.**

MODEL	QUANTITY	UNIT PRICE	TOTAL PRICE
☐ VISTA 1A			
☐ VISTA 1B			
☐ VISTA 1C			
☐ VISTA 1D			

Total Price $_____

Please check one: ☐ 110 Baud ☐ 300 Baud ☐ Current Loop

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

P.O. # _____

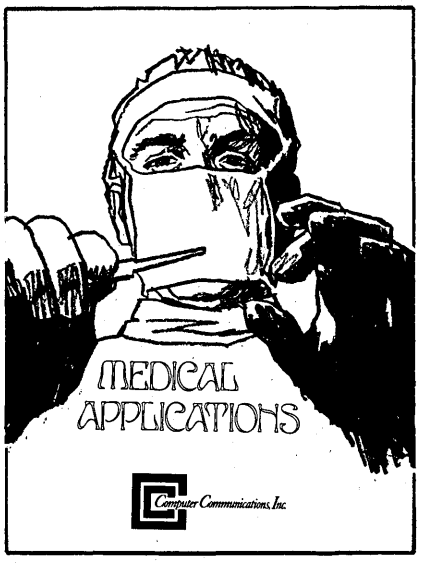
Authorized Signature _____

MAIL TO: INFOTON INCORPORATED
Second Avenue, Burlington, Mass. 01803

Mail too slow? Call (617) 272-6660

Sales and Service in United States and Canada represented by MAI

Infoton



Prescriptions

Dp applications in avanced medical systems are described in six-page foldout brochure containing basic flow diagrams, as well as sample instruction and input/order forms. Three systems are detailed: heart monitor, student training, and medical information processing. These systems and equipment are being used in various hospitals and research centers across the country. Procedures of students and medical personnel vis-a-vis the computer and terminals are also explained, and the equipment used is designated. COMPUTER COMMUNICATIONS , INC., Inglewood, Calif. For copy:

CIRCLE 300 ON READER CARD

Ticket Reader

Both machine printed marks and special block printed characters can be ready by the OpScan 50. Uncluttered eight-page brochure describes this system, operating entirely apart from a computer, for handling tickets or documents from 1x1½ inches to 3⅝x7⅝ inches. The reader can take any weight paper from 20 pound to tablulating card stock, and variations within the batch are acceptable. The data is transferred directly to mag tape compatible with all major computer series. System components are described and illustrated. OPTICAL SCANNING CORP., Philadelphia, Pa. For copy:

CIRCLE 301 ON READER CARD

Multiprogramming

A 43-page booklet discusses design of multiprogramming systems that can be used with small computers (i.e., PDP-8). I/O scheduling, storage, buffering and interpreting command language are taken up, in a study originally made for the Army. Order AD-691 181. Price: $3; microfiche, $.65. U.S. DEPT. OF COMMERCE CLEARINGHOUSE, Springfield,Va. 22151.

MAC's Software

Eight-page color brochure enumerates software systems for the MAC 16 and MAC Jr. computers, including assemblers, loaders, ASA FORTRAN IV, simulator, compiler, source editor, debug, monitors, executives, math library . . . etcetera. Accompanying diagrams show multiplexing capability and core allocations. LOCKHEED ELECTRONICS, Los Angeles, Calif. For copy:

CIRCLE 303 ON READER CARD

The First Word

Bulletin sheet describes Word/One, a time-sharing text-editing system which can file, retrieve and revise on order from diverse types of terminals: IBM 2741 and other Selectric-based, correspondence code, BCD and EBCD. The system has remote batch processing capabilities. Besides revisions and corrections, the program enables text searching, formatting, rough or finished copy printout on command, and combining of different material out of context. The system provides both on-line and off-line storage. BOWNE TIME SHARING INC., New York, N. Y. For copy:

CIRCLE 304 ON READER CARD

Optoelectronics

Optical electronic component distributor is offering a glossary of technical terms in its field, along with a monthly newsletter, titled *Eye On*, including a check-off coupon for requesting additional product literature. The eight-page glossary begins with *Acceptor* and ends with *Zoom*, claims it represents "the first industry standardization of optoelectronic terminology based on research with all major manufacturers." SCHWEBER ELECTRONICS, Westbury, N.Y. For copy:

CIRCLE 302 ON READER CARD

Many Millimeters

Desk-drawer size chart listing millimeter-inch equivalents in four decimals for measurements from .01mm through 10.00mm, in .01mm increments, is offered to those in quality control. Chart measurement (with one fold) is 8½ x 11 inches. DELTRONIC CORP., Costa Mesa, Calif. For chart:

CIRCLE 305 ON READER CARD

Dial-Up Data

Four-page bulletin gives thorough details on data set that can transmit 3600 bps over long distance dial-up facilities, also operates over dedicated lines in full or half duplex, with reverse channel and secondary channel modes. The reverse channel can process up to 150 bps simultaneously over a single two-wire line, dedicated or dial-up, to acknowledge data in the high speed channel, and transfer data in the opposite direction, meaning no time required for turn-around. INTERNATIONAL COMMUNICATIONS CORP., Miami, Fla. For copy:

CIRCLE 306 ON READER CARD

Manna for Managers

Four-page brochure claims to offer "the first guide to give management full administrative control of edp," listing chapter and versing of a 304-page book offered on a 10-day trial basis. Some of the headings: "Educating and Training Management and EDP Personnel," "Considerations for Evaluating and Selecting EDP Equipment," and "Management States Its Problem." The author is Leonard I. Krauss, now director of MIS for Computer Inquiry Corp., formerly a project manager for advanced systems at Union Carbide. His aim has been to furnish a "guide to managerial action—not reaction." PRENTICE-HALL, INC., Englewood Cliffs, N. J. For copy:

CIRCLE 312 ON READER CARD

Lots of Lines

Four-page brochure with colored routing diagram describes expandable communications controller which can handle up to 64 lines with adapters. It interfaces with data sets or local terminals. Asynchronous communications run from 45 to 2000 bps; synchronous, 2000 to 9600 bps. Interfaced with a 16-bit processor, it can be used as a front-end. A product specification booklet with complete functional analysis and illustrations of subsystem configurations and word formats is also offered. KDI INTERACTIVE DATA SYSTEMS, Irvine, Calif. For copies:

CIRCLE 308 ON READER CARD

(Continued on P. 158)

LITERATURE

LITERATURE CONTINUED

Useful for Users

The second in a series of directories for computer users, *Computers 70 of Southern California,* covers the area from Santa Barbara to San Diego, listing over 1,000 companies and more than 1,500 computer installations. All state and federal facilities are included. The same organization is offering a tape-storage data bank, comprised of the information gathered for the two directories (the first covered northern California), together with a specially written program for standard computer systems. The bank contains more than 60,000 pieces of accessible market research material. KLH ASSOCIATES, San Francisco, Calif. For information:

CIRCLE 311 ON READER CARD

Here Comes Debug

Twelve-page brochure describes the virtues of a COBOL symbolic debug method which can access the customer's stored data and edit program instructions directly through the terminal to the computer (no keypunch or card changes), compile and test run it, and pinpoint error within seconds. Corrections can be made directly, in COBOL, and the program can be restarted at any desired stage. The proponents claim up to 10 error corrections possible in one run. COMPUTER SOFTWARE SYSTEMS, INC., Stamford, Conn. For copy:

CIRCLE 309 ON READER CARD

Random Research

Developments in RAM are both summarized and forecast in an annual report, *The Random Access Memory Industry 1965-1974.* The spiral-bound, 100-page-plus-index compilation is part of an annual service with quarterly updates furnished to management at a $1200 subscription rate. The RAM report includes tabulated and comparative information on usage, distribution, applications—increased or new—shipment of different configurations, sales and price figures, investment required, and a company-by-company product summary. Other computer-related industry reports are scheduled for release. TECHNOMETRICS INC., Oakland, Calif. For information:

CIRCLE 307 ON READER CARD

DPMA Proceedings

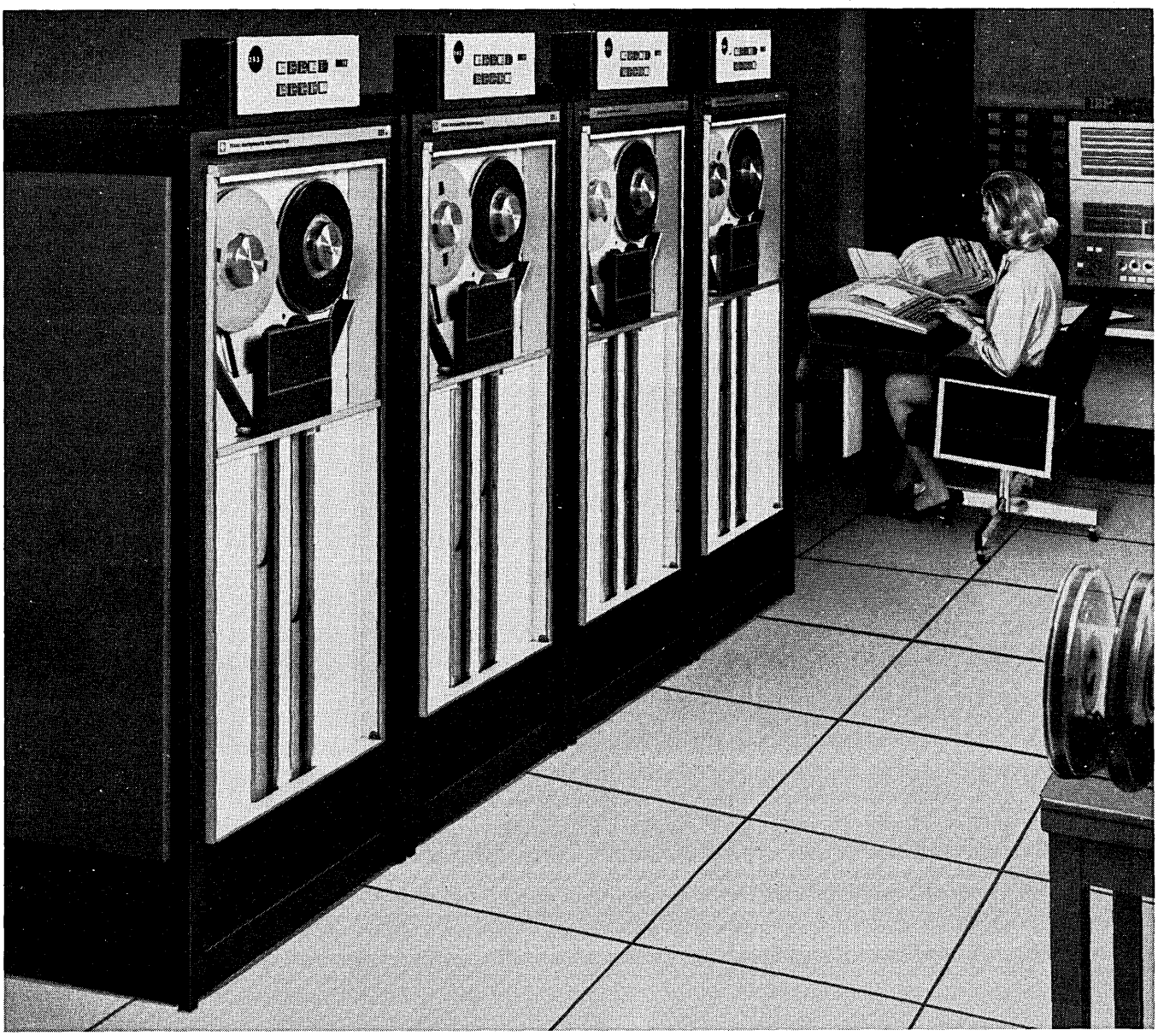
Vol. XIV, a 500-page hardcover book, contains the proceedings of the DPMA 1969 Montreal conference, comprising 50 papers divided into 11 subject areas, including systems analysis techniques, computer management, real-time, software, installation, personnel, information storage, and new programming applications. Price: Members, $9.95; others, $11.95. DPMA, 505 Busse Highway, Park Ridge, Ill. 60068.

Transistor Testing

18-page brochure goes into extensive detail about its T241 computer-operated transistor test system. Besides testing, the system classifies and datalogs all important transistor parameters. The test instrument itself is described. Kinds of tests are explained with diagrams. The system also can be applied for quality control and wafer-probing. An assortment of software is available. TERRADYNE, INC., Boston, Mass. For copy:

CIRCLE 310 ON READER CARD

NOW... Low cost plug-for-plug replacement of System/360 original tape units from TI!



Unplug the original tape units, plug in the Series 924 Magnetic Tape units. Your System/360 gets better performance at lower cost. Whether you lease or purchase, the new Series 924 units offer a lower price than original equipment (as much as 50%), and better performance in tape and data handling.

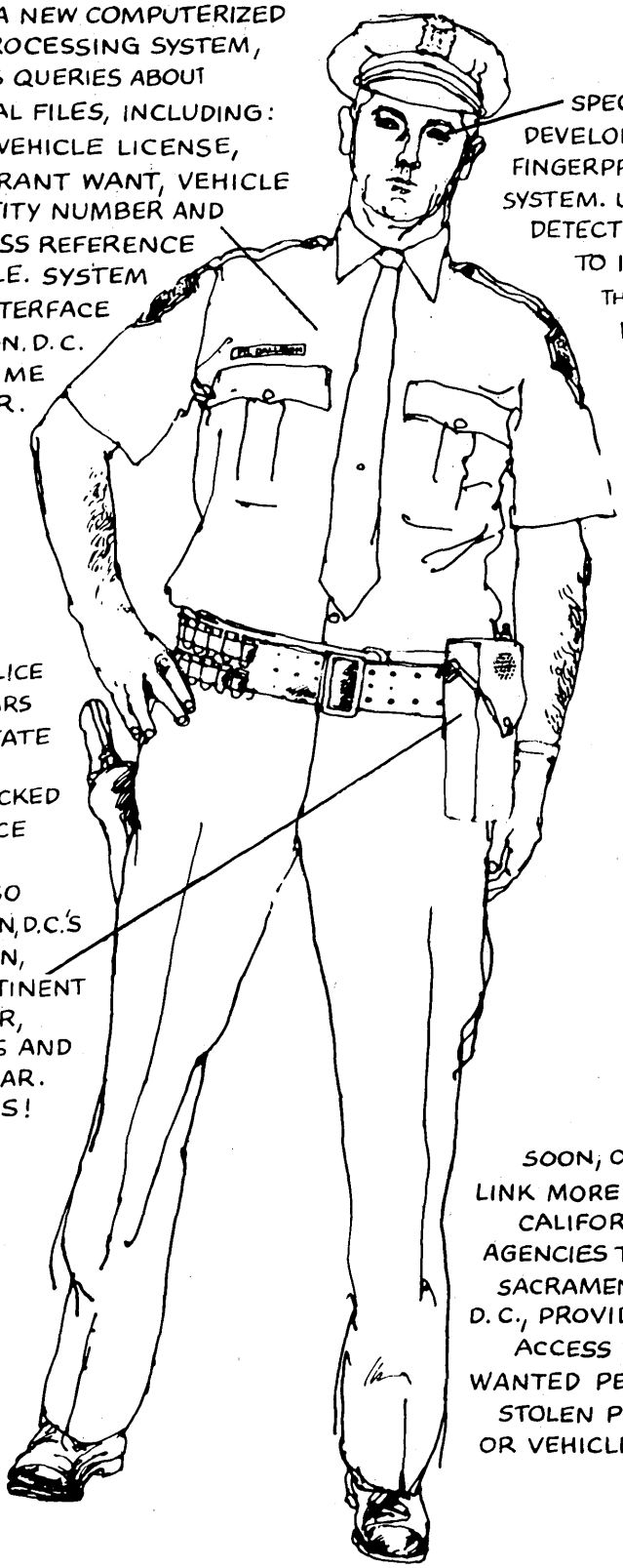
Your tapes will last longer, data transfer will be more reliable and routine maintenance requirements will be lower. If you are considering updating or enlarging your System/360, or if you simply want to reduce costs and tape-unit downtime, get the facts from Texas Instruments!

Write or call Digital Systems division—Houston. Texas Instruments Incorporated, P.O. Box 66027, Houston, Texas 77006 (713-526-1411). Ask for data about the Series 924.

TEXAS INSTRUMENTS
INCORPORATED

265A

CIRCLE 89 ON READER CARD



OUR NETWORK ALLOWS AN UNDERMANNED POLICE FORCE TO PROTECT LARGE POPULATION AREAS. IN SECONDS, ALERT, A NEW COMPUTERIZED TELEPROCESSING SYSTEM, ANSWERS QUERIES ABOUT SEVERAL FILES, INCLUDING: NAME, VEHICLE LICENSE, WARRANT WANT, VEHICLE IDENTITY NUMBER AND CROSS REFERENCE INDEX FILE. SYSTEM CAN ALSO INTERFACE WITH FBI'S, WASHINGTON, D.C. NATIONAL CRIME INFORMATION CENTER.

SPECIALISTS ARE DEVELOPING A COMPUTERIZED FINGERPRINT CLASSIFICATION SYSTEM. USING OUR NETWORK, DETECTIVES WILL BE ABLE TO IDENTIFY "SCENE OF THE CRIME" FINGERPRINTS WITHIN SECONDS.

OUR NETWORK LETS POLICE CHECK OUT SUSPICIOUS CARS BY RADIO. OUT-OF-STATE LICENSES ARE CALLED TO HEADQUARTERS AND CHECKED THROUGH THE STATE POLICE COMPUTER SYSTEM. IF NECESSARY, THEY ARE ALSO RUN THROUGH WASHINGTON, D.C.'S SYSTEM. IF A CAR IS STOLEN, COMPUTER TRANSMITS PERTINENT FACTS, VIA TELETYPEWRITER, BACK TO HEADQUARTERS AND THEN TO WAITING PATROL CAR. ALL WITHIN 15 SECONDS!

SOON, OUR NETWORK WILL LINK MORE THAN 450 CALIFORNIA LAW ENFORCEMENT AGENCIES TO CRIME FILES IN SACRAMENTO AND WASHINGTON D. C., PROVIDING INSTANT ACCESS TO INFORMATION ON WANTED PERSONS, LOST OR STOLEN PROPERTY, FIREARMS OR VEHICLES.

Data communications helps enforce the law and protects the public.

Next time you're moving information, remember—no one knows more about moving it than the people who run the world's largest communications network.

Key people are borne losers.

Stop carrying key personnel . . . the "people" part of keypunch, key-to-tape, key-to-disk, and every other non-productive system for converting information from original business forms into computer-ready data. We can give you exactly the same results and save 90% of the cost of getting it.

Why bear the expense of special processing staffs installed in isolated computer-room quarters? When you've already got all the people you need, right in your own business offices. Where your regular business typists can automatically prepare your facts and figures for the computer, while performing their everyday work. With data-conversion simply an on-the-spot by-product of their normal typing functions.

All it takes is a system. DATAPLEX™. The Recording Typewriters that any accountant, secretary, clerk or office-typist can operate. By doing her job just as before . . . same way, same place. Without disrupting your business routines. Without altering a single one of your particular business forms.

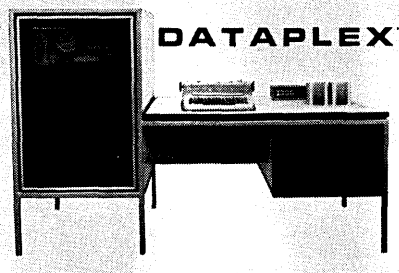
Invoices, purchase orders, inventory, whatever—as each business document is originally typed on a DATAPLEX Recording Typewriter, the information is stored simultaneously, ready for the DATAPLEX Processor. No more batch, code, keypunch, verify and pool. And the waste of time and errors they involve. It's all done automatically, electronically, logically, using our exclusive software package. Requiring no change whatsoever in your computer or its programs.

Where it usually costs you 5¢ to prepare one unit record (2¢ if you are lucky now and then), DATAPLEX does the job for 0.2¢. That's just 1/5-of-a-cent per unit record, a whopping ten-to-one improvement over the nearest alternate method. That can amount to thousands of dollars a month for a typical business.

DATAPLEX. The total system from Data Instruments Company, that cuts 90% of your data handling costs, by eliminating the need for specialized data preparation personnel. So those bright young heads can find themselves in more productive, more profitable projects.

Call collect for immediate consultation. Data Instruments Company, 16611 Roscoe Place, Sepulveda, California 91343. (213) 893-6464. New York (212) 986-7987. Chicago (312) 696-3440.

DATA INSTRUMENTS



CIRCLE 71 ON READER CARD

BOOKS

***The Economics of Computers*, by William F. Sharpe. Columbia University Press, 1969. 581 pp. $10.**

Little academic interest in the economics of computers existed until recently because few economists were computer oriented and because few data were available.

Dr. Sharpe's book is unique in that it is the only authoritative work with such breadth and depth. Sharpe has pulled together most of the relevant literature on computer economics and carefully integrated, elaborated, and interrelated it. In so doing, he has performed a monumental service for computer scientists, computing managers, and economists alike. The book is written in an easy-to-understand style. Sources of information and data are carefully footnoted.

The Economics of Computers is divided into two parts: Part I, representing about one-third of the book, contains a lucid, short course on micro-economic theory. It allows noneconomists to become acquainted with the economic theory relevant to the rest of the book, and to review concepts as they appear in Part II.

Part II, "Applications," represents the significant portion of the book. It consists of seven chapters and an appendix on regression analysis.

The first chapter of Part II (Chapter 6) primarily covers the computer-manufacturing industry, describing the evolution and development of the industry and sources of industry data. Chapter 7 covers the terms and conditions of most computer rental and purchase contracts in depth, detailing the various options, charges, and discounts which apply in the industry.

Chapter 8 covers some constraints and issues concerning the sale and rental of computers, including legal history and implications of various pricing procedures, and has a very interesting section on the relationships among purchase prices, rental charges, and maintenance costs.

Chapters 9 and 10 cover cost-effectiveness of computer systems and storage devices. They include much data on cost, performance, and technological progress between the mid-1950's and 1966. Much of the performance evaluation literature is reviewed here and is available to readers in a well-distilled and annotated fashion.

Chapter 11 concerns pricing of computer services by computing centers and is an especially valuable contribution. Here Sharpe pulls together a great deal of interesting and important literature, along with his own comments—presenting the salient as well as the subtle aspects of pricing and relating this to micro-economic theory.

Chapter 12 is devoted to a discussion of the remainder of the industry including leasing companies, used computer markets, computer time, time-sharing, service bureau markets, software, personnel, and communications costs.

Sharpe's book has something in it

for everyone. It is a must for anyone concerned with computer science, computer economics, or computing management because it brings together, for the first time, an enormous amount of vital and significant literature, boiled down and interrelated in an especially significant way.

My only criticism, if there is one, is that more space was not devoted to the especially difficult problem of charging (pricing) for computer services in multiprogramming and multiprocessing environments, although Sharpe does devote about four pages to the subject. In all fairness, when this book was being written in 1968, widespread use of multiprogramming systems had not been experienced and, therefore, it is probably unreasonable to expect much coverage. Besides, no one book can be completely exhaustive on all aspects of a subject.

—Martin B. Solomon

BOOK BRIEFS

***Working Papers of the IFIP Seminar in ADP*, edited by B. V. de G. Walden and A. A. M. Veenhuis. Swets & Zeitlinger, Keizersgracht 487, Amsterdam, Holland, 1969. $38.50.**

The International Federation for Information Processing (IFIP) has for some years been concerned with the adp personnel problem, particularly in developing countries. Encouraged by a successful seminar in Rome in 1965-1966, they organized a further seminar in London in 1967. They hoped that the experience gained could be consolidated and used to prepare documentation which might serve as a foundation from which similar courses could be organized in other countries.

The principal papers have now been issued in four volumes (bound in two), and supplementary material is also available: (1) "ADP Equipment"—Punched cards and related equipment, inventory control, accounts receivable, and automation literature; (2) "Programming"—general material, a paper on COBOL, and one on decisions tables; (3) "Mathematical Techniques"—operations research and programming, critical path planning, and linear programming; (4) "Organization and Systems"—the systems concept, management and automation, internal control and auditing, the effect of 3-generation software on edp management and organizations.

Each volume contains a course reading list.

***Minicomputers: A Study in Opportunity*. Digital Applications Inc., 866 Third Avenue, New York, 1969. 177 pp. $1,000. Looseleaf binding.**

This is a tutorial presentation on minicomputers and their applications, principally in process control systems. The reader is assumed to have no background in computers or programming, but is expected to have a gross understanding of one or more application areas. Coverage includes fundamentals of real-time computing and minicomputers, applications, system implementation, and discussions of supervisory and direct digital control. One would normally expect a book as costly as this to contain some very-hard-to-get market or competitive analyses. Such is not the case. Most of the information presented could be obtained by cursory reading of trade publications. A short bibliography and an extended glossary of terms are included.

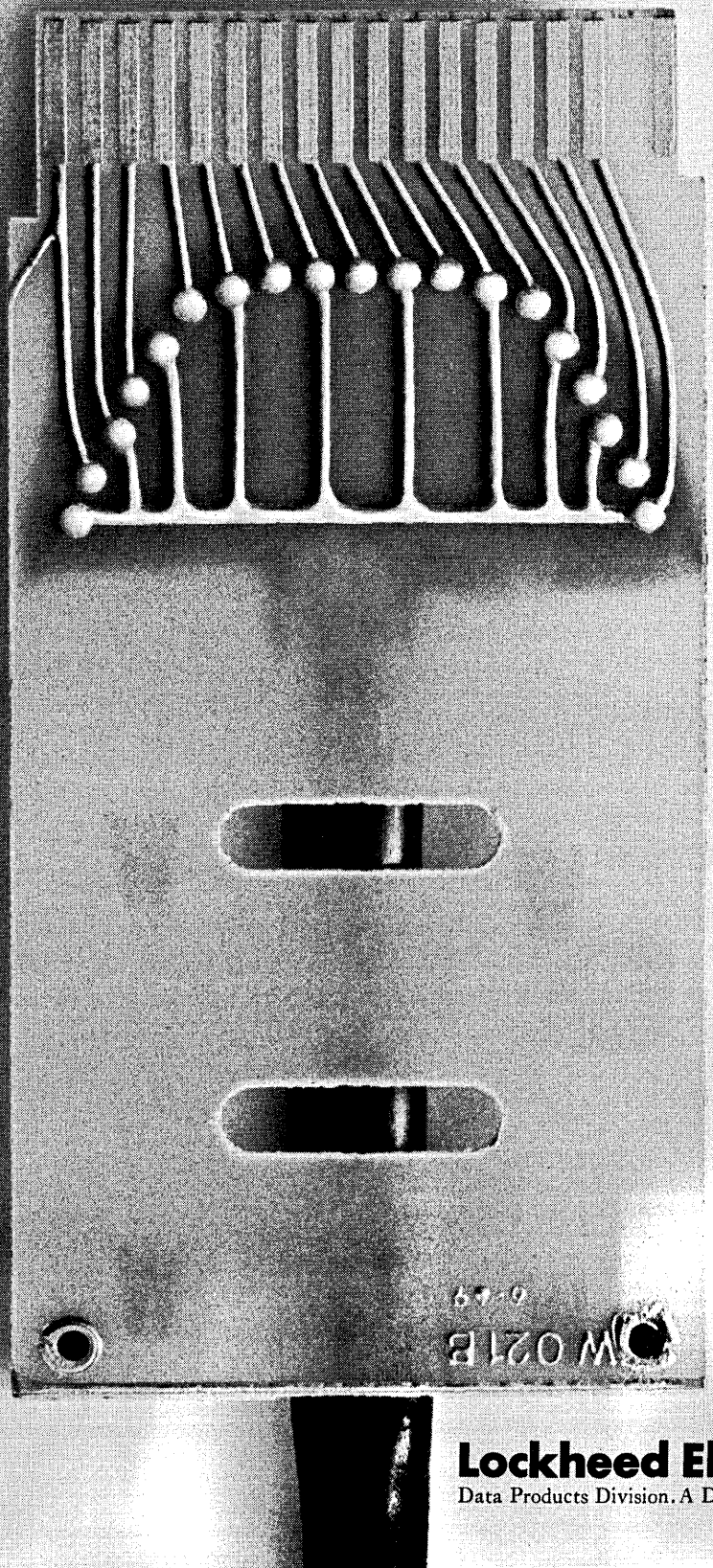
If your PDP-10 could stand expansion, but your budget can't, here's your answer.

Plug-compatible with PDP-10, our CEK-100 core memory has 1-microsecond cycle time, capacity of 64K words by 37-bits, and is available with either 4- or 16-port interface.

Those may not be Lockheed exclusives, but this grabber is: the CEK-100 costs just about 1/3 less than the comparable system offered for PDP-10. And that amounts to a walloping savings.

Circle our number and get the full specs on CEK-100, the thrifty PDP-10 expander. From the people who've shipped more bits of high-speed core memory systems than all other independent manufacturers combined.

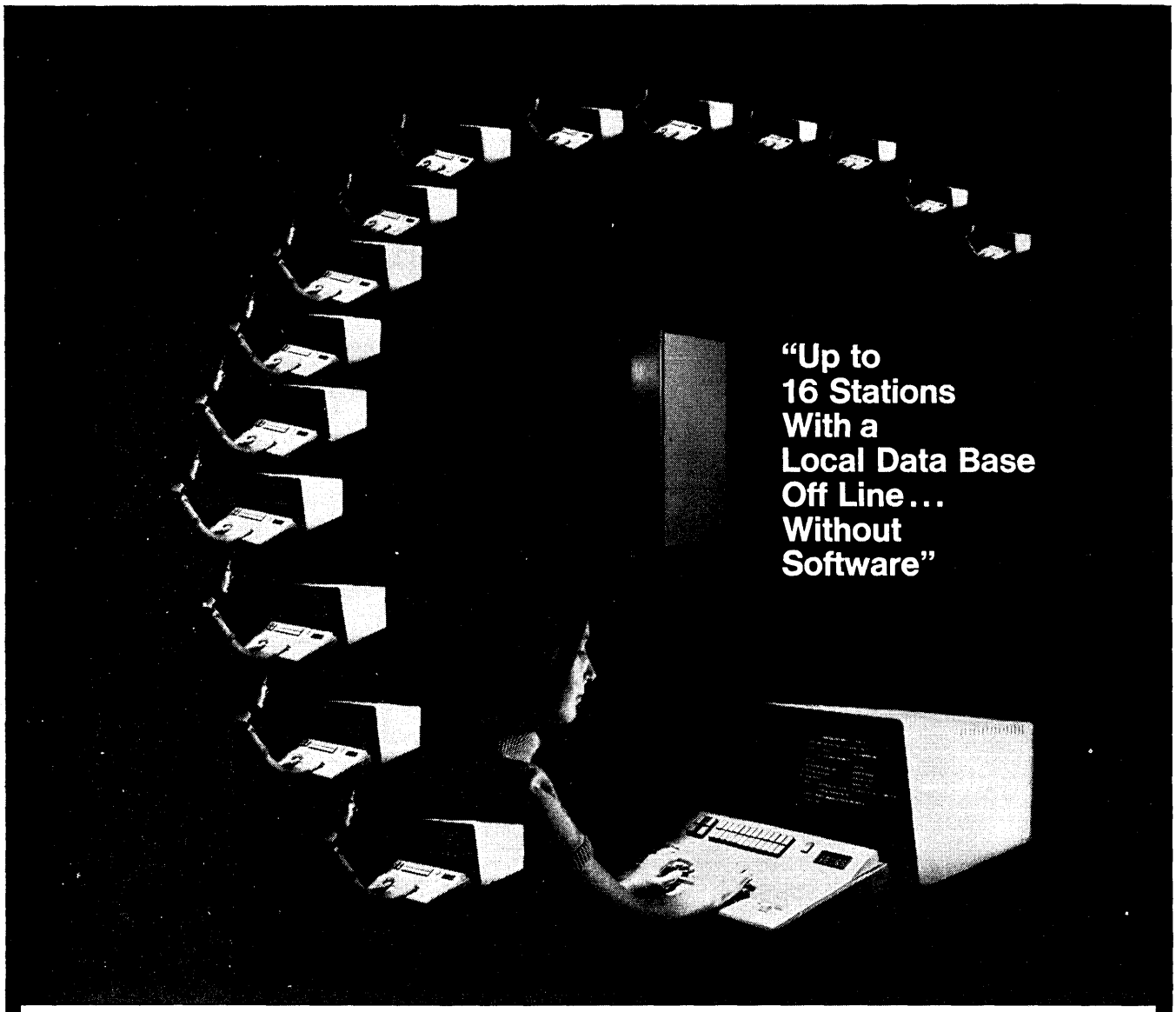
The CEK-100 memory fits two things. PDP-10 and a tight budget.



Lockheed Electronics

Data Products Division. A Division of Lockheed Aircraft Corporation

CIRCLE 15 ON READER CARD



APPLICATIONS

- **Message Composition and Transmission**
- **Information Dissemination**
- **Message Editing**
- **Data Base Update**

THE BR-700 INFORMATION SYSTEM

. . . is a stand alone, off-line data information display system operating from its own local base . . . Since the BR-700 is a completely self-contained system, the local data base may be accessed, altered, and data refiled without software . . . The controller and the local storage is field expandable to service 16 operator stations . . . Off-line message composition and validation assure error-free transmissions . . . The BR-700 has provisions for communicating with printers, mag tape, modems, computers, and other operator stations of the system . . . Bulk data transfers may be accomplished into and out of the BR-700 storage at high speed when communicating with a central data bank . . . For additional information contact the Bunker-Ramo Marketing Department.

THE BUNKER-RAMO CORPORATION
DEFENSE SYSTEMS DIVISION
31717 LA TIENDA DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91360

PEOPLE

Retirements and resignations are noted:

In 1944, at the age of 52 when most men are thinking more of slowing down than starting, **Alexander M. Poniatoff** founded Ampex Corp. with three associates. Next month he will retire—26 years later—as chairman of the board of a company employing some 14,000 people around the world. He himself has been around the world in experience, from his birthplace in Russia, through mechanical engineering studies in Germany, as a World War I pilot, and fighting on the White Russian side in the revolution. A refugee from the USSR, he worked for seven years in Shanghai before emigrating to the U.S., where he secured a berth at GE in Schenectady. Living in the San Francisco Bay area since 1930, he will continue his activities as director of the research laboratory named for him, and keep regular hours at his office in Redwood City. He will be succeeded as chairman by **William E. Roberts.**

Alexander Trowbridge resigned from his post as president and chief executive officer of the American Management Association because of "fundamental disagreement on important policy issues and future courses of action." This Alexander, who had been in office for two years, was previously Secretary of Commerce in the Johnson cabinet. The AMA executive committee expressed its "respect and appreciation" for his services, and designated **Don G. Mitchell,** longtime AMA board chairman, to fill in as chief executive officer.

Stanley Friedman has resigned as vp/gm of Lockheed Electronic Company's data products division in L.A. to take another position in New York, and has been succeeded by **S. W. Horrocks,** who before joining Lockheed in 1964 was exec vp at Autonetics and president of Hoffman Electronics, has also served on the EIA board of governors. And before that he was 19 years with RCA. His total electronics experience is 30 years. He was a Newark, N.J., boy, got his engineering education at Newark College of Engineering and then went to Columbia University for his masters.

Cuthbert C. Hurd relinquished his presidential post at Computer Usage Co. to make room for **Victor E. Bartoletti,** a young executive from Computer Technology South, who brought two other CTS men with him. (CTS is part of Computer Technology, Inc., which was taken over by University Computing Co., and hq moved to Dallas.) Bartoletti and team also have IBM experience. He was only in Atlanta for about a year with CTS, and prior to that held an IBM post in the midwest. He will be on the road (or more accurately, in a plane) for a good part of the time, promoting CUC's push in facilities management. Hurd will continue as chairman of the board.

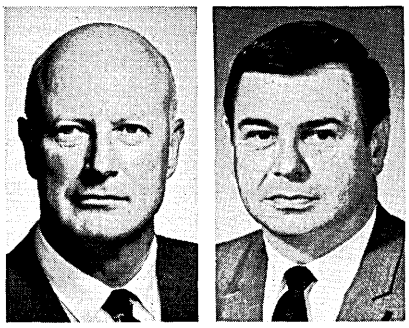
Early this month, **John D. (Don) Madden** joined Compata Inc., Los Angeles-based software and hardware consulting and design firm, as vice president and general manager of the Palo Alto office. Madden previously was executive director of the Association for Computing Machinery, a post he held since August, 1964, and one that did not exist until that time. Prior to this, he was with IBM as manager of programming methodology and special projects, with System Development Corp. as director of information processing and associate director of research, and with RAND as head of programming.

Madden

Jacobs

The National Microfilm Association installed **George H. Harmon** as its president. Harmon is manager for information systems at Information International Inc., Cambridge, Mass. Vp and next year's president elect is **John R. Robertson,** an Eastman Kodak sales director. . . . University Computing Co. marketing services vp, **Robert D. Jacobs,** has gone over

to the president's post at Academy Computing Corp., Oklahoma City software and time-sharing firm. Jacobs was with GE until two years ago. Former ACC president **Edward J. Hardebeck** was named vice chairman of the board. . . . A 20-year dp veteran, **H. Edward White,** formerly president of Midwest Software, Inc., in Chicago, has become manager of corporate planning for I/O Com, Inc., in Sunnyvale, Calif., a data communications manufacturer. He has published various articles on dp, and is a frequent speaker at technical society meetings. . . . System Development Corp. has secured the services of **Gorden N. Selby, Jr.,** as vp of its new corporate development organization. He was most recently president of a group of private computer service companies, has been with CSC and IBM. . . . Butler Data Systems, the Hawthorne, Calif., technical publisher and developer of computerized printing processes, has announced that **James E. Still, Jr.** is executive vp and chief operating officer of the firm. An aerospace man (from Lockheed), he will be responsible for Butler's airline/aerospace division as well as the data services division. In his less executive years he played pro football in both Los Angeles and Chicago. . . . **Robert L. McIntire,** founder of a software firm that merged with Management Systems Corp., has become president of the



Still Selby

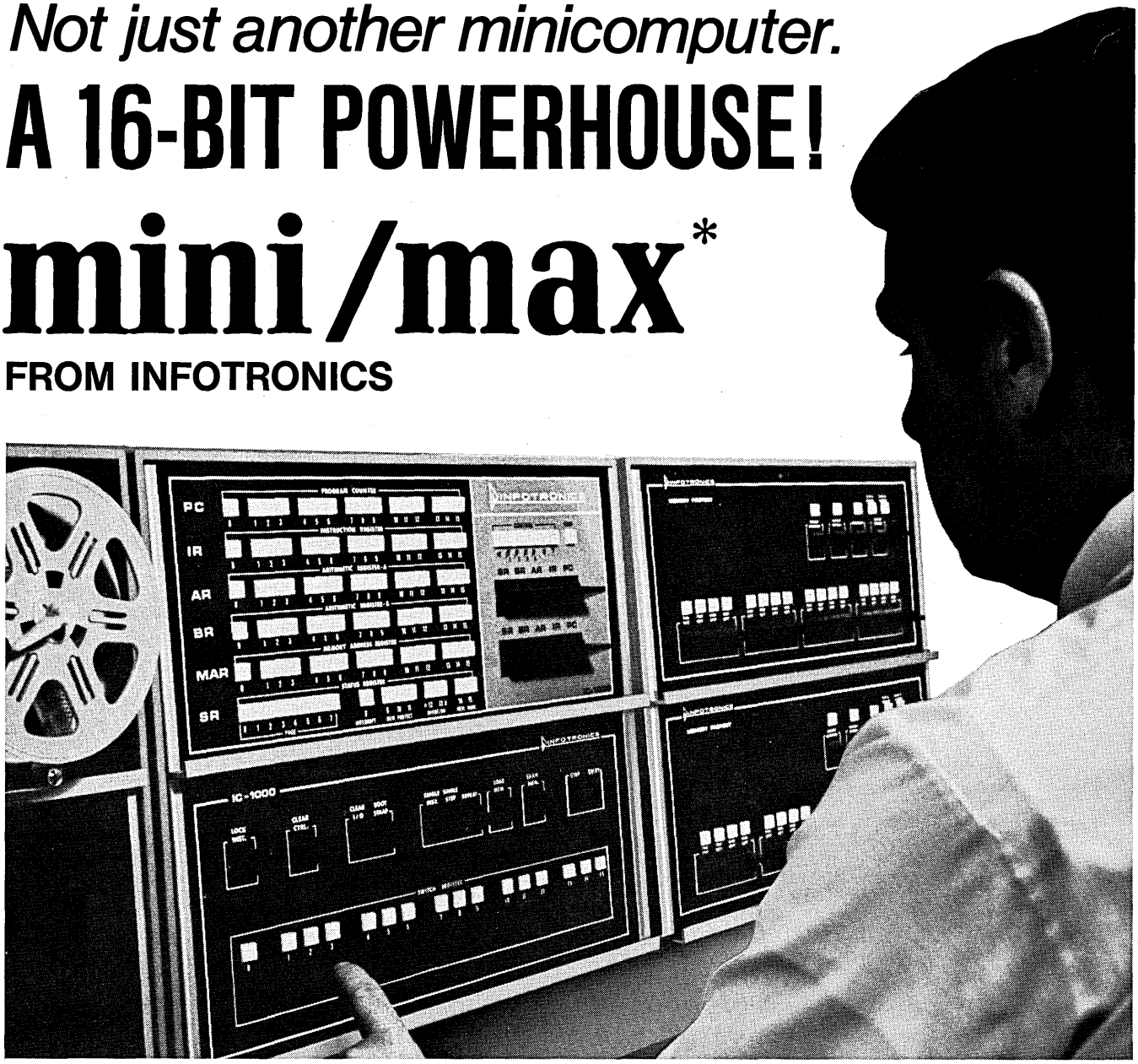
latter company, which in turn is a subsidiary of American Biomedical Corp. McIntire's former specialty was in the petroleum field, where he holds 20 patents. Now he has developed MANAGE, a t-s and info retrieval system that will be installed in clinics. . . . Former president of Interbank Card Association (Master Charge), **Garrison A. Southard, Jr.,** has been appointed president of Bank Computer Network Corp., Chicago real-time service firm for the banking industry which plans to offer some 200 services (the first, Margin Monitor, a portfolio-watcher). He has been the marketing/management route with IBM and RCA. . . . This month the presidency of **Henry Chauncey** begins at EDUCOM (Interuniversity Communications Council), a cooperative venture among 100 universities and colleges to advance computer technology and information system sharing. Headquarters are being moved from Boston to Princeton, where Chauncey also has been president of Educational Testing Service since 1948. He has been an educational adviser to various government and national organizations. . . . **Terrence E. Kleffman,** one of the founders of International Timesharing Corp., Chaska, Minn., has been elected president, at 35. He was mainly responsible for design and implementation of the company's national t-s system. The board's comment: "We believe he's a winner." ■

Not just another minicomputer.

A 16-BIT POWERHOUSE!

mini/max*

FROM INFOTRONICS



3000 OPERATION REPERTOIRE - REALTIME APPLICATION SUITABILITY

A 16-bit computer with remarkable power, instruction capability and flexibility of application . . . the **mini/max** computer system is uniquely suited to implement realtime systems, data acquisition, process control, batch processors, data concentrators, communication links, and other demanding applications. Modular design of total hardware and packaging allows full expansion capability—forever . . . assuring the customer of optimum capability without over-investment. A systems manufacturer can purchase a computer configuration to fit precisely his specific need.

The **mini/max** instruction repertoire of over 3000 discrete operations is unmatched by any minicomputer available today. Even the simplest **mini/max** accommodates software techniques of a sophistication not normally applicable to equipment of this size. Input/Output, Interrupt and Direct Memory Access structures provide exceptional expansion capability allowing complete customization within the modular concept.

Off the shelf peripherals include teletypes, high speed paper tape reader, high speed paper tape punch, 300 LPM printer, a 300 CPM card reader and a disc controller for disc storage up to 2,048,000 words. Available software developed by Infotronics includes assemblers, diagnostics, arithmetic packages, utility packages and others.

Get the full story on the powerful **mini/max** from Infotronics, 8500 Cameron Rd., Austin, Texas 78753 . . . or for fast answers call Wes Harrison (512) 454-3521. 489

*Trade name of Infotronics Corp.

INFOTRONICS CORP.

Two months ago, Raytheon Computer introduced the new 1.5μs 704 Computer.

We just changed our minds.

We've speeded up the 704 by a third and made it more powerful. And, best of all, we didn't change the price.

Now the 704 has a 1μs 4k memory that's expandable to 32k for those big data performances. And DMA to get to it — fast.

The 704 has 4 addressable registers and 74 instructions. It's big in software. Over 400 programs and subroutines available off-the-shelf. Software that most small computers don't even offer. All field proven and working.

Like our exclusive executives and monitors for disc and mag tape operating systems or for batch processing. And our 360-compatible superset of USASI FORTRAN IV. And our conversational FORTRAN in just 4k. And the only small-computer Sort/Merge package. And the fastest, most accurate math library in the class. (Try us with a benchmark.)

And the Raytheon Computer 704 is just as big in hardware. With options like hardware multiply/divide, bootstrap and a high-speed, real-time Array Transform Processor. And interfaces that let our computer talk to anything you've got. Analog or digital. Processing or control. One-of-a-kind or OEM.

For the most complete under $10,000 computer, call or write and ask for Data File C-187.

RAYTHEON

Raytheon Computer, 2700 South Fairview, Santa Ana, California 92704. Telephone (714) 546-7160.

The only thing Raytheon Computer does is your job. Faster.

CIRCLE 91 ON READER CARD

WASHINGTON REPORT

U.S. TO FIGHT TRIPARTITE ACCORD

U.S. officials are determined to prevent the European electronics (tripartite) accord from becoming a non-tariff barrier to American exports. But State and Commerce Dept. officials say they can't do much until the U.S. electronics industry resolves internal conflicts and decides how it wants the government to proceed. EIA, at its convention in Chicago last month, formally established a committee to study the problem.

Washington officials already have started to crank up the machinery of the General Agreement on Tariffs and Trade (GATT) to attack the accord as a non-tariff barrier. If that gambit doesn't work, pressure will be shifted to OECD (the Office of Economic Cooperation and Development).

Washington sources fear the accord is the first step in an effort to shut out many American dpe exports, as well as other products. They explain that the "mark of conformity" established by the accord to identify products which have gone through specified quality-assurance procedures could be attached to any manufactured item. Overseas buyers don't have to limit their purchases to products carrying this seal of approval, but our sources say there will be a tendency to do so, particularly in government buying offices.

COMMON CARRIER STATUS QUESTIONED

EIA presented FCC with a Boolean conundrum last month when it argued that "a communications service for hire" is not the same as a "common carrier communications service for hire." Hybrid services involving a combination of message switching and dp were the object of the argument. In its tentative decision in the computer/communications inquiry (May '70, p. 166), the commission concluded that these services should be regulated if they are devoted predominantly to message switching. EIA's point was that regulation is required only when a message switching service supplier "rises to the status of a common carrier." NAM and Collins Radio expressed similar sentiments in comments filed about the same time.

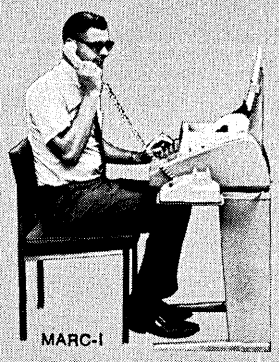
FCC WANTS TELPAK SHARED

FCC told AT&T last month to permit Telpak sharing on an unrestricted basis—a decision that could lead to big savings for many private line users. New Telpak rates are due in August. The commission indicated it will accept an increase, provided Telpak users still get a significant discount compared to individual private line users. FCC added that users should form their own sharing groups and deal direct with the carriers instead of working through middlemen.

CAPITOL BRIEFS:

Bill Andrus, ex-IBM standards director, recently became an ex-special assistant to IBM vp Jim Birkenstock and left the company completely. We hear Andrus may be appointed director of the NBS Center for Computer Sciences and Technology; he's one of 15-20 candidates. The job was formerly held by Herb Grosch.

CYBER eliminates the great computer


MARC-I

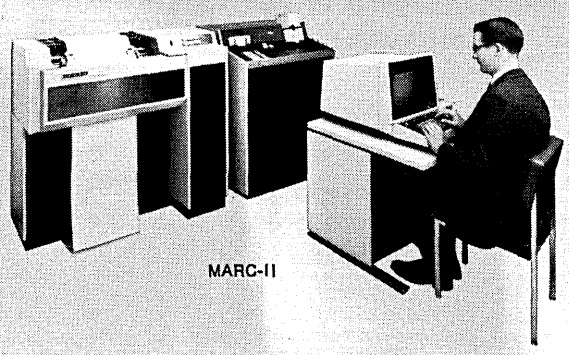
Until now you've had a choice.

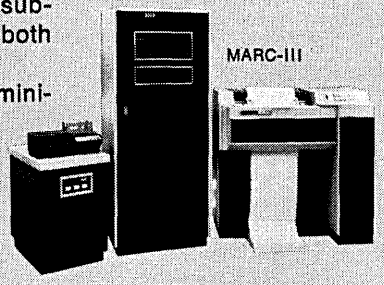
Either you got a computer large enough to handle your peak loads (and absorbed the costs for idle time), or you got one for average through-put (and sweated out the peak periods).

Some choice. It gave you the option of upsetting your financial manager or the people with the hot data processing problems.

Today CDC has eliminated the need for the great computer compromise. You can get the best of both size systems—plus some other advantages you may not have considered—with the CYBERNET System.

Control Data's CYBERNET System is a network of computer centers located in 33 cities across the United States and worldwide. With CDC 6600 and 3300 computer systems, these centers provide a perfect combination of computing power and high capacity data processing capability. Problems that would take hours or days on medium-sized computers are solved in seconds or minutes with the 6600 supercomputer—a factor that means substantial savings in both time and costs.


MARC-II


MARC-III

And, there's no minimum charge for computer time with the CYBERNET System—you pay just for the resource you use for the time which you actually use it. All the computer capacity you need for peak loads is in this network, and it's only as far away from you as your telephone outlet.

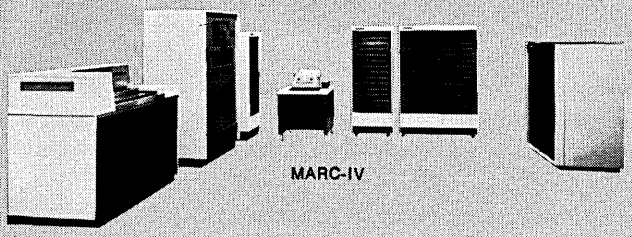
CDC's MARC terminals can be used to augment your present computer system, for testing and debugging programs, or as a primary data processing source. There's a complete line of systems and peripherals to choose from—with input/output capacities ranging from 10 to 6000 bytes-per-second.

Pick out the terminal that fits your needs, select the peripherals you want, and install the system *without* the usual problems of environmental control, false flooring, etc. Most systems are ready to run the day they're installed. Your terminal will be tied into the CYBERNET center nearest you—either by voice-grade or wideband telephone lines. Software includes the most complete versions of FORTRAN and COBOL, as well as a comprehensive library of special programs

NET™ system compromise.

—ALGOL, SIMSCRIPT, OPHELIE II, and systems for assigning zip codes to street addresses, for structural analysis, for analysis of random data, for tabulating and analyzing survey data, to name a few.

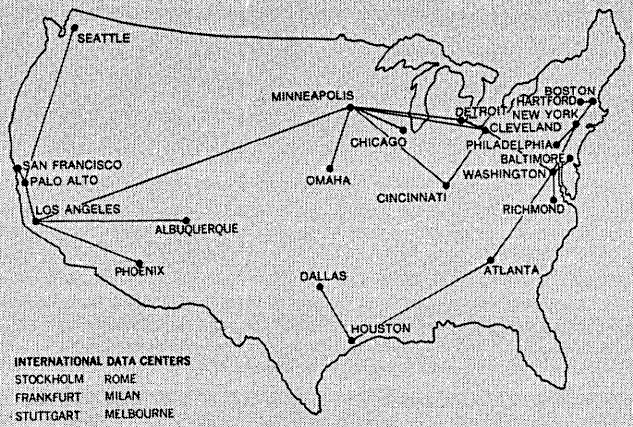
And now we have two new software systems that help you use the full potential of the CYBERNET System—SHADOW and SHADE. SHADOW is a system that allows you to select any 3300 or 6600 in the CYBERNET System, or a combination of both, to solve your problem with optimum efficiency and economy. In addition, the powerful command and control features of SHADOW allow you to direct the scheduling and routing of your work flow. SHADE is a system that provides you, from your own site, the capability to store data files at the CYBERNET center so all you have to transmit for any problem is new input or changes. You can alter, update, search or copy files from your own terminal.



MARC-IV

MARC-V

Take a few minutes to find out exactly what the CYBERNET System and MARC terminals can offer your firm. Call your nearest CDC Data Center, or contact us directly.



INTERNATIONAL DATA CENTERS

STOCKHOLM	ROME
FRANKFURT	MILAN
STUTTGART	MELBOURNE
THE HAGUE	SYDNEY

CONTROL DATA CORPORATION

Call us "collect" from anywhere in the U.S. on our Hotline (612) 884-8195.

For further information, call or write:

In the United States:
Data Services Division
Dept. 412, Room 346
Control Data Corporation
4550 West 77th Street
Minneapolis, Minnesota 55435
Phone: 612/884-8195

In Europe:
CDC Data Services, Dept. 412
Control Data GmbH
6 Frankfurt am Main 16
Niddastrasse 40
West Germany
Phone: 71-231

Even the price is Teletype replaceable!

Here, finally, is a CRT terminal you can cost-justify. $88 per month!

It's the all-new, stand-alone, solid-state CRT display with features that anticipate tomorrow.

The Hazeltine 2000 is engineered, built and backed by the Company that's been pioneering progress in electronics since 1924, the Company whose reputation for engineering excellence, uncompromising quality and service is known and respected worldwide.

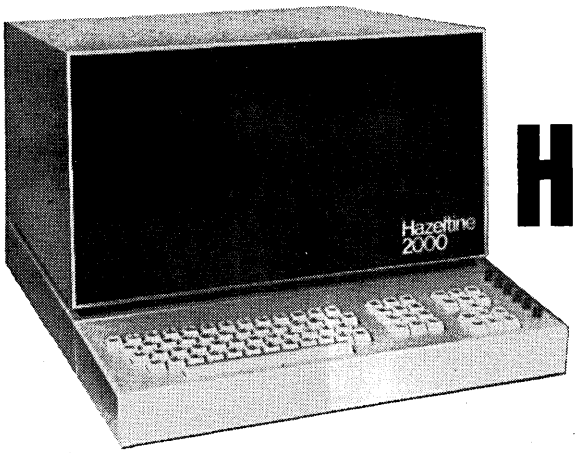
Standard Features

- Teletype Replaceable
- 1998 Character Display (74 characters per line; 27 lines)
- Full or Half-Duplex Operation
- Selectable Transmission Rates
- Powerful Editing Capability (Line and Character Insert/Delete)
- Selective Roll-Up
- 2048 x 8 Magnetic Core Memory
- Cursor Addressability
- Split Screen
- Solid State Keyboard May be Operated Remotely

Available as Options

- Instant Hard Copy Accessory
- Magnetic Tape Cassette Accessory

Contact us immediately for a demonstration or additional information.



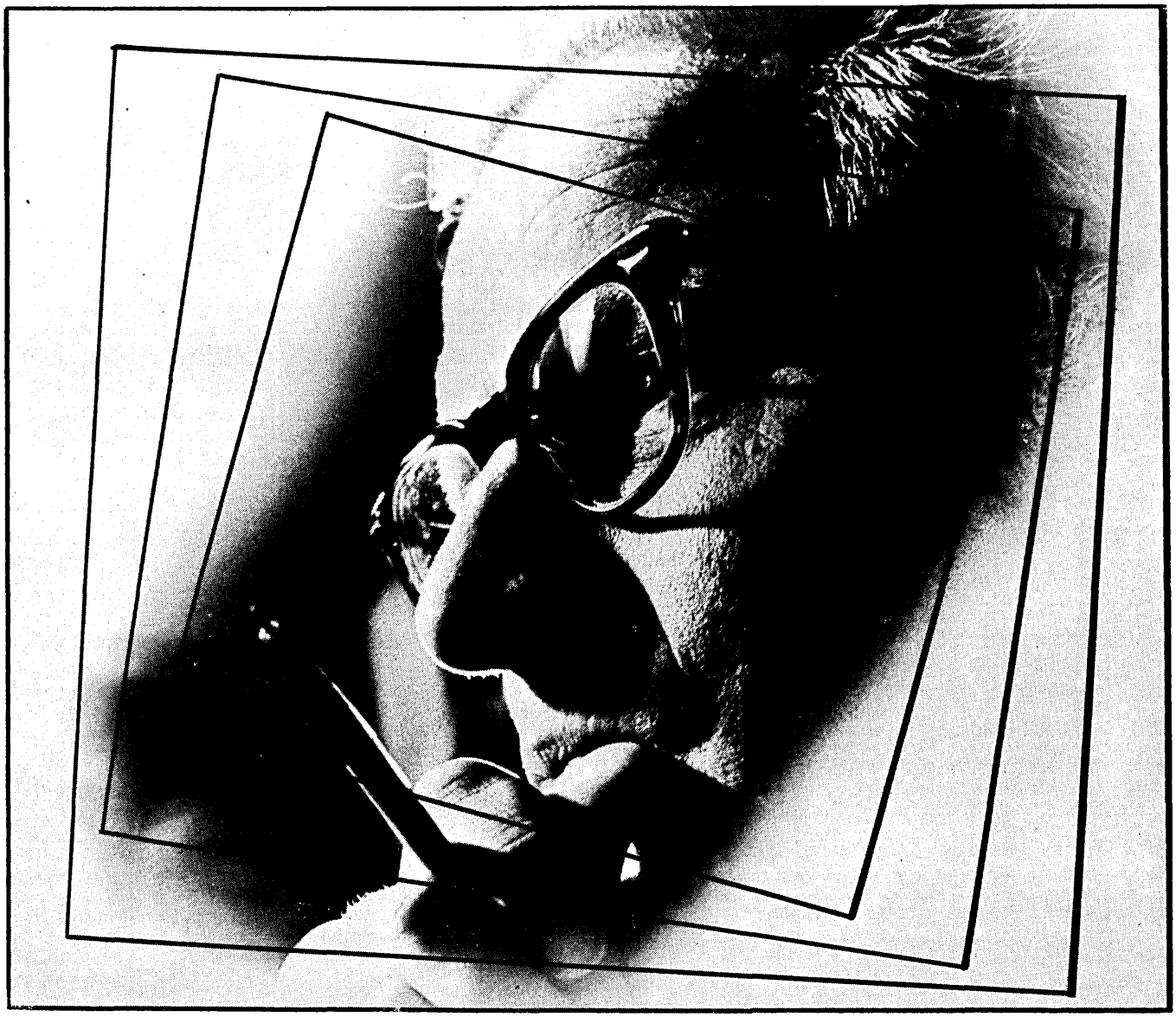
Hazeltine 2000

Hazeltine Corporation
Industrial Products Division
Little Neck, New York 11362
(212) 423-4800

Hazeltine and the Pursuit of Excellence

RECRUITMENT ADVERTISERS' INDEX

For the convenience of those readers interested in professional opportunities, we have gathered in this and the following pages the advertisements of these industry firms and professional placement agencies:



RCA Marlboro wants systems programmers with questions about the future.

RCA Marlboro is a new kind of facility, designed to help create computer equipment that's far ahead of its time. There are openings at various levels in our New Product Line Systems Programming area. We are seeking experienced people who are ready to assume responsible leadership positions in interesting areas.

Architectural Systems
Will serve as group leader, to develop overall architecture of new systems, specifications for hardware—software interfaces, working with software implementation groups.

I/O Control Systems
Will be responsible for implementation of device-oriented software modules, related to input/output and data management aspects of modern computer systems.

Executive Systems
Will be responsible for a group effort in developing and implementing significant portions of a modern operating system for a multiprocessor, time shared computer system.

Diagnostics
Will have responsibility for devising and implementing On Line Diagnostics. Duties will include fault location, reconfiguration and restart in multiprocessor environment.

If you have the right background, and feel that you could lead or be a significant contributor in one of the activities described at left, you should investigate the opportunities at RCA Marlboro.

To arrange an interview, send a resume to Mr. D. J. McPhee at RCA Computer Systems Division, Dept. D-7, 200 Forest Street, Marlboro, Mass. 01752. We are an equal opportunity employer.

RCA
COMPUTERS

CIRCLE 513 ON READER CARD

ADVERTISING OFFICES

Sales Manager & Vice President — JOHN BRENNAN
205 West Wacker Drive, Chicago, Ill. 60606
(312) FInancial 6-1026

Eastern District Managers — JAMES M. MORRIS
WARREN A. TIBBETTS
IRWIN L. WERFEL
35 Mason Street, Greenwich, Conn. 06830
(203) 661-5400

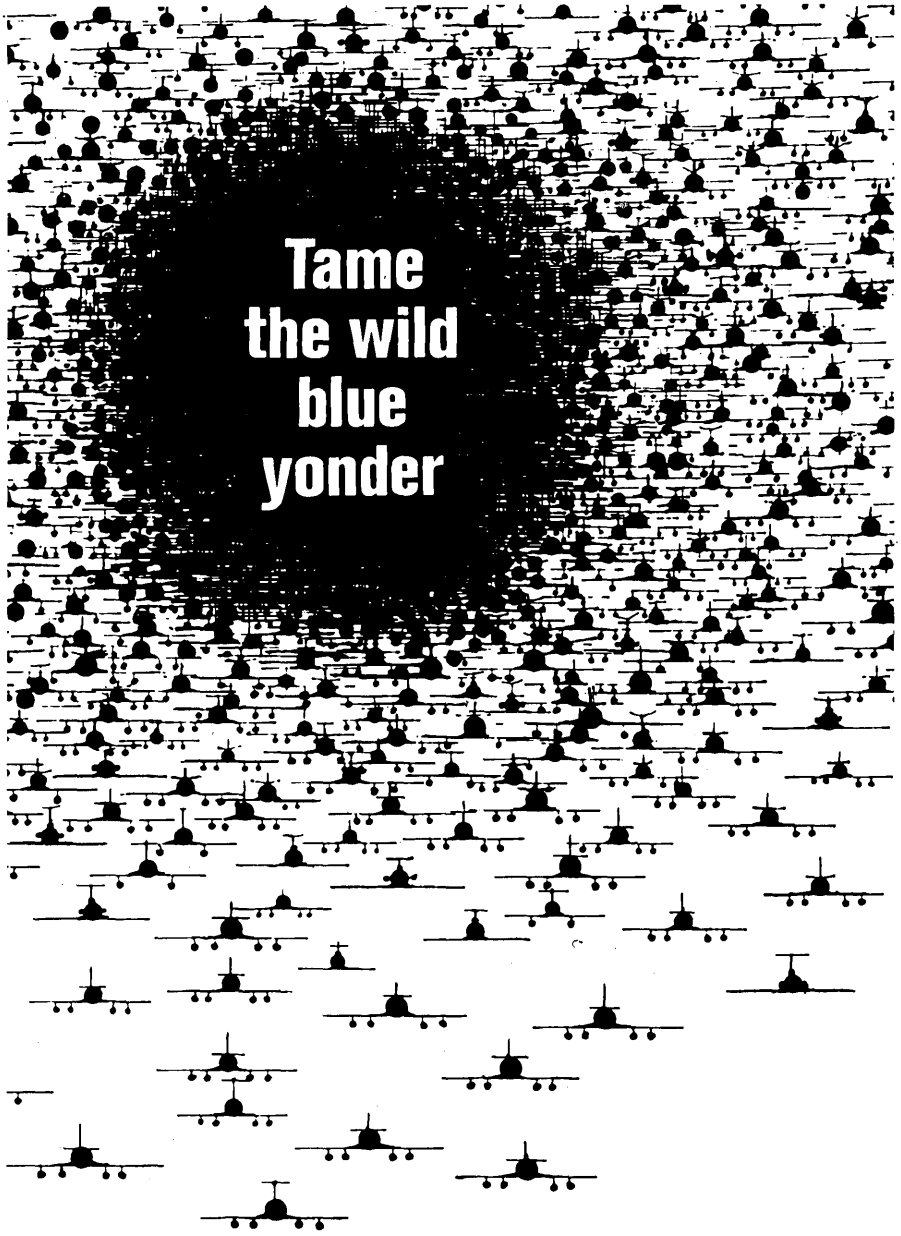
New England District Manager & Vice President — WARREN A. TIBBETTS
112 West Haven Rd.
Manchester, N.H., 03104 (603) NAtional 5-9498

Midwest District Manager — JOHN M. GLEASON
205 West Wacker Drive, Chicago, Ill. 60606
(312) FInancial 6-1026

Western Manager & Senior Vice President — HAMILTON S. STYRON
94 So. Los Robles Ave.,
Pasadena, Cal. 91101 (213) 795-9721
(213) 681-8486—from Los Angeles

Western District Manager — JAMES E. FILIATRAULT
260 Sheridan Ave.
Palo Alto, Calif. (415) 321-1440

ADVERTISERS' INDEX



Right now some 25 million flights a year fill our skies. Within ten years there are going to be over 50 million. And MITRE's playing a key role in the design of the National Airspace System that will effectively control those flights. To do the job we need top-flight systems people in Atlantic City, New Jersey where the Federal Aviation Administration's prototype air traffic control systems are now under development. Their mission: to provide the system engineering to the FAA. Their job encompasses such technical areas as broad level system analysis, computer program analysis, system specifications, system logical design and system test planning for design verification.

We are especially interested in individuals who are familiar with computer program architecture and with design and production problems of large, complex, real-time computer program systems. Relevant experience should include several years with large scale, real-time command and control systems or extensive experience in other software systems. Background encompassing overall computer program system design, and higher order language knowledge – JOVIAL preferred. If you have a degree in electronics, mathematics, or physics, and interest in systems work, write in confidence to: Mr. Boyd E. Wanzer, The MITRE Corporation, FAA/NAFEC, Bldg. 8, Atlantic City, New Jersey 08405.

THE MITRE CORPORATION

An equal opportunity employer (M & F)

CIRCLE 516 ON READER CARD

CAREERS

COAST TO COAST
EUROPE

TOP 20%

EXCLUSIVE!

The unique personal and confidential relationship we establish with you and our clients permits us to offer you outstanding job opportunities, many not found anywhere else. If your potential or abilities are above average and you are looking for a challenge, our unique service provides 49 state and international coverage.

OUR CURRENT TOP 3 NEEDS:

1. **URBAN, EDUCATIONAL, PUBLIC SYSTEMS**
2. **HARDWARE DESIGN AND DEVELOPMENT**
3. **SOFTWARE SPECIALISTS** in OS/360 or small computers

Openings at V.P., Consulting to Intermediate Levels

- Management/Computer Consulting
- O.R. Management Sciences
- Computerized Process Control
- Management Information Systems
- Systems Planning/Development
- Business Systems, Programming
- BAL or PL1 Programmers
- Scientific Computation
- Logic/Digital/Circuit Design
- Software/Applications Packages

SALARIES $10,000-$35,000

Our clients assume all expenses

Call collect or write in full confidence to
Joseph Albert **212/695-5214**
855 Ave. of the Americas, N.Y., N.Y. 10001
5710 West Manchester Boulevard,
Los Angeles, Calif. 90045
Corporate Headquarters, Santa Fe, N.M.

Indicate salary and geographic requirements

ALBERT A ASSOCIATES

Member ACM; Career Consultants in the EDP Field

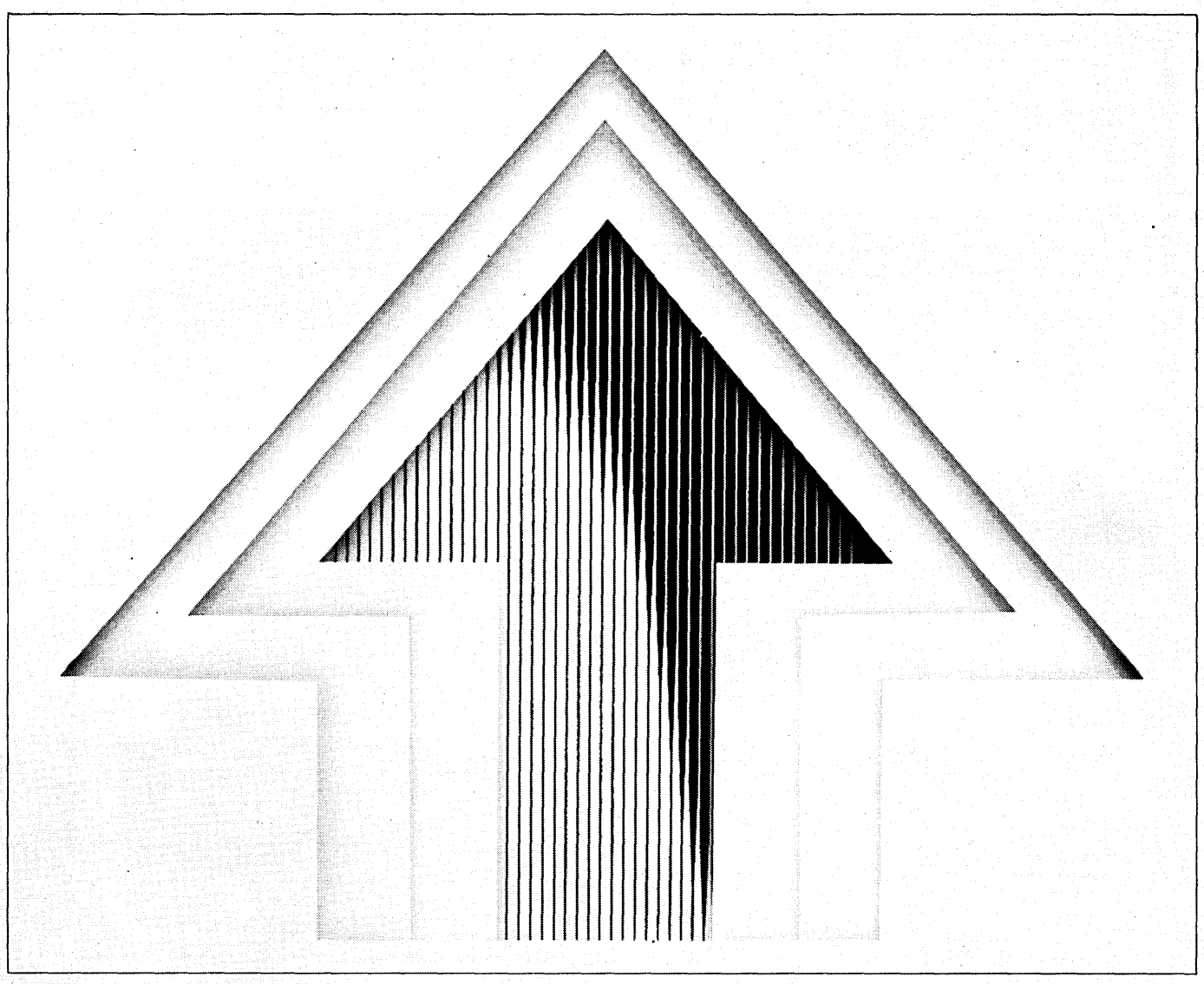
CIRCLE 500 ON READER CARD

Advertisers' Index...

We have the biggest growth in time sharing, multi-function, multi-user systems.
We have an eighteen-month lead on the field.
We have some of the best minds in the business.
We have a place for you.

Are you ready for a change? The chance is here right now. There's no doubt about the growth. It's faster in large, time-sharing, multi-function, multi-user systems than in any other portion of the computer market. And at RCA we're 18 months ahead of the field already. We call our work "total systems architecture." It offers unlimited opportunities for EDP professionals who do total system designs for hardware and software . . . including software design automation. There's an undercurrent of excitement here as we set our sights on even faster growth in broad-based systems for large time sharing machines. If this sounds like the right place, we'd like to hear from you. Your experience should be in any of the following: programming; language processing; control systems; operating systems; utility systems; communications systems; micro-programming; field sales and system support; education or product planning.

Write to: Mr. Thomas Beckett, Dept. 19, RCA Computer Systems Division, Bldg. 202-1, Cherry Hill, New Jersey 08101. We are an equal opportunity employer.



RCA
COMPUTERS

THE FORUM

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

In a world in which even simple everyday items cannot be bought confidently —where the buyer is at the mercy of the seller in the purchase of clothing, tires for his automobile, meat for his table—is it any surprise that computers appear to be difficult to specify and to procure? Let me assure you at the outset that none of the vendors of hardware or software purposefully deceives his customers. He simply doesn't know what the customer wants. He does have an interest in selling you a system which will give you the most for your money. Like many other businessmen he depends on your good will and repeat business.

Let us look at the problems the vendor faces. The vendor must market for the common denominator in the consumer spectrum; he cannot afford to tailor his system too much toward a specific class of consumers lest he lose all others. Because of the many varieties of hardware and software systems available, the customer must choose that vendor who most closely satisfies his need. Unfortunately, the user doesn't really know what he needs now and has no idea at all of what he will need later. Generally, in this business, the customer is less knowledgeable than the vendor. Of course there are some exceptions—there are some customers who know what they want, but even they can be wrong in predicting what they will need. These customers pay the price for the ignorance of the others; they either pay for products which are not optimized for their particular needs, or they pay the price of special development. I suggest the former is cheaper.

Ideally, vendor and customer should be satisfied at the conclusion of a transaction. But let us look more closely at the internal structure of buyer and seller. Both are structured hierarchically. The technicians in both organizations try to solve the problems, but they must filter them through their management to the level at which the negotiations take place. It is axiomatic that top management doesn't listen to advice from the line, and that the bottom of the line holds that its management is incompetent. Since only management considers itself capable of negotiating transactions as large as the purchase of a computer, the people who really know what they want and those who know what they can deliver rarely get to know each other before a sale is consumated. By the time the programmers specify what they want, managers interpret the specifications, top management reaches compromises with the vendor, the salesman communicates his needs to his management who, in turn, communicate it to the technicians—several more layers of constraint are added to the problem to be solved. It is not surprising that applications and equipment don't always match well, except, of course, in the minds of the salesmen and corporate heads.

To avoid such failures some customers have specified special systems, for instance, the LARC, NORC, Burroughs 8500, and STRETCH projects. These systems were tailored to meet the customer's specifications. They were written tightly and the manufacturer had little choice but to deliver what was wanted. Even in these cases, both user and vendor ended up dissatisfied—because they got what they asked for. Without fail, problems show up the day a system goes on the air; planning is always inadequate. Even the sophisticated users are not capable of planning adequately for the future needs.

Will the future improve all this? Chances are it will not. The big word today is management information systems. We can define MIS as a system which delivers all the information when and where you want it. Future equipment will not supply this want. We know too little about MIS to offer a good system, but we will offer faster and faster machines. Not because they are the best solution, but because they are technologically feasible. Also, we will not offer much better software, because the vendor has no magic formula for being more inventive than the customer. On the contrary, he does have the constraint of having to build his software to satisfy as many customers as possible with one set. Some of the software houses will continue to skim the market by providing specialty programs. As more and more vendors attempt to probe the market, the vendor jungle will get much worse before it will get better. The customer will simply have to learn how to survive. The computer industry is heading for a second shakeout. It is not necessarily true that Snow White and the Seven Dwarfs will be the surviving entries in the computer game. It is just possible that someone with a better idea may overtake all of them.

Some people have turned to standards as a panacea in solving today's vendor jungle. This is particularly true of the federal government. Standards play but a small role in the vendor jungle, as standards are only as good as their objectives. The industry currently spends between $5 and $6 million a year on national and international standards, the costs being borne equally between users and vendors; but has no plan, no objectives. The federal government is taking a strong lead in this activity but has not come up with any plan. Much of the money is wasted because standardization lacks a driving motive. We can boastfully look at the

standards we have developed—28 of them—but look at their significance. The majority are simply a statement of the status quo. They tend to hinder rather than encourage further development in that area. Typically, as a result of standardization, COBOL may tend to freeze where it is rather than continue to advance. The only forward-looking standard is ASCII. Networks of computers are affected by standards in codes and procedures. Yet there seems to be much resistance on the part of the manufacturers to standardize keyboards, a basic need for the operation of networks. Under the guise of competitiveness, the proposed standard keyboard was specified so loosely that the common denominator between "standard" keyboards is drastically reduced. Standards which reduce rather than improve the utility of the devices which they standardize do not speak to the needs of the community.

The vendor jungle is influenced by people more than anything else. It can be said that our programs are in the pre-technological stage. So are our programmers. It's easy to make someone a scapegoat, and in the dp industry the programmers are the whipping boys. Let us take a closer look at the programmer. The programmer is normally trained in a department of computer science under the guidance of a scientist who wants to advance the state-of-the-art of computing rather than to provide industry with a disciplined individual trained to provide a reliable product. I suggest that, rather than educating our programmers in the department of computer science, we should have them educated in departments of civil, mechanical, or electrical engineering, so that by the time they graduate they will have been instilled with a desire to keep records of everything they do and to avoid duplicating things just for the sake of invention. When the ACM stops putting a premium on theoretical topics and starts publishing things useful for the working engineer; when the university puts computer science into engineering; when programmers will document what they do even though it is difficult; then the vendor jungle will gradually disappear.

—Eric H. Clamons

THE FIRST IN A SERIES OF SYSTEM 21 REAL-LIFE SUCCESS STORIES

VIATRON GOES AUTO-MOTIVE.

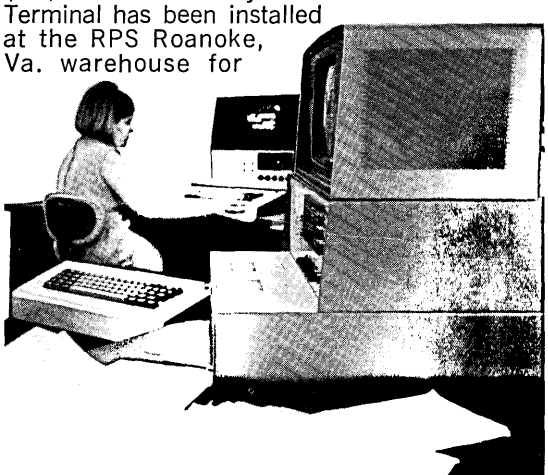
System 21 shifts auto parts accounting system into high gear. Saves more than 175 man hours a month for RPS.

A day to remember at RPS Products, Inc.

April 23, 1970. That was the day that VIATRON's System 21 went into action at RPS Products, Inc. Baltimore headquarters. A wholesale automotive parts supply chain, with warehouses in six states, RPS was faced with an ever-increasing pile of paperwork in the Accounts Payable and Inventory Control departments. Traditional data processing via keypunch techniques just couldn't keep up with the 10,000 plus invoices per month. Something had to be done. Eric Tiebauer, Data Processing Manager at RPS consulted with Don McCullough from North American Computer Corp., the local VIATRON dealer.

System 21 to the rescue

System 21 puts the logic where the work is. In the hands of the people assigned to enter and process the RPS invoices. Three System 21 Data Management Stations were installed in the Accounts Payable Department. Two were basic System 21 Data Management Stations with black and white displays and VIATAPE Recorders. The third System 21 was equipped with a Card Reader/Punch Adapter feature for automatic conversion of VIATAPES to punched cards. Total cost of the three System 21 Terminals was $13,256. Another System 21 Terminal has been installed at the RPS Roanoke, Va. warehouse for inventory control. In all cases, the RPS operators had little or no typing experience and no keypunch training. Yet, after only eight hours of on-the-job training for the Accounts Payable operators and only ten hours for the Inventory Control Specialists by the VIATRON dealer, System 21 was on-line saving more than 175 man hours of processing and keypunch time a month. Increasing efficiency and eliminating keypunch errors and delays as well.



Throughput up 300%

VIATRON's unique Distributed Data Processing philosophy is the key to this success story. The astounding timesaving benefits are derived by putting System 21 to work where the work is. By transforming ordinary clerks into source data input stations. Before System 21, RPS vendor invoices were posted by hand on keypunch layout sheets. Vendor number, general ledger number, invoice number, due date and amount were hand-written by two Accounts Payable clerks. Layout sheets were then forwarded to the keypunch section. Error control was accomplished in Accounting by comparing manual postings against original invoices. Now, with the System 21 method, Accounts Payable specialists work directly from vendor invoices and key data into the terminal using the Master Record on the video display as a guide. After completing an entry, the specialist eye-verifies the original invoice against the displayed data. The entry is then recorded on a VIATAPE cartridge. Periodically the VIATAPE cartridges are removed and converted to punched cards automatically by a dedicated System 21 terminal equipped with a Card Reader/Punch Adapter.

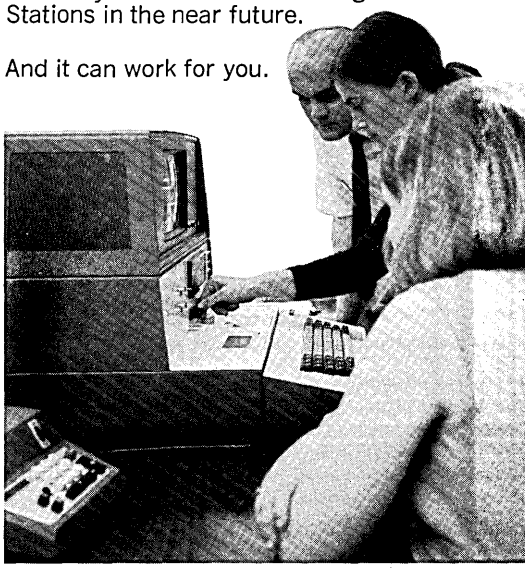
In Inventory Control at RPS the increased efficiency and savings of the System 21 concept are being realized also. Before System 21, inventory control forms were written out manually and forwarded to Baltimore for keypunching. Now, System 21 allows inventory data to be entered as the transaction occurs, no chance for error. The VIATAPE cartridges are then mailed to Baltimore for central conversion to punched cards on the System 21 terminal described above. Yes, VIATRON's System 21 is turning paperwork into profit for RPS Products, Inc.

A friend indeed, your VIATRON dealer

North American Computer Corporation of Baltimore is typical of the VIATRON dealers across the country. They are experts in solving data processing problems on a logical basis through the System 21 Distributed Data Processing concept. They can show you as they showed RPS how you can build and capitalize on the Systems of the 70's. How System 21 can not only cut your data processing costs but also produce an immediate measurable return on investment.

It works for RPS. In fact it works so well, RPS is planning to install 15 more System 21 Data Management Stations in the near future.

And it can work for you.



Contact your local VIATRON dealer and ask him about the System of the 70's. He'll analyze your needs and recommend the best solution. You'll find a complete list of authorized VIATRON dealers on the following page.

VIATRON

SYSTEM 21

The standard of the 70's

Here are the VIATRON dealers who can help you turn your paper work into profit

Baltimore, Maryland
*North American Computer Corp.
5026 Herzel Place
Beltsville, Md. 20705
Tel: (301) 685-7448

Birmingham, Alabama
ComputerComm, Inc.
1026 Eighteenth St., So.
Birmingham, Ala. 35205
Tel: (205) 328-8430

Boston, Massachusetts
*Programming Sciences Corp.
209 W. Central St.
Natick, Mass. 01760
Tel: (617) 655-3576

*Viatron Programming, Inc.
3 New England Executive Park
Burlington, Mass. 01803
Tel: (617) 272-2345

Buffalo, New York
Computer Task Group, Inc.
5586 Main Street
Buffalo, N.Y. 14221
Tel: (716) 634-9090

Cape Kennedy, Florida
General Space Corp.
910 Pine Tree Drive
Indian Harbor, Fla. 32935
Tel: (305) 773-3126

Chicago, Illinois
*Executive Computer Systems, Inc.
1211 West 22nd St.
Executive Plaza East, S. 720
Oak Brook, Illinois 60521
Tel: (312) 325-6040

*Pryor Computer Industries
400 N. Michigan Ave.
Chicago, Ill. 60611
Tel: (312) 644-5650

Cleveland, Ohio
ComputerComm, Inc.
11740 Clifton Blvd.
Lakewood, Ohio 44107
Tel: (216) 221-9214

Dallas/Fort Worth, Texas
General Space Corp.
8383 Stemmons Freeway, Suite 332
Dallas, Texas 75240
Tel: (214) 638-0703

Dayton, Ohio
Data Services Corporation
2835 Springboro Road
P.O. Box 1007
Dayton, Ohio 45401
Tel: (513) 294-0406

Detroit, Michigan
Executive Computer Systems, Inc.
17200 W. Ten Mile Road
Rogers Building S. 130
Southfield, Michigan 48075
Tel: (313) 354-2290

Pryor Computer Industries
1314 Penobscot Bldg.
Detroit, Mich. 48226
Tel: (313) 961-6120

Fort Wayne, Indiana
Cards, Inc.
Indiana Bank Bldg., Suite 600
Fort Wayne, Indiana 46802
Tel: (419) 331-3076

Greensboro, North Carolina
EDP Associates Inc.
1707 Spring Garden Street
Greensboro, N.C. 27403
Tel: (919) 273-5575

Greenville, South Carolina
Computer Programming, Inc.
Daniel Bldg.
Suite 1001
Greenville, South Carolina 29602
Tel: (803) 242-4180

Hartford, Conn.
COMTROL
1800 Silas Deane Hgwy.
Rocky Hill, Conn. 06067
Tel: (203) 563-2349

Houston, Texas
*General Space Corp.
1115 Gemini Blvd.
Houston, Texas 77058
Tel: (713) 488-1388

Indianapolis, Indiana
Anacomp, Inc.
6161 Hillside Ave.
Indianapolis, Ind. 46220
Tel: (317) 257-6555

Kansas City, Missouri
Control Industries
2800 McGee Trafficway
Kansas City, Mo. 64108
Tel: (816) 221-2833

Lakeland, Florida
*Digital Systems Corp.
4404 So. Florida Ave.
Lakeland, Fla. 33803
Tel: (813) 646-5757

Lima, Ohio
Cards, Inc.
415 Kiracofe St.
Elida, Ohio 45807
Tel: (219) 742-4266

Los Angeles, California
Boothe Resources International, Inc.
3435 Wilshire Blvd., Suite 2230
Los Angeles, Cal. 90005
Tel: (213) 380-5700

Miami, Florida
*Digital Systems Corp.
224 Palermo
Coral Gables, Fla. 33134
Tel: (305) 444-7486

Minneapolis-St. Paul, Minnesota
Programming Sciences Corp.
7851 Metro Parkway
Minneapolis, Minn. 55420
Tel: (612) 727-1410

Newark, New Jersey
New Jersey Data-Matic, Inc.
190 Moore St.
Hackensack, N.J. 07601
Tel: (201) 342-7766

Tele-Data Corporation
130 U.S. Highway 22
North Plainfield, N.J. 07060
Tel: (201) 755-1124

New Orleans, Louisiana
Quanta Corporation
3229 Carondolet
New Orleans, La. 70115
Tel: (504) 891-2808

New York, New York
*Diversified Data Services & Sciences, Inc.
105 Madison Ave.
New York, N.Y. 10016
Tel: (212) 889-1800

EDP Associates Inc.
1250 Broadway
New York, N.Y. 10001
Tel: (212) 695-6630

Major Computer Corporation
647 Franklin Ave.
Garden City, L.I., N.Y. 11530
Tel: (516) 742-8870

New Jersey Data-Matic, Inc.
1450 Broadway
New York, N.Y. 10016
Tel: (212) 695-6151

Programming Sciences Corp.
6 East 43rd St.
New York, N.Y. 10017
Tel: (212) 869-1600

*Software Methods, Inc.
10 East 40th St.
New York, N.Y. 10016
Tel: (212) 689-0669

Oklahoma City, Oklahoma
Computer Congenerics Corporation
4545 Lincoln Blvd.
Oklahoma City, Oklahoma 73105

Olympia, Washington
Boothe Resources International, Inc.
Capitol Center Bldg., Suite 616
Olympia, Wash. 98501
Tel: (206) 352-3533

Philadelphia, Pennsylvania
National Information Systems
150 Allendale Rd.
Valley Forge, Pa. 19481
Tel: (215) 265-5000
(215) 265-0150

Phoenix, Arizona
Arizona Terminal Systems Co.
3550 N. Central Ave., Suite 408
Phoenix, Ariz. 85012
Tel: (602) 277-5357

Information Systems Design
1826 N. Central Ave.
Phoenix, Ariz. 85013
Tel: (602) 252-1957

Management Computer Services, Inc.
301 W. Indian School Road
Suite D135
Phoenix, Arizona 85013
Tel: (602) 279-0684

Pittsburgh, Pennsylvania
The Troutman-Black Co.
2323 Main St.
Pittsburgh, Pa. 15215
Tel: (412) 781-7760

The Troutman-Black Co.
1910 Cochran Road
Manor Oak, Suite 261
Pittsburgh, Pa. 15220
Tel: (412) 343-3933

Rochester, New York
Computers Unlimited
540 Main St., East
Rochester, N.Y. 14604
Tel: (716) 454-4180

Sacramento, California
Boothe Resources International, Inc.
111 Capitol Mall, Suite 102
Sacramento, Cal. 95814
Tel: (916) 446-4971

St. Louis, Missouri
*Financial Data Systems, Inc.
6680 Chippewa
St. Louis, Missouri 63109
Tel: (314) 832-4150

Salt Lake City, Utah
Wiscomb/Weidner Co.
768 East 9th South
Salt Lake City, Utah 84105
Tel: (801) 328-3205

San Diego, California
Boothe Resources International, Inc.
2320 Fifth Ave.
San Diego, Cal. 92101
Tel: (714) 233-4610

San Francisco, California
Boothe Resources International, Inc.
ALCOA Bldg., 1 Maritime Plaza
San Francisco, Cal. 94111
Tel: (415) 989-6580

EDP Associates Inc.
260 Kearny Street
San Francisco, Cal. 94108
Tel: (415) 989-0258

Information Systems Design
7817 Oakport St.
Oakland, Cal. 94621
Tel: (415) 562-4204

Information Systems Design
525 University Ave. S. 102
Palo Alto, Cal. 94301
Tel: (415) 321-6620

*Viatron Programming, Inc.
1 California St.
San Francisco, Cal. 94102
Tel: (415) 989-3160

San Jose, California
ADATA Company
100 W. Rincon
Room 208 B
Campbell, Cal. 95008
Tel: (408) 378-1022

Schenectady, New York
Finserv Computer Corp.
1462 Erie Blvd.
Schenectady, N. Y. 12305
Tel: (518) 377-8831

Washington, District of Columbia
Diversified Data Services & Sciences, Inc.
4809 Auburn Ave.
Bethesda, Md. 20014
Tel: (301) 657-3155

Programming Sciences Corp.
1000 Connecticut Ave., N. W.
Washington, D.C. 20036
Tel: (202) 293-1050

VIATRON INTERNATIONAL OFFICES

France
VIATRON Computer Systems S.A.
Monceau Commercial Building
38, Rue de Lisbonne
75
Paris 8
France
Tel. 387-5509

Belgium
VIATRON Computer Systems S.A.
Westbury Building
5 Rue de Luxom
Brussels, Belgium
Tel. 117014

London
VIATRON Computer Systems Ltd.
928 High Road
Finchley
London N 12
Tel. 01-446-1381

Canada
VIATRON Computer Systems of
Canada Ltd.
1262 Don Mills Road
Don Mills 404, Ontario
Canada
Tel. (416) 447-6408

Germany
VIATRON Computer Systems GmbH
6236 — Eschborn
Max-Planck Strasse 28
Frankfurt, Germany
Tel. 06196 . 41764

South Africa
Mechandised Methods (Pty) Ltd.
M. M. House
69 Juta Street
Braamfontein, Johannesburg
South Africa
Tel. 724-0311

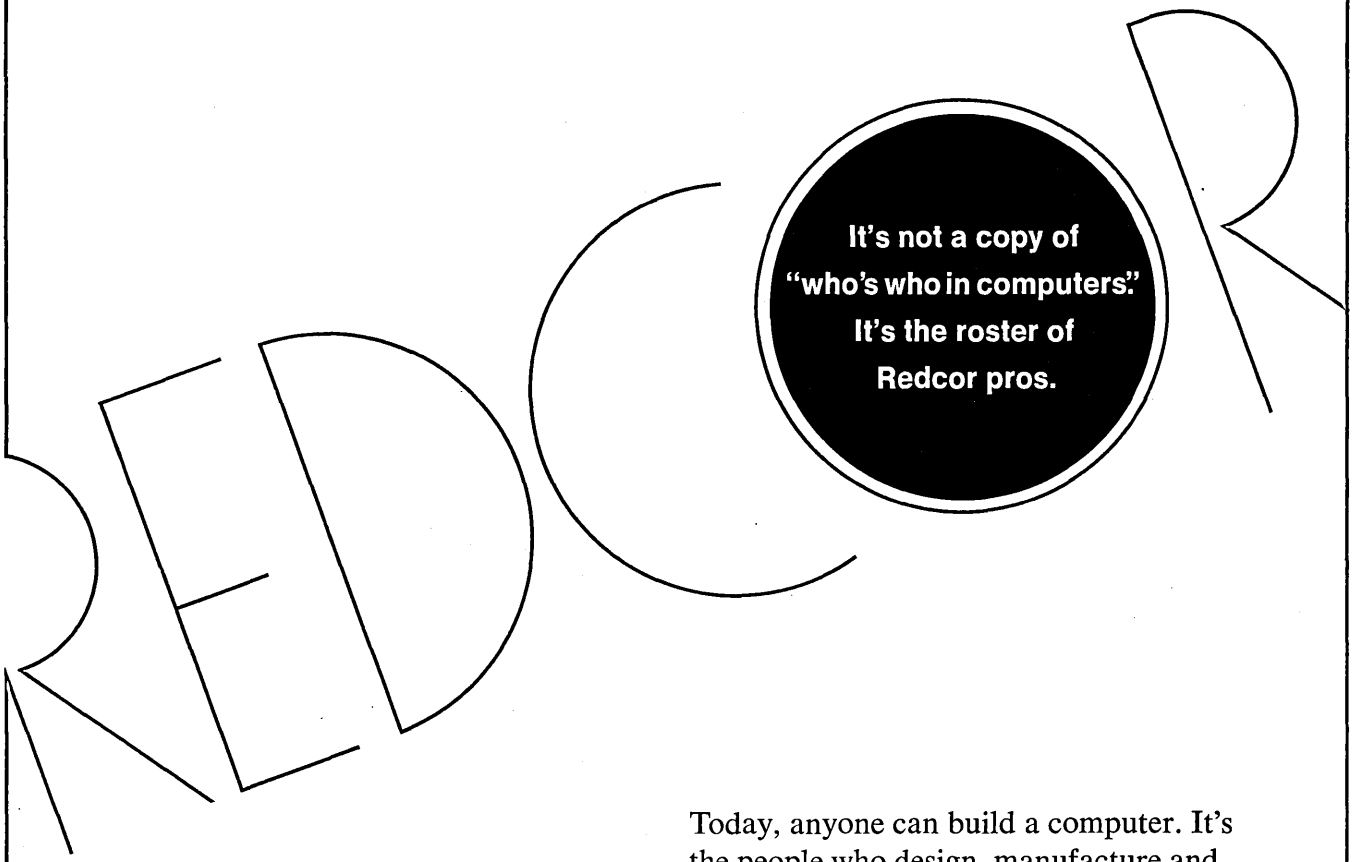
For further information, write VIATRON Computer Systems Corporation, Dept. D-16, Crosby Drive, Bedford, Massachusetts 01730. Tel. (617) 275-6100.

VIATRON
SYSTEM 21

The standard of the 70's

***Certified by VIATRON to provide customer training on System 21.**

Printed in the U.S.A.



It's not a copy of "who's who in computers." It's the roster of Redcor pros.

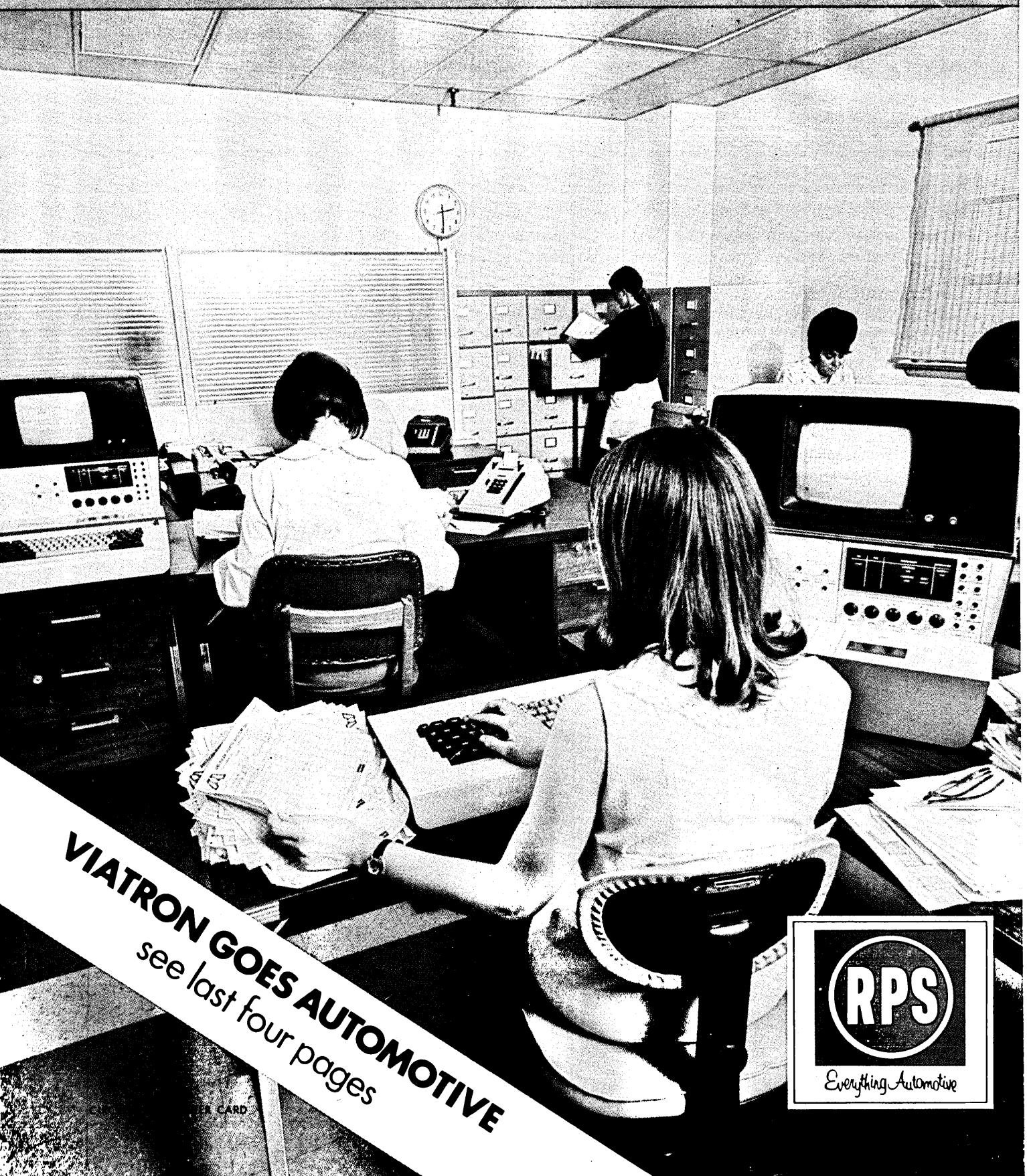
Today, anyone can build a computer. It's the people who design, manufacture and market the computer who make the difference. Since January, 1969 we have assembled a team of real professionals in management, marketing, and engineering . . . many of the top names in the industry. A lot of companies are selling 8 to 16 bit computers with specs a lot like ours, and some are even a little cheaper. But no one offers our complete "one source, one responsibility" systems commitment. We design and build all our own compatible systems components, computers included. And we also provide systems engineering, software and on-the-spot field service. That's a major commitment for any company . . . but we deliver. If you have an on-line real-time problem, let one of our Systems Pros find the solution.

It's not the computers we build. It's the problems we solve.

REDCOR CORPORATION
Telephone: (213) 348-5892

CIRCLE 2 ON READER CARD

VIATRON



VIATRON GOES AUTOMOTIVE
see last four pages

RPS
Everything Automotive