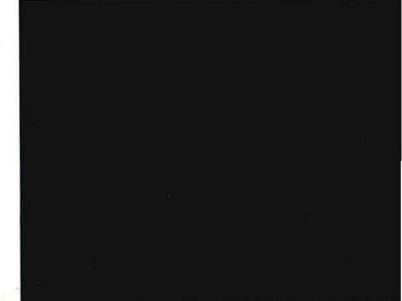
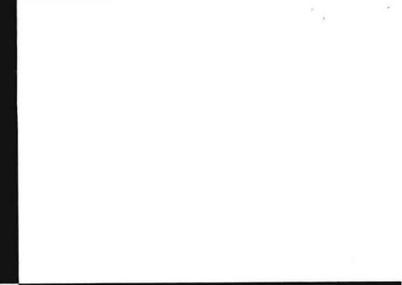
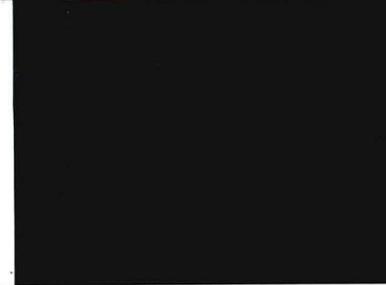
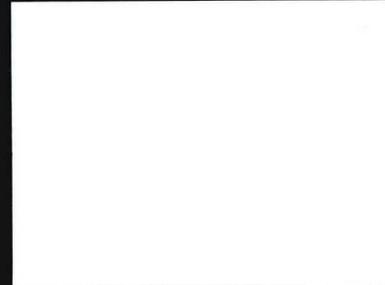
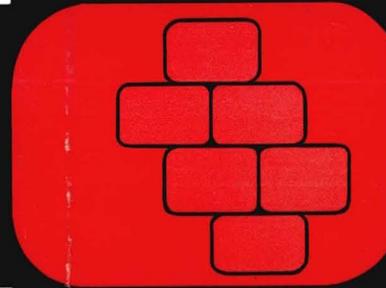
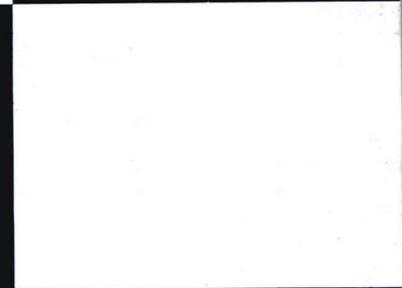
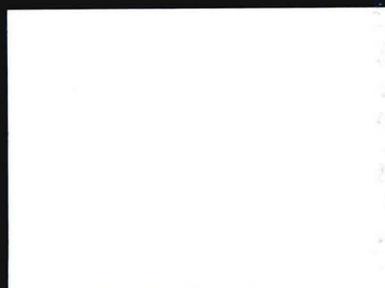


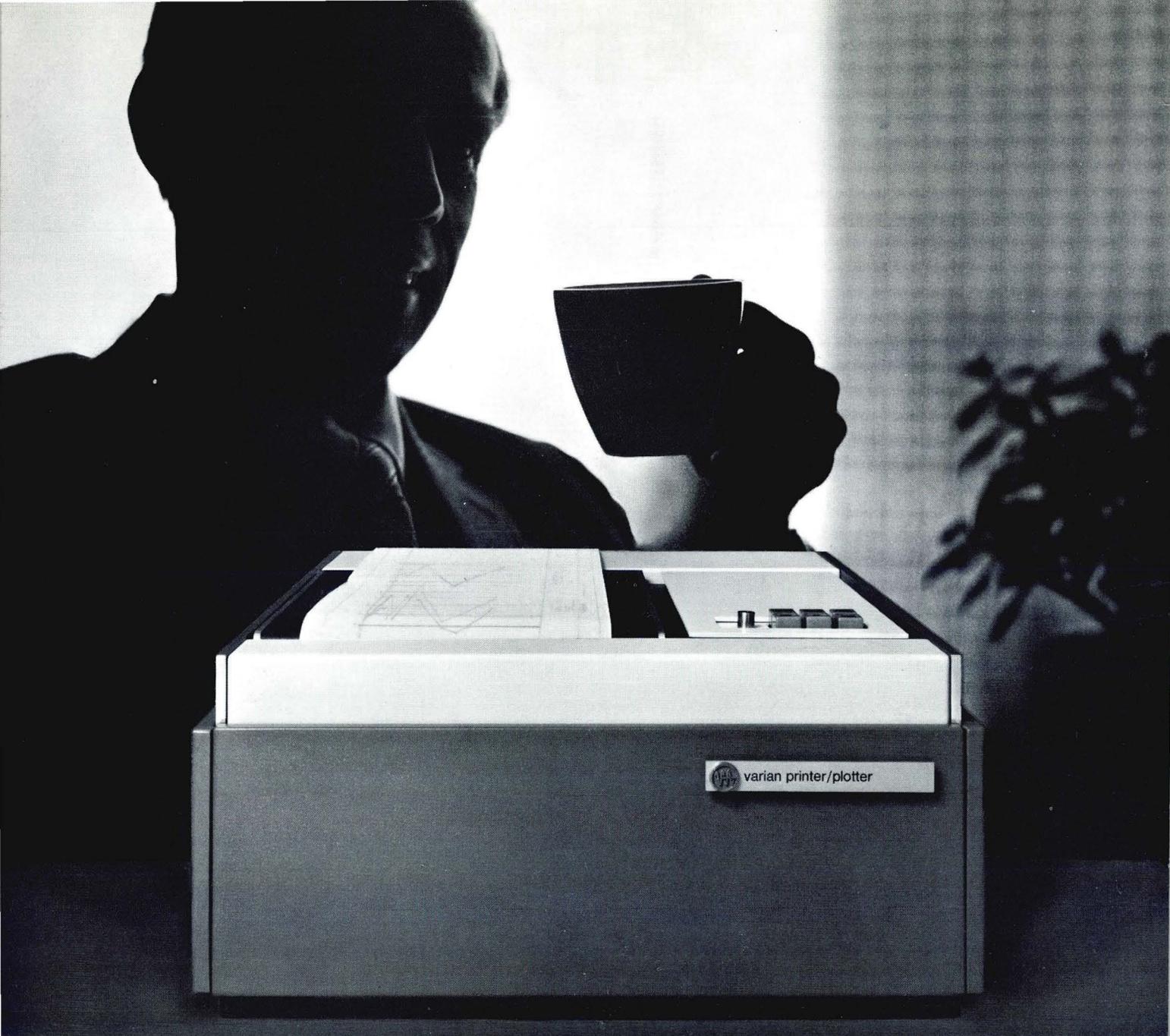


MODERN DATA

MAY 1971

PRODUCT
PROFILE:
TELEPRINTERS





Statos 21 will print 300 pages of charts, graphs, and text while the boss has his coffee.

(But he'll have to drink fast!)

This new printer/plotter, latest in a line of electrostatic devices pioneered by Varian, can deliver hundreds of pages of computer-generated text and graphics while you take a 5-minute coffee break. That's four times the speed, at half the price, of most impact printers. And it does it in a 2-foot square without a whisper.

Statos 21 page-a-second printing is a full 8½ x 11, 80 column by 88 lines page. And its turn-around time in data

processing applications is phenomenal! Just imagine: Core and tape dumps in seconds. Top management summaries generated in minutes, while bulk printing continues. Graphs printed simultaneously with alphanumeric characters, much faster than with separate printers and plotters. Card-image records and teletype-compatible listings handled with ease.

A problem solving computer peripheral—Statos 21 is plug-to-plug compat-

ible with IBM/360, Varian 620/f and other computers both large and mini. The fact is, nearly every data processing and management information system can benefit from Statos 21. So for more on the story of Statos 21, contact us at 611 Hansen Way, Palo Alto, Calif. 94303. Call (415) 326-4000.



varian
data machines
graphics & data systems division

what do you do when the inkwell runs dry?

Small thing with an automated graphics system? Maybe. But when your computer drops a bit of information? Or when your system encounters mechanical drag or interference?

Small thing? Not when you're halfway through a complex drawing that takes hours to do and your drafting department doesn't have enough time as it is.

With DATAPLOTTER® systems you don't have to worry. Back up the tape control unit to the trouble spot on the drawing, replace the ink and go again . . . it's all very casual, fast and accurate.

Small thing? Try it on other automatic plotting machines. Chances are you'll have to throw away the drawing and start over.

Most other plotters are incremental (and incidentally pretty noisy). It means that the last plotting reference was the pen's last position on the table. Disturb it and you've lost the reference. DATAPLOTTER systems operate from absolute reference all the time (and quietly). The drawing assembly backs up and repeats unerringly ($\pm 0.003''$ yet).

A small point? Maybe not.

There are other big points you ought to know about DATAPLOTTER

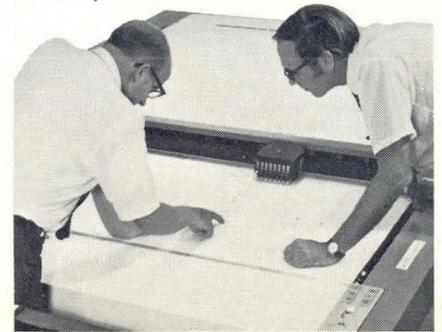
systems. Like six modes of plotting that give you built-in versatility. Like straight lines and smooth curves at any angle with no "sawtooth effect". Like resolution of .001 inch. Like 16" per second curve speeds. Like a six-foot plotting surface of the 430/200 DATAPLOTTER system. Like many packages of applications software . . . symbol drawing, three dimensional drawing, contour drawing, schematic drawing, subdivision plotting, and numerical control.

Combine the unique features of the DATAPLOTTER with our new error detection system . . . that's right, automatic, foolproof error detection . . . drop a bit, receive a line spike or even some mechanical disturbance . . . the pen lifts and the plotter stops . . . no glitches!!!!



Take our new MAPLOT package . . . annotation around curves . . . eliminates misplaced numbers, easy to read, easy to program . . . Civil Engineers have told us it's the finest sub-division software package they have ever seen.

There is more to tell about the DATAPLOTTER system than we have room for here. Further descriptive material? — yours for the asking. Just write or call Electronic Associates, Inc., 191 Monmouth Parkway, West Long Branch, New Jersey 07764. Phone: 201-229-1100 ask for Tony Glinskas; In United Kingdom: Victoria Road, Burgess Hill, Sussex, England; In Europe: 116-120 rue des Palais, Brussels, Belgium; In Canada: 6427 Northern Drive, Malton, Ontario.



ask about DATAPLOTTER Systems

and some folks still think
we just make good analog computers.

CIRCLE NO. 2 ON INQUIRY CARD

EAI graphics systems

New Tape Cassette Unit adds versatility to our teleprinter.

We can now furnish a magnetic tape unit for your General Electric TermiNet*300 Teleprinter to add fully automatic send and receive capability.

Designed as an alternative to the paper tape reader/punch option presently being supplied, the new accessory, uses standard cassettes and plugs into any TermiNet 300 Teleprinter.

The small compact desk top unit can read, write, rewind or stop with no operator present.

High speed tape transfer rates up to 1200 bps can be obtained.

Additional advantages include compact data storage, reusable tapes, and simplified editing. You can advance or reverse the tape a character at a time with local or remote controls.

This is but one of 18 available options which make the TermiNet 300 Teleprinter one of the most versatile teleprinters on today's market.

For a demonstration, contact your nearest GE Data Networks sales office. They're listed below.

Or give us a call; Dial 703-942-8161 and ask for TermiNet 300 Printer Sales
General Electric Company, Data Communication Products Department,
P. O. Box 4197, Lynchburg, Virginia 24502.

GENERAL  ELECTRIC

Terminet 300 DATA COMMUNICATION PRINTER

CIRCLE NO 3 ON INQUIRY CARD

*Trademark General Electric Company, U.S.A.



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READER SERVICE CARDS OPPOSITE PAGE 96

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If you're looking for a low-cost computer system, don't spend many months and thousands of dollars trying to put it together. Raytheon Data Systems computer peripherals are already mated to their 700-Series gp computers. A perfect match — from the beginning.

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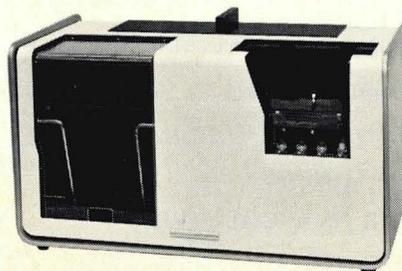
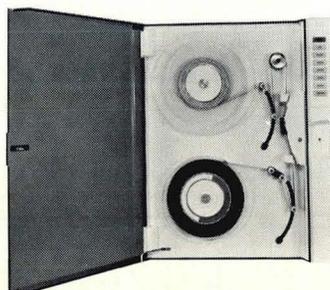
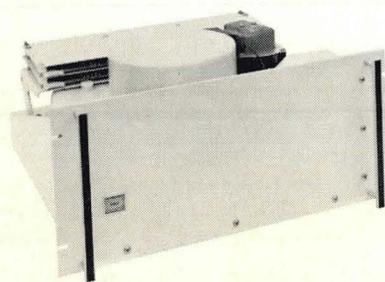
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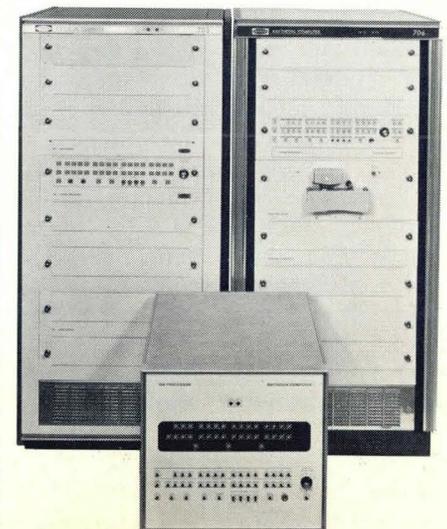
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CIRCLE NO. 4 ON INQUIRY CARD

LETTERS TO EDITOR

To the Editor:

I would like to bring to your attention certain errors which exist in your February *Technology Profile* on line printers.

On Page 64 you list Telex Computer Products as a company manufacturing a Model 5803 chain high-speed printer mechanism. The correct model number is 5403 and the printing mechanism used is a Train. This particular point is an extremely valuable one to us in that we are the only other manufacturer in the world to market a high-speed Train Printer compatible with the IBM 1403-N1. On Page 67 you make the same error. I would also appreciate it if you would correct the pricing on Page 64 for the Telex 5403 Train Printer: leasing price is \$910 per month and purchase is \$37,100.

**G. Harry Ashbridge, Vice Pres.
Telex Computer Products, Inc.
Tulsa, Okla.**

To the Editor:

With regard to the Lockheed Electronics full-page ad on Page 19 of *MODERN DATA*, March, 1971, containing the remark, "Why, on-line or off-line, our system will be so foolproof even *girls* can operate it!" I am sending a copy to my Congressional representative, Bella Abzug, so that she can ask the Equal Employment Opportunity Commission (operating under the Civil Rights Act of 1964) and the Office of Federal Contract Compliance (operating under Executive Order to insure that the federal government does not contract with suppliers who discriminate against women) to investigate the hiring, promotion, and personnel practices of Lockheed Electronics to see if the disparaging attitude toward women present in this ad in the form of weak humor is corporate policy reflected in employment discrimination.

**P. H. Trainor
New York, N.Y.**

To the Editor:

In the June 1970 issue of *MODERN DATA* (WHBW Dept.), you published ten commandments for students using their school's computer. The item was titled "The 1010² Commandments." Please advise when the remaining 1,020,090 commandments will be published, or, in the event they were published in one of the issues I did not see, please send me a copy.

**E. H. Barton
Falls Church, Va.**

The Editor's Reply: *Our usually superb supertypesetter was feeling substantially subpar when he substituted a superscript for a subscript. O.K.?*

To the Editor:

The August 1970 issue of *MODERN DATA* had an article entitled "Survey of Program Packages — Report Generators and File Management Systems." The survey was divided into six different tables. I was interested in Table 2—File Management Systems; Table 3—On-Line Systems; and Table 5—Retrieval Systems. However, I was very unhappy with the survey since 30% of the companies listed either had no telephone listing, no telephone in service, no longer offered the software package, or did not know of a software system by the name as listed in the survey.

I can only deduce that whoever conducted the survey did not investigate very deeply into each source.

**Richard E. McIntire
Hewlett-Packard
Cupertino, Cal.**

The Editor's Reply: *As it happens, these packages and their suppliers were checked quite thoroughly. Your problem probably stems from these sources:*

1. The survey was completed in June and appeared in the August issue. As you may know, the soft-

ware industry has been in a great state of flux during the past year. Companies have disappeared, moved, and merged.

2. Packages are also in a state of flux. One current source states that during the past six months, 1000 packages have gone off the market, and 650 new ones have appeared. That's about 50% of the market!

3. In some cases, we found that one department of a company might not even know of a package offered by another.

We limited the amount of data on company addresses, etc. because of space and because hard-copy inquiries often tend to find the correct point of supply with more success than telephone calls. However, if you are especially interested in one or two packages in the survey that you were unable to trace, let us know what they are and I should be able to fill you in.

K. Falor, Contributing Editor

To the Editor:

After reading Larry Martin's letter [re. "MIS Folklore" by contributing editor Ken Falor, *MODERN DATA*, Dec., 1970] in the March issue of *MODERN DATA*, I am prompted to request an article by Mr. Martin. My money says it will be very stimulating reading.

**Edmund DeWan
Automated Graphic Technology
Champaign, Illinois**

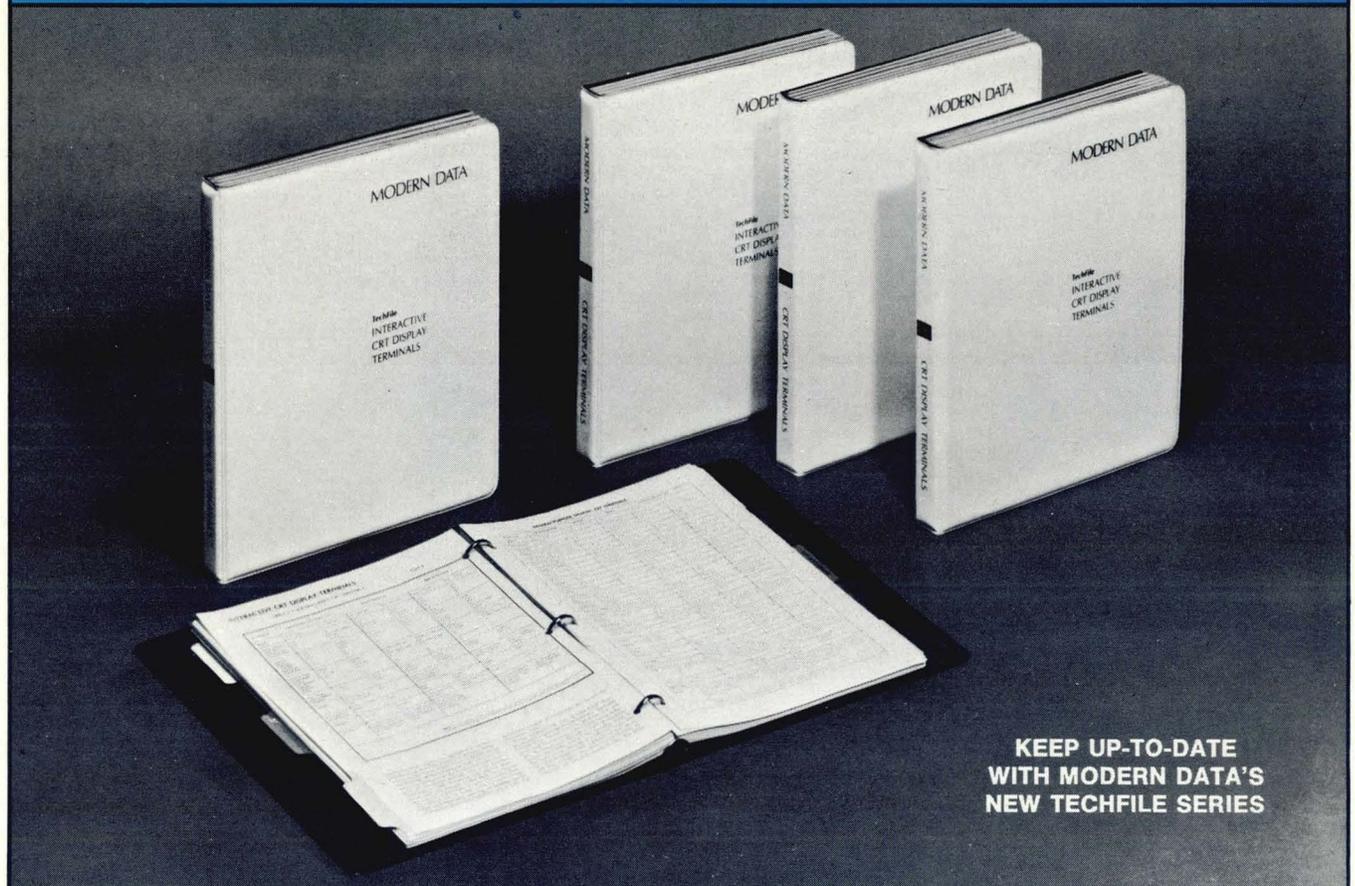
The Editor's Reply: We second your suggestion and have invited Mr. Martin to provide *MODERN DATA* with an article.

To The Editor:

Excellent job on MIS FOLKLORE — AN OPINION. Would like to see Mr. Falor tackle another folk myth — DATA BASES.

**Russell Bowen,
Systems Programming
Aetna Life & Casualty
Hartford, Conn.**

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So you can plug a single Videomaster terminal, or even a whole cluster, with optional printers, into your system and no one will even notice the change.

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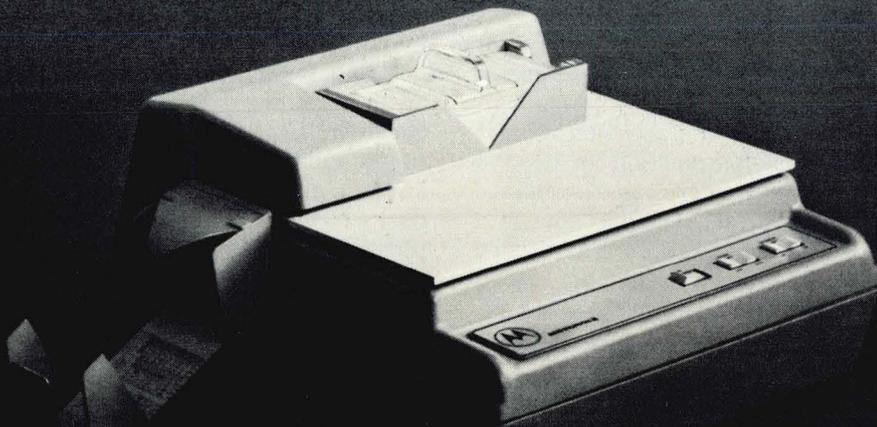
If you've been having problems finding, training and keeping keypunch operators, maybe we have a solution. The MDR Series Document Reader. It gets the job done when you want it, how you want it, and at a cost far lower than you are now paying.

Source data collection and conversion to machine language can be achieved automatically. If your system is built around the IBM-029, our reader can easily convert pencil marked data to a deck of punched cards. Automatically. Without error. Without a keypunch operator.

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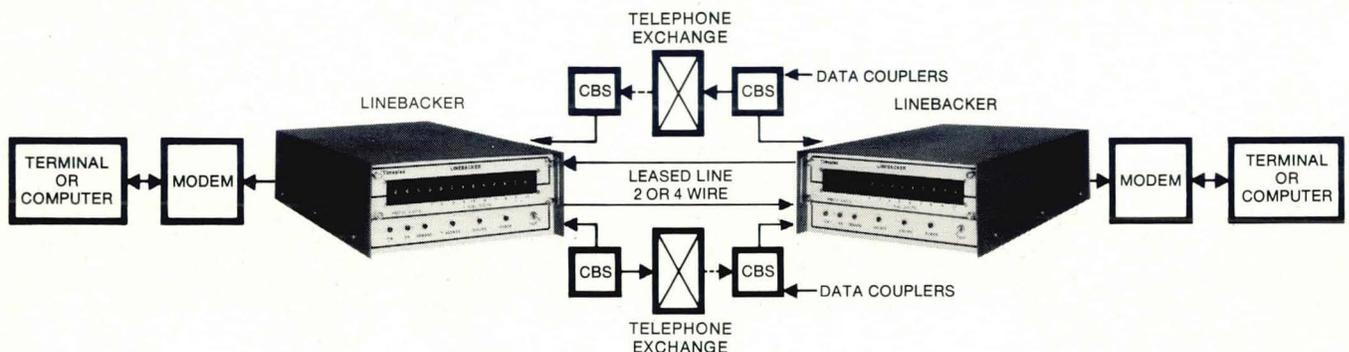


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makes mistakes,
takes coffee breaks,
or needs a
vacation.**



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EDITORS' JOURNAL

Brief reports about visits made by members of MODERN DATA's editorial staff to companies in the EDP community will be issued from time to time. This report covers a recent visit to the West Coast by John Murphy, Associate Editor.

DENVER

Hewlett-Packard is advancing at both ends of the EDP power spectrum. At the low end, their Loveland, Colorado, calculator group has added another peripheral to a growing line of devices supporting the 9100 Programmable Calculator Series. This new addition is the 9107A Graphic Digitizer — a unit capable of inputting X-Y coordinate data to the 9100. The Loveland staff sees a large market for programmable calculator systems where on-location, easily accessible (and programmable) computing power for mathematical and statistical problems is needed.

S.F. BAY AREA

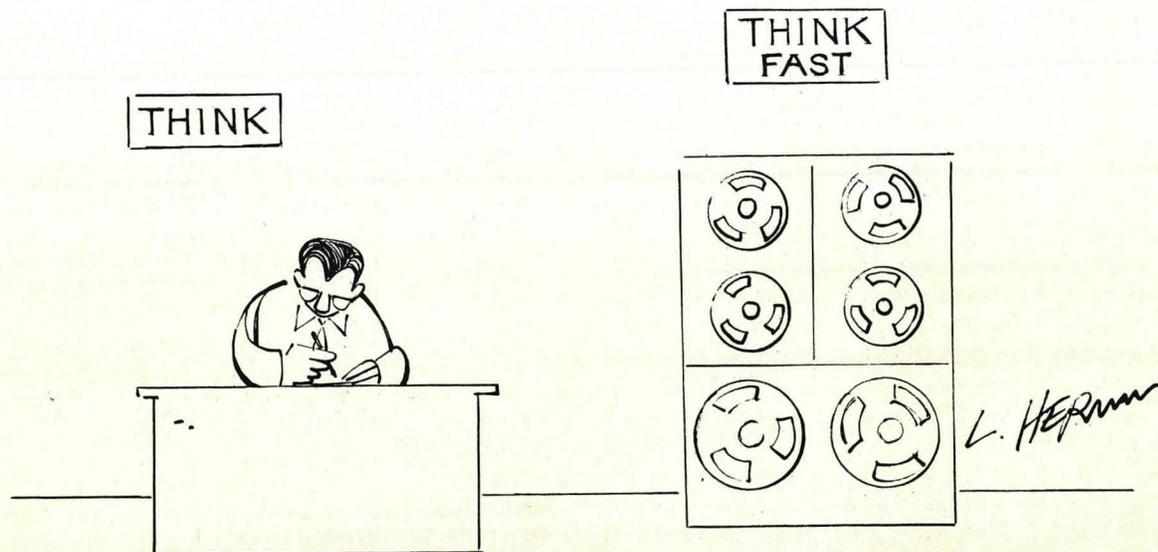
At the high end, Hewlett-Packard's Cupertino California operation will be introducing a new time-sharing system, fully supported by per-

ipherals, applications packages and other software, training, and maintenance services. The new system is intended for in-house time-sharing and will handle a wide variety of tasks such as electronic circuit and systems analysis, production scheduling, financial reporting and analysis, test control and statistical analysis, market analysis, and computer-aided instruction.

Another Cupertino firm, Four-Phase Systems, is offering a systems approach to tying in CRT interactive displays to large data bases. Their System IV/70 combines an all LSI processor with up to 32 CRT displays to provide a front-end, I/O system to IBM 360/370 data bases. The IV/70 is fully supported by a range of peripherals and services.

PORTLAND, OREGON

North of the San Francisco Bay Area, Tektronix at Beaverton, Oregon, is expanding its line of interactive graphic CRT display terminals. The new 4002A terminal will have split-screen capability and expand upon the features of the 4002. The previously introduced scan converter, light pen, and hard copy output units are finding good markets in the OEM as well as in the present Tektronix terminal user area.



We have the widest line of memory systems in the world.

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After all, we make more kinds of memory systems than anybody in the world. Memory systems that wind up as original equipment in some of the best computers made.

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Our drum role:

First, there's our CLC-1. A 10" genius if there ever was one. Just made for mini computers.

You can get our AB series in 10" and 18" models. It's a pair of drums nobody can beat.

Then there's our CD series. The 10-inch model remembers twice as much as it used to. And has a transfer rate that's double what it was before. Or for a truly mind-expanding experience, we also have an 18" model. You can imagine what it can do.

Do we make disc drives, you say? Boy, do we make disc drives. We've got a brand-new one called the 2200. It's plug to plug compatible with IBM's 2314 and 2319. We also make a smaller model, the 1100, that's every bit as good. Every bit as compatible.

With the 720 mini-controller, you just unplug one Bryant drum and plug in another

with the larger capacity you're looking for. Or you can leave both drums hooked up. Or add drums.

With the 720 you can interface up to eight of any Bryant drums made. With almost any mini computer made.

As you grow, you just keep plugging. All the way up to 608 million bits.

That ought to make your mind reel.

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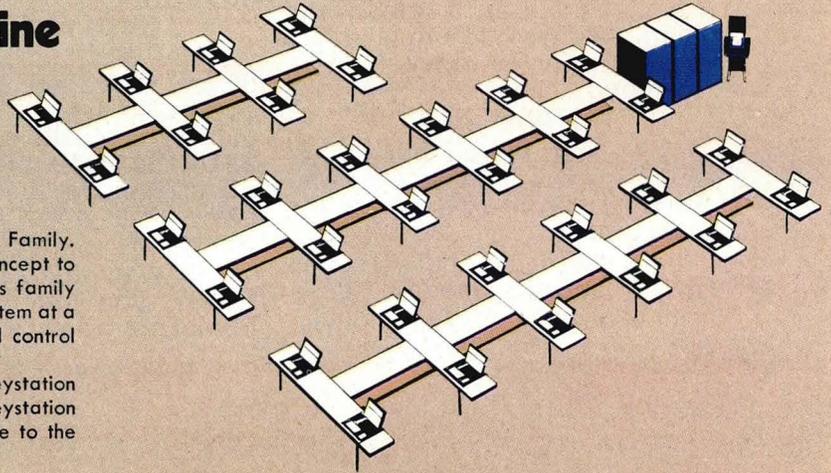
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This is the KEY-EDIT model that made Consolidated Computer a world leader in data input equipment. Introduced little more than a year ago, more than 100

KEY-EDIT™ systems are installed and working in cities throughout North America and Europe. And they're serving an equally diverse mixture of government, industry and business.

KEY-EDIT is known to these users as "The Incredible Reducing Machine" because it reduces data preparation problems to an absolute minimum. KEY-EDIT 100/100 combines all the advantages of the shared-processor with powerful editing and control features.

The KEY-EDIT 100/100 is now available with a variety of newly designed data stations with many optional configurations and new model colors.

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The Incredible Reducing Machine for communications and remote editing.

This communications-oriented addition to the KEY-EDIT™ family, with powerful control and editing features as standard, can be tailored to a variety of user processing needs.

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With a powerful editing and control processing capability, the 100/145 becomes a high-performance introductory system to large users for evaluation and specification development.

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CIRCLE NO. 10 ON INQUIRY CARD

CPMA PETITIONS FOR WWMCCS

Three years ago, the ambitious Dept. of Defense program to acquire and link some 100 computer systems into a single "World Wide Military Command and Control System" (WWMCCS) was welcomed by the entire EDP industry as representing about \$150-175 million in potential awards. That was the "old" WWMCCS. Since then, most of the originally-proposed systems have been single-sourced to IBM and, for the package of 15 systems which remains to make up the "new" WWMCCS, bids are still being solicited only from mainframe suppliers.

All this recently prompted the Computer Peripheral Manufacturers Association (CPMA) to petition U.S. Comptroller General Elmer B. Staats to stop the WWMCCS program immediately, put aside any present WWMCCS awards, and initiate a congressional investigation into "violations of federal procurement laws, regulations, and procurement ethics in respect to the Executive Branch of Government."

The CPMA wants DoD forced to break out peripherals from the overall system RFP. The CPMA argues that IBM should have been disqualified from bidding on WWMCCS hardware after being called on to design the system and write its specifications, "which allowed IBM to design the system around IBM computers, peripherals, terminals, software, displays, communication, and integration for IBM's sole advantage." By permitting this, says the CPMA, "DoD has allowed IBM, without any competition, . . . to install about 75 of the original systems."

COMPUTER HISTORY

An audio-visual exhibition of old and new computer artifacts has been opened to the public at IBM's Madison Avenue headquarters in N.Y.C. Entitled "A Computer Perspective," the IBM sponsored exhibit features a 48-foot, glass-enclosed wall of historically significant computer memorabilia that includes hundreds of devices, documents, and photographs dating back to 1890—the year of the first mechanized census.

CDC TOTAL SERVICE OFFERING

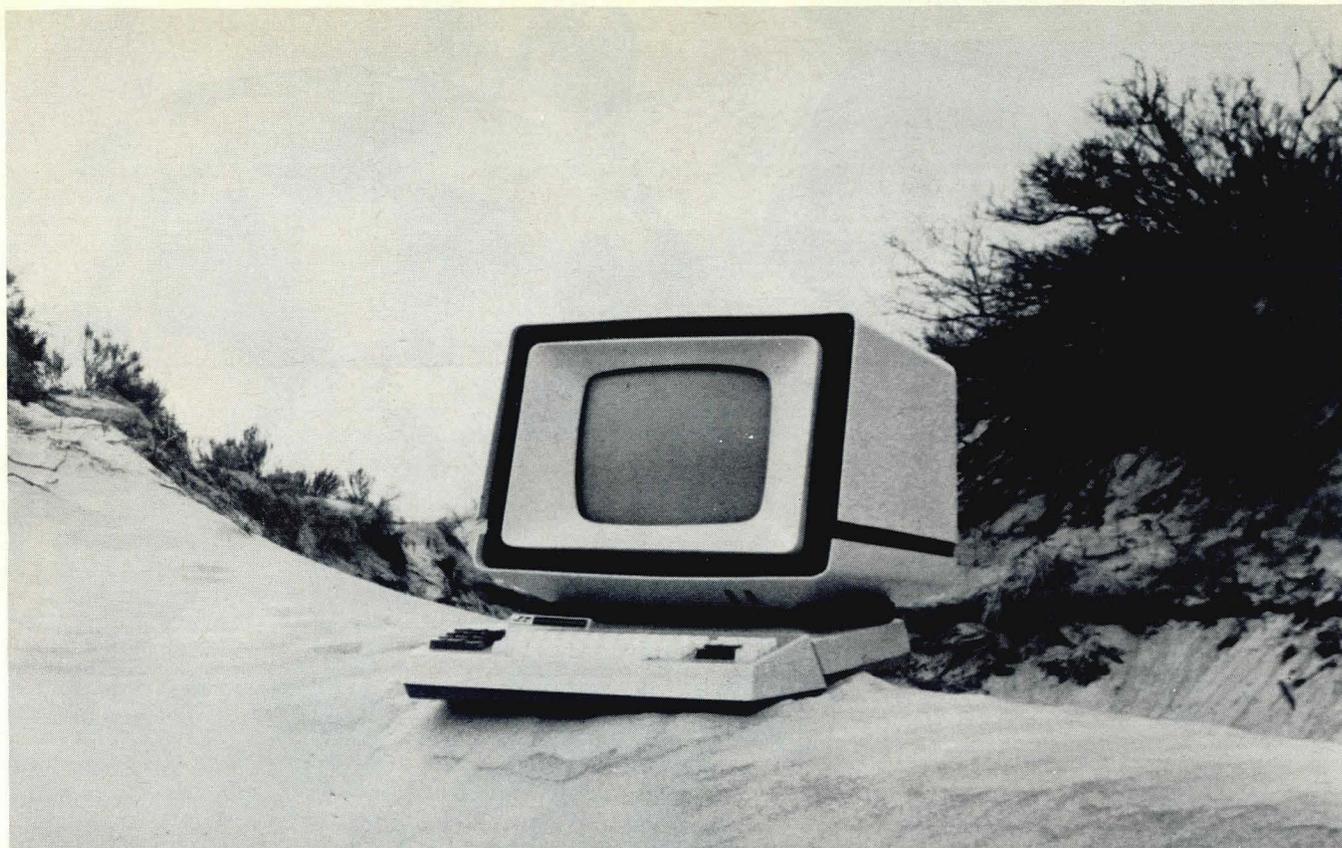
CYBER 70, a new family of systems and products from Control Data, will be offered to support CDC's CYBERLINK concept of distributed processing via the company's CYBERNET nationwide network of more than 30 data centers. Included among the new CYBER 70 products are four CPUs, a disk subsystem, a batch terminal station, a high-speed communications subsystem, and three new stand-alone display and printer terminals. CYBER 70 systems will be supported by CDC's SCOPE and KRONOS operating systems, and will, of course, be fully compatible with the CDC 6000/7000 series.

ORGANIZATION FOR BLIND PROGRAMMERS

A new international cooperative organization has been formed for and by blind programmers. Visually Impaired Data Processors International (VIDPI) will publish a periodic newsletter in Braille to keep its members up to date on Technical developments, investigate ways to secure governmental funding for research on ways to aid blind programmers, and establish a counseling service. For further information about VIDPI, contact: **Richard J. Snipas, Bradford Computer & Systems, 220 East 42nd St., New York, N.Y. 10017.**

ALTERABLE ROM PERIPHERAL

Read-Only Memories (ROMs) in minicomputers allow users to structure their machines internally, tailoring them to dedicated applications. The problem arises if and when the ROM "micro-program" must be changed; most ROMs can be altered only with special equipment, and changes are always expensive. A new plated wire peripheral from Memory Systems, Inc. of Hawthorne, Cal. now promises to eliminate this difficulty. MSI's EAROM (Electrically-Alterable Read-Only Memory) can be altered on site under keyboard or console control as often as necessary—then locked-out to refunction as a conventional ROM. MSI presently has EAROMs available in 1K to 4K, 16-bit, plug-in configurations for more than a half-dozen minicomputers.



The world's #1 display (and #2, #3, #4, etc.)

Because it's fully programmable, the SPD™ 10/20 can assume any number of clever disguises . . . without requiring a single change in central site software.

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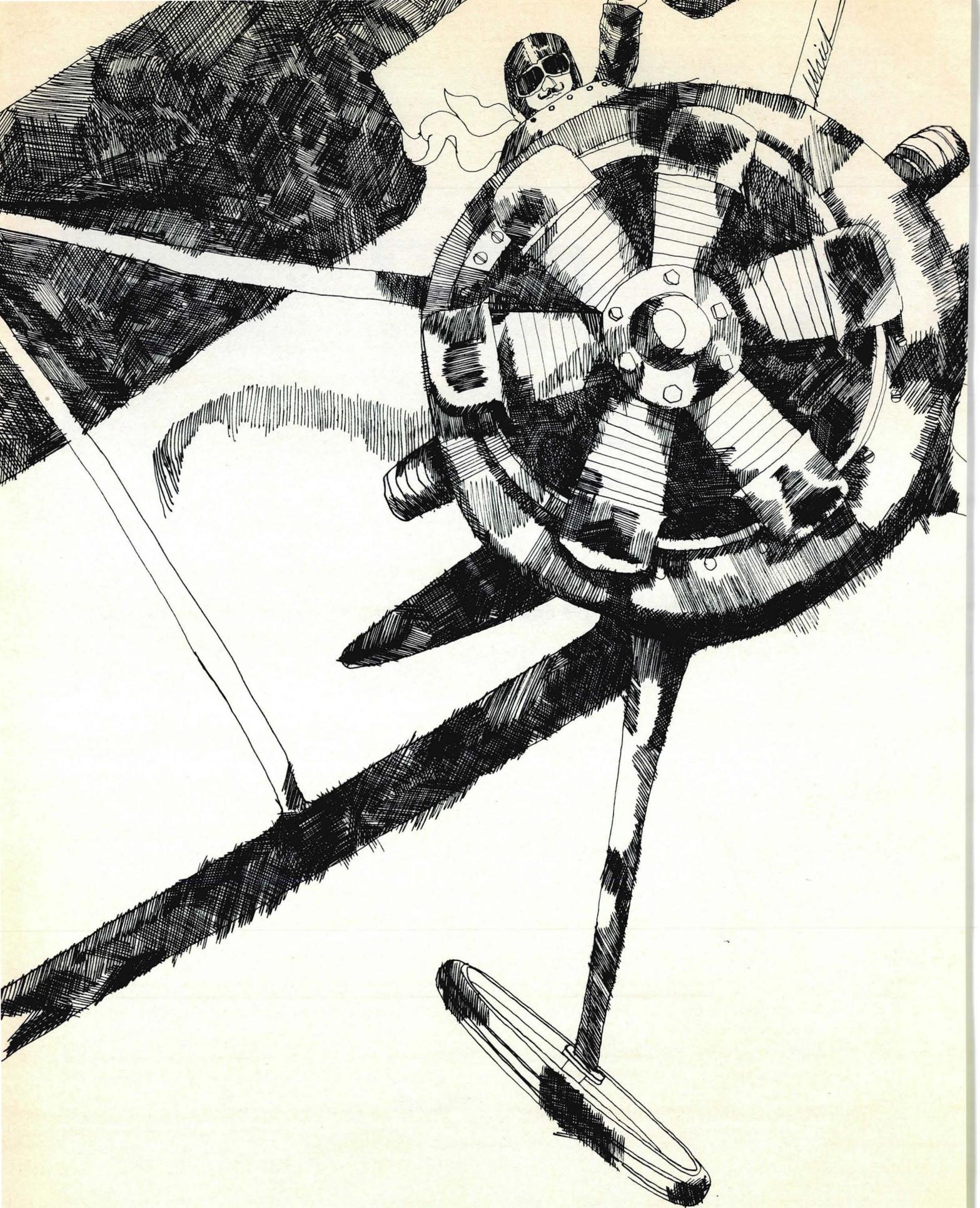


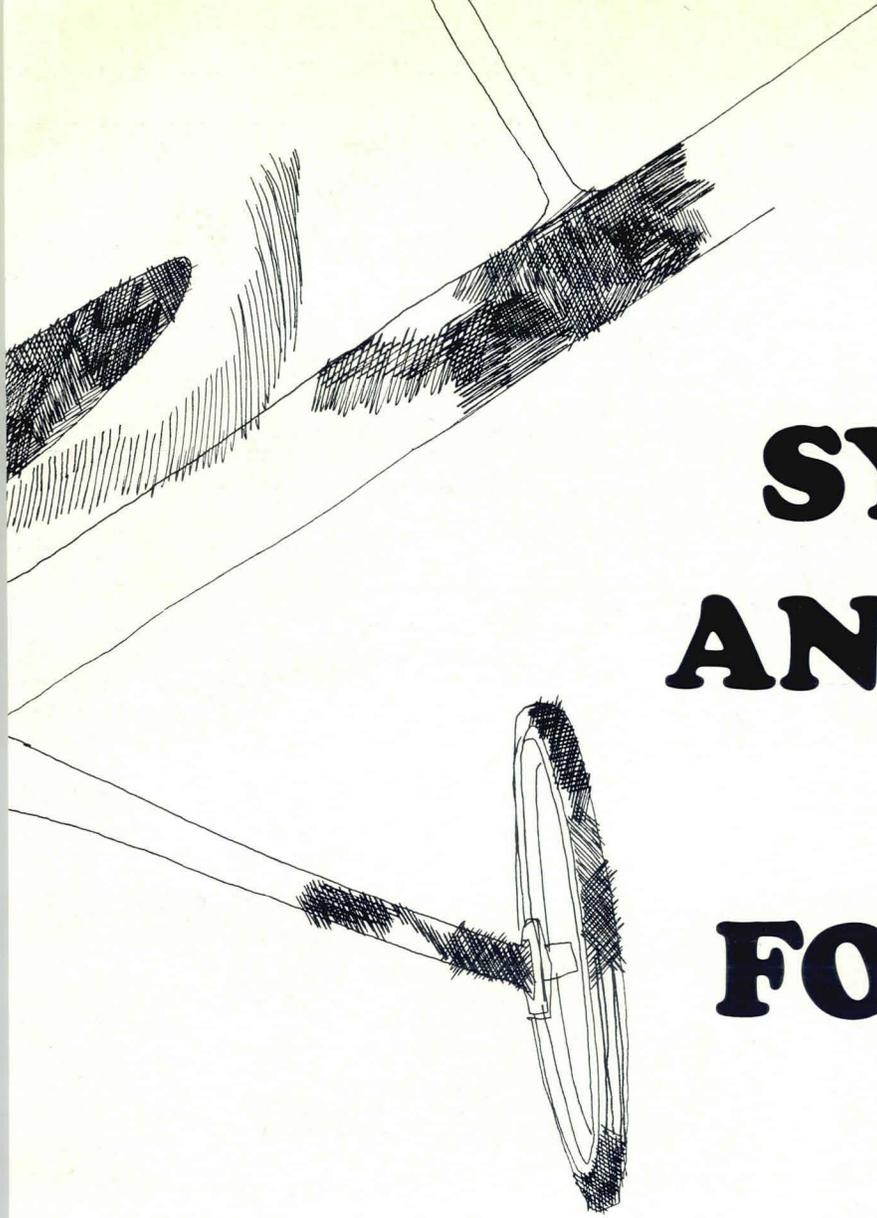
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ORDERS AND INSTALLATIONS

Computer Communications, Inc. has been selected to supply the Midwest Stock Exchange Service Corp. with a nation-wide computerized high-speed message switching and brokerage data processing network. CCI values the original phase of the contract at \$1.2 million.

Potter Instrument Co. has been awarded a contract by the Defense Supply Agency of DoD for the lease (with option to purchase) of more than 300 magnetic tape and disk units valued at approximately \$5 million.

Hybrid Systems Division of Digital Resources Corp. has signed a contract with Volkswagenwerk AG in Wolfsburg, West Germany for the sale of three SS-100 Analog Hybrid computers valued in excess of \$775,000. The SS-100s will be used for R&D activities.

The U. S. Postal Service has awarded a \$1.1 million contract to Recognition Equipment Inc. for development of a Code Sort Optical Character Reader capable of handling up to 600 letter-size envelopes a minute. The contract is in addition to a \$6.9 million contract awarded REI in 1970 for development of an Advanced Optical Character Recognition system.

Core, Ltd., a British sales and marketing distribution firm, has signed a \$3.7 million marketing agreement with Centronics Data Computer Corp. The agreement requires Core, Ltd. to purchase at least 2,000 Centronics Model 101 line printers and related spare parts and accessories over a three-year period starting in the second quarter of 1971.

TRW Controls Corp., a Houston-based subsidiary of TRW, Inc., has contracted to purchase \$5 million worth of Xerox Data Systems' Sigma 3, Sigma 5, and Sigma 7 computers for use in electrical utilities energy management and pipeline control systems.

SofTech, Inc. of Waltham, Mass. has received a one-year, \$99,000 extension of its existing contract with the Air Force Materials Laboratory to continue its maintenance of the Public AED System. AED is a high-level, modular, machine-independent software development system created by SofTech's founders.

Pulse Communications, Inc. of Falls Church, Va. has announced receipt of a \$140,000 contract from the Washington State Patrol for teleprinter controllers and modems for use on a new message switching network being installed this spring. The new network will link local, state, and federal law agencies with each other and Washington State computers.

Honeywell Information Systems has been awarded a \$6-million contract for installation of direct data entry equipment at three new Internal Revenue Service regional tax processing centers. The new contract builds on a seven-center, \$21 million, IRS project which began two years ago and covered a total of 3,390 Datanet 770 key station terminals. More than 700 terminals are involved in the new contract.

Computing and Software, Inc. has announced that NASA's Goddard Space Flight Center has exercised an option to renew its existing contract with C&S for one year. This is the first of two one-year options written into the contract, each valued at approximately \$6.1 million.



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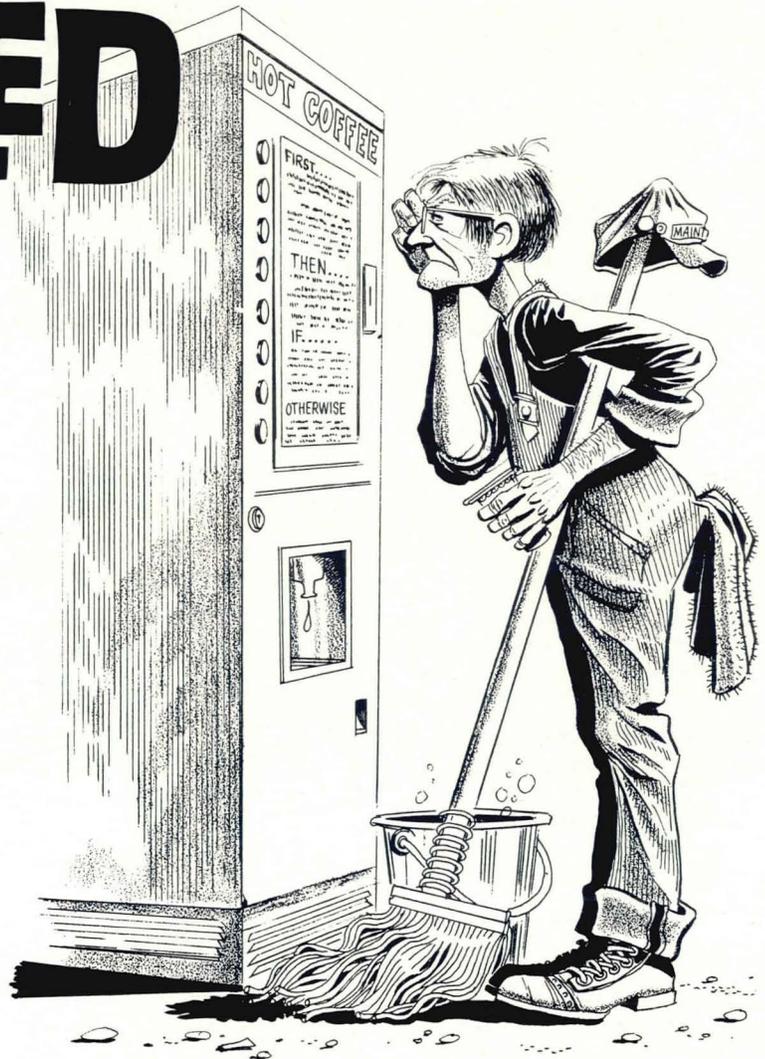
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MODERN DATA/May 1971

CIRCLE NO. 13 ON INQUIRY CARD

D C DATASCAN

A VICTORY FOR THE INDEPENDENTS — After more than 4 years of study, the Federal Communications Commission has formally adopted rules prohibiting regulated common carriers with annual revenues of \$1 million or more from offering services that compete with those offered by independent EDP firms. The carriers will be allowed to provide EDP services only through affiliates which have been completely separated from the parent company. In addition, "The affected common carrier shall not promote or sell data processing services on behalf of its data processing affiliate; shall not allow the affiliate to use the name or symbol of the carrier in the affiliate's name or promotion of its activities; shall not itself obtain data processing services from its data affiliate; and shall not sell, lease, or make available to any other entity any capacity or computer system com-

ponent which the carrier uses to provide its own communications services."

The Commission began its study of the computer-communications problems with an inquiry notice released Nov. 10, 1966 (7 FCC 2d 11 (1966)) in which the Commission asked for comments on a wide range of issues including the nature and extent of regulatory requirements, the need for additional common carrier facilities, and protection of privacy. In a Tentative Decision and Notice of Proposed Rule Making (FCC 70-338, April 3, 1970) the Commission estimated that there are about 800 service bureaus offering data processing services through some 2,000 branch offices; that annual sales are expected to climb to \$1.2 billion by 1972; that about 5,000 data processing companies have sold excess computer time and capacity in their systems; and that over 1,000 banks offer data processing services to customers.

ARMY INVENTORIES — The Comptroller General has reported to Congress that the Army has been scheduling physical inventory work loads at depots without adequate consideration of available EDP resources. The report indicated that "Generally, overscheduling or underscheduling was caused by the failure of inventory control points to adhere to reported depot capabilities because they did not provide the EDP support needed or did not have a proper understanding of the procedures."

Improvements in Army inventory controls are certainly needed. In 1969, because the inventory records were wrong, \$830 million, or 27.7 percent of the \$3 billion Army inventories in the continental U.S., were adjusted up or down. In other words, the Army thought that it had \$439 million of inventory that did not exist, and found \$391 million of inventory it did not know it had. Army inventories in Europe were in worse shape: adjustments of \$643 million were necessary — an error ratio of 58 percent for an average inventory of \$1.1 billion.

COMPUTERCIDE — The number of bombings in the U.S. — some 4,330 in 15 months — underscores the need for business and industry to take steps to prevent "computercide," Rep. John M. Murphy (D-N.Y.) recently told the House of Representatives. Computercide, he explained, is the destruction of computer centers. Louis Scoma, Jr., President of Data Processing Security, Inc., Hinsdale, Ill., is quoted by Murphy as warning that the "guerrilla war" against business establishments is feeding on recent success and will certainly widen its thrust in the months to come. Computer centers and data banks, it was pointed out, should be separate facilities within a company, otherwise they are easy prey for destructive attacks.

IN BRIEF

National Science Foundation is seeking a firm in the D.C.-area to provide systems studies, programming, keypunching, and initial monitoring of systems performance. Approximately \$150,000 is involved for the one-year project. An award is expected July 15.

Records of significant plant pests intercepted at U.S. ports of entry are now being computerized, the Dept. of Agriculture reports.

The U.S. Postal Service plans to expand its "mailgram" experiment by installing a third-generation computer facility at Middleburg, Va.

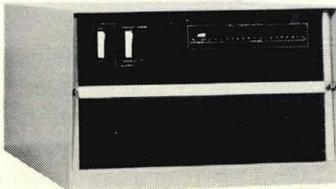
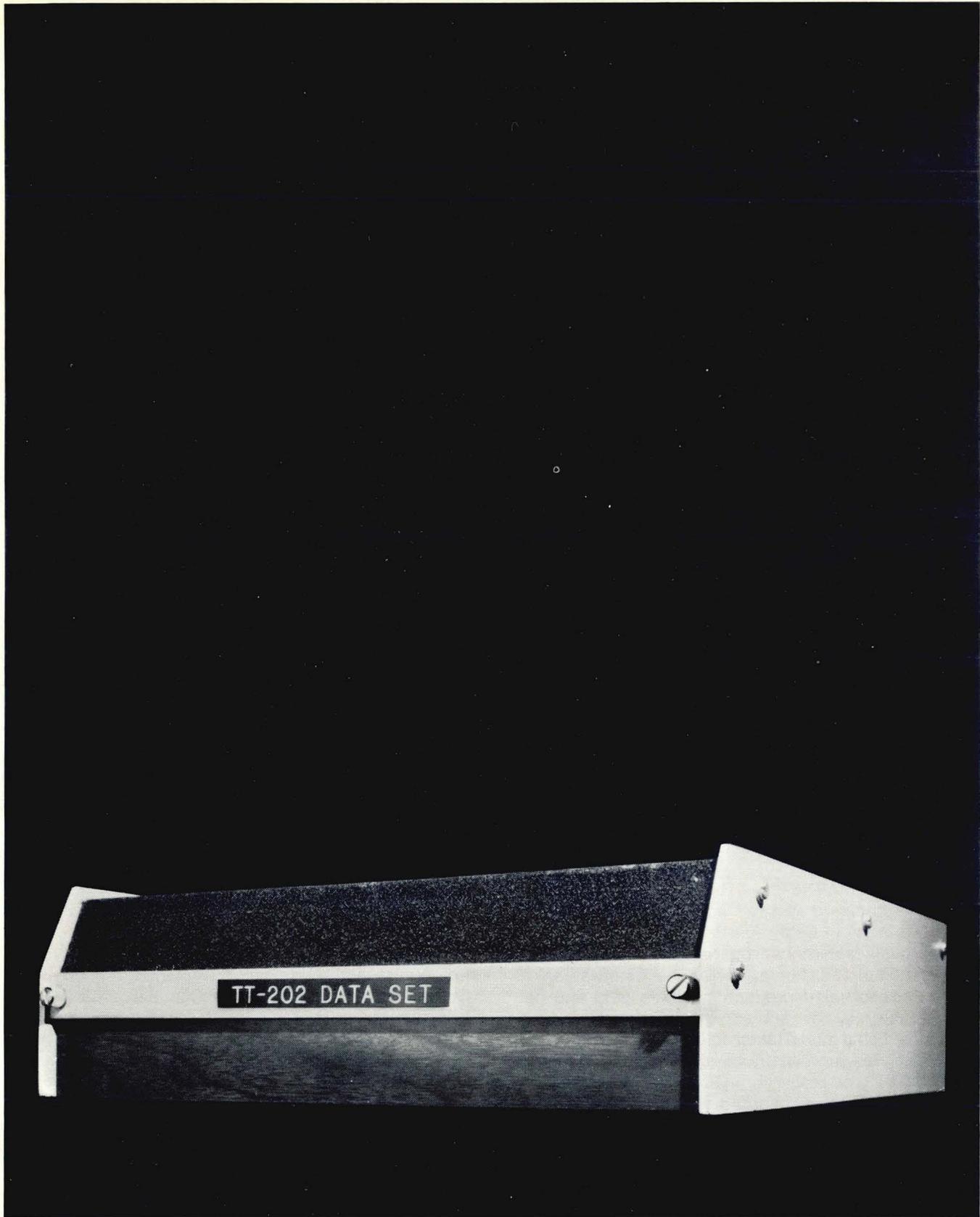
The Civil Service Commission will experiment with a government-wide computer-based program to match talents of mid-career (GS 12-15) employees in personnel management and industrial relations occupations against agency manpower needs for specific skills.

A new Labor Dept. film on how computers help public employment service offices provide better service for employers and jobless applicants is now available. "To Fill A Need", a 26-minute color-sound film on Job Banks, is available free-of-charge to employers and civic groups through state employment security agencies.

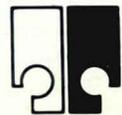
A 78-page "Guide to the 1970 Census Data and Map Products and Evaluation of their Utility in Computer-Assisted Analysis," prepared at the Univ. of Washington for the National Science Foundation, is available for \$3.00 from the National Technical Information Service, Springfield, Va. 22151. Request document PB-196 331.

The Wage and Hour Division of the Dept. of Labor is considering new regulations which would broaden the traditional tests for determining coverage of professional employees under the Federal Labor Standards Act. One area under consideration is the application of the regulations to computer programmers.

President Nixon has called upon the judiciary "to take advantage of many technical advances, such as electronic information retrieval, to expedite the result in both new and traditional areas of the law."



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MODERN DATA/May 1971

CIRCLE NO. 14 ON INQUIRY CARD

INTERNATIONAL NEWS

USSR LAG — Lack of centralized planning is one of the main problems hindering the development of computers in the Soviet Union, reports Dr. Barry W. Bohem, Rand Corp., after a two-week tour of USSR computer centers. However, Dr. Bohem believes the USSR has the raw technical potential to achieve something near parity with the U. S. within 10 years. While Soviet computing has suffered from a serious lack of equipment and from virtually nonexistent support services, Dr. Bohem found that in certain high-priority areas, such as space and military activities, the Russians were "less far behind." The USSR's best general-use computer is the BESM-6, with a 32,000 word core memory capable of 500,000 operations a second. It is estimated that the USSR has 5,500 to 6,000 computers compared to 24,000 in Western Europe and 63,000 in the U. S.

ICL ON ITS OWN — U.K.-based International Computers Ltd. will no longer be favored with the margin of preference under which the British Government previously accepted bids of up to 25% more for the ICL label. But ICL says it welcomes the new policy, supporting Minister for Industry Sir John Eden's view that "ICL is perfectly capable of standing on its own feet." ICL believes its early commitment to government systems has not only earned the company its dominant position in the U.K. government market, but succeeded in building for it an almost impervious wall of government systems expertise. As a result, ICL views the new government policy as affording it an opportunity to certify its credentials in an open market.

NORWEGIAN MARKET — The outlook for sales of EDP equipment in Norway appears promising, the U. S. Embassy in Oslo reports. Many sectors of Norwegian business are investigating the use of computers in their areas. For example, the Embassy says, computer-controlled production of the pulp and paper industry is the subject of a research project presently being undertaken jointly by a paper company, the Research Institute of the Paper Industry, and SINTEF (the research institute at the Trondheim Technical University). Three time-sharing companies have, moreover, been established in the last year and a half, and it is considered likely that more companies will offer such services in the future.

SINGAPORE SYSTEM — Gammon South East Asia Berhad, a large engineering and construction company located in Singapore, has completed what is described as "one of the most powerful computer installations in Southeast Asia." The system, an NCR Century 200 utilizing Card Random Access Memory (CRAM), will be used in a management information system designed to assist in the planning and supervision of building projects.

GERMAN COMPUTER BOOM — There was a 25 percent increase in 1970 over 1969 in computers in the Federal Republic of Germany, the New York "Journal of Commerce" reports. The total number of medium to large-sized machines is estimated at 8,000 — about half being made by IBM. Siemens is second with about 15 percent of the market. Siemens claims it now fills one of every four big computer orders in Germany and predicts a 1970/71 turnover topping \$235 million based on a present backlog of \$275 million. Planned federal expenditures of \$50 million annually, plus similar sums by the larger states of West Germany will result, it is believed, in domestic public computer outlays of over \$250 million yearly for the next two or three years.

RESTRICTIONS CONTINUED — Export restrictions issued temporarily in Dec. 1970 against Logatronik GmbH Vienna, Austria, have been continued by the U. S. Dept. of Commerce. USDC's Bureau of International Commerce found that Johann Nitschinger, operates Logatronik in addition to Comp-Data, GmbH, a firm denied U. S. export privileges in April 1970. The order prohibits Logatronik from dealing in U. S. goods and technical data, and forbids parties in the U. S. and abroad from furnishing the firm, either directly or indirectly, with commodities or technical data of U. S. origin.

QUICKLY AROUND THE WORLD

The University of Cape Town, South Africa, will soon be using a Univac 1106 as the nucleus of its computing facilities.

Computers and parts valued at \$7.3 million were licensed by the U. S. Dept. of Commerce during the last quarter of 1970 for sale in Eastern Europe. These sales were primarily to the USSR, \$3.2 million; Hungary, \$1.1 million; Romania \$0.7 million; and Czechoslovakia, \$0.5 million.

Some problems of developing memory units for digital computers in the USSR are discussed in a 170-page translation available for \$3.00 from the **National Technical Information Service, U. S. Dept. of Commerce, Springfield, Va. 22151. Request document AD-716-674.**

The Government of the Federal Republic of Germany reports "there is a serious shortage of trained staff in computerization, a branch of industry which is supposed to save time and labor." Industry experts reckon that 250,000 computer specialists will be needed by the mid-70s.

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CORPORATE AND FINANCIAL NEWS

Data Automation Co. of Dallas, Texas, has successfully refinanced approximately \$1,500,000 of secured and unsecured debt owed to IBM. The company's two largest senior creditors, United States National Bank of San Diego, Cal., and IBM, both extended the terms of their indebtedness. However, DAC's refinancing program is not yet complete. One secured Dallas lending institution has not yet agreed to an extension, and DAC is still seeking to rearrange \$2,400,000 of subordinated debentures. The program will be completely successful only if all major creditors cooperate.

Telex Computer Products, Inc. has formed a new development and manufacturing division to provide Telex with its own capability for advanced disk memory systems. The organization, Telex Direct Access Storage Division, will serve to reduce Telex's previous dependence on Information Storage Systems, Inc. (recently merged with ITEL) for its disk systems, and to insure a continuation of the present Telex disk line into other advanced markets, such as for the IBM S/370.

Dicom Industries, manufacturer of cassette magnetic tape systems for minicomputers, has announced that it is now out of bankruptcy. Approximately half of the company's unsecured creditors took notes which are convertible to common stock. The remaining creditors received cash at 15% on the dollar or reduced their claim to \$50 cash. Dicom filed bankruptcy under Chapter XI on August 6, 1970 and has received additional capital from new and present investors of approximately \$500,000.

MERGERS AND ACQUISITIONS:
Computer Services Corp., a computer service company based in Southfield, Michigan, will acquire **Computer Control Corp.**, also of Southfield . . . **Computing and Software, Inc.**

has purchased **W. R. Simmons & Associates Research, Inc.** for an undisclosed amount of cash and notes from **National Student Marketing Corp.**, which had acquired Simmons in 1969 . . . **Geodatic**, a computer-based marketing services company located in Princeton, N.J., has ac-

quired **Pica Data Systems**, also of Princeton . . . **Gould, Inc.**, Chicago, and **Dictaphone Corp.**, Rye, N.Y., said that agreement in principle had been reached for the acquisition of Dictaphone by Gould. Terms of the agreement call for the exchange of one share of Gould Inc. com-

BOX SCORE OF EARNINGS

Company	Period	Revenues	Net Earnings (Loss)	Earnings (Loss) per Share
Appl'd Data Research	12 mos. 12/31/70	7,189,537	(226,646)	(.23)
	12 mos. 12/31/69	6,151,405	104,139	.11
Calif. Comp. Prods.	6 mos. 1/3/71	20,827,889	991,365	.43
	6 mos. 1/4/70	10,357,880	231,883	.10
Comp. Preparations	9 mos. 1/31/71	1,307,103	82,552	.25
	9 mos. 1/31/70	1,270,864	81,132	.24
Conrac	12 mos. 12/31/70	52,776,402	1,577,085	1.12
	12 mos. 12/31/69	52,314,611	1,750,321	1.26
Data Tab	12 mos. 12/31/70	3,929,054	(301,027)	(.53)
	12 mos. 12/31/69	3,437,882	116,043	.20
DCS Comp. Services	3 mos. 12/31/70	349,483	14,603	.03
	3 mos. 12/31/69	143,502	9,263	.02
Elec. Mem. & Mag.	12 mos. 12/31/70	92,639,000	(14,257,000)	(2.87)
	12 mos. 12/31/69	88,499,000	5,740,000	.93
Fabri-Tek	9 mos. 1/1/71	14,163,165	(2,007,065)	(.62)
	9 mos. 12/26/69	15,025,016	399,664	.13
Gen'l Automation	3 mos. 1/31/71	2,985,000	103,000	.06
	3 mos. 1/31/70	1,521,000	(646,000)	(.38)
Inforex	12 mos. 12/31/70	2,854,808	(3,174,352)	(2.44)
	12 mos. 12/31/69	-	(2,375,182)	(2.50)
Intn'l. Tel. & Tel.	12 mos. 12/31/70	6,364,494,000	353,307,000	3.17
	12 mos. 12/31/69	5,671,421,000	292,623,000	2.65
Keydata	6 mos. 1/31/71	2,835,317	51,044	.02
	6 mos. 1/31/70	1,823,113	(530,555)	(.37)
Mngmt. Assistance	3 mos. 12/31/70	14,588,000	(268,000)	(.05)
	3 mos. 12/31/69	16,582,000	(1,113,000)	(.21)
Planning Research	6 mos. 12/31/70	29,108,178	1,570,197	.30
	6 mos. 12/31/69	31,747,858	1,651,500	.34
RCA	12 mos. 12/31/70	3,300,000,000	91,700,000	1.26
	12 mos. 12/31/69	3,400,000,000	159,800,000	2.27
Redcor	6 mos. 12/27/70	4,588,500	(398,600)	(-)
	6 mos. 12/28/69	3,118,500	(674,600)	(-)
Robins Industries	12 mos. 12/31/70	2,681,647	95,698	.24
	12 mos. 12/31/69	2,909,870	13,823	.03
Sanders Assoc.	6 mos. 1/31/71	78,200,000	375,000	.08
	6 mos. 1/31/70	84,800,000	265,000	.06
Sys. Computer	12 mos. 12/31/70	350,000	(500,000)	(-)
	12 mos. 12/31/69	712,014	32,941	-
Tally	12 mos. 1/3/71	14,019,000	352,000	.20
	12 mos. 1/3/70	10,977,000	(1,823,000)	(-)
Tracor	12 mos. 12/31/70	70,216,000	81,000	.04
	12 mos. 12/31/69	83,435,000	2,670,000	1.25
TRW	12 mos. 12/31/70	1,597,385,000	79,315,000	2.40
	12 mos. 12/31/69	1,599,737,000	78,230,000	2.36
Tymshare	12 mos. 12/31/70	10,233,113	98,709	.05
	12 mos. 12/31/69	6,371,895	(640,022)	(.38)
University Computing	12 mos. 12/31/70	113,927,000	(17,565,000)	(2.58)
	12 mos. 12/31/69	90,371,000	16,826,000	2.50
Vernitron	12 mos. 12/26/70	40,446,145	(13,921,534)	(4.22)
	12 mos. 12/27/69	43,174,803	121,330	(.04)
Western Union Intn'l	12 mos. 12/31/70	54,535,000	4,698,000	1.62
	12 mos. 12/31/69	36,673,000	4,115,000	1.52
Xerox	12 mos. 12/31/70	1,718,587,000	187,691,000	2.40
	12 mos. 12/31/69	1,482,895,000	161,368,000	2.08

mon stock for 2.75 shares of Dictaphone common . . . **Levin-Townsend Computer Corp.** has entered into a definitive purchase agreement providing for the sale of 1,200,000 shares of common stock (85% of shares outstanding) of **Tolley International Corp.**, formerly **Levin-Townsend Service Corp.**, to Mr. Russell M. Tolley, president of **Russell M. Tolley & Associates, Inc.**, a subsidiary of Tolley International . . . **Management Concepts, Inc.**, Bala-Cynwyd, Pa., a management consulting firm specializing in the graphic arts field, has agreed in principle to acquire **Williston Graphic Services, Inc.**, Milwaukee, Wisc., a producer of instruments and materials for the business forms industry . . . **Optimum Systems, Inc.**, Palo Alto, Cal., has acquired the net assets of **International Data Systems Corp.**, New Orleans. IDS and its subsidiary, **Management Concepts, Inc.** of Baton Rouge, La., offer data processing and computer-related consultant services . . . **Record Retention and Retrieval Corp.**, a microfilm service bureau, has agreed to purchase **Opticom Data Management Corp.** of Manhattan, a firm providing similar services . . . **Applied Data Research, Inc.**, computer software and service company, has agreed to sell its computer center in Arlington, Va. to **Software Systems, Inc.**, which will continue to operate the facility at its present location . . . **Teleprocessing Computer Corp. of America, Inc.** has purchased the Oklahoma City computer center of University Computing Co.'s **Data Link Division**. Price and terms of the transaction were not revealed . . . **Tracor Computing Corp.** has agreed to acquire, for stock, **Bresnahan Data Center, Inc.** and **Applied Data Sciences, Inc.**, both of Chicago and both wholly-owned subsidiaries of Bresnahan Computer Corp., which is engaged in computer leasing and manufacturing control system software . . . **West-**

ern Union Corp. has acquired **Distronics Corp.**, an information services firm with computer facilities at Cherry Hill, N.J. which provides on-line teleprocessing for wholesale distributors.

RECENT ENTRIES IN THE COMPUTER FIELD: **Automatic Information Retrieval, Inc.**, a new company dedicated to fighting the paperwork explosion through systematized document storage and retrieval, has been formed in Palo Alto . . . **Azrex Inc.**, formerly known as the Boston Division of Wolf Research and Development Corp., will offer computer facility management, software consulting, design and programming, and proprietary computer programs from its Burlington, Mass. office . . . **DFM Associates, Inc.**, Stamford, Conn., has been formed to provide EDP consulting and software to banks and other financial institutions. The firm is a subsidiary of Data Facilities Management, Inc., also of Stamford . . . **The Edumatics Corp.**, Oceanport, N.J., will offer consulting services and develop specialized materials for use in computer education and training . . . **Energy Conversion Devices, Inc.** has formed a subsidiary company, **Ovonic Memories, Inc.**, to manufacture and market optical mass-memory systems utilizing ovonic material as the information-storage medium. The new company will be located in Los Angeles . . . A microfilm service specializing in computer output microfilm has been established by **Pako Photo, Inc.** **Pako Microfilm** will be located in an annex of **Pako Photo's** Minneapolis processing plant . . . **The Plessey Company Ltd.** has formed **Plessey Communication Systems Corp.** in Hillside, N.J. for the sale and rental of private telephone switching equipment. R & D efforts will concentrate on the convergence of voice and data communications.

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CORPORATE PROFILE

Featured this month:

DATA TRENDS, INC. (over-the-counter)

Parsippany, New Jersey 07054

DIRECTORS: Robert W. Hughes, Chairman of the Board, Data Trends, Inc.; Roger E. Bremer, President and Chief Executive Officer, Data Trends, Inc.; Jane C. Hughes, Secretary, Data Trends, Inc.; Donald McMillion, President, First Securities Corp. of North Carolina; Dr. Maxwell Pollock, President, Van Dyk Research Corp.

BACKGROUND: Data Trends, Inc. (DTI) was organized in 1962 to design and build computer communications systems, terminals, and related equipment. Its officers and managers have seen prior service in management and engineering with ITT, Northrup, Western Union Corp., Ford Motor, Sperry Rand, Bell Telephone Laboratories, and Texas Instruments.

FACILITIES: Data Trends' corporate headquarters and a principal manufacturing R&D facility occupy a 30,000-square-foot building in Parsippany, N.J. A second 20,000-square-foot plant in nearby Hanover currently produces stand-alone key-to-tape encoders. The company also maintains a sales and executive office in New York (at 2 Penn Plaza).

PRODUCTS: DTI's early growth centered on systems design and installation for such customers as the Chicago Board of Trade and the New York Racing Association. In 1967 design started on a computer-controlled "Telex III" circuit switch for ITT World Communications. Successfully installed in 1969, DTI is now engineering additional equipment to expand the system's message-handling and functional capabilities.

The company also has an OEM relationship with Burroughs Corp., producing stand-alone key-to-tape encoders marketed as Burroughs' Series N. Featuring an English-language display and a range of field-expandable options, Series N competes in a fast-growing segment of the market.

A proprietary product is DTI's Brokers Terminal System. Centered around a DTI-built minicomputer, it uses a guided-input concept to aid in properly formatting stock brokers' orders for relay to stock exchange trading floors, reducing order errors, and paperwork. Up to 8 terminals may share the central minicomputer-processor. Rental

approximates \$100 per month per terminal. Fifteen systems are now installed and operating.

Later this year, DTI expects to introduce a series of intelligent data collection and processing units, featuring display (with proprietary guided-input feature) and a unique MOS/LSI processor with "virtual memory." The first two units in the series are described as (1) an on-premise book-keeping system having full accounting and report generation capabilities for specific small-business applications, and (2) an intelligent terminal designed for close-to-the-source batch data-processing applications.

Other products under development include those using new techniques for key-data entry, including large-volume batch processing, and advanced communications systems.

CURRENT POSITION: In the year ended last June 30, net profit was over 18% on average capital invested; revenues per employee exceeded \$28,000. At that date, the company reported over-all backlog at \$10 million, and current ratio was 1.8:1.

FINANCIAL SUMMARY: DTI's first public offering consisted of 100,000 shares, offered at \$3 per share through Mayflower Securities Co., in April, 1965. Presently there are 928,748 shares outstanding, held by about 1,600 shareholders. Directors and officers as a group hold about 30 percent; institutions hold no significant percentage. Secondary ("shelf") offerings of 375,660 shares in April, 1970 and of 193,623 shares in March, 1971, also were registered, with no underwriter involved. (The latter offering includes 69,236 shares which were included in the 1970 registration, and 108,500 shares being registered for the company's stock option plan.) DTI has no bonded debt, nor preferred stock outstanding.

SIX MONTHS ENDED DECEMBER 31

	Revenues	Net Income (loss)	Net Income (loss) Per Share
1970	\$4,142,954	\$431,060	\$0.46
1969	2,576,767	198,969	0.21



**Peter Denning
joined ACM for technical information
and contacts.**

**Now he's involving
other members
in everything from
microprogramming
to data banks
and privacy.**

Peter Denning, 29, is an Assistant Professor of Electrical Engineering at Princeton. He's also an ACM member and chairman of our committee on special interest groups and committees (SIGs/SICs). He wasn't always as active in ACM.

"I joined in 1965 while working on my thesis," says Peter. "Mainly for technical material and a chance to meet other computer professionals. In 1968, I was asked to edit the Operating Systems (SIGOPS) newsletter. I got involved and quickly

took on more responsibility. After two leadership positions, I ran for SIG/SIC chairman.

"Special interest groups are what ACM is all about," says Peter. "We've got 27 now, from microprogramming techniques to the impact of computers on society. One out of three ACM members belong to at least one group. I want this share to grow.

"Now I can do something about it. Like help restructure the whole SIG/SIC operation. Some groups may

have to be split up, to cover less ground. Others need stronger leadership. A few we should have don't even exist yet, like performance evaluation and computer architecture."

Peter Denning is involved in ACM, the oldest and most respected association in the computer field. He's advancing his career. Sharing his ideas. And making a contribution to the computer profession.

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COMPUTER STOCK TRENDS

MONTH ENDED APRIL 8, 1971

EXCH	COMPANY	PRICE					VOLUME (IN 100'S)			EARNINGS	
		1971 RANGE (1)	1 YEAR AGO	CLOSE APR. 8 1971	MONTH NET CHG.	MONTH % CHG.	THIS MONTH (3)	LAST MONTH	AVG. VOL. UME (2)	PER SHARE LATEST 12 MONTHS	PRICE-EARNINGS RATIO
N	BECKMAN	27-42	39 1/2	42	+3 3/8	+8.7	1246	1658	2034	1.39	30
N	BURROUGHS	105-126	141 1/4	124 3/8	+9 1/4	+8.0	6023	12898	10052	3.83	32
N	CONTROL DATA	48-66	50 1/4	65 1/8	+1 3/8	+2.1	4592	8113	8151	-0.39	-
O	DATA GENERAL	19-38	32 1/2	37 1/2	+5 1/2	+17.1	(3)	-	-	0.44	85
O	DATACRAFT	5-8	N/A	7 3/4	+1 3/8	+21.5	(3)	-	-	-	-
N	DIGITAL EQUIPMENT	53-73	101 7/8	68	+4 3/8	+6.8	3883	6619	5982	1.39	49
N	ELECTRONIC ASSOC	5-8	8	7 1/4	-1/4	-3.3	772	1052	1434	-1.94	-
O	GENERAL AUTOMATION	12-26	21	22 1/2	0	0.0	(3)	-	-	-0.44	-
N	GENERAL ELECTRIC	94-117	75 7/8	116 3/4	+8 1/8	+7.4	8545	8095	10452	3.63	32
N	HEWLETT-PACKARD	30-45	41 7/8	40 3/8	-1 3/8	-3.2	5086	2793	3834	0.87	46
N	HONEYWELL	83-115	126 7/8	114 5/8	+9	+8.5	4685	4608	5332	3.58	32
O	INTERDATA	6-11	N/A	10 3/4	+2 1/8	+24.6	(3)	-	-	0.02	538
N	IBM	310-364	325 3/4	356 3/4	+2 3/4	+0.7	4926	5380	6311	8.92	40
N	LITTON INDUSTRIES	20-31	22	31	+3	+10.7	8730	11463	14953	1.45	21
N	NCR	38-47	65 1/2	44 1/8	+1/2	+1.1	11199	14485	14475	1.37	32
N	RCA	26-36	29 7/8	34 7/8	+3/8	+1.0	9952	10200	13151	1.26	28
N	RAYTHEON	27-40	27 3/8	39 5/8	+7/8	+2.2	4465	6563	6671	2.32	17
O	REDCOR	5-9	27 3/4	7 5/8	-1 1/8	-12.8	(3)	-	-	-2.81	-
O	SCIENTIFIC CONTROL	1-2	N/A	1 3/8	-1/4	-15.3	(3)	-	-	-	-
N	SPERRY RAND	25-37	34 1/4	36 1/8	+2 1/4	+6.6	15130	11324	20327	2.22	16
A	SYSTEMS ENGRG LABS	14-18	36 1/4	14 5/8	-1 3/8	-8.5	4244	3368	4857	0.57	26
N	SYSTRON DONNER	10-17	19 1/8	15 3/4	+1 5/8	+11.5	1849	1761	1982	0.59	27
N	VARIAN ASSOCIATES	13-18	21 1/4	17 7/8	+1	+5.9	3725	4835	5967	0.51	35
O	VIATRON	1-4	35	1 1/4	-3/8	-23.0	(3)	-	-	-	-
N	WANG LABS	29-45	37	42	+4 3/4	+12.7	1789	1237	1548	0.85	49
A	WYLE LABS	4-6	6 5/8	5 1/2	-7/8	-13.7	813	1534	1327	-0.04	-
N	XEROX	85-110	85 3/4	108 1/8	+7 1/8	+7.0	7896	8440	11261	2.40	45
O	ADVANCED MEMORY SYS	22-37	N/A	26	-4	-13.3	(3)	-	-	-	-
N	AMP	55-70	51 7/8	69 1/2	+7 3/8	+11.8	1960	2372	2317	2.00	35
N	AMPEX	17-24	32	23 3/4	+3 1/8	+15.1	7864	8968	8879	0.53	45
O	APPLIED MAGNETICS	14-17	17 1/2	16 7/8	+1 5/8	+10.6	(3)	-	-	0.50	34
O	ASTRODATA	1-2	N/A	1 1/8	-1/8	-10.0	(3)	-	-	-	-
O	ASTROSYSTEMS	4-6	5 7/8	4 1/2	+3/8	+9.0	(3)	-	-	-	-
N	BUNKER RAMO	10-16	12 1/2	15 3/8	+1	+6.9	9749	9680	9659	0.39	39
A	CALCOMP	23-32	25 1/2	32 1/4	+4 5/8	+16.7	4002	4101	4559	0.68	47
O	CHALCO INDUSTRIES	1-4	N/A	2	-1/2	-20.0	(3)	-	-	-	-
O	CODEX	5-10	N/A	8	+7/8	+12.2	(3)	-	-	-	-
O	COGAR	40-71	56	48	-7	-12.7	(3)	-	-	-	-
O	COGNITRONICS	6-9	8 1/2	7 1/8	-1	-12.3	(3)	-	-	-0.34	-
N	COLLINS RADIO	14-20	25 1/8	18 7/8	+5/8	+3.4	2653	2391	2941	-0.90	-
O	COMCET	4-9	32 1/2	7 7/8	+1/2	+6.7	(3)	-	-	-	-
O	COMPUTER COMM	6-19	28 1/2	15 1/2	+2	+14.8	(3)	-	-	-1.02	-
O	COMPUTER CONSOLES	7-11	11 1/2	8 1/4	-3/4	-8.3	(3)	-	-	-	-
A	COMPUTEST	13-20	25 1/2	15 3/8	-2 1/2	-13.9	1467	807	1224	0.72	21
N	CONRAC	16-25	21	23 3/8	-1	-4.1	316	393	668	1.12	21
O	DATA 100	8-13	9	8	-2 5/8	-24.7	(3)	-	-	-	-
A	DATA PRODUCTS	6-10	14 5/8	8 3/8	-1/8	-1.4	5631	3490	6397	-1.30	-
O	DATARAM	1-3	N/A	2 5/8	+1	+61.5	(3)	-	-	-	-
O	DATA RECOGNITION	3-8	N/A	7 1/2	+2	+36.3	(3)	-	-	-	-
O	DATASCAN	4-7	22	4 1/2	-7/8	-16.2	(3)	-	-	-	-
O	DIGITRONICS	4-8	8 3/4	4 5/8	-1 3/8	-22.9	(3)	-	-	-0.71	-
A	ELEC ENG OF CAL	5-9	9 1/8	8	+1	+14.2	217	278	388	-0.58	-
N	ELEC MEMORIES + MAG	8-14	23 7/8	13 1/4	+1 1/2	+12.7	9351	6628	9041	-2.85	-
N	EXCELLO	20-24	27 3/8	20 1/4	-2	-8.9	1623	1200	1841	1.45	14
O	FABRI-TEK	2-3	5 1/4	3 3/8	+5/8	+22.7	(3)	-	-	-0.09	-
O	FARRINGTON MFG	1-3	6 5/8	2 3/8	+7/8	+58.3	(3)	-	-	-2.16	-
A	GERBER SCIENTIFIC	11-16	17 1/8	12 5/8	+3/4	+6.3	640	992	688	-0.17	-
O	GRAPHIC SCIENCES	15-34	13 1/4	33 1/2	+13	+63.4	(3)	-	-	-0.82	-
A	HI-G	5-7	13 1/2	6	-5/8	-9.4	155	230	249	-0.45	-
O	INFORMATION DISPLAYS	5-8	16 1/2	7 3/4	+2 3/8	+44.1	(3)	-	-	-	-
A	ITEL	15-22	13 7/8	21 1/2	+1 3/4	+8.8	4697	1957	4140	1.00	22
O	LOGIC	5-9	11	8 7/8	+2 1/2	+39.2	(3)	-	-	-	-
A	MILGO	18-26	34 7/8	20 1/4	+1	+5.1	2072	3501	4075	0.84	24
N	MOHAWK DATA SCIENCES	23-38	57 3/8	37 3/4	+3 3/8	+9.8	6301	5600	5915	1.25	30
O	NORTH ATLANTIC IND	3-5	5 3/4	3 3/4	-1/2	-11.7	(3)	-	-	-	-
O	OPTICAL SCANNING	13-18	32	17	+1 1/4	+7.9	(3)	-	-	-0.53	-
A	POTTER INSTRUMENTS	17-24	37	23 1/4	+3/4	+3.3	3404	2316	3096	0.94	25
O	RECOGNITION EQUIP	14-26	44	21 3/4	-2 1/4	-9.3	(3)	-	-	-1.03	-
N	SANDERS ASSOCIATES	13-22	14 1/2	21 7/8	+2 5/8	+13.6	3592	3708	4006	0.19	115
N	SANGANO	14-20	19 5/8	18 1/2	-3/8	-1.9	1065	1866	1834	0.64	29
O	SCAN-DATA	6-11	22	7 1/8	-1/2	-6.5	(3)	-	-	-	-
A	SEALLECTRO	4-6	7 3/4	6	+3/4	+14.2	322	202	283	-0.05	-
O	SYKES DATATRONICS	2-6	7 3/4	4 1/2	-7/8	-16.2	(3)	-	-	-	-
O	TALLY	11-16	18	13 3/4	-1 1/8	-7.5	(3)	-	-	0.11	125
N	TELEX	15-22	26	21 3/4	+2 5/8	+13.7	17766	19779	24770	0.78	28
N	TEXAS INSTRUMENTS	80-110	114 3/4	109 1/4	+9 1/4	+9.2	2437	2905	3161	2.71	40
O	VARIFAB	1-3	3 1/4	1 3/4	+1/8	+7.6	(3)	-	-	-	-

COMPUTERS

PERIPHERALS & COMPONENTS

FOOTNOTES: (1) TO NEAREST DOLLAR
 (2) AVERAGE MONTHLY TRADING VOLUME SINCE JANUARY 1, 1970
 (3) VOLUME IS NOT REPORTED FOR OVER-THE-COUNTER ISSUES AND NEW LISTINGS
EXCH: N=NEW YORK EXCHANGE; A=AMERICAN EXCHANGE; O=OVER-THE-COUNTER; L=NATIONAL EXCHANGE;

EXCH	COMPANY	PRICE					VOLUME (IN 100'S)			EARNINGS	
		1971 RANGE (1)	1 YEAR AGO	CLOSE APR.8 1971	MONTH NET CHG.	MONTH % CHG.	THIS MONTH (3)	LAST MONTH	AVG. VOL. UME (2)	PER SHARE LATEST 12 MONTHS	PRICE-EARNINGS RATIO
A	APPLIED DATA RESCH	5- 13	8 1/8	10 3/8	-1 1/4	-10.7	849	2386	1576	-0.22	-
O	APPLIED LOGIC	1- 3	N/A	1 5/8	0	0.0	(3)	-	-	-	-
O	ARIES	1- 2	3 3/8	1 3/8	- 1/2	-26.6	(3)	-	-	-	-
N	AUTOMATIC DATA PROC	44- 59	38	57	+1 1/4	+2.2	779	1165	1299	0.75	76
A	BOLT, BERANEK, NEWMA	6- 8	8 1/2	7 1/8	- 1/2	-6.5	131	165	172	0.24	30
O	BOOTHE COMPUTER	13- 26	23 1/4	25 5/8	+7 5/8	+42.3	(3)	-	-	1.50	17
O	BRANDON APPLIED SYS	1- 1	N/A	3/4	+ 3/8	+100.0	(3)	-	-	-	-
O	COMP ENVIRONMENTS	1- 2	N/A	1 1/4	0	0.0	(3)	-	-	-	-
O	COMPUTER EXCHANGE	4- 9	6	5 1/4	-1	-16.0	(3)	-	-	-	-
A	COMPUTER INVESTORS	8- 13	8 7/8	12 3/8	0	0.0	649	779	673	0.61	20
O	COMPUTER METHODS	1- 2	N/A	1 1/8	+ 1/8	+12.5	(3)	-	-	-	-
O	COMPUTER PROPERTY	6- 9	N/A	8 1/2	+1 1/2	+21.4	(3)	-	-	-	-
N	COMPUTER SCIENCES	9- 13	16	13 3/8	+ 3/4	+5.9	6272	9724	8321	0.03	446
O	COMPUTER TECHNOLOGY	5- 11	N/A	10 1/2	+3 1/4	+44.8	(3)	-	-	-	-
O	CTC COMPUTER	2- 4	5 1/2	3 7/8	- 3/8	-8.8	(3)	-	-	-	-
O	COMPUTER USAGE	5- 16	6 1/4	10 1/2	+ 1/4	+2.4	(3)	-	-	-2.05	-
A	COMPUTING + SOFTWARE	27- 45	45 5/8	44 1/2	+6 7/8	+18.2	3115	2895	2879	1.25	36
O	COM-SHARE	4- 6	N/A	5 7/8	+ 7/8	+17.5	(3)	-	-	-	-
O	CYBERMATICS	8- 11	12 3/4	10	- 5/8	-5.8	(3)	-	-	-	-
O	DATA AUTOMATION	1- 4	N/A	3 1/2	+1 5/8	+86.6	(3)	-	-	-	-
O	DATA DYNAMICS	1- 4	N/A	3 1/2	0	0.0	(3)	-	-	-	-
N	DATA PROC FIN + GEN	11- 19	16 3/4	17 5/8	+1 1/2	+9.3	5964	5718	6803	0.64	28
O	DATA SYSTEM ANALYSTS	2- 3	N/A	1 3/4	- 1/4	-12.5	(3)	-	-	-	-
O	DATRONIC RENTAL	2- 4	5 3/4	3 1/8	+ 3/8	+13.6	(3)	-	-	-	-
A	DEARBORN-STORM	24- 37	20 1/4	37	+3 1/2	+10.4	771	1114	1366	2.11	18
O	DECISION SYSTEMS	1- 1	N/A	5/8	+ 1/8	+25.0	(3)	-	-	-	-
O	DIGITAL APPLICATIONS	1- 2	4	1 1/2	+ 1/8	+9.0	(3)	-	-	-	-
O	DIGITEK	1- 2	N/A	1 5/8	- 3/8	-18.7	(3)	-	-	-	-
A	DPA, INC	4- 8	6 1/4	7 5/8	+ 3/4	+10.9	1369	1512	1409	0.63	12
O	EFFICIENT LEASING	1- 3	3 3/4	2 1/4	+1 1/4	+125.0	(3)	-	-	-	-
A	ELEC COMP PROG INST	3- 7	8 1/2	6	+ 1/2	+9.0	369	369	533	0.01	600
N	ELEC DATA SYSTEMS	31- 85	159	79	-1 3/8	-1.7	(3)	-	-	0.75	105
A	GREYHOUND COMPUTER	7- 11	11	10 1/2	- 1/4	-2.3	428	896	750	0.76	14
O	INFORMATICS	7- 12	10 1/4	11 7/8	+2 1/2	+26.6	(3)	-	-	0.13	91
O	INTL COMPUTER	2- 6	5 3/4	5	- 1/4	-4.7	(3)	-	-	-	-
L	INTL COMPUTER SCI	1- 2	N/A	1 3/4	0	0.0	(3)	-	-	-	-
N	LEASCO	16- 22	16 1/8	19 7/8	- 5/8	-3.0	6144	7973	10471	0.03	663
O	LEVIN-TOWNSEND	5- 9	7 1/8	7 1/4	+1 1/8	+18.3	(3)	-	-	-0.74	-
O	LNC DATA	1- 1	N/A	1	+ 1/8	+14.2	(3)	-	-	-	-
O	MGMT ASSISTANCE	1- 2	N/A	7/8	- 7/8	-50.0	(3)	-	-	-	-
A	MANAGEMENT DATA	8- 11	20	9 1/2	- 1/8	-1.2	312	438	356	0.56	17
O	NATIONAL COMP ANAL	1- 4	5	3	+1 1/2	+100.0	(3)	-	-	-	-
N	PLANNING RESEARCH	16- 25	29 1/8	24	+3 1/4	+15.6	7285	4207	6576	0.68	35
O	PROGRAMMING METHODS	18- 29	17	20 1/2	- 1/2	-2.3	(3)	-	-	-	-
L	PROGRAMMING SCIENCES	1- 3	N/A	1/4	0	0.0	(3)	-	-	-	-
O	PROGRAMMING SYSTEMS	2- 4	3 3/4	3 3/8	+ 7/8	+35.0	(3)	-	-	0.14	24
O	SCIENTIFIC COMPUTER	2- 3	2 7/8	2 1/8	0	0.0	(3)	-	-	0.09	24
O	SCIENTIFIC RESOURCES	1- 2	7 1/2	1	- 5/8	-38.4	(3)	-	-	-	-
O	SYSTEMS CAPITOL	3- 6	5 1/8	3 1/4	- 7/8	-21.2	(3)	-	-	-	-
O	TIME SHARE	1- 2	N/A	1 1/4	- 1/4	-16.6	(3)	-	-	-	-
O	TRACOR COMPUTING	2- 4	5 1/4	3 5/8	- 1/4	-6.4	(3)	-	-	-0.44	-
A	URS SYSTEMS	7- 11	10 1/4	8 1/2	-2	-19.0	1004	1336	1836	-0.21	-
O	UNITED DATA CENTERS	2- 6	4	5 1/8	+1 1/8	+28.1	(3)	-	-	-	-
N	UNIVERSITY COMPUTING	21- 32	36 5/8	30 1/4	+5 1/4	+21.0	9650	8612	9932	-1.26	-
O	US TIME SHARING	1- 3	N/A	1 3/4	0	0.0	(3)	-	-	-	-
N	ADAMS MILLIS	14- 19	11 7/8	16 3/4	-1 3/4	-9.4	942	1398	1474	1.17	14
O	BALTIMORE BUS FORMS	6- 10	N/A	9 3/4	+1	+11.4	(3)	-	-	-	-
A	BARRY WRIGHT	8- 13	12 1/4	10 3/4	- 7/8	-7.5	1284	750	1291	0.44	24
A	CAPITOL INDUSTRIES	17- 22	42 1/4	17 1/2	-2 3/8	-11.9	1536	2074	1797	0.92	19
A	DATA DOCUMENTS	18- 29	25 3/4	25 1/4	-3 1/8	-11.0	300	176	254	1.51	17
O	DATA PACKAGING	7- 10	19	8 7/8	+ 1/2	+5.9	(3)	-	-	-0.03	-
N	DENNISON MFG	22- 31	18 7/8	31 1/4	+4 1/2	+16.8	2020	2093	2640	1.92	16
N	DUPONT	130-145	102	144 1/2	+5	+3.5	2399	3168	3163	6.76	21
N	ENNIS BUSINESS FORMS	10- 13	16	11 3/8	- 1/2	-4.2	3136	875	1645	0.60	19
O	GENERAL BINDING	25- 31	28	30	+ 1/4	+0.8	(3)	-	-	0.86	35
O	GRAPHIC CONTROLS	6- 10	14 1/4	9 3/4	+1 7/8	+23.8	(3)	-	-	-0.21	-
O	LEWIS BUSINESS FORMS	10- 13	16 3/4	11	- 1/2	-4.3	(3)	-	-	0.79	14
N	MEMOREX	54- 78	116 1/4	69 1/8	+1 1/8	+1.6	7573	5828	7217	0.83	83
N	3M	96-116	103 5/8	113 3/8	+4 5/8	+4.2	3113	3909	4406	3.35	34
O	MOORE CORP LTD	37- 42	N/A	40 3/4	+2	+5.1	(3)	-	-	-	-
O	REYNOLDS + REYNOLDS	37- 50	42 3/4	50	+2 3/4	+5.8	(3)	-	-	1.52	33
A	SAFEGUARD INDUSTRIES	10- 15	13 1/4	14	- 1/2	-3.4	1032	1260	1429	0.78	18
O	STANDARD REGISTER	19- 23	28 1/4	21 1/2	-1 1/8	-4.9	(3)	-	-	1.82	12
N	UARCO	25- 30	34 1/2	28 1/8	+ 7/8	+3.2	616	1079	680	1.92	15
N	WALLACE BUS FORMS	18- 23	19 5/8	22 3/4	+1 5/8	+7.6	363	572	419	1.18	19

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GRAF/PEN



LAWRENCE A. FEIDELMAN, Vice Pres. • Information Spectrum Inc., Cherry Hill, N.J.

The computer data entry business is dynamic from both its technical and marketing viewpoints. It is ripe for the innovative company. The process of providing everyone with an easy means of communicating with the computer at a low cost appears to be its basic challenge. A data entry device, known as the Graf/Pen and developed by Science Accessories Corp. of Southport, Conn. is representative of how an innovative company can meet this challenge.

Graf/Pen employs a data entry technique for both graphical and alphanumeric input requiring little change to present data preparation procedures. The device uses a specially-designed ball point pen to enter data into the computer system simultaneously as the information is recorded onto a document. Its simplicity of use is a tribute to the inventor, Dr. Albert Whetstone, a physicist who developed the technique from spark chamber experiments. Science Accessories, which started in the physics experimentation business, now has Amperex (a North American Philips Company) to back them.

The principle of the Graf/Pen is based upon the use of sound transmission to define positional movement of the recording instrument. The equipment consists of a stylus, tablet, and control unit. The stylus combines a ball point pen (in actuality any type of writing instrument can be employed) with a low-energy spark generator located at the tip of the pen. The standard tablet consists of a 14x14-inch transparent plate with strip sound sensors located on two sides of the plate. Both the size and 2,000 x 2,000 point resolution are easily expandable. The sensors pick up signals as generated by the stylus and transmit the data to a control unit. The control unit interprets the data from the sensors to determine the X,Y coordinate position of the stylus at any given time, digitizes the positional information, and outputs the data to a magnetic tape, paper tape unit, or to a computer directly. An optional CRT display unit can show the data as it is entered. Also, the Graf/Pen can

interact with microfilm viewers. The basic single unit cost is \$2,800. However, with multiple units in a multiplex arrangement the cost per unit can be substantially reduced.

The user simply places the document onto the tablet and then uses the stylus to record the information onto the document. Simultaneously, the X, Y stylus position is digitized and converted to machine language. A specially-designed hardware unit or computer software package can then interpret the resultant data.

The basic advantages over light-sensing devices, such as the light pen, are (1) the stylus looks and feels like an ordinary ball point pen and can be employed in the same manner, (2) hardcopy is simultaneously prepared with no additional cost, (3) tablet size can be expanded easily and inexpensively, (4) system costs are dramatically lower in a remote terminal environment, and (5) the unit is an unusually versatile, general-purpose computer data entry device.

The Graf/Pen has been used for the computer input of graphs, rough sketches of drawings, land contour outlines, weather patterns, and tracings of X-rays and other photographic images. (In the latter case, a frosted lucite plate permits images to be projected from the rear of the tablet permitting ease of tracing.) By utilizing various forms design and character recognition algorithms, the Graf/Pen can also perform the functions of a mark-reader, handprint character reader, or keyboard input device. Whereas the mark reader and handprint character reader require additional logic, the keyboard input function can be accomplished with the present system.

The mark reader function is accomplished by defining positional marks on the document which are identified by the location of the pen as the data is recorded. In order to interpret the information on the form (see Fig. 1), a special logic package, representing an image of the document is required. Among the advantages of this method are that dirt does not present any problem, that more information can be placed on the same size document as required by a mark reader, that data is

Mr. Feidelman is a regular contributor to Source Data Automation.



Fig. 1—A Graf/Pen being used to mark, and enter data simultaneously from, a MODERN DATA Reader Service Card. The metal strip built into the side of the tablet at the right of the card (top on photo) senses sound waves generated by a spark produced at the pen's tip. Another strip, not shown in this close-up photo, is built into the tablet above the card.

more easily read, and that forms can be designed primarily for the user's benefit rather than the machine's.

A more sophisticated recognition algorithm can permit on-line handprint character recognition. Due to the on-line monitoring of recorded data, a more accurate handprint technique than is otherwise available can be obtained.

The keyboard input function is accomplished by placing a keyboard layout on the tablet. As the pen is placed over a particular character box, its position is converted into the character's ASCII code. Many keyboard layouts can be strategically placed on different parts of the tablet, or they can be overlaid, with a code indicating the level being referenced.

Graf/Pen terminals can be placed on-line or off-line and coupled with many other terminals connected to a central control unit. CRTs, for example, can be used in conjunction with the Graf/Pen not only for verification, but, by overlaying a form on the tube face, for direct, interactive applications as a light-pen replacement. But here we open a whole new range of promising areas for the Graf/Pen, and this being a short column, we leave enumerating them as an exercise for the reader's imagination. ▲

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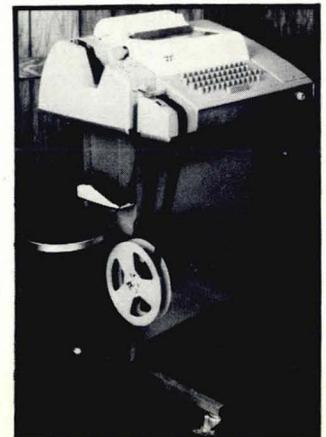
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CIRCLE NO. 17 ON INQUIRY CARD

MAN THE RESOURCE vs. THE RESOURCEFUL MAN

FRITZ KINDERHAUFEN • Lajitas Mgt. Assoc., Alpine, Texas

EDITOR'S NOTE: Mr. Kinderhaufen's December column, "Where did all the Flowers Go?," discussed the subject of motivation. Essentially, the redoubtable Mr. K's point was that, because a good man is self-motivated, systems people should not try to motivate employees as much as "to minimize those things we do to de-motivate our employees." The following letter, from one of MODERN DATA's readers, replies to that column, Mr. K's reply to this reply is appended.

Dear Mr. Kinderhaufen:

I would like to comment on your stimulating article in the December issue of MODERN DATA regarding the motivational problems of systems personnel. I absolutely agree with you that motivation is a naturally inherent characteristic of life. In fact, I also support your view to relying on the natural motivational tendencies of a project rather than a functional organization. It is certainly an ideal to shoot for in the absence of anything better. Organizational life, however, is reality. And if you ask: "Where did all the flowers go," I can only say that I have been asking this same question for many years, since I was one of those nuts who entered the field because of my interest in it and quite naively disregarded the other aspects of the job, pleasant or unpleasant. I belonged to this small group of "self-motivators" so widely praised and exploited by managers. Here are a few comments on some related subjects, based on my 15 years in the field.

1. There are never enough challenging assignments to go around. At least 85 percent of all projects are routine or a revamping of another one. 2. Many of the most interesting and challenging assignments potentially (but

not actually) present today are usually not big money-makers and are therefore not adequately supported. Everybody keeps talking about "civionics" but, as long as there are no major investments made, the jobs (expected to be really innovating and satisfying) will not materialize. 3. I presume that your article was aimed primarily at large corporations. In this regard, my experience has been that rewards and promotions are not distributed on the basis of merit but of political ability. In fact, the technical aspects of a job are considered by management the least important, and the engineer is the necessary evil who can be bought and sold by the pound. 4. The project organization has no stability on a long-term basis. There is no guarantee that there will be a "next project" to follow. This is especially important whenever engineers approach the "critical" age of 40 to 45, at which time they can expect to be laid off for no other reason than their age. This noise about obsolescence is a recent invention by management, for it is quite illogical that they really believe that a theoretical knowledge of mathematics and "textbook" science can completely substitute for the seasoned experience of an older engineer. As long as engineering (and all human endeavors, for that matter) contain elements of "art" (i.e., intuition) rather than being a "pure" science, experience will always have an intrinsic value. Be that as it may, however, the fact is that, under external pressures, the perpetuation of the job becomes more important than the technical aspects. This is, of course, well known but not often talked about. Although it is equally true about functional and project organizations, the project organization tends to emphasize it more because of its inherent instability. The project of bear catching is fine because everyone tacitly assumes that the supply of bears will never run dry. But if we accept that motivation is a natural characteristic of life, we must

Mr. Kinderhaufen is a regular contributor to Up The System Down Time.

not consider it "unethical" if a man is "naturally" motivated to stay on the job as long as he can, for starvation is probably a more powerful motivator than the intellectual satisfaction of designing a gadget, system, or whatever.

Let there be no misunderstanding. In general, no engineer would ever mind constantly putting himself out of business by completing project assignments. What he **does** mind is being thrown on the garbage heap at a certain age bracket. Especially so if he "wasted" his time on technical matters and ignored the political aspects of his job. **5.** At a large organization, there are several projects carried on simultaneously which are supposed to share certain resources and services. In my experience, resource sharing is a matter of politics; since there are never enough resources to support equally every project, it becomes a political matter as to who should and who should not get the support. **6.** Most large companies have a relatively slow growth rate which permits a climate in which the technical output is least important and the political output is most important. Small wonder, then, that efficiency is about 10-20 percent. This is why there is no engineering shortage brought about by the fact that older engineers are eliminated. On the surface, their knowledge appears to be going down the drain while there is a perpetual cry for more engineers. But at this low efficiency, there is no need even for many of the presently employed engineers. There is an abundance of talent and experience, but these resources are poorly utilized. **7.** What has that got to do with motivation . . . Well, no matter how we would like to sweep the truth under the carpet, the fact remains that the most "natural" motivation is for survival and not for project execution. Only the youngest and greenest engineer thinks otherwise. And "that's where all the flowers went!"

Stephen Smith
San Francisco, Cal.

Dear Mr. Smith:

There are a number of serious questions raised in your letter and my major reactions are as follows:

THE SAKE OF CHANGE

There is a profound irony here. We live in a vortex of technological change which demands constantly quicker responses and more, always more, operational flexibility. We see ever decreasing product cycles and shifts in consumer attitudes that seem to doom anything that is static to an ever mounting trash heap. We see products become obsolete before we have had a chance to get the bugs worked out of them. Our companies are managed by men increasingly forced to make decisions and revise those decisions in an atmosphere devoid of the luxury for quiet reflection. Politics, yes . . . but the politics of survival. It is ironical that we technicians who fire the cauldron of technological change should feel victimized by its consequences.

DIRTY PRACTICAL POLITICS

We have rarely worked with a company in which most employees were not keenly aware of "politics." The word as commonly used refers to the collection of contacts, friendships, alliances, and ambitions of employees who are motivated to get ahead. The only certain thing about company politics is that when **we** win **our** point, it is with merit, hard work, and our ability to work with all the facts. When we lose, it is due to behind-the-scenes political cunning exercised by unethical parties upon ignorant management.

Because of the fickle nature of politics, we must be ever wary that our activities contribute to the objectives and survival of a company. We must constantly be alert to learn what those objectives are and to evaluate the economic consequences of what we do. Oth-

erwise, there is always a politician who will pounce when we don't appear to have these points thoroughly covered.

The existence of politics, even unethical politics, is more than just a fact of life; **it is a personal necessity.** How sterile and humiliating it would be to live in a world of perfect justice in which our failures could result from nothing but our own incompetence. . . .

Your letter, Mr. Smith, is a sobering warning to any young man who will take the time to read it carefully. You say that you entered the field because of your (technical) interest . . . and disregarded other aspects of the job. . . . Most of your letter points out frustrations resulting from the disregard of "organizational reality" by the professional, and from the ignorance of technical realities by managers, owners, and administrators. You say that ". . . starvation is . . . a more powerful motivator than . . . intellectual satisfaction . . ." warning us that we must see beyond the technical aspects of a project for intellectual satisfaction and continuing success.

Perceptive management is now pursuing the future, but through more flexible project management approaches. Our environment will not tolerate over-speculation.

POINT AND COUNTERPOINT

But what I have said so far perhaps oversimplifies your particular situation, as you did enumerate several cogent and worthwhile points which are quite likely in the minds of many individuals like yourself who are in a similar position. So that these points are not passed by too glibly, let me address them as you have described them.

1. "*There are not enough challenging assignments to go around.*" True, and companies lose capable people regularly because no one takes the initiative to put it all together. Few would bet that Orville Wright's contraption could fly, but then there are few Orville Wrights. There **has** been considerably more than 85% of the original effort subsequently expended on revamping his project. Challenge, like beauty, is in the eye of the beholder.

2. "*Civionics.*" Much **could** be done in areas such as transportation and construction. There is an obvious need and people are anxious to pay for any acceptable project. If we could lay-off politicians and company v.p.'s in equitable proportions during economic squeezes, perhaps we would have the right mix to staff such projects. The frightening problem we would then face is whether poli-

ticians can manage complex projects which managers fear to try. . . . Keeping customers happy is much more complicated than merely landing men on the moon.

3. "*Not merit but political ability.*" Engineers, like other living things, cannot exist in a vacuum. They must communicate — i.e., relate, coordinate, and cooperate — with their associates. And the larger the organization, the larger the number of associates. "Ivory tower" engineers can be and are being replaced by computers, since they have all of the disadvantages and few of the advantages of their replacements. Even computers are judged on their I/O capabilities. (But not **only** on their I/O capabilities!)

4. "*The project organization has no stability.*" True, thus no one waits for his boss to drop dead. All he has to do is weaken. The static organization is increasingly in trouble **because** of its stability. Let us respect the structured organization as befits the condition of that which is established; but let us not envy the drowsy periods, the sluggishness, and the restricted view-points that accompany its condition!

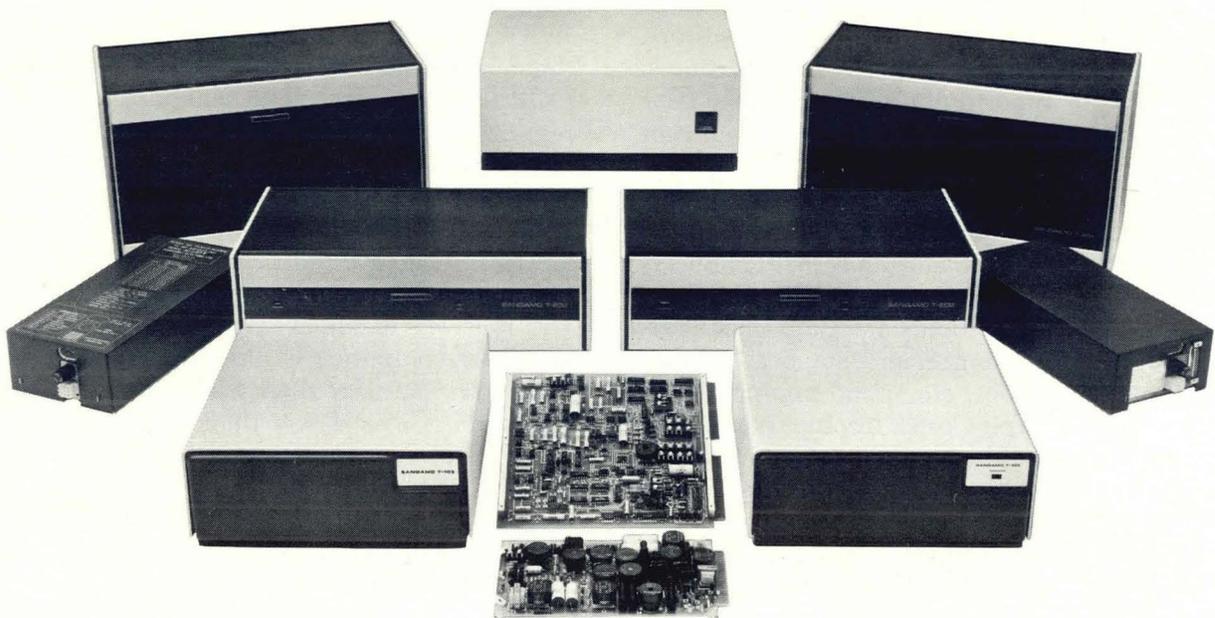
5. "*Resource sharing.*" I am reminded of a slogan under a coat-of-arms which goes somewhat like this, "Battle only with the certainty that virtue is with us." It is true that there is contention for resources, but, in a macro sense, that's the motivational attribute which we use to distinguish between the quick and the dead.

6. "*Slow growth rate and poor utilization of skills.*" Management tends to treat technical specialists as resources, and therefore seeks the maximum output for the minimum investment. It is a general rule that the most specialized tools are quite expensive and limited to a very few uses. Perhaps it is unfair that the same rules which apply to tools and machinery also seem to apply to human resources as well, but the answer requires a very human judgement of tradeoff values by employees, customers, and stockholders.

7. "*Natural motivation is for survival, not project execution.*" If there is a conflict, then survival is the only choice. But if a company cannot execute its projects, there is no survival. When you are choked by an organization in which politics, incompetence, or ignorance regularly prevent project execution, you must change the environment or leave it. This country was founded on the belief that no man should have to play in a game that he can't win. Accept no arbitrary handicaps! ▲

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1: Modems compatible with Bell data sets and all business machines. **2:** Modems compatible with the F-57951, F-58012, F-58118, 1000A, 1001A, or 1001B data couplers. **3:** Modems that have been supplied for over eight years to the communication industry. Also see SANGAMO: **1:** A company that has a data test center for your use in proving-in modem performance. **2:** A company that is delivering 300 bps, 1200 bps, 2000 bps, 2400 bps and 4800 bps modems. **3:** A company that provides on-site service, repair center service and schools for training your technicians. **4:** A company that guarantees a full one year warranty.



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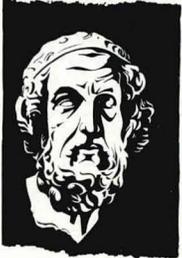
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A SQUINT AT OCR



J.P. TIRESIAS • New York, N.Y.

Why after a decade of development work and universal recognition of the need for better input, has optical character recognition (OCR) floundered so badly? We have taken the opportunity in these columns to note the overzealousness of investors, advisors, and entrepreneurs in the EDP business. Now we have an opportunity to stimulate the conscience of the user about his lack of enthusiasm over OCR.

OCR seems to be the perpetual premature darling of the computer industry. OCR units are peddled by three groups: mainframe manufacturers (IBM, CDC, GE, Honeywell, NCR, Univac); publicly-owned independents (Cognitronics, Farrington, Optical Scanning, Scan Data, Scan Optics, Recognition Equipment, etc.); and non-public independents (Datatype Corp., Infoton, etc.). It is difficult to determine the computer manufacturer's role and success in this business, but we have a clear picture of how independents work.

Two major criticisms have been made of the OCR people — unsettled technology and deficient marketing. The basic technological dispute centers around the virtues of matrix photo-electronic discernment of characters versus the outlining technique of the flying spot scanner. Beyond this are other ramifications such as standardization of type fonts and document input.

Shortly after the commercial success of the electronic computer, talk began about the inadequacy and inefficiency of punched cards. Complaints continue to this day! However, even the advent of key-to-tape input devices has failed to diminish substantially the popularity of punched cards. One

reason for this is the reluctance of IBM to give up this extremely lucrative part of its business.

Bob Burns, president of Scan Data, says that, "If IBM were to put a major marketing effort behind its OCR business, it would help the entire OCR segment of the industry." But IBM will not push OCR until somebody else makes significant progress in the market-place. Conversely, nobody else has a chance until IBM ends its prolonged affair with the punched card.

Estimates of keypunch installations range from 400,000 to 800,000 units. If there are between 70,000 and 75,000 computer installations in the country, that leaves an average of five to ten input units per computer. Published estimates indicate that there are less than 1,500 OCR installations and perhaps even fewer than 1,000. It is said that some of these are running at less than 50 percent of capacity. These figures do not represent a healthy prognosis.

A case in point is that of Farrington Manufacturing Co. Farrington, a pioneer OCR independent, was founded and led by a respected "techy type," Dave Shepherd, who was blamed for Farrington's failure to freeze design. While his technical ability was never in question, it was said that he lacked managerial ability. Result: Shepherd left to start Cognitronics. After Shepherd's departure, it is noted that Farrington failed to evidence innovation or increase marketing, and apparently adopted some very funny accounting practices. End result: Chapter Ten. OCR's reputation has been adversely affected by such events as the Farrington failure.

Promises to make OCR available to all data processing users and claims to have a \$3,000 to \$50,000 unit for everyone will come forth. "But," says

J. P. Tiresias is a pseudonym for an individual at home in both the industrial and financial communities. This column, which represents opinions garnered from many specialists, interprets significant trends in the EDP marketplace.

Philip Meyer, OCR securities analyst for F. Eberstadt Co., "be wary. Few of these firms have adequate follow-up R&D." The principals will generally be limited to one product or product line. Worse yet, they will lack marketing power in a market segment that will need a great deal of it in view of ease of entry at the lower end. Many will enter the commercial market, fail, and — if lucky — end up in the OEM trap. Not all new OCR companies fit this description, but study and discretion by investors is strongly advised.

IBM must eventually put aside its low marketing profile in the OCR area and do some missionary selling. An economically viable alternative to keypunch must be offered to match the needs and speeds of new computers. Few see this happening this year. Some see it within three. The problem now is less and less the viability of alternatives — what is becoming increasingly important is IBM's willingness to market aggressively these alternatives, one being OCR. (There are, however, some signs that IBM is becoming more aggressive in OCR and on-line data entry as alternatives to punched card input.)

IBM and other manufacturers, such as CDC, can offer something else as well. They can develop creative applications and software support. IBM however, has indicated that it will not introduce OCR units with as many options as, for example,

Scan Data does. IBM can provide creative applications assistance and marketing support, but only for units it is willing to market.

Another obstacle for independents is the reluctance of users to purchase or long-term lease from them. When technology changes so frequently it is impossible to expect more.

Meyer maintains that mainframe manufacturers have a good chance of maintaining their current 60% to 65% of the OCR dollar market. "Profitable OCR needs the reasonably broad applications support, marketing, and financial resources of the mainframe competitors," he says. He believes that the largest and most profitable market will be in the \$75,000 to \$250,000 range largely due to its dominance by mainframe manufacturers. While the \$3,000 to \$50,000 small machine may well capture a good portion of the overall market; profitability for independents is likely to be elusive in this segment. Conclusion: OCR is unlikely to be highly profitable for the little fellow.

Ultimately, responsibility and responsiveness of users becomes the issue. Little interest, daring, and creativity has been shown by them. What a refreshing innovation it would be if the user took it upon himself to demand what he knows is available and would probably fulfill his needs without waiting for a decree from papa-IBM.

Meanwhile, double-knits, modular housing, and attractive P/E's continue to hold sway. ▲

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STATUS REPORT



ROBERT F. GUISE, Jr. • Com-Share, Inc., Ann Arbor, Mich.

Time-sharing issues are currently somewhat obscured by the general lackluster performance of the industry. But there are still many issues which do affect users and practitioners, and which should be reviewed at this point in time.

With the recent shakeout of companies in this area, it is little wonder that customers are wary of time-sharing. Some have come to consider the service a "frill" rather than a necessity, partly the result of over-selling. Also, the industry has not been especially successful in supplying commercial applications. Difficult times are not yet over.

One specific area of difficulty is among the independents. Almost miraculously, a fair number remain in business. Even a short six months ago, I was among those predicting that consolidation was the only route to salvation. Alas, this was not to be. The entrepreneurs are stubborn men, and somehow many have managed to survive without selling out. Part of the reason for this can be attributed to the type of individual who ventures into these new areas—"personalities" standing in the way of companies getting together. Whatever the outcome, it does not look like consolidation is a good bet at this time.

The investment bankers have walked away, the underwriters have walked away, the financial analysts and customer's men have walked away, the customers have walked away, and the time-sharing people are even walking away from each other. Where does this leave them in the future?

Robert F. Guise, Jr. is Chairman of the Board, Com-Share, Inc., Ann Arbor, Michigan, and President of the Computer Time-Sharing Services Section of the Association of Data Processing Services Organizations (ADAPSO).

EDITOR'S NOTE: Writing a time-sharing column in a down market is like selling refrigerators to Eskimos. Nevertheless, we believe that as time-sharing continues as a moving force in the industry, more and more users must continually evaluate the services available to them. **Time-Sharing Topics** will address itself to new and unusual time-sharing applications, the manufacturer's role, the new technology, in-house time-sharing, and the industry's relationship with other business and the economy. Your opinions and reactions are welcome.

Fortunately, there are still those who believe that time-sharing is a legitimate service with a brilliant potential. From this hard-core group, the new time-sharing industry will arise. You may expect more rigorous standards and better applications, particularly in the business area (since that is the greatest potential market), and better support from private capital sources and the market. Since we are looking up from the floor, I can only say the future will be better. While we have ourselves to blame for the current situation of time-sharing—the over-optimism, the narrow marketing—we own some fairly respectable accomplishments, and these solid developments will see us through.

Of course, as always, the final burden of proof falls on the user and potential user. Customers and potential customers perusing the current menu of services available can pretty much count on their being around for awhile. If they've lived through this blood bath, chances are better for further survival. But this does not *guarantee* survival, of course; users must determine their own standards for evaluating the companies they want to do business with. Emphasis should be on genuine need and

the services available. Here it is as much the user's responsibility to determine need and credibility as it is the time-sharers. Users should not immediately expect the price of time-sharing to go down just because time are rough. If anything, it is just the contrary, prices are going up. Nothing much can be done about this condition until we have more standardization and cheaper equipment, and until telephone line charges and restrictions are clarified.

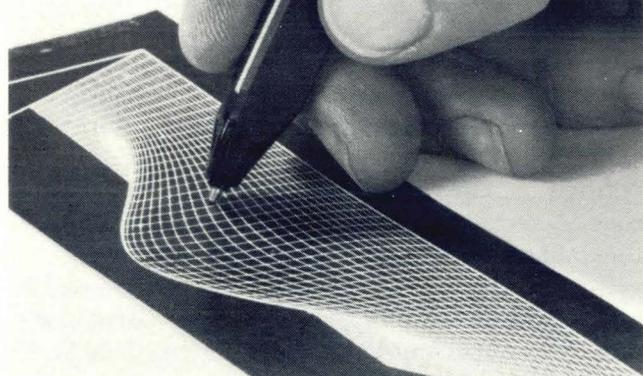
In this connection, and as president of the Computer Time-Sharing Services Section of the Association of Data Processing Service Organizations (ADAPSO), I can say that every effort is being made in our struggle with the telephone companies. Many dollars and man-hours both of the Association companies and individuals are being expended to check the telephone companies' efforts to wear down the time-sharing services industry. In the past year, Bell System member companies have, on a painstaking state-by-state basis, filed tariffs raising the cost of transmitting digital data on telephone lines by as much as 600 percent. With their far vaster resources, it looks like Ma Bell is in a position to wear us down. But I can assure you that no relaxation on the part of cooperating time-sharing firms is intended. Furthermore, the prospect of the FCC accepting widespread utilization of microwave for data transmission (which makes far more sense anyway) is ever-present, and stands to circumvent the dependency on lines.

Any effort to establish the so-called nationwide utility is temporarily bogged down by a similar personality impasse, both corporate and individual, and by a lack of acceptable standards. Granted, little has been done to create these standards. When some of our other battles are fought and won perhaps more attention can be devoted to constructive efforts such as communication standardization and equipment compatibility.

One trend you can safely bet on is towards more and more applications-oriented service. Time-sharers have learned from the present crisis that you cannot be all things to all people. Those services which are data base-related will continue to function on that basis. The dream of publicly-available sources of common data in huge files is over. The dream of an individual company establishing, marketing, and maintaining a truly national data network is all but over. That one dies hard.

Practical applications that fulfill legitimate needs in a controllable and contained environment are what both customer and time-sharer alike should be looking for. After all the *mea culpas* are over, time-sharing will have a brilliant future. It takes times of trouble to strengthen a young, dynamic industry. I, for one, am confident that it will survive and prosper. ▲

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DATA CENTER INVOLVEMENT IN THE SOFTWARE MARKET PLACE



L. A. WELKE • International Computer Programs, Inc., Indianapolis, Ind.

The line between data centers and software firms, at one point as thick as a quantum jump in P/E ratio, is now barely discernible in many cases. The reasons, can be reduced to two.

Software firms are realizing the comfort that monthly repetitive processing (and its monthly repetitive income) can bring to an otherwise all too chaotic earnings pattern. To put it more bluntly, the data center work is a nice cushion to have.

Conversely, a good many data centers are realizing the profit potential of software, particularly proprietary "packages." Neither activity is alien to the other — indeed, for a host of reasons, not the least of which being the resultant stability one could give the other, data centers and software firms might willingly become marriage partners.

Admittedly, data centers and software firms have their differences. Data centers are unromantic data factories with a frequent odor of hard work usually enveloped in a general atmosphere of nit-picking accuracy. Software firms, on the other hand, have the allure of creativity, challenging opportunity, and most of the good buzz words. For instance, even when they do get involved in data center work, they would prefer to call it "facilities management."

There is also, however, an underlying similarity between the two: both are comprised of data processing professionals. That is, the men and women who are in either of these businesses have chosen

In July 1966, L. A. Welke founded **International Computer Programs, Inc.**, publishing the "*ICP Quarterly*," a catalog of available, saleable computer programs. ICP also conducts executive seminars on the purchase and sale of computer programs, and undertakes consulting and marketing research projects in the software industry.

EDITOR'S NOTE: Each month this column will address itself to specific issues and problems confronting the data processing services industry, particularly as it relates to the data center segment. Various services, including applications, software, consulting, time-sharing, and data facilities management will be covered, and reader suggestions and comments are encouraged.

to put their money where their mouth is. They live on the profitable employment of computers and the intelligent processing of data within the confines of market needs.

Not many EDP managers have the constraints that data center management has. For example, the center manager is not only confronted with a budget; the penalty of budget violation for him might well be an educational experience in bankruptcy proceedings.

This leads a data center operator into both minimizing his costs and maximizing his return on investment. If he can see that in-house programming will allow him to offer a new service or satisfy a client's needs at five times the cost of doing the same thing with a package, he'll take the package. But if he has no choice other than to go the in-house route on programming, you can bet he'll try to get as much mileage out of that system as is possible. One way, obviously, is to sell it as a proprietary product outside of his marketing area.

Both practices are sound. The first has made the data center industry a prime target for anyone selling software packages. Because of it, the centers have been able to quickly get into new services with a minimum of investment and time.

The second, that of selling software, has earned them an extra coin in a natural adjunct to their

normal business. Some of the best software products on the market have come from data center environments, where multi-client use has provided universality and proof of operability. And if the data center has determined the geographical area it can service, they can sell the software package throughout the rest of the country.

The third act of data center involvement in software, after buying and selling for their own portfolio, is their selling of software for a third party. Sometimes a center will act as an agent for another center; more likely, they will undertake an agent responsibility for one of their good (and large) client companies.

The data center which does this best is probably one that is already familiar with the problems — and needs — of the marketplace. The originator of the software under these circumstances, e.g., a Fortune 500 company, may not want to gear up a marketing effort to sell packages. And yet that originator can realize a return on his investment by having the package marketed by someone.

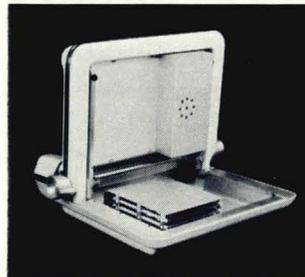
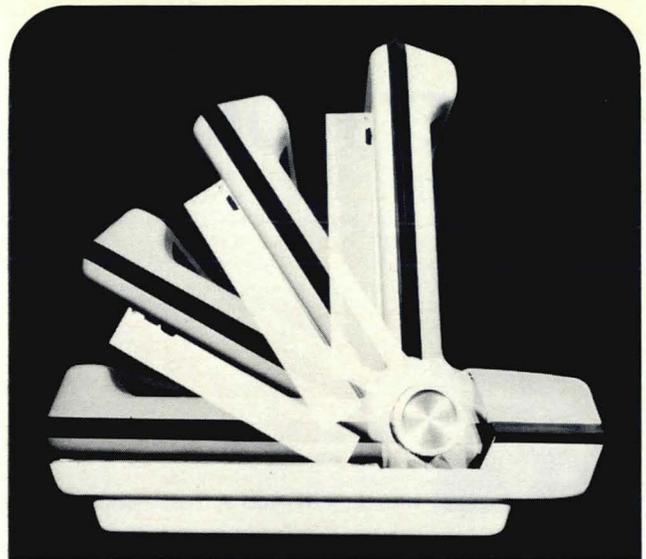
The center thus provides a service to the originator who earns an income otherwise not available, the public gets a package that otherwise might not get to the marketplace, and the center itself has another source of income. Everybody wins. But the center must also be familiar with the market and know how to structure the proper relationship for on-going support and maintenance of that package with the originator and/or the buyer. Or everybody loses!

A good number of these marketing relationships between the regular computer user and a data center already exist. More are in the negotiating stage. It's fair to assume it will become a common practice in the industry.

Finally, a thing that is happening in the marketplace with increasing frequency involves the software source, be it data center or software firm, which first sells a package program and then not only installs the system, but runs it well. This can only be done with a total — or turnkey — system.

Some industries are more apt recipients of this approach than others. Brokerage firms, subscription fulfillment operations, ad agencies, fund raising operations — this is where it has happened to date. The similarity between these cases is that the program package and all that it embodies seems to be a full step ahead of the present practices of the client firm. The client, rather than trying to integrate the new system into this existing procedure, merely turns the entire process over to the software seller.

Everything that is happening points to a more sophisticated marketplace — better sellers, better buyers, and better results. Maybe someday we'll even reach the point of being able to define "information." ▲



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TURNKEY FRONT ENDS



THOMAS DeMARCO • Independent Consultant

In early 1965, IBM made a commitment to a dual-processor Data Text system utilizing a 360/65 and a 360/50. The 50 was to serve as a front-end communications processor. After about 20 man-years of development, some brave soul asked one of those questions so frowned upon by IBM: "Couldn't we do the same thing with only one machine?" The next version of the system had no front end. The 65 had a larger memory, and a resident telecommunications handler, but performance was about the same.

In the intervening years, there has been little to suggest anyone's improved understanding of front-end processors. The third generation has yet to make itself felt. The DataNet devices from GE were the only front ends to gain widespread acceptance and they have been discontinued by Honeywell. In place of the DataNet, Honeywell is now pushing the 516, a device of the same ancient vintage. At least five front-end companies have merged out of sight or filed for bankruptcy.

In spite of it all, there is a continuing market for front-end systems for message switching and general-purpose communications processing. The potential buyer must consider a dizzying array of possibilities. The different vendors have gone in radically different directions, so the technical evaluation is particularly complicated. The spectre of financial instability haunts every decision. Even solid vendors re-evaluate their commitments continually because of front-end development and support costs. Any one of the present vendors might be expected to desert the field at any time for the relative security of Anything Else.

One of the most ambitious front-end vendors is Comcet. The company is experiencing some financial growing pains, but the product is particularly nice. It is a 360-like device with about the power of a 40. The technical capacities of the support

personnel are better than adequate. Several configurations have been running for the past year.

Collins, Marshall and Phillips offer front-end and message-switching systems that are by-products of Military Command and Control Technology. Unfortunately, only armies, navies, and government agencies can afford them.

Among minicomputer companies vying for the front-end market, Interdata stands out. At least 12 of their small-to-medium configurations are now running, mostly with low-speed lines.

A number of systems houses have put together front ends that are worth looking at. One of the best of these comes from Programming Methods in New York. The company has two front-end products, one using the Honeywell 516 and the other a Tempo processor. Since both Tempo and PMI are part of the "GTE family of companies," there is at least one cubic mile of money behind them. The line interface hardware on the Tempo is the prettiest on the market, and very attractively priced.

Viewed from the 360/370 side, the PMI front end looks like a tape drive on the selector channel. All interface software is written at the logical level under OS. For those already using the INTERCOMM multitask monitor and file handler from PMI, cutting in the front end is almost a transparent process. Both front-end products are available in duplexed configurations.

Informatics bids a system utilizing XDS hardware. The price is fairly steep, but it looks like a good product. Cybermatics and Wells Management bid smaller systems using the Digital Equipment PDP-11 and IBM 1130, respectively.

The above doesn't represent an exhaustive list but just a starting point. Be prepared for prices ranging from expensive to outrageous. And, in many cases, be prepared to buy the whole company if you want it to be around long enough to service your system. ▲

Mr. DeMarco is a regular contributor to The Systems Scene.

The DISKSTOR 510® is a mass memory system with removable media. This operator-replaceable, head-per-track disc storage system will add fast access memory capacity to data processing equipment (average access of 8.7 ms.) Double-surfaced discs, which store up to 5 million bits per surface, can be changed simply and quickly. Ideal for mini-computers, auxiliary memories, process control, automatic test systems, data acquisition, etc.

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CONCENTRATORS AND MULTIPLEXERS

Communications Clinic is a regular monthly column written by the staff of **Berglund Associates, Inc.**, consultants in telecommunications. Readers are invited to submit questions on any aspect of communications or suggestions for future Clinics to:

Communications Clinic
c/o Berglund Associates, Inc.
1060 Kings Highway North
Cherry Hill, New Jersey 08034

There exists substantial confusion in the industry as to the functions of the devices variously labeled multiplexers, concentrators, port selectors, communications controllers, communications handlers, and pre-processors. This month's Clinic is an attempt to define these various devices in terms of function, and the use of minicomputers or hard-wired logic for implementation. Names are attached based on our experience in usage.

MULTIPLEXERS

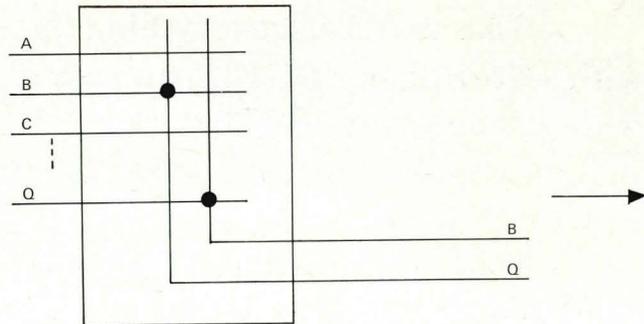
As a general rule, the multiplexing function implies:

- convergence of a number of low-speed lines to one high-speed line, with all low-speed lines having either continuous or periodic appearance on the multiplexed channel; *and*

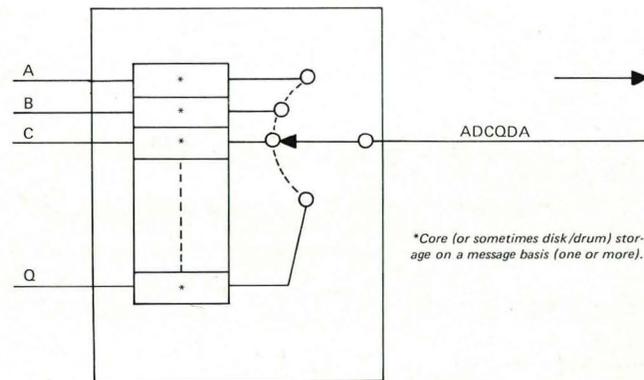
- no — or negligible — storage per line for each low-speed line.

The two basic types are frequency-division multiplex (FDM) and time-division multiplex (TDM). In FDM, the multiplexed channel is divided up into a number of individual small segments of bandwidth, each of which is assigned to one of the low-speed lines. Hence each line has a *continuous* appearance within the multiplexed channel. For FDM there is no per-line storage. FDM devices are not implemented with minicomputers.

In TDM, the entire bandwidth of the multiplexed channel is driven at its highest practical bit rate — usually 2400, 4800, or 9600 bps for voice channels. The TDM terminal accepts a bit or character from one of the low-speed lines and transmits it over the multiplexed channel at the high bit rate. The terminal then takes a bit or character from the next low-speed line and forwards it at high speed, etc. Hence, each low-speed line appears *periodically* on the multiplexed channel. The per-low-speed line storage is generally one to two bits for a "bit interleaved" TDM, and one to two characters for a "character interleaved" or "byte interleaved" TDM. TDM terminals can be built around a minicomputer, but for pure TDM function, their logic is generally hard-wired for lower cost.



A. CONTENTION CONCENTRATOR—Lines B & Q being served; no other line may be served until either B or Q disconnect.



B. STORE & FORWARD CONCENTRATOR—Output sequence is a function of message rates on incoming lines, and of the priority rules (if any) inside the concentrator.

Fig. 1—Concentrators

Multiplexers may exist as free-standing remote devices; free-standing devices located adjacent to the CPU, much as a peripheral; or integral with the CPU. The IBM 270X class of computer I/O interfaces perform a TDM function and are frequently referred to as multiplexers.

CONCENTRATORS

As a general rule, the concentrating function implies:

- concentration of m lines to n lines, where n is smaller than m , and both sets of lines are the same bandwidth. This is frequently referred to as a "contention concentrator." Any of the m lines accesses one of the n lines as one of the n lines becomes non-busy. If all n lines are busy, $m-n$ of the input lines cannot get through. *or*

- concentration of m low-speed lines to one high-speed line, with each low-speed line appearing on the multiplexed channel either at a periodic rate *or* at a rate equal to the proportion of its traffic to the traffic on all other low-speed lines. *with*

Continued on Page 52 . . .

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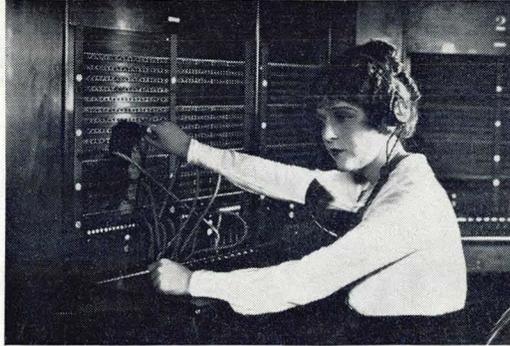
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After helping a jillion feet of paper tape wind and unwind its way through communications systems everywhere, Teletype announces the addition of magnetic tape data terminals.

There are some basic advantages in both mediums. But as you are well aware, the medium that's right for a system depends a lot on the application criteria.

The new magnetic tape data terminals have many operational features that make life less complicated for the operator.



New, modular line of Teletype® 4210 magnetic tape data terminals.

For example, take a look at the tape cartridge, which was specifically designed for reliability required for data transmission.

Its vital statistics are: 3" x 3" x 1".

It contains 100 feet of 1/2" precision magnetic tape.

It will hold 150,000 characters of data, recorded at a density of 125 characters per inch. The equivalent of a 1000 foot roll of paper tape.

This means that your data is easier to store, easier to handle, easier to work with than ever before. And it's reusable.

DATA COMMUNICATIONS

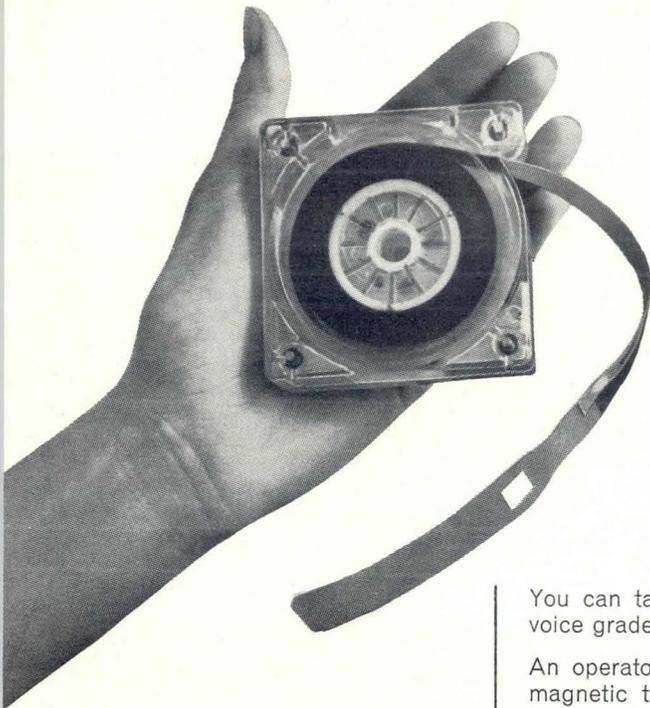
equipment for on-line, real-time processing

The units have a "fast access" switch which will move tape forward or reverse at a speed of 33 inches per second. A digit counter provides a reference point to help locate various areas of the tape.

Four ASCII control code characters can be recorded in the data format to aid character search operations. When the terminal's "search" button is pressed, tape moves at the rate of 400 characters per second

Also magnetic tape adds high speed on-line capability to low speed data terminals.

You can zip data along the line at up to 2400 words per minute. For example: Take a standard speed Teletype keyboard send-receive set, and a typical typist. Add a new magnetic tape unit to this combination and the on-line time savings can pay for the magnetic tape terminal in short order.



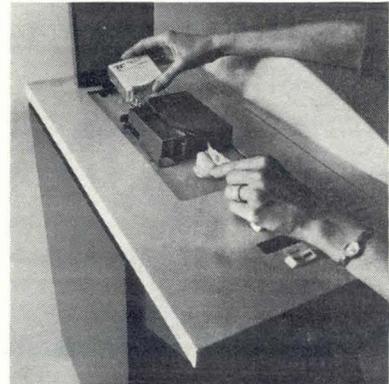
until the control code selected is detected. Then the terminal stops the tape automatically.

A "single step" switch is also provided which enables you to move the tape forward or backward one character at a time. In editing or correcting tape, you can send a single character using this feature.

You can take better advantage of voice grade line speed capabilities.

An operator can prepare data for magnetic tape transmission using the keyboard terminal in local mode. Then send it on-line via the magnetic tape terminal up to 2400 words per minute.

These new modular magnetic tape data terminals offered by Teletype are perfectly compatible with model 33, model 35, model 37 and Inktronic® keyboard send-receive equipment.



Straight-through threading makes tape loading and unloading exceptionally easy.

They can send or receive at high or low speed. Or can be used independently as stand-alone terminals on-line.

If you would like to know more about this new line of Teletype magnetic tape data terminals, please write Teletype Corporation, Dept 40-15, 5555 Touhy Avenue, Skokie, Illinois 60076.



Teletype 4210 magnetic tape data terminal with 37 keyboard send-receive set.

machines that make data move



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CIRCLE NO. 26 ON INQUIRY CARD

COMMUNICATIONS CLINIC Cont'd

- storage for "messages" from and to the low-speed lines. This storage may be per-line, or it may be common and dynamically shared between lines. Messages are usually defined in length — typically 80 characters. This type of concentrator can be referred to as a "store-and-forward" concentrator.

The contention concentrator is generally hard-wired and appears as a front end to a remote multiplexer, or as a front end to a CPU. Its principal application to date has been by time-sharing service suppliers. That service is characterized by a finite number of CPU ports plus an "infinite" number of remote terminals which may try to access a port, with varying rates of seizure-try. The contention concentrator (also called a "port selector" in this application) interfaces the finite number of ports to the diverse seizure-tries coming in over the exchange network. Similarly, a CPU in one city can provide service to subscribers in a distant city. To do this, the ports are "extended" to the distant city by a multiplexer, and interfaced to the universe of subscribers by a *contention concentrator*. These applications also illustrate another source of confusion in that a *concentrator* is being used to drive a *multiplexed* channel.

The store-and-forward concentrator is generally used where:

- there is a finite number of discrete terminals;
- all the terminals require a better grade of service (or psychological sense of service) than dial-up;
- no single terminal can justify its own full-time channel in a *multiplex* system;

Classic applications include servicing desk sets in reservation and stock quotation systems.

Store-and-forward concentrators can be located as a remote device, or adjacent to the CPU, from whence the name "communications front end." Either remotely or locally, they may also be viewed as "communications controllers." Regardless of location, if the only function is concentration, the name "concentrator" is probably most valid. However, if the device is performing other functions — such as code conversion, editing, or error control — it may be viewed as a "communications pre-processor." When operating locally, the interface to the CPU may be either a communications port or a peripheral device channel. Store-and-forward concentrators are generally built around a minicomputer.

SUMMARY

MULTIPLEXER — thru channels on a continuous or periodic basis, with negligible per-line storage.

CONTENTION CONCENTRATOR — m to n lines, all of the same bandwidth, any of m connecting to any of n on a contention basis.

STORE-AND-FORWARD CONCENTRATOR — m low-speed lines to one high-speed line, with per-line storage on a message basis. This unit may also be called a communications front end or communications controller. With functions in addition to pure concentration, it becomes a communications pre-processor. ▲

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WHAT HATH BABBAGE WROUGHT Dept.

THEY GET AN 'A' FOR EFFORT

I have tried unsuccessfully to have my out-of-town bank remove my former zip code from their monthly statements they send me. After five months of requests, I received the following personal letter from them explaining the situation:

Dear Mr. Jacobsen:

We received the duplicate of your Check Reserve statement today — that extra zip code was still there!

We have attempted to erase the 95070 zip code for many months, but have failed to do so as yet. We have submitted all possible record changes available to us, have written directly to the manager of our computer center in San Francisco, and to our regional office in San Jose.

The current consensus of opinion is that there is a problem with the computer program, which programmers in San Francisco are attempting to solve at this time.

We are sorry the progress has been so slow, but we do not become aware of our failure to erase the 95070 zip code until we receive your monthly statement at which time we submit another record change.

We are certain this is a particularly frustrating experience, especially for a man with your capabilities in computer programming. You can be assured that we will do everything possible to hasten the correction on your statement.

Thank you for your patience in this matter.

*Very truly yours,
Instalment Loan Department*

Submitted by: Laron Jacobsen, Venice, Cal.

MODERN DATA will pay \$10.00 for any computer- or EDP-related item published in our **WHAT HATH BABBAGE WROUGHT Dept.** Humorous 'information' for consideration may include weird memos or operating instructions, unusually incongruous documentation, and off-beat items of a general nature (for review by our off-beat editors). Send all submissions to:

WHBW
MODERN DATA
3 Lockland Ave., Framingham, Mass. 01701
All entries become the property of MODERN DATA.

TOO MUCH OF A BAD THING

If you think you get lots of junk mail, consider this nightmare situation: A steel company executive requested a leading industry magazine to change his mailing address from his office to his home. The computer operator, via a mailing list maintenance program, erroneously instructed the computer to re-address all the magazines sent to the company. After six weeks of receiving five mail sacks of magazines, the executive finally got the publication to correct their list. But, like most publications, the magazine generates additional income by selling its mailing list. Now when the steel executive receives a junk mail letter, he often gets several thousand copies of it!

Suggested by:
Fred Basch
Mansfield, Mass.

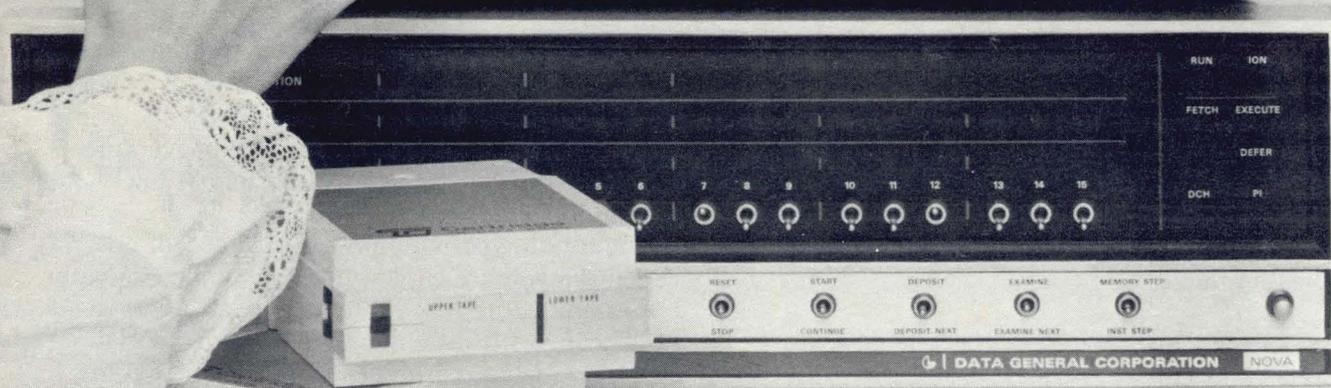
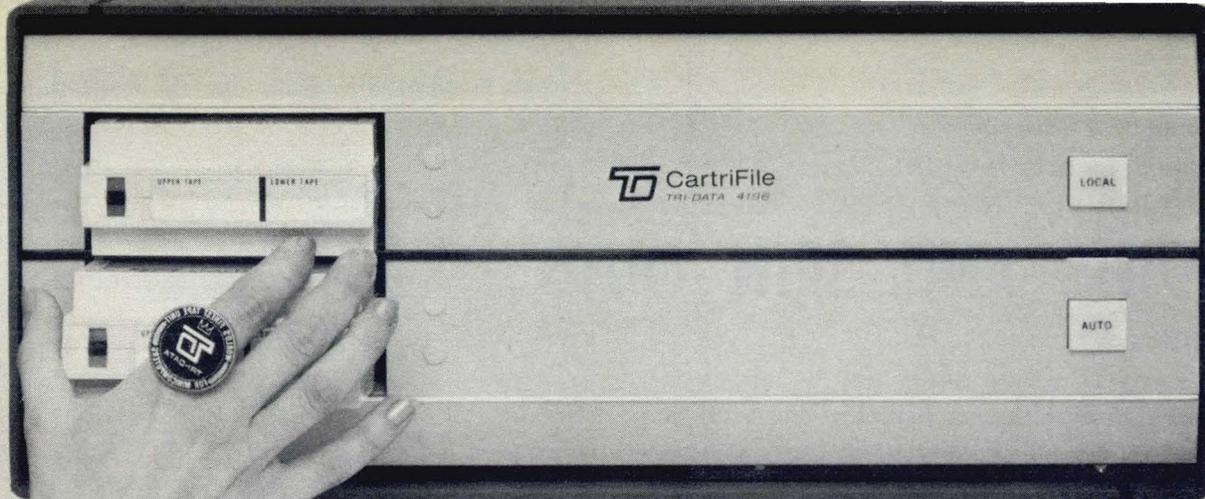
HELLO, HELLO; GOOD-BY GOOD-BY . . .

The story may be apocryphal, but reportedly the ultimate in computer confrontation occurred here.

A computer was programmed to report its own malfunctioning to a serviceman. The equipment went on the blink one night and called the serviceman, who had moved. The telephone company's computer responded with a recorded message that the telephone was disconnected. The computer broke the circuit and re-dialed the disconnected number, and the telephone replied again with the recorded message.

This contest of mechanical persistency reportedly continued throughout the night until business hours the next day.

Submitted by :
Henry G. Owen
Edina, Minn.



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Additional design features speed thru-put. First, you can write on any one of the four tapes

while reading on any other, which can double your thru-put in some applications. Secondly, the tape format and systems-oriented design mean shorter programs are stored in your computer. The less stored program, the more memory is available to you.

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CIRCLE NO. 45 ON INQUIRY CARD



SPIN INS AND SPIN OUTS

A brief introduction to the mechanics of corporate acquisition and divestiture pertinent to companies in the computer field.

Basically, a "spin-in" occurs when a corporation supplies the venture money to create a new corporation (or venture group), generally with a buy-out option based on the success of the enterprise. "A spin-out" occurs when a corporation has a division, part of a division, or product which no longer fits its long-term corporate goals and thus becomes eligible for sale.

SPIN-INS

Spin-ins can take two forms. The more traditional approach is where a corporation sets aside a group of people with a product idea and gives them a budget and the supporting marketing, engineering, and manufacturing talent to bring the product through the various test stages to the marketplace. This approach has been effective in allowing some of the younger members of management more responsibility and flexibility in implementing their ideas, and in avoiding frequent restrictions of the "not-invented-here" (NIH) factor.

The other type of spin-in is where the corporation sets aside a pool of venture capital money and takes an interest in companies which are just being formed. Examples are Electronic Memories' and Magnetic Inc.'s financing Caelus Memories (disks), and California Computer Corp.'s financing Century Data Systems (disk drives). Although the role here is analogous to that of the traditional venture capitalist in supplying high-risk seed money, the corporation has several advantages. First, it can afford a much longer-term prospective

look than the normal venture capital investors. Second, there can be an active trade-off of ideas between the people in the venture company and the funding corporation. Third, if the venture is not successful, the people can be folded back into the funding corporation.

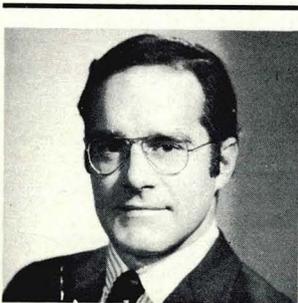
The funding corporation can also accept criteria which the venture capital investor cannot tolerate. For example, the corporation can back a very good R&D team with little manufacturing or marketing capability, whereas the venture investor requires a complete team. Additionally, the corporation, because of its traditional long-term outlook on research and development, is accustomed to funding basic R&D projects which could take years before becoming marketable products. The venture investor is not likely to finance a basic R&D project of this nature.

SPIN-OUTS

As mentioned previously, spin-outs occur when a corporation has a division, part of a division, or product which no longer fits its long-term corporate goals. Spin-outs can also be separated into two forms: divestiture of the division or product, and sale of a part of a division to the public.

The corporate divestiture can be motivated by several factors. In the current market, the conglomerates which bought a wide variety of companies are very seriously reviewing the problems they face in running them. An uneconomical scale of operations, planned obsolescence, lack of satisfactory returns, restrictive regulations, etc., are all reasons why a division might be sold. The division or product becomes worth more to a potential buyer than it is to the present owner.

The second type of spin-out is where the corporation is selling a minority portion of a particular division to create a new public entity. A partial spin-out is most frequently used by corporations with low price-earnings ratios which have a wholly-owned subsidiary with a considerably higher price-earnings ratio. This was the case in



Robert F. Johnston has worked for several years on Wall Street with investment banking firms such as F. S. Smithers and Co. and Smith, Barney Company. He is currently running a venture capital firm, Johnston Associates, which primarily acts as representative for the managements of small companies in the computer field in search of money. He is also a consultant to Collins Securities Corporation, a young investment banking firm.

the STP spin-out from Studebaker-Worthington, and in the Computer Technology, Inc. (CTI) spin-out from LTV.

THE CTI PARITAL SPIN-OUT

The LTV-CTI case is probably the best known example of the partial spin-out. In the spring of 1969, the stock market was paying ridiculously high prices for computer-related companies. The excessive values placed on many of these companies made the managements of larger, traditional corporations consider converting what in essence was overhead (i.e., their computer support function) into an asset the way James Ling did with Computer Technology, Inc.

CTI was the result of the combination of the computer center of LTV, the computer center of LTV Aerospace, and the business of Service Technology Corporation, a subsidiary of LTV Aerospace. The prospectus dated April 2, 1969 shows LTV receiving \$18 million for approximately 12% of CTI. During the time period given in the prospectus, 91% of CTI's net earnings were contributed to LTV and its subsidiaries.

The Computer Technology, Inc. method of setting up data processing facilities as a separate corporation and having this newly-formed organization do work for clients other than the parent corporation is worth noting. It is of particular in-

terest to the corporation which may have an excess of computer capacity and/or highly-skilled people, or a recently completed management control system with applicability to other corporations. Recently, several major corporations have considered getting into the facilities management business for these reasons.

THE CURRENT SITUATION

The current situation in the computer industry and in the economy as a whole offers an opportunity for traditional old-line companies to enter a rapidly growing field at minimum cost. There were a great many bright, young entrepreneurs who were financed by the investment community over the past two years, but will not get additional venture capital in the current market. Some of these companies can now be acquired at a price equal to their tax loss carry-forward and a formula pay-out based upon their earnings. The ideal arrangement is where the acquiring company has a service and marketing organization that can handle new, high-technology products of the young company.

The investment climate toward the computer industry and its related products is extremely negative at present. But this is a simple case of over-reaction where the investment community was too optimistic previously. The areas to be entered and the companies to be acquired have to be picked with care, but the opportunities do exist. ▲

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THE PROGRAMMER'S RPG

A Complete Reference

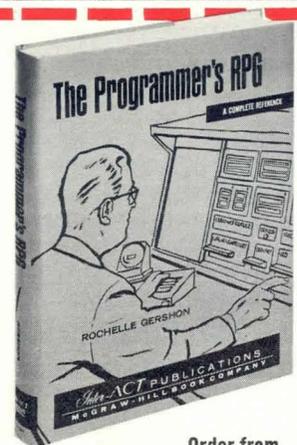
Most complete guide available! An intensive treatment of the RPG language as it is generally used and implemented in the widest variety of computer systems. A practical reference for the working programmer; an excellent aid to train new and experienced programmers in RPG usage. Differences in major RPG language facilities available in various computer systems are pointed out.

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By Rochelle Gershon, Senior Consultant / Advanced Computer Techniques Corp.

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SURVEY OF SOFTWARE PACKAGES— Data Base Management Systems



KEN FALOR • Cullinane Corp., Boston, Mass.

This month's **SOFTWARE SURVEY** continues our survey of program packages. The first part of the survey covered 114 Programming Aids and appeared in the March 1970 issue. The second part covered 100 Report Generators and File Management Systems and appeared in the August 1970 issue. This part concerns Data Base Management Systems. Subsequent parts, covering facility management aids, general utilities, and several categories of applications packages, will appear in future issues of **MODERN DATA**.

POLICIES

We refer you to the general statements of policy and procedure made in the first part of our survey. Briefly, the surveys derive principally from a special mailing of questionnaires. If your package is not listed, or if the current entry requires correction, write

Program Survey, **MODERN DATA**,
3 Lockland Ave.,
Framingham, Mass. 01701.

We have omitted programs for which support appears dubious—those from individuals and non-software institutions, those for which no support is claimed, and those priced less than \$100.

DEFINITIONS

Data Base Management Systems are defined here to include systems principally designed to handle the establishment and use of large central data bases. In most cases, they are, in effect, enhancements of the computer operating system, much as are access methods. For the type of system we are discussing, user programs normally written in Assembly, Cobol, or other high-level "host" languages may be used in conjunction with these systems in the normal way, except for a few minor provisions. The Data Management System mainly worries about where the data is stored and how to get it.

It is, in a sense, an access method coupled with a specific, highly-structured and chained file organization. (See Software Forum in April **MODERN DATA** for a detailed discussion of one of these systems, IBM's IMS.) Some of these system have some special provisions for on-line retrieval and/or off-line report generation, but others do not.

Data Base Management Systems, then, as we are defining them here, differ considerably from what we term "File Management Systems." The latter usually work with a variety of file formats, utilize a simplified parameter scheme to update and/or retrieve, and do not furnish a file interface for normal user (Assembly, Cobol, etc.) programs.

EVALUATION

Our past comments regarding the evaluation for purchase of other types of packages holds here as well. Find out as much as possible about what you are buying. Know the conditions for the sale (warranties, support, etc.). Talk to users. Also be sure to find out about the company, its history, personnel qualifications, reputation, and financial condition (it can't continue to support a package if it goes of business). Finally, try to get a package that is well documented; besides facilitating proper use, this can also be a hedge against future changes in ownership or policy of the supplier company.

THE TABLE

The Table covers 8 Data Base Management Systems. As much as possible, the statements in the "Description" column are the words of the supplier. The hardware information usually refers to the minimum configuration. Where prices are not given, the software is supplied free-of-charge by the hardware manufacturer. Of course, prices and other factors are subject to change and should always be verified. ▲

DATA BASE MANAGEMENT SYSTEMS

SOURCE	NAME	DESCRIPTION	COMPUTER
BURROUGHS Detroit, Mich.	DISK FORTE Disk File Organization Techniques	Parameter-controlled program to create and manipulate a set of files organized and interrelated in as much detail as the user desires and Forte conventions allow. Generates Cobol routines to be used in connection with Burroughs head-per-track disk units. Permits index-sequential, index random, random, and unordered files. Permits use of chaining, linking, and list-type (including ring) field/record/file interrelationships. Routines are inserted in conventional application programs.	Burroughs B2500 B3500 B6500
CINCOM SYSTEMS, INC. Cincinnati, Ohio	TOTAL	Functions with any host language at the CALL level. Features a Data Base Description Language (DBDL) and a Data Manipulation Language (DML). Provides integrated multi-file, multi-linkage capability. Data independence is provided down to the data element level. Provides protection from concurrent updating, with logging of transactions and automatic recovery and restart facilities for dynamic environments with comprehensive data integrity protection. Leases for approx. \$750/mo.	IBM 360 DOS, OS HIS, RCA
COMRESS, INC. Rockville, Md.	DART-1 Information Management System	Similar to IBM's IMS, but requiring less equipment. Priced at \$60,000.	IBM 360 OS, (MFT, MVT)
HONEYWELL INFOR- MATION SYSTEMS Phoenix, Ariz.	IDS Integrated Data Store	Organizes, stores, retrieves, updates, and delegates information stored on a direct access device. Also allows user to define file structure. Primarily designed to operate within a procedural host language — Assembly, Cobol, GECOM and, in some cases, Fortran.	HIS (formerly GE) 625/635 425/435 225/235
HONEYWELL INFOR- MATION SYSTEMS Wellesley Hills, Mass	OS/200 Data Base Subsystem	Indexes and retrieves information from millions of records stored on disk. Directory of files stores all descriptive information about files and subfiles, and location of data within them. Data element organizes data in hierarchial fashion into master records, detail records, and data items. Permits fast retrieval of all information on a file relating to a particular data item such as an account number or part number. Cobol program can access and manipulate the data base through a standard Easycoder interface.	HIS 1200 OS/200
IBM White Plains, N. Y.	IMS/360 Information Management System	Essentially an enhancement of OS to permit construction of a large central data base which may be expanded without affecting existing programs. Establishes mnemonics for records which are used by normal programs; IMS locates the records. Also provides teleprocessing facilities. Several versions are available, one of which is free-of-charge.	IBM 360/40 OS 262K (131K if no terminals)
ICL (International Computer Limited) New York, N. Y.	NIMMS Nineteen-Hundred In- tegrated Modular Man- agement System	A total system in which a user data base in variable form and applications packages are joined together by data management software. Provides a high degree of file independence and saves programming effort. Allows linking a wide variety of ICL applications packages to the user's data base.	ICL 1900 32K
RCA Information Systems Div. Marlboro, Mass.	OCRCA Data Base Management System	Communications-oriented system for real-time or batch multi-programmed environments. User may specify random, sequential, or index-sequential formats. Permits file redefinition without requiring data base conversion or program maintenance. Can incorporate programs written in Assembly, Cobol, etc.	RCA Spectra 70/45 TDOS 131K

GENERATING ERRORS TO REDUCE ERRORS

EDITOR'S NOTE: Many forms of input errors remain undetectable by built-in computer checks. This article describes several popular error-detection techniques as well as a method for both raising and estimating the reliability of the most common source of input errors — the operator.

One of the most important issues in computer system design and operation concerns the need to detect erroneous input before it is used unknowingly as valid data by a computer system. Present error-detection techniques include check digits, check sums, reasonability checks, and various computer-generated responses for visual verification.

Check digits provide for an internal consistency check on the number by the computer. They are suitable for account or part numbers, and are usually determined by a simple algorithm. Typically, this would be done by taking a weighted sum of the individual digits, dividing the sum by a number, and taking the remainder as the check digit. For example, a modulo 11 check digit, with weights 4, 3, and 2 for a three-digit number, might be formed as follows for the account number 953:

$$4 \times 9 + 3 \times 5 + 2 \times 3 = 57. \quad 57/11 = 5, \text{ remainder } 2.$$

Therefore the account number as used would be 9532. This calculation will detect all single digit (e.g., 9562) and all digit pair inversion errors (e.g., 9523).

Check sums are generally used where a series of numbers are to be entered into the computer. The sum of the numbers is developed manually (on an adding machine) and entered. A computer disagreement indicates an error in either the data entry or in the adding machine checking process. Further examination will resolve the source of the problem. The sum of the numbers need not make "sense", e.g., one could sum a list of account numbers as a check that they were entered correctly.

Reasonability checks are useful when one can establish reasonable bounds for the size of certain number fields that will be entered. For example, in an inventory system, orders above a specified size

can be called out for special verification.

Visual verification systems consist of returning to the operator the same information he input or some related information. For example, entering an account number may cause the name of the account holder to be returned to the operator. In such a system the operator would have available the name from another source for verification.

Some types of data just cannot be checked by the computer. The system depends on the operator checking what he enters. For example, a misspelled name, address, or laboratory test result value (within normal range) cannot be checked by the system. The operator *must* enter it correctly. Parity checking hardware or software can help detect hardware errors, but not human errors.

Since the computer receives and returns keyed data without error "almost always," the operator loses his sensitivity to errors. When there is an isolated error, particularly in the middle of a string of good data, it is often not seen. The problem is to raise the operator's sensitivity to errors. One way of doing this would be to raise the error rate artificially so that it is no longer a negligible fraction. The computer would be programmed to insert errors into (say) 1% of the critical fields when it returns the data to the operator for verification. At the same time it sets a flag. If the operator catches the error, the computer could send a congratulatory message and his score for error detection would be updated. If he does not spot it but proceeds with his usual operation, the computer could inform him and down-grade his score.

In the situation where the system depends on the operator for correct data and has no way of catching errors itself, this scheme could also be used to estimate the number of errors that enter the system. For example, suppose an operator catches 94% of the intentionally-generated computer errors. Also suppose that the computer counts the number of times the operator enters corrections for *non-intentionally-generated* errors (line noise or keying errors he has detected and corrected by himself). Let's assume that (1) on an average day this happens 47 times; and (2) that if the operator catches 94% of computer-generated errors, he also catches 94% of his own errors. Since $0.94 \times (\text{number of errors}) = 47$ errors caught, the number of errors = 50. Thus 3 errors per day, or 6% of all errors, can be assumed as going undetected. ▲



Dr. Jan Polissar is an independent automation consultant. He has been actively involved with computers since 1965 and has special interests in human factors in system design, and the use of mini-computers. He is presently completing his doctoral thesis in operations research from Harvard.

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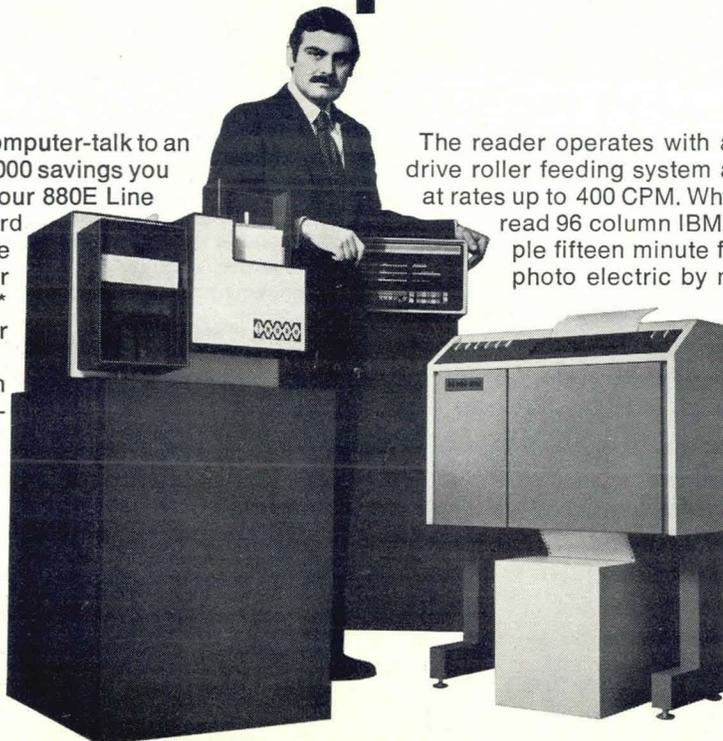
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*Source: DEC standard published price list dated Feb. 1, 1971



The reader operates with a unique clutchless friction drive roller feeding system and reads 80 column cards at rates up to 400 CPM. When you are ready, it can also read 96 column IBM System 3 cards, with a simple fifteen minute field conversion. Reading is photo electric by means of a fiber optic light

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A GUIDE TO COMPUTER CENTER EFFICIENCY

What has to be done and who does it?

In today's rapidly-expanding business world, it is no longer enough to purchase and install a computer, train its operators, and write programs that will provide useful information. Because of the large increase in the number of computers being installed, one must consider yet another aspect of computer installation and usage if an efficient computing organization is to be achieved. That aspect is **systems support**.

By systems support we mean an organization that will undertake the day-to-day clerical jobs that enable a computing center to function effectively. Such an organization is normally staffed by several nontechnical clerks, supervised by an administrator or clerical manager. The purpose of this organization is to relieve machine operators, programmers, or managers of the clerical tasks necessary for smooth operation.

The organization should consist of groups or individuals assigned to the following tasks: tape library supervision, job control, time accounting, equipment (hardware) inventory, material supply, and clerical administration. The organization's duties would be to gather time charges for billing; to maintain control of tapes (and disk packs and data cells); to forecast workload and equipment requirements, and types of runs to be made on the system; and to generate reports that will enable management to manage their computing center more effectively. The interrelationship of these groups is shown in Fig. 1.

TAPE LIBRARY

The storage of tapes should be given great consideration. While the means by which the library is laid out and arranged is important, it is not as critical as the system used in storing and identifying tapes. We have found that a **sequentially numbered** library is the most practical and manageable

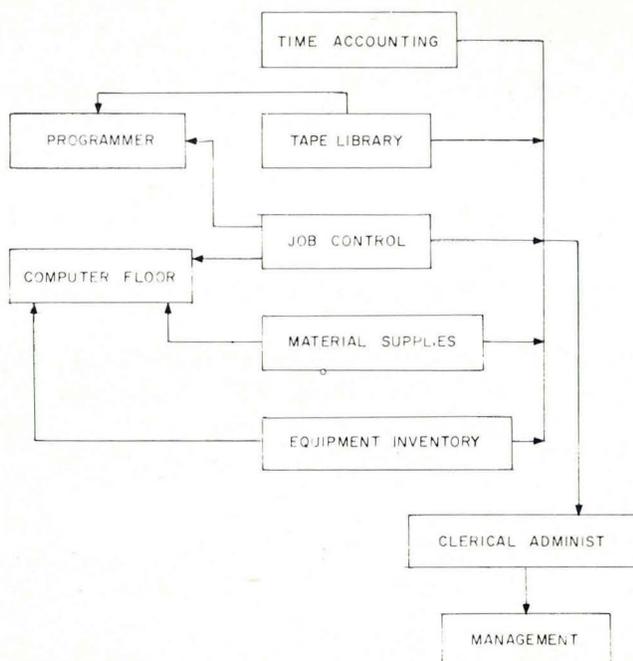


Fig. 1 Each group in a systems support organization performs an essential task. This figure shows the interrelationship of the various groups with programming, the computing floor, and management.

since it allows for **programmed** record-keeping. Numbering the library tapes sequentially also makes the day-to-day jobs — such as scratching, assigning, auditing, and inventory — simpler and less time-consuming.

The labeling of tapes lends itself to several different approaches. We have found that the following system works well for us:

New tape labels are created on the system by the operator at the time that the tape is created. A duplicate of the newly-created tape label is forwarded to the tape library twice daily (or when sufficient labels have been created to make such pickups a necessity). The tape library will record the tape number, the individual to whom it is assigned, the date assigned, the system it was as-

signed on, the scratch date, and a brief description of the information on the tape — unless the programmer has requested special labeling information via his job request card. After the tape label has been created, it is affixed to the tape and will remain as part of the tape's records until the tape is scratched. The pre-numbered tape will be restored in its pre-numbered storage location.

Audits of the tapes held by each programmer are sent out to the tape library users on a bi-monthly schedule. The returned audits, indicating those tapes that the programmers want scratched, account for 90% of the tape library's available scratch tapes. Disk packs and data cells can be handled in much the same manner.

JOB CONTROL

To simplify the duty of "in-house" job control, a system based upon the use of credit cards can be employed. Its operation is straightforward and is described as follows:

Each programmer who uses the facilities of the computing center is issued a credit card. This card is ordered by his manager and is the responsibility of his manager. It contains the programmer's project or problem number, his department, his name, his telephone extension, his room and building address, and the name of his project.

The reason for using a credit card is to insure correct delivery of completed jobs and the charging of computer time to the correct project and individual; and to provide the machine operator with the telephone extension where the programmer can be reached. A **Job Request Card** can be used in conjunction with the credit card. The job request card, filled out by the programmer, gives the machine operator all the necessary information he needs to run the job and label the tapes, disk packs, and/or data cells that might be created. The job card is arranged to provide an area that the programmer can stamp with his credit card, and no jobs are accepted for processing by job control personnel unless the job request card is stamped. In special cases, the time accounting of-

fice may issue a temporary credit card to be used on a restricted basis.

Job control personnel receive and log jobs into the computing center. The job control office will issue a sequential job number to the job, request the appropriate tapes, disks, disk packs, and data cells from the tape library, and transport the job to its specific system (correct core size, correct I/O devices, etc.). When the job is completed, it is transported back to the job control office and logged out. The log will provide management with a turn-around time report and control over job flow. It also enables a trace to be placed on jobs that are in-shop, making it possible to run down "lost" jobs.

TIME ACCOUNTING

This group is responsible for the accurate accumulation of charges arising out of computer usage. When a user's job is run on a system, the operator or system must record the times that the job started and finished as well as the system's idle time, engineering change time, and malfunction time. By maintaining time records on type of job, type of system, and the dollar worth of the machine time used, the time accounting group provides local and higher management with information that is not only important from the standpoint of decision-making, but also from the legal standpoint since some of this time might be taxable under state and/or federal laws.

The time accounting group also computes the "rate" at which time should be charged in order to pay the expenses of operating the computing center, and produces and oversees the credit card system. Their control of the credit card system is ap-

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EFFICIENCY Cont'd.

appropriate because they are the group that is responsible for charges made against individuals and/or departments.

EQUIPMENT INVENTORY

The equipment inventory clerk will maintain an inventory of the computers and equipment in the computing center. He prepares and maintains a full set of records and issues management reports on machine type, machine features, purchase or rental price, installation date, and termination date (if known or anticipated). He records any moves that take place on his computing floor — what machines have been moved and their new location — and maintains records pertaining to equipment transferred to other locations.

MATERIAL SUPPLY

The stock clerk requests the paper, tape, etc. required by the computing center to carry on its normal business. He maintains a running inventory of stock in order to allow the clerical administration group to place orders with sufficient lead time to insure delivery before his regular "on hand" stock is depleted. He prepares a monthly management report on items in stock, items on order, items received, and monthly expenses.

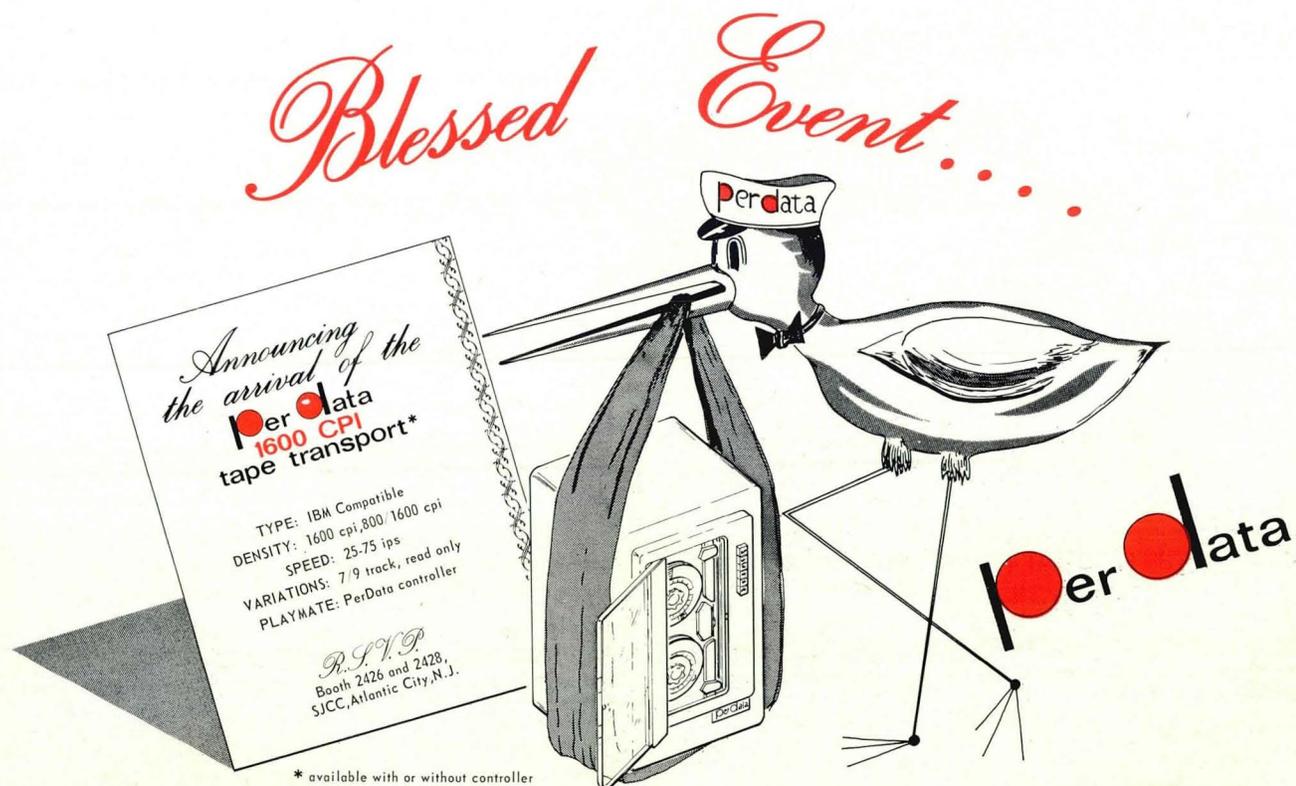
CLERICAL ADMINISTRATION

The duties of the clerical administration group vary depending upon the overall computing center organization. In general, this group performs the actual ordering, exercises cost control, and suggests alternatives.

One of the clerical administration group's most important duties is to prepare and distribute a forecast of the machine time to be used. They do this by polling the various users of the computing center for their projected needs during the ensuing year. This forecast is broken down by group, department, project, and type of system required. From this forecast, clerical administration prepares reports for management for scheduling. With the assistance of time accounting, this group also prepares a monthly report comparing the amount of time forecast with the amount of time actually used.

SUMMARY

The foregoing is but one possible approach to achieving computer center efficiency. The proper functioning of the groups or individuals that comprise a well-rounded systems support organization provide for effective delegation of the many responsibilities involved in setting up and running a computing organization. The solution offered is by no means a cure-all, but is one tested approach to the problem. ▲



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CIRCLE NO. 31 ON INQUIRY CARD

TELEPRINTERS

MALCOLM L. STIEFEL, President • M. L. Stiefel Co.

JOHN A. MURPHY, Associate Editor • Modern Data

Next to the mouth, the ear, the wink, and the telephone, the teleprinter is probably the most widely used data communication instrument in the world. It is in operation everywhere — in offices, factories, schools, hotels, railroad depots, airports. . . . New applications are being found almost daily, inspired by the proliferation of computers, and the New Teleprinter is emerging — a sleek device that can accept inputs from computers and people, and generate outputs to both, quickly, quietly, economically, in standard, almost universally accepted formats.

In this Product Profile, a teleprinter will be defined as a terminal device with a keyboard that produces hard copy printouts and can transmit to — and receive digital information from — remote elements. Within this definition, no restrictions are placed on printing speed, communications speed, or communications media. Printing systems with stand-alone (as well as built-in) keyboards are also included. This Product Profile is intended to complement the two-part Profile on line printers and mini-printers that appeared in the February and March issues of **MODERN DATA**.

FEATURES AND OPTIONS

Teleprinters can be characterized in several different ways: by their capability to interface with computers and other terminals; by the sorts of goodies that can be hung on them (magnetic tape transports, paper tape punches and readers); by their degree of portability; by their printing characteristics; by their communications capability; and by internal features such as tabulation control.

Virtually every teleprinter on the market can be configured to interface with a computer, either directly or via a communications link. But some, like the IBM 2741, are designed to interface only to a computer. That is, the operation of the terminal requires remote computer control of the network; the operator cannot dial or switch to another similar terminal for point-to-point communications.

Most teleprinting terminals, like the IBM 2740 or any of Teletype's models (Figure 1) can be operated off- or on-line with respect to a computer. These units use communication procedures which permit the local operator to control the network.

In the last two years an important class of teleprinters has arisen. These are the terminals that incorporate or can interface with **magnetic tape cassettes or cartridges**. The cassettes or cartridges store typically 50,000 characters — more than enough to hold a day's worth of source input data — for transmittal to a remote central processing location at night when telephone line charges are most favorable. The teleprinters also accept remote inputs for local printout the next morning.

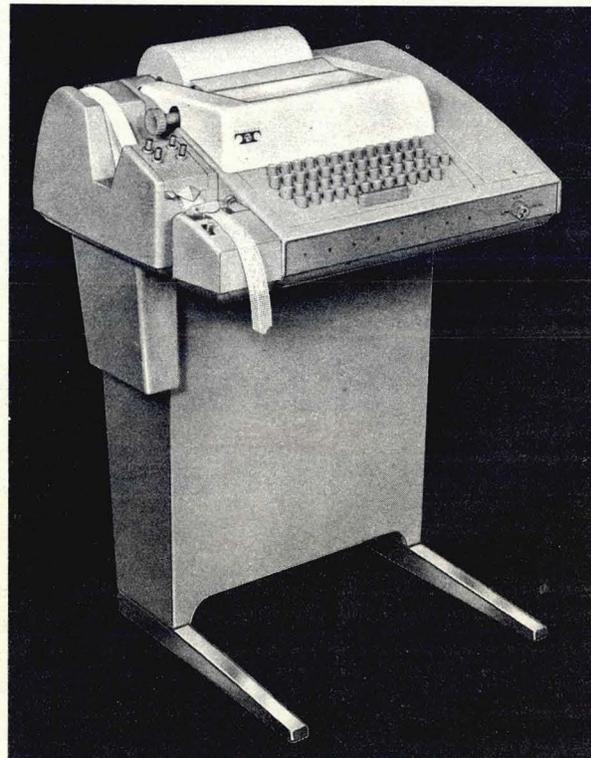


Figure 1 • Teletype Model 33 Teleprinter with PaperTape Punch and Reader

This feature is a modern-day counterpart of the **paper tape reader and punch** that has been the favorite teleprinter add-on. The paper tape option is still with us, but as cassette or cartridge technology advances, and the magnetic tape devices gain greater acceptance and decrease in price, paper tape should gradually fade from the scene.

Functionally, records stored on cassette or cartridge and on paper tape are alike—all are sequential storage media. There is one distinction, though—the paper tape can be imprinted so it's readable by people. Unless a specific record can be identified by a unique key and printed out, the mag tape must be read by use of some other expensive gadget, like a CRT.

An interesting new group of teleprinters are the **portables** (Figures 2 & 3). For the most part, they come naked except for an acoustic coupler which is used for transmission over telephone lines. Usually, no fancy mag or paper tape options are included. These terminals are designed for short-term, conventional desk-top information retrieval, tied to a remote computer or to another terminal.

Another recent innovation has been the introduction of new **printing techniques** (ink-jet, electrostatic, thermal) and a significant across-the-board elevation of **performance** characteristics. Speeds up to 120 characters per second; line widths of over 150 characters per line or columns; upper and lower case lettering; 2-color printing to distinguish between locally and remotely generated inputs. On some models tabulation can be performed up or down, left or right, to draw graphs, to write equations, or to assist in ordinary printing functions. The process of setting vertical and horizontal tab stops has been made simple; operators can move tab stops with the touch of a switch, and in some teleprinters, the setting can be triggered by control signals from a remote computer.

One significant advance has been the industry's acceptance of the 8-level (128 character) **U.S.A. Standard Code for Information Interchange** (USASCII or just plain ASCII) shown in Figure 4. Almost every teleprinter built today generates



Figure 2 • Omnitec Model 800 Portable Data Terminal—a Strip Printer Terminal with Integral Acoustic Coupler.

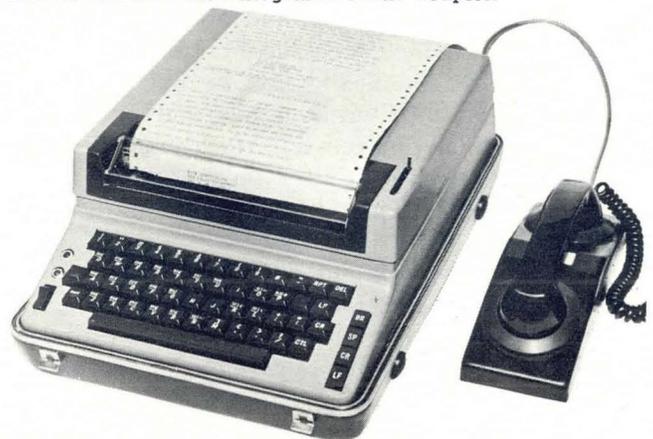


Figure 3 • Mite Model 123T Data Communications Terminal—a Page Printer Terminal with Stand-Alone Acoustic Coupler

and receives the full ASCII code or some subset of it. Obviously, this practice has permitted manufacturers to proceed without worrying about code compatibility.

The **electrical interface** between a teleprinter and its modem has also been standardized. The Electronic Industries Association (EIA) RS-232B interface is widely used. It defines pulse widths, rise times, amplitudes, and the like for equipment designers.

This does not imply that other electrical and data interface standards, and codes are not used. One important code is IBM's PTT/BCD code

Bits		COLUMN							
		0 ₀	0 ₀ 1	0 ₁ 0	0 ₁ 1	1 ₀ 0	1 ₀ 1	1 ₁ 0	1 ₁ 1
Row	Column	0	1	2	3	4	5	6	7
0 0 0 0	0	NUL	DLE	SP	0	@	P	`	p
0 0 0 1	1	SOH	DC1	!	1	A	Q	a	q
0 0 1 0	2	STX	DC2	"	2	B	R	b	r
0 0 1 1	3	ETX	DC3	#	3	C	S	c	s
0 1 0 0	4	EOT	DC4	\$	4	D	T	d	t
0 1 0 1	5	ENQ	NAK	%	5	E	U	e	u
0 1 1 0	6	ACK	SYN	&	6	F	V	f	v
0 1 1 1	7	BEL	ETB	'	7	G	W	g	w
1 0 0 0	8	BS	CAN	(	8	H	X	h	x
1 0 0 1	9	HT	EM	)	9	I	Y	i	y
1 0 1 0	10	LF	SUB	*	:	J	Z	j	z
1 0 1 1	11	VT	ESC	+	;	K	[	k	{
1 1 0 0	12	FF	FS	,	<	L	\	l	!
1 1 0 1	13	CR	GS	-	=	M	]	m	}
1 1 1 0	14	SO	RS	.	>	N	↑	n	~
1 1 1 1	15	SI	US	/	?	O	←	o	(DEL)

Figure 4 • 8-Level ASCII Code

NORMAL					SHIFTED			
8 4 2 1	BA 00	BA 01	BA 10	BA 11	BA 00	BA 01	BA 10	BA 11
0 0 0 0	(SPACE)	@	—	&	(SPACE)	¢	—	+
0 0 0 1	1	/	J	A	=	?	J	A
0 0 1 0	2	S	K	B	∩	S	K	B
0 0 1 1	3	T	L	C	:	T	L	C
0 1 0 0	4	U	M	D	:	U	M	D
0 1 0 1	5	V	N	E	%	V	N	E
0 1 1 0	6	W	O	F	'	W	O	F
0 1 1 1	7	X	P	G	"	X	P	G
1 0 0 0	8	Y	Q	H	*	Y	Q	H
1 0 0 1	9	Z	R	I	(	Z	R	I
1 0 1 0	0)			
1 0 1 1	#	,	\$	.	≠	,	!	.
1 1 0 0								
1 1 0 1		LF	NL			LF	NL	
1 1 1 0	UC	EOB	BS	LC	UC	EOB	BS	LC
1 1 1 1	EOT		IDLE	(DEL)⊗	EOT		IDLE	(DEL)⊗

Figure 5 • 6-Level PTT/BCD Code

(Figure 5) and the related PTT/EBCD code. The printing industry uses a standard paper tape code applied to specially designed teleprinters.

Other advances involve optional automatic dial-up, automatic answer-back, and unattended operation, features which have facilitated economical transmission in the wee hours or have enabled communication with terminals that gather data in remote, relatively inaccessible locations. Remote batch operation, probably the most effective of all teleprinter applications to date, depends heavily on these options.

Except for the portables, most teleprinting units don't carry their own modems so users must procure them separately; this introduces a problem that hasn't been completely solved. There are many possible modulation schemes and many possible communications media. Modems must be tailored to each. This doesn't present problems to the user who hooks into the public switched network (telephone system), but it can annoy the user who wants to move to a leased line, to a dedicated private network, or to a shared line (shared with others and used exclusively for data transmission). A separate modem may be required for each network. Moreover, a terminal designed for the communication procedures of one type of system (e.g. switched network) may not be usable in another (e.g. a private network that uses PTT/BCD and associated procedures) without extensive modification or complete replacement.

This isn't necessarily a serious problem, since users have little occasion to bounce between networks regularly. But users with heavy investments

in teleprinters who want to employ a new system can find themselves trapped into an unwanted configuration if they can't easily dispose of their present terminals. One answer, of course, is to rent, rather than buy; this avoids the problem but doesn't solve it. A related sort of problem can also be avoided through careful planning. This problem involves terminals equipped for half-duplex or full-duplex operation. If two send-receive terminals are communicating in an I-talk-then-you-talk-then-I-talk mode, that is called "half-duplex" operation. The point is, there is only one-way communications per unit of time. If I am talking to you, you are forced to listen; when I am done, it's your turn to talk, and so on. But if two-way communications is available, I can send data from my keyboard to your printer (talk), while simultaneously, you can send data from your keyboard to my printer. This is called "full-duplex" operation. I don't get a hard copy of my output, and you don't get a copy of yours, unless we are using paper tape or magnetic tape to store the locally generated text for playback later.

There is a variant of this arrangement in which I send, you receive, and your terminal automatically echoes each character back to my printer to form a continuous acknowledgement loop. This enhances error detection at the source, but it uses the communication line inefficiently.

A full-duplex-equipped terminal can operate in half-duplex mode but the reverse isn't true. This is something a user ought to consider in setting up his network. Duplexing limitations adversely affect system reliability, since a spare half-duplex

TABLE 1 • TELEPRINTERS

COMPANY MODEL	PRINT RATE MECHANISM	CHARACTER SET & SIZE CHAR./LINE NO. FORMS	INTERFACE COMPATIBILITY	DATA TRANSMISSION DEVICES	DATA RECORD/READ DEVICES	PRICE	OTHER FEATURES & COMMENTS
ANDERSON JACOBSON AJ 841	15 cps IBM Element	uc & lc 130/156 cpl 10 Forms	— IBM 2741 Compatible	Modem (opt)	Ext. Cassette (opt)	\$4,100 \$111/mo	• 8" x 21" x 21" Case Total wt 54 lbs
BARKER ENGRG. N/C 33 EIA	10 cps Drum	48 uc 72 cpl 8 Forms	RS232B TTY Compatible	110 bps Acoustic Coupler (opt)	Paper Tape (std)	\$1,950 \$66/mo	• Numeric Key- board (opt)
COMDATA Series 33	10 cps Wheel	64 uc 74 cpl 2 Forms	— TTY Compatible	110 bps Acoustic Coupler or Modem (opt)	Paper Tape (std)	\$1,248 \$45/mo	• Price Incl Modem
COMPACE Versicom 300	10/15/30 cps (sw sel) Wheel	64 uc 132 cpl 6 Forms	RS232C TTY Compatible	300 bps Acoustic Coupler or Modem (opt)	Paper Tape or Cassette (opt)	\$4,200 \$97/mo	• Numeric Key- board (opt) • Graphics Capability
COMPUTER DEVICES CDI 1010	10 cps Impact	64 uc 80 cpl 4 Forms	RS232C TTY Compatible	110 bps Acoustic Coupler or Modem (std)	—	—	• 6" x 16" x 22" Case Total Wt 26 lbs
CDI 1030	10/15/30 cps (sw sel) Thermal	96 uc & lc 80 cpl 1 Form	RS232C TTY Compatible	300 bps Acoustic Coupler or Modem (std)	Paper Tape or Ext. Cassette (opt)	\$3,500 \$110/mo	
COMPUTER TERMINALS MINN. TP 110	11 cps Drum	64 uc 80 cpl 5 Forms	RS232 TTY Compatible	110 bps Acoustic Coupler or Modem (std)	Cassette (opt)	\$1,750 \$100/mo	• 8" x 14" x 16" Case Total Wt 33 lbs
TP 150	15 cps Drum	64 uc 80 cpl 5 Forms	RS232 —	150 bps Acoustic Coupler or Modem (std)	Cassette (opt)	\$2,000 \$115/mo	
COMPUTER TRANSCIEVER SYSTEMS Execuport 300	10/15/20/30 cps (sw sel) Thermal	96 uc & lc 80 cpl 1 Form	RS232 TTY Compatible	300 bps Acoustic Coupler or Modem (std)	Ext. Cassette (opt)	\$3,800 \$128/mo	• 6" x 17" x 19" Case Total Wt 29 lbs
CONN. TECHNICAL HyperPerf 70	16 cps Typebar	88 uc & lc 148 cpl —	To Order TTY Compatible	Acoustic Coupler or Modem (opt)	Paper Tape (opt)	\$3,000 —	• Numeric Key- board (opt)
CONTROL DATA Model 712	30 cps Wheel	64 uc 132 cpl 6 Forms	RS232C —	to 4800 bps Modem (std)	Mag Tape (opt)	—	• Numeric Key- board (std)

unit can't be wheeled in to replace a sick full-duplex unit. The solution? Get full-duplex terminals exclusively, equipped with a switch for half-duplex operation.

Almost unnoticed in the parade of shiny new gadgets has been the **keyboard** revolution. They have become quieter and more reliable. Electrical interlocking prevents generation of false codes; required keystroke pressure has been reduced. Various key layouts are available: standard typewriter; separate nested numeric keyboard; separate function keys, with labels to match the various transmission codes.

Data transmission rates have also gone up. Whereas 60 words per minute (6 characters per second or cps) was once the norm, 100 wpm (10 cps) is now standard, 300 wpm (30 cps) is commonplace, and 1200 wpm (120 cps) is in limited use. Further increases can be expected as private data-oriented communications networks grow.

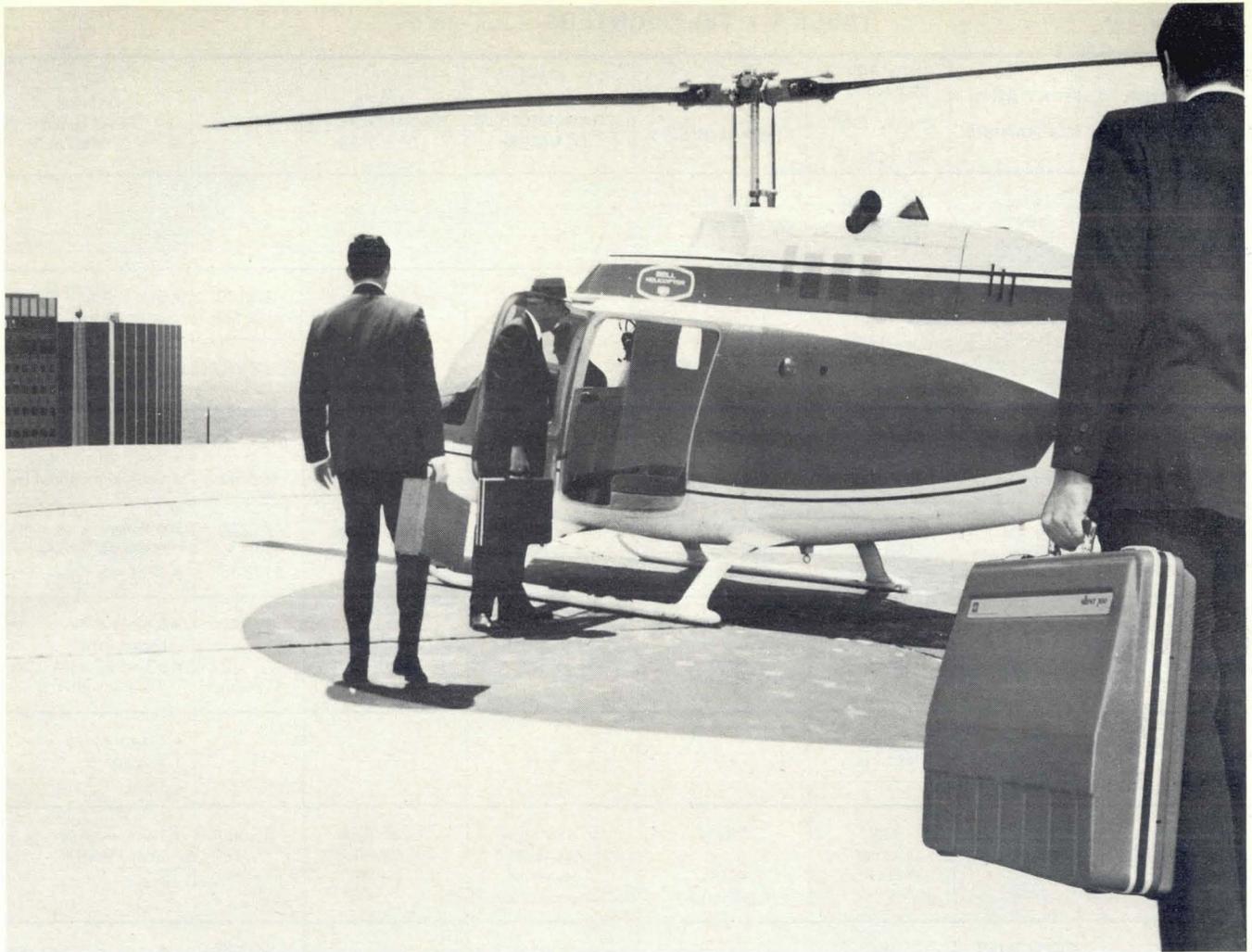
APPLICATIONS

Functionally, teleprinters are used in situations where data is to be transmitted rapidly from a given point to a remote point for further processing, and where a local hard copy of the trans-

PRODUCT PROFILE:
TELEPRINTERS Cont'd

TABLE 1 • TELEPRINTERS Cont'd

COMPANY MODEL	PRINT RATE MECHANISM	CHARACTER SET & SIZE CHAR./LINE NO. FORMS	INTERFACE COMPATIBILITY	DATA TRANSMISSION DEVICES	DATA RECORD/READ DEVICES	PRICE	OTHER FEATURES & COMMENTS
DAEDALUS COMPUTER PRODUCTS Model 711PDT	30 cps Wheel	64 uc 132 cpl 6 Forms	— TTY Compatible	to 1200 bps Modem (std)	Cassette (std) Paper Tape (opt)	\$12,500 \$345/mo	• Programmable Terminal with 516 Byte Memory • Numeric Key- board (std)
DATA ACCESS SYSTEMS Model 720	10/15/30 cps (sw sel) Thermal	64 uc 80 cpl 1 Form	— TTY Compatible	300 bps Acoustic Coupler or Modem (std)	Paper Tape or Cassette (opt)	\$3,395 \$179/mo	• 6" x 18" x 18" Case Total wt. 35 lbs
DATA INSTRUMENTS Model RP35	15 cps IBM Element	88 uc & lc 120/180 cpl 6 Forms	202C —	550 bps	Cassette (std)	\$4,950 \$133/mo	• Numeric Key- board (opt) • 10" x 19" x 24" Case Total Wt. 85 lbs
DATA PRODUCTS PC-8110	10 cps Impact	64 uc 80 cpl 4 Forms	RS232 TTY Compatible	300 bps Acoustic Coupler or Modem (std)	Ext. Cassette (opt)	\$2,450 \$80/mo	• Numeric Key- board (std) • 5" x 18" x 19" Case Total Wt. 29 lbs
DATA TERMINALS Model 1700	10 cps Wheel	96 uc 72 cpl 6 Forms	— TTY Compatible	110 bps Acoustic Coupler or Modem (std)	Paper Tape (std)	\$1,459 \$53/mo	—
DIGITAL EQUIPMENT LA/30	30 cps Wire Matrix	96/128 uc & lc 80 cpl 2 Forms	— TTY Compatible	300 bps	—	\$2,500 —	—
ELECTRONIC ARRAYS CT 100	10 cps Electro- static Matrix	64 uc Strip Prnt. 1 Strip	—	Acoustic Coupler (std)	Ext. Cassette (opt)	—	• Touch-Tone Key- board (std) • Tel Dial Card Reader (std) • Attache-Size Case
FEDER DATA CENTER APT 1000	15 cps IBM Element	56 uc & lc 130 cpl 5 Forms	— TTY Compatible	to 1200 bps Modem (std)	Cassette (std) Paper Tape (opt)	\$15,500 —	• Numeric Key- board (std) • Graphics Capability
GENERAL ELECTRIC Terminet 300	10/15/30 cps (sw sel) Chain	94 uc & lc 75/118 cpl 6 Forms	RS232B/C —	to 1200 bps Modem (opt)	Paper Tape or Cassette (opt)	\$3,625 \$125/mo	—
GULTON INDUSTRIES Ten/Thirty	10/15/30 cps (sw sel) Wheel	64 uc 132 cpl 6 Forms	RS232 TTY Compatible	—	Ext. Cassette (opt)	\$3,950 \$145/mo	• Numeric Key- board (std) • Graphics Capability
HONEYWELL ACT 735	10 cps Drum	64 uc 72 cpl —	— TTY Compatible	Acoustic Coupler (std)	Paper Tape (std)	\$1,600 \$70/mo	—
SRT 301	10/15/30 cps (sw sel) Chain	94 uc & lc 118 cpl 7 Forms	RS232 TTY Compatible	300 bps Ext. Acoustic Coupler (std)	Paper Tape (opt)	\$5,220 \$145/mo	—



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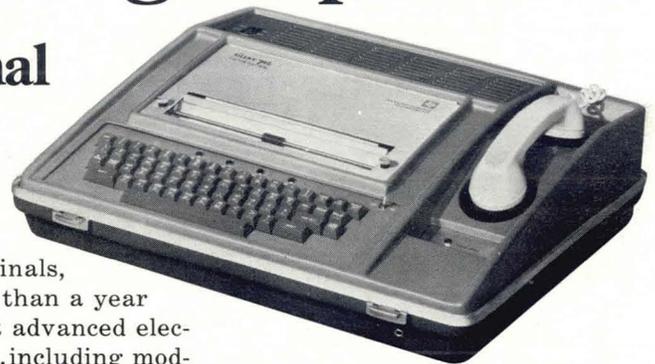
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TEXAS INSTRUMENTS

INCORPORATED

TABLE 1 • TELEPRINTERS . . . Cont'd

COMPANY MODEL	PRINT RATE MECHANISM	CHARACTER SET & SIZE CHAR./LINE NO. FORMS	INTERFACE COMPATIBILITY	DATA TRANSMISSION DEVICES	DATA RECORD/READ DEVICES	PRICE	OTHER FEATURES & COMMENTS
IBM 2740/41	15 cps IBM Element	88 uc & lc 130/156 cpl 10 Forms	RS232B	—	—	—	—
I/O DEVICES Model 100	30-50 cps Wheel	96 uc & lc 256 cpl 6 Forms	— TTY Compatible	—	—	\$3,160 (OEM)	<ul style="list-style-type: none"> • Stand-Alone Keyboard (std) • Numeric Keyboard (opt) • Graphics Capability
ITEL Model 1021	15 cps IBM Element	88 uc & lc 156 cpl 10 Forms	RS232 IBM 2740/1 Compatible	134 bps	—	\$3,350 \$95/mo	<ul style="list-style-type: none"> • 9" x 20" x 31" Case Total Wt. 87 lbs • Graphics Capability
Model 1051	15 cps IBM Element	88 uc & lc 156 cpl 10 Forms	RS232 IBM 2740/1 Compatible	134 bps	Paper Tape (std)	\$5,695 \$175/mo	<ul style="list-style-type: none"> • 9" x 20" x 31" Case Total Wt. 92 lbs. • Graphics Capability
INTERFACE MECHANISMS Model 3201	70 cps Wheel	128 Strip Prnt. 1 Strip	RS232B TTY Compatible	to 1200 bps Modem (opt)	Printed Tape (std)	\$5,200 \$150/mo	<ul style="list-style-type: none"> • Numeric Keyboard (opt) • 9" x 22" x 24" Case Total wt. 65 lbs
LITTON ABS Model 30	30 cps Wheel	— 192 cpl	—	—	—	—	<ul style="list-style-type: none"> • Stand-Alone Keyboard
MAXSON ELECTRONICS DT-140	10/15/30 cps (sw sel)	128 132 cpl 6 Forms	RS232 TTY Compatible	to 4800 bps Acoustic Coupler or Modem (opt)	Paper Tape or Cassette (opt)	\$6,000	<ul style="list-style-type: none"> • Numeric Keyboard (std)
MEMOREX 1240	10/15/30/60 cps (sw sel) Chain	94 120 cpl 6 Forms	— TTY Compatible	to 600 bps Modem (opt)	—	\$4,200 \$115/mo.	—
1280	10/15/30/60 cps (sw sel) Chain	94 120 cpl 6 Forms	— TTY Compatible	to 1200 bps Modem (opt)	Cassette (std)	\$6,100 \$180/mo	<ul style="list-style-type: none"> • Numeric Keyboard (opt)
MITE Model 123T	10 cps Drum	64 uc 80 cpl 6 Forms	— TTY Compatible	110 bps Acoustic Coupler or Modem (std)	Ext. Cassette (opt)	\$2,000 \$95/mo	<ul style="list-style-type: none"> • 7" x 13" x 18" Case Total Wt. 29 lbs.
NCR	30 cps Thermal	96 uc & lc 80 cpl 1 Form	— TTY Compatible	300 bps	—	—	<ul style="list-style-type: none"> • Stand-Alone Keyboard (std)

mitted data and/or hard copy response are required. Their application is determined by the overall "system" response time. If the data can arrive a day or week late and still be useful, the mails or a courier may be employed effectively. If the perishability of the data (the time from creation to obsolescence) is short, direct data communication may be called for. Since virtually every situation involving perishable data also calls for local hard copy, the teleprinter is a natural choice.

Next there is the question of the system configuration. Is data to be stored locally for batch transmission? Are the response time requirements sufficiently stringent to warrant essentially in-

stantaneous transmission? What sort of form can be used locally? Will a plain piece of paper be sufficient, or is it to be one or more highly formatted pre-printed forms? How many copies are required? When transmission is finally accomplished, what will the peak input traffic (messages per unit time) be? What will the peak output traffic be? How many recipients are required for outputs? How many terminals will be in the network?

When answers are obtained, the system designer can intelligently begin to choose a terminal during the process of establishing the optimum system configuration.

There are innumerable applications where tele-

PRODUCT PROFILE:
TELEPRINTERS Cont'd

TABLE 1 • TELEPRINTERS Cont'd

COMPANY MODEL	PRINT RATE MECHANISM	CHARACTER SET & SIZE CHAR./LINE NO. FORMS	INTERFACE COMPATIBILITY	DATA TRANSMISSION DEVICES	DATA RECORD/READ DEVICES	PRICE	OTHER FEATURES & COMMENTS
NOVAR 5-40 Mod II	15 cps IBM Element	88 uc & lc 130 cpl 8 Forms	— TTY Compatible	to 2400 bps Modem (opt)	—	\$4,400 \$130/mo	• 8" x 19" x 21" Case Total Wt. 55 lbs • Graphics Capability
5-41	15 cps IBM Element	88 uc & lc 130 cpl 8 Forms	— TTY Compatible	135 bps Modem (std) Acoustic Coupler (opt)	—	\$4,500 \$115/mo	• 14" x 27" x 30" Case Total Wt. 65 lbs • Graphics Capability
5-50	15/30 cps (sw sel) IBM Element	88 uc & lc 130 cpl 8 Forms	— TTY Compatible	to 2400 bps Modem (std) Acoustic Coupler (opt))	Cartridge (std)	\$16,715 \$195/mo	• Numeric Key- board (opt) • Graphics Capability • Tape Editing (5-50) • Tape Merging (5-51)
5-51	15 cps IBM Element	88 uc & lc 130 cpl 8 Forms	— TTY Compatible	to 2400 bps Modem (std) Acoustic Coupler (opt)	Cartridge (2-std)	\$8,155 \$235/mo	
OMNITEC 800 PT	10 cps Wheel	64 uc Strip Prnt. 1 Strip	— TTY Compatible	Acoustic Coupler (std)	—	\$950 \$60/mo	• Attache-Size Case Total Wt. 27 lbs
RCA 6740	10 cps Impact	64 uc 72/84 cpl 5 Forms	— TTY Compatible	110 bps	Paper Tape (opt)	\$5,650 \$147/mo	—
6750	15 cps Impact	94 uc & lc 72/84 cpl 5 Forms	— TTY Compatible	150 bps	Paper Tape (opt)	\$7,810 \$200/mo	—
REDACTRON Model 300	15 cps IBM Element	88 uc & lc 156 cpl 6 Forms	—	—	—	\$1,475 (OEM)	—
REPCO Model 120	120 cps Electro- static Matrix	64 uc 80 cpl 1 Form	RS232B —	to 1200 bps Modem (opt)	—	\$1,500	• Stand-Alone Keyboard (std) • 9" x 13" x 18" Case Total Wt. 21 lbs.
SCM Kleinschmidt Model 311	to 300 cps (sw sel) Drum	64 uc 80 cpl 4 Forms	— TTY Compatible	300 bps	—	\$4,500	—
Model 321	27/37 cps (sw sel) Drum	64 uc 80 cpl 4 Forms	— TTY Compatible	300 bps	Paper Tape (std)	\$5,600	—
SIEMENS AMERICA TP 100	7 cps Impact	50 uc 60 cpl 10 Forms	— TTY Compatible	100 bps	Paper Tape (std)	\$2,400	—
SYNER DATA Beta ASR	10/15/30 cps (sw sel) Wheel	64 uc 132 cpl 6 Forms	RS232C TTY Compatible	300 bps Modem (opt)	Paper Tape (std)	\$6,490	—

TABLE 1 • TELEPRINTERS . . . Cont'd

COMPANY MODEL	PRINT RATE MECHANISM	CHARACTER SET & SIZE CHAR./LINE NO. FORMS	INTERFACE COMPATIBILITY	DATA TRANSMISSION DEVICES	DATA RECORD/READ DEVICES	PRICE	OTHER FEATURES & COMMENTS
TELETYPE Model 28	10 cps Impact	64 uc 80 cpl	—	110 bps	Paper Tape (opt)	\$1,440	—
Model 32	10 cps Impact	64 uc 72 cpl	—	110 bps	Paper Tape (opt)	\$500	—
Model 33	10 cps Impact	—	—	110 bps	Paper Tape or Ext. Cartridge (opt)	\$600	—
Model 35	10 cps Impact	—	—	110 bps	Paper Tape or Ext. Cartridge (opt)	\$1,700	—
Model 37	15 cps Impact	126 uc & lc 132 cpl 6 Forms	RS232B/C	150 bps	Ext. Paper Tape or Cartridge (opt)	\$2,450	—
Model 38	10 cps Impact	94 uc & lc 132 cpl 6 Forms	—	110 bps Modem (opt)	Paper Tape or Cartridge (opt)	\$700	—
Inktronic	120 cps Ink Jet Matrix	94 uc & lc 80 cpl 1 Form	RS232B/C	to 1200 bps	Ext. Cartridge (opt)	\$6,800	—
TERMINAL EQUIPMENT Tycom 35/37	10/15 cps (sw sel) IBM Element	uc & lc 130 cpl 10 Forms	RS232B/C TTY Compatible	300 bps Acoustic Coupler or Modem (opt)	Paper Tape or Cassette (opt)	\$3,200 \$73/mo	—
TEXAS INSTRUMENTS Model 710	15/30 cps Thermal	86 uc & lc 80 cpl 1 Form	RS232B IBM 1051/52 Compatible	Modem (opt)	Paper Tape (opt)	\$3,750 \$170/mo	—
Model 715	15/30 cps Thermal	86 uc & lc 80 cpl 1 Form	RS232B IBM 2741 Compatible	Modem (opt)	—	\$3,020 \$160/mo	—
Models 720 & 730	10/15/30 cps (sw sel) Thermal	128 uc & lc 80 cpl 1 Form	RS232B TTY Compatible	300 bps Modem (opt)	Paper Tape (opt)	\$3,000 \$160/mo	—
Model 725	10/15/30 cps (sw sel) Thermal	128 uc & lc 80 cpl 1 Form	—	300 bps Acoustic Coupler (std)	—	\$3,300 \$170/mo	• 6" x 19" x 21" Case Total Wt. 35 lbs

printers are appropriate; an exhaustive survey is impossible. But here are some of the major ones:

• **Time-Sharing** — With the CRT/keyboard display terminal in hot pursuit, the teleprinter equipped with an interrupt capability remains the number one time-sharing terminal. To a programmer, it affords a medium for examining what he did 20 minutes ago or yesterday, as he goes along interactively creating or modifying programs. To the engineer, it affords a record for later reference

of each calculation in a circuit analysis or a stress computation routine. To a user with a large on-line data base, it affords a formatted record of each query and response, in multiple copies, if necessary, for distribution. Airline and hotel reservation systems are examples of dedicated time-sharing systems that made widespread use of teleprinters.

• **Material Distribution Systems** — As a branch store depletes its inventory, reorder requirements are typed out on the teleprinter and stored locally

PRODUCT PROFILE:
TELEPRINTERS Cont'd

TABLE 1 • TELEPRINTERS Cont'd

COMPANY MODEL	PRINT RATE MECHANISM	CHARACTER SET & SIZE CHAR./LINE NO. FORMS	INTERFACE COMPATIBILITY	DATA TRANSMISSION DEVICES	DATA RECORD/READ DEVICES	PRICE	OTHER FEATURES & COMMENTS
TRACOR DATA SYSTEMS TDS 1601	10/15/30 cps (sw sel) Impact	64 uc 80 cpl 3 Forms	RS232B TTY Compatible	300 bps Acoustic Coupler or Modem (opt)	Ext. Cassette (opt)	\$2,150 _____	• 10" x 18" x 21" Case Total Wt. 35 lbs.
TRANSCOM CT-264	10 cps Electro- static Matrix	64 uc Strip Prnt. 1 Strip	_____ TTY Compatible	110 bps Modem (std) Acoustic Coupler (opt)	_____ _____	\$1,600 \$37/mo	• 8" x 16" x 19" Case Total Wt. 27 lbs
TTS TTS 110 AM	10 cps Wheel	64 uc 105 cpl 4 Forms	RS232B TTY Compatible	300 bps Acoustic Coupler (std)	Paper Tape (std)	\$1,400 \$75/mo	• Numeric Key- board (opt) • Graphics Capability
TYPAGRAPH DP-30	10/15/30 cps (sw sel) Drum	96 uc & lc 132 cpl 4 Forms	RS232B TTY Compatible	300 bps Acoustic Coupler or Modem (opt)	Paper Tape or Cassette (opt)	\$3,500 \$110/mo	• Numeric Key- board (std) • Graphics Capability • 10" x 18" x 26" Case Total Wt. 35 lbs
UCC Datel 30	15 cps IBM Element	88 uc & lc 130/156 cpl 6 Forms	RS232 _____ _____	135 bps Acoustic Coupler or Modem (opt)	_____ _____	\$3,750 \$90/mo	• 12" x 30" x 30" Case Total Wt. 60 lbs
Datel 31	15 cps IBM Element	88 uc & lc 130/156 cpl 6 Forms	RS232 _____ _____	to 1200 bps Acoustic Coupler or Modem (opt)	Cartridge (std)	\$5,750 \$160/mo	
UNIVAC DCT 500	10/15/30 cps (sw sel) Wheel	64 uc 132 cpl 6 Forms	RS232C _____ _____	300 bps Acoustic Coupler or Modem (std)	Ext. Paper Tape (opt)	_____ _____	• Stand-Alone Keyboard
WESTERN UNION DATA SERV. EDT 33	10 cps Wheel	93 uc 72 cpl 3 Forms	RS232C _____ _____	110 bps Acoustic Coupler (std) Modem (opt)	Paper Tape (std)	_____ \$65/mo	_____
WILTEK Model 300	10 cps Impact	_____ _____	_____ _____	to 2400 bps Modem (std)	Mag Tape Loop (2-std)	_____ _____	_____
XEROX DATA SYSTEMS 7015/7025	10 cps Impact	64 uc 86 cpl 4 Forms	RS232B TTY Compatible	110 bps	_____ _____	\$3,600 \$81/mo	_____
7017/7027	10 cps Impact	64 uc 86 cpl 4 Forms	RS232B TTY Compatible	110 bps	Paper Tape (std)	\$5,600 \$126/mo	_____
7018	15 cps Impact	96 uc & lc 84 cpl 4 Forms	RS232B _____ _____	150 bps	_____ _____	\$4,600 \$104/mo	_____

on magnetic or paper tape; a hard copy of each order is generated simultaneously for visual verification. At night, the central office polls the branches one at a time, and the orders are transmitted. The polling is either done by the central office computer or by an operator at a central teleprinter. In either case, the branch units are unattended. When all the data is collected, the computer does the processing, updates the warehouse inventory, and prepares shipping orders to each branch. By mid-morning (or sooner, depending on the system and the urgency of a given request) the material is on its way. Branch inventories are kept at a minimum, since the turnaround time is shortened by rapid data communications and processing.

• **Centralized Accounting Systems** — These systems are similar to the material distribution setups, except that the reports from the outlying districts concern daily income and hours worked by employees, rather than inventory. In the morning each branch manager gets back a report of the previous day's activities. Chain stores, insurance companies, and other multi-office operations use this method of data collection. It is also used in operations where the central office is a service company and the terminals are placed in different customers' offices. Some medical billing firms have teleprinters in doctor's offices. One company provides accounting services for automobile dealers, another for the wholesale drug industry.

• **Dynamic Order Entry and Inquiry Systems** — Here's where the portables come in. The salesman brings the teleprinter into the customer's office and dials the computer (charging the call to his telephone credit card). He asks the computer for quotes on price and shipment data for goods the customer wants. If the quotes meet with the cus-

tomers' approval, the sale is made, the salesman enters the order (thereby automatically reserving the goods for the customer immediately). The customer's credit is checked, the shipment is scheduled, and the salesman's account is credited.

• **Transportation Systems** — Teleprinters are used in various ways to keep track of the arrival and departures of buses, trains, planes, and trucks. Communication is maintained between the depots and a central dispatcher and among dispatchers in various regions. Tie-ins with computers in this area are growing slowly; most networks involve teleprinters, but no automatic data processing equipment.

• **Law Enforcement** — Teleprinters are used by local and state police, and Federal bureaus in exchanging information about suspects, stolen cars, and events that affect several law enforcement agencies.

THE TABLE

Table 1 is organized to give the potential user a starting point for selecting a teleprinter. It furnishes an overview of some of the more significant teleprinter parameters.

Pricing information for each teleprinter should be interpreted with care. Some manufacturers may cite only the teleprinter price — not including the interface; others may spell out the OEM quantity price — purchases involving 5 to 500 units.

Additional information on the teleprinters listed in Table 1 may be obtained from the manufacturers by consulting Table 2 and circling the appropriate number on the Reader Service Card.

TABLE 2 • REFERENCE LITERATURE

For more information on TELEPRINTERS listed in Table 1, circle the appropriate number on Reader Service Card.

COMPANY	READER SERVICE CARD NUMBER	COMPANY	READER SERVICE CARD NUMBER
Anderson Jacobson, Sunnyvale, Cal.	200	Maxson Electronics, Great River, N. Y.	225
Barker Engineering, Cleveland, Ohio	201	Memorex, Santa Clara, Cal.	226
ComData, Niles, Ill.	202	Mite, New Haven, Conn.	227
Compace, Minneapolis, Minn.	203	NCR, Dayton, Ohio.	228
Computer Devices, Woburn, Mass.	204	Novar, Mountain View, Cal.	229
Computer Terminals of Minn., Minneapolis, Minn.	205	Omnitec, Phoenix, Ariz.	230
Computer Transceiver Systems, Paramus, N. J.	206	RCA, Marlboro, Mass.	231
Connecticut Technical, Hartford, Conn.	207	Redactron, Hauppauge, N. Y.	232
Control Data, Minneapolis, Minn.	208	Repco, Orlando, Fla.	233
Daedalus Computer Products, N. Syracuse, N. Y.	209	SCM/Kleinschmidt, Deerfield, Ill.	234
Data Access Systems, Dover, N. J.	210	Siemens America, Iselin, N. J.	235
Data Instruments, Sepulveda, Cal.	211	Syner-Data, Beverly, Mass.	236
Data Products, Stamford, Conn.	212	Teletype, Skokie, Ill.	237
Data Terminals, San Jose, Cal.	213	Terminal Equipment, Pompton Lakes, N. J.	238
Digital Equipment, Maynard, Mass.	214	Texas Instruments, Houston, Texas.	239
Electronic Arrays, Woodland Hills, Cal.	215	Tracor Data Systems, Austin, Texas.	240
Fedder Data Center, Baltimore, Md.	216	Transcom, Bloomfield, Conn.	241
General Electric, Lynchburg, Va.	217	TTS, Santa Monica, Cal.	242
Gulton Industries, Hawthorne, Cal.	218	Typagraph, San Diego, Cal.	243
Honeywell, Waltham, Mass.	219	UCC/Datel, Dallas, Texas.	244
IBM, White Plains, N. Y.	220	Univac, Blue Bell, Pa.	245
I/O Devices, Montville, N. J.	221	Western Union Data Services, Mahwah, N. J.	246
Itel, Palo Alto, Cal.	222	Wilttek, Wilton, Conn.	247
Interface Mechanisms, Mountlake Terrace, Wash.	223	Xerox Data Services, El Segundo, Cal.	248
Litton/ABS, Carlstadt, N. J.	224		

Our new alpha-numeric terminal does everything you wanted it to do.

\$36.80 a month.

The CT 264 conversational communications terminal gives you better cost/performance than any alpha-numeric unit around.

The cost is self-evident. The performance starts with an electronic printer that gives hard copy verification of all data sent or received. It prints 64 ASCII characters plus ASCII control codes on a 1/2" paper tape. And there's no ribbon, no noise, no moving parts. It all adds up to top quality.

There's a built-in modem that eliminates costly data sets. You get complete plug-in compatibility with any computer. And you can carry this new terminal almost anywhere, relocate it anytime. It weighs less than 20 pounds.

This is what \$36.80 a month buys with off-the-shelf delivery. Lower price with volume orders. And when you consider our options, like a plastic card reader, automatic answering, acoustic coupler, and several others, your system capabilities increase manifold.

But this is only part of our story. At Transcom, we've been taking the systems approach to data communications from the very beginning.

We manufacture a family of compatible communications devices that at one end of the system includes a variety of remote communications terminals, card and paper tape readers. And at the other end, inside data central, we offer a line of receiving interface units for card and paper tape that makes for a complete, consistent peripheral system of data collection.

All our products are wholly electronic, solid state, portable and noiseless. They offer low cost/high performance operation. Everything considered, they're unbeatable for versatility and price.

If you want to know more about products that do what you want them to do, or if you want to tell us what you think our terminals ought to be doing, call or write: Transcom, A Division of Hi-G, Inc. 12 Tobey Road, Bloomfield, Connecticut 06002 (203) 243-1486.

Transcom

We know what you need.

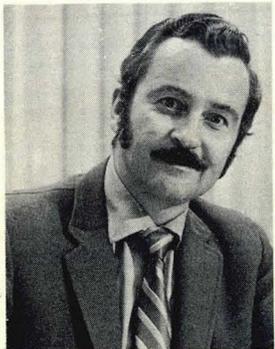


AUDIO RESPONSE — WHAT, WHERE, AND WHEN

WHAT ARE THE BENEFITS?

A computer audio response system is perfect for data collection and information retrieval applications because it is low-cost, flexible, and communicates in everyday spoken language. It is so simple to operate that everyone in an organization with a need to know can have immediate access to the computer for inputting or outputting information. Using Touch-Tone terminals, a remote computer station can cost as little as \$5 a month — or practically nothing if it also does double duty as an ordinary telephone. This makes it possible to put a remote station at every desk and workbench.

A Touch-Tone terminal answers the question of portability also. You may have seen the ads where the intrepid salesman hauls his CRT or hard-copy terminal into the corner phone booth. But these ads fail to answer the question "Where do I plug it in?" and it's a bit awkward to balance a typewriter on one knee and an acoustic coupler on the other in the tight confines of a telephone booth. Conversely, it's possible that AT&T will have Touch-Tone telephones in every hotel room, gas station, or phone booth in the land within a few short years. With 128,000,000 telephones operating in the United States and phone industry plant expenditures at \$9.7 billion for 1971, almost any prediction concerning the growth of Touch-Tone appears conservative.



JOEL A. NAIVE, Chairman of the Board, founded Wavetek in 1962 as a one-person operation to develop and market a then new item of test instruments called function generators. Since that time, Wavetek has grown to a company with annual sales of approximately \$5 million. During the past year, Mr. Naive, in his capacity as technical director, has spearheaded the development of an audio response system for use with on-line computers, which is marketed through the subsidiary company, Wavetek Data Communications. Mr. Naive received his B.S. in mathematics from Pomona College in 1949, and his M.S. in E.E. from Stanford University in 1951.

EDITOR'S NOTE: The potential for audio response systems that use the common Touch-Tone telephone as a data terminal has only begun to be tapped. What these systems consist of, and where and how they might be used, were among the questions put to Wavetek Data Communications' Board Chairman and Director of Engineering, Joel Naive. Mr. Naive's comments, we feel, deserve to be shared with our readers.

HOW DOES AN AUDIO RESPONSE SYSTEM OPERATE?

A typical audio response system is made up of four basic components: the terminal, the communications equipment, the audio response unit, and the computer. Tone-coded data is generated directly by the user on the Touch-Tone keyboard or on a special Touch-Tone button pad. This data is sent to the computer over regular telephone lines or over a dedicated communications network.

The communications equipment converts the tone-coded data into digital form and forwards it to the computer for processing. The computer returns the answer in digital form to the audio response unit, where it is converted into a spoken message by automatically assembling words, numbers, and phrases which have been pre-recorded on an audio drum. The verbal response from the computer can acknowledge receipt of input data, answer inquiries, and provide instructions to the user.

Modern audio response systems have a large vocabulary and offer a great number of computer access channels, making it possible for many users to communicate simultaneously with the computer. A good example of this is the Wavetek Audio Response System at the Rohr Corporation in Chula Vista, Cal., where, in less than three minutes each afternoon, over 1,500 workers sign out using Touch-Tone terminals. Each worker receives back a cheery "OK" from the computer, with the average transaction taking less than 5 seconds. And this is just one of the simpler tasks assigned to

the system, which also keeps track of all work in process, parts, tools, engineering change orders, and man-hours relative to the literally thousands of jobs that simultaneously are being handled by Rohr, "the world's largest job shop."

WHAT ARE TYPICAL APPLICATION AREAS?

The banking industry is a natural for computer audio response systems. The use of the telephone as a remote terminal makes a computer communications network feasible for the hundreds (or even thousands) of people in a single bank, or a network of many branches. Bank employees can input data regularly and receive answers back immediately, regardless of where they are physically located with respect to the central data processor. Further, because audio response systems allow



A Wavetek audio-response terminal being used as a desk-top source data entry station.

clustering low-cost Touch-Tone terminals with more expensive terminals, a customer could instantly be telephoned information concerning his or her account or, alternatively, have a complete statement visually displayed on a CRT or printed out on a line printer.

Credit authorization systems can also make good use of audio response because of the many instances where credit verification is a "maybe," requiring further interaction between the clerk at the remote station and a supervisor at credit headquarters. Wavetek has developed a system which combines supervisors' CRT terminals with conventional Touch-Tone terminals. Should an account be questionable, a control unit signals the clerk and lights a light on each of the supervisors' switchboards. When one of the supervisors takes the call, the clerk's telephone line is switched from the audio response system to the supervisor's

head-set so that the two parties can converse, and the computer dumps the entire account file into the supervisors' CRT terminal. The supervisor can then discuss the account with the clerk or customer.

WHY HAS AUDIO RESPONSE BEEN SLOW CATCHING ON?

There are many reasons for this. Primarily, it is because there were no vendors around to take complete systems responsibility. And during the '60s, most end-users of computers were reluctant to stray outside of the protective umbrella of the major mainframe companies. The '70s are a different ballgame, however. The computer-user is far more cognizant of the advantages of dealing with specialists in the areas of computer peripherals and systems. He knows that he can save money and get the equipment mix that best serves his needs by dealing with more than one firm. With companies such as ours now capable of providing total audio response systems, including a variety of terminals, concentrators, receivers, and control units, the end-user has the assurance that he can now buy or lease a plug-compatible system to tie into his mainframe. We think that's what will make the 1970s the decade of audio response. ▲

Introducing the little wonder modem tester. It not only tests any modem, it tests itself.



The new Bowmar modem test set 251A does an awful lot for so little cost. In fact nothing else around comes anywhere near it. It will test individual synchronous or asynchronous modems or modem systems up to 9600 bps. And the 251A has a unique self test capability so you can tell anytime that it is doing what it's supposed to be doing.

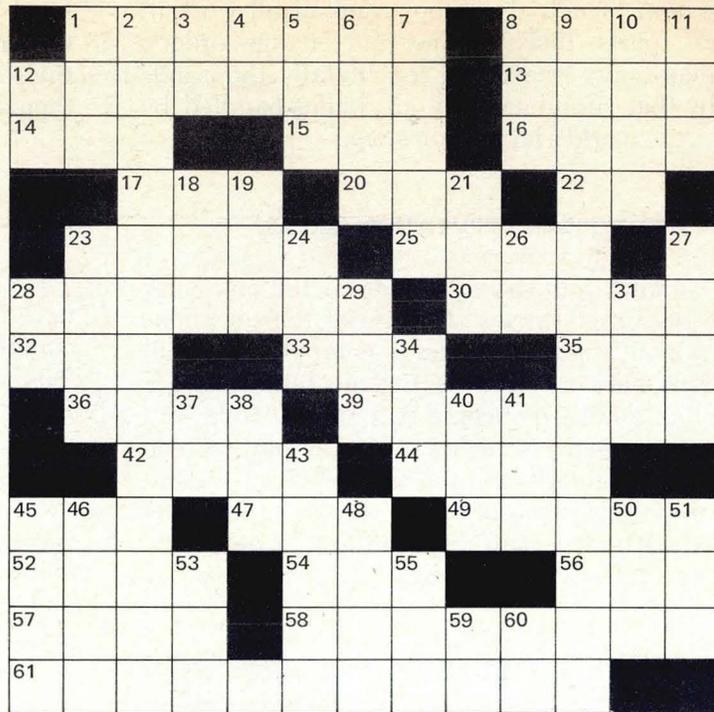
The number of bits employed in each test is switch-selectable, so that a known error rate per 1000, 10,000 etc. can be directly read from the solid state numeric display. (Which incidentally uses another Bowmar product, LED's.) Equally easy to use in the laboratory or the field, it is also compatible with Western Electric's 900 series test set.

Complete technical details are yours for the asking. Please write to Mr. Jim White, Bowmar/ALI, Inc., (formerly Acton Laboratories, Inc.) 531 Main St., Dept. MD-5, Acton, Mass. 01720

BOWMAR

COMPUTER CROSSWORD

LANE SCARISBRICK • Torrance, Cal.



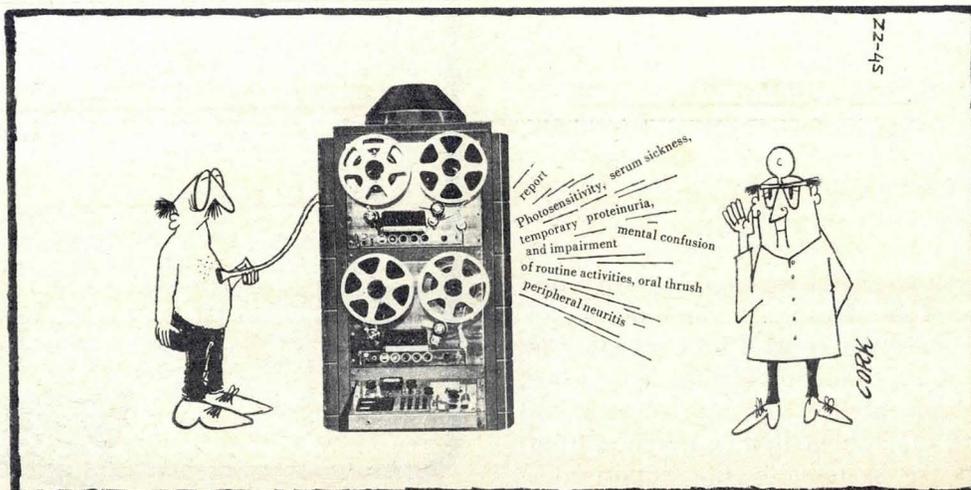
ACROSS

1. Branch of mathematics
8. Do not bend, fold, spindle, or mutilate this
12. A facial expression of pain or contempt (past tense)
13. Continuation of word defined in 47 across
14. A number base
15. Father
16. Expression concerning Friday
17. A child (colloq.)
20. _____, die, das (German)
22. Tune in, turn _____
23. Higher level language
25. Type of Fortran variable
28. Computer storage media (two words—jargon)
30. A body of machine level code similar to a subroutine
32. Date that's always hard to meet
33. Us (German)
35. Any number to the zeroth power
36. Legal document
39. A number system
42. Computer storage media
44. To mince
45. Honor students are familiar with this Greek symbol
47. Astronomical term for cloudy patches of gas (continued at 13A)
49. One of the early large computer systems
52. Greek letter
54. IBM disk systems use this
56. Load address instruction (mnemonic)
57. Flip _____
58. An addressing method
61. A widely used version of a scientific language (two words)

DOWN

1. Second person plural of be
2. Assigns absolute addresses (two words)
3. This company might produce a fastback computer
4. Two most widely used vowels
5. Decimal coding scheme
6. Fortran input statement
7. Heart of the arithmetic unit
8. To sever
9. Can't run Algol programs without this (two words)
10. Precipitation
11. Hexadecimal string; 1101 1110 1111
12. Fortran comparison operator
18. Magazine: International Science and Technology (abbrev.)
19. Intelligence gathering arm of DOD
21. Unit of measure for radiation exposure.
23. Unit of measure for transmission speed of modems
24. Some time-sharing schemes charge only for time used on the _____
26. Prominent organization
27. Christmas word
28. This degree gives you the title of Dr.
29. Last statement in many Fortran programs
31. Genetic chemical (abbrev.)
34. Watches over the stockmarket
37. Electro-optical readers (abbrev.)
38. Half of a prominent business rating firm
40. Cuban guerrilla
41. Charged particle
43. 28 and 42 across are examples of magnetic storage _____
45. _____, paff, pouf
46. _____gram; laser produced
48. City in Germany
50. Airborne Digital Computer (abbrev.)
51. System command for catalog function (abbrev.)
53. Appropriate; fitting
55. Serial Data Flow (abbrev.)
59. Generic description of statements like READ, WRITE, etc.
60. Symbol for ruthenium

SOLUTION APPEARS ON PAGE 89



With umpteen black boxes to choose from, how do you pick the right data modem?

To pick the right data modem, pick the right modem company.

Look beyond the hardware a company offers. Evaluate the other factors that insure optimum transmission throughput and more efficient use of expensive telephone lines.

By all means, look at United Business Communications.

When you buy data modems from us, you get a combination of product reliability, application expertise and back-up capability that, we believe, offers you the best overall value.

With our subsidiary company, Rixon Electronics, we're a stable, continuous source of low maintenance, quality, 1800 to 9600 bps data modems. Modems you can purchase, lease or rent—in any quantity—depending on your needs.

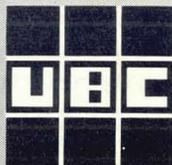
The knowledge and experience of our data engineers insure the best possible application of our modems, no matter how demanding your requirements.

Our parent, United Utilities, Incorporated, operates the nation's third largest telephone system. So, we do know quite a bit about telephone lines. And that's often the key to effective data transmission.

Finally, consider our support capability. Strategically located UBC sales and service offices are staffed with knowledgeable application and maintenance people.

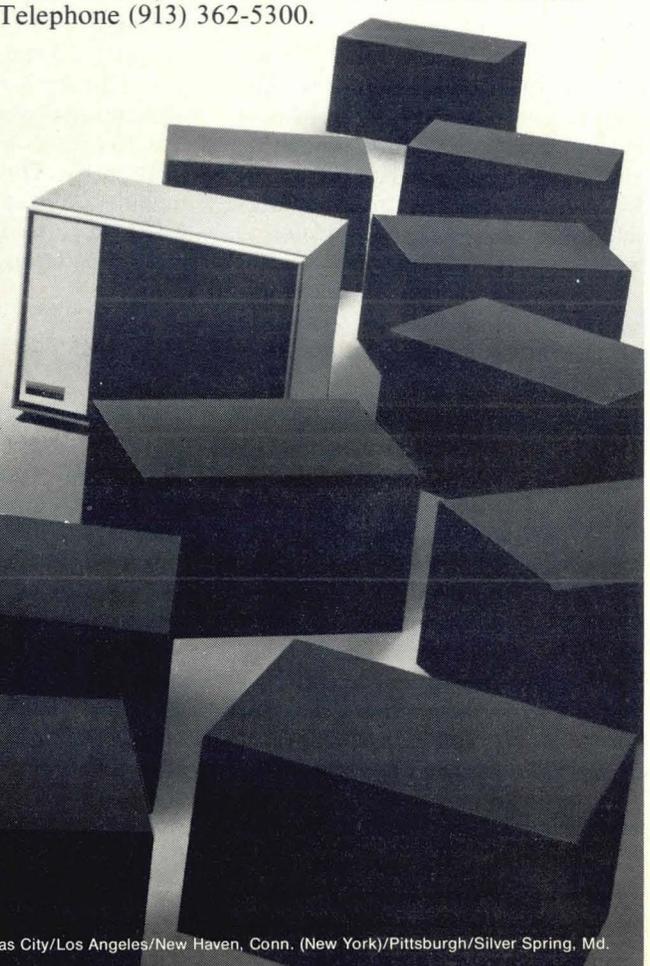
You get more than black boxes when you choose United Business Communications to supply your data modem needs. For more information and *free telephone line conditioning guide*, write: General Sales Manager, UBC, Dept. MD-8-5, 6405 Metcalf, Shawnee Mission, Kansas 66202. Telephone (913) 362-5300.

**To pick the right data modem,
pick the right modem company.**



United Business Communications

Subsidiary of United Utilities, Incorporated



Sales and service offices in: Atlanta/Burlington, Mass. (Boston)/Chicago/Dallas/Kansas City/Los Angeles/New Haven, Conn. (New York)/Pittsburgh/Silver Spring, Md.

NEW PRODUCTS

PAPER TAPE TO CARD CONVERTER

The Model 110A is a media converter that transcribes alpha and numeric data on paper tape to IBM cards. Data may be in the ASCII IBM seven level or other codes. The unit features integrated circuit construction, its own paper tape reader, and, as an option, a separate input for direct Teletype conversion. The output will drive most IBM card punches. The normal operation of the card punch is in no way affected. *Digital Automation, Trenton, N.J.*

Circle No. 358 on Inquiry Card.

PRINTER SYSTEM

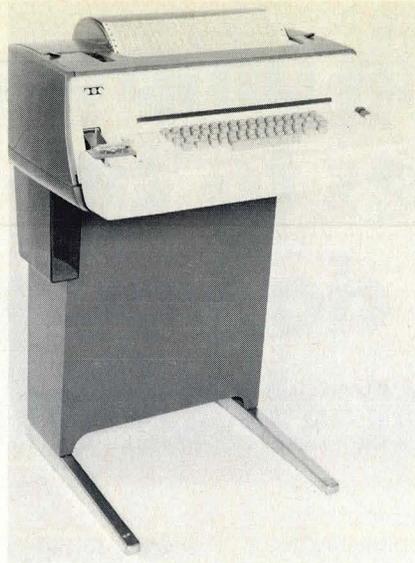
The system is designed for mini-computer-to-printer or off-line magnetic tape-to-printer operations, and consists of a tape-to-printer controller with memory, an IBM-compatible tape drive, and an A. B. Dick Videojet printer. Designated the 5096-960, the printer is capable of generating up to 300 characters per second from mini-computer or 7-/9-track, variable format tape inputs. *Datum, Anaheim, Cal.*

Circle No. 347 on Inquiry Card.

FUNCTIONAL MINI

DEC has introduced the PDP-16, a family of functional minicomputers for OEM applications. The PDP-16 is designed to order by a flow charting procedure, where the user constructs a simple flow chart of his tasks, and DEC designs a PDP-16 specifically for him. Volume prices range from \$800 to \$3,000, with first deliveries set for June. *Digital Equipment, Maynard, Mass.*

Circle No. 328 on Inquiry Card.



NEW TTY'S

Latest addition to Teletype's line of data communications equipment is the new family of Teletype 38 terminals. The model 38 data terminal features the capability of both upper and lower case print-out and also a wide platen which will allow a standard 132 character line at 10 characters per inch. Text can be sent or received on-line on standard 14 $\frac{1}{2}$ " wide computer paper stock using the same format found in the computer room. The 38 keyboard generates the full 128 ASCII code combinations with vertical parity. The 38 family will also include RO (receive-only) and KSR (keyboard send-receive) terminals. *Teletype Corp., Skokie, Ill.*

Circle No. 353 on Inquiry Card.

TAPE DELIVERY SYSTEM

The LCS-5 system is a computer-controlled tape library delivery system capable of transferring individual tapes between the library and the drives, as well as providing automatic file updating and administrative functions. The LCS-5 consists of a series of tape storage modules, each containing 1000 tapes, which are connected to the tape drives via a trolley, elevator, and overhead shuttle system. The shuttle speed of 5 feet/sec will deliver tapes in 10 seconds to any drive. *Advanced Digital Systems, Mohawk, N.Y.*

Circle No. 323 on Inquiry Card.

HIGH-SPEED DRUM PLOTTER

Gerber's 462 high-speed drum plotting system is designed for circuit and NC tape verification, schematic, and charting applications. The system consists of the Model 62 drum plotter and the Series 400 mag tape controller. The Model 62 drum plotter is capable of drawing at speeds of up to 1,600 inches/min with an acceleration time of less than 30 millisecond from zero to maximum velocity. The controller uses an H-P 2100 with 4K, and an IBM-compatible, 800 bpi, 9-track transport. Drawing sizes up to 34" x 44" and roll sizes of 36" x 125' can be accommodated. 462 System prices start at \$35,000, with delivery within 120 days. *Gerber Scientific Instruments, S. Windsor, Conn.*

Circle No. 324 on Inquiry Card.



DATA RECORDER

The system, the PD-1001, consists of a battery-operated, portable digital data recorder, a transmitter, and a receiver interface for link-up to a printer or off-line computer-compatible tape transport. Alphanumeric data is entered into the recorder via a 16-key keyboard and recorded onto a magnetic tape cassette. When the cassette is full, the data is sent over telephone lines to a receiver, located at a computer central. The PD-1001 enables a firm to do such tasks as inventory recording at branch locations or to collect any kind of field data and then transmit such data off-line to be used when desired. The PD-1001 may be used by multi-branch stores or by anyone desiring to eliminate a keypunch operator. *Digital Technology, Halesite, N.Y.*

Circle No. 321 on Inquiry Card.

COMMUNICATIONS TERMINAL

The Comproport is a 25 lb, portable, 80-character line page impact printer packaged to conform with airline carry-on requirements. The terminal features a built-in acoustic coupler with DAA and RS232 connectors. The Comproport produces up to 5 copies and costs \$2,200. *Compro Corp., Santa Ana, Cal.*

Circle No. 337 on Inquiry Card.

VOICE RESPONSE

The Phonplex Model 7050 system is designed to provide rapid verbal information retrieval for credit verification, reservations, stock market quotations, and voice warning systems. The 7050 can be interfaced both on-site and remote to the computer center, and can handle up to 256 telephone data access lines. Vocabulary is virtually unlimited due to the phoneme storage ability of the 7050. Base price for the voice response system is \$19,000. *Phonplex Corp., Huntington, N.Y.*

Circle No. 330 on Inquiry Card.

OFF-LINE PRINTER/PLOTTER

The printer/plotter system consists of the Gould 4800 Electrostatic Printer/Plotter; a 9-track, 800 bpi mag tape handler; and an interface/control which allows for record search and single or multiple copy selection of any number of consecutive pages. The 4800 produces both alphanumerics and graphics, separately or together. It utilizes an 80 dots/inch matrix, prints up to 800 scan lines/sec or 4800 character lines/min. Standard software includes a Character Generator package to emulate standard line printer formats. The Basic Gould Plotting package facilitates formatting commonly used plotter graphics such as charts, perspective drawings, and contours. An optional Quick Draw package enables a user to program with common languages (e.g. Fortran) to produce graphics and text. *Gould/Brush Div., Cleveland, Ohio.*

Circle No. 336 on Inquiry Card.

DEBUG

ON-LINE SYSTEMS FASTER AND EASIER!



The Spectron Universal Monitor insures fast, accurate diagnosis of on-line system problems.

Get on-line and stay on-line, with minimum system downtime. We offer a simple, economical way to do this. Our Universal Monitor helps you pinpoint problems in *all* system hardware and software by showing you—in the form of hard copy—exactly what was sent and received over the data link. So errors caused by software bugs, equipment malfunctions or line problems are immediately visible. Less time is spent tracing problems because system operation is shown in full detail.

The Universal Monitor is simple to install and is as easy for programmers to use as it is for engineers. It connects to the business machine interface of any standard modem, and automatically synchronizes with the data stream to provide a record of every character on the line—not only the usual printable characters, but all control characters as well. The system monitors any code and speed up to 7200 bps, accommodates all line coordination systems, and works with synchronous or start-stop transmissions.

There are two basic components of the Universal Monitor system. These are a Monitor Control Unit which provides synchronization and control, and decodes the monitored data for printing; and the Monitor Printing Unit which is a high-speed non-impact printer. Other components are available which allow switch-selection of lines to be monitored in a multi-line system. For more information or a demonstration, fill in and return the coupon below. Or call (609) 667-5700.

SPECTRON

CORPORATION

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Cherry Hill, New Jersey 08034

Please send technical bulletin
on Universal Monitor System.

Please arrange Universal Mon-
itor System demonstration at my
convenience.

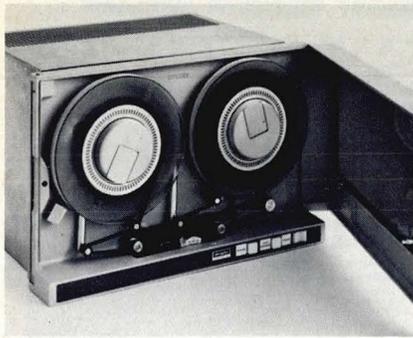
Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone _____



PAPER TAPE PUNCH

The Remex Model RPS-1075 paper tape punch can operate at speeds of 75 characters per second continuously, and has an anticipated life of 8.4×10^7 characters. Features include fully proportional servo spooling of the $8\frac{1}{2}$ inch reels, backspace capabilities, TTL compatible modular electronics, and integral power supply. The unit is priced at \$1,690, with OEM discounts available. *Remex Electronics, Hawthorne, Cal.*

Circle No. 356 on Inquiry Card.

MAGNETIC TAPE UNIT

The synchronous BI 2600 Magnetic Tape Unit is compatible with 7-track IBM and 9-track ASCII NRZI formats at 200/556/800 bpi, and 9-track phase-encoded format at 1600 bpi. Recording can be done at 1 to 37.5 ips and data may be read out bidirectionally at 4 to 37.5 ips, with a maximum data transfer rate of 60,000 characters per second. The BI 2600 comes with a 13-month warranty, with service available nationally. It is priced at under \$3200 in OEM quantities. *Bright Industries, San Francisco, Cal.*

Circle No. 325 on Inquiry Card.



MINICOMPUTER

Varian has announced a new addition to its 620 family — the Varian 620/L. Features of the 620/L are 4K of core, party line I/O bus, direct memory access, automatic priority interrupt, integral power supply and a front panel console with lock. The 620/L is 100% software and peripheral compatible with the 620/i. Base price is \$5,400, with additional 4K increments at \$2,300 each. *Varian Data Machines, Palo Alto, Cal.*

Circle No. 327 on Inquiry Card.

DATA CONVERSION SYSTEM

The Mini-Linkage 1000 is a data conversion system which provides real-time communications between a digital computer and various electronic and electromechanical devices and systems. The linkage system was designed to meet the rigorous computational data transfer demands of simulation and training systems of which the digital computer is the heart of the complex. One basic Mini-Linkage System provides: 128 (min) to 512 (max) channels of digital (discrete bit) input; 32 to 512 channels of digital output; 16 to 32 channels of analog-to-digital conversion; 16 to 80 channels of digital-to-analog conversion; and modular expandability — with large or small digital computers. *Singer/Link, Binghamton, N.Y.*

Circle No. 326 on Inquiry Card.

CASSETTE CLEANER

Vacutape is a tape cleaning machine designed for the users of magnetic tape cassettes. Vacutape is designed to clean by having the tape ride over two uniformly ground and buffered surfaces. A post blade removes particles from the uncoated tape surface, and a second blade engages the coated surface and cleans, in addition to lapping the oxide layer to provide improved tape contact with the head. A vacuum system maintains blade cleanliness during operation. *Acutor, N. Reading, Mass.*

Circle No. 332 on Inquiry Card.

MODEM TEST SET

The test set, designated 251A, is designed for the testing of individual synchronous or asynchronous modems or modem systems. The unit directly connects to the RS-232-C connector on the modem. In use the pattern generator section of the tester sends one of five selected patterns to the modem as an input.



The modem output is received by the test set and a self-synchronizing circuit compares the pattern received to that which should be received. If a difference is detected, a numerical counter is incremented. *Bowmar/ALI, Acton, Mass.*

Circle No. 331 on Inquiry Card.



ALTERABLE ROM FOR MINICOMPUTERS

Memory Systems is offering a plated wire EAROM (Electrically Alterable Read Only Memory) as a plug-compatible peripheral for most popular minicomputers. The user is able to modify on-site, in real time, under keyboard or console control, the contents of EAROM to debug or optimize his software. After optimization, the Write circuitry of EAROM may be disconnected, and the unit will operate as a standard ROM. An additional feature of MSI's EAROM is its nonvolatility — power outages or shutdowns will not cause a loss of control instructions. *Memory Systems, Hawthorne, Cal.*

Circle No. 335 on Inquiry Card.

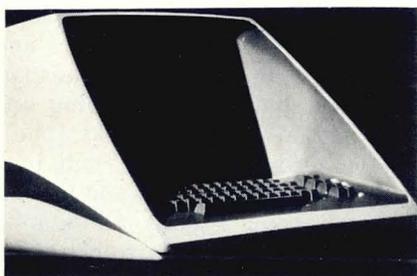
MEASUREMENT ENGINE

The Measurement Engine is designed to provide data processing management with a measurement tool to assist in the identification and reduction of computer performance problems. By applying the concepts of installation calibration and continuous performance monitoring, the Measurement Engine is able to provide the user with timely information with which he can solve computer performance problems. The controlling module is the ME-1011 Event Monitor. Through measurement probes attached to the host computer system, the Event Monitor receives and records signals generated by the function or operation being monitored. These signals may then be logically combined in a user-determined manner to visually display and automatically record the desired measurements. *Boole & Babbage, Cupertino, Cal.*

Circle No. 345 on Inquiry Card.

CRT TERMINAL

DECterminal I is a 12-inch CRT terminal which can display 20 lines of 72 characters each. The terminal is TTY compatible and is designed for use on any computer system that uses ASCII code. Transmission rates range from 110 to 2,400 baud, and the cursor may be addressed to



any point on the screen with only three commands. A built-in interface allows the DECterminal I to drive multiple TV monitors; it also has a video mixing capability allowing variable background pictures to be projected simultaneously on the screen. Price, in quantities of 100, is \$1,995, with first deliveries this summer. *Digital Equipment, Maynard, Mass.*

Circle No. 322 on Inquiry Card.



I/O EXPANDER AND INTERFACE CONTROLLER

The RTP7410 Series universal I/O expander and interface controller allows the user to interface any of Computer Products' analog, digital, or operator I/O equipment to any minicomputer he selects. The basic I/O expander contains cable drivers and cable terminators capable of driving one RTP I/O cable string with up to eight peripheral devices attached. Unit quantity prices for the RTP7410 are from \$800 to \$1,200 depending on the selected computer. *Computer Products, Ft. Lauderdale, Fla.*

Circle No. 334 on Inquiry Card.

TAPE CASSETTE TRANSPORT

Designed for digital recording and interchangeability of cassettes between transport, the CM-101 single-unit, CM-102 two-unit, and CM-103 three-unit models utilize a direct drive system to eliminate the need for a capstan and pinch roller. Standard tape speed is 10 ips, start/stop time is less than 40 ms with packing density at 800 bpi. The compact design includes internal power supply and serial/double parallel buffer with all analog circuits. *Computer Mate, San Clemente, Cal.*

Circle No. 329 on Inquiry Card.

BURSTER-IMPRINTER

A high-speed burster capable of handling multi-copy bursting jobs and of imprinting has been introduced by NCR. The imprinting feature allows for the signing of payroll or accounts-payable checks, purchase order validation, address identification, or other special message imprinting tasks. *NCR, Dayton, Ohio.*

Circle No. 350 on Inquiry Card.

BE A KNOW-IT-ALL

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INFORMATION SPECTRUM, INC. has prepared a publication describing source data automation equipment and design methodology to assist you.

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CIRCLE NO. 37 ON INQUIRY CARD

NEW PRODUCTS

DATA SETS

The series of acoustic couplers and modems, designated the 71 Series, are Bell 103 compatible and provide for transmission of serial binary data at speeds up to 300 baud (30 characters) per second. Prices for the 71 Series start at \$235 in unit quantities. *Livermore Data Systems, Livermore, Cal.*

Circle No. 338 on Inquiry Card.

FLEXIBLE MAC

Flexible MAC is a custom OEM version of the MAC Jr. minicomputer. The minicomputer memory may be expanded from 2 to 28K words (16-bit) within the computer chassis. Organization is optimized for specific user requirements; CPU, memory, and controller boards can be located anywhere in the chassis to maximize space utilization. Flexible MAC can be configured in a 19 inch chassis with 30 logic card slots or a 24 inch chassis with 39 slots. Major functions of almost any system configuration can be accommodated within one chassis, eliminating substantial packaging and interconnect expense. Logic card kits are available for customized special functions. *Lockheed Electronics, Los Angeles, Cal.*

Circle No. 348 on Inquiry Card.

MTST TAPE TRANSPORT

The unit is available as a tape reader — Model 3000R, or as a tape recorder — Model 3000W. Speeds to 120 char/sec. asynchronously or synchronously at 400 char/sec. can be obtained. Interfacing to some minicomputers such as the DEC PDP-8 is available as a special option. *Digi-Data, Bladensburg, Md.*

Circle No. 340 on Inquiry Card.

BUSINESS-ORIENTED MINI

The PPC-50 is a desk-top processor with 100-200K bits (48 bit word length) of magnetic drum memory and with capabilities for accounting, billing, word processing, and data communications. The PPC-50 features a direct memory access, ability to accept decimal as well as binary arithmetic, and an interface system capable of handling 15 input devices, 16 output devices, at long distances, with character parity as standard equipment. The main memory of the model 50 has an average access time of 2.5 milli-sec and execution time is 20 usec per instruction. A "scratchpad," separate from general storage, provides an additional block of memory for fast operating speed and for frequent access to some special memory locations. *Peripheral Processor Co., East Hanover, N.J.*

Circle No. 346 on Inquiry Card.

COMMUNICATIONS TERMINAL

The Comproport, a 25 lb. portable communications terminal, features a full-page 80-character-line impact printer and built-in acoustic coupler. The Comproport can produce up to five copies on pin-feed, roll, or standard office paper. OEM price is \$2,200. *Compro Corp., Santa Ana, Cal.*

Circle No. 352 on Inquiry Card.

MULTI-CRT-TERMINAL 2248/2260-REPLACEMENT

A multi-terminal system compatible with IBM 360/370 hardware and software has been introduced by Trivex. Called The Trivex 40/80, this system is a direct replacement for the 2248/2260 at a lower rental cost. Designed for direct interface, the modularly expandable controller is capable of handling up to 32 CRT displays, four printers, and two magnetic tape cassette drives. *Trivex, Orange, Cal.*

Circle No. 342 on Inquiry Card.

BUSINESS SYSTEM

An office computer for invoicing, accounts receivable, payroll, inventory control, and general ledger reporting has been introduced by Philips. Designated the P-359, the computer comes with either an 800- or 1200-word core memory, and features a 672-digit magnetic ledger card system and a 30-inch split-platen forms printer. *Philips Business Systems, New York, N.Y.*

Circle No. 351 on Inquiry Card.

TELEWRITER COUPLER FOR CALCULATOR

Typewritten records of computed data are added to the outputs now available from the Hewlett-Packard Model 9100A/B Calculators. With the Model 9106A Typewriter Coupler, the Calculator will print out computations through an IBM typewriter at a speed of 15 cps. *Hewlett-Packard, Palo Alto, Cal.*

Circle No. 341 on Inquiry Card.

MINICOMPUTER CASSETTE SYSTEM

The Model 2020 Cassette Tape Transport System provides the minicomputer user with three independent cassette loaded magnetic tape drives, a tape drive controller, a complete interface, and software support. The transport features simultaneous reading and writing on separate decks, back-space record capability, and high speed bidirectional search for addressable files. Data is redundantly recorded on two data tracks using phase encoding for reliability. Interfacing is accomplished by changing a single circuit card and cable inside the unit; several interfaces are available. Software support for each minicomputer includes cassette oriented Assembler, Editor, and Utility programs. Software also includes a keyboard controlled Executive program for "hands off" system operation. *Camberra Industries, Meriden, Conn.*

Circle No. 349 on Inquiry Card.

JUMBO NOVAS

Data General has announced Jumbo models of its Nova 1200 and Nova 800 mainframes. The Jumbo 1200/800 will accommodate 17 fifteen-inch printed circuit boards in 10½" rack space. Using one or two central processor boards, a standard I/O interface board, and 8 memory boards (32K sixteen-bit words), the Jumbo provides additional space for six to seven large interface boards. The Jumbo offers this board space at an added cost of \$850 over the standard chassis. *Data General, Southboro, Mass.*

Circle No. 344 on Inquiry Card.

DIGITAL PRINTER

The small digital drum printer converts any binary coded decimal (BCD) input into a permanent printed form on paper tape, IBM cards, tickets of various widths, and pressure sensitive labels. Up to 4 copies can be printed out at a maximum rate of 2.5 lines/sec. Printout of floating decimal point and floating colon is possible by selective dual over-printing. *Mechanics for Electronics, Wilmington, Mass.*

Circle No. 343 on Inquiry Card.

UNIVERSAL TAPE READER

The Model 8197 Universal Tape Reader is a read-only system for off-line reading operations, capable of reading any IBM-compatible tape: 9-track, 800/1600 cpi; or 7-track, 200/556/800 cpi, NRZI or Phase Encoded. All densities are switch-selectable, and dual speed operation for identical data rates is optional with 1600 cpi operation. The single unit price of Model 8197 is \$8300; \$6640 in quantities of 100. *Kennedy Co., Pasadena, Cal.*

Circle No. 339 on Inquiry Card.

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NEW SOFTWARE AND SERVICES

UPDATE LIBRARIAN

PULMACS provides an IBM system 360/370/DOS user with a means to store, maintain, compile, and test source programs on tape or disk. It can also catalog, delete, rename, or replace either complete units or portions of cataloged programs. PULMACS is currently licensed at \$995 with free updates and maintenance for one year included. *Management & Computer Services, Philadelphia, Pa.*

Circle No. 380 on Inquiry Card.

CIRCUIT DESIGN

The Logic Network System is a circuit design analysis service for logic circuit engineers. The system performs a wide range of load analysis, simulation, packaging, timing, and error checks on logic networks of any level of complexity. *Electronic Graphics, Garland, Texas.*

Circle No. 397 on Inquiry Card.

PDP-10 FORTRAN FILE HANDLING

RAX, an advanced file handling system, offers simple and efficient handling of PDP-10 files, and enables the user to read or write any number of words starting with any word in a file. Features include automatic creation of files, automatic appending to an existing file, automatic expansion of directly addressed files, direct sequential reading and writing, and continue-on-channel. RAX is offered to users through time-sharing vendors on a daily rental basis. *The Bedford Group, Bedford, Mass.*

Circle No. 387 on Inquiry Card.

DOS SPOOLING SYSTEM

This system provides automatic spooling of data from card reader-to-disk and from disk-to-line printer or card punch for an IBM 360 Model 25 and up, and requires no changes in application programs. It runs in a foreground partition, requiring less than 10K core, and requires MPS with very little operating intervention required. Provisions for running special forms and spooling interrupt for on-line printing of rush jobs are included. Actual benchmarks have proven that up to triple the throughput of a 360 Model 30 is possible with certain processing combinations. Purchase price of the system is \$6900 including installation, documentation, and training. *Computer Educational Services, Atlanta, Ga.*

Circle No. 376 on Inquiry Card.

COMMERCIAL APL

Multilevel provides additional capabilities to the users of IBM's APL Terminal System, making it feasible to use the APL Language for in-house commercial data processing. In addition to the APL capabilities received from IBM, the package provides fast-formatting, shared files among many terminals, 3 levels of sequestering, APL workspace extension I/O, generation of Standard-programs for fast I/O, individual I/O instruction access from APL, catenation of mixed APL data-types, high-speed APL sorting, arrays stored on disk, an APL operator for code translation at machine speed, execution of assembler-language programs as strings from within the workspace, data security for a data-name and other features. *APL General, Trenton, N.J.*

Circle No. 389 on Inquiry Card.

DATA BASE MANAGEMENT SYSTEM

TOTAL is a complete integrated data base management system which performs all functions of data base maintenance, update, retrieval, and data integrity at the host language level. The system is continually self-optimizing, eliminating both performance degradation and the requirement for periodic data base reorganization. As data requirements change, new data and associations may be added without affecting the application programs. TOTAL may be used with IBM S/360 under DOS and OS, RCA Spectra/70 under DOS and TDOS and Honeywell under MSR Mod 1 and OS 200. *Cincom Systems, Cincinnati, Ohio.*

Circle No. 393 on Inquiry Card.

MINICOMPUTER BASIC

A generalized extended Basic compiler interpreter, suitable for small to medium scale time-sharing systems, is available. The system allows multiple users to execute Basic programs in a fully interactive time-share environment. As the design is modular, it may be tailored to satisfy particular requirements. Cost for the Basic processor is in the neighborhood of \$30,000; development requires four to six months. *Polymorphic Corp., Palo Alto, Cal.*

Circle No. 383 on Inquiry Card.

TAX PACKAGE

TAXCAL is a program that calculates federal, state, and local withholding taxes, and can handle all payroll periods, earnings, deductions, and exemptions. Through it, companies can keep their payroll systems in compliance with ever-changing tax regulations. TAXCAL is modularized, and a company need only order modules for the areas it requires and then add new modules as needed. TAXCAL is written in Cobol and requires 2500 to 18,000 bytes of core. TAXCAL with calculations for FICA, Federal Withholding Tax, and ten state modules costs only \$500. Each additional state module costs \$50. *Datasonics, New York, N.Y.*

Circle No. 386 on Inquiry Card.

SUPER BASIC

Super Basic allows the UCS-VI time-sharing user to define his problem with simple English statements, thus reducing and simplifying the total programming required. Programming is further simplified by extensive error diagnostic messages and program debugging features. UCS Super Basic also offers extensive character string manipulation capabilities, complex and logical variables, 24 data files in use at one time, accuracy to 14 significant digits, asterisk filling and floating signs in output fields, and the capability for storing and executing object programs. *United Computing Systems, Kansas City, Mo.*

Circle No. 395 on Inquiry Card.

UTILIZATION REPORT SYSTEM

A computer utilization report system (CURS) for IBM DOS POWER users is available. The system accesses all the POWER-generated data elements and provides additional control fields of its own. CURS offers complete flexibility by allowing custom formats to be cataloged within the system. It produces detail and summary reports, totals and subtotals, and has the ability to weigh the hourly usage by shift or priority and to produce accurate billing or in-house memorandum figures. The system sells for \$950. *Computer General, Washington, D.C.*

Circle No. 382 on Inquiry Card.

CIRCUIT DESIGN SERVICE

AIDE is an automated, integrated design and engineering service which takes raw logic diagrams or equations and produces finished drawings, printed-circuit board artwork, NC tapes, and documentation required by a manufacturer to produce electronic hardware. The use of computers and automated graphic equipment allows AIDE to partition, assign, and route PC boards, as well as design back panel wiring and test for faults. *Algorex Data Corp., Hicksville, N.Y.*

Circle No. 381 on Inquiry Card.

COBOL WRITING SYSTEM

The SNOFLAKE program writing system provides a means for implementing many business data processing functions. The user, who need not be a programmer, specifies the details of the function desired. The Cobol program written by the system may be in any of the IBM-defined dialects of Cobol. Currently available functions include report writing, label printing, and file rebuilding and reformatting. System features include multiple input files, sequential or indexed-sequential; powerful file subset selection capabilities; and unrestricted number of (report) subtotal levels. The system runs under OS/360; function prices are: Report, \$4,000; Label, \$2,000; Rebuild, \$2,000. *Software Engrg., Norton, Mass.*

Circle No. 385 on Inquiry Card.

NOVA PROGRAM ASSEMBLY

Three software packages that allow the assembly of programs for the Nova line of computers on the IBM 360/370, Univac 1108, and CDC 6600 computers are available. Each assembler is written in Fortran and is compatible with the Nova line Extended Assembler (relocatable). By allowing the user to develop his software independently on a large computer, the assemblers have several advantages over conventional program development. *Data General Corp., Southboro, Mass.*

Circle No. 396 on Inquiry Card.

MERGE AND EDIT PROGRAM

A merge and edit package which enables the typographer to output camera-ready copy with little or no need for manual paste-up is available. Called EDIT/SET, the program interfaces with a master phototypesetting program, PHOTASET, when configured for Inter-type, Photon, and Mergenthaler devices. EDIT/SET is available in four versions: paper tape to paper tape; paper tape to magnetic tape; magnetic tape and line printer to magnetic or paper tape; or paper tape and line printer to paper tape. *Composition Systems, White Plains, N.Y.*

Circle No. 379 on Inquiry Card.

CASSETTE DUPLICATING SERVICE

The service duplicates digital programs recorded on tape cassettes, and will provide exact copies of master programs upon verification of ownership by the purchaser. Duplicates of such standard programs as ECMA and those used in Wang 700 Series programmable calculators can be delivered in as little as two days. Minimum orders for as few as five duplicates of standard programs will be accepted. *Information Terminals, Mountain View, Cal.*

Circle No. 378 on Inquiry Card.

FORTRAN ANALYZER

Called FORTUNE (FORtran TUNEr), the program analyzes each statement of a Fortran program, inserts code which counts statement executions, executes the program, and prints out the original source code. Each statement of the source listing is annotated showing the exact number of executions and the approximate cost of execution (in machine cycles). This listing is used to locate those statements which use the greatest amount of computer time and thus should be optimized. *Computer Performance Systems, Santa Clara, Cal.*

Circle No. 388 on Inquiry Card.

SOLUTION TO COMPUTER
CROSSWORD ON PG 80

A	L	G	E	B	R	A	C	A	R	D	
G	R	I	M	A	C	E	D	U	L	A	E
T	E	N	D	A	D	T	G	I	F		
K	I	D	D	E	R	O	N				
B	A	S	I	C	R	E	A	L	N		
M	A	G	T	A	P	E	M	A	C	R	O
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D	E	E	D	D	E	C	I	M	A	L	
D	R	U	M	C	H	O	P				
P	H	I	N	E	B	E	N	I	A	C	
I	O	T	A	D	O	S	L	D	A		
F	L	O	P	I	N	D	I	R	E	C	T
F	O	R	T	R	A	N	F	O	U	R	

CalComp doesn't claim to be driving IBM right out of the business, of course.

But together with our disk drive subsidiary, Century Data, we're claiming a pretty fair share of the market. And a bigger share every month.

Last month, for example, we received orders for more than 300 disk drives.

And while over 90 percent of them will replace compatible IBM devices, we doubt if IBM will replace any of ours. For several reasons.

First, with average access times of 30 to 35 milliseconds, our disk drives are twice as fast as theirs.

Second, with electromagnetic positioning instead of mechanical pawls, detents and gears, ours are simply more reliable.

And third, ours cost less. Ten percent less on a year's lease than IBM's new, low-priced 2319 system, to be exact.

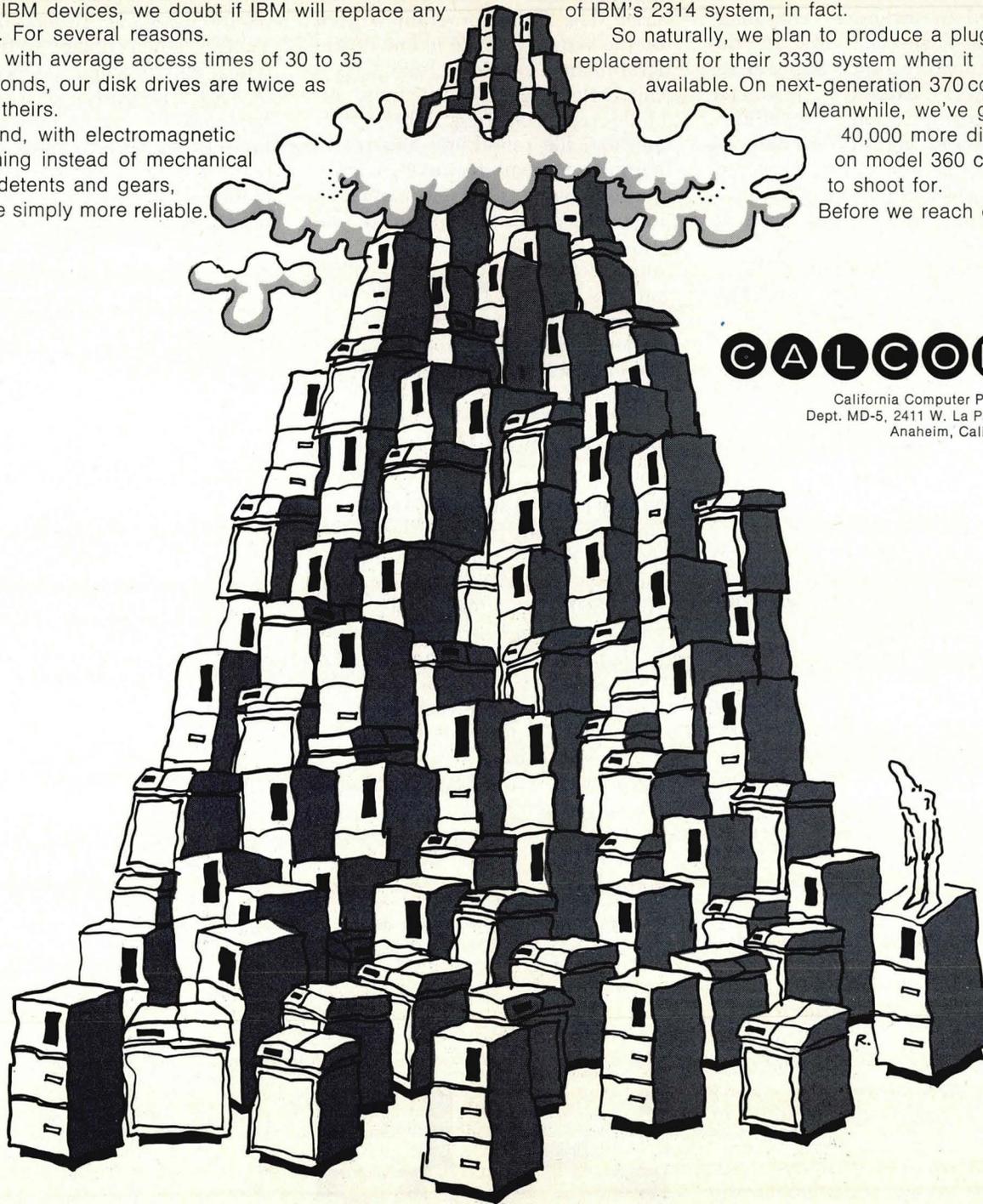
What's more, we've announced a new system of our own, called the CD 1015/215. In addition to being twice as fast as anything IBM delivers, it costs less and stores twice as much per spindle.

CalComp is the leading independent disk drive producer. The first independent to deliver a complete equivalent of IBM's 2314 system, in fact.

So naturally, we plan to produce a plug-to-plug replacement for their 3330 system when it becomes available. On next-generation 370 computers.

Meanwhile, we've got about 40,000 more disk drives on model 360 computers to shoot for.

Before we reach our peak.



CALCOMP

California Computer Products, Inc.
Dept. MD-5, 2411 W. La Palma Avenue
Anaheim, California 92801

**WE REPLACED
THIS MANY IBM DISK DRIVES
LAST MONTH.**

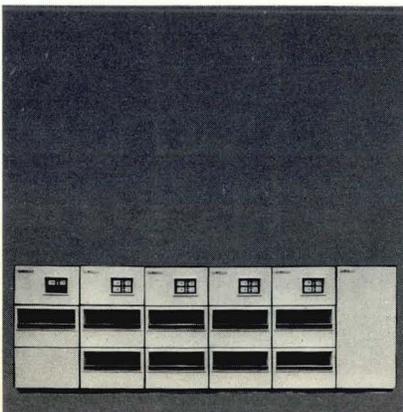
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*service only

For complete information, addresses and phone numbers, please ask for Bulletin No. 130.

CalComp's CD 22/14 replacement for the IBM 2314 system. Each 2-high cabinet stores up to 58 million 8-bit bytes.



CIRCLE NO. 39 ON INQUIRY CARD

NEW LITERATURE

PLOTTER

Literature is available describing the Auto-Pro 3500 digital plotter, a unit capable of accepting serial or parallel data and of functioning both as an incremental digital and standard analog plotter. *Beckman Instruments, Fullerton, Cal.*

Circle No. 402 on Inquiry Card.

DATA TERMINAL

The SYS 200BDT, a programmable batch data terminal, is described in a single-page spec sheet. *SYS Computer, Hackensack, N.J.*

Circle No. 411 on Inquiry Card.

S/3 ACCESSORIES

Cabinets, work stations, files, sorter racks, and other card and system accessories for S/3 installations are described in a 14-page booklet. *Wright Line, Worcester, Mass.*

Circle No. 417 on Inquiry Card.

GRAPHIC DISPLAY

The SC Delta-1 multi-console graphic display is outlined in a two-page review. *Systems Concepts, San Francisco, Cal.*

Circle No. 410 on Inquiry Card.

MINICOMPUTER

The BR-1018 computer, an 18 bit, 4K, telephone-sized machine, is described in a 16-page booklet. *Bunker-Ramo, Westlake Village, Cal.*

Circle No. 415 on Inquiry Card.

MICRO 400 MINICOMPUTER

The Micro 400 minicomputer is described in a six-page brochure. *Microdata, Santa Ana, Cal*

Circle No. 407 on Inquiry Card.

DATACOM

A four-page brochure explaining the use of Datacom, Western Union's low-speed, low-cost data transmission service, has been published. *Western Union, New York, N.Y.*

Circle No. 404 on Inquiry Card.

DISK MEMORY

A product bulletin describes the 5000 Series of disk-cartridge and fixed-disk drives. *PEC, Chatsworth, Cal.*

Circle No. 416 on Inquiry Card.

MARKETING SERVICE

A brochure is available describing Codimark, a computerized direct marketing information and communications service. *Information Services, Babson Park, Mass.*

Circle No. 408 on Inquiry Card.

SERIAL PRINTER

A spec sheet describes the Friden Model HP-030 serial printer, a 30 cps, 132 column impact wheel printer for OEM applications. *Singer/Friden, San Leandro, Cal.*

Circle No. 420 on Inquiry Card.

FLOORING

A 4-page loose-leaf insertion discusses steel-encased raised flooring systems for EDP installations. *Westinghouse, Grand Rapids, Mch.*

Circle No. 412 on Inquiry Card.

EDITING TYPEWRITER

An 8-page foldout describes the Data Secretary editing typewriter, and outlines time savings to be gained by using such equipment. *Redactron, Hauppauge, N.Y.*

Circle No. 406 on Inquiry Card.

NEW LITERATURE

OCR FORMS

A four-page brochure entitled "Solving the 10 Toughest OCR Forms Problems" is available. The brochure identifies and describes 10 serious problems, such as dimensions, aspect ratio, line spacing, margins, field separators, and others. *Graphic Controls Corp., Buffalo, N.Y.*

Circle No. 403 on Inquiry Card.

PAGE PRINTER

The Model 4440C80 80-column page printer is described in a 4-page brochure. *American Regitel, San Carlos, Cal.*

Circle No. 418 on Inquiry Card.

NOVA CRT TERMINALS

CRT terminals, interfaces, and software for Data General mini-computers are described in a series of spec sheets. *Mark Computer Systems, Garden City, N.Y.*

Circle No. 405 on Inquiry Card.

IBM-COMPATIBLE DISPLAY

A six-page brochure describing ITT's Alphascop Display, an IBM 2260 compatible unit, is available. *ITT Data Equipment and Systems Div., East Rutherford, N.J.*

Circle No. 401 on Inquiry Card.

PROGRAMMABLE CALCULATOR

Calculators with scientific notation or floating decimal display, and a learn mode for programming directly from the keyboard are described in a four-page brochure. *Wang Labs, Tewksbury, Mass.*

Circle No. 400 on Inquiry Card.

PERSONNEL CONTROL SYSTEM

BCD has issued a report describing a personnel control system that provides current status information for such functions as job status, seniority, salary, and security clearance. *BCD Computing, Buffalo, N.Y.*

Circle No. 419 on Inquiry Card.

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All for you at the SJCC: line printers, magnetic tape drives, disc storage systems, time-sharing computer systems, remote batch terminals, 10/15/30 CPS terminals, and special input terminals.

Ask about our quality, performance, com-

petitive prices, unsurpassed reliability, availability and service.

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Quality in computer products.



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TDS/BSL TERMINALS — Special data input devices let you enter data by keyboard, see it in digital format for verification, then, by pushing the SEND key, transmit it to tape, disc, computer or modem. Quiet, compact, easy to operate.

TDS/PGI-833/733 — The disc storage system that's 100% compatible with the 2314 and the 2319. Also showing the TDS/PGI-711 disc storage drive, a direct replacement for the 2311. And the TDS/PGI-700 Disc Drive Exerciser for off-line testing and the TDS/PGI-705 I/O Tester.

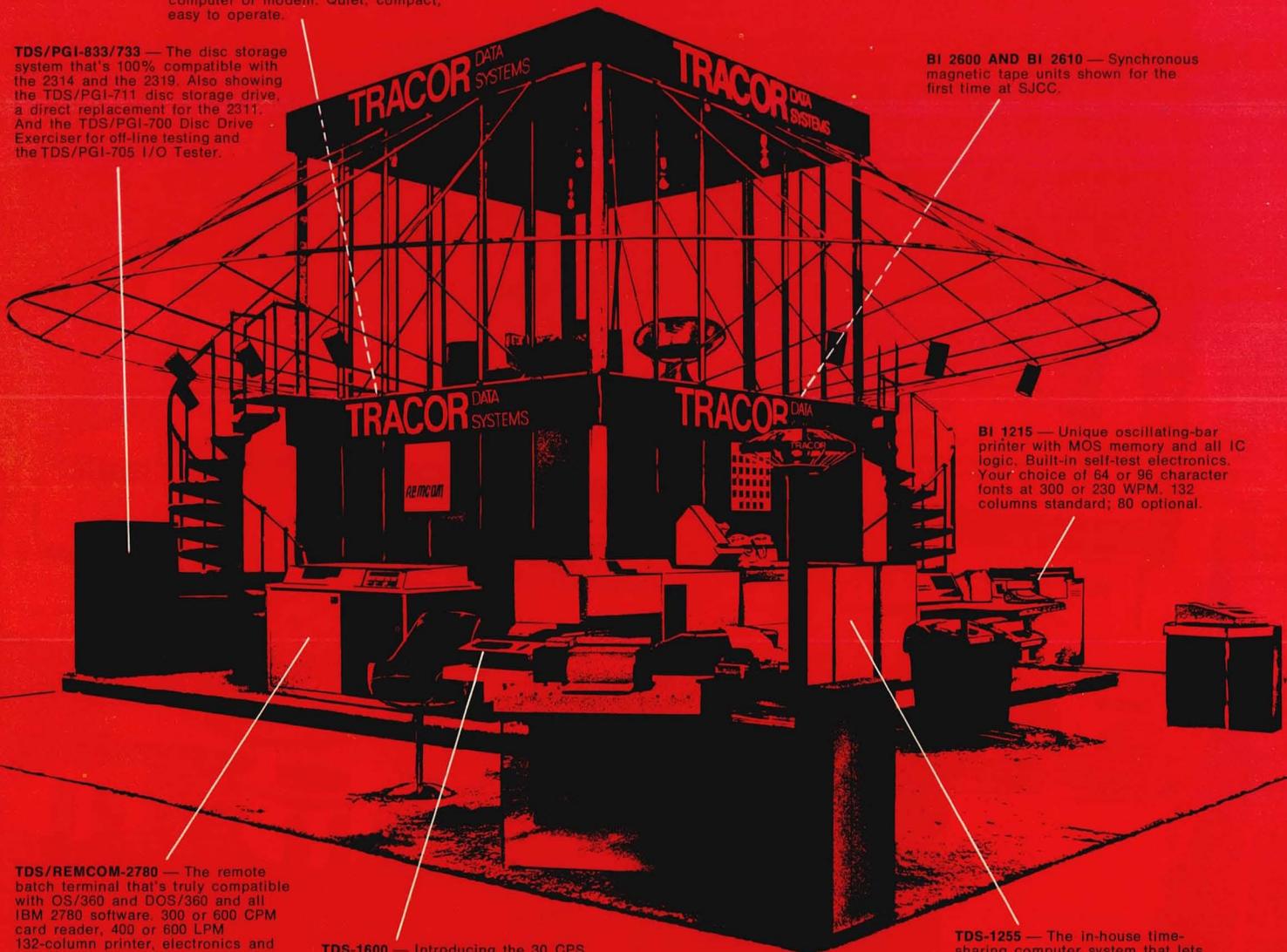
BI 2600 AND BI 2610 — Synchronous magnetic tape units shown for the first time at SJCC.

BI 1215 — Unique oscillating-bar printer with MOS memory and all IC logic. Built-in self-test electronics. Your choice of 64 or 96 character fonts at 300 or 230 WPM. 132 columns standard; 80 optional.

TDS/REMCOM-2780 — The remote batch terminal that's truly compatible with OS/360 and DOS/360 and all IBM 2780 software. 300 or 600 CPM card reader, 400 or 600 LPM 132-column printer, electronics and interface in one cabinet.

TDS-1600 — Introducing the 30 CPS model of the TDS-1600 impact conversational terminal series. A combination of high-speed performance and the simplicity and reliability of the 10/15 CPS TDS-1601.

TDS-1255 — The in-house time-sharing computer system that lets you write, debug and run big-system programs. 256K words big! Enhanced FORTRAN IV. Handles up to 16 terminals plus peripherals for concurrent batch processing.



Lightweight printheads for heavyweight OEMs

If you can use quality printheads in quantities as large as one-hundred or more, our unique series of 30/15/10 CPS impact printheads is for you: The answer to your needs for hard copy and other communication or computer terminal applications.

It's simple. Highly reliable. Weighs as little as 6½ pounds. And makes multiple copies.

In your choice of three models.

The first offers a 64-character ASCII subset at 30 CPS. And prints 80 columns on standard 8½-inch roll or sprocket-fed continuous stock.

Our second model gives you the same features at 10/15 CPS (20 CPS in parallel mode).

And with our third, you get up to 20 CPS in a 156-column format.

Of course, we use these printheads in our own 10/15/30 CPS terminals, the TDS-1600s. We omitted

hundreds of moving parts in their design; our printheads allowed us to use advanced electronics.

Which reduces the noise and repairs. Increases the up-time.

You really ought to have our printhead examined. It's a lightweight heavyweight.

Contact Tracor Data Systems, 4201 Ed Bluestein Blvd., Austin, Texas 78721. Or call (512) 926-7770.

TRACOR DATA
SYSTEMS

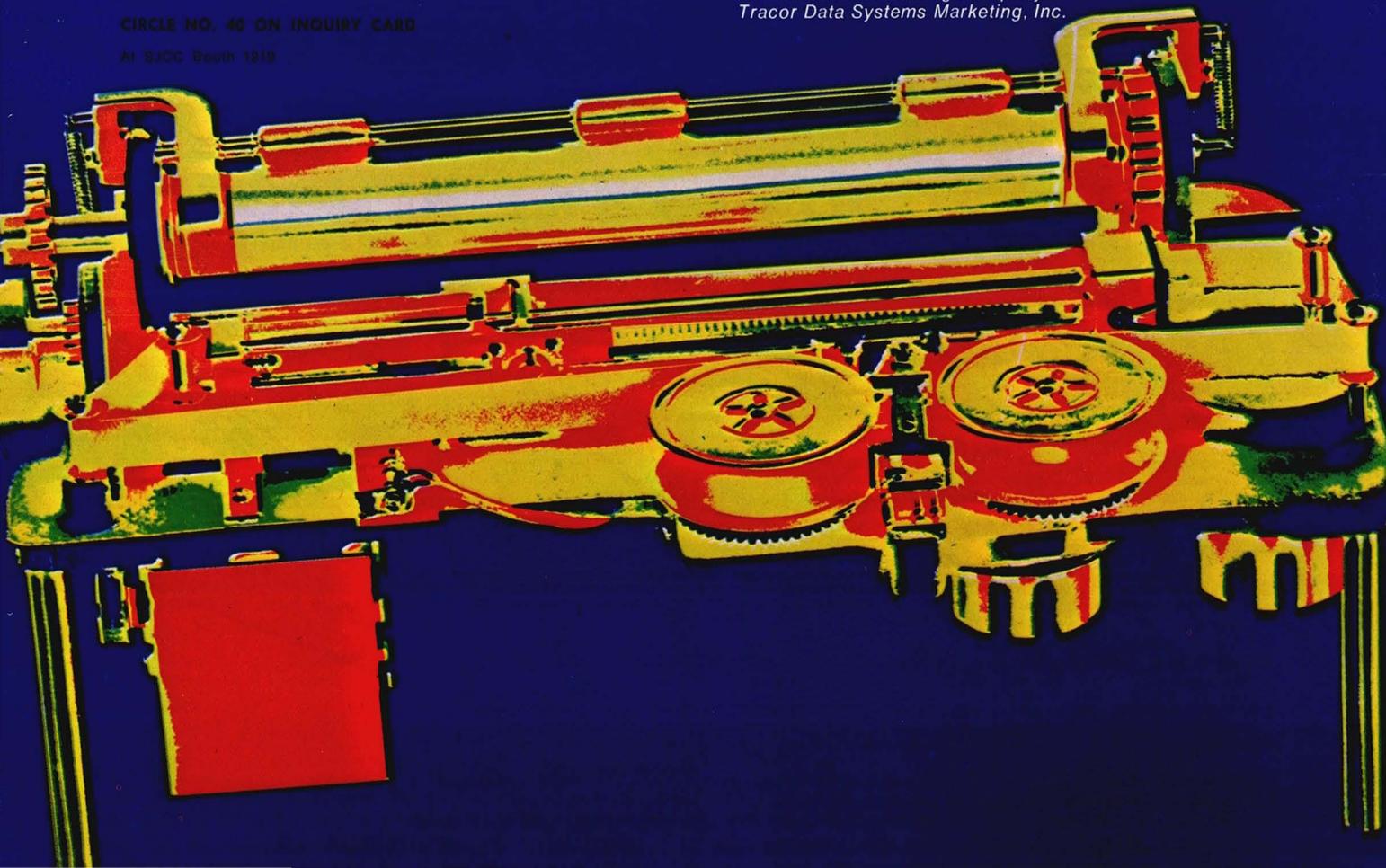
Quality in computer products.



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CIRCLE NO. 40 ON INQUIRY CARD

At 5100 Basin 1210



NOW, TRACOR gives you a 30 CPS terminal

Introducing the 30 CPS model of the TDS-1600 impact conversational terminal series.

It's ideal for your time-sharing and computer I/O requirements. And it provides the same simplicity, high reliability and performance of other TDS terminals.

It uses the same, simple impact printhead.

Hundreds of parts inherent in more complicated terminals have been designed out of TDS terminals... in favor of advanced electronics.

This reduces the noise, downtime and repairs.

The new TDS model generates a 64-character ASCII subset, 80 columns wide, in full or half duplex mode.

It makes multiple copies, using standard 8½-inch paper, roll or sprocket driven.

Other options are available: built-in telephone acoustical coupler, magnetic tape cassette unit, Receive-

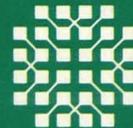
Only model, and your choice of teletypewriter or parallel interface.

Of course, our lightweight printhead is available separately in OEM quantities.

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Quality in computer products.



At SJCC Booth 1219

CIRCLE NO. 41 ON INQUIRY CARD

If you're underwhelmed

... with outside computer time-sharing, consider the convenience of an in-house TDS-1255. It's the time-sharing system that lets you write, debug and run big-system programs. 256K words big. Then run them, if you wish, on big computers.

For example, with its enhanced FORTRAN IV, the TDS-1255 has processed programs written for the 1108 and the larger 360 systems with no changes.

TDS-1255 combines 512K words of virtual memory with access to 8-, 16- or 32-million characters of mass disc storage... directly addressable in FORTRAN. It handles up to 16 terminals simultaneously, local and remote. And it accommodates additional peripherals to facilitate batch processing concurrent with time-sharing.

Other important features include File Edit, MATH, built-in usage accounting, random and sequential file management processors, and extensive diagnostics that explain program mistakes in English.

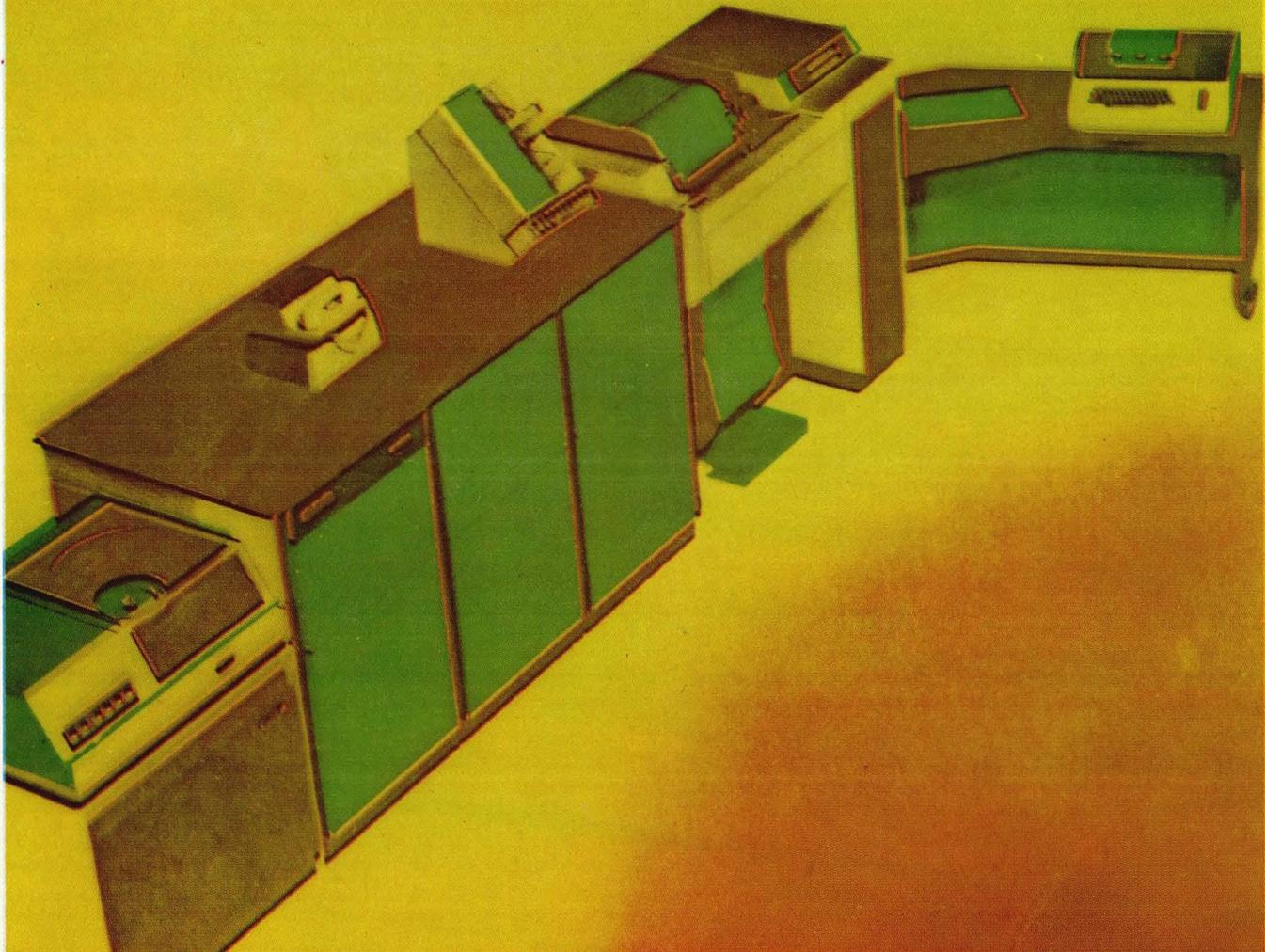
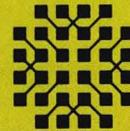
We can deliver it in 90 days for as low as \$2,700 a month, *including maintenance*. No extra shift charges. It's yours 24-hours-a-day.

We'd like to give you a live demonstration of the TDS-1255. You may find it overwhelming.

Contact Tracor Data Systems, 4201 Ed Bluestein Blvd., Austin, Texas 78721. Or call (512) 926-7770.

TRACOR DATA SYSTEMS

Quality in computer products.



How in blazes will your insurance cover this kind of loss?



Obviously, no insurance policy can cover the loss of irreplaceable data. If it could, no company could afford the premium. That's how things stood before Fenwal made the computer scene. Now there's the Fenwal high-speed fire suppression system. It stops fires dry in seconds, before the sprinklers get hot enough to melt their plugs. Before water washes your memory bank down the drain.

It all happens so fast, you're underwhelmed by what you didn't see. Like sensors that can spot

a flame instantly. And a dry, safe-for-people, non-corrosive gas that knocks out fires fast—before damage is done. The entire area is left clean, ready for immediate reuse.

To see this Fenwal system in slow-motion, write today to Mr. George Grabowski, Division Manager. And ask to arrange a showing of the color film, "The Fireaters." No obligation, of course. Fenwal Incorporated, 411 Main Street, Ashland, Mass. 01721. Phone (617) 881-2000.

FENWAL

The Repco 120 Printer.

It's fast, quiet, reliable, compatible, compact.



The REPCO 120 is a low-cost, solid state impactless printer designed to interface with all CRT terminals, minicomputers or other remote data terminals. It operates asynchronously at speeds to 120 characters per second, 80 characters per line, 5 lines per inch vertically. It will handle serial or parallel data of 64 character standard ASC II code. When interfaced with a modem or acoustic coupler, it can be used

as a terminal printer over telephone or private wire communications lines. By adding the keyboard option, REPCO 120 becomes an interactive terminal for your minicomputer. REPCO Incorporated, 1940 Lockwood Way, P. O. Box 7065, Orlando, Fla. 32804, telephone (305) 422-2451.

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SCOPE Incorporated.

Repco

(Circle 44 Reader Service Coupon)

For demonstration in your area: **EAST:** Bartlett Associates, Inc., Wayne, Penna., (215) 688-7325; White Plains, N.Y., (914) 949-6476; Bethesda, Md., (301) 656-3061 **SOUTHEAST:** Gentry Associates, Inc., Orlando, Fla., (305) 841-7740; Huntsville, Ala., (205) 534-9771; Burlington, N.C., (919) 227-2581; Atlanta, Ga., (404) 233-3816 **MIDWEST:** SEA, Inc., Indianapolis, Ind. (317) 846-2593, Chicago, Ill., (312) 282-6694; Waukesha, Wisc., (414) 547-6637; Minneapolis, Minn., (612) 425-4455 **MOUNTAIN STATES:** PLS Associates, Inc., Albuquerque, N.M., (505) 255-2330; Englewood, Colo., (303) 771-0140; Salt Lake City, Utah, (801) 262-2866 **WEST:** King Engineering Co., Inc., Encino, Calif., (213) 981-0161; Santa Ana, Calif., (714) 546-6883; La Jolla, Calif., (714) 453-7042; Mountain View, Calif., (415) 964-2942; Phoenix, Ariz., (602) 277-5902.

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