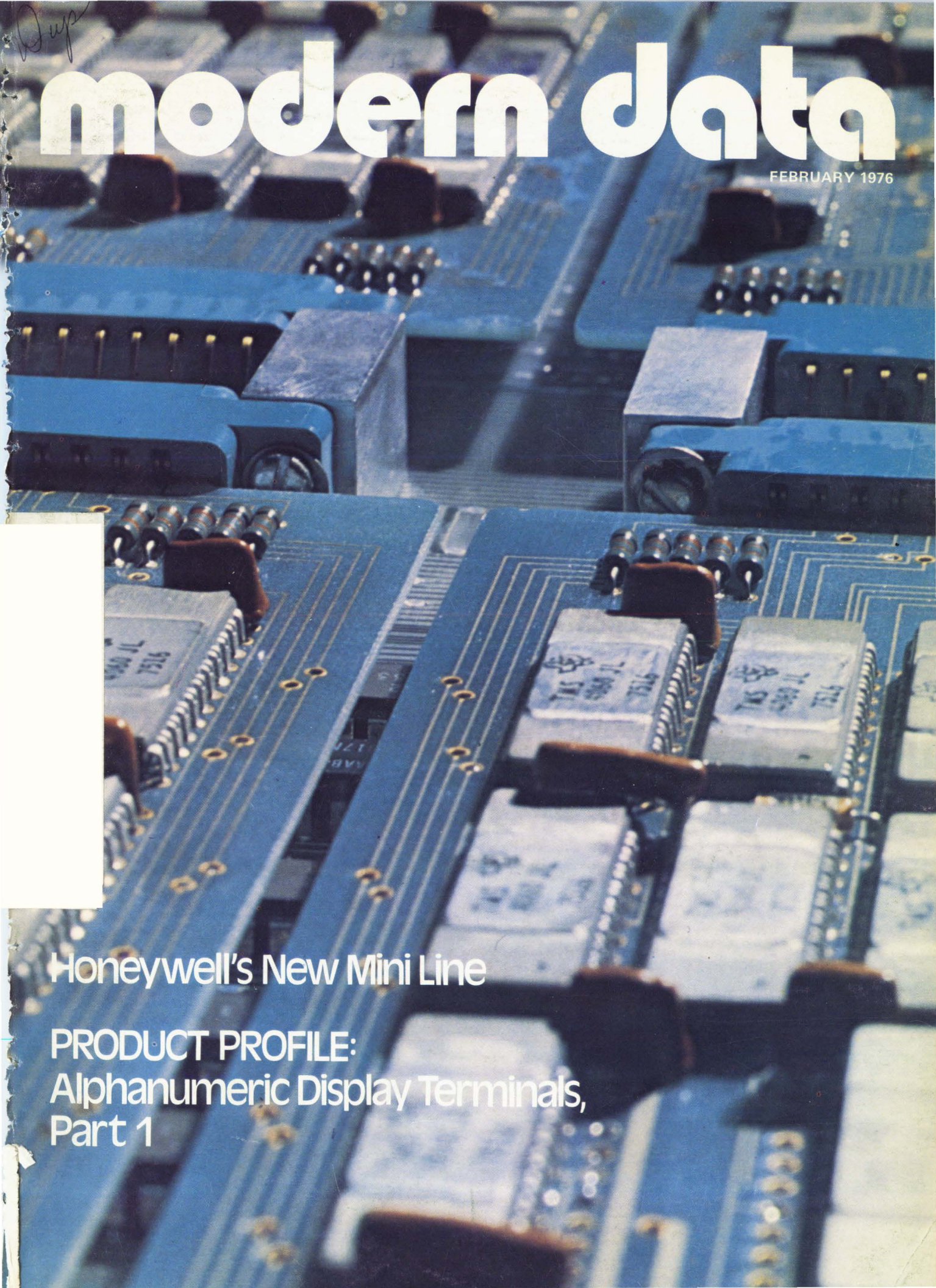
modern data

FEBRUARY 1976



Honeywell's New Mini Line

PRODUCT PROFILE: Alphanumeric Display Terminals, Part 1

FROM THE WORLD LEADER IN TTY-COMPATIBLE VIDEO TERMINALS... A NEW CONCEPT IN COMPUTER TERMINALS FOR THE OEM MARKET

modular one

from **Hazeltine**

Now, through plug-in modularity, systems manufacturers can configure terminals to meet specific user requirements while maintaining complete spare parts compatibility. A full range of options to choose from, at prices reflecting the advantages of microprocessor technology.

Standard Features

- ☐ 1,920 character display (80x24).
- ☐ 12-inch bonded screen.
- ☐ Incremental and absolute cursor positioning.
- ☐ Dual video intensity.
- ☐ 10-key numeric pad.
- ☐ Movable keyboard.
- ☐ Choice of 8 transmission rates up to 9600 baud.
- ☐ Communication interfaces switchable between EIA RS-232 and current loop.
- ☐ Choice of block or blinking underscore cursor.
- ☐ Choice of white-on-black or black-on-white display representation.

The Editing Option

- ☐ Field attribute designation, which allows the host computer to assign one or more of the following conditions to specific screen locations:
  —Blink or no blink.
  —Standard or reverse video.
  —Low- or high-intensity representation.
  —Protected or unprotected data from operator input.
  —Alpha, numeric or alphanumeric entry only.
  —Display or non-display of data.
- ☐ 8 different video representations.
- ☐ 8 Special function keys.
- ☐ Data compression and record separation.
- ☐ Tabulation advance, back, set, clear and automatic.
- ☐ Automatic repeat function for period, space and dash.
- ☐ Insert and delete line.
- ☐ Insert and delete character.

The Polling Option

Provides protocol compatibility for interfacing to communications networks. Protocol may be user-defined.

Other Options

- ☐ Upper/Lower Case
- ☐ Parallel Output Connector
- ☐ Serial Output Connector
- ☐ 202C Compatibility
- ☐ Synchronous Interface
- ☐ Modem Cable
- ☐ Mechanical Security Lock.

Human Engineering Features

- ☐ Clear, Sharp 7 x 9 dot matrix display.
- ☐ Elevated bonded screen for comfortable viewing.
- ☐ Stair-stepped keyboard for rapid, error-free data entry.
- ☐ Non-glare key caps for operator comfort.
- ☐ Moveable keyboard with disappearing cable.
- ☐ Modern design complements any office.

Now, with Modular One, Hazeltine makes it easier than ever for system manufacturers to have precisely the right terminal at the right price! Phone your nearest Hazeltine representative today for a demonstration and price quotation.

Modular One establishes new standards of reliability and value for computer terminals, incorporating the latest in high-reliability design techniques and components . . . the kind you expect in any product bearing the Hazeltine name, the Company with more than a half-century of leadership in electronics and displays.

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CIRCLE NO. 1 ON INQUIRY CARD

Batch is a bitch.

Batch may be an adequate way to process your data if all you're doing are conventional jobs like payroll or cost accounting.

But when you get into operational jobs like product distribution and manufacturing control, it's going to present some problems. Because batch processing produces reports periodically. So it tells you the way things used to be, not the way they are right now. Instead of giving the specific information you need, it gives you reams of printout that you have to wade through. And you can't get updated information until the next time your job is scheduled to run.

Which is why World Tableware International decided to pull out its batch computer and bring in a Data General computer.

Each department works directly with our computer. And it works directly for them processing orders, inventory, billings and receivables in line, as the business activity flows.

And because the computer participates in the work each department does, the data in the computer is always up-to-date. So it always puts out up-to-date reports whenever the people who need the reports need them.

And anytime they want to know the status of a specific job, they can just ask the computer. Instead of making them search through reams of printout, it tells them just what they want to know.

World Tableware found our computer not only easier to use, but also able to pay for itself within two years.

A Midwest automotive parts distributor brought in a Data General computer so it could get up-to-the-minute inventory control and promptly cut its inventory carrying costs by 40%.

A member of the New York Stock Exchange installed one of our computers to instantly analyze and compare the quality of thousands of bonds. And during the first week of operation our computer helped make a sale that completely paid for the computer.

(Not all our installations pay off like that, but it's nice to know it can happen.)

Over 15,000 Data General computers are being used to directly support operations. Sixteen examples can be found in our brochure, "The Sensible Way to Use Computers."

Write for it.

And stop all that batching.

DataGeneral

Data General, Dept.IM, Route 9, Southboro, Mass. 01772 (617) 485-9100. Data General (Canada) Ltd., Ontario.
Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361/Sydney (02) 908-1366.

CIRCLE NO. 2 ON INQUIRY CARD

A TOTAL FAMILY OF CARTRIDGE TAPE SYSTEMS ...WITH PDP-11 & NOVA INTERFACES

l. to r. 2700 PORTABLE PROGRAM LOADER/LOGGER, 600 TAPE DRIVE, 2200 TAPE SYSTEM, 2400 TAPE SYSTE

Yes Sir! Total. That's a fact. Qantex is the only manufacturer with in-house production of tape drives, tape formatters, tape storage systems, and interfaces...in both commercial and military versions. One example. A completely integrated system fully interfaced to your PDP-11 for under $2500...and that includes interconnect cables... even a data cartridge. That's got to make your job easier. Just plug it in and run!

Applications include small business systems, process control, mini diagnostics...and for the application where we don't have an interface, we have a tape formatter that's really neat and packed with function. All in all, a good tape choice for dedicated minicomputers...and even microprocessors, like the 8080 (we have a unique approach for this interface too!).

The Qantex cartridge tape systems offer minis up to 23+ megabytes of storage with a minimum use of panel space. The 2400 handles up to 8 tape drives (four in each 8½" panel), and that means almost 18 kilobytes per square inch. The 2200 comes with one or two tape drives in just 5¼". The 2700 takes no panel space at all — it's our suitcase portable. Both 2200 and 2400 are completely modular thus permitting field expansion to the maximum capacity of drives in just minutes. Yes minutes; like five per drive.

The heart of Qantex cartridge tape systems is the 600 tape drive. With the 3M data cartridge, it's packed to 2.5+ megabytes at 1600bpi with 30ips read/write, has 6 kilobytes/second transfer, plus 90ips search and rewind. The ANSI-compatible 600 is packed with trouble-saving features for the volume OEM-user too.

Maybe that's the reason a special version of the 2400 has been selected by the U.S. Navy as the standard cartridge peripheral for the AN/UYK-20 mini.

Call or write today for full information. Our sales representatives are located throughout the free world waiting to introduce you to our family.

P.S. Another member of our family is a super ½" tape drive; 75ips, but no vacuum columns or tension arms. Interesting, isn't it?

Qantex DIVISION

NORTH ATLANTIC INDUSTRIES, INC.

200 TERMINAL DRIVE, PLAINVIEW, NEW YORK 11803 516-681-8350

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BPA

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Shown is one of the modular memory boards of Honeywell's new Level 6 minicomputer (See cover story on page 52). Each memory board can hold from one to four "pacs," each pac containing 8K words of MOS memory.

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You can make it in the OEM systems business in 7½ seconds.

It takes only 2½ seconds if you have a push-button telephone. Because all you really have to know is the phone number for Microdata.

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Call us and find out about the most powerful OEM computer systems on the market. Completely integrated systems. Computers. Disc drives. Tape transports. PRISM™ display terminals. Ready-to-use software. We make it all. So you get single-source responsibility, support and service.

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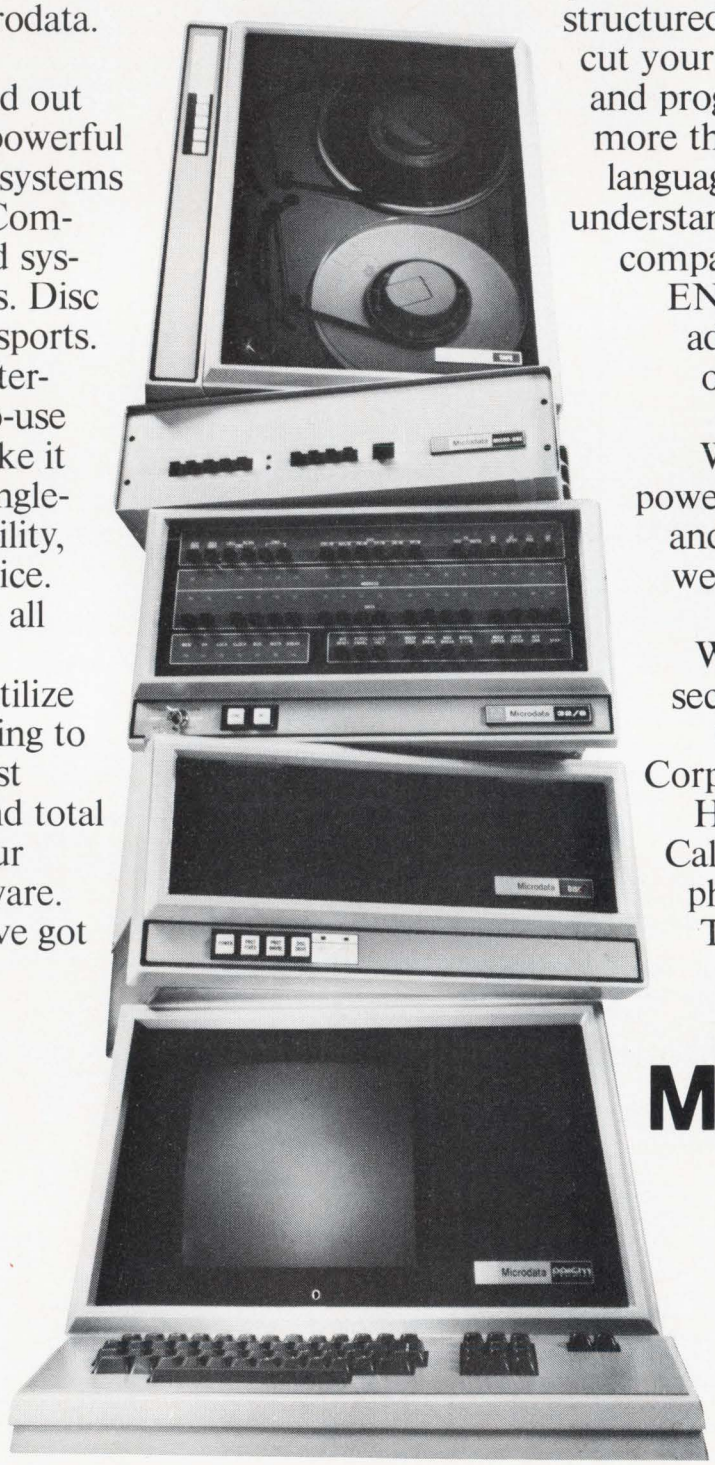

Microdata

Circle No. 4 on Inquiry Card for Immediate Need
Circle No. 5 on Inquiry Card for Information Only

letters

To the Editor:

Your article entitled "Technology Profile: Computer Printers" in November, 1975, issue inaccurately stated that A. B. Dick Company has stopped manufacturing ink jet printers. In fact, A.B. Dick ink jet printers sold under the VIDEOJET Printer trademark are finding rapidly increasing acceptance in the graphic arts and industrial marking fields. In the graphic arts field, VIDEOJET Printers under computer control are used to print computer-generated variable information directly on the paper surface transported in web offset presses, sheet-fed presses of different types, business forms presses and finishing equipment, book, catalogue and magazine bindery lines, the delivery end of newspaper presses and other post press finishing operations. In industrial marking applications, free-standing VIDEOJET Printers equipped with alphanumeric and numeric code selector tables are used to date code a host of products, including those in the beverage, foods, pharmaceuticals, cosmetic and general manufacturing industries.

As you can see from the above, VIDEOJET Printers *are* being manufactured by A.B. Dick Company, and are very much in use everyday by our many customers.

George E. Marton, Marketing Manager
Information Products
A.B. Dick Company
Elk Grove Village, IL

The Author's Reply:

The statement that A.B. Dick was no longer manufacturing ink-jet printers actually referred to computer printers, not printers in general. To my knowledge, A.B. Dick had manufactured two models of their VIDEOJET printers, Model 9500 and Model 9600, used as terminal or computer printers. The statement was made relative to them.

I have been aware of the fine products which A.B. Dick has been producing for use in the graphic arts and industrial marking fields. There are many other technologies and applications of printing technology which were not covered in the article.

Please accept my apologies for the statement on ink-jet printing and also for others in the printing business whose products and technologies were not mentioned in the article on computer printers.

Irving L. Wieselman,
Vice Pres.-Product Programs
Dataproducts Corp.
Woodland Hills, CA

To the Editor:

The Taconic Girl Scout Council recently acquired a bookkeeping program which is to be run on an IBM System 3 computer – RPG II language, model 10 (8K) card system (small cards). We are anxious to be in touch with someone who uses such equipment in the area of White Plains, Westchester County, NY, and who would work with us in implementing the program. It is our hope that some philanthropic System 3 user will be interested in donating the estimated run time of about one hour for the monthly reports which we require. If this is not possible we would like to investigate the cost of purchasing the service.

We will appreciate any assistance you can provide.

Betty H. Miller, Executive Director
Taconic Girl Scout Council
Deer Park Plaza
Katonah, NY 10536

Covered with mud, dropped off a desk, and working like a champ.

Our 300 is a 30 CPS, portable terminal that operates over regular telephone lines. It's lightweight, compact, and a joy to work with.

It's also the most reliable terminal of its kind ever built. By anyone.

Ask a salesman who leased a 300 from us about a year ago. He dropped his unit off a desk during transmission, creating a shock that was probably harder on our friend than our machine. The 300 lost two characters, then continued operating as before.

Seemingly determined to destroy our unit, this same fellow then put this same 300 into the trunk of his car. An unscheduled rainstorm filled his trunk with muddy water, giving our machine a thorough bath, not to mention a perfectly good excuse for never working again.

The 300 came through with shining, if somewhat muddy, colors. Plugged in, it operated beautifully.

If you'd like to know more about a terminal that can stand up in this tough world, get in touch with Charles Kaplan or Shirley Newman at (201) 261-6800. Computer Transceiver Systems, Inc., East 66 Midland Ave., Paramus, New Jersey 07652.

CTSI

Execuport 300 portable terminal.
Not just reliable. Practically unstoppable.

CIRCLE NO. 6 ON INQUIRY CARD

NAME CALLING

"Data Communications Interface '76" recently obtained a restraining order from a Boston area court preventing "Datacomm '76" cosponsors *Computerworld* and *Datacomm User* from using the name "Datacomm" to promote a data communications trade show. According to the plaintiff, Data Communications Interface was the original data communications show, not Datacomm. Furthermore, it says the similarity of names confuses the public. As it stands now, Data Communications Interface '76 will be held March 29-31 in Miami Beach and Datacomm '76, still going under its original name, will be held February 16-18 in New Orleans.

THE IBM WAY

Recent articles in *Business Week* and on the AP wire highlight some aspects of The IBM Way of doing business. The front-page reports on lawsuits, charges and countercharges perhaps cause us to lose sight of some of the reasons why IBM is able to recruit and retain one of the world's most dedicated work forces. The following items may provide some inspiration for policy innovations at those companies which may want to consider spending their money someplace other than on lawyers to file suits.

- In more than 35 years, IBM has never laid off a worker for economic reasons. Instead, it retrains workers unneeded in one job and assigns them to another. Since 1970 it has retrained and physically relocated 5,000 employees.
- IBM's "open door" policy, under which a worker can protest his manager's decision on work-related issues, enables an employee to appeal to the chairman himself, through successive levels of managers. IBM makes the procedure work by appraising how fairly its managers treat "open door" gripes.
- A worker with 25 years' service can retire on half salary for four years, or until he becomes 65. In addition, he receives a pension, if eligible; reduced pensions start at age 55.
- IBM's code of business conduct is based upon three "basic beliefs": Respect for the individual, the best customer service possible, and "excellence" in the pursuit of goals. Specifics are contained in an 84-page book entitled *Business Conduct Guidelines*, the contents of which all managers and many others must, on a yearly basis, certify they understand by putting their signature below a phrase stating, "I recognize that any violation of these guidelines may be cause for dismissal from the company."

BEGINNING OF ACH NETWORK

Since they began about five years ago, Federal Reserve-centered Automated Clearing Houses (ACH) have sprung up in many metropolitan areas. Considered the first step in an electronic funds transfer network, the ACHs collect and distribute funds by direct computer-to-computer transfers instead of with cash. Until now, ACHs have communicated with the computers of member banks, but not much among themselves. However, 1976 will mark the beginning of interstate communication as the California and Oregon ACHs transfer funds between each other. According to *Thruput*, an American Bankers' Association publication, the Fed considers this a major step toward a nationwide automated clearing house network.

USER LIKES AND DISLIKES

Users are generally happier with software packages supplied by software houses than those supplied by hardware vendors, according to a recent *Datapro* study. Of the 25 packages out of a possible 1400 achieving an "excellent" in overall user satisfaction, IBM's RPG II was the only one supplied by a mainframer. Listed among Datapro's Top 25 for the third consecutive year were ALLTAX (from Management Information Service), ASAP (Universal Software), Disk Utility System (Westinghouse Electric), DYL-250 (Dylakor Software Systems), EPAT and GRASP (Software Design), the Librarian (Applied Data Research), Panvalet (Pansophic Systems), QUIKJOB (System Support Software), and UCCTWO (University Computing).

Datapro's biggest surprise came with its user survey for general-purpose computers. Digital Equipment Corp., best known as a mini maker, received the highest overall rating for its large-scale DECsystem 10. Also receiving high ratings in at least one hardware, software or service category were Xerox, Burroughs and IBM. Complete copies of both surveys ($10 each) are available from *Datapro Research Corp., 1805 Underwood Blvd., Delran, NJ 08075.*

BURROUGHS' NEW SERIES

Preannounced in October and announced again in December, the Burroughs 800 Series is here. The initial offering of B 2800, B 3800, and B 4800 medium systems will compete with IBM's 370/125, 135 and 145. MOS main memory for the B 2800 ranges from 100K to 500K bytes, and processor cycle time is 333 nanoseconds. According to Burroughs, the B 2800 offers 1.5 to 2 times the performance of the B 2700. The B 3800 has a similar performance improvement ratio over the B 3700. But the B 4800 with a performance improvement 2 to 4 times that of the B 4700 is the real star. The B 4800 features a 200K to 1000K-byte bipolar memory with a 125-nanosecond cycle time. Prices for the medium systems range from $485,000 to $3,735,000. First deliveries will be first quarter 1976.

SINGER JUMPS SHIP

Although first on the scene with the electronic cash register, Singer had never been a profit maker in data processing. The Singer Business Machines Division accounted for only 11 percent of 1974 Singer sales, but for a good share of its losses. Singer's new president, Joseph Flavin, saw no way Singer could continue to carry this burden so he pulled it out of data processing: "The company has decided to withdraw over the next 12 months from the manufacture and sale of its Business Machines Division product line, including retail terminals and data systems." Getting out won't be easy. Singer will have to absorb a $400 milllion writedown in 1975, $345 from Business Machines. Before this, Singer's credit crunch took its toll on its consumer products receivables, graphics systems and telecommunications operations.

Singer will continue to provide hardware and software to customers over the next five years. And if it sells the division as it is trying to, it will demand complete service for its customers from the purchaser. Although Singer was one of the major POS terminal manufacturers, NCR and Sweda remained ahead. So Singer, like RCA, General Electric, and Xerox, will return to the business it knows best.

Terminals should be seen and not heard.

And not break down.

The DECwriter II Keyboard Printer is as quiet as it is good looking. And being almost totally electronic makes it just as reliable.

It's also versatile, so you can use your standard line-printer forms. You get a true 30 cps, 132 column printing, a 14-key numeric pad and vertical and horizontal tabs. And the reliable tractor type paper feed takes up to 6-part forms — any width from 3 to 14⅞ inches. So you don't need special forms.

Service? Every DECwriter II is backed by a field service force of 3,000 in 240 branch offices worldwide. And that's a lot of support.

They're available now from the Components Group, Digital Equipment Corporation, One Iron Way, Marlborough, Mass. 01752. Dial 800-225-9480 toll free (Mass. dial 617-481-7400 Ext. 6082). Canada: Digital Equipment of Canada, Ltd. Europe: 81 Route de l'Aire, 1211 Geneva 26, Tel. 42 79 50.

digital
COMPONENTS GROUP

CIRCLE NO. 7 ON INQUIRY CARD

international news

BOHDAN SZUPROWICZ / International News Editor

ITALIAN ECONOMIC SLOWDOWN, INCREASING MINI DEMAND

For the first time in a quarter of a century, Italy was expected to have a negative growth rate for 1975, according to a recent U.S. Dept. of Commerce report. This was due to Italy's stablilization program designed to control inflation and improve its balance of payments deficit. However, in 1976 things should improve and a 2 percent annual growth rate is projected. One of the main beneficiaries will be U.S. computer equipment, which had a market of $450 million in 1974 and is expected to reach $565 million by 1977 – a 20 percent annual growth rate. Minicomputer demand will be especially strong, with mini sales expected to grow at a 30 percent annual rate in the same period. Terminals and peripherals will not be standing still either. Public communication lines which had an estimated 4000 terminals in 1973, are expected to have 30,000 by 1978. By 1977, peripheral equipment sales should reach $16.9 million, a 276 percent increase over 1972's $4.5 million.

For a closer look at what's happening in Italy, visit the U.S. Dept. of Commerce Exhibition of Computers and Related Equipment held in Milan, May 11-15, 1976. For more information, write *Donald Mathes, Office of International Marketing, Room 1012, U.S. Dept. of Commerce, Washington, DC 20230.*

THE RUSSIAN GRAIN TECHNOLOGY DEAL

Instead of having to buy grain from the U.S., the Russians are studying how to increase their own grain production. And one of the main models is the American agribusiness, which is being increasingly integrated with computer technology. As part of a 1973 U.S.-USSR Agreement on Agricultural Cooperation, a Russian technical team visited the U.S. recently to study the use of computers in American agriculture. Two of the firms visited were Computer Sciences Corp. (El Segundo, CA) and Computone Systems, Inc. (Atlanta, GA). Computer Sciences' remote computer network, Infonet, is used by the U.S. Dept. of Agriculture to produce reports on crop production, timber production and grain exports, as well as to construct economic models of certain crops. Computone demonstrated its remote telephone-linked terminals, which provide feed manufacturers and livestock growers with nutritional and management advice.

BRITISH COMPUTER PRIVACY

Centralized government information systems and privacy do not go hand in hand, according to a recent British Government White Paper. Unlike the U.S. government, the British Government has very little linkage between computers used by different departments and has no intention of establishing a central data bank that would bring all information together. Say the British: "the best protection (of privacy) lies in collecting only the minimum amount of information which the system needs to carry out its designed task efficiently, in erasing it when it is no longer needed, in keeping different information systems separated from each other, . . ."

CHINESE COMPUTER CENTERS

Chinese computer production is concentrated in five major areas of the country, according to a *Fred Glynn Marketing Research Study.* Digital computers are produced at two plants in Peking, and analog computers are produced in Tientsin, Peking, and Shanghai. In recent years, China has also been active importing computers from the West – at least 50 digital, analog and special-purpose computers valued at approximately $20 million from Japan, France, West Germany and the United Kingdom.

WESTERN EUROPE CHANGES TACK

Unable to compete individually with IBM and unable to form an effective union to compete with IBM, Western European computer manufacturers are getting out of mainframes and getting into terminals, minis, and small business systems, according to a recent *Auerbach Reporter.* But they have a lot of makeup work to do. Until now, each European government supported its own mainframe manufacturers, but ignored minicomputer and peripheral manufacturers. The 20 mini and 18 terminal manufacturers that did exist were oriented toward large communication networks instead of toward the OEM or systems house market. So U.S. firms filled the gap. Although IBM has the terminal market sewn up, Europeans are making progress with small business systems, banking terminals and teleprinters. Minis are big business in Europe, but European firms have only a combined 25 percent share, with Digital Equipment having 50 percent and other U.S. manufacturers 25 percent. France has been the only government to take an interest in minis and terminals, and it is using CII facilities (separate from CII-HB) in hopes of increasing mini production 250 to 500 percent between 1974 and 1980.

GETTING TOGETHER AND FALLING OUT

The much talked about merger between Compagnie Honeywell Bull (CHB) and Compagnie Internationale pour l'Informatique (CII) has at last been completed (except for French stockholder approval, essentially a formality). The new company, CII-HB, will be owned 53 percent by French interests and 47 percent by Honeywell Information Systems. Honeywell will receive $58 million in return for giving up part of its present 66 percent interest in HB. Honeywell President Edson Spencer said he expects CII-HB's computer market share to increase substantially due to French government support and the combined technologies of both companies. The new company will develop, manufacture and market its own products.

Although it was originally thought that the CII-HB merger would strengthen CII within the Unidata organization, it did the opposite. When the CII-HB merger was signed, Siemens disclosed that the three Unidata partners – Germany's Siemens, Holland's Philips and France's CII had terminated their Unidata contracts. Unidata was formed in July, 1973, combining the interests of all three companies in order to compete against IBM and other American competitors. At its height, Unidata was one of the largest computer groups outside the U.S.

Time was when high speed printing meant a high speed line printer.

Times have changed.

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CIRCLE NO. 8 ON INQUIRY CARD

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NAN MEREDITH / Washington Editor

THE USSR COMPUTER MORATORIUM

Last month we reported CDC's and IBM's problems with the U.S. government on export licenses for Socialist countries. Since then the controversy has heated up. West Virginia's Senator Robert Byrd, the Senate deputy majority leader, recently called on the Departments of Commerce and State to halt exports of computers to the USSR. He charged that according to American intelligence sources, the USSR is using Western-purchased computers and scientific instruments to help in military technology. According to Byrd, the USSR purchased $2.7 billion worth of computers from Western nations in 1974, $500 million from the U.S. Byrd's proposal would cut off the U.S. portion of the Eastern market, which is only 20 percent. It's unlikely CII-HB, ICL and Siemens would let this gap go unfilled.

CROP FORECASTING BY SATELLITE

Computer Sciences Corp., which operates the computer network used by the Dept. of Agriculture to forcast U.S. crop production, is also helping to develop techniques for forecasting global food production through satellite photographs. The experiment involves computer analysis of satellite pictures of the wheatgrowing zones of North America in an attempt to develop better means of predicting crop yields. If successful, the experiment will be extended to other crops and other regions of the globe.

TVA'S ALTERNATE POWER SOURCE

Although originally established to harness electrical power, the Tennessee Valley Authority is planning to build seven nuclear plants. Control Data's Cybernet network is helping with the design and construction of the plants by performing structural, piping and safety analysis. Another arm of TVA at Muscle Shoals is developing improved methods of scrubbing stack emissions from power plants burning coal. Sulphur dioxide, a common atmospheric pollutant from these plants, is being studied to see if it could be used in manufacturing fertilizers. Cybernet helps here too by determining the economic feasibility of the various options as well as the locations of the processing plants.

LASER MASS MEMORY FOR SENSITIVE AGENCIES

The Department of Defense is especially interested in Precision Instrument's System 190 Laser Mass Memory. Unlike soft magnetic records that can be easily erased, laser data is hard and any attempt at alteration can be detected. Laser-recorded data will not deteriorate or print through and is immune to electro-magnetic radiation and computer power failures. Additionally, the laser system can store up to 128 billion bytes at about 1/10th the cost ($0.0002 per bit) of magnetic media, according to Precision Instruments. To record data in the laser system, a laser beam forms patterns on the surface of polyester sheet coated with a thin layer of rhodium metal. To read data, the laser reflects light from the recorded surface, reconstructing data into a digital bit stream. With the announcement that DoD would take delivery of the first system in October, Precision Instruments breathed a sigh of relief. The near bankruptcy of the firm as the result of the slower than planned development seems to be averted for the present by the incoming capital.

NEW NBS PUBLICATIONS

Computer Security Guidelines describes three categories of technical safeguards to maintain the integrity of personal information and protect it from unauthorized use: physical security procedures, information management practices, and computer system/network security controls. SD Catalog No. C13.52:41, $.70.

Six Data Base Management Systems: Feature Analysis and User Experiences (Fong, Collica, and Marron) discusses advantages of DBMS over traditional software and the criteria used in the selection of the six systems. SD Catalog No. C13.46:887, $1.45.

Exploring Privacy and Data Security Costs – A Summary of a Workshop (John Berg) discusses the benefits or increased value for EDP managers from implementing privacy requirements, direct or hidden costs, and how costs should be allocated among those who receive privacy's benefits or face its obligations. SD Catalog No. C13.46:876, $.85.

Order the above publications prepaid from the *Superintendent of Documents, U.S. Govt. Printing Office, Washington, DC 20402.*

VOLUNTARY CONVERSION TO METERS?

Metrication may seem kilometers off, but a 17-member United State Metric Board has been created "to coordinate the voluntary conversion to the metric system." Whether this board will speed things up or slow things down is debatable, but its responsibilities will be to educate the public and coordinate national metrication. Until now, the National Bureau of Standards had the responsibility for providing metrication information. The Bureau will still be responsible for maintaining the present national measurement system. If you're at a loss how to convert, NBS has a metric kit available. Write *NBS Metric Information Office, Washington, DC 20234.*

STANDARDIZING COMPUTER-AIDED MANUFACTURING

Component parts for numerically-controlled machine tools and computer-aided design systems come from far and wide – from the computer industry, the sensor and instrumentation industries, the machine tool manufacturers and the materials handling systems manufacturers. The National Bureau of Standards would like to standardize the data base formats, computer languages and especially the interfaces so the various modular components of the systems could fit together without special engineering and computer programming. NBS feels this is important for small and medium firms without large capital resources, which make up about 3/4 of the value of shipments in the discrete parts manufacturing industries. The Commerce Dept.'s Assistant Secretary for Science and Technology, Dr. Ancker-Johnson, presented the NBS opinion at the recent three-day Second International Computer-Aided Manufacturing Standards Workshop in Washington.

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book reviews

YOUR COMPUTER AND THE LAW *by Robert P. Bigelow and Susan H. Nycum. Prentice-Hall, Englewood Cliffs, NJ, 07632. 278 pages and index. $18.95.*

It is said, "The man who tries to be his own lawyer has a fool for a client." But this book doesn't try to be a handheld lawyer. Rather, it gives you the basic legal concepts and maps the pitfalls to avoid so you won't *need* a lawyer. Intended as a reference or study guide for the computer manager or businessman, its six self-contained units discuss legal aspects of data system operations from data use to insurance.

Bigelow, a leader in the field of computer law, and Nycum, a lawyer with ten years of computer operations experience, seem to have thought of everything. Yet despite the scope and legal technicalities involved, the book is intended for the layman (although lawyers might also find it useful) and is therefore easy to read.

Your Computer and the Law contains an extensive discussion of the legal aspects of financial record keeping, taxation, and data communications. A section devoted to proprietary rights and statutory methods of software protection. What to expect and look for in your next computer contract, whether it be hardware, software, or service, is another section. Another section discusses computer responsibility from the standpoint of privacy safeguards and the Tort Law, and there is a section just for the EDP manager, describing security precautions, insurance policies and antitrust laws. The appendices include samples of computer contracts and a copy of the Privacy Act of 1974.

If you're thinking of buying or designing a computer, this book seems a necessary reference tool. Beyond that, it's interesting to see exactly where the computer industry and legal network intersect right now. — B.A.R.

ENOUGH FORTRAN *by Thomas A. Boyle. Technical Directions, P.O. Box 2221, West Lafayette, IN 47906. 74 pages + tests, $2.95 (paper).*

Not too little, not too much, but an adequate amount of Fortran to enable the student to write an elementary program. All of us have used programmed texts before, but how about programmed *tests* with matched *text*? The array of tests is something like a chain of branched achievement tests. The computer scoring of the test provides output for each individual at three stages of learning. At each stage, programmed messages tell the student how he is progressing and what he should study next. This general introductory text to programming and Fortran is probably enough, providing there's an instructor to supplement it. —B.A.R.

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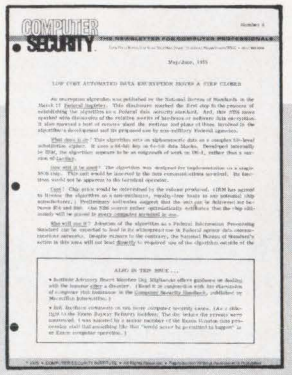
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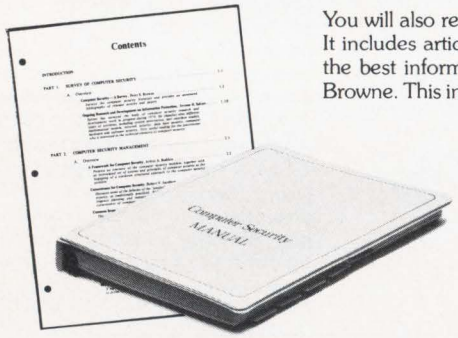

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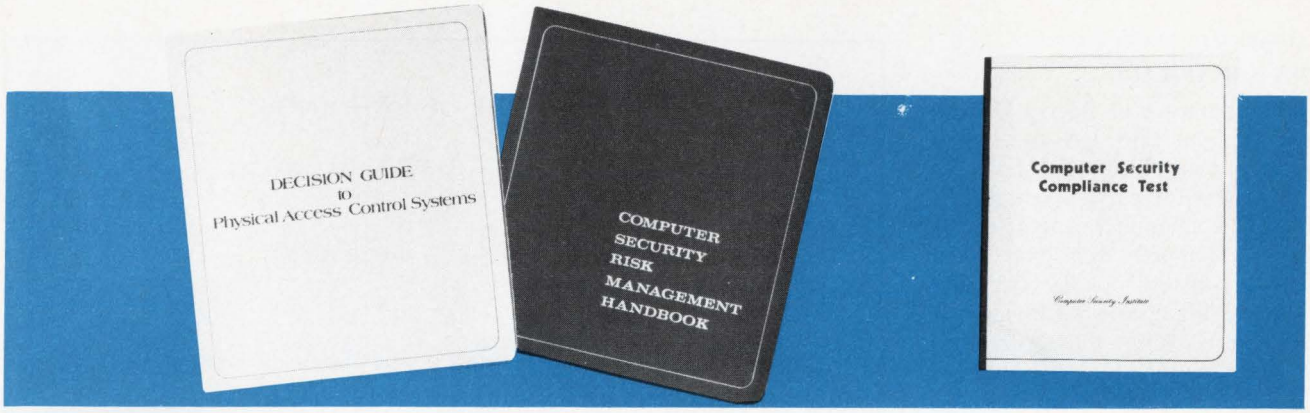

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The ISS operation of Sperry Univac, located in Cupertino, CA, has signed an agreement with Electronic Memories and Magnetics for purchase of certain of the media manufacturing assets of its Caelus Memories subsidiary. The agreement provides for ISS to take over the existing Caelus facility located in San Jose, with key Caelus development and manufacturing personnel joining ISS.

HONEYWELL, XEROX SUPPORT AGREEMENT

Honeywell Information Systems has agreed to provide maintenance and marketing support services to Xerox mainframe computer customers in the United States. Comparable agreements between overseas and Canadian subsidiaries and affiliates are expected to be signed in early 1976. The arrangement generally follows the letter of intent signed Oct. 15 by the two companies. Under the agreement Honeywell will be responsible for essentially all marketing contacts with Xerox mainframe customers and potential customers for equipment and services. Xerox will continue its hardware and software engineering operations through 1976, after which Honeywell will perform ongoing engineering support. Xerox will also operate its manufacturing and distribution facility at El Segundo through 1976, after which Honeywell will take over these functions. Honeywell will offer employment to more than 600 U.S. employees of Xerox mainframe operations, about 500 of whom are field service employees. Honeywell will retain most maintenance revenues. In most cases Honeywell will also retain 40 percent of the balance of payments from leases, installment sales or future sales of Xerox computer equipment. No other cash payment is involved in the transaction, other than employee benefits exchanges. Xerox will continue to own its computer equipment, and will continue to make and sell computer disk drives, serial printers and terminals, and high-speed non-impact xerographic printers for edp use. Also excluded from the Honeywell agreement is Xerox Computer Services, which provides computer services for businesses and public agencies.

BOX SCORE OF EARNINGS

COMPANY	PERIOD	REVENUES	NET EARNINGS (Loss)	EARNINGS (Loss) PER SHARE
Advanced Micro Devices	6 mos. 9/28/75	14,843,000	368,000	.14
	9/29/74	13,332,000	(2,081,000)	(.87)
Advanced Systems	6 mos. 9/30/75	3,915,000	160,000	.15
	9/30/74	3,483,000	111,000	.11
American Telephone and Telegraph	12 mos. 11/30/75	28,614,141,000	3,118,792,000	5.10
	11/30/74	26,011,014,000	3,174,306,000	5.28
Applied Digital Data Systems	9 mos. 8/31/75	11,825,967	2,136,278	.57
	8/31/74	6,418,171	1,960,175	.52
Aydin	9 mos. 9/27/75	25,944,000	1,826,000	.89
	9/28/74	23,291,000	2,016,000	1.06
Boothe Computer	9 mos. 9/30/75	36,789,000	4,206,000	1.08
	9/30/74	31,187,000	(2,958,000)	(1.34)
Burroughs	9 mos. 9/30/75	1,149,815,000	91,571,000	2.31
	9/30/74	1,048,546,000	81,121,000	2.08
California Computer Products	3 mos. 9/28/75	26,655,000	(3,224,000)	(.96)
	9/29/74	32,873,000	781,000	.25
Electronic Associates	9 mos. 10/3/75	22,803,000	2,128,000	.80
	9/27/74	22,386,000	(11,991,000)	(4.49)
General Automation	3 mos. 11/1/75	14,993,000	7,000	—
	11/2/74	14,193,000	177,000	.07
Greyhound Computer	9 mos. 9/30/75	46,412,000	301,000	.07
	9/30/74	39,705,000	1,080,000	.25
Incoterm	9 mos. 11/22/75	23,943,817	1,910,189	.95
	11/23/74	13,995,520	(298,044)	(.22)
Keane Associates	9 mos. 9/30/75	3,790,000	242,000	.29
	9/30/74	3,238,000	282,000	.34
Microdata	3 mos. 11/30/75	4,902,033	413,817	.25
	11/30/74	3,441,735	(147,705)	(.09)
Milgo Electronic	12 mos. 9/30/75	40,409,945	4,248,466	2.50
	9/30/74	30,795,510	2,723,915	1.64
Mohawk Data Sciences	6 mos. 10/31/75	80,624,000	2,435,000	.36
	10/31/74	83,224,000	(10,474,000)	(1.68)
National CSS	9 mos. 11/30/75	26,289,480	1,541,200	1.41
	11/30/74	24,704,634	1,382,000	1.26
Omnitec	12 mos. 7/31/75	9,848,746	735,273	.06
	7/31/74	659,493	80,613	.01
On-Line Systems	6 mos. 10/31/75	5,073,991	213,413	.25
	10/31/74	6,140,782	881,322	1.05
Recognition Equipment	12 mos. 10/31/75	59,254,000	3,374,000	.58
	10/31/74	42,913,000	2,087,000	.39
Standard Computer	9 mos. 9/30/75	4,300,000	32,000	.05
	9/30/74	4,496,000	390,000	.65
System Development	3 mos. 9/28/75	25,402,000	366,000	.20
	9/29/74	25,286,000	124,000	.06
Terminal Data	12 mos. 9/30/75	4,706,040	282,075	.40
	9/30/74	3,079,423	(224,098)	(.32)
Tektronix	12 wks. 11/15/75	82,210,000	6,160,000	.70
	11/16/74	77,153,000	5,182,000	.61

Announcing Honeywell's Series 60, Level 6.

Our new minicomputer – it's small and quick and very smart.

Now Honeywell has a whole new family of minicomputers.

Level 6 means high-reliability hardware that's easy to program, easy to configure, easy to service. For only $2634.*

Powerful central system architecture: Level 6 architecture is designed to support the most demanding minicomputer applications, and provide a full range of compatible systems from which the user will be able to select the one best suited to his requirements. Initial models include many of the following architectural features:

- Microprogrammed instruction set with writeable control store available to the user.
- Direct addressing up to 8 million words of memory.
- Minimum of 18 programmable hardware registers.
- Bit, byte, word and multi-word addressing.
- Hardware stack and queue management.
- Proven N-channel MOS memory in 8K by 16-bit modules, with byte parity and up to 32K words on a single board. Cycle time is 650 nanoseconds.
- Error detection and correction (Corrects single bit, detects two-bit errors).
- Memory management hardware.
- Over 100 basic instructions, with more than 600 variations.
- High-performance scientific and commercial instruction set extensions.
- Common asynchronous Megabus™ operating in an interleaved mode, with a bandwidth of 6 million bytes per second.
- Vectored interrupt capability with up to 64 interrupt priority levels.
- Separate trap structure with more than 20 unique entry points.
- Microprogrammed input-output controllers.
- Multiprocessor and networking capabilities.

The benefits include the ability to write compact and efficient programs, increased processing speed, reduced memory utilization and memory management overhead, reduced software overhead, increased throughput, and the capacity to handle large and versatile configurations.

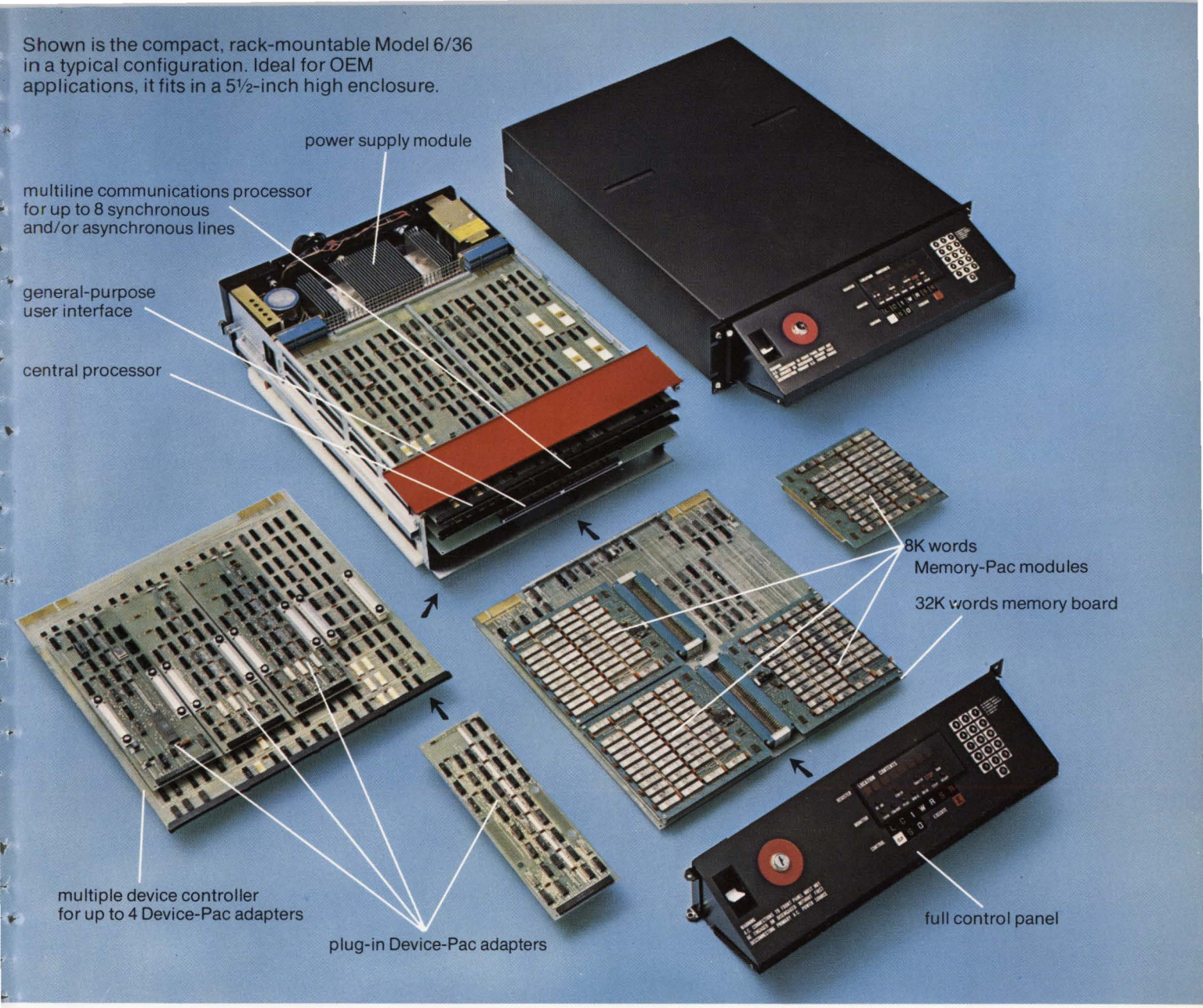
Models 6/34 and 6/36 incorporate subsets of the above features and are immediately available. These models are well suited for OEM and system-builder applications. Maximum memory for the 6/34 is 32K words, and for the 6/36, 64K words.

Advanced modularity: Level 6 combines TTL logic, LSI and MSI circuitry, firmware-driven microprocessors, MOS memory, and etched wire connections in a new way to achieve plug-in modularity with optimum configurability and replaceability. Specifically:

- The entire central processor is contained on a single board 15″x16″.
- Other 15″ x 16″ boards are devoted to the memory, communications processor, peripheral controller, and user interface.
- Functional modules (i.e. device adapters and memory modules) plug into the 15″ x 16″ boards.
- Boards fit into the bus without backplane wiring.

Level 6 offers a choice of rack-mountable, cabinet and tabletop models. Level 6 also includes a new full line of low-cost peripherals in both tabletop and rack-mounted versions. Shown are the tabletop minicomputer, diskette and CRT.

*U.S. price in quantities of 50 for rack-mountable Model 6/34. Includes 8K words of MOS memory, with parity, multiply/divide, realtime clock, and bootstrap loader.



These features offer the following benefits: The sharing of costly logic elements such as controller microprocessors and memory error correction lowers the system cost. A system can be easily configured through the selection of a minimum number of appropriate boards and modules. Fewer components and connections mean increased system reliability. And serviceability is improved by having fewer — as well as more easily replaceable — components.

Microprogrammed communications processor: Honeywell's multiline communications board functions as a true front-end processor. It offers unusually powerful communications capability at moderate cost.

- Separately programmable memory allows tailoring to individual requirements.
- Usable memory of 4096 bytes enables execution of complex line-handling procedures with no central processor involvement.
- Each board handles up to eight full-duplex lines.
- A variety of modules adapt the communications processor for different line types and speeds (up to four modules per board, line types and speeds may be mixed on the same board).

As a result, the central processor is relieved of most of the data communications overhead, and the user has maximum application flexibility.

Built-in test and verification: The Level 6 system provides an automatic configuration integrity check and self-diagnosis:

- Light-emitting diodes on the central processor and each controller board verify logic quality.
- A console indicator verifies that boards, terminators, and bus cabling are properly connected at time of system initialization.

By means of these features, together with the simple replaceability of boards and plug-in modules, the Honeywell Level 6 system is designed to be the most serviceable minicomputer ever built.

Efficient system-building software: Honeywell has gained considerable system building experience through the application of minicomputers within the general purpose computer and control system segments of its business. This experience, together with the expertise gathered in ten years of

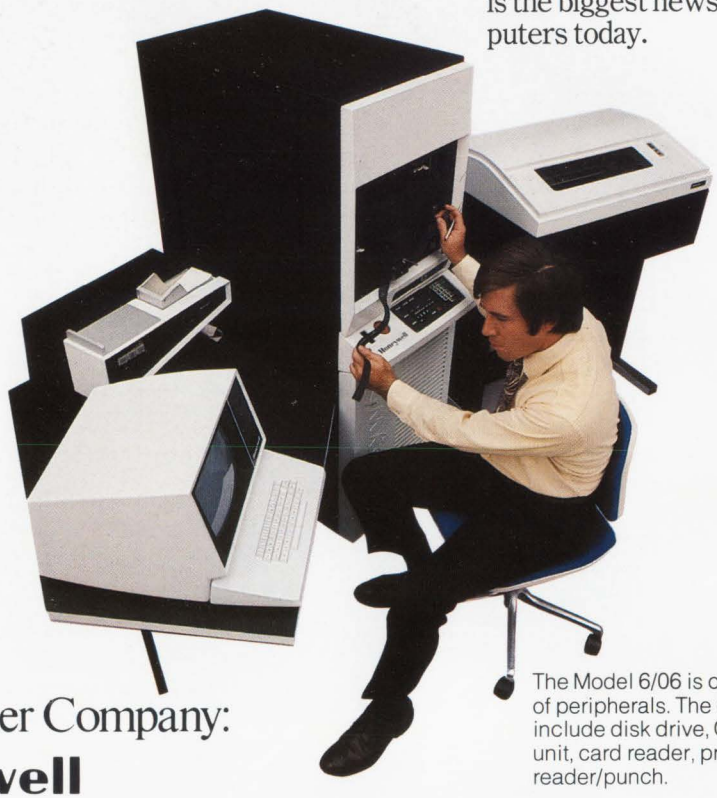
building minicomputers, has been applied to Level 6 hardware and software design to produce integrated system products particularly well-suited to a wide variety of jobs. The initial software includes:

- Stand-alone program development system.
- Stand-alone multitasking realtime executive.
- Disk-based multitasking realtime operating system.
- Assembler, FORTRAN and utilities.

These are the first results of a comprehensive software development program. Scheduled for future release are additional higher level languages, communications software enhancements, and operating system extensions.

System 700 compatibility: Level 6 offers System 700 compatibility via the Model 6/06. The 6/06 incorporates the packaging and technology advances of Level 6 and supports the full range of System 700 software and peripherals. Memory is available in 8K word increments up to 64K. Systems are available for immediate shipment.

For more information, please mail us the coupon or circle number 125 on reader card. We'd like to show you why Honeywell's Level 6 is the biggest news in minicomputers today.



The Model 6/06 is offered with a variety of peripherals. The configurations shown include disk drive, CRT, tape cassette unit, card reader, printer, and paper tape reader/punch.

The Other Computer Company:
Honeywell

Honeywell Information Systems, 200 Smith Street, MS 440, Waltham, Massachusetts 02154

☐ Please send me more information about Level 6 minicomputers.
☐ Please have a salesman call.

Name_____

Title_____

Company_____

Address_____

City_____ State_____ Zip_____

Phone_____

To help you answer my request more effectively, here's some basic information:

I'm an ☐ OEM ☐ End-user ☐ I have a need for_____ minicomputers during 1976.

My intended application(s) is_____

CDEFG

I am interested in Model(s) ☐ 6/34 and 6/36 ☐ 6/06

corporate & financial

NORTH AMERICAN PLACES $10 MILLION WITH CALCOMP

California Computer Products announced that North American Corp. of New York City has agreed to purchase CalComp equipment valued at up to $10 million during the next 12 months. The equipment to be purchased is to be placed on non-cancellable leases of 18 to 36 months duration and includes CalComp disk memory systems, tape memory systems, digital graphic systems and automated tape library (ATL) systems. Calcomp will service and maintain the leased equipment and has agreed to act as the re-marketing agent for North American when the initial lease term is completed.

VARISYSTEMS DISCHARGED FROM CHAPTER XI

Varisystems Corp. of Plainview, NY, has been discharged from Chapter XI of the Bankruptcy Act. The Plan of Arrangement, submitted on April 1, 1974, was confirmed by the U.S. District Court, Westbury, NY. Varisystems designs and builds phototypesetting keyboards and composing systems for the publishing and printing industries.

RECENT ENTRIES

AMTEK has been organized in Orange County, CA to manufacture automatic production equipment for semiconductor manufacturers. Current products include an automatic feed system used in manufacturing LED displays for calculators, an automatic epoxy dispensing system and an alignment device for positioning microscopic IC circuits during assembly.

ImTECH, Inc. of Silver Spring, MD, specializes in problems involving the computer processing of pictorial data, particularly in the development of image analysis and computer graphics techniques, and their applications to industrial automation, document processing, medicine and remote sensing.

Western Peripherals Corp. has been formed in Anaheim, CA, to manufacture and market minicomputer tape and disk interface systems. The company's goal is to operate as an independent minicomputer peripherals company supplying both the end user and OEM markets.

MERGERS & ACQUISITIONS

Medicus Systems Corp. of Chicago has acquired **Spectra Medical Systems, Inc.** of Palo Alto, CA. Spectra Medical Systems is developer of the Spectra 2000 computerized medical information system which Medicus will market through its network of regional offices . . . . . An agreement has been reached for the sale of **Greyhound Computer's Los Angeles Data Center** services to **Multiple Access, Inc.**, a subsidiary of Multiple Access, Ltd., a Canadian firm . . . **Penril Corp.** of Rockville, MD, has entered into an agreement for Penril's purchase of **Data Technology's Data Instruments Division.** The division, located in Santa Ana, CA, manufactures electronic digital instrument products which include digital panel meters, digital multimeters, chart recorders, analog to digital converters and a line of logic modules . . . . . **Pertec Corp.** of El Segundo, CA, has entered into an agreement for the merger of **Computer Machinery Corp.** into Pertec. The purchase contemplates the exchange of 1.8 million shares of Pertec stock for all the outstanding shares of CMC . . . . . **Xylogic Systems, Inc.** of Natick, MA, has acquired **Interface Corp.** of Melrose, MA, for an undisclosed amount of cash and stock. The Interface operation will be moved to Natick where it will become the Xylogic OEM Components Group specializing in microprogrammable interfaces and controllers for minicomputer equipment and systems. Xylogic Systems produces mini-based turn-key systems providing interactive text-editing and typesetting for the graphic arts industry.

FOUR-PHASE SYSTEMS INCREASES CREDIT LINE

Four-Phase Systems has increased its credit lines to $42.5 million through a new agreement with a group of major lending institutions led by Bank of America in San Francisco. The credit lines, which include $6 million in Canadian funds, will be used to finance the leasing of equipment to Four-Phase customers and to finance accounts receivable associated with sales. The credit will be available through December 31, 1976 on a revolving basis, after which the lease portion of the revolving credit will convert to a term loan.

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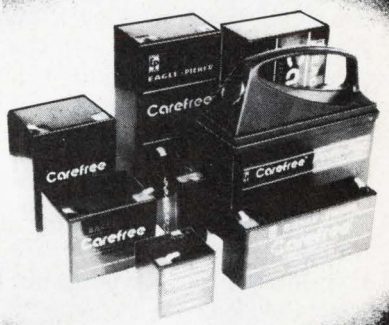

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CIRCLE NO. 9 ON INQUIRY CARD

corporate profile

FEATURED THIS MONTH:

(OVER-THE-COUNTER)

Vermont Research Corporation

No. Springfield, Vermont

OFFICERS & DIRECTORS: ***Hugh M. Taft,*** President, Treasurer; ***Richard A. Stover,*** Exec. Vice Pres.; ***Whitney Hartshorne,*** Vice Pres.-Finance; ***Andrew S. Dowd,*** Vice Pres.-Marketing. **Other Directors**: ***John G. Kristensen, Stuart J. Lock, John G. Moody, J. Franklin Jones, Jr.***

BACKGROUND: Vermont Research Corporation was incorporated April 4, 1960. In its early years the company's operations were developmental, funded by a contract with the Office of Naval Research for investigation of high density, high-frequency magnetic recording. The company's research in the use of air-bearing supported read/write heads led to the development of a proprietary line of products. In 1969 Vermont Research purchased the outstanding stock of Computer Memory Systems, Ltd., of Leatherhead, Surrey, England. CMS was engaged in drum memory system production and had been the agent for sale of Vermont Research products in the United Kingdom and Europe since its founding in 1967. In 1969 Vermont Research Ltd. was formed to sell to and service U.K. and European customers. In 1973 the company acquired OMI Memories, Inc. (Los Angeles) by merger into VRC California, Inc., a wholly-owned subsidiary. In addition, it acquired the moving-head magnetic disk memory developed by OMI Memories prior to the merger.

FACILITIES: In 1963 the company built a modern 19,000 ft.^{2} plant in North Springfield, VT, which now serves as sales, engineering and administrative headquarters. In 1969 it acquired and remodeled a 26,000 ft.^{2} plant in Springfield, VT, for additional manufacturing space. An additional 11,000 ft.^{2} plant is leased in England. The company also leases space for its sales offices in various cities. In 1970 the company acquired 52 acres of land in North Springfield as a possible site for a future plant. As of January 1, 1976, VRC employed 122 persons at its Vermont facilities and 42 in England.

PRODUCTS/SERVICES: Vermont Research designs, manufactures and sells two standard product lines of rotating magnetic memories: fixed-head magnetic drums, which have always been sold under the Vermont Research name; and moving-head magnetic disk drives, which were added to the product line with the OMI acquisition. Vermont Research sells its products principally to original equipment manufacturers (OEMs) who incorporate them into systems which they sell under their own names. The company is not in the IBM plug-compatible memory replacement business in any way. All sales, whether OEMs or to the occasional end-user, are firm sales and do not involve lease revenues or deferred income.

CURRENT POSITION: Vermont Research products have been marketed successfully in North America, Europe and Japan for over 15 years. During this time there has been designed and marketed seven generations of head-per-track drums. Customers for the current 3000 Series include two of the largest industrial process control computer manufacturers in the world: Honeywell in the U.S., and Siemens in West Germany. With the acceptance of the 3000 Series, 1975 showed a significant increase in sales and profitability over 1974. The contribution made by Vermont Research Ltd. in marketing and support of VRC products in Europe continues to be significant in the company's overall operations with some 40% of the company's revenues originating in that market area. Broadening its product line of rotating magnetic memories, Vermont Research has recently introduced a moving head cartridge disk drive which stores 400 megabits on only two standard disks.

OUTLOOK: VRC intends to continue increasing its share of the head-per-track market through continued product development and expanded marketing activity. During 1975 the Model 4000 drum was introduced for application in such high-volume markets as point-of-sale systems, and the Model 3020, a ruggedized high-performance drum, has been well received by users with severe environment applications, such as on shipboard or in mobile vans. With the continued expansion of the moving head disk market, VRC is in a strong position with its Model 5017, 400 megabit cartridge disk drive. VRC-patented interspersed servo technology allows the 5017 to operate with a track density of 500 tracks per inch. Development is continuing on controllers to interface all current VRC products to selected minicomputers.

FINANCIAL SUMMARY: As of Sept. 30, 1975 Vermont Research had 719,300 shares outstanding. No public stock offering has been made since 1964. Operations are financed through a line of credit with commercial banks. Long term debt is in the form of real estate and equipment mortgage notes. 1974 saw a net loss in earnings due to the company's outlays for research and development of new products. 1975 saw a return to profitability with significant shipments of 3000 Series drums in both the U.S. and Europe. Additional growth in 1976 is expected with increased shipments of the 5000 Series disk drive. In 1971 the company increased its allowance for doubtful accounts by nearly $500,000 because of a principal customer's (Consolidated Computers, Ltd. of Canada) financial difficulties. Essentially the same amount was recovered in 1972 and 1973.

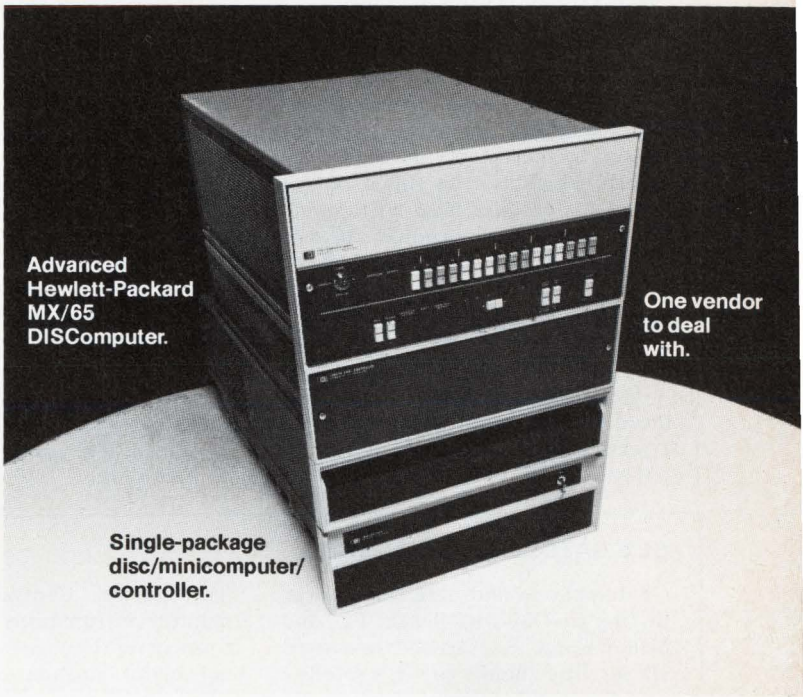
Period	Revenues	Earnings (Loss)	Earnings (Loss) Per Share
F.Y. 9/30/71	5,050,696	(678,323)	(1.02)
F.Y. 9/30/72	5,744,059	904,250	1.36
F.Y. 9/30/73	4,397,662	67,422	.10
F.Y. 9/30/74	3,808,057	(309,596)	(.43)
F.Y. 9/30/75	5,363,688	169,898	.24

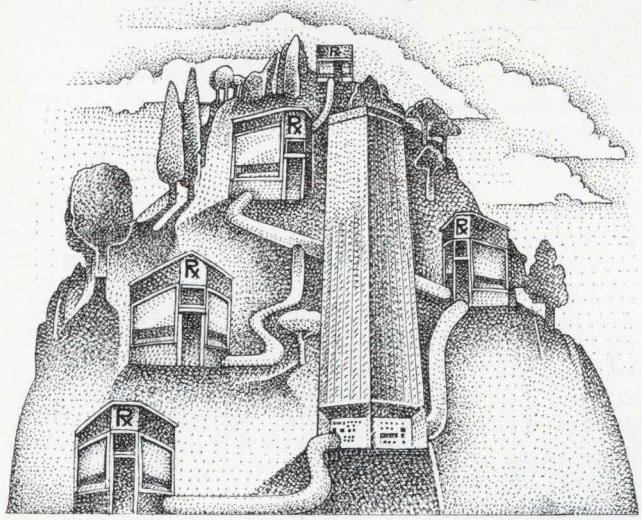
THIS OEM ASKED US FOR A HEAD START.

Management Systems Technology in Chicago was in the market for a minicomputer and a disc. We said, "There's a better way."

Then, we introduced them to the Hewlett-Packard DISComputer concept.

Some vendors offer systems in which a disc, controller and minicomputer have been *put* together. In contrast, the elements of the HP DISComputer were *designed* together.





Management Systems Technology, Inc., builds a system that provides druggists real-time data on patient profiles and drug interactions, prints labels, handles billing and taxes. At its heart a Hewlett-Packard DISComputer.

This means you don't get bogged down trying to optimize the performance of our hardware. Instead, you can jump ahead and put your efforts into developing your own systems.

You can also benefit from advanced HP software. RTE-III, the newest member of the RTE family, gives access to 64 partitions, up to 128K words of main memory, plus multiple languages and multi-programming.

At $17,655;* the MX/65 DISComputer price/performance ratio is exceptional. The further economies of dealing with a single vendor could help turn a head start into a winning performance any day of the week.

Just ask Management Systems Technology.

THE HEWLETT-PACKARD MX/65 DISCOMPUTER AT A GLANCE

Minicomputer:	Controller:	Disc:
8K to 128K words. Solid state 4K RAM memory. Optional Dynamic Mapping System. Microprogrammable. Parity, EAU, floating point standard. Brownout-proof power supply.	Links to multiple CPU's. Combined seek/data transfer. Built-in error detection and correction. Automatic track switching. Data protect and recovery features.	25 msec average seek time. 15 Mbytes of storage, expandable to 120 Mbytes. Exceptional 937 Kbyte transfer rate. Operates over wide power and environment range.

*DOMESTIC USA OEM PRICES QUANTITY 50 WITH 32K MEMORY, 15 MBYTE DISC.

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CIRCLE NO. 10 ON INQUIRY CARD

WU EXTENDS INFOMASTER SYSTEM

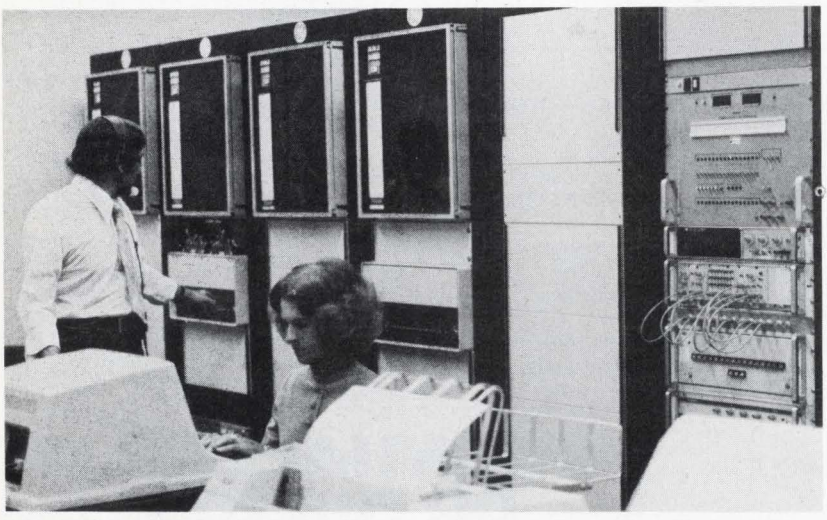
Western Union has filed a tariff amendment with the FCC for a list storage service to Telex-TWX subscribers utilizing InfoMaster, the company's store-and-forward computer message-switching system. The new service, called Redi-List, permits the Telex-TWX subscriber to store mailing addresses, in increments up to 250 for each list, which can be called out of the InfoMaster data base with seven-letter codes. Price schedule for the Redi-List service includes a basic $25 fee for establishment of the list itself, up to a maximum of 250 addresses; $5 per month computer storage fee for each list; and for changes in the list a fee of $5 plus $1 for each address changed. Messages sent using the Redi-List service will be charged at regular InfoMaster rates.

SATCOM TERMINAL MARKET

A recently-completed study ("Satellite Communications Applications and Terminals") by MarTech Strategies, Inc. of Indialantic, FL, concludes that domestic shipments of military and commercial satellite communication user terminals will approximately double between 1974 ($216 million) and 1979 ($427 million). MarTech believes these markets will account for $1.5 billion in end-user terminal shipments through 1979. Factors considered significant to this expansion include: growth of dedicated application services; development of private satcom networks; IBM's entry as a domsat carrier; new Ku-Band satellite technology; and the "ballooning growth of digital data traffic due to expanding computer communication networks."

GE'S SATELLITE SWITCHING

GE telephone and data traffic originating in Daytona Beach, FL, and Valley Forge, PA, can now be carried via satellite thanks to GE's satellite private SCPC (single channel per carrier), DAMA (demand assigned multiple access) telephone network. The network is connected with AT&T's CCSA network. It works like this: Satellite circuits are demand-assigned under the centralized control of a computerized system routing center by assigning matching frequencies at the GE Daytona Beach and Valley Forge earth stations. The routing center performs all telephone signalling and supervision, as well as the frequency assignments, using a single common 40-kilobit per second satellite channel. Centralized network maintence functions are also performed via the single common channel under routing center control. The SCPC equipment at the Daytona Beach and Valley Forge earth stations digitizes the analog telephone voice for satellite transmission using variable-slope-delta-modulation techniques. Voice operated switching is used in each digital voice channel to lower overall power requirements, and echo suppressors are used to mitigate the effects of satellite round trip delay. Digital voice channels use a 40-Kbps data rate and are spaced on 60 kHz centers. Coming is 30 kHz spacing, permitting 1200 digital voice channels per 36 MHz satellite transponder.



AT&T ON REGISTRATION PLAN

AT&T told the Federal Communications Commision that a plan to register and allow the direct electrical connection to the telephone network of all kinds of customer-provided telephones and PBXs was "inadequate for (telephone) network protection" and would be a "serious mistake." Earlier AT&T had asked the FCC to reconsider and modify its initial plan to register and allow connection of ancillary devices (such as answering sets and speaker phones), data equipment and extension phones. The company opposed the registration of equipment provided by the telephone companies as "unnecessary and improper," stating that existing protective programs as well as a program of registering only "jointly designed discrete protective circuitry" as proposed by the company last July are preferable to the FCC's program scheduled to go into effect April 1.

In comments filed with the FCC on the Commission's announced intention to extend its registration plan to main telephones, key phone systems and PBXs, AT&T said the plan's standards and procedures are "inapplicable and inadequate for extension to those classes of equipment" because it was not technically feasible or appropriate to apply one set of criteria to all types of terminal equipment, and because the testing procedures in the plan for PBXs and key phone systems would be "impractical, if not impossible." AT&T also challenged the FCC's authority and jurisdiction under the Communications Act to adopt a registration program.

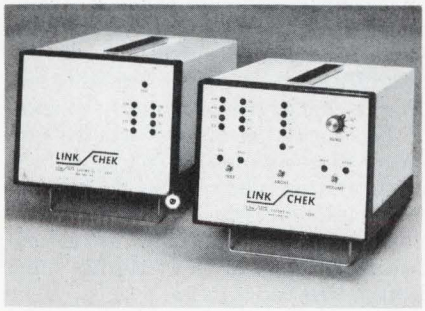
ADL ON FIBER-OPTICS FOR SHORT-HAUL CARRIAGE

Designs for two pilot electro-optical telecommunications systems for which business opportunities should be available within ten years, are being developed by Arthur D. Little, Inc. One system is digital, the other analog. Both are short-haul (intrabuilding or intracity) and can carry voice, data or video signals. The Cambridge, MA, research organization determined that short-haul use was the most promising near-term application of electro-optical technologies that involve use of fiber-optic, rather than metal, cables to transmit signals. These systems are said to be considerably lower in cost, although their exact cost is still undetermined. Also, the small, lightweight fiber-optic cables are unaffected by electromagnetic and radio interferences and can be used in explosive atmospheres. According to ADL's Dr. David

A. Curtis, "The value of short-haul trunking, using conventional technology, installed in the United States alone should exceed $400 million annually by 1980, rising to $600 million by 1985, based on current costs. These figures, however, do not account for possible widespread availability of optical fiber communication technology, which is potentially more economical."

ASSURE LINE QUALITY

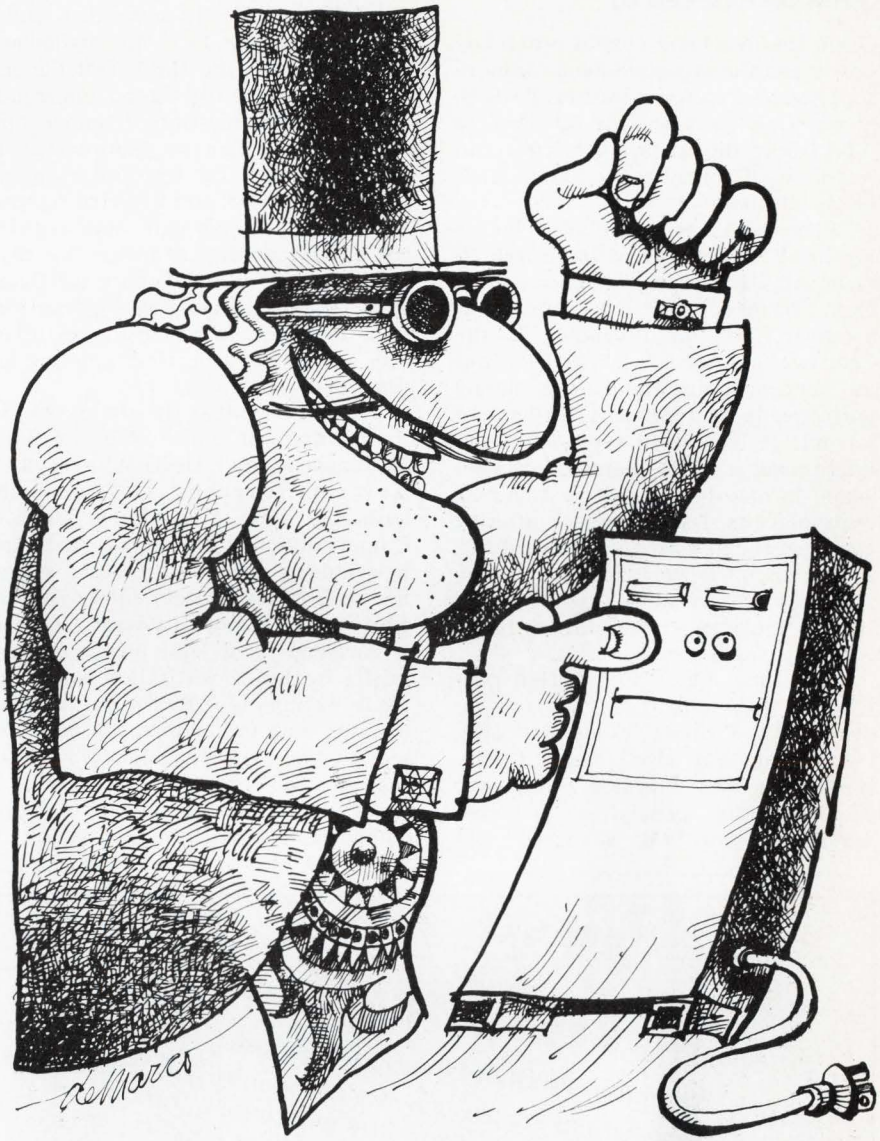
Not checking line quality before launching into a lengthy transmission can be costly. Paring those costs is the job of these neat little boxes from Com/Tech Systems (New York City). The *Link/Chek* 202 system consists of one master unit and any number of



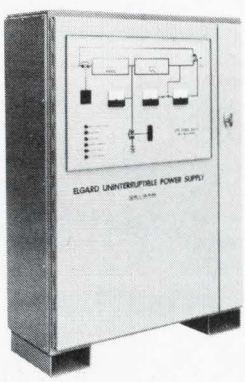
slave units, one at each of the called ends. *Link/Chek* verifies half- or full-duplex performance by transmitting a pseudo-random bit sequence and then displaying a count of the number of bits in error returned (echoed). From the results the user can determine whether to transmit as is, redial for a better line, or select another data rate. System (one master, one slave) prices start at under $1000.

ICC ELIMINATES SERVICE CHARGES

International Communications Corp. has announced a new customer support policy that it said will eliminate most field service charges on ICC data communication products installed by ICC personnel. The new service policy applies to ICC customers who ordered equipment after September 1, 1975. Customers who purchased equipment will receive customer support services during prime shift hours at no additional charge for a period of six months. Customers leasing equipment will receive the same coverage for the full term of the lease. Equipment leased prior to September 1 can be covered by extending the lease for one year. The current prices of ICC products will remain in effect.



Buy protection. Or else.



Or else when the power fails, your computer can lose its mind, its memory... and your data. But an Elgard Uninterruptible Power System can give your computer all the protection it needs—up to several hours of back-up time, plus continuous isolation from line spikes and transients. Elgard models are available in 0.5KVA through 40KVA capacities.

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ELGAR

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CIRCLE NO. 11 ON INQUIRY CARD

IBM VS. AT&T OVER DATASPEED 40

Given the decreased cost of processing power and the increased need for more sophisticated communications devices, it was only a matter of time before AT&T introduced a product that would test its legal ability to market an intelligent terminal.

When AT&T ventured into the market in 1973 with its first Dataspeed 40 terminal, the only objection came from Incoterm and that was later dropped. The inital version of the Teletype-supplied Model 40 CRT was an asynchronous stand-alone model with speeds of 1050 or 1200 bits per second. It had a full typewriter keyboard and a 1920-character display. Then, in October of last year, AT&T expanded its Dataspeed 40 offering and filed the new tariffs with the FCC. The new models were clustered, binary synchronous versions with higher speeds, and were very similar to IBM's 3270 Display Systems.

This time AT&T found itself contending with more than just one independent. Protests came not only from IBM, but also from CBEMA (Computer and Business Equipment Manufacturers Association) and even traditional anti-IBM advocate, CIA (Computer Industry Association). Although the protests were filed separately before the FCC, the arguments were based on the thesis that the enhanced Dataspeed 40 was no longer just a data communications terminal, but was now also a data processing terminal. In the unregulated data processing industry, the IBM side objected to having a regulated monopoly as one of the market participants. The fear was that AT&T could cross-subsidize the Dataspeed 40 with other Bell system offerings. In 1956, an antitrust consent decree forbade AT&T from entering an unregulated business.

As evidence that the Dataspeed 40 represented an entry into the data processing market, the IBM forces cited New York Telephone's tariff proposals with the New York Public Service Commission, which stated that the new models could also be used as airline reservation or order entry systems. IBM, CBEMA and CIA want the FCC to suspend or at least investigate the tariffs further. Investigation would include examining AT&T's market projections and full equipment costs to see whether there was indeed cross-subsidization.

IBM said that it would welcome the additional competition from AT&T if it were on a *competitive* basis, not a *regulated* basis. For this to happen, the FCC would have to ask the Justice Dept. for modification of the 1956 decree.

AT&T has replied that the new Dataspeed 40 is still a data communications offering, but that it agrees with IBM that unregulated and regulated terminals should not compete in the same market. The utility thus concluded that *all* communications terminals should be regulated. (AT&T has always been unhappy with the deregulation of the interconnect industry.)

According to AT&T, the difference between data processing and data communications is that data processing is "the function of operating on information to increase its worth to the end user through changing its inherent informational content." AT&T maintained that the additional Dataspeed 40 features do not enhance the worth of the data transported because they do not change the content of the data.

The tariffs have been delayed and now will not go into effect until February. Having tried once in 1971 to define data processing and communications services in relation to the original Dataspeed 40, the FCC still has some work in semantics to do.

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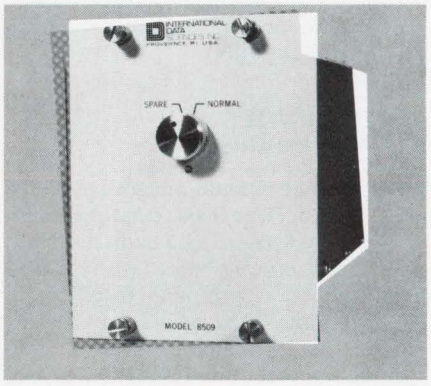
SP ARE MODEM SWITCH

O.K., you've isolated the fault to the modem. Now what? Obviously the modem must be replaced, but that can be time-consuming, particularly if it is rackmounted in a maze of wiring and/or there are no maintenance



personnel onsite. International Data Sciences offers a very simple solution: a switch that throws in another modem instantly. The application sounds trivial, but the benefits can be substantial. Think of it this way: If you value your communications at just $2/minute, the $220 switch will pay for itself when it eliminates just two hours of downtime. **For more information, Circle No. 95 on Reader Inquiry Card.**

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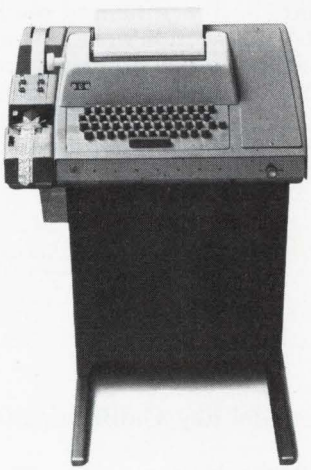

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CIRCLE NO. 12 ON INQUIRY CARD

NOVA AND PDP-11 INSTRUCTION MANUALS DON'T MENTION THIS FACT:

Ampex makes pin-compatible memories. They save money, they work perfectly, and they always give you something extra that you just can't get from the original mainframe manufacturer.

New For The Nova 2 The newest Ampex pin-compatible memory is the ARM-2, designed for Data General Models Nova 2/4 and Nova 2/10. Completely transparent to Nova software and hardware, the ARM-2 provides a full 16K of memory (32K bytes) per slot, at an access speed of 280 nanoseconds and a full memory cycle speed of 800 nsec. In addition to the 16K speed advantage, the Ampex ARM-2 saves you more than 20% of the cost of Data General's own memory.

More For The Nova 1200 More memory capacity per slot is provided by the Ampex ARM-1200 than you can get from Data General. Plug in an ARM-1200, and you add a full 16K of memory. That means twice as much memory in the original mainframe cage as you thought you could accommodate. Naturally the ARM-1200 is completely program compatible, and even more important, with Ampex, you save about 20% over the original mainframe manufacturer's price.

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NOVA is a trademark of Data General Corporation. PDP-11 is a trademark of Digital Equipment Corporation.

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ARM-2 /CIRCLE NO. 13 ON INQUIRY CARD
ARM-1200 / CIRCLE NO. 14 ON INQUIRY CARD
ARM-11 / CIRCLE NO. 15 ON INQUIRY CARD

TAVORN THANANITAYAUDOM / Systems Communication Division, International Business Machines Corp., Kingston, NY

TAVOGRAMS

An IBM-developed nomographic technique for simplifying network design problems.

Transmission delay between a remote terminal and the central computer plays an important role in communication system cost/performance optimization. And in planning a communication system, the best design alternative must be found to satisfy given cost/performance criteria.

The planning process usually consists of a tremendous analysis effort involving iterations of design calculations, ranging from intuitive guess to extensive modeling and simulation. Many analyses are required to determine a line configuration that achieves satisfactory performance at minimum cost. To estimate the system performance under each line configuration, message transmission times and contention delays (caused by other terminals sharing the same line) must be accounted for along with several other variables.

The nomograph method described here provides a quick, accurate estimate of transaction response time. This response time, as experienced by a terminal user, is the duration from which an input message or inquiry is entered at the terminal until an output message or response from the central computer is received at the terminal.

The nomographs are based on simplified queuing equations used to calculate queuing delays on a full duplex (FDX) multipoint communication line with polling. In designing an optimum network, iterating the nomograph procedure will provide a range of line configurations with loadings that satisfy a given response time constraint.

Because of the simplicity of using nomographs, the systems designer can quickly obtain solution alternatives over an applicable range of values for each parameter involved. By aiding in the rapid determination of those factors to which the response time is most sensitive, the nomograph assists in concentrating design effort on the dominant elements. The resulting accuracy is more than sufficient for a "first-cut" design and analysis, and the number of design alternatives is reduced to a manageable level so that extensive analyses can be performed.

ASSUMPTIONS

To avoid misleading results, an understanding of the assumptions underlying the queuing model represented by the nomograph is essential:

1. Terminal controllers are attached to the host computer by means of an FDX multipoint line. Host interface is FDX, while the controller interfaces may be either FDX or HDX (half duplex).

2. Terminals and message traffic are distributed evenly among the controllers.

3. Only interactive transactions are considered. (Each input produces an output message to the same terminal.)

4. Input message interarrival time at the terminal is exponentially distributed and is significantly greater than the process time of the message. (As the interarrival time approaches the process time, this technique will produce increasingly conservative results.) Messages are of constant length. Host and controller delays are also treated as constants.

5. Each controller is polled once in a complete poll cycle and all input messages queued are transmitted. If there are no input messages, the controller will send a negative response (a control message with same length as a poll message).

Tavorn Thananitayaudom received a Bachelor of Engineering degree in 1965 from Chulalongkorn University in Bangkok, Thailand, and an MS from the State University of New York at Stony Brook in 1968. He joined IBM in 1968 and worked in the IBM 360/370 Systems Diagnostic Engineering group. He joined the System Performance Evaluation department in 1972. At present he is a staff engineer with major responsibilities in communication systems network analysis.

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INPUT WORKSHEET

Line speed, S = 4800 baud, (use effective bits rate where applicable).
Line propagation delay (one-way include modem delay), t_d = 25 ms.
Number of controllers on the line, M = 5 ; FDX or HDX controllers ?
Modem turnaround time (or clear to send delay), t_m = 30 ms.
Number of terminals per controller (cluster size), N = 10.
Mean time between messages from each terminal, t_a = 40 sec.
Total message rate ($M \times N / t_a$), λ = 1.25 msg per sec. (or 75 per min.)
Message lengths: Poll message (or negative response), L_o = 100 bits.
Input message, L_1 = 1000 bits. Output message, L_2 = 2000 bits.
Host delay (CPU, file, & teleprocessing front-end), t_{cpu} = 1000 ms.
Controller delay (round trip terminal - controller), t_{cu} = 200 ms.

NOMOGRAPH INSTRUCTION WORKSHEET

CHART 1 (step numbers are as shown on nomograph key)

Step 1: Poll transmission time: L_o & S read — t_o = 21 ms.
Input transmission time: L_1 & S read — t_1 = 210 ms.
Output transmission time: L_2 & S read — t_2 = 420 ms.
Step 2: Positive poll utilization: λ & t_o read — ρ_o = 2.5 %
Input message utilization: λ & t_1 read — ρ_1 = 26 %
Output message utilization: λ & t_2 read — ρ_2 = 52.5 %
Step 3: Duplexing factor (for FDX), ρ_1 & ρ_2 read — P_d = 14 %
Step 4: If HDX controller, P_d (from step 3) & M read — P_d = 11 %

CHART 2 (step numbers are as shown on nomograph key)

Step 1: ($t_o + t_d$ = 46 ms) & (t_m intersects P_d) read — A = 112 ms.
Step 2: ($\rho_1 - \rho_o$ = 23.5 %) & (ρ_2 intersects P_d) read — B = 73 %
Step 3: Join A (from step 1) & B (from step 2) to intersect scale C.
Step 4: C (from step 3) & M read polling cycle time — T = 2100 ms.

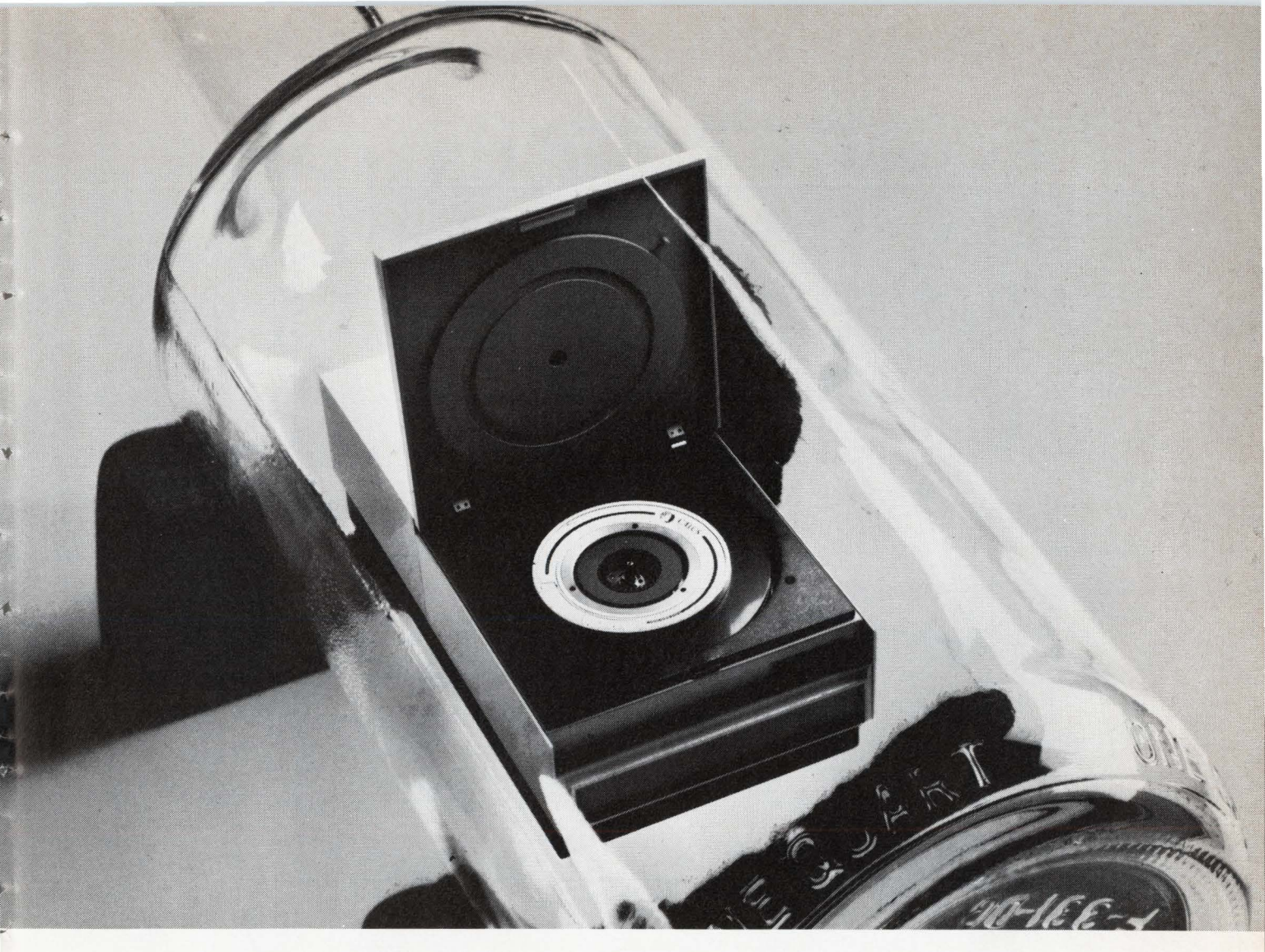
Users must apply judgment in determining the validity of the technique to their situation. Significant deviation from the above assumptions (typical of analytic models) will limit the nomograph's usefulness, and may require construction of a simulation model.

USE OF THE NOMOGRAPH

Because several nomograph readings are required, the worksheets provide instructions leading the user through the required steps. While the worksheets may appear complex to the first-time user, experienced users will find that they can work directly with the nomograph.

The use of the worksheets and nomograph charts can be demonstrated by the given example. The configuration and system parameters are given in the input worksheet.

By following Steps 1 and 2, the line utilizations can be obtained from the nomograph on the right of Chart 1. Step



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CALCOMP

CIRCLE NO. 16 ON INQUIRY CARD

CHART 1

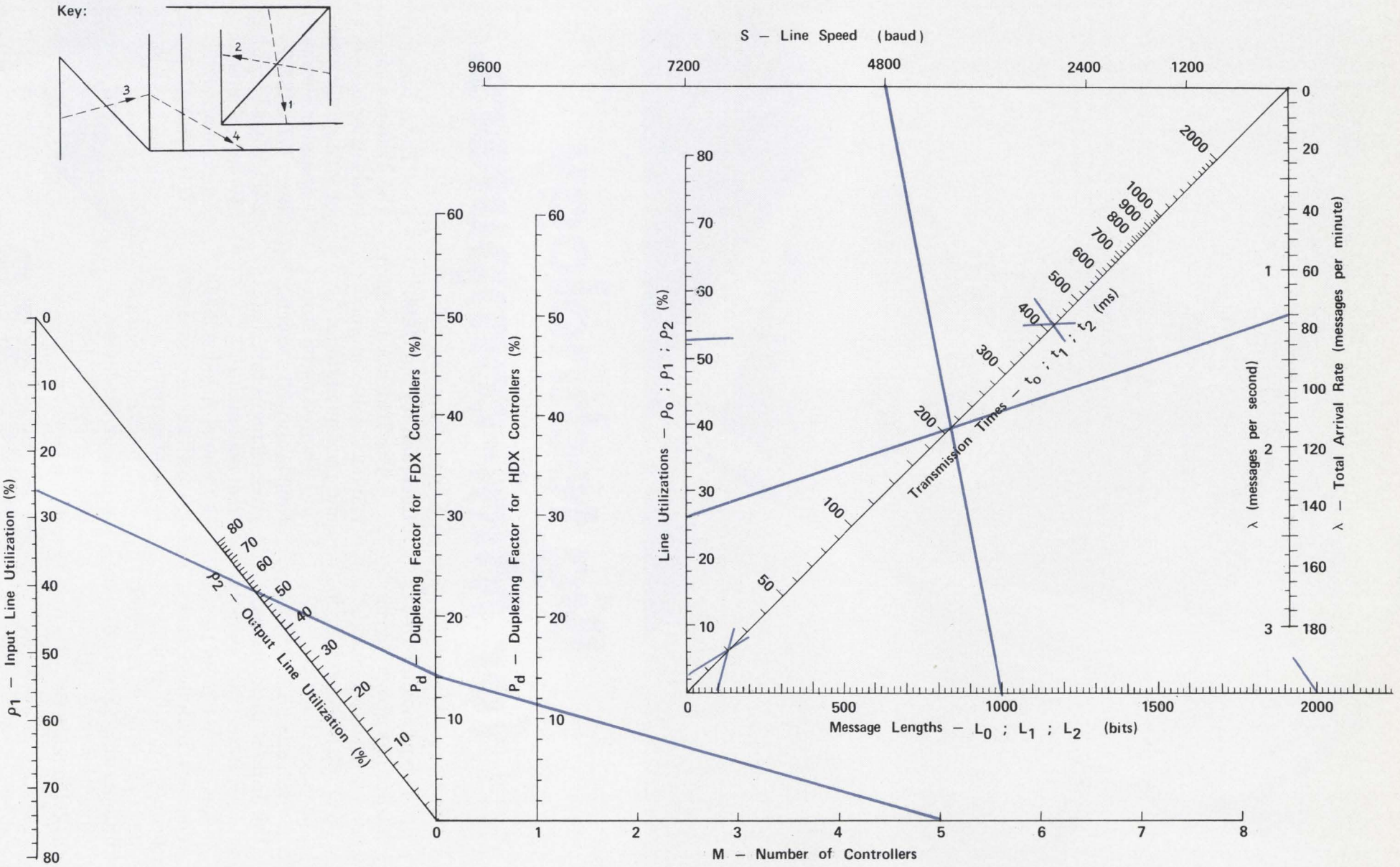
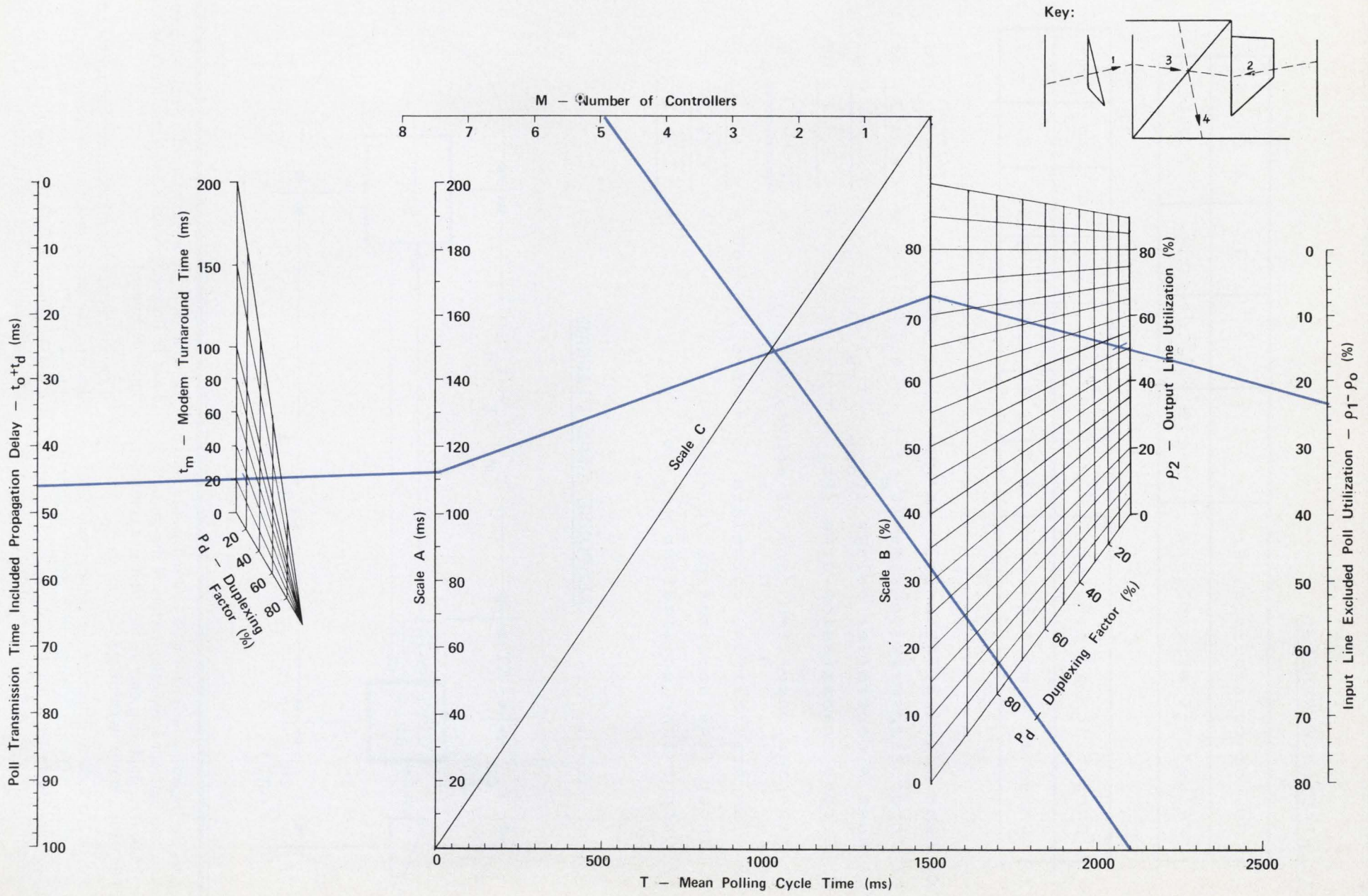

Key:
1
2
3
4
S — Line Speed (baud)
9600
7200
4800
2400
1200
ρ_1 — Input Line Utilization (%)
ρ_2 — Output Line Utilization (%)
P_d — Duplexing Factor for FDX Controllers (%)
P_d — Duplexing Factor for HDX Controllers (%)
M — Number of Controllers
Line Utilizations — ρ_0 ; ρ_1 ; ρ_2 (%)
Transmission Times — t_0 ; t_1 ; t_2 (ms)
Message Lengths — L_0 ; L_1 ; L_2 (bits)
λ (messages per second)
λ — Total Arrival Rate (messages per minute)

CHART 2


Key:
1
2
3
4
M – Number of Controllers
8 7 6 5 4 3 2 1
Poll Transmission Time Included Propagation Delay – t_o+t_d (ms)
0 10 20 30 40 50 60 70 80 90 100
t_m – Modem Turnaround Time (ms)
200 150 100 80 60 40 20 0
Pd – Duplexing Factor (%)
20 40 60 80
Scale A (ms)
200 180 160 140 120 100 80 60 40 20
Scale C
Scale B (%)
80 70 60 50 40 30 20 10 0
ρ_2 – Output Line Utilization (%)
80 60 40 20 0
Duplexing Factor (%)
20 40 60 80
Pd
Input Line Excluded Poll Utilization – $\rho_1-\rho_o$ (%)
0 10 20 30 40 50 60 70 80
0 500 1000 1500 2000 2500
T – Mean Polling Cycle Time (ms)

CALCULATION WORKSHEET

No. of controllers, M:	1	2	3	4 & over
Value of K multiplier:	1.5	1.0	0.8	0.7 ✓

Output utilization ρ_2:	20	30	40	50	60	70	80%
Value of P multiplier:	1.0	1.1	1.2	1.3 ✓	1.5	1.8	2.2

(a) Mean waiting for a poll ($K \times T$) = 1470 ms.

(b) Input transmission time ($t_m + t_d + t_1$) = 265 ms.

(c) Host & controller delays ($t_{cpu} + t_{cu}$) = 1200 ms.

(d) Output transmission time ($Pt_2 + t_d$) = 570 ms.

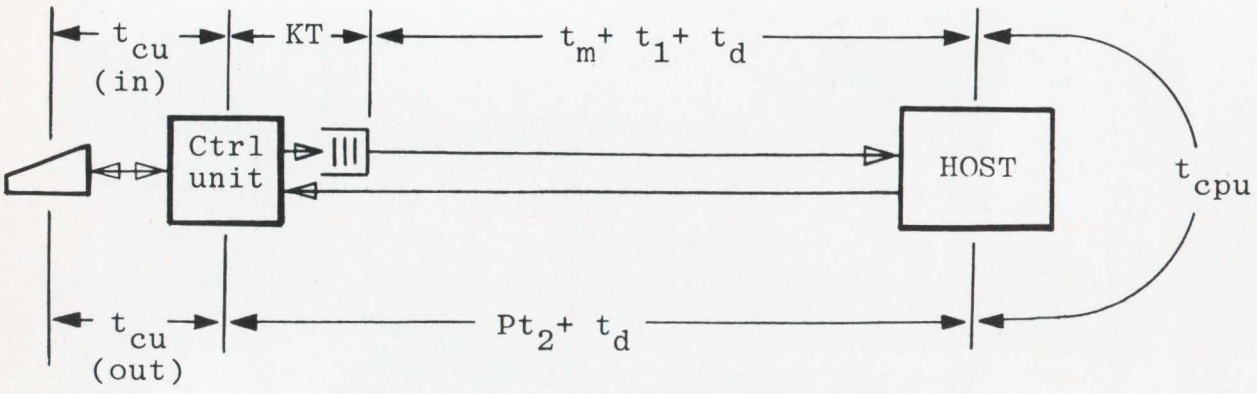
(e) Mean response time (sum of above/1000) = 3.505 sec.

For line utilization, calculate $\rho = (M \times t_o/T) \times 100$ = 5 %

(f) Input line utilization ($\rho_1 - \rho_o + \rho$) = 28.5 %

(g) Output line utilization ($\rho_2 + \rho$) = 57.5 %

RESPONSE TIME DIAGRAM



3 gives the duplexing factor for FDX controllers. Step 4 is required to determine duplexing factors if the controllers are HDX (i.e., duplexing only results from one controller sending while another is receiving).

Chart 2 is used to determine the polling cycle time, a major element in overall response time. Step 1 takes into account the overlap due to duplexing (by locating the intersection of t_m and P_d in the triangular pattern) and produces the value of A, an interim variable. Similarly, Step 2 produces B. Following Steps 3 and 4, the mean polling cycle time is determined.

On the calculation worksheet, the response time diagram illustrates the various time elements comprising the overall response time. To facilitate rapid look-up, these elements (determined earlier) are double underscored. Thus, the transaction response time and line utilizations are calculated. ■

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CIRCLE NO. 17 ON INQUIRY CARD

6800 EMULATION SYSTEM

The DICE/68 is a microcomputer system development aid designed to provide users of the 6800 microprocessor and the Motorola *Exorciser* development system with the capability of in-circuit CPU emulation, and is said to be the first emulation system offered for the 6800 processor. By plugging the 40-pin DICE/68 adapter directly into the 6800 CPU socket on one's own hardware, it is possible to debug a 6800 system prototype, complete with RAM, ROM, I/O circuitry and two-phase clock, using the full range of diagnostic aids available. through the Motorola *Exbug* operating system. The user can, after specifying through DICE/68 the block of memory allocated to the prototype system, begin the hardware debugging phase of development. All of the facilities of the development system, such as trace, breakpoint, single step, etc., are available to the user during all phases of the system debugging process.

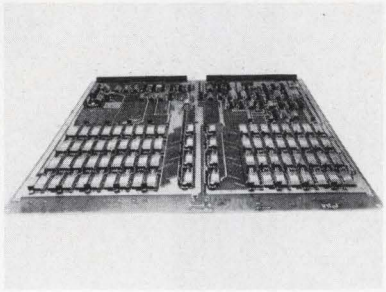
The DICE/68 system consists of two electronic assemblies, plus interconnecting flat cable and the 40-pin adaptor. One assembly is a printed circuit card which plugs directly into the *Exorciser* and connects through flat cable to a System Status Console. Controls on the console allow the user to single step through the control program to initiate an interrupt, a system halt, or a reset. A microstep feature allows the user to review the status of the system bus during all sub-cycles of a previously executed 6800 microprocessor instruction. **For more information, Circle No. 81 on Reader Inquiry Card.**

MILESTONES

Both Digital Equipment and Computer Automation announced numerically significant deliveries recently. DEC said it had shipped its 1,000th LSI-11 microcomputer only ten months after the product's introduction, and Computer Automation said it shipped its 10,000th *Naked Mini* only a little more than a year after shipping Number 5000. The DEC shipment set a new computer delivery record for that company. After the PDP-8 mini was introduced in 1965, 30 months passed before the 1000th PDP-8 was delivered. Twenty-four months elapsed between the announcement of the PDP-11 and delivery of the 1000th unit.

INTEL ADD-IN FOR INTERDATA 7/16

An "add-in" semiconductor memory system for the Interdata Model 7/16 Basic mini has been introduced by Intel Memory Systems. The new Intel in-4716 system stores up to 16,384 17-bit words on a single card (including parity bits) and up to 32K words on two cards. An in-4716 can be used in the same



"Intelerdata" Memory

system as core memory modules, since it is completely compatible. However, its memory element is the Intel 2107B, a high-speed (300 nsec access; 1 μsec cycle) 4K dynamic MOS RAM. The basic single-card system is available in three versions storing 8K, 12K and 16K words. Each card is a complete system, with all control, refresh and interface logic required for plug-to-plug compatibility with the Interdata 7/16 computer. At 16K, the in-4716 costs $1,985, or about $.07 a bit, in single unit quantity.

HP-65 USER'S CLUB

We've often heard it said that the Hewlett-Packard HP-65 programmable calculator marked the first truly personal, full-blown computer. Without getting too deep into that sticky question, we do admit to viewing the HP-65 as at least a beachhead to the invasion that is sure to follow. No better proof of the potential for a personal computer market could be found then that more than a year ago the HP-65 engendered an organization of enthusiastic users. Now that organization even has its own publication – *65 Notes* – a monthly newsletter edited and published by Richard J. Nelson, 2541 West Camden Place, Santa Ana, CA 92704. If the HP-65 could do all that, imagine what's waiting for the complete (i.e., delivered assembled with A/N keyboard, display) BASIC system under $1000 that can't be more than a year or two away.

2K STATIC RAM

Fairchild Camera & Instrument has announced a 2,048-bit static N-channel RAM chip oriented to microprocessors and peripheral equipment. The new 3539 is organized as 256 x 8 bits, and is available in two versions with maximum access times of 650 and 500 nsec. Two separate chip-select inputs allow direct expansion to 512 bytes of memory. The device has a power dissipation of less than 500 milliwatts, and requires only a single 5-volt power supply. Inputs and outputs are compatible with standard TTL circuitry. The 3539 is available in a standard 22-pin DIP package. Pricing in 100 quantities is $8.50 for the 650 nsec 3539, and $9 for the 500 nsec 3539-2.

TRIPROCESSOR

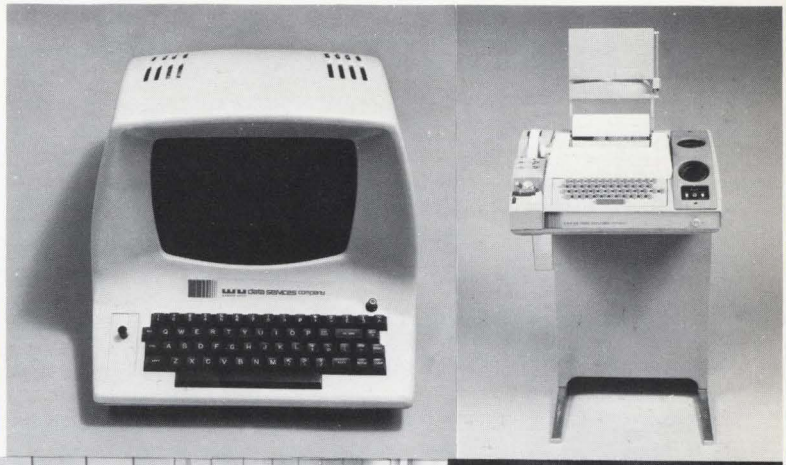
Rolm's new Model 1664 features a hardware variable precision floating point processor that operates simultaneously with a microprogrammed general-purpose processor and a direct memory access processor. Designed for military or severe environment applications, the 1664 has a conductive cool-

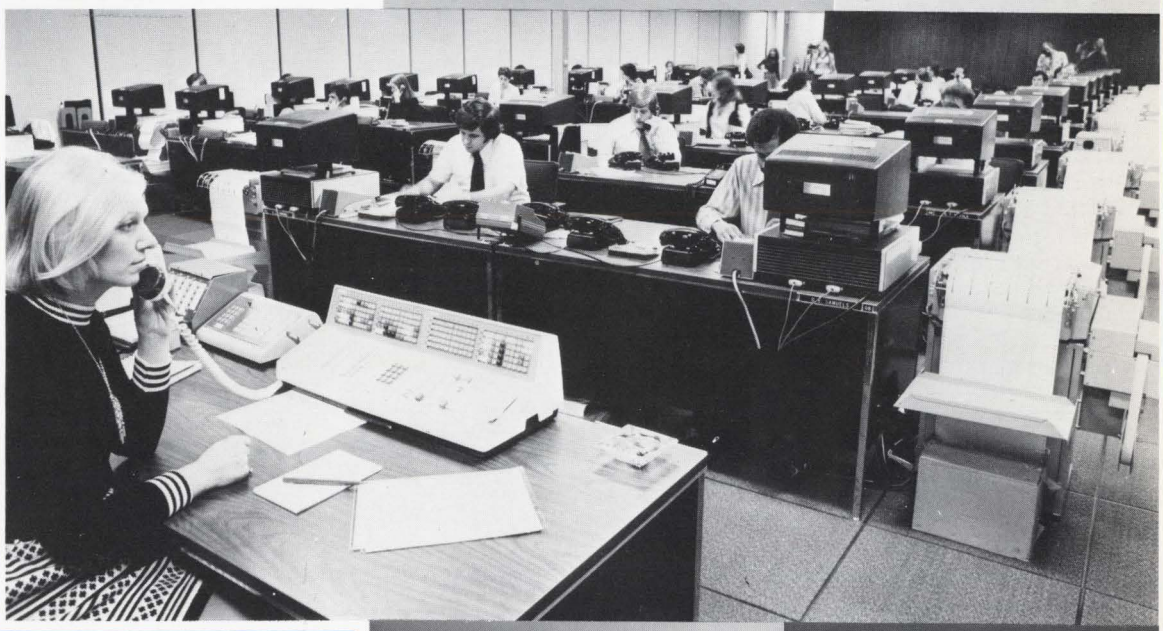
ing system that makes internal fans or coolants unnecessary. A full software offering, including SOS, RTOS and RDOS operating systems, and Fortran IV, Algol and Basic, is available.

A SINGER STILL HEARD

The Singer Corporation is no longer singing the praises of its own data products, but its recent withdrawal from the edp and pos manufacturing scenes has not taken it completely out of hearing. Recently it was learned that the firm's Simulation Products Division has begun to install 32-bit computers from Interdata under a contract exceeding $500,000. The Interdata Model 7/32 and 8/32 computers are part of the Orbiter Aeroflight Simulator being built by Singer for the NASA space shuttle program. The systems are being installed at Singer/NASA facilities in Binghamton, NY; Huntsville, AL; and Houston, TX.

western union data services company





COMMUNICATION TERMINALS SUPPORTED BY TERMICARE

INTRODUCTION

Western Union Data Services offers a broad line of data communications terminals with all the features, options, maintenance and supplies you need. We offer impact teleprinters—our Exchange Data Terminal series (EDT); and cathode ray tube terminals—our Video series. Our terminals operate at 10-, 30- and 120-characters per second. They are available with just a keyboard (KSR); with a paper tape buffer (ASR); and with a magnetic tape cassette buffer (MSR)—with or without integrated modems.

Whether you do timesharing, remote data entry or remote batch processing, talk to us. With thousands of terminals throughout the U.S., we have the experience and organization to help you.

TERMICARE SUPPORTED

Termicare ™ is Western Union Data Services' total support system which goes to work the minute you sign up for one of our terminals. A detailed description of your terminals, along with installation dates, is entered into Termicare's computer, so that Termicare Center analysts at company headquarters will have your complete terminal records. On the day of installation, our service engineers test your terminals through terminal-to-terminal communications with the Termicare Center.

When you have a terminal problem or a question, you call one toll-free number for immediate over-the-phone diagnostic help from Termicare analysts. Frequently they clear up your problem instantly. Or they dispatch a service engineer from any of over 400 service locations throughout the United States. And Termicare monitors your problem until it is resolved.

FOR REMOTE DATA ENTRY

Data collection and dissemination is simple for our ASR and MSR terminals. A central station such as a computer, mag-tape unit or EDT terminal can poll our ASR or MSR terminals to pick up prepared data and return hard copy to printing terminals; most often these remote terminals operate unattended. Our 1200-baud MSRs are used in many operations such as order entry, accounting and inventory services, branch-office reports, project accounting, general ledger preparation, and inquiry/response work.

VIDEO 100 SERIES

The Video 100 terminal is simple to operate as well as economical and reliable for use in timesharing and inquiry systems. It has a 59-key typewriter-type keyboard with a 12-inch diagonal screen. The bright display shows 24 rows of 80 characters that have been sent or received. Transmission can be in upper-and-lower case for remote output of all 128-character ASCII characters. Capable of full- or half-duplex operation, Video 100 offers 11 selectable speeds ranging from 75 to 19,200 baud.

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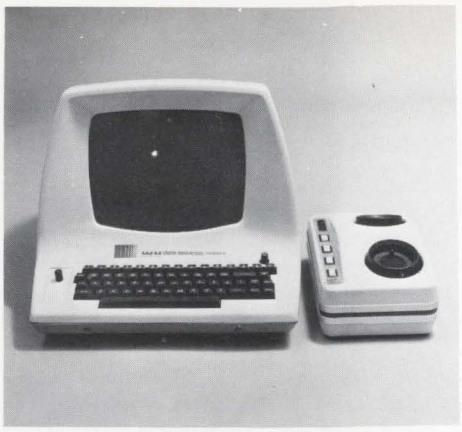

EDT 33 SERIES

This smallest multi-copy terminal is only 22 inches wide. Its four-row keyboard generates 63 ASCII printing graphics, plus the space character, in upper case and all control characters. It has a 72-character print line, with an 86-character line available. The EDT 33 produces an original and two copies on conventional paper. Available in KSR, ASR and MSR configurations; and in basic, Data-Phone®, Data Access Arrangements (DAA) and acoustic-coupled arrangements.

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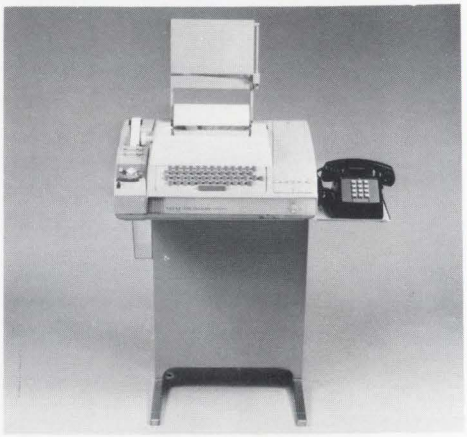

EDT 300 & 1200 SERIES

These quiet units transmit and receive over the dial-up network at 10-, 15- and 30-cps for the EDT 300 and at 10-, 30-, and 120-cps for the EDT 1200. Switch-selectable speeds allow these terminals to communicate with a variety of other teleprinters. Both units have standard keyboards that generate all 128 ASCII characters in a 118- or 120-print-position line, with a 75- or 80-position option. Each key generates one character at a time and each code stroke produces an adjustable, audible beep. The EDT 300 and EDT 1200 produce up to six copies. Paper up to 12 27/32'' wide may be used. The EDT 300 and 1200 are available in KSR, ASR, and MSR configurations; and in basic, Data-Phone, DAA and acoustic coupled arrangements.

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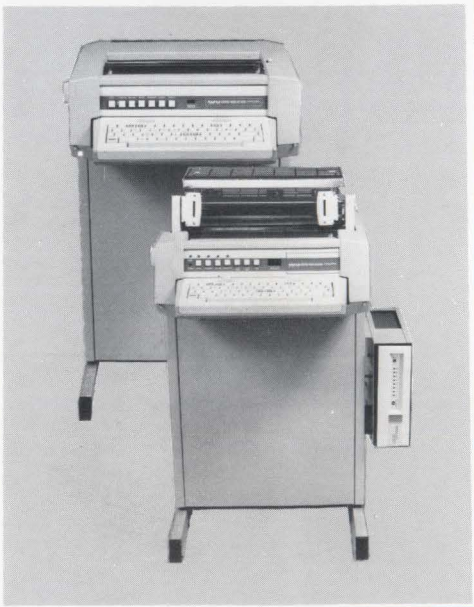
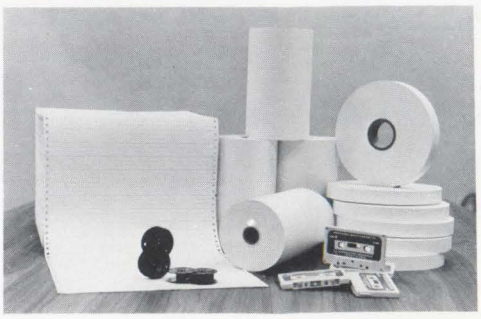
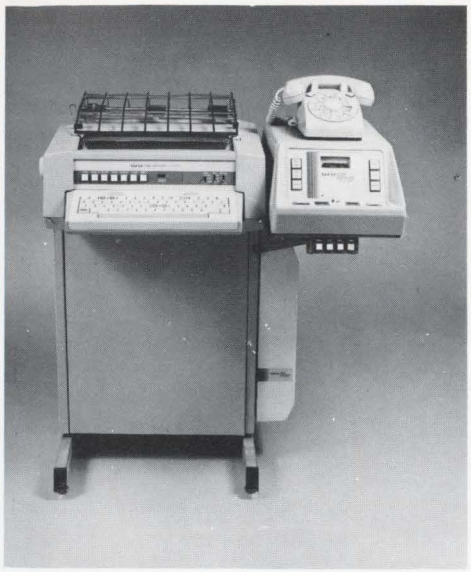


TELEPRINTER SUPPLIES

We are a national supplier of paper rolls (up to three ply), paper tape, fanfold forms (8½'' and 12 27/32'' wide, 11'' long), ribbons and magnetic-tape cassettes for use with our EDT 33, 35, 300 and 1200 terminals. We offer form-feed/vertical-tab accessories for our EDT 300 and 1200 devices.



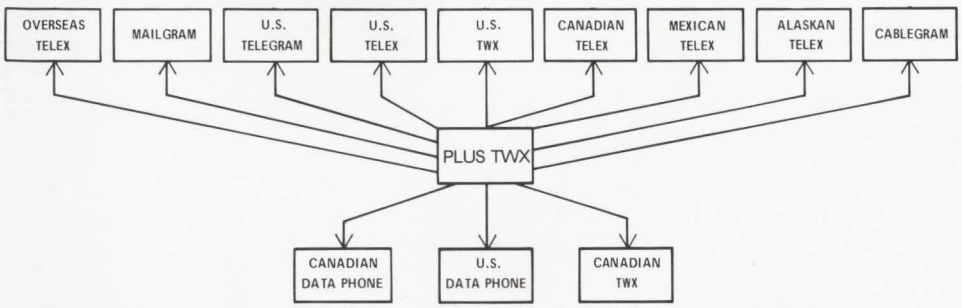


PLUS TWX FEATURES

Our Plus TWX™ terminal configuration gives you the dual capability of data transmission over the dial-up telephone system plus access to the TWX™ communications network—using only a single terminal.

We offer Plus TWX on a variety of terminals such as the EDT 33 MSR, EDT 300 ASR, EDT 300 MSR, and EDT 300 KSR. With Plus TWX you can send data on the dial-up network at up to 30 characters per second and TWX messages at 10 (or 15) cps. Plus TWX lets you do everything ordinary TWX does. All Plus TWX terminals have an integrated modem for direct connection to Telephone Company (DAA) and Western Union TWX (TAA) interconnect coupling devices.

Circle No. 53 on Inquiry Card



MAGNETIC TAPE BUFFER

Our magnetic tape cassette buffer has switch-selectable speeds of 10, 30, and 120 cps. As the intermediate between a system's terminals and its computer, our MSR buffers serve as a terminal system standardizer. This way different computer protocols are not required for different speeds of terminals on your system.

All our terminals can operate with our MSR buffer. For low-speed printing with faster on-line communications, our buffer acts as a speed converter. For both our low-and high-speed printers, our MSR buffer operates as a storage device for batch transmission.

It writes, reads, rewinds and does character editing under remote computer or local control. It also has a 24-character answerback for positive terminal identification. A control switch allows data search by stopping the tape after each character, word or line or the ASC11 Group Separator (GS), File Separator (FS), or DC3 code. Forward-skip and back-skip controls facilitate high-speed data search to locate specific data recorded on tape. Error correction is easy—our MSR has backspacing for editing. Data can be corrected by character without affecting adjacent characters or data blocks.

Circle No. 54 on Inquiry Card

FOR TIMESHARING

All our terminals let your operator interact on-line with computers. For light volumes, use our low-cost Video 100 or EDT 33 ASR. For higher-usage sites, our EDT 300 ASR, KSR or MSR is reliable and efficient. To print lengthy reports with light data input use the EDT 1200 KSR or MSR. High volumes of data can be transcribed efficiently by our ASR and MSR terminals for storage and later transmission or printing.

OPTIONS

There are currently over 300 terminal options and special customer arrangements available to ''customize'' our terminals to your needs. Some of these are:

- Sprocket feed
- Vertical tabulation and form feed out
- Horizontal tabulation
- Answerback for terminal verification:
  Printers - 20 characters
  MSR - 24 characters
  Video 100 - 32 characters
- Low paper and paper out alarm
- 103 operation
- acoustic couplers and integrated modems
- 202 operation
  integrated modem; ETX, EOT or non-coded line control
- 1050 baud operation
- 11 unit code at higher speeds
- MSR auto rewind and printout
- Form accumulating shelf
- Printer copy holder
- MSR terminal accessory cabinet
- Paper tape winder/unwinder
- Mobile carts
- Numeric key pads
- Direct-connect computer interfaces

MSR SPECIFICATIONS

Tape:
0.150'' wide, certified computer grade 2-½''x4'' Philips cassette

Cassette Capacity:
Approximately 300 feet

Storage Capacity:
In excess of 50,000 characters

Data Rate:
10, 15, 30, 60 120 cps (105 cps optional)

Tape Rewind Time:
Approximately 90'' per second—total rewind less than 55 seconds

Fast Forward:
350 cps nominal, at about 14 inches per second tape speed

Fast Reverse:
150 cps nominal, at approximately 6 inches per second tape speed

Specifications	EDT 33	EDT 300	EDT 1200	VIDEO 100
Data Transmission				
Code:	USASCII x 3.4 - 1968 or 1963	USASCII x 3.4 - 1968	USASCII x 3.4 - 1968	USASCII x 3.4 - 1968
Interface:	AC, DAA & EIA	AC, DAA & EIA	EIA Standard RS 232C and DAA	EIA Standard RS 232
Speed Interactive:	10 cps - 110 Baud	10/15/30 cps	10, 30 and 120 cps	10, 15, 30, 60, 120, 180, 240, 480, 960, & 1920 cps
Type:	Serial asynchronous	Serial asynchronous	Serial asynchronous	Serial asynchronous
Printing/Display				
Type:	Impact: original plus 2 copies	Impact: original plus 6 copies	Impact: original plus 5 copies	24 lines x 80 characters
Spacing:	Horiz.: 10 char/inch (12 cpi - optional) Vert.: 3 or 6 lines/inch	Horiz.: 10 char/inch Vert.: 3 or 6 lines/inch (operator selectable) (8 lpi optional)	Horiz.: 10 char/inch Vert.: 3 or 6 lines/inch (operator selectable) (8 lpi optional)	12" diagonal screen
Paper:	Friction-feed roll 8-1/2" wide paper sprocket feed 8-1/2" wide optional	Friction feed: 8-1/2" roll, mounting inside external feed up to 12-27/32" Optional: sprocket feed tractor feed	Sprocket feed tractor from 3" to 12.85" wide paper	
Character Set:	63 printable graphics (upper-case only)	94 printable graphics of USASCII including upper and lower case	94 printable graphics of USASCII including upper and lower case	64 displayable characters (optional 95 characters)
Ribbon:	Dual spool 1/2 inch 12 yd. DSC ribbon nylon	Dual spool 1/2 inch 16 yd. DSC ribbon silk or nylon	Dual spool 1/2 inch 16 yd. DSC ribbon silk or nylon	
Speed:	10 char/sec	10, 15, or 30 char/sec (operator selectable)	10, 30 or 120 char/sec (operator selectable)	10, 15, 30, 60, 120, 180, 240, 480, 960, 1920 char/sec (operator selectable)
Environmental				
Temperature:	40°F to 110°F operating -40°F to 150°F storage	+32°F to 110°F operating -20°F to 160°F storage	+32°F to 110°F operating -20°F to 160°F storage	50°F to 120°F operating 0-150°F storage
Relative Humidity:	2 to 90% operating and storage	10 to 95% operating and storage	10 to 95% operating and storage	5 to 95% operating and storage
Altitude:	0 to 10,000 feet operating—no limit storage	0 to 12,000 feet operating - 0 to 50,000 feet storage	0 to 12,000 feet operating - 0 to 50,000 feet storage	0 to 12,000 feet operating no limit—storage
Electrical				
105 to 129 VAC, single phase, 60 Hz	± 0.45 Hz	-1.5 Hz + 1 Hz	-1.5 Hz + 1 Hz	-12 Hz + 3 Hz operating ±.5 Hz display stability
		KSR 60 / ASR 60 / MSR 145	KSR 60 / ASR 60 / MSR 145	
Standby:				80 Watts
Printing:	160 Watts	175 / 300 / 275	175 / 325 / 275	80 Watts (operating)

Physical	KSR	ASR	MSR	KSR	ASR	MSR	KSR	ASR	MSR	
Depth:	18-1/2"	18-1/2"	18-1/2"	22"	22"	22"	31.78"	31.78"	31.78"	19"
Width:	18-5/8"	22"	33"	20.50"	26.75"	31.50"	20.50"	26.75"	31.50"	15-1/2"
Height:	32-7/8"	32-7/8"	32-7/8"	37.06"	37.06"	37.06"	37.06"	37.06"	37.06"	12-1/2"
Weight:	54lbs	56lbs	86lbs	125lbs	160lbs	155lbs	125lbs	160lbs	155lbs	25 lbs.

FOR FURTHER INFORMATION

Call or write: General Sales Manager, Western Union Data Services Company,
70 McKee Drive, Mahwah, New Jersey 07430
Phone: Toll-free 800-631-7050; in N.J.—201-529-1170, TWX 710-988-5468

western union data services company

IBM 5100 TRIAL OFFER

If you've been wanting an IBM 5100 to carry around but have been reluctant to spend at least $8975 until you know how it will fit in for you, it's now possible to pilot test it. Under the IBM plan, you can have a 16K BASIC machine for three months for $1350 or for six months for $2700. But then you have to decide. If you buy, part of the pilot test cost can be applied to the purchase price. The plan is available for all models of the 5100. In conjunction with the plan, IBM announced a serial I/O adapter. The RS-232C interface allows attachment of non-IBM peripherals such as instrumentation devices, plotters, printers and CRTs. The interface sells for $700 and leases for three months for $105. According to IBM, this will enable users to test for instrumentation applications before they buy, but concessions from IBM might also mean that the 5100 isn't moving as fast as IBM thought it would. And for those who want a real lease, Time Sharing Resources (Great Neck, NY) is offering three, four and five-year pay-out leases of the 5100. A supplier of APL time sharing, Time Sharing Resources is interested in selling its online services to the 5100 user.

DON'T BE FOOLED

The apparent ease with which a microprocessor can be selected and implemented in a product has led to several major misconceptions, says Don McDonald, Manager of Computer Development for Technology Marketing Inc., a Costa Mesa (CA) computer design firm. These include overestimating the capabilities of micros, underestimating their complexity, and failing to distinguish important differences in the function and performance of available chips. Warns McDonald: "Most designers like to use the latest technology available, and many are intrigued by the idea of the microprocessor which often sounds like a great solution to their problem when they read about it. Similarly, corporate executives can easily succumb to the glamour of a 'computer on a chip' and direct their engineers to use it without fully understanding the level of expertise needed to design one into a system and attain the required cost and performance goals. The potential trap is that it's every bit as complicated to design using a microprocessor as it is to incorporate a minicomputer into a system."

8080 PROGRAM DEVELOPMENT

A new microcomputer, the PDA-80, from NEC Microcomputers, Inc. (Lexington, MA) features an expanded-function front switch panel and integral E-PROM programmer. The panel allows an engineer to single-step his program, either by instruction or machine cycle, and to examine the contents of memory and the seven internal registers in the processor. The system also has software breakpoint capability. Once developed, the program may be written into NEC's electrically alterable PROM (μPD45D), a 2K-bit, N-channel memory chip with an access time of 800 nanoseconds. Software for the PDA-80 is supplied at purchase and consists of a series of punched paper tapes including text editor, macro assembler, online debugger and diagnostics. A tape loader/monitor program can be resident in the system's internal ROM (optional). Prices start at $4095. **For more information, Circle No. 80 on Reader Inquiry Card.**

SILVER MEDAL FOR NATIONAL SEMI, GOLD FOR MITS

National Semiconductor recently outfitted a leisure van with PACE and IMP-16 demonstration systems and a

full complement of microprocessor support equipment. The van visits customer locations in southern California to support training sessions and aid customers in developing software. National Semi deserves credit for putting the idea into action, but we feel obliged to take issue with the company's statement that the concept marks a "first in the microprocessor industry." MITS, of Altair 8800 and Altair 680 fame, has been driving its similarly-equipped MITSmobile around the country for more than a year.

UNBELIEVABLE!!!!!
The Intecolor® 8001
A Complete 8 COLOR Intelligent CRT Terminal
$1,995*

"**Complete**" **Means**
• 8080 CPU • 25 Line x 80 Character/Line • 4Kx8 RAM • PROM Software
• Sockets for UV Erasable PROM • 19" Shadow Mask Color CR Tube
• RS232 I/O • Sockets for 64 Special Graphics • Selectable Baud Rates to 9600 Baud • Single Package • 8 Color Monitor • ASCII Set
• Keyboard • Bell • Manual

And you also get the **Intecolor®** 8001 9 sector Convergence System for ease of set up (3-5 minutes) and stability.

Additional Options Available:
• Roll • Additional RAM to 32K • 48 Line x 80 Characters/Line • Light Pens
• Limited Graphics Mode • Background Color • Special Graphic Characters
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*Quantity 100 (Unit Price $2,495.)

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CIRCLE NO. 18 ON INQUIRY CARD

DEC'S BIG BRIDGE

The DECsystem 20 ties the knot in a now unbroken string between micro (LSI-11) and giant (DECsystem 1080).

The 36-bit DECsystem 20, specifically the 2040, is a dual-processor offering. The KL20 CP is a smaller, 3-board ECL version of the TTL-implemented KL10, and is some 2-1/2-times faster. The second processor, a PDP-11/40, is dedicated to unit-record peripherals, console operations, terminal communications and diagnostics. The entire processor unit (CPUs, memory and I/O controllers) occupies only 28 ft^2.

Main memory is core – up to 1M bytes. Because of the 2040s virtual memory, high-speed data channels (7M bytes/sec. bandwidth) and overlapped I/O "Massbus" controller organization, the system is described as having relatively little to gain from semiconductor memory. It should be noted, of course, that DEC strings its own cores and does not produce its own ICs. At least not currently.

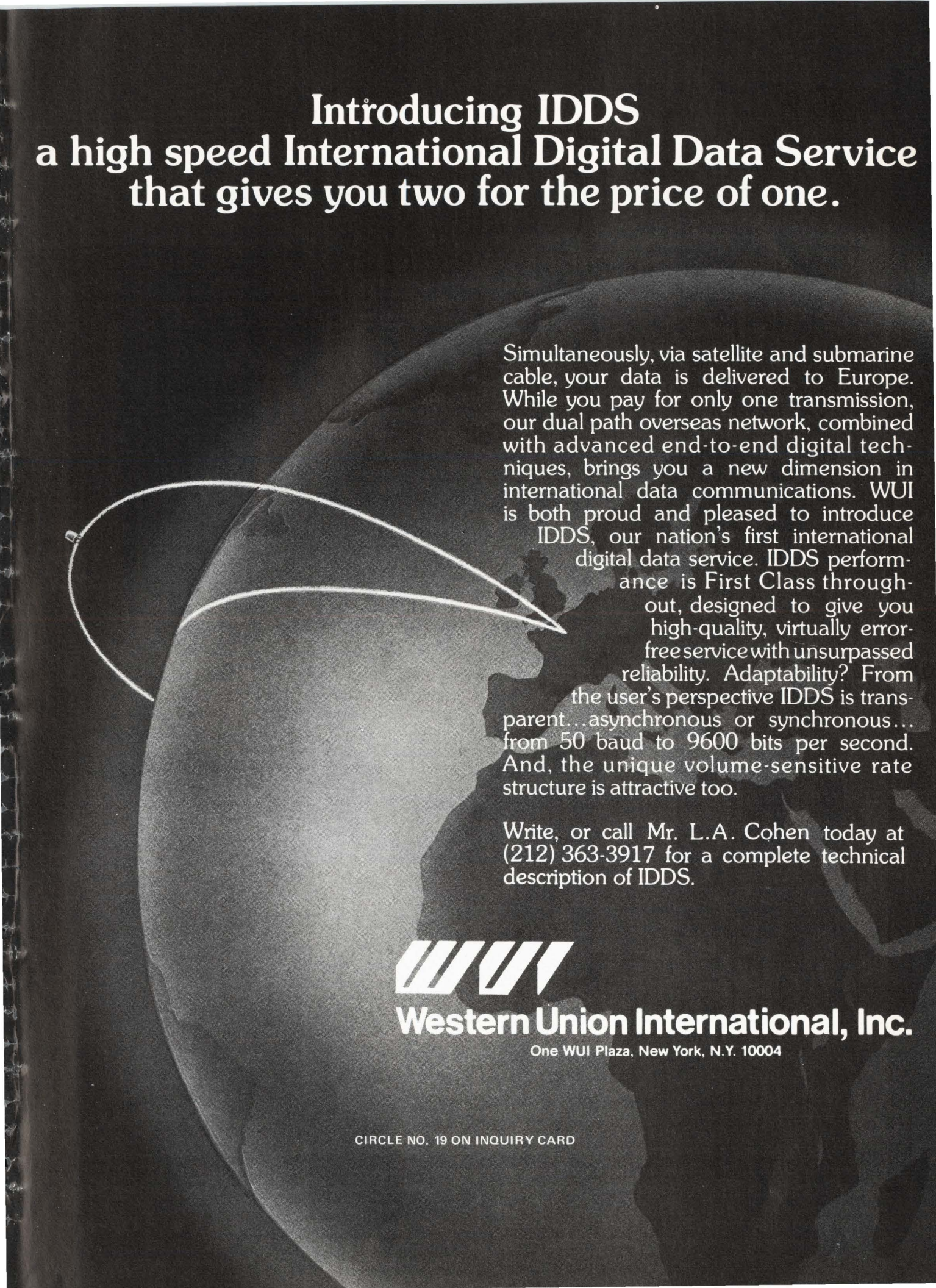
Software is comprehensive, reflecting the system's multifunctional capabilities in the areas of interactive and transactional timesharing as well as batch usage. Languages supported include Cobol, Fortran, Basic, Algol and APL. DEC's ANSI-68 Cobol supports ISAM and DBMS. There is also MACRO for users who might wish to do their own assembly language programming.

TOPS-20, the 2040's operating system, is the most ambitious software undertaking in DEC's history. It appears to incorporate every resource management feature provided in the DECsystem 10, and to surpass the 10 in the areas of error correction, data security, restart/reinitialize, and communications. The TOPS-20 development effort was an outgrowth of DEC's experience with the now 6-year-old TENEX operating system developed for the ARPA packet-switching network by Bolt, Beranek and Newman. Of the 25 DECsystem 10s presently interconnected to the ARPAnet, 17 run under TENEX. Needless to say, DEC has incorporated that communications know-how into TOPS-20, even to the point of offering a remote diagnostic (shades of Amdahl) capability.

The minimum hardware configuration for the 2040 consists of the KL20/PDP-11/40 processor pair with 64K 36-bit words on the KL20 and 32K 16-bit words on the PDP-11; a 100 Mbyte disk drive; a 75 ips, 1600 bpi tape unit; eight communication lines; and an LA36 keyboard printer. Entry level price is $250K. By the end of 1976 DEC expects to be manufacturing – and delivering – one every working day! ■

Digital Equipment's new DECsystem 20 features a PDP-11 utility processor as well as a new ECL-version of the processor contained in the largest DECsystem 10s. The 36-bit word length computer closes the gap between DEC's smallest and largest product lines.

Introducing IDDS
a high speed International Digital Data Service that gives you two for the price of one.



Simultaneously, via satellite and submarine cable, your data is delivered to Europe. While you pay for only one transmission, our dual path overseas network, combined with advanced end-to-end digital techniques, brings you a new dimension in international data communications. WUI is both proud and pleased to introduce IDDS, our nation's first international digital data service. IDDS performance is First Class throughout, designed to give you high-quality, virtually error-free service with unsurpassed reliability. Adaptability? From the user's perspective IDDS is transparent...asynchronous or synchronous... from 50 baud to 9600 bits per second. And, the unique volume-sensitive rate structure is attractive too.

Write, or call Mr. L.A. Cohen today at (212) 363-3917 for a complete technical description of IDDS.

Western Union International, Inc.

One WUI Plaza, New York, N.Y. 10004

CIRCLE NO. 19 ON INQUIRY CARD

BARBARA A. REYNOLDS / Associate Editor

ALPHANUMERIC DISPLAY TERMINALS

Part 1. The CRT Market and Technology – Where They Stand Now.

This first part of a 2-part product profile on alphanumeric cathode ray terminals (CRTs) discusses how and why they came about, what they do, and how they do it.

It all began about 15 years ago when an engineer without a television to quiet his nerves got tired of listening to the teleprinter. Experimental vacuum tube prototypes were first. Then came integrated circuits and cathode ray tubes. But high prices and lack of hard copy output stalled immediate acceptance of CRTs as interactive terminals. The Teletype was still king.

ENTER THE COMPUTER GIANT

In 1966 came the stamp of approval for the industry to exist. IBM introduced the 2260 Display Station. To this clustered terminal system, IBM added the 2265 stand-alone system in 1967. Both terminals were originally designed to communicate with the 360. Soon independents entered to compete with the 2260 by offering lower prices, larger screens and more terminals per controller. In 1971, as 2260 revenues leveled, IBM introduced the 3270, providing lower cost, higher transmission speeds, a larger screen, increased cursor control and editing capabilities and more extensive hard copy printer options.

THEN THE COMMUNICATIONS GIANT

As some independents pursued the IBM replacement market, others went after the teleprinter replacement market. The rock bottom KSR-33 at $500 was hard to beat pricewise, but CRTs were quickly approaching the $1000 mark and offering significant advantages. They had faster access and transfer rates, editing capability, electronic instead of mechanical operation, and optional printers were available for hard copy.

According to the *Venture Development Corp.* study, 1975's interactive terminal market was 1.28 million units. Teleprinters made up 51 percent; CRTs 33 percent. More important was the fact that the CRT market had been growing at a 25 percent annual rate for the past five years.

Teletype saw this trend developing in the early 1970s and declining revenues made it impossible to ignore. In 1973, Teletype Corp. (a subsidiary of AT&T's Western Electric) introduced the Model 40 Data Terminal. AT&T followed with the Dataspeed 40 service using the Model 40. AT&T/Teletype hoped this would halt the spread of the independents' teleprinter replacement market (and maybe halt the spread of their fellow giant).

TWO GIANTS AND ONE MARKET

According to *Venture Development* estimates, the CRT 1975 installed base was 418,000 units. Of these, 97.6 percent, or 412,000, were alphanumeric and the remainder were graphic or combination graphic-alphanumeric. The alphanumeric terminal market was controlled by IBM's 3270 and compatibles, followed by teleprinter replacements (see Fig. 1). To show which segment has been growing most rapidly, *Venture* obtained 1974 shipment volumes (see Fig. 2). Total shipments were 118,000 terminals. The 3270 still led, followed by teleprinter replacements. The 2260 was rapidly declining in volume and the Teletype Model 40 was growing. Independents and mainframe manufacturers (other than IBM) were remaining relatively stable.

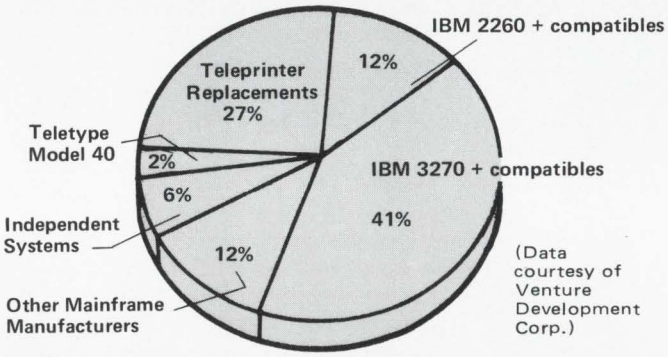


Fig. 1 – 1975 CRT Terminal Installed Base (percent of units)

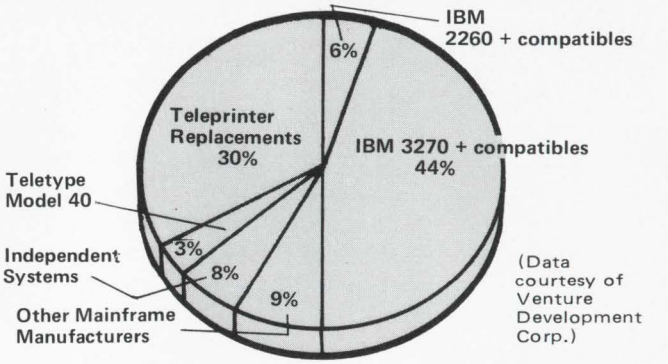


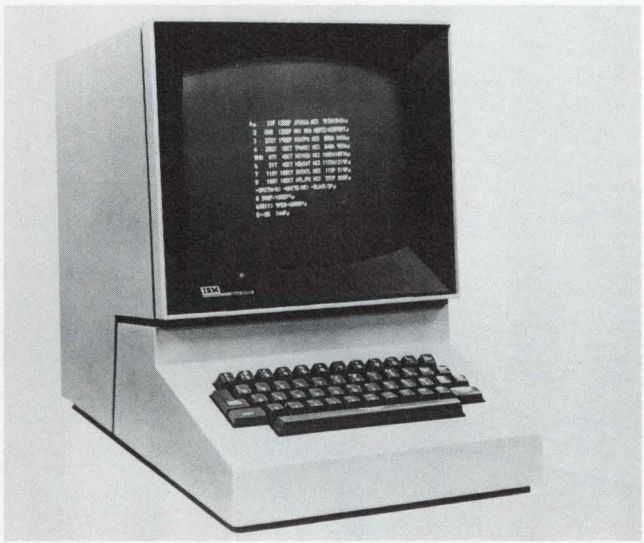
Fig. 2 – 1974 CRT Terminal Shipments (percent of units)

This profile is based largely on a study *Alphanumeric and Graphic CRT Terminals* recently prepared by Venture Development Corp., a nationally recognized marketing research and technology assessment firm. Only a few of the many market breakdowns and projections contained in the study are mentioned in this article. For more information on the 203-page study, write *Venture Development Corp., One Washington St., Wellesley, MA 02181.*

INDUSTRY STANDARDS: WHAT THEY LOOK LIKE

Independents pursue four major markets; 2260, 3270, teleprinter replacements, and soon the Teletype Model 40. These are some characteristics of the market standards.

IBM 2260. If high data throughput and keyboard editing features are not important, the 2260 (and 2265) are still viable systems. However, IBM no longer produces them and discourages their use by not supporting them under newer operating systems. The 2260 is a clustered system, permitting up to 24 display stations. The stand-alone version, the 2265, operates with a display control also and is available in remote configurations only. Both models display a 64-character ASCII code set and have a Selectric-like keyboard with optional numeric keypads. Maximum display capacity is 960 characters, 12 lines of 80 characters per line. The 2260 uses a raster driven 5x7 dot matrix; the 2265 uses the cursive stroke technique. Remote configurations communicate asynchronously over 1200-bit per second (bps) lines in half-duplex mode. An optional printer is available for both models. Besides small size, the 2260 and 2265 are dated due to their limited cursor controls and editing facilities. Independents have been less willing than IBM to forget what they felt was a good thing. They enhanced their 2260 compatibles by offering lower prices, larger screen sizes, more terminals per cluster, and additional editing and format handling features.



The First Industry Standard: IBM's 2260 Display Station

IBM 3270. An improvement over the 2260 in terms of price, features and transmission speeds, the 3270 is the present industry standard. And it probably will remain so until at least 1978, according to *Venture Development.* The 3270 comes in clustered versions, permitting up to 32 terminals, or in stand-alone versions with integrated controllers. Display sizes are either 480 characters (12 lines of 40 characters each) or 1920 characters (24 by 80). Each display can generate either EBCDIC or (optionally) ASCII character codes, and characters are formed by a 7x9 dot matrix. Keyboards are available with either 66 keys or 78 keys including 12 program-defined function keys, and all include cursor control, back tab, character insert and delete keys. Remote systems can communicate at speeds up to 7200 bps using either IBM's BSC (Binary Synchronous Control) or SDLC (Synchronous Data Link Control) transmission protocols. Three printers are available with speeds ranging up to 125 lines per minute. The independents have countered IBM's

THE COMPUTER SOFTWARE PACKAGES & PACKAGED COMPUTER SERVICES MARKET

According to a Frost & Sullivan survey, the number of computer software packages and packaged services purchased by users in 1974 was 72% greater than in 1973, and more than half of these were purchased directly. Approximately 70% of them were used without modification.

Frost & Sullivan has completed a 193-page report analyzing and forecasting the computer software packages and packaged computer services market. The primary input for the report was a complex and highly detailed questionnaire survey responded to by 221 users. Other sources of information include a questionnaire survey of suppliers (the respondents sell to thousands of users and their responses were matched with the users' replies), supplier and selected user interviews, trade and financial sources, and Frost & Sullivan studies completed and in process. The report is organized in these seven categories, and sales forecasts to 1984 are provided for them and for selected software packages and packaged services: hardware dependent/dedicated packages; systems software packages; standard software packages; general applications packages; industry-oriented application packages; general packaged services; and special industry and data base services. The report breaks down the types of users and suppliers, tabulates the products and services used and supplied, analyzes the life cycle characteristics of the packages and services from supplier conception and development to user selection and ultimate replacement, identifies voids in the current marketplace and the needs of current and potential users, and reports on the plans of current and potential users. General trends in the computer industry, including problems and opportunities, and significant factors in the general marketplace which affect the market for software packages and packaged services, are considered.

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CIRCLE NO. 20 ON INQUIRY CARD

VOLUME 1 NUMBER 16 • DECEMBER 29, 1975

MINI/MICRO SYSTEMS
A FORTNIGHTLY NEWSLETTER

top·of·the·wire

DIABLO INTRODUCES MATURE DISK STORAGE

The latest introduction of a new line of disk files for the small computer industry, the Diablo Series 400, combines a comprehensive, wide-ranging, compatible product line with technical innovations which would have brought screaming headlines not many years ago. The Series 400 consists of a compatible family of 8 disk drives, ranging in capacity from 13.3 Mbytes (in one removable disk) to 53.3 Mbytes (the removable disk plus up to 3 fixed disks), in price from under $2500 to $3600, and available in both top and front-loading models, all in the same package size. Price per megabyte has been reduced 30 to 50 percent. The new disks incorporate several technological innovations. An inertial actuator, operating on a fly-wheel principle, reduces the power required to position the head mechanism by a factor of 50. The fly-wheel drive accomodates two independent positioners, one for the removable disk and the other serving the fixed disks. DC power is provided by a motor generator set driven through the inertial system, thereby providing complete isolation from the power line, and protection against power interruptions; this also permits the drive to continue operating for 150 milliseconds after power fails. Another important new feature is track positioning through pre-recorded servo data written in each sector, so that each head operates in a closed-loop servo on the track it is seeking; this should significantly increase positioning accuracy, improve pack interchangeability, increase thermal range of operation, and eliminate the need for special disk packs for head calibration. With all of these goodies, the inclusion of a microprocessor for logic control, internal diagnostics, and interface adaptations, seems suddenly mundane. Access time is 10 ms track to track, 40 ms average, and transfer rate is 655 Mbytes/sec. We applaud both the solid engineering achievements, and the sensible systems approach and broad compatible line embodied in this new family of storage devices for the minimicro industry. Diablo, which in only 6 years has come from a couple of guys laboring in the shadow of Mount Diablo to the thriving flagship of the almost-weekly-increasing Xerox presence in the minimicro industry, appears to have made a significant contribution to our emergence as a mature and stable industry.

DISK STORAGE IS AN IMPORTANT MINIPERIPHERAL

Disk drives are the second most numerous peripheral that users plan to add to their minicomputer systems, according to Modern Data's *1975 Minicomputer Market Survey*; printers (see minimicro system) ran first. Cartridge drives were the designated form of disk storage for nearly half of those planning to buy such peripherals, followed by floppy disks with about 25% of the projected market, with head-per-track-drives a poor third. Diablo was designated as the disk cartridge drive vendor of nearly half of the users; Century Data garnered about 20%. In the floppy disk area the leading vendors were Calcomp and Memorex sharing about 2/3 of the business, followed by Shugart with about 15%. Digital Development and Data Disk were the leading head-per-track vendors.

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EDITOR Dan M. Bowers • MANAGING EDITOR Linda Ladd Lovett
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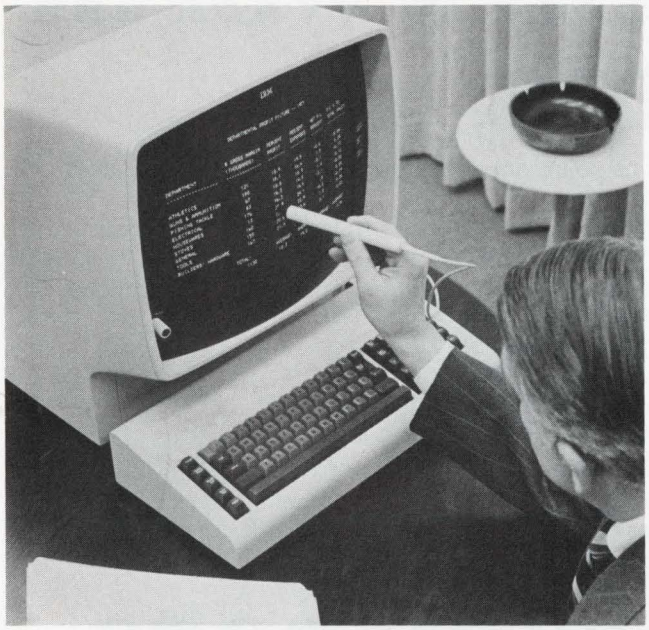
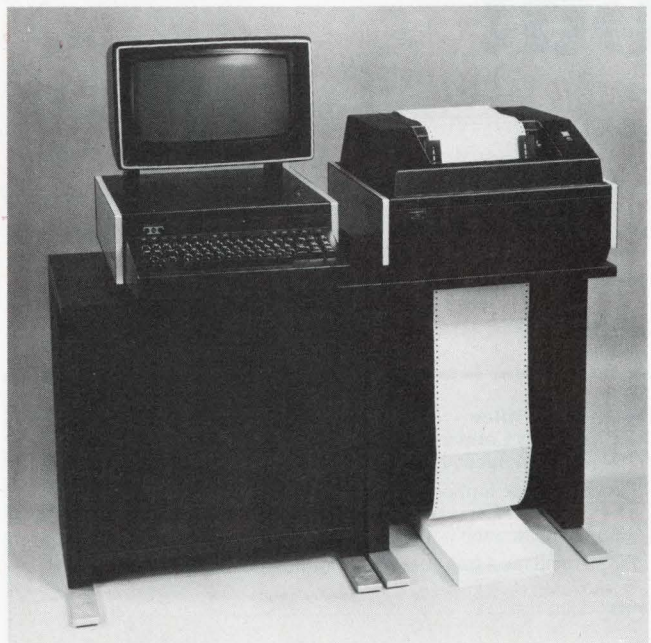
offering with their versions, offering 10-20 percent lower prices and special features such as local, random access storage for display formats, cassette storage of input data, character blink capability, numeric keyboard options, 9600-bps transmission rate and full upper- and lowercase keyboards.



Today's Industry Standard: IBM's 3270 Display Station

Teleprinter Replacements. Price is the crucial factor in this market with CRTs trying to approach teleprinter prices (less than $1000). Ranges of operating characteristics in this market are far and wide (see "Specification Ranges and Norms").

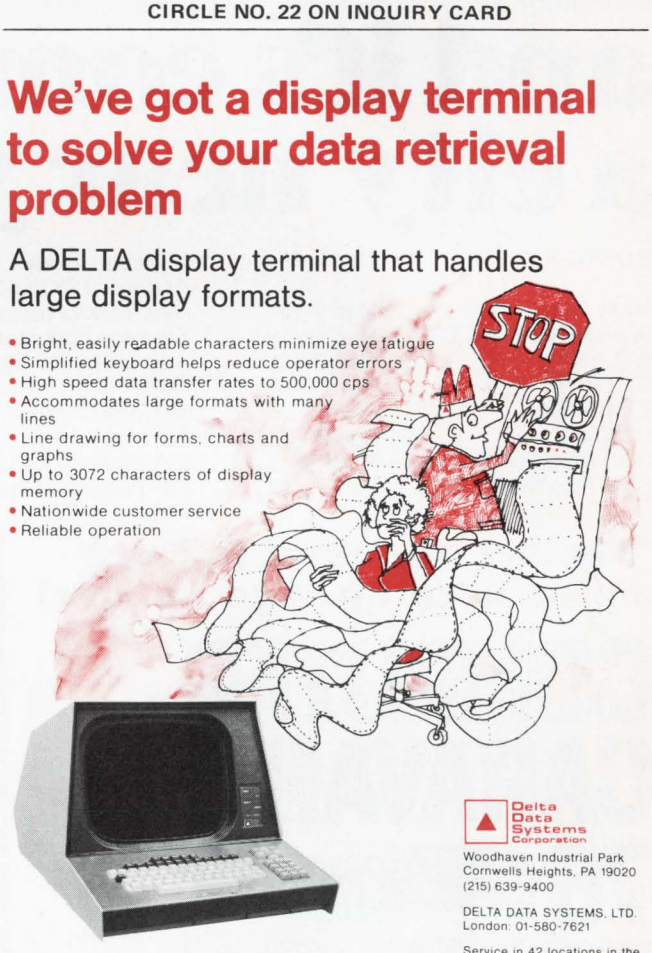
Teletype Model 40. Although priced at the upper end of the teleprinter replacement market, the Model 40 is expected by *Venture Development* to become a mimicked model as it



An Up and Coming Standard: Teletype's Model 40 Data Terminal

takes an increasing share of that market. It has a 1920-character display (24 lines by 80 characters) with a full 128-character set (upper- and lowercase). Character generation is with a 7x9 dot matrix. The terminal transmits asynchronously at speeds of 110 to 4800 bps. Also available are edit-

CIRCLE NO. 22 ON INQUIRY CARD



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ing features and a broad selection of communication interfaces permitting half or full-duplex operations. Three versions are available: receive only printer; keyboard and display; and keyboard, display and printer.

SPECIFICATION RANGES AND NORMS

According to the *Venture Development* 1975 study, the 1920-character, 12-inch diagonal screen display is the most popular, with 54 percent of the installed base. The 480-character, 5-inch display is gaining in popularity, and the 960-character screen is decreasing in popularity. Character generation is usually with a 5x7 or 7x9 dot matrix, each having almost equal market shares, but with the trend towards the 7x9 matrix. A 64-character set with uppercase alphabet, numerals and punctuation is used in 64 percent of the installed base; the 96-character set in 23 percent; the 128-character set in 12 percent. A typewriter keyboard is used in 80 percent of the applications. Remote transmission speeds are 4800 bps or lower in 90 percent of the cases, with half-duplex mode most often used. ASCII has become synonymous with asynchronous transmission just as BSC and SDLC, both developed by IBM, have become synonymous for synchronous transmission. SDLC, IBM's newest line discipline, is expected eventually to replace BSC. Printers are used in 32 percent of the installations. Other peripherals the *Venture* study found popular were the tape cassette and the floppy disk.

CRT TECHNOLOGY: OLD BUT NOTHING BETTER YET

The technology is more than 15 years old, but cathode ray tubes are still the least expensive, most reliable method of

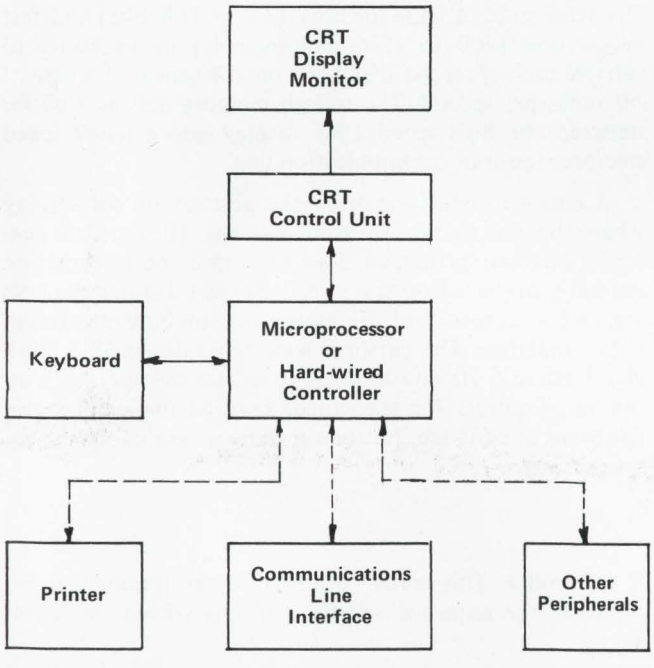

Fig. 3 – Alphanumeric CRT Block Diagram

interactive display. The basic CRT consists of a display monitor, control unit, controller, and a keyboard (see Fig. 3). A printer, the communications interface and other peripherals can also be added.

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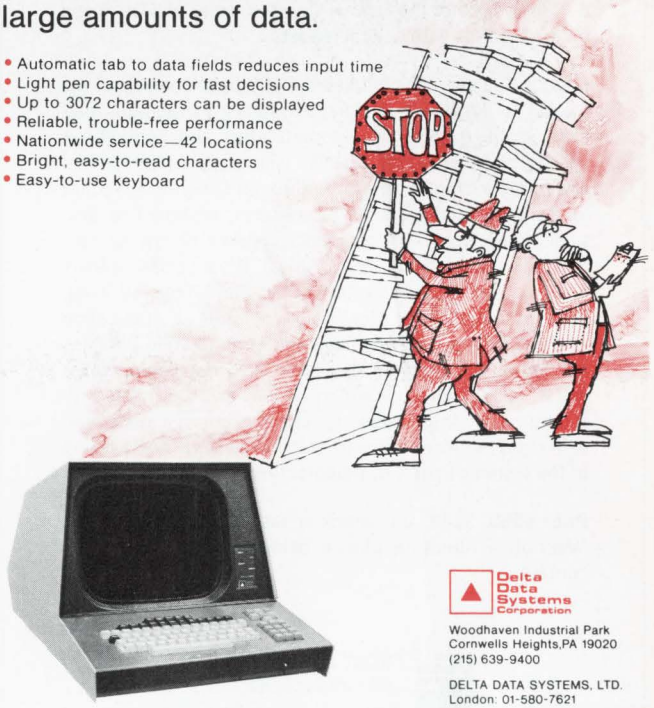

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THE KEYBOARD TO STORAGE MARKET

The keyboard to storage market in 1975-1984, will total $7.5 billion — and its makeup will change dramatically. By 1980, 50% of the keyboard to disc sales will be mixed media systems with optical readers.

Frost & Sullivan has completed a 190-page analysis of the market for keyboard to storage systems, including a forecast of the nature, size, opportunities and competitive structure of the market. Specific sales forecasts, in dollars and number of units, are given through 1984 for: keyboard to computer compatible tape systems; keyboard to disc systems (3 types); mixed media systems (2 types); keyboard to storage terminals (3 types). Product descriptions and comparisons, advantages and limitations, pricing, expected technological developments and an application analysis, are discussed. Expected configuration changes are identified. Recommendations for improvements are made. A questionnaire survey of end users furnished information on their future purchasing plans, satisfaction with equipment and software features desired, and a rating of the systems in use, by manufacturer.

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Display Monitor. Something like a high quality television monitor with turning circuits deleted, the common raster scan CRT display consists of a horizontal array of lines (typically 525 lines) that cover the screen from top to bottom. A beam of electrons strikes the screen, which is coated with a phosphor, and results in a small bright spot. The spot is deflected from left to right along each horizontal scan line and then quickly retraced to the next lower scan line, where the deflection is repeated until the entire screen has been covered from top to bottom. This scan of the entire screen is continually repeated at a typical rate of 60 times per second. The spot can be turned on or off at any point in time, which implies that the screen can be effectively divided into a large matrix of dots, each of which can be independently controlled. By illuminating selected dots on the screen, characters can be formed and information displayed.

The phosphor on the screen is characterized by its color and persistence level. Persistence is the amount of time it takes for the light to decay to an imperceptible level. The most common phosphor used, called P4, has a white light and a relatively short persistence level. Due to the short persistence, information on the screen must be "refreshed" 50 or 60 times per second so that the image will appear stable to the eye. Green phosphors have a longer persistence level but are not as bright.

Control Unit. The character generator, refresh memory and cursor come under the control unit's jurisdiction. The character generator determines the character dot matrix, size of the character set, number of characters per display, number of characters per row, and number of rows per display. The refresh memory is usually implemented by a shift register or random access memory. It is used to store each individual character in the form of a six to eight-bit character code. A large memory (3K to 16K bits) and fast access time (400 to 1200 nanoseconds) are necessary to retrieve each character displayed on the screen at a rate of 60 times per second. The refresh memory acts as a buffer between the high speed CRT display and a lower speed microprocessor or communication line.

A cursor is used to identify the position on the display where the next character is to be entered. The cursor is generally nondestructive and does not erase the information currently displayed on the screen. Several distinct symbols are used as cursors, but the most common implementation is the underline. The cursor is sometimes designed to blink at a 1 Hz to 6 Hz rate in order to attract the operator's attention. Controls for the cursor may be implemented in hardware or software, but newer systems are likely to rely on software.

Controller. This is the "heart" of every terminal. It coordinates the sequence and flow of data within the terminal by:

- Recognizing a keyboard depression and decoding the character
- Sending data to the printer when it is idle
- Sending/receiving data via the communication line
- Retrieving/storing data from/into memory
- Performing I/O interface control

Terminal controller technology during the past decade has paralleled the advancements made in the integrated circuits industry. The development of the RAM, ROM, and the microprocessor have had the most significant impact. In the 1960s, terminal controllers were "hard-wired," or custom designed, for specific applications (i.e., stock quote or airline reservation systems). A new application would require redesign of the controller and months of engineering/production efforts. Obviously, the main drawback of hard-wired controllers was the lack of flexibility. Prior to the introduction of the microprocessor, several terminal manufacturers designed custom microcomputers that used RAM as a temporary storage device and ROM to store instructions and canned messages. As technology progressed, the microprocessor replaced the custom-designed microcomputers. This made CRTs much more flexible. Hardware design could now remain static and software could change to satisfy specific applications.

FLICKERS, PINCUSHIONS AND BELLYDANCING

These are just some of the problems with present CRT technology. Screen flicker is the most common problem. It can be corrected by adding a filter in front of the screen, using a longer-persistence phosphor or increasing the refresh rate. However, a dense filter cuts down brightness, which is also the result of using a longer-persistence phosphor. Increasing the refresh rate can cause a form of distortion called "belly-dancing" (snake-like undulation of screen information). Screen focus is another problem. "Pincushioning" distortion is caused by curvature of the screen – a sharp focus in the center results in out-of-focus corners. (The converse of this is "barrel" distortion.) Also, there are horizontal and vertical linearity problems, i.e., inconsistent character height, width, and shape. Although relatively minor, CRTs do have drawbacks, but there's still nothing else around with fewer problems for the same price.

SMART OR DUMB

The level of intelligence of a CRT terminal is extremely difficult to quantify, and many manufacturers are guilty of "specsmanship." The classification of a terminal as "smart" or "dumb" has little significance, because all terminals have some level of intelligence. The level of intelligence can be determined by evaluating units for the following sophisticated functions:

- Programmable by user or manufacturer
- Processing capabilities (arithmetic/logical)
- Formatted data entry with protected fields and editing
- Cursor controls
- Special functions keys (page rolling, line delete, page erase, etc.)
- Interrupts via keyboard/communication line
- Preprocessing of communication data/block transmission
- Auxiliary I/O control (printer, cassette, disk)

CRTs: LONE AND CLUSTERED

As it turns out, most CRTs are not alone. Clustered terminals account for 52 percent of the 1975 installed base: stand-alone for 48 percent, according to *Venture Development* estimates. However, over 90 percent of teleprinter replacements are stand-alones. The average cluster includes a controller and 6.8 terminals. But the cluster size is expected to increase due to declining terminal prices and distributed processing. The trend toward distributed processing can also be confirmed by analyzing the local and remote distribution of CRTs. Local terminals made up 56 percent of the 1975 installed base; remote terminals 44 percent. However, in terms of 1974 shipments, local applications accounted for 46 percent, remote for 56 percent. *Venture Development* attributes this trend to AT&T's changing communications policies. As communications lines increase in quality and data transmission costs decrease, remote terminals become more cost-effective. Also part of the distributed processing trend is the movement toward programmable CRTs using either a minicomputer or microprocessor. The lower cost microprocessor is replacing the mini and is becoming an integral part of many CRTs because it gives them added flexibility. Although only 9 percent of the 1975 installed base had microprocessors, 24 percent of 1974 shipments had them. *Venture Development* expects that 60 percent of shipments will have microprocessors by 1980.

BIG SHOTS AND THE FUTURE

For a look at who's who in the CRT industry, where the industry is going in terms of market, and what's coming as alternatives to CRTs, watch for Part 2 of *Alphanumeric Display Terminals* in the March issue of MODERN DATA. ■

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CIRCLE NO. 25 ON INQUIRY CARD

BARBARA A. REYNOLDS / Associate Editor

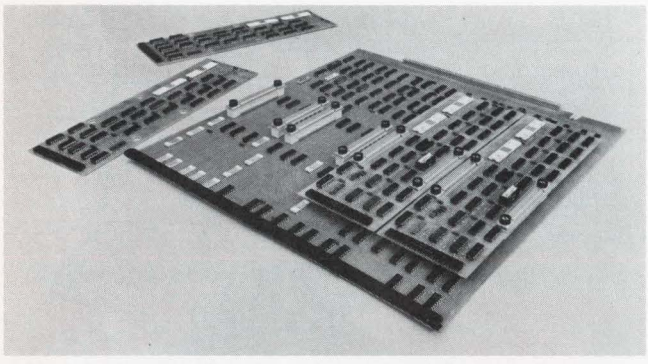
Honeywell's Level 6

A Mini New From The Bottom Up

Back before minis were king, a small Framingham minicomputer company, Computer Controls Corp., made its first mini and was battling it out with Digital and Hewlett-Packard for the majority market share. That was 1962. Then in 1966, it was absorbed by a larger company, Honeywell. Under Honeywell came the 316 in 1969 and the 716 in 1972. But minis were overshadowed in the sales marketing effort by large mainframes and in the research and development area by Series 60. Digital, Data General and HP took over the mini market and System 700 remained as it was, a sophisticated, large and expensive mini oriented towards end-users and communications.Then what began as a back-room operation at Honeywell a few years ago turned into the most all-encompassing company effort since Series 200: designing a whole new mini. Communications would not be forgotten, but the orientation would be toward high-volume OEM users this time. This mini would have to be *small* and *cheap* and *fast*. Enough to turn heads in a market where there was hardly enough room left for a head to turn.

A WHOLE NEW MINI

Level 6 *is* small and cheap and fast. The first members of the new Honeywell mini family are two OEM versions, the 6/34 and 6/36, and one end-user version, the 6/06. According to a Honeywell spokesperson, this is only the beginning. More sophisticated models are to come and all will be compatible with one another. Honeywell feels Level 6 will not only help reposition it as a leading minimaker, but give the company the added advantage of being the only manufacturer able to supply a total distributed processing network with large mainframes and small minis.



SUPER BOARD. *The multiline communications processor board can hold up to four plug-in communications "pacs," each pac controlling up to two full-duplex synchronous or asynchronous lines. Also part of the board are a microprocessor and a 4K-byte RAM memory.*

HIGH-DENSITY MODULARITY

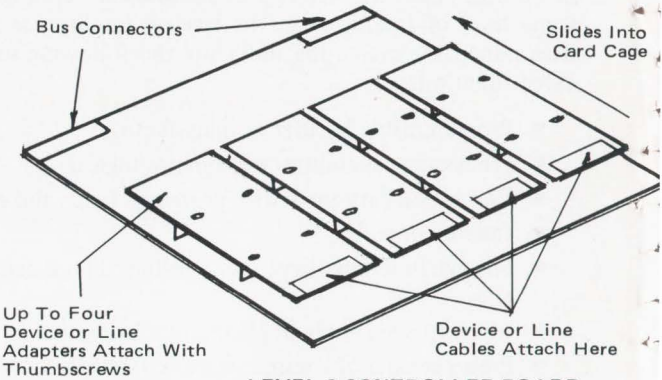
Level 6 architecture is based on the Megabus – a fast bus with a throughput rate of 6 megabytes per second. Plugging into the bus is a series of 15x16-inch boards, each board having up to four plug-in "pacs" (see diagram). There's no backplane wiring – etched wire connections do the job. There's a processor board incorporating LSI and MSI TTL circuitry. There are memory boards, each taking four plug-in 8K-word NMOS memory pacs for a total of 32K words per board. With the microprocessor-controlled general-purpose interface board, the OEM designer can customize his own plug-in interface. The microprocessor-based device controller board holds four device pacs. Each pac can operate a printer, diskette, CRT or card device. All four devices attached to a board can operate simultaneously. Cartridge disk units take a separate board – the microprocessor-controlled mass storage controller. Communication is handled by a board that

Technical Analysis

A MODERN DATA Staff Report

From a technical viewpoint, Level 6 is a fresh start for Honeywell. Compatibility with earlier Honeywell minis is localized to the 6/06 processor and the I/O bus adapter, without compromising the new architecture. Naturally, a few influences can be detected, but it is fundamentally a new design. Not a revolutionary design, Level 6 takes standard, up-to-date technology to a high degree of refinement.

Definite Pluses. Perhaps the most significant Level 6 feature is its packaging. The product density, in capability per cubic inch, sets a new standard. This is due in part to the "major board-minor board" approach. (See illustration.) Common logic for a large function or a set of functions is on a 15"x16" board. This board is adapted to smaller functions or specific functions by adapter boards ("pacs") that attach to a standard interface atop the larger boards. Three examples were announced: a memory board to handle up to 64K bytes, which mounts up to

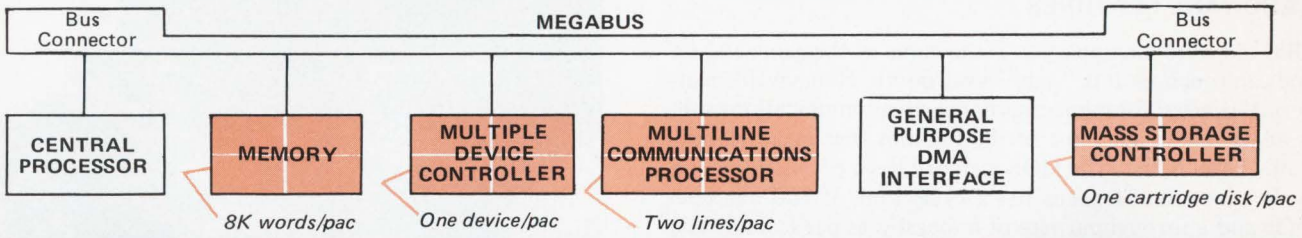


LEVEL 6 CONTROLLER BOARD

might have been marketed as Super Board – the multiline communications processor. It holds four communications pacs, each supporting two synchronous/asynchronous low and medium-speed full-duplex lines. Synchronous and asynchronous lines can be combined on the same board. Actually, this board looks more like a front-end processor since it includes its own microprocessor and 4K-byte RAM memory, making it user-programmable. According to company spokespersons, most components of Level 6 are bought from OEM suppliers so Honeywell gets the best product at the lowest cost.

THE ROCK BOTTOM SYSTEM

The basic Model 6/34 consists of a central processor mounted in a four-slot Megabus chassis, a memory controller with parity, an 8K-word memory pac, a basic control panel, hardware multiply/divide, a realtime clock, and the ROM bootstrap loader. All for $3990 in quantity 1 or $2634 in quantity 50. Options include an additional 24K of memory, the multiple device controller, mass storage controller, general-purpose interface, multiline communications processor, battery backup, memory save and auto restart. Peripherals available include a 4K-byte diskette, 2.5M- to 10M-byte



LEVEL 6 SYSTEM CONFIGURATION. *Mix and match up to four of these boards for the Model 6/34, up to 23 for the 6/36. But mix and match doesn't stop at the board level. From one to four pacs attach to the memory board, multiple device controller, multiline communications processor, and mass storage controller.*

# of Honeywell's Level 6 Minis

four 16KB boards with the memory chips; a controller for up to four low-speed devices, matched to specific devices by adapter boards; and a communications processor for up to eight lines, with line type determined by adapters. This approach provides the density of "big board" technology with some of the modularity only small boards can offer.

This is not to imply that "daughter boards" or "rider boards" have never been used before in a mini. Of course they have. What we feel is new here is the use of a standard interface between the "mother board" and the "daughter board," permitting any of a group of "daughter boards" to occupy a position and thus yielding excellent configurability.

The packaging is also extremely clean. All the boards slide in from the front; the power supply comes out with only two screws. Clearly, a lot of thought has been given to maintainability.

Maintainability has also been considered in the design of the units themselves. Each processor or controller executes a self-test when initialized, lighting an LED if it fails. Memory is also tested, by the CPU.

The instruction set is new. It is cast in the traditional mold, and is oriented to multiple registers. Level 6 designers did not opt for the fully symmetric, two address instruction style of the DEC PDP-11 and the TI 990. Rather, one operand must be in a register, which permits using additional bits for operation codes and addressing modes.

The CPU has fourteen registers: seven accumulators and seven base (or address) registers. This, too, is a compromise, and we feel it is a good one. Seven (or eight) registers are often not enough, while a single set of fourteen (or fifteen or sixteen) registers would impact the instruction set via longer register selection fields. The split approach has the additional advantage of making some types of bit-fiddling address manipulation impossible.

The Level 6 Megabus definitely appears to be a descendant of the PDP-11 Unibus. (One difference is that I/O devices have their own set of addresses; they are not treated as memory locations.) Its evolutionary improvements include greater memory addressing range, slightly higher speed, and a better interrupt structure.

Possible Minuses. On the debit side, the Level 6 offering is thin. Peripherals are limited: no fast paper tape, no card punch, no disks larger than cartridge units, no magnetic tape. The CPUs do not offer memory over 64K words, memory mapping or protection, or floating-point capability. Most of these are coming, but Level 6 sales will be constrained until they do.

A similar situation holds with software. Honeywell offers a basic realtime executive; an operator-controlled program development system with an assembler, a Fortran compiler and a linker; and utility routines. Disk-based multiprogramming software, networking software, and other languages are missing. Again, they must be in the works – but they're not here yet.

Finally, Honeywell has a history to overcome. Their recent minis are reliable products with good software, but their order entry, administrative and maintenance procedures have been cumbersome. For Level 6 to succeed in the low-cost, high volume markets where Honeywell has not been competitive, these must all change. [**Editor's Note:** And they seem to be changing. Honeywell's new sales force, reorganized order entry under marketing, and new maintenance procedures will go a long way in overcoming past problems.]

Initial Level 6 sales will have to be in a very narrow market. The low end will be captured by lower-priced systems, such as stripped Nova 3s and TI 990s. The high end needs more software and peripherals than Honeywell has now. If these come as predicted, they will be a potent factor in the mini business once again.

cartridge disks, 300- or 500-cpm card readers, and 240- to 600-lpm line printers. Honeywell believes the Model 6/34 is price competitive with DEC's 11/04 and 11/05, but performance competitive with the lower-end 11/35.

The Model 6/36 has the same central processor and features as the 6/34, but has 23 slots available and a maximum 64K-word memory. Memory management is unnecessary. The end-user system, the 6/06, combines Level 6 hardware and System 700 software and has prices comparable to the 6/34 and 6/36.

HARDWARE FEATURES

"Bit and byte manipulation is the name of the game and no one can touch us at it," said David Booth, Honeywell's marketing director for minicomputers and communications subsystems. These are some of the features that make Honeywell's Level 6 fast. The MOS memory has a 650-nanosecond cycle time; the Megabus has a cycle time of 300 nanoseconds and a throughput rate of 6 megabytes per second. The word size is 16 bits, but the address width of the Megabus is 24 bits. Microprocessors enable 64 levels of vectored interrupt. The 107 instructions work on seven address and seven data registers. Additional registers include a program counter and status, mode and indicator registers. Bit and byte manipulation takes on real meaning in the index registers, which do not count by any fixed unit, but adjust to the type of data manipulated. They count by bytes if bytes are loaded, by words if 16 bits are loaded. This is what Honeywell means when it refers to Level 6 as a "multiword length" machine.

THE HEALTH INDUSTRY DATA PROCESSING SYSTEMS AND SERVICES MARKET

The market for health care-oriented computer systems and services reached $460 million in 1974, will top $1 billion by 1978 and total $9.3 billion in sales for the period 1975-1984. Although the industry has been relatively backward in utilizing data processing, it is now being forced to do so by complex third-party billing, the government's increasing controls and regulations, spiralling operating costs, resistance to payment of high medical costs and an awareness of the significant potential of data processing.

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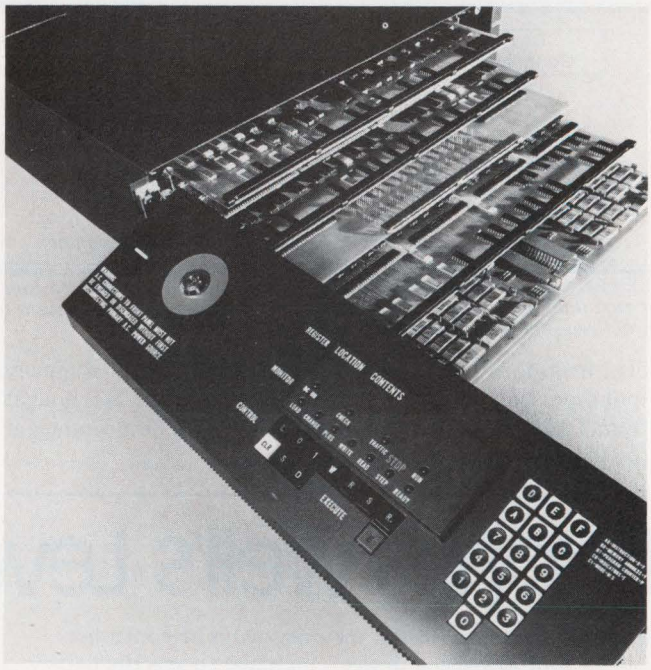
DIAGNOSTICS ON A STRING

A "shoelace" circuit ties all microprocessor-controlled boards together. As each board checks its Megabus connection and performs a basic logic test, a light-emitting diode (LED) mounted on each board extinguishes if the test was successful, remains lit if there was a malfunction. The operator can tell from LEDs on the control panel which board is malfunctioning. He can further locate the problem by looking at the LEDs on each pac of the board. From there it depends on the maintenance agreement selected: full



LEVEL 6 PACKS A LOT IN. *Five boards and a power supply slide into this 5-1/4" high rack-mountable drawer.*

Honeywell field engineering, coactive customer-Honeywell maintenance, or full customer maintenance. The responsible party can replace the pac by removing four screws. Spares are available by air or land from marketing instead of engineering (one of System 700's problems).

OEM SOFTWARE

GCOS/BES1 is the name of the initial offering, but it should not be confused with the rest of Series 60 GCOS. The diskette-base GCOS/BES1 includes a stand-alone program development system, a stand-alone multitasking realtime executive, a disk-based multitasking realtime operating system, an 8K assembler, a 16K Fortran compiler and utilities. In other words, enough for OEM program development, but not enough for end-users. They can go with the 6/06, which uses System 700 software, or they can wait. GCOS/BES2 scheduled for release later this year will include higher level languages, communications and executive extensions.

UP AND RUNNING

Yes, if you can believe it. One system has been installed and working since October. Production model shipments began in December – no more one-year lead time. And just to show it's serious about this, Honeywell has recruited a dedicated technical sales force to sell to OEMs. The regular sales force will still sell to end-users with the help of the special sales force. Honeywell is convinced it is in the computer business to stay. Now it just has to convince the rest of the world. This mini should be positive proof. ■

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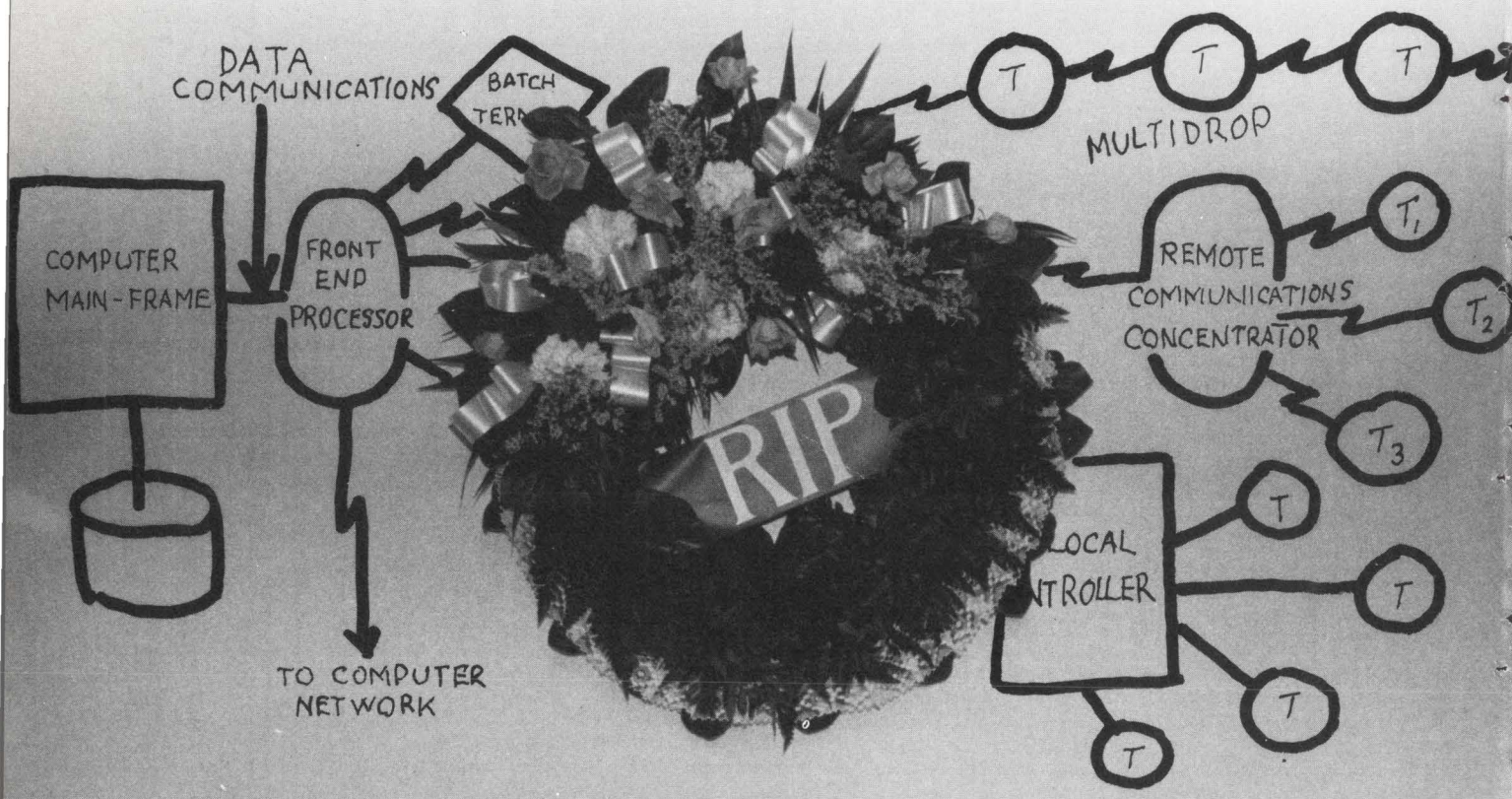

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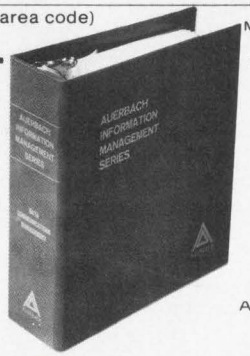

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TANDEM COMPUTER'S NONSTOP "MINIPLEX"

"We believe the growth of the "NonStop" system market has been restricted by the need for customizing each system – software and hardware. If this is correct, the availability of a standard solution using only production modules of both hardware and software can be expected to increase the market potential. In fact, we believe that, in time, all terminal driven, Realtime systems will include a "NonStop" systems capability. Tandem's goal is to be the leader in this migration."

– Samuel Wiegand, Vice Pres.-Marketing, Tandem Computers, Inc.

Tandem Computers of Santa Clara, California, has announced a new minicomputer product line aimed at the "sophisticated end-user market" – specifically, those mini and midi computer users for whom very high availability is foremost. This market is dominated by online operation and includes banking, process control, communications, hotel/motel reservations, etc. (See Fig. 1) A Tandem spokesman explained to MODERN DATA what Tandem means by "sophisticated." It means: 1) that the application has a need for automatic recovery and fail-soft operation; 2) that the user understands the need, the application programs,

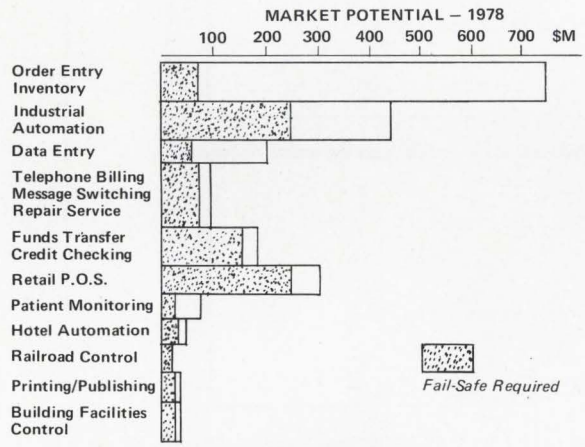
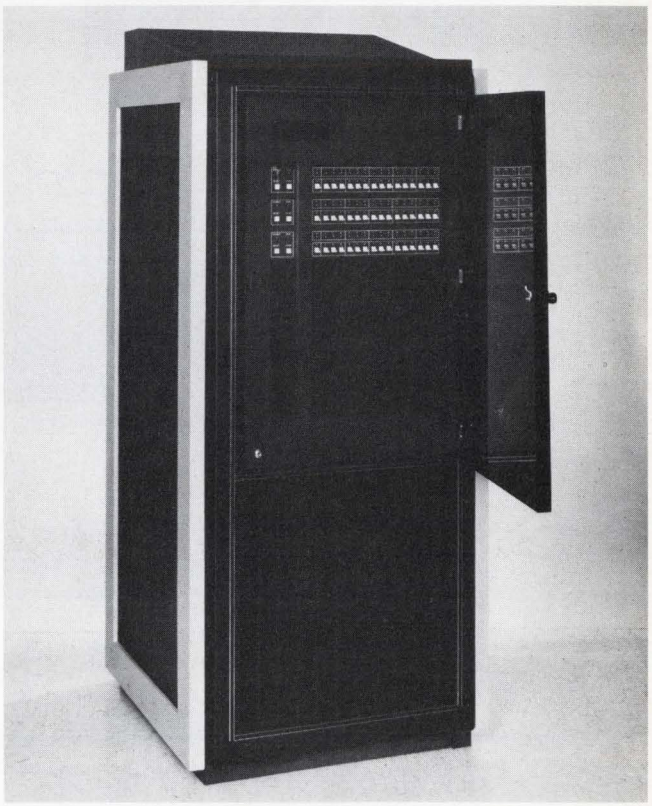


Fig 1 – Where Tandem sees its markets through 1978. Excluded from these projections are military and very large systems.

and the problems; 3) but that the user is not willing or does not have the resources to do the special hardware engineering or to write the kind of operating system needed for fail-soft operation.

To achieve availabilities of the order of 0.999999 (or one hour of downtime in a hundred years), Tandem has designed its product line as a multi-computer complex in which all the configuration switching gear and other hardware needed to detect and correct hardware malfunctions automatically has been built-in from the start. It is generally recognized by system architects that this is not merely a matter of providing a CPU-CPU channel, a watchdog timer, power transient interrupts, and bus switches. Careful attention must be paid to packaging, power supply and distribution, and interface logic levels. For example, it must be possible to turn off the power in one unit without interfering with the operability of others, or to pull a printed circuit card without blowing it or some other nearby cards. These specialized requirements tend to pervade the entire design. It is decidedly not a simple matter of a few clever boxes.



The Tandem 16 NonStop™ System *consists of a minimum of two and a maximum of 16 processors per computer system. This particular unit has three processors.*

EARLIER ATTEMPTS

The hardware and software engineering of fail-soft systems is not new, going back to vacuum tube days and the AN/FSP-7 SAGE computer, for one. Nor is Tandem the first computer manufacturer, maxi or mini, to offer such features in a product line. There has never been a significant

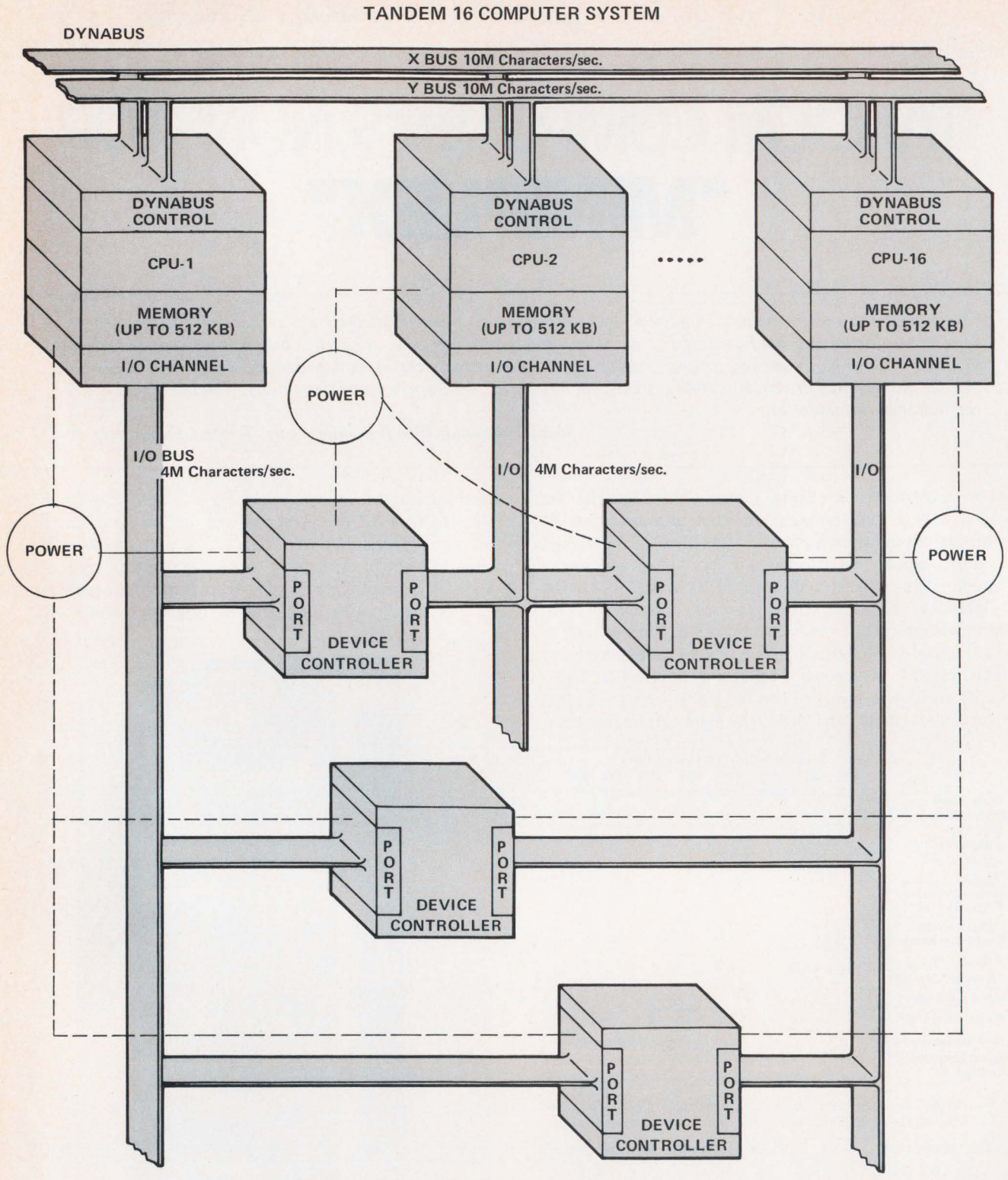


Fig. 2 — Tandem 16 Computer System

problem in obtaining the special hardware units and hardware modifications if you were willing to pay one-time engineering charges. Similarly, the somewhat exotic software required to run such systems has been available from custom software houses. There are over a thousand such systems in operation today, ranging from simple duplex systems built around minicomputers, to giant multicomputer complexes. Some of these have been working for over ten years without a single total outage due to hardware failures (though we know of none which has not been knocked down at least once due to application software bugs).

Most manufacturers who offer such hardware have done so by adapting an existing product line, with varying degrees of success. These manufacturers leave the end user painfully lonely when it comes to providing the kind of operating system needed to take advantage of the hardware. We suspect that the previous ambivalent attitude of computer manufacturers has not been due to lack of understanding or

ability, but because the segment of the market represented by fail-soft systems has been too small to warrant heavy investments in product development. Furthermore, there has always been an OEM and/or software house in the picture to take responsibility for the engineering of fail-soft systems when the end-user could not. What this has meant to the potential user of a fail-soft system built around a mini is that one-time engineering costs and operating system software costs would be likely to exceed basic hardware costs.

A TANDEM FIRST

What makes Tandem Computers different is that it is, to our knowledge, the first minicomputer manufacturer to be totally committed to the high availability end-user market. This commitment is reflected not only in the design of the hardware, which appears to have all the necessary bells and whistles, but in the simultaneous offering of a multicomputer operating system that will, according to Tandem, take care of all the hairy (and they are hairy indeed) problems of fielding software to go with the hardware. Presumably, the sophisticated end-user will be able to concentrate on application software and will not have to delve into the mysteries of fail-soft operating systems. It is, of course, too early to tell if Tandem's operating system will do the job. Only live field trials can substantiate workability claims for such operating systems. And there is a dismal record of hardware and software house offerings along this line which either did not work at all, or as promised, or required so much tailoring that they could hardly be claimed as being general purpose. However, Tandem seems to know what fail-soft is all about, both in hardware and software areas.

As for the system itself (see Fig. 1), it features a dual inter-processor bus (from 2 to 16 CPUs). All device controllers are dual ported and can be connected to the I/O bus of two different CPUs, and all the specialized considerations generally considered necessary for fail-soft systems appear to be implemented. The CPUs themselves are16-bit machines with a stack architecture. There is virtual memory hardware with more than the usual page protection. Semiconductor memory cycle time is 500 nanoseconds and core is 800 nanoseconds. There is character, word, and double word addressing with direct, indirect, and indexing modes as well as hardware multiply and divide, automatic stack management, DMA, etc. In short, all the features we have come to expect at the upper end of today's minicomputer offerings. Price, despite the specialized hardware (which is standard), is claimed to be lower by 15% to 20% than equivalent systems bought from competitors. Tandem is quick to point out that since the software is part of the deal, the net cost to the end user should be significantly lower. The software package includes the operating system, utilities, code editor, file manager, system generator, and a high-order language (T/TAL) designed for transaction-oriented applications.

According to Tandem, equipment is presently ready for shipping, but is undergoing extensive testing that will provide quality assured hardware *and* software by April. Tandem sees its primary competition as the minicomputer "giants," particularly DEC, HP and Data General. Assuming that hardware and software are available, fully working, and in accordance to the planned schedule, Tandem's success will depend upon whether or not the end-user market for fail-soft systems has matured to the point where it will support a company devoted to it.

Tandem Computers, Inc., is located at
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REEL-TO-REEL RECORDER

The Series 9832 Asynchronous Magnetic Tape Recorder uses dual random access memories to record time-independent data with no loss of data during gap insertion. With the asynchronous transports, data can be both written or

read at any rate up to 250,000 characters per second. Also, buffers and format electronics are contained within the transport chassis, thereby eliminating interconnecting cables. The 8.5-inch reel transport operates in conjunction with dual RAMs of 512, 1024, or 2048 bits. Input data is strobed into the first buffer asynchronously. When one buffer is filled, input data is transferred to the other buffer while the transport formats and records the data in the first. OEM prices range from $5100 to $6600. *Kennedy Co., Altadena, CA.*

Circle No. 126 on Inquiry Card

DUAL INSTRUMENT COUPLER

The Model 1700 Dual Instrument Coupler is said to couple any two instruments with BCD or binary outputs to any recording or display device to create an inexpensive data acquisition system. It is a parallel-to-serial or parallel-to-parallel converter that provides various output formats and multiple baud rates. Output cards are available for Teletypes, RS-232 devices, paper or magnetic tape recorders, and IBM 029 card punches. *Data Works Instrumentation, Chatsworth, CA.*

Circle No. 129 on Inquiry Card

MINI PRODUCTION CONTROL

The Capac 101 Production Control System includes several online terminals installed throughout a plant, and a minicomputer. When an employee inserts his badge into the badge reader device and manually types a prescribed code on the keyboard, the data is collected by the mini and used to analyze labor costs and utilization. *Capac, Inc., Ridgefield, CT.*

Circle No. 128 on Inquiry Card

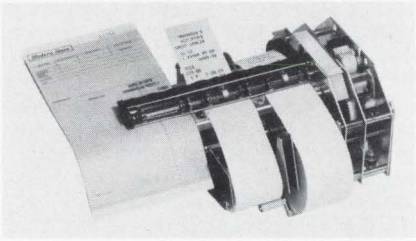
DUAL FLOPPY SYSTEM

The 3190D is a complete dual floppy disk system using two Pertec drives and the Ball Model 3190 disk controller. With the controller logic card included within the chassis, no CPU I/O slot is required. This frees an I/O slot for additional memory or another peripheral and eliminates the need for an expansion chassis when no I/O slots are available. Multiple chassis can be daisy-chained, allowing up to eight drives to be operated from a single controller installed within the first chassis. The chassis is program-compatible with Data General Nova and Nova-like processors. *Ball Computer Products, Inc., Oakland, CA.*

Circle No. 141 on Inquiry Card

MULTIMEDIA A/N PRINTER

Model SV alphanumeric printers can simultaneously print different data at each of three independently controlled stations, at two lines per second, using



a unique segment matrix character format. Sixty-four characters (10 numerals, 32 alpha and 22 symbols) are provided. The unit accommodates roll papers and/or cut forms. Features include paper rewind mechanism, automatic paper cut-off, roll paper supply and out-of-paper alarms. *Sweda International, Pine Brook, NJ.*

Circle No. 138 on Inquiry Card

PROGRAMMABLE COMMUNICATIONS INTERFACE

The ASPI Series Programmable Interface for message switching and communications formatting may be used in a wide variety of digital interfacing applications, such as baud conversion, mode conversion, code conversion and data routing. The unit features a microprocessor as its programmable control unit, runs on standard 110v-60Hz line power, and requires no special environmental considerations. Serial inputs and outputs meet EIA-RS-232C standards for industry-wide compatibility. Price including initial program is $2200. *SSC Corp., Salt Lake City, UT.*

Circle No. 131 on Inquiry Card

PORTABLE INSTRUMENTATION RECORDER

The Four-O-One Portable Recorder provides laboratory caliber recording performance in rugged and remote field applications. The unit has up to seven channels on 1/2-inch tape or 14 channels on 1-inch tape. It accepts reels up to 10-1/2 inches. It has seven bidirectional speeds ranging from 15/16 to 60 inches per second. Maintenance and repair are effected by way of a hinged back panel through which all components and plug-in modules are accessible. *Bell & Howell, Datatape Division, Pasadena, CA.*

Circle No. 133 on Inquiry Card

SMALL BUSINESS SYSTEM

The System 1300 includes a new processor with internal processing speeds that average four times faster than those of other Qantel systems. Priced at $42,500, a mininally configured System 1300 includes 40K bytes of memory (8K of which are available to the user), 6M bytes of disk storage (3M bytes fixed; 3M removable), a 27-line, 1728-character video display terminal and a medium-speed serial line printer. The processor, which is completely compatible with existing Qantel hardware and software product lines. *Qantel Corp., Hayward, CA.*

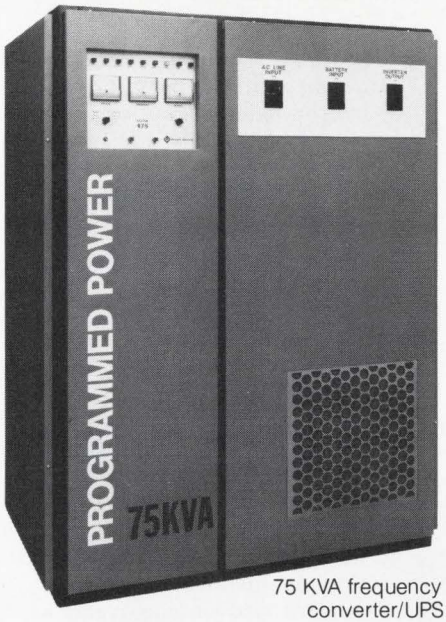
Circle No. 132 on Inquiry Card

SINGLE-BOARD CRT

The in-477 CRT Display Memory stores an entire video image on a single board built with 4K RAMs, said to make it almost four times as compact as conventional display memories using 1024-bit shift registers. The memory locations can be accessed both randomly and sequentially and at data rates up to almost 20 million bits per second, allowing the in-477 to be used in special image processing applications. Each in-477 board stores 256 kilobits of data in 64 n-channel silicon gate MOS 4K RAMs. This capacity allows one board to operate a standard television display of 512 lines with 512 picture elements per line. To create multi-color and gray-scale displays, or to operate displays requiring greater storage capacities, boards can be used in parallel. Each in-477 card operates as a self-contained system. Expansion is simplified by a built-in card-select control. Price for one in quantities of 100 is $1,725. *Intel Memory Systems, Sunnyvale, CA.*

Circle No. 140 on Inquiry Card

PROGRAMMED POWER...



75 KVA frequency converter/UPS

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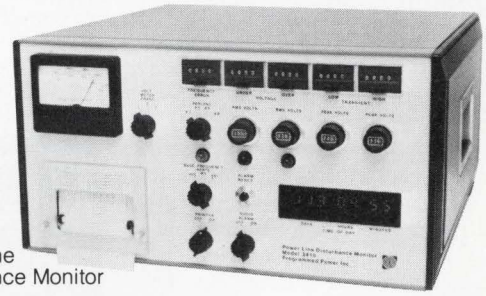

Power Line Disturbance Monitor

Franklin Electric
Programmed Power Inc., 141 Jefferson Drive, Menlo Park, Ca 94025 (415) 323-8454

CIRCLE NO. 26 ON INQUIRY CARD

new products

PDP 11/70 FLOATING POINT PROCESSOR

The FP11-C processor provides up to 17 decimal digits of accuracy and is said to have more than twice the speed of DEC's previous floating point processor. It has 46 hardwired instructions and its own set of six 64-bit floating-point accumulators. It is priced at $5900. *Digital Equipment Corp., Maynard, MA.*

Circle No. 158 on Inquiry Card

GRAPHICS TERMINAL

The Conographic-9 terminal displays curvilinear information by conic curve generation rather than by x-y plotting, producing smoother curves with less data. Standard features include 17-inch 1029-linescan video monitor with high screen light output; built-in zoom/pan; a joystick for graphics interaction, and a hardware graphics processor for scaling graphics and alphanumerics. The architecture includes a microprocessor and ROM memory. The basic price is $9750. *Hughes Aircraft Co., Carlsbad, California.*

Circle No. 160 on Inquiry Card

TERMINAL DISKETTE

DataMaster II is a flexible disk I/O data recorder and editing system intended for plug compatible attachment between ASCII printer/display terminals and their RS232 modems. It features random access to any of 2431 128-character records in an average of 0.3 second. A search command can initiate a scan for data or file locators of up to 128 characters in length at an average speed of 12 seconds per disk. The word processing edit system permits correction, insertion, addition or deletion of characters, words or lines without rearranging text. It attaches to any 110 to 1200-bps ASCII terminal. *Western Telematic Inc., Costa Mesa, CA.*

Circle No. 150 on Inquiry Card

INTELLIGENT PRINTER

The IPS-7 Impact Dot Matrix Printer is buffered and includes an RS-232 C interface. Character size and the height and horizontal scaling of bar codes is flexible from line to line. The printer can buffer one block of ASCII data from the computer while expanding and printing another. All of the expansion is internal to the printer; the driving program only is required to specify with each line of data the size of the characters to be printed and how the form is to be spaced after the line is completely printed. Printing speeds range from 120 to 180 characters per second. Unit price is approximately $7000. *Dataroyal, Inc., Nashua, NH.*

Circle No. 135 on Inquiry Card

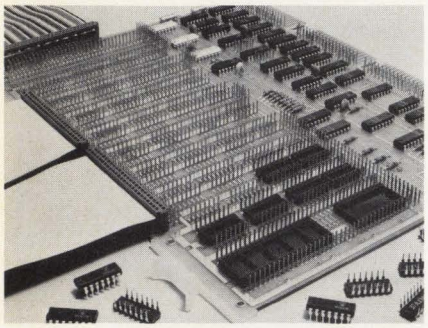
INTERFACE FOR INTERDATA CPUs

The Programmable Asynchronous Triple-Line Adapter (PATLA) uses Schottky technology, microprogrammed interrupt logic and macro-programmed status signals. It provides three RS-232C compatible asynchronous communication channels, 50 to 9600 bps, half or full duplex in one half mounting slot of an Interdata 6/16, 7/16, 7/32, or 8/32 CPU. The PATLA has full hardware and software compatibility with Interdata's Single Line Adapter, the PASLA. One PATLA replaces three PASLAs. *RDV Engineering, Tustin, CA.*

Circle No. 157 on Inquiry Card

INTERFACE MODULE FOR PDP-11

The MDB-1710 General Purpose Interface Module is a PDP-11 Unibus to-peripheral interface with address and

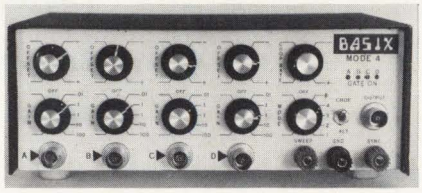


dual vector interrupt logic. Essential and universal Unibus logic interface elements are premounted and interconnected, with wire-wrap facilities for address selection and interrupt vectoring. Wire-wrap posts also make it possible to connect Unibus driver inputs and receiver outputs for multiple-controller applications. Integrated circuit devices furnished on the module provide logic to handle three primary functions: address selection, interrupt control, and the Unibus electrical interface. The board is priced at $250. *MDB Systems, Orange, CA.*

Circle No. 147 on Inquiry Card

MULTI-CHANNEL DISPLAY FROM SINGLE-CHANNEL SCOPE

Converts to digital electronics usually find their single-channel oscilloscopes inadequate. The Mode 4 Quad Analog Amplifying Multiplexer addresses itself to this problem by providing an alternative to the purchase of an expensive 2- or 4-channel scope. The Mode 4 displays up to four simultaneous analog and/or digital signals on any single (or dual) scope without modification, and provides individual .01x to 100x gain control (in decade steps) for each channel. Signals from DC to approximately 5 KHz are viewed in the parallel multiplex mode, essentially a sampling technique in which the individual inputs are multiplexed to a single output at a rate much higher than the frequency



of the signals being observed. Serial multiplexing is normally used for higher frequency display. Price is $189. *BASIX, Bethlehem, PA.*

Circle No. 146 on Inquiry Card

MODULAR CRT

The Modular One CRT uses a microprocessor and programmable ROM to permit modular expansion of the terminal through the addition or deletion of plug modules. The basic terminal pro-

vides a 1920-character 12-inch display, incremental and absolute cursor positioning, dual video intensity, 10-key numeric pad on a movable keyboard, choice of eight transmission rates up to 9600 bps, communication interfaces switchable between EIA RS-232 and currentloop, choice of block or blinking underscore cursor, and a white-on-black or black-on-white display presentation. Price in quantities of 100 is $1275. *Hazeltine Corp., Greenlawn, NY.*

Circle No. 142 on Inquiry Card

Microprocessors and Microcomputers

A TECHNOLOGY PROFILE

Comprised of material which appeared in the January and February, 1975, issues of MODERN DATA, this 24-page Technology Profile is the most thoughtful and comprehensive effort to date to organize and summarize the complex, confusing, and fast-moving world of micro systems. This booklet will serve, for years to come, as a primer to the newcomer and a review guide for the more experienced.

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INTELLIGENT CRTS

The Models 310 and 320 are intelligent data entry terminals designed primarily to prepare data for small business computers. Both terminals include a CRT, keyboard, ECMA-compatible cassette recorder, and a microprocessor with 8K bytes of ROM firmware. The Model 310 includes one cassette recorder and may be equipped with an optional 3K bytes of RAM. It can communicate using both binary synchronous (1200-4800 bps) and asynchronous (110-1200 bps) procedures. The Model 320 includes two cassette recorders and provides automatic input of stored format programs, tape pooling, selective copying of data from one cassette to another, storage of information for file search and retrieval, and automatic transmission and reception of data. It can communicate using binary synchronous procedures. The Model 310 is $204 per month on a 1-year lease; the 320 is $239 per month on a 1-year lease. *Sycor Inc., Ann Arbor, MI.*

Circle No. 143 on Inquiry Card

I/O BUS CONVERTER FOR ECLIPSE

The RTP7410/60 I/O Bus Converter is contained on a single printed-circuit board that plugs directly into any unused I/O slot in the Data General Eclipse computer. It allows Computer Products' complete RTP family of analog and digital input/output measurement and control equipment to be operated under Eclipse control using the computer's standard I/O instructions. Up to eight RTP controllers can be chained to one I/O bus converter. Price of the RTP7410/60 including one I/O bus termination card is $450. *Computer Products, Ft. Lauderdale, FL.*

Circle No. 149 on Inquiry Card

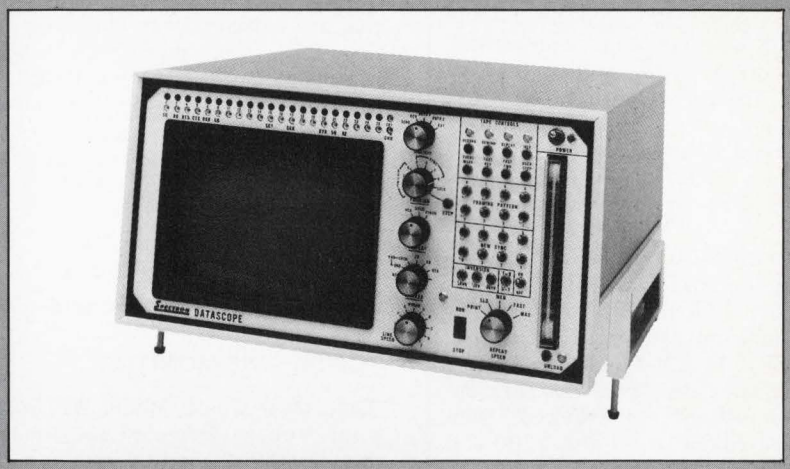
BANKING TERMINAL

The Megadata Banking Terminal contains 2K to 16K of PROM for program and fixed format storage, and 2K to 8K of RAM for transaction entry, processing, queueing, and forwarding. The manufacturer claims the unit can be programmed to operate with any computer using any communications protocol. Keyboard layouts, keytop colors, condition indicator lights, and audible signals can be configured exactly to a bank's requirements and are designed to simplify the operation of the terminal. Printers and floppies can be attached. *Megadata Computer and Communications Corp., Bohemia, NY.*

Circle No. 136 on Inquiry Card

MINIMIZE DOWNTIME

PINPOINT SYSTEM FAILURES
DEBUG SOFTWARE



DATASCOPE D601

Universal Communications Monitor

The Spectron Datascope is a unique time-saving, portable test instrument for troubleshooting and monitoring data communications channels. It provides both a CRT display and a magnetic tape recording of all line traffic at the business machine (EIA RS-232C) interface of any standard modem. The unit pinpoints problems in system hardware and software by showing exactly what was sent and received. Errors caused by equipment malfunctions, incorrect programs or line trouble are immediately visible with less time spent isolating system problems. The Datascope is as easy for operating personnel to use as it is for programmers and engineers.

- PROVIDES CRT DISPLAY OF EVERY DATA LINK CHARACTER, SENT OR RECEIVED
- SIMULTANEOUS FULL DUPLEX DATA STREAM TAPE RECORDING
- ACCEPTS ALL CODES, LINE DISCIPLINES AND SPEEDS UP TO 9600 BPS
- SWITCH SELECTABLE ALPHANUMERIC, HEXADECIMAL, OR EBCDIC DISPLAY
- MONITORS FULL AND HALF DUPLEX CIRCUITS
- PRINTED RECORD AVAILABLE ON STANDARD TELETYPE PRINTER
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new products

LSI MODEMS

Last month's MODERN DATA included a feature on LSI modems by Hycom's (Irvine, CA) President Takashi Mitsutomi that described how a single LSI chip can do the job of multiple TTL components. Two other major modem makers have recently introduced LSI modems.

Paradyne Corp. (Largo, FL) LSI modems offer up to a 70-percent size reduction over conventional modems. Computations in the receiver digital filter, transmitter digital filter and adaptive channel equalizer are said to require over 6 million multiplication/addition cycles per second. The LSI digital filters eliminate analog drift such that no manual adjustment is required. Data rates available are 9600, 7200 and 4800 bps.

Circle No. 153 on Inquiry Card

Codex Corp. (Newton, MA) offers a series of eight LSI modems with point-to-point models available in 9600, 7200 and 4800 bps. The Fast Poll Multipoint units provide 9600, 7200 and 4800-bps speeds on the outbound master side in polled networks. The 4800-bps LSI-48I is compatible with all other V.27 modems. The LSI 48D model is intended for dial networks. Prices for the point-to-point models start at $4325 for 4800 bps, $6500 for 7200 bps and $8500 for 9600 bps.

Circle No. 161 on Inquiry Card

DCC'S NEW MINI

Shortly after Data General was granted an injunction against Digital Computer Control's D-116, DCC announced the Mod Five mini. It is priced about the same as the D-116, but offers these additional features: an enriched single-word instruction set with new classes of instructions, overlapped instruction fetch concurrent with the execution of instructions, and triple stack processing, coupled with a vectored interrupt system. The Mod Five is available with 1200, 1000 or 800-nanosecond cycle times. Eight accumulators are standard. It is completely upward compatible with the firm's present D-116, D-116H, 216, 316, 416 and 616 minis. Existing controllers and software developed for the D-116 and D-116H will also run the Mod Five. *Digital Computer Controls, Fairfield, NJ.*

Circle No. 162 on Inquiry Card

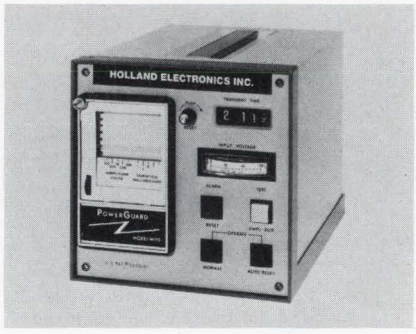
FORMS HANDLING PRINTER

With the Series 500D printers and their forms handling options, both ledger cards and cut form or continuous paper applications can be handled by changing the detachable forms handling mechanism. The series has three basic print speeds: 80, 120 and 165 characters per second at 10, 12 or 16.5 characters per inch. All models feature a 5x7 matrix, elongated boldface characters, a one-line buffer and operator-changeable forms-handling device. End-user prices range from $3530 to $5180. *Centronics Data Computer Corp., Hudson, NH.*

Circle No. 139 on Inquiry Card

POWER LINE MONITOR

The Power Guard Model W115 Transient Voltage Detector and Recorder guards against costly errors and computer data rework resulting from undetected high speed line transients caused by fluctuations in the AC line power-



ing computers. Power Guard plugs into the same AC line as the computer. When a high speed transient occurs, an alarm sounds and the amplitude and duration of the pulse are logged. Price is $1485. *Holland Electronics Inc., Brooklyn, NY.*

Circle No. 148 on Inquiry Card

CRT PRINTER

The Model H Series Printer prints 32 characters per line in a 5x7 dot matrix at a speed of 40 characters per second with 10 or 12 characters per inch. Each line can be printed in either red or black, selectively. Transmission speeds of 110, 150, 300, 600, 1200, 4800 or 9600 bps are switch-selectable. An internal strap permits selection of 7- or 8-bit character lengths, one or two stop bits, and odd or even parity. The Model H is compatible with Informer CRTs and others using RS-232 interfaces. Price in quantity of five is $995. *Informer, Inc., Los Angeles, CA.*

Circle No. 156 on Inquiry Card

PRINTER FOR SYSTEM/3

The DAC/3 Model 750 Chaintrain Printer is a 132-column, 750-lpm printer compatible with the 600 lpm IBM System/3-15. It comes with a sound deadening cabinet, single-line memory, and paper slew rate of 20 inches per second. The chaintrain printer uses character links that ride on a monorail track to ensure proper alignment and print quality. *Digital Associates Corp., Stamford, CT.*

Circle No. 134 on Inquiry Card

TAPE/DISK CONTROLLERS

Western Peripherals' (Anaheim, CA) has a single-board PE and NRZ magnetic tape controller that can mix 7- and 9-track NRZ, PE or dual-density tape units in any combination up to eight units, and 4-6-6 pack on 7-track which allows the user to dump core memory onto tape. The controller is software-compatible with all Data General Nova and Eclipse computers, DCC-116, Keronix and other Data General-emulating computers. Price of the TC-120 is $3100.

Circle No. 144 on Inquiry Card

Northeast Services, Inc. (Wallingford, CT) has introduced two disk controllers, one for floppies and one for disk packs. The floppy controller (256K to 640K bytes) features fully buffered read/write operations and 278 bytes of internal memory. The controller automatically controls head loading and removes the head from the disk surface if no operation is taking place. The floppy controller costs $713 in small OEM quantities. The large storage (27.3, 54.7, or 82 Mbytes) disk pack controller features fully buffered read/write operations and an internal memory that holds an entire sector of 220 data words. It is priced at $1425 in small OEM quantities.

Circle No. 151 on Inquiry Card

iCom, Inc. (Canoga Park, CA) offers the CF360 floppy disk controller that accommodates from one to four floppy disk drives and includes a general-purpose mini/micro interface. The controller is fully IBM 3740 and 3540 compatible and performs all formatting and deformatting, track seek/verify, cyclic redundancy check generation and verification automatically. Price is single quantity is $850.

Circle No. 152 on Inquiry Card

seminars
ADP procurement in the federal government

GOVERNMENT SALES CONSULTANTS, INC. is pleased to announce the expanded availability of their successful seminar designed for all people engaged in either buying or selling ADP equipment and related software, maintenance and consulting services in the Federal Government.

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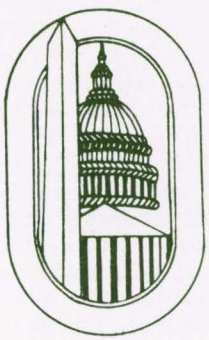

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DATA MANGEMENT FOR HP-3000

BIS/3000 is a business-oriented management system for the Hewlett-Packard 3000. It consists of a programming language (called PL/DB), the data management system, and input and output subsystems. Special features include program control statements that have been integrated with data base accessing, inverted accessing of files, and an error checking input subsystem. *Data Base Management Systems Inc., North Miami, FL.*

Circle No. 209 on Inquiry Card

SOFTWARE LIBRARY FOR DG

The Pelam Software Library (PSL/2) is a collection of subroutines used with Fortran IV on Data General computers. These routines include extensions to the Fortran IV language, "canned" solutions to common programming problems, and additional system service routines. The routines were originally written to support projects such as a report generation compiler; an interactive questionnaire composition system; a 24-hour online, multiterminal, multitasking, dedicated data entry system; and a mailing-list maintenance program. *Pelam Inc., Schiller Park, IL.*

Circle No. 207 on Inquiry Card

PRODUCTION FORTRAN

Production Fortran (PFN) provides users of General Electric's Mark III service with computer output identical to that generated by FIV, minus nonessential features like line number references in error messages, warning messages and subscript checks. It uses the same syntax as FIV. PFN is especially suited for use on proven, stabilized production-type programs currently running in FIV core image or object code. *General Electric, Vienna, VA.*

Circle No. 210 on Inquiry Card

SORT PACKAGE

CYBERSORT is a high-speed standalone or Fortran-Callable sort program for CDC 6000-series users. It accumulates user specified fields, takes subtotals and totals, and prints all headings and footings to allow immediate report generation directly from the program. The sort routine, in core or from file to file, is said to allow an unlimited number of sort keys and subtotal fields, and the record length is limited only by the available memory. *Cyber Associates Inc., Pittsburgh, PA.*

Circle No. 226 on Inquiry Card

CROSS ASSEMBLERS FOR INTEL

Xener Corp. (Alexandria, VA) makes a macro cross assembler for Intel models 8080,8008, 4040 and 4004 designed for use on 16-bit computers. The coding format is said to be identical to that required by Intel's cross assembler for 32-bit computers; thus firms which have been using Intel's cross assembler are not required to recode existing programs. Additional features are cross reference, selective listing, extended error messages, and forms control. The cross assembler is currently being used on DEC, Data General and IBM computers.
Circle No. 233 on Inquiry Card

Industrial Programming Inc. (Greenvale, NY) has an assembler linking loader system for Intel 8080 programs – INTALL. Currently available for DEC, Data General and Interdata minicomputers, INTALL comprises two programs: a macro assembler and a linking loader. The assembler accepts Intel's source program format and produces relocatable object code. The linking loader forms an 8080 load module by linking together the relocatable object code to form separately assembled subprograms. The assembler generates a cross-referenced symbol table; the loader generates a load module map. The one-time licensing fee for INTALL is $2000.
Circle No. 203 on Inquiry Card

MycroTek Inc. (Wichita, KS) has an 8080 cross assembler written in ANSI standard Fortran IV that will execute on 16-bit word computers with compilers supporting this language. It can also run on machines with word lengths greater than 16 bits. Microcomputer programs are written in 8080 assembly language using mnemonics common to the processor along with special assembler instructions. The program generates an assembled program listing and a hexidecimal object tape compatible with Intel's MCS-80. The major features of the assembler are: no disk access required; will run on an 8K machine; accepts ANSI standard Fortran IV logical unit numbers for I/O devices; two-pass assembly; and complete documentation. Price is $300.
Circle No. 231 on Inquiry Card

Micro Systems Software's (Sunnyvale, CA) one-pass assembler runs in resident mode on an 8080, assembles a compatible subset of the Intel language and generates machine code directly into memory for immediate execution. It occupies less than 2K bytes of memory and can be placed in PROM/ROM. Execution-time features include a bias-address offset for storing machine code and three output print options: print object and source, print object only, and no print. A general-purpose I/O interface is included so the assembler can fit into most system environments.
Circle No. 211 on Inquiry Card

SMALL COMPUTER DATA BASE

Version II of DRS, a data base management system for small computers, includes changes to provide support for 16 different record types, hierarchical data structures, inverted indices, and large data bases. Also included are several new commands, a data base analyzer, a programmer interface, expanded peripheral device support, improvements to the Modify and Delete commands, and a data base dump-restore utility. DRS may be operated in batch mode, interactively through the console, or on a remote terminal in a dedicated or timesharing environment. The small computer version is available for the CHI 2130, DSC Meta-4, GA 18/30 and the IBM 1130. *A.R.A.P., Princeton, NJ*

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UNIVAC 1004 EMULATOR FOR DG MINIS

The UN1004 program for Data General Nova and Eclipse computers emulates a Univac 1004 terminal and permits the user to communicate with the central site for remote job entry. The program interfaces with DG's RTOS (Real Time Operating System) and RDOS (Real Time Disk Operating System), provides full operating system support for all standard peripherals, and can also be used with disk or magnetic tape. It operates at speeds up to 9600 bps and requires 4K words storage. A one-time fee of $1500 includes relocatable binaries on paper tape, source code on 9-track magnetic tape, and the instruction manual. *Gamma Technology, Palo Alto, CA.*

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HIGH LEVEL PROGRAMMING FOR NOVA

ASGOL is a structured programming language operating under RDOS or XDOS that allows programmers to develop systems software usually rendered in assembly language. With high level constructs similar to ALGOL or PL/1, ASGOL features a stylized listing to replace the flow chart. *MDB Systems Inc., Orange, CA.*

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EFTS APPLICATIONS

Three software systems to support paperless deposit and payment services are written in ANS Cobol and are available in IBM OS and DOS, and Burroughs versions. The Social Security Deposit System provides for the automatic processing of federal recurring payments. The system will accept Social Security checks and/or Automated Clearing House (ACH) formatted tapes, split deposits between DDA and savings, produce notification of deposit, and provide branch level reporting and stop payment capability. The Guaranteed Payment System is used in connection with the Social Security Deposit System. This system provides payment guarantee options, including prespecified amount or percentage of previous transaction amount. The Reformatter System fulfills the conversion requirement for companies to provide ACH or NACHA formatted entries. The system is parameter driven and provides cross-referencing from an individual identification number to Route/transit/bank number. The price of the Social Security Deposit System is $2000; the Guaranteed Payment System is $500; and the Reformatter System is $1500. *Financial Industry Systems, Hartford, CT.*

Circle No. 205 on Inquiry Card

DOS/OS UTILITY

CS-COMP is a DOS/OS utility program which compares corresponding records on sequential and/or index sequential files and lists all differences between them. When two records being compared have differences, both records are printed, one directly below the other with asterisks appearing under the unequal positions of the records. Other features in this program make it flexible with regard to files being compared and the method of comparison. For O/S systems, the dataset information is entered via JCL. For DOS systems, the dataset information is entered vis JCL. For DOS systems, file information will be on a control card. License fee for CS-COMP is $30.00 per month for a minimum of six months. *C-S Computer Systems, Inc., New York, NY.*

Circle No. 227 on Inquiry Card

F8 MACRO ASSEMBLER

This cross assembler for the Fairchild F8 Microprocessor is designed to run on a PDP-8 computer with a minimum OS/8 operating system. The assembler will handle any size program with a maximum of 600 labels. Features include: shorthand or free form input data, formatted list output, binaries in "Fair-Bug" loader format, and a simplified instruction set. The assembler requires only 8K of memory. *Logic Systems, Santa Clara, CA.*

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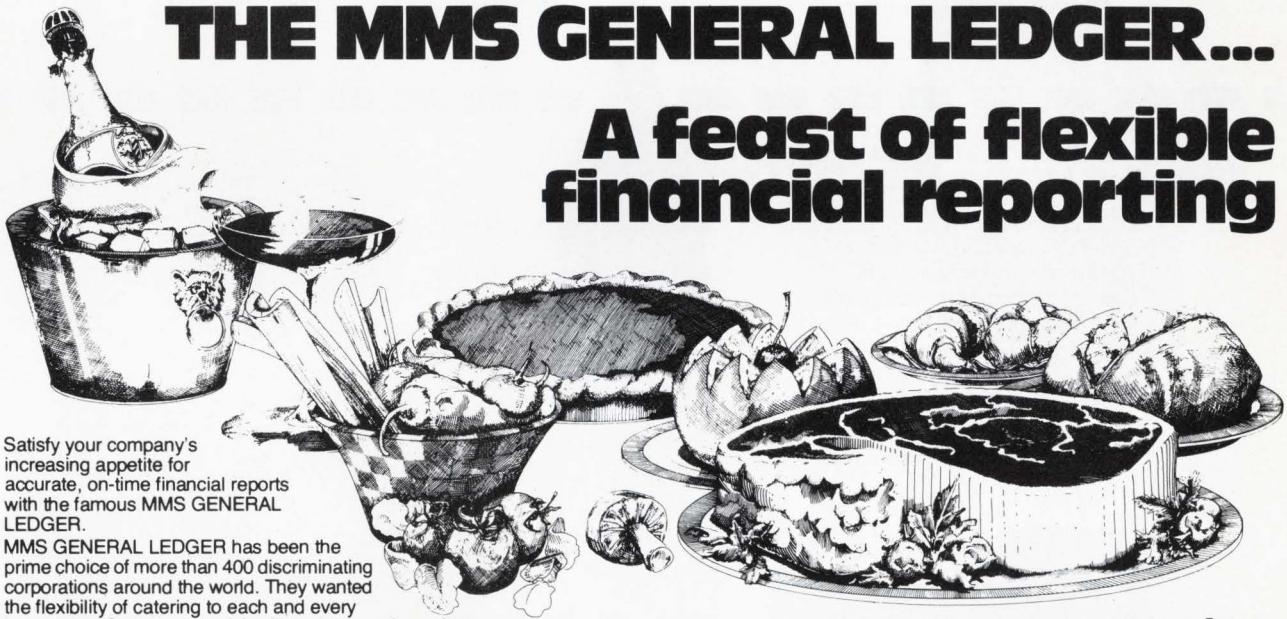

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'76 NCC Landmarks in Data Processing

Mark the place and time...New York City, June 7-10... for the National Computer Conference, a landmark event for computer professionals, applications specialists, users, business managers, administrators, educators, and others concerned with data processing.

The '76 NCC will be your one opportunity during the Bicentennial Year to hear leading experts, to see and evaluate the latest in products and services, and to confer with colleagues, customers, and industry representatives... all in one place at one time.

More than 100 information-packed sessions will analyze the latest trends and issues affecting performance, productivity, and profit. The program sessions will be organized into 10 or more major areas, or "tracks," running throughout the Conference and covering such topics as complex systems, hardware technology, software and components, system architecture, computer communications, management concerns, education and training, advanced applications, and societal issues.

In addition, the program tracks will include more than 20 special one-day "mini-symposia," each consisting of four sessions. In advanced applications, for example, mini-symposia will cover medicine and health care, banking and electronic funds transfer, and business systems. Other symposia will include such key topics as government policy, control instrumentation, performance measurement, standards, networking, privacy, legal considerations, and word processing systems.

And there's much more. The world's largest lineup of data processing products and services will be displayed on three floors of the New York Coliseum.

Included will be the latest offerings from more than 275 organizations, ranging from mainframes, minicomputers, peripherals, packaged programs, and publications, to microprocessors, memories, terminals, systems, and services. Among the exhibitors will be such leading companies as Ampex, Control Data, Data General, The Harris Corporation, Hewlett-Packard, IBM, ICC/Milgo, Lear Siegler, Modular Computer Systems, NCR, Pertec, and Xerox.

Conference registrants will also have the opportunity to attend five special Plenary Sessions featuring leading spokesmen from industry, the computing profession, and major user areas. And, for an additional fee, they will be able to choose among a number of in-depth Professional Development Seminars dealing with advanced techniques for cost-effective computer usage.

In addition, a Pioneer Day Program will honor individuals from the Moore School of Electrical Engineering, University of Pennsylvania, who developed ENIAC—the world's first electronic digital computer. All this plus a Computer Art and Graphics Display, a National Student Computer Fair, the annual Conference Reception, and many other high-interest events promise to make '76 NCC a landmark event for the entire computer industry.

Advance full-conference registration brings you the *NCC Bicentennial Card*, providing complete access to all four days of the Conference program, including exhibits. Benefits include a $15 saving over the on-site full-conference registration fee, advance housing information and forms, and a copy of the '76 NCC Proceedings. Post-conference price of the Proceedings alone is $50.

Fill in and mail the coupon below for advance registration or to get all the facts; or contact AFIPS, 210 Summit Avenue, Montvale, New Jersey 07645, telephone 201/391-9810.

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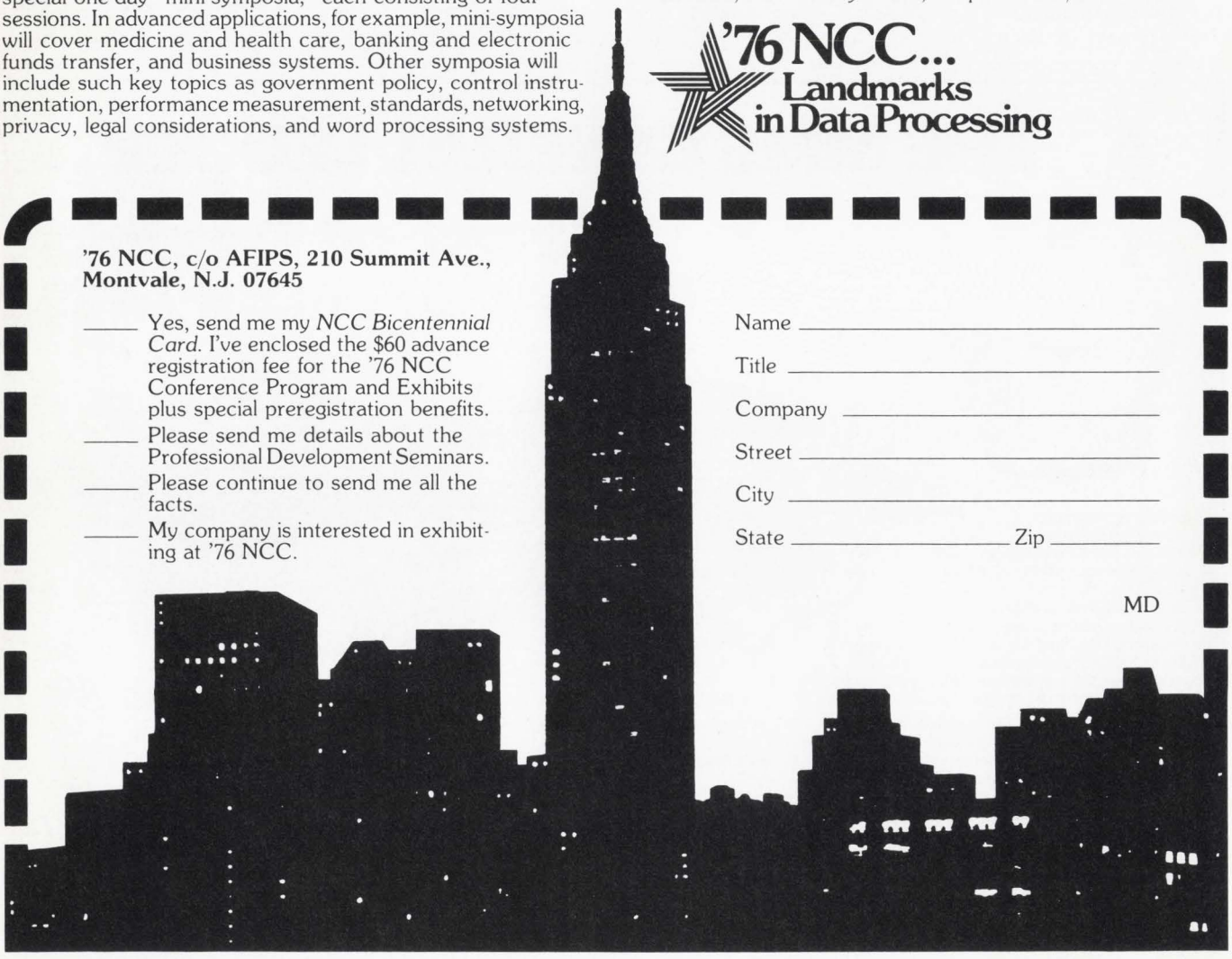

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COMPUTER MAPPING

An interactive approach to computer-based mapping, which uses a data management system to capture, manage and display graphic data including related text and numbers, is described in this 6-page bulletin. The Calmagraphic Interactive (CGI) Data Management System was designed specifically for cartographic applications. Its most important feature is its data hierarchy, which allows the user to create a unique tree structure for his particular data. This structure comprises four classes of data – drawing, overlay, domain and group – each a subdivision of the preceding classification. *Calma Co., Sunnyvale, CA.*

Circle No. 262 on Inquiry Card

HP BASIC

This 15-page booklet describes HP Real-Time Basic software for HP Series 2100 minis and Series 9600 measurement and control systems used to automate lab experiments and calculations, carry out plant-wide monitoring and control, capture data, and test products. Other topics include time and event scheduling, multi-terminal input/output, multi-user operations, distributed systems and implementation and control. *Hewlett-Packard, Palo Alto, CA.*

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IBM USERS' GROUP

COMMON, the IBM Users' Group for small computer users, is described in this 12-page brochure. Group objectives and membership information are included. *COMMON, Chicago, IL.*

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WAREHOUSE CONTROL

Automatic warehouse control systems based on the concepts of functional modularity and distributed control are covered in this 6-page brochure. Photographs and diagrams illustrate the capabilities of a new line of system modules employing both microprocessor and minicomputer technologies. Users can expand from a basic system to one including both automatic and semi-automatic operation, inventory control, data base control, online reporting, and data base protection. *Ann Arbor Computer Corp., Ann Arbor, MI.*

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COMMUNICATIONS CATALOG

This 4-page catalog describes Western Union Data Services' entire product line. Included are its Video 100 CRT terminal; 10-, 30- and 120-character per second teleprinters: TWX data terminals; magnetic tape buffer with switch-selectable speeds of 10, 30, and 120 cps; and teleprinter supplies. *Western Union, Mahwah, NJ.*

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PAPER TAPE

This 8-page booklet shows what Scandanavian design can do for paper tape. Described are tape readers, winders, handlers, and punches. *GNT Automatic Inc., Waltham, MA.*

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COMMUNICATIONS TEST INSTRUMENTS

Analog and high-speed digital communications test and measuring instruments are described in this 4-page brochure. The analog communications test sets include transmission measuring equipment, microwave system analyzers, and pulse echo test sets. *Tautron Inc., Billerica, MA.*

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RETAIL MANAGEMENT

The independent retailers' use of computers to increase sales and profitability is discussed in this 16-page brochure. POS devices and back-office methodology are described followed by program examples and comments regarding their use. *Retail Electronic Systems, Staten Island, NY.*

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PROGRAMMABLE CRT LINE

A 4-page brochure describing Ontel User Programmable Display Terminal Systems provides product specifications and a chart comparing the entire range of Ontel user-programmable CRT display terminals. *Ontel Corp., Plainview, New York.*

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COMPUTER RIBBONS

This 16-page catalog illustrates the various ribbons available for over 200 machines. Sizes, prices and ribbon materials are described. *Computer Ribbon Specialists Inc., St. James, NY.*

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DATA ACQUISITION

This 6-page application note describes the Datel DAS-16-LP low power data acquisition system and how it is used. The CMOS system accepts 16 analog channels to 12-bit accuracy and consumes 200 milliwatts while operating. Circuit drawings showing connectors to the clock and external control signals are included as well as a full timing diagram for random and sequential channel operation. *Datel Systems Inc., Canton, MA.*

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DISK UTILITY

This 17-page publication for IBM OS installations outlines how reports are produced by the Pansophic software system PAN*DA, The Disk Analysis and Data Set Management System. Reports are by volume, user group, track or multiple volume. Other reports exhibit VTOC Dump, automatically scratched data sets, automatically compressed PDSs, and more. *Pansophic Systems Inc., Oak Brook, IL.*

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free listings

Free listings are available for people and companies seeking to sell or buy or license mini/micro computer-related product-lines and/or inventions. All listings are given a key number so that the identity of the offerors remain confidential.

Send your listing (approx. 30 words) to:

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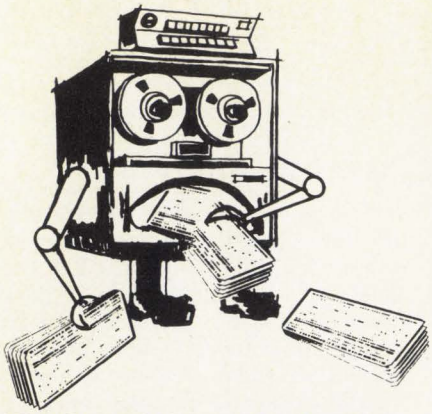

IF YOU HAVE A COMPUTER, LOOK AT THE COSTS TO FEED IT!

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We know — because we have helped other users and we can help you. Our knowledge can be obtained for $95.00 simply by subscribing for one year to DATA ENTRY TODAY. DATA ENTRY TODAY (now over 450 pages) contains descriptions of how to design and select data entry systems, and describes characteristics of all commercially available data entry equipments (keypunch, keyboard to disc, portable data recorders, keyboard to tape, intelligent terminals, optical readers, magnetic readers, factory data collection, point of sale, and alphanumeric display terminals). DATA ENTRY TODAY contains evaluations on present data entry systems. These analyses are not typical manufacturer-supplied data, but insights into the highlights and deficiencies of the system. They are backed up by a User Feedback Section in which data entry systems are rated by present users.

Included are two semi-annual report updates and monthly Data Entry Awareness Report newsletters that keep you constantly up-to-date on new data entry systems and applications. *If you have a computer, you had better know what it costs to feed it.* Send your check for $95.00 today. New Jersey residents add 5% sales tax. If you prefer to be billed, send your purchase order. (An additional 5% will be added for postage and handling.)

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