

DATA MATI⁷⁴ON[®]

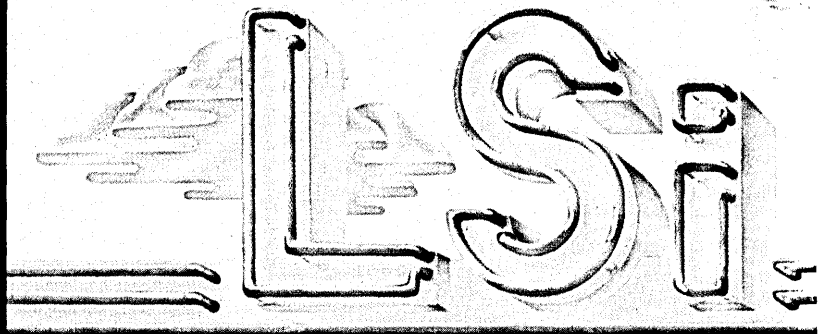
September

DATA BASE MANAGEMENT

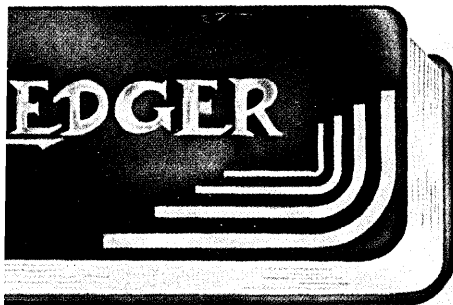
Also: dp in developing nations, disaster planning, and optimizing throughput...



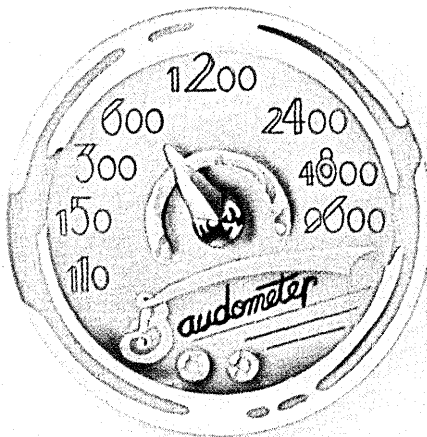
A POWERFUL IDEA IN TERMINALS



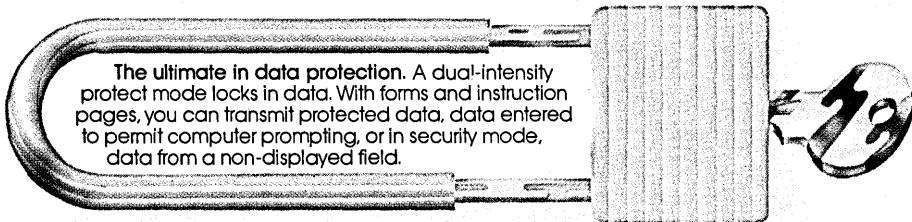
We've put the whole ASCII set in lights. LSI's new powerhouse, the ADM-2 video display terminal has all 128 characters, including upper and lower case letters. Now you can perform text editing and pick up every character needed for line control procedures. The 12" CRT also features a 1920 character display in the 24 line format.



A shortcut to the numbers game. Our special numeric pad is set up like a calculator and includes period, comma, minus, tab, and return keys for concentrated power. Your controller will love its operation. Its price, too.



Safe at any speed. ADM-2 has the power to transmit at any of eight rates, up to 9600 baud. You can send data by line or page, send the cursor coordinate, defined message or function sequence. And you can tie into a line printer for even more peripheral power.



The ultimate in data protection. A dual-intensity protect mode locks in data. With forms and instruction pages, you can transmit protected data, data entered to permit computer prompting, or in security mode, data from a non-displayed field.

Editing like you've never seen before.

Eleven separate cursor control keys and ten edit keys speed data editing by page, line, or single character, then get you home fast. Additional functional control keys have equally broad capabilities, and eight CRT status displays provide instant feedback on a wide variety of information to keep all that power on target.

our monumental advance in power. Sixteen function keys give you instant access to the special commands you specify. This re-programming system provides one-key implementation of programs, forms or instructions...with power to grow! Set up 2 commands now and change them anytime in the future. alter format, answer questions, modify sub-routines, whatever. Let your imagination—and our quest for power—in wild.

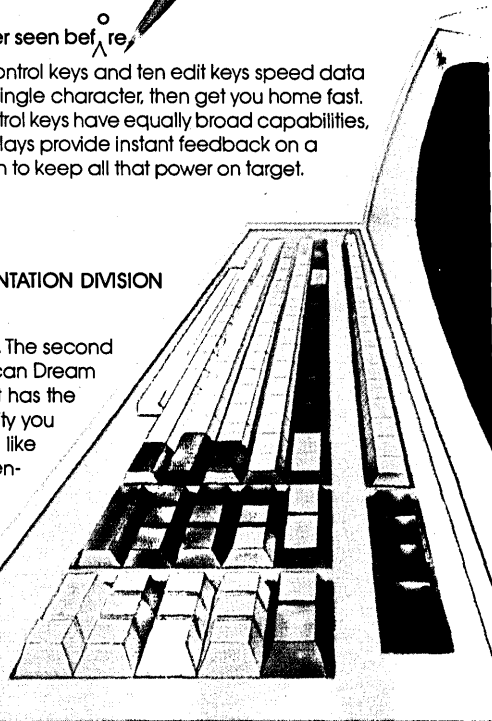


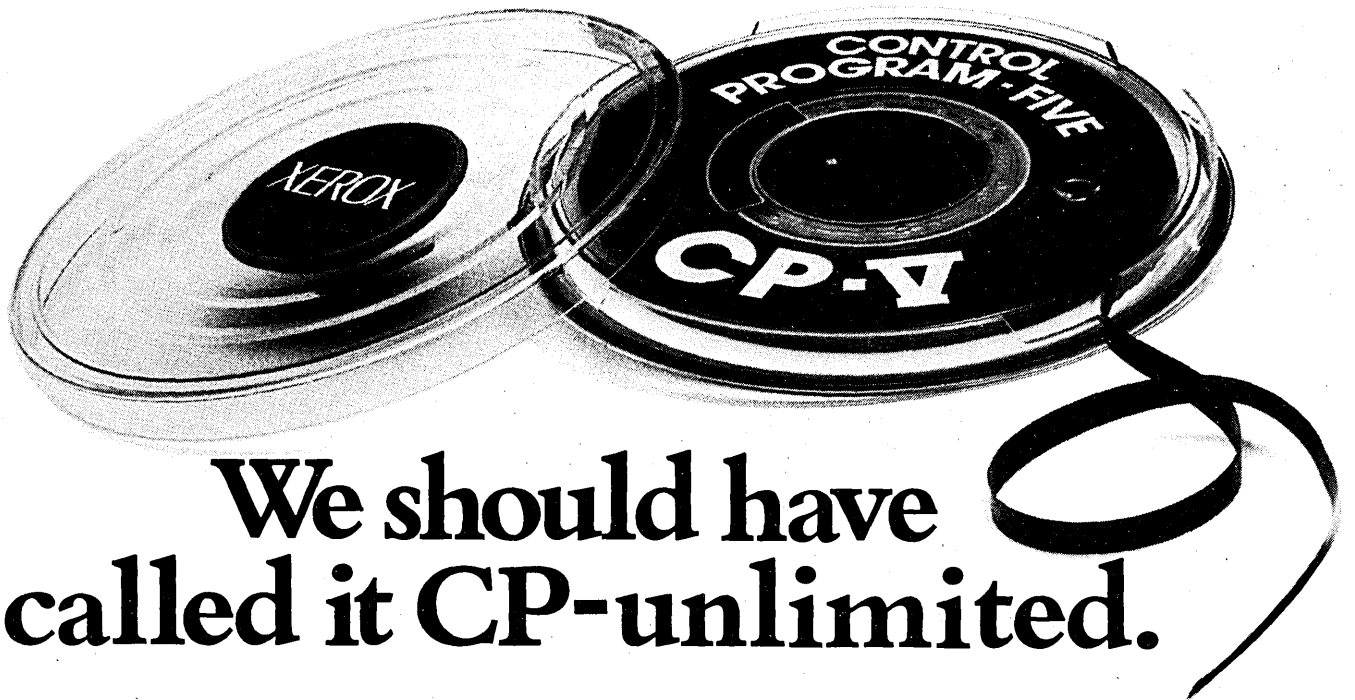
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DATA PRODUCTS

Pick up your keys to power. The second generation, 119-key American Dream Machine is now a reality. It has the power, capacity, and flexibility you need. It lets you add options like polling and addressing whenever you're ready. We can interface with practically anything in asynchronous data equipment, and our low price drops rapidly on quantity orders.

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CIRCLE 1 ON READER CARD





We should have called it CP-unlimited.

After all, it is the most advanced operating system around.

And it's already been proven. And tested. (As any of our customers will tell you.)

Plus, CP-V does give you simultaneous access in five modes. Real Time. Time-sharing. Multi-programmed Batch. Remote Batch. Transaction Processing.

There is the additional fact that Control Program Five (CP-V) ties together Xerox Distributed Multi-use computer systems.

And that CP-V is a key reason why our approach to hardware and software really works. (We've combined a unique hardware interrupt structure with independent processors and multi-port memory.)

All of which means you can talk to your computer and have it talk back to you intelligently. When you want to.

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It means more computer accessibility for more people in your company. Which means a smarter company. Which could mean a more profitable company.

And you can find out about CP-V for your company by calling (800) 421-6882. In California, (213) 679-4511, ext. 950. Or drop us a line at Xerox Corporation, Dept. I5-08, 701 S. Aviation Blvd., El Segundo, California 90245.

So why'd we merely call it CP-V instead of CP-Unlimited?

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XEROX

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Epoch 4: Worth its weight in gold.

When you commit your company's data to computer tape, you invest hours of costly computer time — plus valuable information.

But, most of all, you commit your company's money.

That's what makes Epoch 4 such

a solid investment.

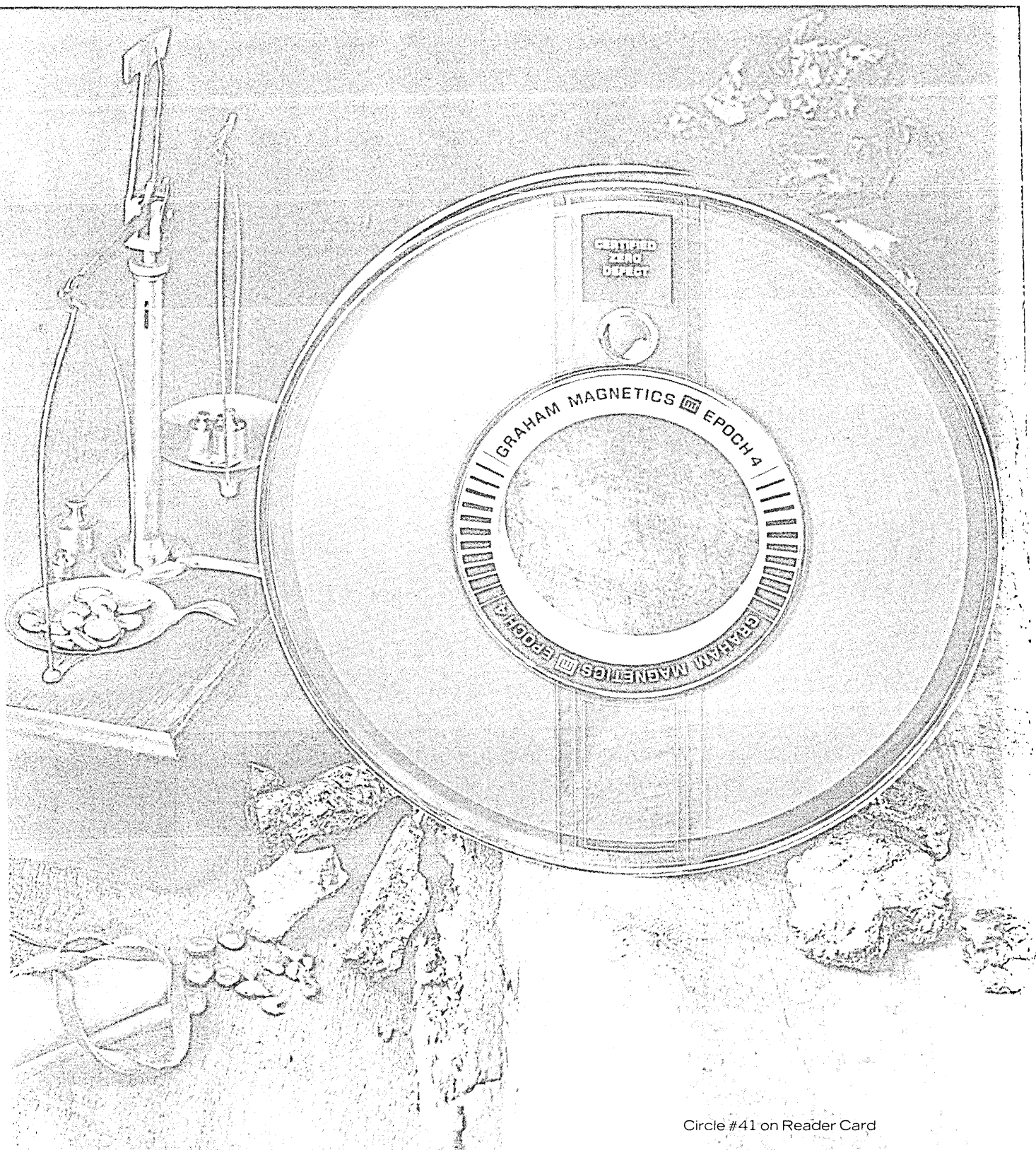
Because it's 8000% tougher than any other tape, and 100% certified, you know your data will be there when you need it.

And, when you consider the 20-year warranty, Epoch 4 is probably

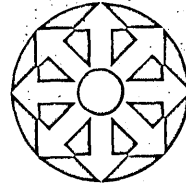
the least expensive computer tape on the market — about 6 cents a month per reel.

Epoch 4. It's as good as investing in gold. Maybe even better.

Epoch 4 A Solid-Gold Investment



DATAMATION 74 N



SEPTEMBER, 1974

volume 20 number 9

This issue 133,257 copies

data base management

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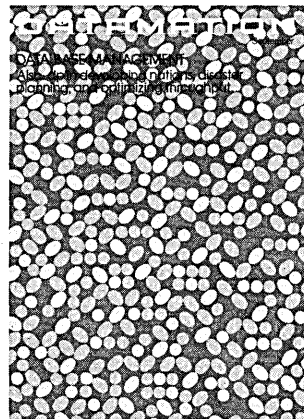
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about the cover

The shifting images, and the apparent flexibility of arrangement, reflect the art of data base management in all its complexity as it assumes a major role in large and small business. Design is by Barbara Benson.

Your computer is only as good as its cassette.



Introducing the Maxell DC-300.

Don't blame your computer for dropouts, read-errors or write-errors. Blame the cassette.

Or, better still, replace it with a Maxell DC-300.

We subjected the DC-300 to a comprehensive inspection on the working tracks on all reels, one-by-one, according to standard specifications.

The results: The DC-300 proved to be completely free of read-errors and write-errors over an extended testing period.

Maxell also developed a special binder for the DC-300 that has resulted in a radical decrease in drop-outs. And by finishing the binder to a mirror-like surface the tape is now in closer contact with the head.

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In other words, the new Maxell DC-300 is the finest data cassette on the market today...and tomorrow.

And if you don't believe us, ask your computer.
Or write us for technical data.

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CIRCLE 104 ON READER CARD

DATAMATION.

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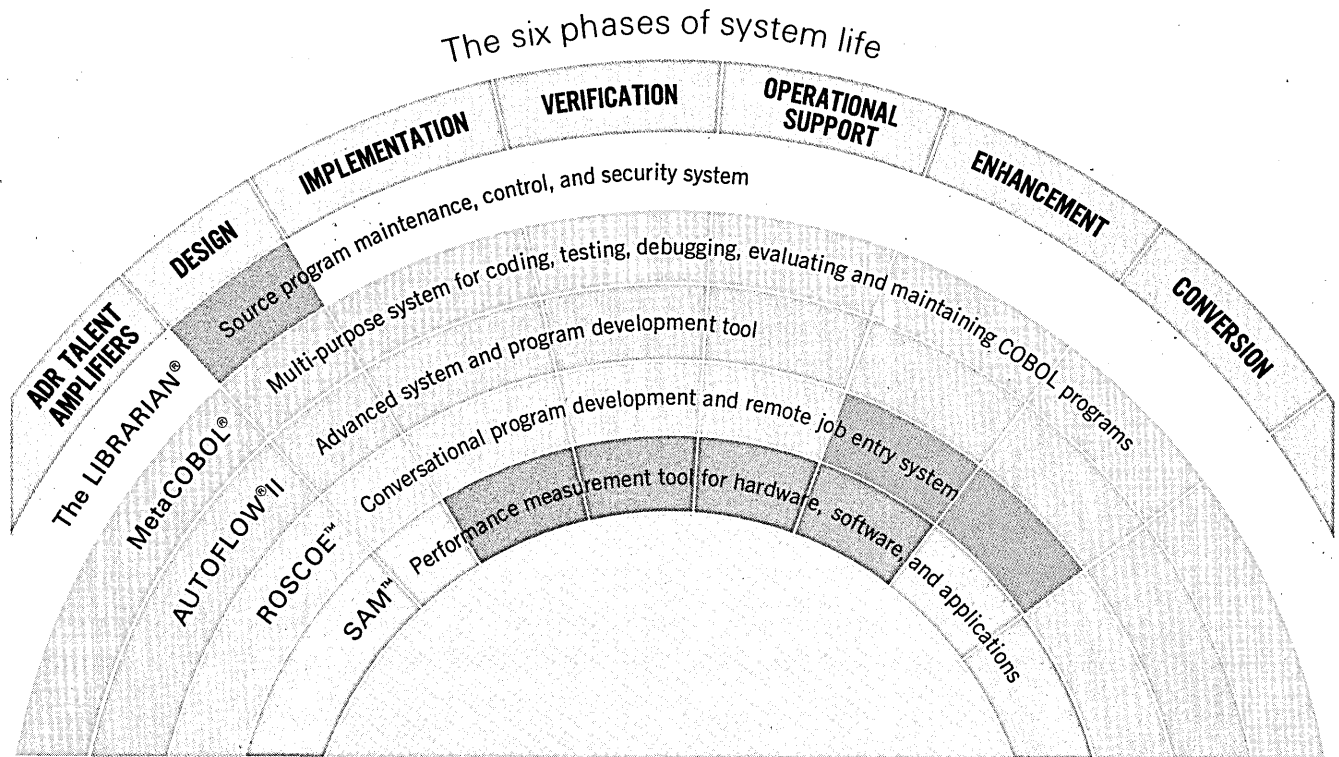


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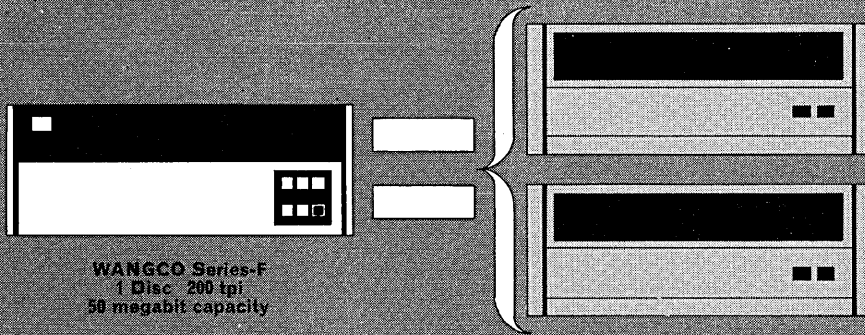


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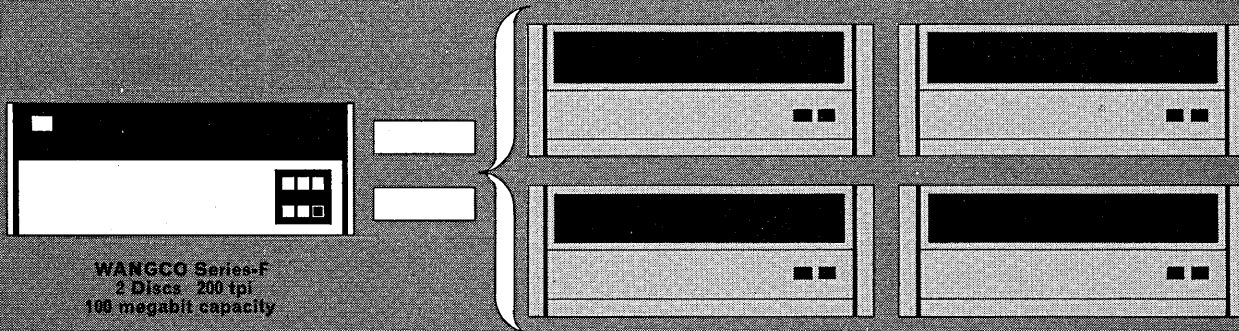
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1 Disc 200 tpi
50 megabit capacity

Diablo Model 31
1 Disc 100 tpi
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WANGCO Series-F
2 Discs 200 tpi
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WANGCO'S NEW MATH

EQUATIONS FOR SUPER SAVINGS!

If you have one or two Diablo Model 31 disc drives in your system, and if your data storage requirements have outgrown them, try this easy answer to your problem: One WANGCO Series-F Disc Drive will give you two or four times the capacity of the Diablo Model 31, in the same space.

One WANGCO Series-F drive, with 200 tracks per inch and the WANGCO I/O integrator, looks to your computer like 2 or 4 Model 31's, without the tangle of daisy chain cables. Whether you're building a new system or expanding an existing one, the Series-F can save you up to 65% of your disc storage cost. The interface is identical to that of the Diabo Model 31, so your system is unchanged except for disc capacity.

The WANGCO Series-F, with either 50 or 100 megabit capacity, fits into the same space as one 24 megabit Model 31. No new

cabinets are needed for system expansion, and to save you even more space, WANGCO disc drives have power supplies built right in.

The Series-F uses WANGCO's new voice-coil actuator and optical head positioning system, assuring you efficient, trouble-free performance.

Remember, when you expand your disc storage, or select a disc drive for your new system... WANGCO's new math adds up!

Write for detailed literature. WANGCO Incorporated, 5404 Jandy Place, Los Angeles, Calif. 90066. (213) 390-8081.

WANGCO INCORPORATED —
SETTING THE PACE IN PERIPHERALS



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There is no stronger shield than "Crashguard."

"Crashguard" is a tough oxide protection against headcrash damage. You get it from the people who developed the first computer tape in 1953. People who will go to any length to solve a customer's problem. People who thrive on assisting. The Data Recording Products Division of 3M. A proud clan.



Call out the clan.

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calendar

SEPTEMBER

25th SICOB, Sept. 19-27, Paris. Sponsored by SICOB (International Salon of Data Processing, Communications, and Office Administration), this international show will feature: an exhibition of business machines and equipment; demonstrations of advanced techniques; roundtable meetings; and seminars. Fee: 5.00 FFr.; free for foreign visitors. Contact: SICOB, 6, place de Valois, 75001 Paris, France.

OCTOBER

Eighth Annual Instrumentation and Computer Fair, Oct. 8-9, Washington, D.C. On the theme "Instrumentation and Computer Applications," the program will include papers, seminars, and workshops, as well as exhibits from more than 300 manufacturers. The target audience is program managers, systems engineers, and technicians involved in the collection and analysis of data by computer, the instrumentation of test and evaluation projects, and data processing for research and development projects. No fee. Contact: Robert Harar, Instrumentation and Computer Fair, 5012 Herzel Pl., Beltsville, Md. 20705, (301) 937-7177.

37th Annual Meeting of the American Society for Information Science (ASIS), Oct. 13-17, Atlanta. This year's conference will explore in depth the concept and services of information utilities, emphasizing the development and use of on-demand information systems. Sessions will be on such topics as: information services to the public, information services to the professions, issues concerning the developers and regulators of information utilities, and the importance and effect of information utilities from a long-range viewpoint. An exhibit with 65 participants is planned in conjunction with the conference. Fees: \$50, members; \$65, nonmembers; \$5 less for advance registration. Contact: Robert McAfee, Jr., ASIS, 1155 16th St., N.W., Washington, D.C. 20036, (202) 659-3644.

International Conference on Microprocessors, Oct. 14-17, Lausanne, Switzerland. Sponsored by the Swiss Federal Institute of Technology, this program will discuss structures and applications of the "microprocessor-on-a-chip." A first day of tutorials will be followed by 30 papers on: microprocessor description and implementation, applications in information processing, and applications in industrial control and instrumentation. Fee: 150 Swiss Francs. Contact: Secrétariat des Journées d'Electronique, chemin de Bellerive 16, CH-1007, Lausanne, Switzerland.

19th Annual Conference of the American Records Management Assn. (ARMA), Oct. 20-23, Seattle. The program will include: general seminars, tutorial sessions, panel discussions, mini-tours, users' forums, industry forums, all-conference sessions, special topics sessions, and an exhibition. Registration has been divided into two tracks so that participants can attend sessions at the right skill level. Fee: \$110, members; \$135 nonmembers. Contact: ARMA, P.O. Box 281, Bradford, R.I. 02808.

ADAPSO 41st Management Conference and 14th Annual Meeting, Oct. 23-25, New York. The Assn. of Data Processing Organizations (ADAPSO) is the sponsor of this program on the theme "Management, Marketing, Manpower—The

Tools for the Continuing Growth of the Computer Services Industry." More than 200 industry executives will evaluate new management techniques and the changing marketplace and discuss issues confronting the industry. Fee: \$110, members; \$175, nonmembers. Contact: ADAPSO, 210 Summit Ave., Montvale, N.J. 07645, (201) 391-0870.

16th Annual Retail Electronic Data Processing and Telecommunications Conference, Oct. 27-31, Quebec. This year's edp conference of the National Retail Merchants Assn. (NRMA) will feature about 75 sessions covering current and future edp installations and point-of-sale (POS) applications, with discussion of: "After POS, what next?" Approximately 1,000 retailers, consultants, and equipment manufacturers from all over the world are expected to attend what is billed as "the largest retail computer conference in the world." Contact: Irving I. Solomon, Information Systems Div., NRMA, 100 W. 31 St., New York, N.Y. 10001, (212) 244-8780.

NEREM '74, Oct. 29-31, Boston. NEREM, the annual IEEE Northeast Electronic Research and Engineering Meeting, will feature exhibits of electronic products and equipment from more than 100 companies. This year's program will stress broad coverage of disciplines and technologies, with emphasis on topics relevant to working engineers. This is the last of 28 consecutive conferences under the direction of the Boston section of IEEE; from 1976 on, NEREM will be joined by IEEE Intercon, and alternate between New York and Boston on a yearly basis. Contact: NEREM Business Office, 31 Channing St., Newton, Mass. 02158, (617) 527-5151.

NOVEMBER

Exhibition of Minicomputers and Peripherals, Nov. 25-28, Paris, and Dec. 3-6, Frankfurt. The United States is the principal supplier of computers and related equipment to France and Germany, countries which are ranked fourth and third in the world, respectively, in use of such equipment. These exhibitions, sponsored by the U.S. Dept. of Commerce, are arranged so that the vendors can accomplish maximum market penetration with a minimum of time, effort, and expense. Contact: James Moorhouse, Director, U.S. Trade Center, 123 avenue Charles de Gaulle, 92200 Neuilly, Paris, France; and Gustaf Coonts, Director, U.S. Trade Center, 2-4 Bockenheimer Landstrasse, 6000 Frankfurt/Main, W. Germany.

CALL FOR PAPERS

1975 National Computer Conference, May 19-23, Anaheim, Calif. The American Federation of Information Processing Societies (AFIPS) has issued a call for papers and for proposals to organize sessions for next year's NCC. Topics will center in three major areas: applications and methods, science and technology, and interaction with and impact on society. Papers should be new and not previously published, with total length not exceeding 5,000 words (abstracts no longer than 150 words). Session proposals should be in the form of 250-word abstracts, with lists of prospective panelists, their titles, and affiliations. Please submit abstracts and proposals for sessions in triplicate *immediately*; final deadline for finished papers is Nov. 12. Contact: Donal Meier, 2756 Mountain View Dr., Escondido, Calif. 92027, (714) 747-7239.

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

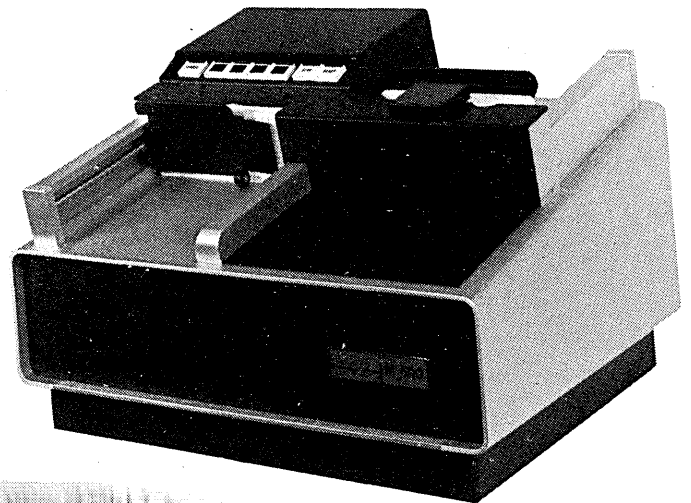
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Go ahead. Blow through a card deck. See how air pressure causes the cards to riffle and gently separate. No friction. This basic air flow principle is behind all high speed Documation card readers.

Conventional card readers use wheels or other friction devices to push or drag cards through the throat of a reader. Friction causes card wear. Stress during the critical start up can crumple cards. Jams occur.

A jet of air generates initial thrust on Documation card readers in the 285 to 1200 cpm range. No friction means no wear. Then to virtually eliminate the source of jams, a vacuum pick places only one card at a time on the track.

Today Documation provides card handling equipment for more than 100 computer system manufacturers. Ask your computer representative for more details about how Documation helps make a more reliable computer system. If he can't tell you, then maybe you should be talking with another computer company.



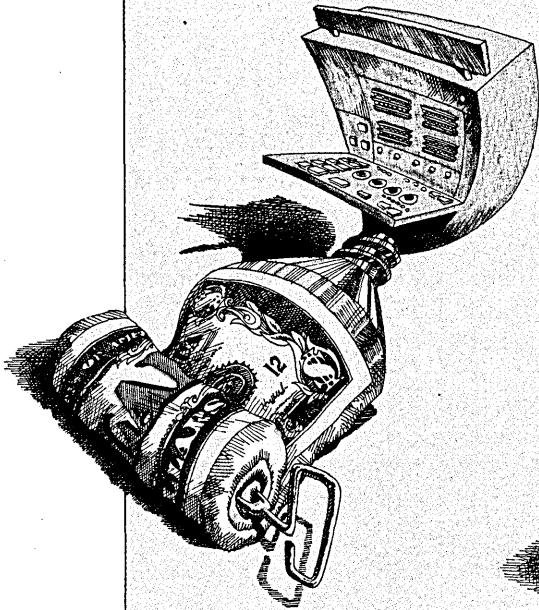
This is the basic configuration for high speed Documation card readers. Look for it in your system.



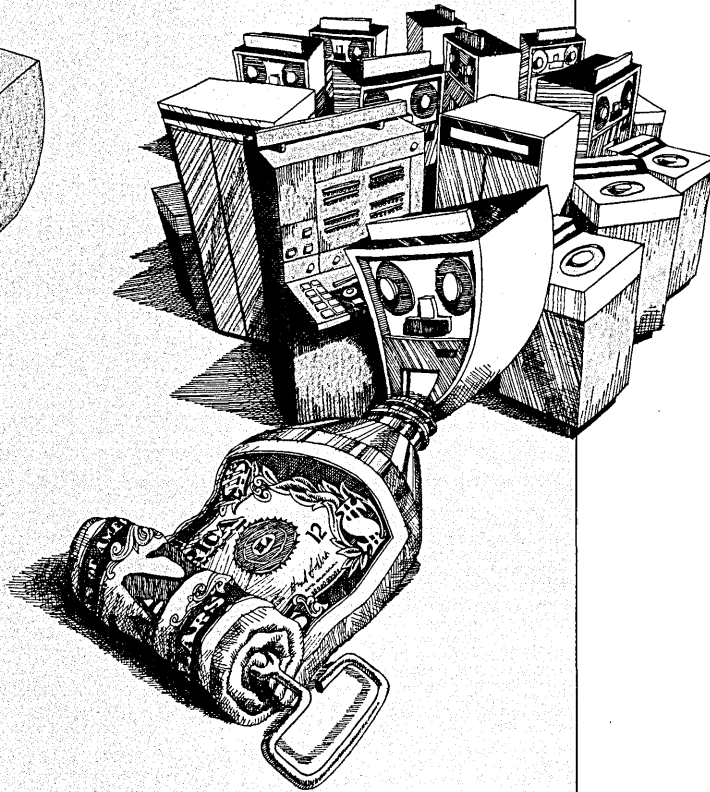
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people

HOLDING DOWN GROWTH

As might be expected of a former West Pointer, Timothy C. Cronin's conversation is sprinkled with military anecdotes. One of the favorites of the chairman of Inforex is about the platoon leader who tells his troops to "follow me" up the hill. Halfway up, the platoon leader turns and finds he is alone.

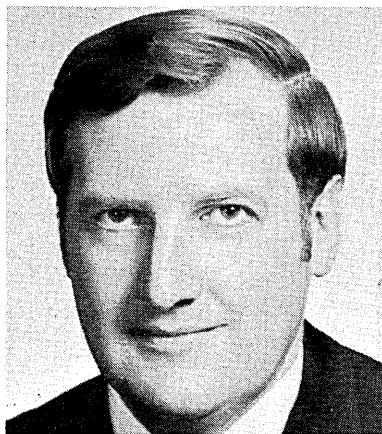
Cronin uses that anecdote to illustrate his recent decision to raise prices on his firm's key-to-disc data entry equipment. Although he started up the price increase hill alone, Cronin figures the other data entry firms will end up following him.

It was a bold step—the decision to raise prices—and the way Cronin did it says a great deal about his management style. "I went to my regional managers and said I wanted a big price increase," recalls Cronin. "I said we can work it out together or I can go into the closet with the treasurer for a couple of days and we'll work it out."

Regional sales managers, of course, tend to look upon equipment price increases in much the same manner as the bubonic plague was viewed during

the Middle Ages. They got involved in the pricing exercise, however, and hammered out a plan whereby Cronin got a 9% increase.

Cronin says that the measure produced some immediate results and that additional dividends should occur in the future. Initially, many Inforex customers converted their equipment on lease to outright sales to avoid paying the increase—a move the capital-hungry firm encouraged. The price increase also has the obvious advantage of increasing the amount of funds that will flow to Inforex from its equipment. In addition, there is an inverted advantage: Cronin is attempting to slow down the rapid growth of the data entry firm, and while he doesn't say so



TIMOTHY C. CRONIN
A professional manager

himself, it's obvious that a price increase will impact sales somewhat.

More than anything, though, the pricing incident shows how Cronin has operated since he took the helm of Inforex early this year. The firm was

hemorrhaging badly, losing more than \$1 million in the last quarter of 1973 alone. While many felt Inforex needed a strong man on horseback to perform radical surgery—and there are still those who continue to subscribe to this theory—Cronin is gaining rapid acceptance for his quiet but effective way of getting things done. Moreover, the 6 ft. 4 in. Cronin is the first to admit there have been problems at Inforex and in the entire data entry industry.

Because of the difficulties of raising capital, Cronin is attempting to hold down the growth of Inforex to 30% a year ("That's not easy either. Our order pace continues strong in the face of a weak economy.") He has placed a lid on hiring and is emphasizing sales over leases. In the product area, Cronin says a most important effort is being made to expand Inforex's existing line of data entry equipment. He indicates that Inforex will have new products in the high end of the data entry line.

Indeed, for a non-technical type, Cronin pays a great deal of attention to new products and research and development—an interest he developed during his 10 years at Honeywell, where he once was involved in the management of funding of advanced development and engineering. "I can still walk into an engineering shop and I can tell right off whether it's a good one or not," he says. "It's like a mechanic listening to an engine."

Essentially, Cronin is a professional manager, although his computer background is extensive from his Honeywell days. At West Point he took many engineering courses, but in graduate school, he took business courses.

JAY REESE AND HIS MAGIC WAND

"My primary aim is to get mass acceptance of OCR (Optical Character Recognition). Once that is accomplished, and with the systems we have in production and in prototype phase, Recognition Equipment will be rolling."

It sounds like a tall order . . . "mass acceptance of OCR" . . . but Jay Rodney Reese has given and taken some tall orders in his time. The former vice president of Texas Instruments received the lion's share of credit for putting TI near the top in the electronic calculator business in just over a year; no mean feat, considering the fact that TI sales had never before been consumer-oriented.

Reese elected to leave TI at the peak of his success. When questioned, he responds that TI is a "fantastic company, but it had gotten to be a bigger

company than I enjoyed being with."

"I came to REI because there was a challenge here to take a small company and make it profitable. The REI board has given me the freedom to run my own company. I'd lost that freedom at Texas Instruments."

In ten months at REI, Reese has indeed "run his own company." Long term debt, which was pegged at about \$20 million when he arrived, has been trimmed to \$9 million. The work force at REI numbered 1,810 when Reese took the helm. It currently is down to a more manageable 1,570.

TI management/planning training has been imported and some department heads who never knew the meaning of "plan ahead" now attend monthly review meetings of three days' duration. REI's European sales and service

organization plans are reviewed quarterly, and that operation is now headed by Robert Pierson who, along with



JAY RODNEY REESE
He gives and takes tall orders

people

REI's controller and several other key people, is also a former TIER.

Reese says he certainly is not "raiding" TI for people, but he apparently has a crack in the door for those who fit his plans of making REI profitable.

"Engineering multiplier" is a favorite phrase with Reese. Heretofore, REI was pretty much a one-of-a-kind shop. With their acknowledged expertise in OCR, they produced systems for banks, the postal service, major oil companies, and even foreign governments. However, all these systems were oriented to one specific task and were quite costly . . . especially when you consider the one-of-a-kind aspect.

With the OCR wand which Reese has in prototype phase, he hopes to apply his "engineering multiplier" to a production unit which will sell for under \$1,000, versus the \$500,000 or so cost of earlier REI bank and postal systems. NCR and Singer must think he can do it. They have contracted for \$15 to \$29 million of the point-of-sale wands during their first two years of production.

Reese, 48, spent 19 years with Texas Instruments. He came up through the ranks from field sales to managerial and divisional vice president slots in the semiconductor-components area. From 1962-64 he was vice president of TI's International Div. and spent another two years as corporate marketing vp.

Reese received his B.S. in electrical engineering from Princeton in 1950, after a tour in the U.S. Army Signal Corps. He worked for the Philadelphia Electric Co., Philco, and National Union Radio before joining TI.

By revamping REI's banking system to a modular format which permits tailoring to a bank's need, rather than offering one giant system that fits only an individual bank, Reese has made impressive inroads on some of his competitor systems.

These modular TRACE systems, now in use and on order from many of the largest banks in the nation, form the initial basis for his profitability push . . . with the OCR wand assuming about a

30% share of his sales "in the last two or three years."

When Reese joined REI, their business was 70% lease and 30% outright sales. He would like nothing better

than to turn that percentage around. Application of an "engineering multiplier" to his "magic wand" should do much to help him accomplish that feat.

"THE WAY THINGS HAVE TO BE DONE"

Nell Cox is a strong believer in the need for electronics funds transfer and automated clearing houses. "I'm positive this is the way things have to be done." But she sees EFT on a nationwide basis as being five years away.

Mrs. Cox, a vice president and data processing manager of City National Bank in Beverly Hills, Calif., is the bank's newest director and the first



NELL COX
An EFT believer

woman to be elected to the board of the 20-year-old institution. She was active in California's pioneering SCOPE (Special Committee on Paperless Entries) effort which put the first Automated Clearing House (ACH) into operation in October 1972 and is proud of the fact that her bank was the first to use this for debit transfers, handling bills for a mortgage company.

She admits that EFT isn't moving ahead "the way the poor plotters had hoped" but feels that "once the big insurance companies get into the swing it will pick up momentum." City National currently is working on a program with Occidental Life Insurance Co.

Mrs. Cox believes banks are more

dependent on computers than any other kind of business and, as a consequence, "banks had better computer installations earlier than others." She feels that banking as an industry is in a period of rapid change. "New things are being done. Newer things are going to be done. Interest on checking accounts is going to happen. Flexible interest rates on mortgages is going to happen and the computer is what will make it all possible."

Although she talks today with knowledge and enthusiasm about both data processing and banking, Mrs. Cox didn't exactly plan her career. When attending UCLA in 1940 and '41, "I changed my major every semester." After college she devoted her time to her home and her three children. Following her husband's death in the mid '60s, needing employment, she considered three fields: real estate, stock brokerage, and programming. Her children were still young. Real estate was discarded because it would mean working weekends. Stock brokerage, she surmised, would mean getting to work early in the morning. She laughs when she says she chose programming because she wanted a normal day. Her husband had been in computer engineering and she had had some programming instruction, "mostly playing around." She took other courses but claims "I learned most from doing it." Her first programming job was with a mortgage company. She joined City National as a programmer in 1966.

A native of Baltimore, Mrs. Cox moved to California at the age of three months and considers herself "practically a native." Away from her computers (a 360/30 and a 370/145) and the bank, she likes to sail and water-ski on the Salton Sea. "The water's dirty but it's a great place for skiing."

WALLACE CARRIE, JR. has been elected a vice president of the Computer Leasing Div. of James Talcott, Inc. . . . EDWARD J. PALMER, assistant director of administrative data processing, Boston Univ., is the new international president of the Data Processing Management Assn. . . . FLOYD O. HARRIS, JR., is general chairman and chairman of the program advisory committee for DPMA's INFO/EXPO '75 to be held in Atlanta, Ga., next June . . . EDWARD T. KEATING moved up from vice president

and general manager of Stromberg Datagraphix, Inc., a San Diego based subsidiary of General Dynamics, to become president of the subsidiary . . . WILFRED J. CORRIGAN is the new president of Fairchild Camera & Instrument Corp. C. LESTER HOGAN moved from that position to become vice chairman of the board . . . Control Data Corp. promoted C. A. ZERA to vice president, CYBERNET Service. He had been general manager for Latin American operations. □

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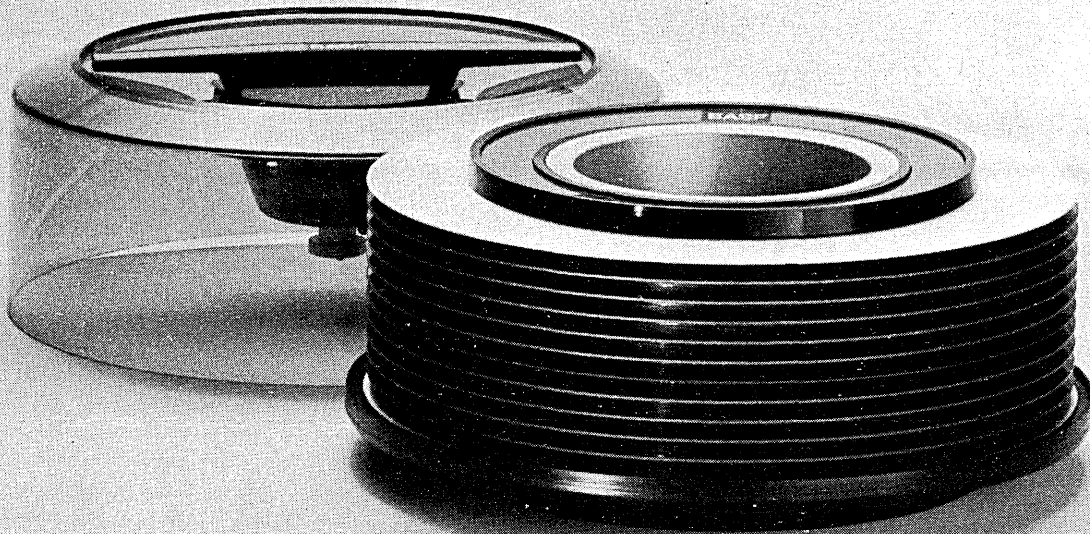
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Our own coating process

As the trend toward higher packing densities continues, it becomes increasingly important to monitor the thickness of coating deposited on the disk. The problem is compounded by the necessity of progressively varying the coating thickness from the outside

toward the inside of the disk, because packing density is greater as the circumference decreases. For those reasons, we've discarded conventional coating methods in favor of an exclusive process using our own BASF-designed equipment.

A polished performance

Following the coating operation, we use our own exclusive polishing process to achieve optimum surface regularity. We've been able to achieve a surface so flat that the possibility of a head crash being caused by uneven disks is completely eliminated. We might mention here that the coating and binder formulation, combined with coating and polishing techniques, all are important factors in achieving surface hardness, which is the ability of the coated surface to survive excessive or extended head loading.

Achieving balance

Like any rapidly rotating object, a disk pack will behave strangely if not perfectly balanced. In our precision balancing operation, any weighting required is screwed into

place, which eliminates the potential of shifting inherent in a conventional adhesive weighting system.

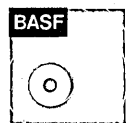
And to make sure...

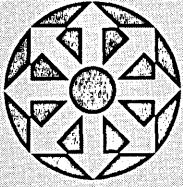
We test our 1236 disk packs to standards much tighter than those of the leading equipment supplier. If anything unpleasant should happen, we'd much prefer it happen here than on your drive. As a regular procedure, we do scratch tests to check coating thickness, impact tests to determine head crash resistance, detergent tests to check resistance to wear and temperature variations, and drop tests to make sure balance and alignment don't shift during shipment. We test to make sure our 1236 disk packs are error free.

Finally

Our 1236 costs no more than other twelve-high disk packs. You're already paying for BASF quality... you might as well have it. For more information on the 1236 or other BASF disk packs or cartridges, write to BASF Systems, Crosby Drive, Bedford, Massachusetts 01730.

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





LOOK AHEAD

HARRIS MIGHT INTEGRATE COMPUTER OPERATIONS

Computer industry venture capitalists and entrepreneurs have gone the way of the dodo bird, but--surprisingly--there are still some computer industry start-ups. The newest will be called Harris Computer Systems. It will be a division of the Harris Corp., formerly known as Harris Intertype. Its central unit will be the recently acquired Datacraft Corp. And that name will soon become extinct, although Datacraft's president, Harold N. Morris, will be the president of Harris Computer Systems, and headquarters will be in Ft. Lauderdale, Fla.

One hint of things to come can be picked up from the operation's SLASH 4 virtual memory system. The 24-bit big memory machine (up to 768K bytes) looks suspiciously like it could have some commercial data processing applications. Furthermore, it's known that the firm has been beefing up its sales and field service staffs--often a hint of a coming assault on the commercial market.

The machine undoubtedly will sell in Harris-Datacraft's traditional scientific and research marketplace--the first machine is being used for number crunching at a missile tracking station in Hawaii--but its multitasking capabilities surely could make it attractive to commercial users too. Harris Computer Systems also will consist of Datacraft's core memory operation. Also intriguing are Harris Corp. units that aren't in the new operation. Other Florida operations include a semiconductor facility and a crt editing terminal manufacturing plant. Harris is also big in data communications with its Harris Communications Systems in Dallas. Put them all together and you have a big, broad computer and data communications company.

NCR-CDC: A COMMON LINE BEFORE 1980

Control Data and NCR expect to have a "common line" of computers before the end of the decade, but a CDC spokesman denies talk about a possible eventual merger of the two firms. Questioned at a recent meeting of security analysts in Minneapolis, CDC's senior vp and chairman of the company's management committee, John W. Lacey, did admit that there has been discussion with the Justice Dept. over whether a future common product line will lead to price cutting as the two companies compete in the same market with identical products. He says, though, that price cutting is "not the name of the game."

Lacey says the cooperative development effort begun in August of '73 between the two companies with the CDC-NCR Advanced Systems Laboratory will save CDC approximately \$1 million in 1974, and over a period of 10-15 years could save the firm more than \$100 million.

CDC, meanwhile, has told its Cybernet data service network customers that it's increasing its fees for the first time in the operation's history. A CDC spokesman says one of the major reasons for the increase is the rapidly escalating price of paper. "Cybernet profits are being eroded by high paper costs," he says. Then, confirming something everyone knew all along, he adds, "A lot of paper gets consumed in this business."

INFOREX PONDERES FOCUS FOR NEW PRODUCTS

A product encore is particularly important to Inforex, because its last product encore turned out to be a product discord--the company couldn't get its KeyScan optical character reader into production. Thus the peripheral firm has been extra cautious with its system 5000.

LOOK AHEAD

The low-priced computerized filing system is not only already in production, but sources talk of several installations of the system to date. The problem now for Inforex is one of focus, or the challenge of learning where to market it. Inforex hired a consultant, paid him \$30,000 to look at possible markets for the system, and he found more markets than the company could reach. Another consultant stopped counting applications when he got to 125,000.

It's much the same with customers. One obtained a system 5000 to maintain engineering records and listings and a short time later added its parking lot record-keeping to the system. Another user acquired a system for accounts payable applications and soon thereafter added a spare parts inventory program. To outsiders, Inforex appears to be struggling with marketing direction, while insiders say the firm doesn't know whether it has a nice little product line extension or a possible explosive new concept.

GRAND JURY LOOKS INTO IBM SPY CLAIMS

An international spy ring that is suspected of peddling IBM trade secrets is being investigated by Massachusetts law enforcement authorities. Details are still sketchy but the story essentially goes like this: IBM suspected that someone--perhaps one of its employees--was lifting various secrets from the company. The secrets, reportedly product information and customer site information, were then peddled by a businessman who shuttled between Marlboro, Mass., Switzerland, and New York City. An intermediary was said to have been based in Jaffrey, N.H.

IBM busted the case wide open when it hired a private detective who arranged a meeting with a member of the ring. The private detective bought the information and, after IBM did an analysis of it, it apparently developed enough information to bring a complaint to the Massachusetts Attorney General's office. At this writing, the case was before a Massachusetts Grand Jury.

NIXDORF SEEKS COMPATIBILITY

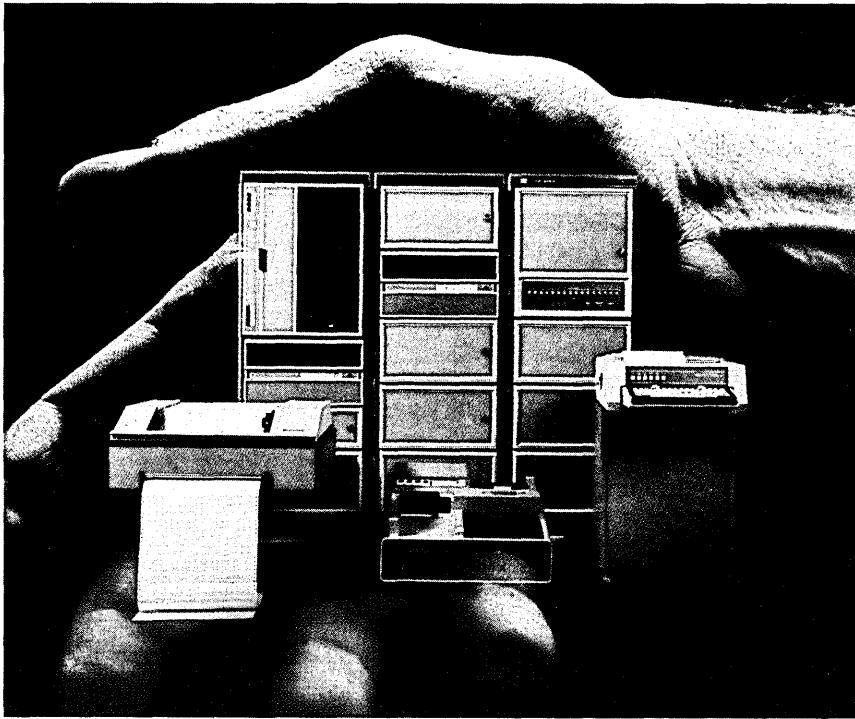
A small unit of Nixdorf Computer AG, which had quietly been developing a low-end 370-like computer in Costa Mesa, Calif. since late last year (see Aug., p. 116), was directed by the parent firm to "shelve" that project in favor of developing interfaces to enable IBM and compatible peripherals to be used on Nixdorf computers. C. Allen Burns, architect of the Gemini computer, who had headed up the California operation, has been transferred to Germany.

UNIDATA: A DISPLAY OF SOLIDARITY

Industry opinions vary widely throughout the European computer community as to whether Europe's Unidata will survive and flourish. But the 14-month-old combine of Siemens (Germany), CII (France), and Philips (the Netherlands), in a show of progress and solidarity, is announcing, but not displaying, three additions to its 7000 series at the SICOB computer exhibit in Paris this month.

The new releases are the 7.730, 7.740, and 7.750 machines, comparable to IBM's 370/125, 135, and 145. Larger machines in the series are planned but there's no announcement date. Unidata will display the 7.720, made by Philips in Apeldoorn and announced earlier this year. Siemens will make the 7.730 and 7.750, and the 7.740 will be made by CII.

(Continued on page 145)



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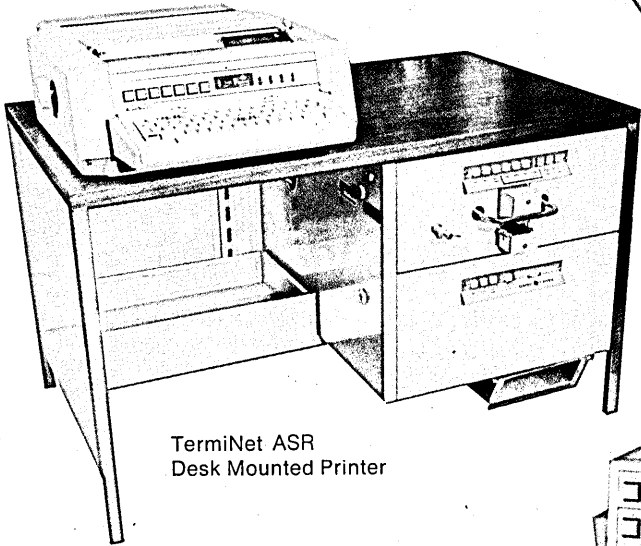
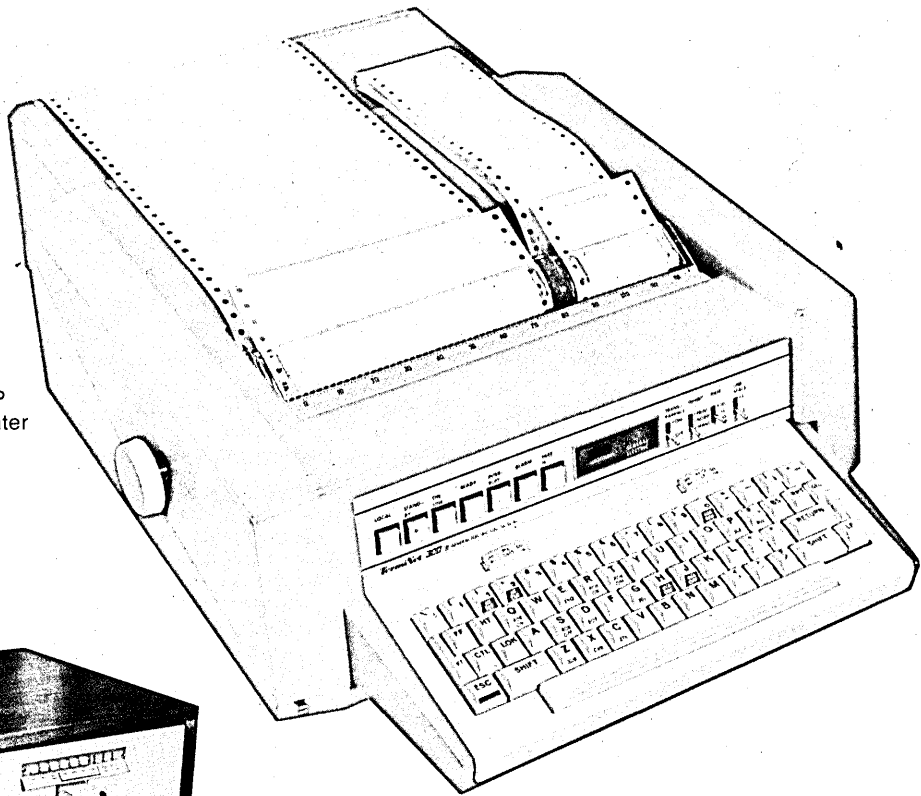
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September, 1974

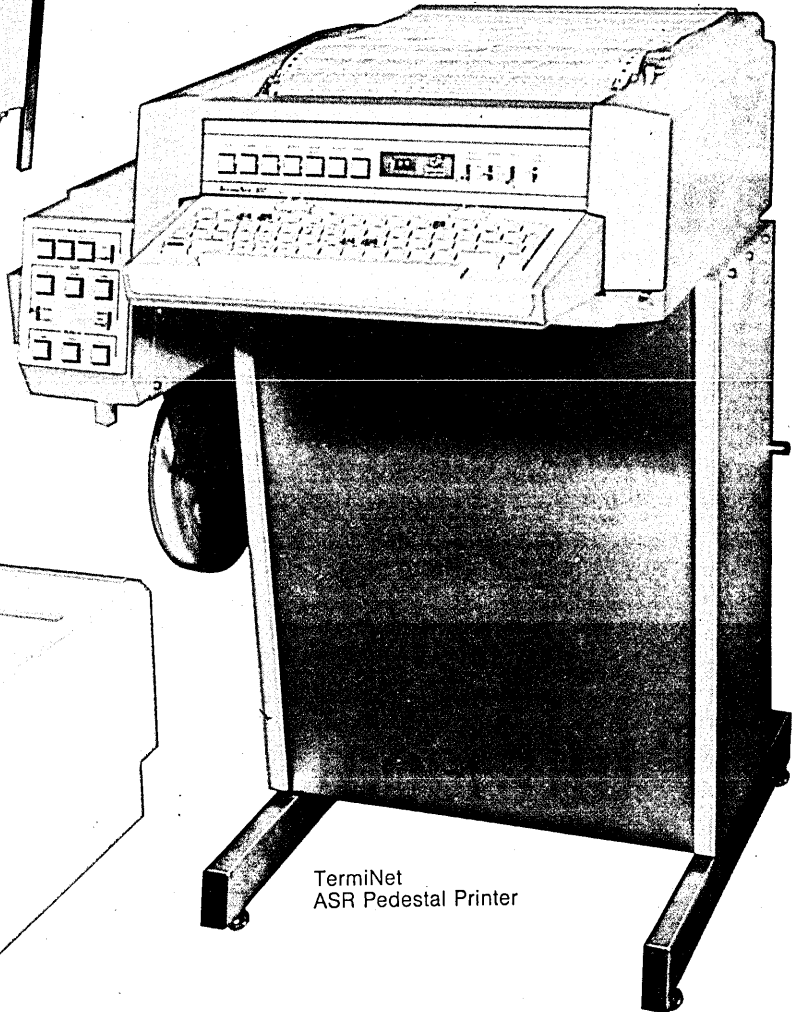
CIRCLE 18 ON READER CARD

19

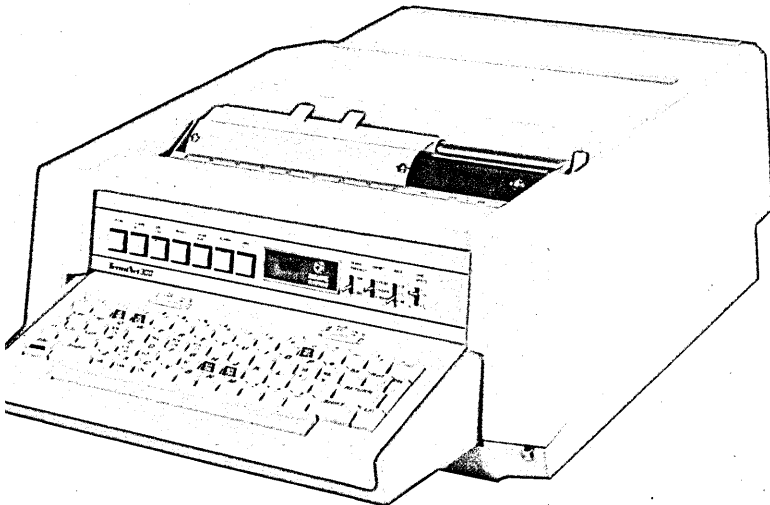
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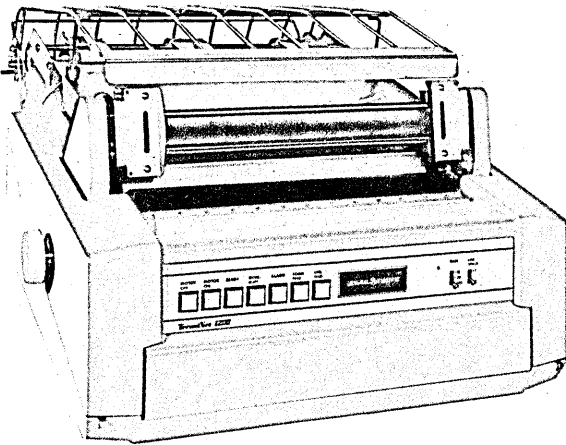


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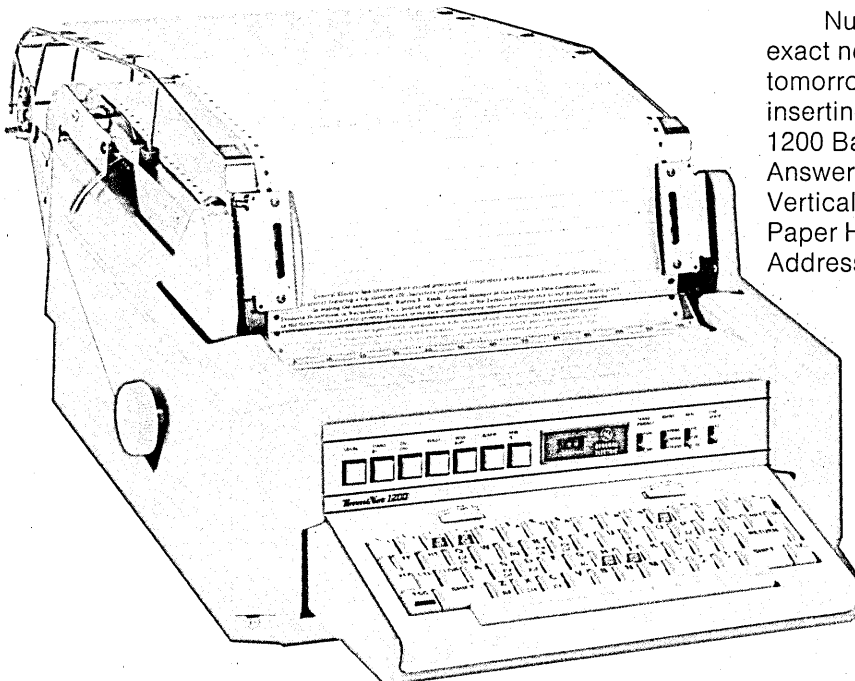
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letters

Rookie scabs?

As one who has experienced a strike involving a data processing installation from both sides (at different times, naturally), I find your correspondent's report on the strike at Stanford (July, p. 124) somewhat deficient in its descriptions of the non-managerial programming personnel who were "forced" to take over operations.

He terms them "temporary help," "rookie pinch-hitters," and a "temporary workforce." I term them "scabs" and "strikebreakers."

I also feel the article itself is extremely biased in its coverage and approach. Or doesn't it matter, in the big picture, how the computer and key-punch operators fared during the strike, not to mention what it was they were striking for, and whether or not they got it.

J.-J. SEITZ
Conseiller en Informatique
Centre Hospitalier Univ.
Univ. of Sherbrooke
Sherbrooke, Quebec, Canada

Mr. Yasaki, the author, replies: We failed to mention that the striking operators and dispatchers were part of a group of 900 or so strikers university-wide, ranging from kitchen helpers to plumbers and carpenters to computer operators. The strike issues were the same across all those jobs, including wages, medical coverages, pension, and university grievance procedures. In wages, they sought parity in each job category with Bay Area scales and settled for an overall average increase near 7%.

Loop person

While most of what Frederick Haney says in the Forum in your June issue (p. 169) is true, the way he says it tends to obscure the really important issue at hand. *The only really flexible, adaptive systems we know how to build have at least one person in the prime control loop.* Anything else is clearly beyond the state of the art. The only persons presently available for use in our systems are human beings, and their input/output channels have peculiar bandwidths and information rates that must be respected by any good systems designer. From this viewpoint, what Mr. Haney has attempted amounts to an indirect, incomplete set of interface specifications.

LEONARD F. ZETTEL, JR.
Buffalo, New York

Jolly blue giant?

I admit to being a newcomer to the field, so perhaps I am ignorant about the details of the inefficiencies of IBM operating systems. But, except for size, how is IBM different from most other mainframe manufacturers (CDC excluded, according to Martin Goetz's Forum in the July issue)? When you lease or buy a Whiz-Bang computer, you're pretty well stuck with a Whiz-

Bang os of one sort or another. I have never heard of Mr. Goetz's company, or anyone else for that matter, attempting to develop an operating system for some of the "lesser lights" among computer system hardware.

Conversely, does Mr. Goetz imply that no one else ever told a user, "We shall no longer maintain this software," or that no other operating system is inefficient, occupies too much
(Continued on page 26)

Structured programming

In the article "Structured Programming in FORTRAN," (July, p. 110), I agree with Ted Tenny's statement (p. 113) that "it's very important to show the structure of the program . . ." but do not like his use of blank comment lines in Fig. 3. The internals of the IF-THEN-ELSE are well separated but the start and end of the IF-THEN-ELSE appear to be run on with the preceding and following blocks. I feel that the separation between blocks is much more important than the separation internal to a block.

I assume the lines
"C CALL INPT2" should be
"CALL INPT1"
"C CALL INPT2" should be
"CALL INPT2"
are typos.

TONY ABERNATHY
Engineer
Cities Service Oil Company
Lake Charles, Louisiana

The necessity for the programmer to manually translate structured programming pseudo code into machine-readable form is a major drawback to management and programmers alike who want to implement structured programming techniques into their dp installations. This manual approach is, I believe, a serious threat to the effectiveness of structured programming itself because it introduces too many opportunities for error and involves complex transliterations which result in the programmer having to maintain code in a language other than the one it was written in. If structured programming is to succeed, the pseudo-code *must* be machine-processable—thus requiring a pre-processor for COBOL, FORTRAN, and PL/1, and a macro facility for Assembly.

MARTIN A. GOETZ
Vice President
Applied Data Research, Inc.
Princeton, New Jersey

In the structured context, for the reasons cited by Mr. Tenny, FORTRAN is properly regarded as an unmaintained "invisible" language level (as was the

"REPEAT s UNTIL c" is an undesirable alternate form of "while c do s" because the loop-exit code is vertically displaced and hard to assimilate:

```
FIRST = .TRUE.  
2205 IF (.NOT. (FIRST .OR. c)) GO TO 2206  
FIRST = .FALSE.  
s  
GO TO 2205  
2206 CONTINUE
```

or, eliminating FIRST:

```
GO TO 2207  
2205 IF (.NOT. c) GO TO 2206  
2207 CONTINUE
```

intermediate AUTOCODER in the 1401 COBOL compilation process), and therefore more attention should be given to reproducing the IPL program's "structure" verbs (BEGIN, END, REPEAT, UNTIL, WHILE, ELSE) in the comments of the generated FORTRAN program. Were I writing an IPL-to-FORTRAN translator, I would put the "structure" verbs right-justified on the comment lines, with some numeric level indicator for nested blocks. I also submit that

which brings the testing of "c" up front. The same single LOGICAL variable FIRST can be used to expand *all* REPEAT statements within a program unit, because its scope is only a single execution of the three statements that reference it (providing that structuredness is preserved in the program).

ROBERT HIGGINS
Computing Center
University of Delaware
Newark, Delaware

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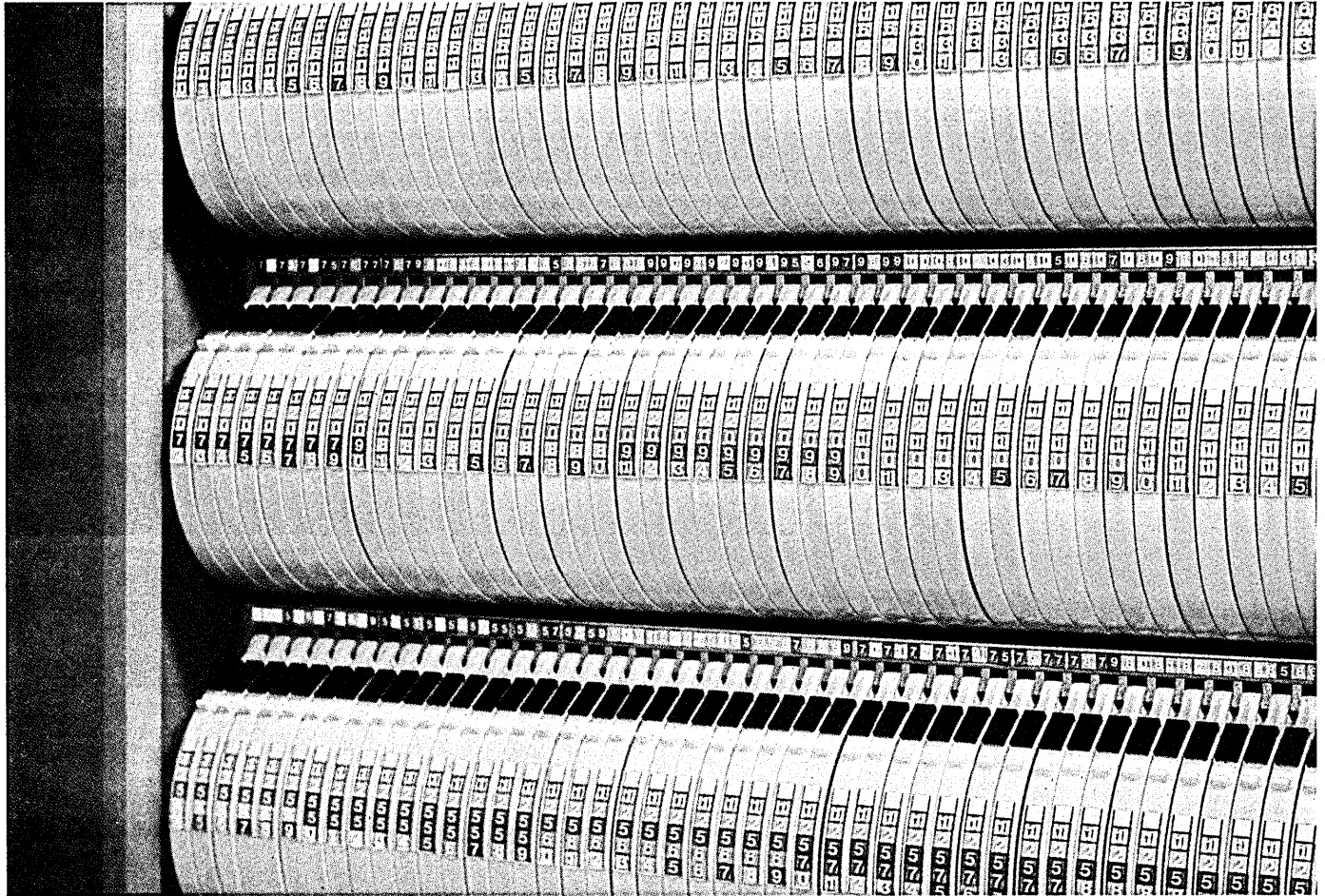
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letters

core, or is incapable of supporting certain peripherals?

I submit that if IBM is the greatest offender against the public good in the computer industry, that it is so because of its size, not because of the intrinsic nature of its actions. I believe that there are more serious breaches of public trust by smaller manufacturers which often go unnoticed simply because they are smaller in scope. IBM's difference from the rest is one of de-

gree, not of kind.

While I was at computer trade school (name withheld), we used an IBM 360/20 and another competitive make. The instructors were in a constant dither over the "screwball operating system and the hardware held together with spit and baling wire" of the other system as often, if not more, than they were over the bugs in the 360/20. At my present employer (name withheld for obvious reasons), I have heard systems programmers wonder which was worse, the hardware or the software, of another (non-IBM) computer system.

IBM may be a giant, but I think an awful lot of people make it out to be an ogre, because it's easier to justify an attack on Godzilla than an attack on the Green Giant, excuse me—I mean the Blue Giant.

MYRON R. FELDMAN
Programmer-Analyst
Pomona, California

Methvin didn't abdicate

Your article regarding Computer Automation's entry into the end user market (July, p. 131) could easily lead readers to believe that our company is abdicating its position as a major supplier of minicomputers to the oem market, and nothing could be further from the truth.

While it is true that we are planning a variety of minicomputer-based systems (in addition to our four-year-old CAPABLE Tester System), we are also continuing to expand our already sizable customer base in the oem market, through increased marketing and product development efforts. To paraphrase an apparent misquote in your article, "We've been an oem house and we will continue to be one; the market is growing and the profit margins are excellent."

D. H. METHVIN
President
Computer Automation, Inc.
Irvine, California

Seattle \$pending

Re the article on John Elliott, the new dp administrator for the city of Seattle (June, p. 13), Seattle taxpayers, beware! The octopus called city government is growing another tentacle to strangle you.

Watch out for those \$statement\$:

"... a dp staff of 'some 50 odd people' was expected to double within a year."

and

"... that work's (referring to service bureau contract) going to be brought into the city organization."

Haven't dp managers learned by now that quantity is inversely proportional to quality? Why the needless duplication of dp systems which will be the inevitable result? Administrator Elliott is well advised to read the editorial "Learning to Share" on page 8 of the June 19, 1974 issue of *Computerworld*, which says in part:

"... most other state and local governments will develop their own systems for these jobs (ADP systems) instead of adapting existing programs to their needs."

What our profession needs most of

(Continued on page 151)

Like a key, Ruscard opens doors. That's where the similarity ends.

Security access control starts in the parking lot.

The RUSCARD "key" activates parking gates, elevators, doors and entrances of all types. It controls who goes where and when from the moment the employee enters the parking lot. Park-O-Matic is another division of Rusco, manufacturing a complete line of automated parking gates, controls and equipment.



Ruscard doubles as a photo ID badge.

The same size and shape as a standard plastic credit card, the cryptically-encoded RUSCARD "key" can be printed and embossed on both sides. It is compatible with Polaroid™ and other ID systems.

It controls access for 1 to 20,000 cardholders, 1 to 100 entrances, 1 to 7 work shifts.

Keys can easily be duplicated by anyone. The RUSCARD "key" defies duplication. A lost key compromises your entire security system. Then you have to change locks and reissue keys. With the RUSCARD "key" you "rule out" the lost card instantly and it will never open anything again. The RUSCARD system can also provide a permanent record of all personnel movement within your facility.



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Ruscard systems provide data collection capabilities.



In addition to recording personnel movement the RUSCARD system provides multi-purpose information for use in attendance recording, time-keeping, automated payroll, job cost accounting and more.

You won't blow a fuse when you hear the price.

Cost is low. Just pennies a day can provide you the most advanced security system on the market. The RUSCARD representative in your area will tailor a program to suit your needs.

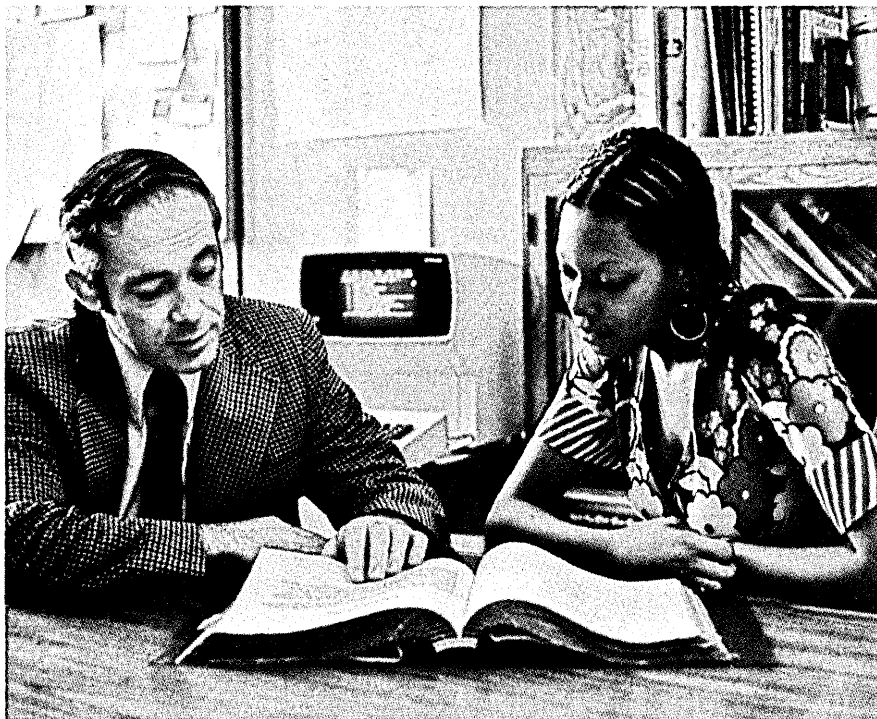
Write Mr. B. Martin, Rusco Electronic Systems, P.O. Box 2848D, Pasadena, Ca. 91105. Or call toll free: (800) 423-4194. In California, call direct or collect: (213) 682-3601. Sales and service throughout the world.



DP DIALOG

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

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



Dan Heintz discusses career objectives with LaVatryce Jones after she has run through a computer-based career program.

The Search for the Right Career

Choosing a career is a difficult decision most students confront sometime during their education. For many the decision is often based on inadequate information on the number and variety of career opportunities and generally insufficient knowledge of the educational training needed for each.

Students at 75 schools across the

country are getting help from an innovative program called the Computerized Vocational Information System (CVIS). It was started in 1967 at Willowbrook High School in Villa Park, Illinois under the direction of Dr. JoAnne Harris. An interactive system, CVIS enables students to compare their own abilities, interest and grades with infor-

mation on some 500 different occupations.

Using the Willowbrook system as base, Proviso Township High Schools, just outside of Chicago, further developed CVIS to make it function as a total data base. On the East campus, 3,800 students are using CVIS. An additional 4,400 students are served on the West campus.

At visual display stations, students answer preprogrammed questions and indicate their interest in various career opportunities. The school's System/370 Model 135 checks constantly to see if they are on the right track.

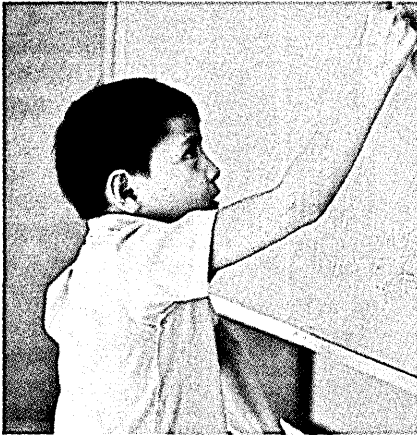
Dan Heintz, Vocational Counselor at Proviso East, says, "The system has already helped our counseling effort immeasurably. Instead of spending time hunting for information, our counselors can now concentrate on counseling. They also have access to up-to-date information on a wide variety of careers."

Besides keeping track of career opportunities, CVIS also provides information on some 1,600 colleges, as well as specialized and technical schools. "By the end of the year," says Howard Schumacher, Director of Management Information Services for Proviso Township High Schools, "the system will also include information on financial aid and local jobs."

"CVIS gives our students a chance to see the number of careers available to them and helps them focus on their own potential and interest," says Dan Heintz. "We hope that information provided by this system, together with our own counseling efforts, will help steer these students in the right direction."

IBM

Reading the Navajo Way



Learning to read can be difficult for any child. But learning in an unfamiliar language is an even greater struggle—one which 53,000 Navajo children must face every day.

These children are part of the largest Indian tribe in the United States—over 130,000 people living on a reservation which spans parts of Arizona, New Mexico and Utah. They attend school mainly staffed with teachers who don't understand Navajo and who are teaching Navajo children who don't understand English.

To help solve this educational dilemma, Dr. Bernard Spolsky, director of the Navajo Reading Study at the University of New Mexico, has undertaken a project which will set out first to train Navajos themselves as teachers. Secondly, it will develop Navajo reading materials with the help of a computer so the children, when they first enter school, can learn in their own language.

"Then," says Dr. Spolsky, "once they have learned to read in their own language, a language they understand, they can begin to learn English in, say, the second or third grade.

"The computer enters the picture with the development of the Navajo reading materials," says Dr. Spolsky who is also a professor of elementary education, linguistics and anthropology. "To develop effective first grade readers, it is not enough to know the child speaks Navajo. You must know in detail how he uses the language—what words he doesn't use, what words he uses and precisely how he uses them.

"To uncover this information we interviewed over 200 Navajo children on the reservation—in their homes and at school. There were no restrictions on subject matter: home life, coyote tales, space ships, whatever came up."

The material was then keypunched for processing on an IBM system at the university. "At this point we had a body of speech of over 11,000 sentences, 53,000 different words and 8,775 different word types. Computer processing made it possible to do our analyses on as large a data base as we could gather in the time available."

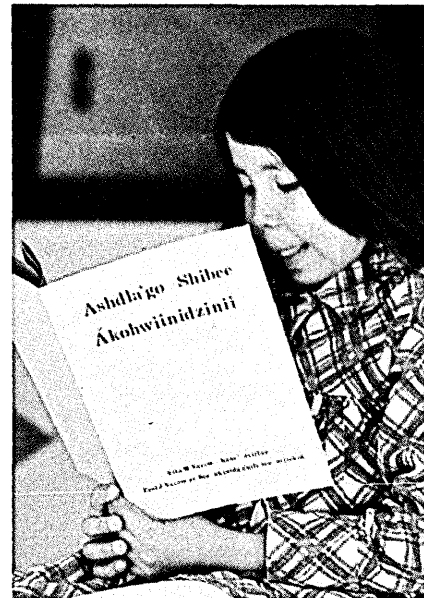
The computer was able to run several analyses on this amount of data. It prepared a concordance, or an alphabetical index of all the words used in the interviews in context of the sentences in which they occurred. Then it ran frequency studies by word and word type, studies of individual letters and letter units and analyses of vowels and consonants. "All of these reports were extremely useful in providing the basis of language intelligence for planning reading materials geared to the language the child is speaking."

The results of the complex computer analyses are 13 new books, mainly for the first grade reading level but some also for the intermediate and advanced levels. Dr. Spolsky recalls a typical story in one of the primers. "It has to do with the children and the

school bus. The children board the bus, a rabbit gets on, a coyote gets on, then a skunk gets on, sits down and emits his characteristic odor. Very quickly the driver stops and everyone gets off. It has an element of humor for the six-year-old, and also a kind of introduction to fantasy, all in terms familiar to the child."

In addition to the reading primers, the Navajo Reading Center has brought out ten publications that are reprints of older selections from Navajo history, long out of print.

"Could we have done without the computer? Concordances done manually are monumental projects. We just couldn't have taken it on. In addition to our bilingual education work, the file in the computer provides the basis



for another thrust—the study of the Navajo language development process.

"In 1940 the Navajos used virtually no English words and only a handful of Spanish words. Of the 53,000 words we have now classified, 500 are loan words from English. So the language situation on the reservation has changed somewhat in the past 30 years.

"Even so, the Navajo language has remained remarkably pure. In 300 years of contact with the Spanish, the Navajos borrowed only 30 to 40 words. There's something about the spirit of the language. They traditionally have not borrowed words, preferring to compound their own to deal with new entities."

In any event Dr. Spolsky feels there is a special satisfaction in helping maintain a vibrant, living language and in combining basic research with actual teaching activities, using the most advanced technology. **IBM**



Computer Aids Children of Migrant Workers



Billy is in the fifth grade classroom for the second day in Thomasville, Georgia. His teacher knows he has a way with numbers, difficulty reading either English or Spanish, and has a 20% hearing loss in his left ear—probably because of a case of measles he had when he was six.

Two years ago, it's likely that the school wouldn't have known a fraction of this, and by the time it pieced together his background and took the first definitive steps in helping him, Billy would have been on his way to a new

town, another school, and possibly the gloomy prospect of facing still another set of academic obstacles.

Today, Billy, the son of migrant farm workers and one of an estimated 900,000 such children in the United States, not only stands a better chance of completing his education, but can learn there are ways of earning a living other than working in the fields.

Because of a computer-based communications network called the Migrant Student Record Transfer System (MSRTS), Billy's education and medi-

cal records can now keep up with him.

The system is the result of a joint project between the federal government and the State of Arkansas, which started in 1968 on an experimental basis. It now enables 8,000 school districts throughout the United States to obtain current scholastic and medical histories of more than 400,000 registered migrant children. These records are stored in an IBM System/370 computer in Little Rock, Arkansas.

Using teleprinters linked to the central computer by telephone lines, authorized school districts can get needed information in a matter of hours. The records of each student are updated by means of the same equipment.

"The problem of educating migrant children is quite complex," says Winford Miller, the system's administrator. "Schools along the country's three main migrant streams often have no way of knowing what subjects have been studied and what grade levels were achieved. Moreover, health records are often incomplete or non-existent.

"With the availability of MSRTS, at least a promising start has been made," says Miller. "It's only a small advance but it has large implications. Certainly it means the nation's migrant children have a better shot at schooling than they had before."

IBM

It's Never too Hot or too Cold at East Fishkill

Well, almost never. For nearly two years, a System/7 has been helping to keep IBM's System Products Division facility at East Fishkill, N.Y. comfortable while conserving fuel and energy.

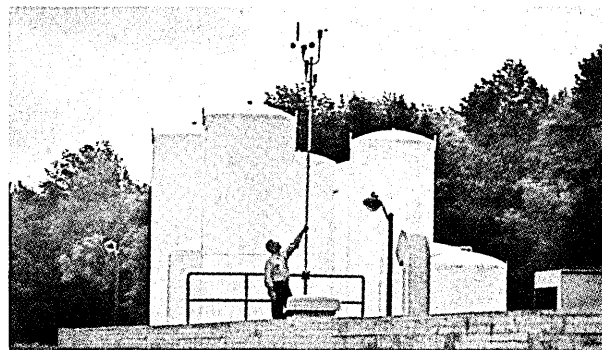
With floor space equal to 1,000 single-family homes, and a population of 7,000 people, the East Fishkill site is much like a small city. Even before stringent energy conservation measures were adopted, the sensor-based system's ability to optimize the efficiency of heating and air conditioning equipment had made possible a 6 percent reduction in fuel oil use and a 10 percent drop in electrical consumption.

Mechanical Facilities Manager Gordon Harrison explains that facilities technicians formerly walked a beat, taking electrical consumption readings at 26 points in the 2.3 million-square foot facility, and relaying the information to a central point, where calculations were performed by hand.

"Not only were we subject to human error," Harrison recalls, "but there was a time lag of up to 15 minutes in

the readings. We never knew on a real-time basis if we were exceeding peak electrical usage targets, which can mean paying a substantial premium. Now, we are literally up to the minute."

In the Computer-Assisted Facility Operation, or CAFO as it's called, sensors continuously monitor 200 temperature, flow, pressure and electrical variables. This data is logged by the System/7 and then analyzed at an IBM 1130 host computer, which compares readings with weather data and historical consumption patterns to predict heating and air conditioning requirements. Technicians are supplied with a continuous flow of data on the loads, capacities and operating efficiencies of five boilers and ten chillers, and the information they need to balance the system and keep total consumption



This weather station is a key part of a sensor-based heating and cooling system at IBM's East Fishkill facility.

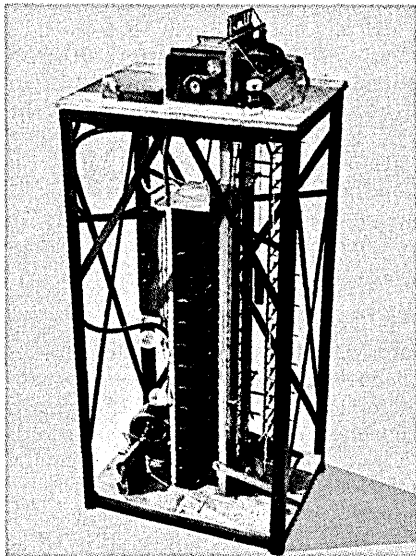
within pre-determined limits.

"We've replaced intuition with information," Harrison says, adding: "At the height of a 12-day heat wave, we were able to cooperate with the local power company's request to avert possible brownouts. Because of our monitoring and forecasting capability, we were able to reduce over-all power demand by 10 percent without affecting operations."

IBM

Computing Pioneers: Part II

In an earlier issue, DP DIALOG traced the evolution of calculating devices from the abacus to the late 19th century. A number of readers asked that the story be continued. So, here are a few more of the events that led to the modern computer.



Automatic punch card sorter (c. 1910).

By 1890, a growing nation and its expanding industrial economy were producing numbers, figures and statistics in profusion. No longer was the census merely a matter of counting heads, for example. By 1890, it had been expanded to include statistics on immigration, race, health, literacy and employment. It was clear the government needed an efficient way to tally this wealth of information.

Herman Hollerith, a Census Bureau statistician, solved the problem with the first electrical tabulation machine. Fast and accurate, it used cards in which holes were punched to represent vital statistics. Systems like it earned growing acceptance throughout the next thirty years, although they were modified and speeded up to handle the

ever-increasing needs of the government, business and scientific communities. To accommodate more information for business use Hollerith increased the size of the punched card itself. As his design model, he chose the dollar bill of the time.

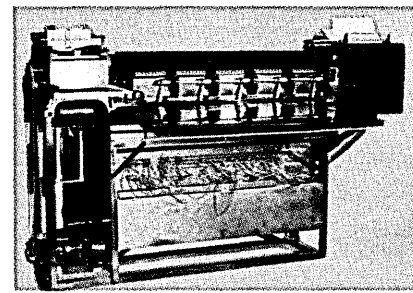
Between 1900 and 1910, railroads began using "Hollerith machines" to tabulate waybills. Insurance companies, with actuarial statistics to correlate and mortality predictions to make, were quick to see the advantages of mechanical tabulation. And public utilities, with countless customer records to maintain, also turned in growing numbers to machine accounting. More sophisticated methods—such as cost accounting and sales analysis followed.

With the United States' entrance into World War I, the Wilson administration set up a plethora of public agencies to control transportation, communication, manufacturing and distribution. Under Bernard Baruch, the War Production Board established committees on commodities as diverse (and unlikely) as baby buggies, biscuits and crackers, and pocket-knives. To operate effectively, these agencies needed rapid access to vast quantities of information, and thus installed large numbers of tabulating machines.

By the thirties, many large firms had established a "tab" department, but it remained for the government to undertake the largest bookkeeping job ever. The Social Security Act of 1935 made it necessary to maintain employment records on 26 million people. To handle this task, a production line punched, sorted, checked and filed 500,000 cards a day.



During World War I, the Army used punched-card sorters in the first large-scale application of psychological testing.



This high-speed card-sorting machine (c. 1920), handled 400 cards a minute.

By the mid-thirties technology had advanced to the point that mechanical reading, writing and arithmetic were available—but separately, as individual functions of distinct machines.

From the 1937 master's thesis of MIT student Claude Shannon came a way of using symbolic logic to improve electrical switching circuits. In one example, he showed how to automatically add two numbers using only relays and

PHOTO: COURTESY OF THE NEW YORK NEWS

BIGGEST BOOKKEEPING JOB BEGINS

Social Security Board Has Gigantic Task

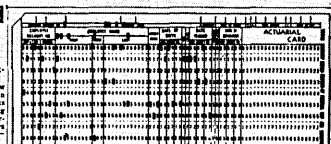
Baltimore, Jan. 9.—The world's biggest bookkeeping job is under way here. Thanks to the Social Security Board, this city is now famous for the thing more than Fried chickens and Tempies in Maryland. For here's where all those security blanks came last month, after the deadline closed. In place on his keypunch, they're being counted, sorted and spider-worked on sheets that will pay pensions to good many years.

When the Social Security Board's office in Washington, D. C., got the job, it was a big one. The Social Security Board, which is the largest of the Federal Government's agencies, has a budget of \$1,000,000,000 a year. It is the largest of the Federal Government's agencies, and it is the largest of the Federal Government's agencies.

At the end of 1935 a day, the Social Security Board's office in Washington, D. C., got the job. It is the largest of the Federal Government's agencies, and it is the largest of the Federal Government's agencies.



John D. Wines, head of the work.



This is the actual card that tells the story of your life to the Social Security Board. The holes punched in it record about every act of your life in the past and the things you have done since. You see, before they're through you've got to be in a line with the Social Security Board. The very purpose of a Social Security card is to record every act of your life. The Social Security Board is the largest of the Federal Government's agencies, and it is the largest of the Federal Government's agencies.

This article said of the IBM collators, "They're incredible. They do everything but take off their hats and bow."

switches. Although any numbering base could be used, Shannon said, the circuit would be greatly simplified by adopting the base two.

That same year, working independently, George Stibitz of Bell Labs built such an adder in his home. He called it the "Model K", after the kitchen table on which it was constructed.

At about the same time, Wallace Eckert of Columbia University used a mechanical programmer to link together different kinds of punched card and accounting machines to allow complex astronomical calculations.

Such developments foreshadowed many of the advances of the next decade. As early as 1937, Harvard graduate student Howard Aiken had proposed that a new kind of calculating machine be built. It was later to become known as the Mark I, the first automatic, general purpose digital calculator.

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books

Freedom's Edge: The Computer's Threat to Society

by Milton R. Wessel
Addison-Wesley, 1974
160 pp. \$4.95 (paperback)

This is a book about the implications of computer technology on society, a very important subject on which there has not yet been an adequate discussion in the United States. I know the author personally and have discussed computer-societal issues with him many times; it is clear that he has, because of his legal background and acquaintance with computery, many important ideas and significant perspectives to contribute. This should have been a great book. Unfortunately, it does not come off well; it is a disappointment, doubly so in view of the author's qualifications to address the matter.

My guess is that the publisher has shortchanged the author by omitting adequate and thorough prepublication critical review; that's what it needed. The book is left with three substantial faults: looseness of language; weak organization; and inappropriate or misleading discussion of technical issues. The original cartoons by Will Eisner cannot offset these faults. Editorial attention and critical review by someone skilled in presenting technical ideas to a lay audience could have fixed them all.

A very unfortunate aspect is the confusion between the computer as a tool and the uses to which the computer is put by people and organizations. The difficulty starts even with the subtitle: *The Computer's Threat to Society*. The computer is not a threat to society but, on the contrary, is probably one of the greatest tools ever conceived and one of the most positive forces for improving society and government. The real issue concerns the collection and acquisition of information from and about people, and the subsequent use of such information for the expedience and convenience of or-

ganizations, be they governmental or private. The central matter is that society does not have an adequate mechanism for resolving the question: How can computer technology be exploited for the benefit of commercial, industrial, or government enterprise while not adversely affecting individual or societal behavior, life style standard of living, personal freedom, and privacy? Confusion is perpetuated in many places through anthropomorphic ascriptions of the causes of various events to "the computer." In a technology where jargon and terminology are still far from standard and on a subject which is difficult to discuss at best and often charged with emotion, such looseness of language can only compound confusion in the mind of the reader, especially the lay reader.

The author speaks at length about a "computer utility" and he cites a number of rules to govern its conduct; collectively they form a "Computer Utility Bill of Rights." However, the wording of them clearly implies that the author's concept is more that of something imposed on the public by government or other organizations, which would thus impact the public welfare. This is in dramatic contrast to the usual concept of a utility service as something that an individual buys voluntarily when he needs it or when he has an economic justification for it. Here is a major example of terminological looseness that will cause confusion.

The first three chapters have the shortcomings noted above, but the writing style and quality of presentation change significantly for the better after that. From the early part of chapter four on, the book makes many good and valuable points that can be readily perceived in spite of minor editorial problems:

- It characterizes many existing information banks and their implications for society.
- It develops the very crucial point that the mere existence of data can impair one's sense of freedom in some action.
- It includes much current history and activity—although this might date the book.
- It explores several subtle aspects of the concept of privacy.
- It suggests possible legal issues that might arise from some kinds of computer-based systems, e.g., point-of-sale ones.

Subsequently, the author, who is a lawyer of extensive experience, suggests a specific solution to the privacy issue: a limited-life Privacy Commission with limited powers, but with the authority to license and to require an impact statement for each operating or proposed data bank. Shortly thereafter, the author notes that the computer tends to reinforce "the Establishment," but he might properly have phrased this in the broader context that the computer reinforces the position of anyone who has information or can acquire it, wherever "anyone" happens to be in the societal structure or in an organization.

This book may serve to inform the lay reader about computer-based or computer-controlled services, but it will not illuminate the basic issues for him as well as it might have. The book is a mixture of very worthwhile and often original points, of useful current history, of first person anecdotes and reminiscences—all intermixed in a structure that should have been much better. On balance, therefore, the reader will have to be very perceptive in sifting out the important and significant contributions from the sometimes diffuse presentation, especially in the first three chapters.

Throughout the text there is presented as indented and italicized sections a number of principles and rules; these are also assembled in an appendix as "The Ten Commandments of Computer Usage." It is appropriate to observe that a few of these "commandments" are worthy of being considered as candidates for a public policy on the conduct of data banks and the use of data.

—Willis H. Ware

Dr. Ware, a senior computer scientist at the Rand Corp., is chairman of the AFIPS Special Committee on the Right of Privacy. He also served as chairman of the H.E.W. Advisory Committee on Automated Personal Data Systems.

Computer Programs Directory 1974

Richard J. McQuillin, ed.
Published for the Joint User Group (JUG) of the Assn. for Computing Machinery.
MacMillan Publishing Co., Inc., 1974
806 pp. \$25.

According to the editor of this sequel to an earlier directory published in 1971, "the success of our first effort has prompted the program library committee and our publisher to publish this new directory that includes new program listings." This may be, but it is difficult to see how the present directory could elicit an equally enthusiastic response except among a very narrow segment of computer users. Of the 670 pages devoted to describing some

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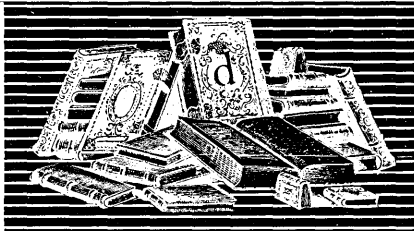
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3,394 programs, 208 are dedicated to programs for DEC equipment, 151 to CDC's 3000 series, and 191 to Hewlett-Packard gear. The remainder covers programs available through something called the Educational Information Network (now defunct) and from Wang and CDC 6000 series computer users. Programs for IBM computers are virtually nonexistent in this volume.

Like most compendiums of program abstracts, this one suffers from a paucity of uniformly detailed descriptive information about each program. The interested user must have recourse to the particular group listing the program to obtain further details. There is a useful subject-category index at the back of the volume, but the program library classification codes at the beginning are, for some mysterious reason, not applied to the body of the abstract material. Programs are listed within each contributing organization according to whatever coding or numbering scheme that organization has chosen to employ. For example, the Digital Equipment programs are *all* preceded with the acronym DCS followed by a five digit number and a program name, and the Hewlett-Packard programs are each tagged with an HLP followed by a



ten digit alphanumeric designation and program name.

A scan of the Joint User Group membership list in the 1974 publication provides some interesting insight into what has been happening to JUG over the past few years. Absent are several major groups listed in 1971, including COMMON (IBM small computer users) and SHARE as well as the Burroughs, Honeywell, and Xerox user groups. JUG has picked up an NCR user group plus a few others, but seems clearly to have suffered a net loss in terms of the representiveness of the JUG membership and certainly in terms of the representativeness of the programs presented to readers of this volume.

—Robert V. Head

Mr. Head is a special assistant within the Dept. of Agriculture and has served as a contributing editor of DATAMATION. He is founder and past president of the Society for Management Information Systems.

literature

End User Markets

What edp equipment do end users prefer? To answer this question, DATAMATION conducted its second annual brand preference study of the edp industry, and the results are compiled in a 127-page report, *OEM and End User Markets*. Classes of items surveyed include computers, peripherals, terminals, software and services, special purpose systems, components, etc. Sample questionnaires and the market research methodology used to gather these statistics are discussed. Price: \$45. Marketing Research Dept., DATAMATION, 35 Mason St., Greenwich, Conn. 06830.

Federal COBOL Standard

A proposed standard, developed by the American National Standards Institute for voluntary industry adoption, defines the elements of COBOL and rules for their use. The purpose is to provide for program portability. The standard is expected to be used by implementors as the reference authority in developing compilers and by users for writing programs in the language. The proposed standard is available from the office of ADP Standards Management, Inst. for Computer Sciences and Technology, NATIONAL BUREAU OF STANDARDS, Washington, D.C. 20234.

Communication Newsletter

A weekly government publication, *Communication Newsletter*, gives business and technological coverage of research and development news in communications. Areas covered include communication policy, regulations and studies; radio & tv equipment; common carriers and satellites; socio-political topics; etc. Cost: \$45/yr. (\$57 foreign). NATIONAL TECHNICAL INFORMATION SERVICE, U.S. Dept. of Commerce, P.O. Box 1553, Springfield, Va. 22150.

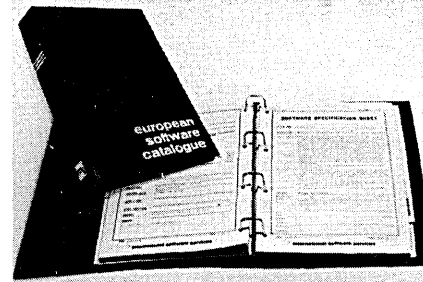
Electronic Market Study

Total dollar volume of electronic equipment sales reached \$31.6 billion in 1973, up 7.4% from 1972. Consumer electronic product sales increased 4.2% to \$6.9 billion in 1973. A breakdown of market statistics for specific product segments of the industry can be found in the 116-page *1974 Electronic Market Data Book*, available for \$10 to EIA members, \$20 to

nonmembers. Public Relations Dept., ELECTRONIC INDUSTRIES ASSN. 2001 Eye St., N.W., Washington, D.C. 20006.

European Software

The *European Software Catalogue*, produced in cooperation with International Software Services, provides basic information on software packages available in Europe. Descriptions of each package, including product specifications, manuals supplied, personnel



training, maintenance, contractual arrangements, costs, etc., are presented. A standardized, loose-leaf format facilitates the insertion of updated pages, supplied three times a year as an additional service. The price, including this year's updates, is 460 Swiss Francs (about \$160). For the updating service alone, the price is 180 Swiss Francs (about \$35) per year. VERLAG MODERNE INDUSTRIE AG, Dörflistr. 73, CH-8050 Zürich, Switzerland.

Supplier Directory

Profiles of 600 companies that offer edp products and services of all types are gathered together in the 124-page *Directory of Suppliers*. Standardized entries describe each company's location, size, executives, financial status, ownership, sales and service organization, and product line. The directory is reprinted from the July supplement to *Datapro 70*, a regularly updated report for subscribers on computer equipment and software. Price: \$25. DATAPRO, 1805 Underwood Blvd., Delran, N.J. 08075.

Remote Batch Terminals

About 9 out of 10 users rate overall performance, ease of operation, and reliability of remote batch terminals as excellent or good. Of manufacturer's maintenance, 23% think it fair or poor, and 30% assign similar ratings to software and technical support. These ratings are given by 285 responding users based on the experience with 875 such terminals, and are compiled in a survey report, *All About Remote Batch Terminals*, reprinted

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You need someone who knows the score on EDP labels. And Nashua's expertise goes way back in coated papers and EDP products. We developed Davac® dry gum label paper, Nashua Carbonless papers, and a growing line of dependable computer storage devices.

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small portion of the total EDP labeling system cost, high quality labels are vitally important. Nashua EDP labels help assure minimum down-time in this high-cost system.

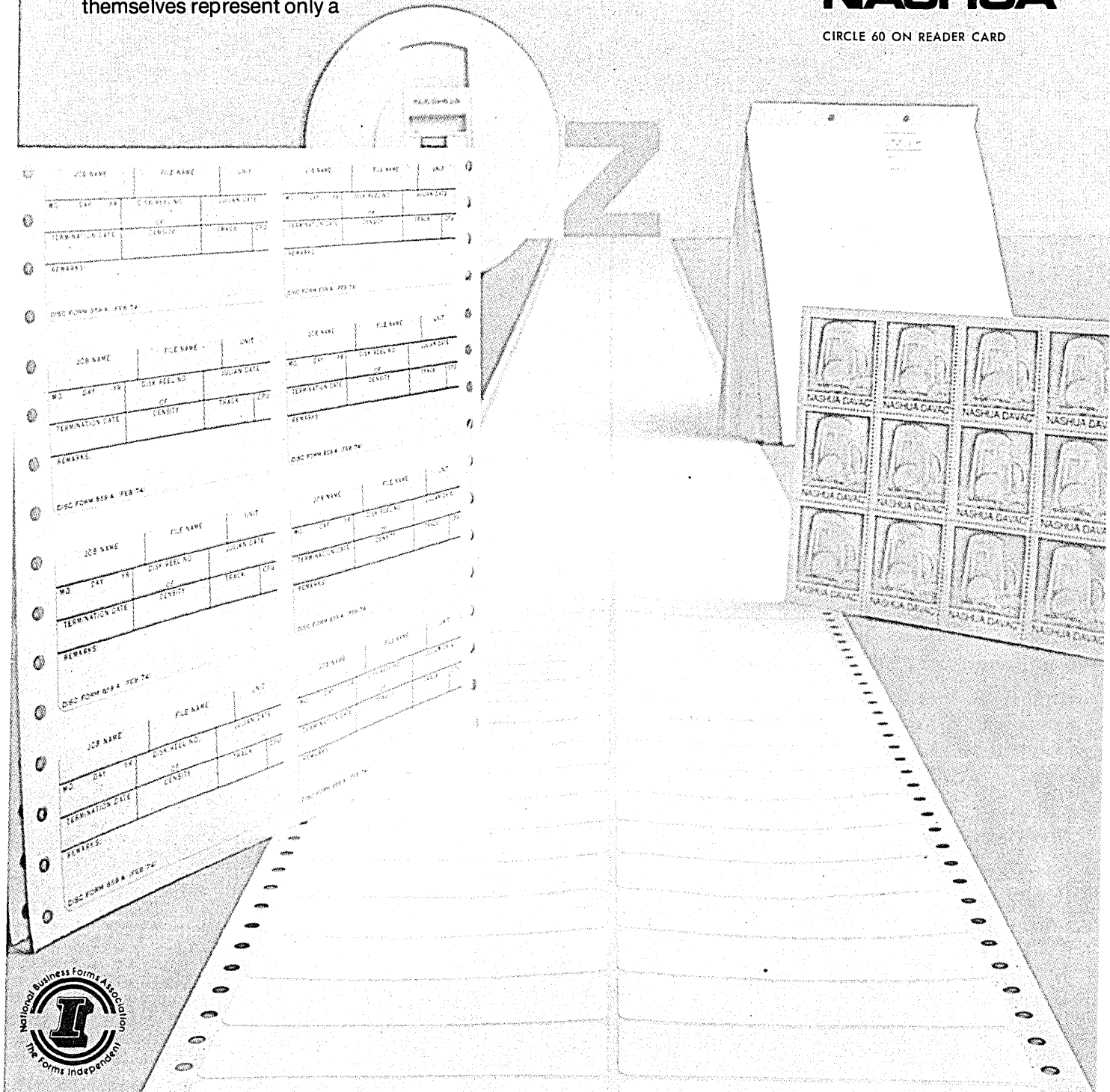
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helping you give quick, on-the-spot cost quotes.

All Nashua stock EDP pressure-sensitive labels are marginally punched and fanfolded on continuous carriers. Two manufacturing facilities and three warehouses strategically located across the country keep Nashua customers well supplied. All the more reason to get in touch with Nashua Corporation, Nashua, New Hampshire 03060. (603) 883-7711.

NASHUA

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IN THE AREA OF
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AND ARTS
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AND HEALTH
AND WELL-BEING
AND QUALITY OF LIFE
AND SUSTAINABILITY
AND RESILIENCE
AND ADAPTABILITY
AND INNOVATION
AND LEADERSHIP
AND COLLABORATION
AND PARTNERSHIP
AND NETWORKING
AND COMMUNITY
AND SOCIETY
AND HUMANITY
AND PLANET
AND FUTURE

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Intelligent Data Entry: Datapoint 1100/Dataform

The Datapoint 1100 Intelligent Terminal is widely recognized for its high IQ, flexible data communications, variety of peripherals and outstanding human engineering—and now we've added DATAFORM, a powerful, dual-level language which permits fast, convenient generation and display of data entry "forms" for sales order entry, accounts payable, inventory control and many other applications where source data has to be entered swiftly and accurately from remote locations.

DATAFORM, in fact, delivers two levels of capability: Level 1, a convenient form generation program with many inherent data checks. Using this level, the system designer can quickly and easily create, correct and change the entry forms needed to write data efficiently to storage media. Level 2 allows more sophisticated operations to be programmed and performed on field data, including range checks, table look-ups, arithmetic and other automated aids to the entry process.

As many display forms as needed can be readily stored on an 1100 tape for sequential or random usage, as operation requires. Source data is entered via the forms with automatic read-after-write checking for complete accuracy. After source data is captured on tape, it can then be transmitted unattended during low phone rate hours via an automatic polling process to a home office computer in any of a variety of disciplines: IBM 2780, 3780, UT 200 and DCT 2000, among others. With the computer-based Datapoint 1100, the user can elect to have just the basic edit checks performed locally or, if required, extensive pre-processing of data before its transmission to the central computer, relieving the processing burden there.

Moreover, the Datapoint 1100 Intelligent Terminal is priced competitively—just \$138/month lease price—and you can add peripherals such as printers and card readers as needed. It's a system that can grow with your needs, not only through peripheral additions but through upward compatibility with the Datapoint 2200® and 5500 dispersed processing systems.

For your intelligent data entry needs, we urge you to take a close look at the new industry benchmark, the Datapoint 1100/Dataform combination. For further information, write or call Datapoint Corporation or contact the nearest sales office.

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Cincinnati/(513) 421-6122 • Cleveland/(216) 831-0550 • Dallas/(214) 661-5536

Denver/(303) 770-3921 • Des Moines/(515) 225-9070 • Detroit/(313) 557-6092

Hartford/(203) 677-4551 • Honolulu/(808) 524-3719 • Houston/(713) 688-5791

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CIRCLE 17 ON READER CARD

source data

from the June supplement to *Datapro* 70. Price: \$10. DATAPRO, 1805 Underwood Blvd., Delran, N.J. 08075.

Environmental Design

Two reference works detail the use of computers in environmental design. *Computer Programs in Environmental Design* is a five-volume collection of 335 abstracts of computer programs on such keyworded topics as feasibility study, architectural programming, site planning, and environmental control. Price is \$210. *Bibliography of the Computer in Environmental Design*, 2nd ed., in three volumes, is a compendium of computer applications information covering 2,000 articles, books, conference papers, and unpublished items in this subject area. Price: \$110. ENVIRONMENTAL DESIGN & RESEARCH CENTER, 938 Park Square Bldg., Boston, Mass. 02116.

Building a Data Base

How to Harness Information Resources: A Systems Approach discusses the management of information, documented and undocumented, evaluated and raw. Topics of information transaction and manipulation, such as capturing, recording, coding, indexing, abstracting, etc., are covered. Guidance in a systems approach to the total problem, from the purposes for the information through decision-making stages, is provided. The 147-page book is available in paper for \$7.50

from the ASSN. FOR SYSTEMS MANAGEMENT 24587 Bagley Rd., Cleveland, Ohio 44138.

Market Studies

Three reports analyze specific markets for specialized computer equipment.

Analytical Instrument Markets in the U.S. tracks an expanding market for analytical instrumentation in the U.S. and projects a 2½ times increase from current levels to \$1.3 billion by 1982. More than 100 manufacturers are turning to microcomputers for instrumentation control and in data reduction and analyses; and the study predicts microcomputer-based systems will eventually displace minicomputer-based systems.

Health Care Leasing Markets sees a growing trend in the next 10 years for leased health care equipment, especially radiology and nuclear equipment. In 1973, edp hardware alone accounted for \$73 million in health care lease arrangements. User markets—hospitals, nursing homes, clinical labs, private practitioners—which are increasingly accepting leasing, are examined in the study.

The insurance industry will become the most computerized business in the next 10 years, according to *The Markets for Insurance Computer Systems and Services*. The value of computer systems, peripherals, software, and related services sold to this sector, now at a \$600 million annual rate, will exceed \$1 billion by 1978—a growth rate of 11% per annum, the report says. FROST & SULLIVAN, New York, N.Y.

FOR DATA CIRCLE 350 ON READER CARD

products & services

Minicomputers

Hewlett-Packard is offering two booklets on products and services for mini-computers.

A 16-page booklet presents photos and descriptions of the microprogrammable control processor, the semiconductor memory system, the power system, and the I/O section of the HP 21MX Series minicomputers. Also discussed are available programming languages, software, and such application aids as H-P's Terminal Control System, Image/2000, and Remote Job Entry to IBM 360/370 computers.

A 26-page catalogue presents descriptions and color photos of H-P's line of oem computer products. Over 100 such products are detailed, including the HP 21MX Series and the HP 2100 Series minicomputers, all with microprogramming options. Peripherals included are plotters, magnetic tape and disc subsystems, line printers, and paper tape and card readers. Also described are H-P's I/O extenders, general and data communications interfaces, and software. HEWLETT-PACKARD, Palo Alto, Calif.

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Academic Microfilm

Information management problems within educational institutions eased

products & services

Dr. Frankenstein and The Capable Tester

From *The Moving Pitches Company*

Move aside, Andy Warhol. You have been surpassed in the annals of film-making, at least among admirers of the story born of the fertile, gothic mind of Mary Shelley. Computer Automation has taken the Dr. Frankenstein banner and brought it to depths your conservative soul would tremble to approach.

"Electrifying," "shocking," and "revolting" are only a few of the words too feeble to describe the drama brought to the conference room screen by Rand Bridges, Kip King, and Victoria Carroll—with "bits and pieces by

The CAPABLE Tester was the method to his madness

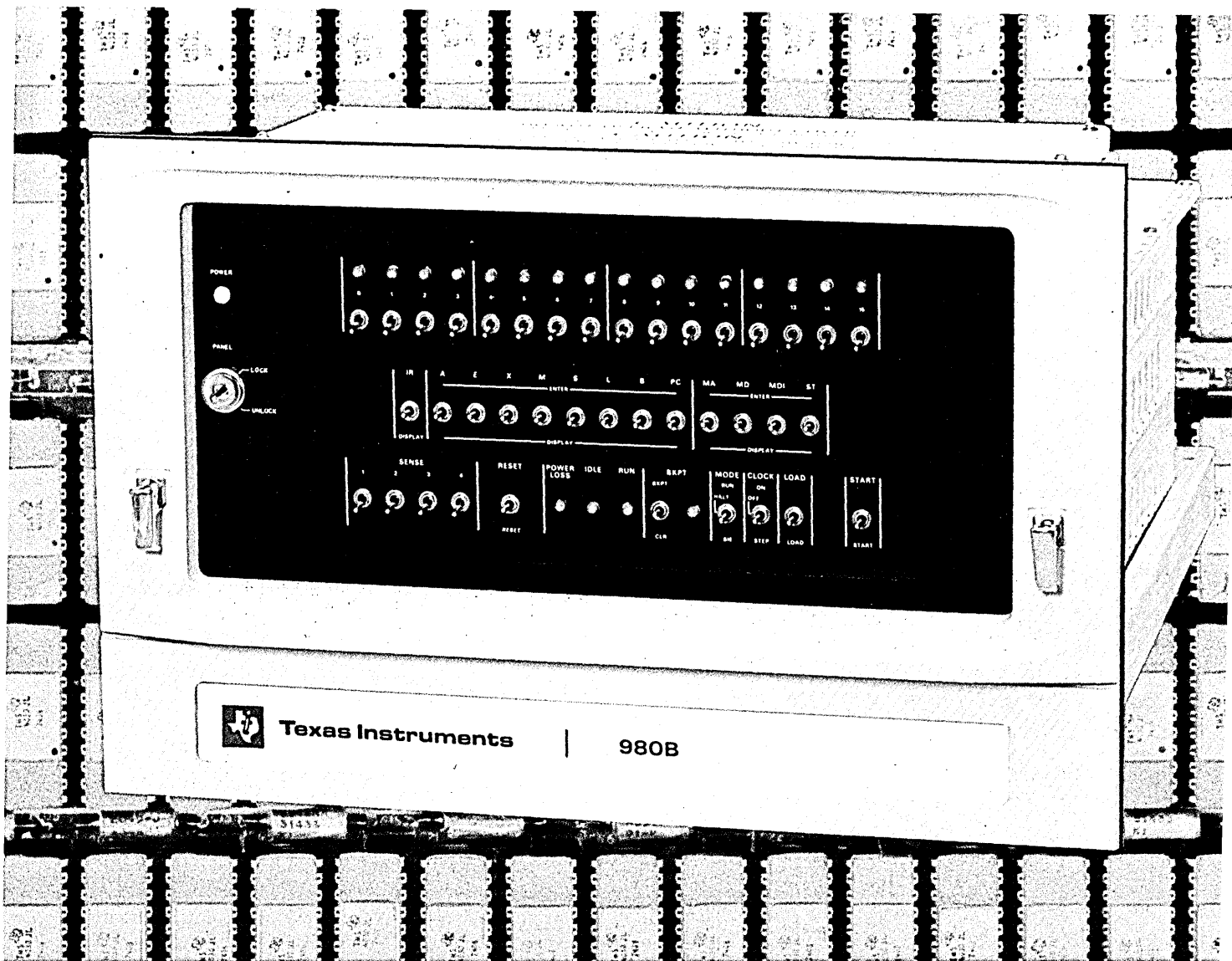
Computer Automation
Industrial Products Division Presents
**DR. FRANKENSTEIN AND
THE CAPABLE TESTER**
(Or how to solve "monstrous" testing problems)
The poignant story of a simple mad scientist whose dream is to build the world's most
"hardcore" (and get to the bottom line) more than just a few lines back! It's over!
A compelling drama of the final fight against MONSTEROUS TESTING PROBLEMS.
See it with a companion you love.
Starring
RAND BRIDGES and KIP KING
Co-starring
Victoria Carroll
Featuring 100+ bits and pieces by software makers.
Produced by RAND BRIDGES and KIP KING. Screenplay by RAND BRIDGES and KIP KING.
Directed by RAND BRIDGES and KIP KING. Music by RAND BRIDGES and KIP KING.
Distributed by THE MOVING PITCHES COMPANY.

Playing now at
a conference room near you.

unknown donors." Performances unlike any seen in Hollywood epics pull the viewer into the doctor's 1974 laboratory as if drawing him helplessly into an unsterilized hypodermic syringe.

Armed with a CA board tester and a demented operator, the doctor casts only a backward glance at his past mistakes, remarking "One bad product can ruin your reputation," and seldom slips into his old ways, as when he says that engineers can cost "an arm and a leg." It is monologue like this that makes the film what it is.

We will not spoil the ending for you. See it for yourself by having your lab equipment buyer contact a Computer Automation Industrial Products Div. office during any full moon. □



New 24K memory board from Texas Instruments . . . using large scale integration.

TI sets new standards in minicomputer price/performance

Higher performance at a lower cost results from state-of-the-art, ultra-reliable semiconductor memory systems used in Texas Instruments new 900 series minicomputers. Built-in error detection and correction circuitry, with fault indicator lights, is a standard part of every memory.

Now, you can start with 8K, 16K, or 24K 16-bit words of memory on a single board . . . at prices substantially below those of previous semiconductor memories. For larger requirements, you can expand memory capacity to 65K in the mainframe.

Model 960B minicomputers reduce costs in industrial automation, process control, and data communications.

They have an exclusive communications register unit and 128 I/O lines (expandable to 8,192) that greatly simplify interfacing for these applications . . . at low, quantity-one prices of \$4,350 with 8K memory . . . \$5,850 with 16K . . . and \$7,350 with 24K. **Model 980B** minicomputers, offering computing power far above that of comparably priced CPU's, are ideal for general-purpose and scientific data processing . . . as well as data communications. Along with an impressive list of standard features, they provide hardware multiply/divide with 16- or 32-bit add and subtract . . . in addition to programmable memory protect and privileged instructions . . . all at an

attractive quantity-one price of \$4,995 with 8K memory . . . \$6,475 with 16K . . . and \$9,975 with 24K.

Software and Support. TI offers a full line of peripherals and software packages for the 900 series computers, plus user training and applications assistance. The company also maintains a nation-wide service network backed by TI-CARE*, an automated remote diagnostic and dispatching system, to support all products.

Call your nearest TI sales office for more information. Or write Texas Instruments Incorporated, P.O. Box 1444, M/S 784, Houston, Texas 77001. Or phone (512) 258-5121, extension 2539.



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TEXAS INSTRUMENTS
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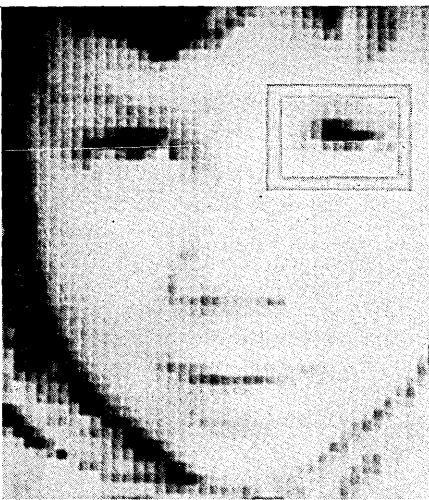
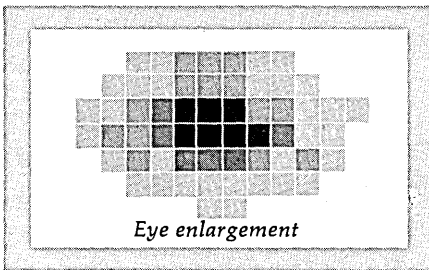
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by the use of microfilm are the subject of *Microfilm Programs for Educational Institutions*. How microfilm use can save money and improve the efficiency of student record keeping, business office accounting, computer reports, reference materials and library systems, is discussed. Another topic covered is micropublishing—publishing on film rather than on paper—and the resulting savings to higher education study programs. KODAK BUSINESS SYSTEMS MARKETS DIV., Rochester, N.Y.

FOR COPY CIRCLE 352 ON READER CARD

Image Data Processing

Basic application areas involved in machine manipulation of pictorial data are described in a brochure which also defines the basic concept of a digital image. Computer peripherals for inter-



facing pictures with computers are also described, including image digitizers for converting film images to computer-compatible forms, digital image recorders for constructing color or black/white images from computer output, etc. Two picture processing systems are detailed, one which creates full-color business graphics, the other which automatically interprets aerial and satellite photographs for earth resources management. DICOMED CORP., Minneapolis, Minn.

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CICS Productivity Aids

CICS users are offered a set of over 30 utility modules that solve a variety of user and system-oriented problems requiring on-line solutions. Areas where programming capabilities can be extended are CICS temporary storage interfacing for standardized paging, data base access for diagnostic purposes or direct file modification, CICS utility and maintenance routines for systems programmers, etc. SOFTWARE MODULE MARKETING, Sacramento, Calif.

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Data Base Systems

Getting hands-on experience putting together a data base system will be a special feature of a three-day AMA course. Aimed at managers, systems programmers, and analysts, the course will be given twice in Atlanta (Sept. 23-25 and Nov. 11-13) and once in Chicago (Oct. 7-9). Arrangements can also be made for in-house presentation. Price: \$425, AMA members; \$485, nonmembers (team fees are less). AMERICAN MANAGEMENT ASSN. 135 W. 50 St., New York, N.Y. 10020.

Minicomputers

A seminar for managers, dp engineers, and technical personnel with the need to know about minicomputer systems will be held by AMR in Washington, D.C., (Sept. 23-25) and in Boston (Oct. 30-Nov. 1). To be covered are the practical aspects of selecting minicomputer systems for initial automation of important applications; upgrading existing computer installations; developing reliable teleprocessing applications; and digitizing, plotting, and controlling data in the factory, lab, and office. Price \$425 (\$370 each for three or more). ADVANCED MANAGEMENT RESEARCH, 1370 Avenue of the Americas, New York, N.Y. 10019.

Structured Programming

A number of courses on structured programming, on-line systems design, and advanced programming techniques are scheduled for the fall in various cities around the country. *Structured Programming Concepts* will be run in Boston (Sept. 18), Hartford (Sept. 19), New York (Sept. 20), Chicago (Oct. 9), Atlanta (Nov. 6), Phoenix (Dec. 9), and other major cities. *Structured Programming Tech-*

niques, a seminar, will run in Los Angeles (Sept. 18-20), New York (Oct. 2-4), Chicago (Oct. 7-9), and elsewhere. A workshop in structured programming is scheduled for Washington, D.C. on Nov. 18-22. For information on these and other courses, and other cities scheduled, contact YOURDAN INC., 575 Madison Ave., New York, N.Y. 10022.

Systems and Procedures

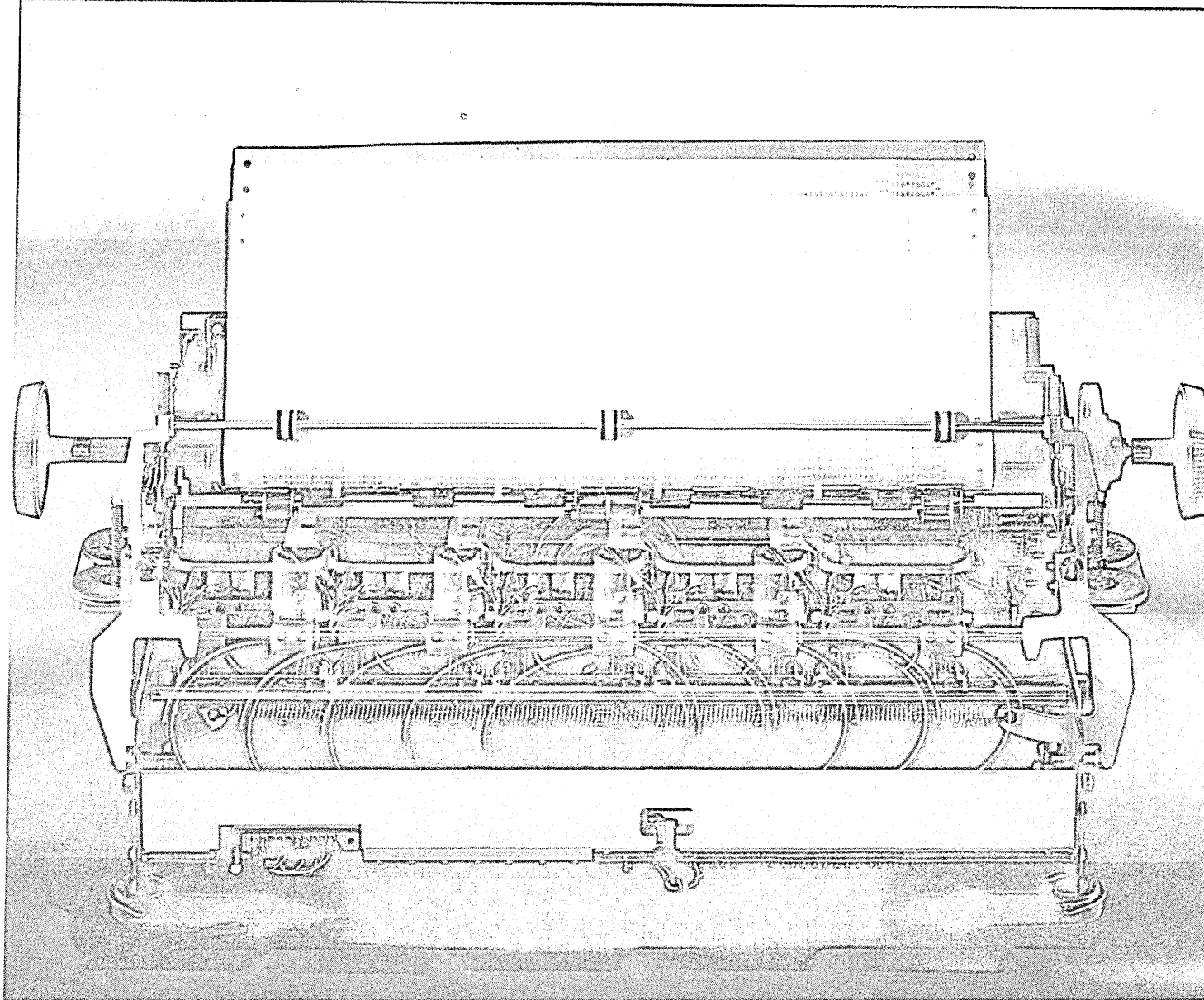
A senior systems and procedures course, designed as a refresher course for senior systems executives, is scheduled by the AMA to be given twice at its New York City headquarters (Sept. 23-27 and Mar. 24-27). It will also be held in Chicago (Nov. 18-22) and in Atlanta (Jan. 6-9). Questions to be aired include: What systems proved successful for other companies? Which have failed? Who is to make the final decision on implementation of new business systems—the user or the systems department? Price: \$495 for AMA members; \$570, nonmembers (team fees are less). AMERICAN MANAGEMENT ASSNS., 135 W. 50th St., New York, N.Y. 10020.

Audio-Visual Course

An audio-visual educational package on computers is offered to the user with little or no knowledge of data processing. Available for either self- or group instruction, the package consists of two parts, each with three tape cassettes, student workbooks, and Sokra-Test packages (forms for self-grading). For groups to be led by course leaders, color transparencies for use with overhead projectors are also supplied. Prices are \$215 for each part of the self-instruction package and \$550 for each part of the group instruction package, with manuals and SokraTest packages extra. MANAGEMENT INFORMATION CORP., 140 Barclay Center, Cherry Hill, N.J. 08034.

Management Information

Arthur D. Little, Inc., is scheduling a series of three-day management information systems seminars to be held in New York City between Oct. 7 and Dec. 19. Course topics include programmer productivity (Oct. 7-10), minicomputers (Oct. 7-10), data base systems (Nov. 11-14), and project management (Dec. 2-5). There will be a total of 16 different topics, one—fundamentals of data processing—being given twice (Oct. 21-24 and Dec. 16-19). For information, contact Ms. Sandy Padrick, NEW YORK MANAGEMENT CENTER, 360 Lexington Ave., New York, N.Y. 10017. □



Three times the throughput. 1/5 the moving parts.

Diablo's HyType 1 Serial Printer gives you clear, crisp printing at throughput speeds three to five times greater than the most widely used I/O typewriter. And does it with one-fifth the moving parts. Electronic servos control critical movements like character and column selection. Stepping motors control paper and ribbon feed. HyType has electronic tabbing for both horizontal and

vertical spacing. In addition to greater throughput, elimination of 4/5's the moving parts assures extra long life and trouble-free performance in heavy duty operations with minimum routine preventive maintenance. Optional features include regular or pin feed platens and auxiliary form feed tractors. One and two color cloth ribbons and multi-strike carbon film ribbons are available

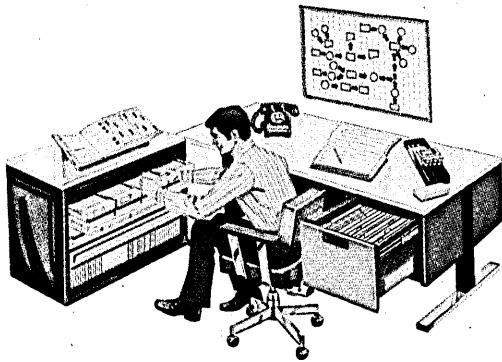
in snap-in cartridges. Diablo's character wheel is available in 12 fonts, many languages, interchangeable in a few seconds. For the best in low-cost, high performance printers demand Diablo HyType for your system. For a complete technical presentation, write or call Diablo Systems, Incorporated, 24500 Industrial Boulevard, Hayward, California 94545, (415) 783-3910.



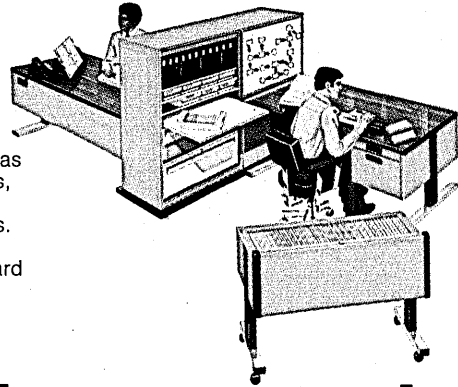
Diablo Systems, Incorporated
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Cluster type layout for programmers includes Reference File for hanging storage of loose print-out in Wright Line Hanging Print-Out Folders.



Programmers work station has specialized storage for cards, loose print-out in hanging folders and other documents. Portable key punch and Magnetic Visual Display Board are also shown.



systems and programming work environments

Systems analysts and programmers have needs that cannot be properly met with conventional office furniture. Wright Line's specialized Systems and Programmers equipment meets these needs in work stations that are efficient, aesthetically pleasing and compact from the standpoint of floor space requirements.

Our new brochure shows typical work environments and specialized equipment. For a copy, circle the readers' service number or write to Wright Line, a Division of Barry Wright Corporation, 160 Gold Star Boulevard, Worcester, Massachusetts 01606.

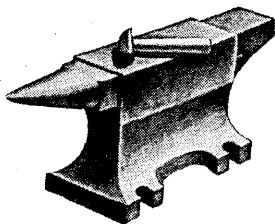


Systems and Programming library designed to store and access mixed media includes Optimedia Reference Stand, Optimedia Cabinets and Truck.

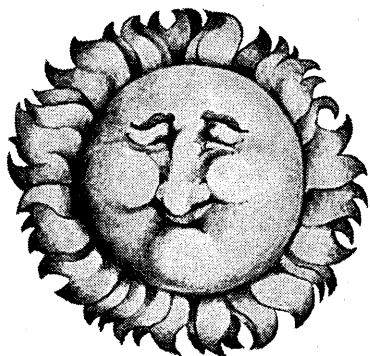


Highly compact work environment for systems analysts includes work surface, completely flexible storage arrangement and magnetic visual display boards for PERT or flow charting.

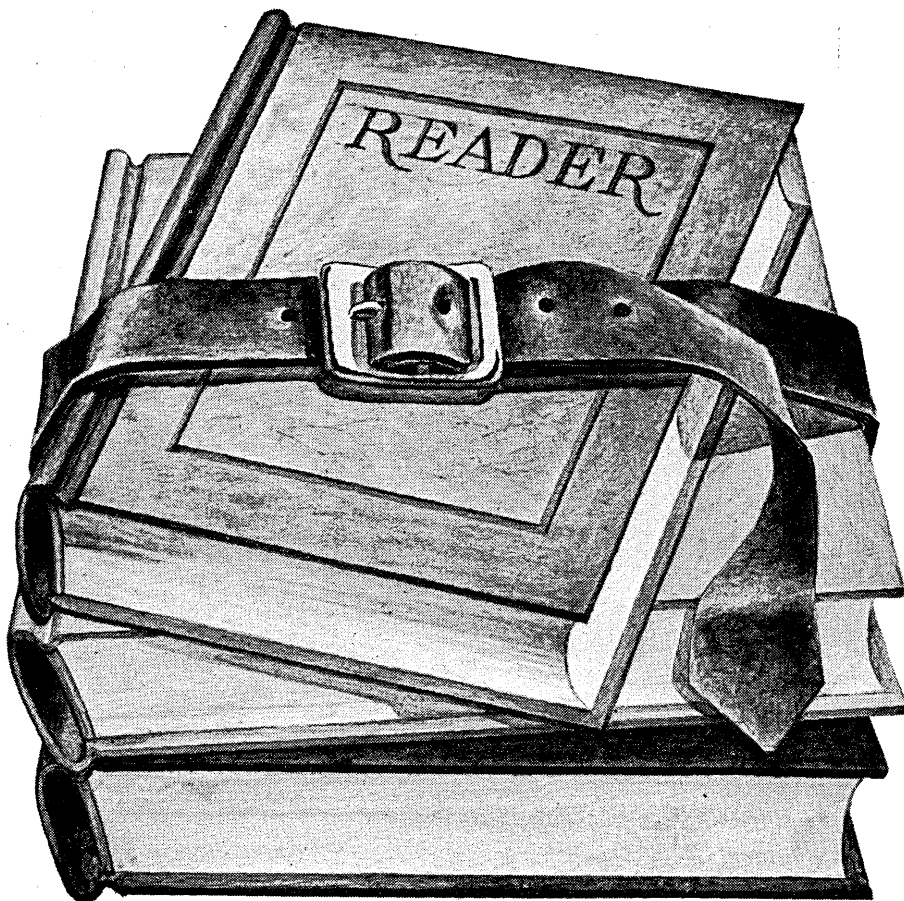
Shipping something heavy— like a ton of books? United's Lower Deck Containers give you the speed of air.. at the rates of truck.



DENSITY COUNTS!
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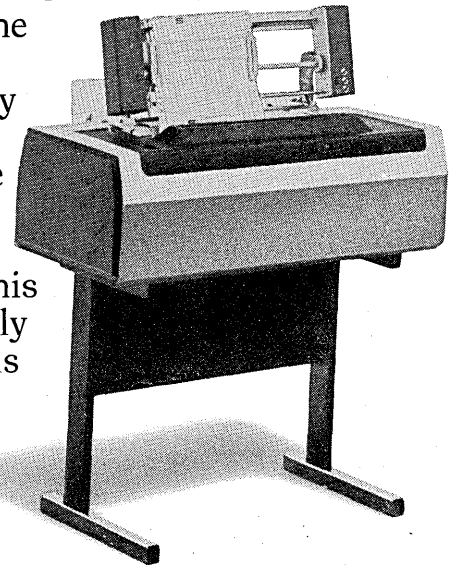
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Editor's Readout

PROPOSED LAW THREATENS DP USERS

Personal information collected for one purpose by the federal government, state and local governments, and private bodies is being disseminated for other uses without the knowledge of the individuals concerned. Some control over this is imperative. Two bills aimed at providing this control are now being rushed through Congress, and observers feel they will be passed before the November elections. These bills have not had sufficient preparation. Their omnibus character and looseness of language offer little in improved privacy and will cost the data processing community a great deal in terms of revised procedures, altered programs, and reorganized files. Unfortunately, although the intent of the legislators is laudable, this legislation is bad.

The bills in question are SB 3418, championed by Sen. Sam Ervin, and HR 15528, introduced in the House by Reps. Barry Goldwater Jr. of California and Edward I. Koch of New York. These bills attempt to assure that those who collect and disseminate personal information on individuals do so without violating those individuals' Constitutional rights.

The bills apply to every personal information file, whether manual or computerized, and whether the files are used for internal purposes, business purposes, or sold to the public. This includes personnel and payroll files, and even a deck of 3x5 index cards with names of sales contacts.

The bills would require that owners of such files maintain a detailed record of all file accesses. And if a record were found to have contained an error, the operator would have to go back through that access log and send the corrected record out to everyone to whom the erroneous data had been distributed. This provision is not limited to important data (the phone

number might have been incorrect) and contains no historical time limit.

Ruth Davis of the National Bureau of Standards noted recently that a credit reporting agency with one million records of 220 characters each would have an average file growth of 10% a year—33 million additional characters each year—just to meet the requirements of the legislation.

Another effect of the law would be to end the use of the social security number as a personal identifier, but those who currently use these numbers as file keys would have only 12 months in which to restructure their files and change their computer programs. A spokesman for the City of Los Angeles, whose personnel files are coded by social security number, estimates it would cost the city \$400,000 to restructure those files.

To top it all, the bills allow banks to continue using the social security number because "it has been authorized by law." Further, one of them allows any federal, state, county, or city body to use the number as a personal identifier by declaring the use "legal." The private sector, then, would be the only one affected.

Certainly we cannot fault the intent of these measures. They provide, among other things, that no personal information system's existence be a secret; that information on an individual be appropriate and relevant to the purpose for which it has been collected; and that there be a prescribed procedure for an individual to learn the information stored about him, the purpose for which it has been recorded, and particulars about its use and dissemination. The bills also state the procedure for an individual to correct, add explanations to, or erase inaccurate, obsolete, or irrelevant information.

However, one finds the wording so

poor that any bright systems analyst could find a way around some of the provisions. There are exclusions so broad in the name of national security and law enforcement that the biggest abusers wouldn't have to conform with the legislation at all, or even report what they are doing, much less submit to any review.

All in all, while the intent is good, there are sections that are either unworkable or woefully expensive. On a cost-effective basis, one can see only cost and little effectiveness.

For this reason, DATAMATION urges its readers to acquire copies of these proposed measures, interpret their provisions in the light of their own personal experience and the impact they will have on their employers, and voice their feelings to elected representatives. If, as seems likely, Congress is intent on passing a privacy measure in the current session, the time to respond is short.

There does not seem to be any disagreement that some privacy legislation, or at least some privacy guidelines, must be established at the federal level. Anyone who does business in more than one state is going to find it very difficult to comply with the variety of laws being adopted by the various state legislatures.

Admittedly, there is some disagreement whether we should be talking about privacy or the more general subject of fair information practices. But the current effort in the Congress of the United States to achieve what so many people see as a dire need is inept. We opt for no legislation on this subject from this session and a good law next session so we can save our money, time, and talent until we can get more privacy for the effort invested.

—Robert L. Patrick
Editorial Advisor



DIRECTIONS IN DATA BASE MANAGEMENT TECHNOLOGY

by Richard F. Schubert

Many users still fear to tread where data base applications have been successfully operating for years. Data base management technology will be improved, but only after the flaws in current systems are discovered through use.

THE SUCCESSFUL IMPLEMENTATION of a data base requires detailed planning with particular attention to data base design, modular application development, simplicity of application program design, and application support by both software and operations personnel.

Not all implementations of data base management systems have been successful, and some systems being marketed today may not be considered successful in several years. Little wonder that many enterprises currently considering constructing a data base are confused by the "data base debate" and concerned about the success of their own systems development plans.

It is reassuring to find many successful data base applications which have operated reliably for relatively long periods of time. Many successful applications support the ongoing, vital business and manufacturing operations of an enterprise.

The following articles describe various successful data base applications on different hardware systems. The point of commonality is that the applications are based on three CODASYL-type data base management systems available today.

The continued success of CODASYL-type data base applications, and the increased number of implementations of CODASYL data description and data manipulation language specifications on a variety of hardware systems, indi-

cate increased acceptance of the CODASYL approach.

It appears likely that the CODASYL specifications will be widely adopted in the next few years for foundational, common data base facilities for most hardware systems.

Part of the specifications regard languages. A foundational data base language must possess a great degree of flexibility in data description and data manipulation facilities, and also must permit user control over logical data structure and disc storage structure as well as physical data placement and allocation of storage devices. Of course, a foundational language can be used effectively in its basic form as an extension of existing languages, such as COBOL, FORTRAN, assembler and others. Continued use experience of CODASYL-type systems will provide insight for implementors and users alike. Such experience and insight will lead to knowledgeable direction of the development of additional capabilities at the foundational level. The CODASYL specifications provide the basic tool for developing other higher-level data base systems which may be specifically designed for a given application or may be general purpose, self-contained systems.

CODASYL-type systems

The following is only a partial account of CODASYL-type systems which are now being used or implemented.

- The Phillips Host Language Systems (PHOLAS), developed by Phillips Data Systems, Apeldorn, Netherlands, is designed to operate with COBOL as host language on Phillips P1000 machines with a minimum memory of 64K and is compatible with all P1000 operating systems.
 - Integrated Database Management System (IDMS) operates on IBM 370 vs systems as well as IBM 360 OS and DOS systems. IDMS interfaces with COBOL and other languages which possess a CALL verb. IDMS has operated in a production environment since January, 1972 and is currently being developed by the Cullinane Corp. IDMS also operates on the Univac System 2 and is currently being implemented for DEC PDP/11 hardware systems.
 - DMS-1100 was developed by Univac for operation with COBOL on their 1100 series hardware. DMS-90, based on IDMS, has been converted and installed for use on Univac 9000 series hardware.
 - Integrated Data Store (IDS) is the oldest of the CODASYL-type systems available. It runs on Honeywell Series 400, 6000 Series and Series 60 computers. Currently IDS-I is being enhanced to conform more closely to the April 1971 CODASYL DBTG specifications. The new IDS-II is being implemented for Honeywell 6000, and Series 60-Level 66 computers.
 - Data Management System (DMS) has been developed to operate on the Xerox Sigma 6, 7 and 9 systems. The Extended Data Management System (EDMS) is an upward compatible extension to DMS to include many CODASYL DBTG facilities and operates under the Xerox CP-V operating system.
- The commonality of CODASYL-type

DIRECTIONS IN DATA BASE MANAGEMENT TECHNOLOGY

data base software among IBM, Honeywell, DEC, Xerox, Phillips and others allows portability of data base applications among hardware systems without extensive application redesign and reprogramming. These systems currently provide much of the capabilities needed to support different types of scientific, manufacturing, business and financial applications.

Current problems

The greatest deterrent to widespread use of data base systems is the user awareness that an integrated data base approach within an enterprise mostly represents a change in direction from whatever type of system currently is in existence. The potential user is faced with an uncertain picture in terms of numbers of highly skilled personnel required to support and maintain the data base software. Added to this is the lease cost of the software and the amount of added computer hardware required to provide reasonable performance. As the following articles show, use of a data base does not automatically require a data communication system with on-line terminals. A particular data base application can be designed to run in batch mode and may only represent a small, manageable portion of another larger, integrated data base. Additions to an existing data base can be part of a carefully planned implementation of a larger data base which will integrate many business and financial processes in an enterprise. Also, not all applications need to be data base oriented. Many applications should be batch serial from cost effectiveness and data security viewpoints.

The selection of a data base management system is an important decision for a user. Once applications are developed with a given data base management system, the user becomes locked-in to continued use of the system for the life of an application, which may easily be five years. If the particular data base management system is abandoned by the vendor, the user must decide whether to continue using abandoned software or stand a considerable conversion cost. Careful consideration must be given to the data base management technology which will survive and flourish in the next 10 years, regardless of which hardware vendor will survive. The overall success of CODASYL-type systems today indicates at least a 10-year existence and appears to be the way of the future.

What is needed today

Many data base software implementation problems have been identified by both users and implementors of existing data base management systems.

Such problems reflect the recognized need for added data base capabilities. However, this should not deter active use of current data base technology. The following items describe additional needs arranged in chronological order.

- *Host Language.* CODASYL data base technology should be extended from its present COBOL orientation to provide a common data base and Data Manipulation Language capabilities for a wide range of other basic assembler, intermediate and scientific host languages as well as languages used in a time-sharing environment. A separate common Data Description Language should be used for all host languages.

- *Education* is needed in the proper techniques of data base design, techniques of data and data relationship manipulation, and data administration. The user must have the necessary training to translate the natural data and data relationship of a business, scientific, process control or financial activity into a data base design which will adequately support applications within an enterprise. A data dictionary facility is also needed to control data base design, performance, resource management, programming productivity and data protection. An important first step in education is to identify and publish the data structure diagrams and experience of data base users with critical applications.

- *Conversion* techniques must be developed as an extension of education to convert existing related serial applications which may be up to 10 years old in design. Conversion of data structures and data manipulation capabilities of existing dead-ended data base management systems to CODASYL specifications is also needed. Much of this technology may be provided by user experience; in some cases it may be computer-aided.

- *Query Language and Generalized Report Language* specifications should be developed to interface with a data base description which will provide necessary information to select desired data for display. Several software packages exist today to provide basic capability.

- *Reliability and Stability* of the data base management system must achieve the level of hardware devices and retain sufficient flexibility and adaptability to meet future needs. Good reliability cannot be achieved with current technology because the data base management system is primarily software and resides in the same environment as the operating system, communication software, compilers, and application programs. Often a failure in one area

crashes the entire environment including the data base management system. As applications become more sophisticated and demanding of data services, the rollback/recovery function will greatly increase in complexity.

The portions of the data base management system which could be appropriately committed to firmware should be identified.

Further improvements in reliability could be achieved by separating the

Basic CODASYL Definitions

The following data base application articles employ these basic CODASYL terms in text and figures:

Data item

A data item is the smallest unit of data in a data base. A data item is referenced by an assigned name (e.g., PART-NUMBER) and has other attributes which define its length and type.

Record

A record is a collection of one or more data items. A record type is a named description of data items and data attributes included within a record. In effect, a record type is a

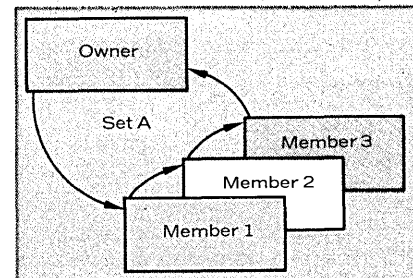


Fig. 1. Set occurrence

model or template which describes the contents of all occurrences of that record type in the data base. In each of the diagrams in the articles a record type is represented by a rectangular box.

Set

A set establishes a named logical relationship between two or more record types and is a basic building block which allows the data base designer to establish complex data structures. Fig. 1 is a representation of one set occurrence which includes four record occurrences (shown as rectangular boxes). A set has only one record type as its owner and at least one record type as member. There may be any number of member record occurrences in a set but only one owner occurrence. Fig. 1 shows three member record occurrences. Logical relationships

data base management function into a separate processor/controller. Although this is not a new idea, work should proceed on the design and implementation of a hardware data base controller based on the CODASYL specifications. This approach has several advantages.

- a. Isolation of basic data base functions into a separate processor improves overall stability of data base control.

- b. Control of data security is improved by hardware separation of application programs.
- c. Separation of data base hardware allows interfacing different makes of hardware.
- d. Each associated processor requires only a functional interface to the data base controller. This allows commonality of data among different makes of computers.

- e. Data base administration can control access and performance in a more predictable manner.

- *Data Security.* Further study of software and hardware techniques needed to produce satisfactory levels of access protection depending on data sensitivity is required. The CODASYL specification provides adequate privacy facilities as part of the Data Description Language. However, this facility provides little protection if the hardware does not prevent unauthorized access to the operating system and data base management software.

- *Continuous Operation* of a data base management system 24 hours per day, 7 days per week will be a requirement in the near future. Most of today's implementations require recurring periods when normal data base operations cannot be executed because maintenance functions such as reorganization, restructuring, or image copying to tape are being performed. Continued implementation of vital applications in manufacturing, on-line operation and other applications requiring 24 hour operation will require implementors to design for perpetual reorganization and other maintenance while operating concurrently with normal data base update and retrieval operations.

These represent general areas where further work is needed. A number of issues must be resolved and technical decisions in each category must be thoroughly understood by both users and implementors before a suitable solution can be proposed. This can only be accomplished by applying current technology to today's business, manufacturing, financial, and scientific processes, as was done for the applications in the following articles. □

are established by a pointer mechanism which links all record occurrences into a continuous chain. The April, 1971 CODASYL specifications allow optional bidirectional chains as well as pointers associated with each member record occurrence to identify the set owner.

The shorthand abbreviation of a set is shown in Fig. 2. The tail of the arrow always touches the rectangular box representing the owner record type, whereas the point of the arrow always touches the member record type. The arrow is equivalent to all chain pointers shown in Fig. 1. Each set is identified by a name (A) which appears next to the arrow. Note that the point of the arrow identifies any number of member occurrences whereas the tail identifies only one occurrence of the owner record type. This is an important key to the understanding of the data structure diagrams shown in the following articles.

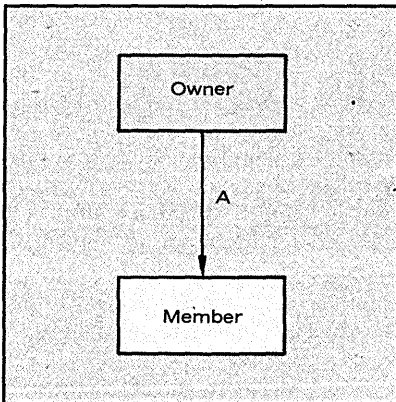


Fig. 2. Set representation

Area

An area is a named subdivision of logical address space in a data base. In the case of IDMS and DMS, an area represents a specified number of contiguous pages in the data base. Each record type appearing in a data base must be stored within a named area and more than one record type may be assigned to a given area.

Schema

A schema is a complete description of all data items, record types, set types and areas which exist in a data base. A schema provides the foundation of a data base dictionary system.

Subschema

A subschema is a logical subset of the schema which names only those record types, set types, and areas that are accessed by one or more specific application programs. In effect, the subschema removes all other record types, set types, and areas from view. Any number of subschemas may be defined for a given schema.

CALC

CALC is an abbreviation of the word "calculated" and refers to one method of record placement (and retrieval) within a data base. A CALC record type is stored in the data base using the value of one or more named data items within the record occurrence to be stored. A hashing algorithm uses the data item values to compute a logical storage position within the area in which the record is to be stored. The data base management system (DBMS) then stores the record occurrence in the data base using this calculated position. When a record occurrence is to be retrieved at some later time, the user program must supply the named data item value before the retrieval operation is requested. The DBMS hashing algorithm is used to recompute the logical entry point in the data base and then proceeds to retrieve the specified record.

In each of the data structure diagrams in the following articles, a CALC entry point into the data base is shown by an asterisk (*) within the rectangular box record representation. In CODASYL-type systems, entry points are specified by the data base designer based on application processing requirements and are independent of data structure.



Mr. Schubert is director of MIS—Technical Support for B. F. Goodrich Co., Akron. He has been a member of the CODASYL Data Base Task Group since 1970 and the CODASYL Data Description Language Committee since 1972. He also served on the CODASYL Systems Committee from 1963 to 1972.



THE DATA BASE IN A CRITICAL ON-LINE BUSIN

MOST PROFIT-ORIENTED COMPANIES dealing in commodity production and sales have a similar organization structure. Their structure is made up of departments which are responsible for performing tasks such as billing, accounts receivable, payroll, manufacturing, distribution, or sales. The tasks performed within each department, however, are not independent of other departmental tasks, but are integral parts of the operation of the company as a whole.

Serial computer applications have been historically developed to handle many of the manual jobs within each department. These serial systems were unable to efficiently interrelate the job functions. Large volumes of redundant data had to be passed from one application to another.

A solution to this problem is the establishment of a common data base to provide for the efficient sharing of data and the physical relationship of logically related data. A history of the development of such a data base at B. F. Goodrich will provide insight into some of the problems and advantages inherent in this approach.

One company's approach

The B. F. Goodrich Chemical Co., a division of The B. F. Goodrich Co., is a major manufacturer of plastics, rubber, and specialty chemicals. It has nationwide manufacturing facilities with around-the-world marketing and sales. The data base applications which have been developed for it are critical to the everyday business functions of the company.

Initial experience included a single data base implementation in 1967 which supported an on-line order entry/finished goods inventory system. This system offered some of the advantages of a data base including elimination of redundant data, on-line data base updating and video inquiry. The technology of disc processing, essential to a data base, at that time had shortcomings compared to tape serial processing. Disc processing was then too slow to support passage of large volumes of data for sorting and printing and too costly for storage of large volumes of data. Where on-line interactive data processing during the day was

The existing flow of financial data is the key to modularly constructing an integrated company data base which will efficiently support critical dp functions.

ESS ENVIRONMENT

by Gerald E. Huhn

not required, serial processing was still a better approach.

By the early seventies, disc technology had made significant advances. Direct access retrieval was considerably faster on the new devices and the cost per unit volume of disc storage had been greatly reduced. Both hardware and software were available to support a large integrated company data base system.

Following completion and acceptance of the April, 1971 report of the CODASYL Data Base Task Group (DBTG), Goodrich implemented a subset of the DBTG specifications for operation on an IBM 370/155. This implementation, called Integrated Database Management System (IDMS) has been in production operation since January, 1972, and was originally intended for use within Goodrich.¹

Building a piece at a time

The implementation of an integrated data base to support major company functions such as distribution, billing, accounting, sales, etc., is an intriguing challenge to most companies. How-

ever, computer systems are not born overnight and such an effort might be a three-to-five year project and require a sizable investment in system and programming effort. Before the possibility of developing this single data base is discarded because of this investment, however, one point should be made—a single data base does not necessitate a single systems development. Just as serial systems, data base systems can be developed in a modular form, each adding a new piece to the total picture. Some of these systems may be new, while others may be stepwise conversions of existing systems.

In defining the company data base, the most common denominator is financial accounting. We can define the major company functions which have an impact on the financial data. These functions may also have interrelationships with other functions. A diagram of these interrelationships looks like an interdepartmental data flowchart. Fig. 1 represents the major elements of this picture.

With this general analysis of the ma-

ior company functions and their interrelationships, we can map out a plan for systems development. As stated earlier, the complete data base system need not be developed at one time. The initial application should consider a company's data base experience as well as application needs. For instance, a customer or vendor master or a sales history might be considered for initial implementation onto which new systems can be built.

Though the use of a data base offers many advantages for some systems, it should not be blindly considered for every application. Infrequent use, such as quarterly or yearly budget and business planning systems, or the security required for payroll or other sensitive applications may make serial master file processing more desirable.

After considering the feasibility of developing a system using a data base, the mode of processing, on-line versus batch, must be decided. In making this decision, the first question to consider is "how critical is the timely processing of this data?" The timely processing of an order may be considered critical

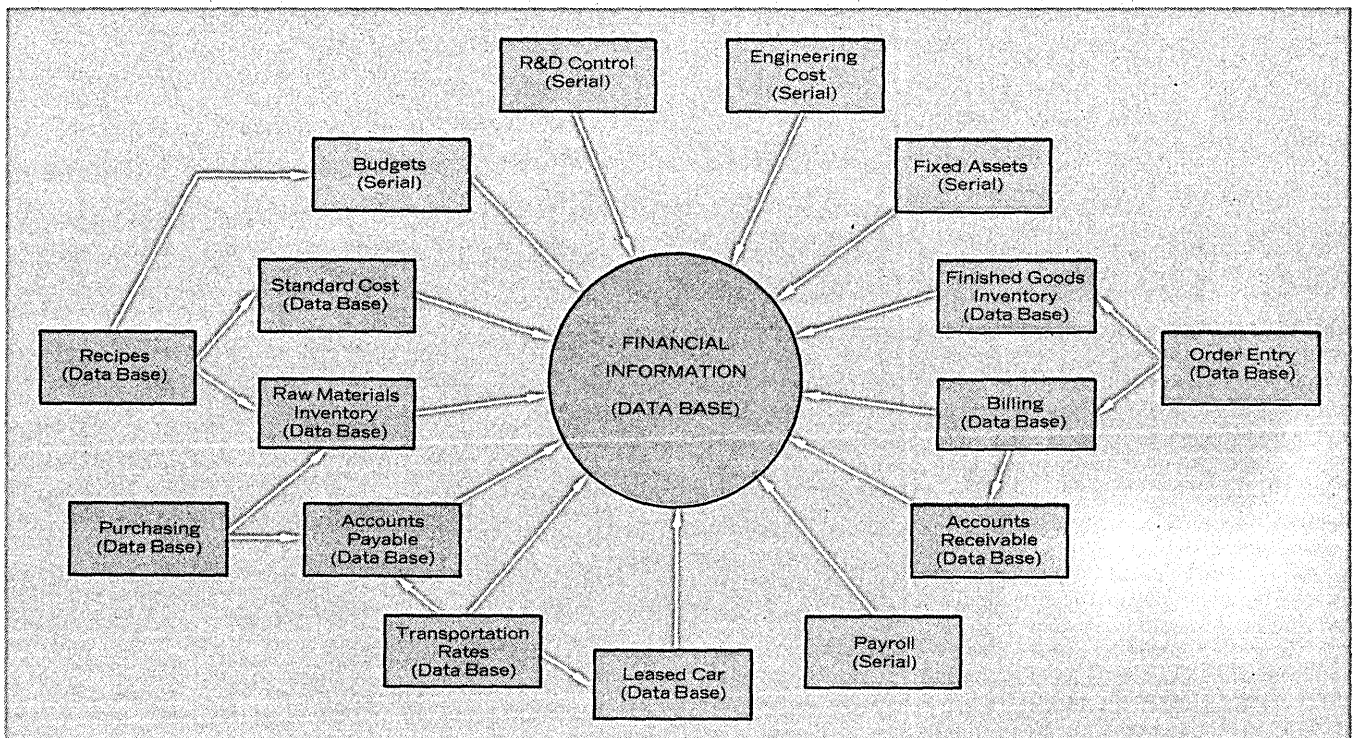


Fig. 1. The most common denominator in defining a company data base is financial accounting. The illustrated relationship

of pieces of financial data is a good approximation of an interdepartmental data flowchart.

¹For information about IDMS, contact The Cullinane Corp., Suite 102, 3250 W. Market Street, Fairlawn, Ohio 44313.

THE DATA BASE IN A CRITICAL ON-LINE BUSINESS ENVIRONMENT

while the billing or accounts payable functions may only require daily or bi-daily processing.

Also to be considered is the cost of on-line processing. On-line systems require data communication programs to handle messages and control a variety of remote terminals. The discs for the on-line data base applications must be continuously available to the system. Program maintenance and testing also must be considered in an on-line environment. Also, recovery following a system crash is considerably more complex in an on-line environment. These costs and problems must be weighed against the benefits of the on-line system.

Converting order entry

The initial step in developing an integrated company data base was the conversion of an existing on-line order entry and finished goods inventory system from a GE 235 to an IBM 370/155. The basic data structure for this system is shown in Fig. 2. Each rectangle represents a single record type. The arrows represent the logical set* relationship among the record types. Records which may be selected based on the value of an item contained within the record are identified with an asterisk. Such record types are called CALC (CALCulated) records and serve as entry points into the data base.

In reference to Fig. 2, we can start describing our data base with the Customer Base record. This record is unique for each customer served by the company. For each customer there may be several shipping locations and billing locations. These are represented by the Customer Bill and Customer Ship records. The records contain shipping and billing names, addresses, other codes and data pertinent to that customer's shipping and billing functions. The next basic records are the Order and the Order Item. The Order is defined as a member record in the customer order set (co) which permits many orders to exist for each Customer Ship record in the data base. This same type of relationship exists between the Order and the Order Item where many items can be placed on each Order. The Order Item is also related to the Product Master record. With this structure, an application program can select all the orders for a particular customer, or for a particular product. This structure can provide fast response to order status inquiry by either customer or product.

The Finished Goods Inventory record is also related to the Product Master record. In this relationship,

there may be one or more Finished Goods Inventory records depending on inventory location, type of packaging, or manufacturing lot number. Basic product pricing data is contained within the Base Price record related to each Product Master record. The Contract Price record is related to both Product Master and Customer Ship records. As such, this represents a negotiated contract price for a given product for a specific customer.

In the processing of an order, the customer's credit status may be checked. The Customer Base record contains the customer's credit exposure based on current open orders, billings, and accounts receivable.

The relationships of Standard Routing and Customer Ship records to the Customer Requested Routing record define the most preferred method of

delivering products in various plant and warehouse locations to customers.

The Shipment record is related to the Order Item record and contains the status of shipment for each item on the order. The shipment information was originally extracted on a daily basis during the evening and passed to a serial batch billing system for creation of customer invoices.

Conversion of an existing batch serial billing system on a GE 235 to a data base was the next step in developing an integrated system. The new billing system is a batch data base system. It accesses data contained in the Shipment record and generates customer invoices using information contained in the Order, Order Item, Customer Ship, Customer Base and Customer Bill records. Invoice information previously was generated for input to an

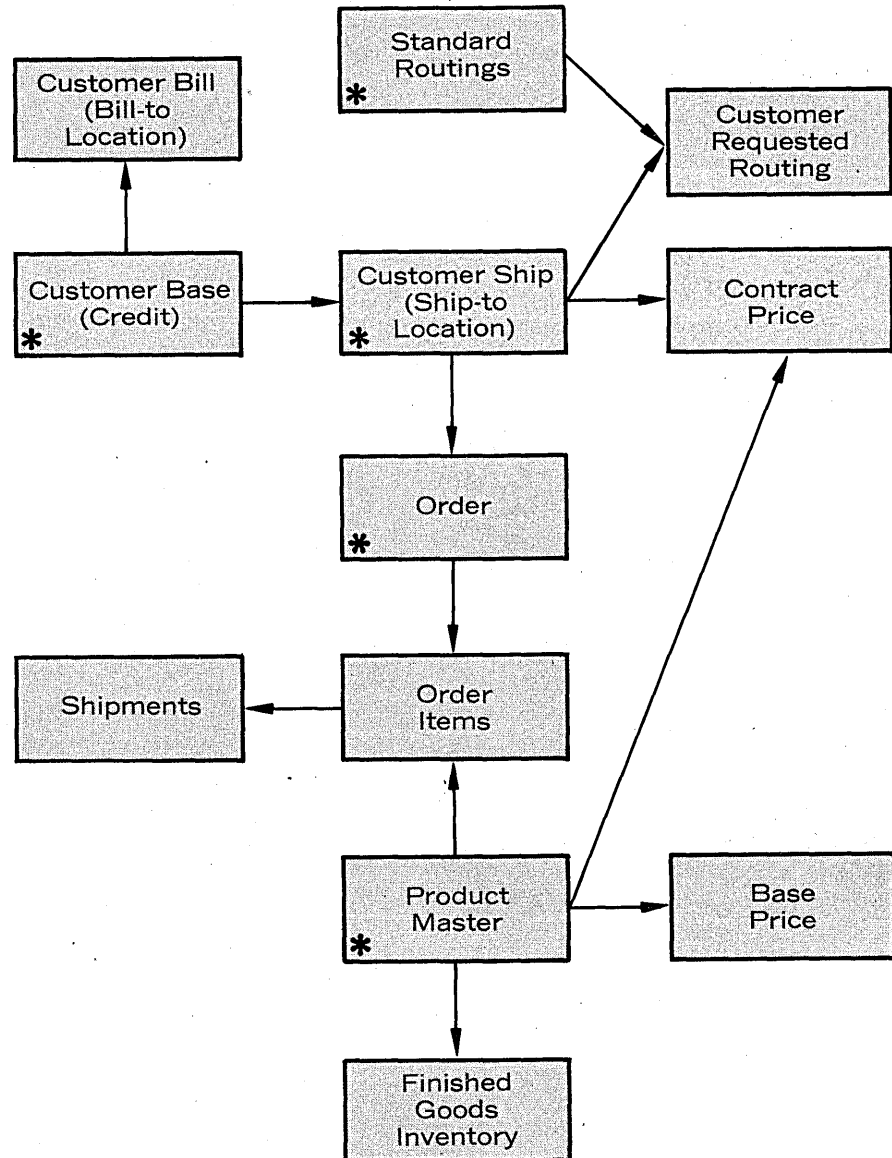


Fig. 2. Entry into the data base can be made through keys in any of the asterisked records. The data base can contain one record of each of the top six types for each customer, but there may be as many Order records as that customer has outstanding orders, and many Order Item records for each Order record.

*For definitions of this and other data base terms, see the introductory article by Richard F. Schubert in this issue.

existing batch serial accounts receivable system. Note that implementing a data base billing system only involved modifying data items within existing records in the data base.

Converting accounts receivable

The next modular step in data base development was converting the serial accounts receivable system to operate with a data base by adding new record types and set relationships, as shown in Fig. 3. Since several invoices can be created for a given order, the Accounts Receivable record is related to the Order record. Each payment made by the customer is compared with the original invoice and stored as a Payment record. Both accounts receivable and billing systems update the credit status of the customer in the Customer Base record.

Prior to the development of order entry, finished goods inventory, billing, and accounts receivable systems, a separate batch accounts payable system was implemented as the first IDMS production application in January, 1972. The Accounts Payable record is related to the Vendor Master record and each vendor is related to the Purchasing record. The addition of Raw Material Master and Raw Material Inventory records to the Purchasing records, to control both engineering stores and chemicals, is the next step in data base development.

The Freight Bill record is related to both Shipments and Accounts Payable records and interconnects two portions of the data base which were developed separately. This illustrates the approach of separate development of data base modules to achieve initial

simplicity of application design and implementation. Extensions of existing modules to support additional new applications may then involve the interconnection of one or more other modules. Careful planning and a workable implementation strategy are keys to the successful development of an integrated data base.

In any design of an integrated system, consideration must be given to the cost trade-offs of a data base versus a serial tape organization of data. The problem of data base recovery following a software or hardware crash is more complicated than a serial system and may be more costly. Finally, the cost of achieving an adequate level of data security is considerably less with a batch serial system and may be more reliable.

Development cost

The primary concern in developing a new system is "What will it cost to design and program?" To determine the design cost of a data base system versus a serial system, a comparison of simultaneous designs by two teams of analysts would be required. Time and cost considerations eliminate this as a practical approach. However, several guidelines in design can be offered:

- The data base offers the systems analyst a means of relating data in a manner which closely resembles the real world relationships. The completed data base layout (Figs. 2 and 3) is in itself an excellent foundation for designing both current and future applications.
- The design of data validation methods is greatly simplified because the entire data base is available to each transaction. Input data need not be sorted since the data base can be accessed randomly.
- Program documentation is enhanced. Use of the data manipulation language verbs of IDMS such as STORE, FIND, DELETE or MODIFY reflect the type of operation being performed and thereby add meaning to program functions.

Analyses for several systems of similar complexity have shown that programming and debugging a data base system takes 20% to 25% less time than programming serial systems. Although a data base system does require additional coding and testing to establish the data base record definitions, this is offset by the decrease in application coding and testing. Much of the time saved can be attributed to the simplicity of accessing and updating data base records compared to the file-merging and end-of-file logic inherent

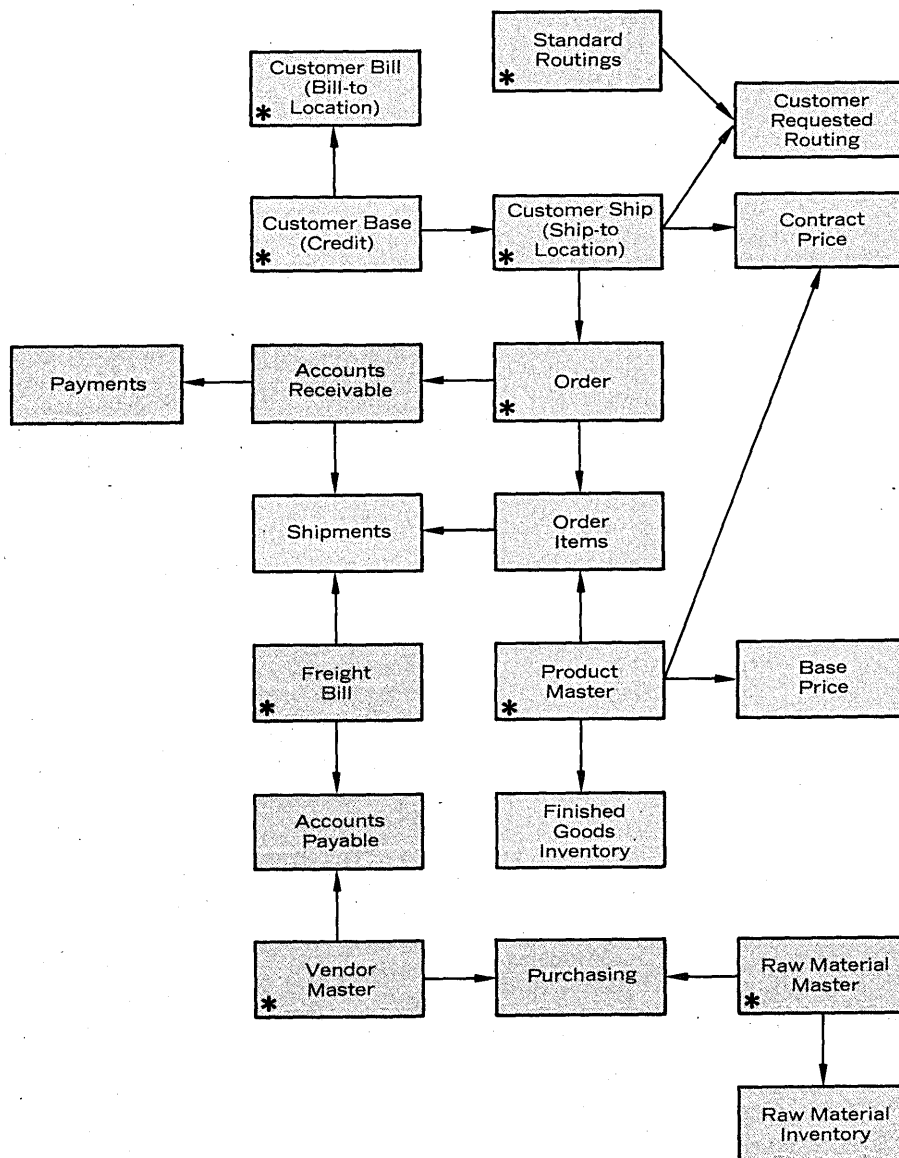


Fig. 3. To have a single data base, it is not necessary to have a single data base development project. Just as serial systems, data base systems can evolve modularly, as the additions here indicate.

THE DATA BASE IN A CRITICAL ON-LINE BUSINESS ENVIRONMENT

in serial processing. In addition, because the entire data base can be accessed, fewer numbers of programs are required in applications which use a data base; this also decreases the perpetual cost of maintenance, once the applications are operational.

Basic IDMS benefits

There are other benefits to IDMS besides reduction in number and complexity of application programs. The IDMS Data Dictionary/Directory provides cross reference documentation of sets, records, data items, subschemas and user programs. The Data Dictionary/Directory also provides complete record descriptions which are automatically included in the Data Division of a user program during compilation. This reduces the amount of coding and coding errors during program implementation and establishes common data names and data description for all applications which access the data base.

Data integrity and recovery

The ability to recover from application program failures, power failures and hardware crashes is critical to continued operation of the order entry, daily rules reporting, and distribution functions of Goodrich.

The major key to this recovery is the journal tape. Whenever a change is to be made to a record on a particular page in memory, the page is copied from IDMS page buffers to a journal tape prior to the change. This is referred to as the "before" page. Further, a copy of an updated page is written to the journal tape prior to return of the updated page from memory to the data base on disc. This is called the "after" page. Checkpoint records are also written on the journal tape to mark the beginning of program execution.

In the event of a software or application program failure, the "before" pages are copied from tape to the data base to restore the data base as it existed just prior to start of job execution. The "after" pages are used to recover the data base following a hardware crash.

When a program failure occurs, other data base programs are temporarily halted and the recovery utility is automatically invoked. Programs in "hold" status are then released, permitting continuation of on-line processing. The time required for recovery and release of the data base is dependent upon the volume of the data to be recovered from the journal tape. Normally, a recovery requires a 10 to 15 second interruption in on-line processing. For power failure, operating system or hardware failure, recovery must

be handled manually. Such failures, however, generally take more consideration than just data base restoration. If on-line terminals are involved, I/O message status for the on-line systems must also be evaluated. Except for failures which require vendor assistance, complete recovery of the system can be accomplished in 10 to 15 minutes.

In addition to on-line recovery, total file recoverability is maintained through dumps of the entire data base file at the beginning and end of each day's on-line processing. All input transactions are also dumped to tape to permit reprocessing an entire day's business if necessary.

Data security

Data security is maintained by a data base administrator. His function is to monitor and control all operational aspects of the data base. His primary responsibility is to participate in data base design and control implementation of the integrated data base. He is responsible for the complete schema description which defines record, set and area relationships for the entire data base. IDMS permits segmenting this schema into subschemas. A subschema is a named collection of specific records and sets which are needed by a given program. This means that the program is not permitted to access any records or sets other than those included in the subschema invoked by the program.

A data base area may also be specified to allow specific record and set types to be physically located on a removable portion of the data base.

Additional security problems exist when on-line data base inquiry applications are developed. Here the security can be built into the inquiry software and into the processing program. Access to inquiries for a particular system can be restricted to certain on-line display terminals. In addition, security ID numbers can be maintained for particular programs within a system.

It is clear that considerably more work needs to be done in data base security.

Performance

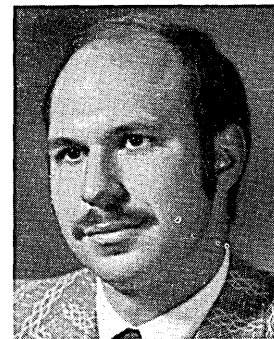
One of the final considerations of a data base system is its performance. "How much time does it take to process data and how much disc storage, and how much core?" The processing time per transaction can vary considerably depending on the complexity of processing. Performance is also dependent on hardware components and operating system characteristics. Goodrich order processing is run on the IBM 370/155 using OS MVT, HASP

3.1, and IBM 3330 disc drives. The typical order for two products may require up to six 80-character lines which may be input from cards, teleprinter or video terminal. Processing requires:

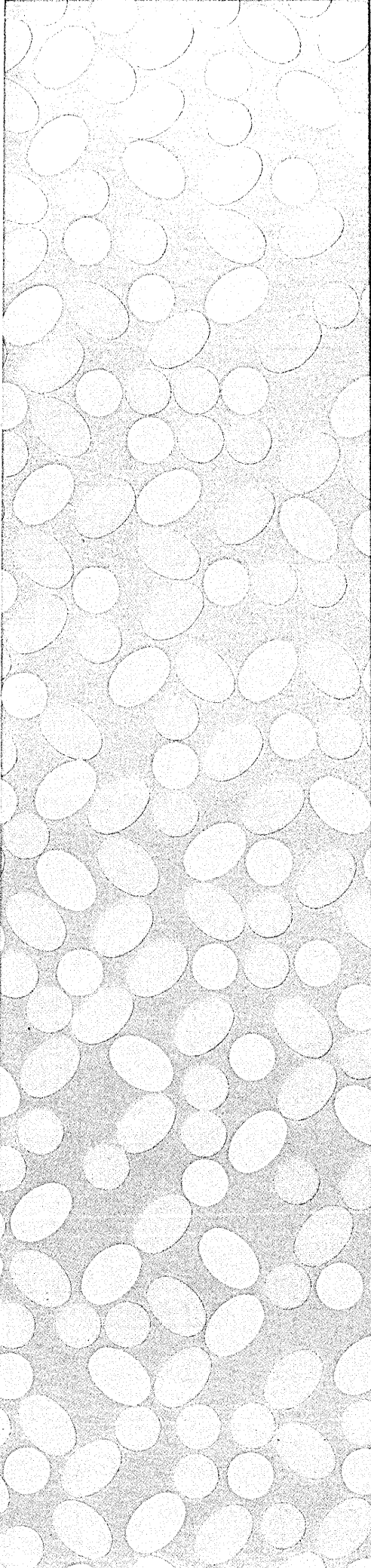
- approximately 15 changes to the data base involving new record occurrences, retrieval, and modifications to existing records,
- complete validation of the transaction,
- order processing (two programs), and
- creating shipping order and other messages based on type of order.

Central processor time amounts to approximately 0.5 seconds. The memory requirement for IDMS is 32K plus 18K for six page buffers. An additional 8K is required for the version of IDMS which handles simultaneous access to the data base for video terminal updating and inquiry, as well as the processing of the telecommunication input. Hardware overhead also includes one tape drive devoted to the data base journal tape and two 3330 disc drives for on-line data base storage. A third 3330 is used for batch data base systems.

The experience at B. F. Goodrich Chemical Co. has proven that a data base system is a viable system capable of handling major company business processing activities, and that a modular stepwise approach to the development of the data base works. In addition, we have proven a data base approach can be used to support critical data processing functions of the company and can be interfaced effectively with serial processing systems. A data base system *can* be an economical and feasible solution to a data processing problem. □



Mr. Huhn has spent six years on data base applications development with B. F. Goodrich Chemical Co. A project manager, he is responsible for data base management, for the on-line order entry and inventory systems, and for the financial information system (which includes factory and sales accounting, general ledger, and financial statements).



Though some conversion is likely, a data base system can continue to evolve to incorporate more and more of a company's data.

THE EVOLUTION OF AN INTEGRATED DATA BASE

by Kenneth D. Reside and Theodore J. Seiter

THE INTEGRATED DATA BASE utilized by General Electric's Aircraft Equipment Div. is the product of an evolutionary development begun within the Utica, New York operations in 1959. This evolution, which is still continuing, has provided the information systems staff with an excellent vehicle for assessing the benefits and the problems associated with data base techniques.* This article will attempt to share some of our experience with the reader.

The management problems associated with the aerospace electronics industry are complex and challenging. Tight schedules, competitive bidding, unavailable material, and state-of-the-art designs are just a few of the aspects that lead to numerous design changes, end-of-schedule squeezes and other cascading production control headaches for the contractor.

In the late 1950s, inventory problems, such as end of job shortages, led us to the development of our first data base system. The solution to the inventory situation was to lock and centralize the scattered stockrooms. We believed that the logical way to accomplish this successfully was through the design of an information system that could be accessed frequently enough to keep inventory counts accurate and thereby insure the availability of material in the stockroom based on data acquired from the system.

Our first systems

An inventory control application was developed in 1959 which contained a data base with one record type. It was

used to successfully control a serious business problem. Inputs and outputs were batch processed every half hour throughout the first shift to ensure the accuracy of data on the file.

In 1963, the system was converted to the first Integrated Data Store (IDS) data base manager, which operated on GE 225 computers. The structure utilized in that data base is depicted in Fig. 1. The modified inventory control system supported production material control functions for the department. All production material receipts and releases from stock were processed through this system on a semi-real time basis on regularly scheduled intervals throughout the day. With this early data base structure and our management philosophy concerning inventory control, we were able to produce accurate stock balance listings, drawing inquiries, stock balance information by requisition number, and valuable statistics used by manufacturing personnel to control inventory levels.

However this system solved only a portion of the material control problem. We were employing manual engineering documentation procedures and purchasing techniques which were fraught with problems and inconsistencies that obviously had to be dealt with if we were to continue cutting costs and schedules.

Successful support of Utica operations placed user-oriented requirements on future application development. These requirements were as follows:

- Data had to be available on a timely basis.
- There would be no degradation of operating flexibility.

*For definitions of data base terms, see the introductory article by Richard F. Schubert in this issue.

INTEGRATED DATA BASE

- Application operating procedures would be enhanced.
- A common data base would be provided for all applications.
- Control of data base integrity would be improved.
- The application system had to be difficult to circumvent or override.
- Minimum changes would be made in user procedures.

All these criteria led to the development of another data base in 1965 as the solution to our engineering business needs. The data structure developed for this application is shown in Fig. 2. The engineering documentation control system that was established maintains a linkage of the documentation necessary to fabricate and ship a final product. This development eventually became the foundation for the data structure of the integrated data base in use today. This structure evolves from the release of new drawings by Engineering and the subsequent use of those drawings on parts lists and other drawings. It contains the logical linkage of all engineering data required to produce the output documents from the system, such as parts lists, manufacturing material requirements and microfilm aperture cards. In addition to providing top-down equipment breakdown lists, complete file inquiry capabilities exist. For instance,

“used-on” reports identify a part’s usage across all of our products.

A key feature of this application is the elimination of redundancy, a valuable feature considering the many uses of a given drawing number or part number. The flexibility provided by this system also enables us to track engineering revisions by part or by document sheet.

The Quality Assurance subsystem conducts the audits necessary to insure that the parts, materials and processes are approved for use in a product, and that the vendors have been authorized to supply a particular component. This audit is conducted prior to the engineering release. If a particular part fails the audit, it will not appear as a parts list item (Fig. 2) and therefore won’t be purchased.

Complete file inquiry capability was also included in this system. The most important asset of this application is the system controls which were established. The only way a parts list can be released is through this system. This insures that the data base always represents an exact replica of the document released by Engineering, and therefore, makes the data base available to other functions with a 100% guarantee of integrity. By the same token, a part selection, as mentioned previously, must have quality assurance approval before it will appear on the parts list.

This audit is performed at the time of parts list release and again at the time of procurement.

Enlarging the scope

The next phase of data base development occurred in 1966 in the purchasing area. The data structure,

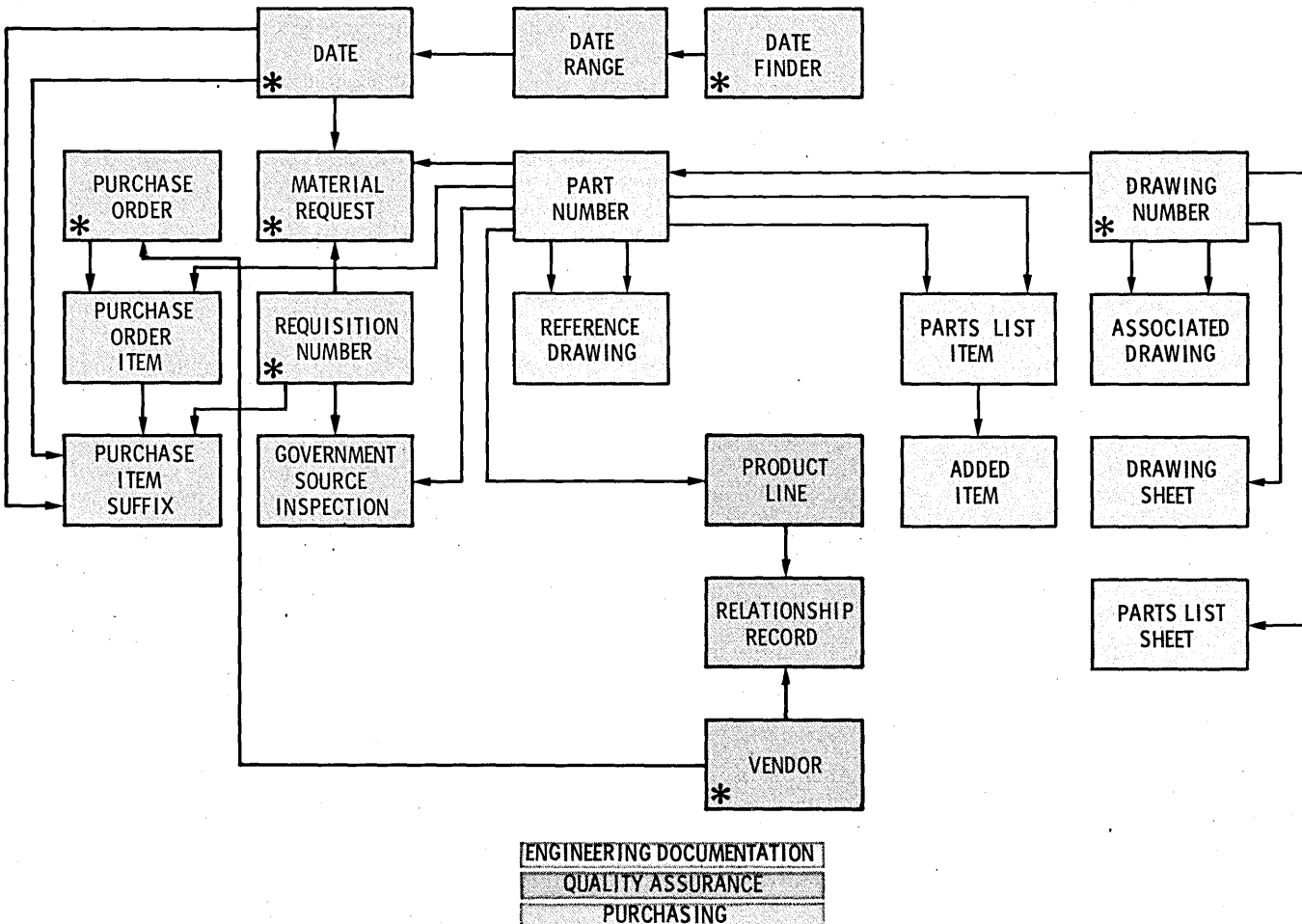


Fig. 3. The incorporation of purchasing information to the documentation and quality assurance data base provided control over purchase order backlog, material requests expediting, and purchase order status.

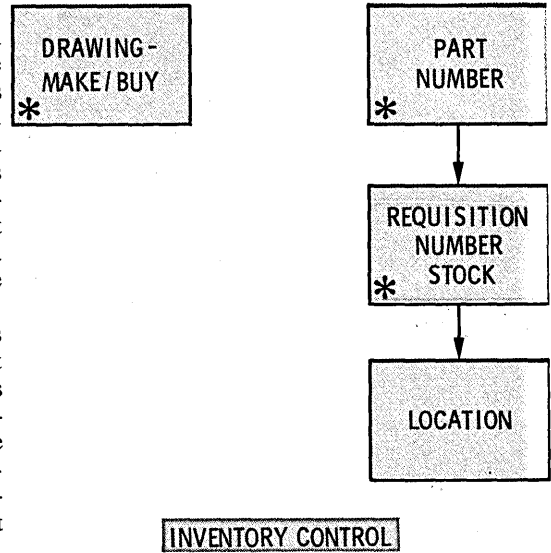


Fig. 1. In 1963 an existing simple inventory control system was converted to Integrated Data Store and modified to support production material control. Note that the asterisks indicate entry points into the data base.

shown in Fig. 3, integrated purchasing data with document control data to provide necessary control over the problems of purchase order backlog, material requests expediting, and purchase order status.

We believed that a system of this type must not only produce the paperwork required to purchase the material, but, more important, must provide capability and visibility for material expediting purposes. To this end, the data base incorporates information such as material orders, material-required dates and vendor-promise dates with the appropriate engineering drawing and component approval data. This supports the preparation of the required output data.

The system utilizes the results of a material explosion from engineering requirements to create an open material request file by generating a material request document for the buyer. This document displays the requirement schedule of a particular drawing number which becomes the fixed information for the purchasing activity. Upon completion of the material request document by the buyer, the purchase order data is processed by the system, the material request record is reconciled and a purchase order record is created.

Throughout the working day, the file can be interrogated to obtain material status of all open purchase orders of any particular vendor. This display

shows the required dates and promise dates of all purchase order items. On a contract basis, an inquiry could identify not only the open purchase orders but also all orders which are in process in purchasing, providing a complete display of material status for a contract. The most important feature of this system is that there is no parallel manual system which can be operated to procure production material. The importance of file integrity and file

availability in a system of this type cannot be stressed enough.

The final phase

Fig. 4 depicts the final phase of the data base evolution. It shows the complete integration of the four areas previously mentioned. This phase involved the complete rewrite of all data base programs in COBOL, and the complete restructure of the data base to include our separate inventory control.

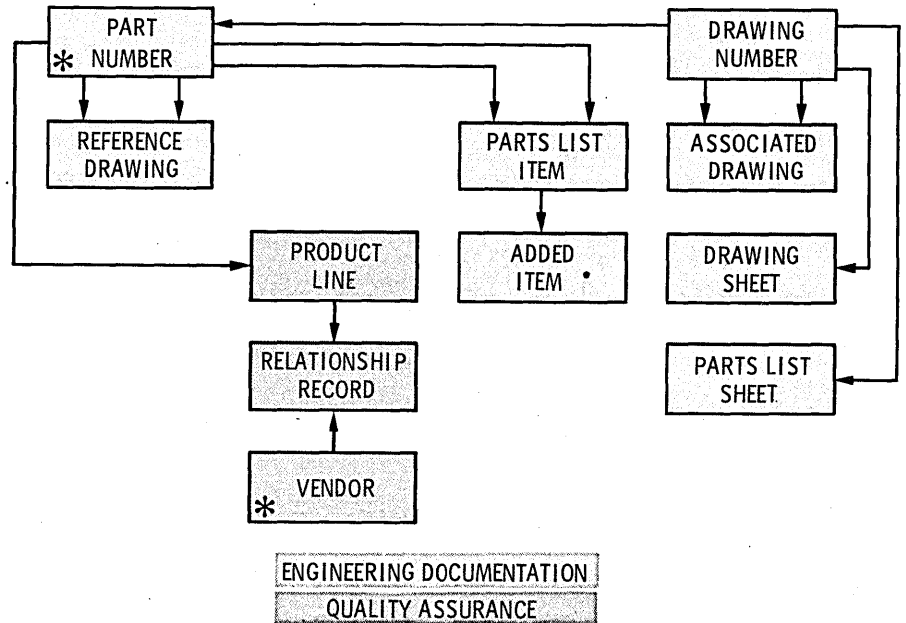


Fig. 2. The second major development was the creation of a separate document control and quality assurance data base.

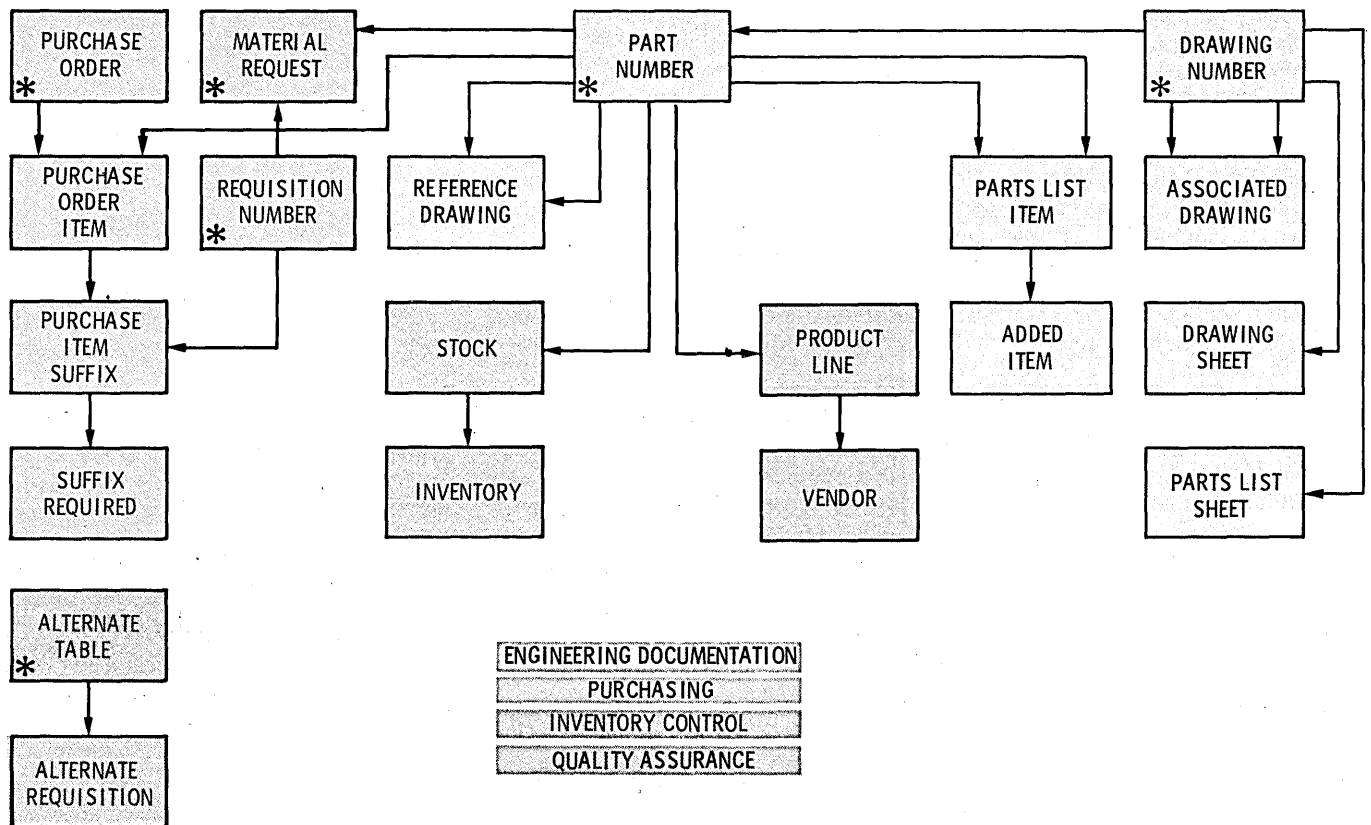


Fig. 4. The final stage of development saw the integration of the documentation/quality assurance/purchasing data base with the inventory control data base. This phase required the complete rewrite of all data base programs in COBOL, but pro-

vided such synergistic features as the ability of the purchasing system to screen available material stocks before drafting new purchase orders.

INTEGRATED DATA BASE

Two of the most significant revisions that were made at this time (1969) due to processing cost considerations were the elimination of the vendor and date records as entry points to the data base. These inquiry features which were mentioned previously during the discussion of the purchasing application are now processed in a batch mode only.

An additional benefit obtained from this final integration of data is the ability of the purchasing system to automatically screen other available material before requests are placed on the buyer for procurement. Prior to being forwarded to Purchasing, the material requests are screened against in-house end-of-job surplus material and previously purchased quantity discount material. All open purchase orders having quantity discount material due are also screened, and the appropriate change paperwork and receiving masters are generated for internal use.

Data base integrity is probably the foremost consideration in developing an application of this type. Our data base protection routines are designed to collect all input transactions, including job control cards, on a transaction journal tape as they enter the data base update program. In addition, copies of disc pages about to be updated are collected on a separate journal tape. When a system failure occurs during a data base update, the data base can be rolled back to the beginning of a program which caused the failure using the "before" page images previously collected on the journal tape. This recovery rollback occurs about six times a month in our present environment. It is also noteworthy that when disc hardware damage is suspected or actually occurs, both customer service personnel in our data processing operation and data base personnel from the systems and programming area get involved in setting up and following data base re-creation or recovery runs. We are currently developing an automatic rollback software package which will function within our operating system. This package will be implemented in phases over the next two years to provide a complete data base recovery and re-create package.

Remote access

Another key point for discussion is our experience with remote interactive access to the data base. Significantly, most of the major product-oriented computer systems developed from 1963 until 1972 had been oriented toward the ultimate use of remote processing techniques. The benefits of allowing data processing users to interact with the computer led to the addition

of a frontend network processor to our GE 635 hardware configuration in 1972. The use of remote CRT inquiry capability in our drafting, purchasing, inventory control and components engineering activities reduced complexity in our data collection procedures and provided current, accurate status information. Users were now able to obtain parts usage inquiries, stock balance information, material request and purchase order status, drawing information and part approval information, which were previously available only in a batch mode.

The installation of this remote inquiry capability led to a data base user's request for on-line data base update to further reduce critical production release cycles. However, there were complications. As mentioned previously, our approach for successfully controlling part of our business utilizing a data base system as a tool is based upon data base integrity and availability. There did not appear to be any way to effectively retain our strict journalization procedures and still allow users to freely access the data base for update purposes.

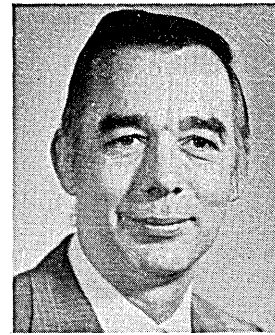
The solution to this problem was the implementation of an on-line delayed update application. In this application, the user enters transactions using a CRT terminal. A transaction verification program, having retrieval-only access to the data base, receives the transaction, verifies its validity on-line and posts it to a disc transaction file. Invalid transactions are corrected immediately by the user at his terminal. A batch file update program is spawned by the transaction verification program when the user signs off. The advantage of this procedure is that it gives the user a way to enter and immediately verify critical transactions, with a minimum impact on existing batch oriented data base update programs, and still allows us to employ full transaction and page image journalization, to be used for rollback and recovery.

In our operating environment, there are limitations to the types of programs that can access an IDS data base concurrently. Any number of retrieval-only inquiry programs can access the data base concurrently, but an update program must have exclusive access to the entire data base. Due to this, our remote users frequently were denied access to the data base while an update activity was executing. Conversely, batch updates were denied access while remote inquiries were executing. These delays were not acceptable to the users of the system. In order to rectify this situation and still avoid the full cost of a fully recoverable data base system that would allow free update/retrieval

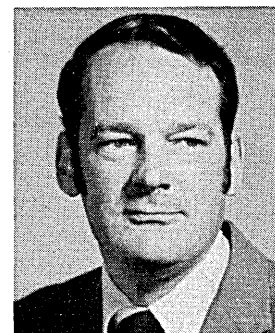
access to all users, we elected to install a compromise scaled-down multi-access capability to meet our needs. In this application, one update program and an unlimited number of retrieval-only programs are allowed to access the data base concurrently. Although each of our retrieval programs had to be modified to allow for instances where update and inquiry modules would be asking for the same data simultaneously, this application was very easily implemented with no increase in processing costs, and it completely solved our data base access lock-out problem.

The evolution continues

Currently, the data base contains approximately 70 million data and control characters stored on 100 million characters of disc space. Our future plans call for continued evolution of the data base to modularly integrate other product-oriented applications. We believe that the key to continued success in this will rest with our ability to advance technically while demonstrating the direct economic business benefits from improvements in data base management. □



Mr. Reside is the manager of business information systems for General Electric at Utica, New York. He has worked in software systems development for scientific and business applications.



Mr. Seiter is the manager of manufacturing and engineering systems and programming for General Electric at Utica, New York. His background includes nine years experience in information systems work, primarily with data base projects.

A data base approach can be profitable even with many small data bases instead of one large one, and even when most of the processing is done sequentially.

WE BET OUR COMPANY ON DATA BASE MANAGEMENT

by J. Stevens Blanchard

A LITTLE LESS THAN THREE YEARS AGO we bet our company's future on the use of a data base management system. Since then our sales have almost tripled and the company has been in the black for more than a year and a half. In short, the bet paid off.

Our company, Science Dynamics Corp., is a five-year-old specialized service bureau located in Torrance, Calif. Accounts receivable processing for medical professionals is our only product. We originally did our processing with a tape-oriented system, and there was some question whether our application was really suited for data base management. Even now our system is unusual among data base applications in several respects:

1. More than one data base is involved. We service more than 120 customers, each having a separate and unique data base. These customers range in size from single-physician offices to large medical schools with 800 or more doctors.
2. The structure of the data bases is not elaborate. There are only 18 records and eight sets* involved in each.
3. The majority of the processing done on the data bases is *sequential* in nature.

The primary language used in the application programs is COBOL—with a few assembly language routines. The application is run on a Xerox Sigma 6 computer under Xerox's CP-V operating system. The data base management software used is Xerox's Data Management System (DMS).

DMS contains two major compo-

*For definitions of this and other data base terms, see the introductory article by Richard F. Schubert in this issue.

nents, the File Definitions Processor (FDP) and the Data Base Manager (DBM). The FDP accepts information describing a data base and its components and creates a schema file. The DBM is a library of routines which reside with the application program and interface it to the data base with help from the schema file. A DMS data base is a file consisting of a quantity of 2048-byte pages which are directly accessible by number.

The application

The Medical Accounts Receivable Management Service, MARMS as we call it, consists of a balance forward accounts receivable system with two billing functions. One billing is directly to the patient or the head of the family and the other to the insurance carrier or another third party. Master files are updated and transactions are entered into the system with complete reporting back to the customer daily. Demand, retroactive insurance statements, and detailed month-to-date journals are produced weekly. (Journals produced by MARMS are patient financial histories including beginning and ending balances.) Patient statements, automatic insurance statements, monthly and year-to-date journals, aged accounts receivable and delinquent accounts reports, and detailed production and income management analyses are produced monthly.

The billable entity and unit for which balances are kept is the account. It usually is a family but may be one person or a company. The account number, name, type code, zip code and status are stored in the NDX (index) record and the rest of the basic information pertaining to an account is stored in the ACCT record (see Fig. 1).

WE BET OUR COMPANY ON DATA BASE MANAGEMENT

The reasons for the existence of the NDX record will be explained later.

Both the NDX and ACCT records are CALC records, which means that they are entry points into the data base and can usually be retrieved with a single disc access. That is, the account number is used to calculate a page number which, in turn, is used to retrieve a page from the data base with a single physical access. The page retrieved is the owner of a special set which has as its members all CALC record occurrences which calculated to that page. This set, which is completely transparent to the application program, is searched to obtain the record desired. The set will usually be contained entirely on the page retrieved and therefore so will the desired record. However, if the page was full when the DBM was trying to store a group which calculated to that page, the set will spill over onto adjacent pages. This situation can be minimized by keeping the data base pages from getting too full. MARMS has a built-in 20% spare space factor for just that purpose.

Associated with each account is one or more patients. These are persons for whom services have been performed by the doctors or who are related to the account in some other manner, such as the holder of an insurance policy. Each patient's number, name, sex, birthdate, etc., are stored in a PAT record (see Fig. 1). This record is stored through the P set in patient number order and is accessible either through the P set, or, since it is an inverted record, by patient number. Access through the P set is the most common access method and is used when updating the account and patient records during daily processing, and for all reporting and billing functions.

The inverted access involves one access by patient number to a special CALC record to obtain the physical location of the patient record, and then another direct access to get the patient record itself. The DBM takes care of the creation and maintenance of these special CALC records. This inverted access is used when entering transactions during the daily processing. It allows the customer to use uncorrelated medical chart numbers to identify patients although most of our customers use the account number with a dependent number suffix. The point is that the identification of the account may be, but doesn't have to be, part of the patient number used when entering transactions. The patient-account relationship is stored implicitly by the system in the P set. Once a patient is located, the associated account can be obtained by asking the DBM for the owner of the P set.

Information regarding customer transactions (charges, payments, and adjustments) is stored in the TRANS records (see Fig. 1). These are located in posting order under the PAT record through the T set and are primarily accessed through the T set. Every TRANS record stored under a PAT record which, in turn, belongs to an ACCT record also becomes a member of the AT set owned by that ACCT record. The TRANS records are stored in the AT set in date-of-service order which provides a means of allocating receipts from an account to charges incurred by that account on an oldest-first basis. This function is called payment allocation and is an important competitive feature of MARMS.

The TRANS records are the most volatile records in the data base. They are entered during the month by the daily runs. Then, after they have been billed and applied to the balances, they are removed from the data base and stored on a history file tape for reporting in retroactive insurance statements and the year-to-date journals. Since some of our clinics and medical schools create extremely large volumes of transactions, the monthly purge that transfers these transactions required some special considerations to reduce its execution time.

When a customer transaction is to be removed from the data base it is flagged as being logically deleted without being physically removed. Then the T and AT sets are traversed to allow the DBM to delink the logically deleted transactions. When a transaction has been delinked from all the sets it participated in, it is physically removed. Alternatives to this scheme led either to long run times, because the DBM attempted to delink each transaction immediately, or to wasted disc space, whenever transactions were logically deleted but not physically removed because the account became inactive.

The AXTRA, PXTRA, and TXTRA records are used to store extra information associated with the ACCT, PAT, and TRANS records respectively. For instance, insurance coverage information is stored in AXTRA2 records, diagnosis codes are stored in PXTRA1 records, and laboratory charges are stored in TXTRA1 records. These records provide, therefore, a means of storing a variable quantity of ancillary information associated with the main record.

The DBID record is a single occurrence, directly accessed record that is used much like a user label on a tape file to verify ownership and condition of the data base. "Direct access" here means the exact location of the record is known by the application program

and passed to the DBM for retrieval. The other records shown in Fig. 1, OPT, DR, etc., are collectively called the "practice profile" and serve to customize MARMS to the particular needs of a customer.

The physical data base structure consists of three areas, mainly for ease in serially accessing the records in areas A and C. Serial access consists of retrieving all records of any kind in an area in the order in which they are physically stored. The NDX record occurrences, for instance, are stripped off, sorted, and used as an index to the data base for weekly and monthly reports. The NDX record occurrences are stored in an area all by themselves to minimize the time required to serially access all of them.

The results

MARMS was originally designed, written and made operational with about two man-years of effort. That effort produced over 32,000 lines of code, basic documentation, and a working system that needed some tuning. I don't believe the job could have been done with so small an amount of effort without DMS. The majority of the work was straightforward programming in a high level language with proven software doing the file management and catching many of the bugs.

MARMS has been an extremely dynamic system since its maiden run, and many of the changes made have been incorporated to improve its operating efficiency. Some of the improvements are too technical to be within the scope of this article, while others are as simple as modifying a report so that the number of transaction records in the data base could be reduced. The procedure used to transfer customer transactions, described above, is another example of an improvement that was added during the initial tuning period.

Daily processing (account and patient master file updating and transaction entry) has shown the greatest improvement over our early tape-oriented system. This was expected since daily processing involves accessing and updating only a small portion of the total data base. The improvement has been dramatic. At one time, daily processing ran 12 hours. Now, with nearly three times the volume, daily processing runs only 3½ hours. In other words, it would take a 36 hour day to process our current volume on the former system.

Weekly processing has gone up about 10% because each customer's data base is copied to tape for a back-up. There was no equivalent step with

the old system. Monthly processing times are essentially unchanged.

The problem of sequential processing almost kept us from using DMS. All our weekly and monthly runs involve sequentially accessing and processing a significant portion of the total records in the data base. The serial access method, described above, is the only sequential access that can be used to retrieve CALC records. MARMS uses it to retrieve the NDX records from area A, but it is much too slow to be used to go through the entire data base. If it were used, the information would have to be sorted into a usable order since CALC records are stored physically in an essentially random fashion.

Our solution to the problem of sequential processing is unusual but it works. The NDX record contains all of the sort keys and status information for an account. All occurrences of the NDX record are obtained by the serial access method, sorted in the desired reporting order, and stored in a conventional, consecutive file. The file is then accessed sequentially and the record status interrogated to select accounts for processing. For those selected, the ACCT record is accessed and the posting and reporting is done. Actually, several reports may be generated simultaneously with a single pass through the data base. All that is required is that there be enough memory for all the code required and that the reports all be in the same sort order. Changes to ACCT records are stored in the data base but changes made to NDX records are stored in the temporary, consecutive file to reduce disc accesses. The file is re-sorted and passes are made through the data base until all the work has been done. If any of the NDX records were modified, the consecutive file is re-sorted to its original order and the updates applied to the data base.

The prices paid

One of the prices paid for using DMS is the increase in disc storage required to keep page overflows to a minimum as mentioned above. With our batch system the additional cost is the medium itself and amounts to about \$150 per month (16 extra 2314 type packs). In our on-line system the cost is significantly higher because that extra 20% must be kept spinning. Considering the advantages of having one physical access per logical access, however, the price isn't too high.

Another price paid is additional memory for program execution. DMS requires about 34K bytes of memory including space for the DBM code, buffers, and a working storage record definition and communication area. Some of this increase is compensated

for by simpler and therefore shorter application program code. The MARMS programs are bigger than their predecessors but are more heavily overlaid to work in the same memory.

A third additional cost resulting from the use of DMS is increased cpu time. Our former system used the cpu only 5% of the total job time. MARMS uses 50% with essentially all of the increase due to DMS. This additional cpu time is required to interrogate the schema to determine the characteristics of the records and sets, to take care of the deblocking of record occurrences from data base pages, etc.

Since the beginnings of the company the ultimate product goal has been an on-line system. One of the factors that favored the use of DMS for MARMS was the need to build a system with a good

posture for adding on-line features. The on-line system is now a reality with the incorporation of data entry and data retrieval functions earlier this year.

Data entry is accomplished off-line. That is, the data is collected from the customer's terminal during the day but is not applied to the data base until the daily processing is done in the evening in the batch mode. Data retrieval is done on-line with the data bases open in the read-only mode. This conservative approach greatly reduces the possibility of a catastrophic loss of data.

Xerox's CP-V operating system offers two methods of interactively supporting communication lines: transaction processing and time-sharing. Transaction processing involves queuing input from and output to several communication lines so processing can be done

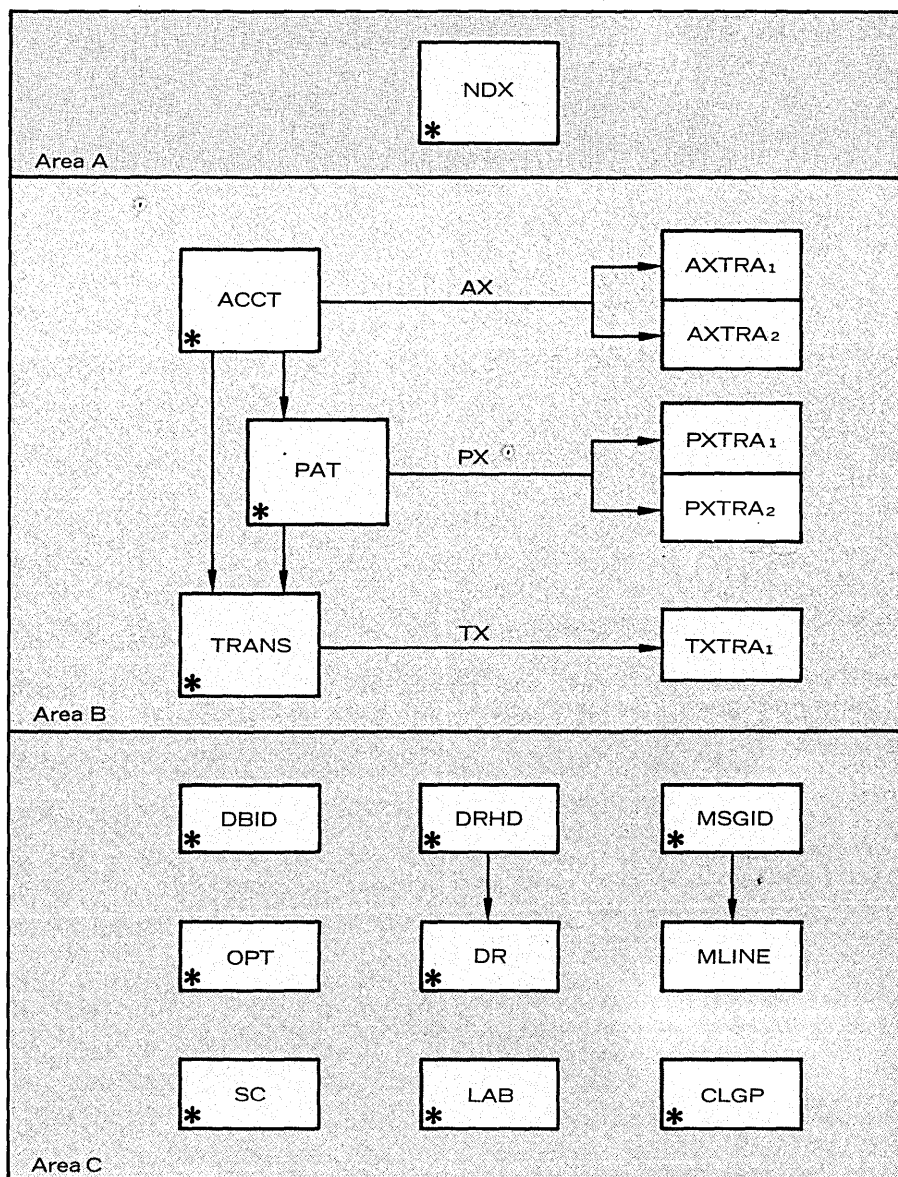


Fig. 1. MARMS uses three areas of disc: one for customer index records (account number, name, type code, zip code and status), one for account information (including patient records and patient transactions), and one for the "practice profile" which serves to customize MARMS for customers. The asterisks indicate entry points into the data base.



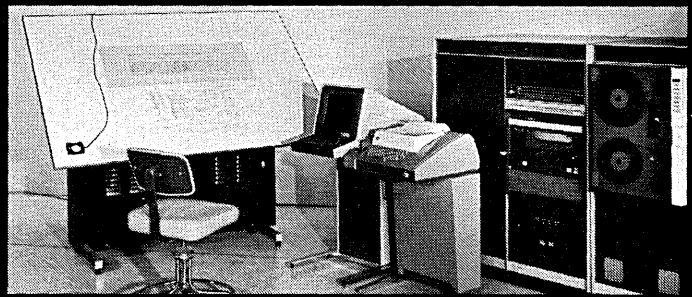
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Bendix **Computer
Graphics**

WE BET COMPANY

for one user at a time by a single program. With time-sharing, on the other hand, each line is associated with its own separate copy of the program.

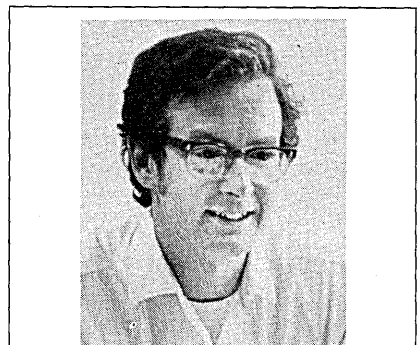
A quick analysis might conclude that neither transaction processing nor time-sharing is well suited to our data retrieval requirements. Our need to have more than one data base open simultaneously makes the utilization of transaction processing nearly impossible. Time-sharing solves the multiple data base problem but wastes main memory and swapping storage executing individual copies of the same retrieval program. Fortunately, CP-V offers a way out of this dilemma. It allows the procedural code of specially designated programs to be shared among several time-sharing users, each of whom has his own data storage areas of memory. This feature, combined with the ease of coding an application under DMS, allowed the implementation of an efficient data retrieval system within a modest programming budget.

The right bet

In spite of its unusual features—multiple small data bases and sequential processing—our application is successful. I think we have demonstrated that the data base approach can offer the following advantages:

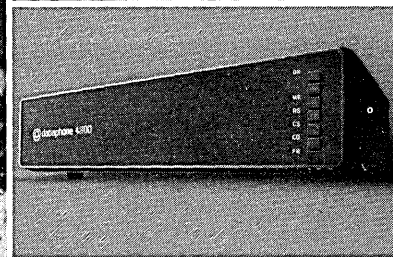
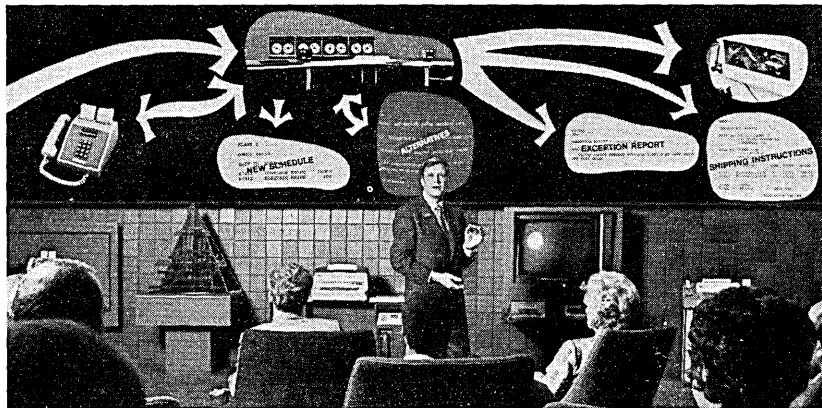
1. minimum implementation time
2. excellent efficiency for random access applications
3. acceptable efficiency for sequential access applications

We made the right bet. We are currently installing a Sigma 9 computer to supplement the Sigma 6. We are incidentally moving into a new data center three times larger than our present facility and Science Dynamics Corp. continues to show a profit. Doesn't that say it all?



Mr. Blanchard is manager of programming at Science Dynamics Corp. Previously he spent eight years with GE's Ordnance Dept. as head of a programming group in engineering analysis and computation. His M.S. in Systems Science is from Polytechnic Inst. of New York.

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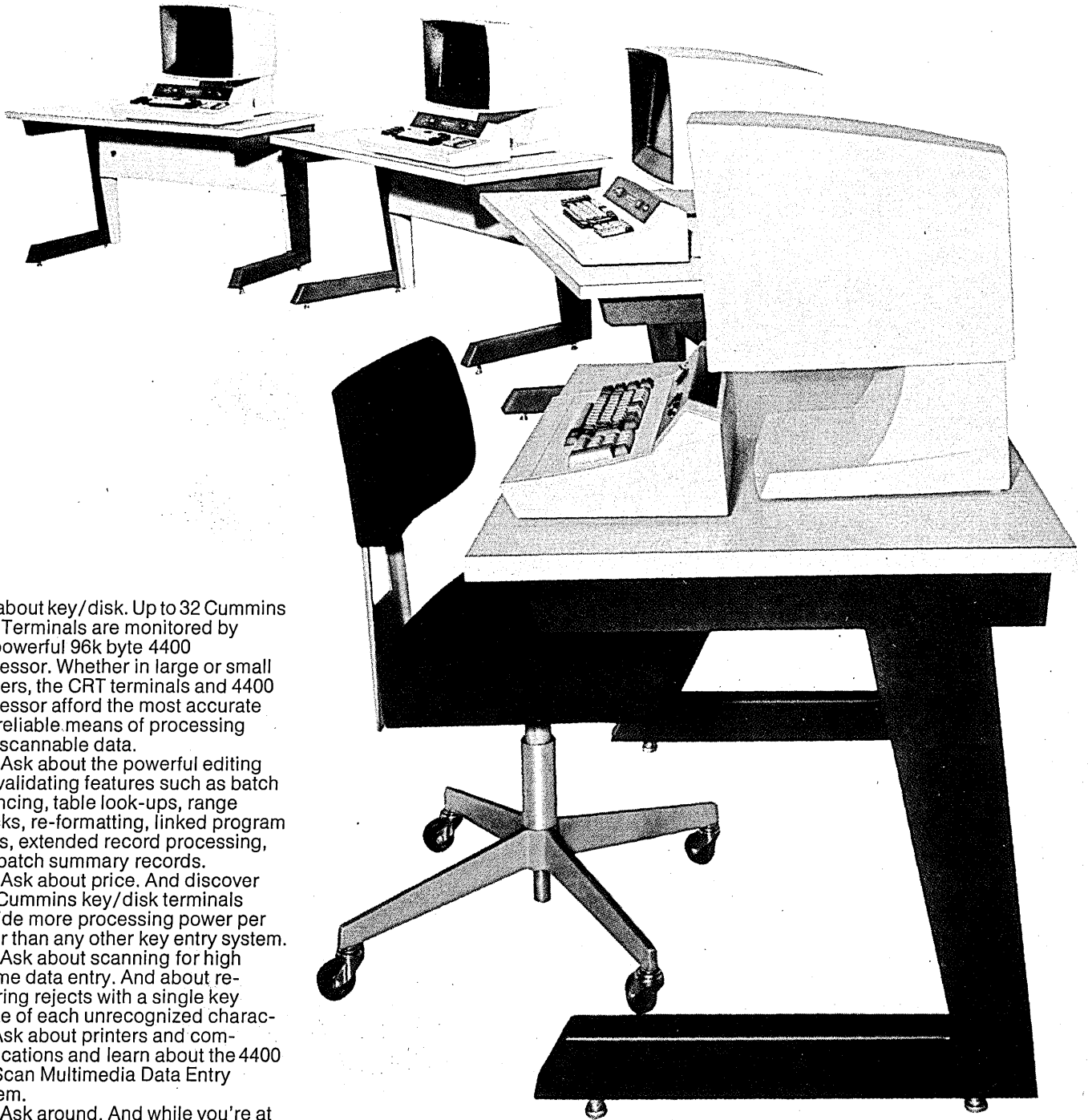
We hear you.

CIRCLE 89 ON READER CARD

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Ask about multimedia. And software.

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the nuts and bolts
and how many bytes...

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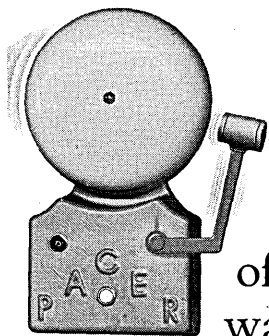
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4400

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The Bully.

ADDS new Consul 980.
It'll take on anybody in the magazine.



Round 1.

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If you've ever eyeballed our Consul 880, you know how the 980 looks: the "Gorgeous George" of CRT terminals. But these two have a lot more in common than good looks and 1,920 characters; they share a reputation built on design, engineering and service. Not to mention some 100% pure sweat.

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have probably put it this way:

Now inserting or deleting characters is fine, but the 980 also edits a line at a time!

Our character set displays a black on white face, and it comes in upper and lower case!

The computer can read the cursor position, and that is certainly a welcome addition!

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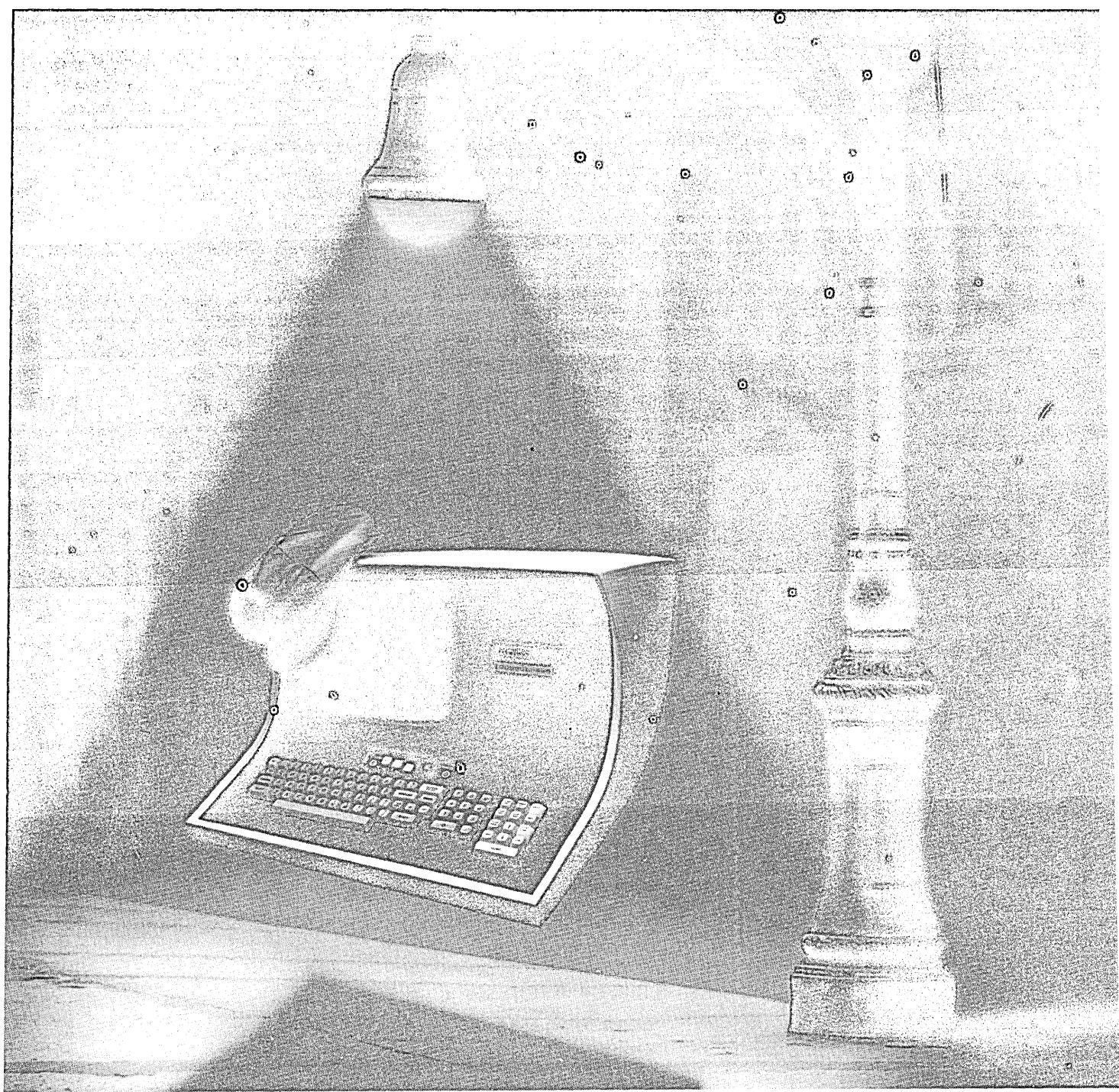
Printer and cassette ports, and just in case, current loop as well as EIA interface!

As if all these features didn't suffice, it's an entirely remotely controllable device!

Now we hope you understand fully, just why we call 980 the Bully.

Hitting below the belt.

If you're expecting a championship terminal like the 980 to



cost you an arm and a leg, hold on to your socks. \$2800. Everything included. With OEM discounts of over 30%. Need we say more?

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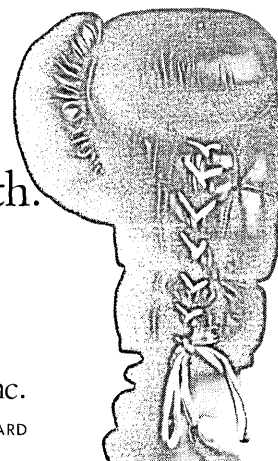
Digital Data Systems, 100 Marcus Blvd., Hauppauge, New York.

Every contest has one winner. Sometimes it's a technical decision. Sometimes it's a knock-out. And sometimes it's both.

Consul 980.

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CIRCLE 11 ON READER CARD



Now... mainframe architecture in a remote communications processor!

COPE[®] 1600 by HARRIS

The COPE 1600 is *all new*, from its mainframe architecture and communications-oriented design to its built-in capacity for growth. This enables you to start with a basic RBT and expand as your volume and applications increase. All in all, COPE 1600 is your best way to achieve cost-effective communications!

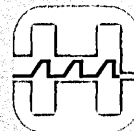
What do we mean by cost effective? Read on. The minimum COPE 1600 system is a high-performance RBT in the COPE tradition. Then through expansion you can operate 16 asynchronous circuits concurrent with HASP/multileaving at 9600 bps with *no degradation*. Asynchronous speeds are available from 75 to 9600 bps. The 1600 will also operate up to 4 synchronous communications interfaces from 2000 to 50K bps.

Wondering about operational flexibility? Compare these features. The 1600 incorporates a multi-task communications operating system enabling you to control up to 16 concurrent program operations. The initial system accommodates five different emulators: HASP/multileaving, 3780, 2780, 1004 and 200UT. These emulators can communicate concurrently with two mainframes (of different protocols if desired). IBM SDLC hardware is built-in to accommodate future requirements.

Want to know more about the 1600? Then consider these advantages: expandable memory from 16K to 65K in 8K byte modules. Direct memory addressing. Comprehensive repertoire of 104 instructions. Structured programming language. Plus, there's a

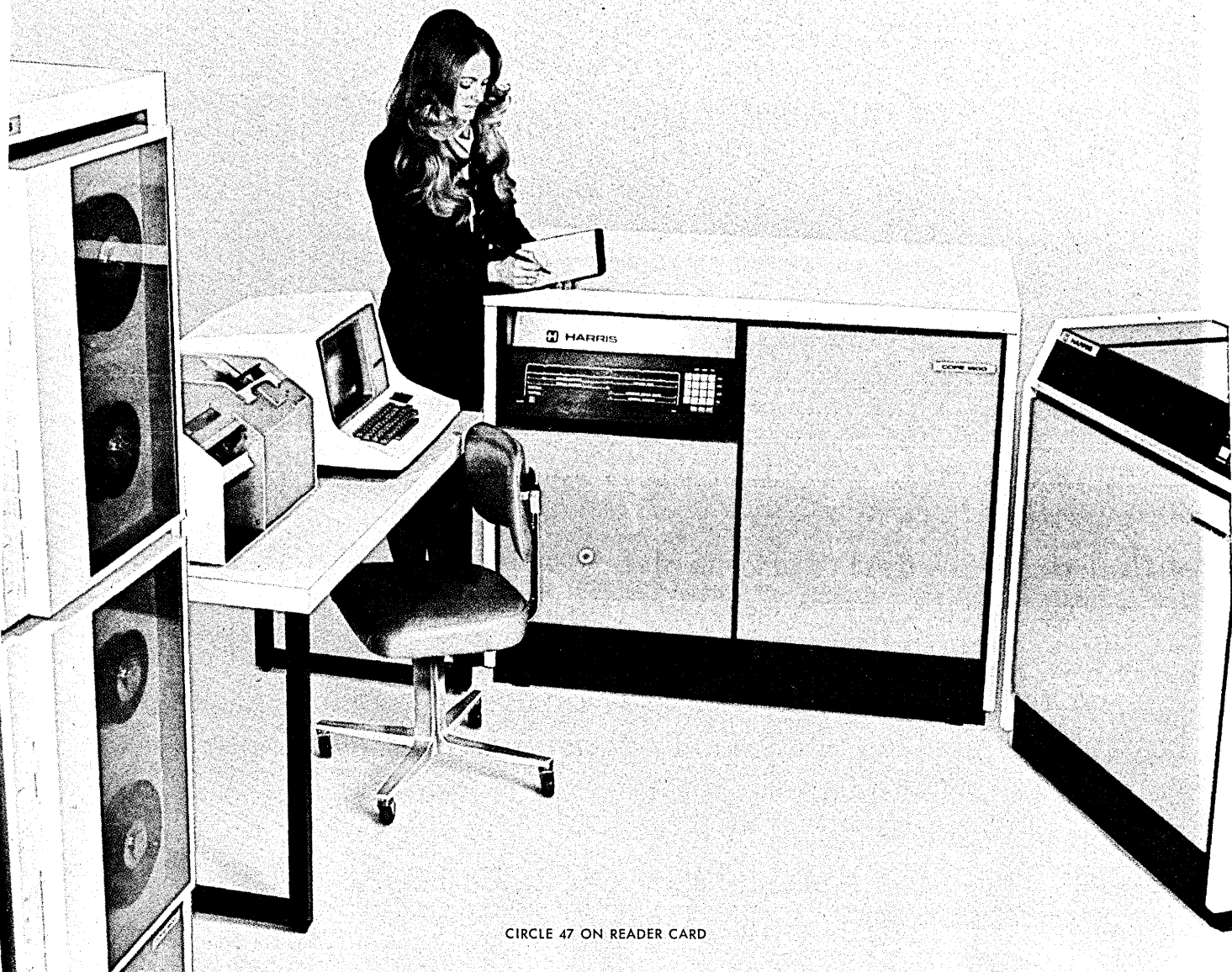
full complement of peripherals, of course, including magnetic tape and disk. And back-up support nationally by Harris' own Field Engineering Department.

That's only part of the COPE 1600 story. For more details on how you can 1) eliminate redundant system hardware, 2) reduce line costs, and 3) improve your overall network performance call your nearest Harris office. Or contact Harris Corporation, Data Communications Division, 11262 Indian Trail, Dallas, Texas 75234, (214) 241-0551.



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CIRCLE 47 ON READER CARD

ACM MILESTONE MEETING

Two chapters of the Assn. for Computing Machinery recently observed milestones. The Los Angeles chapter celebrated its 20th anniversary, honoring more than a dozen past presidents, including Sybil Rock, the chapter's first chairperson. In New York, author Dan McCracken reminisced for the oldtimers with typical irreverent fun that marks such gatherings. These notes from an anonymous reporter describe the NYC affair.

Covered NYC/ACM 10th Anniversary meeting on June 19 . . . Found the room decorated with leftover silver bells from New Year's Eve . . . Largest crowd in years surprised when arrangements chairman Jim Adams delivers steak in lieu of usual ACM-standard mystery meat . . . and unlimited wine.

Awards night to recognize those who kept chapter alive. Highlight was Barry Gordon, ACM regional rep., reminding people of Asher Opler who did so much for chapter in early years. Chairman D'Auria provided his successors with impressive gavel to beat disrespectful NYC crowd into silence . . . Special certificates awarded to Absentee of the Year, Phantom of the Year, Oldest Professional Activity, Cruel and Unusual Punishment, and Pessimist of the Year—the last to finance chairman Stumph who in face of rising revenues predicted deficit and delivered surplus.

Awards ceremony followed by filling of glasses and film of new super computer complete with magnetic tapes and electrostatic memory . . . Machine is revealed as IBM 701 . . . Sounds funny, but sales pitch sounded very familiar . . . History of ACM movie follows. Both films produced by Impossible Budget Movies—well known company headed by George Sampson.

Speaker introduced . . . Dan McCracken, author, ex-programmer, crusader . . . Talk entitled "A Backward Look



Dan McCracken, left, was the guest speaker at the 10th Anniversary NYC/ACM festivities. He warned Noel Zakin, first chairman, and Arthur Hutt, first vice chairman (on right), that all other chapters he had addressed as frequently are now defunct.

at the Future." Admits this is the third time he has spoken to a chapter three times . . . other two chapters now defunct.

McCracken holds up 701 vacuum tube . . . recognized by five people in audience; others look blank. ACM publications board manager Gosden calls it a valve . . . McCracken shows a 701 program he wrote in 1953, still complete with errors. Reminds people that "You are your own loop" was invented by CPC user chasing back and forth between stack-

er and reader. New members ask what was CPC. (Answer: IBM's late forties pre-computer, the Card Programmed Calculator.) . . . McCracken states that 701 was last machine that was fun to watch running, even if it took 20 minutes to solve problem now handled in two seconds or slightly longer with hand-held calculator . . . Harks back to good old days when light-sensitive 701 would halt if machine room went dark or photographer aimed flashbulb at it.

Jumps ahead to 1961 when wrote his first FORTRAN book (has now sold 325,000 copies, topped only by 360 Assembler manual also written by Dan in spite of IBM label on cover).

Remembers 1964 when 360 was just announced, programs were written in Assembler, computers had discrete components, and there had been no discovered cases of computer-based fraud . . . Reminds us of his prediction that within 10 years computer would be smashed by ax, but admits that he did not anticipate bombs.

1966 was a good year. McCracken left dp field for divinity school and discovered, after three years, that people go to seminary because they have religion or are trying to get religion . . . The analogy to psychiatrists is striking.

Predicts that by 1984 computer languages will be COBOL, FORTRAN, PL/1, BASIC, APL . . . that there will be few large machines and millions of minis . . . He expects tight government control of all computers except government computers, that at least one Fortune 500 company will go bankrupt from computer failure . . . IBM will be largest corporation in the world, although separately organized IBM Legal Department could be larger . . . Computer people will become more socially conscious: first, because they will be



701 CLUB: At Los Angeles ACM chapter 20th anniversary meeting, featuring a film on introduction of the 701, former operators of IBM's venerable machine gathered for this photo, taken by Eugene Jacobs: Sol Pollack, Virginia Goddard, Stuart Shaffer, Jim Holt, Tom Sanborn, Roger Mills (kneeling), unidentified, Frank Wagner, Jay Kleinbard, John Carlson, Gloria Silvern, Frank Ingrassia, Florence Anderson and Ben Handy.

forced to by increasingly vicious public anti-computer hostilities; and second, because of their own consciences.

McCracken predicts that by 1984 Grace Hopper will be a Rear Admiral, Herb Grosch will have been fired (twice, of course) by *Computerworld* and will be Chairman of Massachusetts Conservative Party while working on nostalgic history of ARPANET on grant from Honeywell, Barry Gordon will be in his third term as ACM President having cancelled two previous elections on national security grounds, and Dan McCracken will have written 17 FORTRAN books.

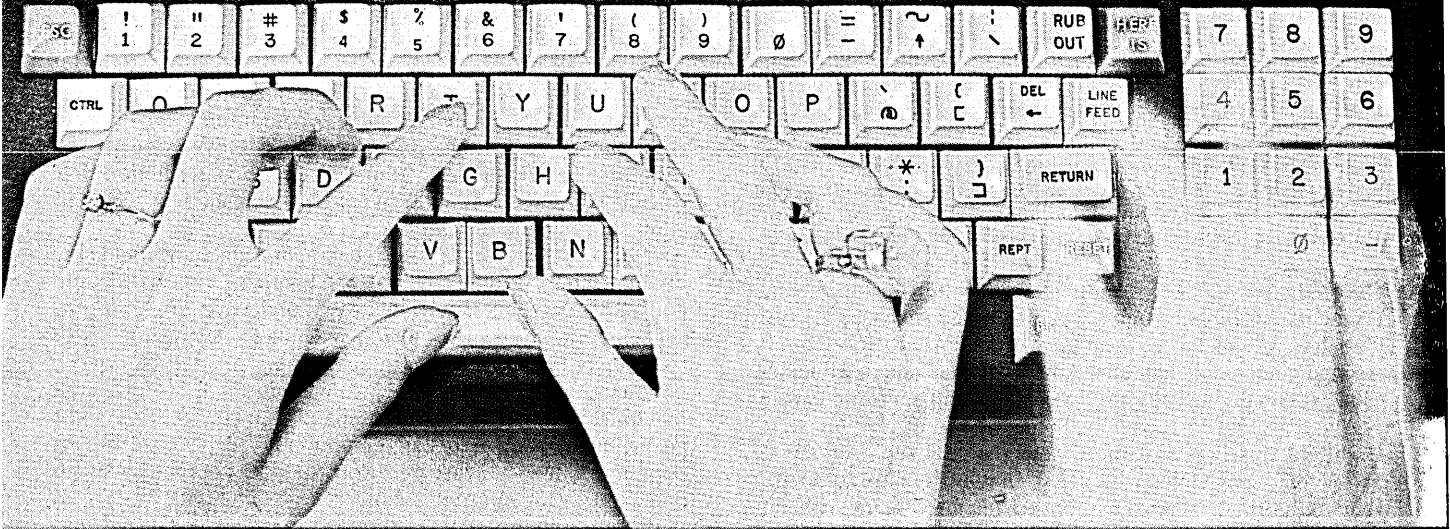
Smothered in funny remarks were frightening truths about relations between computer types and general public, insights into McCracken's conscience (which ought to be conscience of computer industry but regrettably isn't). The insights too strong . . . future bleak . . . had better stop at bar on way out and discuss with . . .

Editor's Note: Here the manuscript trickled off into a series of phrases, mostly undecipherable. We decoded a few including: "Computer Professionals Against ABM," "shift left 14 places," "CPC runs at 150 operations per minute," and "write my own cosine routine."

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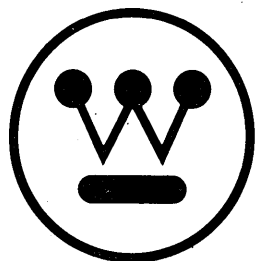
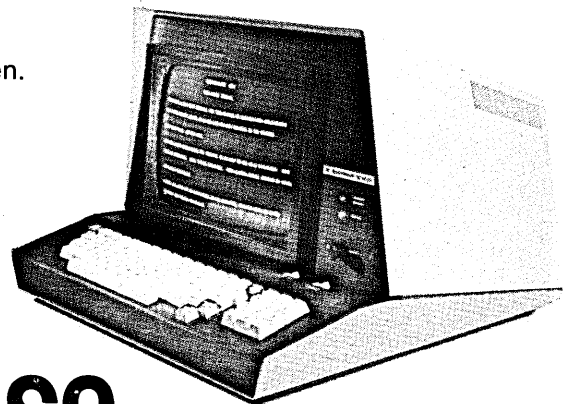
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CIRCLE 70 ON READER CARD

Manpower, not hardware, is the critical data processing resource in developing countries. Fortunately, there are several ways these countries can acquire or develop that resource.

SOFTWARE IN DEVELOPING COUNTRIES

by Barry W. Boehm and Benton Dexter, Jr.

One of the most striking and indicative distinctions between computer usage in developed countries as opposed to developing countries is, in simplified form, the following:

- In a developed country, the typical software expert works 8 hours a day, while the typical computer works 16.
- In a developing country, the typical software expert works 16 hours a day, while the typical computer works 8.

The main reason for this is that it takes much longer to train software experts than it does to buy a computer. Moreover, an organization will often buy a computer without realizing the necessity for local software experts to develop the specialized applications software to tap the full productivity potential of the hardware. And because of a shortage of such local software experts, these applications are generally delayed and the computer is often idle.

As a result, there is generally a great demand for software experts in developing countries, and the outlook is that such demand will continue well into the future. As with other effects of computerization, the relative expenditures on hardware and software in developing countries tend to follow trends established in developed countries such as the U.S. And, as seen in Fig. 1, software costs in the U.S. are rapidly rising. They currently comprise about 70% of the total hardware-software cost and are expected to be 85-90% by 1985. [1] (In this article, "software" includes systems software, applications software, and related documentation.)

The overall shortage of competent software personnel places a particular burden on the small group of software experts in the developing country. To increase the supply of software personnel through education requires the skills of the already scarce software

experts. In order to support a national program of technical growth and innovation, the expert may add to the job of development a number of the following chores as well:

- teaching courses
- formulating computing curricula
- administering a university computer science department
- administering a university computer center
- performing and guiding computer science research
- working or consulting on edp in industry or government
- serving on government edp advisory boards
- writing and/translating computer science textbooks
- playing a role in professional society activities

Thus the 16 hour day!

The shortage of software experts also manifests itself in other ways than underutilized hardware and overworked people. Rafael Ulloa, in his paper on educating data processing managers in developing countries [2], cites symptoms for Colombia that are familiar in many developing countries—a shortage of good computing managers, unmaintainable software, duplication of software efforts, and high software personnel turnover. Added effects include the establishment of unrealistic schedules for software development, "gold-plating" (adding expensive, superfluous features) of systems by vendors if only to protect themselves against ill-defined requirements, and major software design retrofits that consume additional scarce software personnel resources. [3]

Organizations in developing countries have a number of options available to improve their situation, however. Some general guidelines on how to determine the best options for any particular situation, and a case study of a successful ongoing project, can

illustrate many of the more effective options available to an organization in a developing country.

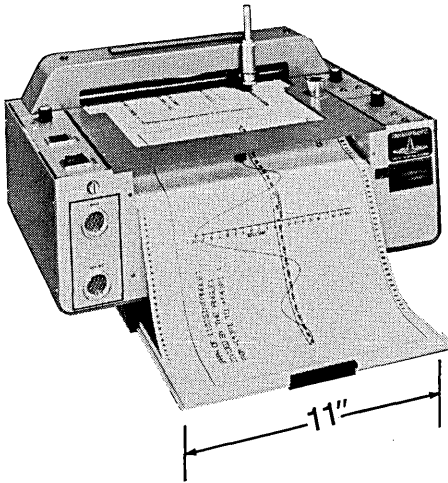
With regard to software manpower, the developing countries face a classic resource allocation dilemma known as the "bottleneck problem." As mentioned, demand for the scarce software experts now exceeds supply, and will continue to do so. However, producing more manpower requires that experts be diverted from development into training. How then should a developing country attack such a problem?

The often-forgotten first step is to take into consideration the particular aspects and ramifications of the problem that hold only for the particular country under concern. There are no universal solutions which are independent of a country's educational attainment levels, capital availability, resource and industry mix, or political associations. There is, however, a technique which may still be useful in practically every case: developing a manpower planning model.

Manpower planning models can be developed at whatever level of detail the data and objectives dictate. Basically, they involve these steps:

- defining the categories of manpower under consideration (job types, economic sectors, organizational divisions, etc.)
- determining the current supply and demand for these various manpower categories
- projecting the likely future demand and the control parameters influencing it (often in terms of ratios to other future activity levels, e.g., industrial production)
- determining how the transitions from one job category to another are affected by various control parameters (e.g., salary scales, training budgets)
- inserting various values of the control parameters, calculating

WHAT SIZE DIGITAL PLOTTER DO YOU NEED?



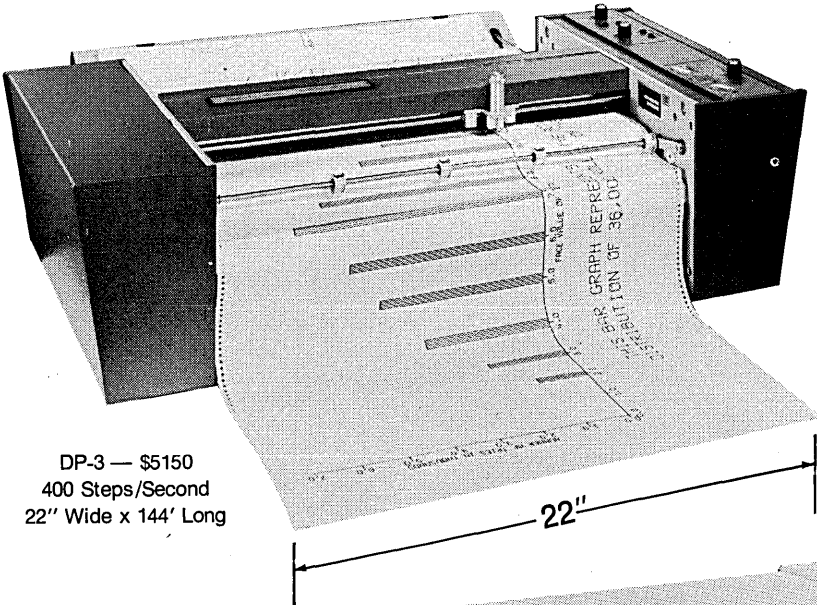
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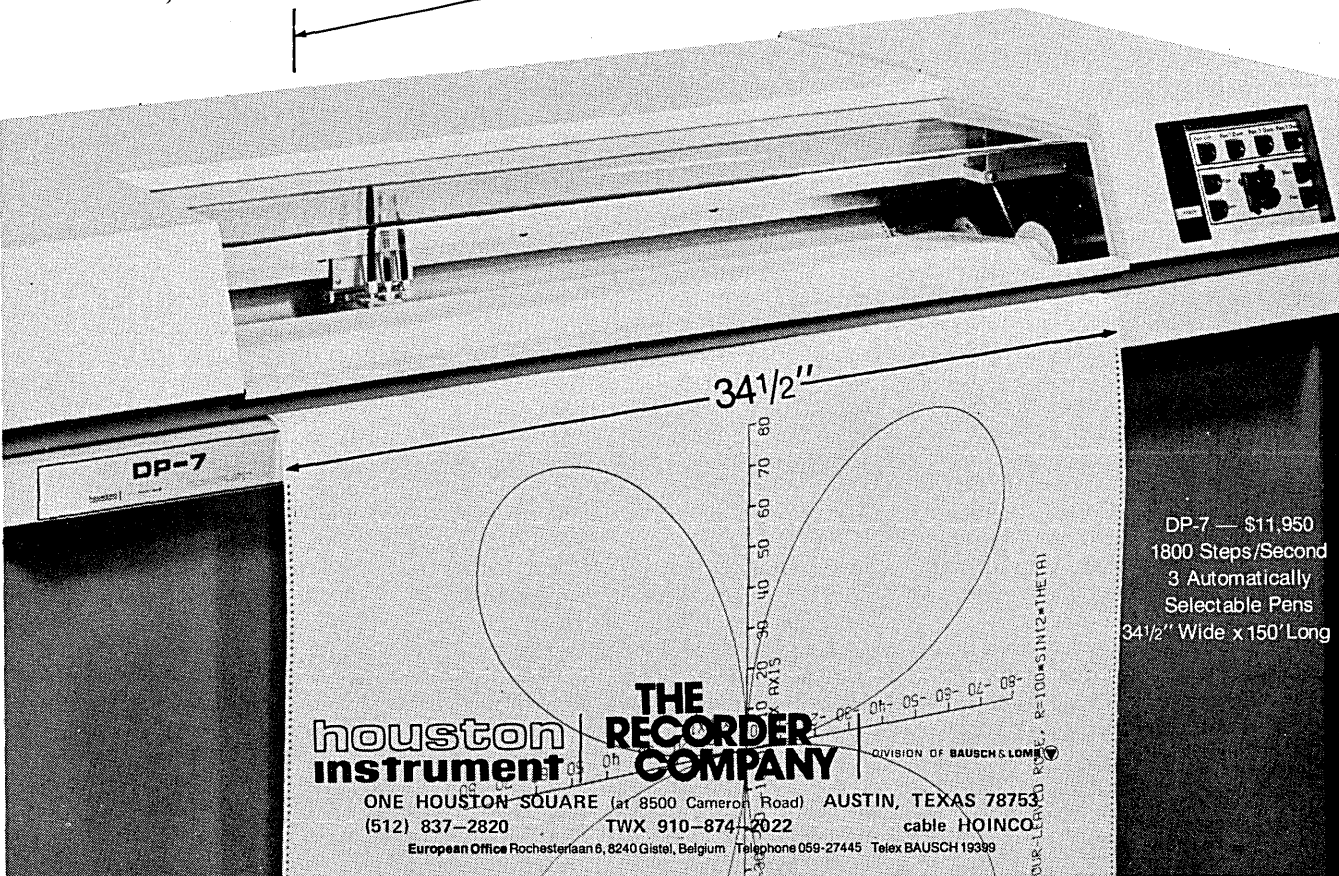
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SOFTWARE IN DEVELOPING COUNTRIES

the resulting supply-demand trends, and iterating both the model and the parameters toward an acceptable balance between desires and reality

Manpower planning models are naturally most valuable on a national scale, where there is more opportunity to influence such key factors as educational policy, but they can also be quite useful to an individual organization. (References 4 and 5 provide a good introduction to the use of such models.)

Improvement options tend to fall into four major categories: increasing software manpower supply, increasing manpower efficiency, reducing personnel demand, and obtaining software manpower elsewhere. Below is a discussion of each category, followed by an example containing components of all four categories.

Increasing software manpower

There are two major improvement options here: training and retention. Besides training of operators, programmers, and system analysts, a most important need is to train application system managers.

A good outline for an applications system manager edp training program, as presented to executives of a large manufacturing company in India, is given by V. Rajaraman. [6] The two-week evening course featured case studies worked on-site by the executives and edp personnel. The subject matter included the following:

1. Procedure formulation for computers—using a stores inventory processing example (2 hours).
2. Demonstration on the computer

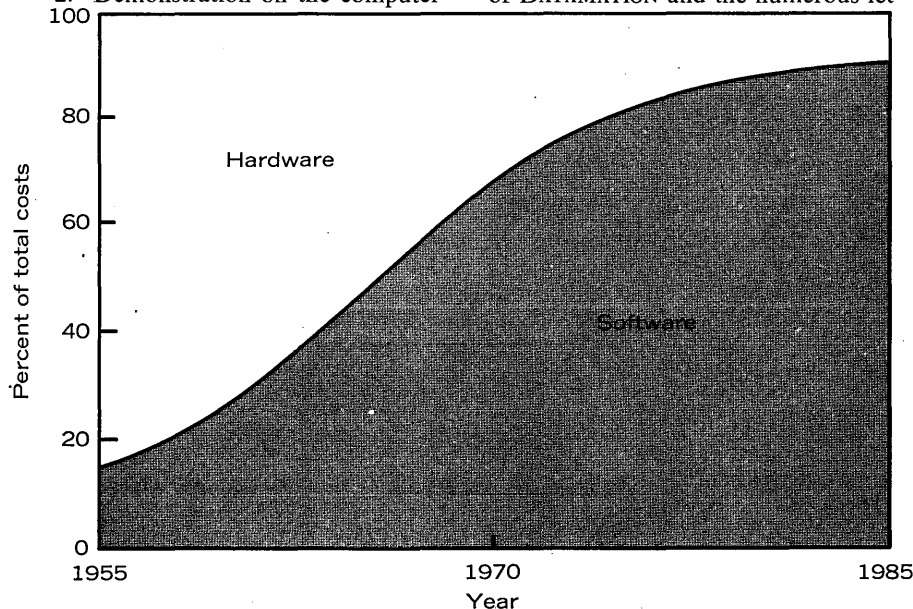


Fig. 1. The costs of software (systems software, application programs, and related documentation) already far outweighs the cost of hardware for an average application. The effect on developing countries is to make manpower the critical resource, rather than hardware.

of a few simple programs (2 hours).

3. Presentation of one case picked from the organization illustrating problems of codification punching, checking and program logic. This was presented by one of the edp department personnel with guidance from the instructor (2 hours).
4. Demonstration on the computer (2 hours).
5. An overview, questions, discussions (2 hours).

The author reported enthusiastic reception of the course but recommended, where facilities permit, an additional three to four hours spent on the elements of a higher level language with "hands on" programming experience on simple problems.

On the retention side, a good deal can be done in salary scales and other motivators such as management participation to assure that skilled software personnel do not correlate advancement with "getting away from programming" or "getting out of the edp center." This is particularly a problem in developing countries, where there is a strong competing demand for any sort of person with an advanced education.

Increasing manpower efficiency

Here, good policies for developing countries tend to be similar to those in developed countries. The nature and utility of such techniques as top-down development, chief programmer teams, and structured programming have been extensively discussed in the series of articles in the December 1973 issue of DATAMATION and the numerous let-

ters appearing in subsequent issues.

One additional set of options now becoming available involves the adoption of automated aids which make software development less of a labor-intensive activity. In this direction a number of organizations have evolved packages that shift onto the computer many of the tedious, manual, error-prone processes of code generation, modification and cross-checking that usually consume so much software effort. Examples of such automated aids are given below [7, 8]:

- COMMON package or other data base generators
- preprocessors to accommodate special applications, decision tables, COBOL shorthand, etc.
- subroutine and data cross-reference generators
- automatic flow-charters
- documentation generators
- program performance evaluators
- software library and module-management systems
- source code consistency and singularity analyzers
- test data generators
- program structure analyzers and associated test data generation and test monitoring aids
- test data management and retest exception reporting capabilities

Reducing manpower demand

One option often available for reducing demand for scarce software manpower is to consolidate data processing operations. As software costs continue to outpace hardware costs, more and more organizations in both developed and developing countries are realizing that software economies of scale are at least as much a force toward consolidation as are hardware cost factors.

A second means of reducing software manpower demand is by acquisition of packaged software. If a package can be found that meets the application requirements, this alternative makes good sense. Acquisition has the benefits of reducing the time required to attain operational status as well as conserving the demand on local software personnel. A purchased package may also be more economical than a custom application, since development costs of packaged software are spread among many customers.

There is need for caution, however. The acquiring organization must carefully verify that the package performance matches marketing claims. Besides performing the required functions, it should be efficient, reliable and easy to use. Moreover, the initial application represents only one particular set of demands. The software must also

SOFTWARE IN DEVELOPING COUNTRIES

be able to grow, shrink or otherwise adapt to changing usage needs, because needs inevitably change.

Once installed—whether purchased or custom-developed—the software needs to be maintained. Resident programmers must be able to modify the product to rectify a deficiency, add new capabilities, or allow a program to operate on a different computer system. Unless the software is specifically engineered to be understandable, testable and easy to modify, maintenance costs can eat up all the resources needed for development of new projects. Indeed, the initial investment in a software product may represent only the tip of the iceberg as far as total lifetime costs are concerned.

For example, a recent survey of computer installations in Great Britain [9] revealed that about 40% of the country's software effort was devoted to maintenance, with many installations reporting maintenance efforts of 80-90% (see Fig. 2). The distributions for developing countries are likely to be even more heavily weighted toward maintaining existing programs, since they are more dependent upon software developed elsewhere.

Packaged software in general is not particularly noted for its maintainability. In developing a software product for the market, there are great pressures on the producer to minimize development costs and maximize hardware efficiency, to include "salesy" features and skimp on the "insides"—the qualities that make a product lasting but are not readily apparent at the time of sale. Buyers in developed countries are becoming more sophisticated in this matter. There is strong economic

motivation to assess probable maintenance requirements before accepting software and an increasing interest in defining the characteristics that predict maintainability.

One valuable tool for software people in developing countries would be a checklist of questions to help judge the relative maintainability of alternative software products under development or being considered for acquisition. A step in this direction was taken in a recent study on the "Characteristics of Software Quality." [10] This study further refined the components of software maintainability from understandability, modifiability and testability into the more primitive characteristics of "communicativeness, accessibility, self-descriptiveness, structuredness, consistency, conciseness, legibility, and augmentability." It then provided checklists of questions to judge the extent that a software product possessed the characteristic, and assessments of the amount of expertise necessary to make the judgment and the relative benefit of doing so.

As an example, a partial checklist is given below for the characteristic of self-descriptiveness, which is of particular concern in the process of understanding and modifying a software package.

Self-descriptiveness. A software product possesses self-descriptiveness to the extent that it contains enough information for a reader to determine its objectives, assumptions, constraints, inputs, outputs, components, and status.

Checklist:

1. Does each program module contain a header block of com-

mentary which describes: (1) program name; (2) effective date; (3) accuracy requirement; (4) purpose; (5) limitations and restrictions; (6) modification history; (7) inputs and outputs; (8) method; (9) assumptions; (10) error recovery procedures for all foreseeable error exits that exist?

2. Are decision points and subsequent branching alternatives adequately described?
3. Are the functions of the modules as well as inputs/outputs adequately defined to allow module testing?
4. Are comments provided to support selection of specific input values to permit performance of specialized program testing?
5. Is information provided to support assessment of the impact of a change in other portions of the program?
6. Is information provided to support identification of program code which must be modified to effect a required change?
7. Where there is module dependence, is it clearly specified by commentary, program documentation, or inherent program structure?
8. Are variable names descriptive of the physical or functional property represented?
9. Do uniquely recognizable functions contain adequate descriptive information (e.g., comments) so that the purpose of each is clear?
10. Are adequate descriptions provided to allow correlation of variable names with the physical property or entity which they represent?

SOFTWARE MAINTENANCE

(HOSKYNS STUDY OF 905 BRITISH INSTALLATIONS)

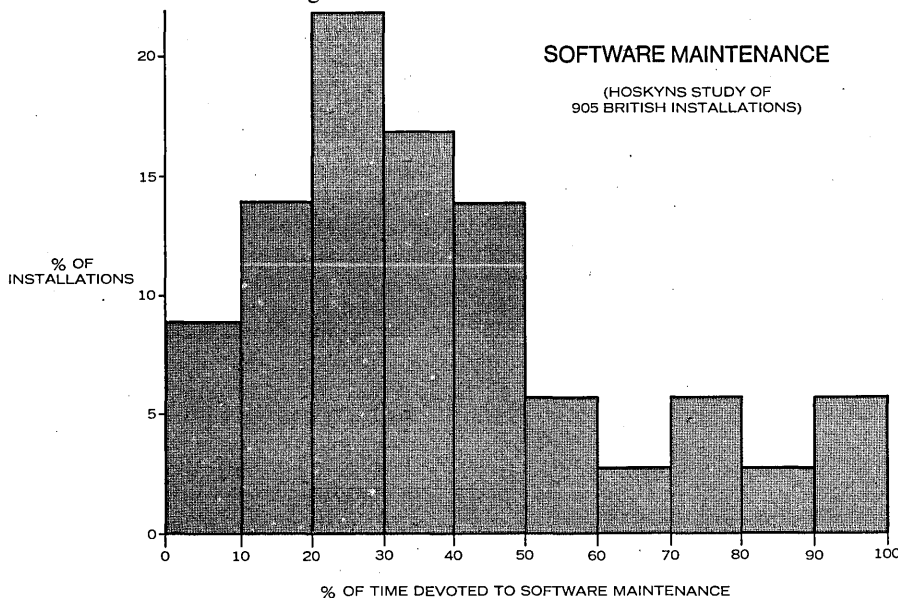


Fig. 2. The manpower resource can be severely strained by maintenance needs alone. These results are for 905 installations in Great Britain. Since developing countries must rely more heavily on programs developed elsewhere, their maintenance effort is likely to be even heavier than that shown here.

Importing manpower

Organizations in developing countries can exert much more leverage in this area than most of them realize. One avenue is by using contract development and support as a means of implementing the three options described above through on-the-job training and concurrent importation of advanced software tools, techniques, and packages. This avenue will be described in the case study below. The other avenue involves getting more training and support as part of a computer purchase.

As emphasized earlier, good software personnel tend to be much more of a critical scarce resource in a developing country than is computer hardware. Yet, one usually finds that computer system procurement policies in

developing countries assume that hardware will be the scarce resource. Very often, the dominant criteria for choosing a computer system are MIPS (millions of instructions per second) and megabytes of memory storage per unit of cost. Using these criteria, computer systems are often procured with little software support or training, thus straining the scarce local software personnel resources even further.

Instead, organizations in developing countries could be using computer hardware procurements as opportunities to increase the supply and expertise of software personnel. Competitive procurements for computer systems should emphasize software documentation and training deliverables much more than hardware capabilities, even in thorough computer "hardware" procurements in developed countries. One competitive evaluation for a general-purpose computer system in which one author was involved (in the U.S.)

used the following relative weights:

- 27%—hardware;
- 27%—supervisory system software;
- 8%—data management software;
- 16%—language processing software
- 2%—utility, scientific, and statistical software;
- 12%—conversion support (including training);
- 8%—vendor support (including hardware and software maintenance, documentation, user group effectiveness, and availability of experts).

For computer system procurements in developing countries, the weights allocated to training and vendor support should be considerably higher.

The case study to be described illustrates the other high leverage option available; it involves importing experienced personnel from the developed countries.

In developed countries the increased

supply and reliability of consulting services has helped to take the trauma out of "computerization" in recent years. Expert guidance can be obtained for any phase of implementation, from initial planning to ultimate operation. Moreover, consultants may be used in many ways—from advisors only to developers of complete systems.

Organizations in developing countries should be aware of this range of utilization options and employ the consultant firm in a way that best helps them achieve their dual objectives of obtaining trained software personnel and operational software systems. The options range, basically, from an approach that is purely tutorial to one of virtual independence for the consultant.

In the tutorial approach, the consultant firm trains the customer personnel, who then perform the work. This approach provides a direct way to increase the numbers of people knowledgeable about computer technology. However, if projects must wait until people are sufficiently experienced to begin working on them, the development process may produce results at a slower pace than is desired by the customer.

At the other extreme, the consultants may design a system in their own facility, deliver the product, train the customer to use it, then walk away, leaving customer personnel to fix any problems and adapt to the system as well as possible. This approach is the fastest way to obtain operational software. It may work satisfactorily in applications requiring negligible human interface. For systems that affect a wide spectrum of people, however, this approach is liable to fall short of meeting the customers' true needs. Moreover, it provides little or no opportunity for transfer of skills to local personnel.

An approach that provides on-the-job training in the process of developing a working system is likely to achieve the highest payoff for the developing country. In the joint approach the consultant firm works with the customer organization in such a way that the end product is a joint development effort. Customer personnel are thus able to learn through doing in a highly motivational setting, so that technology transfer is at a maximum.

A case study

A partially good example of this latter method of software technology transfer is afforded by the information system being jointly developed for one of the largest national energy agencies in Venezuela by personnel from that

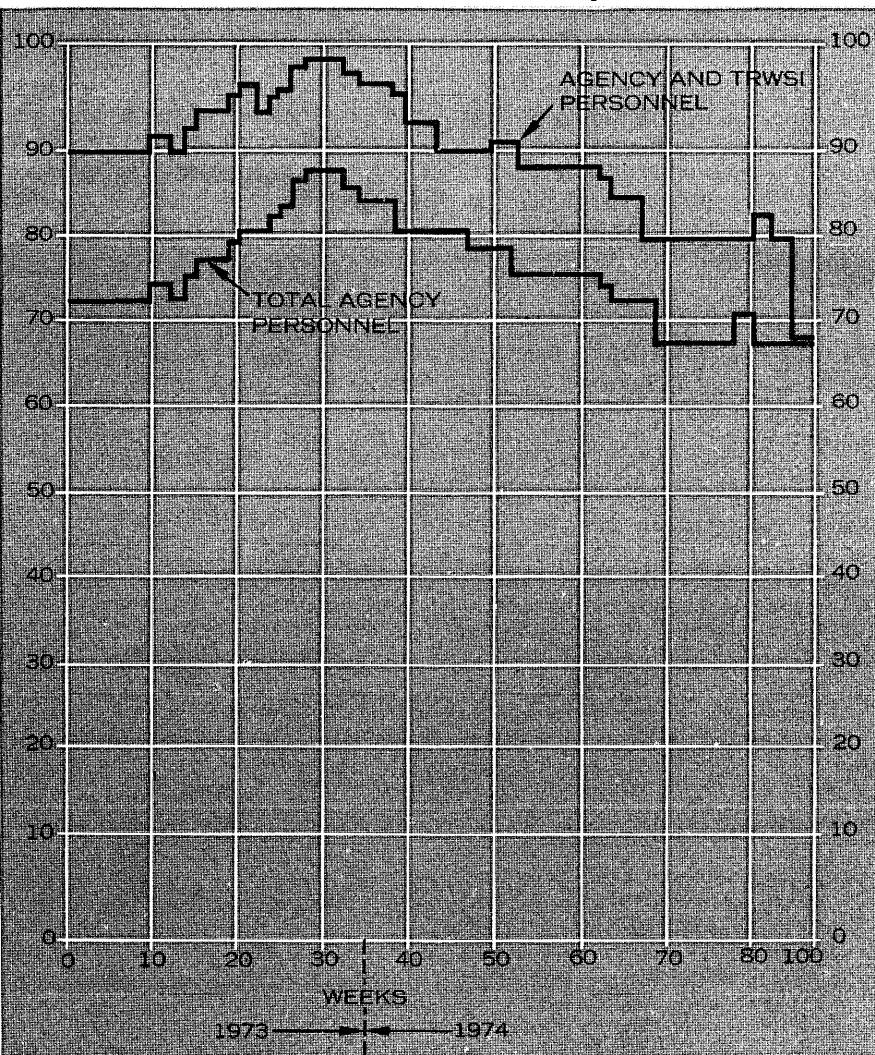


Fig. 3. Developing countries have good leverage in obtaining outside support and manpower. One approach that works well is to have a high ratio of inside personnel to contracted personnel on applications developments, as this yields a large number of experienced in-house personnel to maintain the finished product. The data shown is for a South American electrical power agency project being worked on by TRW Systems International.

SOFTWARE IN DEVELOPING COUNTRIES

agency and from TRW.

The scope of the information system project is sizeable. The agency itself serves approximately three quarters of a million customers throughout an area of more than 300,000 square miles. It employs more than 6,000 people at present and is expanding electrical service to rural parts of the country as rapidly as possible. The information system provides support at three management levels: operational, tactical, and strategic. All major management and administrative functions are included. The tactical and strategic level systems provide on-line access to managers and utilize TRW's GIM (General Information Management) system as the basic data base management system. Most operating level systems are developed in COBOL and are designed to be compatible with and provide selected information to the on-line systems.

In directing the information systems project, the agency has adopted an approach that utilizes TRW personnel as joint partners to the agency's own systems analysts, programmer analysts and user group representatives. Each project task is assigned to a team staffed by agency and TRW personnel in an average five- or six-to-one ratio. A major portion of the software design and development effort, therefore, is actually performed by agency personnel. Team efforts are closely guided by the TRW and agency joint managers. Overall manpower loading is shown in Fig. 3 (p. 77).

Progress through design and implementation is made through mutual concurrence. The joint managers meet daily. Planning and scheduling are carried out jointly. Work authorization and acceptance require joint approval. Formal weekly progress reviews with functional and project managers assure management visibility, early resolution of potential problems, and ample opportunity for redirection. The approach thus permits the sharing of responsibility on an equal basis by all team members assigned to a given task. It also assures the total involvement, commitment and feeling of ownership which the authors of this paper have found to be the most essential element for the rapid and effective transfer of technology.

Working together, the consultant and agency team members were able to bring 20 applications to operational status within a year. To date, over 100 professionals have been trained in the development and use of computer-based information system technology. Furthermore, utilization of the subsystems developed to date has been cited by a president of the agency as a major

reason the agency increased its profits from almost zero to a 1973 year-end dividend of 6%.* Profits are being reinvested to bring electrical service to marginal profit sites in the country.

Adopting such policies and technologies will not only help developing countries better cope with current problems, but also ease the transition toward the foreseeable time when their software costs will equal or surpass the 70% of total data processing costs currently being experienced in developed countries such as the U.S.

Conclusions

Expert software personnel, and not hardware or operating budgets, is the scarcest resource involved in information processing activities in developing countries.

To make best use of these scarce personnel resources, and to meet escalating future demands for software manpower, organizations in developing countries will have to reorient a number of their existing policies. A useful structure for addressing such problems is provided by the use of a manpower planning model. A number of options exist for improving the situation. They generally fall into the categories of increasing software manpower supply and efficiency (through training, automated aids, etc.), reducing demand (through consolidation, purchased software packages, etc.), or obtaining more manpower support from developed countries.

For importing support, organizations in developing countries can often apply a great deal more leverage than they currently realize. One option is to obtain higher levels of support and training when buying computer systems from developed countries. Another very high-leverage option involves the use of consultant firms from developed countries. In general, using such firms for pure training or pure "turn-key" development functions will not lead to best results. A strategy involving joint system development and on-the-job training works much better.

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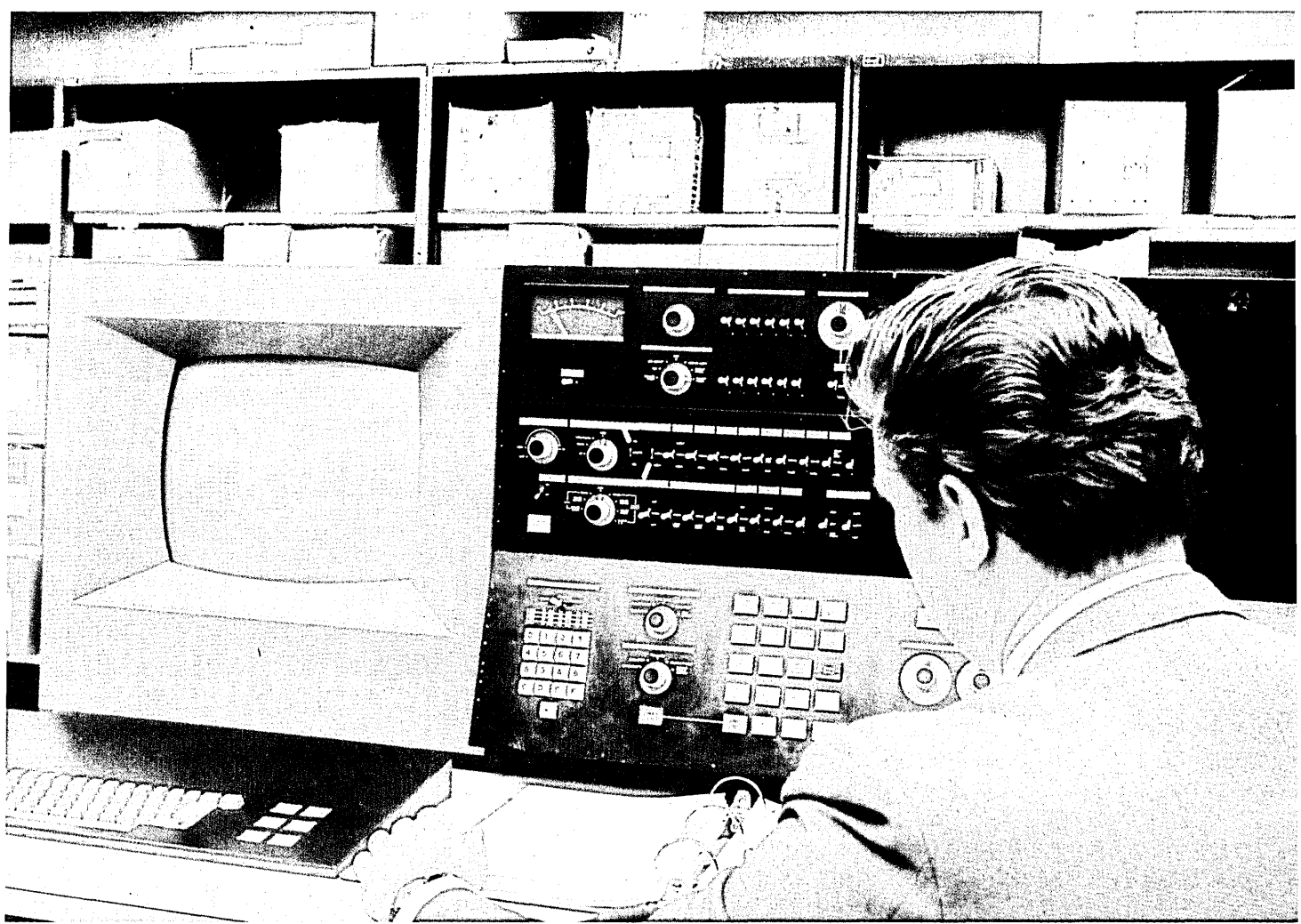


Dr. Boehm is director of software research and technology at TRW Systems Group. He is involved in integrating research in methods of developing large-scale software. Among other government advisory committees, he served on a joint U.S. National Academy of Sciences/Brazilian panel on Computing Education and National Development in Brazil.



Mr. Dexter is manager of information systems at TRW Systems Group and vice president of TRW Systems International Inc.

*Quoted in the Caracas *El Universal*, Feb. 28, 1974.



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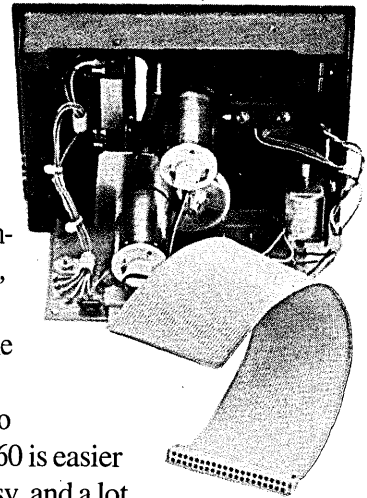
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CIRCLE 46 ON READER CARD

Critical applications can be identified in terms of dollars and cents. Special precautions can be taken to assure these get processed under emergency conditions.

CONTINGENCY PLANNING: WHY? HOW AND HOW MUCH?

by Ludwig Stern

It's Saturday night around 10:30; you're entertaining a group of friends when suddenly the telephone rings. Your shift supervisor is calling from the computing shop downtown to tell you that the fire in the building next door is really a big one. Your only assurance is that he'll keep you posted. His next phone call reveals that the fire is out of hand; it's a five alarmer. By morning you know that your computer operation is now out business: the building next door collapsed, a wall fell on your shop, and water from the building flooded your operations. Your computer and you are in bad shape—even if you are lucky enough to have insurance coverage, the insurance will not help you to continue your operations.

Instead of a fire, it could have been flooding or a hurricane; it could have been an airplane landing in the wrong place, or any one of many hazards [1] over which you have no control and which you cannot prevent. Now what do you do? You should have had a contingency plan [2,3] to cover any emergency [4].

Many managers in the industry have taken this position: they protect their computing facilities as much as they can; they take all the necessary precautions and then trust in the good Lord! I can't accept this as being adequate.

Some people have taken another position: if they experience a catastrophe then their top management will decide what to do, what reaction steps to take. Management will even decide which computer runs are important enough to be handled in an emergency under a limited scope of operation. I cannot agree with that approach. It forces

managers to be schedulers under emergency conditions, at exactly the time management should concentrate on more important things.

At Sun Oil Co. we think we have a better idea. Our data processing security programs have three major objectives: prevention, detection, and response to emergencies. We believe that the response to emergencies can be considered separately. Therefore, we decided to think ahead, to assume the worst, and to make specific contingency plans to cope with emergency conditions[5].

Our approach was to base the contingency plans on rational economic analysis, and to avoid problems of internal politics, of giving "grease to the wheel that squeaks the loudest," and of the user who firmly believes his work to be the most vital to the company. This is the story of how we went about developing those plans.

For an appreciation of the scope of our problem, consider our configuration. The company's computing is done by a wholly-owned subsidiary, the Sun Services Corp. Our computing network currently includes two major computer facilities, in Philadelphia and in Tulsa. We have remote job entry terminals connected from a large number of locations, including Corpus Christi, Houston, Dallas, and Richardson, Texas; Duncan and West Tulsa, Oklahoma; Toledo, Ohio; in numerous locations near Philadelphia; and at various other sites through our marketing territory. Our user community includes all segments of Sun Oil and its subsidiaries.

Although most of our work is currently in batch mode, there is extensive use of time-sharing; we are seeing a

trend toward more and more on-line processing.

Presently we have almost 200 batch application systems running. One of those 200 systems (our marketing accounting system) consists of six major subsystems representing a total of 160 application programs. Similarly, our stock-holder system represents a total of 90 programs. Contingency planning was no small task for us.

Planning the project

At the start of the project, early in 1973, we formed a team consisting of the three regional managers of customer services. In each case they assigned additional personnel to work with them in their regions. Overall project leadership and coordination became the author's responsibility. Since development of a contingency plan was to be a pioneering effort for our team, we had to carefully develop a detailed project plan. Our team members closely collaborated with one another to make the best possible estimates of the effort required for each anticipated task.

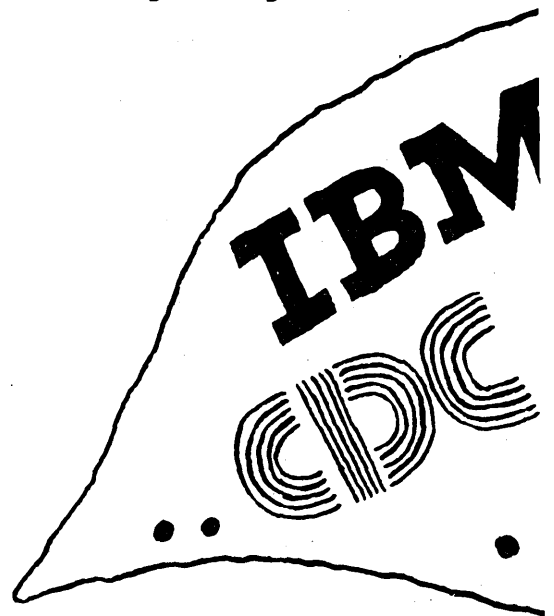
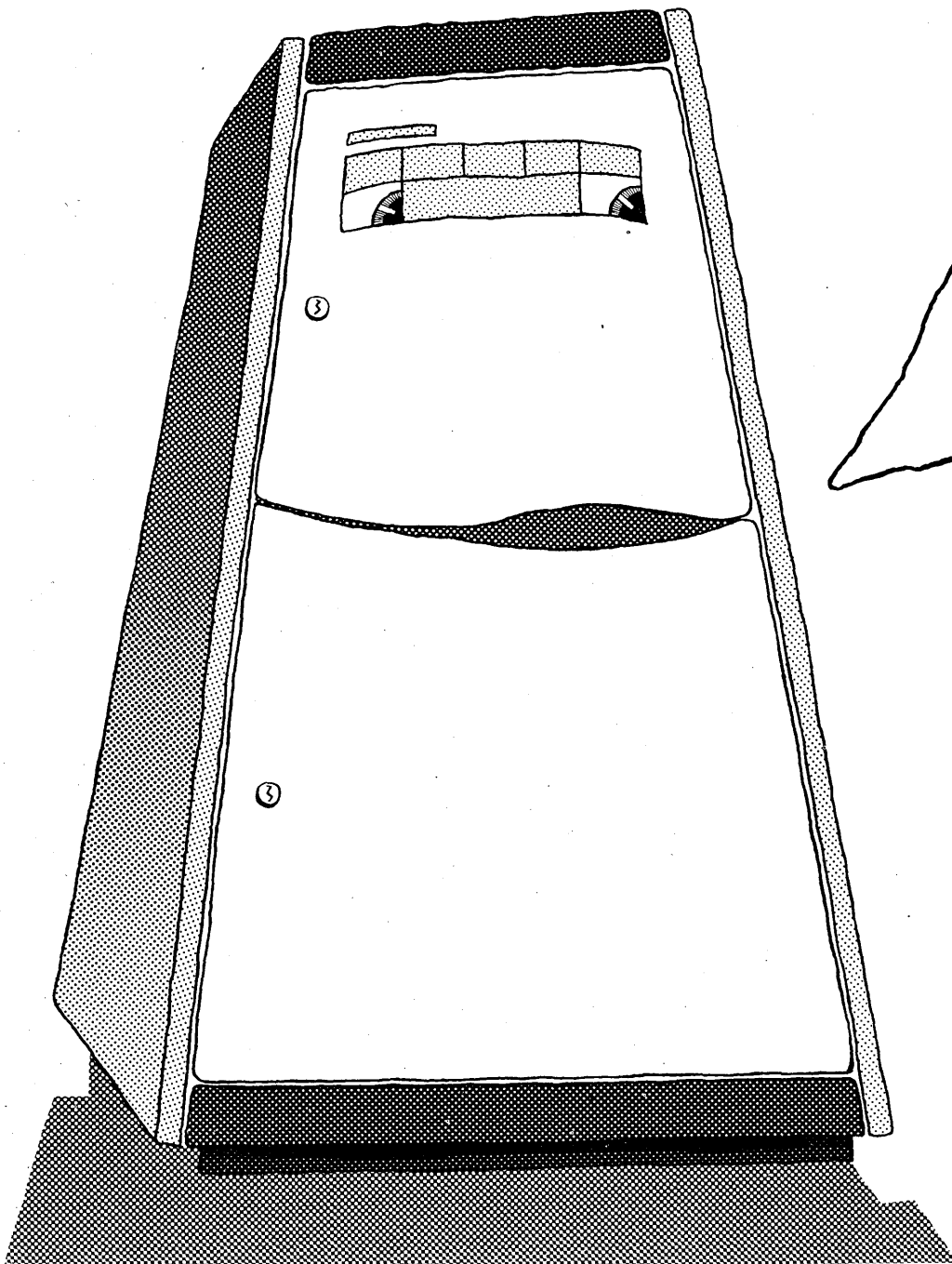
Fig. 1 is an overall outline of the project, revealing an estimate of 219 applied man-days for the total effort. This pertains only to the development of the contingency plan including an emergency notebook, the evaluation of the loss potential, the identification of critical applications, the formulation of response actions, and the package of restoration data as well as recommendations to management for testing, maintenance and updating.

The objectives of the project team included the following:

- (a) conservation of assets upon exposure to a major hazard,

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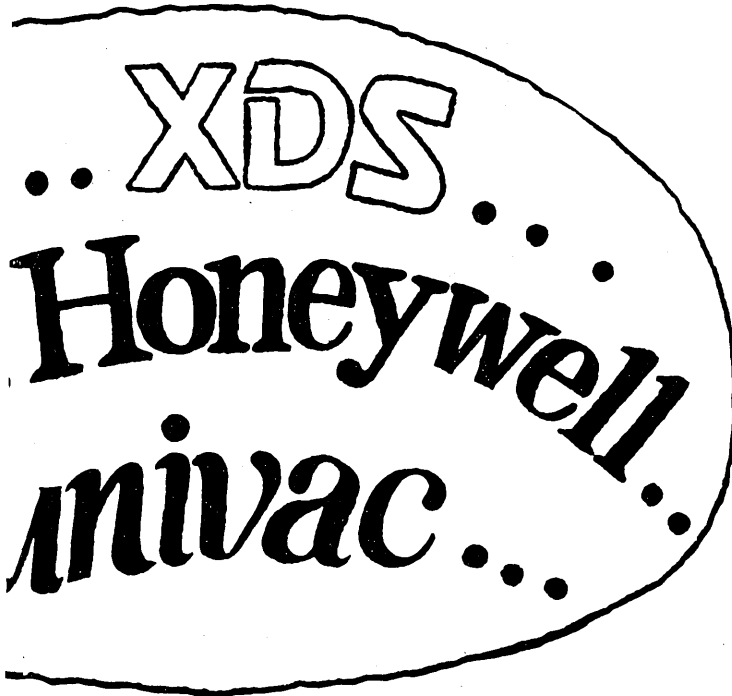
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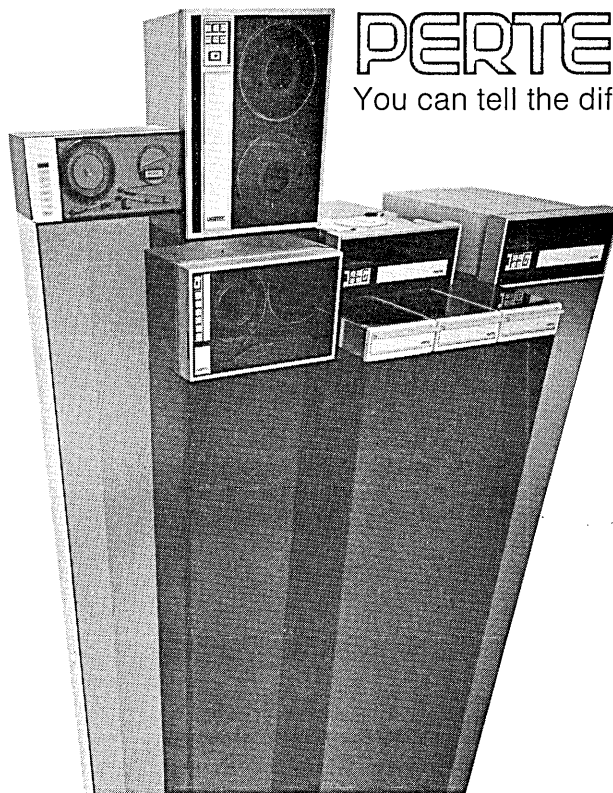
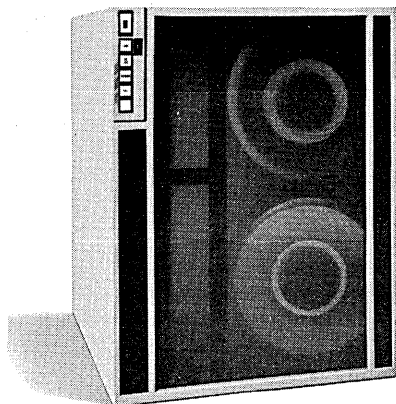
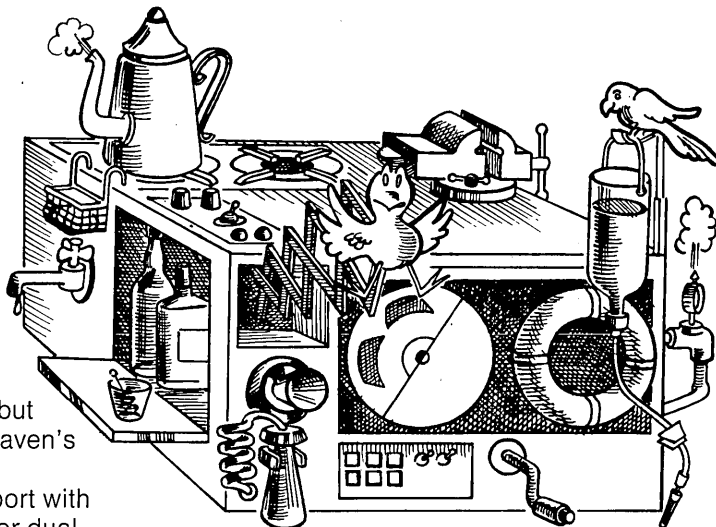
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CONTINGENCY PLANNING

- whether fire, storm, sabotage or other peril;
- (b) assurance that the corporation will survive even if the computer facilities are disabled; and
- (c) specific action plans that a "prudent man" should take while in stewardship over the corporation's most vital asset, data processing.

Backup and recovery

In our analysis we examined the numerous and various hazards [6] which could disable our computer operations. We then categorized them as follows:

- (1) hardware and software failures;
- (2) environmental failures involving electric power, air conditioning, building integrity, etc.;
- (3) accidents like fire, smoke, water, storms;
- (4) vandalism, sabotage, riot;
- (5) operational errors—probably the most frequent cause for inability to operate, often with the most severe consequences; and
- (6) unavailability of personnel whether due to strike, disease, communications breakdown, or disruption of transportation.

For any of the first five categories, the effect would be partial or total inoperability, or perhaps the destruction of facilities, data, programs, and files. The duration of the effects could range from a temporary interruption to a permanent loss. The sixth category, the unavailability of personnel, would result in a temporary interruption.

As backup for the first five of these, one could provide alternate hardware and facilities. Similarly, one could also make up and cycle duplicate copies of the latest versions of data, programs and software [7]. In addition, one should document and securely store all the information needed to restore or duplicate the facilities if they are lost—not only the facilities but also the equipment, services, and supplies that are usually on hand and necessary for successful operations.

To provide backup for the unavailability of people, one could provide for training of alternate personnel for key duties by rotating jobs. (For the job functions at Sun Oil, we normally have cross-training to cover for absenteeism due to sickness or vacation. By extending this normal cross-training into a broader program designed to satisfy contingency plans, we know we can handle the problem of people being unavailable.)

Preparing procedures

We developed the form represented in Fig. 2 (p. 91) as a tool for uniformly recording and evaluating our data, showing the potential losses to Sun Oil if a hazard makes it impossible for our computers to produce outputs on time. In effect, a giant matrix is produced in which we list all programs, subsystems, and systems. And for each we show the cost to the company if we are unable to produce the output as required, but assuming various delay times: less than 12 hours, 12 hours, 24 hours, 2 days, 4 days, 7 days, 2 weeks, one month and longer.

Fig. 3 (p. 91) shows a typical, completed analysis sheet having to do with a segment of one of our critical systems. In this example each of the entries stands alone. In other systems, however, one subsystem must be tied to another since the critical subsystem cannot be run without also running prerequisite and associated programs. For such systems we did the analysis in detail and itemized; we then consolidated the entire net into the total dollar losses per time-frame for the interwoven programs.

Fig. 4 (p. 93) is the "Exhibit B" referred to on the second line of Fig. 3. "Exhibit B" summarizes the detailed calculations used to arrive at the cost of delay. Note that mailing of checks represents a fixed cost, while the balance varies with the length of delay.

In many cases we discovered that the cost to the company if we were unable to produce the output on time was of such magnitude that both we and the users agreed that under no circumstances would the company tolerate such losses. Hence, a dual evaluation was undertaken for those application systems with extremely high loss potentials. First, we calculated as usual

the loss to our company if unable to produce the output on time. Then, for comparison, we contemplated the steps that would be required under the worst conditions—regardless of cost—to prevent this major loss from ever happening. In some cases the user established that a large group of clerks and typists would be hired to do manually what we couldn't produce under the circumstances. We estimated the costs for manpower, floor space, calculators, typewriters and supporting services that would be needed temporarily. (We assume unrealistically but for the sake of argument that the large number of clerks and office machines required could be immediately available.) Nevertheless, the dual evaluation gave us base points to calculate, and to be applied judiciously in our analysis. We see no inconsistency in this, since we are aware that our analysis is relatively rather than absolutely accurate.

The detailed analysis in essentially all cases was done by the user group itself, with assistance and guidance from our team members. It is vital that each analysis be undertaken according to identical directions to make sense of the cost comparisons. We assured this through published guidelines and personal instructions.

Getting the user directly involved in the analysis was found to be of high value. For the first time it forced our users to think through what they might have to do in case of an emergency. It also compelled them to make an economic analysis of the value of their work in a corporate sense, rather than from the usual parochial point of view. The awareness that the criticalness evaluation aroused in the users brought about a healthier relationship between the user community and our people in

PROJECT OUTLINE	
TASKS	APPLIED EFFORT MAN-DAYS
A. PLAN THE PROJECT	11
B. ESTABLISH CURRENT STATUS OF BACKUP AND RECOVERY	8
C. PREPARE PROCEDURES, LISTS, AND FORMS	9
D. ESTABLISH DOLLAR LOSS DUE TO DELAY	80
E. SPECIFY CRITICAL APPLICATIONS	26
F. EVALUATE ALTERNATE RESPONSES	18
G. DOCUMENT RECOMMENDED PLANS	17
H. EMERGENCY PROCEDURES NOTEBOOK	22
I. DOCUMENT INFORMATION TO RECONSTRUCT	18
J. COMPILE PROJECT "PACKAGE"	10
	219

Fig. 1. Establishing dollar losses resulting from delays in processing is the most difficult part of contingency planning. Sun Service's 80 man-day estimate for figuring these losses proved 65% low.

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data processing. The full impact of this will be seen in the future since we are now only at the beginning of the closer relationship fostered by considering the dollar value of the work rather than less basic factors.

Establishing dollar losses

A crucial element of our contingency planning was the identification of critical applications to assure that these will be processed somehow and somewhere under any emergency. The process for the identification of critical systems was based strictly on a rational economic analysis involving the potential dollar loss to Sun Oil if processing of the application systems were delayed.

Certainly we did *not* take the simplified and unrealistic approach of looking at the various application systems and classifying them as non-critical if they merely report historic or accounting data, or critical if they are the bases for management decisions. It is my contention that this approach is impractical because probably most programs lie in the grey area where accounting and decision-making are combined. How would you break these down and classify them realistically? The importance of the task seems to justify a more appropriate classification scheme.

We based our "criticalness" evaluation on the cost the corporation would incur if we were unable to produce the output on time as requested by the user. Our "criticalness" is based then on the economic impact the delay in data processing would have on the company. We considered loss of revenue, additional cost, loss of discount, loss of leases, lost production, operational inefficiencies (such as our refinery scheduling, our supply and distribution commitments, our marine scheduling), and legal requirements (such as fines and potential law suits). Ill will (due to late pay checks, goods not delivered on time, dividends going out late, or whatever) was most difficult to evaluate; we considered ill will in our analysis only if a dollar value could be ascribed to it. Our criticalness evaluation was based entirely on economics, on the potential dollar loss to the company expected from delays in data processing.

As can be seen from the outline (Fig. 1), the largest segment of our project was Task D, the establishment of the loss potential. Let me explain how we arrived at the estimate of 80 man-days. We chose to develop this number from two different points of view. The first was based on statistical expectations. We assumed that 10% of our systems would require 8 hours

each for analysis, that 25% of the systems would require 3 hours, and that 65% can be handled in 1 hour each. We applied this on a regional basis. Our second approach was to sample in each region a list of the component programs for the application systems. A quick analysis by those familiar with the systems established that it would take from 10 minutes to a few hours to examine the cost of delay for each of the component programs. Both estimating methods brought us very close to the 80 man-days indicated.

Converting the applied effort to a calendar basis, we assumed that 67 percent of the available time would be productivity used for this project (all on part-time only, since all team members had to continue their normal functions). This enabled us to establish a schedule for all tasks in the project, and to assign specific people for specific tasks. Our original schedule showed that the economic analysis would be performed from May through July of 1973, and involve at least eight people. Actually, our project slipped a little and the analysis took place from July to mid-November of 1973. (It turned out that the actual effort devoted to the economic analysis of our loss potential was 65% higher than estimated.)

To give a better understanding of how we approached the economic analysis and identified the critical systems, let me detail Task D referred to in Fig. 1 above by breaking it into its components.

The first thing we did was to establish a list of all the application systems and show their subsystems, modules, and programs. Then we identified the responsible user personnel for each. We included the manager who authorized each system, and also ascertained the user contact at the working level who is intimately involved with each application. Eventually we sat down with these people to explain the purposes of the contingency plan, how to accomplish the analysis and how to follow the procedures and guidelines. The user contacts then actually calculated most of the numbers. Finally, as part of the loss analysis, our team reviewed the analysis and supporting documentation. By having the data keypunched we were able to run sorts to establish the ranking by dollar loss due to the delay for each time-frame. This established the critical list.

Factors in delay costs

Some of the factors we considered in establishing the costs of delay are the following:

- First and usually most important was loss of income. This could be

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due to delay in billings, lost interest on accounts receivable, lost sales, loss of future business, lost leases in our gas and oil fields, delays in cash flow, and similar deprivations of income.

- Under the category of additional costs, we include loss of discount on accounts payable, contractual penalties for lateness, extra effort required when manual operations must replace edp processing, overtime, additional interest payments for higher costs due to delay.
- Although it was difficult to establish losses due to operational inefficiencies, we did consider supply and distribution factors for our raw materials and finished products, higher transportation rates, and the necessity of running refineries at suboptimal schedules.
- Costs due to legal requirements were also considered. We took into account contractual penalties for late delivery of goods or delayed transmittal of reports to

government agencies plus potential damage payments for lawsuits and additional legal staff costs.

Specifying critical applications

After completing the economic analysis which led to the identification of critical systems for each time-frame, we were able to undertake refinements. It became evident that in many cases a system critical in one time-frame of delay was not so in others. By examining the data for each time-frame independently, we obtained a rational, firm basis for scheduling our work for limited operations under emergency conditions. If the limits imposed by the magnitude of an emergency are such that we cannot run all the jobs identified as critical, the results of our analysis—the ordering in terms of potential loss—allow us to simply shift the fine line dividing the more critical from the less critical jobs to be processed. This then, reduces our contingency scheduling job to one firmly rooted on the dollar sign and nothing else.

We made multiple analyses for those application programs where the cost of delay varies with the particular calendar time in which the program is run, in other words, where there are different costs depending on the time within the program cycle. An example of such multiple analyses is the portion of our payroll system which generates W2 forms; these forms are not critical throughout the year except in January. Similarly, in our marketing accounting, the criticalness will only prevail during the closing of the books at the first few days of the month.

Taking a closer look at Fig. 2, we see that for a 24-hour delay, program A3N would incur a \$50,000 loss and would be the most costly of those application programs shown here. Whether or not the job with the \$15,000 loss is also critical really depends on further examination. Obviously, those subsystems or programs that have the lower costs of delay are not considered critical. Looking at the time-frame for two weeks of delay,

CRITICALNESS EVALUATION									EXPLANATORY REFERENCES
APPLICATION PROGRAMS	\$ LOSS TO SUN IF DELAY IS:							1 MONTH	
	< 12 HOURS	12 HOURS	24 HOURS	2 DAYS	4 DAYS	7 DAYS	2 WEEKS		
SYSTEM A			1M				5M		
SUBSYSTEM A3			0				175M		
PROGRAM A3N			50M				70M		
PROGRAM A3M			2M				5M		
SUBSYSTEM GB			15M				25M		
SYSTEM R			3M				200M		

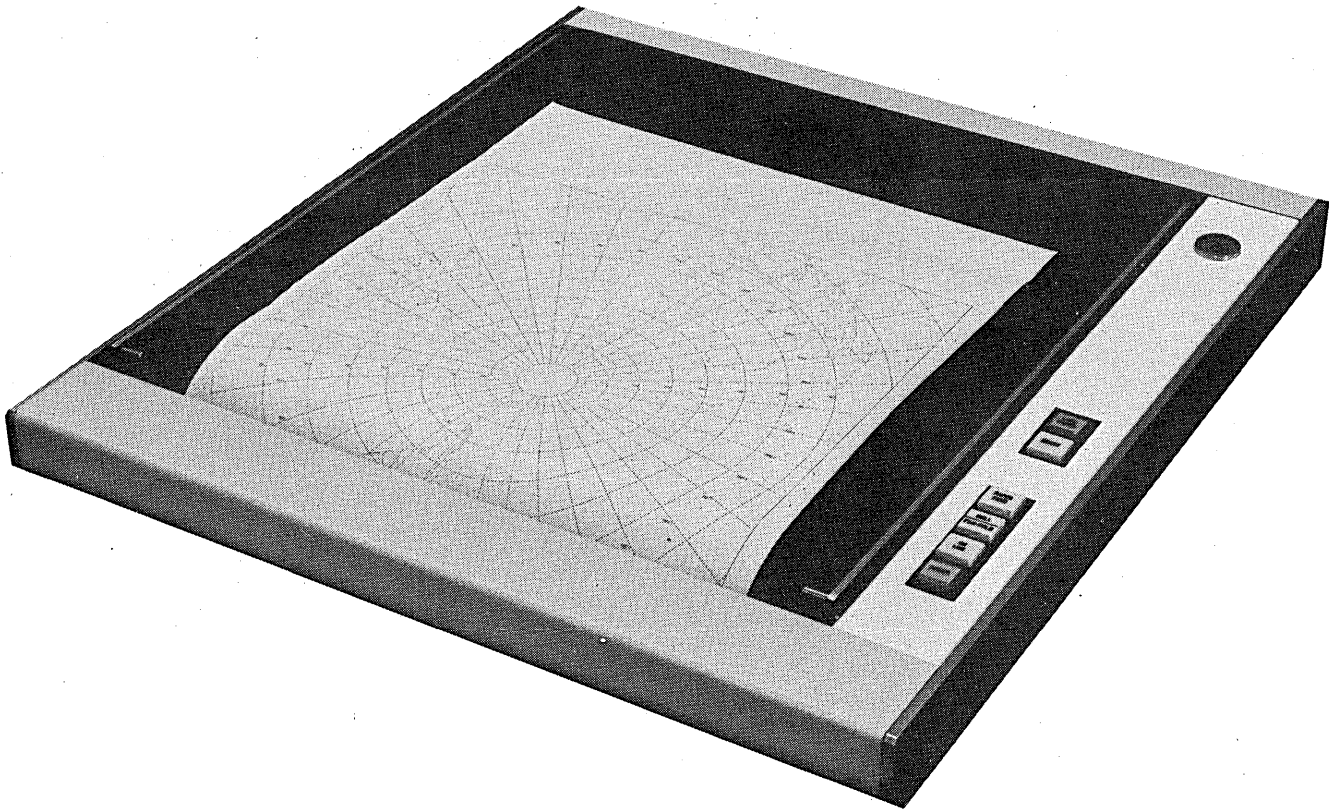
Fig. 2. The object of the contingency plan is to discover which applications programs are most critical in terms of dollar losses incurred for late processing.

SUN SERVICES CORPORATION CONTINGENCY PLAN PROCEDURE FOR CRITICALNESS EVALUATION (Refer to Attached Guidelines)		I/O Site: NEDPO User Organization: XYZXYZXYZXYZ User Contact Name: Robert C. XXXXX User Contact Title: Coordinator-Data Process S&C Representative: Dominick XXXXXX Date Completed: August 14, 1973					
USER'S APPLICATIONS (Identify Descriptively & Completely)	DOLLAR		OIL IF DELAY IS:		EXPLAIN & REFER TO SUPPORTING DOCUMENTS, WORKSHEETS, NOTES, ETC.		
	< 12 HOURS	12 HOUR	2 WEEKS	1 MONTH OR LONGER			
APPLICATION A			12.2	12.2	Supporting Notes: Par. C and Exhibit A		
APPLICATION B: (Mailing XYZXYZXYZ Checks)			45.2	64.0	108.9	Supporting Notes: Par. D1 and Exhibit B	
APPLICATION C			1,986.1	3,718.6	7,183.6	8,925.1	Supporting Notes: Par. D2 and Exhibit C

Fig. 3. The data collected on the criticalness evaluation forms is recapped by department or customer. Each line on the recap represents a set of costs or losses incurred for rerun processing and for non-dp expenses.

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again it is easily seen that the programs with \$200,000 loss and \$175,000 loss are to be considered critical. Whether or not to include the \$70,000 item will depend, of course, on a second analysis: how much time is available in our alternate operation mode, what is involved in the specific contingency plan, what are some of the unique economic considerations relating to the other application systems competing for limited resources available in an emergency?

Having identified the critical jobs, we were then able to establish all the requirements of those jobs:

- **Timing:**
schedules; acceptable delays; min.-max. for normal processing
- **Equipment:**
core; tapes (density, tracks); discs; printers; (special features)
- **Data:**
files; generation data group; catalogs and procedures
- **Software:**
special programs; protection; passwords
- **Preprocessing:**
user interface; inputs; data preparation; error handling; prerequisite runs
- **Personnel:**
user contacts; data preparation; data controller; distribution; supervision; support
- **Postprocessing:**
distribution lists; controls
- **Others:**
documentation (block diagrams, I/O record layouts, source program listing); procedures (operating instructions, checkpoint and restarts); security, storage; forms; supplies.

Evaluating alternate responses

With the critical systems satisfactorily identified, what should be our responses to an "accident" or catastrophe? Let me summarize first the essential elements of any form of response to an unwanted event which would lead to delay in data processing operations.

1. Obviously one must *evaluate the situation* and estimate the consequences including a recognition of the time period in which the accident occurred. If it occurs on a weekend, some specific steps must be taken. At what period of a cycle in processing are we when the operation is brought to a sudden halt?
2. Probably the most neglected response element is *communication* with all of the affected parties. One should not hide the fact that a significant emergency has occurred. Mechanisms (including responsibilities and authorizations) must be set up in advance to communicate with the users, suppliers, personnel and all others in any way involved or impacted.
3. As quickly as possible, the selected response *actions* should be initiated. Operations in the backup mode should be activated on the basis of the contingency plans developed, and by those made responsible in the plan. Necessary check points and controls should not be overlooked, including extra security safeguards. It should be remembered that everything will be under abnormal conditions; for instance, transportation problems may be-

come severe.

4. Actions to *restore normalcy* should be started. During the emergency the data processing is based on a limited scope. Once back to operating in the old fashion, normalcy has not yet been reached. Time will be needed on equipment and overtime for most of the personnel to restore master files and bring them up to a current status. Those files and systems that were temporarily processed in a contingency mode will require much updating. Additional checking of files and supplementary audits must be undertaken to assure that normalcy is indeed restored.

Let us now examine some of the alternative responses:

- Accept the delay. Just do nothing and wait, if one can afford to. This is the simplest response.
- Attempt to remove or minimize the cost of delay. Perhaps it is necessary to negotiate with a state tax office, or to send representatives of management to lease holders and assure them that the royalty payments will come within a few days. But in any case, one should try to minimize the cost of delay.
- Change immediately the schedules of operations and process only what is critical, using as a basis the economic analysis of critical jobs. By reducing the scope of operation one will concentrate on only the true essentials.
- Go off-site whether locally or remotely. This may require running

EXHIBIT B

POTENTIAL LOSSES RELATIVE TO DELAY IN MAILING XYZXYZXYZ CHECKS

INTEREST ESTABLISHED BY SUIT:	1 DAY	2 DAYS	4 DAYS	7 DAYS	2 WKS	1 MONTH
	\$	\$	\$	\$	\$	\$
XXX \$ 8,600,000						
XXX \$ 7,900,000						
<u>\$16,500,000 @ 1%/Month</u>	5,450	10,900	21,800	38,100	76,200	165,000
LESS INTEREST RECEIVED BY SUN @ X% PER ANNUM	(3,300)	(6,600)	(13,200)	(23,100)	(46,200)	(99,000)
LEGAL FEES—10% OF AWARD	550	1,090	2,180	3,810	7,620	16,500
Cost to produce and mail checks:						
15 Min. Computer	\$ XXX					
175,000 Checks	\$ YYY					
Envelopes	\$ ZZZ					
Inserts	\$ AAA					
Postage	\$ BBB					
Bulk Charge	\$ CCC					
<u>\$26,350</u>	<u>26,350</u>	<u>26,350</u>	<u>26,350</u>	<u>26,350</u>	<u>26,350</u>	<u>26,350</u>
	<u>\$29,050</u>	<u>\$31,740</u>	<u>\$37,130</u>	<u>\$45,160</u>	<u>\$63,970</u>	<u>\$108,850</u>

Fig. 4. Backup documents are prepared to explain the cost entries on the analysis sheets.

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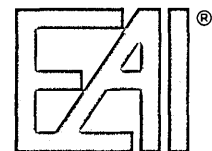


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extra hours for the main processing, and again subsequently to help catch up with the backlog of systems to be updated. For any processing off-site, appropriate concern must be shown for configuration and software compatibilities. Cash advances or credit cards should be handy to provide air tickets for personnel to fly out suddenly. Communications, workflow, controls, and security will become important items requiring attention.

For our situation, involving a computer network based now at two major centers, it is certainly appropriate to identify specific resources that should be common and standardized at the two sites in order to provide backup for each other.

Our emergency procedures notebook, like our whole contingency plan, is designed to limit losses. It is available to console operators, shift supervisors, and operations managers. Included in it are sections dealing with fire, water, flood, bomb threats, smoke, dirt, storms, electric problems, air conditioning failure, building hazards, communication facility problems, hardware malfunctions, evacuation of the building and reentry procedures, and other emergency situations. (The section on other situations deals with radar interference, magnets, backup tapes, situations involving our off-site data storage vaults, lack of supplies and forms, vandalism, theft, and fraud.)

Much of the information incorporated in these sections previously existed within the company in various shapes and forms, and in various degrees of completeness. By consolidating all the information, and by assembling the best for each source, we were able to produce a useful reference.

In an emergency, things usually go from bad to worse. Taking hasty steps, by-passing normal precautionary measures and making faulty responses aggravate the situation. But our emergency procedures notebook will certainly help avoid this. By assigning specific contingency responsibilities in advance of a major emergency, we will do much toward the elimination of chaos and confusion. In our plan, and in our notebook, we have spelled out in detail each response action—after thinking them out under calm conditions.

Compiling the package

In order to achieve ultimate restoration of the data processing operations, one needs to be able to replace damaged or destroyed facilities. This calls for an up-to-date package of records

containing complete specifications and purchasing information for all resources necessary in the operation. It should include data for hardware, communication equipment, system software, operating procedures, run instructions, and various logs. Also to be included are data needed for the reconstruction of files, and for updating, testing, and debugging of programs. One should be certain that the environmental services such as air conditioning and electric power, as well as paper stock, tapes, discs, printer ribbons, forms and general supplies, are all taken care of.

Conclusions

Contingency planning is not easy, and it can take a great deal of time for sophisticated installations. But planning for emergencies is well within the state of the art. The methodology is listed here for those who wish to take advantage of it. It's worth doing.

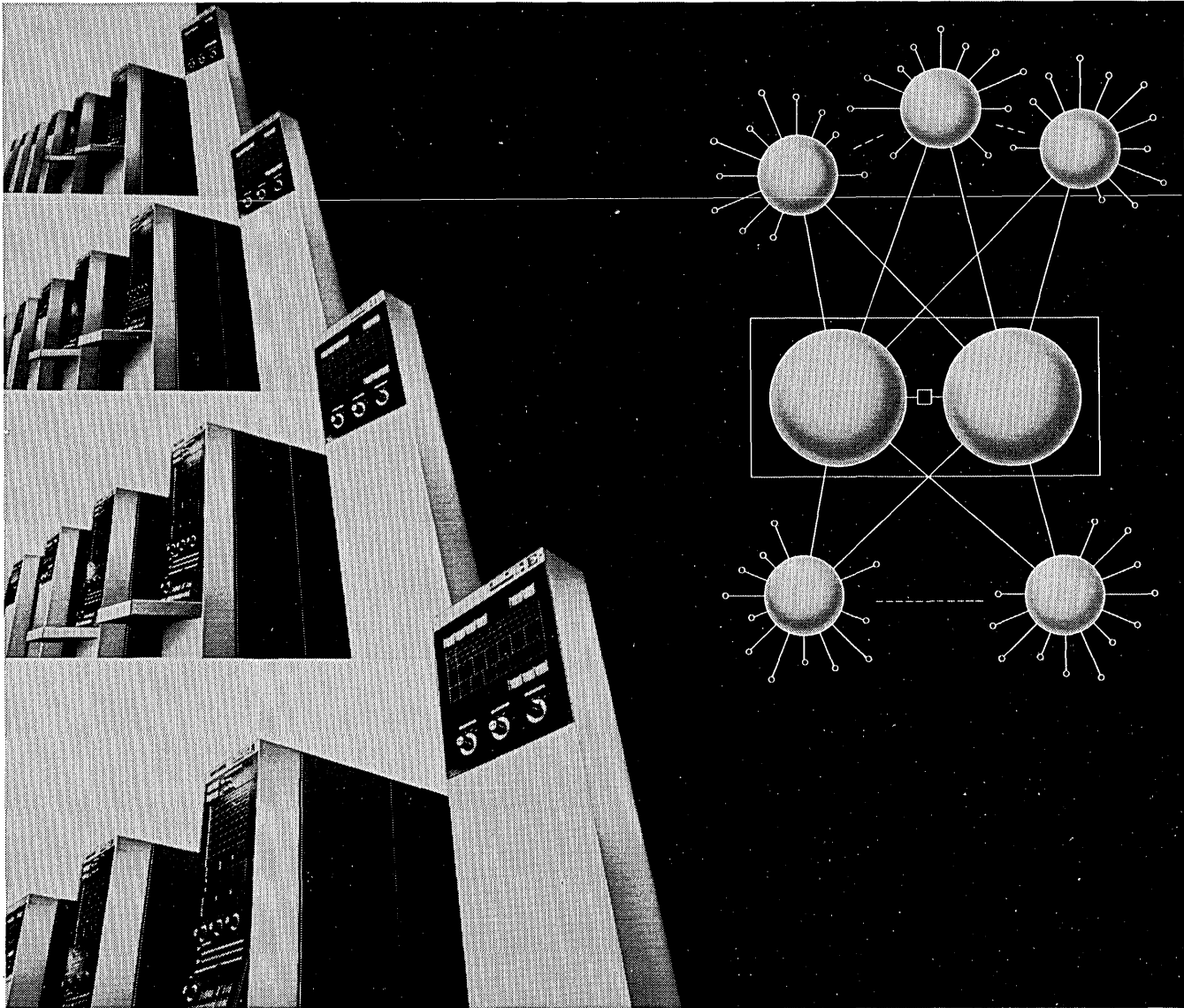
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Mr. Stern is responsible for dp security and back-up provisions at Sun Services Corp. His 24 years of industrial experience includes management of technical and administrative support groups for dp operations, with heavy emphasis on security, safety, and internal controls.

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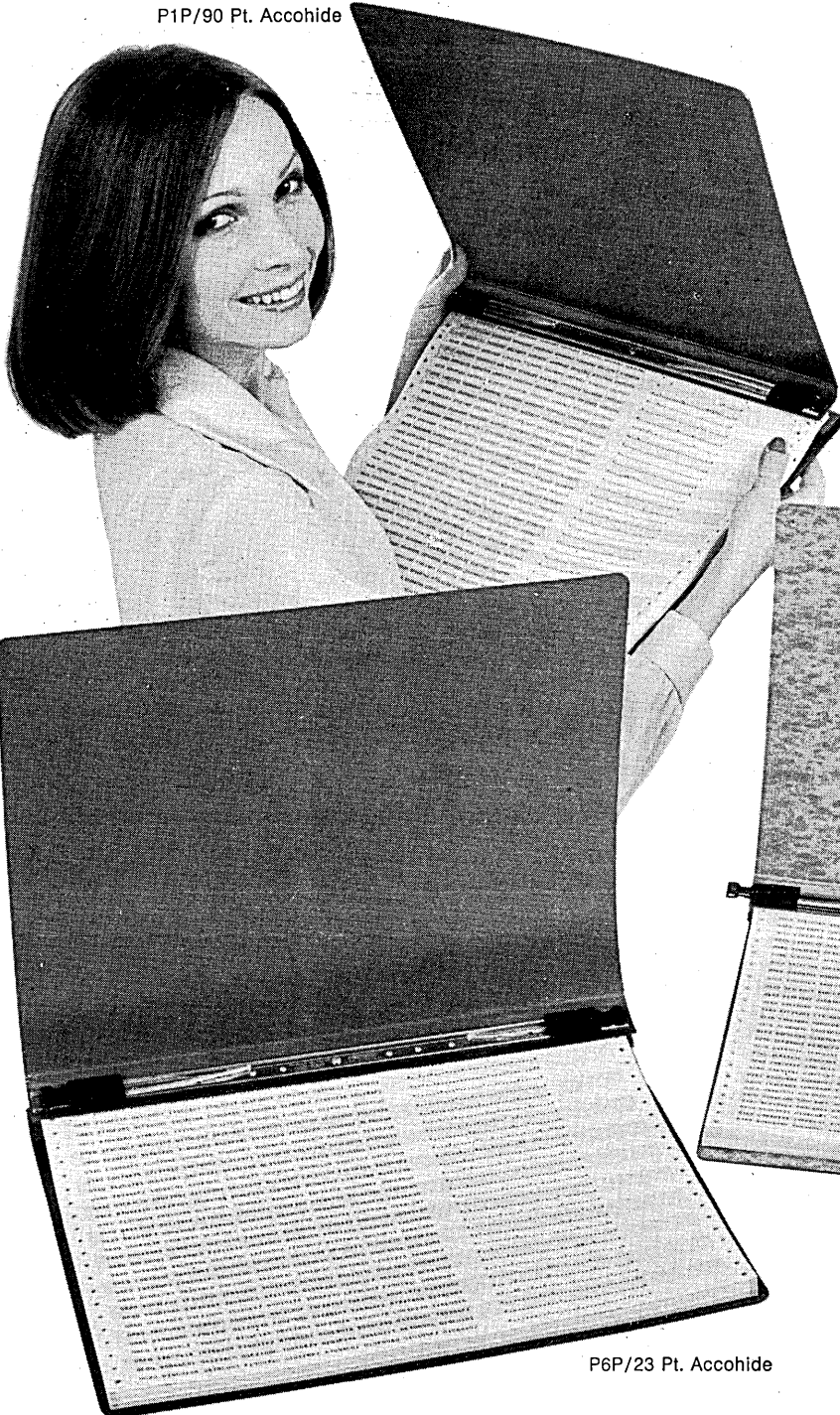
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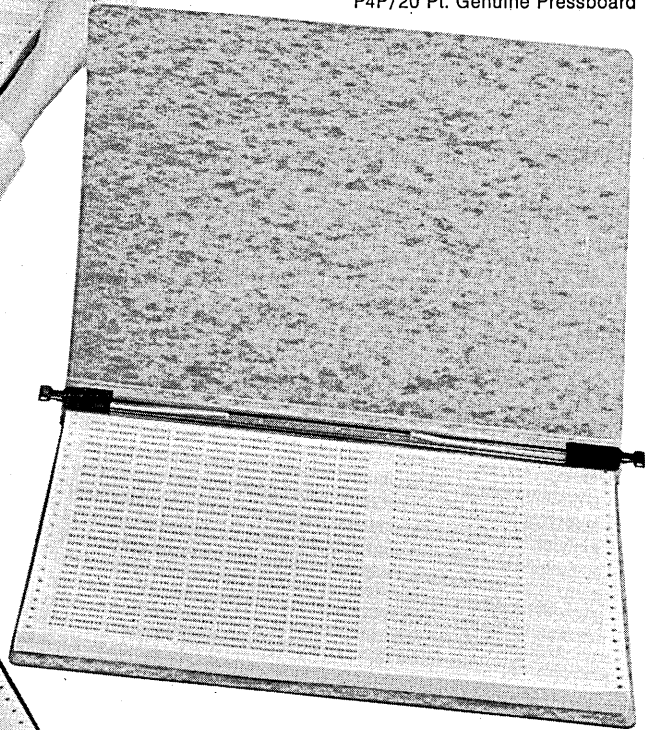
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A computer for automated testing in the lab proves fast and useful, but go with the supplier's executive.

AUTOMATED TESTING IN THE ENGINEERING LAB

For a company such as Warner Electric Brake and Clutch Co. to keep abreast of the changing product requirements of its customers, automated testing has turned out to be the fastest and most effective technique. The situation in the industrial products marketplace is such that the supplier's product performance is linked critically to that of other components in the customer's system, and success depends on properly matching the components as well as the characteristics of each system. To gain a competitive edge, the supplier must assemble, instrument and test seemingly endless permutations and combinations of components in order to amass the necessary applications data for his customers.

Five years ago, Warner Electric faced this formidable problem of testing and classification. Our broad product line of electric clutches and brakes, stepping motors and linear actuators used in incremental motion control systems depend strongly on electronic control and system load conditions for performance. Amassing and reducing the data for our customers was further complicated by the diversity of markets we serve, ranging from automotive to computer and computer peripheral.

The peacemaker in this potentially frustrating situation of adequate application information versus finite engineering budgets is, of course, the computer. We first ventured into the land of analog computation, modeling our products and simulating user conditions, but soon returned to the real-time world when relatively low cost digital computers hit the market.

From an engineering management viewpoint, our choice to automate our engineering laboratory rather than physically expand the lab or add additional engineering personnel was a

pioneering effort for our industry, but the dividend from this decision—vastly improved customer assistance capability—has been handsome.

Automating the lab

Initially, our attempt to know our product line better was formulated into a broad project goal: to assemble the hardware and software necessary to transfer from manual to automated product testing, data analysis and reduction; to greatly expand knowledge of product performance in diverse systems; and to upgrade the technical level of the data. Adjunct goals were to expand laboratory utilization through unattended testing during night hours

by Ronald Knoerzer

and to free engineering staff members from the shackles of routine product testing for more creative design and application roles.

Along the way we discovered variations in product characteristic definitions from one market group to the next, so company-wide standard definitions were adopted. With an eye to the future, and with computer conversion at our disposal, we also adopted dual dimensioning of all data. And perhaps most important, we brought together our several engineering groups, which are physically located in different buildings, through the umbilical cords linking remote control cabinets, data terminals, and test stands, to our cen-

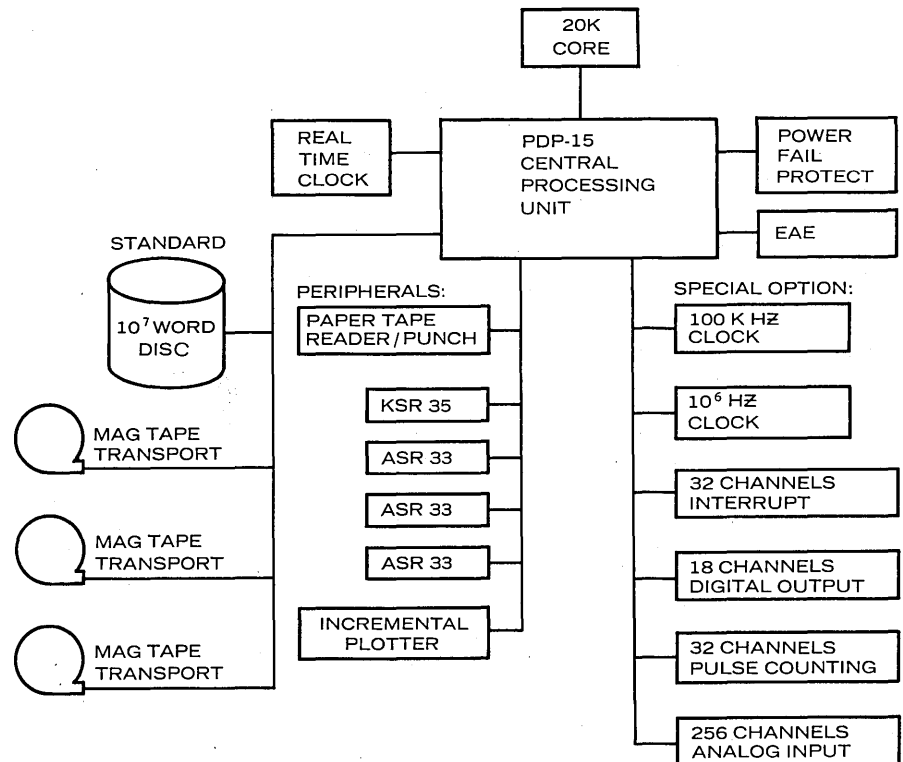
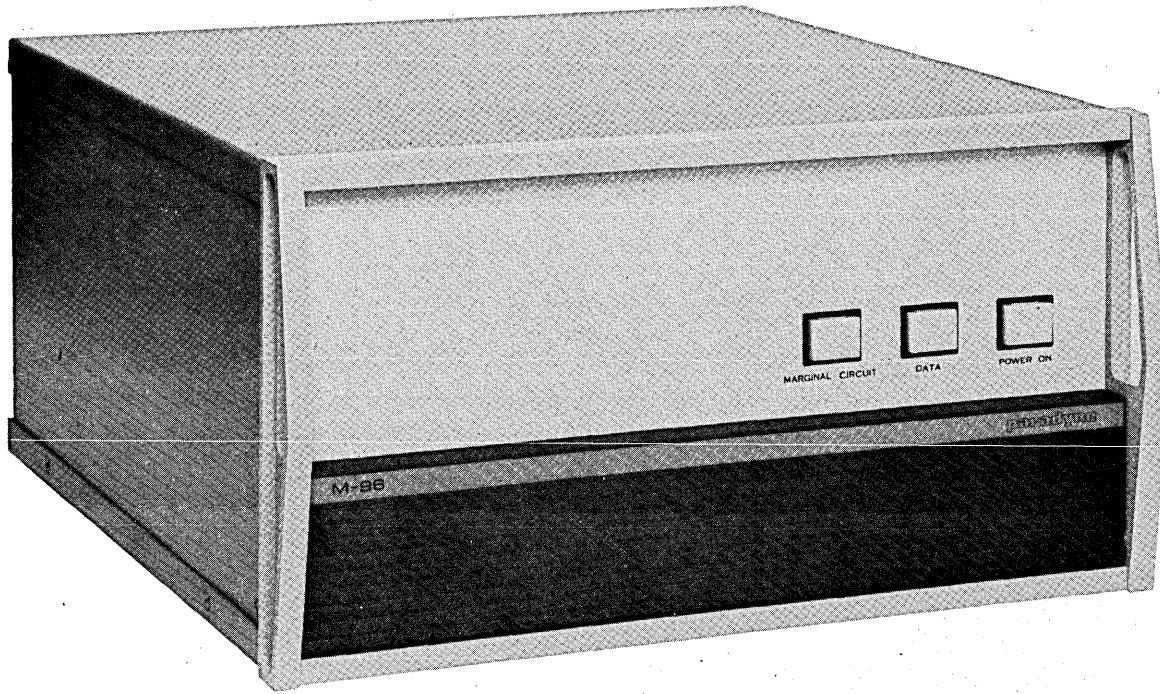


Fig. 1. The typical testing system for Warner Electric includes custom designed equipment such as a megahertz pulse generator.



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AUTOMATED TESTING

tral computer.

Although other computers and memories would have served our needs just as well, we settled on a Digital Equipment Corp. PDP-15 Model 20 computer with 20 thousand words of core, a real-time clock and power fail protection. The standard peripheral equipment on the system includes a 10 million word disc, two tape transports, a high speed paper tape reader/punch, four Teletypes, and a CalComp incremental plotter.

Custom designed equipment to satisfy our unique needs was also required: a 100 KHZ clock for accurate timing; a megahertz pulse generator for step motor control; and 32 channels of interrupt, 18 channels of digital output, 32 channels of pulse counting and 256 channels of analog input with programmable controlled amplification (see Fig. 1).

For each product type, we build an instrumented physical stand, normally consisting of a prime mover or motion producing device, the motion device under test, a physical or simulated load, and the necessary measuring devices to produce computer compatible signals (Fig. 2).

In some cases, for example, step motors, the motion device and the prime mover are one device. For some static tests, the prime mover and load are not even required.

In a sense, the test stand makes possible the accommodation of our automated testing system to our physically dissimilar products. Through the use of transducers, analog signals can be generated for rpm, voltage, current, temperature, force, torque, pressure, etc., and the computer neither knows nor cares whether the signal was generated by a clutch, brake, step motor or some other device.

Standing as watchful supervisor and go-between interfacing test stand and computer, control cabinets receive output commands from the computer in digital form, initiate the function, and automatically operate the test stand as prescribed.

Different cabinets have been custom built for each test, but all feature computer command decoding circuitry which receives digital commands from the computer and initiates the functions represented by the command. By using a decoder, we tie up only 12 bits of digital output while simultaneously performing as many as 64 unique commands on any one of 32 test stands. The added flexibility and cost savings of decoded command speak for themselves.

All cabinets are designed to be operable without computer hookup, so we can test our setup and check operation

of the test stand without tying up the computer.

Beware of your own executive

Because we were bootstrapping our automated testing systems, we developed a real-time executive that works in conjunction with Digital Equipment's disc operating system monitor. Normally, a single user such as Warner Electric finds it prohibitively expensive to custom design a real-time executive, but we had no choice. RSX, MTS and TSX, real-time scheduling programs available today, were not available in 1968.

Of course, the system is a mixed blessing. We have an efficient real-time monitor tailored exactly to our needs, providing all necessary functions but no extras. Consequently, system cost rings up at about \$50,000 less than a comparable system operating under a supplier's real-time executive. Additionally, we can modify our executive in house, bypassing costly outside software support.

On the debit side, program change time is longer, and we don't have provisions for time-sharing. Modification time on the supplier's system runs three to five minutes. Ours currently takes 15. And as for time-sharing, through

self-discipline we use daytime hours for program development, report writing and test stand setup, and relegate unattended on-line testing to the night.

What is our recommendation to a manufacturer automating his lab today? Go with a supplier executive. For the additional cost, you'll gain greater flexibility.

How the system operates

Operation of Warner Electric's executive is straightforward. To start a test, a technician requests the program via data switches at an operator's console. Within one second, his request is granted and the program is queued for execution.

After all higher-priority programs are executed, this program enters core from our bulk storage device and is executed. The computer asks a series of questions regarding the test configuration, including the type of device under test, test duration, conditions to test, and calibration factors of the measuring instruments.

Once the input portion of the test is complete, the collect portion is automatically entered and reentered on a periodic basis until all test conditions have been satisfied and the data recorded.

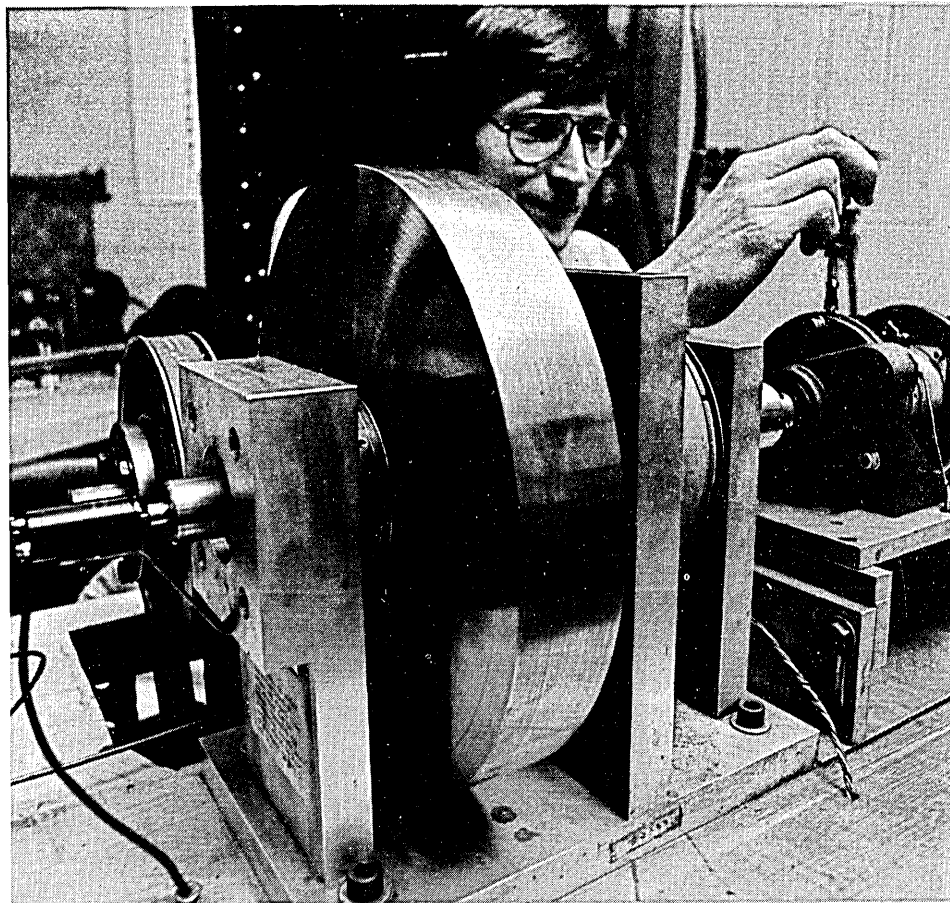
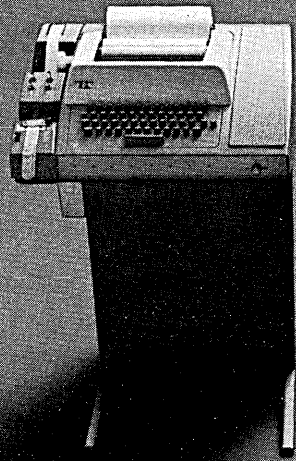


Fig. 2. A clutch-brake test stand, designed and built by Warner Electric, is being prepared for computerized testing in the lab. Engineering test stands located in different buildings can be connected to the central computer.



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Some of their improvements have made the model 33 more

reliable and rugged. Others have kept the cost down.

But as improved as the model 33 is, the changes haven't outmoded previous model 33's. So the oldest unit still putting in a hard day's work is compatible with the units coming off our assembly lines right now.

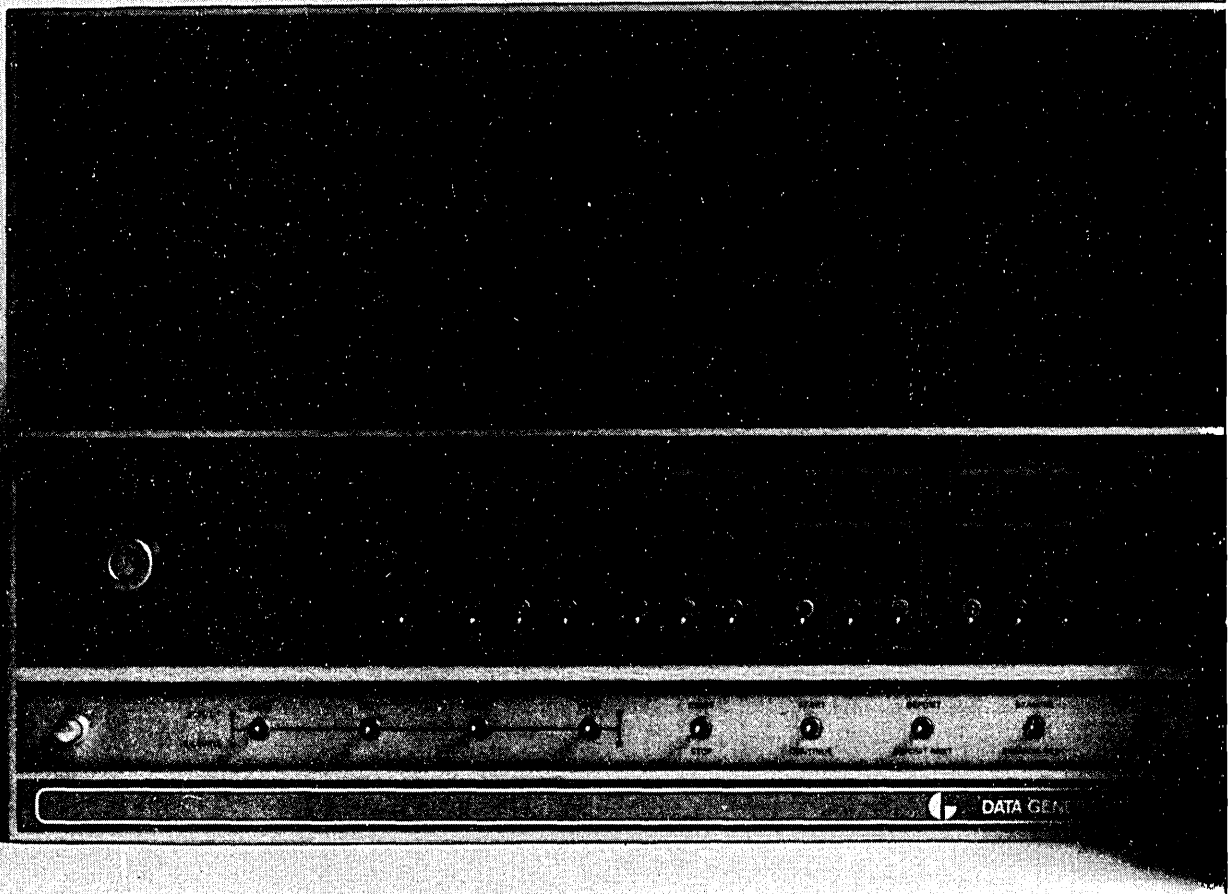
However, there is one small part of the model 33 we're trying to keep as old-fashioned as possible. That's the price. We want to make sure our customers get more than a data terminal. By making sure they also get a bargain.

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even with entire systems.

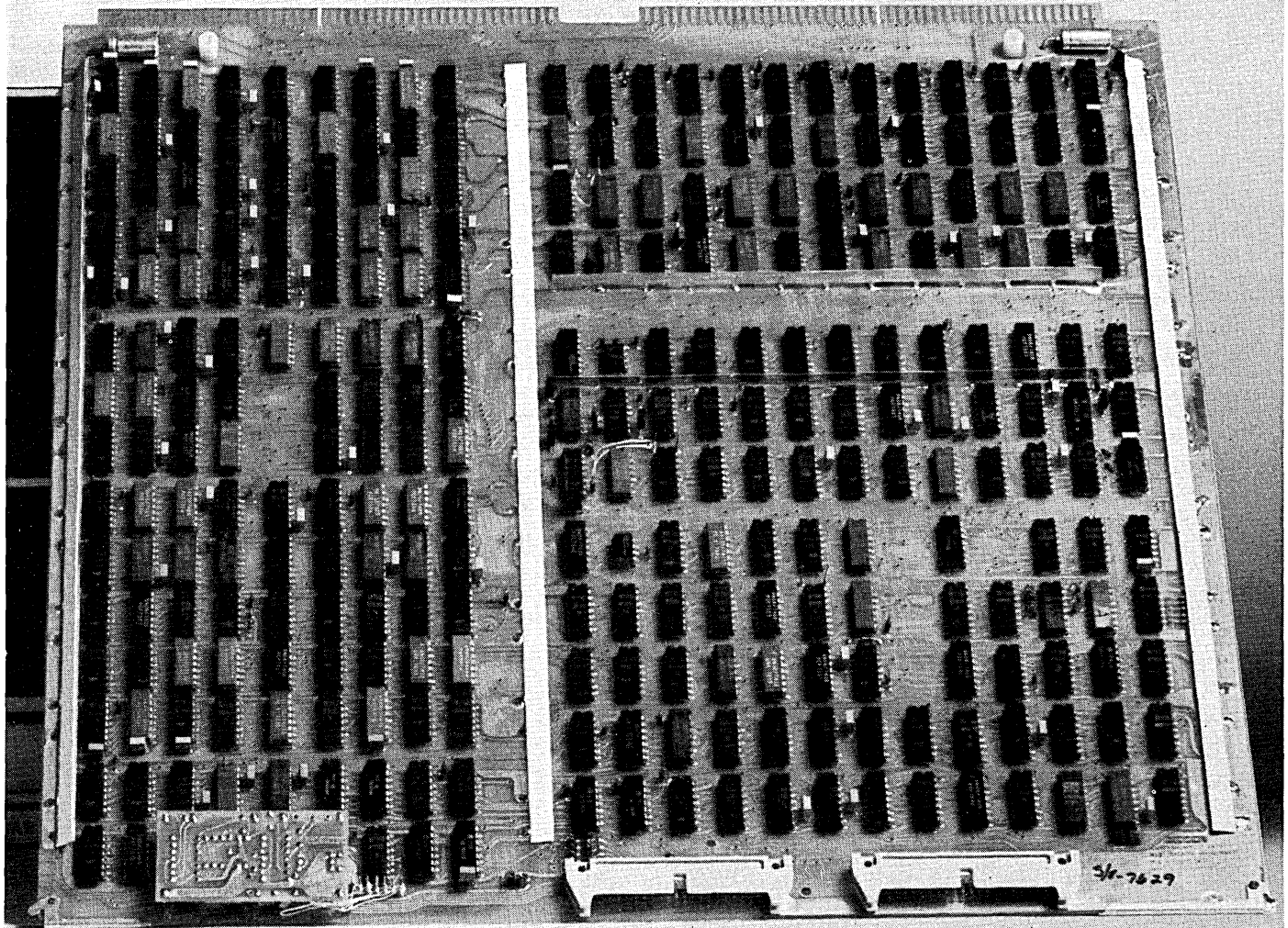
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The peripheral systems we make come in all shapes, sizes and kinds. Complete with controllers,

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drives, power supplies, cables, terminators, diagnostic and operating software and documentation. And a whole staff of support and service people dedicated to keeping you happy with it all.

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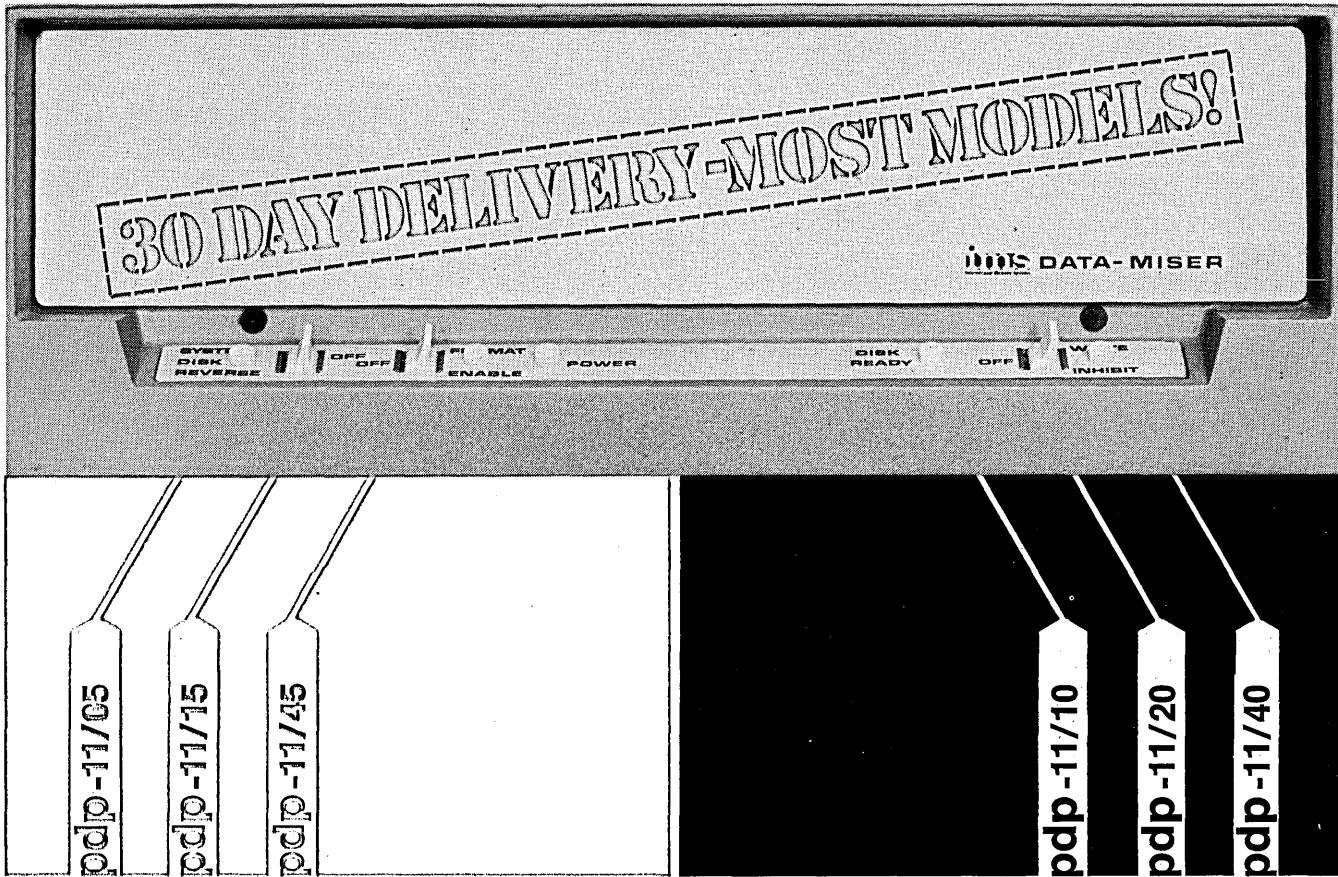
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This linear programming technique can optimize throughput on small-scale or large-scale configurations.

COMPUTER RESOURCE ALLOCATION

There is a way to approach computer resource allocation through linear programming. We used the approach in developing a scheduling technique for a small-scale processor acting as a remote job entry station, and we were successful in improving throughput. Our machine was a Honeywell 115 which was capable of communicating with several mainframes over leased lines or the dial-up network, and which was also used for local batch processing. But the specific features of the hardware and software are secondary; the ideas are applicable to many hardware configurations.

Fig. 1 is a simplified schematic of the H-115 computer system and its communications features. It represents the small-scale end of the hardware spectrum. Although it has no operating system, the supervisor does provide the capability for concurrent foreground-background processing, that is, certain off-line functions can be performed while the system is communicating with a remote site. In particular, there are six functions that can be performed:

1. receive to tape
2. card to tape
3. transmit from tape
4. transmit from cards
5. tape to printer
6. receive to printer

With a relatively slow (300 lpm) printer, medium speed communications (3600 bps), and the usual demand from users for rapid turnaround, the question logically arose as to how to best utilize the above capabilities. (Basically, it is desirable for all new jobs to be entered into the system

without slowing the printing of output from jobs previously entered and executed on the remote computer.)

One approach to the solution of problems of this kind is represented by the technique of linear programming.

Briefly stated, linear programming is a technique which can be used to maximize functions of the form

$$R = \sum_{j=1}^m C_j X_j$$

subject to inequalities of the type

$$\sum_{j=1}^m A_{ij} X_j \leq C_i \quad i = 1, 2, \dots, n$$

$$\text{and } X_j \geq 0 \quad j = 1, 2, \dots, m$$

These relationships and inequalities will be developed specifically in the discussion to follow.

Fig. 2 depicts a "time line" proportional to the desired (or allowable) RJE processing period T. T might be limited to a portion of a particular shift due to local batch processing require-

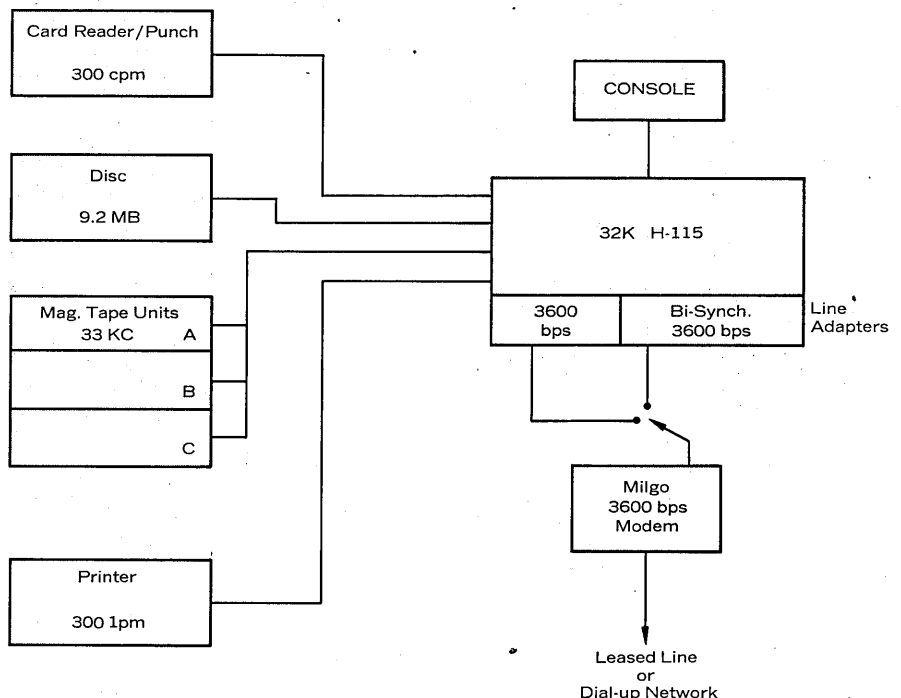


Fig. 1. The Honeywell 115 was used for local batch processing as well as remote job entry. Linear programming led to improved throughput for this configuration, but the technique is not limited to small-scale hardware.

by K. W. Chester

COMPUTER RESOURCE ALLOCATION

ments such as payroll or program development and testing. In lines 2A, 2B, and 2C, foreground-background capability is *not* assumed.

In 2A a time subinterval t_1 is shown devoted to transmission of a given volume of card images to the remote site. The time remaining is used to print output transmitted from the remote site. Suppose this results in X lines of hard copy.

In 2B we see that a time subinterval t_2 is devoted to writing the card images on magnetic tape which are then transmitted to the central site. If (as implied) t_3 is less than t_1 , we can expect to be able to print X + Y lines.

In 2C we show a time subinterval t_4 devoted to writing remote output on magnetic tape which is printed during the subinterval T- t_4 . Now if it happens that the printer can be driven faster from tape than on-line, it may be possible to print X+Y+Z lines. In this case, we should clearly adopt the input schedule of 2B and the output schedule of 2C.

The point here is that non-obvious throughput improvements may be possible if we can evaluate and properly schedule the available resources. The effect of a foreground-background capability is indicated in 2D by the fact that, in this example, the entire period T can be used for printing.

Application

If we use the notation Δt_i to represent the time subintervals appropriate to each of the six possible functions, the following definitions can be made:

Symbol	Function	Constant
Δt_1	receive to tape	T_{rt}
Δt_2	card to tape	T_{ct}
Δt_3	transmit from tape	T_{xt}
Δt_4	transmit from cards	T_{xc}
Δt_5	tape to printer	T_{tp}
Δt_6	receive to printer	T_{rp}

The symbols in the column labeled "constant" stand for the (measured) average time required to process a unit quantity of records by each of the various means. Thus the average number of records received to tape during the subinterval Δt_1 is $\Delta t_1/T_{rt}$.

In the present case, we are concerned with minimizing the turnaround time for RJE, hence we seek to maximize the number of lines printed

during the specified time period T, i.e. maximize

$$R = \frac{1}{T_{tp}} \cdot \Delta t_5 + \frac{1}{T_{rp}} \cdot \Delta t_6$$

subject to the constraints

$$\Delta t_1 + \Delta t_3 + \Delta t_4 + \Delta t_6 \leq T$$

$$\Delta t_2 + \Delta t_5 \leq T$$

$$\Delta t_5 + \Delta t_6 \leq T$$

$$\Delta t_2 + \Delta t_4 \leq T$$

$$\Delta t_2 + \Delta t_3 \leq T$$

$$\Delta t_1 + \Delta t_5 \leq T$$

$$\frac{1}{T_{rt}} \cdot \Delta t_1 - \frac{1}{T_{tp}} \cdot \Delta t_5 = 0$$

$$\frac{1}{T_{ct}} \cdot \Delta t_2 - \frac{1}{T_{xt}} \cdot \Delta t_3 = 0$$

$$\frac{1}{T_{ct}} \cdot \Delta t_2 + \frac{1}{T_{xc}} \cdot \Delta t_4 = N_{in}$$

$$\Delta t_i \geq 0 \quad i = 1, 2, \dots, 6$$

where N_{in} represents the number of records that are to be transmitted to the central site.

It may be noted that two additional constraints could be invoked, due to the presence of a combination card reader/punch, namely

$$\Delta t_2 + \Delta t_6 \leq T$$

$$\Delta t_4 + \Delta t_5 \leq T$$

In practice, however, it was found unnecessary to do so.

Implementation

The solution to the maximization problem outlined above was achieved using an application library program available on the remote computer. The measured constants' values are shown in Fig. 3. A sample run of the time-shared scheduling program is shown in Fig. 4. In this connection, note that the H-115 computer is not used to compute the resource schedule. This is accomplished by a BASIC language time-shared program run from an ASCII (10 or 30 cps) terminal near the H-115.

H115 SYSTEM CONSTANTS	
Symbol	Average Times (for 1000 records)
T_{rt}	4.8 minutes
T_{ct}	4.0 minutes
T_{xt}	5.0 minutes
T_{xc}	7.0 minutes
T_{tp}	4.2 minutes
T_{rp}	6.7 minutes

Fig. 3. Constants for items like the time T required to read cards to tape (rt) are determined by the hardware.

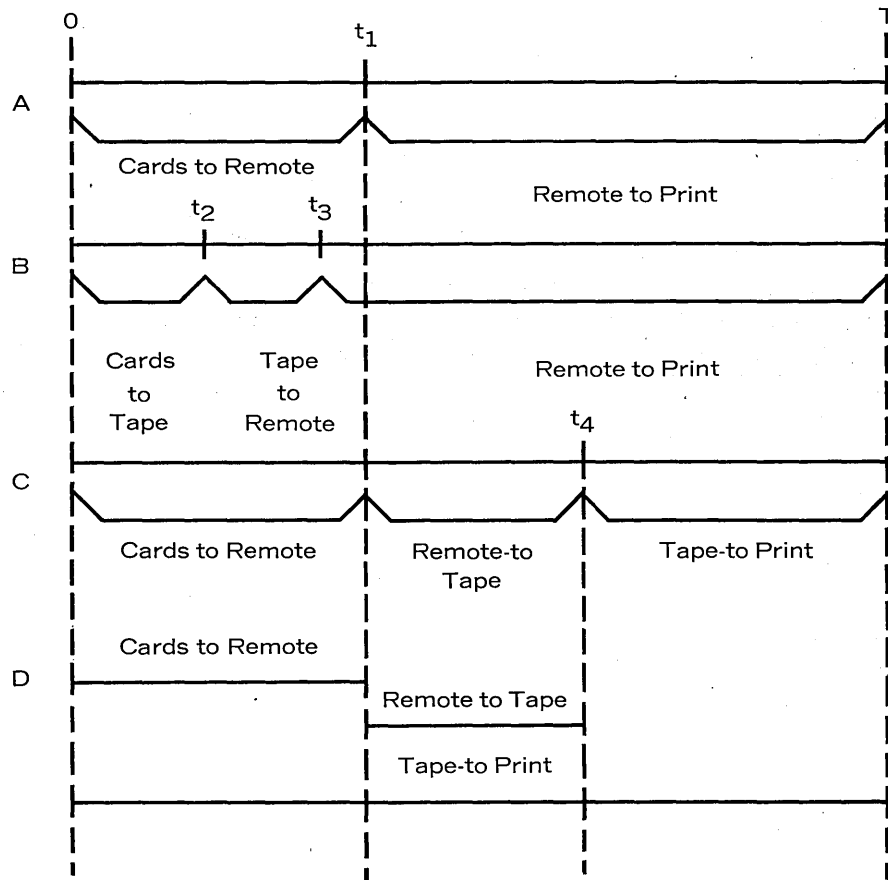


Fig. 2. The technique leads to conclusions which are not obvious. In this simple example for time T, there proved to be a "best" method for maximizing print time.

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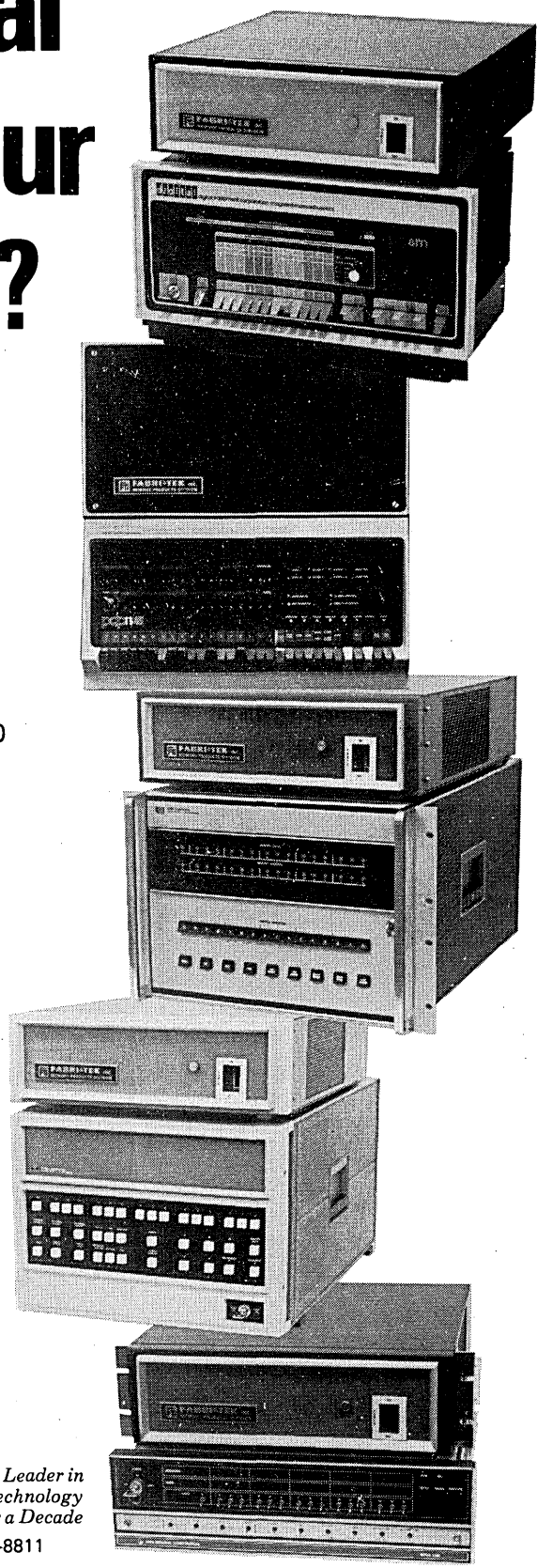
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COMPUTER RESOURCE ALLOCATION

Thus the operator (or perhaps the I/O clerk) is able to quickly recompute the schedule at any time during a shift.

It should perhaps be emphasized that the scheduler does not indicate which jobs should be entered or printed, nor in what sequence. Sequencing is left to the operator, who is normally aware of any job priorities. He must be alert to avoid truncating or cutting off jobs in the process of shifting functions.

Example

In Fig. 4, the time period is defined as 120 minutes. There are 5000 cards to be transmitted to the central site.

The operator should then ideally time his activities as follows:

1. 64 minutes (53% of the 120 minute period) are to be spent in receiving records to tape.
2. 20 minutes are to be spent in reading punched cards and writing the images on tape.
3. 25 minutes are to be spent in transmitting card images from tape.
4. No time should be spent in transmitting card images directly upon reading the punched cards.
5. 56 minutes are to be spent in

printing previously taped records.

6. 31 minutes are to be spent in printing records on-line.

The number of records/lines which can be printed, assuming the schedule is followed exactly, is 18,000.

If, instead of the above schedule, the operator took the "obvious" approach of transmitting the cards from the card reader and then printing on-line, the best performance he could expect would be computed as follows:

$$\Delta t_4 = 5 \times T_{xc} = 5 \times 7 = 35 \text{ minutes}$$

required to read cards.

$$\Delta t_6 = 120 - 35 = 85 \text{ minutes}$$

available for printing. The number of lines printed would then be given by

$$(85/T_{rp}) \times 1000 = (85/6.7) \times 1000 = 12,687.$$

Thus the scheduler indicates that an increase of $(18,000 - 12,687) = 5313$ lines, or an improvement in throughput of $(5513/12,687) \times 100 = 42\%$, is technically possible.

Conclusions

The 18,000 lines mentioned above is obviously an idealization since the nature of the actual job stream will sel-

dom, if ever, permit the schedule to be followed exactly. Similarly, the time spent by the operator in switching functions and servicing the card reader, printer, and tape units will tend to reduce the optimally achievable results. Nevertheless, it is helpful to the dp manager and his operations personnel to be able to assess what the system can do, even if under somewhat idealized circumstances. Incidentally, the dp manager can also employ this technique to evaluate the effect on performance of proposed changes in systems (including communications) hardware.

In our particular RJE environment, the main benefit derived from this approach lay in the added insight the operators gained into the RJE capabilities of the system; that is, it served as an inexpensive and effective training aid. Once they had executed the scheduler a number of times, for various periods and numbers of input records, the operators were able to achieve comparable results on the basis of their own judgment. This outcome was perhaps aided by the fact that most of our RJE runs involve a reasonably large number of I/O records, consequently it is virtually impossible to adhere closely to the optimum schedule without truncating (and losing) some jobs. Given a substantial mix of both large and small jobs, or a predominance of small jobs, it is doubtful that the average operator could compete with the automated scheduler. \square

```
SYSTEM ?BASI
OLD OR NEW-OLD OPTIM
READY
*RUN
```

```
ENTER TIME PERIOD(MIN.),NØ. OF INPUT CARDS(K) ?120,5
```

FUNCTION DEFINITIONS:

- 1=REMOTE TO TAPE
- 2=CARD TO TAPE
- 3=TAPE TO REMOTE
- 4=CARDS TO REMOTE
- 5=TAPE TO PRINT
- 6=REMOTE TO PRINT

```
SCHEDULE FOR T= 120 MINUTES, AND
NØ. OF RECORDS IN= 5 K
```

FUNCTION	MINUTES	PERCENT
1	64.00018	53.33348
2	20	16.66667
3	25	20.83333
4	0	0
5	55.99982	46.66652
6	30.99982	25.83319

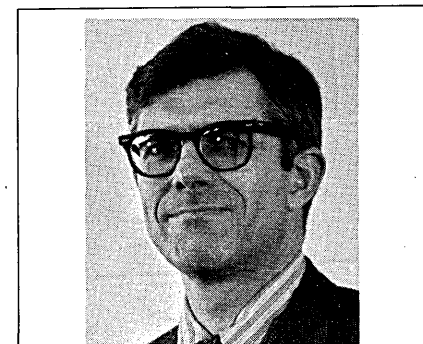
```
MAX. NØ. OF RECORDS WHICH CAN BE PRINTED= 18.09872 K
```

```
READY
```

Fig. 4. Initially the output from a time-shared scheduling program was used to guide operator actions. Eventually the operators could achieve the same results without aid.

References

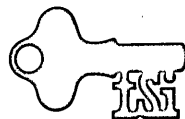
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Mr. Chester is the area manager for Bechtel International Corp.'s Ann Arbor service bureau, which offers time-sharing, local and remote batch. He was introduced to linear programming while studying for his MS in Administration. His 17 years in dp include a period at the U.S. Naval Academy at Annapolis, where he was responsible for the Academy's use of some of the earliest commercial time-sharing systems.

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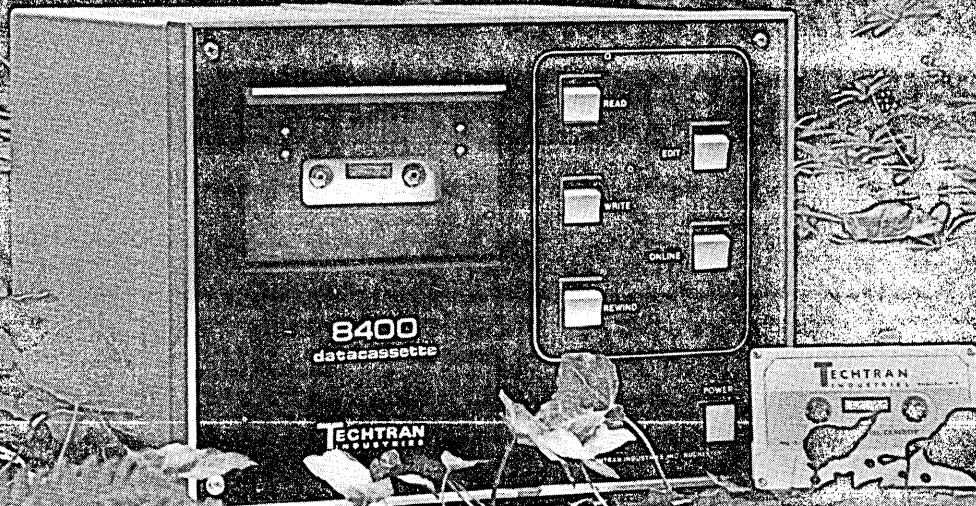
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news in perspective

Most standards activities in the computer business have been consistent failures, with one exception, page 115. IBM's position as a de facto standards setter is examined . . .

Ma Bell has given way a little on the foreign attachment issue, page 117. But in allowing attachment of telephone answering devices to its dial-up network, can AT&T then deny similar attachments of other kinds of terminals, including computer terminals? . . .

Owners of IBM's 370 and 360 computers who hesitate to move to VS systems now find it easier to remain holdouts, page 122. Here's a report on how OS users find enhancements to support their investments in purchased equipment . . .

As the Washington merry-go-round gathers momentum, privacy legislation is imminent. But many commercial operators of personal data bases take comfort in revisions to the legislation that at first is targeted at files operated by government, not the private sector, page 130 . . .

Privacy was a prime concern of many attending IFIP 74 in Stockholm. The triennial conference drew a record turnout in August, page 133 . . .

The resignation of President Nixon stirs talk that the Justice Dept.'s antitrust suit against IBM could be settled with a Consent Decree, page 137 . . .

A celebrated on-line hospital information system finally gets the go-ahead in California. It turns out to be just what most of the nurses and a lot of the doctors ordered, page 138.

Standards

"Desirable" to Become The De Facto Standard

Where Others Failed, IBM Is the Most Successful

Mention "computer industry standards" and a vision is conjured up of a rolling deep fog mixed with rhetoric, frustration, and even despair. One reason so little is known about computer industry standards is because there really isn't much in the way of concrete computer industry standards.

Governmental agencies, user groups, and industry and trade associations have all been remarkably consistent in producing failure in the area, however well-intentioned and hard-working they may be.

That leaves us with IBM, which has been the most successful standard setter in the industry. Much has been written about the above-named standards groups, but little about IBM as the standard setter of the computer industry. How, then, does IBM approach the issue of standards internally? Various IBM internal documents—chiefly the Management Review Committee (MRC) and Management Committee (MC) minutes and exhibits—give some clues. The two long-term policy making bodies recently were consolidated into a four-man group called the Corporate Management Committee (CMC).

In early 1970, the MC had this to say: "In general, the MC concluded, and all agreed, that it is desirable for IBM Engineering to become the de facto standard." The comment was made in connection with IBM's ongoing study of the peripherals industry.

It is understandable that IBM—and any other computer manufacturer, for that matter—would desire to be in the position to set de facto standards. Conversely, according to the minutes, IBM does not desire that other firms set de facto standards. In a MC report to the MRC during 1970, the IBM document states: "We reviewed activity in both the tape cassette and credit card area. In both instances, present standards activities are based on preserving maximum options and therefore are not a hindrance to any contemplated IBM approach. Here the MC noted that the real threat is the establishment of a de facto standard, i.e., Philips in the cassette area

and NCR in the credit card area."

CODASYL "Inconsistent"

In the large data base area, internal IBM documents dated 1971 and 1972 indicate that Honeywell attempted to formalize "a standard based on the work" of the CODASYL Data Base Task Group. The IBM documents point out that such an action could "lead to a standard and market requirements inconsistent with our own product directions."

There are also indications that IBM shifted its leanings at least partially toward the work of the CODASYL subcommittee, after IBM's work with a new data base product called AM-1 had problems. "Our previous concern," the documents state, "was that the proposal under study (by the CODASYL subcommittee) was inconsistent with our product plan, particularly AM-1. Since our December report, AM-1 has been stopped because of poor performance and our probable new direction is much more consistent with the CODASYL work."

Standard FORTRAN

How does a standard evolve? IBM set out a few examples. In one diagram on programming languages, it was noted that FORTRAN was implemented by IBM in 1957, and, after a period of user experience, became a de facto standard in 1961 with IBM releasing control of the scientific programming language the following year. FORTRAN then became an industry standard in 1966.

The case with PL/I was similar, with the programming language specified by IBM's user group, SHARE, in 1965. There was then a period of "open discussion and user experience," and release of contract with PL/I to become the industry standard later.

With COBOL, however, it was a different story, with the product being developed between 1957 and 1961. The IBM diagram listed COBOL "user experience" at 1962 with the language becoming the industry standard in 1968, and IBM's product not to appear until later. Thus, IBM realizes that it doesn't *always* set the industry de facto standards and

news in perspective

in fact, on occasion, follows others.

The IBM top management documents also hit upon a recurring problem in the standards area—the contention that computer technology often moves faster than standards can be set. In one statement on CODASYL, it was reported: “The real difficulty is that technology is moving much faster in this area than is the standards community. . .”

In another comment on interfacing specifications, the IBM documents carry a statement to the effect that “there is

less interest in evolving a standard because of the realization that moving technology raises doubt about the usefulness of standards . . . many who were pushing for standards would now much prefer announcement of full interface specifications at announcement time. We feel this is impractical because of the multiple changes which occur during the normal B & C test cycles.”

Early in 1968, the MC made a full-blown presentation to the MRC on standards. Although that presentation, of

course, is in the distant past, scores of products currently coming off IBM production lines could have been designed with these principles in mind.

On the basis of the 1968 presentation, it is indicated that nitty-gritty business considerations play a prominent role in the IBM standards game. The document states that “implementation of industry standards is a business decision based upon market considerations” and “industry standards affect P/L (profit/loss)—and therefore require management involvement.”

When a standard isn't

The presentation also noted that “IBM

Sanders' Plea for Terminal Interface Specs

Arthur W. Carroll thinks that the Don of Armonk has taken out a contract on terminal companies, just like it took out contracts on the leasing and peripherals companies. Naturally, Carroll is uneasy about the situation since his company—Sanders Data Systems—is in the terminal business.

Carroll, who is vice president and general manager of the Sanders Associates' subsidiary, has taken the lead in attempting to beat off the IBM assault. Sanders instituted legal action against IBM over support of the 2260 and competitive terminals and IBM backed down and agreed to continue supporting the terminals for users. More recently Carroll and Sanders Associates' president, Royden C. Sanders Jr., have been continuing the attack.

“We're not asking for product information from IBM,” says Carroll. “We think IBM and its competitors can use totally different products. We want interface specifications and we think everyone should be able to get full interface specs at the time of IBM's first offering of their new terminals.”

As it has become more evident that the various computer standards organizations have been unable to establish and enforce standards, there is a growing momentum for early release of specifications.

As Carroll sees it, IBM is able to control the terminal market—and other markets, too—by using complicated interfacing specifications. He thinks both IBM's competitors and its users are caught in a vicious product cycle.

In that cycle, IBM announces a new product, but refuses to release specs. IBM would rather go to the added expense of supporting customers

than release specifications. Many users hold up on their purchases of competitive products to wait and see how the IBM equipment will perform.

When the IBM equipment is first delivered, IBM releases a product manual, but Carroll contends that is a far cry from full product specifications. Competitors then purchase the IBM equipment and begin to de-



ARTHUR W. CARROLL
All he wants are the specs

velop the best interfaces they can. Meanwhile, IBM often continues to release “mid-life kickers”—in the form of both hardware and software—that are not compatible with the interfacing that the competitors are producing.

Restart the cycle

Finally, the competitors begin to deliver their products, usually more than 24 months after IBM began its deliveries. Shortly thereafter IBM announces another product offering and the cycle begins again.

Carroll fears that the only way a company can effectively beat the IBM

product cycle is for the firm to engage in industrial espionage—that is, to steal the plans from IBM. If the evidence presented in several recent trade secret suits brought by IBM against competition can be believed, then industrial espionage is commonplace in the industry.

Moreover, Carroll thinks IBM's stranglehold in the terminal area will grow with the spread of large systems software and the growth of the data communications market. In both areas, the specifications are important on both sides of the transmission of data.

As for legislative (regulation) and legal (antitrust) remedies, Carroll feels they can be too long and drawn out to be effective solutions to the problems. Plain and simple, he sees “full disclosure of full interface specs at the first offering” of the product as the only logical solution. By “full specs” Carroll means things like command information that flows across the interface, and technical specs on formatting, timing, responses, protocol, loading, and diagnostic commands.

Sanders Associates is also concerned about IBM's planned entry into satellite communications via its proposed controlling interest in CML Satellite Corp. In a recent statement before the U.S. Senate Judiciary Committee's Subcommittee on Antitrust and Monopoly, Royden Sanders said:

“Although IBM will not control the only satellite communications system, it alone will possess the resources to control the \$110 billion domestic market that encompasses business equipment, data processing, and business communications—the total market for integrated business systems.” □

will actively participate in industry standards programs" and that "standards are 'minimums'—do not preclude added features nor products different from the standard." It was also observed that "IBM participation or vote does not commit the company to implementation."

It was also noted that "standards should not proscribe creativity."

There are indications that as late as early 1970, IBM still had drawn up no firm strategy on standards. In a MC report to the MRC, it was stated: "We were disturbed to learn that in no case is a crisp written strategy available (for standards issues). For that matter, it appears that little or no work is being done to develop the underlying technical requirements, etc., to allow such a strategy to be written. It was pointed out . . . that there are numerous instances where we feel it is premature to have a standard and that any standard would be disadvantageous from the point of view of all parties, users and manufacturers alike. . . ."

"We have acknowledged that it is conceivable that the state of the art in some instances is so unknown that nothing more can be done other than to continue to study the problem and the definitions of its parameters. Even in these cases, however, we have requested a fall-back strategy based on the most probable set of assumptions."

In many cases, the MC and MRC minutes are sometimes confusing to the outsider, and attempts to have IBM explain the minutes and give its opinions on standards were declined by the firm. An IBM spokesman said that a court order in the U.S. antitrust case against IBM made it impossible for the firm to comment, because the issue of standards has been raised in the case. An unusual press gag order initiated by IBM's outside legal counsel in the case forbids both IBM and the Justice Dept. from commenting to the press on aspects of the Justice Dept. case.

—W. David Gardner

Communications

Interconnect Bar Lowered Slightly

AT&T is going to let telephone answering devices be connected to the dial-up network through protective connecting arrangements built by independent manufacturers. The announcement in August appeared to be a significant softening of the telephone company's long-standing resistance to the use of "foreign attachments."

With one major exception, dial-up

users who wanted to link independently made terminals directly to the network have had to obtain a connecting arrangement from the phone company. The installation and monthly rental charges frequently add a considerable amount to the cost of the terminal, and so many users decide to obtain their terminals from AT&T. Customers of the Rochester (N.Y.) Telephone Co. are the only ones, at the moment, who can link independently made terminals to the dial-up network through non-Bell connecting arrangements. However, they must use devices supplied by Rochester Tel.

Effects

The AT&T announcement, by permitting independently made connecting arrangements for answering devices, will enable manufacturers of this equipment to incorporate the devices in their terminals, eliminating the separate charge now imposed on the user by Bell. As a result, independently made answering devices may become more price-competitive with those supplied by the Bell System.

AT&T made it clear, in announcing the new policy, that it will apply only to answering devices. Said senior vice president Edward B. Crossland: "AT&T's position requiring telephone company connecting arrangements for other customer-provided equipment and services remains unchanged. Answering devices lend themselves to this arrangement because they do not originate calls and can be connected in a simple manner."

Nevertheless, it's hard to see how AT&T can continue requiring telephone company-supplied connecting arrangements for other types of terminals.

In California, Utah, Minnesota, and New York, independent terminal equipment makers and/or users are pushing vigorously for a more open policy. Early this month, for example, the Communication Certification Laboratory (CCL), a private testing organization whose president, Amos Jackson, reportedly has close ties to the Utah Public Service Commission, proposed a plan for that state under which "ancillary devices"—answering units, automatic dialers, conferencing devices, call diverters, and call restricters—could be interconnected to the telephone network directly, after being certified on the basis of procedures and standards that would be specified in a new tariff. CCL's proposal included detailed certification specifications, which attempt to integrate recommendations made earlier by AT&T, independent terminal manufacturers, and other participants in the national interconnect debate.

Since AT&T imposed the present re-

strictions—late in 1968, after the FCC's Carterfone Decision—foreign attachment makers have been insisting that their equipment poses only a minimal threat to the proper functioning of the telephone network, and that this danger can be removed either by certifying the terminals beforehand or by using independently made connecting arrangements built to agreed-upon specifications.

AT&T, on the other hand, has insisted that it must supply the connecting arrangements to insure the integrity of the network. Now it has retreated from that position, at least for telephone answering devices. But, almost certainly, the independent manufacturers are going to argue that if independently made connecting arrangements can safeguard the network against harm from answering devices, they can do likewise for other kinds of terminals.

Spokesmen for the independents were skeptical about the effect of AT&T's latest move. Jim Holmes, executive director of the North American Telephone Association (NATA), said, "We still don't know how much the connecting arrangement referred to in the AT&T announcement will cost, and how much it will add to the final price of the answering device." CCL's Jackson said Bell was estimating this added cost at \$10. "Certification, by comparison, would cost only \$1/unit," he pointed out. Jackson added that limiting the new policy to answering devices was a serious shortcoming, and he also thought that Bell's plan to assume total control over connecting arrangement specifications posed possible antitrust problems.

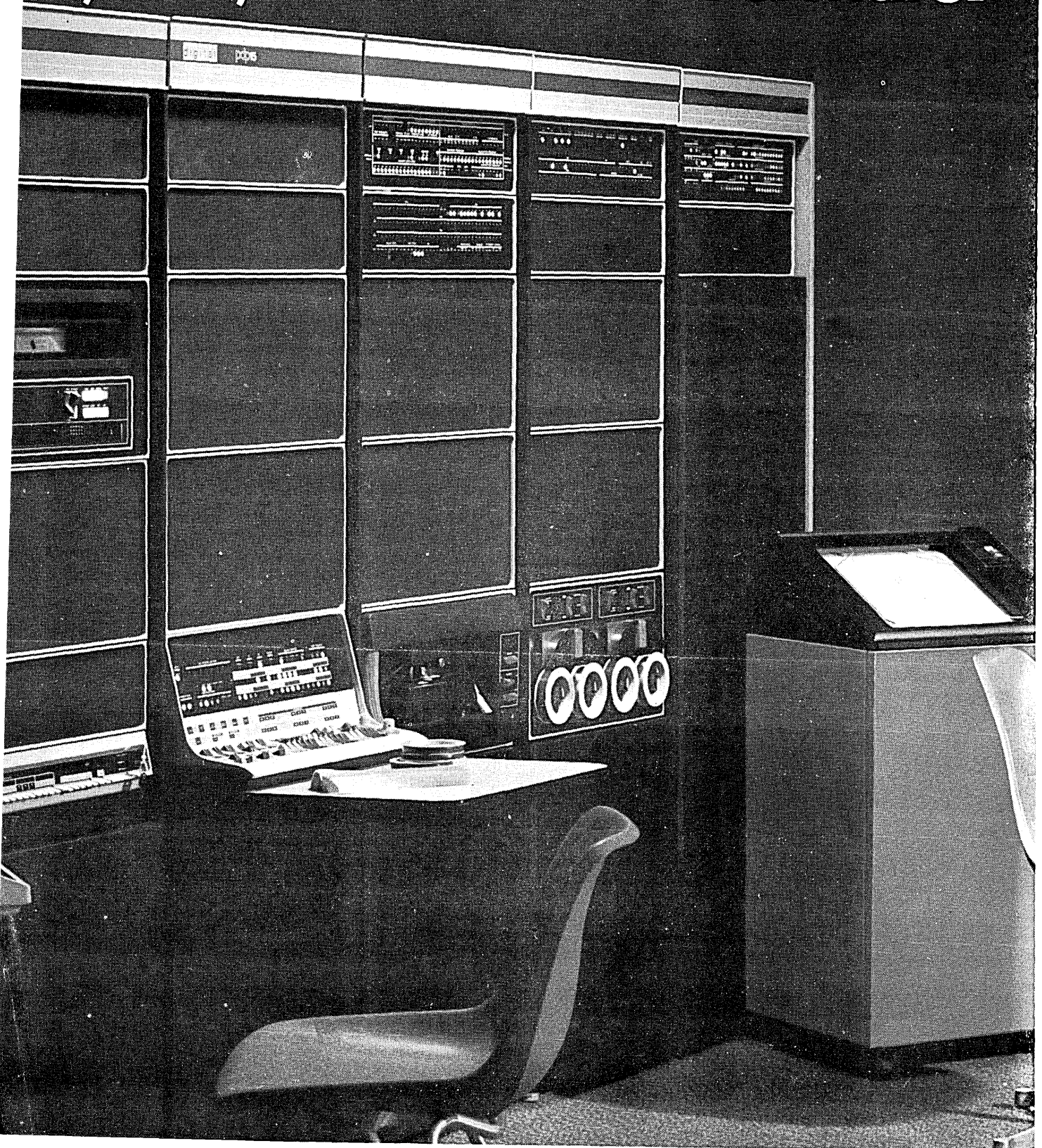
Bell's motivation

The AT&T announcement appears to have been motivated by several recent developments—notably, the widespread direct connection of telephone answering devices to the dial-up network without any network protection. Getting manufacturers of this equipment voluntarily to install protective connecting arrangements is obviously a cheaper and easier solution to the problem than going after the users.

Another possible reason for the phone company's change of heart is a recent report issued by the National Assn. of Regulatory Commissioners (NARUC), a group composed of the officials who regulate intrastate communications rates and practices. The report proposed that "the telephone industry work together with the computer industry to develop an internal program of standards and certification for the interconnection of terminal equipment required for data transmission."

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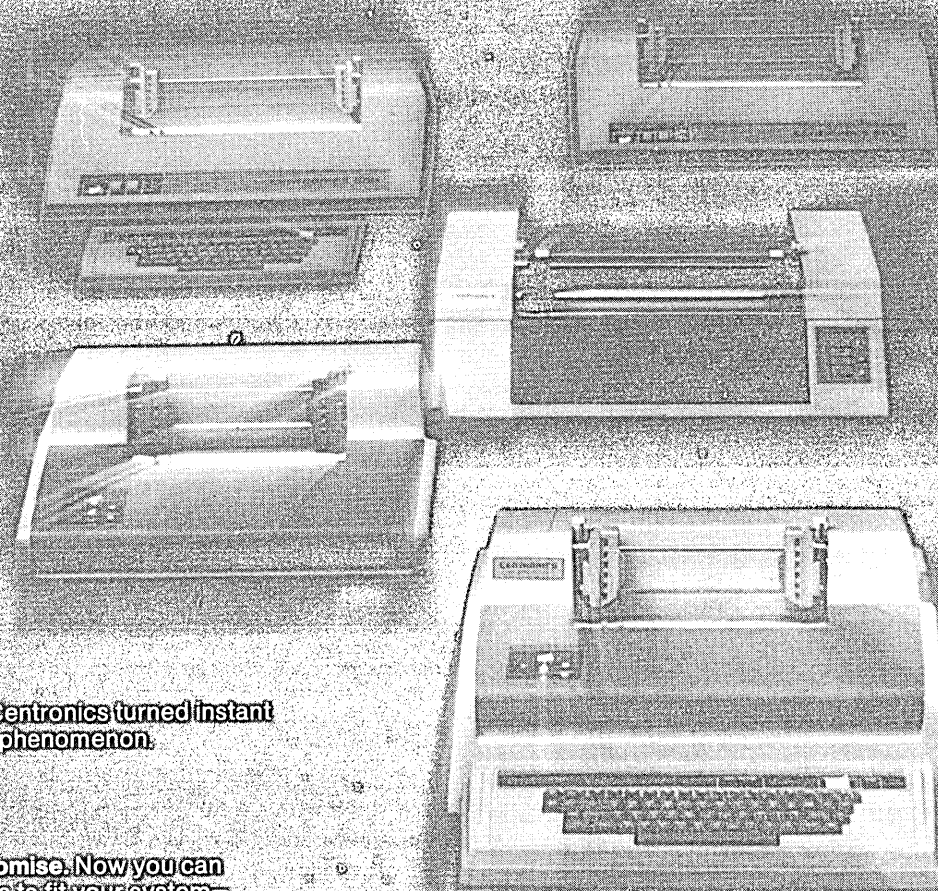
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news in perspective

position on interconnection had been a carbon copy of AT&T's.

Data communications equipment makers are now understood to be developing a plan to exploit NARUC's proposal. The likely result is that next month the FCC will be asked to establish a new advisory group to develop certification standards for data communications equipment and ancillary devices. Unlike previous efforts along this line, the new group would include technicians from the office of the FCC's chief engineer, who would be empowered to resolve disagreements arising between representatives of the carriers and the terminal manufacturers.

—Phil Hirsch

SPCC Unveils New Digital Data Tariff

A tariff covering the first nationwide U.S. digital data service went into effect late this summer when Southern Pacific Communications Company (SPCC) won FCC's authorization to offer digital service among seven cities at speeds of 2400, 4800, and 9600 bps.

SPCC's main rival is AT&T, which has proposed a digital data service linking Chicago and four East Coast cities initially. This system, which ultimately will stretch across the country, was to go into commercial operation Sept. 5 but could be delayed.

The cities to be served initially by SPCC are San Francisco, Los Angeles, Houston, Dallas, Chicago, New York, and Philadelphia. Six more cities are to be added later this year, another seven by April '75, and 25 more by December '76, to make a total of 45.

The tariff covers only point-to-point service between certain of the seven cities. In each case, the paired locations are many hundreds of miles apart—for example, Los Angeles-New York. An SPCC spokesman said his company plans to tariff shorter haul digital service, between intermediate points, but he declined to estimate when this would happen. A switched digital service is contemplated by the end of next year, the spokesman added, as well as expansion of the offering to 56 Kbps, 110 Kbps, and possibly higher speed offerings. Reportedly, SPCC is actively searching for a cost-effective 56 Kbps line driver that can be used on T1 or equivalent local loops as well as on digital microwave local distribution links.

SPCC's rates, as specified in the new tariff, are generally higher than those proposed by AT&T for its competing ser-

vice. For example, between Los Angeles and New York, a 2400 bps channel from Southern Pacific costs \$1,866/month, while AT&T proposes to charge \$1,157. But, if and when Bell's digital data service is approved, the SPCC spokesman indicated his company would stay competitive by filing a new schedule of charges.

Initially, SPCC's new service will consist of a communication pipe containing 22 circuits, each rated at 2400 bps, or the equivalent. In "four or five" of the initial seven cities, user local loops— analog or digital—will interface with General DataComm digital multiplexors and Codex 8300 high-speed modems. The signal transmitted along the backbone from these points will be regenerated, rather than re-amplified. At other nodes in the network, a conventional analog transmission scheme will be used until traffic increases to a level where digital multiplexing equipment can be supported.

SPCC will supply digital microwave

local loops, "given sufficient demand," said the spokesman. He added that the company also plans to lease T1 or equivalent loops from AT&T, where this is possible.

SPCC's analog network is already operational coast-to-coast. It uses company-owned microwave links tied to facilities leased from others, primarily Western Union. In August, SPCC and Datran worked out an arrangement enabling the two companies to share use of microwave towers—initially between St. Louis and Chicago and later between Chicago and New York. Datran is selling the sites to SPCC and leasing back space for its transmission facilities. A Datran spokesman said the agreement "will enable both companies to extend their service capabilities on a broader scale, more rapidly and with appreciable savings in capital requirements." The spokesman added that the saving was "significant," but he declined to disclose the amount.

In October, SPCC plans to begin using Western Union's Westar satellite to provide more direct service between certain cities within its territory than is possible on the company's terrestrial network. □

Arthur K. Watson

On July 26 Arthur K. (Dick) Watson died at the age of 55, a few days after a fall in his Connecticut home.

This mercurial, intuitive man deserves much of the credit for IBM's success today. It was his international portion of the company that shot ahead as the domestic portion was adversely affected by the U.S. recession a few years ago—and World Trade's spectacular success helped keep the company's overall growth curve on an even keel. Just as this was happening, in 1970, Dick Watson left IBM, where he had been the company's ambassador to the world, to become instead the U.S. ambassador to France, a country he always loved.

It is ironic that on the day he died the European Economic Community announced it was about to begin hearings into IBM's "dominant position" (the European euphemism for monopoly) in the European computer industry.

From his first European business trip with his father, Thomas J. Watson, Sr., Dick held to a conviction that Western Europe eventually would emerge as a united economic community. He was a supporter of the formation of the EEC. IBM World Trade was one of the first U.S.-based companies to build manufacturing and development facilities within the Common Market.

Watson majored in international af-

fairs at Yale Univ. and in 1942 interrupted his college career to join the U.S. Army. After serving five years in the Ordnance Dept. of the Army where he was a major, he returned to Yale to receive his B.A. He joined IBM as a salesman in 1947 and went to IBM World



news in perspective

Trade when it was formed in 1949. IBM sales at the time were less than \$50 million. When he resigned in 1970 to accept the ambassadorship to France, IBM World Trade sales had expanded to more than \$2.5 billion.

One of his first acts in Paris as U.S. ambassador was to help launch a joint U.S.-French effort against the heroin traffic then finding its way into the U.S. from Marseilles. He sought and won substantial increases in both the French and U.S. overseas narcotics forces. He persuaded the French to give Marseilles police priority on equipment and at times provided special devices from the U.S. The U.S. Army, at Watson's request, aided in aerial surveillance over the Mediterranean; the Sixth Fleet helped in the search for smugglers at sea; and even the CIA assisted. Heroin seizures in Marseilles increased to five times the rate they were on Watson's arrival, and the cutback was felt on the streets of New York, where heroin came into short supply. Watson later said this was the proudest accomplishment of his life.

When he returned from France in 1972, Watson was re-elected to IBM's board of directors and its executive committee. He also formed Partnership Dankist, a venture capital firm in Stamford, Conn.

Dick Watson was fiery, difficult, changeable—but he also had all the qualities of a great leader, and these largely were responsible for IBM's spectacular success abroad. The characteristics he exemplified included a sense of the grand symbol—for example, he personally piloted the company plane into Holland after a great European snowstorm, the first plane to fly in after three days, simply because he thought an IBM training course at Blaricum was deeply important to his people.

He had the knack for picking the right people at the right time—an independent bunch of entrepreneurs in the '50s, who gave impetus to the various country organizations without limiting their freedom, and then in the '60s more of the "organization men" who could bring order into the chaos of the fast-growing overseas company.

Moreover, Dick Watson had good instincts, and he trusted them. He knew when the time was ripe to begin discourse with the Russians, and in the mid-'60s he made IBM's first grand tour through Eastern Europe after years of corporate absence there. Wherever he went, IBM's ambassador was greeted with enthusiasm and reverence by people who had always considered them-

selves members of the IBM Family. Then, as America's ambassador it was he who opened discussions with China, and later for IBM he visited China and began discussing trade possibilities.

The motto of IBM World Trade, a le-

Software

OS Holdouts: Time to Paddle Your Own Canoe

A growing number of IBM users are making the change to vs (virtual storage) systems. But not all of them are doing so with any great anticipation. One user last November converted from a 370/155 under OS/MVT to a 158 under vs2 "because IBM no longer supports OS." He adds, "we feel we had to bite the bullet."

There is, however, a stalwart group that has decided to hold out for as long as they can, staying with OS and incorporating software modifications that they were afraid to use previously. The announcement last month of Release 21.8 of OS is known to be IBM's final update, freeing users to make modifications to the operating system without fear of such changes locking them out of subsequent releases. Indeed, such enhancements to OS now number in the hundreds.

Leo White of Statistical Tabulating Corp. in Chicago estimates that there are from 700 to 800 modifications just to HASP, the enhanced spooling program first developed to run under OS. Release 4.0 of HASP runs under vs, however, and at a number of user sites people are expending a considerable effort to retrofit this version to run under OS. One such user, who insists on anonymity for his company, acquired such a package from Duke Univ. and is working on a retrofit for his installation. "There's a lot of operational benefits in HASP 4 that aren't available in previous HASP's," he explains, "mostly in the area of printer control."

Back at Stat-Tab they've incorporated an OS optimizer, usually referred to as Quickcell, which other sources credit to some ingenious systems programmer at Standard Oil of Indiana. It purportedly is an enhancement from vs that now is being used to optimize OS. "It's unbelievably fast," exclaims Mike Stack of Northern Illinois Univ. In addition Stat-Tab also has a package called Executor, which is an OS initiator replacement that also speeds things up.

gacy from Dick's father, also exemplifies the son. World Peace Through World Trade is easy to spoof, but in everything he did, Dick Watson showed his own belief in it, and made it more believable to the world outside IBM.

(This story is based on files from European correspondent Nancy Foy, author of "The Watsons, the War and the Wall," an account of IBM in world markets.)

Between the two, says Stat-Tab's White, they're getting back perhaps 30% more of their CPU cycles.

"It's a honey"

A number of modifications have also been made to the OS at the Dept. of Labor in Washington—to their TSO (time-sharing option), linkage editor, and assembler. But they also have the so-called Quickcell, to which they give credit for bringing back 10-15% of wall clock time. "It's a honey," says Labor's Barry Lewis.

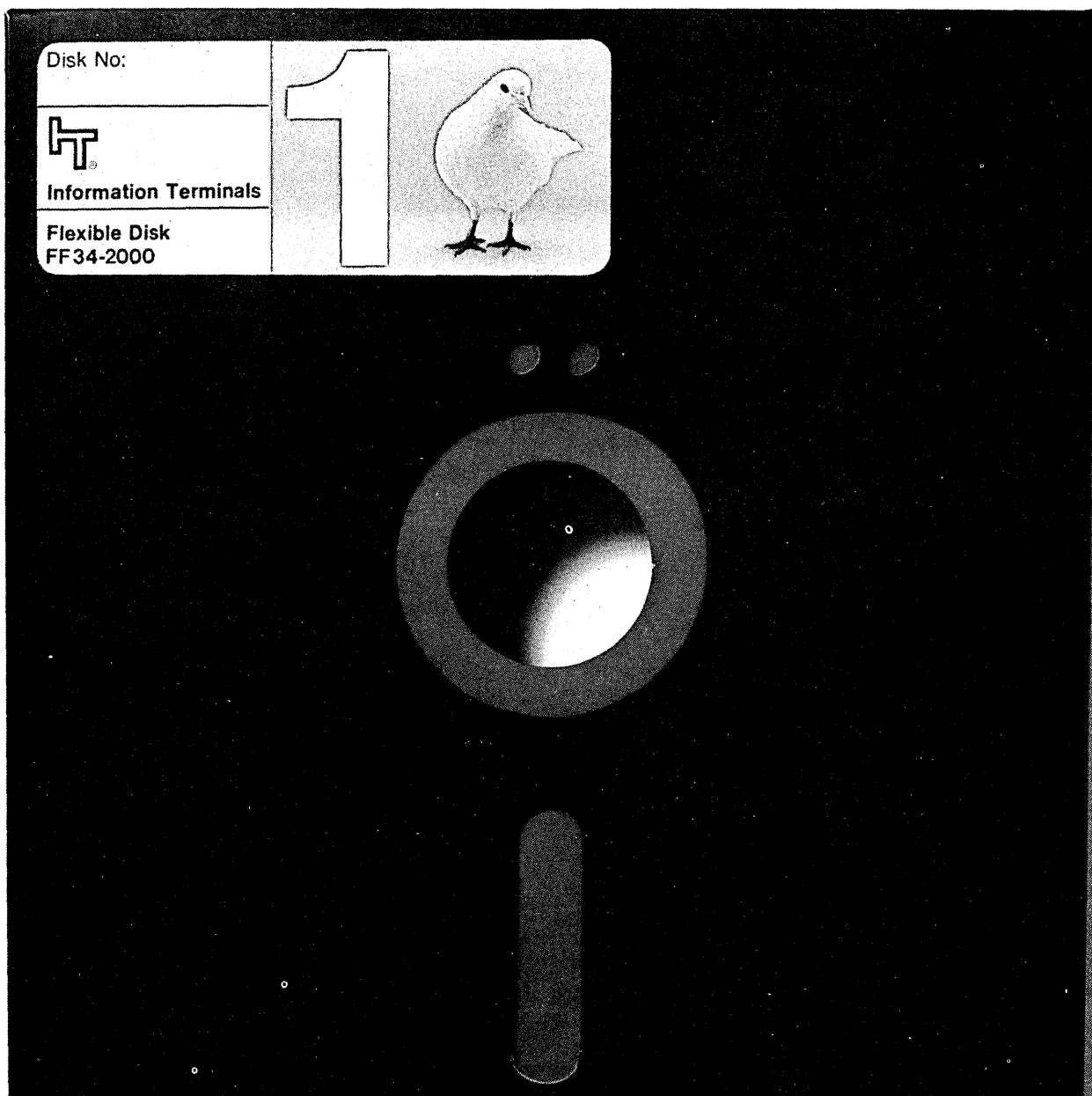
Among large-scale IBM users, enhancements and retrofits such as these have proliferated to such an extent that SHARE, the user group oriented toward scientific applications, formed an OS/MVT-MFT project headed by Dr. Robert Rannie of Union Carbide. The members of this project around the country are determined to continue operating under OS for as long as they can, and hope for that duration to receive the support of their mainframe supplier. As this was being written, members of the user group were preparing for a big meeting in Chicago. And members of this project, aware they may be on a sinking ship, were ready to carry with them at the conference a paddle ("you gotta paddle your own canoe now") with the inscription, "Help Support OS/MVT-MFT."

Good reason to stay

To indicate the economic incentive for this appeal, Rannie explains that at his installation are such purchased mainframes as a 360/91, 75, and 50, plus a 195 and a 155. "Thus it's more economical to stay with OS for a while," he says.

Rannie says there's an interest on the part of GUIDE, the IBM user group, to organize an effort along the same lines as SHARE's OS/MVT-MFT project. It's possible, he added, that the two organizations could set up a common data base or data bases. But no effort has yet been

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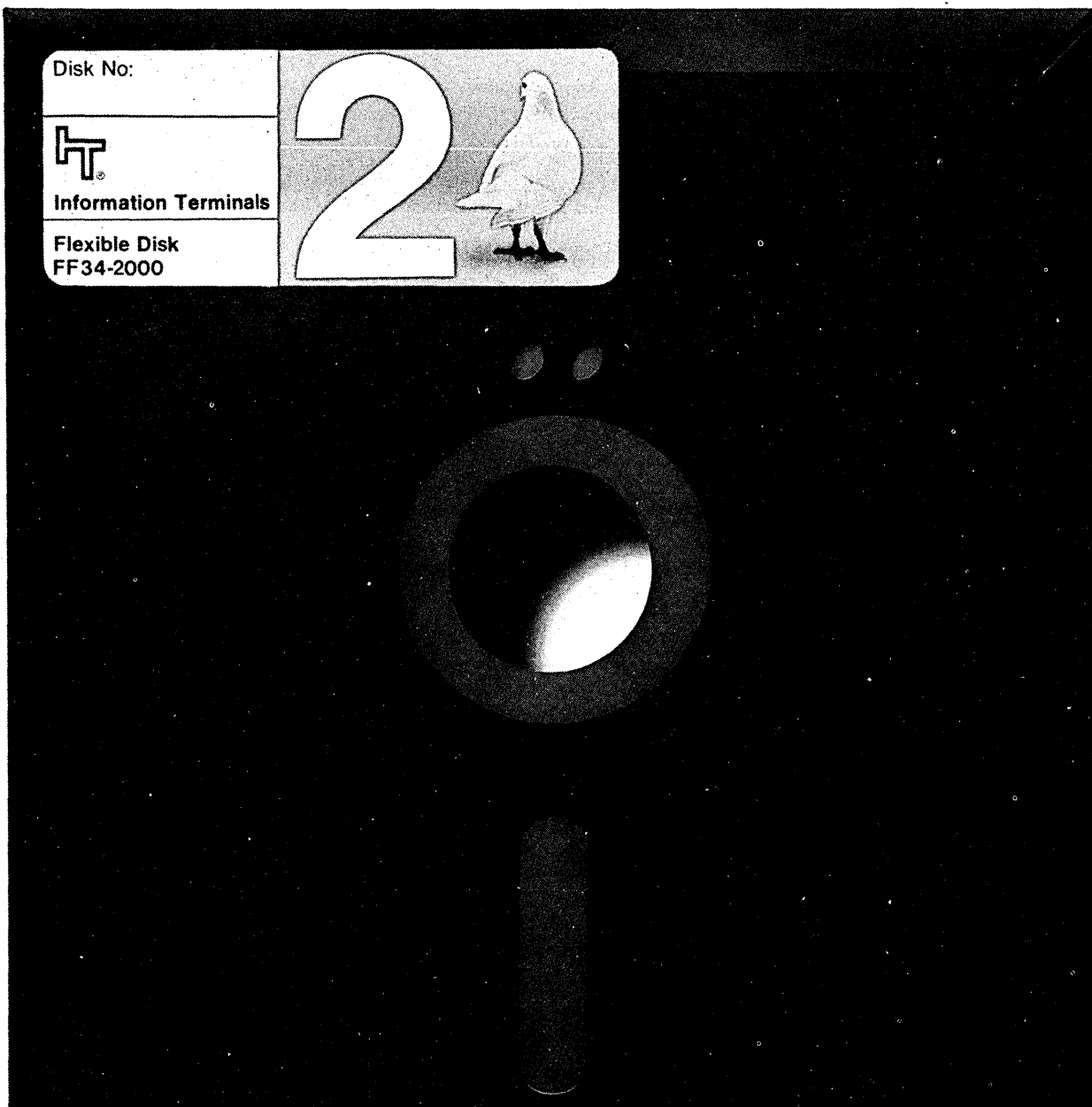
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One of these SHARE data bases, containing abstracts of modifications to HASP, is maintained at the Stat-Tab facility in Chicago. It is in the nature of systems programmers to diddle with systems software, but there may be an explanation for the large number of modifications to HASP. Says Robert Rannie, "HASP has been something that the systems community and even the user community likes because it is very amenable to user modification." Indeed, Stat-Tab's Leo White admits he himself has submitted 46 modifications.

The Executor package mentioned previously came out of West Virginia Univ. originally, from which it was available at minimal cost. But it has since been enhanced, and is being sold commercially by a for-profit company.

Itel's retrofits

Similar commercial packages are legion. Software Design Inc. has a DOS and a DOS/vs replacement called GRASP. And Comten has an improved version of ISAM (index sequential access method) called Amigos. To name but a few. Although it isn't a software house, San Francisco-based Itel Corp. is busily engaged in the same type of enhancements, as well as retrofits of vs software to run under os.

Itel has some \$200 million worth of 360s that it must sell by the end of 1975, having decided to drop out of 360 leasing arrangements. It thus has been making modifications to os and dos in an attempt to ease this marketing activity. With changes to os, for example, the company has made it possible for 360/50 and 65 users to use the

3330-equivalent disc file that Itel calls the 7330. It now has more than 75 of the mod 65s installed with the 7330, plus about 10 mod 50s installed with the slower mod 2 version of the 7330. For DOS users with those same mainframes, Itel has also modified Release 27 to achieve the same result.

To further support this marketing activity, the company is also bringing VSAM (virtual storage access method) back to the 360. The idea is to allow users of the 145, 158, and 168 to share data sets on 3330-type devices with users of 50s, 60s, and nonvirtual 370s like the 155 and 165.

In such an environment, VSAM replaces ISAM (index sequential access method), which a number of users have found to be a poor performer. Bob Cabiness, director of systems support at Itel, cites a user group report that claims a two to three times increase in throughput with VSAM over ISAM, depending on how much updating and deleting must be done in the ISAM file.

Cabiness says they've made no direct modification of VSAM, but instead have adapted OS/360 MVT by bringing back certain vs components. VSAM thus runs on top of MVT Release 21.7. They've also repackaged VSAM modules to fit into a much smaller space. Further, by not changing a single VSAM module they've made it possible for the user to apply PTF's (temporary fixes) as they're issued by IBM.

"We will be bringing back TSO" (the time-sharing option), he adds, from vs. When they're finished, he thinks MVT 21.7 will look a lot like vs2, but without paging. "We think it will probably be efficient enough that we may even have some 158 and 168 users who will opt to use it instead of, say, vs2."

Part of the package

Itel has a brokerage operation that does nothing but buy and sell 155s and 165s. And the VSAM they're developing will be included as part of those sales packages. "At this point," says Cabiness, "we're not particularly interested in getting into the software business. Once we get rid of the 360s, which is really the reason for the programs, we'll determine whether we want to make it (VSAM) available at a fee."

Not stopping there, the company is also bringing DOS/vs (the disc operating system for virtual storage) back to the 360 DOS user. Releases 26 and 27 of DOS for 360s and nonvirtual 370s have a three-partition system. In DOS/vs this goes up to five partitions. Other features that purportedly add to the appeal of DOS/vs include a relocatable loader, a procedure library, and a spooling package called Power that was not a part of releases 26 and 27 but was an add-on that

Anyone for a "DAMN" Box?

A communiqué circulated as a spoof among the directors of a computer user group has received wider circulation than intended by the author, who now pleads for anonymity. Copies of the document, "Impending IBM Announcement," reached the computer center of a large southern California manufacturing firm where dp people gobbled up the "inside information" on the announcement, possible this month, that would go a long way towards solving problems encountered with virtual memory as implemented on all 370 mainframes.

Specifically, the announcement would address problems of excessive paging rates, program design, massive real memory requirements, and console management of between 400 and 800 system batch initiators.

The first two models in the new line are the 155 and 165 Retarded Function. To enable existing 158 and 168 users to migrate gracefully to these machines, a feature called Direct Address Modification Negation (or DAMN box) will allow these users to run in what will be called the "non-virtual mode." But only after a one-time charge of \$350K. Current 155 and 165 model II customers may run in the new mode by detaching the DAT boxes of these machines, which IBM will do for a one-time charge of \$500K. As many as 60 hours of dedicated, prime time schedule will be required to effect this change.

Some new, almost revolutionary software reportedly will accompany the announcement. OS/vs2 users will be provided with a system called OS Release 21.6. JES2 users will be offered something called HASP. This software is said to have had more extensive field testing than any previous IBM software products, mainly because user groups supplied more extensive inputs on these systems "than on any other ever." Also part of the software package is a common replacement for the ISAM, VSAM, TCAM, and VTAM data access methods that apparently involves reading fixed length records serially from unlabeled tapes and is referred to as the Sequential Tape Concept (STC). The report notes, though, that IBM marketing people have objected to this acronym, so it definitely will be changed before product announcement time.

A new lease plan accompanying the product announcement should assuage the feelings of virtual machine users who feel locked into purchased equipment or long-term leases. It's called the modified ETP (Endless Term Plan). Virtual machine users can switch to the new plan immediately, but it requires a 10- or 12-year commitment.

One long-time virtual memory user apprised of the new announcement exclaimed: "That's funny. But it's not funny."

—M.W.C.

news in perspective

could be installed separately. And with the elimination of paging and channel command word translation, Itel figures on fitting the reworked DOS/vs into 8-10K less space. Uppermost in their minds, however, is to be 100% compatible with IBM's DOS/vs.

"With this software, the 360 user can assume he has a virtual 370 without paging," says Cabiness. "So he can send his people to IBM schools, use the latest IBM manuals, and not feel that he or his staff is in the Dark Ages." He adds that it would also make it easier to recruit personnel and to retain high caliber people, for they will be running the latest IBM software, albeit with an older machine.

Back to 360s

Itel's first order for this DOS/vs is with a 360/65 that will replace an installed, on-rent 145, a changeover they expect to accomplish over a weekend. Thus the software package becomes a tool to get a virtual 370 user back to a 360 without a conversion effort.

As a test, Itel ran the same set of programs on a 370/145, one with virtual capability and a minimum amount of paging and the other in the 360 mode (IBM calls it the Basic Control Mode)

with Itel's modified DOS/vs. "Running five partitions. . . we got about a 14% throughput improvement (in the Basic Control Mode)," he says. "So it's possible that at some point in time we may have users with very large memory systems on, say, 135s and 145s who would opt to use something like this, as opposed to vs, where they do the paging and have all the overhead associated with it."

Explaining the advantages of this approach for the user, Cabiness says the user is able to stay with OS, use the new VSAM and other components of vs that are brought back to OS, and have no transition problems should he decide later to migrate to vs. At the same time, Cabiness continues, the user will be able to provide back-up for a 158 with his 155, since a program that runs on a 158 will also run on the 155.

As to plans for the future, Itel anticipates supporting the double-density 3330 on 360/65s, something that will require more hardware modifications than software changes. They foresee first hardware delivery for this in the first quarter of 1975.

—Edward K. Yasaki

Service "Machines" Programming Tasks

An automatic system generator called GENASYS is the basis for a new service venture recently undertaken by International Computer Trading Corp. Howard Bromberg, president of the San Francisco-based company, says GENASYS takes the "arts and crafts" of programming—the labor-intensive process—and substitutes a machine-intensive process. The result is said to be the production of programs in a predictable time and cost and in a standard, consistent manner.

Although ICT is less than a year old, GENASYS has generated more than 50 systems in the last two and a half years, Bromberg adds. The software is credited to Ken Winegarner and Kim Jones, both now with ICT. And now the system generation service is being offered in Japan through Kozo Keikaku in Tokyo, with whom ICT has signed a cross-licensing agreement. On that occasion, Bromberg and Dr. Makoto Hattori, Kozo president, filled in the left eye of the traditional Japanese good luck doll.

Kozo is primarily a structural engineering house that developed numerous programs for this application, in time becoming the largest software firm in Japan. It is also the largest stockholder upon Mini-Computer, being in ef-

fect the local software arm of that company. And Kozo more recently formed Systems Research Inc. in Osaka, which is known as a business dp software house. Through SRI the GENASYS service will be marketed in Japan, the first customer being Daiwa Bank, part owner of SRI.

In the U.S. a recently completed project for a manufacturer comprised five major subsystems: payroll and labor distribution, billing, accounts payable, accounts receivable, and a statistical sales reporting system. It consisted of 130 programs running on a 370/155 under OS/MVT. For another company there was an accounting system that consisted of 20 COBOL programs running on an NCR Century mod 50. And another, consisting primarily of a mailing and order entry system, was programmed in PL/1 for a 360/65 under OS/MFT.

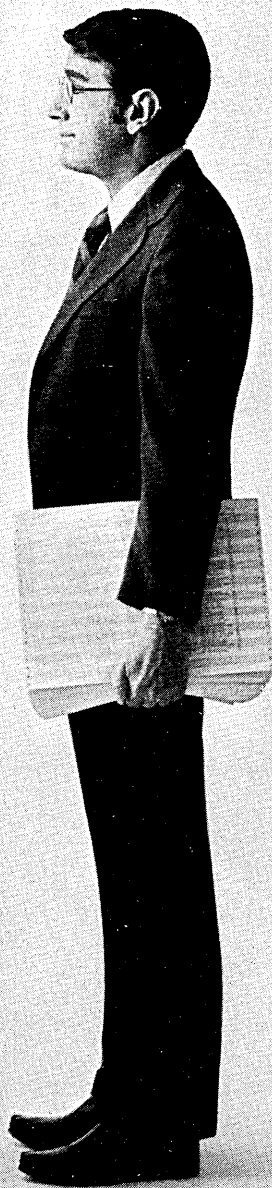
Supports PL/1

Designed originally to generate COBOL programs, GENASYS will also support PL/1, and can be made to convert macros to support any other language —BAL or Fujitsu's assembler. It will also

(Continued on page 130)

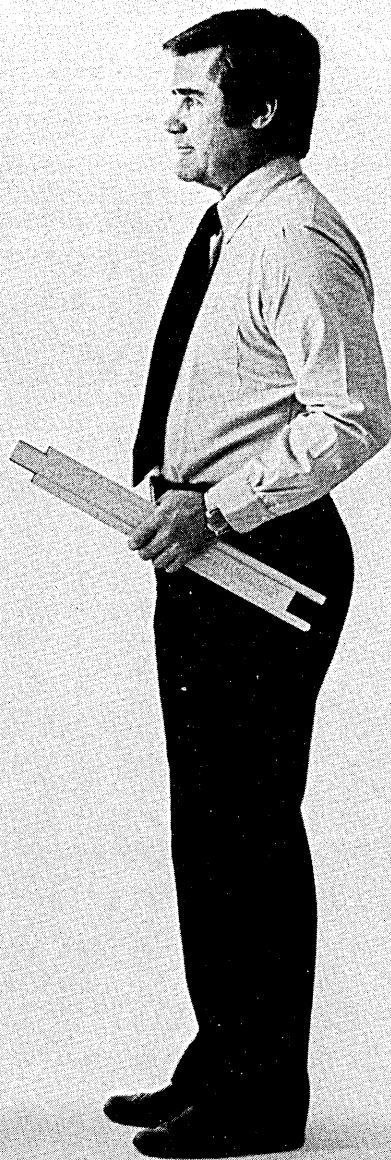


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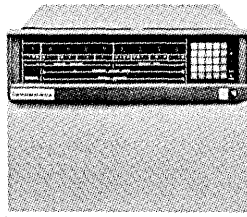
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Memory speed (nanoseconds)	750	800	900
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Addressing range (bytes)			
Direct	1,048,576	512	65,536
Relative	±16,384	±256	±32,768
Indirect	1,048,576	65,536	65,536
Double indirect	1,048,576	No	No
General-purpose registers	32 32-bit	4 16-bit	8 16-bit
Index registers	30 32-bit	2 16-bit	8 16-bit
Vectored interrupt levels	Yes	No	Yes
Minimum interrupt overhead time (μsec)	6.5	47.5	46.5

Price	7/32	Nova 840	PDP-11/40
32 KB processor	\$ 9,950	\$12,950	\$15,345
64 KB processor	14,450	19,250	26,215
128 KB processor	22,450	35,810	44,725
256 KB processor	41,450	61,230	80,235
1 Megabyte processor	171,650	Not available	Not available

Source: Data General Price List, 5/15/73. DEC PDP-11/40 Price List, 6/73. DEC OEM & Product Services Catalog, 1973. Auerbach Minicomputer Characteristics Digest, June, 1973. "How to use Nova Computer", 1973.

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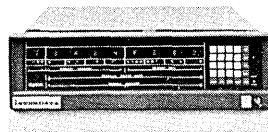
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Instruction word length (bits)	16, 32	16	16, 32, 48
General-purpose registers	16	4	8
Hardware index registers	15	2	8
Maximum memory available (K-bytes)	64	64	64
Directly addressable memory (K-bytes)	64	2	64
Automatic interrupt vectoring	Standard	Not available	Standard
Parity	Optional	Not available	Special order
Cycle time (μsec.)	1.0 or 0.75	1.0 or 0.8	0.9
Available I/O slots	4	2	2

Price	7/16	Nova 2/4	PDP-11/05
8 KB processor	\$3,200	\$3,200	\$4,795
16 KB processor	3,700	3,700	6,495
32 KB processor	3,300	3,300	10,895
Multiply/Divide option	\$950	\$1,600	\$1,800
Floating Point option	\$4,900	\$4,900 plus \$1,000 for 7/10 configuration	Not available

Source: Data General Price List, Copyright 1973, and addendum dated 5/1/73. Nova 2/4 bulletin 012-00060, 1973. DEC OEM & Product Services Catalog, 1973. Auerbach Minicomputer Characteristics Digest, June, 1973. "How to use Nova Computer", 1973.

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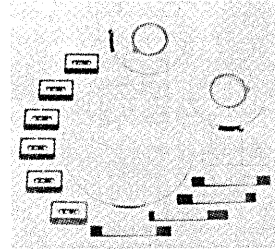
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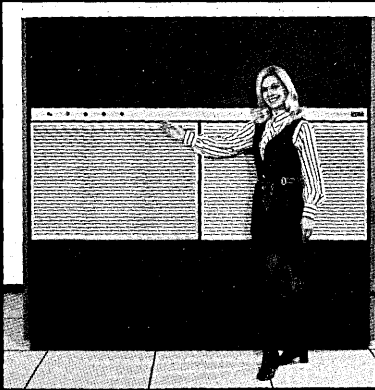
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Privacy

Privacy Legislation: Public Sector First

It appears as if the public sector will take first licks in adhering to legislation governing the handling of information relating to individuals and aimed at protecting the individual's right to privacy.

A bill is expected to be passed by the 87th Congress before it adjourns next month which would marry two bills which have been passing through the separate Houses since mid-summer. They are HR 16373, the Federal Privacy Act, introduced by Rep. William Morehead, and SB 3418, authored by Sen.

Sam Ervin. The former never impacted the private sector. The latter did until a version referred to as Print 5 came out Aug. 19, and was reported out of the Senate Government Operations Committee.

Still another bill, an omnibus bill authored by Reps. Barry Goldwater, Jr. and Edward I. Koch, reworked and renumbered several times (its current number is HR 15806) is expected to die with this Congress, to be reintroduced under a new number in the 88th Congress, and to face hearings sometime around next March. Some observers feel these hearings will never come off because of certain provisions in the Ervin bill. These are in a part of the bill which still impacts the private sector. They create a Privacy Protection Commission authorized to study the handling of individual data. It will consist of five members and will include representation from the computer community.

William M. Stephens, director of government affairs for the American Retail Federation, whose members would be greatly impacted by any legislation affecting the private sector, believes there's more to come. "This (the privacy issue) is getting a lot of attention from the White House. Ford even mentioned it in his inaugural speech." And the new president's counsel, his former law partner Phil Buchen, was number two man when the then Vice President headed up the Domestic Council Privacy Committee. This council, said Stephens, is currently studying a number of proposals, and seeking others which could lead to legislation to be presented to Congress which would impact the private sector.

Victory for some

The virtual elimination of the private sector from the first legislation expected to be passed is deemed as somewhat of a victory by industry groups which attempted to temper both HR 16373 and SB 3418 as they passed through the Congress in the summer.

The Ervin bill succumbed the most to industry pressure with the release of Print 5, which exempted the private sector from portions governing the actual handling of information relating to individuals.

The Morehead bill was less affected, but Joe Hartney of WEMA, an electronics trade industry association, feels that some of its ambiguities will be corrected when it is married to the Ervin bill by the House-Senate Conference Committee. He considers the Ervin bill "better

constructed."

The Morehead bill was introduced in the House subsequent to the introduction of the first version of the Goldwater-Koch omnibus bill, then HR 14163. The omnibus bill was referred to the impeachment-burdened House Judiciary Committee. Morehead's bill went to the less busy House Government Operations Subcommittee for Government Information. Both Goldwater and Koch are among the cosponsors of HR 16373.

Well received

A WEMA delegation met last month with members of the House subcommittee and with several members of the House itself including Goldwater, Koch, and Peter McCloskey. "We were well received," said Hartney. "We told them our concerns . . . that involving the private sector now would be unwise . . . that there are ambiguities in definitions in the bill . . . that there are some incredible exemptions . . ." The WEMA group took away a draft of HR 16373, studied it, and submitted to the subcommittee a three-page memo including some two dozen suggestions for specific changes both in substance and in language. Late last month, when Hartney received a printed copy of the bill, he said, "I was disappointed to see they had only incorporated one of our suggestions." This was the substitution in one section of the word "exemptions" for the word "deviations" and was not considered an important change.

The WEMA group also took aim at SB 3418 while in Washington and in this effort, said Hartney, "we didn't get the hearing we thought we would." They were to have met with Marcia McNaughton of the Senate Government Operations Committee. "She cancelled the meeting. First we heard she was sick, then we heard she was too busy." They met instead with the committee's chief counsel, Robert B. Smith. "He gave us a courteous reception but he took no notes."

The WEMA group subsequently met with several Senators' staffers in hopes that, if they couldn't get results from the committee, they could at least get an argument going when the bill reached the Senate floor. WEMA's chief concern with the Senate bill was its potential impact on the private sector.

This also was a major concern of the California Bankers Assn., which also sent a delegation to Washington in August, one which apparently had better luck with the Senate committee than WEMA did. "We met with 12 different people," said CBA's counsel, William R. Pascoe. These included members of the staff of the Senate Government Operations Committee and California Senators

Allan Cranston and John Tunney. "They listened. They understood." The group left Washington feeling the private sector would be exempted from major provisions of the Senate bill with one exception to which the CBA did not object. This would be private organizations with direct grants or contracts from or agreements with the federal government, for the specific purpose of constructing an information system to be used by the federal agency that issued the contract or grant or entered into the agreement.

No objection

Print 5 of SB 3418 justified the CBA's expectations. Pascoe said his group has no objection to the private sector's being subject to the part of the bill relating to the study of the handling of information relating to individuals. "That's fine. We want to cooperate in any study. We want to assist them in doing that."

Pascoe said the CBA was asked to take its case to Washington by the American Bankers Assn. He feels the California group's selection for this job, and part of the reason for the seeming success of its mission, was its reputation for being concerned about threats to personal privacy arising from its fight in the CBA vs. Schultz (then Secretary of the Treasury) case, in which it fought, up to the Supreme Court, against the right of federal agencies to examine private bank account information under the Bank Secrecy Act of 1970. The CBA didn't win the case but it did win a reputation.

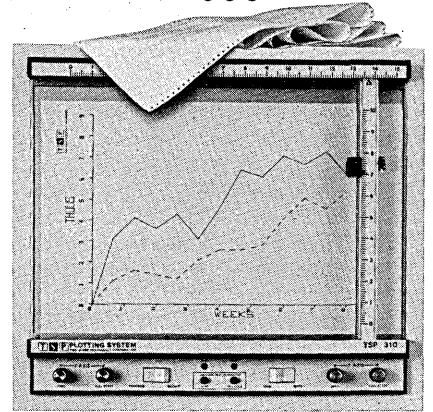
SSN objection

None of the concerned industry groups is entirely happy even with Print 5 of SB 3418. "They've cleaned it up an awful lot and there are fewer objectionable parts," said the Retail Federation's Stephens. "But social security numbers are still a problem." An effect of the original bill would have restricted use of the social security number as a personal identifier, which some feel would create massive recoding problems for those who currently key their files to these numbers. Print 5 eliminated this provision but authorized the Privacy Protection Commission to look into its potential.

Representatives of all of the industry groups expressing concern over pending privacy legislation are unanimous in stating they feel some kind of legislation to protect individual privacy and to prevent indiscriminate dissemination of information on individuals is needed. What they want is more input from industry.

It would seem that the private sector, at least, has gained some time in which to accomplish this. For private industry it's a new ball game with many innings

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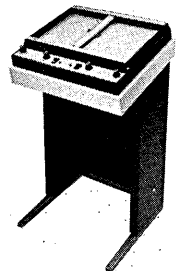
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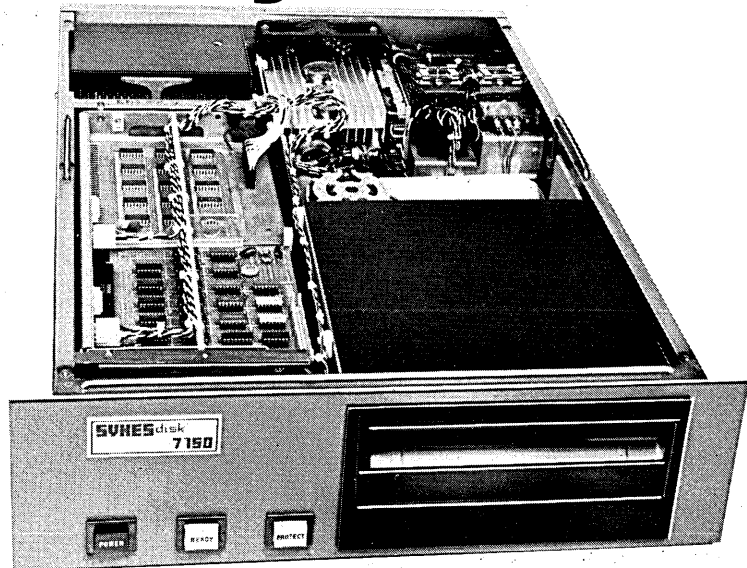
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left. There will be opportunities to be heard in any hearings which might be held on the Goldwater-Koch bill when and if it is reintroduced in the 88th Congress. There are opportunities to offer suggestions to the Presidential Council, now headed by Douglas W. Metz. And, of course, there is time and opportunity to do a little self policing and policy tightening, to be ready for any privacy legislation coming up which will affect the private sector. And come it will.

—Edith D. Myers

International

IFIP 74: Delegates Face Social Issues

In the week President Nixon resigned, the English-language newspapers were a day late arriving at the Stockholm newsstands to the chargin of Americans attending the 1974 Congress of IFIP, the International Federation of Information Processing Societies, Aug. 5-10.

They crowded the UPI wire service facility at the Stockholm Sheraton all week. Americans would grab a passing Swede waving a local paper and ask wistfully, "What does it say? What's happening?" Or a taxi driver would be pressed into service as a translator for the radio news.

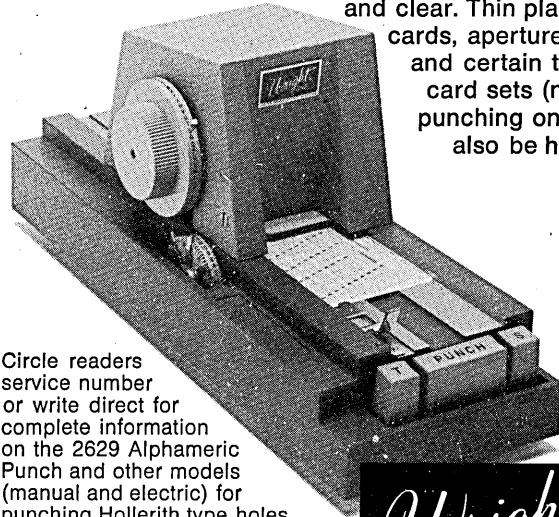
Once a day at 6:02 p.m., one radio station presented the news in English, again to clusters of American IFIP delegates. When the Nixon speech finally came, at 2 a.m. Swedish time, one American ceremoniously tore off the teletype bulletin at the Sheraton wire service center to save for his grandchildren. Other night-blooming Americans broke into patriotic songs, or phoned their families to share the sense of history. The next day, while available newspapers still were out-of-date, *Data*, the conference newspaper, scooped Stockholm with a "Nixon Resigns" headline.

To those gathered in Stockholm for the triennial event of the 15-year-old federation of computer scientists and theorists, it was a week of change both in world politics and in this kind of conference. IFIP had drawn more than 4,000 delegates, the most for any IFIP outside of the U.S. And in sharp contrast with IFIP '71 in Ljublanja, Yugoslavia, this gathering underscored the growing concern of computer people with social

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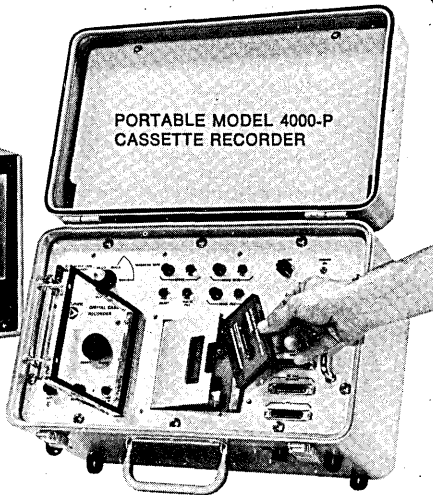
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issues. At Ljublanja there were no formal sessions on the subject—only an ad hoc meeting of about 20 persons. In Stockholm there were half a dozen formal meetings and several played to standing room only.

The Swedish law

One was a session on Sweden's famed pioneering privacy legislation. Jan Freese, a former judge and member of the Swedish Privacy Board, said that although the Privacy Board had been in operation only one year, already more than 800 applications had been received from organizations wanting authority to build personal data files. Some 210 had been accepted, the others were still pending. Freese said no applications for data banks—the Swedes call them "registers"—had been totally rejected, although a number of them required "cleaning" to remove material that would have violated the principles of the country's Data Act.

Freese said that although the law specifically exempts the Parliament and other government agencies from the requirement to request permission to build a data register, they have nevertheless cooperated fully and voluntarily. Unlike the revelations of Sen. Sam Ervin regarding data banks operated by the U.S. government, Freese said in his country the concept of a secret data register is virtually known.

A loophole in the Swedish law is being subjected to detailed scrutiny, Freese said. The act does not cover a register that exists outside Sweden but is accessed within Sweden. Although there has been some stirring at the international level to create agreements to control the transmission of data across national boundaries, to date there is no protection in Sweden for the individual affected by this situation. Freese was hopeful that the problem could be corrected in the next year or two.

Delicate subject

Privacy is a delicate subject at IFIP, with its members from every type of government, because the difference between Eastern and Western European views on individual privacy often intrudes on IFIP's ability to come to grips with the issue. For example a new technical committee on the subject was formed at the conference called the "Technical Committee on the Relation between Computers and Society." To satisfy some Eastern European members of IFIP, this title was selected

because it encompasses the effect of the society on the computers as well as the other way around.

The largest privacy session at IFIP was chaired by Hanspeter Gassman, who has been involved with the subject for more than five years at OECD, the Organization for Economic Cooperation and Development in Paris. OECD hosted its own seminar on policy issues in data protection and privacy in late June, with representation from governments of most of the 17 OECD countries. (OECD is sometimes called "the rich men's club" because it encompasses Western Europe plus other major industrial countries including the U.S., Canada, Australia, and Japan.) The summary statement from that seminar, although very carefully couched as is any document that purports to represent the combined views of so many governments, nonetheless made a strong appeal for policy on five fronts:

First, it says that regulating agencies are needed, with the same independence and professionalism regarding data banks that auditors have regarding finance. Second, it calls for member countries to be careful in their use of personal ID numbers. (Gassman himself does not use credit cards—"that's one way to insure a little more privacy.") Third, it calls for countries to establish the individual's right to access to information about himself. Fourth, it sees a strong need to harmonize data communications policies, and, finally, it wants further studies to be done of the economic and social costs of data banks. "With all these considerations, people like the delegates at IFIP are becoming the environmentalists of the information society," said Gassman.

Data bases and privacy not only concerned computer people at IFIP, they also pervaded discussions at MEDINFO 74, held in Stockholm in conjunction with the congress. With just over 1,000 registrants, the meeting was large enough to have some lively exchanges, but not overwhelming. The hottest exchanges dealt with such non-medical subjects as the use of a personal identification number for keeping track of patients, a common enough practice in Scandinavia, but one most likely to be banned by upcoming U.S. privacy legislation.

The exhibit

The IFIP commercial exhibit was a success and the organizing committee came out in the black, looking forward to an even larger show in Toronto in 1977.

The conference hall—a new, huge factory type structure painted bright orange with blue trim—had wide aisles and streamlined exhibits. IBM, which

had turned up at the National Computer Conference in Chicago last May with a mere System 7, regarded IFIP with more reverence, obviously, and fielded an entire 370/158 with a 3333 disc, doing TSO, Call, APL, and Lisp, and attended by a phalanx of young Swedes in IBM-blue T-shirts. Britain held a large government-sponsored collection of small exhibitors, but ICL chose not to exhibit at the show, which occurred only a few months before the long-awaited announcement of the computer company's new line, or "New Range" as ICL prefers to call it. Also among the missing were Honeywell, NCR, and Xerox.

Singer-Sweden's exhibit was almost as large as IBM's with a domino motif and strong emphasis on the 1500 intelligent terminal system. During IFIP Singer announced it had sold and already in-

stalled one 1500 in Poland. U.S. and COCOM approvals were received in June, and by the time of IFIP in early August the Central Medical Library in Warsaw was working on-line through its Singer 1500 to the MEDLINE (alias MEDLARS on-line) IBM machine in Stockholm for bio-medical documentation retrieval. The 1500 also will be used as a standalone processor to gather, edit, and sort local data for a Polish medical data base, to be held on a service bureau machine in Warsaw.

More interesting than the sale itself is the fact that the Poles financed it through the Ex-Im Bank and that U.S. export authorities allowed the sale of intelligent terminals which tie the East to the West. Approvals took about six months, held up at the COCOM level to some extent by dog-in-the-manger atti-



IFIP 74: Stockholm conference drew 4,000, largest turnout outside the U.S. in federation's 15-year history.



THE SCOOP: The staff of *Data*, daily conference newspaper, posed for this "hard at work" scene. *Data* "scooped" Stockholm with Nixon resignation story.

news in perspective

tudes on the part of Britain's ICL, which has heretofore had relatively little competition in Eastern Europe for smaller systems. Poles are now training in Stockholm, familiarizing themselves with the system at Singer-Sweden, and Singer also has set up an office in Warsaw with about a dozen people.

Another active exhibitor was Ferranti, which showed the ADE (Automatic Draughting Equipment). Ferranti's interactive "Freedraft" system, with a digitizer workstation and support computer, drew many inquiries as well as big pictures.

The U.S. government had a large, centrally located booth, and a less expensive way of introducing American companies to the European market than the British down the aisle. Instead of bringing in mountains of equipment and people, the Americans brought in a coffee pot and a lot of catalogs. Robert J. Graydon, representing the U.S. Dept. of Commerce, served as a "middle man" for a catalog show representing 95 U.S. companies, most of whom were seeking representation in Scandinavia.

Conferences

NCC: Welcome to The Uninvited

The American Federation of Information Processing Societies (AFIPS) is aggressively soliciting "unsolicited" papers for the National Computer Conference (NCC) next May in Anaheim. "No one individual can claim a total overview of the information processing community as it is now constituted," explains Stephen W. Miller, the conference program chairman. He adds, "It is doubtful if any committee—even on a full-time basis—could possibly be aware of all of the significant developments now taking place."

Miller, who is with Stanford Research Institute's information science and engineering division in Menlo Park, Calif., issued a statement calling for "unsolicited submissions of ideas, suggestions, and specific proposals," and said of these non-invitational papers, "a great deal of the vitality of the NCC is dependent on" that kind of participation.

dent on" that kind of participation.

The NCC, to be held May 19-22 at the Anaheim convention center, is the third such annual event following the demise of the twice yearly Fall and Spring Joint Computer Conferences. Previous conferences were in New York and Chicago. The Anaheim affair is certain to be a commercial success. AFIPS as early as August had taken reservations for 89% of the exhibit space—800 booths booked by about 180 companies. It now is forecasting a show of 300 exhibitors in 900 booths and an attendance of 30,000.

Sessions trimmed

The conference will have 84 sessions, considerably fewer than the 119 offered at the Chicago NCC last May. And there will be no more than six parallel sessions at any one time. Miller said AFIPS plans to transcribe the proceedings at non-published sessions and edit them as separate publications. At the NCC in Chicago, the conference proceedings contained fewer than 150 of the 500 or so presentations.

Miller's committee of 24 is taking what he calls a "two-tier" approach to planning the program. "The first tier consists of some nine program staff members charged with monitoring the

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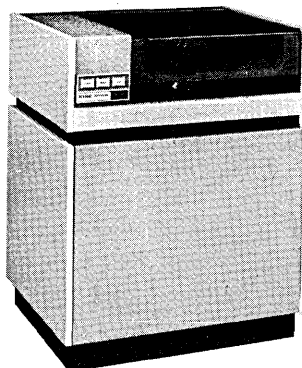
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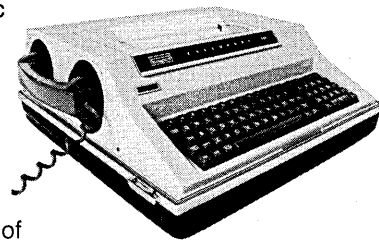


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relevance of the entire program and assuring that all key areas are covered adequately." He said the second tier is a



STEPHEN W. MILLER
NCC program chairman

group of 15 persons putting together special sessions.

There is no conference theme. If one were selected, though, Miller said it would be "The Challenge of Entering the Era of Operational Systems." He de-

scribes these as systems dedicated to a major function within an institution or corporation, "hopefully enabling management to control the function while it is happening." He said the committee welcomes proposals and papers related to such systems.

He defines these as: communication links and networks; specialized terminals; transaction and account processing; advanced techniques in storage and processing; system reliability; training of user personnel; definition of systems requirements and user management objectives; systems security and fraud prevention; systems design from the user's point of view; and societal issues impacting the use of large-scale operating systems.

The program committee has asked for proposals and abstracts immediately. The closing date for completed papers or proposals is Nov. 12 (see p. 8).

Antitrust

Consent Decree Talk Follows Resignation

With Gerald Ford's takeover of the Presidency, many computer industry ob-

servers believe the possibility increases for a Consent Decree between IBM and the Justice Dept. as a settlement to the government's case against the computer colossus. Actually, the whiff of Consent Decree speculations has more to do with the demise of Richard Nixon.

The reasoning goes like this: During the days of the scandal-ridden Nixon administration, any attempt to work out a Consent Decree between the government and IBM would have raised eyebrows, particularly in the wake of the ITT-Justice Dept. fiasco. Moreover, the Watson brothers of IBM were closely linked to the 1972 Nixon political campaign. The late Arthur Watson had been one of the heaviest contributors to the Nixon campaign—he gave about \$300,000—and Thomas Watson, Jr. served as vice-chairman of Democrats for Nixon. Thus, the biggest obstacle to a Consent Decree was removed in a single stroke when Nixon stepped down as President.

Meanwhile, the trial of the case has been delayed until after Dec. 2, and most observers expect the trial to get under way after the start of the year—some six years after the initial Justice Dept. complaint against IBM was filed.

IBM's outside legal counsel said the firm was prepared to go to trial on the

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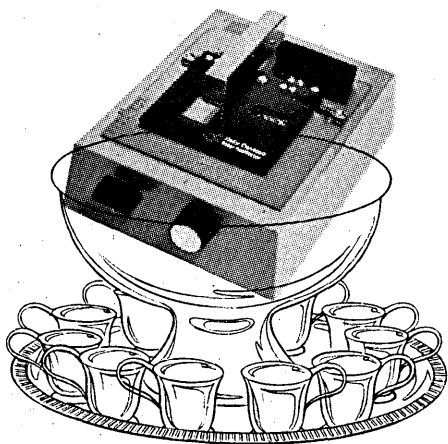
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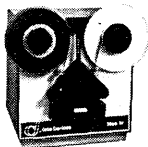
Let the Model 68 Tape Punch "bowl" over your 12-Channel printer format tape loop preparation problems.

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news in perspective

Oct. 7 date previously set by Chief Federal District Court Judge David N. Edelstein, but Justice Dept. attorneys said they couldn't prepare their case in time. IBM maintains that the Justice Dept. is seeking more time to introduce new issues into the case that were not included in the government's initial claim against the computer firm. The government maintains that IBM has been harassing it with various motions and legal maneuvers.

One nagging problem in the case has been IBM's drive to obtain certain Commerce Dept. documents and information, and Commerce Secretary Frederick B. Dent's refusal to turn over everything that IBM seeks. If the issue is not resolved, the case will surely be delayed again.

—W.D.G.

Hospitals

What Most of the Doctors Ordered

A hospital-wide information system, described by some as the most comprehensive and advanced of its kind, was for some three years on the verge of being thrown out. Last month, however, it was accepted by the hospital's board, and a five-year, fixed-price contract signed.

Early surveys of physicians and nurses who had to use the system showed clearly that the medical staff wasn't about to have crt/keyboard terminals, even with handy lightpens, replace their trusty pencils and paper (see Oct. 1973, p. 142). But as the system bugs were removed, as improvements were made to the form of the patient charts, and as more features were added to the system, the sentiment slowly changed. The latest count, made in July, showed that 61% of the doctors favored retaining the system and 94% of the registered nurses voted likewise. The high percentage of physicians favoring the system was a significant jump from the previous tally last November when only 52% cast an affirmative vote.

Last month El Camino Hospital in Mountain View, Calif., signed the contract with Technicon Medical Information Systems (TMIS), also of Mountain View. TMIS had acquired the system from Lockheed Missiles and Space Div., and had begun its installation at El Camino's admission department in 1971. From that time to the present, the hospital had been paying TMIS only the

amount of its savings from the use of the experimental system. It also had the right to ask that the system be removed.

Now, however, it is paying TMIS \$67,379 a month, which the hospital figures is about \$19,000 a month less than its savings from the use of the system. Of the total savings credited to the use of the system, \$40,000 a month reportedly comes from the reduction in pre-printed forms previously required and in the cost of people who handled that paperwork. The other \$46,000 saving is in cost containment, or the additional costs associated with operating under the previous manual system. A study of local hospitals with comparable operations showed their expenses for certain functions had risen these last few years, whereas those at El Camino had not.

Admission to release

From its inception, the on-line system was designed with features that benefited the hospital. It tracked patients from admission to release, made it difficult not to charge a patient for services or medication rendered, and simplified the bill preparation when he was released. But with the vocal opposition of physicians to the system, the system developers redirected their focus and added features that benefited doctors and nurses.

Medical information, for example, was made available to doctors through the terminals. They're able to call up a display of antibiotic sensitivity data, updated periodically by laboratory personnel, that show the probability of susceptibility of a given strain of bacteria with a given antibiotic. They put in a whole series of laboratory interpretation guides, the abstracts of the entire U.S. surgical literature, information on how each antibiotic should be used, and information on nuclear medicine.

More than aspirin

There's no way they can quantitatively prove the utility of this service to the doctors, admits Melville H. Hodge, executive vp and general manager of Technicon Medical Information Systems. "But there's no question that this has opened up the potential in the eyes of doctors," he says. "They now see that this is not just a machine for ordering aspirin, but something that can really help them to make clinical judgments and decisions on the fly all day long."

Hodge points out that doctors are not forced to enter their orders through the terminals, but instead can continue to write them out as they have in the past and have a nurse do the inputting. But he notes that 70% of patient orders are

input by doctors, referring to this high frequency as a vote of confidence in the system.

The terminals are supported by a 370/155 at the TMIS facilities. The same processing center also runs the same system at a smaller hospital in San Francisco. Although it has not been announced yet, an order for the system has also been received by a large Eastern hospital. It will be serviced by a regional processing center that TMIS intends to establish.

—E.K.Y.

Companies

A Villain's Lot Is Not an Easy One

At the annual meeting of Dataproducts Corp. last month, Erwin Tomash, chairman of the board, and Graham Tyson, president of the Woodland Hills, Calif. printer, core memory, and telecommunications firm, were reporting the company's best year ever (fiscal 1974), a record (75) first quarter, and attainment of positions as the "most profitable core memory maker in the world" and as "the largest printer manufacturer except for IBM."

"We're truly a strong company on the threshold of our greatest opportunity," Tomash told shareholders.

There was only one sour note—a note which caused Tomash, late in the meeting, to comment rather plaintively, "It's hard to be cast in the role of a villain." The casting was done by one Edythe Brown, an Engineering Administrator for Dataproducts. Ms. Brown has filed a complaint with the Equal Employment Opportunities Commission (EEOC) charging Dataproducts with sex discrimination. She claimed she was passed over for a job she felt qualified to fill by a less competent male.

At the annual meeting, though, she showed she isn't all the way mad. She spoke in favor of a motion for a vote of confidence in Dataproducts management, saying she thought they (management) work hard and do a good job.

Talk, but no action

But she feels an affirmative action program is lacking. She said she represented a group of Dataproducts employees, both men and women, who shared this feeling. She said there had been some talk at the company of forming an affirmative action council, but that three meetings scheduled to get this going had been cancelled.

Ms. Brown's comments at the annual meeting were dramatized by pickets from the National Organization of Women carrying signs which said, among other things, "Dataproducts is Sexist."

Tomash doesn't think so. He told shareholders the company is in dire need of mechanical engineers. "If there are any female mechanical engineers needing employment . . ."

Ms. Brown's position at Dataproducts hasn't changed since the annual meeting or the filing of the complaint. The EEOC, as is its practice, has turned the complaint over to the state's Fair Employment Practices Commission. Representatives of the FEPC had visited Dataproducts twice as of this writing, talking to employees, but no action had been taken.

A company spokesman said the passing over of Ms. Brown referred to in her complaint didn't involve any promotion but was, rather, a reorganization which resulted in Ms. Brown reporting to someone she considered less competent than herself.

Dataproducts' management can easily take its mind off the EEOC complaint by basking in this year's first quarter report showing revenues of \$23,349,000, up 24% from a year earlier, and fully

Suddenly, a small plotter with speed

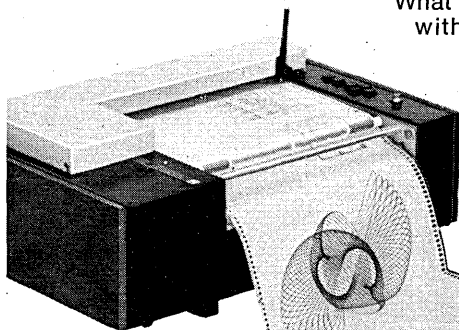
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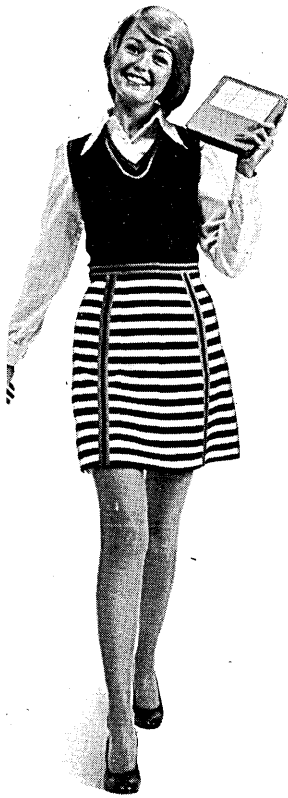


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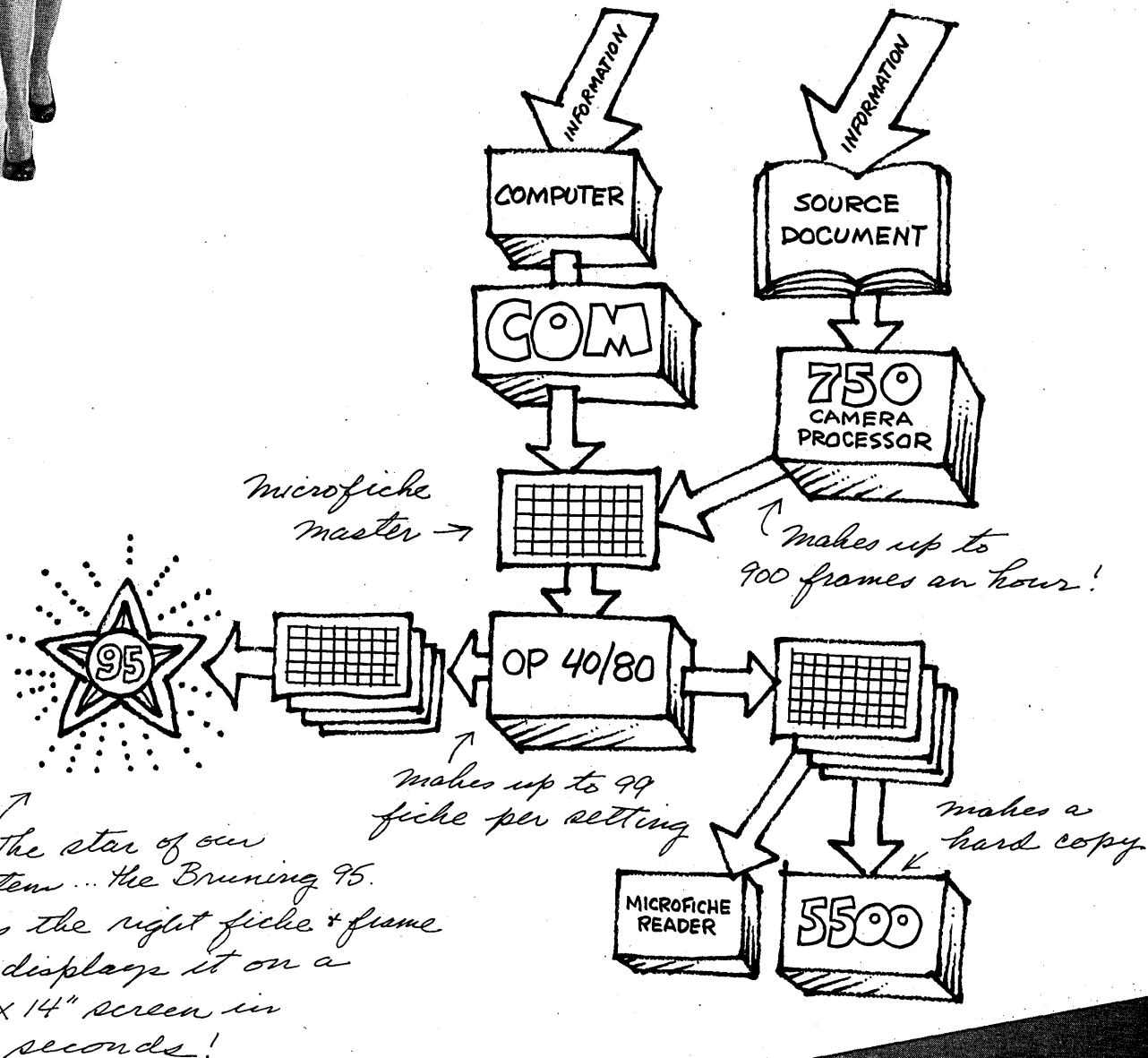
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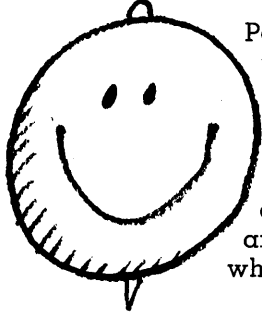


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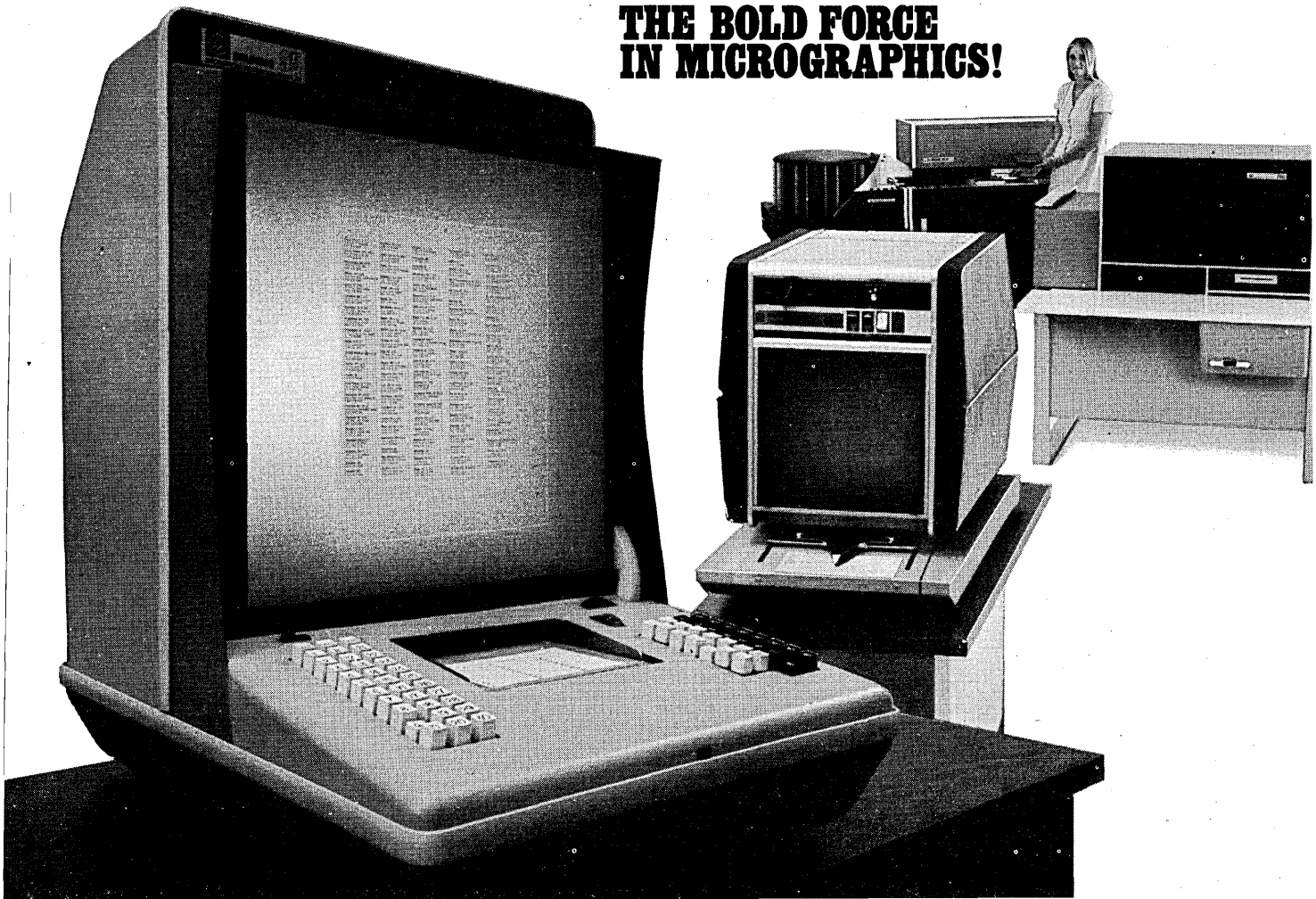
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Among the many other features, the RFS7400's fail-safe drive design offers Tracks "00" and "76" sensing to prevent machine damage and loss of data at both ends of the media. It offers approximately 50% longer life than competitive drives. And average random access time is more than 30% faster.

The system includes formatter electronics, with up to four separate drives, and power supply. Diagnostic software, I/O drivers and computer compatible interface controllers are available as options for PDP-11 and NOVA minicomputers. Like all other Remex computer interface packages, we guarantee system compatibility.

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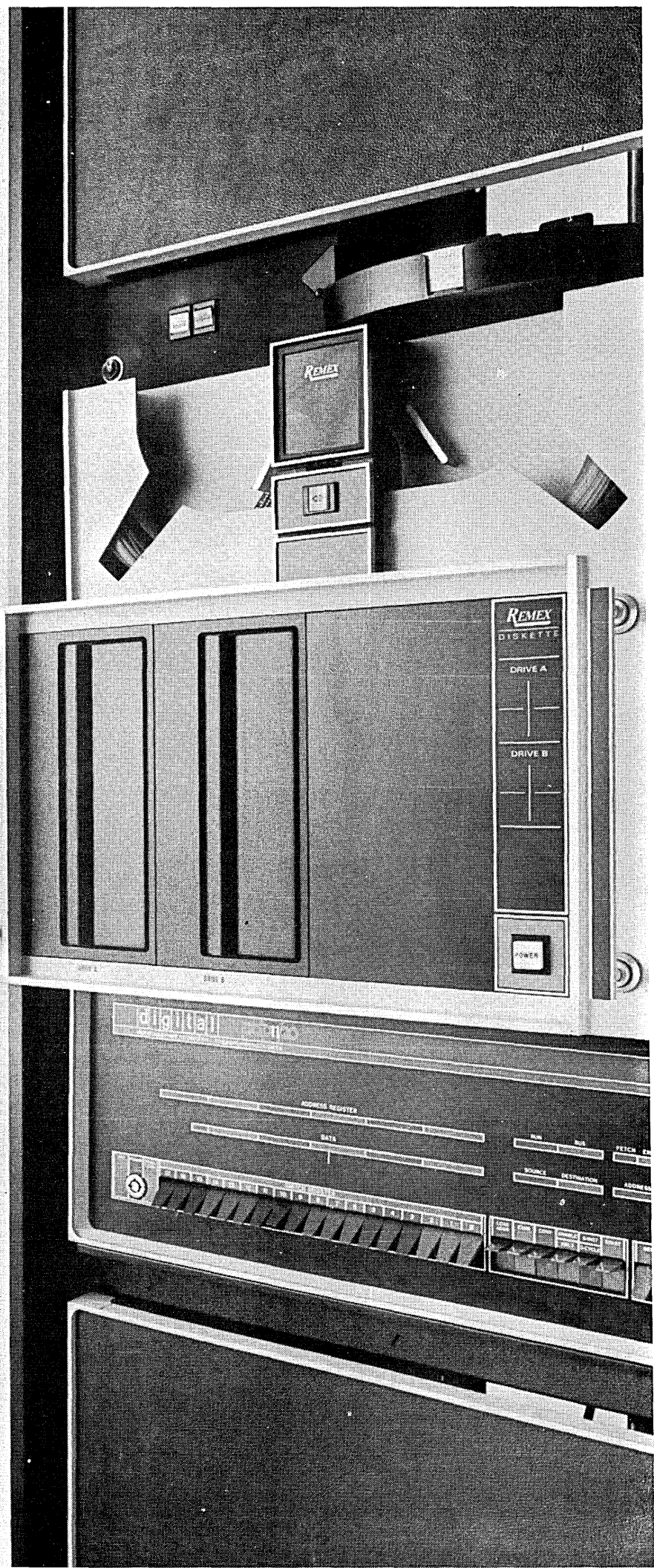
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news in perspective

taxed profits of \$1,381,000, up 26%.

The only negative impact on Data-products profits in the last year and a quarter came from Stelma Telecommunications, a data communications equipment maker it purchased in 1969. One stockholder wondered why the company didn't sell Stelma. Said Tomash, "We would if a buyer came along offering the right price."

—E.M.

Benchmarks

IBM Avoids Suit: With the payment of \$13 million to Ampex Corp., IBM avoided the burden of another antitrust lawsuit. Allegations of patent infringement and antitrust violations made by Ampex were denied by IBM in discussions that never reached the courts. Ampex president Arthur H. Hausman said the patents alleged to have been infringed had to do with computer tape transports and



ARTHUR H. HAUSMAN

disc memories, but refused to be more specific. Nor would he elaborate on what restrictions the agreement places on future suits the company might want to bring against IBM, except to say that Ampex cannot bring litigation "with respect to the subject matter that was in controversy and was the subject of the settlement." The settlement, in addition to the payment, calls for an exchange of patent licenses "covering their respective business interests in the dp field. Both existing patents and future inventions are included."

The patent discussions, Hausman said, preceded any talks about antitrust. According to a spokesman for Ampex, the talks were begun more than two years ago. And Hausman says the anti-

trust discussions were "comparatively more recent." Asked if other plug-compatible manufacturers applied any pressure for Ampex to bring suit, Hausman said, "No, we have no contact with them . . . We don't get together and go into that sort of thing." The settlement boosted Ampex fiscal first quarter profits to \$1.21 a share, compared with eight cents a year earlier.

A Concession to CalComp: In the second pre-trial hearing in San Francisco on antitrust suits against IBM filed by California Computer Products Inc., Memorex, Transamerica Computer Corp., Marshall Industries, and Hudson General Corp., Federal Judge Ray McNichols granted a CalComp motion to stay discovery on the IBM counterclaim alleging CalComp had infringed certain IBM patents, ruling the patent infringement claim is unrelated to the antitrust suit. The judge denied another CalComp motion to stay discovery on an IBM counterclaim that CalComp had monopolized the digital plotter market, stating he believed the issue raised by this counterclaim should be tried as a part of the antitrust suit.

Lawyers Win Again: An out-of-court settlement appears to have ended litigation between Information Systems Design, Oakland, Calif., and University Computing Corp. It was an employee of ucc's service bureau in Palo Alto, Calif., who triggered it all by accessing and removing from ISD's system a software package that drove a remote plotter. In August 1972 ISD was awarded some \$300,000 in damages in its civil action, considered at that time to have barely covered the service company's legal fees. ucc appealed only the amount of the award, but during the trial last month settled with ISD for a figure that is not being released.

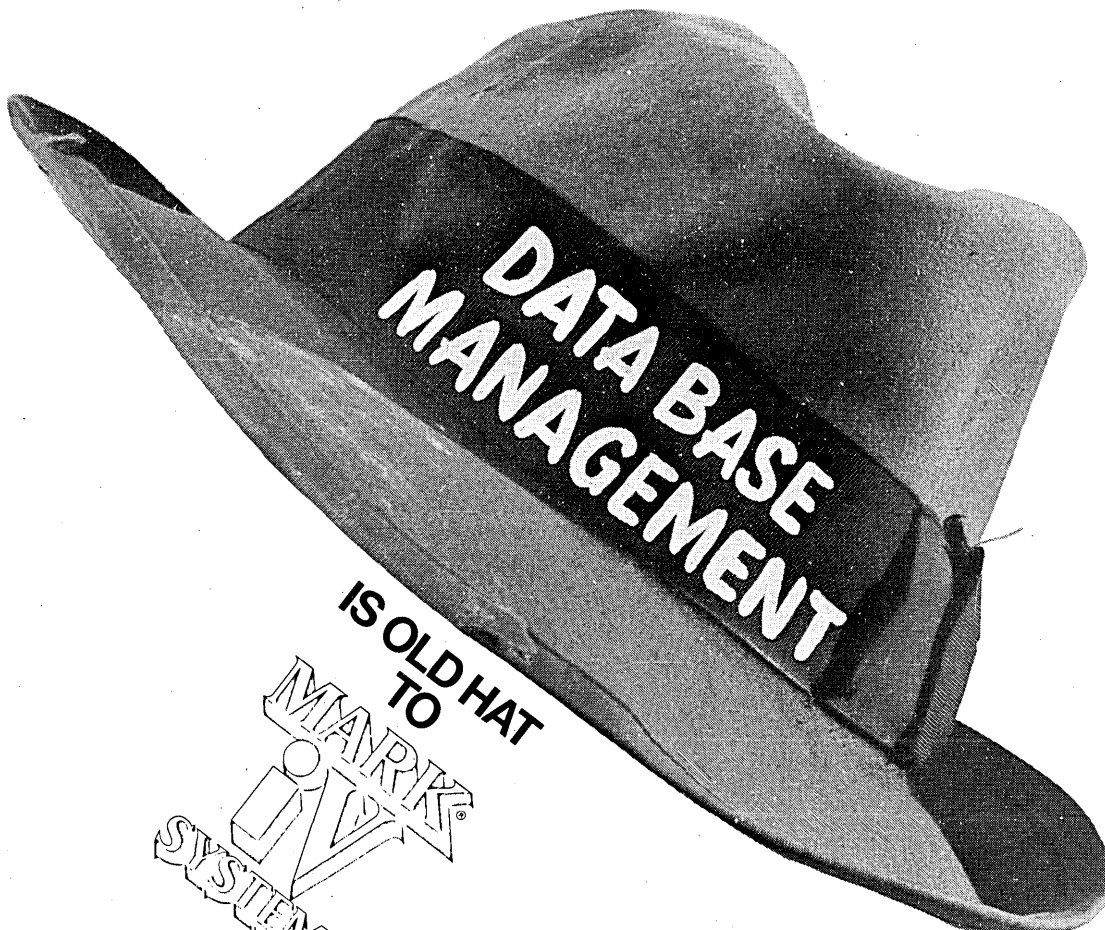
Suit Consolidation Ordered: Federal Judge David N. Edelstein has ordered the consolidation of two Xerox suits against IBM based on patent infringement charges. One suit covers IBM's Copier I, and the other its Copier II. Judge Edelstein, who also is handling the IBM-Justice Dept. case now in pre-trial discovery, said he issued the order to consolidate "in order to eliminate potential and existing problems generated solely because the two cases remain separate and distinct entities." The first suit was filed by Xerox in April of 1970. The second was filed in August of last year.

The Beginnings of Nationwide EFTS:

The fledgling National Automated Clearing House Assn., launched in early July, is into the nitty gritty of getting organized and establishing operating guidelines for interregional paperless exchanges this month, following an Aug. 31 deadline by which regional Automated Clearing Houses (ACH's) had to submit applications for charter membership. NACHA, started with four ACH groups—the California Automated Clearing House Assn., the Georgia Automated Clearing House Assn., the New England Clearing House Assn., and the Upper Midwest Clearing House—had received membership applications from six other ACH's in mid-August and was expecting five more to come in before deadline. The national association has purchased the SCOPE (Special Committee on Paperless Entries) software and related licensing authority from the Los Angeles and San Francisco Clearing Houses for \$200,000. One of its first efforts will be to redesign and redevelop the programs which were developed to operate on small-scale 360 computers, with the result that they are segmented into more routines than really are needed.

The Need to Talk: Edp auditors want to talk to other edp auditors wherever they might be. It was this want that took the EDP Auditors Assn. from a handful of members in a local Los Angeles organization back in 1972 to a 330-member national organization by its second national conference last June. Every published mention of the fledgling organization has drawn responses from edp auditors who want to join. Now the responses are getting international. They're coming from West Germany, Switzerland, Canada, India, and even from Dakar, Senegal, West Africa where even the computers have got to be lonely. G.E. Paling of Dakar wrote of his interest in the association and questioned whether "foreigners are admitted as a member of your association." Said past president, Bud Friedman, "We'll find a way."

New from Singer: Singer Co. has added four new computers to its System Ten family, priced from \$25,000 to \$66,000. The firm said the new computers are especially suitable for small to medium-sized businesses and are fully upward compatible with all other Singer computers. Deliveries began last month on two of the computers, the 110-4 and the 110-5. Deliveries of the 110-1 and the 110-3 are scheduled to begin in November. □



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LOOK AHEAD

(Continued from page 18)

Observers close to Unidata look for the 7.720 to be replaced soon by a technically advanced model and for the entire 7000 series to be replaced within three years. One observer, disputing suggestions that Unidata, with its "management by committee" structure, is a joke, expresses the viewpoint of many competitors contacted in Europe, saying, "I respect their abilities." He says the partners communicate effectively with each other, seem to have a thorough knowledge of the dp industry, and are building strong local sales forces with an awareness of the regionalized marketing peculiarities of Europe.

NOTHING TO WORRY ABOUT, BURROUGHS TELLS USERS

Large financial users of Burroughs equipment--threatened when customer engineers in the computer company's New York Financial Branch covering New York City, New Jersey, and Long Island walked out on strike Aug. 26--were resting easy at press time on the basis of Burroughs' assurances that supervisory personnel could handle their service needs and that picketing would be restricted to the Burroughs' plant and would not spread to user installations. The latter possibility was a fear of some users who worried that their own personnel might not cross a picket line. To what extent Burroughs was able to keep its promises will be covered in the October issue of DATAMATION. We wondered at press time if some of the financial users might not find themselves in a spot similar to that of Stanford Univ. data processing personnel hit by a strike last June (July, p.124). The striking Burroughs' engineers were demanding that the company negotiate a contract with Local #3 of the International Brotherhood of Electrical Engineers and formally recognize the local as their bargaining agent.

ANYONE FOR TERMINAL CARTS?

The Denmark telephone administration (PTT) allows non-telephone supplied modems to be used on the telephone network--provided the terminals are portable and are not attached to a single phone number. One effect has been the end of a long-standing monopoly on modems by the three Danish telephone companies. Another involves the transportation of bulky terminals. Programmers often take them home and, in many offices, heavy terminals are made "portable" by being moved around from phone to phone. In fact, there's a thriving little sub-industry there making wheels and carts for these "portable" terminals.

RUMORS AND RAW RANDOM DATA

Without any preceding fanfare, Hughes Aircraft Co.'s Industrial Products Div. quietly took the first color version of its Conographic graphic display terminal to Info 74 in New York this month. Coupled with a video memory, the system will sell for under \$50,000...If imitation really is the sincerest form of flattery, then Management Assistance, Inc., which pioneered the marketing of IBM plug-compatible peripherals, should temper with pleasure any concern it might have about manufacturers that now eye plug-ins to its ubiquitous (1,500 installations) Basic Four small business computer system... EFTS won't take the float out of banking, says the Society for Worldwide Interbank Financial Telecommunications (SWIFT). The Brussels-based network of 239 banks soon will set what it calls a "value date"--that is, an artificial date on which a payor in a transaction would be debited and the payee credited. Banks then would continue to use the artificial "float" as investment money.

Something always goes rong.

And before you can fix it, you've got to find it.

That can be an absolute (expletive deleted).

So we've done two things to help you delete that particular expletive from your data communications system.

One, we've built system diagnostics into every time division multiplexer that goes out our door. So that when the inevitable does happen you can find it, and fix it, fast.

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Synchronous or asynchronous. 50 bps to 9600 bps. In five different test modes. For fifteen separate interface test points.

Our motives in helping you with other people's multiplexers and modems are not entirely pure.

For one thing, an Infotester costs about \$2,000. Which makes it a bargain for you, true, but still leaves a few dollars for us.

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System diagnostics:
About \$2,000.
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Either way, a bargain.



Infotron Systems

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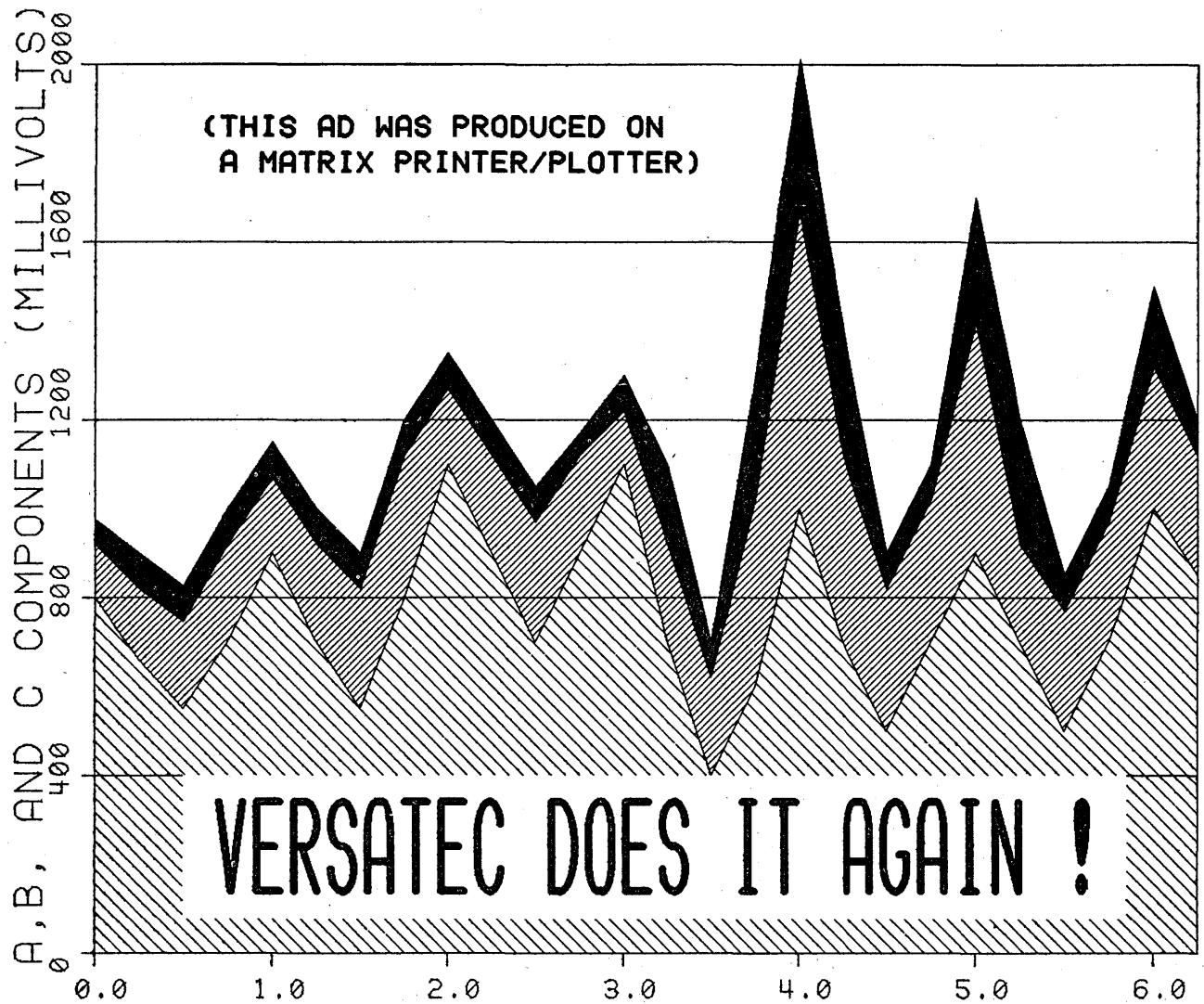
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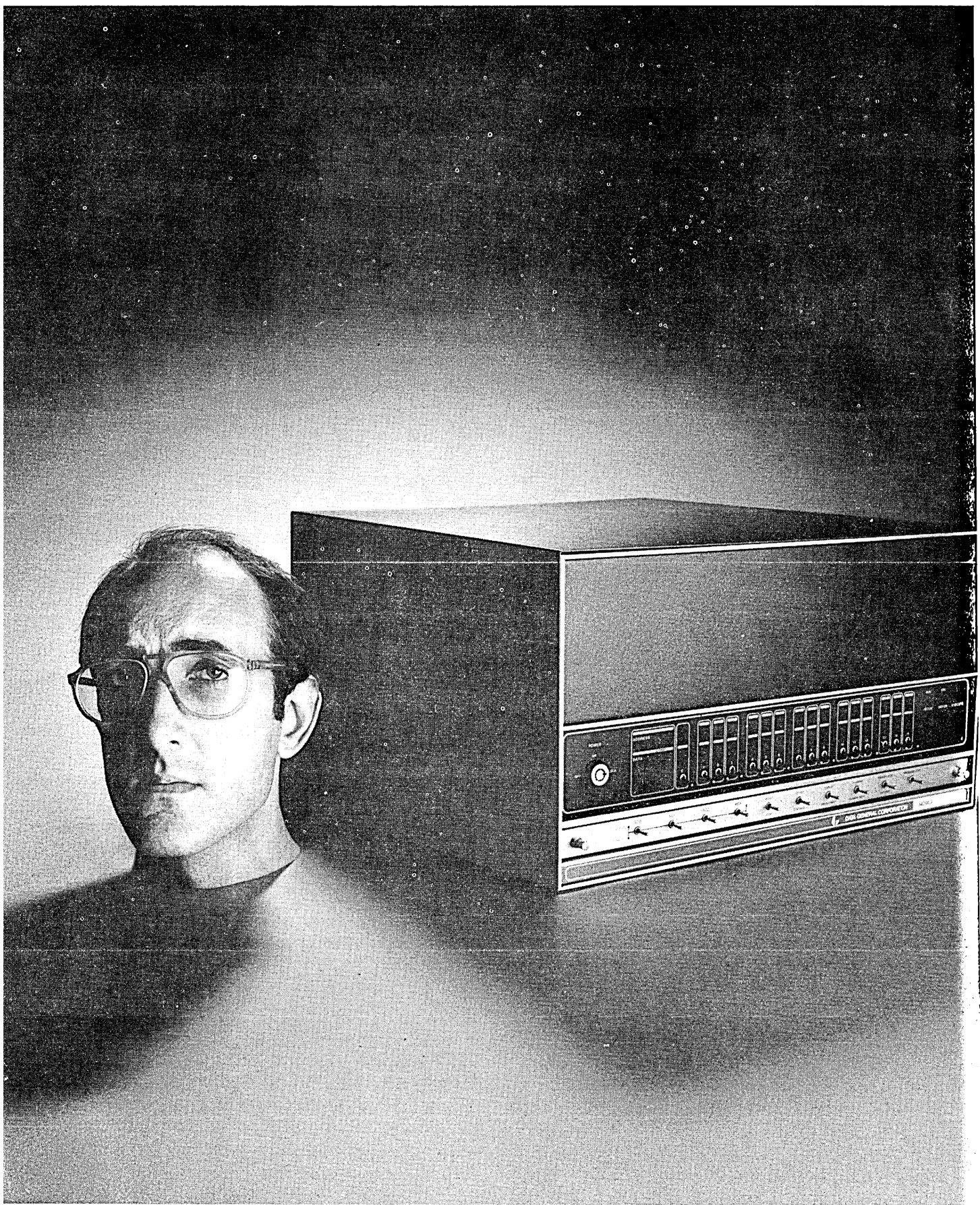
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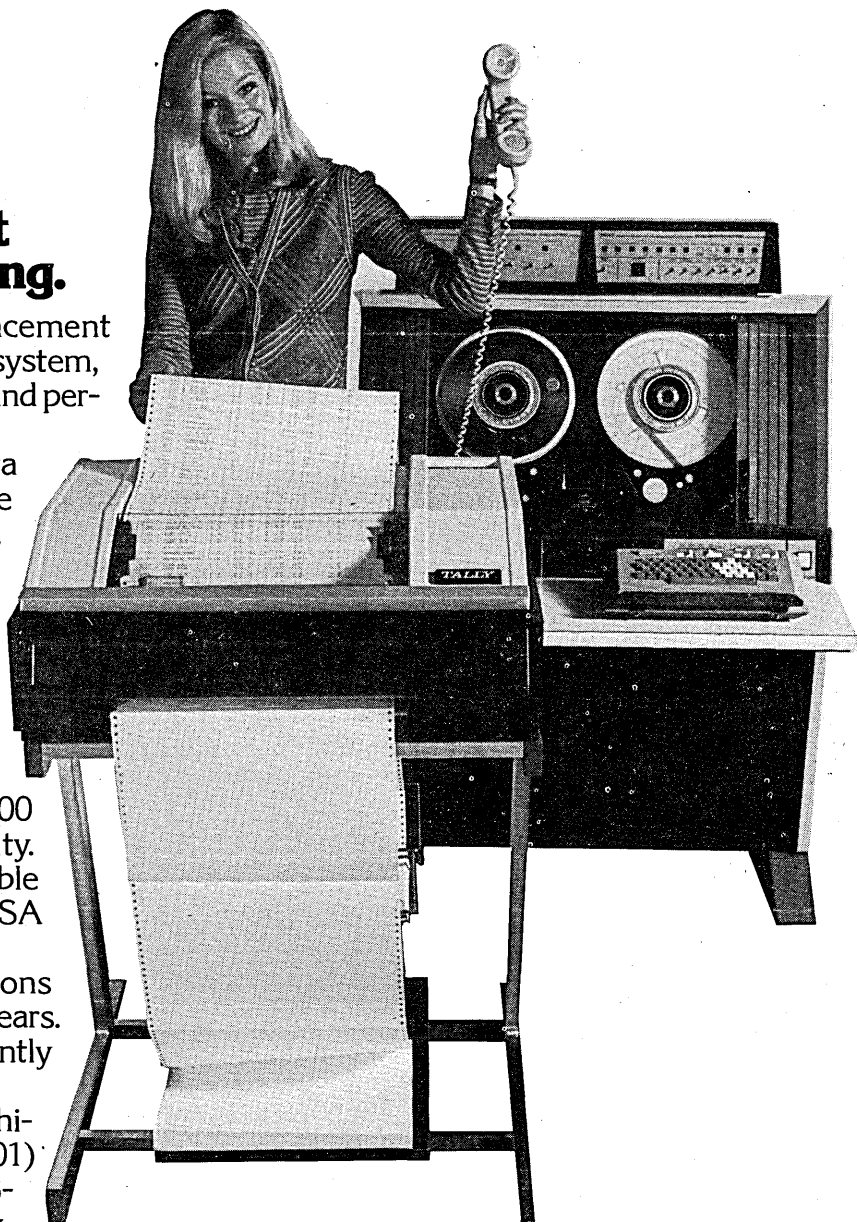
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TALLY®

letters

(Continued from page 26)

all is personnel dedicated to professionalism and not to the Inverse Peter Principle (April, p. 123).

LOUIS H. VISSER
San Lorenzo, California

Slipped schedules

In my article, "An Automatic Scheduling System" (July, p. 75), several typographical errors were introduced. Here are corrections:

- Fig. 2, line 9250 should be 9250 RETURN; END
- Fig. 5, last line insert another comma after A001 OUT
- Fig. 8, first line should be *FILENAME 'B001CMF'
- Fig. 12, line 140 delete the right parenthesis following ARRAY
- Fig. 16, line 1470 add a single quote at the end of the line
- Fig. 17, line 1530 change 14 to I4

W. C. HOFFER

DATAMATION regrets that these typographical errors were not caught. We are changing our procedure for reproducing source listings to insure this will not recur.

ltr. to th. ed.

I. as an enlightened. forward looking. and compulsively progressive computer user. am thrilled. delighted. and overjoyed. to see that DATAMATION. the paragon of computer usage description. has. at long last. adopted the comma-less style. originated by e.e. cummings. which is easier to write. easier to keypunch. easier to typeset. and offers the additional advantage of relieving a portion of the energy crisis. that malthusian curse. by reducing the quantity of printers ink expended in hard to read journals. such as yours. at least pages 116-135 of the July. 1974 issue.

C. R. WATSON
Research Scientist
Battelle Pacific Northwest
Laboratories
Richland, Washington

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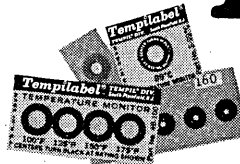
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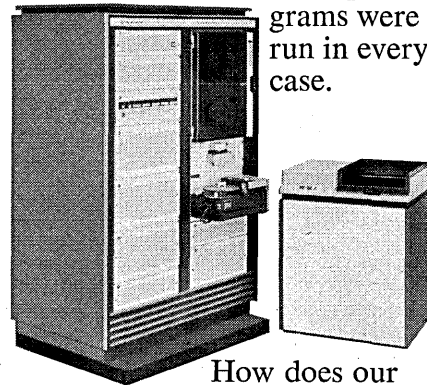
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A=B+C	7	33	58	19	51
(double) A=B+C	10	82	61	29	98
A=B	4	14	35	7	13
Do Loop	4	22	10	11	17
A(I,J)=B	22	63	39	28	46
A=Sin(B)	100	251	266	197	1583

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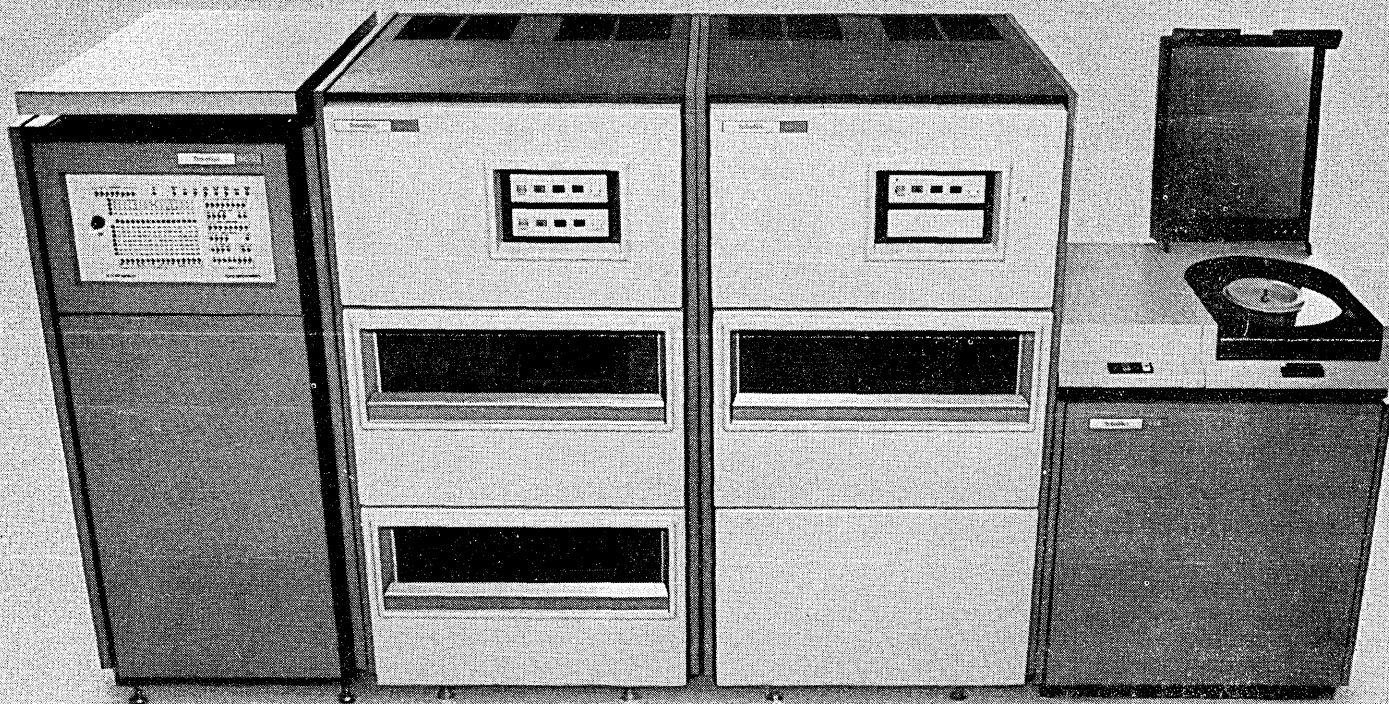
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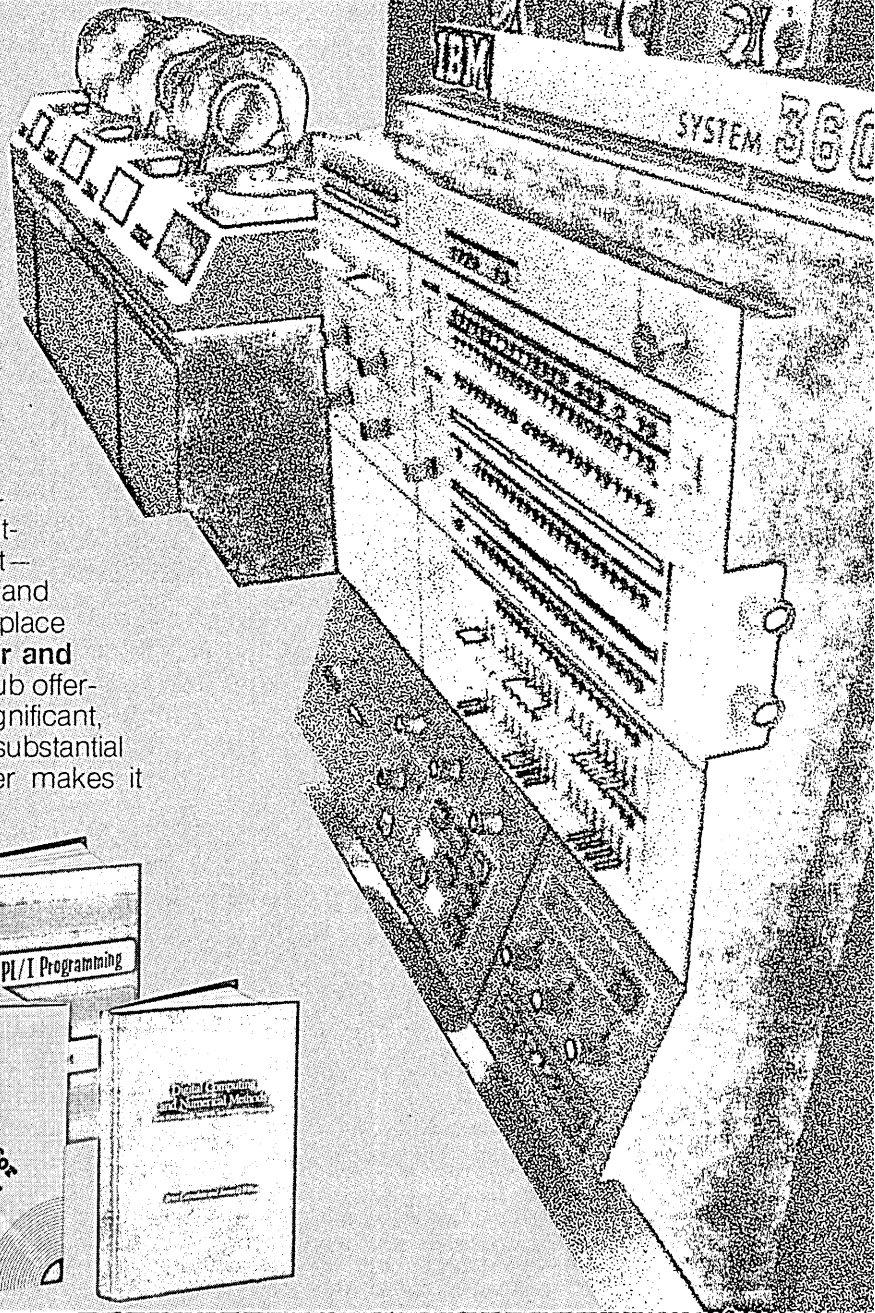
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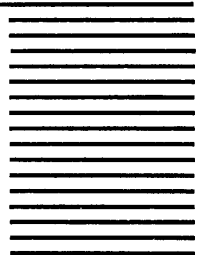
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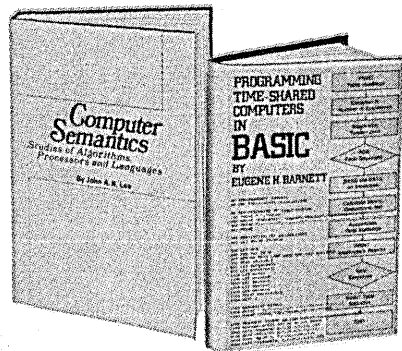
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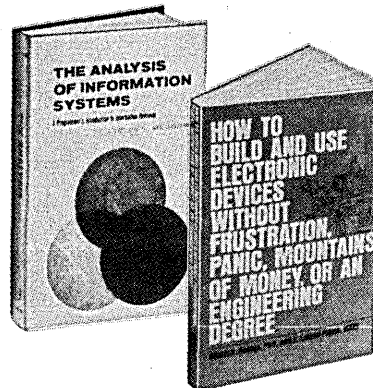
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hardware

Off-line

A survey of microprocessor and microcomputer products is in the works for our November issue. If your firm currently manufactures these products, please send for a questionnaire to: DATAMATION, 1801 S. La Cienega Blvd., Los Angeles, Calif. 90035, Attn: Microsurvey.

Total minicomputer/miniperipheral shipments by U.S. manufacturers are on their way to a 44% increase from the 1973 level of \$893 million worldwide, according to International Data Corp. Surpassing the billion dollar mark for the first time in 1974, it's expected that the figure will grow to \$3.2 billion by 1978. Of that amount, minicomputer suppliers will account for \$2.67 billion. Miniperipheral suppliers will have reached the \$600 million level by 1978, according to the IDC report. Soaring end user market value will be accompanied by rapidly growing oem shipment values, with total systems in the microcomputer range lending particular impetus to the figures.

An electronic drive assembly that could be used as the basis for a new generation of floppy disc drives has been developed by a small, new, North Hollywood, Calif. company, Advanced Magnetic Products, Inc. The device, patented as a magnetic actuator, is used to position read/write heads accessing up to 256 tracks. Based on the consequent poles principle, the design is being shown to a number of current floppy and standard disc unit manufacturers.

If the 12-meter yacht Courageous is the U.S. representative chosen to defend the America's Cup this month, it will partly be due to a Data General Nova 1200 mini used to aid the navigator. Readings such as the apparent wind speed and direction, boat speed, heel angle, and compass course are updated in the 16K Nova four times each second in order to calculate how the course should be sailed. Minicomputers are increasingly showing up on racing and private yachts, and it would appear that the days of the naviguesser are numbered. Octally.

Optical Character Reader

IBM has come up with a clever enhancement for its low-cost model 3886 OCR device. Now letters, numbers, and even signatures that are normally unreadable by OCR techniques can be captured, stored, and displayed on a screen so that an operator can enter the information that is shown. The screen is a specially equipped 3277 terminal. The nice thing about this development is that the operator probably doesn't have to refer to original docu-



ments to see what the rejected character was. There are other advantages, too. Non-OCR fonts can be fed into the 3886, with the operator making the "true" information entry into the system. Users can choose three methods of applying the new feature: allow video-collected data to be transferred by user-written programs from the 3886 directly to a computer; ship the input to a 3410 tape drive; or simply attach a modified 3277 to the 3886. The two-year lease rate on the new feature varies between \$224 and \$324. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 371 ON READER CARD

Serial Printer

The model 120 is an asynchronous printer/plotter terminal available for the DEC PDP-11 and PDP-8 minicomputers. The peripheral utilizes either the Diablo Hytype or Qume printer together with a proprietary interface that users can plug into the mini's Omnibus, or into one of the peripheral card slots. Upper- and lower-case printing is performed at 30 or 45 cps from a 96-character set using a carbon ribbon cartridge. Overprint and reverse printing are also standard, as is a vertical resolution of $\frac{1}{48}$ inch and a horizontal resolution of $\frac{1}{60}$ inch (optionally $\frac{1}{120}$ inch.) Complete with interface, the model 120 is priced at \$3-900. Deliveries have begun. DATA

SYSTEMS DESIGN, Berkeley, Calif.
FOR DATA CIRCLE 373 ON READER CARD

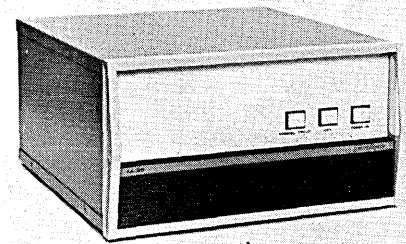
Magnetic Striped Card

A lower capacity magnetic striped card has been introduced for IBM MC/ST applications that don't require the full 5,000-character capacity of the original card. The developers claim that the standard letter length of 1,750 characters justifies a small capacity card, and the new card holds 3,000 characters. For an installation using 10,000 cards a year at \$1 each, the savings resulting from using the new cards, at 25¢ each, would approximately equal the cost of a new MC/ST system. ABCOM BUSINESS PRODUCTS, INC., New York, N.Y.

FOR DATA CIRCLE 374 ON READER CARD

All-digital Modem

The M-96 9600 baud modem seems to incorporate a number of design breakthroughs that should mean increased reliability for users. Most of the signal processing and filtering performed in previous modems is handled digitally in the M-96, with the logic committed to LSI chips. There are a number of

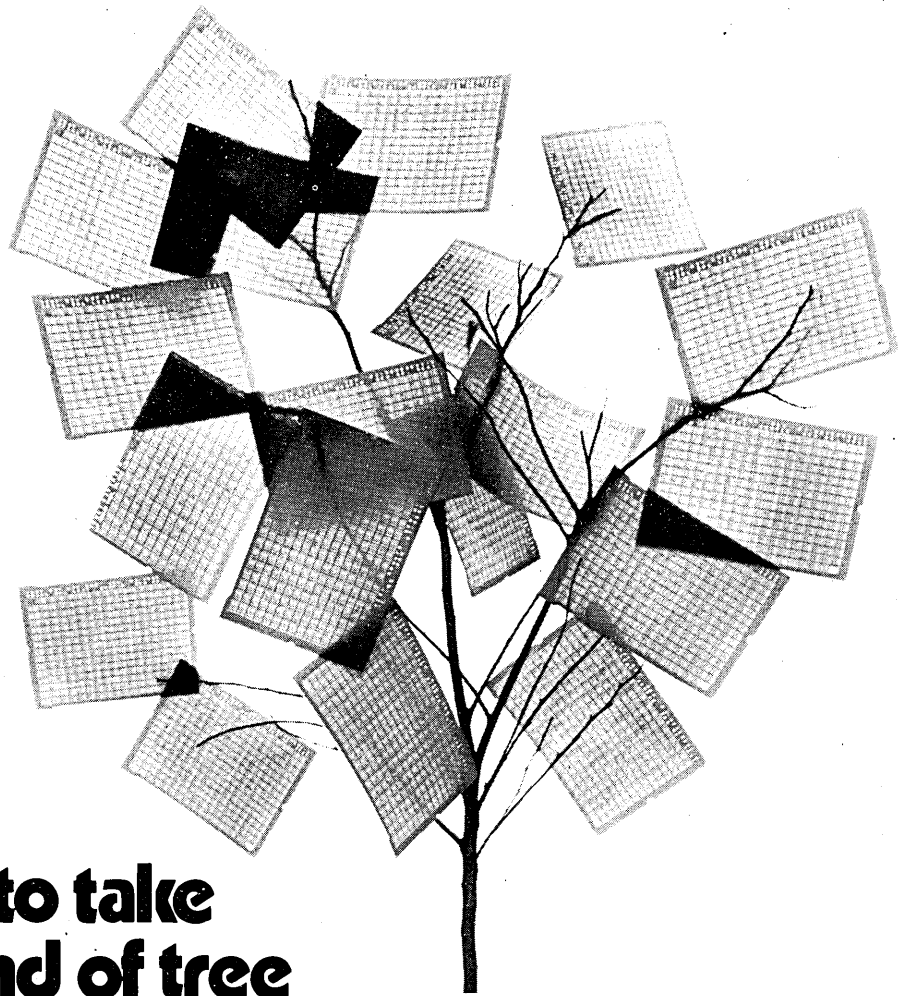


field-strappable options that are implemented by simply plugging in read-only memories. The decreased number of leads on the LSI chips should help reliability considerably.

The M-96 is designed for use in 4-wire point-to-point applications, where it can be set by the user to run at 4800, 7200, or 9600 baud. Extensive test features are standard on the M-96, with remote loopback, remote test, and two- or four-part multi-plexors optional. The single quantity price is \$6,500, dropping to \$5K for an order of 50. The model will be available before the end of the year. PARADYNE, Largo, Fla.

FOR DATA CIRCLE 372 ON READER CARD

(Continued on page 161)



It's going to take a new kind of tree to solve your paper problems.

Why use miles of forest . . . when all you may need are inches of microfiche? One of our modular DatagraphiX System 4500 COM recorders can help you beat computer-crippling paper problems in several ways.

Take the short supply of paper, for instance. No need to worry with DatagraphiX System 4500 on the job. Your viewer replaces paper—unless you want an occasional printout.

Or consider paper costs—which have recently risen as much as 75%. Also, some computer stock is now being discontinued by suppliers, forcing you to upgrade to more costly paper.

And don't forget the storage situation. To keep ahead, you must buy in unnecessary volume—then find floor space for the paper until it's needed. We've got your record storage problems under control, too. Just compare inches of fiche with mountains of paper.

The System 4500 is designed in modular units to fit your exact needs now. But you can always add on as requirements grow.

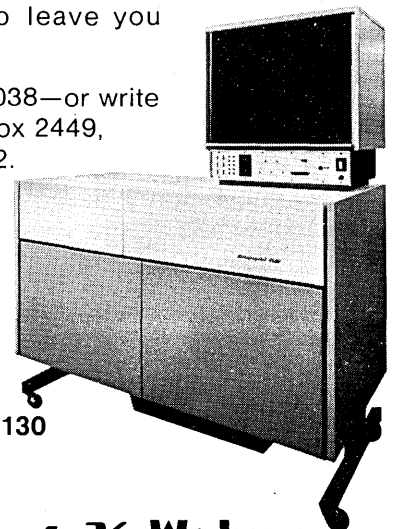
The versatile off-line Model 130 COM recorder (shown) accepts magnetic tapes from a wide variety of computers. Incorporate a high-speed mini-computer and solid-state electronic data terminal—

you have our Model 150, eliminating host computer handling and reformatting. Or consider the online Model 120 which interfaces directly with existing computer equipment. And there's still much more to come in the modular System 4500.

So, if you're not looking good on paper, look at our new technology in computer information handling.

We're not about to leave you out on a limb.

Call us—(714) 283-1038—or write DatagraphiX, P. O. Box 2449, San Diego, CA 92112.



System 4500 Model 130

DatagraphiX **We have the answers.**

Stromberg DatagraphiX Inc. a General Dynamics subsidiary

a card access control system...

The Mosler Accessor.

It keeps the Toms, Dicks and Harriets out of the computer center.

Can you afford to have everybody and his brother strolling in and out of the computer center at will? The company snoop? A disgruntled former employee? Or worse yet, an industrial spy or saboteur?

There is a beautiful alternative: the Mosler Accessor. Accessor is the program-able controlled access system that unflinchingly tells the difference between authorized and unauthorized personnel. It stands guard outside the computer center, lets the right people in, and keeps the wrong people out.

Accessor uses ID-entry cards, each one specially encoded with information on every authorized employee: what areas he can enter, and when he can enter them.

A card reader at the restricted area, coupled with a central processing unit, does the thinking. When the employee wants to enter an area, he inserts his card in the card reader, and punches his four-digit memorized employee number into the system. If the number

is correct, he is authorized to enter that area, and if the time is right, Accessor lets him in. But if something is wrong, the door remains locked. And impenetrable.

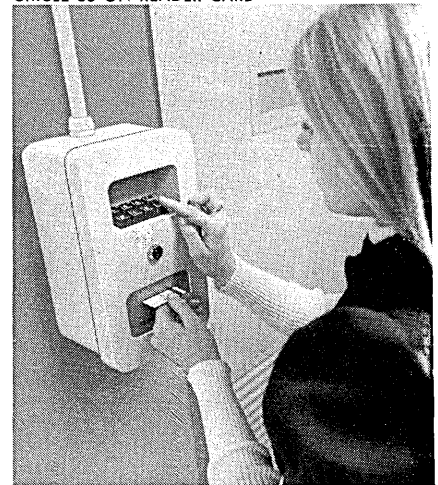
Lost or stolen cards can't fool it. Attempts at compromise anger it (Accessor can erase a misused card, or trigger an alarm when interfaced with building security systems). And through it all, Accessor can record arrival and departure times for printout retrieval.

The Mosler Accessor controlled access system. From the company whose business is total security.

For a closeup look at the Mosler Accessor, write us at Dept. D-974. We'll tell you everything you want to know—and then some.

Mosler

AN AMERICAN-STANDARD COMPANY
HAMILTON, OHIO 45012
CIRCLE 56 ON READER CARD



hardware

Programmable Terminal

If the appearance of this firmware-controlled data entry crt reminds you of AT&T's Dataspeed 40, it's supposed to, as that product will be the principal competition for the 40+ Data Display system. This is ICC's first entry into the communications display market after



considerable success with its other product lines. The same world-wide service network that serviced its modem installation base will be trained to handle the 40+.

The 40+ looks like a winner. It has

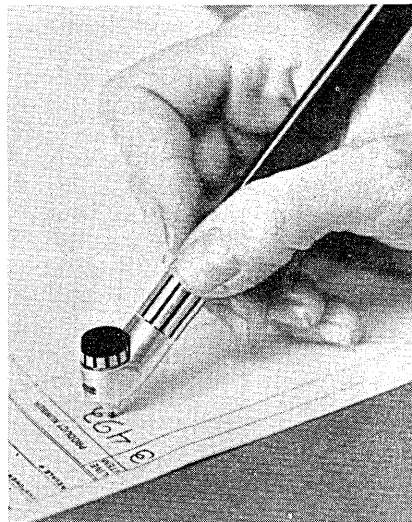
some features that the highly regarded Dataspeed 40 doesn't have, and the few dollars more a month required for it appears to be justified. The standard keyboard contains 127 ASCII codes; six cursor controls; eight data editing functions including character, word, and line insert/delete; and a send/receive/local operation mode switch. Up to 1,920 characters can be displayed in 7x11 dot-matrix form across the 5¼ x 10½-inch screen, arranged in 24 lines of 80 characters. To help fight glare, the screen can be tilted 10° vertically and 30° horizontally. The controlling microprocessor can be equipped with up to 8K bytes of read-only memory to perform "canned" functions, and random access memory (RAM) is also available for storing up to three full screens of information. The 40+ operates in five modes: 1200 baud synchronous; 2400 baud synchronous; operation compatible with Bell's DDS facility; full and half-duplex; and optionally, with polling capability. The price for the basic unit in small quantities is \$3,850 or \$128/month on a two-year lease, including maintenance. Production shipments will begin early next year. INTERNATIONAL COMMUNICATIONS CORP., Miami, Fla. FOR DATA CIRCLE 375 ON READER CARD

product spotlight

Data Capture/Entry

Several years ago, the Stanford Research Institute developed a special ballpoint pen that could be used to input data as it was written. At that time, however, IC technology hadn't progressed to the point where a usable product could be based on it. Xebec now thinks they've come up with three products that might revolutionize the way data capture is performed.

The first product is a minicomputer-based system whereby from 10-25 "pen stations" will perform order entry, or similar functions such as those of a bank teller, with whatever is written simultaneously going into the data processing system. This approach eliminates waiting until the day is over and sending the accumulated materials to be keypunched and verified. This basic system will recognize 16 characters (the numbers 0-9 plus six control codes) with an additional 16 characters offered as an option. The developers think the system will lease for approximately \$125/month per pen

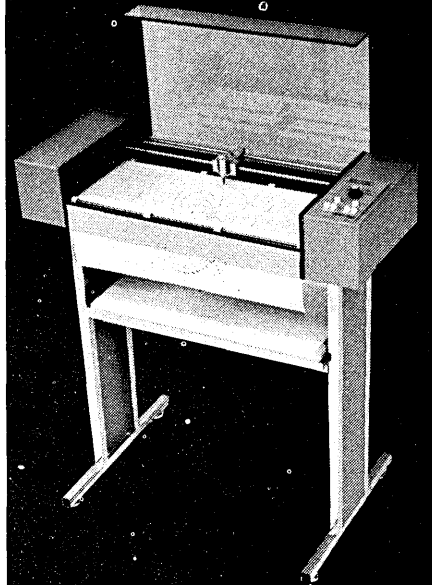


station. This product is called the Alphabec-70.

Downstream somewhat is the second product, a remote data capture system using a microprocessor, with the third product a portable meter reading system somewhere in the future. One strong point of the pen approach is that it doesn't change existing procedures very much, and the original hard document still exists to provide an audit trail. First Alphabec-70 systems go to the field early next year. XEBEC SYSTEMS INC., Sunnyvale, Calif.

FOR DATA CIRCLE 370 ON READER CARD

COMPUTER PLOTTING



Model 1653

A high speed, 22 inch recorder designed to operate on-line to scientific and general purpose computers in graphic output applications.

- Plug-to-plug compatibility (hardware and software) with all standard 300 steps/sec. plotters used in the computer field (CALCOMP and COMPLIT).
- Z-fold paper (367 ft. long) folding conveniently into notebook size.
- 0.01 inch step (0.25 mm optional) with 300 steps/sec. operation.
- Single step resolution with one step repeatability.
- Pen point exposure for manually setting origin.
- Simple control panel layout with single function switch.
- Integral chromed steel stand with paper storage.

PRICE: \$3,300.00

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INSTRUMENTATION

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CIRCLE 90 ON READER CARD

Who Gets Excited When The Computer Breaks Down?

EVERYBODY.

The cost of computer downtime can be horrendous. Last year, a computer failure shut down the Chicago Mercantile Exchange half a day—the cost, an exciting half million dollars.

Computers are different from people in more ways than one. They require a constantly controlled environment held to critical tolerances that comfort air conditioning can't provide.

EDPAC process cooling helps ensure uninterrupted computer operation at a cost of only 1% of overall investment. If you are interested in protecting your computer investment, you should read our informative, non-commercial book, "Process Cooling for Data Center Environment." AC Manufacturing Company, Cherry Hill, N.J. 08034, or call 609-428-9800.

It could prevent some unnecessary excitement!

45A

EDPAC

PROCESS COOLING FOR COMPUTERS

CIRCLE 86 ON READER CARD

hardware

Honeywell Tape Drives

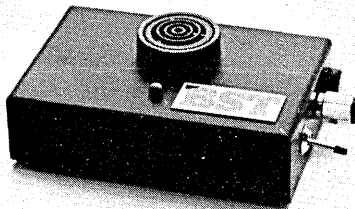
This manufacturer has developed a microprogrammed controller that allows users of Honeywell's 200 and 2000 series equipment to attach IBM 3420 self-loading type tape drives. Up to eight drives can be driven in a dual-channel configuration with read/write simultaneity. The standard recording density is 1600 bpi nine-channel, but there are options for 800 bpi nine-channel, 556-bpi seven-channel, and 200-bpi seven-channel modes—or all on the same controller. Tape speeds possible are 70, 100, 125, and 150 ips. The software interface for the system is claimed to be transparent.

The vendor is preparing to apply for Honeywell installation approval, and states that if Honeywell balks at maintaining systems with this equipment attached to it, Formation will undertake maintenance on the entire system. A six-drive system rents for \$4,300-\$4,600/month depending on the specific tape drive characteristics required. FORMATION, Cherry Hill, N.J.

FOR DATA CIRCLE 376 ON READER CARD

System/3 Aid

The "Stop Watch" is an audio/visual halt signal that tells a System/3 operator that the system is in a halt or standby mode. This frees the operator from continually having to check the machine state at close range to see if it is still running. The signal is in the form of an audible tone (with adjustable volume) and a blinking light so



that it can be seen through a window. Approximately the size of a small hand-held calculator, the unit can be installed in less than five minutes behind the cpu's front panel. It's claimed that the "Stop Watch" is IBM approved. It's priced at \$150, and comes with a 30-day moneyback guarantee. BUSINESS SYSTEMS TECHNOLOGY, Orange, Calif.

FOR DATA CIRCLE 377 ON READER CARD

OPERATIONS MANAGERS

DON'T TAKE JERRY'S QUIZ!

(or you'll end up investing \$1000.00 in **EASY READER™**, our new reader/interpreter subsystem)

QUIZ

Answer: **EASY READER™**

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- Eliminates SYS1.PROCLIB updates,
- Gives each user his own PROCLIB and,
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Easy wasn't it. Try **EASY READER™** free for 30 days — that's easy too. Call Jerry collect or send coupon.

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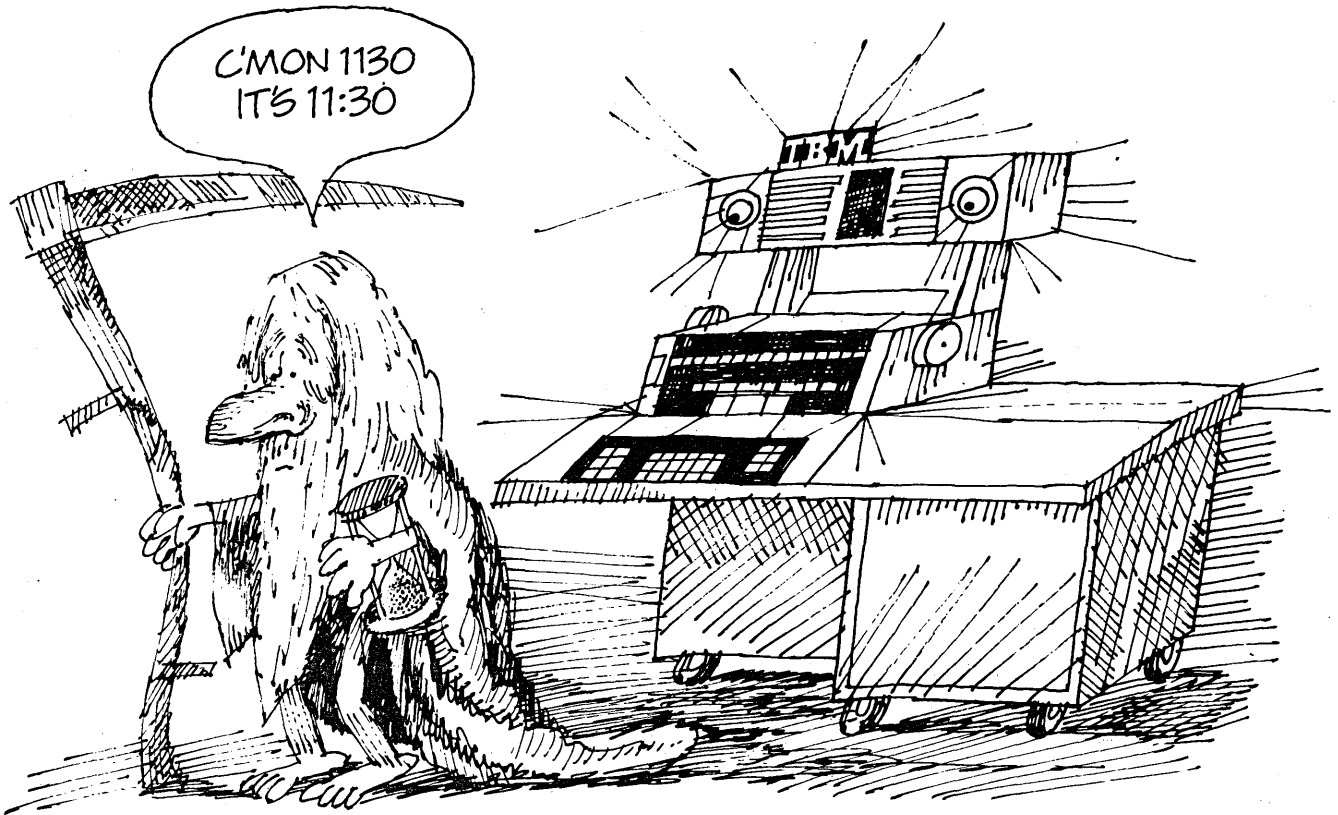
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CIRCLE 108 ON READER CARD

DATAMATION



The 1130 was a fine idea for its time. Time's up.

Introducing the Computer Hardware Inc. CHI-2130. A 16-bit, general purpose central processor with a basic cycle time of 800 nsec. Everything that the 1130 was, plus a heck of a lot more at three to six times faster. It also costs less.

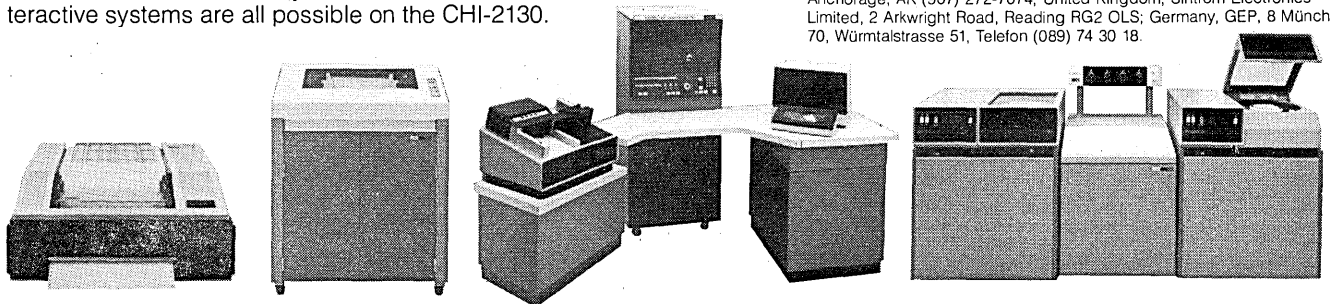
Suppose you now have an 1130 on the floor. Pack it up and send it back. Every scrap of software in your house will run on the CHI-2130 without modification. That includes applications, diagnostics, the whole works. The only difference is speed — you'll be able to do more than twice as much work with the CHI-2130 as you were doing with your old 1130.

Suppose you're interested in communications. With the 2130's internal speed, supporting multiple high speed terminal, on-line order entry, remote batch, and interactive systems are all possible on the CHI-2130.

When you call in a representative from Computer Hardware Inc., you're going to be talking about savings of tens of thousands of dollars. And the sooner you and we get together, the sooner you'll begin saving. Start with our CHI-2130 brochure. It gives you all the facts in a straightforward way that any penny-pinching systems analyst can understand. Turn an ordinary year into something special. Make this the year of the CHI-2130.

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hardware

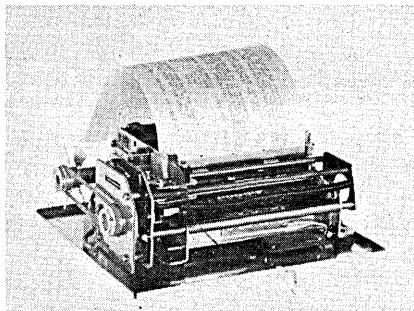
PDP-8 Communications

The Serial Line Interface Module (SLIM) combines eight duplex asynchronous line interfaces, a multiplexor, and a PDP-8 interface on a single cpu board to provide users with instant communications capability. Each serial channel is double buffered, and jumper selectable for word length, parity, and stop-bit options. Transmit and receive frequencies are individually jumper selectable from 12 crystal-controlled and three adjustable frequencies ranging from 50-9600 baud. Serial line I/O is EIA-compatible. The SLIM is priced at \$1,980, and deliveries have started. COMPUTER INTERFACE SYSTEMS, INC. Piscataway, N.J.

FOR DATA CIRCLE 378 ON READER CARD

Crt Hard Copy Unit

The Sidewriter model 1021 generates hard copies of alphanumeric information taken from the face of crt screens at the touch of a button. The \$425 price tag for single units is attributable to two things: to the fact that the unit is basically oem or systems house oriented (no interface exists to hook it to any specific crt), and to some well



thought out engineering. It doesn't make sense to build an 80-column printer for crt's since it will only print a maximum of, say, 24 lines, so the Sidewriter's designers "turned the printer around" and constructed it with 26 print hammers, one for each line. The crt is scanned from top to bottom, with the output going to specially treated aluminum paper. The printer's effective speed is 100 cps, or a full crt page in 12 seconds. A smaller version set up for 12/16-line crt screens is priced at \$389 in single quantities. ELEC-TROL INC., Saugus, Calif.

FOR DATA CIRCLE 379 ON READER CARD

Educational Systems

DEC claims to be just now getting around to supplying one of its bigger markets, the educational community, with all the benefits of PDP-11 based

systems. Typical uses for the EduSystem 100, 200, and 250 include student instruction in computer programming fundamentals, other computer science activities, as an aid to students in other areas of study such as mathematics and physics, and also for administrative records-keeping by the faculty.

The EduSystem 100 permits up to eight simultaneous users to program in the BASIC language. The system operates with a variety of terminals, from standard teleprinters to higher-speed DECwriters and crt terminals. Pricing starts out at \$11K. Add peripheral storage devices and you get EduSystem 200, capable of running larger programs and storing more information on-line.

The EduSystem 250 adds the ability to perform foreground/background processing, allowing eight BASIC users to run along side one FORTRAN IV or assembly language program. Pricing ranges from \$32-54K depending on specific configurations. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 380 ON READER CARD

Intelligent APL Terminal

A specially designed APL keyboard, a 4K microprocessor, and a flicker-free crt display comprise the A4000 intelligent terminal. Among the advantages

*How to succeed in
Business Data
Processing with
Mini-Computers!*

An exceptional opportunity for service bureaus, software companies and facilities managers.

Write for complete information about our unique joint venture program.



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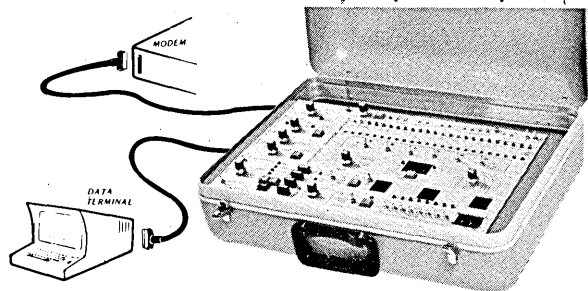
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CIRCLE 109 ON READER CARD

Atlantic Research proudly presents. . .

INTERSHAKE® the Line Protocol Analyzer (and more)



Intershake, from Interface and Handshake, is the first portable data communications test instrument to test both hardware and software. Intershake traps and displays control characters, and provides an optional hard copy printout for resolving the tough ones. Use Intershake off-line for full-duplex monitoring, or on-line to poll or respond to polling. Either way, Intershake can handle almost any speed, code level, protocol or type of data transmission, and isolate the trouble quickly.

If data communications is your job, Intershake could be the test instrument for you. To learn more about this newest addition to the quality products from Atlantic Research call (703) 354-3400 or write



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CIRCLE 85 ON READER CARD

DATAMATION

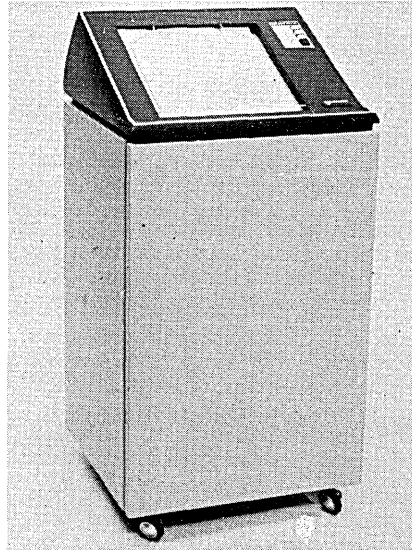


claimed for it over the competition are true APL overstrike capability; a foreground-background switch for selective display of an overstruck APL symbol; and full character editing within the APL definition or execution mode. A single APL "OUT" key permits users to generate the APL special function with one keystroke. The keyboard is similar to the IBM 2741 Selectric, but with special function and transmission mode control keys.

A graphics option for the A4000 employs a 12,800 point addressable matrix to enhance the units graphics

capability. Optional peripherals include printers and discs. Starting prices for the A4000 are approximately \$4,360. ONTEL CORP., Plainview, N.Y. FOR DATA CIRCLE 381 ON READER CARD

Non-impact Printing/plotting
Versatec will ship more electrostatic printers and plotters this year than in the previous four years combined, which might just mean that non-im-



compact technology is finally catching on. The consensus leader in the field (more

than 1,500 installations), the firm has now equipped its product line with 200 points-per-inch printing (up from 160) which significantly improves the legibility of the printout.

The LP-1250 printer uses the overlapping print points to generate 16 x 16 matrices of characters in a font it calls "Versatec Roman." The 132-column lines are printed at 500 lpm across RS-232 interfaces, based on a 96-character ASCII set. The unit is priced at \$7,400.

FOR DATA CIRCLE 382 ON READER CARD

The Matrix 1200 is a raster scan plotter that can generate an entire 8½ x 11-inch page in nine seconds, regardless of the complexity of the plot. It's claimed that the clarity of continuous lines are comparable to the best pen plotters. Including a one-line buffer, the 1200 is priced at \$8,600.

FOR DATA CIRCLE 383 ON READER CARD

The Matrix 1200A is a combination printer/plotter that combines the characteristics of the previous two models. It's priced at \$9,700. Numerous interfaces are available for the products. VERSATEC, INC., Cupertino, Calif.

FOR DATA CIRCLE 384 ON READER CARD

Sooner or later we're gonna getcha!

It may be our clean mechanical design, our reliability, our ease of maintenance . . .

Or perhaps our remarkable power fail protection and gentle tape-handling.

It may be our minicomputer interfaces to the PDP-8, PDP-11, NOVA, and HP2100 series.

Our low, low prices are guaranteed to getcha. Less than \$5,000 for tape transport and minicomputer controller in single quantities.

Whatever it is . . . Digi-Data has it all!

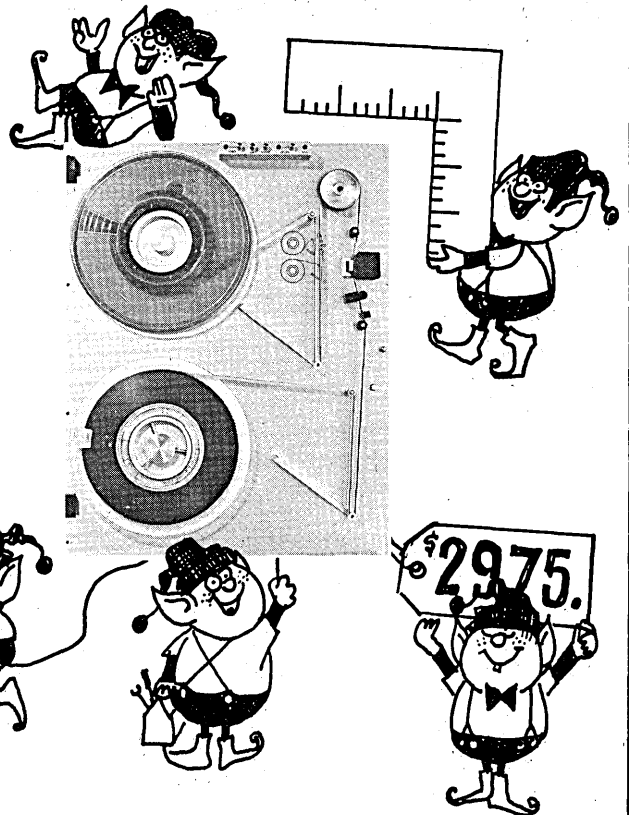
Call or write for our new brochure now.



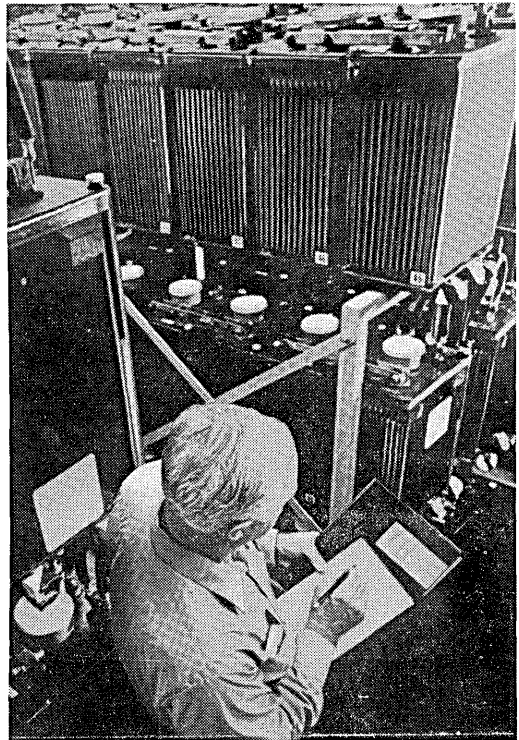
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Lead-calcium back-up batteries. The difference between outage and outrage.



An abrupt shut off of power, and an equally abrupt start up with generators, can damage electronic equipment and the data it contains.

That's why IBM's Advanced Administrative System in White Plains, N.Y. uses lead-calcium batteries to smooth over the rough spots. Short-term power outages up to 30 minutes are straddled without a hitch. In longer outages, the batteries allow the computer installation to be shut down in a series of timed, predetermined sequences, thus

avoiding harm to the equipment.

This uninterruptible power system (UPS) uses 531 lead-calcium batteries, chosen for the long life and minimum maintenance they offer. A simple and economical means of protecting a highly intricate communications network.

Back-up batteries are one of the ways lead helps protect us all. Asarco is a leading producer of lead. Headquarters at 120 Broadway, New York, N.Y. 10005.

75 Years of Progress in Metals

ASARCO⁷⁵

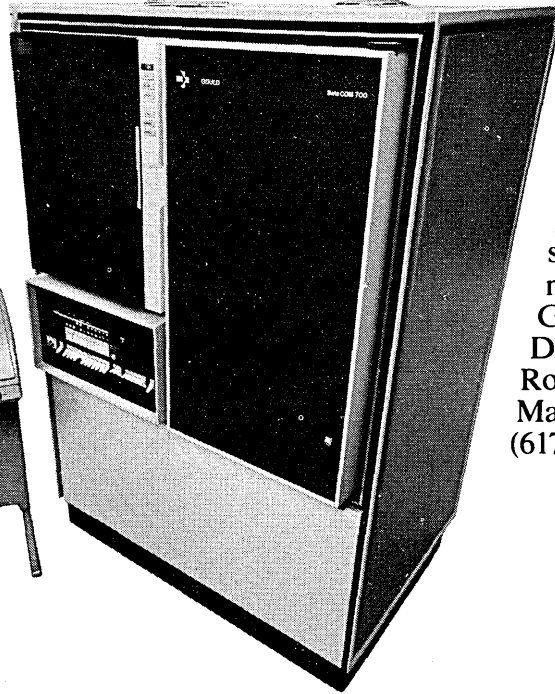
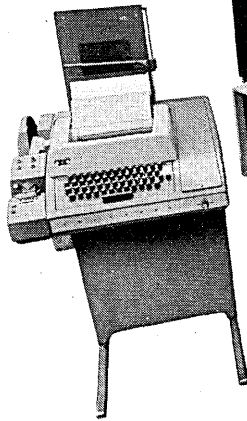
American Smelting and Refining Company

If you're using a hard-wired COM, you may be getting what you want. But you're also pouring money down the drain.

Reason? Every time you get a different tape format, you have to re-program your host computer just so your COM can accept the data. And every hour of computer time costs plenty.

The Beta COM 700L does away with all that. Because, at its heart, is a programmable DEC PDP-8/E. In just 2 minutes, you can call up the appropriate conversion program and accept any standard tape print—be it IBM, Honeywell, NCR, Burroughs, CDC or Univac. Without tying up time and money in your main frame computer.

Depending on the dollar value of your computer time, you could save enough with the 700L to cover its cost.



But that's only the beginning. The 700L lets you produce 16 mm. and 35 mm. roll film, as well as 105 mm. microfiche. High intensity, high resolution fiche output is directly formatted with readable titles, "from-to" headings and an index page. In addition to normal alphanumeric, special software packages allow the unit to convert computer-generated data into graphs, bar charts and pie charts—complete with labelled axes, shadings, even company logotypes.

The fact is, if you're tied to a hard-wired COM, you're simply spending too much time and money to make it go. Ask Bob Jackson to show you how you can make the 700L go for less. Gould Inc., Data Systems Division, 20 Ossipee Road, Newton Upper Falls, Massachusetts 02164. (617) 969-6510.

The Beta COM 700L. For the average user, it could save enough computer time to pay its own rent.

DATA SYSTEMS DIVISION

 **GOULD**

It's here...

Automatic Test Program Generation for your ATE system



**PRD can dramatically cut your test program costs,
and save you time and errors in the bargain.**

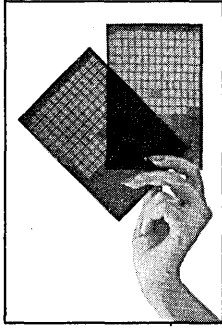
Automatic Test Equipment—its hardware and software—has been the business of PRD Electronics for more than a decade. As a result of this background, we have designed an automatic system that greatly streamlines the development of quality test programs. It eliminates, not one or two, but *three* of the customary, error-prone steps in test program generation, design analysis, program structure and coding/compiling. It provides test programs that can test performance and automatically provide fault isolation for circuit assemblies. By making the analysis at the schematic level, PRD's system provides verification of circuit design and eliminates costly circuit board fabrication errors.

All you need to know is your schematic. We'll show how quickly and inexpensively we generate test programs that can be mated to PRD's family of modular test systems or can be adapted to a test system of your own.

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NCR COM gives you fiche completely cut and dried.

That means savings to you.

NCR's Microfiche Recorder/Processor is the first to give you fiche completely cut and dried. There's no chemical handling because all the film is processed right within the system. You just plug it in. There's no added expense for a darkroom, plumbing, additional processors or extensive training.

NCR software is another plus feature. With little or no change to up-and-running programs. You save on programming costs and eliminate delays. These software

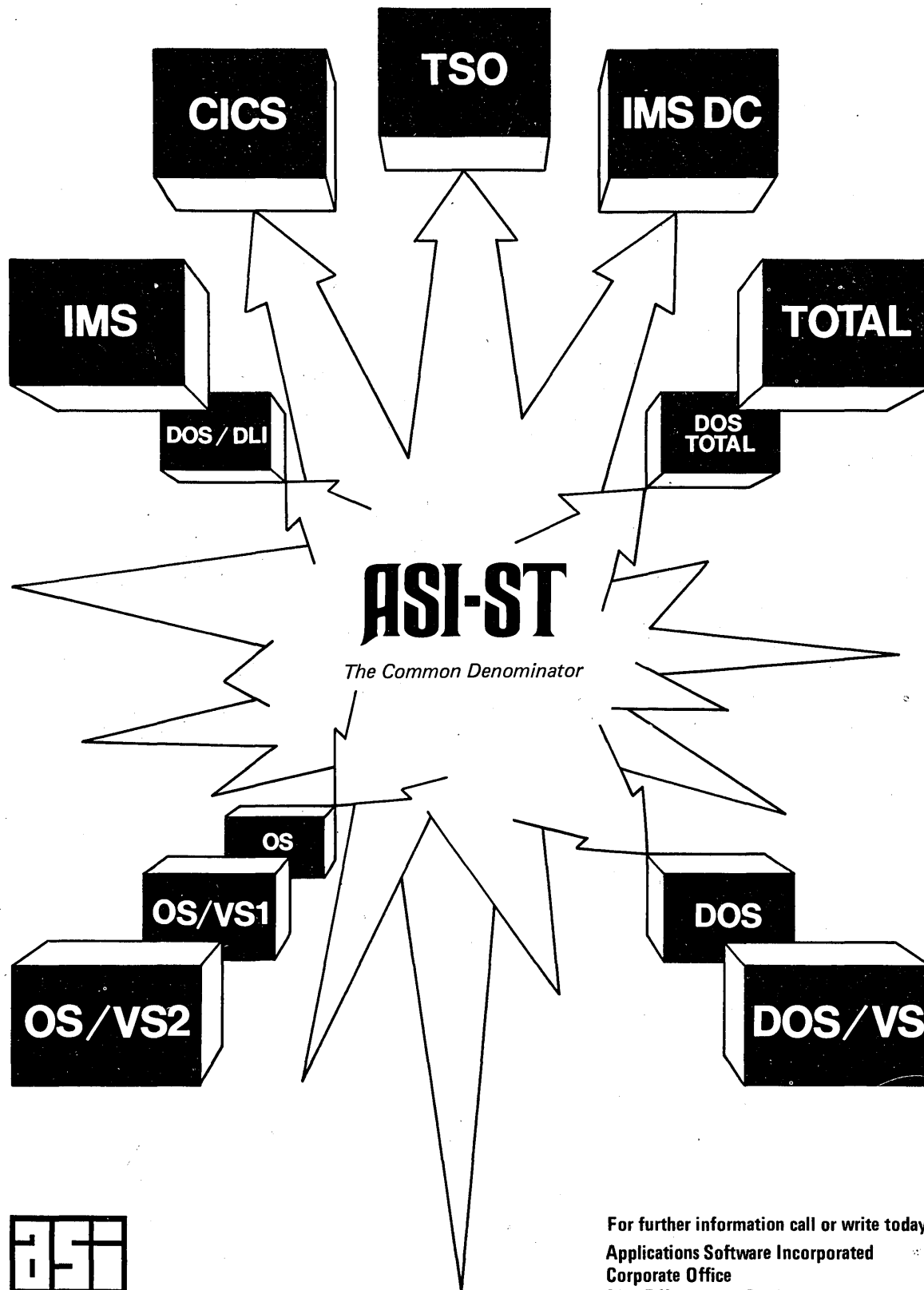
programs are compatible with most mainframes, too.

Service and support? NCR's worldwide network of over 18,000 service specialists, along with a complete line of microform supplies, is the best you can get.

COM is a good thing. And NCR makes it that much better. Get all the facts from your local NCR representative. Or write directly to COM Systems, NCR, Dayton, Ohio 45479.

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software & services

Updates

In recognition of the fact that the line between hardware and software is becoming increasingly difficult to define, the IEEE Computer Society has formed a new technical committee, Software Engineering, which will be concerned with the specification, design, development, management, testing, and maintenance of software systems. Among the software "heavies" who will organize the initial projects of the committee are Dr. Harlan Mills of IBM, Dr. Barry Boehm of TRW Systems, and Prof. C.V. Ramamoorthy of the Univ. of California, Berkeley.

Lockheed Aircraft has developed a part numbering technique, expected to save an estimated \$1 million over the next several years, that could conceivably be applied by many manufacturing organizations. Instead of sending thousands of identification plates to the metal shop to be number-stamped, hand-logged in a part I.D. book, and riveted to L-1011 jumbo jet parts, Lockheed uses a data base to generate reports on how and where each part is used, part number lists, and stick-on part labels specially designed to resist the effects of jet fuel, hydraulic fluids, and oils. A clear polyester overlay is applied to the labels after they are printed to insure legibility over a long period of time. Avery Label Systems, which helped Lockheed put the system together, is located in Azusa, California.

IBM, which would understandably like to hold down the proliferation of programming languages, is receiving an increasing number of inquiries from concerned ALGOL users in Europe over the prospects for ALGOL-60 and ALGOL-68, two alternative compilers to IBM's ALGOL-F that are highly regarded in Europe. Sometime this month the SEAS ALGOL Committee expects to receive from IBM some word on the prospects for ALGOL as the Grey Giant moves swiftly toward announcement of its next machine generation, possibly next year. Any U.S. ALGOL users interested in supplying their inputs (concerns) can do so by contacting Mr. Bruce Rosenblatt, Standard Oil of Calif., 114 Sansome St., San Francisco, Calif. 94104.

Structural Software

With typical British humor, the English developers of this alternative structural engineering program have named it MESS, for Maximum Efficiency Structural System. It's said to have sold well against IBM's STRESS program for 1130s in Europe, because of such features as checking input cards for errors as they are read, so that erroneous cards can be corrected before computation begins. It's also claimed that MESS runs up to three times faster than STRESS.

Loads can be given in local or global coordinates. A load can extend over several members, and MESS will calculate the components for each member. Dead weight loading is automatically generated. Supports can be rigid or elastic; even supports sliding on an inclined plane can be specified. The program accepts members with variable cross-sections, and the program can use member dimensions to compute moments of inertia, and other outputs. The output consists of plots of plane and space structures with joint and member numbers and supports, active loads, and a moment and shear diagram. The all-FORTRAN program can run in as little as 8K on the 1130, and requires a disc, a card reader, and a printer. The price is \$2K. TECHNOLOGY ENTERPRISES, INC., Encino, Calif.

FOR DATA CIRCLE 362 ON READER CARD

VM/370 ISAM Support

This firm continues to announce significant enhancements for IBM's VM/370 operating system, and particularly for installations that run the CMS time-sharing system under it. The latest product is Indexed Sequential Access Method (ISAM) support that can be called from COBOL, PL/1, and assembler programs running under CMS. The CMS usage is compatible with the usage under OS/360. In addition to the support, a set of utility commands is furnished for creating, dumping, and reorganizing ISAM files, and obviates the need to write "quick and dirty" programs to accomplish these tasks. VM/370 ISAM takes less than one day to install and is priced at \$10K. Lease and rental plans are also available. STANDARD DATA CORP., New York, N.Y. FOR DATA CIRCLE 363 ON READER CARD

Fortran ISAM Support

CRISP (Callable Routines for Indexed Sequential Processing) provides FORTRAN programmers on IBM DOS, OS, vs1, and vs2 operating systems the ability to create, maintain, and reference ISAM files using standard FORTRAN IV programming language. Using a set of CALL statements, records can be read from or written to an ISAM file in either the keyed or sequential mode.

software spotlight

370 System Simulation

The operating characteristics of IBM's vs operating system, the Customer Information Control System (CICS), the ISO (Time-Sharing Option) package, and the ASP (Attached Support Processor) submonitor can now be simulated using SAM, the System Analysis Machine. The OS/vs1 model can be used, for example, to compare present throughput on OS/MFT or MVT systems with various parameterizations of the virtual memory system. The CICS model enables current or future users of CICS to determine, in advance, the memory and CPU requirements to support a known number of users and terminals executing a given set of ap-

plications under CICS.

The TSO model can assist in determining the factors which affect the degradation of TSO and concurrent batch jobs, the impact of each additional TSO region, and the impact of increasing the number of TSO jobs within a single region. The ASP model can help larger installations in evaluating the benefits of ASP's scheduling and spooling features.

SAM can also derive a model of the site's existing workload by operating directly on IBM's SMF (System Measurement Function) performance statistics, which could be valuable in determining a given system's capacity to take on added applications. SAM can be rented monthly for \$3K, licensed on an annual basis for \$25K/year, or purchased for \$58K. There is a \$2,500 installation charge. APPLIED DATA RESEARCH, Princeton, N.J.

FOR DATA CIRCLE 360 ON READER CARD

software & services

CRISP allows the sequential reading of the file to start at any point, and records in the file can be modified or deleted. Multiple files can be simultaneously managed, and CALL statements referencing several different ISAM files may be interspersed throughout the calling program. A callable routine is also provided that returns statistics on the status of an ISAM file to assist in determining the need for reorganization. CRISP requires approximately 6K bytes. The package is priced at \$2K and is also available under a licensing plan for approximately \$750/year. Included in the price is an object deck and a user's manual. COMPUTER SYSTEMS INTERNATIONAL, INC., Bowie, Md.

FOR DATA CIRCLE 361 ON READER CARD

NCR Software

NCR has made some significant enhancements and announced new capabilities for its Century series users. The 8C software release provides users of smaller Century mainframes with on-

line inquiry capability and a completely new FORTRAN compiler requiring only 16K of memory. The 8C release also includes a new version of NCR's B3 multiprogramming executive routine, plus some software improvements for support of the 656 and 657 disc units, including the addition of the 656 disc to the random filing system. The on-line inquiry system will support both batch processing and on-line inquiry in cases where only a few teletypewriter-compatible terminals are active handling a small number of inquiries. The inquiry system is called Roll-In/Roll-Out, and can run on configurations as small as a 16K Century 50 processor. The new FORTRAN compiler (FORTRAN B) is designed to run on all Century cpu's up through the Century 200 and requires only 16K of memory. The new software is available to Century users at no charge. NCR, Dayton, Ohio.

FOR DATA CIRCLE 364 ON READER CARD

PDP-11 to 360/370 Link

The Multi-Leaving Remote Terminal Processor (MLRTP) package allows a PDP-11 minicomputer to communicate with any IBM 360 or 370 system that uses the HASP spooling program. The PDP-11 user thus has the flexibility of using disc I/O or standard peripherals

or a combination of both. In a disc only system the user can create files via the standard DEC editor and access the output files when received via the DEC PIP conversational utility program. The system supports standard HASP features including a remote console, multiple line printers, and/or card punches. MLRTP requires approximately 8K of PDP-11 memory in addition to the DOS monitor. The price for the package is \$1,500. CREATIVE DATA SYSTEMS, INC., New York, N.Y.

FOR DATA CIRCLE 365 ON READER CARD

Real-time Operating System

SCORE-11 is offered as an alternative to either of Digital Equipment's real-time operating systems for applications engineers tackling process control, data acquisition, and data communications problems with the PDP-11 mini. The monitor is said to be particularly well suited for use in small- to medium-scale systems involving custom hardware interfaces, since the I/O support for the equipment is readily implemented in the form of driver tasks. Multi-programming capability is provided on an interleaved execution basis, with individual tasks operating either together or independently. Application programs developed using

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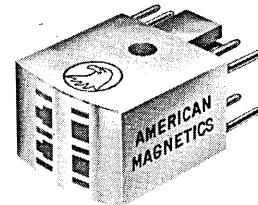
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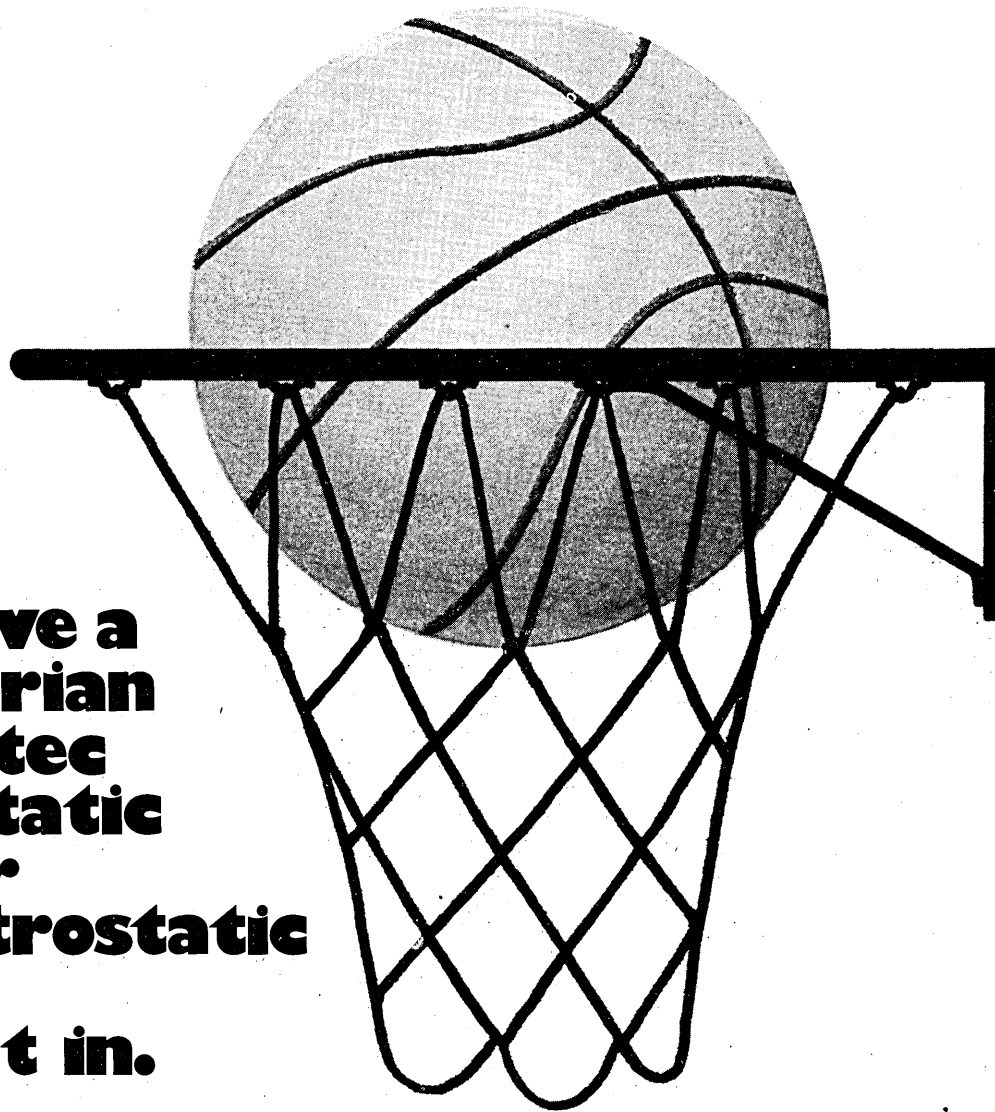
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software & services

DEC's DOS or RT-11 may be linked to SCORE-11 object modules, loaded, and tested using the DEC ODT debugger, but none of the run time facilities are provided. The monitor only requires approximately 4-6K of storage depending on specific requirements, SCORE-11 is priced at \$2K. VIRTUAL MEMORY SYSTEMS, Orinda, Calif.

FOR DATA CIRCLE 366 ON READER CARD

CDC 6000 Linkage Editor

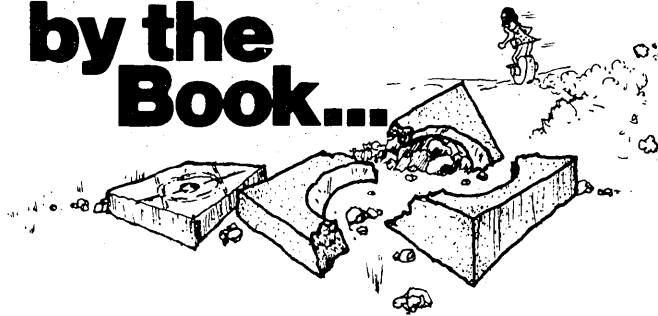
The General Purpose Overlay Loader for CDC 6000 series computers contains modifications and improvements to NASA's NASTRAN structural analysis linkage editor made by the Naval Ship Research & Development Center. They are intended to utilize central memory storage more efficiently for medium and large programs. The loader allows the user to arrange a program into an overlay structure consisting of links and segments within links which can be assigned the same origin addresses and be loaded at different times. Advantages of this linkage editor and as-

sociated segment loader over others available include: an unlimited number of overlay levels; the description of overlay segments to the linkage editor, accomplished using directives specifying subprograms to be included and the libraries they reside on, thus allowing the program to be structured after it has been coded; implicit loading of segments facilitated by their storage on a random access file; dynamic allocation of memory as each segment is loaded; the capability to update individual links without relinking the entire program; and the ability to selectively rename external references.

The linkage editor executes under versions 3.3 or earlier of CDC's SCOPE operating system. Minimal memory requirements for execution are 64K octal words. This field length will typically accommodate a program containing up to 200 subprograms. Written in FORTRAN IV and CDC's COMPASS assembler, the program is priced at \$600; the documentation price is \$13.50. The program reference number is DOD-00038. COSMIC, Athens, Ga.

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CIRCLE 116 ON READER CARD

Minicomputer FORTRAN IV

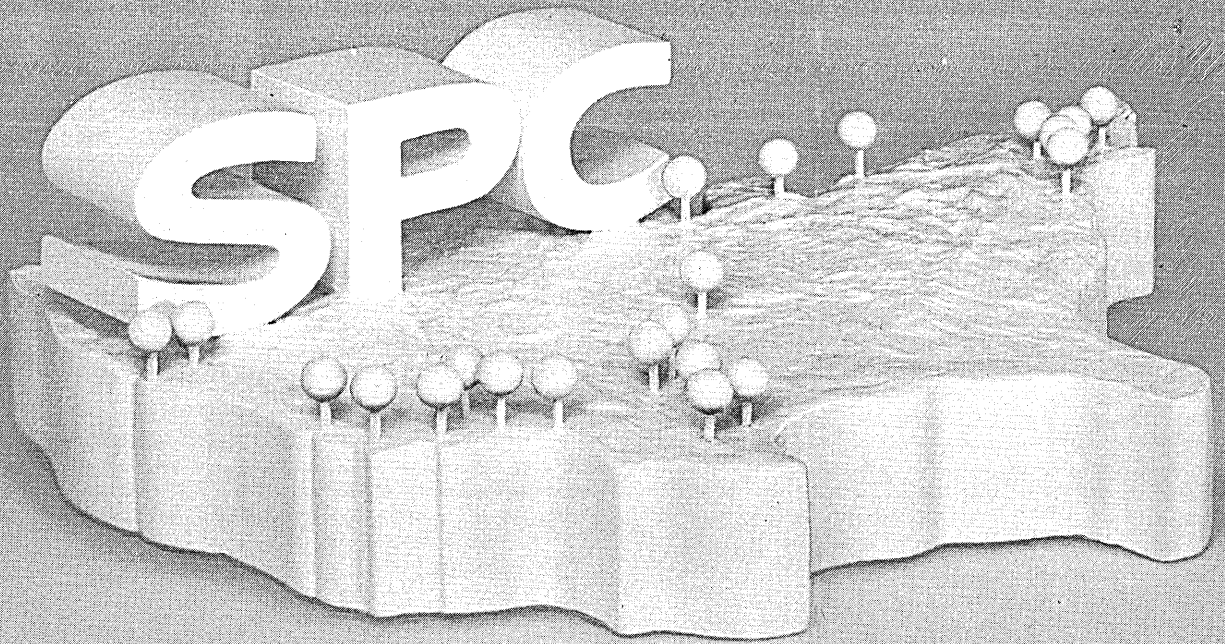
DEC is readying an ANSI (1966) FORTRAN IV compiler for release in early 1975 that should take good advantage of the 300 nsec memory and floating point processor on its PDP-11/45 models. Optimization techniques are used to boost run-time performance, including specialized flow analysis in DO loop structures and the removal of invariant expressions from DO loops. Additionally, optimization permits the direct use of hardware instructions for performing some FORTRAN statements. DEC is showing some benchmark figures that look very attractive for its new FORTRAN IV-PLUS, but since no two users agree on what a benchmark should look like, users should perhaps ask DEC to allow them to run their own. The compiler will be separately priced at \$3K. DIGITAL EQUIPMENT CORP., Maynard, Mass.

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CDC-IBM Data Exchange

RDUSER and WRTUSER are two programs that allow the transfer, in full precision, of arbitrary data (matrices or tables) between IBM 360-370 systems and CDC 6000 series computers. Specify program number LAR-11633 for the IBM-side software, and LAR-11634 for the CDC-side package. Both are priced at \$300 each. COSMIC, Athens, Ga.

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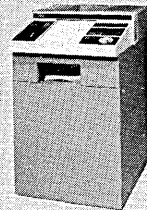
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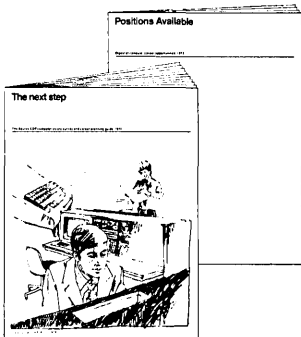


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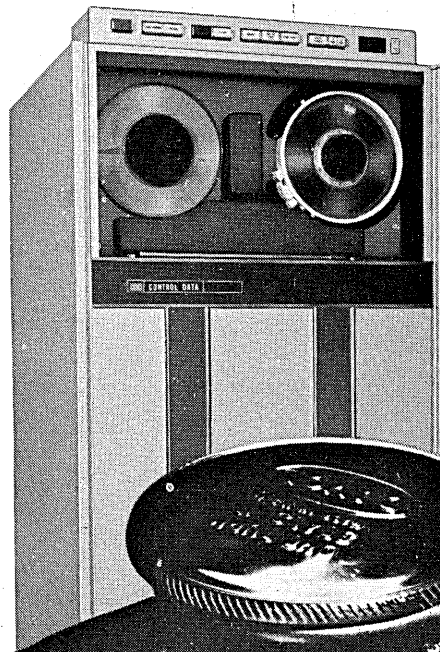
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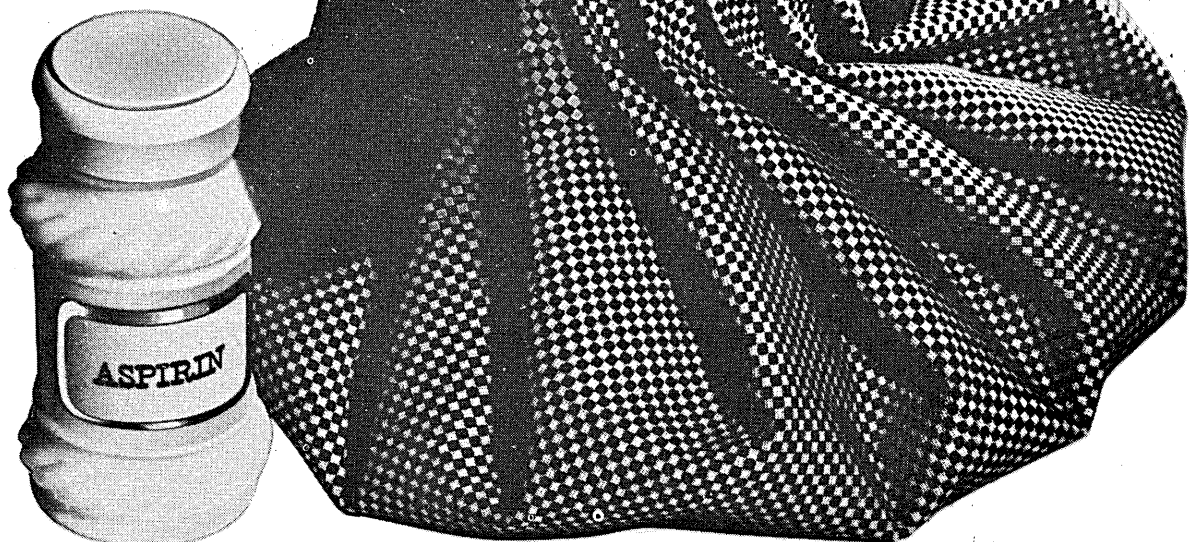
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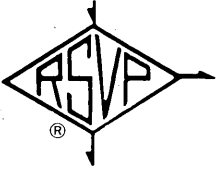
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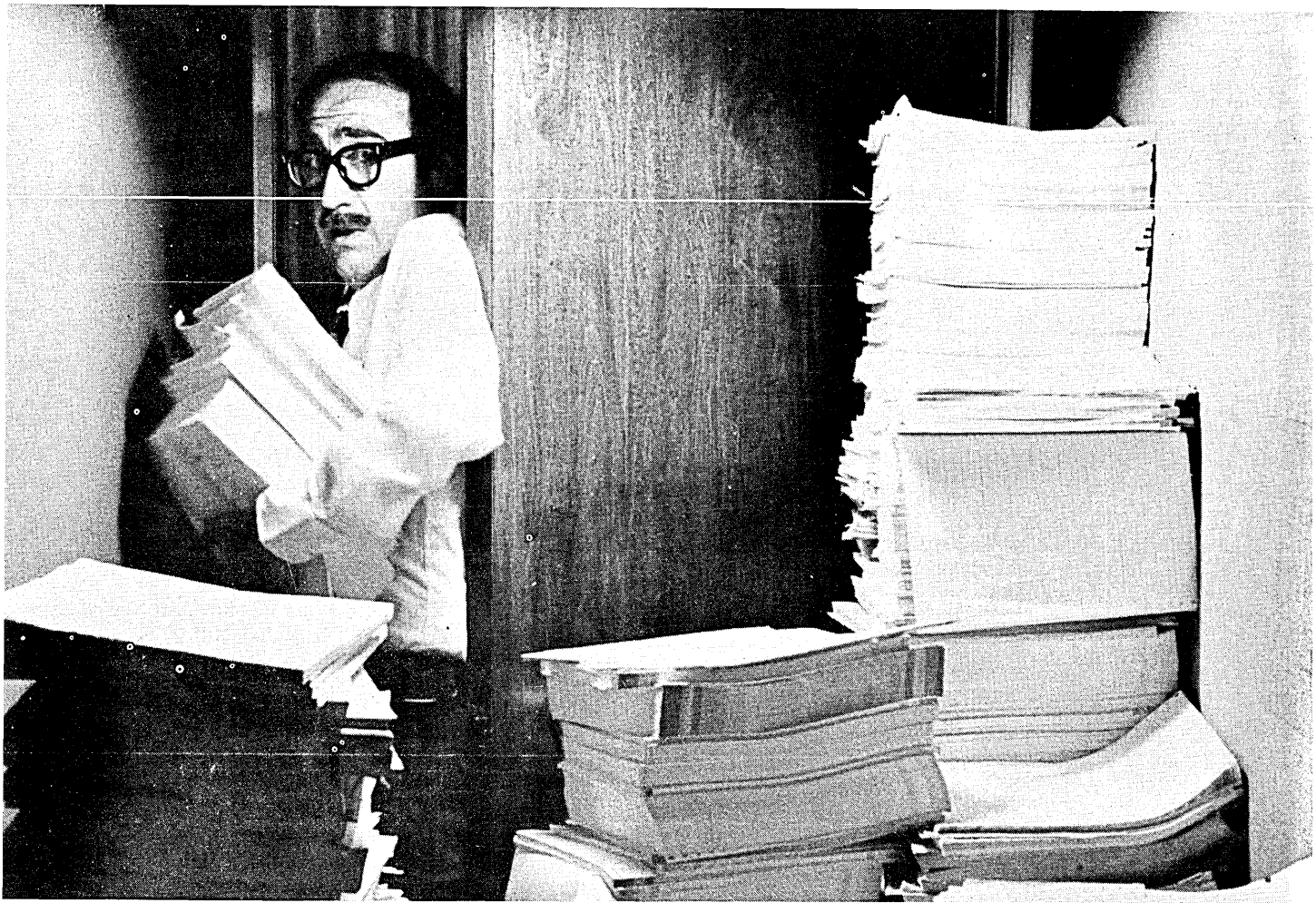
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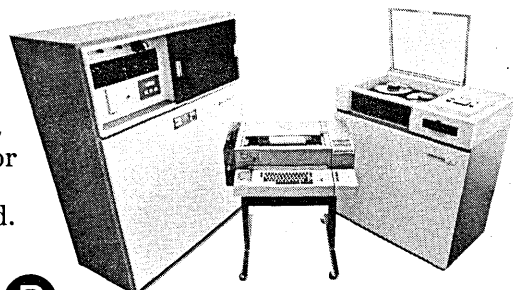
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IBM: A QUESTION OF REMEDIES

The May issue of *Harper's* magazine carried a long article by William Rodgers, author of *Think*, about the IBM lawsuits. The article might be called "Son of Think, out of CIA." It starts with a litany of IBM's size: share value of \$36.5 billion, revenues of \$11 billion in '73, earnings a shocking \$1.58 billion, up 23% from 1972, and so on, contending that IBM probably commands 75 to 80% of the computer business in the United States and more than half the world market. It replays the fierce temper, piety and code of "clean living and clean thinking" of the founder, puts IBM's history into half a page, and dives into the lawsuits.

We've all heard the next part: lists of the lawsuits and how much each demanded. Rodgers estimates the 12 'presently pending' lawsuits are seeking \$4.3 billion collectively. The personae are equally familiar: lawyer Barr, Judges Christensen and Edelstein, competitors Telex and Memorex and CDC, the famous index flap, former Rhodes Scholar Dan McGurk, and even ancient Vernon Bugg, elevated to being "Mr. Watson's assistant" 40 years ago. The article is full of emotive phrases like "lack of prosecutorial interest on the part of the Nixon Justice Dept.", or "monarch among multinationals", or "dingy underside of its carefully polished image," and concludes quite firmly that government and law must exercise their power so IBM's competitors can prevail.

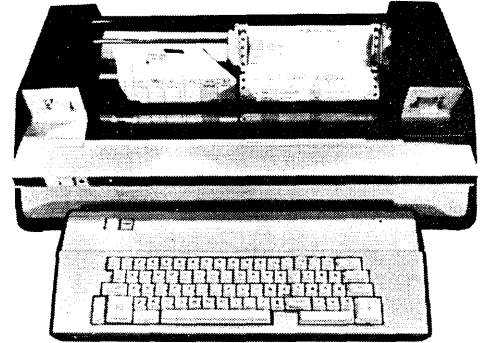
I believe this article, like several others in major journals, tends to mislead people who don't understand our industry and to distract those who do. Instead of "IBM shock horror" headlines, which feel good but achieve little, I think we should be concentrating on the real question: what to do about IBM's dominance of the industry, which has grown to be a problem as the industry itself grew to dominance in modern business.

The Rodgers article has some minor points with which I quibble. There is, for example, the idea that after World War II IBM "took virtual possession of the business by recruiting scientists and technicians and by retraining its army of salesmen and engineers." The last part is true, and one real secret of IBM's success. But the first, the idea that somehow IBM has cornered the market for good technical people, is balderdash, but very prevalent balderdash these days, particularly in Europe. IBM makes its experts, rather than buying them. With the rare exception (and those exceptions are often technical, unless they have special target industry experience), IBM takes people in at the bottom, and keeps their enthusiasm, in part, by offering them chances to become experts in something new and interesting.

Then, talking about the 1956 consent decree, Rodgers dismisses it lightly, saying that by twenty years later "the computer had revolutionized the data processing business, and the decree scarcely gave the company pause." This is not

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left platen

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- Message*[≠]
- Invoice[≠]
- EDP Scratch Pad*
- Data I/O**
- Proof*[≠]
- Inventory Card[‡]
- Unit Record Card[‡]
- Labels*[‡]

*Journal Roll
[≠]Tractor (Pin-Feed) Continuous
[‡]Unit Form - Front Insertion

right platen

- Invoices, Tickets#[‡]
- Passbook Ledger Card[‡]
- Ledger Card[‡]
- Document#[‡]
- Rental Agreement[≠]
- Check, Deposit[‡]
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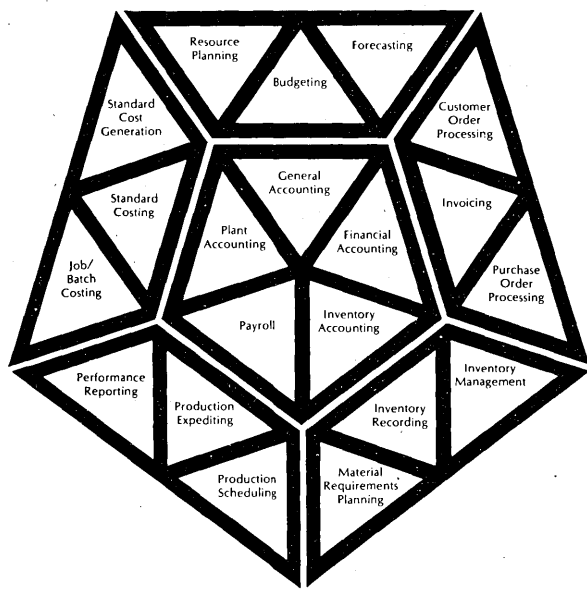
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true. Look at the bureau segment of the business, for example, liberated by that consent decree from IBM's domination, and just this year completely weaned from Big Mother, at least in the U.S. The effect of that decree on the leasing/purchase situation was much more profound—and



permanent—even though it was only supposed to affect IBM's behavior for a six-year period.

Even more important, that decree caused IBM to create internal controls and a set of rules for ethical behavior that each employee has to read and sign every year, even now, 12 years after the 1956 consent decree itself has ceased to have any legal meaning. This cultural meaning is much more important inside an organization like IBM, and should be kept in mind as we look for remedies to the current problems.

Then there's the statement that CDC's Bill Norris "entered the market with his famed Model 6600, the largest computer in the world," as if CDC sprang up fully grown, like Athena, with the 6600 announcement. This paper tiger issue is now dead, killed by its own credibility more than any lawsuit. These days in the computer industry, some companies (e.g., ICL, with several New Range machines already delivered) don't announce at all, and others (e.g., Univac with its new 90/30) won't announce until they can demonstrate a production model of the new machine.

Rodgers twists the meanings in some places, such as Tom Watson Junior's statement that IBM had "to make the hard decisions today so that the same problems don't have to be faced again". Anyone who has read that extract in context knows it refers to belt-tightening within IBM rather than squashing of competitors. Such distortions mask some truths which deserve attention, such as the internal anxiety within IBM to resolve two seemingly conflicting drives—both of which emanate from the founder himself. These are the edicts not to oversell, and not to undersell. Pity the poor IBM salesman, acculturated and imbued with this complicated value system: don't lose the job, but don't overstep the bounds of propriety to get the job.

In an accusatory voice, the *Harper's* article charges that other companies were making products superior to those made by IBM, with implications that only a monopoly situation could explain this anomaly. Yet we all know that just about every product IBM ever offered has been available sooner, cheaper and usually better from somebody else. But IBM waits until the market is ripe, then supports the systems (and customers) more thoroughly and dependably—and at a higher cost—and manages to make money at it. Those

companies (usually mature mainframe companies) who have actually learned IBM's 'secrets of success' are beginning to make noticeable profits now in the computer business—without having to copy IBM's products. Univac and Burroughs and Honeywell aren't suing IBM, they're emulating it.

Philosophically, we seem to have a Hamilton/Jefferson situation. Alexander Hamilton believed that an elite should be trained to run the country, while Thomas Jefferson contended that a well-informed public would manage to muddle through in a more healthy manner. Current events seem to bear him out. But at the heart of its coherent 60-year culture, IBM is a Hamiltonian organization, not a Jeffersonian one. Whatever remedies we consider should be aimed at changing this deeply ingrained approach.

The remedies proposed generally fall into three categories: regulation, breaking up the monolith, and fining it. I don't think government regulation of this company—which certainly *is* a national (and international) resource—is any kind of remedy. One of the things IBM could teach its competitors, if they could see inside, is how to eliminate bureaucracy. For a company with more than a quarter of a million employees, IBM is amazingly streamlined and free from empire-building. One reason may be the extra training that every new IBMer gets, not technical but cultural training, in the IBM beliefs; this results in a stronger sense of 'membership' than people get in most companies, and slightly more unity of purpose. An even more important reason is the mobility of IBM people; if a man does a good job, his reward is seldom his boss's job; it's more likely to be a new job somewhere else, learning something new. Government regulation would impose a burden of bureaucracy on this organization that would adversely affect all the other industries that use computers. It would also impose even more secrecy inside, and thus enhance the Hamiltonian outlook that needs changing.

Breaking up IBM from outside is a prospect that scares many computer industry people. Not only would it remove the salesman a bit further from the ethical edicts that come from the center, but it would also loose two or five or 19 full-grown and terrifying toothy tigers, each one somewhat less amenable to outside pressures. As it stands now, IBM can be controlled to some extent by the three forces it fears most: governments, unions and the press. All are somewhat unknown, and thus feared more than if IBM were a unionized company, regulated by the government, and completely transparent to the press.

Ignoring the question of fines (which IBM can afford if the public morality decides that the monolith must be punished for its monolithity), let's take up that last point—an IBM completely transparent to the press. This is a remedy which I believe would be exceedingly uncomfortable to the company (thus satisfying the desire of so many people to see IBM wince), and exceedingly beneficial to the industry, and to business at large. So far, no one but Judge Christensen has really paid much attention to the merits of a Jeffersonian approach to the IBM problem. I think his remedy could be carried still further.

In the Telex injunctions Judge Christensen said IBM should publish details of each piece of equipment. This approach needs more teeth, and ways to keep the details updated. For example, we deserve answers right now to the 'big-byte' question that hangs over the possibility of a new IBM series in 1976. I suspect that such a phenomenon might occur in a demure, gentle manner, with machines that are perfectly comfortable handling eight-bit bytes; they would simply have the other bit available to all those people who might find it useful. Eventually, who would buy a machine that didn't have the extra bit per byte? This would politely cripple some competitors—a fact of which Univac was

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uncomfortably aware at their grand announcement of the (8-bit-byte) 90/30 in June, though the 1100 series offers no problem. Honeywell already has the big byte on its big systems, and ICL could unwrap it on the 2903 (and presumably its New Range big brothers) if it had to. So only the copycat competitors would suffer mortal wounds. If IBM had to talk about it openly now, the competitors would be less vulnerable when the moment came.

But equipment and software revelations are only a small part of the matter. I see two other areas where total, enforced disclosure seems to offer a real remedy to the IBM problem. One is financial. IBM is an upstanding company; it pays its taxes, and does business on a long-range basis that sets a good example to other multinationals. It could afford to be much more forthright with financial information. I would like to see more detailed breakdowns, country by country and even state by state of IBM's income and outgo, its royalties, fees and transfer prices within the company. If this helps competitors, it can only help users as well.

Finally, and most important, I think IBM should be forced to publish organization charts. The company is already moving towards smaller and more autonomous operating units—breaking itself up, as it were, before anybody else gets around to it. What we need is more outside visibility for each one. Let IBM decide how it should be broken up, but make sure each change is publicly announced. Then, everywhere IBM has a press office, let the company absorb the overhead for an accessible 'organization man,' whose job it is to tell anyone who asks, the name and job of anyone he wants to know about. If an incident of 'overselling' occurred, then we could find out the name of the offending salesman, his branch manager, district manager and area manager, for openers. When such an incident comes to light at present, the salesman is usually fired and all these are quietly punished in IBM's unique culture by some loss of membership—they can be sent to a 'Penalty Box' or to a 'Siberia,' and insiders are aware of it. But if they all knew that an ethical lapse would receive direct outside attention, with their names attached, they'd probably be even more careful about lapses than they are already. (And most of us would grant that IBM is pretty careful in this respect compared to dominant companies in other industries.)

The mere fact that each organization chart must be published (and I believe the U.S. courts could enforce this on a world-wide basis—and if they couldn't, the world-wide trade press could), this alone would enhance the autonomy of each unit inside the company and cut down on what worries me most about IBM—the tendency to overcontrol from the center. A few men steeped all their lives in the IBM culture (and *only* the IBM culture) are making sweeping decisions from Armonk that are not necessarily in tune with the real world of Boston or Brussels or Bali.

In sum, I think daylight is the real remedy to many of the murky IBM problems. I also think it's time that journals of *Harper's* calibre stopped titillating the public with shocking revelations of how big IBM is, and began to join in a considered review of possible remedies. Unless *these* receive some daylight and discourse, soon, the deed will be done before we have a chance to say anything about it for another twenty years.

—Nancy Foy

Miss Foy, one of DATAMATION's European correspondents, is the author of a book on this subject due for publication in October, to be titled "The IBM World" in Europe and "The Sun Never Sets on IBM" in the U.S. (The publisher is Eyre Methuen.)

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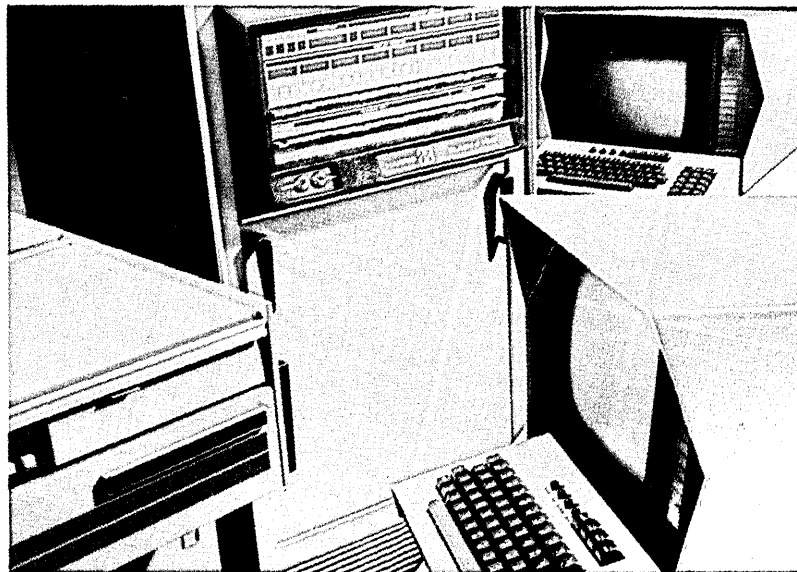
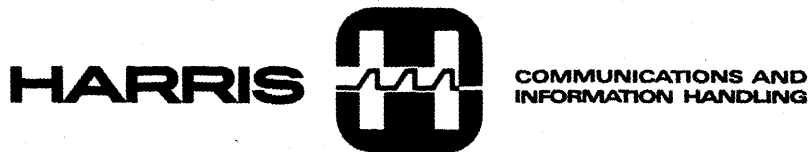
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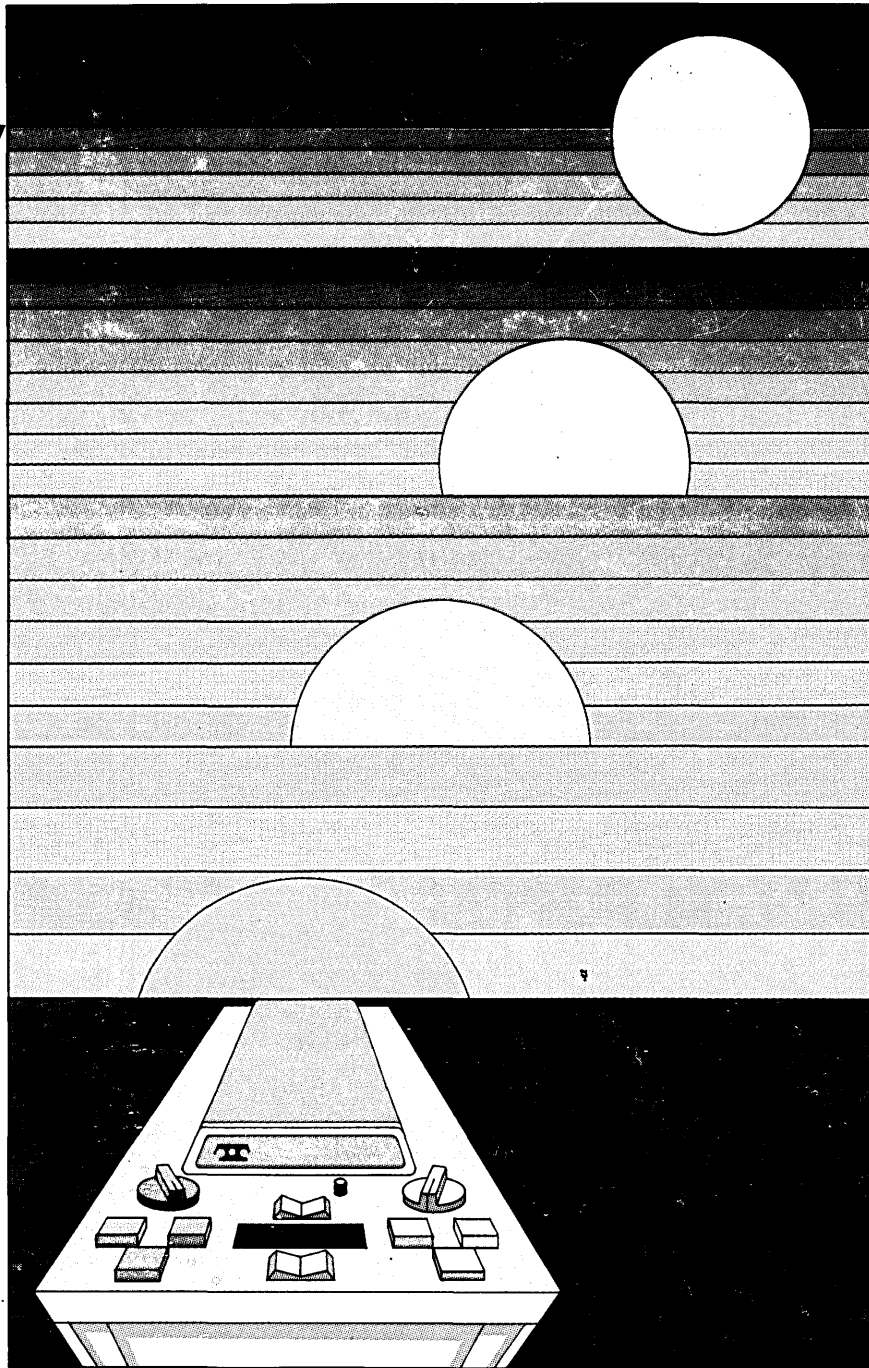
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