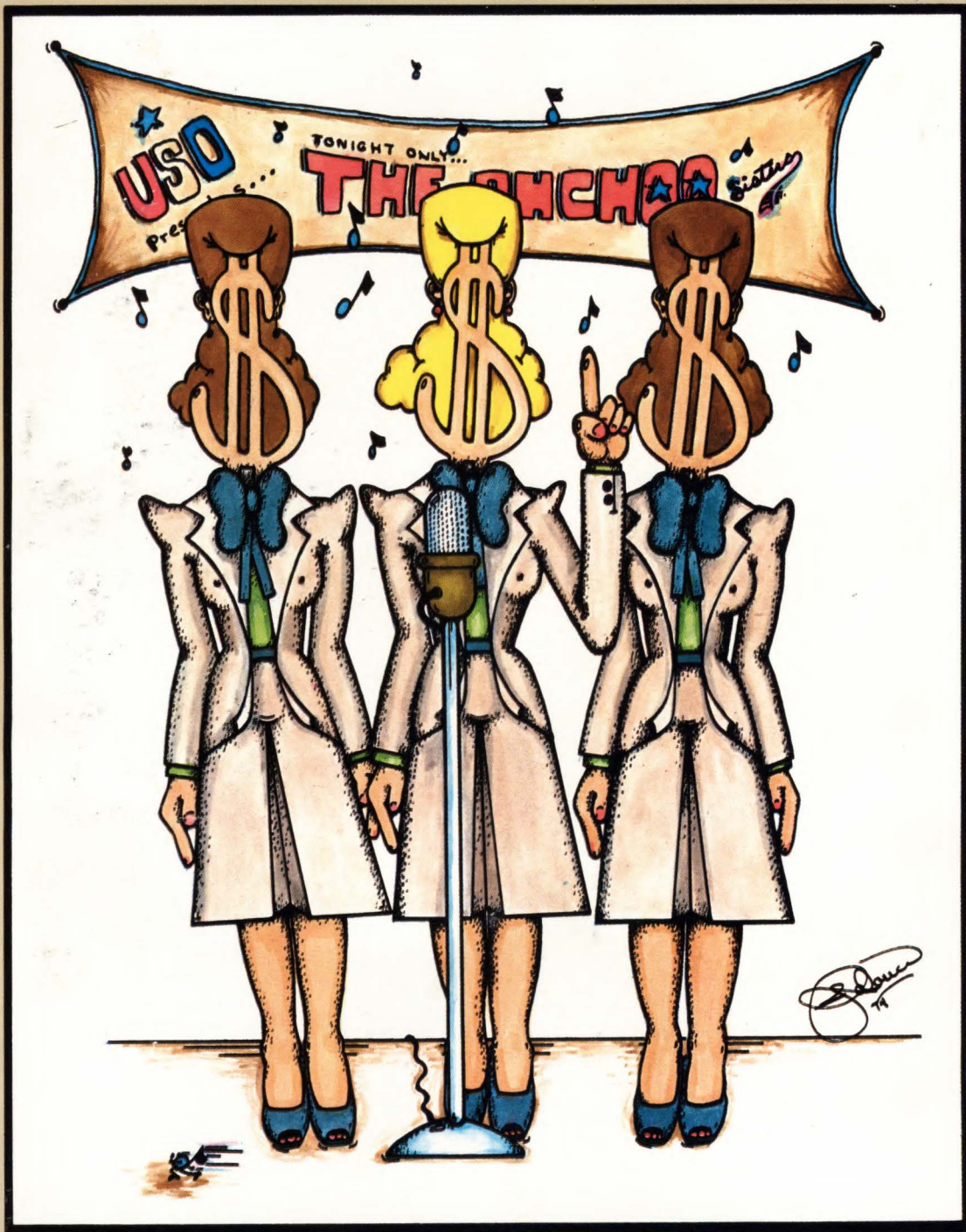


JULY 1974

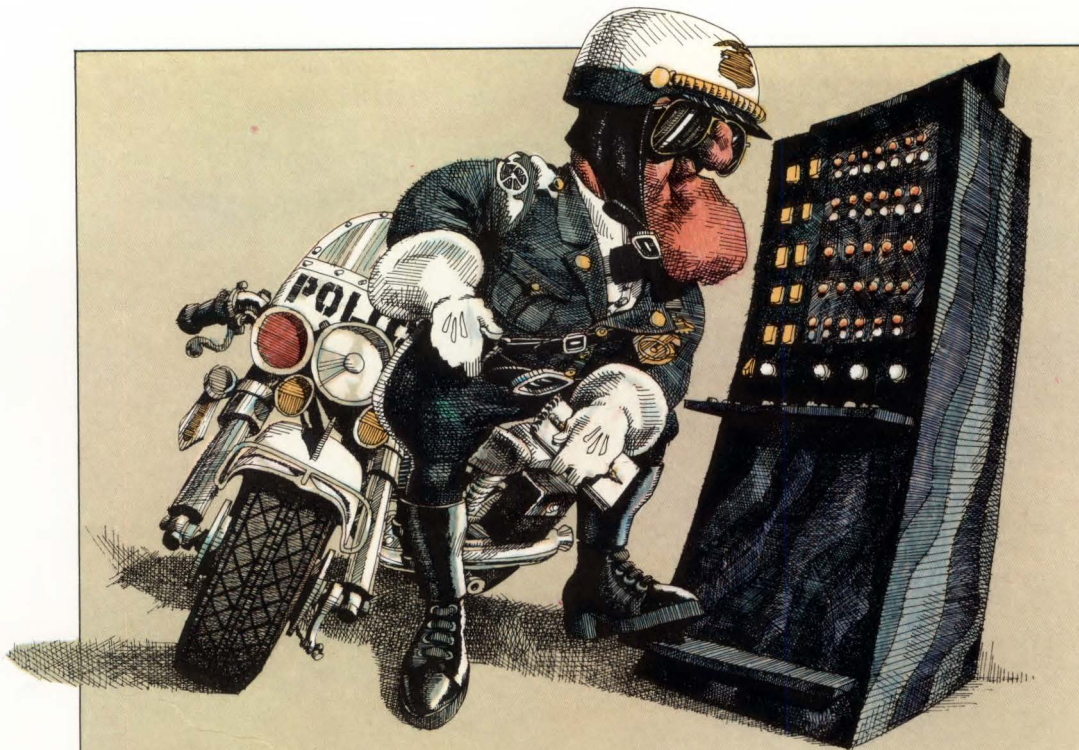
Interactive business modeling
The great Polish management game
Second-guessing the Federal budget

Computer Decisions

A HAYDEN PUBLICATION®



The rhythm of the economy



ITEL can really soup-up your computer.

If you want extra performance in your data processing system, ITEL peripherals have a lot going for them.

Take our money-saving add-on Monolithic Memory. It lets you exceed IBM's capacity limit at far less cost. On the 360/22 up through most 370 models. For example, it expands a 370/155's memory from two megabytes to four megabytes—a 100% increase!

Then, there's our 7330 Disk Drive Subsystem for 360/50, 360/65 and 370 systems. A compact, waist-high unit that handles massive data bases up to 1,600,000,000 bytes. Average access time is a speedy 27 milliseconds.

At ITEL, we couldn't have acquired over half a billion dollars in IBM computer leasing experience without finding room for improvement.

Your financial alternative.

ITEL
CORPORATION
DATA PRODUCTS GROUP

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

DEPARTMENTS

- 2 Undercurrents**
Cache as cache can
- 4 Newsdata**
NBS explores computers and people
- 6 Washington Datalink**
FEDNET changes color
- 10 Inside Story**
Military using non-volatile semiconductor memory
- 70 Editorial**
Make change work for you
- 72 Product Index**

NEW DEVELOPMENTS

- 59 Spotlight**
Interactive crt
- 60 Peripherals**
Memory board
- 62 Accessories**
Alarm system
- 63 Systems**
Batch processing system
- 64 Data Communications**
Low speed modems
- 66 Software**
Teleprocessing monitor

Cover: As stock prices and pop trends echo those of the big band era, there is a swing toward forecasting. Perhaps you will take note of the electric Gypsy's tips.
Illustration by James Talarico

Computer Decisions

FEATURES

- 12 The rhythm of the economy**
The computer has given the economist, the social scientist and the businessman upbeat ways of looking at the economy. If your business swings to the sway of the economy, the computer can be an indispensable instrument.
- 14 The great Polish management game**
Converting a management game to fit the measure of a socialist industry presents many problems. But the outcome is a big hit in Poland.
Robert W. Blanning, Andrzej Kisiel, David Hay, and Myron Uretsky
- 20 Mapping with computers**
Computer mapping techniques reveal to the social planner and business decision-maker relationships that might otherwise be overlooked.
Thomas C. Miles
- 26 Second-guessing the federal budget**
The computers at the Brookings Institution are doing some interesting things, not the least of which is analyzing the Federal budget. They're turning up a lot of surprises.
Larry Lettieri
- 41 Interactive business modeling**
Big firms are hitching big projects to the economy these days. General Electric has a service that's worth sticking out your thumb for.
Computer Decisions Staff Report
- 47 The character of printers**
Even though the price of paper has nearly doubled—if you can get it—the printer remains the major source of computer output. Comprehensive printer specifications follow.
Irving Wieselmann

INFORMATION SYSTEMS AUTOMATED PROCESSING PROBLEM SOLVING

VOLUME 6 NUMBER 7 JULY 1974

Publisher:
Don Huber

Editor:
Hesh Wiener

Associate Editors:
Larry Lettieri
Linda Dermer

Western Editor:
Bill Musgrave

Correspondents:
Heather David
Jon David
Elton Sherman
Ivan Berenyi

Art Director:
James Talarico
Editorial Assistant:
Madeline Orsini

Sales Coordinator
Julie Garrett

Adv. Production Mgr.
Dan Coakley

Circulation Mgr.
Barbara Freundlich

Promotion:
Jeffrey A. Weiner
Karen Kerrigan

Editorial Board:
Robert W. Berner
Staff consultant,
Honeywell Information
Systems Inc.

Kenneth S. Kretschmer
President,
Kretschmer Associates

Theodor H. Nelson
President, The
Nelson Organization

Franklin K. Kuo
Professor of electrical
engineering,
University of Hawaii

COMPUTER DECISIONS is published monthly by Hayden Publishing Company, Inc., 50 Essex St. Rochelle Park, NJ 07662, (201) 843-0550. James S. Mulholland, Jr., President and Treasurer, and Peter T. Rado, Secretary. Printed at Brown Printing Co., Inc. at Waseca, MN and New York, N.Y. Copyright © 1974 Hayden Publishing Co., Inc. Controlled circulation postage paid at Waseca, MN and New York, NY and postage pending at Rochelle Park, NJ. Subscription limited to persons with active, professional, functional responsi-

bility in computer or computer user industry. Publisher reserves the right to reject non-qualified requests. No subscriptions accepted without complete qualifying information. Subscription rates: Qualified subscribers In the U.S., free; Canada, \$12.00; all other countries \$15.00 one year. Limited quota of subscriptions available for persons outside of field served as follows: U.S. and possessions and Canada, \$24.00 one year, \$48.00 three years; all other countries \$30.00 one year, \$60.00 three years. Single copies: \$3.00

UNDERCURRENTS

Cache as cache can

Fairchild Semiconductors of Mountain View, CA, is currently working on a large, fast solid state memory. The 36-kilobit, random-access memory modules, which are said to be organized as eight bit bytes with an extra parity bit, are rumored to have an access time of 125 nanoseconds. However, the grapevine has it that this figure may be high. The real access time of test units approaches 100 nanoseconds. The memory is to be made of several chips mounted on a ceramic base 2 1/2 by 3 1/2 inches. Univac seems to be looking at the new memory. Will it be used in the 90/90?

Hewlett-Packard getting the picture

H-P's Loveland calculator plant is gearing up for a new entry in the desktop line. It's to be a high-powered programmable model with a built-in tube and some graphics hardware. The new calculator will probably price out at the top of the H-P line. Gossip to date indicates there will be no instant hard-copy option for this unit. Aimed at the scientific market, the tube-calculator may also be sold in business circles using mailing lists of H-P 80 owners.

Timesharing net to talk it up—multilingually

General Electric's global timesharing net will soon be adding touchtone input voice output to its mune of services. The squawking will be done by a voice synthesizer so that users can tie in from anywhere and in any language. Some of the planning that has gone into this idea indicates that Rockville is gearing up for a flood of users. For one thing, customers will get a crack at vocalization software as soon as initial shakeout is complete. US customers will be the first on board—in fact a few are already in a test situation.

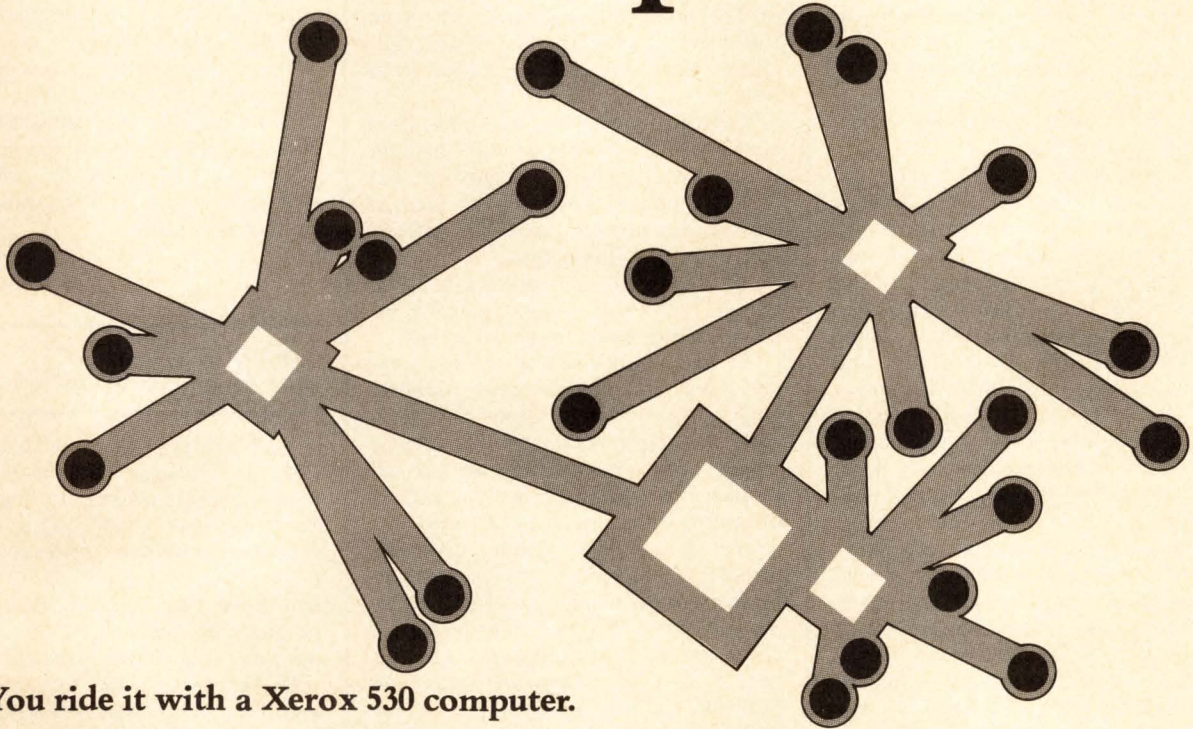
Rumors of FEDNET's death exaggerated

While V.P. Ford has on the surface quashed FEDNET, the GAO's packet network slated to link almost a dozen local dp centers, government insiders say work goes on within the federal bureaucracies. The communication net itself has been broken from the integration plan. And should that move fail, chances are the local machines will get communications gear and be wired over regular old common carriers like the phone system.

DEC readies a line of new terminals

When Digital Equipment Corp. announced its plans to play harder in the peripherals game, one of the products that got emphasis was an inexpensive crt with hard-copy unit option. It looks like there is a lineup on their drawing boards that will compete with everything from the dumbest tty-replacement units through the Datapoint-type smarties. The firm is tired of timesharing users (who often run on a DEC-system-10 without knowing it) being ignorant. By the first of '75, chances are lots of onliners will see that DEC nameplate on their desks.

Xerox introduces a rapid transit system for computers.



You ride it with a Xerox 530 computer.

**And you really move data from where it is to where it's needed.
(Like branch offices to headquarters. Or vice versa.)**

Introducing IDEN: Interactive Data Entry Network. Our sophisticated new system of distributed information processing. Probably the quickest and most flexible way to get pre-edited, clean data available today.

IDEN is so advanced that it provides you with a framework to handle a myriad of jobs concurrently—data entry, inquiry/response and intelligent remote batch processing, to name a few. Yet IDEN is so simple to use that an order entry clerk can become an information processing pro in one day.

It's economical enough to meet your information requirements for today. And flexible enough to handle the growth you plan for tomorrow.

If your company has a long range plan for information management, IDEN is the rapid transit system that can take you there. All you have to do is climb aboard.

We can show you in detail what all this can mean for your company. Call us at (800) 421-6882. In California call (213) 679-4511, ext. 950. Or write Xerox Corporation, Dept. I 5-10, 701 S. Aviation Blvd., El Segundo, California 90245.

NEWSDATA

NBS looks at impact of automation

"Does automation technology lead to an increase in human freedom or a decrease?" asked Ben Bova, editor of *Analogue* magazine.

That depends on who you are, answered Dr. Michael MacCoby, a psychologist whose work concerns the social and personal effects of our technologically accelerating society. We tend, he fears, toward a two-class nation: Technocrats who have come out "winners," tied by business and personal links into society's power grid, and "losers," socially passive persons who may find that personal or vicarious violence is the only relief from an otherwise dreadful and dull existence.

During the third week in May delegates congregated at the National Bureau of Standards to discuss problems and issues that will confront us all—most strongly the government—during the next few years. Anticipating problems, with the hope of preventing them, is a role of an active government. Dr. Ruth Davis, head of the Institute for Computer Science at National Bureau of Standards is leading that effort.

The conference is one of several events that is designed to shape public and legislative opinion during the coming months. Recently there were presentations on computer threats to privacy. While these sessions continue, NBS is opening up additional channels between technologists, social scientists, industry and labor leaders, and legislators. The social impact of automation is the latest issue to receive the attention of the energetic Bureau.

The May panel, a group gathered to open up government and public imaginations to all the various impacts of computers on our lives, was chaired by Wil Lipkowski, science editor of McGraw-Hill's Washington news bureau. The selection of a journalist as a coordinator underscores NBS's sensitivity to media coverage of the issues that will lead to legislative action. Others at the seminar included Gus Tyler, of the International Ladies Garment Workers Union, Dr. John

McCarthy of Stanford's Artificial Intelligence Lab, Lou O'Leary of AT&T, and Daniel DeSimone of the Office of Technology Assessment. Others on the panel included Ben Bova, Michael MacCoby, and Jim Albus from NBS.

Raising many more questions than answers, the panelists brought to light several of the challenges government and the public will have to face as automation impacts factories, offices, and even our home lives.

"If robots do our work," asked Jim Albus, "how can people get the income? Who owns, who controls?"

At issue is our system of economics, based on ownership of property and the exchange of goods and services. We may have some time to find a new economics before we are all replaced by machines, but the effects of automation are with us now.

We may write labor contracts promising lifetime employment to humans or face new Luddites. There are already numerous instances of computer center vandalism. The recent New York newspaper settlement indicates the direction of labor in the face of automation's threats. Will similar pressures be felt in automobile, steel and other basic industries? Waiting for the other shoe to drop is unpleasant for business and government alike.

The stresses produced by increased levels of technology may be greater in less technological industries. Lou O'Leary of AT&T explained that his firm is able to deal with the effects of automation because they are well-understood. Employees of AT&T are planned into rather than out of changes in that company's way of providing service. But even in such a sophisticated environment, the efforts that must be made to treat people fairly are considerable and not always successful at first.

Gus Tyler, of the ILGWU, feels that the impact of automation may eliminate jobs of production workers, but that increased production and particularly mass production leads to vastly complex methods of distribution. Distribution—and in general the service sector of the economy—will remain a human endeavor, according to Tyler, and absorb the displaced manufacturing employees.

Ben Bova noted that many examples of social progress are rooted in technological progress. American slavery, said Bova, was eliminated more by the steam engine than by any political effort. His outlook is a long-term one, and he readily admitted that transitions were difficult for society, even progressive ones.

A full report on the conference will appear in a forthcoming issue of this publication.

GSA charges poor standardization efforts

The General Services Administration, in a report to Congress, has charged that efforts to standardize data elements and codes used in federal computer operations have been "slow and not very successful," and have been hampered by a lack of direction from the Office of Management and Budget (OMB).

In the report, the GSA stated that an effective standardization plan could lower federal dp costs "by eliminating unnecessary duplication and incompatibilities in collecting, processing, and disseminating data." It noted that communications gaps stemming from diverse agency codes frequently make it difficult to consolidate data from the information systems of the various agencies.

The report identified the Office of Management and Budget as the agency primarily responsible for standardization. The GSA report, however, charged the agency with giving "the data standards program a low priority" and with committing "only limited resources to it." Because of lack of leadership from the OMB, the report continued, separate agencies including the Defense Dept., the Veterans Administration, HEW, and others, have begun their own moves to affect some aspects of the standardization plan.

Finally, the report recommended that responsibility for establishment and approval of federal dp standards be transferred to the Secretary of Commerce. It said the Secretary should determine where standards would be most beneficial and set up

priorities for standardization; issue policy and provide for preparation of guidelines, methodology, and criteria; assign responsibilities for development of standard data elements and codes; and monitor implementation to assure uniform adoption and use.

Insurance company goes online

The Hartford Insurance Group recently demonstrated a data teleprocessing terminal that links independent agents representing the company directly to its home office computer in Hartford, CT.

There are twenty four online terminals currently installed in twelve states. They print out personal automobile and homeowners policies, completely rated and premiums calculated, within a few minutes after data from the application has been transmitted via the terminal to the home office.

Officials of The Hartford predict that, though the firm has a development lead in the field, such use of computer terminals by independent agents will be widespread in the industry within a few years. The Hartford expects to have at least twenty more terminals installed by the end of 1974.

The terminals enable agents to give faster and more accurate service to their policyholders. They eliminate use of the mails for transmitting applications and policies, and they reduce the chance of error by involving fewer people in handling and processing data.

In addition to using the terminal for writing new business, independent agents transmit policy changes over the system. They also use it to question the computer about the status of policies they issue, to update renewal data, to quote premiums and to communicate with The Hartford's regional and home offices.

The costs of leasing, installing and maintaining the terminals are borne by The Hartford. The company also furnishes operating manuals, and it trains agency personnel in system use. The terminals, IBM 2740-II's, are identical to those in 60 locations around the country which link The Hartford's regional offices to the home office computer through a nationwide teleprocessing network of AT&T leased lines. This network was set up by The Hartford beginning in 1969 and was online countrywide by the end of 1970.

AFIPS sets up privacy committee

A special committee on the right of privacy has been established by the American Federation of Information Processing Societies, Inc. (AFIPS) in response to a recent invitation from Vice President Gerald R. Ford.

"For a number of years, AFIPS has been active in areas involving privacy and data security," stated AFIPS President George Glaser. "However, the new special committee will provide a focus for our efforts on behalf of the US information processing field and allow us to contribute directly to the work of the recently-formed Domestic Council Committee on the Right of Privacy."

Dr. Willis H. Ware of the Rand Corp. will chair the newly formed committee.

"Dr. Ware's international reputation as an authority on information processing and privacy and data security issues is highly merited," Glaser said. "In addition to his far-ranging responsibilities as a member of the Corporate Research Staff at The Rand Corporation, Dr. Ware served as the Chairman of the Secretary's Advisory Committee on Automated Personal Data Systems, Office of the Secretary, Department of Health, Education, and Welfare. As such, he was a key architect of the resulting report *Records, Computers and the Rights of Citizens*." Ware served as the first president of AFIPS.

The invitation from the Vice President was contained in his address of May 9 to more than 4,000 attendees at the 1974 National Computer Conference in Chicago. According to Glaser, informal discussions were held later on May 9 with Philip W. Buchen, Executive Director of the Domestic Council Committee. Mr. Buchen reiterated the Vice President's invitation which has now been accepted as a major commitment on the part of AFIPS.

Datran: joint effort will serve data comm users

In an address before the Thirteenth Annual Iowa Regulatory Conference, Glenn E. Penisten, president and chief executive officer of Datran, emphasized that regulation, competition and monopoly must make positive, rather than negative and destructive, contribution if they are to produce lasting benefits for users of communications services.

Penisten challenged efforts to convert the principle of the natural monopoly concept to a philosophy that the public interest is better served through the provision of all communications from a single supplier. He declared that "any such philosophy is totally unacceptable as a national policy and . . . destructive to the very goals and purposes of regulation. The task of regulation is clearly not the perpetuation or protection of inherited institutional forms and entities at the expense of economic growth and technological change just because they were once right and proper in one set of circumstances."

He noted that the Federal Communication Act was supportive of that view and that the Federal Communications Commission which administers that Act has been mandated by Congress to make certain that the benefits of new innovations and developments are made available to the people of the United States. Penisten emphasized that response to the FCC's Computer Inquiry in 1966 "pointed up, most forcefully, the scope and extent of emerging requirements and the specific shortcomings inherent in the established network to satisfy those requirements in an adequate fashion." The Computer Inquiry confirmed the need for an all digital switched low error rate communications system to meet the exacting demands of data, he said.

Mini-mizing traffic glut on the Bay Bridge

The San Francisco-Oakland Bay Bridge used to be a rather hectic experience during the morning rush hour. Today it's not quite a picnic, but it is much improved by a new, computer controlled traffic metering system installed at the Oakland end of the bridge.

Simply stated, 17 lanes coming out of the toll plaza merge into the five lanes on the bridge. Before coming under control of the metering system, two of the 17 lanes are merged; this still leaves three approach lanes for each lane on the bridge. Traffic in the 15 feeder lanes is held up by a set of 15 traffic signals under the control of a Data General Nova 1210 minicomputer. The mini receives bridge loading information from five magnetometers located at the begin-

continues on page sixty-seven . . .

WASHINGTON DATALINK

by Heather David

FEDNET OR NEP: WHAT NEXT?

Congressmen concerned with the privacy issue are warily watching the General Services Administration to see what the agency will propose as a substitute to the suspended FEDNET government-wide packet switched communications net.

FEDNET was hastily withdrawn when it drew flack from Congress, the White House Office of Telecommunications Policy, the Office of Management and Budget and finally, Vice President Gerald Ford, chairman of the Presidential panel on computers and privacy.

Sen. Sam Ervin (D-NC) said he was still suspicious of the GSA, whose reaction when faced with criticism, was to change the project name from FEDNET to CDN (Computer Data Network) and then to NEP (New Equipment Project). "Administrator Sampson . . . still had not grasped the serious issues of privacy raised by FEDNET, as well as the role of Congress in policy decisions in this area," Ervin said. "This is not a decision to be made on an administrative level. Much more is involved than a simple decision to purchase a computer . . . such a substantive decision ought to be made by legislative bodies only after extensive public debate on the subject." He added, "What is needed is a national policy on computer data exchange in America."

GSA PUTS BIG COMPUTERS BACK ON FSS LIST

The General Services Administration dropped initial plans to take IBM, Univac, and Honeywell large-scale computers off the Federal Supply Schedule because time was too short to make radical changes before the beginning of the fiscal year July 1. GSA will consider the move for the 1976 schedule, officials said, with an eye to creating greater competition among computer vendors.

GSA TO LIST THIRD PARTY LESSORS

The General Services Administration has set up a data base of the computing equipment inventory available from third-party leasing companies. GSA officials said the data base would be checked before any federal agency is permitted to procure computer equipment sole source off the Federal Supply Schedule or by other means. If identical equipment is available, competitive bidding will be required.

GAO ASKS MORE STANDARDIZATION

The General Accounting Office, ever watchful of government spending in adp, says that despite the fact that the government has 6200 computer systems and spends billions of dollars yearly to manage and support them, most data is still exchanged between federal agencies in hard-copy form.

GAO said data transferred between federal agencies should be handled in machine-readable form whenever possible, to take advantage of speed and accuracies available, and to reduce costly paperwork and duplication of data. Although the Secretary of Commerce issued a policy directive last November on a data standardization program, the GAO said it did not foresee a significant amount of automated exchange until additional measures are taken to see that the policy is implemented.

COMSAT FILES FOR SATELLITE DIGITAL SERVICE

Comsat Corp. has filed proposed rates with the Federal Communications Commission for a new medium-speed digital data satellite service called Digisat. It will make available digital data channels at speeds of 2400, 4800 and 9600 bits per second at rates from \$2,700 to \$3,900 to Comsat's International common carrier customers. The new data service will start between the US mainland and Hawaii, and will be expanded into Europe later this year.

AGRICULTURE DEPT. PLANS BIG BUYS

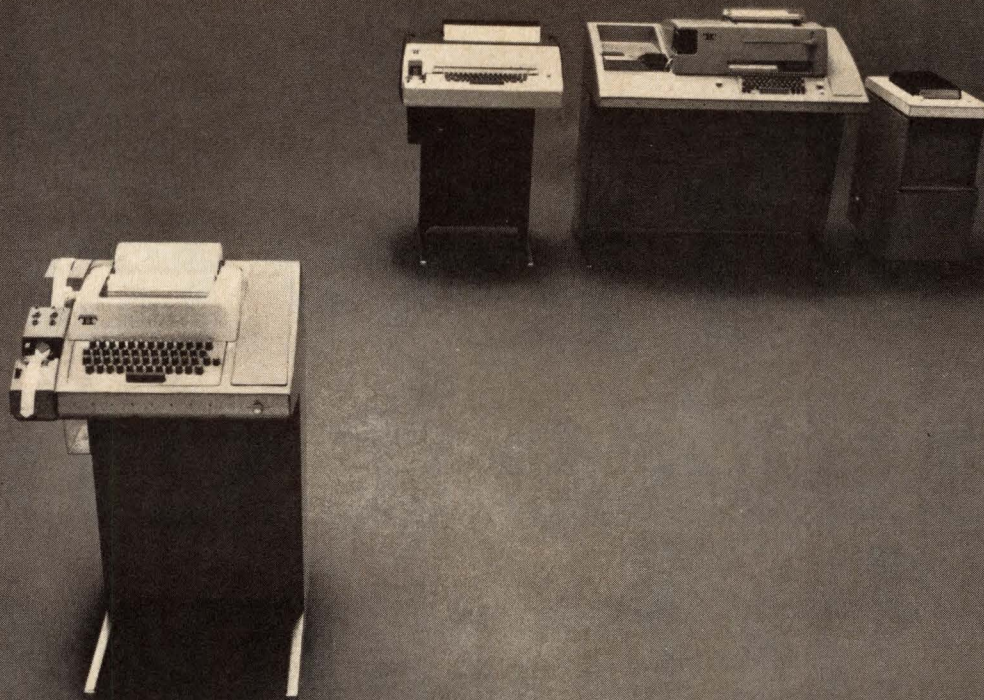
The Department of Agriculture will seek bids for up to 400 remote terminals for its nationwide data system in a procurement delayed by controversy and cancellation of the FEDNET portion. Agriculture now plans to buy something less than 100 terminals in an initial procurement to replace existing installed units, and another 350 or more to expand remote connections to existing computers. The agency is asking for prices for up to 4000 terminals in all, which it could buy over the three year lifetime of the expected contract.

IBM WINS SPACE SHUTTLE SOFTWARE CONTRACT

NASA has once again selected IBM for a major manned spaceflight software program. It will negotiate with the company for a contract for ground based computing and data processing system software design, development and implementation in support of the space shuttle program. IBM estimated a cost of \$11-million for the two year program, beating out Control Data, Univac, TRW Systems, and Computer Sciences for the contract.

PRIVACY STUDY RECOMMENDS MORE BASIC RESEARCH

Basic research to help monitor and understand the social impact of computers should be undertaken, the National Science Foundation has been told. A study called *Toward Understanding the Social Impact of Computers* was prepared for the NSF by the California-based Institute for the Future. It summarizes the work of 60 experts in finance, technology, politics, sociology and economics who drew up lists of the most important questions regarding computers and their acceptance in society.



**As good as the
model 33 is, we're aware
that for some people
it's not enough.**

Our model 33 is the standard of the data communications business for three very good reasons. Economy, reliability and versatility.

Yet we realize some applications require a little more. That's why the model 33 isn't an orphan.

Some of our customers want everything the model 33 offers, but they want it in a wide-platen configuration to accept standard computer fan-folded forms. For them, we make the model 38.

Some customers may have applications requiring an extremely rugged terminal. A

machine that can operate day and night for months on end with little maintenance. For them, we make our heavy-duty model 35.

Still others need a unit that can give them greater speed. For them we build our 4210 magnetic tape terminal. The 4210 is compatible with all our other terminals and can move data on-line at speeds up to 2400 wpm.

Our data terminals are offered in various configurations: models 33, 35 and 38 can be ordered as ASR, KSR and RO units.

It takes more than manufacturing facilities to build the terminals Teletype® Corporation offers. It also takes commitment. From people who think service is as important as sales. In terminals for computers and point-to-point communications.



The computercations people.

For more information about any Teletype product, write or call: TERMINAL CENTRAL, Teletype Corporation, Dept. 94R, 5555 Touhy Avenue, Skokie, Illinois 60076. Phone 312/982-2500. Teletype is a trademark registered in the United States Patent Office.

How to make it small in business.

Don't think big.

When you're working with a computer printout just remember the Xerox 7700 reduction duplicator, and you'll make it small fast.

The Xerox 7700 reduction duplicator with its Computer Forms Feeder automatically feeds, copies, reduces and collates unburst 11 x 14⁷/₈ computer printout into neat 8¹/₂ x 11 sets. At a copy a second. On ordinary paper.

Which means you only need a single ply original to generate copies. Saving you expensive multiply forms, and multiple passes on the computer.

The 7700 also takes care of all your day-to-day copying work. Like making size-for-size copies. Or reducing any oversize document up to 14 x 18 down to a normal size 8¹/₂ x 11.

Of course, when you finally do make it small just remember, it was Xerox who gave you your first big break.

XEROX



INSIDE STORY

Military using nonvolatile semiconductor memory

Although they have only recently exited from the laboratory, the new metal oxide nitride semiconductor (MNOS) memories promise to replace MOS and fixed-head disk and drum memories in certain applications.

MNOS memories are attracting so much attention because they offer small size, low power and, most importantly, nonvolatility. MNOS memory chips are currently available from several suppliers, but entire memory systems are not. Such systems, however, are being developed.

The military is hot for this technology. Development of these semiconductor systems is being sponsored by the Army and the Navy. The most advanced work with MNOS systems is being done by the Army. The work is being carried out by the Westinghouse Electric Corp., Baltimore, MD, and has resulted in an 18-million-bit block-oriented random access memory module (BORAM).

According to Joe E. Brewer, Westinghouse's advisory engineer for the project, the MNOS BORAM is intended to replace electromechanical storage units in military applications. In describing the recently developed module, Brewer notes that data can be accessed a thousand times faster than data in fixed-head disks or drums. Any of 1024 blocks of 2048 bytes can be accessed within 10 microseconds. Further, he stated, data is transmitted and received in bytes asynchronously at rates up to 2MHz.

The module is composed of hybrid microcircuit building blocks which contain 16 2048-bit MNOS memory chips. Each chip contains a fully decoded RAM organized as 64 words by 32 bits, and two 16-bit two-phase dynamic shift registers which pipe data into and out of the memory cells. Retention time for the BORAM exceeds 4000 hours.

The total power dissipation of the module is less than 100 watts, says Brewer, while the power dissipated in the storage section is only ten watts during a read or write operation. The reason for this low power dissipation for such a large module is that power is removed from all chips which are not being read or written. This is possible, of course, because the memory is nonvolatile. Power levels, Brewer continues, are a function of how many chips must be turned on simultaneously rather than of memory size. With careful attention to

system design, he reports, megabit memories with one watt peak power levels are possible.

Commenting on the increased reliability Brewer notes that current state-of-the-art LSI semiconductor devices can reasonably be expected to achieve a failure rate near 0.1 per million hours. In a power-switched MNOS storage system however, the bulk of the memory is always powered down and chip failure rates near 0.01 per million hours can be expected. This means that MNOS can provide larger and/or more reliable storage systems than other semiconductor technologies.

A comparison of the characteristics of some specific existing military storage systems using the MNOS BORAM shows that in every category except cost the BORAM offers advantages over fixed-head disks and drums. However, as the MNOS technology matures, significant reductions in cost per bit will occur and the storage capacity of modules will increase. These changes, says Brewer, will be brought about by the usual learning curve improvements associated with integrated circuits and by the introduction of higher density chips.

The Army BORAM is only one specific example of an MNOS memory system. Other module designs can be configured to provide different data rates, data formats, power dissipations, retention times, failure rates, and storage capacities. One such alternative is being pursued by the Navy in a contract with Sperry Univac Defense Systems, St. Paul, MN.

According to Charles Beltz, supervising engineer, the Navy is looking for a BORAM to use with its All Application Digital Computer (AADC). The memory will be used to store microprograms.

Unlike the large module being developed by the Army, the Navy unit will only be a 1.15-megabit device, organized into 32-k words of 36 bits each. It will be fabricated from 2-k chips. In describing the Navy module, Beltz notes that data are transferred in blocks of 256 words. Access time to a block of data is 2 microseconds; transfer time about 42 microseconds.

Although these memory systems are not yet available on a commercial basis, it appears that they may be in the not too distant future. The availability of 4-k chips in 1974 make 100 megabit modules feasible. Eventual growth to 1000 megabit modules is within the capability of the technology.

—JHG

Cut your runtimes in half with Varian's new V-74 $\frac{1}{2}$.

The new fully-optioned V-74 which we call the V-74 $\frac{1}{2}$ can do that, and more. Pick your program, and watch the computer race through in half the time you expect. (If it's double-precision floating point, the V-74 $\frac{1}{2}$ can float through in a tenth of the time.)

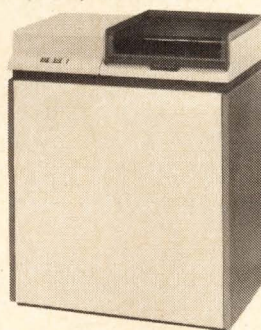
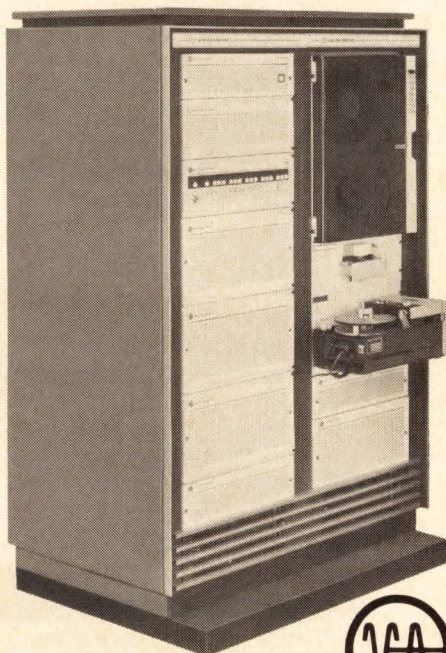
What's the secret? None, really. Just a synergistic combination of hardware, software, and firmware enhancements. Like 64K bytes of 330-nanosecond semiconductor memory. Varian's async memory bus allows you to intermix core and semiconductor at full speed in any ratio.

Then there's the new Varian VORTEX II operating system, with the fastest, most sophisticated FORTRAN IV compiler in existence. Memory can be expanded to 256K, with full hardware memory protection, optimum allocation, and dynamic relocation of multiple tasks.

But for real speed, you can go into overdrive with Varian's new firmware, specially constructed to accelerate FORTRAN-compiled tasks. And if you're in a real hurry, take advantage of the new Floating Point Processor that performs all floating point calculations in integrated hardware.

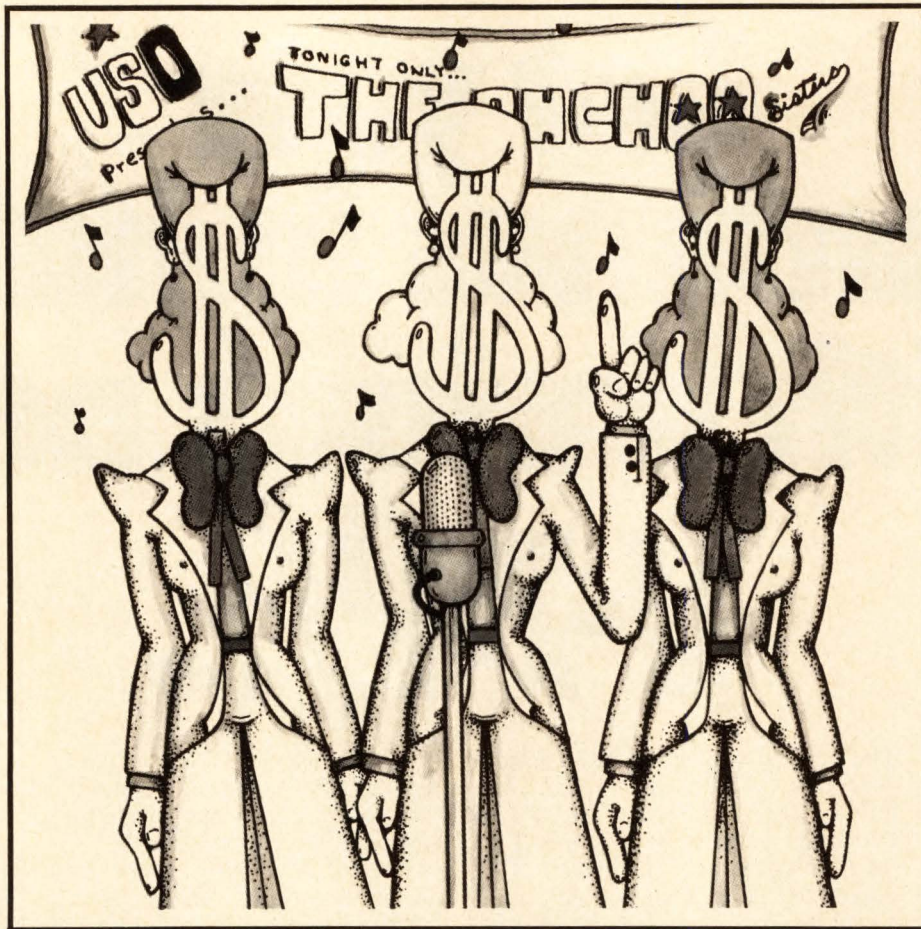
Sound good? Here's the best news of all. You can get the V-74 $\frac{1}{2}$, with all this speed and power, at a price of less than \$50,000. Write today for our "Fast FORTRAN And Floating Point" brochure.

Varian Data Machines, 2722 Michelson Drive, Irvine, CA 92664. (714) 833-2400.



**The mini killers
varian data machines**





The rhythm of the economy

This is the year of the economist. He's number one on government and corporate charts.

Managers' and politicians' heads spin. Wallflower investors wait to dance with the right stock. Brokerage houses sing the low-volume blues. Inflation waltzes away with profits. And the new prophets tell us to tune for a downbeat.

Prognostication is the game. Economists have hitched themselves to the computer for a better look at things to come. At the keyboards of their consoles they are trying to play out the future before it outplays us.

For ten years now scholars and fiscal pros have detailed their econometric models—huge mathematical structures of economic data. Modeling is very effective for, say, predicting the fluctuations in industrial output from data on capital investments and historical production patterns. The popularity of modeling has grown so that now nearly all federal economic policy decisions are based on these predictive pinball machines. Congress has its favorite models, as does the Federal Reserve Board. The President's Council of Economic Advisors similarly uses forecasts as the basis for its recommendations.

Interesting possibilities are awakened as business catches onto using modeling techniques. Subjective approaches to predicting business trends, though unscientific, have for the most part gotten people by. Now, large corporations are using or considering the use of their data bases for planning. Regression analysis—a way to find out which variables count—is catching on

in sharp companies where the computer has risen from the accounting department to the boardroom.

Economic forecasting is still an imprecise art. As such it cannot quell all your anxieties about the future. Nevertheless, you can accurately measure the statistical relationships that exist among the diverse factors affecting the general economy and your business. And while the different schools of economics may never agree on theories, the techniques that have given economists a clearer look at their reality are widely shared. They can steady the manager dizzied by the dervish of the present economy.

In the following pages you'll visit the Brookings Institution in Washington, DC, where economists and social and political scientists play visionaries with a computer. Their research has turned up quite a few surprises. The Administration and Brookings don't always agree.

You'll log-in on General Electric's Mark III time-sharing network and simulate your business on *MAP*, an interactive modeling system. Like the folks at Brookings, you can take a look at tomorrow today.

Across the Atlantic in Warsaw, the Poles have begun to use a business model built at New York University to train their corporate managers. The great Polish management game is scoring big in Socialist industry.

Back near Capitol Hill, Applied Urbanetics is giving computer mapping new latitude and urban planners a better look at social characteristics. It's a better way to get there from here. □

SYCOR INTRODUCES THE SPEED READER.



When it comes to fast data access, our Sycor 340 intelligent terminal with its new Flexible Disk* option has the fastest draw in the West—or anywhere else.

And still costs less than the comparable IBM offering.

Like most models, our new option uses IBM-compatible diskettes. But the similarity ends there. Our Flexible Disk's positioning time leaves the others standing still.

For example, it moves to the center of the diskette (40 tracks) in 117 msec. Ask our competitors for their times.

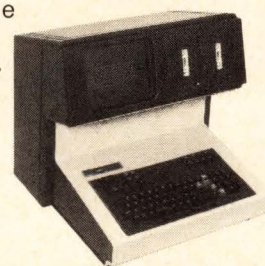
And because it holds two diskettes and either one or two cassettes, our Sycor 340 is the ideal intelligent terminal for order entry applications involving small to medium size customer, salesman and product price files.

It allows you to manage your own mini-database.

Best of all, it can be combined with a host of optional features, including three speeds of printers, a card reader, magnetic tape drives and both asynchronous and binary synchronous communications.

Ask your Sycor representative about our intelligent terminal and its new Flexible Disk option.

The speed reader.



SYCOR



Corporate Offices: Ann Arbor, Michigan 48104 (313) 971-0900. **District Sales Offices:** Atlanta (404) 457-1166 • Boston (617) 890-7290 • Chicago (312) 297-5200 • Cleveland (216) 831-8625 • Columbus (614) 888-8657 • Dallas (214) 521-6710 • Denver (303) 458-0794 • Detroit (313) 355-5770 • Greensboro, N.C. (919) 274-2964 • Hartford (203) 529-1100 • Houston (713) 688-5224 • Indianapolis (317) 784-6779 • Kansas City, Mo. (816) 842-7799 • Los Angeles (213) 640-0120 • Miami (305) 592-1533 • Minneapolis (612) 854-2309 • New York (212) 371-9050 • Philadelphia (609) 665-1170 • Pittsburgh (412) 922-3350 • Portland, Ore. (503) 227-5672 • San Francisco (415) 349-6626 • St. Louis (314) 878-0090 • Washington (703) 527-0200. **Service Centers in 80 cities.** **Canada:** Sycor International Ltd., Toronto (416) 429-0883.

*Patents applied for

The great Polish management game

Converting a management game
to train Polish managers
provides a glimpse into the workings
of a socialist enterprise.

by **Robert W. Blanning, Andrzej Kisiel, David Hay**
and **Myron Uretsky**

For about twenty years management games have been used in the United States and other capitalist countries to train managers in industrial, public, and military organizations. All of these games have contained simulations of the environment in which the managers find themselves. Some of these simulations have become large and complex. Yet few attempts have been made to use a game to train managers in a socialist nation.

But during the past two years, an enterprise simulation to train industrial managers in Poland has been developed. By modifying a model of capitalist enterprise used to train business management students at New York University (NYU) to incorporate the characteristics of the Polish economy, a Polish business was simulated.

A decade ago this conversion would have been impossible; five years ago it would have been difficult. But Poland, like most socialist nations, has been implementing economic reforms for the past 15 years. Their goal is to increase the efficiency of production and to make the system more responsive to consumer demands. This is being done by delegating to lower-level managers the authority to make decisions that had formerly been made at a higher level, and by establishing incentive programs at the lower levels to encourage improved production. The reforms have brought about a degree of decentralization to Poland's industrial system that approaches the growing centralized systems of capitalist countries. This evolution simplified the conversion of the NYU game.

There are five characteristics of the Polish industrial system that required changes in the NYU Management Game. First, in Poland, as in the other socialist nations, almost all production and distribution enterprises are owned by the state, and the managers and workers in these enterprises are employed by the state. An enterprise acquires capital not by equity financing, but by investment of retained earnings, by securing bank credits, and by capital allocation decisions that are made by the central organs of government or are delegated to a lower level.

The second characteristic of the Polish industrial system is that it is considerably more centralized than the US industrial system. In part, this is a consequence of state ownership. However, one purpose of the economic reforms in Poland is to establish a system of decentralized management in enterprises that are state-owned and subject to state direction and control.

The third important aspect of the Polish industrial system is the four principal markets for consumer non-durables: Domestic urban markets, domestic rural markets, foreign socialist markets, and foreign capitalist markets. Each market is distinct and the differences are reflected in the various products and marketing strategies appropriate to them. In addition, Poland must give preference in foreign trade to other socialist nations because of long-term trade agreements.

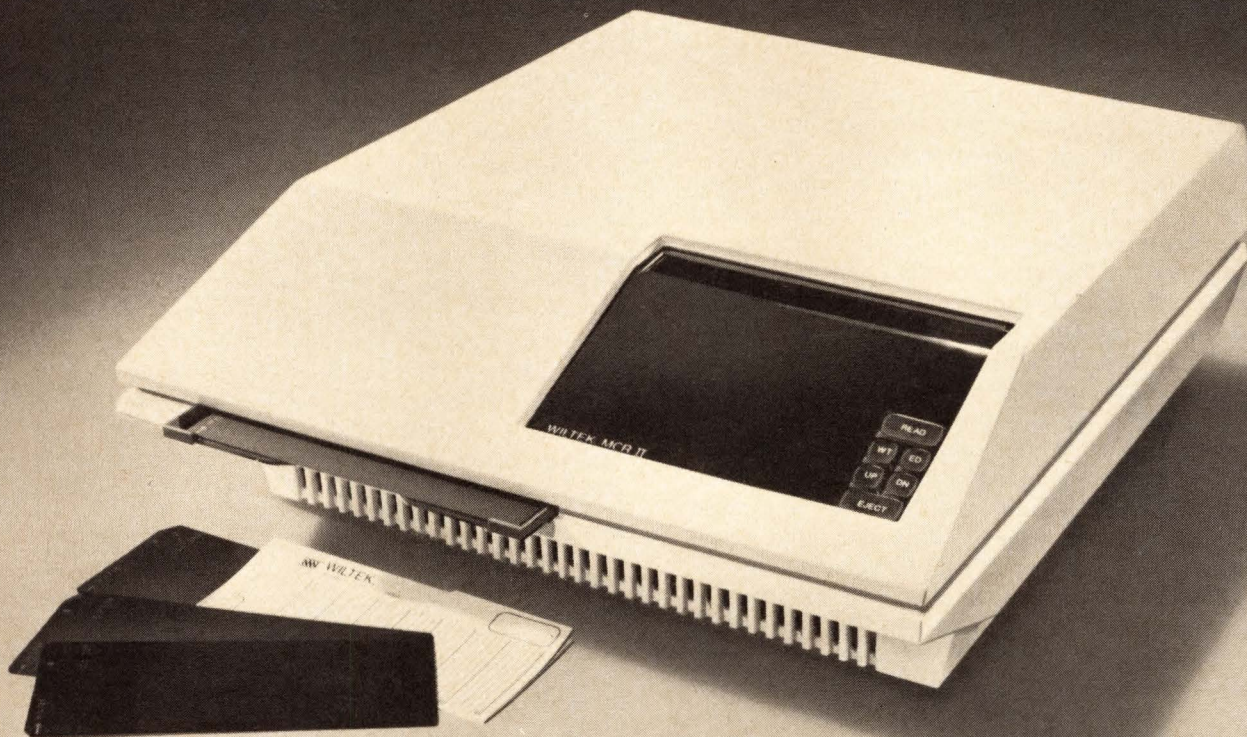
The fourth feature is that Polish industry is more labor intensive and raw material intensive than its capitalist counterpart. Products marketed in Poland also are less price-sensitive than those in the U.S.

Finally, the Polish accounting system differs significantly from the industrial accounting systems used in the United States. The principal difference is that the Polish accounting system makes use of a variety of funds. A fund is an identifiable amount of capital set aside for a specific purpose. The transfer of capital from one fund to another is tightly controlled. In this respect the Polish accounting system is similar to US municipal accounting systems, which contain funds that help the legislature to regulate the expenditures of the executive.

Rules are made to be broken

To convert the NYU game into its Polish equivalent it was necessary to change the game procedures. Three types of changes were necessary, corresponding to the three principal components of each game: The manufacturing component, the marketing component, and the financial and accounting component.

The production component required few modifications. Most major production decisions in an enterprise (such as the production mix, the size and timing of



Wiltek introduces the new MCR II Magnetic Card Reader/Recorder

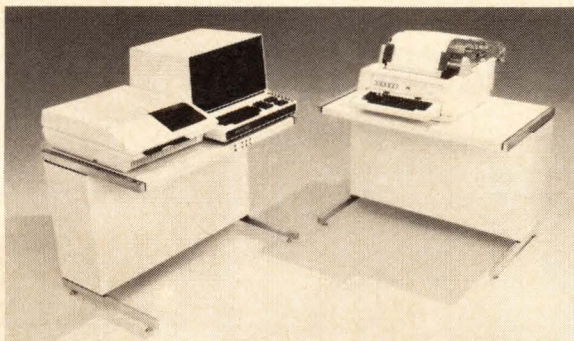
**It's so good,
we built an entire
system around it.**

Wiltek's new MCR II Magnetic Card Reader/Recorder turns the standard 3" x 7" mag card into the perfect medium for on-site data storage. It lets you put aside old-fashioned edge-punched cards and paper tape forever.

The MCR II moves data back and forth between a CRT and the mag card. It lets the operator store, recall, and update data locally.

It speeds such operations as order entry by enabling the operator to prepare and store much-used formats, then call them up as needed. Each card holds 6400 characters.

To realize the full potential of the MCR II, we



combined it with our Model 500 terminal and a high-speed printer. The result—Wiltek's System/500.

System/500 gives you the speed and comprehensive editing features of a sophisticated CRT. Plus fully automatic batching and high-speed transmission.

System/500 makes data handling and transmission faster, more efficient, and more economical than you ever thought possible.

Could the MCR II and System/500 improve data communications for *your* company? Find out. Contact Jim English at Wiltek, Inc., Glover Avenue, Norwalk, CT 06852. (203) 853-7400.

WILTEK

INFORMATION RETRIEVAL NUMBER 15

Polish game. . .

(continued)

raw material orders, and the scheduling of jobs) are now being made by the enterprise directors in consultation with the branch union managers. The only significant changes were in some of the parameters and in the labor negotiations. Production parameters had to be modified because the production process in Poland is more raw material intensive and more labor intensive than in the US. Labor negotiations in Poland are conducted at a level higher than the branch union so were eliminated from the game. However, maximum allowable overtime must be approved by an external participant representing the labor union.

Marketing decisions in Poland have not been decentralized as much as production decisions have been. Prices are set by the branch unions. But a Central Price Commission establishes pricing rules that determine upper bounds for prices of consumer goods sold domestically. No bounds are established for prices of products sold outside of the country. The appropriate ministry, in conjunction with the Ministry of Foreign Trade, establishes desired quantities of socialist and free market currency that must be realized in sales revenues by each branch union.

In the Polish game, prices of domestic products are not set by the players. The participants may propose a price, but the final determination is made by the real-world branch union officials. Furthermore, maximum possible prices of new and existing products marketed domestically are established by the branch union, using the rules set forth by the Central Price Commission.

The Polish game further differs from its NYU counterpart in the variety of marketing regions. The NYU game has four marketing regions. These are domestic regions with slightly different characteristics. The Polish management game also has four regions, but the characteristics differ substantially. There are two domestic marketing regions (urban and rural) and two foreign marketing regions (the socialist nations and the capitalist nations). The principal difference between the urban and rural markets is that urban demand is less price-sensitive and more sensitive to product quality than rural demand. Similarly, capitalist demand is more price sensitive than socialist demand, both domestic and foreign.

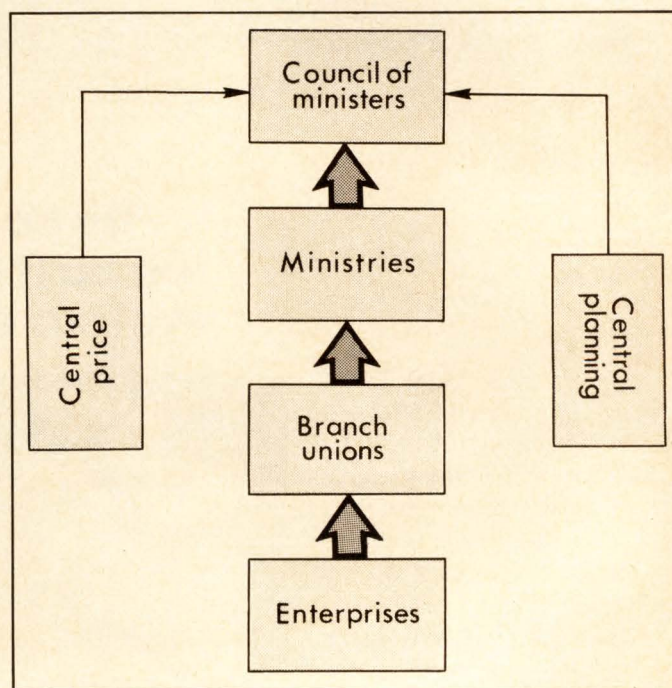
A Polish enterprise may acquire investment capital from three sources—internal funds, bank credits, and categorical grants from the state. Categorical grants do not appear in the Polish version because they are generally used to bring about substantial changes in the capital structure of an enterprise or to initiate the development of a new enterprise.

Internal financing is accomplished through the use of enterprise funds. There are two sets of enterprise funds in Poland: Those included in enterprise costs and those created by a redistribution of profits. The former consists of four funds, three of which are based on a fixed percentage of labor costs: A Social Fund used to provide recreational and cultural facilities for workers; a Housing Fund which provides housing; and a Workers' Bonus Fund. The fourth is the Salary Fund, whose size depends on the value added by the enterprise. The Salary Fund is of special interest to the enterprise

directors, because any deficits in the Salary Fund must be covered by withdrawals from the Management Bonus Fund.

The second set of funds is financed from enterprise net (after-tax) profits. Each enterprise must pay four taxes, two of which are included in its costs and two of which are subtracted from its profits. The distinction is important, because the range of sale prices allowed by the Central Price Commission is based on enterprise costs. Therefore, taxes that are added to costs are reflected in higher prices, whereas taxes that are subtracted from profits are not. The taxes that are added to enterprise costs are a 10% Turnover Tax on sales revenues and a 20% Social Security Tax on salaries. The taxes that are subtracted from the profits are a 5% tax on fixed assets and a 20% tax on salaries. Each year the enterprise pays its taxes and pays from its net profits any investment credits and interest. All short-term and long-term loans are made from banks, which are owned by the Ministry of Finance. The monies remaining are transferred to a Management Bonus Fund and a Company Fund. The latter may be used to increase working capital (cash or inventories of raw materials or finished goods) or fixed assets (new machinery).

Poland's industrial hierarchy



The chief of the Polish government is the premier, who also is the chairman of the Council of Ministers. Twenty-three ministries report to this council. Seven control production enterprises. Though some enterprises report directly to a ministry, some go through a middleman—a branch union. The Ministries of Domestic Trade and Foreign Trade handle distribution and marketing. Some branch unions contain foreign trade enterprises, and some enterprises operate a few domestic retail outfits for better customer feedback.

The NYU Management Game

The NYU Management Game is a simulation of a group of medium-sized, publicly-held corporations that produce and market consumer non-durables in a competitive industry. The players are MBA students in the Graduate School of Business Administration who have elected to play the game in lieu of writing a thesis. The purpose of the game is to allow the participants to experience some of the problems of managing a large organization.

Each firm is operated by nine participants who make production, marketing, and financial decisions. The market consists of four domestic regions with slightly different marketing characteristics. Each week of elapsed time represents from one to three months of simulated time, and the pace quickens as the game progresses. During a simulated month, each firm must make up to 350 decisions: How much to produce; what prices to charge in each of several marketing regions; whether to invest in new machinery; whether to introduce new products; etc. The decisions are entered into the computer program which calculates the consequences of the decisions: Sales, inventories, stock price, etc. Each firm competing with two other firms comprises an industry. The management game can support any number of industries.

The participants interact not only with a computer program, but also with real-world business and government officials who donate their time to assist in the training of the game participants. Each game firm reports to a Board of Directors, consisting of eight senior executives who also are on the boards of publicly held companies or are partners in their firms. The players may obtain simulated capital by negotiating with three banks, a life insurance firm, and an underwriter. The participants file tax returns with the Internal Revenue Service and are monitored by the Federal Trade Commission. If they encounter serious financial problems,

they may be sued before a federal referee.

Two external participants are furnished by the university: Auditors and labor negotiators. Each firm's records are audited, and the firm must negotiate a labor contract that expires halfway through the play period. The auditors and the labor union are played by students taking courses in auditing and labor relations.

The game program is a 15,000 line *Fortran* program consisting of a small main program and 65 subroutines. The program simulates the actions of lower-level employees and the consumer market.

A single one-month simulation of an industry consisting of three firms requires approximately three minutes of cpu time and four minutes of channel time. It takes about 15 minutes to print the output on the line printer. The output consists of an Administrator's Summary and five sets of reports for each team of participants. The input consists of approximately 350 decisions entered on 40 to 50 punched cards. If a particular decision is not made, the program will either set that decision to zero or in some cases, retain the value used in the previous month of simulated play.

The program is structured around a 10,000 element array which describes the state of the three firms, the market, and the economy. The game program reads the array from a file at the start of each simulated month, calculates any changes in the state, and writes the modified array onto the file at the end of the simulation. The Game Director can change any of the elements in the file. However, all decisions of this type are made before the game begins and are not responses to player actions.

The NYU and Polish games ran on IBM 360/50's in New York and Warsaw, respectively. The NYU program runs in a 140k partition under OS/MFT with HASP, and the Polish program runs in a 132k partition under OS/MFT without HASP.

Although internal funds are the principal method of paying for business activities, financing may also be obtained through bank credits. An enterprise may negotiate a line of credit with a bank for a specific purpose. Both the rate of interest and the repayment period depend on the purpose of the loan.

Problems of conversion

The changes required substantial reprogramming of the financial component of the NYU game. Changes also were reflected in the accounting component. Reprogramming of the accounting component was complicated by two features of the Polish accounting system: The organization of accounts is significantly different from the organization used in the United States, and certain transactions require entries into several accounts.

The most difficult task during conversion was modifying the model so that the simulation appeared realistic; that is, to make the simulated enterprise look as much as possible like a real Polish enterprise. This kind of realism can occur only if the information received and decisions made by the players are similar to the information received and decisions made by a Polish industrial manager.

Complications arose in two other areas. Simulating an economy without understanding the workings of the system is difficult. Although certain interactions between the business model and the Polish economy were omitted from the final version of the game, it was necessary to understand the interactions enough to decide what merited omission or inclusion.

Linguistic problems appeared while translating the computer program. The output statements had to be modified or in some cases rewritten: A single English word often translated into two or three Polish words. Since many of the English-language statements were arranged in tabular form, the translation of output led to time-consuming formatting problems. □

Mr. Blanning is assistant professor of management at the Wharton School, U. of Pennsylvania. Mr. Kisiel is a senior specialist in the Industrial Economics Department of the Institute of Management Development in State Administration in Warsaw. Messrs. Hay and Uretsky are with NYU's Graduate School of Business Administration, the former as technical administrator of the game, the latter as professor of computer applications and information systems.

DECsystem-10.



The timesharing computer that's years ahead of whatever's in second place.

The DECsystem-10. Digital's big one, at prices running from \$300,000 to \$2 million.

It can save your organization a bundle, just as it has hundreds of others.

It's not just the price, but what you get for the price.

For as little as \$300,000, you get a powerful 36-bit machine with 64K words of core, magnetic tape, 25 million-character disk line printer and 16 communication lines.

You get an advanced design that's been eight years in the making, and includes features like dynamic core management, virtual memory, multiprogramming, real-time control, reentrant software, shared files, seek and latency optimization, multiprogrammed

batch, synchronous remote stations and associative memory page addressing.

You get tremendous programmer productivity that you can only get from interactive timesharing computers, on the order of 6 to 1 over batch systems.

You get smooth expansion up to 128 users by simply adding additional hardware.

You get extremely flexible operation with batch, interactive EDP, real time and timesharing all running at the same time, using a rich variety of languages and operating under an incredibly simple human-engineered job control system.

And you get the confidence that goes with the name Digital, world's

leader in timesharing with a thousand large and small systems already installed, far more than any other computer manufacturer.

If you want to see what a real timesharing computer's all about, you owe it to yourself to see a demonstration. Anytime.

Anywhere.

For the new DECsystem-10 information kit, write Digital Equipment Corporation, Marlboro, Mass. 01752. (617) 481-9511.

European headquarters: 81 route de l'Aire, 1211 Geneva 26. Tel: 42 79 50. Digital Equipment of Canada Ltd., P.O. Box 11500, Ottawa, Ontario K2H 8K8. (613) 592-5111.

digital

Mapping with computers

by Thomas C. Miles
Applied Urbanetics, Inc.

The Census Bureau can provide more than ten million pieces of data to describe the population and housing characteristics of a single county of 100,000 people. Other national and local public agencies can easily dump another fifty million pieces of data on top of that. But all these data are useless without a way to get them out and use them effectively to answer questions or solve problems. Computer graphics and mapping techniques provide very effective ways of transforming large data bases like these into forms that reveal relationships and interactions that otherwise might be overlooked, besides supplying the data in a format that is easily interpreted.

Work with large data bases has, in the past, been limited simply because of lack of time, staff, and funds needed to develop and communicate meaningful results. Efforts toward effective representation of huge data bases currently use a technique called shaded area mapping. But this technique has certain limitations that make it unsuitable for representing multiple data elements.

Early mapping efforts

Shaded area mapping was designed to operate with readily available and reasonably inexpensive computer hardware: Line printers. It was a logical extension of previous experience in drawing maps by hand—shading an area defined by its visible boundaries according to the value of data elements or characteristics under observation. This mapping method has two important limitations, one arising from computer considerations, the other from a comprehension and communication viewpoint.

From the computer standpoint it is obvious that the machine cannot “see” the boundaries of the area within which it must work. The computer requires a machine-usable digitized format which in turn requires the assigning of x-y coordinate values to each point on each boundary on a surface. For a rectangle, this is easy: Four digitized points, four vectors and two distance factors suffice. The boundaries of states, regions, counties, cities, census tracts and service districts do not adhere to the simplicity of the rectangle.

From the viewpoint of comprehension and communications, shaded area mapping techniques are seriously restricted by design and nature: A map shows one thing at a time. That sounds fairly obvious, but less obvious is the restriction this places on understanding. Most quantitative and statistical concepts are derived from multiple factors or combinations of data elements. The basic statistical concept of percent is a good example. In order to derive percent, at least two numbers are necessary—numerator and denominator. The resulting factor can distort the truth

if taken alone since percent effectively “masks” the denominator.

“Masking” is more accentuated when multivariate analyses are employed—multiple factor regressions, correlations or cluster-factor-cohort analysis.

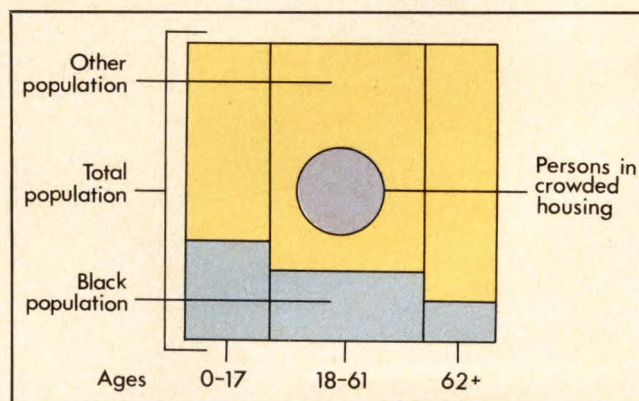
Out of the shade

Shaded area mapping has, then, as its two biggest drawbacks difficulty in simultaneously displaying multiple data elements while still providing clean, readable graphics directly from the computer. These problems are being cleared up with a new approach to computer mapping called symbol maps.

The main advantage of a symbol map over a shaded map is its wider range of display options. There is no technical limitation on the number of data items that may be displayed in a map symbol. Also, there are no technical limitations on the design of the symbol used to display the data. Practical limitations of symbol computer mapping depend upon the ability of the viewer to comprehend the particular concept symbol and spatial display in order to understand the data. Two general types of plotted symbols are used most often: A circle/square symbol and a focus indicator symbol.

Circle/square symbol: The basic components of the circle/square symbol are a circle and square with coincident centers. The square represents a universe while the circle is a subset of that universe. For example, in a map representing social characteristics

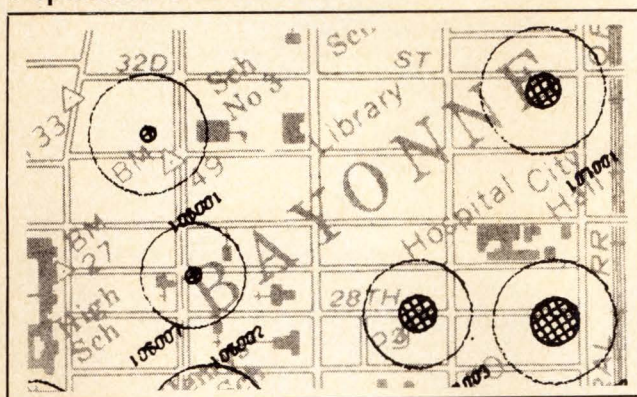
Circle/square symbol



for a city, the square may represent total population and the circle the population living in crowding housing. The radius of the circle is scaled to the edge of the square, depending on the population living in crowded housing. (Above)

The square may be further divided into vertical bars to indicate a breakdown of the data universe

Population distribution



The circle symbols on this map show the distribution of school age children. The full circle shows the total number; the shaded area, children in low-income families.

it represents. Suppose the population of a census tract is divided by age groups. The width of each vertical bar is proportional to the fraction of the total population it represents. Further divisions within each bar can be represented by shading a portion of the bar. Suppose the population of the same census tract is divided into black and non-black population within each age group. The height of the shaded area in each bar is proportional to the black population.

Focus indicator symbol: The basic component of the focus indicator is a circle divided into equal arc fans. The number of fans is determined by the number of data items to be displayed. Each fan is allowed to grow in proportion to its respective data value. An income indicator used in a major data mapping project for the Department of Housing and Urban Development is a good example (Below, right).

This income indicator divides the income of families and primary wage earners into five ranges. The size of each fan represents the number of families and primary wage earners in each range.

The focus indicator is capable of displaying an almost unlimited assortment of values and ranges of data elements. Multiple data sets can be easily viewed and compared. However, mixing percent values and actual number values, choosing characteristics that have widely varying value ranges, and choosing elements that have different conceptual values must be avoided if the interrelationships are to be meaningful.

When actual data values are used in a focus indicator, a decision must be made about scaling the data and the fans of the indicator. The data values may be scaled in two ways: Within each class (e.g. each income range), or all items in all classes together. The former is termed independent scaling, and values in each class or range are scaled separately from all other class values. The latter is dependent scaling, and items in each class rely on items in the other classes.

When independent scaling is used, data values in each class are ranked from the lowest to the highest value. In the indicator symbol, the largest value is represented by the largest fan, the smallest value receives no fan, and intermediate values are ranked in between. The same procedure is applied to each

class interval. Comparisons between data items in independent scaling are limited to values within an interval. Relative fan sizes of the same interval give the viewer an impression of the relative population count in each fan. Comparisons from one interval to another interval may not be made because, although the fans may be the same size, actual values may be different.

When dependent scaling is used, all data values from all classes are ranked together from the lowest to the highest. The lowest value is plotted with no fan and the highest value is plotted as the largest fan. Fan size for intermediate values is determined by the computer.

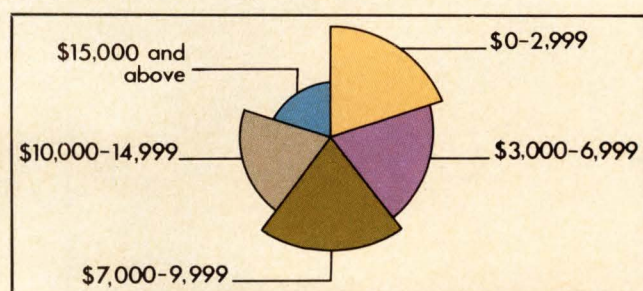
Dependent scaling allows comparisons to be made among all fans in all indicators. The relative fan size always indicates the relative number represented. All elements of an indicator must be expressed in terms of the same base unit for dependent scaling.

While the selection of either independent or dependent scaling determines the relative size of all the indicators, actual indicator size is decided on by the choice between area scaling and linear scaling. When area scaling is chosen, the area of the fan varies. When linear scaling is used, the radius of the fan varies in direct proportion to the data values. If one fan is supposed to represent twice the value of another, area scaling will make the *area* of the first twice as large, while linear scaling will make the *radius* of the first fan twice as large as another.

Linear scaling lets a user directly measure the radii to compare the data values represented. Comparisons among fans of area scaled indicators, however, require the viewer to become accustomed to judging differences in areas of fans. Further, great variation in fan size occurs if there is great variation in the range of data values.

Percent values present a special problem if a focus indicator is used to display them. For example, 2 is 50% of 4, and 25 is 50% of 50. The percents are the same; the numbers are very different. The most useful way to display percentage data in a focus indicator, then, is to display each percent in relation to a base reference percent of that element (e.g., US or SMSA average percent). This requires a reference circle which represents base percents for each data element.

Focus indicator symbol



The focus indicator is a powerful tool for data display when data elements and the map options are chosen carefully. The viewer must read the legend carefully to understand the map so that the proper conclusions may be drawn. □

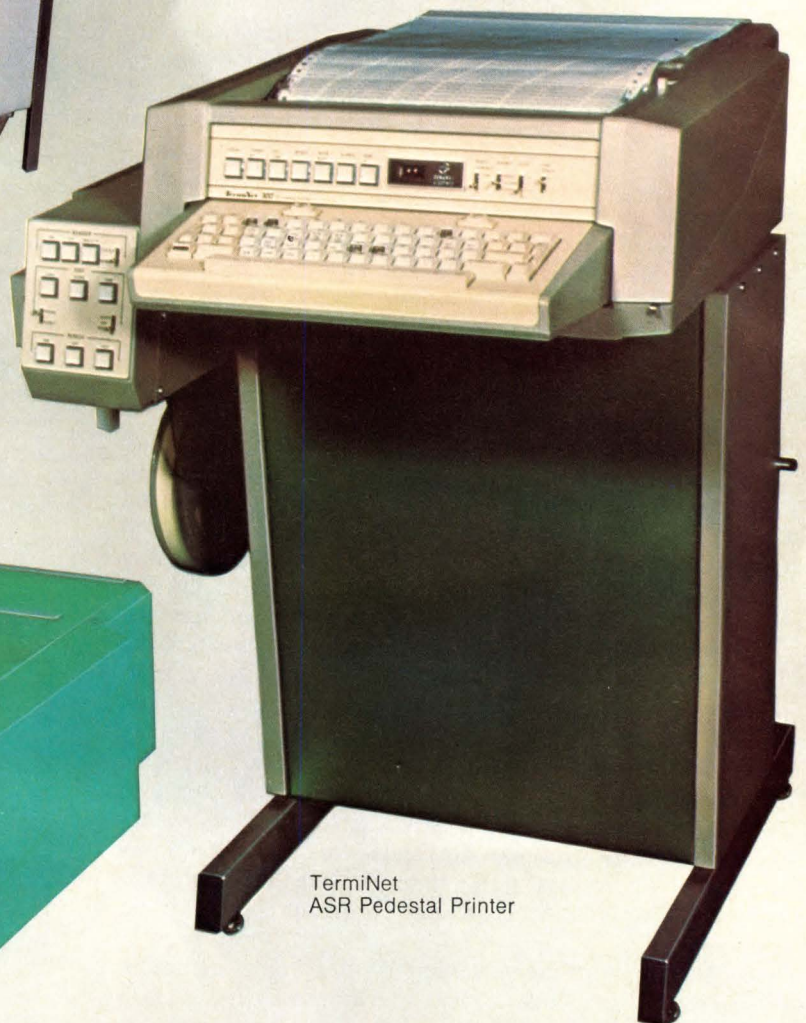
TermiNet 300 SP
Split-Platen Printer



TermiNet ASR
Desk Mounted Printer



TermiNet
ASR Pedestal Printer



TermiNet 300 Printer



TermiNet
Receive Only Printer



Terminal requirements in your data communication systems take on all kinds of sizes and shapes. There are different data distribution patterns. Volume changes from one application to another. Speed, function and configuration requirements are seldom the same. That's why General Electric will continue to expand its line of quiet, high-speed printers and options. Our objective: Offer you diversified products with commonality of components from a single source to meet an ever increasing variety of data communication objectives and eliminate retraining.

TermiNet 300 Printer — 10, 15, 30 CPS. Quieter than a typewriter. The work horse of the line. Designed to give maximum reliable operation.

TermiNet 1200 Printer — 10, 30, 120 CPS. Designed to handle high volume traffic economically. Up to 1200 baud transmission rate optimizes use of public and private lines.

TermiNet 300 Split-Platen Printer — 10, 15, 30 CPS. Two platens operate independently. For any system requiring hard copies for parallel but dissimilar information.

TermiNet Receive Only Printer —

A receive only version of the TermiNet 300, 300 SP, and 1200 printers are available for printing of received data.

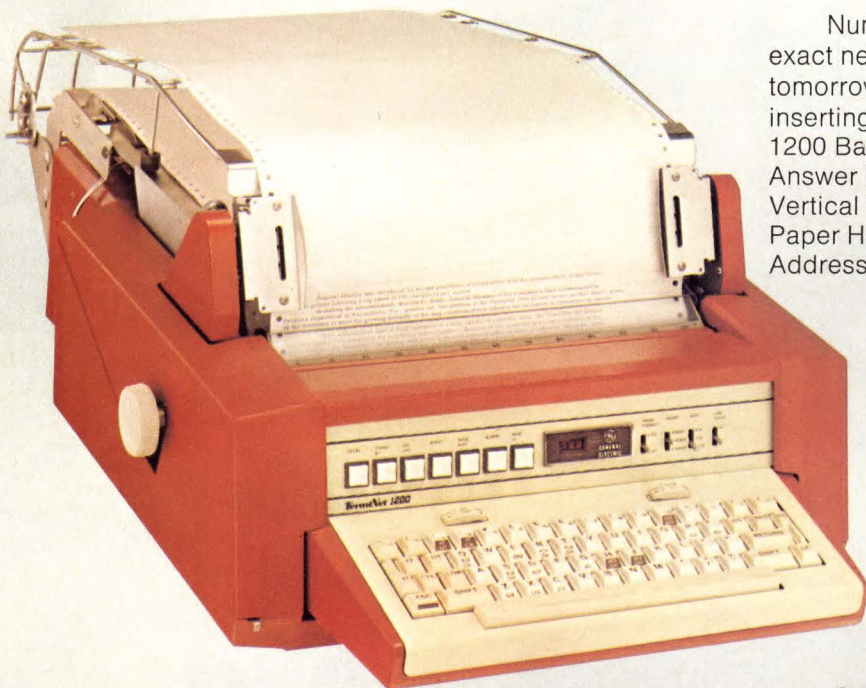
TermiNet Pedestal — Available for the TermiNet 300, 300 SP and 1200 printers. Compact and accessible units offer major savings on premium floor space.

TermiNet Desk Mounted Printer — Convenient work station providing reader and punch operator controls with built-in power supply.

Numerous options are available to match your exact needs of today and your changing needs of tomorrow. Most can be added or deleted by simply inserting an optional plug-in module: 1200 Baud Magnetic Tape Cassette, Numeric Cluster, Answer Back, Horizontal Tabulation, Form Feed and Vertical Tabulation, Parity Error Detection, External Paper Handler, Transparency Switch, Selective Addressing, Automatic Motor Control, Line Control, Form Tray and Restacking Shelf, 1200 Baud Rate Switch, 300 Baud Integral Modem, Current Interface (DATI)

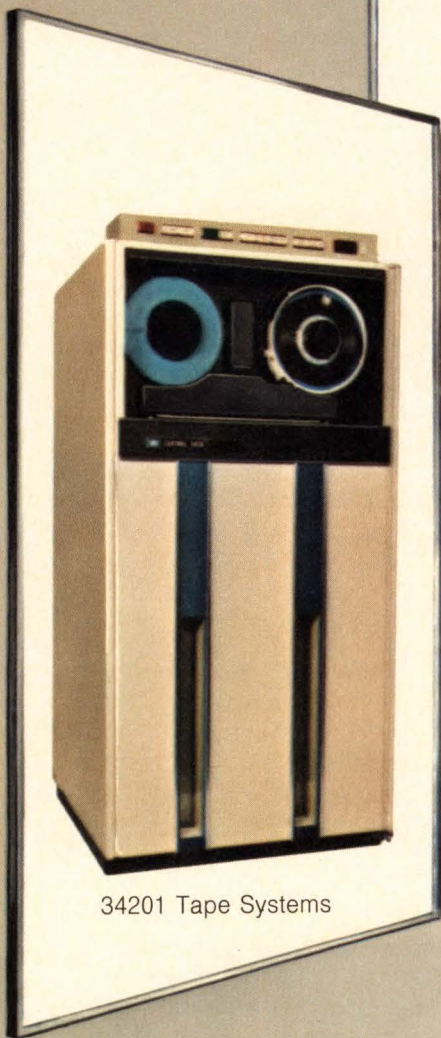
For more information on any one GE TermiNet printer or the complete line, write on your letterhead to Section 794-11, P. O. Box 4197, Lynchburg, Virginia 24502, or let us help you match the right GE TermiNet with your specific data objective, call us collect — (703) 942-8161.

TermiNet 1200 Printer



GE TermiNet printers
Fast·Quiet·Reliable

GENERAL  ELECTRIC



34201 Tape Systems



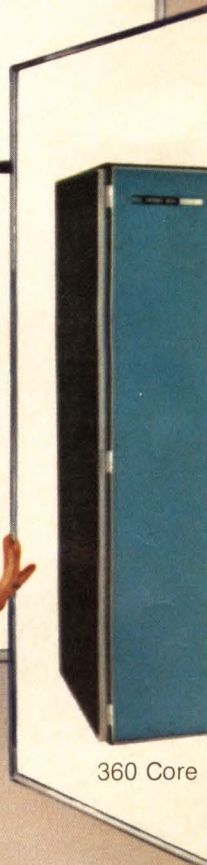
Single and Double Density
Disk Systems



27801 Terminals



370 Monolithic Memory



360 Core



consider all these peripheral advantages from Control Data

Control Data is the only major mainframe manufacturer offering an extensive array of peripheral products for IBM and other central processors...plus worldwide services.

Replacement products often add up to much more than just that

CDC peripheral products usually enable computer users to upgrade system capabilities at lower cost.

In service, your world is our world

We back what we sell with a worldwide maintenance service organization. You would expect to save money by going to your original computer system supplier for any engineering needed to make the most of new peripherals. Actually, chances are good you will do as well or better with Control Data. We will even help with financing, if desired, through our Commercial Credit Company.

Contact your local CDC sales office...or dial our Hot Line collect (612/853-3535)...or write Control Data, Dept. CS-74, Box 1980, Airport Station, Minneapolis, Minnesota 55111.



14031 Printer Systems



OCR Data Entry Systems

CONTROL DATA
CORPORATION

INFORMATION RETRIEVAL NUMBER 25

Second-guessing the federal budget

The computer at the Brookings Institution is doing some interesting things, not the least of which is analyzing the federal budget.

by Larry Lettieri

It's often called "the Administration in exile." A glance at the names on the board of trustees and senior staff leaves little doubt as to the importance of the place. With such notables as Robert S. McNamara, Douglas Dillon, and Charles Schultze in the bridge, the Brookings Institution in Washington, D.C., while it may not make public policy, easily makes waves.

Brookings occupies two unimposing buildings on Massachusetts Avenue—a height restriction placed on buildings in the District lets none overshadow another. No work is secret. Everything is made public. According to its "Program for 1974," the Brookings Institution is "a private, nonprofit organization devoted to research, education, and publication in economics, government, foreign policy and social sciences generally . . . its principal purpose [being] to bring knowledge to bear on the current and emerging public policy problems facing the American people."

The Institution itself is neutral on policy issues—"to safeguard the intellectual freedom of the staff." The interpretations and conclusions of its publications are solely those of the authors. "We don't lobby," says Joseph Pechman, director of the Institution's economic studies program and author of several Brookings' books, "but our research does have some effect. In the past it has worked pretty well."

Making a second policy?

One of the most widely-known and anticipated of Brookings' publications is the analysis of the federal budget. It is not the intention of *Setting National Priorities*, as the work is titled, to raise the Administration's ire. Rather, the book tries to make key budgetary and policy issues more accessible to the public since, as the authors say, "the budget influences just about everyone's job or business, and determines a large part of the congressional agenda."

The fifth volume of the analysis was published in May. It discusses the Administration's budget, examines alternative policies, and compares the budgetary implications of both in the long and short run. The analysis focuses on several major issues that seem likely to foment debate: Economic stabilization policy, changes in defense posture, energy resources administration, federal responsibilities for income support, and national health insurance.

A second very important Brookings book was published on April 15 (though it's said to have been ready early). Entitled *Who Bears the Tax Burden?* the publication is the result of nearly five years' study of an enormous data base.

With a number of tax reform bills making the rounds in Congress, this book will, it is hoped, have some impact on Congressional thinking. "The book does not propose how to change the tax system," says Pechman, a co-author. "It simply says what the system is, and it's up to Congress to decide what to do."

Quite a burden

The tax project was, perhaps, the most expensive project at Brookings. It cost nearly \$270,000 for computer time alone. The research centers on the MERGE file, a data base that combines two basic sources of information on the incomes of individual family units for 1966: The Internal Revenue Service file which contains data from federal individual income tax returns (about 73,000 families) for 1966; and the 1967 Survey of Economic Opportunity (SEO), which is based upon interviews of a sample of the total population in early 1967. The survey was conducted by the Census Bureau for the Office of Economic Opportunity and covered about 30,000 households. No names were provided.

The SEO file contains mostly demographic information, but it also shows some patterns of consumption: How many are home owners, how many cars are in the household, etc. The matching was done by fitting together comparable characteristics found in each data file. Finding a perfect match was unlikely, so it was necessary to establish an acceptable range of major-source incomes from which a tax return could be selected.

"What we did in effect," describes Pechman, "was for every household unit in the [SEO] survey to dig into the tax files and pulled out returns that resembled that survey unit. This gave us a pretty accurate indication of earnings and told us right off the bat what people paid in income taxes."

"From there we estimated what families from different income levels paid out in taxes," he continues. "We were able to tell how much they received in dividends, and imputed corporate incomes on that basis."



This \$66,950* timesharing system gives you two processors and fast response for 32 users.

HP's 2000/F Timeshared Data System has one processor for data communications. Another for the operating system and your on-line data management and computation applications.

Your program segments can run up to 20K bytes long for each of 32 users. High-speed, on-line disc is expandable to 180 million bytes. And you get a BASIC language tailored for interactive use.

By itself or with your existing large system, this innovation works for a living.

You do. So call us.

HP minicomputers. They work for a living.



Sales and service from 172 offices in 65 countries.
1501 Page Mill Road, Palo Alto, California 94304

INFORMATION RETRIEVAL NUMBER 27

*Domestic USA price only.

22421

Second-guessing . . .

(continued)

The demographic data was matched to a tax return using common variables from both. A consumption segment was added to this: An entire set of variables that reflected as closely as possible the spending patterns of a family. If, for example, deductions were made for mortgages, some imputation was done—according to well-known facts about the relationship between home ownership and income—to determine the value of the home. Estimates were made on how much a family spent on tobacco or liquor. Based on these estimates, figures were adjusted to equal the total dollars collected in excise taxes.

"The important thing about the file," Pechman observes, "is that it was the first time we had a distribution of total income that actually added up to the national income. So while we may not be sure about the accuracy, we are certain we are consistent. It's a fair representation of what happens."

What about the results? Who does pay the taxes? The conclusions of the project reflected the effect of eight sets of assumptions. Under all of the assumptions, the authors concluded, "the tax burden is very high at the bottom of the income scale and then drops abruptly until the \$3,000 income level is reached. Between \$3,000 and \$25,000, the effective rates range from 20 to 25 percent of income and then diverge above the \$25,000 level. Under the most progressive set of assumptions, the tax burden rises sharply until it reaches almost 50 percent of income for families with incomes of \$1-million dollars or more. Under the least progressive set of assumptions, the tax burden reaches a maximum of

Where the money comes from . . .

Source	1960		1970		1975	
	Amount	Percent of total	Amount	Percent of total	Amount ^a	Percent of total
Individual income taxes	\$40.7	44.0	\$ 90.4	46.7	\$129.0	43.7
Proposed legislation	...	...	...	...	(-1.9)	...
Corporation income taxes	21.5	23.2	32.8	16.9	43.0	14.6
Proposed legislation	...	...	...	...	(-2.0) ^b	...
Social insurance taxes	14.7	15.9	45.3	23.4	85.6	29.0
Excise taxes	11.7	12.6	15.7	8.1	22.4	7.6
Proposed legislation	...	...	...	...	(5.0) ^b	...
All other	3.9	4.2	9.5	4.9	15.0	5.1
Total	92.5	100.0	193.7	100.0	295.0	100.0

Sources: *The Budget of the United States Government, Fiscal Year 1975*, pp. 46 (n. 2), 297-99, and relevant preceding years; *Special Analyses, Budget of the United States Government*, relevant years. Detail may not add to totals because of rounding.

a. The 1975 figures are estimates. Amounts shown in parentheses for proposed legislation are included in the receipts shown for each tax.

b. The administration has proposed an emergency windfall profits tax that would result in estimated gross receipts of \$5 billion. However, the administration estimates that corporate profits tax receipts would be lowered by \$2 billion under this tax, so the net revenue effect is \$3 billion. In this table, the gross receipts of \$5 billion are allocated to excise taxes. *The Budget of the United States Government* treats the net revenue as a component of corporation income taxes.

Federal budget receipts, by source, fiscal years 1960, 1970, and 1975. (Dollar amounts in billions.) Reproduced with permission of Brookings Inst.

And where the money goes

Category	1960		1970		1975 estimate	
	Amount	Percent of total	Amount	Percent of total	Amount	Percent of total
Defense, space, foreign affairs	\$49.5	53.7	\$ 87.7	44.6	\$ 96.1	31.6
Cash income maintenance	20.6	22.3	46.6	23.7	98.2	32.2
Helping people buy essentials	1.1	1.2	14.2	7.2	33.2	10.9
Aid for social programs	1.3	1.4	10.3	5.3	18.2	6.0
Investment in physical environment	5.4	5.8	9.4	4.8	17.3	5.7
Revenue sharing ^b	0.1	c	0.5	c	6.8	2.2
Direct subsidies to producers	4.5	4.9	6.7	3.4	3.7	1.2
Net interest	6.9	7.5	14.4	7.3	22.0	7.2
Other programs	3.9	4.2	10.8	5.5	23.0	7.6
Financial adjustments	-1.1	-1.2	-4.1	-2.1	-14.1	-4.6
Total	92.2	100.0	196.6	100.0	304.4	100.0
Total as percent of gross national product	18.6	...	20.6	...	20.9	...

Sources: *The Budget of the United States Government*, together with *Appendix and Special Analyses*, for relevant years. Expenditures are reclassified by the authors. Detail may not add to totals because of rounding.

b. Includes small amounts of payments in lieu of taxes on federal lands.
c. Less than 0.05 percent.

Federal budget outlays, by major category, fiscal years 1960, 1970, and 1975. (Dollar amounts in billions.) Reproduced with permission of Brookings Inst.

only about 30 percent for those with incomes of \$100,000 or more."

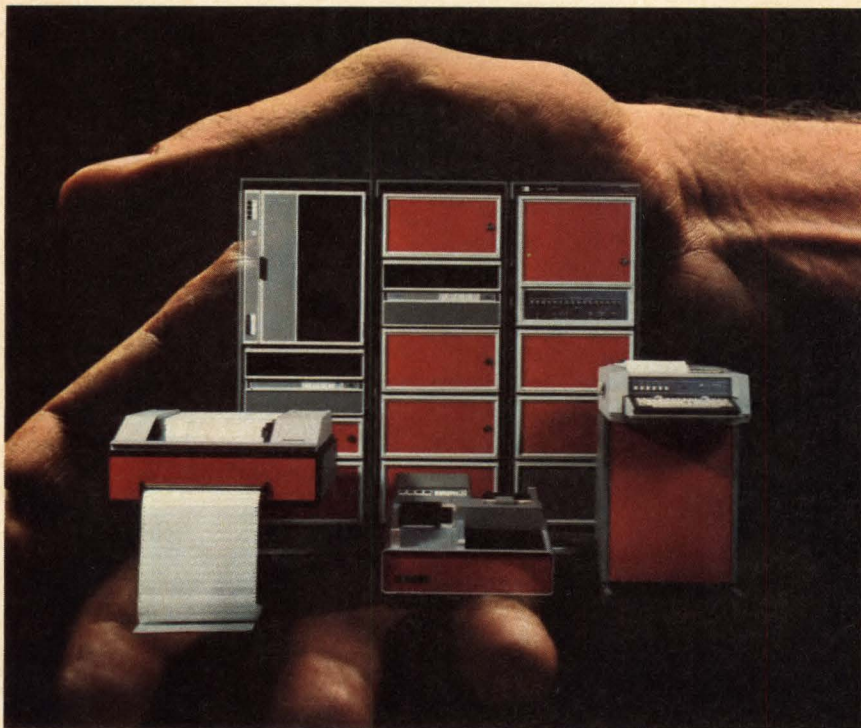
"What this means," explains Pechman, "is that there is virtually no difference in the tax burden—the effective rate of tax paid—for practically 90 percent of the income distribution, say, between \$3,000 and \$30,000. In other words, somebody at the \$30,000 level on the average pays the same proportion of his income in taxes as someone earning \$5,000.

Enter the computer

Research like that done on the federal budget and the tax system relies heavily on computer work. The tax project, for instance, required merging two enormous files, massaging these data, and finally generating reports which cross tabulated many variables. The Social Science Computation Center of the Brookings Institution, then, is an indispensable tool for the economist and researcher.

The Center houses a DECSYSTEM-10 which supports twenty-eight hardwired terminals. Another fifteen terminals access the system via phone lines and acoustic couplers. The system is completely interactive.

Hardware-wise the DECSYSTEM-10 has five five-million-word disks and one seven-track and two nine-track tape drives, all of which are used to input data. DECTAPES also store various applications programs. Since the system is interactive, with most output going directly to the user at the terminal, only one line printer is used. A plotter provides graphics. The system has 128k 36-bit words of core, but a "swapping disk" provides about 450k of virtual memory.



This \$129,500* timesharing system gives you better BASIC than any other minicomputer system. With batch at the same time.

HP's 3000 Model 100 lets you do more with BASIC than ever before. You can intermix integer, real, long precision and complex numbers. Share resources with any kind of peripheral. Call subroutines compiled in FORTRAN, COBOL, and our Systems Programming Language.

In batch you get complete multi-language capability concurrently. And a file system identical to the one used from terminals.

This innovation works for a living.

You do. So call us.

HP minicomputers.
They work for a living.



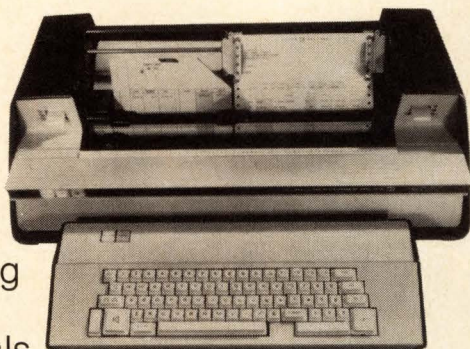
Sales and service from 172 offices in 65 countries.
1501 Page Mill Road, Palo Alto, California 94304

*Domestic USA price only.

22416

INFORMATION RETRIEVAL NUMBER 29

our model 30 applications-oriented printer/forms handler



gives you the
paper-handling
capabilities
of two terminals
for the price of one

What other printer provides these simultaneous forms-handling
features of the Model 30 asynchronous Serial Printer

SPLIT PLATEN: INDEPENDENT LEFT/RIGHT OPERATION typical applications

left platen

- ☐ Journal*
- ☐ Message*#
- ☐ Invoice#†
- ☐ EDP Scratch Pad*
- ☐ Data I/O*†
- ☐ Proof*#
- ☐ Inventory Card†
- ☐ Unit Record Card†
- ☐ Labels*†

*Journal Roll

#Tractor (Pin-Feed) Continuous

†Unit Form — Front Insertion

right platen

- Invoices, Tickets#†
- Passbook Ledger Card†
- Ledger Card†
- Document#†
- Rental Agreement#†
- Check, Deposit†
- Transaction Journal*#
- Control Ledger Card†
- Shipping Document#†

REMOTE CONTROL TABULATION: HORIZONTAL

- ☐ Direct — via program
- ☐ Go to any one of 64 locations — forward/reverse — in one smooth motion
- ☐ Increase data throughput
- ☐ Minimize noise, wear, downtime

REMOTE CONTROL TABULATION: VERTICAL

- ☐ Rapid Line Selection
- ☐ Fast Form Out

FEATURES

- ☐ 192 Character Writing Line
- ☐ Up to Two 8½" Wide Forms
- ☐ Front Forms Insertion
- ☐ Ledger Cards, Checks, Vouchers, Passbooks, or even Intermixed Cut Forms, on Left, Right or both sides of Platen
- ☐ Two Color Ribbon
- ☐ Can be interfaced via RS-232 300 Baud
- ☐ Pin Feed Platens, Friction Feed, Overhead Tractor Feed
- ☐ Optional Keyboard Available

for full details, write or call



OEM PRODUCTS DIVISION

LITTON ABS

Automated Business Systems

34 Maple Avenue, Pine Brook, N.J. 07058/(201) 575-8100

INFORMATION RETRIEVAL NUMBER 30

Second-guessing . . .

(continued)

The Center supplies the novice user with a thorough user's manual. Since many of the people doing research at Brookings will access the computer at some time, the Center keeps everyone up to date with a monthly newsletter.

"The work done on the computer is heavily oriented towards economics," says Barry Bosworth, a research associate in the economics program. "We really use it for two types of problems: One, handling huge amounts of data [like the tax project]; and two, accessing small data sets needing frequent manipulation." Without the routine data manipulations, work like the tax project would be just enormous schemes.

"An awful lot of work involves trying out some particular statistical formulation," says Bosworth, "and seeing what happens. On the basis of those results, you move ahead and do something else."

Simulating money markets

Once an economist or researcher gets his statistical results, "We use them to build models," says Barry Bosworth. "We're currently using our model solution program for simulating the effects of financial policies. In particular we're working with a model of the US capital markets, to try to examine the effects of restructuring financial institutions. The legislation was proposed in 1972 by the Hunt Commission."

Basically, what Bosworth and his associates will do is build and solve a model of the capital market using its current structures. Then, they will change the equations to take account of the new legislation—interest rate restrictions, changes in lending or savings account policies—and solve them. "We'll put in the new equations that sort of represent what we think will happen under the new regulations, and examine the adjustments of the rest of the capital market," he explains.

The results of such models depend entirely upon the accuracy of the statistical equations that the economist specifies, and how he estimates conditions. Accuracy is not at all dependent upon the model being used. Bosworth opines, "It's a long way from being an exact science, but I think modeling is better than nothing."

Ten years ago, in the Sixties, almost no economic policy was based upon the results of economic forecasts. Now almost all federal economic actions are founded in one model or another. The federal government maintains two or three large-scale econometric models. The Federal Reserve Board and the Congress each have one. The US Council of Economic Advisors makes use of forecast results from several models, and from these makes estimates on what it thinks will happen to the economy.

There are as many different predictions as there are prognosticators in the forecasting game. The predictions differ primarily because each forecaster is concerned with a different aspect of the economy. Their models, therefore, tend to stress those areas in which they are interested.

"Economics is still an area of great dispute," notes Bosworth. "People disagree on what they think the

Some people get the picture quicker than others.

Thanks to graphics.

How? Take a look at our 4010 family of low-cost graphic terminals. We'll show you how they cut endless hours of plotting . . . how fast they convert mounds of data into understandable charts, maps and drawings.

Applications? By the hundreds! Today, our graphic terminals are giving new, quick insights to leaders in research, education, business, math and science.

And getting the picture doesn't have to be costly. You can move up to graphics for as little as \$3,995.

There's more. Thanks to our CRT direct view storage screen, you can see clear graphics and alphanumerics in standard ASCII and APL on either 11" or high resolution 19" screens. In minutes they plug into most computers and minis. And our broad-ranging software support turns them on. Copy your results on our dry process, grey scale hard copy unit. Add to that displays, monitors, and paper tape units that enhance your graphics power.

Business forms are programmed and ruled fast with our 4023, the first alphanumeric terminal with

upper and lower case and optional forms ruling.

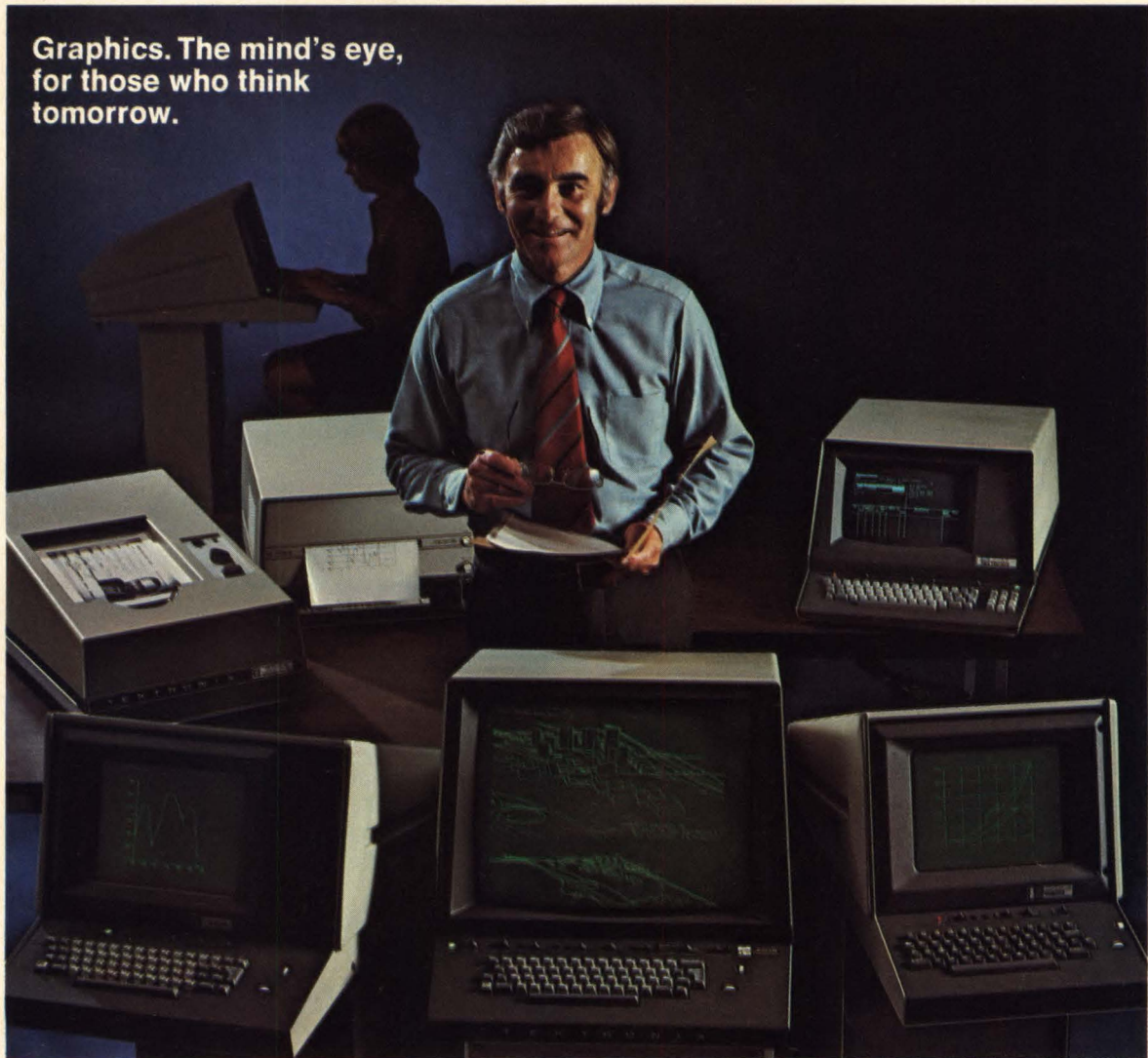
No matter who you are or where you are, our worldwide Tektronix service backs you up. Which is another reason you should get our picture . . . and we should get acquainted.

Tektronix, Inc.
Information Display Division
P.O. Box 500
Beaverton, Oregon 97005



TEKTRONIX®

**Graphics. The mind's eye,
for those who think
tomorrow.**



INFORMATION RETRIEVAL NUMBER 31

Second-guessing . . .

(continued)

correct specifications for some major economic behavior is. So while the models may have the same structure in parts, they have different functional specifications for the determinants." The models do provide a way of testing these differences, though, and give a look at what the possibilities might be for the future.

While there may never be total agreement among economists, the areas of differences do narrow. "For instance," observes Bosworth, "we are much closer to agreeing on what the driving mechanism in the economy is. But as soon as we resolve one area, the economic problems have changed."

As to the effect Brookings' research has on the people on Capitol Hill, Bosworth notes, "They [congressmen] are cautious basically because they question what the impact on the various economic institutions would be. Besides, a model is simply a way of making sure that the assumptions you are making as you examine these impacts aren't contradictory."

Into orbit

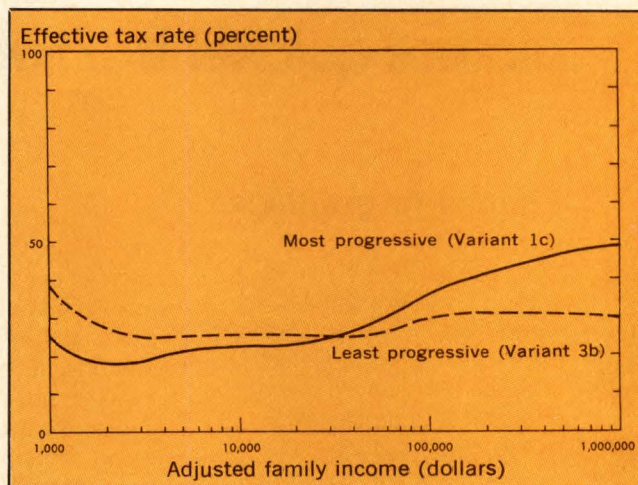
Even when Congressional and Presidential ears are not tuned to Brookings' words, any economic policy changes are felt sooner or later by the business community. What can the business decision-maker learn from the work done at Brookings? For one thing, the Computation Center makes available a very comprehensive parcel of interactive software designed to make the research at Brookings' easier. It can play some part in daily business decisions.

Among the programs in the library is GRAFITI, a graphics program which generates time series graphs and scatter diagrams on the Center's plotter. ICARUS is a regression analysis program useful for large survey files. Its output includes summary statistics—mean and standard deviation—correlation coefficients, for each variable, as well as the regression results. GRATE calculates the annual growth rates of a time series, and takes the yearly values of a series and determines the annual compounded base and a terminal year. But perhaps the most interesting of the Center's packages is an interactive system called PLANETS, designed for the creation, maintenance, and analysis of economic time series and cross section data in a random access environment.

PLANETS is an acronym for *Programming Language for the Analysis of Economic Time Series*. It was developed at Brookings specifically for the Institution's economic modeling projects, but has since been used for a variety of economic and other social science applications. What's so important about PLANETS? Well, as Andy Carron, a research assistant in the economics program, says, "It's primary virtues are its ability to handle a large volume of data—time series and cross sectional—and to perform a wide variety of linear transformations and statistical analyses."

Typically, Brookings uses PLANETS to maintain its two US economy data bases. These are national income (gross national product) data accounts consisting of some 300-plus time series since 1946 arranged quarterly. The time series are updated monthly and

Who pays the taxes?



Effective rates of federal, state, and local taxes under the most and least progressive incidence variants, by adjusted family income class, 1966. Reproduced with permission of Brookings Inst.

quarterly to reflect changes in employment, personal income, industrial capacity, consumer prices—all the variables that affect the economy. This keeps the historical data accurate, and so very effective for constructing an economic model.

"When you build an economic model," explains Carron, "you're dealing with equations made up of time series variables—variables with specific values in many different time slots. What you want to do is see how changing one variable affects the others in that time and in the future." As an example, if a person buys a car today, the dealer is going to order another to replace it. His order is going to reach the plant at some future time. The manufacturer will pay a worker on the assembly line which in turn will give that worker another dollar to buy bread. The model contains equations describing these processes. The processes are interrelated, so too are the equations. They must, therefore, be solved simultaneously.

Currently, Carron is using PLANETS to estimate individual equations which will be used to determine the effects of wage-price controls. "This involves estimating price equations for various stages of a manufacturing process, starting with the raw materials on the wholesale side and ending up with consumer goods," he explains. This system of equations is used to predict what the prices would have been without the controls to see if the controls had any effect.

PLANETS is a statistical analysis program for use by economists and social scientists. But in its present form it would be quite useful to a large corporation. While it's not suitable to maintaining inventory levels or projecting sales, a business could use a program like PLANETS to simulate the activity of its industry in relation to national economic activity. □

Sources: **Setting National Priorities: The 1975 Budget.** By Barry M. Blechman, Edward M. Gramlich, and Robert W. Hartman. Copyright 1974 by the Brookings Institution, Washington, D.C.
Who Bears the Tax Burden? By Joseph A. Pechman and Benjamin A. Okner. Copyright 1974 by the Brookings Institution Washington, D.C.

**Meet a
brand new company
with a 15-year reputation
for reliability.**

**The Components Group
of
Digital Equipment
Corporation.**

**Now you can buy
the components
and peripherals
that support the world's
most popular
minicomputers.**

Separately. In quantity. At extremely low prices.

From us. The Components Group of Digital Equipment Corporation. A new group, formed to supply proven, reliable computer components to the volume buyer at the lowest possible prices.

The products, described in detail on the following pages, are all used by Digital as components and peripherals in the PDP-8 and PDP-11 minicomputer systems, the most popular minis in the world. Our components—like our computers—are designed to deliver maximum price/performance.

Our peripherals can be interfaced readily with all commonly-used minicomputers. Additional products will be available in the near future; product families are planned to provide a range of capabilities.

Until now, if you wanted Digital components, you had to buy an entire system.

Not any more.

Now, if you order fifty pieces or more, you can buy any of these components completely unbundled. Volume buying will get you price breaks you won't believe—just check out the prices on the next couple of pages.

And you can have our components off the shelf. When we've established our nation-wide network of warehouse/depots (due this fall), volume deliveries will be made as fast as we can process your order.

Behind our commitment to deliver stands the entire Digital manufacturing capability—over



two million square feet of manufacturing space in the United States, Puerto Rico, Canada and other countries overseas. These are the same facilities that have produced more minicomputers than any one else, the facilities that manufacture and test the peripherals that support these computers. To meet your demands in the next year alone, we're planning several new plants in the United States and Canada and retooling present production lines to Components Group specifications.

To deliver these components quickly and to maintain our high standard of reliability, the Components Group is planning a network of warehouses. At these depots, products meeting our rigid specifications will be stocked for off-the-shelf delivery.

Our warranty is simple: all hardware is fully warranted for a specified time. If, during this period, any product should prove defective, you simply return it to the nearest depot for fast repair or exchange.

Over the next few years, we expect the cost of computer hardware—especially the cost of the computer itself—to keep going down. Entirely new applications will open up. Volume production of proven components and peripherals enables us to sell at greatly reduced prices. Our low-cost, high-quality products will provide our customers with an opportunity for enhanced profits and a competitive edge in an increasingly price-conscious market.



Terminals and peripherals.

Our cassette mag tape system. Under \$1600 in quantities of 100.

Priced below even paper tape, the TU60 is a truly reliable dual cassette system. We designed it to stand up to repeated use — with cassettes spec'd at a minimum of 1000 passes, and an error rate that's a full order of magnitude lower than most other systems.

Our proprietary cassette design reduces the possibility of hard error. The extra-thick 1 mil mylar tape is specially coated to resist extreme temperature and humidity.

The TU60's reel-to-reel drive increases tape life even more — there are no capstans, pulleys, pinch rollers, or brakes. DC servo-controlled motors reduce stretching and provide precise start/stop characteristics.

To reduce noise interference and ensure that even very low data levels will be read accurately, the TU60 employs an independent high-threshold data block detector and low-threshold data peak detector.

And the TU60 can't accumulate error from tape-speed fluctuation due to power variation or mechanical difficulties: the read electronics adapt themselves to the tape speed by means of a phase lock loop. Other error-reducing features include redundant dual-track recording, automatic leader detection, and CRC-type error control.

Because the TU60 places the burden of recording-reliability on its electronics, not its mechanics, less maintenance is required to keep the system in good working condition. And when maintenance is necessary, it's no problem. The top flips open, everything is accessible, and the two main modules can be replaced in minutes.

Our new DECscope video terminal. Under \$950 in quantities of 100.

The VT50 is the most inexpensive CRT display terminal in the world. It'll give you fast, quiet alphanumeric video capability for the cost of a slow, noisy teletypewriter. Hardcopy output is available too, with our optional low-cost copier.

For a groundlevel budget price, you get 12-line, 80-column good-quality display — 64 ASCII-

standard upperface characters, each on a 5x7-dot matrix. After displaying 12 lines, the page scrolls upward from the bottom; its speed can be adjusted by the user.

The keyboard is an easy-to-use, audible, type-writer-style board, with 3-key rollover to permit fast typing. Our optional copier fits right into the desktop display cabinet.

The VT50 is fast — a full range of baud rates are switch-selectable up to 9600. Interfacing is with a standard 20mA current loop, with inexpensive EIA option.

Installation is easy, just plug it in. The VT50 has few moving parts, so maintenance is simple. Its keyboard is the same field-proven model we use on the LA36 teletypewriter. And its low heat output means no fans, less noise, and low power consumption.

At such an incredibly low price, the VT50 will go far. And fast.

Our remote terminals. Starting at less than \$600.

The RT01 and RT02 terminals provide easy, low-cost interactive data entry and retrieval.

Uncomplicated keyboards make it easy for untrained personnel to enter or retrieve data. There's no need for confusing, numerically-coded instructions. The RT02 will even prompt the inexperienced operator by spelling out on the display what information is needed next.

The RT01 displays up to 12 digits of data in a Nixie™ numeric readout. For non-numeric response, it has programmable status indicators. The 16-key pad will input 30 ASCII characters.

The RT02 costs more and gives you more. A 64-character gas-discharge alphanumeric readout that displays up to 32 characters at once. 16-key or 58-key input. Interactive display prompting.

Both terminals are ASCII-compatible, so you can interface them to any computer with a Teletype™ port. EIA modem interface is also available.

Both have simple displays and few moving parts, for built-in reliability and ease of maintenance.

Logic modules and interfacing.

Digital is the world's largest seller of solid-state modules. We give you the widest choice you can get — over 400 pretested modules, most of which we use ourselves, in our computers and controllers. We also carry a full line of compatible hardware, power supplies, plug-in boards, cabinets, racks and related equipment.

If you do your own interfacing, our Logic Products Handbook and Logic Systems Design Handbook will provide general support and solutions to specific standard problems. The Components Group will also supply, in volume, custom interfaces, custom modules, and custom variations of our standard terminals. Complete descriptive literature on any of these topics is available.

M Series modules.

These high-speed logic modules for computer interfacing use monolithic TTL circuitry to give you high speed, high fanout, large capacitive drive capability and excellent noise margins, in frequencies up to 6MHz. Some of our newer M Series modules also employ current MOS technology.

K Series modules.

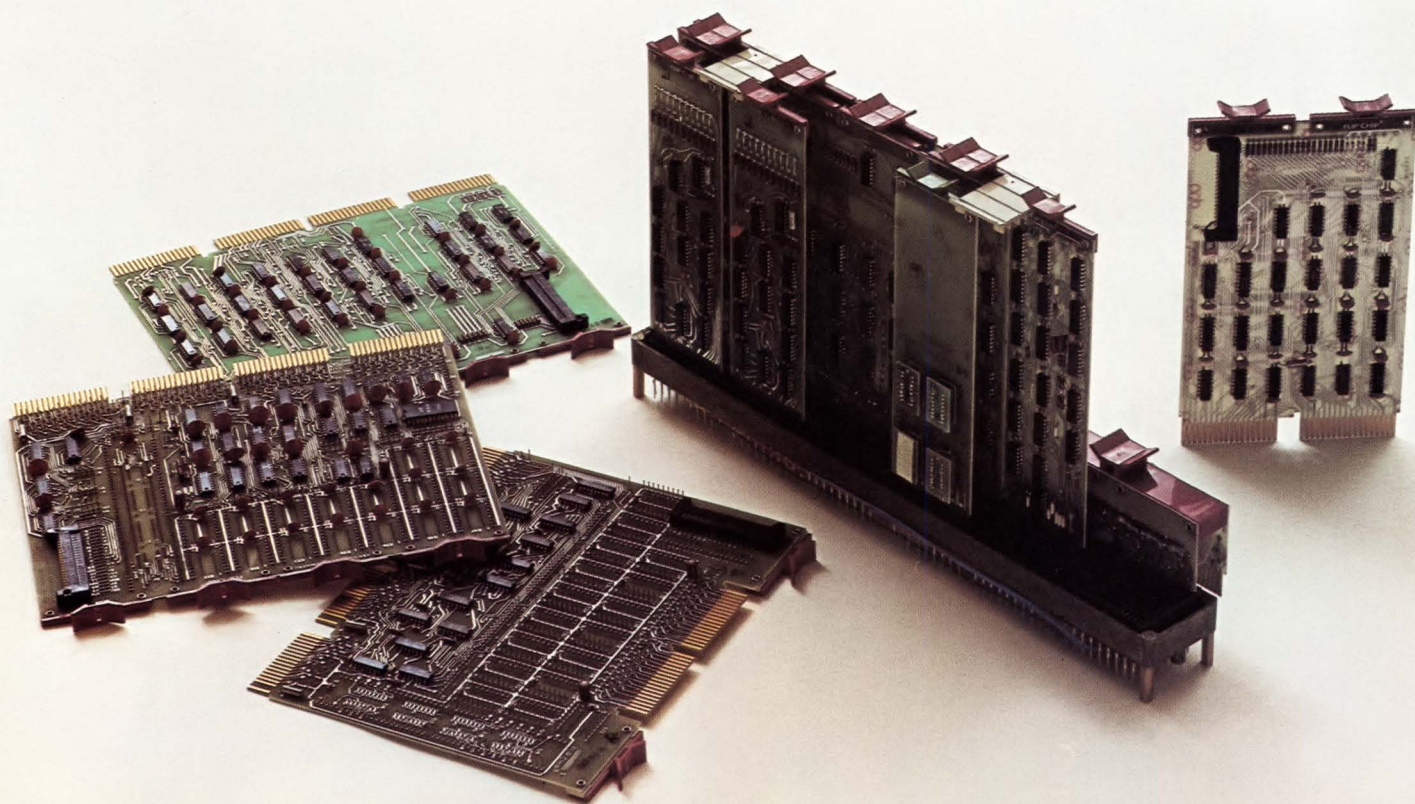
These noise-resistant modules are principally used for industrial control applications where noise-resistance is more important than speed. Frequencies from DC to 100KHz are typical, 5KHz frequencies can be obtained. K Series modules are designed for easy system checkout and troubleshooting and will fit both standard NEMA enclosures and computer mounting racks.

A Series modules.

For communications between the computer and the outside world, these analog modules give 10-bit and 12-bit performance in a family of mutually compatible functions — multiplexers, operational amplifiers, sample-and-hold circuits, A/D and D/A converters, reference voltage sources, and multiplying A/D converters.

DECKit interfaces.

Our DECKits provide pre-tested, fully-documented interfaces for a number of common interfacing situations. Basically just a few modules and a prewired systems unit, they eliminate design time, breadboarding, and wirewrapping in a number of areas. Complete descriptions of the specific interfaces are available.



The start of a new family of component computers.

The PDP-8/A. \$572 in quantities of 100 (CPU & 1K RAM).

For minicomputer applications, the PDP-8/A computer-on-a-board gives you speed and performance at an extremely low price.

The newest, smallest member of the PDP-8 family of minicomputers, the 12-bit PDP-8/A uses only proven, readily available, multi-source MSI semiconductor technology. We know it's reliable, and we can deliver in quantity, starting in late 1974.

To reduce the size and enable low-cost, user-tailored memory capacity, we've added expandable semiconductor memories: ROM, RAM, PROM, and ROM/RAM combinations, expandable from 1K to 32K words. Cycle time is 1.5 μ sec.

The PDP-8/A uses the same powerful instruction set as the PDP-8/E and is fully compatible with other PDP-8 family hardware, operating systems, and high level languages (such as BASIC, FORTRAN IV, FOCAL).

The PDP-8 Omnibus™ backplane facilitates direct interface with more than 60 PDP-8 options and peripherals. Seven commonly-used options are available on two option boards: serial-line interface, 12-bit parallel I/O, front-panel control, and real-time clock on one board; powerfail/auto-restart, memory extension, and bootstrap loader on the other.

The PDP-8A gives the user the flexibility, reliability, and expansion capability of a minicomputer at an extremely low price.

The MPS microprocessor series. \$476 in quantities of 100. (CPU & 1K RAM).

The MPS microprocessor series of modules gives you a simple, versatile 8-bit controller that's inexpensive and easy to use. It will replace hard-wired logic in control applications and perform processing tasks in many new applications.

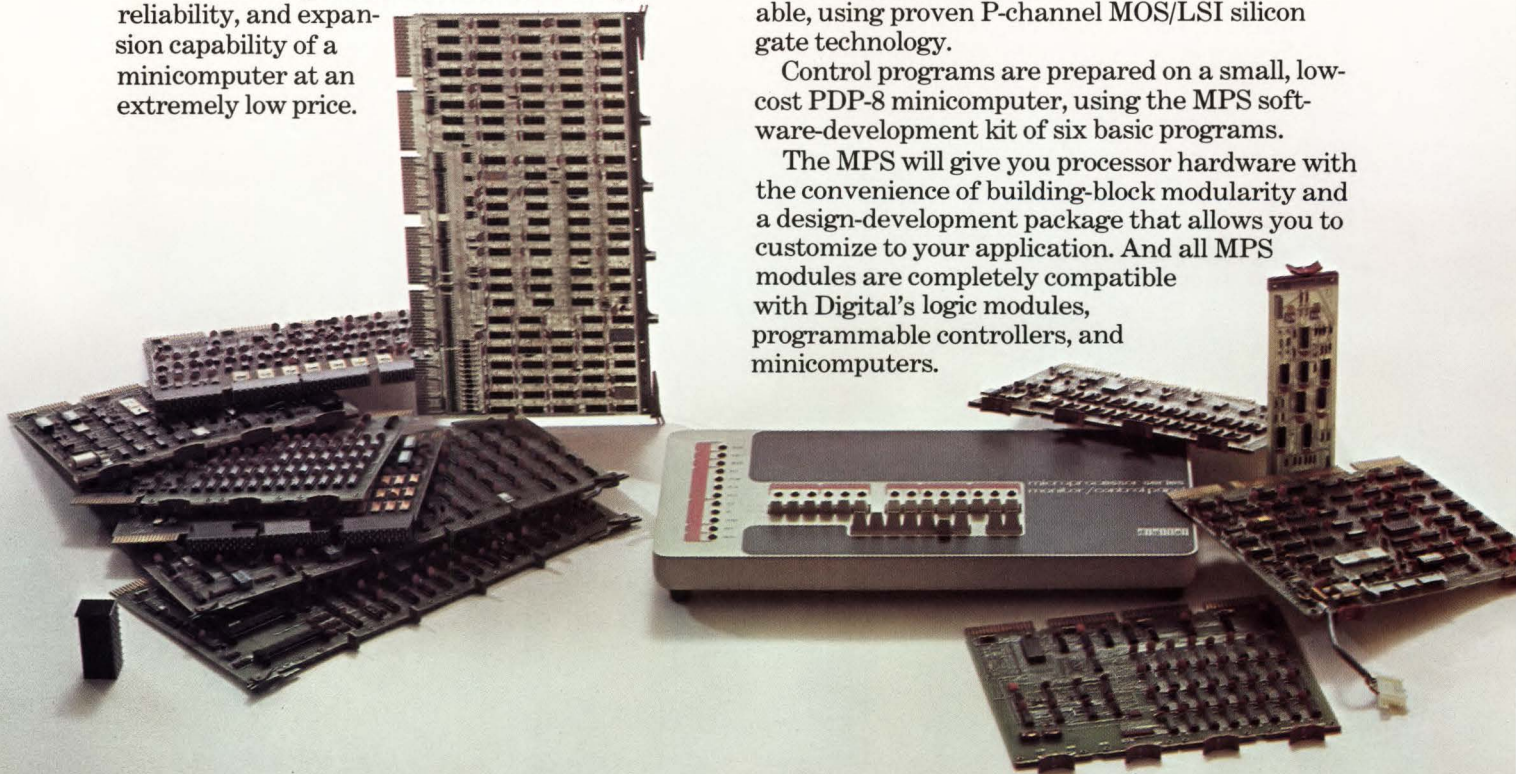
The MPS consists of four building-block modules and an optional control panel. A basic fully operational processor can be assembled from as few as two modules: the CPU and a memory module.

The CPU module with 8-bit parallel processor, 48 data-oriented instructions, and 12.5 μ sec cycle time, can directly address up to 16K words of memory. There are two memory modules: the Read-write Memory module consists of a fully-self-contained random access memory (1K, 2K or 4K words) and all address decoding logic; the Programmable Read-only Memory module contains up to 4K words of UV-eraseable, completely reprogrammable semiconductor memory. The External Event-Detection module provides power-failure detection and automatic start, with 6 interrupt request inputs. The Monitor/Control Panel, which can be cable-interfaced to the CPU, will perform such typical functions as monitoring data paths, memory, and addresses, handling general system operational and diagnostic checks, and entering programs.

We designed the MPS to be immediately available, using proven P-channel MOS/LSI silicon gate technology.

Control programs are prepared on a small, low-cost PDP-8 minicomputer, using the MPS software-development kit of six basic programs.

The MPS will give you processor hardware with the convenience of building-block modularity and a design-development package that allows you to customize to your application. And all MPS modules are completely compatible with Digital's logic modules, programmable controllers, and minicomputers.



digital
COMPONENTS
GROUP

**Unbundling the world's
most popular minicomputers.**

Meet the Components Group now
— we've got a lot to talk about. Call us direct at

800-225-9480

Toll-free from 8:30AM to 5:00PM your time.*

*US only. Massachusetts residents, please dial (617) 481-7400.

Digital Equipment Corporation, Components Group,
One Iron Way, Marlborough, Massachusetts 01752.

In Canada: Digital Equipment of Canada Limited,
P.O. Box 11500, Ottawa, Ontario, K2H8K8, (613) 592-5111.

Prices quoted are in US dollars and will vary outside the United States.

Interactive business modeling

Big firms are hitching big projects

to the economy these days. General Electric has a service that's worth sticking out your thumb for.

COMPUTER DECISIONS STAFF REPORT

The General Electric *MAP* (*Management Analysis and Projection*) Service provides the business manager with an online planning and economic forecasting system. It enables the user to analyze economic, industrial, financial, and market data, make forecasts and plan strategies with a conversational, English-like language.

Besides supporting a large portfolio of public economic data bases and special industry files, the user can create his own data bases. All public and special data bases are fully integrated into the system's standard format and contain pertinent data on the economic environment. Thus, a user can access and analyze his data in relation to external economic indicators.

MAP was originally designed to meet the requirements of General Electric's corporate planners responsible for economic and market forecasting. Its use was later extended to individual corporate departments, and finally to commercial user organizations.

System organization

The *MAP* system is a logically structured set of commands within GE's timesharing network. Its basic function is to establish and keep a user source data file and to manipulate that data as required. The system will store the computed results or display them in the form of plots, reports or diagrams.

You can manipulate data in two ways. First, you can interact with the system in a conversational mode: You may enter a command, get an immediate response, and proceed with the next command. This interactive mode has the advantage of providing immediate feedback at every level of detail.

The second method of data manipulation, the control file mode, is generally used when any commands requiring lengthy printouts are needed. This mode gives you the option of actually creating a *MAP* program consisting of any combination of valid *MAP* commands. The system then runs down the preset commands as if you were online, and places output into a pre-designated user file. The control file mode and the interactive mode may be used simultaneously—once a control file is started, you may perform other interactive work.

Creating a data file

Typical *MAP* data file variables are economic time series (e. g., the US gross national product), market

time series (e. g. the market share for your company's product over a period of years), or financial time series (e. g., the price-to-earning ratio of the Fortune 500 US companies stocks since 1968).

A variable is defined and referenced by its name, and is further described by any other pertinent data. For instance, the name for the variable gross national product would be GNP since that is its standard abbreviation and it fits the rule for assigning names. Decimal data associated with GNP consists of its billion dollar values for given time periods: 503.8 for 1960 or 520.1 for 1961, etc.

Whether the data being stored will be entered from your terminal (in the conversational or control file mode) or by transfer from other files on the system, the first step is to set up a data file. The file is automatically structured and dimensioned to accommodate the storage requirements you specify.

Creating the file is straightforward. A single command (*NEWF*) initiates the file structuring procedure. You then describe the nature of the file—decimal or alphanumeric. Having done this, you establish the time period covered by the file. Yearly data is implied by the format of the time periods specified. (The system asks, for example, *INTRINSIC TIME SPAN*, and you respond with the dates, 60 80, which implies 1960 to 1980.) The dimension of the variables within the file is described next. Finally, you tell *MAP* the number of variable names which the file will store.

Creating the data file—collecting and organizing company data—is only the warm-up for further analysis. Once the file is established you can display (tabulate or graph) the data, analyze them in relation to themselves (fit a trend, calculate an average, or any transformation), or use them with influential external factors to predict stock prices, formulate financial or marketing strategy, or simply estimate inventory strength.

You can display the data in several ways. A request for a simple general description will tell you the type of data—annual, quarterly, etc., the time span they cover, and the date and time they were entered. You are also saved from having to write your own graphics software. *MAP* will plot up to four variables point by point at your terminal, choosing the scale and symbols for the variables and coincident data points.

These analyses, however, look at your company in

isolation, away from the external factors that affect its operation. Interest rates and disposable personal income are influential in choosing a good corporate strategy. It is possible to predict the level of your inventory in relation to projected consumer spending. Having created your company's data files, you can couple them to the data bases available through MAP Service Data Banks.

Looking at the business environment

Once you can pinpoint some of the environmental variables that affect, say, the sales of your company, you can explore their interrelationships. For example, the first step is to calculate the correlation between sales and these influencing factors. Examining the correlation helps to determine if a relationship exists, but does not give insight into the nature of the relationship. For instance, correlation cannot estimate why there will be a change in sales because of a change in personal disposable income. However, through regression analysis it is possible to measure precisely how large and how significant each of the influencing variables is in a historical relation to sales. To see if any relationship exists, a model (equation) of sales and the economic variables is constructed. Regression will estimate sales from the historical data in the company data file and the appropriate public file.

Besides estimating these values, regression is a handy statistical tool for judging the usefulness of the sales model you have built; can locate deviations (residuals) between the sales indicated by the model and actual historical sales; and if forecasts are available for future values of the external variables, make predictions of future sales.

You can also re-evaluate the model used in the previous analysis to check its accuracy. Do the estimated coefficients make sense? If not, should that variable be kept in the model? Are there other variables that should be added? You might have to narrow the time span used in the analysis. Or, you may have to lag certain variables in the model to get them in line with the company data.

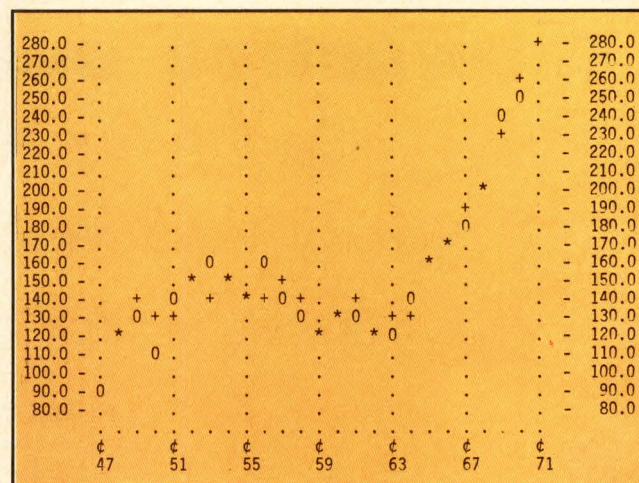
The public side

MAP supports economic data bases that give subscribers a wide range of external economic indicators and variables. The extent of the files is adequate for most financial or strategic forecasting and planning. The MAP system's catalog of data bases includes:

National Bureau of Economic Research (NBER): The NBER maintains an extensive data bank of more than 2000 time series including all National Income Accounts series published in the Survey of Current Business, and all cyclical and economic indicators published in the Commerce Department's BCD and CEA Economic Indicators, as well as many additional series on prices, employment, banking, and other topics. The data bank consists of two files, one containing all series of National Income and Product Account, and the other containing all other series. Both are updated daily.

Federal Trade Commission and Security and Exchange: This file contains quarterly financial statements representing the aggregate of all enterprises classified as manufacturers who are required to file US Corporation Income Tax form 1120. Data are in

Forecasting sales



This teleprinter graph represents actual sales of a firm (zeros), mathematically smoothed actual sales (asterisks) and estimated sales (plus signs) for the years 1947 to 1971. The vertical scale represents volume in millions of dollars, the horizontal scale, time. Such multi-variable graphs, for which the system will automatically determine scale factors and select different symbols, enable users to look at future trends.

current dollars and are not seasonally adjusted retrospectively to account for mergers. The classification of companies into industries is based on the total assets of the consolidated corporate enterprises and differs from other criteria such as establishments or sales of the enterprise. The file is updated quarterly soon after publication of the data.

US Regional: The regional file consists of time series covering economic factors for the fifty states, the territorial US and the nine Census regions. The source of the data is the Commerce Department. Other regional files include the National Planning Association and the Southeastern Economic Project data bases.

General Electric Economic Forecast: GE maintains two files, the Long Range Forecast file and the Benchmark Forecast file. The former contains *annual* time series for about 200 economic variables and selected indicators of the economy. Most of the series start in 1950. The latter contains *quarterly* data on essentially the same variables as those in the long range file. Data begin in 1950.

Besides these economy-wide data banks, the portfolio also includes some specialized industry files: The Association of Home Appliance Manufacturers file, National Electrical Manufacturers data bank, and US Steel Engineers and Consultants data. The portfolio also is being extended to include international files: International corporate profiles; financial reports on US, Japanese, and European companies; and foreign exchange and other rates.

Special planning and analysis services also are available to subscribers. One, called HWMAPS—developed by Hornblower & Weeks-Hemphill, Noyes, Inc., the investment bankers and financial planners—is a package for financial analysis and long range strategic planning. Another, Econoscope's Beta system lets you evaluate the impact of general economic changes on your business. □

DP DIALOG

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

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



Management of a two billion dollar construction program—including new nuclear power stations like this one in Waterford, Connecticut—is one of the applications under development at Northeast Utilities, a VS2 user.

Peak Computing Power for Northeast Utilities

To meet the growing demand for energy among its customers, Northeast Utilities, serving Connecticut and Massachusetts, will invest \$2 billion in capital construction over the next 6 years.

To meet its own growing demand for computing power, and accommo-

date an ambitious information systems development plan, Northeast has already invested in dual System/370 Model 158's with OS/VS2, the virtual operating system which is the compatible extension of OS/MVT.

Through its three major operating

subsidiaries, Connecticut Light and Power, Hartford Electric and Western Massachusetts Electric, Northeast serves nearly 1.2 million customers. A fourth subsidiary—Northeast Utilities Service Company—provides such services as personnel, purchasing, engineering and data processing to the operating units.

Explaining the selection of VS2, data processing manager Albert Schmitz says: "Since the company has been formed out of several separate entities, one important consideration was the need for a common, company-wide operating system capable of absorbing a variety of application programs and steadily increasing workload, while providing a foundation for growth."

The two Model 158's, which form the nucleus of Northeast's data processing operations, were both installed as VS2 systems. Installation of the first—over Veterans' Day weekend in 1973—coincided with the move into a new datacenter. The second was installed last February.

"The initial conversion was relatively trouble-free," Schmitz recalls. "Before the conversion, we spent several months testing application programs on a VS2 system at IBM's Boston datacenter. When the actual change-over occurred, we were able to run production work immediately—and we haven't looked back since."

"One of the most important advantages of VS2," Schmitz notes, "is better memory management. Where once we had to carefully weigh memory size, the number of tapes and availability of disk before running a job, operators

(continued on next page)

Data Security: What IBM is doing

The evidence is clear: in the halls of Congress, in the editorial pages, in the proposals of public interest groups, and in the appointment of Vice President Gerald Ford to a top-priority Domestic Council Committee. There is a new urgency surrounding a timeless question: how to safeguard the right to individual privacy.

Defining what information is to be collected and who is to have access to it is the province of citizens acting through their government. But congressmen, citizens and the data processing community all recognize that data security as a day-to-day practice can make a major contribution to the protection of privacy as a social and legal principle. If the computer's incredible speed and prodigious capacity have the potential for misuse, that same technology also holds out the promise of protecting data far more effectively than any manual record-keeping system.

In 1972, IBM made a public financial commitment to the continuing study of data security and development of appropriate safeguards for its products.

Part of that investment went for a two-year joint study with three outside users; IBM also enlisted the help of its own Federal Systems Division, which served as an experimental control point. The groups completed their work this spring and the results will be placed in the public domain. The publications which will be available through IBM branch offices include six volumes: an Introduction and Overview of general interest; Study Summary; and in-depth technical papers from each of three principal study sites which will be of specific interest to particular audiences.

With their findings the study groups helped to advance data security from dialog to disciplined study and documentation, an essential step in finding workable solutions. In addition to a basic contribution to the literature on the subject and a foundation for future data security research and development, the studies also provide some practical, field-tested guidelines for immediate use.

At the State of Illinois, the emphasis was on detailed guidelines that other users can apply. A privacy action

plan, for example, advises senior executives to establish what data is being collected, identify who needs it and why; assign an economic value to the data and qualify its worth to outsiders; review the probabilities of disclosure; and budget accordingly for security-related costs.

TRW Systems reported on a list of 187 requirements which could be used as a guide to determine whether a system is acceptably secure. They include five major areas: separation of programs and data, controlled access, identification, surveillance, and hardware and software integrity.

Massachusetts Institute of Technology considered the problem of authorization and delegation. While each study site installed IBM's experimental Research Security System, a software addition which made their operating systems more secure, MIT modified a procedure that previously allowed only a security officer to decide who could use or alter a particular set of data. By giving much of this authority to the creator of the data set, MIT was able to accommodate constantly changing relationships between users and data while enhancing security in their time sharing system.

At the same time, IBM has continued to work to make available a number of data security and integrity safeguards designed into system architecture and built into equipment itself. They range from special features like keylocks on terminals and other devices, to magnetic-stripe card or password identification, to high-level integrity in IBM's most advanced operating system, VS2 Release 2. Future IBM products will continue to stress provisions for data security as a formal engineering and design criterion.

Such safeguards are only tools, however. As Dr. Lewis Branscomb, IBM's chief scientist, noted in testimony before a special congressional committee, to be effective, they must be part of an over-all commitment to data security on the part of the data processing user, beginning with such fundamentals as locked doors, trustworthy people and conscientious supervision, and including controls like division of responsibility and periodic audits.

"There is no such thing as perfect

Data Security Information from IBM

In addition to the six study volumes, the following IBM brochures, available through local IBM branch offices, may also be helpful in developing and reviewing physical and data security measures.

1. Considerations of Data Security in a Computer Environment (G520-2169)
2. Considerations of Physical Security in a Computer Environment (G520-2700)
3. 42 Suggestions for Improving Security in Data Processing Operations (G520-2797)
4. The fire and after the fire ... (G520-2741)
5. The IBM Controlled Access System (G520-2540)
6. IBM Data Security Symposium—April, 1973 (G520-2838)
7. Management Control of Electronic Data Processing (GF520-0006)

security," IBM's chief scientist cautioned. "But," he added, "an appropriate level of protection can be achieved."

IBM

Northeast Utilities

(continued from page one)

now can concentrate on tape allocation. We've been able to open up the system and let the flood pour through. Over the first few months, throughput went up 50%, to 15,000 jobs."

In addition to current production work in payroll, personnel, purchasing and general financial applications, Northeast is also engaged in developing a comprehensive, company-wide information system. Understandably, construction management is a primary objective; so are an on-line customer service system and financial modeling capability.

Schmitz notes, "VS2 also offers our systems programmers much greater flexibility. They can now page libraries in and out and make modifications without affecting production."

"And our development programmers, who work with RJE, say they've never seen turnaround like it. Before, they counted their blessings with a once-a-day test shot. Now, they're used to once an hour."

Don Anderson, Northeast's director of systems and processing concludes: "VS2 is an effective way to handle the growth we anticipate—as a company and a data processing organization serving that company. We're confident it will make the progress of both a lot smoother and easier in the long run."

IBM



First System/370 Model 115 to Ski Distributor

Beconta Inc. of Elmsford, N.Y., the largest privately owned importer and distributor of ski equipment in the United States, has become the first in the nation to install the System/370 Model 115, the smallest member of the 370 line.

"The growth of our business in recent years is the main reason for our installation of a Model 115," says president James Woolner. "We needed a versatile system that would help us respond to customer demand for the quality lines we distribute."

Karl Wallach, treasurer and chairman of the board, adds: "We feel we're building for the future since the Model

ties in South San Francisco, Denver and Waco, Texas.

The Model 115, installed at Beconta in early April, replaces a Model 20. Woolner reports, "We can now take care of current business quickly and efficiently in addition to planning for other applications which would have been impossible before."

Beconta is using the Model 115 for such tasks as accounts receivable, accounts payable and inventory for part of the firm's sales line. In the future the company hopes to use the system for credit transactions, inventory of the entire sales line and sales forecasting.

Because Beconta's business is seasonal and international, the job of collecting and analyzing information is more complicated than in many other businesses.

The ordering cycle typically starts in late winter or early spring when buyers attend trade shows and place orders. Ski shops in metropolitan areas generally receive delivery of merchandise from July through September—those in ski areas from October through December.

Catherine Thomas, Beconta's controller, emphasizes: "It's very important we take these delivery times into consideration along with production schedules in the countries producing the goods. At the same time we have to calculate fluctuations in exchange rates."

"Another area we hope to get into is forecasting," she says. "We do a good job of it now, but we expect to do even better when we can develop on the computer a detailed history of past buying patterns."

Installation of the Model 115 went "as smooth as silk," according to Dennis Hickey, Beconta's data processing manager. "Conversion was impressive in both speed and accuracy. The task—involving the transfer of data from disk to tape to disk—took about three hours from start to finish."

"The way things went, we feel confident we can add additional applications just as readily. We look to the day when we will have an integrated management information system up and running."

IBM



DP manager Dennis Hickey and controller Catherine Thomas confer on orders for the ski equipment their company distributes.

115 gives us room to grow. This flexibility is something that only a virtual system can provide."

The firm is the U.S. distributor for such products as Nordica ski boots, Volkl skis, Look ski bindings and Puma footwear. In addition to its own headquarters and distribution center in Elmsford, Beconta operates distribution facilities

10,000 Equations and 15 Hours Later

It usually takes microseconds—perhaps as long as several seconds—for the computer to solve most problems. However, Dr. David Sayre of IBM waited almost 15 hours as a System/360 Model 91 computed the answer to his particular problem—a problem a team of scientists once worked two years to complete.

A mathematician at the T. J. Watson Research Center, Sayre has been engaged in refining the structure of a protein called rubredoxin. Beginning with an X-ray map at a resolution of 2.5 angstroms, Sayre used the Model 91 to process a complex system of more than 10,000 non-linear equations—one of the largest equation systems ever programmed for computer solution. A critical technique he employed, called conjugate gradients, was developed by Professor Magnus Hestenes of UCLA and was adopted by Sayre at the suggestion of a research center colleague, Dr. Philip Wolfe.

With the computation completed, and the resolution mathematically refined to 1.5 angstroms—about the distance between the centers of neighboring atoms—Sayre was able to identify some 400 of the protein's 424 non-hydrogen atoms.

In significantly reducing the computation time required for such high-resolution studies, Sayre's work may lead to

improved understanding of molecules like DNA and RNA, key elements in the reproduction of human cells.

IBM



Dr. Sayre examines the structure of the protein, rubredoxin, on this electron-density map.

Computers Aid Scientific Study Groups Worldwide

In countries around the world, IBM Scientific Centers are experimenting with new ways of applying the computer to the solution of social, economic and technical problems.

In forming unique study groups with academic and government partners, the centers provide facilities and people with computer and scientific skills; the study partner provides experts of its own. Together, they decide what projects are most important and which will help the greatest number of people. Among those underway: studies of air



Breathing Easier in Manhattan

Curbing air pollution in New York City and other large industrial urban areas is an unending battle. But IBM scientists have enlisted the help of the computer in the fight.

This is a computer-generated picture of the sulphur dioxide buildup over Manhattan at 6:00 p.m. when it's at peak concentrations. When data on pollutants in the air is combined with values for every known atmospheric condition, the result is a numerical picture of air above the city.

Thousands of such pictures, calculated by the computer as a changing flow of information, make it clear where air pollution is coming from and where it is going.

The Manhattan air pollution model is a prototype developed by the Palo Alto Scientific Center in California.



pollution in New York, a sinking lagoon bed in Venice, feeding a growing population in Mexico.

Advanced approaches and ideas are already at work for business and industry. Today international scientists are applying the same powerful instrument, the computer, in coping with the more subtle problems of people and in keeping pace with the rapid changes which are shaping our future.

The Future of Venice

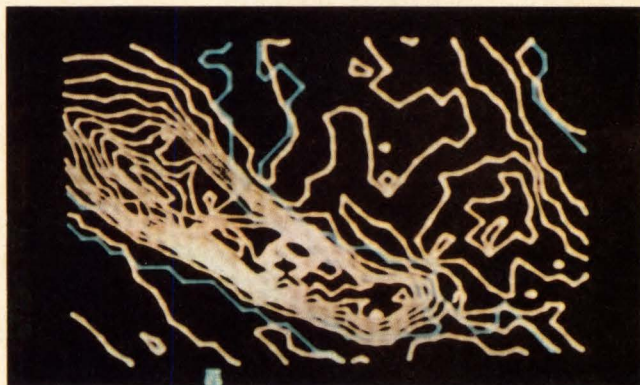
A study team with members drawn from IBM and Italy's National Research Council is preoccupied—as are many people—with the future of Venice.

Aqua Alta, or high water, is a phenomenon that plagues the City of Canals. A product of storms in the Adriatic, Aqua Alta floods the Venetian lagoon many times each year. The problem is further complicated because the lagoon bed on which Venice rests is sinking year by year.

To study the complex interaction of wind and water and tides, a seagoing laboratory belonging to the National Research Council is collecting data the study partners can incorporate into a computer model of the problem. With a mathematical substitute for the real situation, team members can test different theories and hypotheses.

One paradox has already been resolved: Venice is sinking because water is disappearing beneath it—drawn off by the fresh-water wells which supply a nearby industrial area.

It is not likely that the sinking will soon stop, or that Aqua Alta will cease to be a threat. But the study is giving scientists a clear analysis of the forces at work on Venice.



More Food for Mexico's Millions

Like many other developing nations, Mexico is faced with the problem of feeding a growing population while also cultivating crops for export.

Collaborating with the National Agricultural College, the IBM Scientific Center in Mexico City has tackled the job of developing a computer model of the agricultural economy. Its purpose is to allow planners to see the results of their decisions before they are committed to action. Among the "what if" questions they are attempting to answer: what are the implications of planning for more machinery in a certain area; what is the effect of substituting a crop for export, like an oil seed, for the basic staple of the local diet—corn.

These are important questions, and the computer is helping researchers to get accurate answers.

IBM

74-4

The character of printers

by Irving Wieselman
Data Products, Inc.

Paper costs are up nearly 40 percent. Lead times for orders are longer and many companies are doing volume buying, anticipating a severe shortage. And although one business form supplier calls the situation "verging on the extremely serious," the computer printer is still the principal output medium of data processing.

Impact line printers comprise the majority of medium and high speed printers. In June, 1973, there were 350,000 serial and 120,000 line printers operating, while only a few thousand non-impact printers were in use. The growth is in the impact printer market. In fact, the increasing speed of serial printers and the decreasing cost of line printers have resulted in a price/performance overlap in the 100 to 300 lpm range.

Nonimpact printers, nevertheless, will continue to increase where applications require low printing volumes or high speeds, where the cost of paper is not prohibitive and the limitation of a single copy is not a deterrent.

Strong, silent type

Nonimpact printers range in speed from 30 cps to 18,000 lpm. They use chemical or electronic processes to form the image. The techniques that create the image determine the kind of paper used.

An image is created on thermal paper by heated dot elements. Electrostatic printers use a paper which is a non-conducting dielectric. The characters are formed by charged stylii.

Electrolytic printing uses an impregnated paper which prints when two electrodes conduct a voltage across the paper. Photosensitive printing results from a light image scanning the paper. The image appears after heat developing.

Electrothermal and electrostatic printers are most popular. The former are frequently used with interactive keyboard terminals. They are generally less expensive than impact printers with similar speeds and application.

Electrostatic printers are all line printers. The pattern is imprinted on dielectric paper by means of charged wires or pins. The pins supply a charge to the paper in the desired pattern. The characters become visible as the paper passes through a solution containing ink particles of opposite charge to the paper which adhere to the charged spots on the paper.

Ink-jet and xerographic printers, on the other hand, use ordinary paper. Ink-jet printers shoot a stream of charged ink from a nozzle. The ink is deflected by plates to produce dot matrix characters.

Xerographic printers use the same principle for printing as a xerographic paper copier, except that the image is generated from a photographic drum.

Nonimpact printers are usually more reliable than impact printers since they have fewer mechanical

parts. Yet, though they are quieter—and so useful to office environments—and faster, they can produce only one copy. This fact, plus the added cost of special paper, could be a drawback and may force the user to rethink his paper flow system.

Hard hitters

Impact printers form characters by one of two methods. The first technique—used by ordinary typewriters—has the character strike the ribbon forming the image on the page. The second places the character to be printed behind the ribbon with the paper in front. This technique is used by all drum, chain and train printers which represent the majority of medium and high speed impact printers.

A serial character printer prints one character at a time. The print wheel is spun continuously. The printer makes typewriter-like impressions by having a print hammer drive the paper against the wheel. The process is repeated for each column across the page.

Dot matrix printers are character printers. IBM introduced the dot matrix printer for its 2770 Data Communications system at 66 cps and for its System/3 at 85 cps and 115 cps. It provided printing at a more reasonable cost for users with needs between the 30 cps and 100-300 lpm range.

These printers use a 5 x 7 (or 7 x 9) dot matrix character produced by a wire matrix which scans the print line. The matrix configuration is generated from a read-only memory. Though the cost of the printer goes up as the number of print heads is increased, dot matrix printers are less costly than full character line printers.

Line printers appear to print a line at a time. Actually sets of characters are printed together and eventually all the sets form a line. There is one print hammer per column which activates when the character to be printed reaches the column. The characters on a drum move vertically while those on a chain or train move horizontally past the hammers.

Drum printers have the characters mounted on a cylindrical surface. The drum rotates on bearings. Chain and train printers have characters constrained by a linking mechanism and other mechanisms such as tracks which use sliding friction to control positioning. Drums are inherently more reliable than chains or trains. However, the latter two have more character set flexibility because of the larger scanned character set. Both can have changeable character sets.

Two line printers are available which use dot matrix techniques. The Tally printer uses a matrix comb with 132 wire actuators to print 200 lpm. The comb moves to five positions to produce one row of dots. Next, the paper moves to seven positions to produce the familiar 5 x 7 pattern. Potter makes two models at 135 lpm and 300 lpm. □

Impact printers

Manufacturer/Model	Anderson-Jacobsen AJ-841	Anderson-Jacobsen AJ-330	Baltica Series 60	Centronics 101	Centronics 101A
Price	\$4,230	\$2,065	\$1,800	\$4,095	\$4,290
Mechanism/formation	Selectric/full	TTY/full	Selectric/full	Serial/dot	Serial/dot
Character Set Size	88	94	100	64	64
Speed/ch per line	15cps/130	30cps/80	50cps/132-158	60-200 cps/132	60-200 cps/132
IBM/TTY Compat	IBM	TTY	Yes	No	No
CIRCLE NO.	200	201	202	203	204

Manufacturer/Model	Centronics 101AL	Centronics 102A	Centronics 306	Centronics 500	Centronics 308KSR
Price	\$4,190	\$4,775	\$2,055	\$2,995	\$3,495
Mechanism/formation	Serial/dot	Serial/dot	Serial/dot	Serial/dot	Serial/dot
Character Set Size	64	64	64	64	64
Speed/ch per line	60-200 cps/132	125 cps/132	60-150 cps/80	40-150 cps/132	120 cps/80
IBM/TTY Compat	No	No	No	No	TTY
CIRCLE NO.	205	206	207	208	209

Manufacturer/Model	Centronics 308 RO	Centronics 308IP	Centronics 308KP	Centronics 508KSR	Centronics 508RO
Price	\$2,895	\$2,615	\$3,130	\$4,495	\$3,895
Mechanism/formation	Serial/dot	Serial/dot	Serial/dot	Serial/dot	Serial/dot
Character Set Size	64	64	64	64	64
Speed/ch per line	120 cps/80	120 cps/80	120 cps/80	120 cps/132	120 cps/132
IBM/TTY Compat	TTY	No	No	TTY	TTY
CIRCLE NO.	210	211	212	213	214

Manufacturer/Model	Centronics 508IP	Centronics 508KP	Clary SP-20	Clary AN-16	Clary 2000
Price	\$3,615	\$4,130	\$650	\$2,200	\$14,500
Mechanism/formation	Serial/dot	Serial/dot	Character/full	Character/full	Character/full
Character Set Size	64	64	64	64	14
Speed/ch per line	120 cps/132	120 cps/132	20 cps/1	25 cps/1	10-15 cps/21
IBM/TTY Compat	No	No	Yes	Yes	No
CIRCLE NO.	215	216	217	218	219

Manufacturer/Model	Computer Terminal 444	Computer Terminal 666	Computer Terminal 888	Computer Terminal 888C	Computer Tranceiver 1200
Price	\$565	\$650	\$800-2,300	\$1,000	\$4,995
Mechanism/formation	Strip/full	Line/full	Line/full	Line/full	Character/dot
Character Set Size	64	64	64	64	96
Speed/ch per line	25 cps/N/A	25 cps/N/A	600 col. min./N/A	25 cps/N/A	37 lpm/132
IBM/TTY Compat	IBM	IBM	IBM	IBM	Yes
CIRCLE NO.	220	221	222	223	224

Manufacturer/Model	Computer Tranceiver 300	Control Data 9316oem	Control Data 9322oem	Control Data 9352oem	Control Data 9372oem
Price	\$3,190	\$2,350	\$6,100-7,300	\$12,000	\$28,000-34,000
Mechanism/formation	Character/dot	Needle/dot	Drum/full	Drum/full	Train/full
Character Set Size	96	64, 96, 128	64, 96, 128	64, 96, 128	48
Speed/ch per line	30 cps/80	173 cps/132	200-400 lpm/136	650 lpm/136	1200-2000 lpm/136
IBM/TTY Compat	Yes	Yes	Yes	Yes	Yes
CIRCLE NO.	225	226	227	228	229

WIN A TEXAS INSTRUMENTS CALCULATOR!

Complete the information on the survey card found between pages 56 and 57. Deadline is September 1, 1974. **Only those cards with complete information will be selected.**

For complete printer information
For data concerning all printers in this survey circle number **480.**

Cramped for space in your production of computer-generated graphics? Stretch out on the king-size 22-inch bed of the new Gould 5100. In fact, the Gould 5100 gives you the widest plotting capability at the fastest speed of any electrostatic unit. With a price/performance ratio superior to every other printer/plotter on the market.

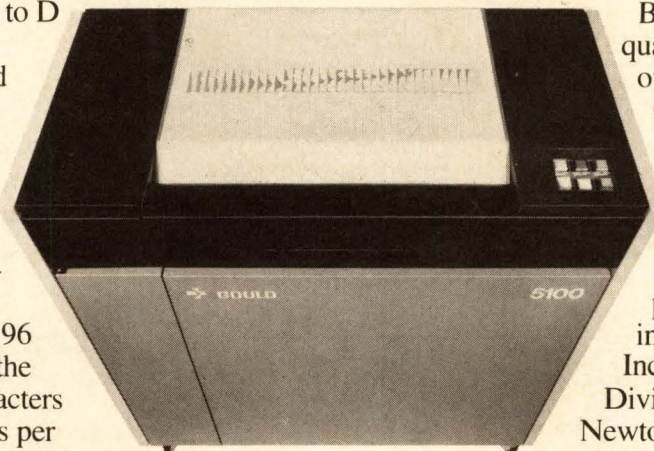
The Gould 5100 has been specifically designed for scientific and engineering work where speed is essential, and where the ability to print out such materials as seismographic charts and A to D size drawings is required.

And it's absolutely loaded with features. 22-inch wide roll paper. Up to 3 inches per second in graphics mode. Resolution of 100 dots per inch horizontally and vertically. Superior density of plotter output.

What's more, the optional 96 ASCII character set allows the Gould 5100 to print 264 characters across the page at 1300 lines per

minute. Direct on-line interfaces are available for IBM System/360 and IBM System/370 computers as well as for most mini-computers.

And Gould software is the most efficient and flexible available anywhere. In addition to the basic software package that emulates the widely accepted Calcomp graphics package, specialized engineering, drafting, scientific and business graphic software enables your computer to efficiently handle the most sophisticated computer graphics.



Built with traditional Gould quality, and backed by Gould's own reliable service, the

Gould 5100 will greatly expand the efficiency and throughput of your production of computer-generated graphics. Let our

Pete Highberg or Bill Koepf prove it to your satisfaction. Get in touch with them now at Gould Inc., Dept. C-7, Data Systems Division, 20 Ossipee Road, Newton, Massachusetts 02164.

The new Gould 5100 printer/plotter. It lets you work out on the biggest bed in the business.

Manufacturer/Model	Control Data 28211/14031	Control Data 512	Control Data 580	Control Data 711-121	Control Data 1742-30
Price	\$1,300/MO	\$819/MO	\$1,300-2,000/MO	\$4,000	\$17,850
Mechanism/formation	Train/full	Train/full	Train, Cartridge/full	Helical wheel/full	Drum/full
Character Set Size	48	48	48	64	64
Speed/ch per line	1200 lpm/132	1150 lpm/136	1200-2000 lpm/136	30 cps/132	300 lpm/136
IBM/TTY Compat	IBM	No	No	No	No
CIRCLE NO.	230	231	232	233	234

Manufacturer/Model	Control Data 2570-1	Control Data 1742-120	Control Data 2570-2	Data Printer 6643	Data Printer V-132C
Price	\$17,850	\$1,533/MO	\$1,500/MO	\$9,750	\$11,500
Mechanism/formation	Drum/full	Train, Cartridge/full	Train, Cartridge/full	Line/Chain/full	Line/full
Character Set Size	64	48	64	64	64
Speed/ch per line	300 lpm/136	1150 lpm/136	1200 lpm/136	600 lpm/132	600 lpm/132
IBM/TTY Compat	No	No	No	No	No
CIRCLE NO.	235	236	237	238	239

Manufacturer/Model	Data Printer C+ 2323	Data Printer C+ 1333	Data Printer C+ 3313	Data Printer 4963	Data Printer 7483
Price	\$9,000	\$9,500	\$9,500	\$10,250	\$10,250
Mechanism/formation	Line/Chain/full	Line/Chain/full	Line/Chain/full	Line/Chain/full	Line/Chain/full
Character Set Size	64	96	48	96	48
Speed/ch per line	300 lpm/132	200 lpm/132	400 lpm/132	430 lpm/132	760 lpm/132
IBM/TTY Compat	No	No	No	No	No
CIRCLE NO.	240	241	242	243	244

Manufacturer/Model	Diablo Hytype I 1200	Data Science	Datadyne 722	Data Products 2230	Data Products 2260
Price	\$1,825	\$1,495	\$600-3,000	\$6,450	\$8,599
Mechanism/formation	Character/full	Serial/full	Line/Drum/full	Drum/full	Drum/full
Character Set Size	Variable	80	64	64-96	64-96
Speed/ch per line	30 cps/132	15 cps/80	600-2400 lpm/32	300 lpm/136	600 lpm/136
IBM/TTY Compat	IBM	No	Yes	No	No
CIRCLE NO.	245	246	247	248	249

Manufacturer/Model	Data Products 2310	Data Products 2410	Data Products 2420	Data Products 2440	Data Products 2470
Price	\$7,740	\$10,980	\$11,900	\$14,100	\$18,930
Mechanism/formation	Drum/full	Drum/full	Drum/full	Drum/full	Drum/full
Character Set Size	64-96	64-96	64-96	64-96	64-96
Speed/ch per line	350-1100 lpm/80	245-1100 lpm/80	245-1200 lpm/80	700-1200 lpm/80	1250-1600 lpm/80
IBM/TTY Compat	No	No	No	No	No
CIRCLE NO.	250	251	252	253	254

Manufacturer/Model	Data Products 2550	Data Products 2910	Data Printer V-236	Data Printer V-306	Dytro 1100
Price	\$23,970	\$20,430	\$8,750	\$9,250	\$223
Mechanism/formation	Train/full	Drum/full	Line/full	Line/full	Line/full
Character Set Size	48-128	64	64	64	10/12
Speed/ch per line	1500 lpm/132	356-1110 lpm/80	200-600 lpm/132	300-600 lpm/132	300 lpm/0
IBM/TTY Compat	No	No	No	No	TTL
CIRCLE NO.	255	256	257	258	259

Manufacturer/Model	Dytro 1223	Digital Associates 2000	Digital Associates 6000	Digital Associates 400	Digital Associates 600
Price	\$240	\$3,700-6,500	\$5,000-8,000	\$7,000-15,000	\$11,000-14,000
Mechanism/formation	Line/full	Line/9x7 dot	Line/9x7 dot	Line/Chain/full	Line/Drum/full
Character Set Size	11	64	64	48, 64, 96	64
Speed/ch per line	2 1/2 lpm/5	125-200 lpm/132	500 lpm/132	200-400 lpm/132	600 lpm/132
IBM/TTY Compat	TTL	TTY	TTY	IBM	IBM
CIRCLE NO.	260	261	262	263	264

**hard copy at 100 cps
is considered medium speed.**

**30 day delivery
is considered fast.**

**our price for both
is considered a phenomenon.**

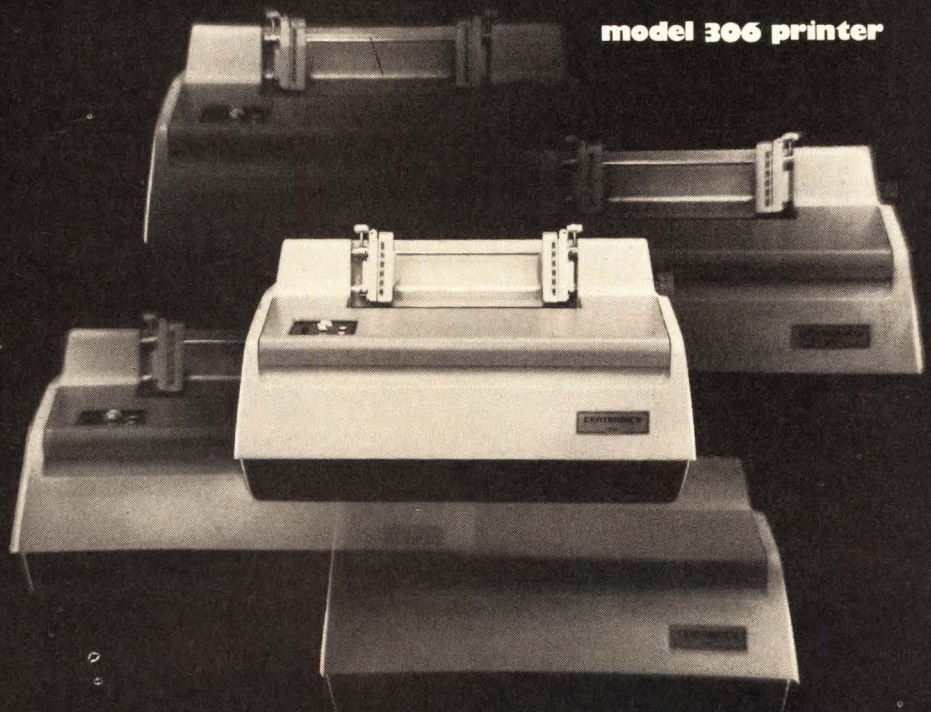
Unbeatable price/performance ratio! The Model 306 is the fastest, low cost 80-column impact printer you can buy. It's one-half the price of our popular 101.

At 60 to 150 lines per minute, the 306 offers a wide range of interfaces for a variety of systems and data communication applications. The 5 x 7 dot matrix print head produces an original plus up to 4 clear carbons—always with perfect fixed vertical/horizontal registration. It changes to elongated boldface characters on command. And feeds paper conveniently from behind or below the printer. The 306 is plug-to-plug and software compatible with all Centronics printers. OEM discounts too.

About Reliability. Many of the same field-proven modules from our other printers are used in the 306. Thousands of Centronics printers are in operation throughout the world.

The 306: price, performance—and it's in production—now!

For full details, phone or write:



CENTRONICS

centronics data computer corp.
hudson, n.h. 03051
telephone (603) 883-0111

eastern region: (617) 272-8545
philadelphia (609) 234-6111
washington, d.c.: (703) 450-5071
central region: (513) 294-0070 (ohio)
chicago: (312) 398-4500
western region: (714) 979-6650 (s. calif.)
san francisco: (408) 733-9530

Manufacturer/Model	Facit-Addo 3841	Facit-Addo 4552	Facit-Addo 4553	Facit-Addo 4501	Facit-Addo 4508
Price	\$1,190	\$525	\$925	\$198	\$198
Mechanism/formation	Character/full	Strip/5x7 dot	Line/5x7 dot	Line/full	Line/full
Character Set Size	92	64	64	64	64
Speed/ch per line	15 cps/160	15 cps/N/A	15 cps/180	180 lpm/18	150 lpm/12
IBM/TTY Compat	TTY	No	No	No	No
CIRCLE NO.	265	266	267	268	269

Manufacturer/Model	GE 300	GE 1200	GTE IS/7011	GTE IS/7012	GTE IS/5581
Price	\$3,625	\$3,995	\$3,960	\$6,000	\$4,400
Mechanism/formation	Character/full	Character/full	Character/full	Character/9x7 dot	Character/full
Character Set Size	94	94	63	63	96
Speed/ch per line	10-30 cps/75-120	10-120 cps/80-120	30 cps/132	30 cps/132	30 cps/132
IBM/TTY Compat	TTY	TTY	No	No	Yes
CIRCLE NO.	270	271	272	273	274

Manufacturer/Model	IBM 1403/N1	IBM 3211	IBM 3203/2	IBM 3203/1	Iomec 200
Price	\$892/MO	\$1,730/MO	\$1,234/MO	\$940/MO	\$7,350
Mechanism/formation	Line/full	Line/full	Line/full	Line/full	Line/full
Character Set Size	Variable	Variable	Variable	Variable	48/64/96
Speed/ch per line	1400 lpm/132	2650 lpm/150	1550 lpm/132	770 lpm/132	200 lpm/132
IBM/TTY Compat	N/A	N/A	N/A	N/A	No
CIRCLE NO.	275	276	277	278	279

Manufacturer/Model	Iomec 352	Iomec 202	Logicon 143	Logicon LPS/LP	Mohawk 1310
Price	\$9,450	\$8,350	\$16,500	\$19,900	\$7,400
Mechanism/formation	Line/full	Line/full	Line/full	Line/full	Character/5x7 dot
Character Set Size	48/64/96	48/64/96	48/96	64	64
Speed/ch per line	350, 420 lpm/132	200 lpm/132	400/220 lpm/120, 136	600 lpm/132	100 cps/132
IBM/TTY Compat	No	No	IBM	IBM	Yes
CIRCLE NO.	280	281	282	283	284

Manufacturer/Model	Mohawk 2443	Mohawk 2444	Mohawk 2445	Mohawk 2446	NCR 640-102
Price	\$12,210	\$16,650	\$25,900	\$42,500	\$27,500
Mechanism/formation	Chain/Cartridge/full	Chain/full	Chain/full	Drum/full	Drum/full
Character Set Size	16-128	16-128	16-128	48-128	51/64
Speed/ch per line	280 lpm/100	380 lpm/132-136	760 lpm/132-136	1250 lpm/132-160	900/450 lpm/132
IBM/TTY Compat	Yes	Yes	Yes	Yes	No
CIRCLE NO.	285	286	287	288	289

Manufacturer/Model	NCR 640-200	NCR 640-210	NCR 640-300	NCR 646-201	NCR 647-201
Price	\$49,000	\$53,250	\$38,950	\$55,600	\$71,400
Mechanism/formation	Drum/full	Drum/full	Drum/full	Train/full	Train/full
Character Set Size	51/64	51/64	64/128	255	255
Speed/ch per line	3000/1500 lpm/132	3000/1500 lpm/132	1200/1600 lpm/132	1200 lpm/132	2000 lpm/132
IBM/TTY Compat	No	No	No	No	No
CIRCLE NO.	290	291	292	293	294

Manufacturer/Model	NCR 649-300	ODEC 3422,3,4	ODEC 2424-2424/80	ODEC 2423-2423/80	ODEC 2422-2422/80
Price	\$24,150	\$3,800-5,700	\$5,300-5,500	\$4,800-5,000	\$3,600-3,800
Mechanism/formation	Drum/full	Chain/full	Chain/full	Chain/full	Chain/full
Character Set Size	64	48/64/96	48/64/96	48/64/96	48/64/96
Speed/ch per line	300 lpm/132	125/300 lpm/132	300 lpm/132	210 lpm/132	125 lpm/132
IBM/TTY Compat	No	TTY	TTY	TTY	TTY
CIRCLE NO.	295	296	297	298	299

Manufacturer/Model	Potter LP 6350	Potter LP 3403	Potter HSP 3609-33-80	Potter LP 6403	Printer Technology Printec-100
Price	\$4,950	\$39,650	\$5,000-20,000	\$54,950	\$2,650
Mechanism/formation	Line/9x7 dot	Line/Chain/full	Line/9x7 dot	Chain/full	Character/full
Character Set Size	128	96	128	48-128	64
Speed/ch per line	500 lpm/132	1500 lpm/132	150-500 lpm/33-80	1500 lpm/132	35 lpm/132
IBM/TTY Compat	TTY	TTY	No	IBM	TTY
CIRCLE NO.	300	301	302	303	304

Manufacturer/Model	Printer Technology Printec-100A	Printer Technology 800 series	Printer Technology 1100 series	Printer Technology 1200 series	Qume Q30
Price	\$2,950	\$3,850	\$3,850	\$3,850	\$1,825
Mechanism/formation	Character/full	Character/full	Character/full	Character/full	Serial/full
Character Set Size	96	64	64	64	96
Speed/ch per line	26 lpm/132	35 lpm/132	35 lpm/132	35 lpm/132	30 cps/132-158
IBM/TTY Compat	TTY	TTY	TTY	TTY	No
CIRCLE NO.	305	306	307	308	309

Manufacturer/Model	Qume Q45	RCA Extel	SCM 7501	SCM 7512	SCM 7502
Price	\$2,100	\$50/mo.	\$1,500	\$1,700	\$1,700
Mechanism/formation	Serial/full	Character/5x7 dot	Character/5x7 dot	Character/5x7 dot	Character/5x7 dot
Character Set Size	96	96	64	64	64
Speed/ch per line	30 cps/132-158	10/15 cps/74	30 cps/80	30 cps/80	30 cps/80
IBM/TTY Compat	No	TTY	TTY	TTY	TTY
CIRCLE NO.	310	311	312	313	314

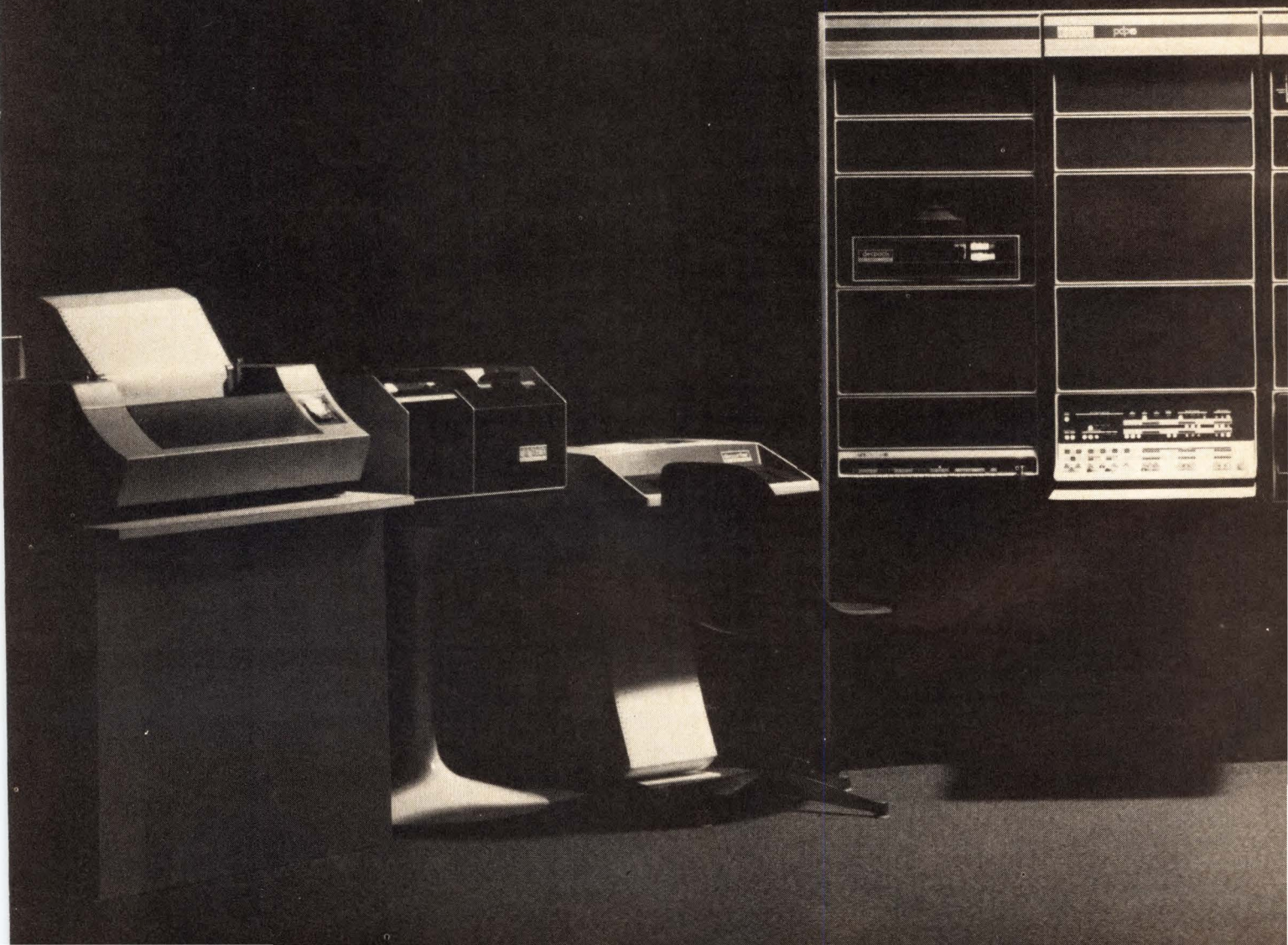
Manufacturer/Model	SCM 7511	SCM 7360	SCM 7303	SCM 7311	Singer (oem) 30
Price	\$1,500	\$9,500	\$3,950	\$1,975	\$900/990
Mechanism/formation	Character/5x7 dot	Drum/full	Drum/full	Drum/full	Serial/9x7 dot
Character Set Size	64	64	64	64	Variable
Speed/ch per line	30 cps/80	600 lpm/136	40 cps/72	40 cps/72	30 cps/80-132
IBM/TTY Compat	TTY	Yes	TTY	TTY	TTY
CIRCLE NO.	315	316	317	318	319

Manufacturer/Model	Singer (oem) 30KSR	Singer (oem) 30RO	Singer (oem) 30ASR	Sycor 3485	Sycor 3484
Price	\$2,100/2225	\$1,650/1,775	\$3,200/3,325	\$250/MO	\$155/MO
Mechanism/formation	Serial/dot	Serial/dot	Serial/dot	Character/dot	Character/dot
Character Set Size	64	64	64	64	64
Speed/ch per line	10-30 cps/132	10-30 cps/132	10-30 cps/132	165 lpm/132	80 cps/132
IBM/TTY Compat	TTY	TTY	TTY	No	No
CIRCLE NO.	320	321	322	323	324

Manufacturer/Model	Sycor 2583	Sycor 2582	Tally 2200	Tally 2100	Teletype 40
Price	\$225/MO	\$155/MO	\$6,000	\$5,500	\$2,025-2,925
Mechanism/formation	Character/dot	Character/dot	Line/dot	Line/dot	Chain/full
Character Set Size	96	96	64/96/128	64/96/128	64/96
Speed/ch per line	165 cps/132	80 cps/132	200 lpm/132	125 lpm/132	300/220 lpm/80
IBM/TTY Compat	No	No	TTY	TTY	N/A
CIRCLE NO.	325	326	327	328	329

Manufacturer/Model	Teletype 33 ASR	Teletype 33 KSR	Teletype 33 RO	Teletype 35 ASR	Teletype 35 KSR
Price	\$885/1,276	\$654/986	\$577/929	\$3,300/4,000	\$2,000/2,800
Mechanism/formation	Character/full	Character/full	Character/full	Character/full	Character/full
Character Set Size	63	63	63	63	63
Speed/ch per line	10 cps/72	10 cps/72	10 cps/72	10 cps/72	10 cps/72
IBM/TTY Compat	N/A	N/A	N/A	N/A	N/A
CIRCLE NO.	330	331	332	333	334

The Many Computer.™ A Lot Of Computers For The Money.



This is Digital's PDP-15
ManyComputer™.

It's several processors integrated into one beautiful system for those applications needing a real number crunching capability mixed with high- and low-speed input/output operations.

Like graphics applications that also require heavy computation, file control, plotting, printing and card reading — all at the same time. Or batch processing operations involving computation, data base management, plotting, printing and communications.

Most systems can't handle a mixed bag like this because they're not designed to. In the PDP-15, several processors work in parallel, orchestrated by the CPU and the system monitor. They do their own thing, at their own speeds, without

slowing other operations. The central processor performs computation, monitoring and file management. There's an integrated floating point processor that pumps out answers (up to 54-bit accuracy) as fast as you can feed it. A high-speed I/O processor channel drives graphic processors, A/D converters, industrial controllers and mass storage devices such as mag tapes and disks. There's a peripheral processor that provides automatic spooling for low-speed devices like line printers, card readers and XY plotters. And two powerful graphic processors that drive up to four stroke-vector display units.

But just as impressive as what the ManyComputer does is what we've done for it, and for you. Like four operating systems, applications packages, utility packages

and a number of program development tools including super fast FORTRAN-IV — \$5 million worth of software in all.

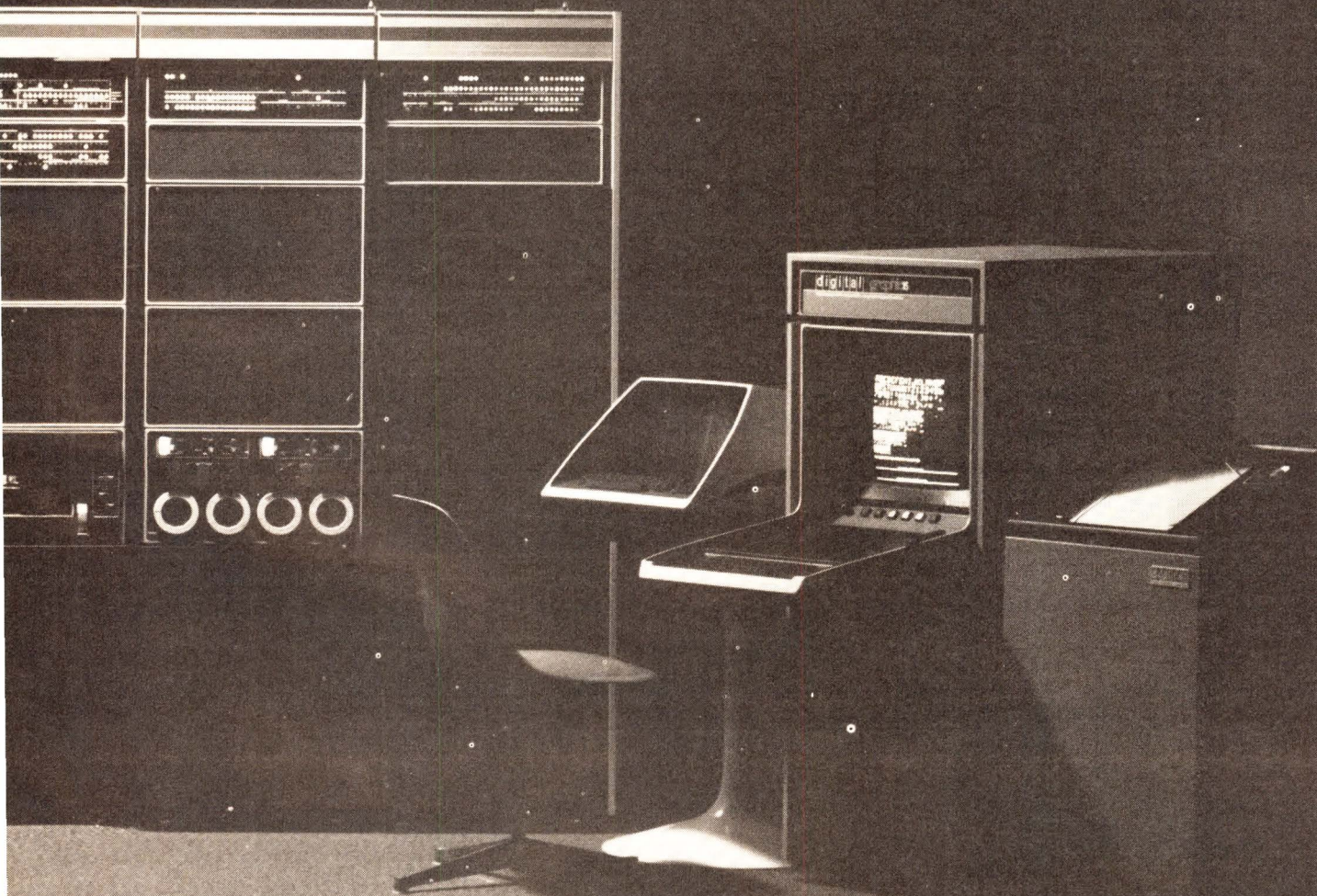
Until now, you couldn't buy a system like this for under \$1 million.

Now you can. As low as \$2,000 a month, or \$4,500 for the system shown here.

If you expect a lot of things from a computer, get a lot of computers. The ManyComputer.

Contact your local Digital office, or write Digital Equipment Corporation, Maynard, Mass. 01754. (617) 897-5111, Ext. 2875. European headquarters: 81 route de l'Aire, 1211 Geneva 26. Tel: 42 79 50. Digital Equipment of Canada, Ltd., P.O. Box 11500, Ottawa, Ontario K2H 8K8. (613) 592-5111.

digital



Manufacturer/Model	Computer Devices 8330	Di An 8379	Di An 8500	Di An 8100	Di-An 9030
Price	\$3,500	\$4,000	\$3,800	\$5,000	\$3,300
Mechanism/formation	Drum/5x7 dot	Drum/full	Drum/full	Drum/full	Character/9x7 dot
Character Set Size	60	64	64	64	128
Speed/ch per line	10-30 cps/132	15 cps/var	15 cps/var	15 cps/var	30 cps/132
IBM/TTY Compat	No	Yes	Yes	Yes	TTY
CIRCLE NO.	407	408	409	410	403

Manufacturer/Model	Media III 2312	Litton 30	Litton Mark II	Uppster Model II
Price	\$5,395	\$3,158	\$3,158	\$30,000
Mechanism/formation	Line/5x7 dot	Serial/full	Serial/full	Drum/full
Character Set Size	96	47	47	48
Speed/ch per line	200 lpm/132	30 cps/192	30 cps/192	9,000 lpm/160
IBM/TTY Compat	No	Yes	Yes	No
CIRCLE NO.	402	404	405	406

Manufacturer/Model	Teletype 35 R0	Teletype 35 ASR	Teletype 38 KSR	Teletype 38 R0	Tycom 750
Price	\$1,675/2,486	\$1,303/1,519	\$1,061/1,274	\$788/1,008	\$1,350
Mechanism/formation	Character/full	Character/full	Character/full	Character/full	Line/full
Character Set Size	63	94	94	94	88
Speed/ch per line	10 cps/72	10 cps/132	10 cps/132	10 cps/132	15 cps/156/132
IBM/TTY Compat	N/A	N/A	N/A	N/A	TTY
CIRCLE NO.	335	336	337	338	339

Manufacturer/Model	Tycom 38	Tycom 35/37 ASR	Tycom 35/37 LASR	Typagraph DP-30	Vogue 880E
Price	\$2,350	\$4,360	\$5,360	\$2,500	\$9,000-11,000
Mechanism/formation	Character/full	Character/full	Character/full	Serial/full	Line/Drum/full
Character Set Size	88	88	88	94	64/96
Speed/ch per line	10 cps/130	10 cps/130	10 cps/130	30 cps/132	400 lpm/80
IBM/TTY Compat	TTY	TTY	TTY	TTY	TTY
CIRCLE NO.	340	341	342	343	344

Manufacturer/Model	Vogue 880TC	Vogue 810	Vogue 400C/TC	Vogue 828M	Western Union EDT 33
Price	\$9,000-11,000	\$5,000-8,000	\$12,000-15,000	\$8,000-10,000	\$44/MO
Mechanism/formation	Line/Drum/full	Line/Drum/full	Line/Drum/full	Line/Drum/full	Character/full
Character Set Size	64/96	73	64/96	28	94
Speed/ch per line	400 lpm/80	400 col/m/18	600 lpm/132	400 lpm/28	10 cps/72
IBM/TTY Compat	TTY	IBM	TTY	TTY	ASC11
CIRCLE NO.	345	346	347	348	349

Manufacturer/Model	Western Union EDT 35	Western Union EDT 300	Western Union EDT 1200
Price	\$84/MO	\$115/MO	\$165/MO
Mechanism/formation	Character/full	Character/full	Character/full
Character Set Size	94	128	128
Speed/ch per line	10 cps/72	10-30 cps/118	10-30 cps/120
IBM/TTY Compat	ASC11	ASC11	ASC11
CIRCLE NO.	350	351	352

Non-impact printers

Manufacturer/Model	Anderson-Jacobsen AJ630	Computer Devices 1030	Computer Devices 930	Computer Devices 830	Computer Devices 1030ASR
Price	\$3,900	\$3,100-4,000	\$2,600-2,685	\$2,700-4,285	\$3,900
Print Technique/formation	Thermal/dot	Thermal/dot	Thermal/dot	Thermal/dot	Thermal/dot
Speed/ch per line	30 cps/140	10-30 cps/80	10-30 cps/80	10-30 cps/80	10-30 cps/80
Character Set Size	95	96	96	96	96
Special paper	Thermal	NCR thermal	NCR thermal	NCR thermal	NCR thermal
CIRCLE NO.	353	354	355	356	357

Manufacturer/Model	Computer Devices 1132	Data Interface DI-120	Data Interface DI-240	GTE IS/7010	Digital Assoc. DAC 240
Price	\$3,900	\$3,100	\$4,100	30 cps/80	\$4,100
Print Technique/formation	Thermal/dot	Magnetic/dot	Magnetic/dot	\$3,390	Magnetic/dot
Speed/ch per line	10-30 cps/132	90 lpm/132	180 lpm/132	Thermal/dot	180 lpm/132
Character Set Size	96	64	96	96	64
Special paper	NCR thermal	No	No	Heat sensitive	No
CIRCLE NO.	358	359	360	361	362

Manufacturer/Model	Control Data 711-120	Control Data 713-120	Gould 5000	Gould 4820	Gould 5100
Price	\$2,730	\$2,730	\$7,600	\$14,200	\$13,700
Print Technique/formation	Thermal/5x7 dot	Thermal/5x7 dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot
Speed/ch per line	30 cps/80	30 cps/80	1600 lpm/132	3,000-3,600 lpm/132	1300 lpm/132
Character Set Size	96	96	64/96	96	96/128
Special paper	Yes	Yes	Dielectric	Dielectric	Dielectric
CIRCLE NO.	363	364	365	366	367

Manufacturer/Model	Scope 200R/O series	Scope 200KSR series	Texas Instruments 754	Texas Instruments 753	Texas Instruments 752
Price	\$1,800	\$2,050	\$1,575	\$1,200	\$1,300
Print Technique/formation	Electroresistive/dot	Electroresistive/dot	Thermal/dot	Thermal/dot	Thermal/dot
Speed/ch per line	150 lpm/128	150 lpm/128	13 cps/80	30 cps/80	13 cps/80
Character Set Size	128	128	51	96	51
Special paper	Electrosensitive	Electrosensitive	Yes	Yes	Yes
CIRCLE NO.	368	369	370	371	372

Manufacturer/Model	Texas Instruments 755	Varian 3182	Varian 3113	Varian 3110	Varian 3312A
Price	\$1,475	\$8,250	\$8,450	\$8,750	\$6,900
Print Technique/formation	Thermal/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot
Speed/ch per line	30 cps/80	1320 lpm/80	1000 lpm/132	1000 lpm/141	460 lpm/80
Character Set Size	96	64	123	123	123
Special paper	Yes	Yes	Yes	Yes	Yes
CIRCLE NO.	373	374	375	376	377

Manufacturer/Model	Varian 3312B	Varian 3313A	Varian 3313B	Varian 3310A	Varian 3310B
Price	\$6,900	\$7,100	\$7,100	\$7,800	\$7,800
Print Technique/formation	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot
Speed/ch per line	690 lpm/80	410 lpm/132	690 lpm/132	370 lpm/141	690 lpm/141
Character Set Size	123	123	123	123	123
Special paper	Yes	Yes	Yes	Yes	Yes
CIRCLE NO.	378	379	380	381	382

Manufacturer/Model	Varian 3314A	Varian 3314B	Versatec LP-860	Versatec LP-1150	Versatec LP-1175
Price	\$10,850	\$10,850	\$4,300	\$4,900	\$5,600
Print Technique/formation	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot
Speed/ch per line	275 lpm/210	550 lpm/210	600 lpm/80	500 lpm/132	1000 lpm/132
Character Set Size	123	123	64/96	64/128	64/128
Special paper	Yes	Yes	Dialectric	Dialectric	Dialectric
CIRCLE NO.	383	384	385	386	387

Manufacturer/Model	Versatec LP-1250	Versatec LP-1616	Versatec 200 A	Versatec 1100 A	Versatec 1110 A
Price	\$7,400	\$6,300	\$5,900	\$6,500	\$7,200
Print Technique/formation	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot
Speed/ch per line	500 lpm/132	300 lpm/100	600 lpm/80	500 lpm/132	1000 lpm/132
Character Set Size	96/128	96/128	64/96	64/128	96/128
Special paper	Dialectric	Dialectric	Dialectric	Dialectric	Dialectric
CIRCLE NO.	388	389	390	391	392

Manufacturer/Model	Versatec 1600 A	Versatec 1200 A	Versatec 2030 A	Versatec 2000 A	Versatec 2160 A
Price	\$8,300	\$9,700	\$14,900	\$10,900	\$13,500
Print Technique/formation	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot	Electrostatic/dot
Speed/ch per line	300 lpm/100	500 lpm/132	1200 lpm/232	300 lpm/232	190 lpm/180
Character Set Size	96/128	96/128	96/128	96/128	96/128
Special paper	Dialectric	Dialectric	Dialectric	Dialectric	Dialectric
CIRCLE NO.	393	394	395	396	397

Manufacturer/Model	Xerox 1200 offline	Xerox 1200 online
Price	\$2,600/MO	\$2,100/MO
Print Technique/formation	Xerography/full	Xerography/full
Speed/ch per line	4000 lpm/132	4000 lpm/132
Character Set Size	95	95
Special paper	No	No
CIRCLE NO.	398	399

WIN A TEXAS INSTRUMENTS CALCULATOR

Complete the information on the survey card found between pages 56 and 57. Deadline is September 1, 1974. **Only those cards with complete information will be selected.**

Anderson-Jacobsen, Inc.
1065 Morse Ave.
Sunnyvale, CA 94086

Baltica Business Machines
130 Lancaster Ave.
Malvern, PA 19355

Centronics Data Computer Corp.
One Wall Street
Hudson, NH 03051

Clary Corp.
320 W. Clary Ave.
San Gabriel, CA 91776

Computer Devices, Inc.,
9 Ray Ave.
Burlington, MA 01803

Computer Terminals Systems, Inc.
52 Newton Plaza
Plainview, NY 11803

Computer Transceiver, Inc.
East 66 Midland Ave.
Paramus, NJ 07652

Control Data Corp.
8100 34th Avenue S.
Minneapolis, MN 55440

Datadyne Corp.
Bldg. 37A,
Valley Forge Center
King of Prussia, PA 19406

Data Interface Associates
4 West Kenosia Ave.
Danbury, CT 06810

Data Products Corp.
6219 DeSoto Ave.
Woodland Hills, CA 91364

Data Printer Corp.
600 Memorial Drive
Cambridge, MA 02139

Diablo Systems, Inc.
24500 Industrial Blvd.
Hayward, CA 94545

Di-An Controls, Inc.
944 Dorchester Ave.
Boston, MA 02125

Digital Associates Corp.
24 Old Kings Hwy. So.
Darien, CT 06820

Dytro Corp.
63 Tec Street
Hicksville, NY 11801

Facit-Addo, Inc.
501 Winsor Dr.
Secaucus, NJ 07094

General Electric Co.
Data Communications Dept.
Wayneboro, VA 22980

Gould, Inc.
20 Ossipee Rd.
Newton, MA 02164

IBM
1133 Westchester Ave.
White Plains, NY 10604

Litton ABS OEM
34 Maple Avenue
Pine Brook, NJ 07058

Logicon/Intercomp
24225 Garnier St.
Torrance, CA 90505

Singer-International Teleprinter
286 Eldridge Road
Fairfield, NJ 07006

Iomec, Inc. Digitronics Div.
Route 9
Southboro, MA 01772

SCM-Kleinschmidt
Lake-Cook Rd.
Deerfield, IL 60015

Mohawk Data Sciences Corp.
World Headquarters
Utica, NY 13503

Media III
2454 E. Fender Ave.
Fullerton, CA 92631

NCR
Main and K Streets
Dayton, OH 45409

Odec Computer Systems, Inc.
25 Greystone St.
Warwick, RI 02886

Potter Instrument Co., Inc.
532 Broad Hollow Rd.
Melville, NY 11746

Printer Technology, Inc.
Sixth Rd. Woburn Ind. Pk.
Woburn, MA 01801

Qume Corp.
26203 Production Ave.
Hayward, CA 94545

RCA Technical Services
Bldg. 204-2 Cherry Hill Office
Camden, NJ 08101

Scope Data, Inc.
5870 S. Tampa Dr.
Orlando, FL 32809

Sycor, Inc.
100 Phoenix Dr.
Ann Arbor, MI 48104

Tally Corp.
8301 South 180th St.
Kent, WA 98031

Teletype Corp.
5555 Touhy Ave.
Skokie, IL 60076

Texas Instruments, Inc.
Box 1444
Houston, TX 77001

Tycom Systems, Corp.
26 Just Rd.
Fairfield, NJ 07006

Trivex, Inc.
3181 Red Hill Ave.
Costa Mesa, CA 92626

Typagraph Corp.
7547 Convoy Court
Box 586
San Diego, CA 92112

Uppster Corp.
845 E. Main St.
Stamford, CT 06904

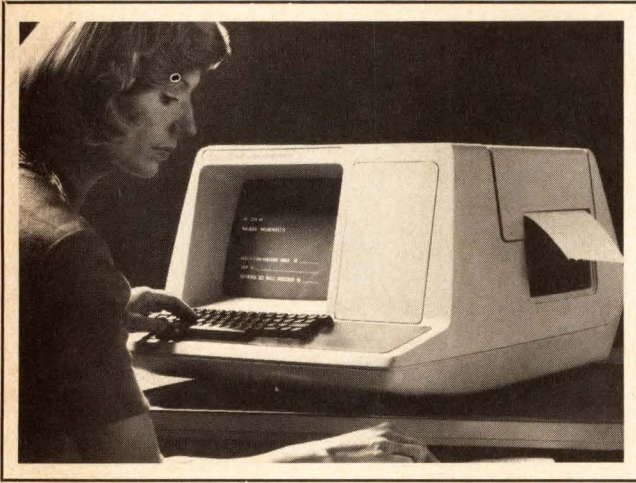
Varian Data Machines
611 Hansen Way
Palo Alto, CA 94303

Versatec Corp.
10100 Bubb Rd.
Cupertino, CA 95014

Vogue Instrument Corp.
131st St. at Jamaica Ave.
Richmond Hill, NY 11418

Western Union
70 McKee Drive
Mahwah, NJ 07430

Xerox Corp.
701 S. Aviation Blvd.
El Segundo, CA 90245



Video terminal is capable of integrated hard copy output

The VT50 DECscope is an interactive crt with integrated hard copy output capability. It is aimed at the high-volume low-cost market where initial cost, availability, and maintenance are the primary selection criteria. The VT50 incorporates an ANSI standard keyboard, and a 12-line 80-column crt display format with a high-intensity screen. Hard copy can be provided in a line-by-line or page mode, using an electrolytic technique and treated paper with no chemicals or toners. The terminal consists of modular components. The video terminal is price-competitive with 10-character per second teleprinters; it will display up to 960 characters, in 12 lines of 80 5 x 7 dot matrices; systems will operate at up to 9600 baud; operator-oriented keyboards are similar to those of standard typewriters. Prices will run about \$950 in oem quantities. First deliveries are expected for the second quarter of 1975.

Digital Equipment Corp., Components Group, One Iron Way, Marlborough, MA 01752. (617) 481-7400.

CIRCLE NO. 101

Processing system interfaces with data base

The RPS-1100 (Remote Processing System) is a tutorial and English language-oriented package that is expected to allow an end user to interface with a data base for his specific needs. A user should be able to develop and employ his applications system without programming support. The system has been designed around the Sperry Univac Uniscope 100 crt terminal. Each interaction with the user involves selections of choices on the screen, filling in blanks, or use of function keys. It will be free of charge to owners of the 1100. The TIP-1100 (Transaction Interface Package) provides an online communications-oriented processor operating under control of Sperry's Executive system. This package is also free of charge to 1100 owners.

Sperry Univac, P.O. Box 500, Blue Bell, Pa 19422. (215) 542-4011.

CIRCLE NO. 102

Interactive hand-held terminal combines portability and power

The Termiflex HT/2 hand-held alphanumeric terminal features a twenty-key keyboard in conjunction with three special shift keys. These keys generate the full ASCII character code. The top four rows of the keyboard provide the printing characters and the bottom row is for control functions. The keyboard is laid out in touch-tone telephone format. The display consists of two 10-character rows of 5 x 7 dot LED matrices. All printing characters in the ASCII set are displayed, including the complete upper and lower case alphabet. Price for the HT/2 is \$1,570; delivery is 90 days aro.

Termiflex Corp., P.O. Box 1123, 17 Airport Rd., Nashua, NH 03060. (603) 889-3883.

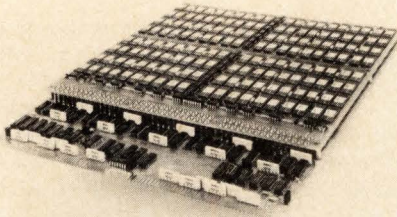
CIRCLE NO. 103

Computer line fills small system, virtual memory needs

The series 60 is a line of seven new Honeywell computers which the company said was designed to make users independent of hardware models and operating subsets. The 62/60 was designed for the small system market and is priced at about \$5,000 per month. Model 64/20 is aimed at the medium computer market in the \$5,000 to \$10,000 per month range. Model 66/20 is an integrated system and features MOS memory, a cycle time of 1.4 micro-seconds and 320k to one million bytes of memory. Purchase price is about \$1.2 million and rental cost is \$23,339 per month. Model 66/40 offers 1.7 times the power of the 66/20. Also an integrated system, it features 524k to one million bytes of memory which can be increased to two million bytes with the addition of another system controller. A typical configuration costs \$36,252 per month or \$1.8 million to purchase. Model 66/60 is the only system offered in both free-standing and integrated versions. Integrated configurations provide MOS memory ranging from 786k to two million bytes, while the free-standing model can provide as much as four million bytes. The system rents for \$48,857 monthly. Purchase price is \$2.5 million. A free-standing system offered in a similar configuration to the 66/60 but with 1.4 times the power is the model 66/80. Memory sizes range from one million to four million bytes. Rental cost is \$94,981 per month. Purchase price is \$4.75 million. The top of the series 60 line is model 68/80. It is aimed at a specialized group of users who need powerful virtual memory, online interactive processing, controlled file sharing, strong file security and continuous operation. The 68/80 provides as much as eight million bytes of MOS memory and 134 million bytes of bulk storage. In terms of virtual storage, it offers six billion bytes of addressable memory. *Multics* can accommodate as many as 10 processors on one system. Monthly rental costs range from \$75,275 for a typical small configuration to \$141,181 for a large configuration. Purchase prices are from \$3.5 million to \$6.5 million. Deliveries of the series 60 computers will be made during the first quarter of 1975.

Honeywell Information Systems, 60 Walnut St., Wellesley Hills, MA 02181. (617) 237-4100.

CIRCLE NO. 104



Memory board holds 16,384 words

The Micram 3000N is a high-speed semiconductor memory. It provides a maximum of 16,384 words or 20 bits per word on a single printed circuit card assembly. Cycle and access times are 300 nsec and 180 nsec respectively. Also available is a high-speed version, the Micromemory 3000N-1, which cycles at 180 nsec and accesses at 150. The Micram 3000N is basically compatible with EMM's Micromemory 3000 (core) memory family. It requires no external circuitry other than power supply. Price is \$4,390 for the 16k card and \$2,080 for the 8k card. Delivery is 60 to 90 days aro.

Electronic Memories & Magnetics Corp., 12621 Chadron Ave., Hawthorne, CA 90250.
(213) 644-9881.

CIRCLE NO. 105

Crt transmits data up to 9600 baud

Designed especially for distributed data processing systems such as bank branches, point-of-sale terminals, etc., the Informer series of computer terminals may be used to enter information on a screen and transmit the data at speeds up to 9600 baud to a polling computer. Up to 128 terminals may be connected to a single computer port, directly or via a modem. For multiple port operation, one or more terminals may be daisy-chained to each port. Each terminal provides standard keyboard spacing and configuration, a separate 10-key number pad and special function keys. Price is \$2,050. D-302 Informer terminals are available from stock.

CAR-MEL Electronics, Inc., 2218 Cotner Ave., Los Angeles, CA 90064,
(213) 477-4216.

CIRCLE NO. 106

ASCII display controller: The series 300 display controller/RO terminal is capable of driving multiple displays (up to 10) in different locations. Teletype compatibility enables the user to either replace the existing model 33 TTY's where a keyboard is not required, or to use both the TTY and the controller. Standard units provide a seven bit parallel interface with a data rate capability of 1200 char/sec asynchronously. Price is \$790.

Digi-Log Systems, Inc., Babylon Rd., Horsham, PA 19044.

CIRCLE NO. 107

Paper tape reader: Speeds up to 150 cps can be achieved with this eight channel Starwheel Sensing Reader. The model 1200 is driven mechanically. The gold try-forcated Starwheel Sensing contacts are compatible with RTL, DTL, TTL and HTL logic as well as relay systems. Price is \$16000.

Data Peripheral Inc., 14 Porter St., Hackensack, NJ 07601.

CIRCLE NO. 108

Read/write memory: The MC10143L is a high performance 16-bit multiport register file capable of reading four-bits and/or writing two-bits at the same time. Access time to any four bits is 10 nanoseconds, while simultaneously writing in new data. Price is \$29 in oem quantities.

Motorola Semiconductor Products, Inc., P.O. Box 20912, Phoenix, AZ 85036.

CIRCLE NO. 109

Add-on memory: Monostore III, an add-on semiconductor memory designed for the PDP-11, expands the system by up to 32k x 16 bits. It is fully Unibus compatible and priced at 1.2 cents/bit.

Monolithic Systems Corp., 2700 South Shoshone, Englewood, CO 80110.

CIRCLE NO. 110

A/D converter: The model ADC-149 analog to digital converter features 14 bit binary resolution and 50 microseconds per conversion. Price is \$249.

Datel Systems, Inc., 1020 Turnpike St., Canton, MA 02021.

CIRCLE NO. 111

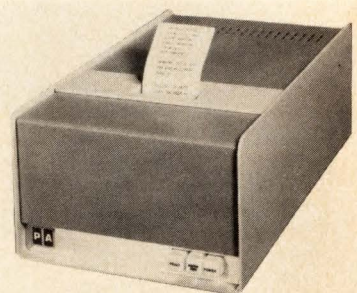


Table-top printer accepts ASCII input

DMTP-1 table-top printer incorporates an impact dot matrix print technique compatible with an ASCII input. DMTP-1 will print up to 24 characters per line at a rate of one line per second. The 7 x 5 image is visible on adding machine tape with inked ribbon, or pressure sensitive paper. Multiple copy tape is optionally available. Price ranges from \$645; delivery is four weeks aro.

Practical Automation, Inc., Trap Falls Rd., Shelton, CT 06484.

(203) 929-1495.

CIRCLE NO. 112

Optical page reader converts copy to ASCII code

The model 101A optical page reader accepts typewritten copy on 8-1/2 x 11 inch pages, converting it to ASCII code at 4000 words per minute. The reader operates on the principle of bar-code recognition, rather than character recognition. In this system, the typewriter (an IBM Selectric) is equipped with a special type element which prints a sub-miniature bar code under each typed character. The page reader is equipped with an automatic feeder, capable of holding up to 50 sheets. It offers certain editing capabilities, such as line-out, and offers flags for character, word and line deletion and insertion, for downstream utilization in editing data or manuscripts. Various code outputs and character assignments are available for specific oem applications. Quantity prices are \$5,000 to \$6,000, with availability from stock to six weeks.

Taplin Business Machines, 4 Ray Ave., Burlington, MA 01803.
(617) 273-2222.

CIRCLE NO. 113

Data module has fixed head storage

This data module with fixed head storage combines both fixed and movable read/write heads, access arms and recording surfaces into a single removable cartridge. The data module has 30 fixed heads that make one-half million bytes of information available. It also stores up to 69.3 million bytes served by movable heads that operate with an average seek time of 25 milliseconds. The new module operates on any two-drive IBM 3340 equipped with a fixed head feature. These drives also can use earlier versions of the data module. Purchase price is \$1,900. First customer shipments are scheduled to begin in the third quarter of 1974.

IBM, Data Processing Div., 1133 Westchester Ave., White Plains, NY 10604.

(914) 696-1900.

CIRCLE NO. 114

Crt data entry: The Keyview crt and data entry terminal features up to 96 characters per line; 32 lines per display; 12 inch screen; data rate up to 9,990 baud; and hard copy capability. Price is \$1,750.

Information Design Inc., Civil Air Terminal, Bedford, MA 01730.

CIRCLE NO. 115

High resolution converter: The model A-856 high resolution, 16-bit analog-to-digital converter has a resolution of one part in 65,536. A buffer amplifier is included. Price is \$1,300.

Intech, Inc., 1220 Coleman Ave., Santa Clara, CA 95050.

CIRCLE NO. 116

Portable cassette: A portable cassette transport for PDP-8 computers reads or writes at 300 characters per second. A single cassette can store over 500k characters. Price is \$795.

TC Systems, Inc., 3303 South Rice, Houston, TX 77027.

CIRCLE NO. 117

Graphic system displays bar charts

Model FS-2000, graphic display system can address a character to any location on a 256 x 256 grid. Images are stored in display lists which can be read back in whole or in part into the cpu via bi-directional interfaces designed for use with a broad range of minicomputers. Standard operations include dual intensity of each of seven colors, blink to half intensity, reverse background for characters, single byte relocation or modification of length, height, thickness and color, and four character sizes. It displays bar charts, histograms, flow diagrams, and other important data. Price is \$8,000. Delivery is 90 days aro.

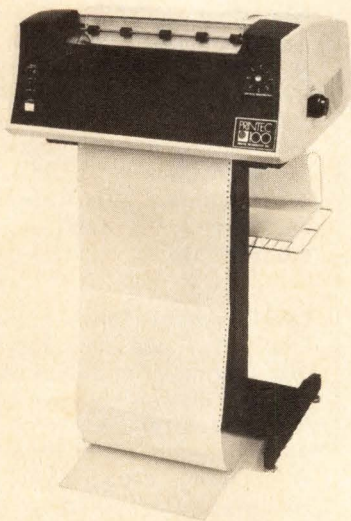
Ramtek Corporation, 292 Commercial St., Sunnyvale, CA 94086.
(408) 735-8400.

CIRCLE NO. 118

BUY DIRECT

You can buy a serial printer from DEC or Data General for around \$6,000.

Or a similar printer direct from us for \$3,850.



The Printec plug-compatible package includes: 100 character-per-second printer, controller card, 15 foot cable, and full software compatibility.

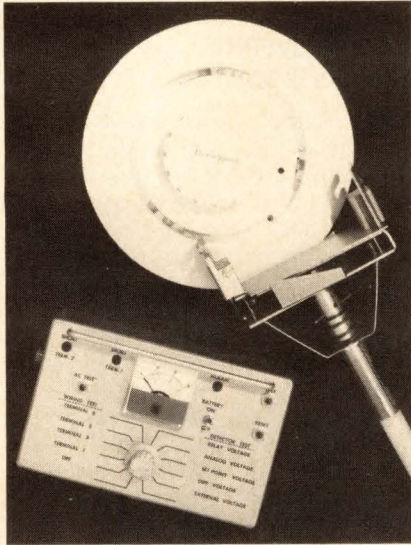
If you have a PDP-11, PDP-8, or a NOVA and need a medium speed printer, you should be talking to PRINTER TECHNOLOGY.

Or maybe you have a Hewlett Packard 2100. We will sell you a complete printer package for \$5,400 (H.P. is priced at \$7,600). If you have a H.P. 9830A programmable calculator, \$3,150 buys a fully compatible printer.

The PRINTEC-100 Serial-impact Printers are backed by nationwide service, full warranty, and proven reliability.

PRINTER TECHNOLOGY, INC.

Gill Street, / Woburn, Massachusetts 01801 / (617) 935-4246



Alarm system summons the fire department

This fire protection system has been developed especially for computer rooms, tape storage vaults, and peripheral equipment areas. The system features detectors that react to fire before there is any smoke or flame. When a detector spots a fire, it flashes a signal to a modular alarm/control panel that turns on emergency signals throughout the fire zone. The modular panel can take over other emergency functions as well. It can turn on sprinklers or chemical extinguishers, move elevators to safe floors, close remote fire doors, start up smoke-evacuation fans, broadcast prerecorded announcements to danger areas, even summon the fire department. Prices begin at \$1,500; delivery is four weeks aro.

Honeywell Inc., 2701 4th Ave., S., Minneapolis, MN 55408.
(612) 332-5200.

CIRCLE NO. 119

Disk cartridge cleaner: The System 315 is an offline motorized disk cleaner unit. It includes presaturated alcohol Texpads, a Texwipe Microduster for air-flushing of the inner cartridge and disk surface, Texwands, lint-free Textsleves for head and disk cleaning, and a 15 ounce aerosol can of Texwipe head and disk cleaner. Price is \$950; available now.

Tek-Mark, Inc., 223 Old Hook Rd., Westwood, NJ 07675.

CIRCLE NO. 120

ID security system "sees" personnel

This electronic access control system combines the cryptocoded Ruscard with an internal, color-photo ID bank. Ruspac can be used with the Rusco R-40 or R-30 central console systems. In operation, an authorized individual inserts his invisibly coded Ruscard in the reader at an authorized entrance. The reader selects the correct 35mm. photo from the photo ID bank and displays it in large format and full color, visible only to guard personnel, on a screen at the entrance, or at the central control station. Visual comparison of the photo and the individual allows access, or denies access and requires investigation. Price is \$3,500; available now.

Rusco Industries, Inc., 1100 Glendon Ave., Los Angeles, CA 90024.
(213) 879-9033.

CIRCLE NO. 121

Cartridge ribbon: The Duroclear III cartridge ribbon is for use on IBM Selectric II, Mag Card Executive, and Mag Card Selectric typewriters. They produce approximately 580,000 characters per ribbon. Price is \$7.50.

Addressograph Multigraph Corp., 125 So. Wilke Rd., Arlington Hgts., IL 60005.

CIRCLE NO. 122

Push button: Users are given an opportunity to make their own keyboard or data display with these 1/2-inch unitized push-button switches. Each unit features independent lamp circuitry; 30 volts DC or 115 volts AC, 2 amps resistive, 1 amp inductive. Price is \$2.45 each in oem quantities.

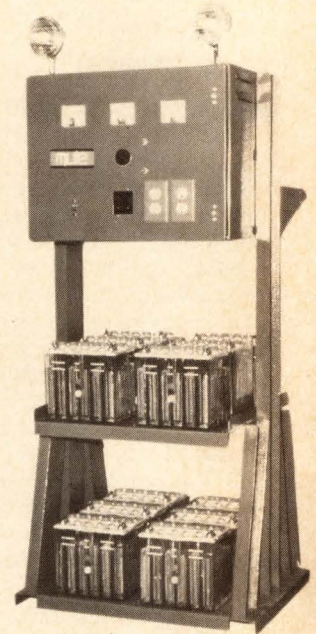
Electro-Mech Components, Inc., 1826 N. Floradale, S. El Monte, CA 91733.

CIRCLE NO. 123

Dampener: The model 11208 helps IBM Mag Card units make a quieter impression in offices. This sound-deadening acoustical cover, requires no machine modifications, fasteners or tools. Price is \$189.50.

Van San Corp., 1180 Centre Drive, City of Industry, CA 91748.

CIRCLE NO. 124



Emergency electrical power source has battery charger

The Mule SPS System includes a fully automatic solid-state battery charger, a solid-state inverter (t24vDC to 115vAC), and two or more heavy-duty industrial grade Mule lead-acid storage batteries. Unlike generator systems, the SPS requires no engine installation, fuel, fuel tanks, engine maintenance, spare parts, or exhaust venting. Price is \$2,500; delivery is 8 weeks aro.

Mule Battery Co., 325 Valley St., Providence, RI 02908.
(401) 421-3773.

CIRCLE NO. 125

Nine-digit calculator: The NS900 is a nine digit calculator that can add, subtract, multiply and divide, do multiple addition and subtraction, squaring and has a fixed two-place decimal. An ac wallplug adaptor is optional. Price is \$39.95.

NS Electronics, 2921 Copper Rd., Santa Clara, CA 95051.

CIRCLE NO. 126

Label system: These non-magnetic labels are designed for System-3 disk owners. They allow the operator to determine if the right pack is mounted for the job about to be done. Price is \$3.00 each.

Telegraphic Ltd., P.O. Box 36, Hauppauge, NY 11787.

CIRCLE NO. 127

Batch systems cover wide performance range

The 72-0001 is a 32k byte, V72-based batch/Fortran processing system, with disk, paper tape reader, line printer and teleprinter. It also includes priority interrupt, buffer interface controller, I/O expansion chassis, cabinet, and MOS software package with Fortran. It costs \$36,300. The 72-0002 batch system is designed for users requiring more peripherals and greater throughput. It has the same equipment as the 72-0001 with the addition of more core memory (48k byte), 9-track tape transport, faster line printer, dual buffer interface controller, card reader, and comes in a twin cabinet configuration. The 72-0002 costs \$61,500. Delivery for both models is 30 days aro.

Varian Data Machines, 2722 Michelson Dr., Irvine, CA 92664.
(714) 833-2400.

CIRCLE NO. 144

Desk-size computer acts as three machines

The Opus III desk-size computer system consists of a desk, computer, typewriter, and cassette drives. This modular system can be three machines in one: an accounting computer; a medium-size computer; and a communication terminal that can be hooked up with a larger system or with another Opus III. Peripherals include line printers; tape drives; card readers; paper tape readers; a disk; and a crt. Price is \$20,000. Available 30 days aro.

Computer Development Inc., 1650 Challenge Dr., Concord, CA 94520.
(415) 798-3123.

CIRCLE NO. 145

Microcomputer family can act as dp subsystem

This n-channel MOS microcomputer product family includes the 8080 central processor unit, peripheral circuits for the 8080, a version of the Intellec 8 program development system, for use with the 8080, and a set of software development packages and system engineering and programming manuals. It can

be used as a control and data processing subsystem in some types of complex systems, as a replacement for multi-chip cpu's, custom MOS large scale integrated circuits, or large assemblies of conventional logic circuits. The 8080 stack architecture enables the programmer to handle both subroutines and inter-

rupts. Also, the new instructions and features facilitate such operations as handling strings of data and decimal and double-byte arithmetic. Price is \$360. Available now.

Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051.

(408) 246-7501.

CIRCLE NO. 146

EXECUPORT 1200: The fast, wide-track one

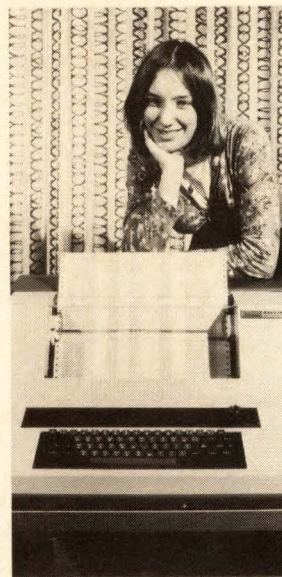
The new Execuport® 1200 prints a fast 120 cps (but select 10, 15, 30, or 60 cps if you wish). It prints this entire advertisement in under 29 seconds... on a line up to 132 characters wide.

It's an asynchronous serial impact printing terminal, compatible with most teletypewriters, computer systems, and cassette magnetic tape units. There's a modem controller for high-speed conversational timesharing; a Bell-compatible 202 modem is available.

The Execuport 1200 makes an original and five sharp copies on standard fan-fold paper. Yet it's quiet enough for an office.

This is the ideal communications printer, billing printer, computer output lister, or remote batch terminal.

Features include full and half duplex operation; three RS232 connectors; upper and lower case; and line, local, and split modes.



Options include top-of-form, horizontal tabbing, and perforation skip.

Basic character set is ASCII, with EBCDIC as an alternate. Or, as an option, you can have both in a single printer. The Execuport 1200 generates the full 128-character ASCII code and prints all 96 ASCII alphanumeric and symbols.

Each character is formed as a 5 x 7 dot matrix, struck simultaneously by a full 35 pins — one per dot. This greatly increases durability and reliability while maintaining the highest print quality.

For more information, use the reader service card or phone us directly.

Ask us for the name of your local representative. He'll show you the complete Execuport line of portable and office terminals and peripherals, including paper tape and cassette units.



EXECUPORT: The tougher terminal.

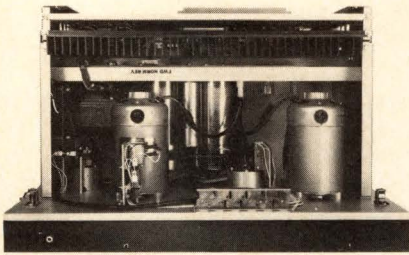


Computer Transceiver Systems Inc.
East 66 Midland Ave., Paramus, N. J. 07652
(201) 261-6800 • TELEX: 138-707

INFORMATION RETRIEVAL NUMBER 66

Oversight:

the view from above.



a failure to notice important details, such as:

DIRECT DRIVE REEL MOTORS

No belts or gears, long motor life.

POWER FAILURE PROTECTION

Reel motors stop under servo control.

CONSTANT TAPE TENSION

Unique shared spring concept.

INTERFACING

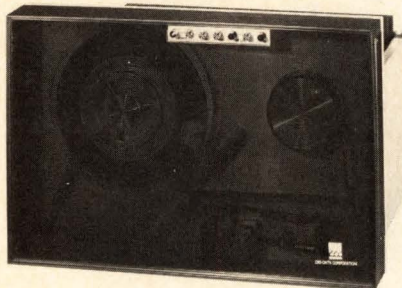
Single connector I/O makes daisy-chaining simple; standard 3 connector I/O available

EASE OF MAINTENANCE

Card basket hinges open, motors unplug, troubleshooting aids.

Foresight:

the view from the front.



The wisdom to weigh future considerations now, such as:

ACCURATE TAPE HANDLING

Single capstan; all tape-handling components on a single flat plate; non-twisting arms; double-guiding.

GENTLE TAPE HANDLING

Short, light, low-inertia tension arms.

ULTRA-RELIABILITY

Twelve years experience manufacturing tape drives.

Avoid

Hindsight:

SEND FOR ALL THE DETAILS TODAY.



**DIGI-DATA
CORPORATION**

8580 Dorsey Run Road,
Jessup, Md. 20794
(301) 498-0200

INFORMATION RETRIEVAL NUMBER 64

New Developments Data Comm



Modems replace Bell 103 and 113 data sets

This series of low speed modems replace Bell 103 and 113 series data sets. The units provide full duplex operation over private line, or over the DDD network when used with the CDT, CBT, or CBS Dial Access Arrangements. The interface can be either EIA, TTY 20 ma, TTL, or MIL-188C. The models in the 7103-LC Series include types for originate only, answer only, originate/answer, and automatic originate/answer. All accept asynchronous serial data up to 300 bps and are FSK modulated. A switch provides loopback of terminal output to input for isolated tests of terminal equipment. Both desk top and rack-mounted units are available. Prices range from \$200 to \$400. Available now.

Tele-Dynamics, 525 Virginia Dr.,
Fort Washington, PA 19034.
(213) 643-3900.

CIRCLE NO. 138

Data modem intended for international markets

The 48001 data modem is designed to comply with recommendation V.27 of the International Telegraph and Telephone Consultative Committee (CCITT) for data modems operating at 4800 bps and is intended primarily for international market requirements. The modem incorporates a range of built-in diagnostic capabilities including local loopback, DC and audio bus-back, as well as optional features such as remote loopback, alternate voice/data, built-in multiplexer, secondary channel, and built-in eye pattern generator. Three standard strap-selectable operating modes are provided. Price is \$4,800; delivery is 90 days aro.

Codex Corp., 15 Riverdale Ave.,
Newton, MA 02195.
(617) 969-0600.

CIRCLE NO. 139

Communications analyzer includes transmission test set

The Data 100 Communications analyzer features a transmission test set that checks the capability of the communications link by using selected test patterns. This feature can be exercised with any RS-232C interface, and with any two-wire/four-wire dial-up or dedicated line. The test set can also utilize the digital loopbacks feature of data sets. A line code analyzer in the unit traps and stores either selected data characters or control codes associated with IBM binary synchronous, BCD user terminal, and Univac DCT 2000 line disciplines. Purchase price is \$3,750. Available now.

Data 100 Corp., 7725 Washington Ave. South, Minneapolis, MN 55435.
(612) 941-6500.

CIRCLE NO. 140

Light weight data trap checks data comm systems

Communication link computer system interfaces operating at speeds up to 9,600 baud can now be checked on a continuous basis for intermittent operation by the model M-501 online data trap. The data trap is transparent to both computer and communication device, while displaying all data passing between units. Normal data characters are presented sequentially as received or transmitted in bright, sharp, clear characters. The M-501 shows ASCII control characters at a lower intensity level than data characters so they may be readily distinguished from data. With the data trap in position, it is possible to determine whether the communications system or the computer system is the cause of random errors. A selector switch permits selection of any of eight internal baud rates, or an external rate. When filled, the screen scrolls up, so that the most recent transmissions are trapped. The screen may be frozen for examination using either a mechanical switch or an electrical level derived from the computer system. Price is \$1,600. Available now.

Car-Mel Electronics, Inc., 2218 Cotner Ave., Los Angeles, CA 90064.
(213) 477-4216.

CIRCLE NO. 141



Line controller interfaces with minis

The Micom 20/10 communications line controller is designed to provide an interface to minicomputers or processors for up to 128 data communication lines. It allows any minicomputer or processor to communicate and control data terminal devices operating on synchronous and/or asynchronous communication lines. The Micom 20/10 CLC also interconnects to multiple minicomputers or processors on the one hand and to multiple line interface bays on the other. Price is \$2,800. Delivery is 90 days aro.

Micom Systems, Inc., 20426 Corisco St., Chatsworth, CA 91311.
(213) 882-6890.

CIRCLE NO. 142

Modular data comm system for minis

A modular communications system available for PDP-8 and other minicomputers uses MOS/LSI technology. Each module accommodates eight ports with each port having program selectable baud rate (50-9600 baud), character length (5-8 bits), stop and parity bit configurations. Interfaced to the minicomputer bus, a controller module drives an extensive line of modules for asynch or synch serialization and modern control. Customers may assemble complete communication systems using their own mini and DCA modules. Complete diagnostic software is also provided at no cost with each hardware order. A typical PDP-8/E based 16 port local EIA or TTY system costs about \$5,800. Available immediately.

Digital Communications Associates, Inc., Suite 400, 2801 Clearview Pl., Atlanta, GA 30340.
(404) 458-6215

CIRCLE NO. 143

DIGITAL ASSOCs.

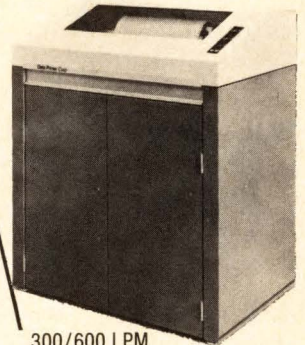
24 Old Kings Highway South, Darien, Connecticut 06820 (203) 655-2222

**PRINTERS!
PRINTER SYSTEMS!**
FOR SALE OR LEASE



125/200 LPM

**WITH
MINICOMPUTER
INTERFACES!**
DEC/DGC/DCC/H-P/INTERDATA/RS-232/ETC.



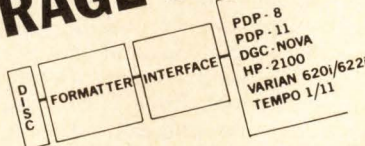
300/600 LPM

**NOW! FOR
IBM SYSTEM/3
MODEL 6, 10 & 15**



225/500 LPM

**FLOPPY DISC
STORAGE SYSTEMS!**



We're the Nation's Leading Supplier of minicomputer-compatible printer systems. Immediate delivery. For sale or lease. Nationwide installation and service available.
We're dedicated to serving you by responding promptly to your specific needs with the best available products and total support at a very competitive price. We invite your inquiry!

**Digital Associates
makes great products
more available.**

Teleprocessing monitor supports local/remote

Shadow is a teleprocessing monitor that simplifies the writing of terminal-based application systems. It supports local or remote telecommunications devices attached to IBM models 360/370 operating under OS, DOS, or VS. *Shadow* provides the interface that monitors terminal activity. Monthly lease prices for *Shadow* will be \$225 for DOS installations and \$425 for OS systems. Purchase prices are \$8,000 and \$15,000 respectively.

Information Facilities, Inc., 1271 Avenue of the Americas, New York, NY 10020.
(212) 765-4200.

CIRCLE NO. 128

DOS/OS addition to 370 is used as spooling system

POWER/VS, a virtual storage version of the current programming component of *DOS/VS*, can be used as a spooling system, to permit tasks to be processed while input jobs are being read and stored, and completed jobs are being printed. In addition, it allows jobs from remote locations to be handled through its RJE facility. Other features of *POWER/VS* that benefit the user include operation in virtual mode; operator commands that allow control over tasks; and job accounting data collection, which simplifies the preparation of billing reports. It will be available to system 370 users without charge in September.

IBM, 1133 Westchester Ave., White Plains, NY 10604.
(914) 696-1900.

CIRCLE NO. 129

Matching technique: *Modfile* is a modular file matching technique for processing up to six input/output sequential files. It encourages the development of further applications routines in modular form and requires a programmer to account for all eventualities which could occur. Price is \$1,000.

Automated Computer Services, Inc., P.O. Box 26428, Richmond, VA 23260.

CIRCLE NO. 130

Software for CPA's: *Client Accounting System* is designed for CPA's and other accounting firms using NCR 399 computers. Individual programs within CAS are grouped into four major categories: maintenance, conversion, processing and general. Within each of these, the payroll and chart of accounts-general ledger requirements are separate. Price is \$1,200 for a one time licensing fee.

The National Cash Register Co., Dayton, OH 45479.

CIRCLE NO. 131

Software for Xerox computers: This enhancement of Xerox operating systems (BCM, RBM or CPR), provides dual processor software that allows computer-to-computer communication and sharing of computer peripherals. Package applies to dual processor configurations that typically consist of a host computer Sigma 5, 6, 7, 8 or 9 and a smaller satellite Sigma 2, 3 or a Xerox 530. These are connected by means of a memory-to-memory link or Channel Interface Unit 10P-to-10P interface. Prices range from \$8,000 to \$13,000.

Code Research Corp., 1363 S. State College Blvd., Anaheim, CA 92806.

CIRCLE NO. 132

New front-end: This package is used with Periphonics T-COMM 7 front-end processors. It permits the TC terminals to be supported on a 360/370 system with no changes in the terminal firmware. This device handler is installed in the Periphonics processor as part of its operating system, *Peri-Comm*. The terminal support module handles the handshaking and housekeeping chores for messages to or from the terminal. Price is \$195 per month.

Periphonics, Airport International Plaza, Bohemia, NY 11716.

CIRCLE NO. 133

Floppy disk handler: This handler for PDP-8E and M computers under OS/8 for the AED 2500 floppy disk subsystem occupies less than 128 words in core in an 8k PDP-8E or M. Price is \$200.

Advanced Electronics Design, Inc., 3197 Park Blvd., Palo Alto, CA 94036.

CIRCLE NO. 134

Operating system supports up to 15 computers

A revision of Data General's *Real Time Disk Operating System*, (RDOS), supports as many as 15 interconnected Nova-line computers. The revised operating system also features an operator communication package that lets an operator monitor and control the execution of tasks within a program; a checkpointable background capability that can suspend one background program temporarily so that a new one can be run; and a multiterminal editing program. It is offered free to current users.

Data General Corp., Southboro, MA 01772.

(617) 485-9100.

CIRCLE NO. 135

Fortran debugger works online/interactive

Breakpoint is a program that allows a programmer to debug a *Fortran* program in an online interactive mode. At the break, the variable name and its value is examined by the user, and changes can be made if desired. The program also features selective printout, suppression of breaks, and other debugging functions. Price of a source version is \$200.

Binary Systems, Inc., 88 Sunnyside Blvd., Plainview, NY 11803.

(516) 822-1585.

CIRCLE NO. 136

Floppy disk software system aimed at Nova users

This flexible-disk operating system is for use with Data General computers. The *XDOS* system features include device independence, lower core requirements, multiple compilation and assembly, multiple file identifiers, simplified editing procedures, batch mode, availability of user application interrupts, random access or sequential access, and virtual memory capability. Price of \$10,000 includes a Nova computer, 8k core memory, the *XDOS* system and a teletype unit.

Xebec Systems Inc., 566 San Xavier Ave., Sunnyvale, CA 94086.

(415) 968-1978.

CIRCLE NO. 137

NEWSDATA...

... from page five

ning of the bridge proper. It also receives approach demand input from pressure plates under the 15 approach lanes. The minicomputer decides which lanes should receive a green light on the basis of bridge loading and demand. Traffic on the bridge is kept flowing at about 40 mph during the morning rush. Two priority lanes always have a green light—lanes that are reserved for busses and carpools.

When asked about the functioning of the new system, Scott MacCalden, Senior Engineer with the California Department of Transportation Highway Operations Division, said "We're quite pleased with it." This approval of the system seems to be shared by most, if not all, of the 22,000 plus-drivers who traverse the bridge each day during rush hour.

Chess champs make move for IFIPS '74

Twelve international computer programs will sit down across the table from each other August 5 to play off the first World Computer Chess Championship at IFIP Congress 74 in Stockholm, Sweden.

Finalists will be selected from 16 candidates in Great Britain, Norway, Austria, Switzerland, West Germany, USSR and the US. Entrants from the United States include the four top finishers in the US Championship finals played at the ACM '73 meeting in Atlanta: *Chess 4.0* (Northwestern University), *Tech II* (MIT), *Chaos* (Sperry Rand Univac) and *Ostrich* (Columbia University).

Six games will be played each evening during the four-day international computer convention. David Levy, International Master from Great Britain and tournament director, will critique the computers' moves on six display boards at a downtown Stockholm hotel.

Screening and ranking of the finalists will be completed shortly, according to Professor Benjamin Mittman, Director of Northwestern's Vogelback Computing Center and tournament organizer. Selection is based on human evaluation of a computer's performance in two games of its own choice, including games against itself. "Even when it loses to itself we can judge its strength," Professor Mittman said,

"because it can lose in smart ways or dumb ways."

In Stockholm the programs will have the conventional two hours to complete their first 40 moves. Moves will be transmitted to and from computers at the entrants' home bases by telephone or terminal. Each contestant will be allowed three 20-minute timeouts per game for communications or hardware failure.

There will be a 40 nanosecond playoff in event of a tie.

Publication geared to computing kids

A publication based on the assumption that computers are fun for kids (of all ages) is being launched by a group of educators, computer professionals and other believers. The bi-monthly, according to its publishers, will include games, classroom software, ways to access publicly funded and private projects in classroom computing, and some material on the impact of computers on society.

Organized by David Ahl, who has been the chief computer gamester at Digital Equipment for years, the board of active advisors includes Dr. Alfred Bork of U.C. Irvine, Dr. Thomas Dwyer, pilot of Project Solo, Bill Mayhew, computer guru of the Boston Children's Museum, Dr. Seymour Papert, a major contributor to the *LOGO* language project and well-known turtle-builder, and Don Spencer, computer games author.

Advisory board members also include Evelyn Bonney, press coordinator at AFIPS, Dr. Lud Braun of the Huntington Project, Walter Koetke, editor of *Mathematics Teacher*, and Rusty Whitney, mastermind of the computer environment at Oregon Museum of Science.

The publishers will provide information about their goals and how to get charter subscriptions (if you hurry). The mailing address is Creative Computing, P.O. Box 1036, Concord, MA 01742.

CAI catches on in Scotland

A computer-assisted instruction (CAI) pilot project linking ten schools to a single central processor is to be set up in Glasgow, Scotland before the end of the year. The system will be based on a 96k Univac 418-III computer supporting ten terminals per school—100 in all. The initial con-

tract will be for a year, and worth about \$437,000 to Univac according to Glasgow's director of education, Edward Miller. Total expenditure on the pilot system is likely to top \$2.3-million if the scheme is extended, as planned, over five years.

Although computing as such is nowadays fairly common in schools, CAI is not. This is because the technique is expensive in terms of computing power, and its effectiveness hard to quantify. Hard pressed for finance, British schools mostly content themselves with basic courses in computer familiarization, though some offer instruction in programming. It is common to find cost-benefit arguments being advanced to justify computer usage as stringent as those in industrial situations. Many schools which operate their own machines use them for a variety of non-teaching applications like scheduling, student records and transcripts in order to optimize machine throughput.

Broadly there are two computing modes that have found favor with schools: In-house minicomputers, or sometimes super-calculators, programmable in high-level languages (most often *BASIC*), and with full alphanumeric capability; and time bought on commercial timesharing systems of large computers operated by other educational users (e.g. local universities). Batch processing is generally too cumbersome, especially when particular classes may only meet once or twice a week, and time bought on non-educational machines like local government computers has been found unsatisfactory because the priorities of the computer's primary user are rarely those of the school.

IBM gets generous with Spanish universities

The oldest of Madrid's three universities, the 'Complutense', has taken delivery of an IBM 360/65 system—an outright gift from the manufacturer. It will replace an elderly 7090/1401 configuration that IBM has loaned to the university for the last five years. The new computer represents a massive upgrading of the university's computing power: Whereas the 7090 processor had 32k 36-bit words of main memory, the 360-65 will have 512k bytes.

Backing storage is greatly enhanced, too, from 12 low-density tape units to four 2314 disk drives plus four high-density tape drives.

This is the largest benefaction yet in IBM's already extensive record of gifts to Spanish universities. Previ-

ously a 360/20 led the field, followed by a 1130 at Valladolid, and 1620s at a number of locations including Valencia, Zaragoza and the Barcelona Polytechnica.

Spanish universities, though theoretically independent of the central government, are in fact heavily dependent for finance on the Ministerio de Education y Ciencia. But the Ministry is most reluctant to provide funds for computer purchases. Hence in order to operate their own computing systems at all, universities are forced to rely on the generosity of manufacturers, beneficent trust funds, or local industry.

The reason the Ministry is not forthcoming with computer finance is that it operates its own Univac 1108 machine, said to be Spain's largest system, which it encourages individual universities and other educational institutions to use, via DCT 2000 RJE terminals. Currently eight universities are linked: The Barcelona Polytechnic, Barcelona Autonoma, Zaragoza, Santiago, Seville, Granada, Salamanca and Cordoba. Likely expansion is such that the Ministry is already talking in terms of adding a second processor (with 131k memory like the first), eight more disk drives to make a total of 14 along with the existing four drums, and four more tape drives to the existing seven.

The Ministry's computer Center now operates three shifts, seven days a week; about 70 percent of its processing capacity is taken up by universities and research institutes, and the remaining 30 percent is taken up by the Ministry for its own administrative purposes.

Teutonic troubles, or What's up, Herr Doktor?

From Germany, an untypical tale of inefficiency and poor coordination.

German general practitioners all belong to one of the country's 2000 or so Kassenartzliche Vereinigungen—doctors' accounting organizations. The individual KV's are supervised regionally by the larger KV's, and the entire hierarchy is watched over by the Kassenartzliche Bundesvereinigung, the federal organization, in Cologne.

It sounds like a model of Teutonic competence, but when it comes to computing the KV's seem unable to make up their minds on either the specifications of a national system or the hardware on which to implement it. In 1971, a plan was formulated which would provide a nationwide

computing network to the KV's, originally to provide online accounting but with the intention of expanding into medical records, bibliography and certain other more medical applications. This would make it much easier, for instance, for patients to move from one region to another, allowing the new doctor to access the records kept on the patient by his former GP, without physical transfer of the records from one region to the other. Obvious security procedures would, of course, have been built into this system.

Quick off the mark, Univac started hawking 1106 configurations to the KV's. By the end of last year, four major KV's had installed identical 131k systems, with a further two smaller KV's linked to 1106's by visual display terminals. These were in Bad Segeberg to serve Schleswig-Holstein; in Mannheim for the Nordbaden region; in Trier for Rheinland-Pfalz; and in Frankfurt to Hessen. The two smaller KV's were in Koblenz and Saarbrücken. In addition Berlin and Dortmund had 9400's and Hamburg a 9300. The two 9400's were expected to upgrade to 1106, while Hamburg's 9300 has link to the 1106 in Bad Segeberg.

Univac, sensing a clean-up of the KV market to the tune of an estimated \$125-million, then moved in for what seemed like the coup de grace: An order for a 262k 1106 configuration from the KB in Cologne. By this time the manufacturer was already touting second 1106's to the major existing users to handle the proposed second stage of the system (medical records, etc.), the idea being a gradual upgrade through 1106-MP's to eventual 2 x 2 1110 configurations. Doctors would then start installing modified Uniscopes for on-line access to the computers.

This increasingly grandiose scheme suddenly began to run into trouble. First of all there was unaccountable reluctance on the part of certain KV's to buying Univac. Making up for lost time, IBM sold 370/135's to Hanover, Nordrhein-Westfalen and Freiburg, and Siemens stuck an oar in too, taking a big order from Bavaria and making a strong pitch for the Berlin replacement order.

As if that was not bad enough, pilot Uniscope 100 terminals planted with two GP's and a medical institute in Frankfurt (the latter intended to allow Professor Leiber, author of a popular medical thesaurus, to study the practicability of a computerized system of aids to diagnosis) began to prove conclusively that they were not the terminals for the job. They are too bulky for the average GP's consulting room, it seems, besides being

overly expensive for the applications envisaged. Certain design features, too, were criticized as inappropriate for the job.

Univac staved off the threat of defection by Berlin in a simple yet effective manner: It took the senior KV staff on a junket to its Rome executive training center. When an 1106 order duly followed, there was an outcry in the local press. Irritated by the problems it was encountering, Univac then let it be known that it could not fund redesign of the Uniscope 100 on its own, and began accusing the KV's of being unable to formulate precisely the specifications of the system required. Currently stasis reigns as the KV's begin to study alternative communications equipment on the market, and commercial lobbies, sensing a chance not lost after all, leap into the fray.

For the time being at least the German medical computing network, a concept in advance of anything else in Europe, seems to be in a state of suspended animation.

Computer speeds justice for San Diego court system

A long-standing fear of judges and attorneys is that "justice delayed is justice denied."

Now, in the San Diego County Court system, a computer helps eliminate the unwieldy backlogs and crowded courtrooms that had been slowing the judicial process.

"Indexing names and numbers, part of the basic paperwork in a courts system, is always the point where the first breakdown occurs manually," said Robert B. James, coordinator of the Law and Justice Agency of San Diego County.

Cases must be indexed by every party involved, he explained. Since many cases involve several plaintiffs or defendants, they require typing and storing large numbers of index cards.

"We now accomplish this quickly at the keyboard of a visual display terminal," James said. "Names are entered into the computer just once, and are retrieved whenever needed. An authorized person simply types in a transaction code and then the name he wants to retrieve."

If only part of a name is known the computer searches its files and produces the full name, along with additional information such as the person's connection with the case, his involvement with other cases, the court involved and the filing date.

Court dockets, or case histories, also are maintained in the computer,

with a chronological history of every activity in each case entered at the display terminals.

"This eliminates paperwork, so papers can't be lost or misfiled," James said. "And if two people want to review the docket, one doesn't have to wait until the other is finished with a folder or ledger. A judge can study the complete file at a terminal, for instance, or could even have a hard copy printed for later review, while a defense attorney can study the same file at another terminal."

Scheduling court appearances also is crucial to court efficiency. This involves coordinating the schedules of judges, courtrooms, lawyers and witnesses.

"We now do our trial scheduling with the computer, by keying the judge, prosecutor, defense counsel and all others involved into the scheduling program when a case is set for trial," James said.

Selecting a date, the computer checks the schedule first of the judge and then of the attorneys involved. If there are conflicts the procedure is repeated with new dates until a suitable time is found. That date is then set for trial and entered by the computer into the schedules of all participants in the case.

San Diego gains several "fringe benefits" from the system, James added.

"In California, for instance, it's necessary to provide the judicial council and other state-wide organizations with statistics relating to our activity. We're now programmed to pull these from the system, using information accumulated by month. This saves countless time in digging through back files."

Courts also can receive a history of continuances, listing who requested them and why. Three alternative dates are included, to which a case can be continued. If a new date is selected it is keyed into the system and the old date erased, to free it for another case.

The county is using an IBM 370/155 plus a package of programs developed by IBM called the *Basic Courts System*.

West coast college packs pocket calculators

Pocket calculators in the classroom—an educational plus or minus? Hot debate rages among academicians with critics denouncing the hand-held gadgets as debilitating crutches, spawning a generation of mathematical cripples. Proponents,

meanwhile, laud the devices as legitimate learning aids which actually increase understanding. Though the number of advocates appears to be on the rise, rare is the educational institution that actively encourages classroom use of pocket calculators.

One that has is Menlo College, in Menlo Park, CA. Menlo's math and science professors feel so certain of the potential of pocket calculators as learning tools that last Fall they equipped an entire classroom with them, revamped teaching methods and altered subject matter to match the capability of the calculators.

Now after a full academic year of use, the program is an unqualified success. In fact, in the coming year, Menlo will place greater curricular emphasis on the calculators, involving more number-oriented courses, more students, more teachers.

At present, six professors teaching nine mathematics, science and business classes use the school's Computation Center. The Center is furnished with 20 Hewlett-Packard HP-45 pocket-sized scientific calculators, one to each student. About one-fourth of Menlo's 550 students use them in at least one class.

Outfitting a classroom with calculators affords all students equal learning opportunity, according to Donald J. Albers, chairman of the mathematics department. This overrides the objection of some critics that the calculators give unfair advantage to those who can afford them while penalizing students who cannot.

"Although no formal study has been made, we are convinced that students actually learn more, not less, using calculators in the classroom," said Leslie B. Seely, Jr., chairman of Menlo's computer science department.

Spanish police going online; Univac, IBM in bidding

Spain, although one of the more heavily policed countries in Europe, is one of the last to provide its internal security forces with a computer-based system of records. That omission is about to be corrected.

Although police work in Spain is split between an array of different forces so bewildering that there is frequently competition between them on the handling of specific cases, all reports are centrally stored by the Direccion General de Seguridad (DGS) which directly controls the Policia Armada (the largest single force in the country).

Now this wealth of statistical information is to be rationalized into six main application areas and stored on computer. These are population statistics, stolen cars, stolen objects, data on personal identity cards, crime and criminal characteristics.

Indications are that Univac's tender of two 1110's is currently preferred, but IBM is putting up strong competition with a dual 370/158 configuration. Whichever mainframe wins, main memory requirement will be 756k bytes with a back-up capacity in online storage of at least 800 and possibly as much as 1,000 megabytes.

The system will work in real time from the moment it is switched on: A network of 110 terminals is planned, two for each of the country's provinces. The system is scheduled to go live in 1976.

There are several distinctive features to the Spanish system compared with police systems in operation elsewhere. As currently specified there will be no missing and wanted persons file, and—perhaps even more surprising—no automation of fingerprint records.

On the other hand, much importance is attached to personal files which in other places might attract controversy.

We owe an apology

In our June editorial we erroneously implied that overcharging at a New York City supermarket was the fault of the store's owner, A&P. The Great Atlantic and Pacific Tea Company, Inc., owner of the supermarket in question, is as upset about the situation as the customers. When the overcharging came to A&P's attention, three employees of that store were immediately dismissed. Civil and criminal charges against the individuals involved, not A&P, are still pending.

The charges stem from an April 17 action by investigators from the New York City Department of Consumer Affairs. Following up a complaint of overcharging, they anonymously made purchases at the store. Their register receipts were \$3.55 too high, they said.

When the investigators brought the situation to the attention of A&P, the firm acted swiftly to pinpoint the source of the overcharging. The cash registers were examined by A&P, and the company was unable to find evidence of tampering.

Make change work for you



In today's unstable economy, managers are apprehensive about making large expenditures, particularly expenditures for computer systems. There is good reason for concern, but that concern should not lead to paralysis. If anything, the uncertainties should be met with decisive action.

Some of the causes of planning insecurity are those events that make daily headlines in the financial pages: High interest rates, materials shortages, rampant inflation, labor unrest, poorly-planned and poorly-stated government policies and the hibernation of the small investor. Every time we think we've adjusted to the muddled state of things, there's a trauma. If it's not an Equity Funding scandal, it's Ross Perot's sad fate on Wall Street. When we've recovered we read about Franklin National Bank's mess or Con Edison's lack of dividends.

There are two philosophies that we have heard expressed about life in uncertain times. One ignores uncertainty. Its tenets lie in a belief that underlying past trends will continue, or at least that you should behave as if they will. The other outlook requires attention to change. You assume that there will continue to be uncertainties, and that there will be some that will break for you and some that will not. You try to move ahead quickly when you can and hold the line when you can't. The second approach requires a good deal more work, but at least offers some hope—and profit.

If your business doesn't seem to be suffering under the current pressures, you should continue the way you have been going. But if you are falling behind your expectations, or behind the competition, you may need to look at the world around you more carefully. Experimentation is one route to planning new management approaches, but in the world of business experimentation can be dangerous. Similar information may be available to your firm through simulation or gaming. Within the confines of a computer system it is possible to test your business under varying marketing, financial, manufacturing, pricing and competitive situations.

Most large firms have data bases that are more than adequate to set up a model. Software and data for simulating the world around your business is readily available. A glimpse at some of the resources available has been offered in these pages. Yet we have only scratched the surface. Whole sections of universities and business schools are devoted to simulation and planning studies. Whole departments in technologically astute industries are doing much the same thing. Yes, this is unfamiliar territory to most computer professionals and managers. But if insecurity is the major cause of your company's inaction, and you do nothing, you will find even greater insecurity at the next stockholder's meeting.

With good modeling guesses, the chances are that your business can gain from the uncertainty that is making those around you lose their heads and their profits. And if things look grim, you should at least be able to brace yourself.

The most interesting possibility is that you will be able to see the causes of your own situation, good or bad, and act on them. If you can't write a glowing letter to your stockholders, you might at least try an informative one to your congressman or banker. And if the news for your keenest audience is good—tell them why.

—H.W.

ADVERTISERS INDEX

*American Vioenetics Corp.....	16B
Beehive Terminals	Cover IV
Centronics	51
Computer Transceiver Systems, Inc.	63
Control Data Corporation	24, 25
Digi-Data Corporation	64
Digital Associates	65
Digital Equipment Corporation	18, 19, 54, 55, 33-40
General Electric Company	22, 23
Gould Data Systems	49
Hewlett-Packard	27, 29
I.B.M.	43, 44, 45, 46
Intel Corporation	Cover II
Litton OEM Products	30
Printer Technology, Inc.	61
Raytheon Company	Cover III
Reader Service	72A
Sycor, Inc.	13
*Tally Corporation	16A
Tektronix, Inc.	31
Teletype Corporation	7
Varian Data Machines	11
Versatec	72

*Demographic and Government Dist.

COMPUTER DECISIONS
Advertising Sales Offices:
New York
Don Huber
50 Essex Street
Rochelle Park, N. J. 07662
(201) 843-0550
TWX: 710-990-5071
Boston
Mr. Bruce Beard
Ragged Hill Road
West Brookfield, MA 01585
(617) 867-7797
Chicago
Bruce Beard
200 East Ontario
Chicago, Ill. 60611
(312) 337-0588
Dallas
Joe Sissom
8383 Stemmons Freeway
Dallas, Texas 75247
(214) 631-4480
Georgia
Mike Mims
3796 North Decatur Rd.
Suite B-12
Decatur, GA 30033
(404) 292-7208
Los Angeles
J. Tell
2930 Imperial Highway
Inglewood, Calif. 90303
(213) 757-0183
North Carolina
Chris Leach
1313 Woodburn Road
Durham, NC 27705
(919) 489-2224
San Francisco
Frank Kelly
3667 Country Club Drive
Redwood City, Calif. 94061
(415) 368-4983

COMPUTER MART

For information contact -
Classified Manager
COMPUTER DECISIONS, 50 Essex St.,
Rochelle Park, New Jersey
07662 Phone 201-843-0550
or 212-751-5530
TWX 710-990-5071

LEASE BUY SELL

DEAL WITH PROFESSIONALS IN
PLACEMENT OF

Pre-owned **360** Equipment

"The Nations Largest Wholesale Dealer"

**computer
wholesale corp.**

SUITE 441-447
NATIONAL BANK OF COMMERCE
NEW ORLEANS, LA. 70112
AREA 504-581-7741

FOR SALE OR LEASE

IBM 1401 Disk System Available Sept. 1, 1974
IBM 1440 Disk System Available Aug. 12, 1974

THE HALSEY CORPORATION

1367 Central Avenue
Middletown, Ohio 45042
(513) 424-1697

Member—Computer Dealers Association

We're where the action is . . .

360's, 370's and I/O Devices
BUY/SELL/LEASE

NVC COMPUTER SALES, INC.
(215) 887-5404

Suite 616
Benjamin Fox Pavilion, Jenkintown, Pa. 19046
Member Computer dealers association

POINT OF SALE CASH REGISTER SYSTEM

100 N.C.R. Class 52 Cash Registers with
Paper Tape Punches. This equipment is
currently in use under N.C.R. Maintenance
and is less than three years old. Seller
will supply software system currently run-
ning on I.B.M. 360/370 System. Transmis-
sion equipment is also available.

Here is an opportunity to pick-up a viable
P.O.S. System at a fraction of its original
cost.

All interested parties contact:

Vice President—M.I.S.

c/o P.O. Box #2474 G.P.O.
New York, N.Y. 10001

BUY • SELL • LEASE • TRADE

IBM 360/370 UNIVAC • CDC HONEYWELL

Flexible plans, low rates, fast service
on systems & peripherals.

CALL US

WASHINGTON . . . (703) 521-2900
PITTSBURGH . . . (412) 921-3077
ATLANTA . . . (404) 252-2670
CHICAGO . . . (312) 298-0888
ST. LOUIS . . . (314) 878-4741
KANSAS CITY . . . (816) 471-7376
HOUSTON . . . (713) 747-7275
LOS ANGELES . . . (714) 645-3712
SAN FRANCISCO . . . (415) 928-7202
PORTLAND . . . (503) 297-4721

 **ComputerLeasing**
COMPANY

2001 Jefferson Davis Hwy., Arlington, Va. 22202
Offices Nationwide • Brokers Inquiries Invited
Member: Computer Lessors Association

Can our Abend Dump Improve-
ment Program G92638 reduce
your debugging time 50%? Try it
free for 21 days and see.

PILKERTON INTERNATIONAL

Box 6372
Anaheim, Calif. 92806

WE BUY ANY COMPUTER

PERIPHERAL or TELETYPE
Send for FREE Price List
Call 617 261-1100

AMERICAN USED COMPUTER CORP.
P. O. Box 68

Kenmore Station, Boston, Mass. 02215
member COMPUTER DEALERS ASSOCIATION

WE BUY • SELL • RECONDITION TELETYPE[®] MACHINES

MODELS 28 • 32 • 33 • 35 • 38

BRPE's • CRT's • Enclosures

Couplers • Modems
10-15-30 CPS TERMINALS

NATIONAL TELETYPEWRITER CORP.
207 Newtown Rd., Plainview, N.Y. 11803
(516) 293-0444

FOR SALE OR LEASE

IBM 729 Magnetic Tape Units

IBM 1401 Systems Configured
to your requirements.

THE HALSEY CORPORATION

1367 Central Avenue
Middletown, Ohio 45042
(513) 424-1697

Member—Computer Dealers Association

For your convenience all products and services appearing in this issue of **COMPUTER DECISIONS** are categorized with their page and reader service number. For more information, check the Reader Service No. on the card opposite.

CATEGORY **RSN** **Page**

SOFTWARE

accounting system	131	66
debugging program	136	66
device handler	133	66
floppy disk handler	134	66
floppy disk operating system	137	66
file matching technique	130	66
operating system	135	66
spooling system	129	66
teleprocessing monitor	128	66
Xerox enhancement	132	66

SYSTEMS

batch system	144	63
computer family	104	59
desk-size computer	145	63
microcomputer	146	63
mini system	11	11
	55	55
processing system	102	59
timesharing system	19	19
	27	27

CATEGORY

RSN **Page**

ACCESSORIES

alarm system	119	62
calculator	126	62
cartridge ribbon	122	62
disk cartridge cleaner	120	62
emergency power source	125	62
keyboard kit	123	62
labelling system	127	62
security system	121	62
sound dampener	124	62

DATA COMMUNICATIONS

communications system	143	65
communications analyzer	140	64
data modem	139	64
data terminal	7	7
data trap	141	64
line controller	142	65
modems, low speed	138	64

PERIPHERALS

a/d converter	116	61
a/d converter	111	60
card reader	15	15

CATEGORY

RSN **Page**

cassette transport	117	61
crt	115	61
crt	101	59
crt	93	Cover IV
crt	106	60
display controller	107	60
data module	114	61
graphic display	118	61
	31	31
hand-held terminal	103	59
intelligent terminal	13	13
memory, add-on	110	60
	91	Cover II
memory board	105	60
optical page reader	113	60
paper tape reader	108	60
printer	112	60
	51	51
	25	25
	23	23
	61	61
	72	72
printer/plotter	49	49
register file	109	60
reduction duplicator	9	8, 9

SERVICES

mix-match systems	92	Cover III
-------------------	----	-----------

SURVEY

printers	200-410	48-58
----------	---------	-------

Versatec does it again! 200-points-per-inch resolution

The Matrix 1200A Printer/Plotter offers twice the resolution of other electrostatic devices.

It plots 3,600,000 points on a standard 8½ x 11 inch page . . . in 9 seconds.

It prints 132 16 x 16 dot matrix characters across the page at 500 LPM in one of the most handsome typefaces around.

It's all possible because of our proven Matrix Electrostatic Writing Technique (MEWT™) . . . the true electrostatic writing technique.

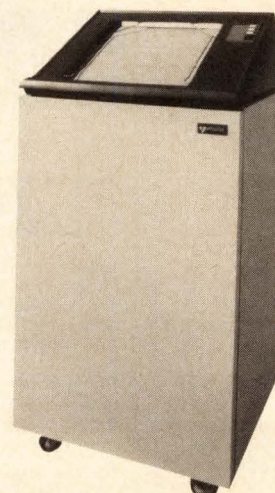
The Matrix 1200A interfaces with most major mini- and midcomputers.

No other printer/plotter offers as many good points.

For details and eye-popping samples, call or write Versatec, Inc., 10100 Bubb Road, Cupertino, California 95014, (408) 257-9900.



Specialists in hard copy information display



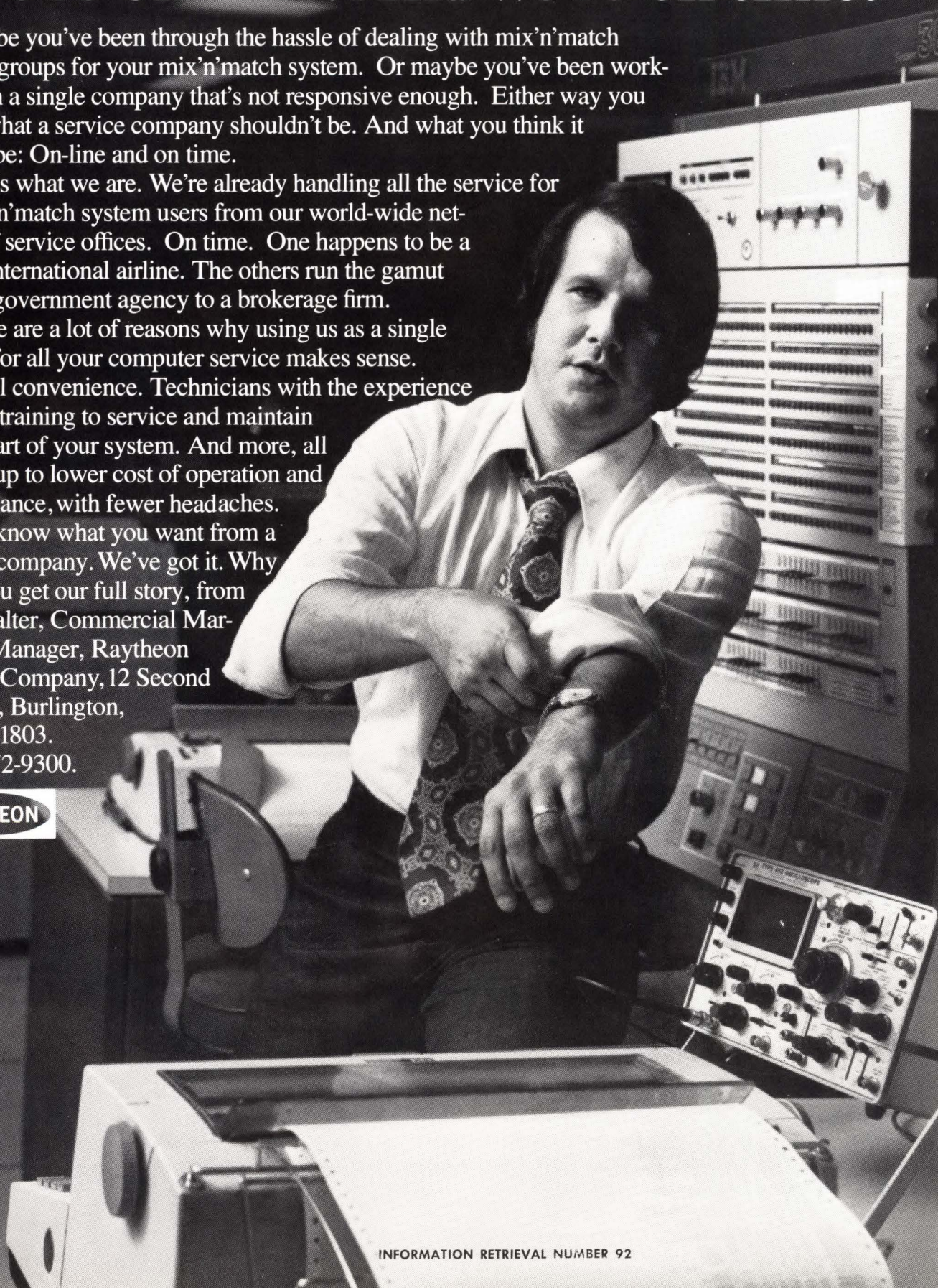
Computer service is an on-line, real time business. We're on-line. And we're on time.

Maybe you've been through the hassle of dealing with mix'n'match service groups for your mix'n'match system. Or maybe you've been working with a single company that's not responsive enough. Either way you know what a service company shouldn't be. And what you think it should be: On-line and on time.

That's what we are. We're already handling all the service for 89 mix'n'match system users from our world-wide network of service offices. On time. One happens to be a major international airline. The others run the gamut from a government agency to a brokerage firm.

There are a lot of reasons why using us as a single source for all your computer service makes sense. One-call convenience. Technicians with the experience and the training to service and maintain every part of your system. And more, all adding up to lower cost of operation and maintenance, with fewer headaches.

You know what you want from a service company. We've got it. Why don't you get our full story, from Mike Salter, Commercial Marketing Manager, Raytheon Service Company, 12 Second Avenue, Burlington, Mass. 01803. (617) 272-9300.



RAYTHEON

the best
of two data communication worlds



BEEHIVE terminals



Asynchronous Data
Transfer Rates
Up to 9600 Bps
All TTY Compatible Codes
Detachable Keyboard
Half or Full Duplex
On-Line Operation
teleprinter-compatible

MINI BEE

Protected Field Formatting
Baud Rate Transmission To 9600 Bps
Complete Edit Capability
80 Character X 25 Line
Detachable 96 Key ANSI Keyboard
Conversational or Block Mode
Complete Cursor Control
Eight Special Function Keys

micro-programmable, ROM

SUPER BEE



call, write or wire for a demonstration before you buy

Beehive Terminals • 870 West 2600 South • Box 19244 • Salt Lake City, Utah 84120 • (801) 487-0741 • TWX 910-925-5271

EAST: Maryland, (301) 588-8134; Massachusetts, (617) 623-7800; New York, (516) 487-0690, (315) 437-6666, (716) 328-2230, (607) 785-9947; Pennsylvania, (215) 265-1020; Florida, (305) 425-5505, (305) 776-4800; Georgia, (404) 939-1674

CENTRAL: Alabama, (205) 539-4411; Illinois, (312) 298-3600; Indiana, (317) 244-2456; Kansas, (913) 362-2366; Louisiana, (504) 366-5766; Minnesota, (612) 884-4336; Missouri, (314) 938-4992; North Carolina, (919) 768-3600, (919) 489-1546; Pennsylvania, (412) 366-5056

WEST: Arizona, (602) 956-5300; California, (415) 321-2414, (213) 937-0790, (714) 544-5121; Colorado, (303) 355-3521; Oregon, (503) 646-3004; New Mexico, (505) 265-5655; Texas, (214) 231-4846, (713) 661-4501, (512) 732-7176; Washington, (206) 624-9020

CANADA: Toronto, (416) 742-8015; Ottawa, (613) 729-4004; Montreal, P.Q. (514) 488-0404; British Columbia, (604) 526-3312

EUROPE: Great Britain, 01-952-8471; Benelux, (020) 151602; Sweden, 08/820410; Denmark, 01/804200; Norway, 02/282624; Finland, 460844; France, 16/861547; Switzerland, 22/332329