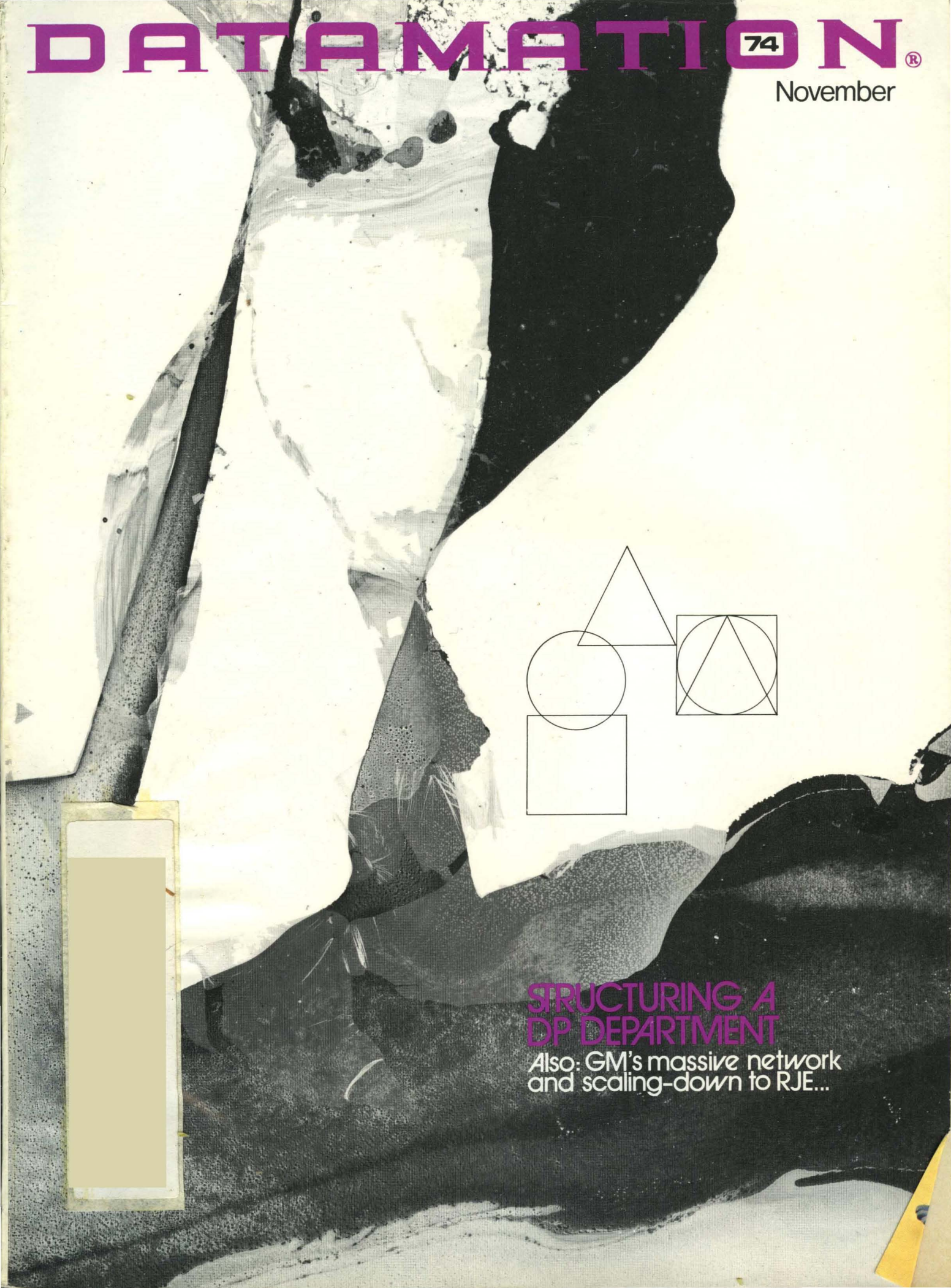
DATAMATION® 74
November



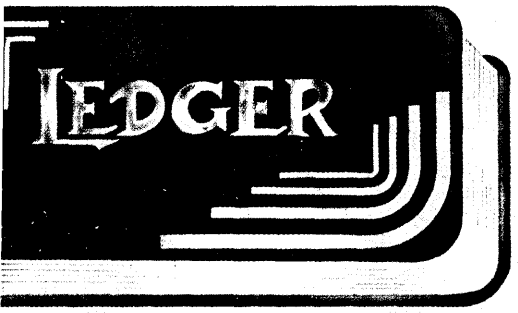
STRUCTURING A DP DEPARTMENT

Also: GM's massive network and scaling-down to RJE...

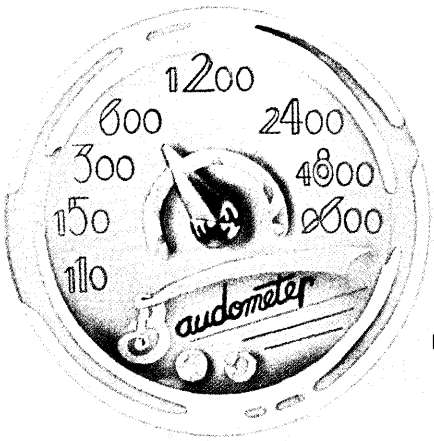
A POWERFUL IDEA IN TERMINALS

LSi

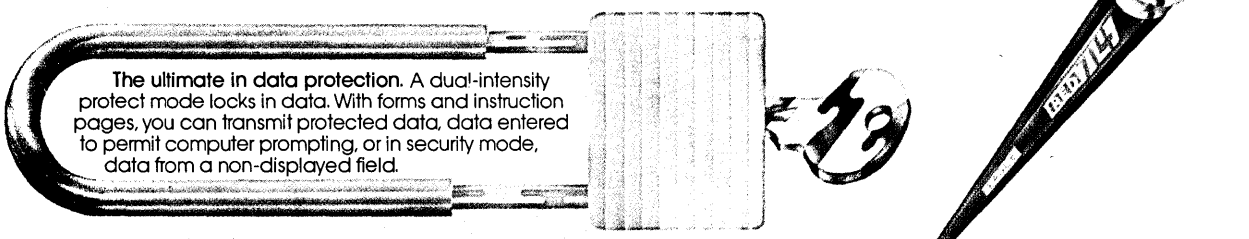
We've put the whole ASCII set in lights. LSi's new powerhouse, the ADM-2 video display terminal has all 128 characters, including upper and lower case letters. Now you can e perform text editing and pick up every character needed for line control procedures. Th 12" CRT also features a 1920 character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

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.

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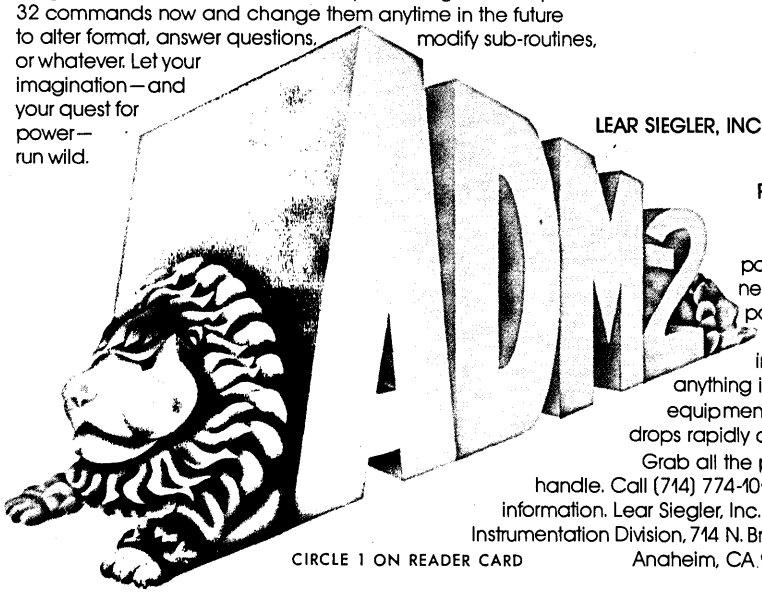

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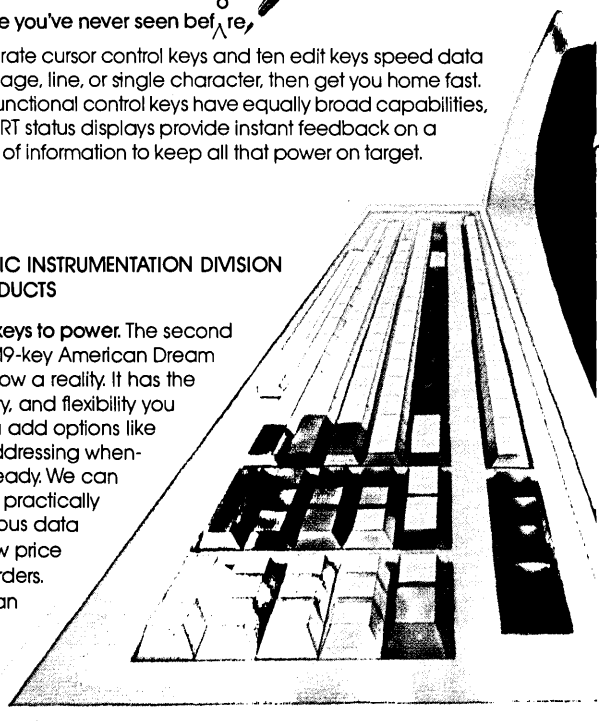

CIRCLE 1 ON READER CARD

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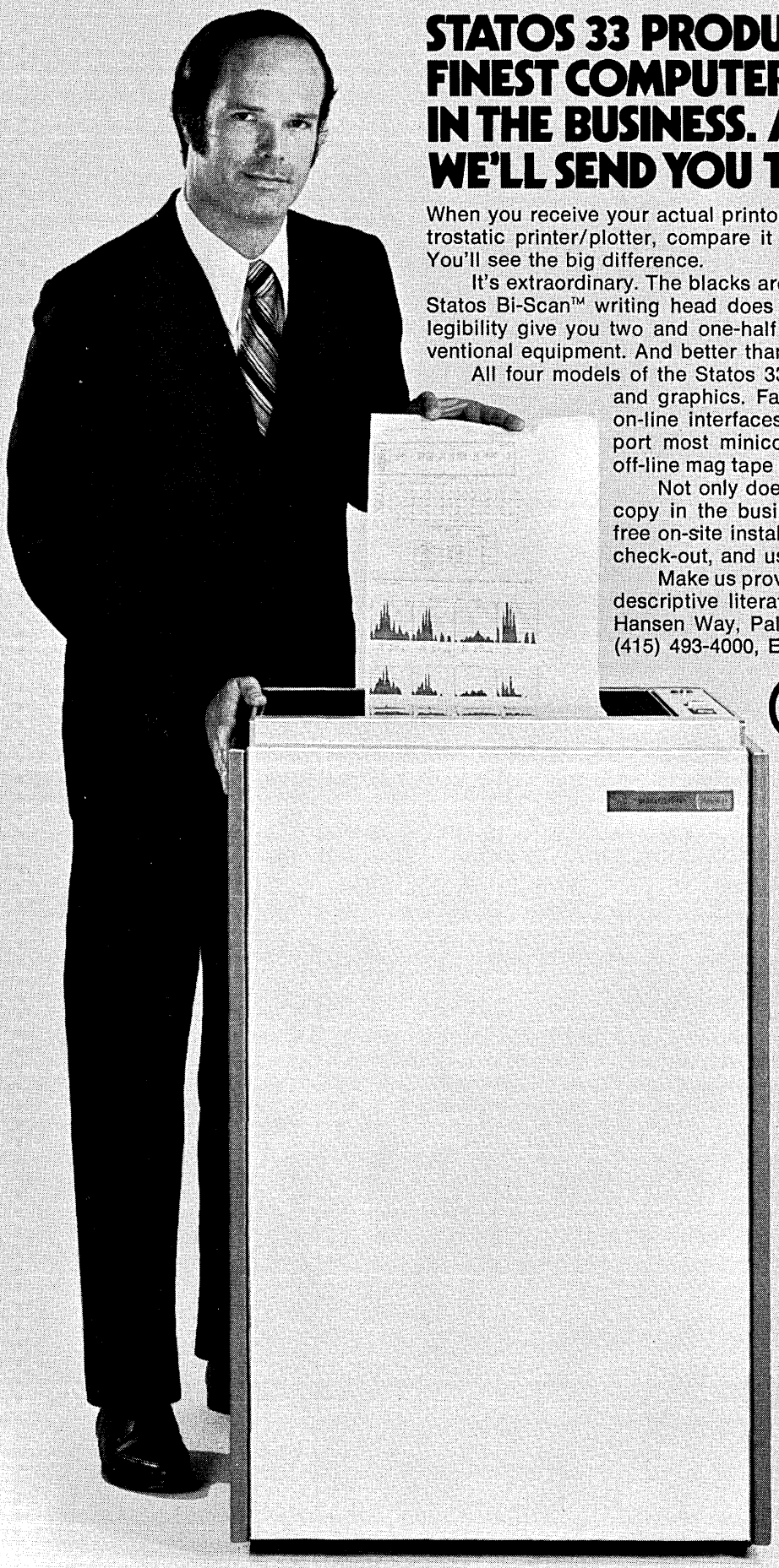

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varian data machines

CIRCLE 82 ON READER CARD

DATAMATION 74®

NOVEMBER, 1974
volume 20 number 11
This issue 120,844 copies

structuring a dp department

There are right ways and wrong ways to organize the staff in a data processing department, and to select the equipment and facilities. Like a machine, the department can be tuned for peak efficiency and operating economy.

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LARS PERSSON

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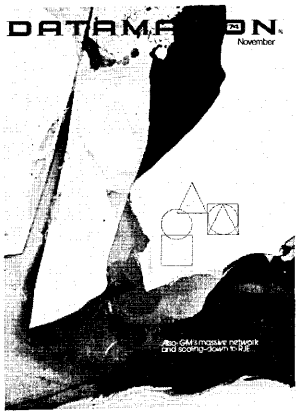

about the cover

The data processing function cannot be effective in an amorphous structure. It's elements and their relationships must be rigidly defined. Design is by Barbara Benson.

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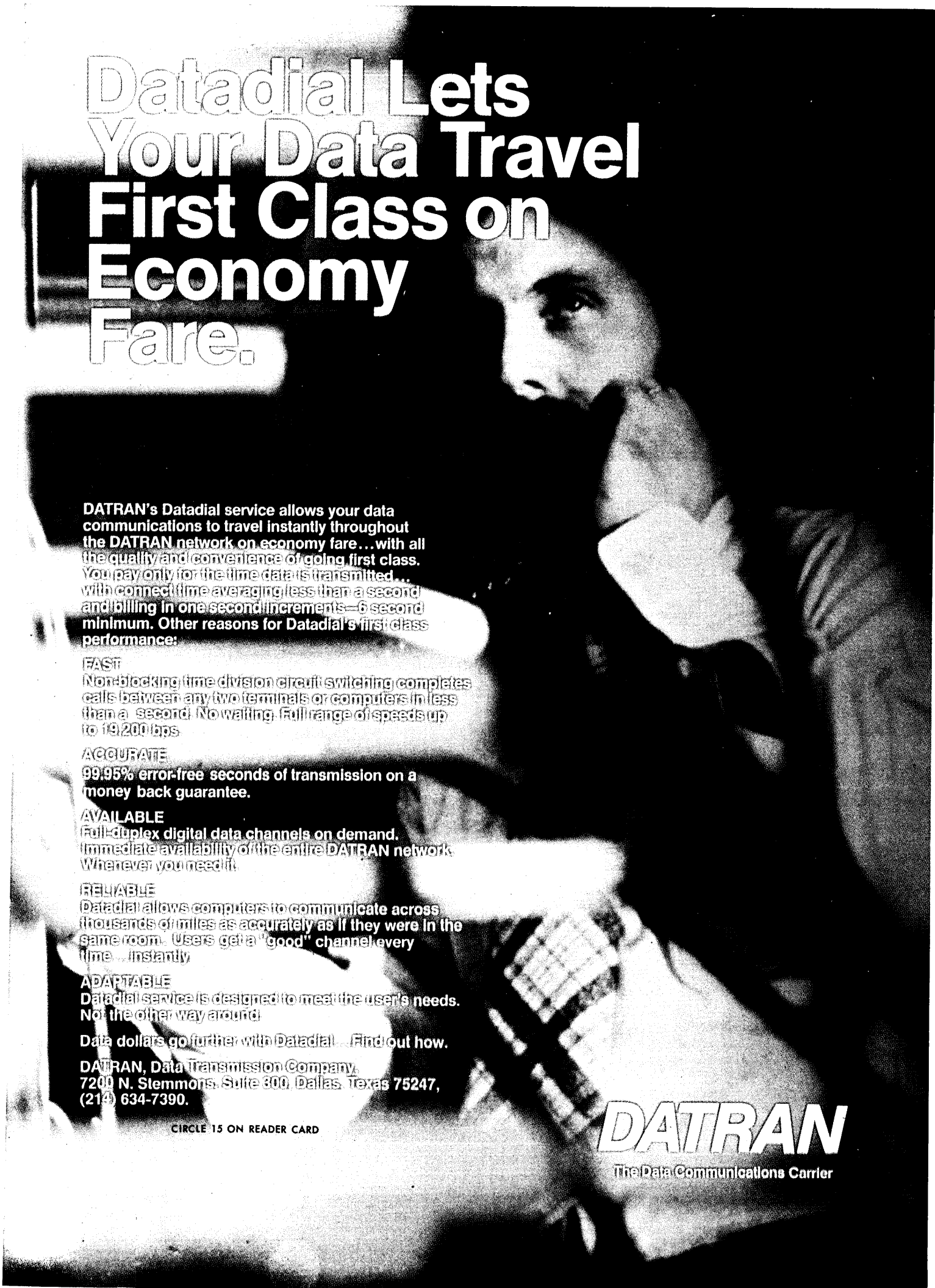

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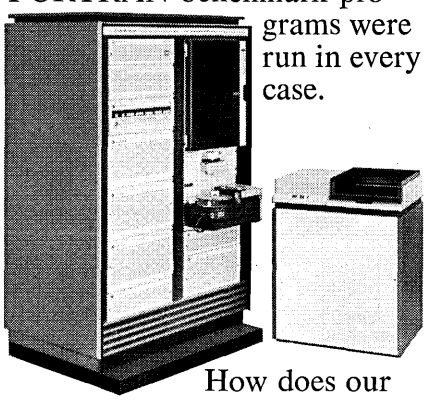
When Varian runs a benchmark, it becomes a milestone. As you can see from these latest figures comparing the performance of our V-74½ with others.

It makes the competition's claims about their superior performance just that. Claims.

All these tests—and more—were run within the last 90 days. On the latest operating systems and compilers. And the same FORTRAN benchmark programs were run in every case.



How does our V-74½ deliver so much more

beaten them all.

Typical FORTRAN execution times (microseconds)

	V74½	PDP-11/45	Nova 800	Mod Comp II	H.P. 2100
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

speed than other systems?

The VORTEX operating system, for one thing. Augmented by the firmware FORTRAN accelerator and our new Floating Point Processor, no one can argue with the fact that it's the fastest, most powerful, most sophisticated FORTRAN IV processor in the business.

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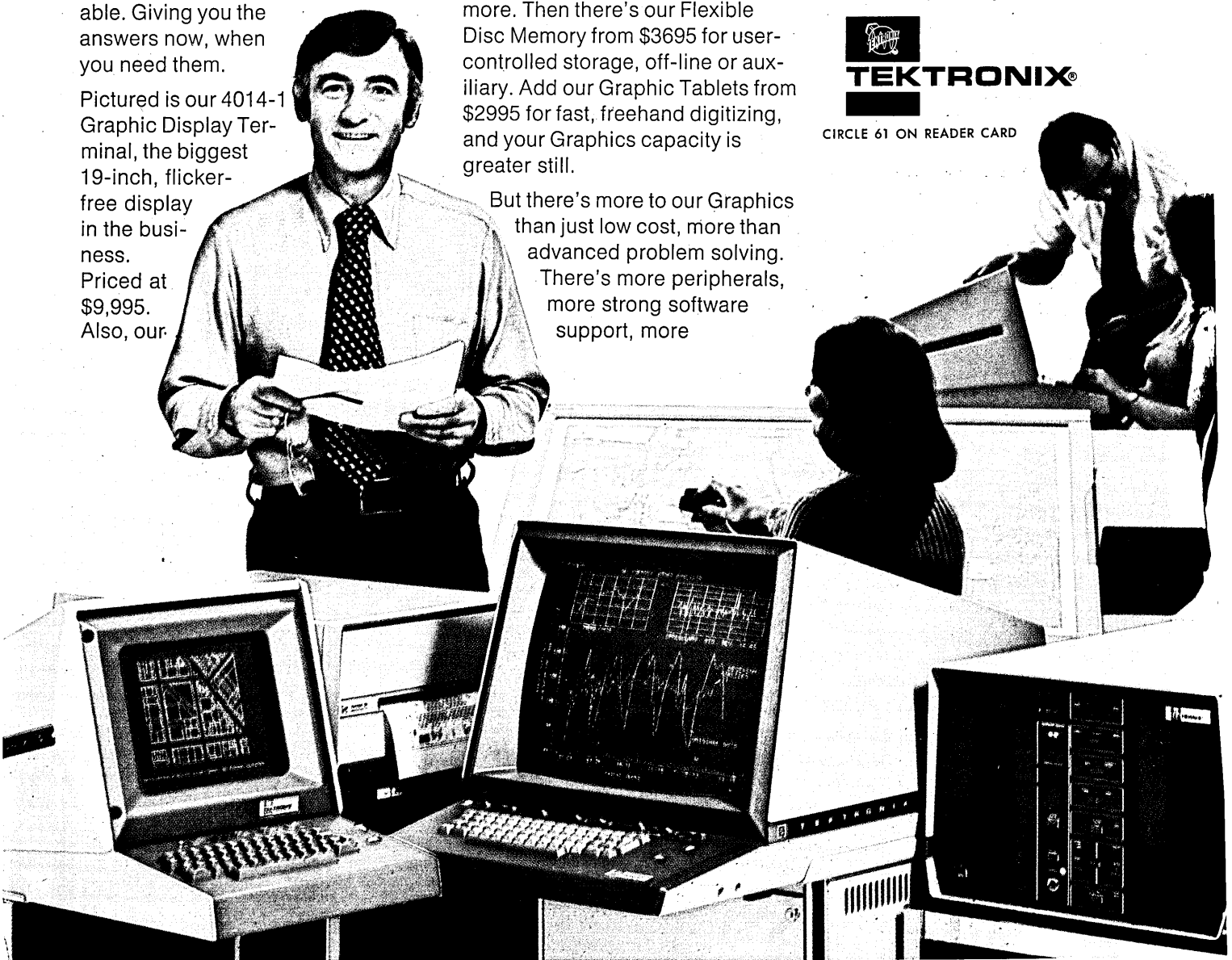

calendar

NOVEMBER

Fourth Annual Conference, Association of Computer Programmers and Analysts (ACPA), Nov. 20-22, Washington, D.C. This year's theme, "You, Your Computer, and Your Job," will stress the practical use of computers in working situations. Topics scheduled include micro programming overview, new standard COBOL for minicomputers, career development, and privacy. Fee for full conference, lunches and banquet: $103, members; $115, non-members. Contact: E. Lawrence Doyle, ACPA 4 Chairman, National Institutes of Health, Bldg. 1, Room 212, Bethesda, Md., 20014, (301) 496-4602.

JANUARY

National Microfilm Association Mid-Winter Meeting, Jan. 15-17, Atlanta. More than 500 men and women active in the micrographics profession are expected to attend the meeting. The theme is "Micrographics—Technology for Today and Tomorrow," which will pervade sessions on state-of-the-art trends, application tutorials, advanced system reports, and current events. The formal meeting will be preceded on Jan. 14 by a seminar on the basics of micrographics; fee $50. One of the highlights of the regular meeting will be an analysis of micrographic technology in Europe, including a look into the Soviet Union, by a representative of Rank Xerox, Ltd., England. Fee: $70 members; $85 non-members. Contact: Conference Director, National Microfilm Assoc., 8728 Colesville Road, Silver Spring, Md. 20910, (301) 587-8444.

Winter Conference, Assn. for Development of Computer-Based Instructional Systems, Jan. 28-30, Charleston, S.C. Sharing of research findings, educational strategies, and course materials will highlight this meeting, sponsored by ADCIS and hosted by the College of Dental Medicine, Medical Univ. of South Carolina. In addition, the Health Education Network Users and the Systems Implementation groups of ADCIS will sponsor pre-conference sessions on Jan. 27. Fees are $15, members; $20, non-members. Contact: Dr. Karen A. Duncan, Office of Computer Resources, College of Dental Medicine, 80 Barre St., Charleston, S.C. 29401, (803) 792-3211.

FEBRUARY

COMPCON 75 SPRING, 10th IEEE Computer Society International Conference, Feb. 25-27, San Francisco. Recognizing this as an era of widespread service by computers and related devices to the general public, the society has chosen as its theme "Computer Technology to Reach the People." Papers will be presented on applications, special equipment and products, system components and devices, and programs and software. About 800 computer technologists in hardware, software, and applications are expected to attend. Registration is $60 ($50 advance), members; $75 ($65 advance), non-members, and $15, students. A separate registration of $50 is required for the micro/mini tutorial on Feb. 24, a full-day session covering topics related to the conference theme. Contact: Lowell D. Amdahl, Compata, Inc., 6150 Canoga Ave., Woodland Hills, Calif. 91364, (213) 884-5400.

16th Annual Winter Convention on Aerospace and Electronic Systems (WINCON '75), Feb. 5-7, Los Angeles. Theme of this year's meeting, "Command and Control and Communications," for defense and non-defense applications, is expected to attract approximately 500 military, government and industry leaders. The conference is co-sponsored by the AES society and the Los Angeles Council, IEEE. The three days of classified and unclassified sessions will be geared to exchange information that can help transfer the military state-of-the-art into the public sector, for example "law and order, and public safety" fields. Contact: Art Slotkin, WINCON, P.O. Box 3356, Santa Monica, Calif. 90403.

Third Computer-Aided Design and Computer-Aided Manufacturing Conference and Exposition, Feb. 10-13, Chicago. The impressive theme of "increased productivity and profitability through the marriage of CAD and CAM" is expected to draw more than 1,000 industrialists, manufacturing executives and engineers responsible for computer-based equipment, systems and software used in industrial applications to the conference. For senior industrial management and government officials, there will be sessions such as "CAD/CAM and Economic Needs" and "CAD/CAM—Labor, Money & Management," while users/designers will attend more esoteric meetings, including three workshops: "CAD/CAM Systems," "Practical Applications," "User Experiences," and "Future Trends of CAD/CAM in the '80s." Fee: $235 to members of the Society of Manufacturing Engineers and associated societies; $265 to non-members. Contact: Society of Manufacturing Engineers, Public Relations Dept., 20501 Ford Road, Dearborn, Mich., 48128, (313) 271-1500.

Federal Data Processing Exposition, Feb. 11-12, Washington, D.C. Since this event is being billed as "the first annual data processing trade show to be held in the nation's capitol," projected attendance figures are meaningless—but the sponsors are hoping for two to three thousand users, mostly from the Federal Government, to attend. In addition to an equipment exhibition, there will be a number of application oriented workshops and seminars. The price is right for attendees—free! Contact: Robert E. Harar, Federal DP Expo c/o Instrumentation Fair, 5012 Herzel Place, Beltsville, Md., 20705, (301) 937-7177.

Computers in Laboratory Medicine Symposium, Feb. 15-16, San Francisco. Approximately 500 medical personnel will explore computer applications in clinical and anatomic pathology and nuclear medicine under the sponsorship of U. of Calif. Extension, Berkeley. Attention will be given to new directions in laboratory computerization, the use of desktop computers, systems currently available and trends in these actively developing adjuncts to laboratory and nuclear medicine. Fee: $125. Contact: Julie Hall or Nathan W. Cohen, U. of Calif. Extension, Berkeley, Calif. 94720, (415) 642-1061.

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

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NEW DIABLO DUAL FLEXIBLE DISK DRIVE

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people

A SOMETIMES "WHIRLING DERVISH"

Two years ago, A. G. W. Biddle, Jr. was fishing in Oregon, happily retired from his former seven-day-a-week job at his private consulting firm.

The phone rang and it was his old friend Dan L. McGurk, former head of Xerox Data Systems, wanting to know if Biddle would come out of early retirement. McGurk was heading up a new organization called the Computer Industry Assn. (CIA), and he

A. G. W. BIDDLE, JR.
A growth strategist

thought "Jack" Biddle would be just the man to be its executive director.

"I was intrigued," recalls Biddle. "Back in 1960, I recommended to Bendix that they get out of the commercial data processing business because I felt it was just about impossible to compete with IBM. In more than a decade, things hadn't changed, so that's why McGurk's offer interested me."

While McGurk got the CIA rolling, he has gradually slipped into the background, and Biddle is now the driving force behind an organization that has become a surprisingly effective voice in the industry in just over two years.

While Biddle and the CIA are often accused of possessing a knee-jerk animosity toward IBM, Biddle views himself as more of a "growth strategist" than anything else and, while he concedes that the CIA has done its share of bad-mouthing IBM — although with what Biddle maintains has been good cause—he thinks that the CIA's focus has been subtly shifting recently.

In short, then, is there a future for the CIA beyond the various IBM antitrust cases?

Biddle sees the organization serving as a voice for the industry. "We're not afraid to take controversial positions," says Biddle. "But I think our voice is balanced."

He points out that the CIA's some 40 members represent a balanced cross section of the industry—a half dozen oem's, three data entry firms, five software houses, a minicomputer company, and just about everything else from memory manufacturers to plotter makers.

Biddle has had an extensive background in the computer industry, primarily as a consultant to computer manufacturers. Although the West Point graduate got some hands-on experience with some of the pioneering computers, and has since done some computer modeling, he does not view himself as a computer professional. He also has an extensive communications background from his military service days.

He stresses the idea that his experience in growth strategy and in long-range strategy all come into play in his CIA position.

It might be added that Biddle is rapidly becoming something of a fixture at Congressional hearings and governmental regulatory hearings, pounding away on this issue or that issue—all of import to the computer industry. His critics say he is simply attacking IBM—or lately AT&T—but his supporters say there is a common thread to all Biddle's CIA positions. He is a die-hard proponent of what he calls the free enterprise system, maintaining that a business should be allowed to succeed or fail on its merits and not be susceptible to outside influences.

His associates have been awed at Biddle's range of expertise, and one associate says the normally hard-driving Biddle becomes a "whirling dervish" while preparing himself for, say, a paper he will deliver in Washington.

The CIA has been making a pitch to users which has thus far been less than successful, but Biddle is committed to pursuing the user until he brings in user representation to the CIA. The organization has set aside $50,000 to stimulate the establishment of a user group but, thus far, there have been no serious takers.

And what does IBM think of the CIA? Armonk doesn't comment on such things, but there are indications that IBM looks upon Biddle and the CIA as public enemy number one.

For instance, when Control Data signed its antitrust settlement with IBM last year, IBM stipulated that CDC not be permitted to join the CIA. "We think that's a compliment," says Biddle.

THREE YEARS IN ENGLAND

He's a chemical engineer. He's a lawyer. He sells computers and his market is the world.

He's Louis B. Perillo, International Director, Data Systems, for Xerox Corp. He enjoys selling computers on an international scale. Perillo returned last April to the El Segundo, Calif. headquarters of Xerox's computer operation after three years as managing director, data systems, for Rank Xerox, a U.K. corporation 51% owned by Xerox Corp. and 49% owned by the British Rank Organization. Rank Xerox, says Perillo, handles 90% of Xerox's products and accounts for close to 50% of the corporation's revenues and profits. Its marketing area is the entire Eastern hemisphere.

Perillo went to Rank Xerox in 1971 "to try to get a computer operation going." Prior to that time, the British company had not handled the computer line Xerox acquired with Scientific Data Systems (SDS) in May of 1969. In the three years Perillo was with Rank, its computer business grew at the rate of 30% a year. It now accounts for some 30% of all Xerox's computer business, and Perillo predicts this share will go to 50% within five years. "The growth rate is greater there

LOUIS B. PERILLO
". . . a pretty good peddler"

people

(Rank's market area) than here. They're four to five years behind us in reaching the saturation point for high technology products."

At the time of the SDS/Xerox merger, Perillo was SDS's vice president, marketing. After the merger he became vp/international for Xerox Data Systems. SDS had been doing some business internationally. It had a branch office in England, a licensing agreement with predecessor companies of France's Compagnie Internationale pour l' Informatique (CII) for manufacture of Sigma 2's and 7's, and a licensing agreement with Japan's Mitsubishi which manufactures and sells Sigma 5's and 7's under the Melcom label. Perillo said Xerox is still getting royalties on Sigmas CII has out on rental and doesn't market 2's or 7's in any of CII's marketing areas except Germany, where "we bought back our rights in 1971."

From 50 people acquired when it assimilated with the SDS English branch office, the Rank Xerox computer effort has grown to 350 people.

Perillo enjoyed his three years in England. "The summers are beautiful. The flowers are beautiful." Via inexpensive "packaged holidays" available there, he and his wife were able to "see many places we never would have seen." The Perillos lived in the country town of Moor Park, 15 miles northwest of London.

The genial, Italian-born Perillo remembers the dim days of England's energy crisis and blackouts. "At first it was random," he recalls. "You never knew when the lights were going to go out. And it was cold." Then came the three-day work week, which meant three days of normal power. "On the other days we worked but we only had power for typewriters, no lights, no heat."

While living in England, Perillo visited his native Bellosguardo, Italy, which he left at the age of three. "Bellosguardo," he says, "means beautiful view. It's wrong."

Perillo grew up in Cleveland, where he became a chemical engineer (Case Institute of Technology), a lawyer (Cleveland Marshall Law School), and got interested in computers. He was working in engineering construction for Arthur G. McKee & Co. in the mid '50s when the IBM 650 came out. His alma mater, Case Tech, got the first 650 and Perillo saw a use for it in his firm's design work. "We rented time on Case Tech's 650 for $1,000 a month and then we got our own." He later pioneered a similar effort for the Ralph M. Parsons Co. in Los Angeles, which he joined in 1957.

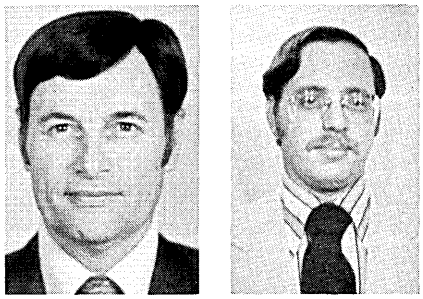
He finally put it all together—engineering, law, his interest in computers—in 1959 when he joined TRW as manager of contracts and proposals for a process control operation. It was at TRW that he met Dan McGurk, who subsequently lured him to SDS in 1965. At the time he made this switch he was director of marketing for TRW's computer operation. "I guess Dan thought I was a pretty good peddler."

ALL ABOUT TIME-SHARING

Cutthroat competition and the economic crunch of the early '70s thinned the ranks of the then-glamorous time-sharing business; but R. Clifton Young thinks about 50 companies are still around. He and Hillel Segal would like to help customers make better use of them.

Late this summer they formed a non-profit association, the Assn. of Computer Time-Sharing Users (ACTSU) to "evaluate, compare, and improve the services offered by the time-sharing industry," and by this month hoped to have signed up at least 100 users at $20 a person (out of the 10,000 persons Young estimates use time-sharing services in the U.S.).

With that number they think they'll be able right away to launch a number of surveys. They think the surveys will help users learn more about pricing, services, program packages, downtime, quality of technical support, educational materials, and other characteristics of the vendors with which they do business. "It's taken me several years to get a comfortable overview of time-sharing services," says Segal, who is a financial analyst with the Hertz Corp.'s Rent a Car division and a user of time-sharing for financial modeling and some accounting work. "The association will help members achieve this a lot faster."



VENDORS WELCOME: R. Clifton Young (left) and Hillel Segal will invite vendors to join time-sharing users group.

Complaints most often cited by users are over the pricing schemes of time-sharing services. "They don't tell us how many dollars you spend in a day," says Young, who is manager of strategic planning at Borg-Warner Chemicals in Parkersburg, W. Va. Users signing off a terminal usually get from the vendor a log-off message listing the connect time and usage of cpu units and storage. He'd like to have this translated into actual dollars, recalling a recent case where a customer was billed $20,000 for a two-month project for which the vendor bid less than $5,000.

The association won't be used "as a club to hold over vendors," says Young, who also is opening membership to vendors of time-sharing services. (The group is accepting membership applications at 210 Fifth Ave., New York, N.Y. 10010.)

Young and Segal have had broad experience with computers as users and as developers of applications. While at the B. F. Goodrich Company in Akron as manager of corporate modeling, Young created "Case-SIM," a programming language for non-programmer planners to use in creating financial models and case study simulations. His interest in the business dates to 1951, when he sold Friden computers and studied business administration at Rutgers Univ. Segal left MCI Communications to do financial modeling at Hertz in New York.

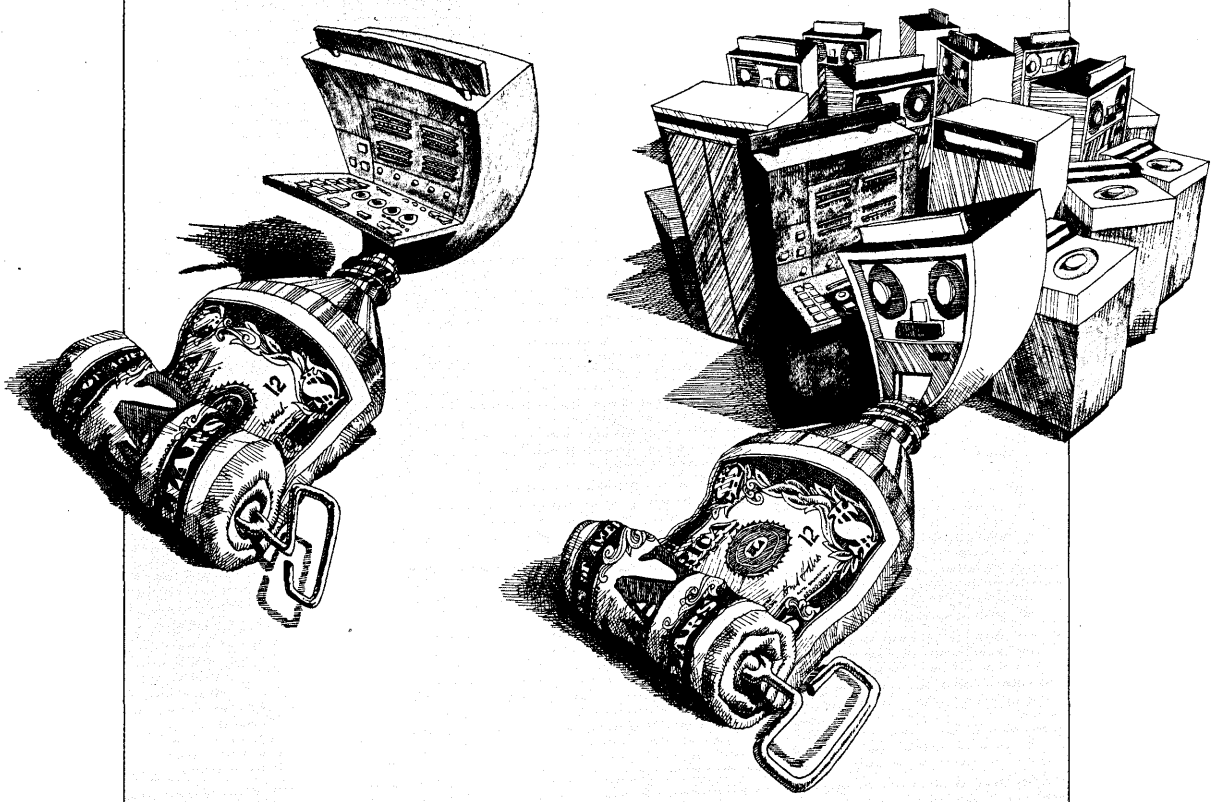
Both are convinced that the computer — via time-sharing — has only scratched the surface as a tool for managing large enterprises, and they see a bright future for the industry in that function. However, they agree that the industry is not recession-proof. Right or wrong, in a cost crunch research is the first thing that is cut and the economists are the first to go. It's this kind of "blue sky" activity that most makes use of time-sharing services. □

IN NEW POSTS

JAMES P. CAMPBELL and CARL D. CARMAN were elected vice presidents of Data General Corp. . . . NORMAN HELLER was appointed director of development at Nixdorf Computer AG's Costa Mesa, Calif. facility . . . EDGAR L. MOORE was named to the new position of Litton Industries' Datalog Div.

$51,238 per month rental

$48,406 per month lease



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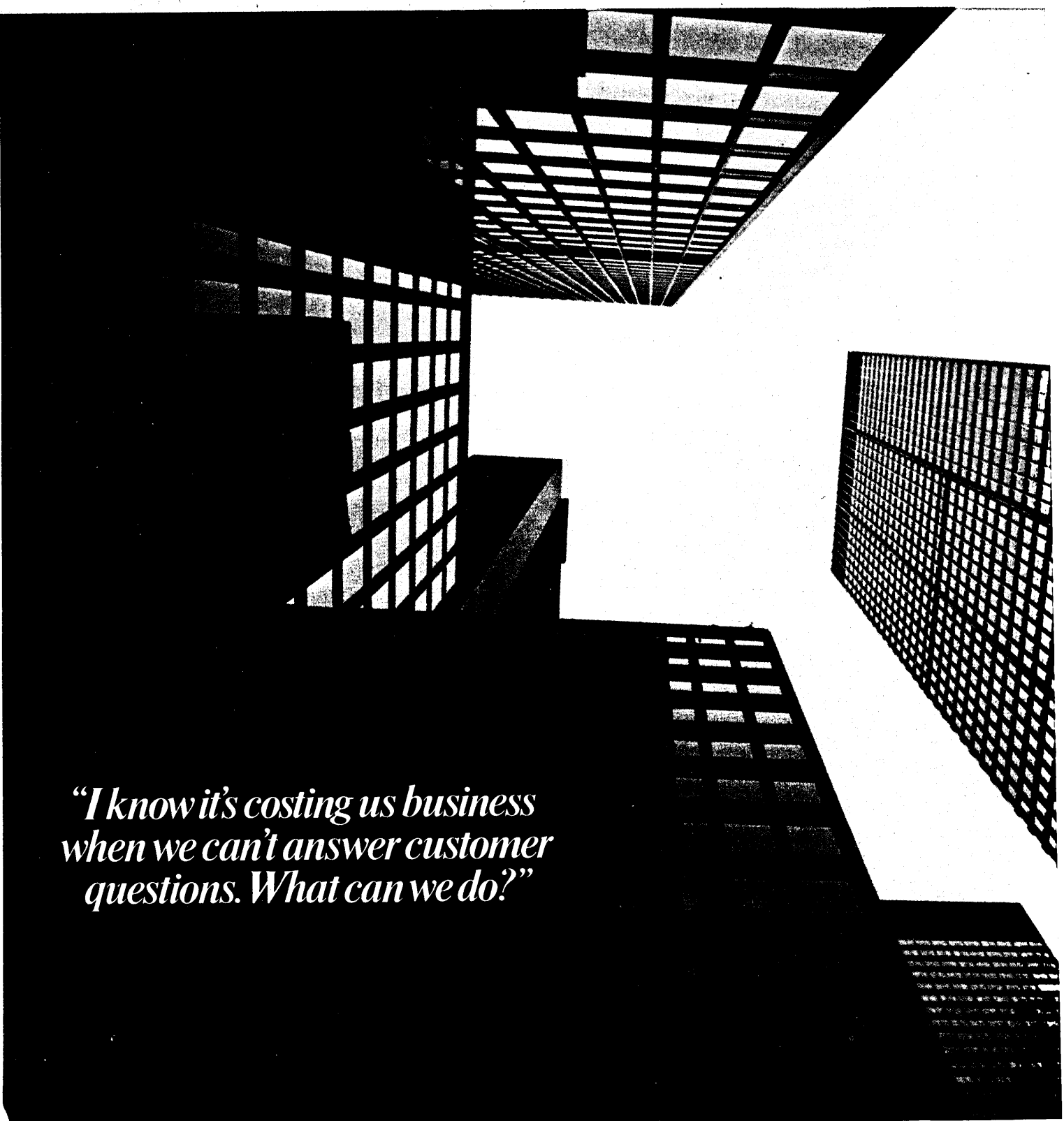
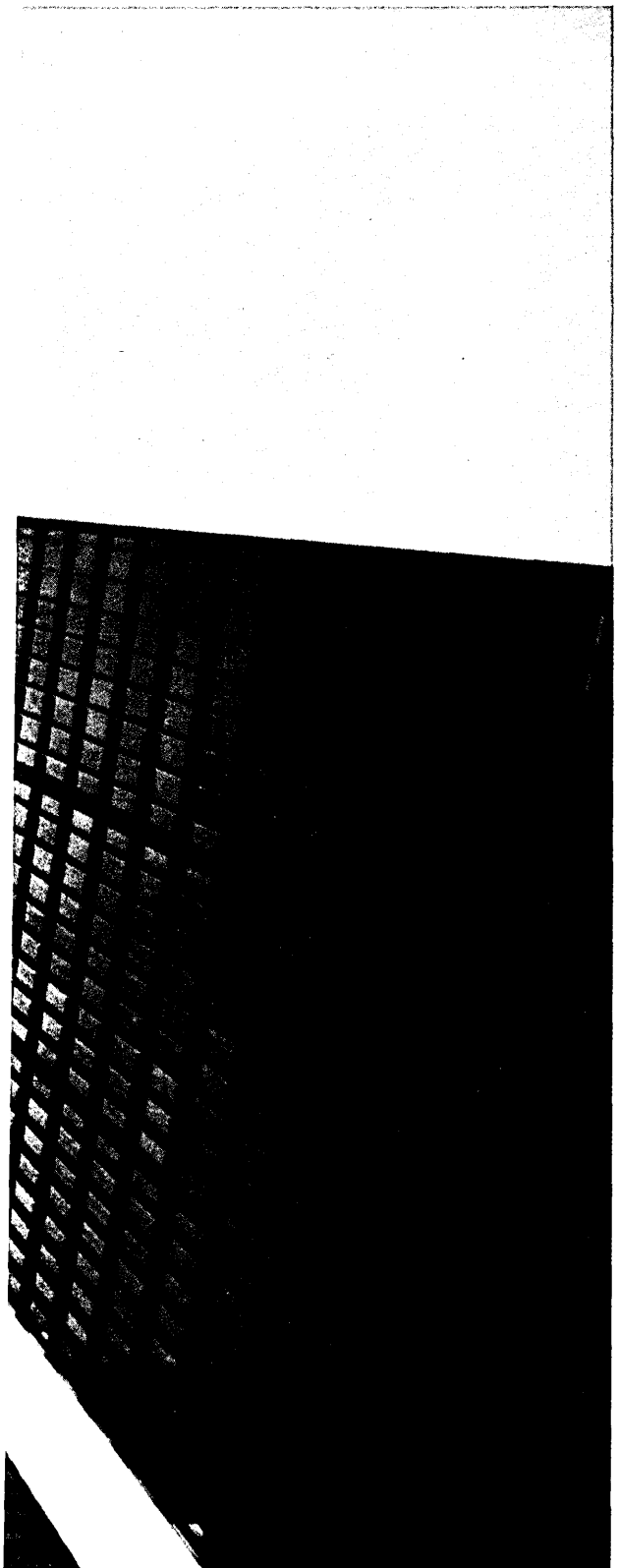


"I know it's costing us business when we can't answer customer questions. What can we do?"

Ask us



You've already gained speed and efficiency in some of your procedures by using microfilm. There's even more dramatic progress available to handle customer inquiries. For example:

A major retailer failed to find the needed records once out of every five calls. Now all the records are on film and virtually any one can be displayed on a screen at the touch of a button.

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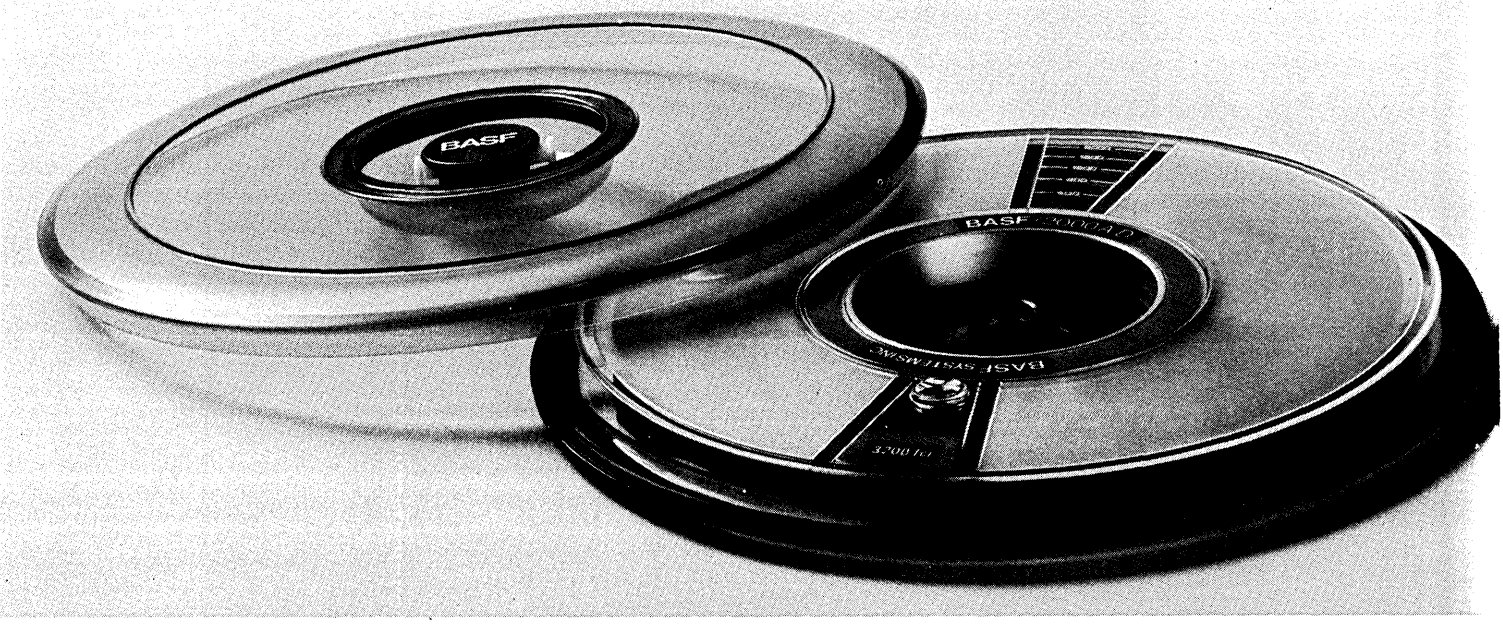
More than just lookups: A bank is using the same basic method to keep track of daily transactions. Having the records on film produced a saving of $50,000 in the first year.

To make this kind of progress in your business takes your determination to seek better answers. The sooner you ask us, the sooner we can help. Just write on your letterhead to W. O. Fullerton, Eastman Kodak Company, Dept. DP4874, Rochester, New York 14650. Or call 800-447-4700. In Illinois, call 800-322-4400.

What you're saving now with microfilm is only the beginning.

If you think all premium computer tapes are alike take a closer look at BASF 2000/A.D.



Because all premium computer tapes are 100% certified and meet industry standards, you might think they're all equal. They aren't. The important difference is the margin by which a manufacturer's standards *exceed* industry standards. It's this extra margin that allows no margin for errors. Let's look at a few superior points of BASF 2000/A.D. computer tape:

Debris-free edges

Rough edges and debris on tapes are the result of inferior slitting, which causes the coating to overhang the base. The projecting edges become detached by tape guides and drive rollers. The result: loss of head-to-tape contact . . . and errors. BASF has eliminated these problems with an exclusive double-cut slitting technique that keeps our tape edges perfectly debris-free.

Straight edges

Another hassle, even with premium tapes, is edge waviness. This causes intermittent reading and writing errors. Dynamic conditions during tape transport can occasionally compensate for the waviness, so it's a tough job to track down. Again, our double-cut slitting technique keeps 2000/A.D. edges absolutely straight and symmetrical.

Uniform width

Uniform tape width is essential, in order to avoid dynamic skew errors. According to industry standards, a width tolerance of ±.002″ is acceptable. We peg our 2000/A.D. standard at ±.001″. It's a small detail, but it could eliminate a few 3:00 a.m. debugging sessions.

Superior coating

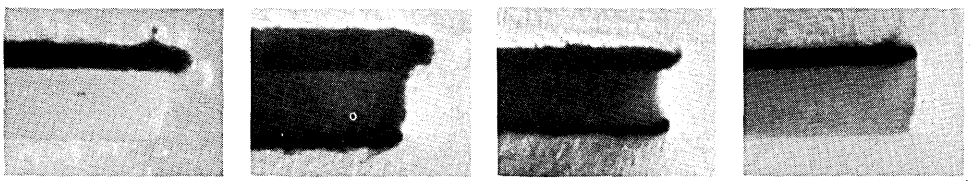
We've developed a new "hotter oxide" coating . . . a higher energy oxide that produces an output consistently higher than that of the National Bureau of Standards reference tape. Then we apply this oxide with a unique coating technique that provides a more even dispersion of oxide particles in the binder. For any bi density, including 6250 B.P.I., 2000/A.D. gives you more reliable writing and reading . . . better bit-to-bit uniformity . . . fewer drop-ins and drop-outs. And virtually no permanent errors.

Hard surface

Head wear is inevitable, but it shouldn't be excessive. That's why we developed a finishing operation that gives 2000/A.D. a harder, smoother surface than anyone else's. It's a lot kinder to your tape head, and keeps your maintenance time to a minimum.

And in conclusion

2000/A.D. costs no more than other premium tapes. You're already paying for BASF quality . . . you might as well have it. For the whole story of how 2000/A.D. stacks up against the competition, write to BASF Systems, Crosby Drive, Bedford, Mass. 01730.



BRAND A BRAND B BRAND C BASF

CIRCLE 12 ON READER CARD

BASF

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

LOOK AHEAD

IBM, JUSTICE DIGGING IN AS RUMORS FLY

IBM has always been a rumor ridden company, but the stories making the rounds now are reaching new heights of imagination. First there was the rumor, denied strongly by IBM, that Arab oil interests were preparing to take over the computer colossus. Then, as the trial date of IBM's antitrust case with the government approached, rumors proliferated that the firm was working out a consent decree with the Justice Dept. That rumor, another phony, was traced largely to a legal advisory service that speculated the case would be settled before the announcement of the trial, which is slated to begin after Dec. 2. Then there was the rumor that IBM's president, John Opel, had moved to Washington where he was hammering out a consent decree. Negative again. Opel has not been hammering out a consent decree with the Justice Dept. Indeed, his work activities appear to have been normal and we understand that, in recent weeks, he's only been twice to Washington where IBM naturally has always conducted a great deal of business.

Both sides in the case appear to be digging in for the upcoming trial. Raymond Carlson, the lead Justice Dept. attorney, normally a quiet and unassuming type, is said to be cocky about his case to the point that he makes Muhammad Ali look modest. Justice apparently will push for a breakup of IBM. Its economists are understood to be sticking to their guns, demanding that each "Son of IBM" have a full range of equipment --- low end to high end.

Meantime, IBM has taken out a one year lease for some 50,000 sq. ft. of office space at 100 Church St., near the federal courthouse in New York City where the case is to be tried.

TELEX VS. IBM: THREE BUSY JUDGES

Remember the IBM-Telex suit? The U.S. Tenth Circuit Court of Appeals agreed nearly a year ago to expedite the decision which had favored Telex. At this writing there was no decision nor inkling when there might be a decision, but those looking for reasons for the slow pace should not have to look beyond the activities of Judge William E. Doyle, one of the three judges on the Appeals board. Judge Doyle presided over the business plan that integrated the Denver Public Schools and that, obviously, consumed much of his time. All three judges in the case have a heavy load. Judge A. Sherman Christensen, the federal district court judge who rendered the initial decision in the Telex case, came out of retirement to hear the case and was unfettered by a heavy case load. That may explain his speedy disposition of the case.

CALIFORNIA'S DMV STICKING WITH UNIVAC

It's still Univac for California's Dept. of Motor Vehicles for at least three more years. The conversion of the DMV into the state's first consolidated data center, the Stephen P. Teale center, was a critical factor in a controversial procurement which stormed for more than two years and saw IBM getting a contract largely because they guaranteed to convert DMV by July 1. They didn't and the giant now is negotiating with the state on its liability for the failure and the state's liability for programs which were converted. And Univac has a new three-year contract for a "temporary upgrade" authorized by this year's budget bill. The new contract ups Univac's revenue from DMV from some $2.5 million a year to about $4.5 million. New equipment in the upgrade includes three Series 70/6's and eight 8440 discs. And Univac has said it can accomplish the state's long sought staggered drivers license renewal in 1976. The DMV system provides real-time access to 32,500,000 plus driver and vehicle records 24 hours a day, 365 days a year. It was to have been the biggest job for the Teale center which currently is serving 32 other state departments. And

controversy about it continues. Assemblyman Mike Cullen called the failure to incorporate DMV into Teale "a multi-million dollar ripoff" of California taxpayers.

WHEN THE SWISS BANK BOUNCED CDC

Control Data may have lost more than the $30.2 million it charged against third quarter earnings after losing a lucrative contract to automate nearly everything the Union Bank of Switzerland does. It could have lost its credibility as a big factor in banking. The Union Bank deal, captured from Univac in 1970 after chairman Bill Norris went over to Switzerland to sign the order, once involved some 150 programmers trying to come up with a workable Transaction Oriented Operating System (TOOS) that would have been used to automate not only the bank teller transactions, but also some 34 back office programs in which the 170-branch Swiss bank was involved.

CDC is trying to salvage part of the deal...as it has since early spring when marketing president Paul Miller began making twice-monthly trips to Switzerland. Late last month, though, no one at CDC wanted to talk about what progress was being made.

Ironically, CDC's plight in Switzerland might make its fourth quarter balance sheet look less than bad. In the writeoff, it's found some justification in giving its 26,000 computer employees five days off before year-end without pay, and cutting the wages of salaried employees 10%. And there were rumors in Minneapolis that another 1,800 are to be dismissed indefinitely between now and Christmas.

SEYMOUR CRAY OF CHIPPEWA FALLS

If you ever go to Chippewa Falls, Wisc., don't call Seymour Cray. He's too busy working on a very big number-crunching computer--but not for CDC, where that company's 6000 series, 7600 system and the Star 100 were conceived. Stories on why Cray left CDC two years ago to form his own company--Cray Associates--are legendary. One has it that he didn't like taking the half-hour air flight from Chippewa Falls to attend CDC directors' meetings in Minneapolis. Another is that CDC decommitted itself from big computers.

The latter explanation has some credibility, considering that CDC last month finally closed its Chippewa Falls operation, moving the 39 remaining souls to other posts within the company.

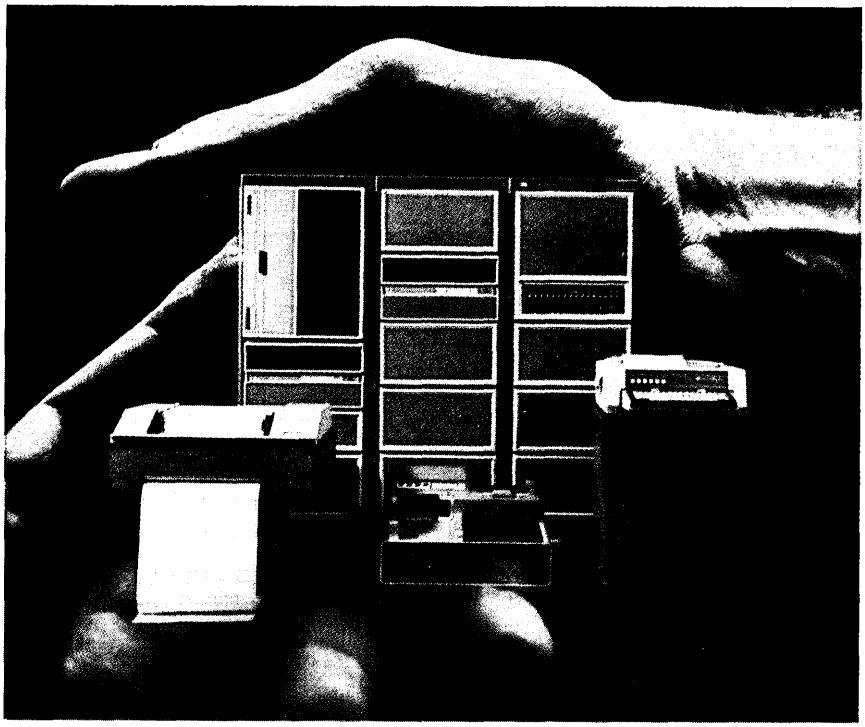
Meanwhile, Cray--who once told a Datamation reporter, "Don't come over here to interview me; I'd get a lot of phone calls if you wrote a story and couldn't get any work done"--is still in Chippewa Falls and doing well. His number-cruncher is underway and we're told he's about to enjoy an influx of $20-40 million in venture capital.

Strange, in these times when venture capital is said to be nil.

HIGH SPEED PRINTER

A 45,000 line per minute printer is in operation at a subsidiary of the Mead Corp. in Dayton, whooshing out individualized letters and address labels for direct mail customers. There were rumors the device runs at up to 75,000 lpm, but company spokesmen deny this, although referring to the 45K lpm rate as a "cruising speed." Paper is fed web fashion, like on a printing press, under a row of 500 ink jets, 100 jets to the inch, each of the jets spurting drops of ink through what is called a "charger ring." Drops that are charged hit the paper, those that are not charged are deflected by an opposite charge away from the paper to a "catcher." All this is done as the paper flies under the jets at rates of 500 to 600 feet per minute (or 36K to 45K lpm).

(Continued on page 130)



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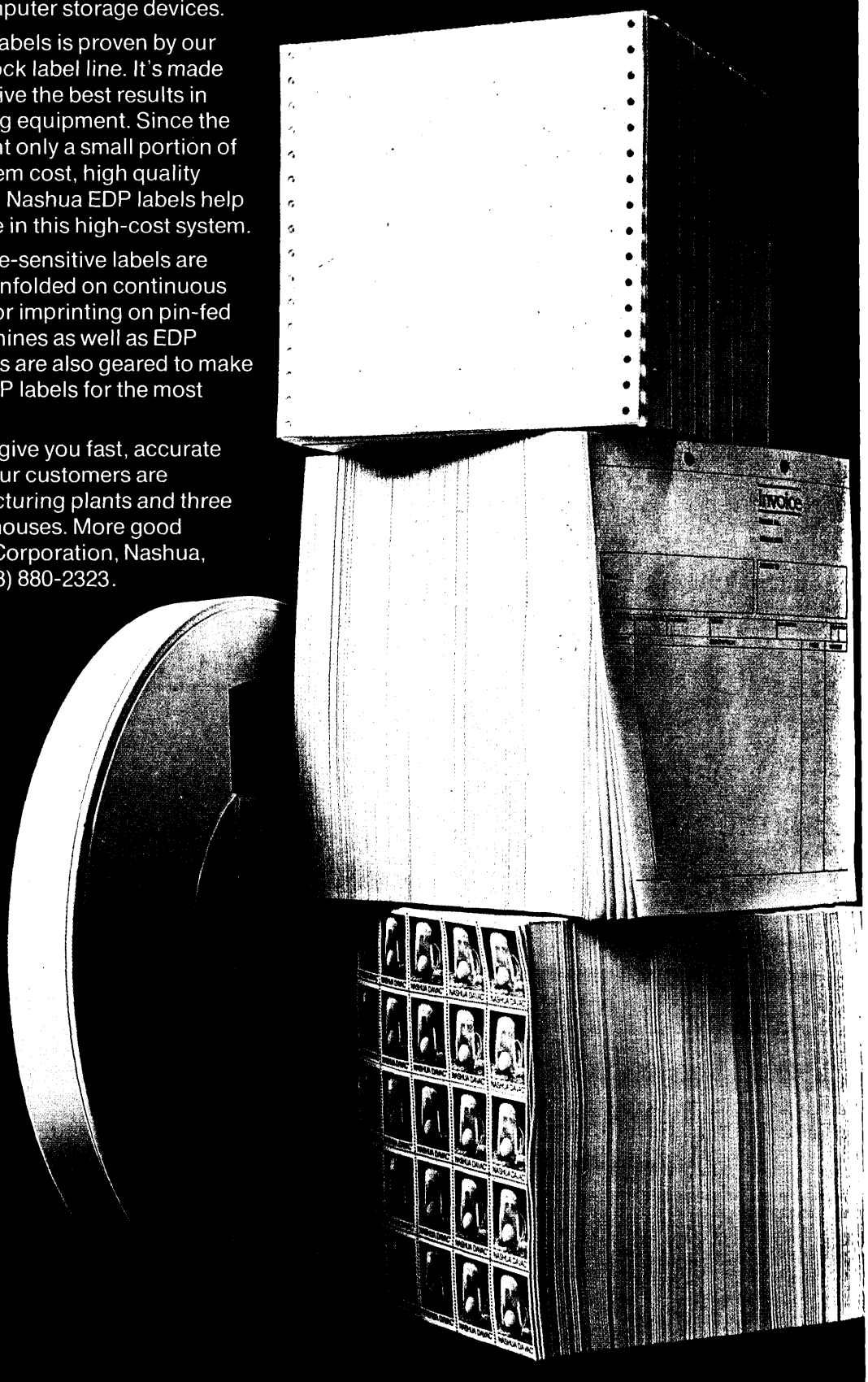

National Business Forms Association
The Forms Independent

CIRCLE 60 ON READER CARD

letters

Privacy costs

In the Editor's Readout (Sept., p. 47), you subjected Congressional bills SB 3418 and HR 15528 to severe criticism based on the cost and expense involved in assuring that computer records are used within Constitutional allowances.

I find that there were no proposals made to keep computer files from being abused. An individual's rights are surely more important than the costs of doing business. All of us realize the great advantage of computer information versus manual record keeping, but we are also aware of the massive foul-ups that occur daily as the result of computer errors. When these errors have the impact of destroying an individual's credit or having raw data fed into law enforcement files, any measure of control is better than none until a suitable replacement is found.

The ball is in your court, DATAMATION, and with your readers. The unscrupulous use of inaccurate computerized information must be halted.

F. PETER GRIFFIN
San Francisco, California

We share Mr. Griffin's concern with privacy legislation; the costs, however, are only one of the issues involved in the proposed privacy bills. Our editorial pointed out that the poorly worded bills actually have broad loopholes through which the worst offenders of privacy, in the name of national security and law enforcement, could slip through. Though laudable in intent, these bills are inadequate to do the job intended.

IBM software

I read with interest your article in the June issue (p. 114) concerning the Amdahl-Fujitsu venture. One point which puzzles me is the legality of running IBM software on another manufacturer's machine. Does Amdahl intend to purchase 168 software or simply to use it on his machine? If he purchases it, does this constitute unbundling of IBM systems software by virtue of their putting a price on it? Incidentally, what would be a ball-park figure for purchase of a major component such as OS?

IAN CAIRNS
Arncliffe, Australia

Mr. Yasaki, the author, replies:
We don't really know the legalities of what Amdahl Corp. is undertaking. Late last year, however, the company prepared a preliminary prospectus, which stated in part: "The Company plans to support the following IBM system 360/370 operating systems: OS/360 MFT; OS/360 MVT; OS/VS1; and OS/VS2. These four operating systems provide reasonably comprehensive coverage of the competitive IBM System 360/370 market. The Company's planned ability to support these operating systems derives in large part from the fact that IBM has placed them in the public domain and imposes no restriction on their use and distribution.

"The Company has completed the necessary software modifications to the IBM operating systems that it plans to support to enable them to be used with the Company's planned products . . ."

Unfortunately I don't know what IBM might charge for something like OS MFT, but development costs are said to exceed a million dollars. Chalk up an equal expenditure for the latest, VS2 Release 2, which is a start-from-scratch replacement for OS MVT, rather than a patched up version of VS2 Release 1.

Wynne's law

You've heard of "Murphy's Law," "Jones' Law," etc.; now I give you "Wynne's Law," namely that "negative slack tends to increase."

Once a programming effort is reported "x" weeks behind schedule at midpoint, then you can pretty well bet

DONT COME FROM (OR GO BACK TO?)

The staff and students of this department have been following the COME FROM controversy (Dec. 1973, p. 62) with considerable interest. We feel that with a little ingenuity one can devise a whole spectrum of new programming constructs of equal value; by analogy with divergent thinking, this is referred to as "divergent programming." Here are some examples:

(1) The prefix DONT, e.g. in FORTRAN

```
    IF (X.GT.Y) DONT COME FROM 100
```

This is as good a method as any of avoiding explicit transfers of control. Its equivalent in COBOL is IGNORE (as opposed to PERFORM).

(2) The pseudo-variable SEVERAL, e.g.

```
      DO 99 I=1,SEVERAL
      ....
      ....
   99 CONTINUE
```

This is of considerable value when it is uncertain how many times a loop should be executed; variants include ENOUGH and PLENTY.

(3) The structured analog of COME FROM, in ALGOL-60, is the AFTER statement:

<after statement> : : = <statement> AFTER <statement>

Whenever the second <statement> happens to be executed, then the first <statement> will be the next one executed. Of course the definition is recursive so we might have

```
      X:=10 AFTER X:=20 AFTER X:=30 AFTER X:=10
```

or even better

```
BEGIN REAL X;
X:=0 AFTER BEGIN
      if X > 100 THEN X:=1 AFTER X:=0
      end;
  BEGIN
  X:=0;
    BEGIN
    IF X > 100 THEN X:=1 AFTER X:=0
    END
  END AFTER X:=900;
X:=900
END
```

It is clear from a detailed study of these examples that the side effects of structured divergent programming have even greater potential than those of self-modifying machine code; for this reason if no other we expect such constructs to have a wide appeal to a certain section of the programming community.

P.S. On reflection, certain troublesome questions have occurred to us. Is a BRIEF CASE statement a computed GO TO, and what is the effect on it of a LOCK statement? What is NAMED UNCOMMON? And is a DURING loop executed by a During machine?

B. E. CARPENTER
Department of Computer Science
Massey University
Palmerston North, New Zealand

letters

that it will be "2x" weeks or so behind schedule by completion time. What is the explanation of this phenomenon? There are at least three reasons: (1) First, no one will ever admit to the true amount of time he is behind, so everything else being equal, the negative slack will appear to grow larger as the delivery date approaches. (2) Second, if one is dumb enough to get behind, he is not smart enough to catch up. (3) Finally, whatever elements made a programmer late in the midpoint will probably continue to do so in a proportional manner over the remaining scheduled time.

You'll find this "law" somewhat more pessimistic than the guy who said "software schedules are incompressible"; rather, as the law states, once you're behind, the schedule tends to continue to expand. I discovered this law in 1962 while working on the Polaris real-time program.

DONALD M. WYNNE
Hydrospace-Challenger, Inc.
Rockville, Maryland

Structured programming

Mr. Tenny, in his article in the July issue (p. 110) on structured programming in FORTRAN, uses more or less exactly the same ideas for implementation of SP in FORTRAN that I have been using for almost a year. However, I let a preprocessor do the translation from the source program, which is written in ANS FORTRAN extended with IF-THEN-ELSE, CASE-, WHILE- and REPEAT-blocks, into ANS FORTRAN.

There are at least four advantages as compared to translating by hand from what Mr. Tenny calls IPL (Idealized Structured Programming Language) to FORTRAN.

1. The readability of the source program is increased because in itself the source program contains the high-level concepts WHILE, IF-THEN-ELSE, etc., which are closer to the human way of thinking, rather than the low-level concept GO TO. Thus there is no need for a parallel IPL-version of the comment cards.

2. You do not have any temptation, as Mr. Tenny puts it, to "improve" the program while translating it, simply because the translation is out of your reach. An "improvement," in this sense, very often turns out to be destroying the structure of the program.

3. The source code can be edited automatically by a program that indents the rows of the source program according to its block depth.

4. When modifying a program you do not have to bother with "non-consistent" labels, if for example, you would like to insert a WHILE-block within another WHILE-block, etc.

The only disadvantage that might be claimed against this procedure is that the cost for compiling will be increased because of the preprocessor. This is true, of course, for *one* compilation. But experience has shown that the number of compilations is significantly reduced and thus the total cost considerably decreased. So the alleged disadvantage actually turns into a fifth advantage to which all managers are sensitive: better economy.

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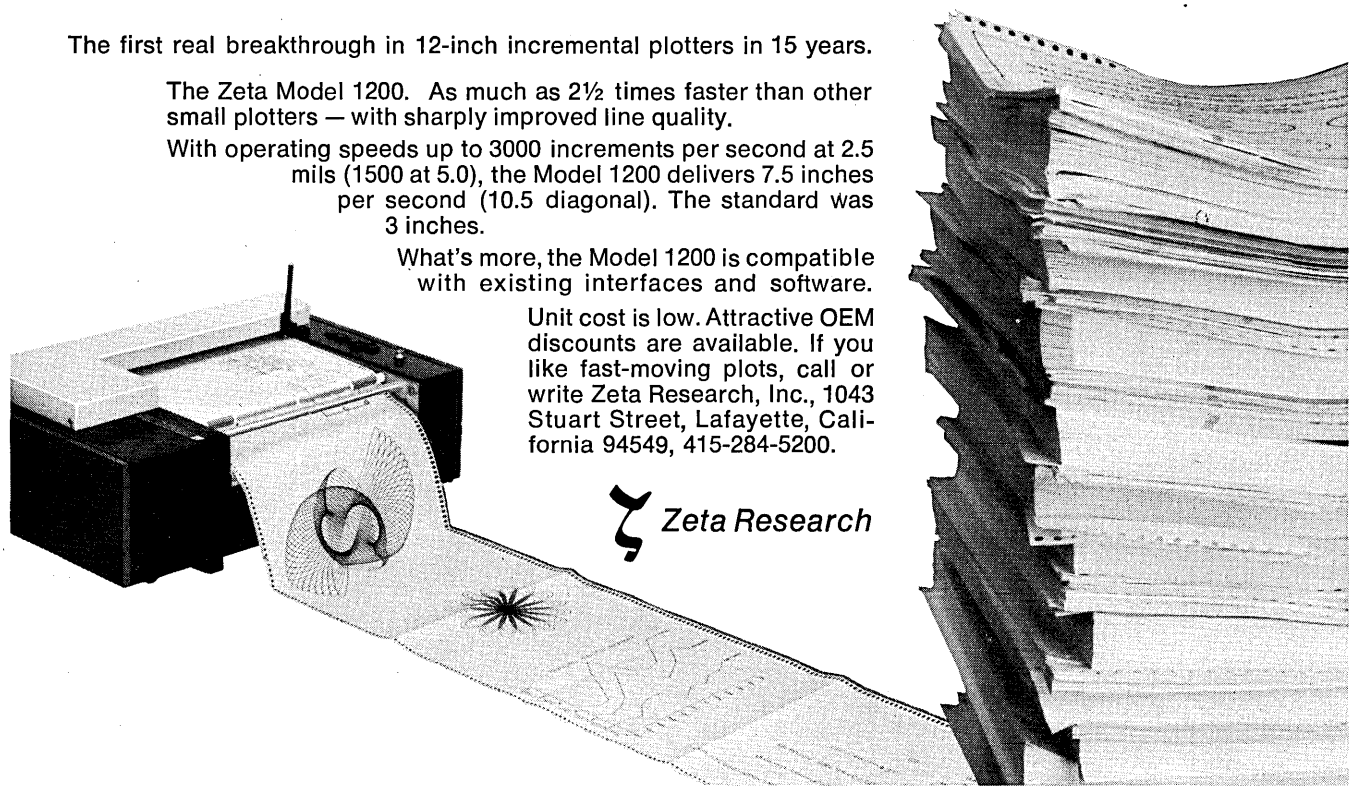

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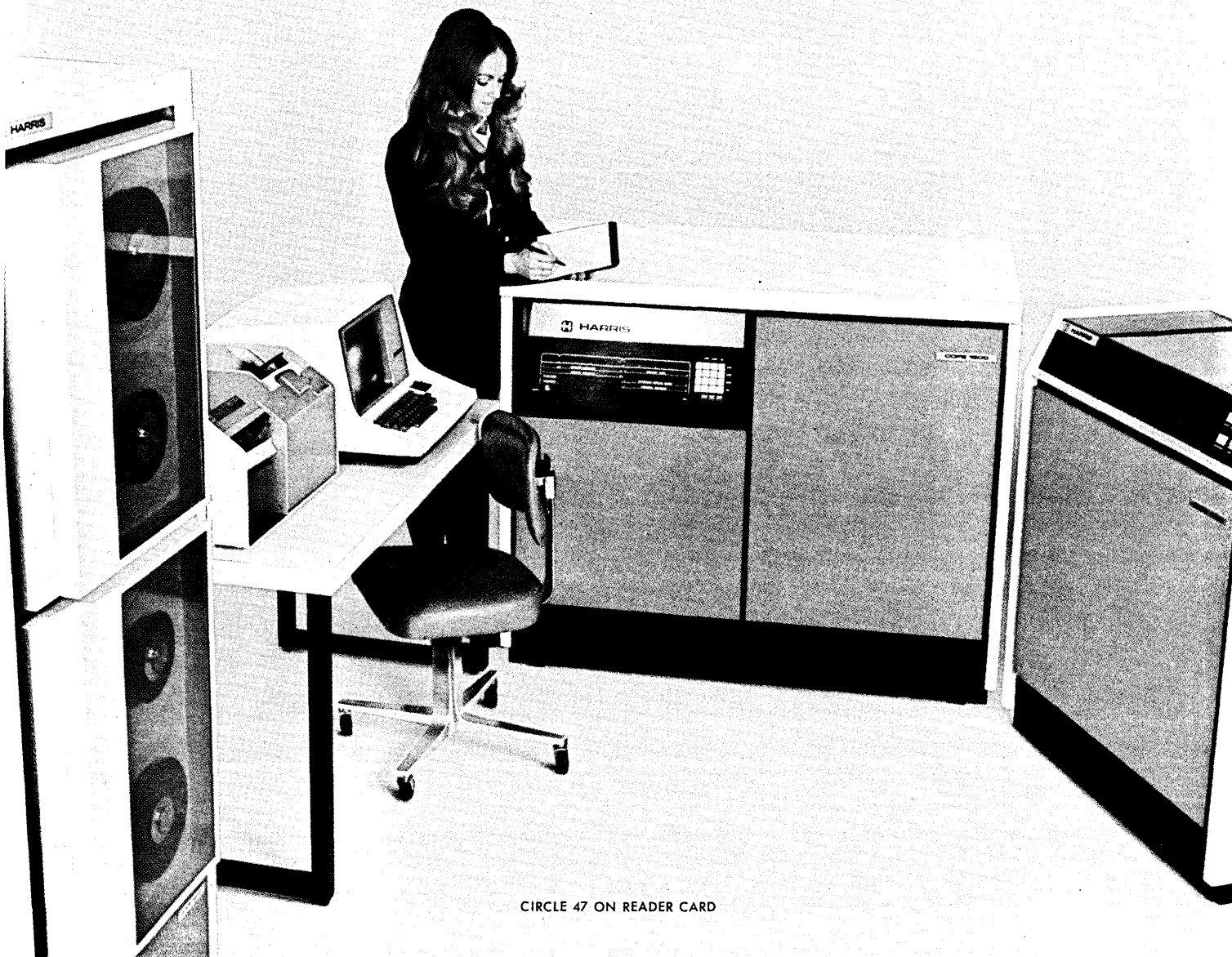

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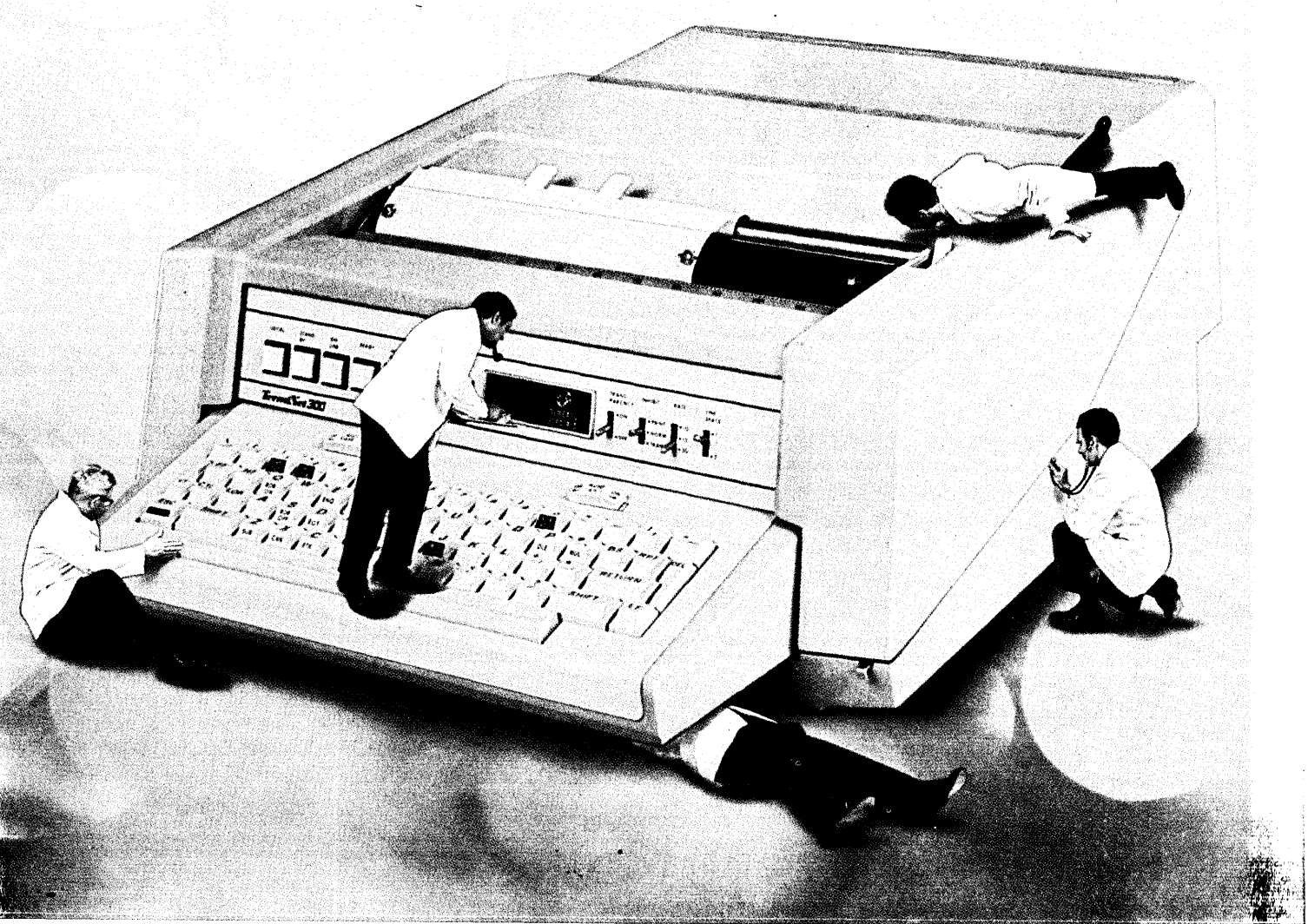

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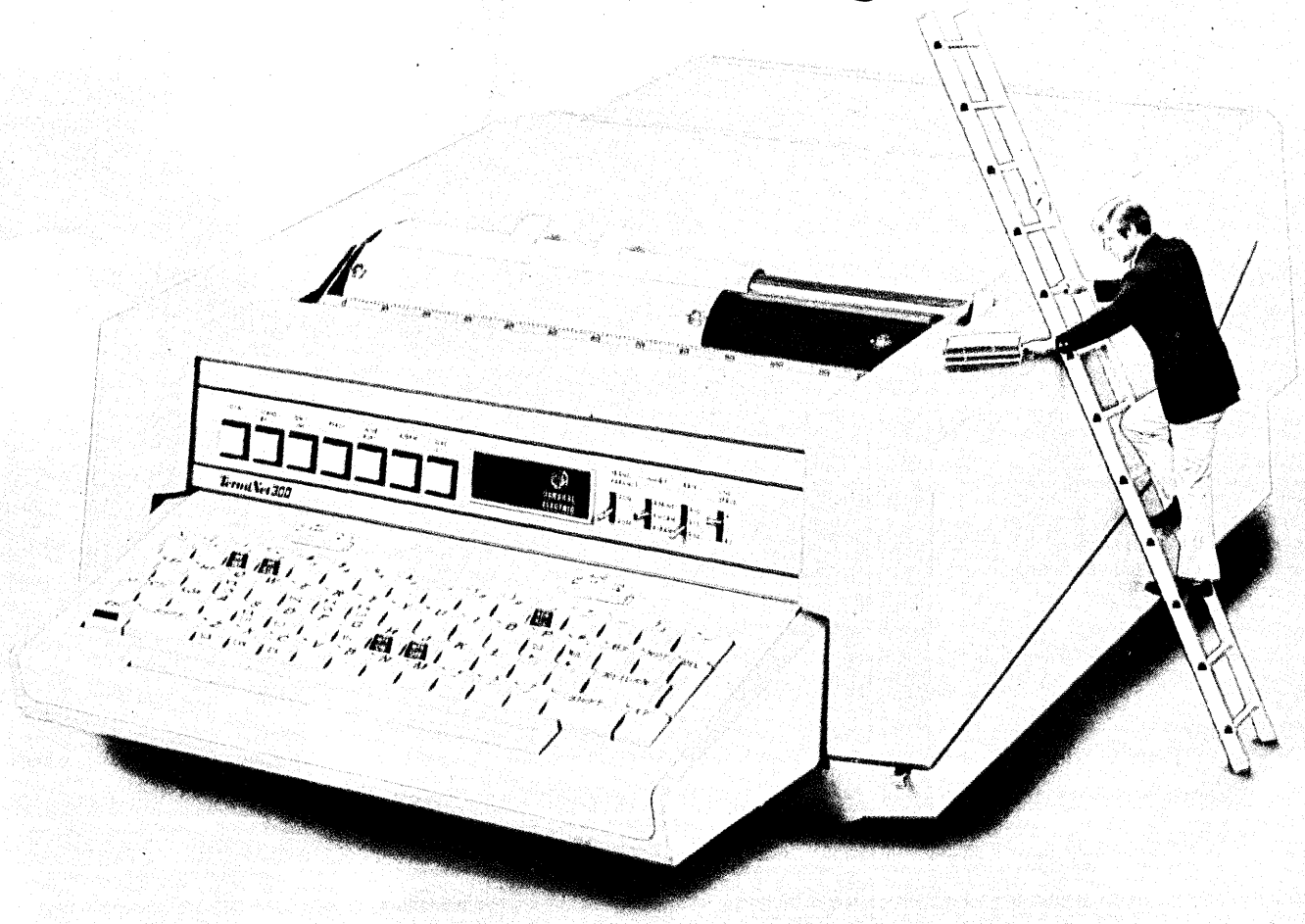

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books

Implications of Using Modular Programming

Central Computer Agency Guide No. 1, Civil Service Dept. Her Majesty's Stationery Office, London, England, 1973 £1.50 (approximately $3.50)

The authors of this book set forth quite clearly its purpose, namely:

"to provide the programming manager with information on the implications of using modular programming. It should assist him to assess the value of modular programming for his own installation."

If you are a programming manager preparing to justify a decision to use, or not to use, modular programming, this is a book for you. It is, in fact, a very good book, if you remember its purpose.

However, if you don't already know what modular programming is—if, for example, you don't know how to decide which of two decompositions of a program (to use Dave Parnas's terminology) is to be preferred—this book will not help you. On the other hand, you may be aided by the book if you are prepared to accept the book's definitions:

"Modular programming is the organising of a complete program into a number of small units (those units can be sections, subroutines, segments, etc.) where there is a set of rules which controls the characteristics of those units."

The authors compare this definition with a number of others to illustrate (and compound) the confusion; I can find the courage to quote only one: "A module is sometimes defined as being the code which corresponds to an A4 flowchart sheet [size: approximately 21 x 31 cm.]."

What might some of the controlling characteristics of modular programming be? Part 2 of the book presents the results of a survey of almost 1,000 data processing users in the U.K. and the U.S., the results of 16 man-months of research, and attempts to answer this question. Respondents to the survey identified 17 "necessary" or "most desirable" characteristics, listed here in decreasing order of necessity or desirability:

- Modules are independent
- Each module is called and is capable of calling
- Modules are closed
- Modules have a single entry point and single exit point
- Modules have a standard interface
- Modules exist in hierarchies
- Each module undertakes a single logical task
- Modular programs are entirely constructed of modules
- Modules are small (less than 100 COBOL statements)
- Modules are separately compiled
- Modules are separately coded
- Modules are parameter-driven
- Modules are separately tested
- Modules are capable of recursion
- Module coding is re-entrant
- Modules have a uniform work content

Some of the conclusions of the survey, and therefore of the book, which give implications of modular programming, are:

1. "Modular programming was found to be used for program design purposes by 96% of modular installations and better program design was considered to be the second most important benefit of modular programming. 85% of modular programming installations thought that modular programming improved program design. More efficient maintenance, which was found to be the greatest advantage of modular programming, is achieved largely as a result of improved design."

2. ". . . 78% thought that testing was easier using modular programming and 64% thought that program reliability was improved as a direct result of using modular programming."

3. The profiles of staff experience at installations using modular programming differs from those at other installations:

Programming Experience	Modular Installations	Non-Modular Installations
> 3 years	25%	40%
1-3 years	5%	30%
< 1 year	70%	30%

4. "The failure of modular programming in an installation was more often found to be the result of unpopularity with programmers than for any technical reasons. . . . [But] most of the objections to the use of modular programming advanced by programmers are seen as advantages by managers, particularly more exhaustive testing, use of standards, tighter management control and using personnel to undertake the tasks in which they have most expertise."

5. Finally, " . . . 65% of modular programming users had obtained increased productivity which they attributed to the introduction of the technique, that 29% detected no difference . . ."

—Robert M. Gordon
Mr. Gordon is director of the Computing Services Centre at Victoria Univ., in Wellington, New Zealand. Previously he held a similar position at the Irvine campus of the Univ. of California.

Systems Analysis Techniques

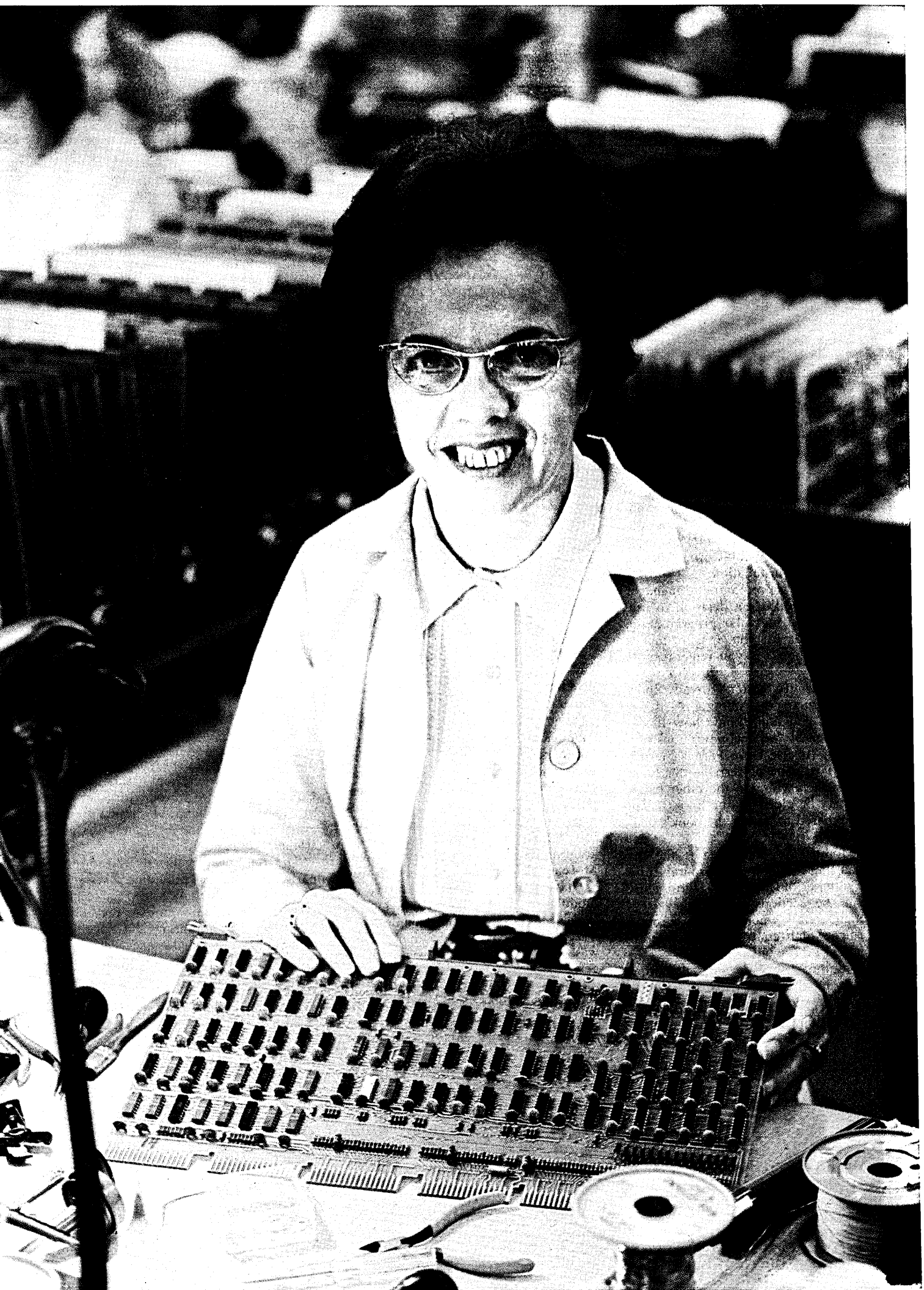
J. Daniel Couger and Robert W. Knapp, ed.
John Wiley & Sons, 1974
509 pp. $14.95

This is a unique and useful book, offering to the systems analyst or student of systems analysis a comprehensive survey of techniques applicable to all phases of systems analysis. The emphasis is on computer-assisted techniques, with coverage of those which are well established and accepted as well as those still in the experimental or theoretical stage.

The book also provides an historical summary of the evolution of systems analysis techniques from unit record days up to what the authors choose to call "fourth generation" techniques. Couger's masterful introductory paper provides a well-balanced summary of every major advance in systems analysis methodology.

The book is organized into three parts, with the first providing a system theoretic introduction to the subjects, the second (which comprises the bulk of the text) presenting the specific techniques for systems analysis, and the third containing papers on cost effectiveness analysis. The last part could well have been omitted, as it pertains only indirectly to the performance of systems analysis.

Part two is divided into four sections, each preceded by a brief introduction. The 20 papers reprinted here are grouped into categories according to the "generation" to which they belong. The authors identify these generations according to a time scale which places the first generation as taking place prior to 1960, the second generation spanning 1960 to 1970, and the third occurring from 1970 to the present. The fourth generation is char-



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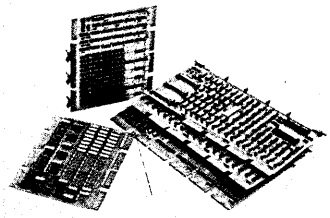

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acterized as providing techniques for integrating each of the phases of systems development to produce a complete system. Although Couger states rather optimistically that "enough research has transpired to recognize the direction of the next step in evolution of systems analysis techniques," it is significant that only one fourth generation paper is provided—a reprint of Teichroew's and Sayani's 1971 DATAMATION article on "Automation of System Building," which describes the Univ. of Michigan's ISDOS project.

In any work of this kind, one could fault the selection of articles included as well as the author's evaluation of the efficaciousness of various techniques. For this reviewer, the authors perhaps treat too generously such notable failures as the information algebra and the study organization plan, while neglecting coverage of more modest but practical techniques like the IBM System/3 application customizer. There is, perhaps necessarily, a tendency to cover techniques which, while interesting theoretically, have failed to gain widespread acceptance. Couger concludes his introduction with the rather plaintive statement that "it is simply amazing that the systems profession delayed so long in using the computer as an aid in systems analysis." But he goes on to assert that "the gap between development of hardware and systems analysis/design techniques will be substantially narrowed by the advent of the fourth generation of computers."

—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

Top Edp Executives

Vice Presidents, Directors, and Managers of Information Systems or Data Processing in corporate staff positions are listed in the latest semiannual edition of *Directory of Top Computer Executives,* published by Applied Computer Research. Organization is alphabetical by company name within eight industry classifications: manufacturing and service, commercial banks, diversified financial, insurance, retail chains, transportation, utilities, and educational institutions. ACR also produces *EDP Performance Review* and *Quarterly Bibliography of Computers and Data Processing.* The directory, published in February and August, is $50 for a single copy, $80 for an annual subscription, APPLIED COMPUTER RESEARCH, Phoenix, Ariz.

FOR DATA CIRCLE 250 ON READER CARD

Programmer Job Analysis

What does a programmer do? Are programmers professionals, technicians, or laborers? Will there still be an occupation called programming in ten years? Answers to these and other questions are given in a report, *Computer Programmer Job Analysis,* which presents the results of a study performed by the AFIPS Professional Standards and Practices Committee, directed by Donn Parker. The report was written by Raymond Berger.

The purposes of the study are to develop programmer job descriptions, to define needed areas of programmer training, and to help in the development of comprehensive examinations for programmer certification—or, in short, to provide standards for the profession. Three groups—programming managers, senior programmers, and a cross section of programmers in general—participated in a nationwide survey to evaluate the tasks and skills which define the programming job. The project resulted in a set of job descriptions which the researchers hope will make for a consistent standard throughout computer technology. Price: $6. AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, INC., 210 Summit Ave., Montvale, N.J. 07645.

Computer Inventory

The 1973 edition of the NASIS annual report, *Information Systems Technology in State Government,* presents essential facts on computers in various government facilities in the 50 states. Along with the names and addresses of prime contacts for the many state agencies using computers, the type, make, and number of computers at each agency are listed. Information on funding and expenditures, personnel, data security and privacy, applications, and difficulties experienced in dp management is included. Price: $10. NATIONAL ASSN. FOR STATE INFORMATION SYSTEMS, P.O. Box 11910, Lexington, Ky. 40511.

Computer Security

Can data in a security system be completely protected? "No" is the answer given by *Executive Guide to Computer Security,* a 16-page primer issued by the National Bureau of Standards (NBS). Safeguards and procedures to assure protection of computerized information are discussed in a question and answer format. Material in this guide is drawn from a report of a computer security workshop held in Rancho Santa Fe, Calif., and sponsored by NBS and the Assn. for Computing Machinery. Available from the Systems and Software Div., Institute for Computer Sciences and Technology, NATIONAL BUREAU OF STANDARDS, Washington, D.C. 20234.

Buyer Guides

Two Datapro reports analyze minicomputers and edp media. *All About Minicomputers,* a 50-page report (a reprint from the Sept. *Datapro 70* supplement), surveys the minicomputer field. Covered are 167 minicomputers and microcomputers from 54 manufacturers, with comparison charts and a summary of the field experience of 213 survey respondents with 633 minicomputers.

All About EDP Media and Supplies, also a reprint from *Datapro 70* (Aug. supplement), summarizes the product lines of 155 vendors and gives brand ratings based on a survey of users. The 30-page report contains detailed comparison charts listing disc packs, magnetic tapes, printer forms, cards, paper tape, microforms, and other products.

Each report is priced at $10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

Eurodata Communications

A 150-page report, *EURODATA—Data Communications Outlook in Europe,* summarizes conclusions of a study performed for telecommunications authorities in 17 European countries. The report is intended as a guide to penetration into the markets for terminals, modems, computer services, communications services, and network services. An analysis of user requirements through 1985, a description of current national carrier services, and projections of new demands over the next decade are provided by the study. Price: $500. QUANTUM SCIENCE CORP., 245 Park Ave., New York, N.Y. 10017.

Analog Market Study

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Computer Markets, a 51-page report of analog products which includes profiles of suppliers and a bibliography of current literature. Price: $50; six-page summary available free. ICON/INFORMATION CONCEPTS, INC., Philadelphia, Pa.

FOR DATA CIRCLE 205 ON READER CARD

UPS

A 12-page brochure gives a management overview of the need for uninterruptible power systems (UPS). Power quality needs of computers and the means to meet those needs are discussed. INTERNATIONAL POWER MACHINES CORP., Mesquite, Texas.

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Interface Manual

An interface manual prepared specially for plug-compatible manufacturers describes the I/O structure of the System/3. This manual includes information on signal descriptions, timing considerations, pin numbering, voltage levels, and physical cable layouts, plus tips and precautions. This information is not available elsewhere, since IBM does not publish System/3 interface descriptions. Price: $5,000. COMPATA, INC., 6150 Canoga Ave., Woodland Hills, Calif. 91364.

products & services

Image Processing

A six-page monograph describes the GRAFIX I image processing system for reading printed multi-font text, complex page formats, and hand-printed text. The system is designed for processing and analyzing filmed images, particularly material essentially binary (black and white), including line drawings, fingerprints, certain biomedical images, etc. GRAFIX I incorporates a large-scale general purpose time-shared computer; a fast, high-resolution flying-spot film scanner; and a "Binary Image Processor" for data collection and manipulation. (The monograph is reprinted from the AFIPS Proceedings of the 1974 National Computer Conference.) INFORMATION INTERNATIONAL, INC., Los Angeles, Calif.

FOR COPY CIRCLE 253 ON READER CARD

Software Booklet

Everything there is to know about the software available with Prime Computer Inc.'s line of small- to medium-scale computer systems is found in a 48-page guide. All system software components—operating systems, language processors, utility packages, and libraries—plus what software is supplied with the user's hardware configuration, are described. Also included is a listing of system software subroutines available, media volumes where the routines are located, and data formats used. PRIME COMPUTER, INC., Framingham, Mass.

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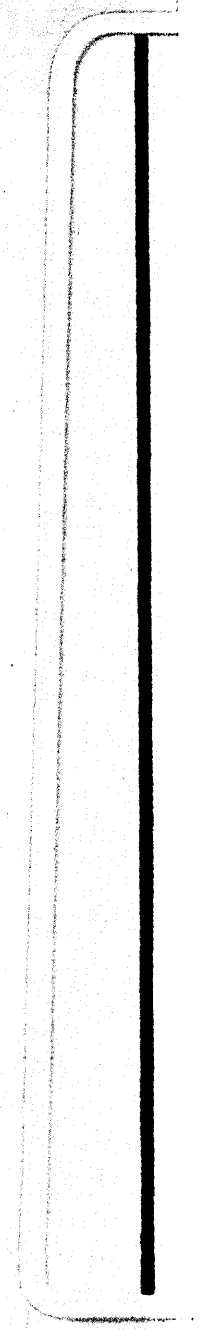

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I may look like other CRTs, but I'm actually quite unique. First, I'm easy to get along with. Editing with me, for example, is a snap. You can enter, delete, store, change, or transmit individual characters, lines, columns, forms, half-pages or whole pages. Correcting errors is a piece of cake. And so is preparing forms. Which is why host computers like to have me around. I save them a ton of work.

Secondly, I can do whatever you want me to do. Data entry, inquiry, retrieval, and communications. Credit checking. Instrumentation, manufacturing or process control.

When you want me to do more, all you have to do is add: Cassette storage. Printers. Then I become a remote batch terminal, if you wish. Memory -- up to 16K bytes in combination of ROM, RAM, PROM. Anytime, right in the field. Point is, I abhor obsolescence.

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It may sound like a lot. But then, I'm just doing my job.

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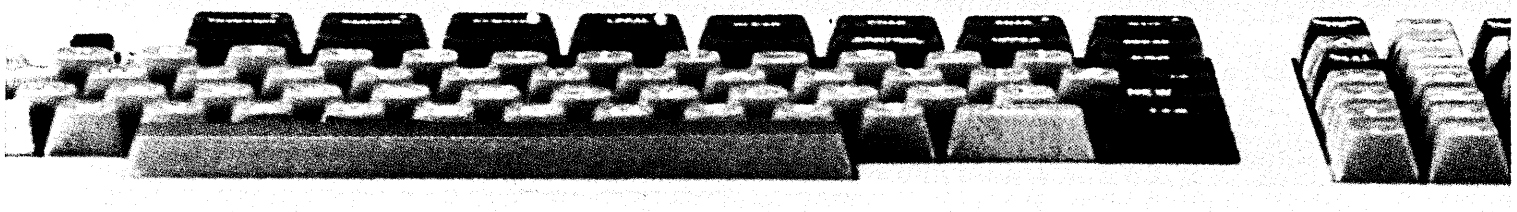

source data

most auto manufacturers blush. Included are semiconductor memory modules (rated at 330 nsec), a fast FORTRAN IV (claimed to produce code which can be twice as fast and efficient as other F IV's), memory mapping, arithmetic firmware (with instructions for floating-point and memory-to-memory moves), accelerator firmware (with incantations like "stack pop double"), and a floating-point processor. VARIAN DATA MACHINES, Irvine, Calif.

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Minicomputers

Data sheets on Rolm's 1602 and 1603 minicomputers provide technical specifications and pricing information. Included is information on computer power, software, reliability, interfacing, and military specifications. The central processors, control panels, and core memories are described in detail, as well as the 1602's microprogram module and the 1603's extended arithmetic unit. ROLM CORP., Cupertino, Calif.

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Disc Packs Refurbished

Rebuilding, converting, repairing, and recertifying any make or model disc pack or cartridge to its original factory specifications are services offered by Precision Methods, Inc. PMI also offers

on-site inspection and preventive maintenance. Claiming to be the largest independent disc repair facility in the U.S., PMI cites rapid turnaround time. PRECISION METHODS, INC., P.O. Box 232, Lorton, Va. 22079.

Tool Catalog

A 112-page tool catalog describes over 2,500 items of particular interest to electronic technicians, engineers, scientists, and instrument mechanics working on fine assemblies. The tool kit section should interest field engineers and service engineers especially. Four pages of technical data on tool selection, which also serve as a glossary, are useful. JENSEN TOOLS AND ALLOYS, Phoenix, Ariz.

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Programmer Aids

The summer issue of Applied Data Research's *Software News*, aimed at dp management and programmers, describes that company's software products. Cited are facilities for a METACOBOL Translator which adapts COBOL to structured programming, and simulation models of IBM system software, such as VS1, CICS, TSO, and ASP, for use with the System Analysis Machine (SAM). APPLIED DATA RESEARCH, INC., Princeton, N.J.

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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.

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

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JUST HOW GOOD IS THE TELETYPE® MODEL 40?

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We think our data terminal system is so good nothing even comes close.

In fact, we believe the Teletype® model 40 system is so good it'll change the way business looks at data. We're that sure it's that good.

Here's why:

It's a complete, versatile, reliable terminal system delivering maximum efficiency in a wide range of applications. From message communications to computer input/output on switched network or private-line systems. Right now, the model 40 system is being used by airlines, news services, brokerage firms, manufacturers, law enforcement agencies and time-sharing services.

Significant features of the system are speed, ease of data preparation and editing, compactness and extremely low maintenance. And since the model 40 is completely modular, you can forget about obsolescence. It's designed to grow as your needs grow.

Data is presented with extreme clarity on the big, 13-inch screen. Characters are 35 percent larger than standard print size and are formed on a 7 x 9 dot matrix. Screen capacity is 24 lines of 80 characters each for a total of 1,920.

Teletype's exclusive solid-state design makes the model 40's fast (up to 2400 wpm), heavy-duty impact printer the most cost-effective unit on the market. Its simplicity of design makes it one of the most reliable printers we've ever made. And after more than 60 years experience building printers that set the standards for reliability, that's saying something.

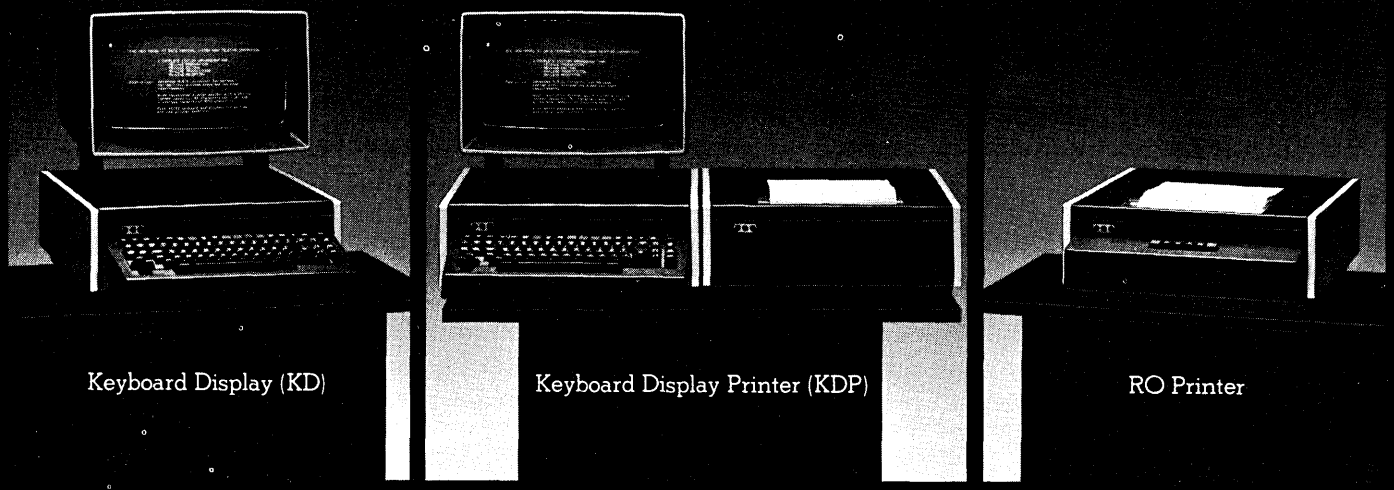
It took a total corporate commitment to come up with something as good as the model 40. For example, we had to develop and manufacture our own MOS. It didn't come easy, but we think it's worth it. Because the solid-state components throughout the system deliver exceptionally high reliability. And the self-diagnostic circuitry and design modularity significantly reduce downtime and maintenance costs.

Operator comfort and efficiency are increased by human-engineering efforts like a brightness control and screen tilt, plus a glare-reducing display tube and an easy to operate keyboard.

The Teletype model 40 data terminal system.
It's every bit as good as you've heard.
And probably even better.

TELETYPE

The Teletype model 40 system.



Keyboard Display (KD) | Keyboard Display Printer (KDP) | RO Printer

The Teletype model 40 is so good it's worth looking into.

Listed below are some of the general specifications of the model 40 system.

Display

5¼" x 11¼" viewing area on a 13" display tube.
High resolution 7 x 9 dot matrix character presentation.
127 characters of ASCII code displayed (all except backspace).
1,920 character screen capacity composed of 24 lines of 80 characters per line.
Anti-glare screen, brightness control plus tube tilt.
Constant image cursor—when cursor is positioned over a character, character becomes a negative image.
Refresh rate: 60 frames/second.

Operator Console

Standard keyboard generates 127 ASCII characters.
Six cursor positioning controls; Home, Return, Left, Right, Up and Down.
Five data editing controls; Clear, Character Insert, Character Delete, Line Insert and Line Delete.
Basic terminal controls; Send, Receive, Local.

Optional Page Printer

Impact printer provides hard copy of data stored in the display memory, or of data received directly from the communication line.
Printing speed is over 300 lines per minute (monocase), or 220 lines per minute (full upper and lower case).

Optional Features

Expanded memory, scrolling, protected format, highlight, tabulation, form send. Plus more.

Technical Information

Speed: serial interface; 105 or 120 cps. Code: 1968 USASCII.
Method: transmission is serial by bit and character with low order bit transmitted first.
Synchronization: asynchronous; 1 start bit, 7 information bits, 1 parity bit, 1 stop bit.
Communication line: switched network at 105 or 120 cps.
Bell System Data Sets 202C, 202R or equivalents. Other speeds optional.
Interface: serial—EIA RS-232C. Mode: half duplex.
Error control: optional vertical parity detection on received data (substitute character printed for errored characters). Keyboard generates even vertical parity.
Power requirements: 117V AC ± 10%; 50-60 Hz.
Operating environment: + 40° to 110° F, 2% to 95% humidity.

For complete technical data, please contact our Sales Headquarters at 5555 Touhy Avenue, Skokie, Illinois 60076. Or call TERMINAL CENTRAL at (312) 982-2000.

Teletype is a trademark registered in the United States Patent Office

TELETYPE

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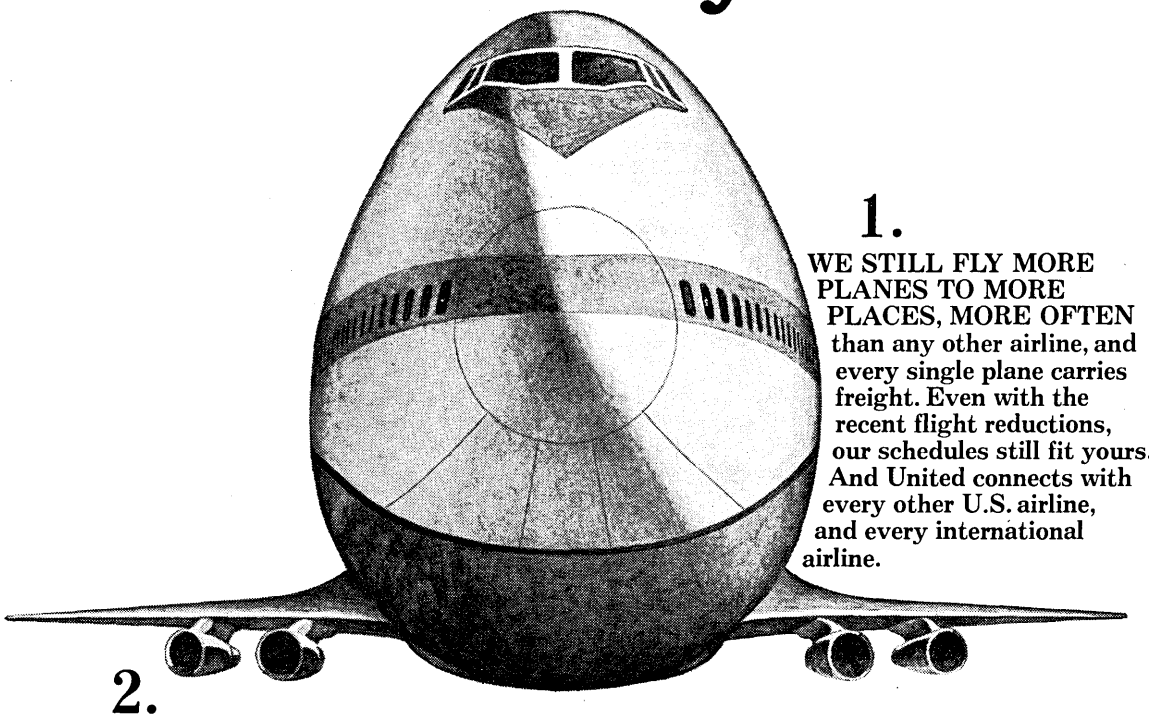

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WE STILL FLY MORE PLANES TO MORE PLACES, MORE OFTEN than any other airline, and every single plane carries freight. Even with the recent flight reductions, our schedules still fit yours. And United connects with every other U.S. airline, and every international airline.

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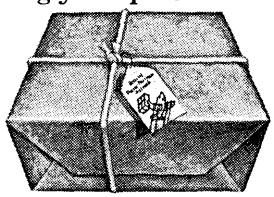

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TI announces the affordable intelligent terminal..

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Now, intelligence in a terminal is truly affordable! The new "Silent 700*" Programmable Data Terminal combines powerful microprocessing capabilities with the proven "Silent 700" features... at virtually half the price of comparable intelligent terminals.

Improved data entry efficiency
The powerful and easy-to-use TICOL language allows the user to generate "fill-in-the-blank" data entry forms, automatically check data for correctness, perform standard arithmetic functions, and tailor data formats for the user's system. All this can be accomplished locally... without the aid of a central computer.

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As an intelligent communications terminal, the new "Silent 700" model is ideally suited for such applications as catalog order entry, remote batch processing, inventory data collection and reporting, and virtually all kinds of branch office data preparation.

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The compact desktop unit contains all the standard features...dual magnetic tape cassettes; quiet, non-impact 30 characters-per-second printing; USASCII keyboard with built-in 10-key numeric cluster; plus a hard-working microprocessor and 10K of memory.

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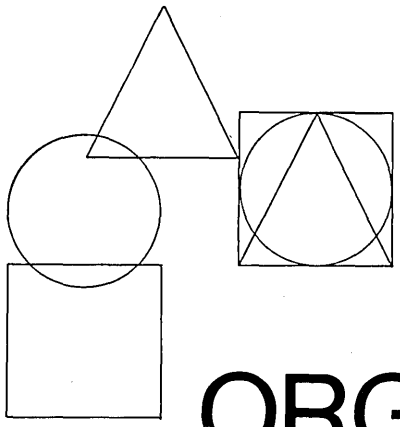


There are several ways to organize systems and programming functions—depending on workload, users, and other factors—and probably only one right way for the computer center.

ORGANIZING THE DATA

THERE ARE MANY WAYS IN WHICH DATA PROCESSING ORGANIZATIONS ARE STRUCTURED. Like most things in life, each way will have some good points and some bad points, but the choice between two structures is not arbitrary. Seldom are two structures equally "right" for any situation. A proper choice of structure depends on the size of the installation, and on its age too, among other factors. The purpose of this article is to make the choosing easier.

The data processing function is carried out by a company group I'll call the data processing division. (Of course in many companies this function is performed at the department level, while at service bureaus it constitutes the major company operation.) The head of the data processing division will be referred to as the data processing director.

The objectives of the data processing division are two: (1) to develop and maintain data processing systems, and (2) to process data. Around these objectives, two groups are usually formed. The group addressing the development and maintenance of systems will be referred to as the systems and programming department; the group which takes care of processing data I will call the computer center. Heads of these groups are the systems and programming manager, and the computer center manager, respectively.

The organization of both groups is the subject of this discussion, and what is said should apply equally to government and nonprofit organizations, and to commercial enterprises.

Systems and Programming

As mentioned, the systems and programming department develops and maintains data processing systems. To reach this objective the department must perform five functions:

1. develop new data processing systems
2. maintain existing data processing systems
3. develop systems-and-programming personnel
4. develop and enforce systems and programming standards
5. research new systems-and-programming equipment and techniques

There are four main types of organizational structure adopted by systems and programming departments to carry out these five functions:

1. Application organization
2. Functional organization
3. Project-functional organization
4. Project-staff organization

Application organization

A schematic of a systems and programming department with an application organization is shown in Fig. 1. The basic principle of application organization is that a supervisor is in charge of the data processing done in each of the company's major application areas. Each supervisor has a number of people—analysts, designers, and programmers—assigned to him. Responsibility for all new system development and system maintenance in each application area falls to the supervisor of that area, and he allocates work to the people in his group. Personnel development, development and enforcement of standards, and research into equipment and techniques are staff functions.

The main advantage of application organization is that it is user oriented. Each application group consists of a number of analysts, designers, and programmers (or the same people performing two or more of these functions) who work only on applications related to a given user area. As a consequence, they build up a knowledge of the user's operations that becomes integrated into the systems they develop.

An application organization works well in the systems and programming department of a company that is just beginning to automate its data processing systems. At that time, the systems, which tend to be the bread-and-butter applications such as payroll and accounts receivable, do tend to follow the company's organizational lines; and since there are no existing automated systems, each of the applications groups has plenty to do.

However, as the company's data processing systems mature, the organization of the systems and programming department along application lines tends to become creaky. New systems under development encompass ever widening scope. Application organization works well when order processing and accounts receivable are financial applications, and inventory and production control are manufacturing applications. However, when these four areas converge to one integrated application, control of system development becomes difficult under rigid application organization.

Furthermore, some application groups become inundated with work, while other groups, subjected to lower demands, have little to do.

The only way an application organization can continue to succeed in a maturing systems and programming department is if the organization is deliberately kept flexible, and the systems and programming manager is strong enough to make organizational changes as required, that is:

1. If a large number of previously-independent accounting, engineering, manufacturing and marketing applications are to be integrated into one new, all-encompassing system, the manager must establish a new applications group (the supervisor of which would be responsible for the development and maintenance of the integrated system), and staff this group by transferring people from the old accounting, engineering, manufacturing and marketing groups. This may also mean abolishing one or more of these old groups.

2. If one application group becomes overloaded with work and another doesn't have enough to do, the manager must have the fortitude to transfer

PROCESSING FUNCTION

by Thomas R. Gildersleeve

people from the underworked to the overworked group.

Functional organization

The functional organization of a systems and programming department is shown in Fig. 2. This is the classic organization structure where each functional supervisor has the responsibility for a given specialty and has a number of people permanently reporting to him. The purpose of functional organization is to develop highly skilled specialists by means of concentration. People in the analysis group do nothing but analysis; people in the design group, nothing but design; etc.

Personnel development, responsibility for standards, and research are the responsibilities of each functional supervisor. Thus, the analysis supervisor is responsible for developing analysts, developing and enforcing analysis standards, and research into analysis equipment and techniques. The design supervisor is responsible for developing designers, developing and enforcing design standards, and research into design equipment and techniques. And so on.

There's no one way to set up a functional organization. Some departments use the organization shown in Fig. 2. Some have an analysis and design group, and a programming and installation group. Another permutation would be an analysis group, and a design, programming and installation group. Still another: an analysis and installation group, and a design and programming group.

Functional organization works well in a production environment. Thus, the classical manufacturing organization is divided into engineering, manufacturing, marketing, and accounting divisions, each of which is headed by a different vice president.

In a functional organization, responsibility for system development and maintenance is split between functional supervisors and is controlled by procedures. For example, when a new system is developed, the analysis supervisor takes initial responsibility for the development. He assigns analysts to the effort, who develop functional specifications. The functional specifications and the responsibility for system development are then passed on to the design supervisor, who then assigns designers to develop design specifications. The design specifications and the system development responsibility are then passed to the programming supervisor, who assigns programmers to develop and test the system. The next step is to the installation supervisor, who assigns installation personnel to install the system.

This split of the responsibility for system development and maintenance

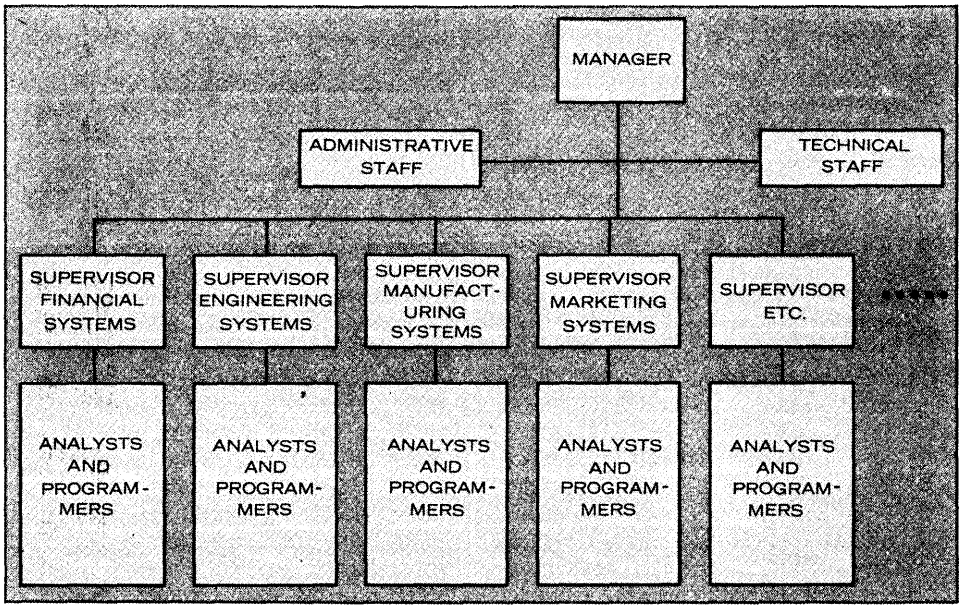


Fig. 1. The big advantage of the applications organization is that it is user oriented. Data processing personnel build up a knowledge of the user's operation which shows in the systems they develop.

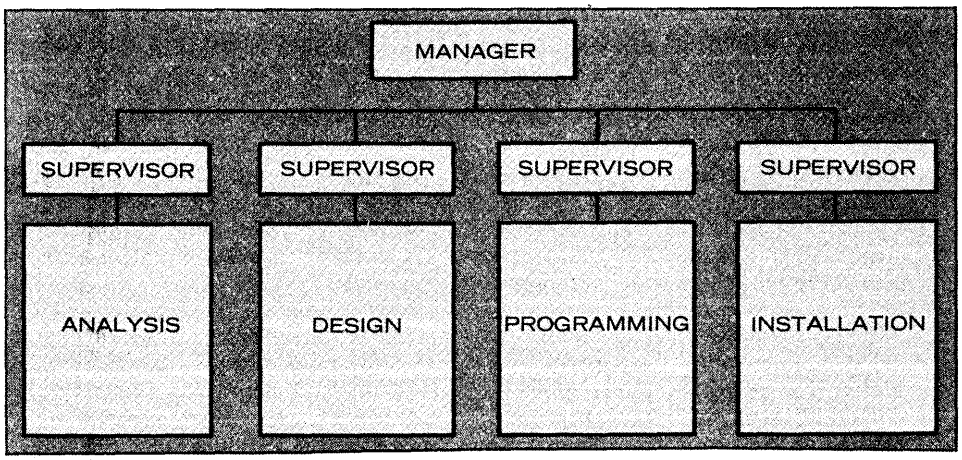


Fig. 2. Functional organization works best in a production environment, but it creates problems of control over system development and maintenance.

between functional supervisors creates problems in the control of such work. Since most of the work in the systems and programming department is development and maintenance, functional organization doesn't work well here. In general, functional organization doesn't work well for any group whose primary work is of the project type.

Project-functional organization

A schematic of a systems and programming department with a project-functional organization is shown in Fig. 3. With such a setup, the department's functional organization is retained, but superimposed upon it is a project organization. This type of organization is often also referred to as "matrix organization."

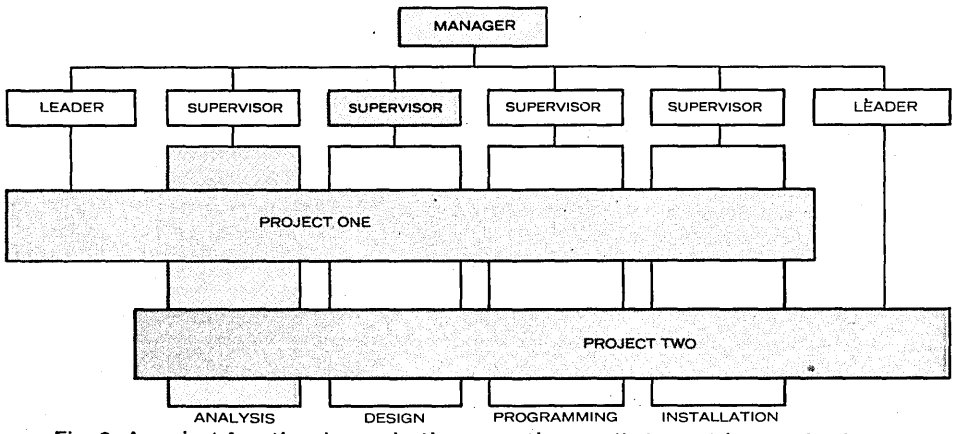


Fig. 3. A project-functional organization, sometimes called a matrix organization, can give the advantages of both project and functional structures, but it has to be handled just right. Its disadvantage is high overhead.

In the project-functional organization, each functional supervisor retains his responsibility for personnel development, standards, and research. However, for each project (system development or maintenance), a project leader is appointed, and he assumes the responsibility for seeing the project through from beginning to end.

It's important that in project-functional organization the project leaders report to the systems and programming manager through a line of authority which doesn't thread through the functional supervisors. Fig. 3 shows the project leaders reporting directly to the manager, and if the number of projects is small enough, this is a feasible approach. If the number is too large, then the project leaders report to one or more project supervisors, who in turn, report to the manager. If there's more than one project supervisor, the projects can be assigned on an application basis, which gives some of the user orientation flavor of the applications organization to the project-functional organization.

The reason for the separate reporting paths for project leaders and functional supervisors is that the purposes of project and functional groups are sometimes crossed. Only through separate reporting lines is the systems and programming manager guaranteed an objective enough report of any conflict to resolve it in the best interests of the department as a whole.

In general, each system development effort is large enough to justify appointment of a project leader to manage the effort. Some maintenance efforts also fit into this category. However, many maintenance efforts aren't large enough to justify a special project leader. As a consequence, it is not unusual to find a supervisor of small projects in a project-functional organization, who reports to the manager and who manages all these smaller project efforts. However, with the exception of his special work assignment, the supervisor of small projects functions in all other respects like a project leader. Similarly, a project leader's responsibility isn't necessarily confined to one development effort. If the development efforts are small enough, one project leader manages more than one such effort simultaneously.

Project organization is effected in one of three ways:

1. Individuals from the various functional groups are selected to serve on a given project team; they report to the project leader who plans and directs their activities.
2. The functional supervisors plan and direct the activities of their group members as they work on the various projects. The project leader of a given project sees that the planning and directing for his project in the various functional groups is coordinated in such a fashion that his project's goals will be met, on time, within cost, and according to specifications.
3. Some combination of the above two approaches: some people work directly for the project leader; others work on the project but continue to be supervised by their respective functional supervisors.

The first type of project organization is typical of small projects—projects involving no more than 15 or 20 people at one time. The second type is typical of large projects—projects involving hundreds of people. The third type is typical of medium-sized projects. Since the typical system development project is, by these standards, small, the first type of project organization is appropriate.

A person is a project leader only during the life of his project. When his project is complete, he returns to his position as analyst, designer, programmer, what have you. Thus, at one time a person can be a project leader on one project team, while at another time, he may be a team member on another project.

The purpose of the project-functional organization is to gain the advantages of functional organization without its disadvantages. The functional part of the organization maintains the emphasis on developing highly skilled specialists, while the project part provides the mechanism for effective control of project work.

Project-functional organization may be appropriate for a large, mature systems and programming department made up of several hundred professionals. A department with a smaller staff generally cannot justify the cost of several functional supervisors, or the duplication involved in several personnel development, standards development and enforcement, and research efforts.

Project-staff organization

Fig. 4 shows a schematic of a systems and programming department

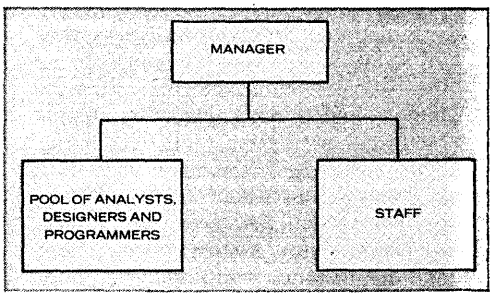


Fig. 4. The project-staff organization, shown here in its simplest form, puts special burdens on the manager.

with a project-staff organization. With this type of organization, the staff has the responsibility for personnel development, standards, and research. For each project, a project leader is selected and a project team is formed from the pool of analysts, designers and programmers.

If the number of projects is large enough, one or more project supervisors sits between the project leaders and the systems and programming manager. Similarly, if the staff is large enough, a staff supervisor sits between the staff and the manager. The existence of a permanent supervisor of small projects who draws his manpower from the pool, is also a possibility.

Project-staff organization is appropriate to a mature systems and programming department of too small a size to justify a project-functional organization. The weakness of the project-staff organization is that, in contrast to the case under project-functional organization, the people responsible for the enforcement of standards (the staff) have no line authority over people who should comply with the standards. Consequently, the systems and programming manager must see that the standards enforcement function is carried out properly. This is also true with application organization, where enforcement of standards is also a staff responsibility.

Finally, under project-staff organization, the systems and programming manager must personally assign personnel in the pool to projects and other appropriate activities.

The Computer Center

The objective of the computer center is to process data. To reach this objective the center must perform four functions.

1. process data
2. develop computer center personnel
3. develop and enforce computer center standards
4. research new data processing equipment and techniques.

The computer center shares the functions of personnel development, development and enforcement of standards, and research into new equipment and techniques with the systems and programming department. A common solution to these organization problems will be discussed below; first, let's concentrate on the function unique to the computer center, the processing of data.

The processing of data is a production operation, and for this reason, the appropriate organization for the computer center is functional.

What functions are necessary to production? In general, there are three:

1. the production function itself
2. the function of controlling the production process
3. the inventory function—supply of raw material and storage of finished goods

The Computer Center should then be organized into three functional areas:

1. the Computer Floor, on which the data processing equipment is located
2. a Control Room, which controls the flow of data before, during and after processing on the Computer Floor
3. a Library, which stores files, programs, operating instructions, and all supplies, such as blank tapes and forms, used in the production process on the Computer Floor

These three functional groups are shown symbolically in Fig. 5. Also shown in this figure is the computer center's customer, the User, and one of its suppliers, the Systems and Programming Dept. The arrows in Fig. 5 show the flow of material (primarily information) between these groups. The arrows are lettered to key them to what follows:

1. Specifications (A) for a data processing system flow from the User to the Systems and Programming Dept.

2. The Systems and Programming Dept. develops programs and operating instructions (B) to implement the system on the Computer Floor. These programs and operating instructions are turned over to the Control Room, which reviews them for completeness and useability. When they have been deemed acceptable, they're stored in the Library.

3. With help from the Systems and Programming Dept., the User's data files (C) are converted to the form required by the new system. These converted files are catalogued into the

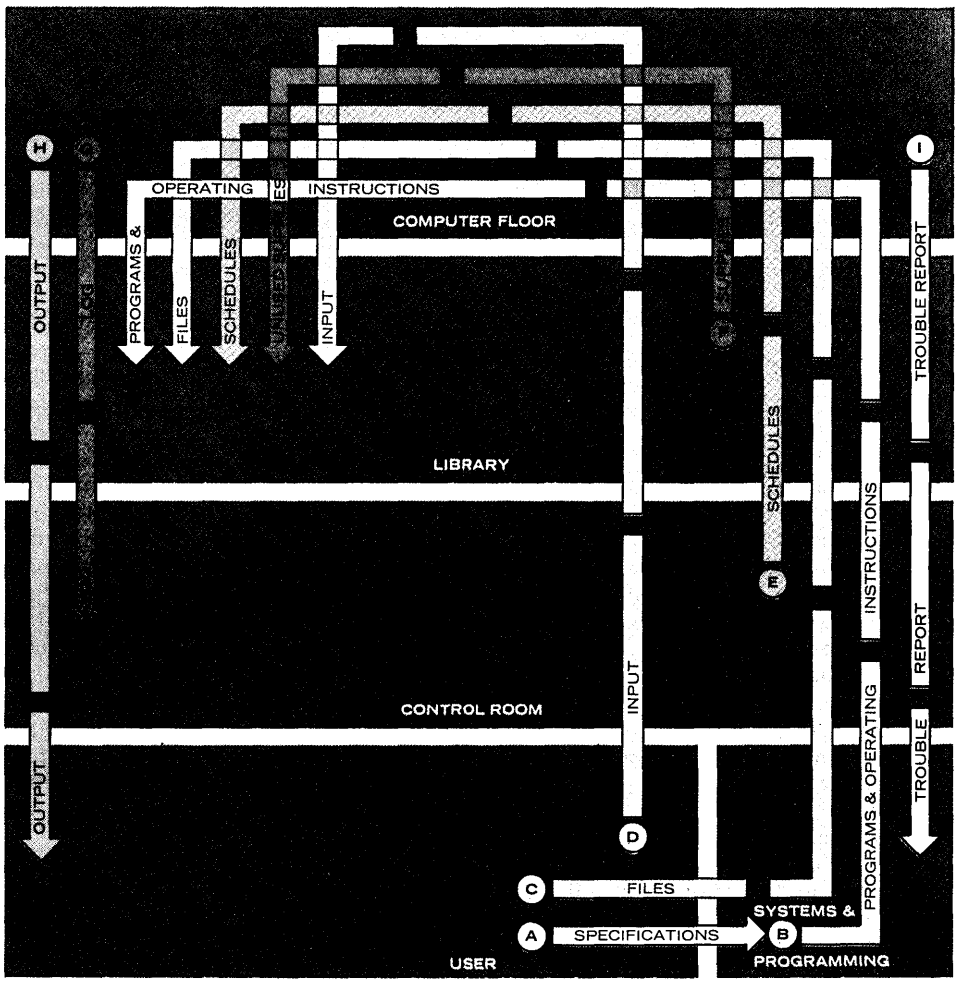


Fig. 5. The processing of data is a production operation; consequently, the appropriate organization for the computer center is functional. This simplified work flow and interface diagram shows the functions involved.

Library under the supervision of the Control Room.

4. On a predetermined schedule, the User submits system input (D) to the Control Room, which reviews it for completeness and useability.

5. The Control Room then attaches a Computer Floor schedule (E) to the input and passes these to the Library together with an indication of what files, programs, operating instructions, and supplies are needed to process the input on the Computer Floor.

6. The Library attaches the indicated files, programs, operating instructions, and supplies (F) to the package received from the Control Room and delivers the resulting package to the Computer Floor.

7. The Computer Floor uses the input, files, programs, operating instructions, and supplies to do the processing indicated by the schedule. The Computer Floor then returns to the Library the input, updated files, programs, operating instructions, and unused supplies, such as unused forms and to-be-blanked tapes, together with a log (G) of the processing performed and the output (H) produced on the Computer Floor.

8. The Library checks the package returned by the Computer Floor to be sure it has received back everything it should. It then catalogs the input (for temporary retention until no processing or legal restrictions prevent its destruction), files, programs, operating instructions, and supplies, and passes on to the Control Room the output and the log.

9. The Control Room checks the output and the log to see that processing has been done properly. It then files the log and passes the output on to the User.

10. If the Computer Floor runs into processing problems, it passes a trouble report(I) back through its channels of the Library and the Control Room to the Systems and Programming Dept. The Control Room sees to it that a response is forthcoming in the form of modified programs and operating instructions, which are reviewed and catalogued. The aborted processing on the Computer Floor is then reinitiated.

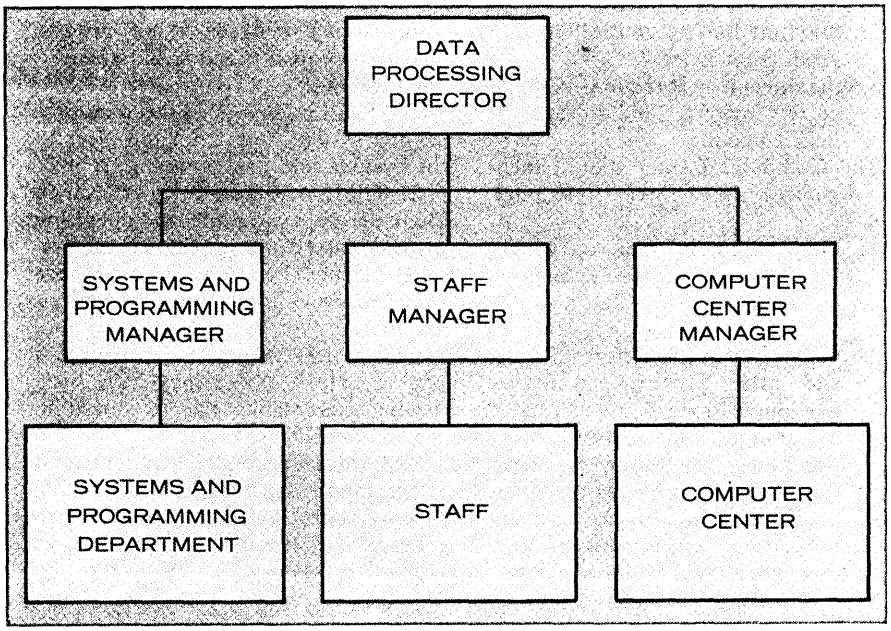


Fig. 6. In the ideal division, the staff manager and the computer center manager sit at the same level as the systems and programming manager. The real world doesn't often work this way, yet.

Organization of the computer center on a functional basis automatically provides for many aspects of processing security:

1. Division of duties—the group that prepares the processing (the control room) is distinct from the group which performs the inventory function (the library), and both these groups are distinct from the group which does the processing (the computer floor).
2. Limited access — few people need access to the control room, even fewer to the computer floor, and the library can be the most secure area of all.

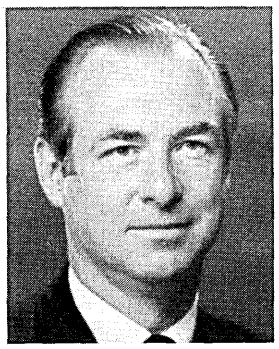
The Staff

The computer center and the systems and programming department share the responsibility for personnel development, development and enforcement of standards, and research into new equipment and techniques. This suggests the data processing division organization shown in Fig. 6, where the personnel, standards and research functions are performed by the staff. The computer center then concentrates on processing data; the systems and programming department, on developing and maintaining systems. With this type of division organization, the systems and programming department can be organized on either an application or pool basis.

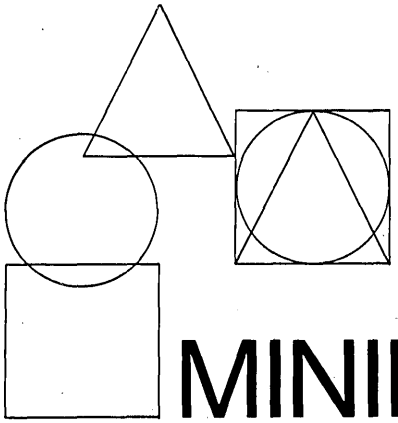
Notice in Fig. 6 that both the staff manager and the computer center manager sit at the same level as the systems and programming manager. This is appropriate, since both the staff and processing functions are as important to the data processing division's success as the system development and maintenance functions.

Conclusions

Good men will usually get their jobs done regardless of the organizational structure they find themselves in. But good organizational structure, consistent with the objectives and functions of the group, can provide the support necessary to make good men superperformers, to transform the average man into an exceptional one, and to turn the mediocre into producers. Although the range of feasible possibilities may not be large, the advantages to be reaped by management with good organization are considerable. □



Mr. Gildersleeve has been a consultant for the past five years, specializing in conducting organization studies, and in developing project management procedures and system development standards. His clients have included very large banks, oil companies, publishers, communications companies, and computer mainframe manufacturers. He also conducts workshops on both project and dp division management, and is the author of "Data Processing Project Management" (Van Nostrand Reinhold, 1974). He previously worked for Univac for 14 years.



100% uptime is an unreasonably expensive goal; a better one can be derived from day-to-day operating statistics.

DESIGNING FOR MINIMUM DOWNTIME

by Lars Persson

WHY SHOULD YOU ACQUIRE a backup computer? Because it is a requirement? Because the competitors do it? Because it is a real-time computer? All of these are weak arguments for huge investments. The only reason to duplicate anything is to save money by doing so. And the only savings you can achieve here come from avoiding the expenses caused by outages. Let me ask one question: "Do you require 100% uptime in the sense that the system should never fail?" If you say "yes," you might be able to save a few million dollars for your company by reading further.

We are surrounded by technical devices which almost never fail, such as telephones, tv sets and watches. Some of these things are less reliable than others, but breakdowns are accepted if they occur rarely. You might think it is reasonable if your tv set fails once in five years, but if your real-time computer is out every second day, you start grumbling and think people in the computer area know nothing about how to handle the problems.

One should remember, however, that increasing complexity often means decreasing reliability. A good measure of the complexity of a system is the number of components included. How many more components do you think your real-time computer has compared to your tv set? Perhaps 10,000 times more? If you answer yes, then a simple calculation can tell that it should fail every fourth hour. I am not trying to indicate that this is a normal figure for computer performance. I just want to say that the requirement for 100% uptime is really a tough demand.

One can do a lot to improve uptime. One can duplicate the hardware, install an Uninterruptible Power Supply (UPS), even run a second site as a backup installation. But he would still not be up to 100% uptime and, I bet, will never get there. But while he tries, it will be rather expensive for his company. It may be cheaper to accept some downtime and have the organization live with it.

In short, irrespective of how much one invests to avoid downtime, he will never get rid of it entirely. And this leads to the first of two difficult questions which this article will try to answer: "How much will my downtime be decreased by an investment in facilities or equipment to duplicate my present computer?"

Collecting statistics

To answer this question, the manager will have to organize the history of his installation's experience along statistical lines. The first summary he should produce is a graph of system outages. I suggest the following method (see Fig. 1).

Let each line represent one day, and let a full sheet contain 31 lines to equal one month. A horizontal scale indicates the time of day. Now mark the time and duration for every outage. Be careful to get all kinds of outages: circuits, concentrators, and terminals, as well as computer outages. Try to report the average number of outages. If, for example, you have three remote concentrators, pick one of them and report the outages. If the three are very different, try to simulate something that looks like an average performance. (Complex networks will create difficulties here, but as you know all of the particulars, find a suitable definition.)

I recommend this exercise be performed for a period of at least three months. The months may be chosen at random. Then have a look at another couple of months, one really bad one and a really good one, just for comparison.

If scheduled outages are less harmful to users than unscheduled ones, you may earmark them if possible. It is up to you to define what you mean by "scheduled stops." Just make sure that scheduled stops are no more expensive in terms of cost per hour than unscheduled ones.

Now mark what you consider to be Expected Working Hours (EWH), the particular hours when you operate. Within that frame you can count Number Of Stops (NOS) which will give Mean Time Between Failures (MTBF) for the whole system as seen from a user's point of view. Also by adding all the Outage Time and dividing the total by the Number Of Stops, you can get the Mean Time To Repair (MTTR), and finally your percentage uptime:

$$\text{MTBF} = \frac{\text{EWH}}{\text{NOS}}$$

$$\text{MTTR} = \frac{\text{TOT}}{\text{NOS}}$$

(TOT = Total Outage Time)

$$\text{Percent downtime} = \frac{\text{TOT}}{\text{EWH}} \times 100$$

Percent uptime = 100% − percent downtime

You may be astonished when you see your MTBF. We were when we saw ours.

Here is another suggestion: Take all your stops, sort them in order of duration and list them, stating the reason for each stop. I suggest the following possible list of reasons:

- software including utilities
- application programs
- cpu
- peripherals
- circuits
- concentrators and terminals
- configuration changes
- operator mistakes
- other manual mistakes
- power air conditioning
- fire, water, sabotage
- unknown

Most of the stops will probably fall under the first two headings. But where do you have your long stops? The long stops probably are the important ones and they indicate where to attack your problems.

If the human mistakes appear to be few, persons other than operators should record the statistics in the future; and in case the "unknown" figure is zero, your troubleshooters should either get a reward for excellence or get fired for lying.

From the duration list one can make a graph as shown in Fig. 2. Here each peak indicates the number of stops of a certain duration.

MTTR for a system and for a unit in

a duplicated system is not the same. There is not even any dependence. I have seen a power interrupt of 0.1 sec cause an outage of two hours for a system. On the contrary, a hardware error in a duplicated cpu could just cause a switchover, and the system is up again within a few minutes. If this does not happen, possibly not only the hardware but also the data base recovery system (software) may be to blame. The repair time for the cpu itself might well be five hours, perhaps even more.

What we really want out of all this, is a graph of downtime per year versus investment. We already have one point on that curve since we calculated our actual percent downtime; and we should know, at least after consulting our accounting deparment, the total cost for the present installation.

We can work in two ways with this graph. We can either estimate what some other precautions will give us and how much they will cost, or we can tell about the bad performance we should have had if it were not for our excellent Uninterruptible Power Supply and the standby compressor in our centralized air conditioning system.

In both cases, the technique is basically the same. The difference is that the first method asks for some experience which we do not have and therefore we have to substitute facts with estimates, while the second method could easily be built up from our statistics.

How expensive is backup?

So let us make a list of the things which we wish to study and, for example, take UPS, the diesel-powered generators (assuming they are not a part of the UPS), and the spare compressor.

Yes, I realize most people are more interested in a duplication of the cpu, a spare disc drive and another front-end communications processor. Unfortunately computer manufacturers do not give figures indicating the MTBF for their equipment. In this regard they differ completely from aircraft manufacturers. Many aircraft components are sold with a guarantee of reliability which is given even before the components are manufactured. There is a design goal for MTBF as well as for performance of any other type. I think that computer manufacturers will eventually have to change their attitude and disclose performance figures.

Table 1 presents an example of a cost/performance calculation. To get the figures for outages per year for a device, I have used the formula:

$$\text{Outages (hours per year)} = \frac{\text{EWH} \times \text{MTTR}}{\text{MTBF}} + \text{scheduled maintenance}$$

To calculate the outages due to power failures, the performance of the main power equipment must be known and the figures treated accordingly. Remember that even extremely short power breaks might really impair the system. Unfortunately big power plants never worry about disturbances of less than several seconds, so their statistics are of little value.

The last column in Table 1 indicates a considerable difference in performance improvement per dollar investment among the three examples. If a choice must be made, the obvious ones would be those giving the best improvement per dollar first. I have already sorted my list of devices in order of improvement per $1,000 of investment.

Now we are close to the answer to our first difficult question, and that answer is shown in Fig. 3. I have arbitrarily chosen 50 hours per year for the lowest point of the curve. This figure will differ according to calculations based on other system downtimes per year.

The "ideal" limit

If more points have been calculated, the curve will probably look more like the following formula:

$$D = D_0 \cdot e - \frac{x}{A} \qquad \text{(See Fig. 4)}$$

where
D_0 = 130 hours per year
and
A = $200,000

which would be a reasonable approximation.
D_0 and A are important constants for an installation and I recommend you estimate a minimum value for A from your graph.

Outage costs

Now to the second of the two questions: "What is the cost of an outage?" If you insist on saying

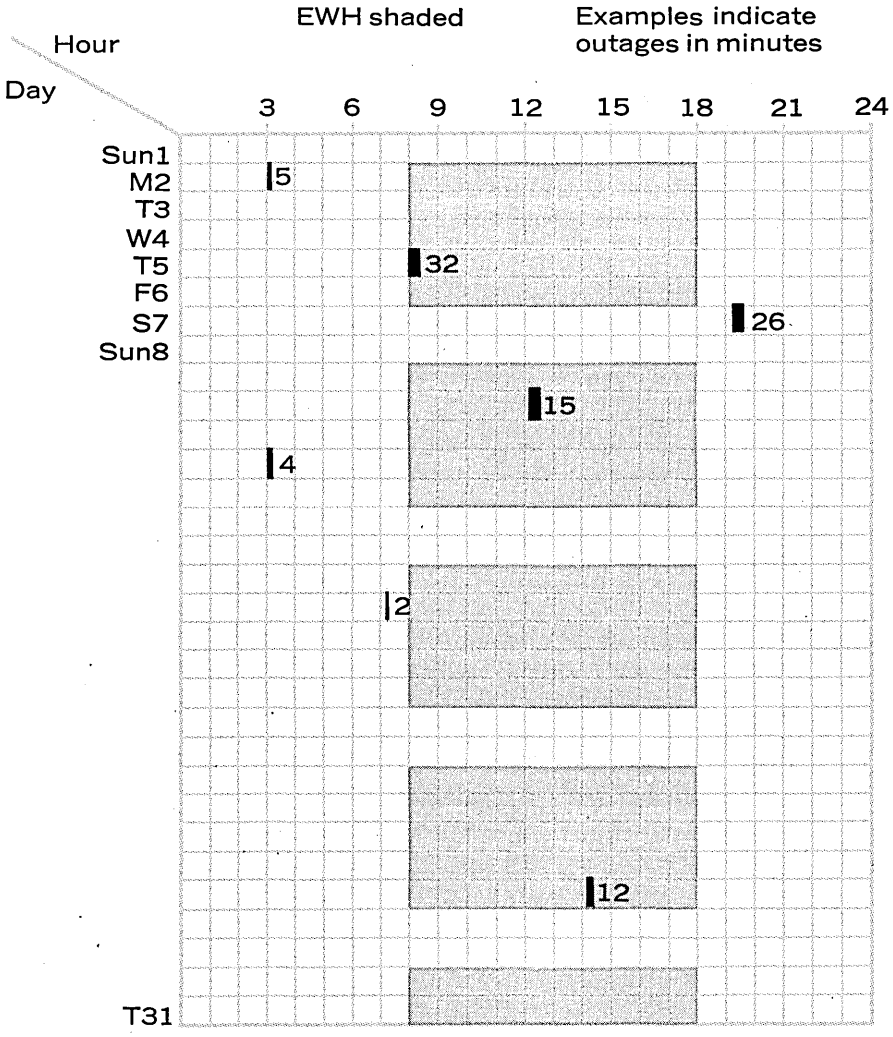


Fig. 1. The first step in calculating how much outages cost, and what to spend on hardware redundancy, is to collect statistics on all kinds of outages. The shaded portion of the form used for this purpose represents working hours; the dark numbers, minutes of downtime.

that you do not know and you will not even try to find out, I will insist on my suspicion that you have been investing the money of your company for a second cpu just to be able to show your own management that you are capable of giving them a high uptime, which is not always the same as a good uptime.

You might be right in your feeling that a second cpu was needed but you have no facts whatsoever behind the multimillion dollar investment necessary to get it. And you have no facts either behind your decision not to make another safety investment of the same size, such as employing a few more systems programmers.

I can see you wriggling while trying to say that it depends on so many things. For example once you lost $10,000 just because of a computer stop, but it happened just once, and you do not know how to get any average out of that.

Let us see, how many stops have you had since you started that application? (Just multiply the average number of stops per month by the number of months until now.) It happened to be exactly 1,000? That means an average $10 per stop. What is the average length of your stops? 15 minutes? That means $40 per hour outage.

What you have done now is that you have taken the cost of an unlikely but rather expensive situation and multiplied that cost by the probability that this situation should occur in connection with a stop. You now have the average cost per stop. Finally you converted it into cost per hour by dividing it by your average stop duration. Now add the cost per hour figures for all the rare occasions you have found, and also for the ones you feared, and you have the first part of the total outage cost figure.

You can use this method also for costs which are not related to any stop. Just pretend there was a stop of duration zero. But you should forget about small figures like the one above. If you need a second computer of any considerable size, your cost per hour is of another order of magnitude.

Then try to catch tangible costs like overtime payment, loss of interest and other solid costs meaning real money out of your pocket. These costs are easier to find; just look into the cost accounts for yourself and for your user.

Finally, estimate carefully the risk of a lost opportunity for good business and similar intangible things. Now try to add them to an average cost per hour of outage. Did you say that short stops like a minute or two will not cost you anything? I was afraid you would say so because that means that you would have to reconsider your downtime and go through your statistics again, omitting stops which are so short that the costs are negligible.

I hope you can agree with me that there is something called average cost per hour for the rest of the stops, and that it is much easier to make these calculations if we can allow ourselves some approximations. It is better to accept approximations and use them as indications than not to calculate them at all since exact calculations are too difficult.

Many of your precautions will

Device	System outage hours/year			Cost for unit in $1,000s	Hours improvement per $1,000
	With this unit	Without this unit	Improvement		
Spare compressor	.06	45	45	$ 45	1
UPS	2	24	22	$110	.2
Diesels	0	5	5	$100	.05
		Total:	72	$255	

Table 1. It is possible to determine how many hours uptime each investment in equipment has yielded, showing which expenditures have the greatest leverage. Presumably it is most helpful to study the operating statistics of shops which have already made the investments.

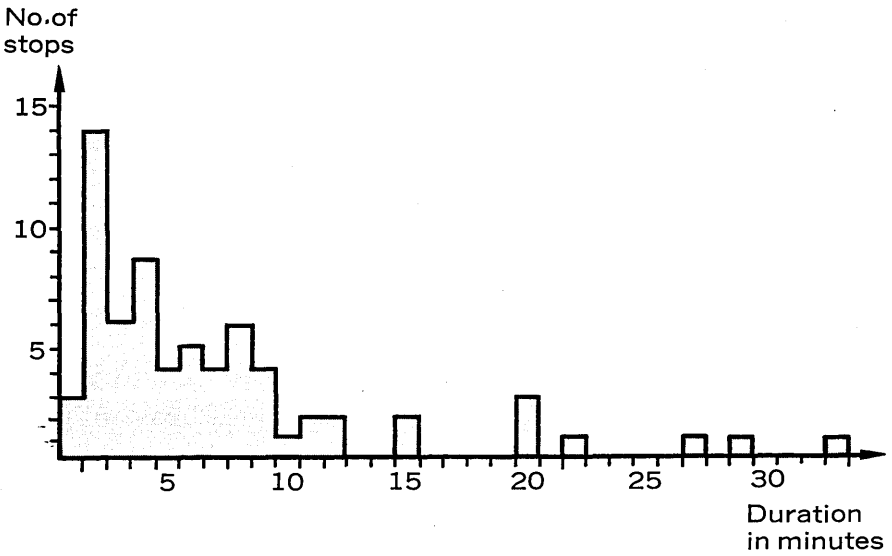


Fig. 2. Step two is to collect data on how much time is usually lost due to an outage.

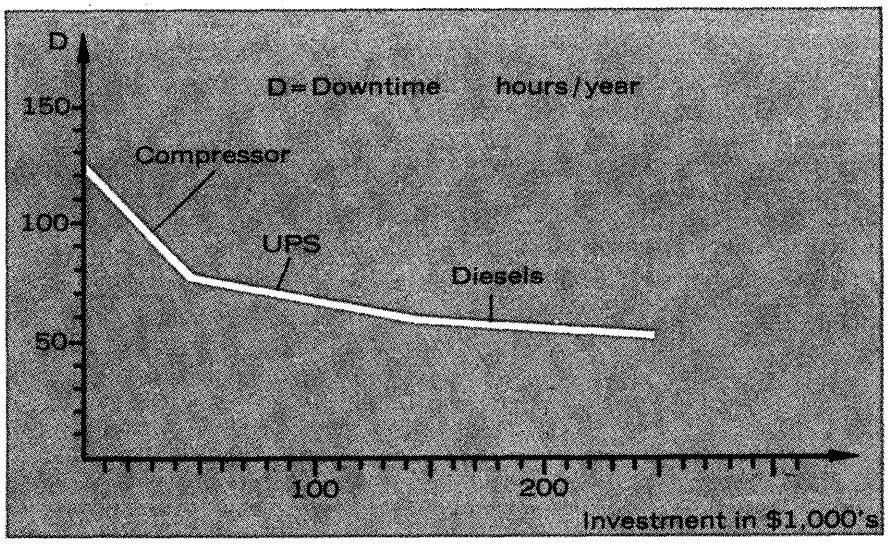


Fig. 3. Each piece of backup equipment will contribute something to system reliability, but there is a diminishing return on investment. In the case shown, investments beyond $200,000 yield very little in additional reliability.

transform a stop from a long one to a short one, for example, adding another cpu, but the number of stops will be the same and your MTBF will not improve. It may even be worse if you introduce too many new components. Unless, of course, you agree to change your definition of a stop, as I hope I persuaded you to when you agreed not to include short stops in your calculations.

Other precautions will substantially change your MTBF, such as, software improvements and redundant units sharing the load.

Duplication of the cpu is just one of maybe one hundred actions you can take to improve your uptime, and it is most likely not the first or most urgent one to take.

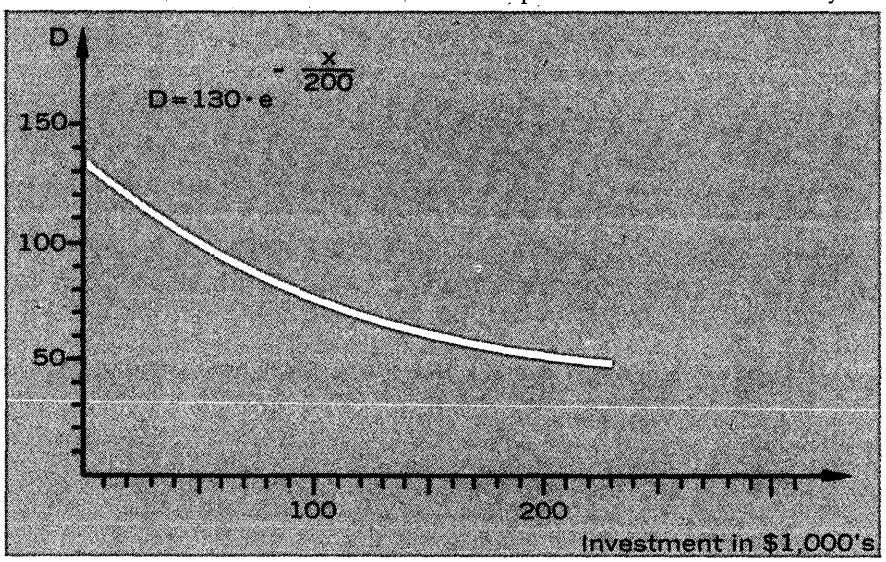


Fig. 4. It is possible to formally calculate the limit of reasonable investment in backup hardware; the plot will look very much like the empirical data graphed in Fig. 3.

There is something we can call optimum downtime, which is the best goal you can settle on. Let me explain it in this way. Too low an uptime means expenses for outages. Too high an uptime means that you have paid much more for protection than you will ever get back in terms of lower cost for the outages.

Here are some formulas which are usable to find your best strategy. Your optimum investment X_{opt} can be found from the formula

$$X_{opt} = A \cdot \ln\left(\frac{C \cdot D_o}{A \cdot T}\right)$$

Here C is the cost per hour of outage, D_o is the downtime per year without any precautions, T, is a factor which depends on the length of the expected depreciation period and the rate of interest used for the calculation. A depreciation period of five years and 10% interest gives T = .273. Finally, A is an improvement sensitivity factor which can be estimated as in Fig. 4, where A appears as the denominator in the exponent of

$$D = D_o \cdot e^{-\frac{x}{A}}$$

(in Fig. 4, A = $200,000)

If you have made that investment you can expect a downtime per year of

$$D = \frac{A \cdot T}{C}$$

and you should not try to get a better uptime than this because that would be too expensive to be worthwhile.

Let me give you some figures as an example. Let us assume that your outage cost is $10,000 per hour and that your improvement sensitivity factor A is $1 million. The value of D_o is dependent upon the computer vendor you chose. I will use 1,000 hours downtime per year as an example. If you think this figure is too high, you can just use your own slide rule and recalculate my figures.

$$X_{opt} = \$1{,}000{,}000 \cdot \ln\left(\frac{10}{.273}\right)$$
$$= \$3.76 \text{ million}$$

$$D_{opt} = 27.3 \text{ hours per year.}$$

This means that you can pay up to $3.76 million and still get your money back in five years with 10% interest. You will get a downtime amounting to 27.3 hours per year. Do not try to "improve" this figure; you will just lose the money.

If you have a batch system, your C figure (cost per hour outage) is probably very low. If it is less than

$$\frac{A \cdot T}{D_o} \text{ (in this example, \$273 per hour)}$$

you should not invest in any redundant equipment whatsoever, not even in a spare tape drive.

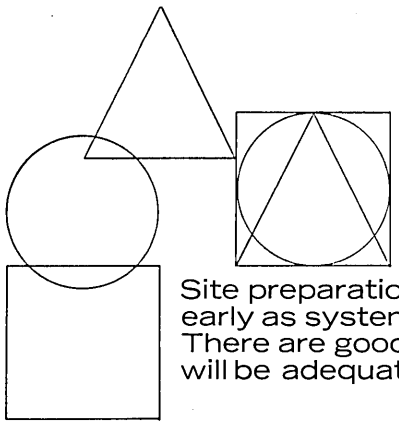
The most important message of this article is that there is a goal for uptime which is not zero, a goal which will give the best possible performance from an economic point of view. This goal can be calculated, but it is necessary to collect information from which the improvement expected from a certain investment can be estimated. It is also necessary to know what this improved uptime will give in terms of lowered cost for outages.

Once this information is collected, which is not easy, you can use the formulas above to calculate how worthwhile it is to spend on improvements and what uptime that will give you.

Remember that the formulas are approximations. If you think you will need better accuracy, you should solve this problem graphically but you will have to collect the numbers anyway. If you have a friend with a shop similar to yours who will share his statistics with you, ask him for his daily run sheets. Don't feel frightened when he comes up with a stack of papers three feet high; it is a sort of a gold mine. The more operating history you can collect, the better your estimates will be.

I leave you here with perhaps some new problems. You may have realized that your statistics were not what they ought to be. I hope though that I have provided some new tools which are usable when you have to convince your management that your uptime should not be higher than what it is today. □

Mr. Persson is a technical consultant with the data services department of Scandinavian Airlines Systems. He has an M.S. from the Inst. of Technology in Stockholm.



Site preparation must begin as early as system selection, sometimes earlier. There are good ways to assure facilities will be adequate; overbuilding is not one of them.

FACILITIES PLANNING

by David A. Reisman

All too often the planning of an adequate site for a computer center takes a back seat to the selecting of computer equipment, system and software design, and to other activities. Facility siting issues are frequently slighted until a problem becomes evident after the entire system is operational. Unfortunately, post-installation solutions are more expensive and riskier once operations begin. The importance of proper and early facility design cannot be overemphasized.

Problems that designers encounter when planning a new facility include:

1. Specifying power and air conditioning requirements for a computer system in the evaluation stage.
2. Selecting an economical and reliable auxiliary power generating system.
3. Deciding to use overhead or underfloor air distribution.
4. Designing grounding, static electricity, and acoustics systems.

These problems can be solved through special design preparation in the early planning stages. At Teleprocessing Industries, Inc., a subsidiary of Western Union Corp., we were assigned such a task as part of a modernization program. The job included doing the system design, software design, hardware design, installation, integration and testing of WU's message-switching computer complex, InfoMaster*, at Middletown, Va. This facility handles Mailgram, telegraphic, teleprinter and other related communications traffic.

*This is a trademark of Western Union Corp.

Phase I of InfoMaster was launched in the late Sixties. There were originally four switching centers. (At present there are three—in New York, Chicago, and San Francisco—one in Atlanta was retired in 1972 after the Phase II InfoMaster absorbed some of the Phase I traffic.)

InfoMaster (Phase I)

A typical switching center configuration included three Univac 418-II processors, each with 65K of memory. One was the processing computer, one the communications computer, and the third a backup. In addition to computer-controlled Telex and TWX traffic, each center handled Info-Com, a record communications system for businesses on which each user has a private network.

In setting up Phase I centers, we used existing buildings and facilities. Space was remodeled to accommodate computers, peripherals, and the communication equipment. Building air conditioning was already in, but had to be upgraded to handle the additional heat load of the equipment and personnel. A decision had to be made to upgrade existing central systems or to go with the free-standing room air conditioners.

We decided to upgrade the central air conditioning equipment since space was tight and the free-standing units could not have been easily accommodated. We also decided to go with available commercial utility power, because brownouts were still rare. We felt that the reliability of utility power would be high in the heart of large cities.

Through the late Sixties and into the Seventies these assumptions held up. Power requirements for typical Phase I Center were relatively small, about 55 to 60KW and 15 additional tons of air conditioning. Three of the four centers had ceiling-supply air, the other had an underfloor plenum.

Phase II

Early in 1970 Phase II InfoMaster began to take shape. The first Phase II center was to be the world's largest commercial communications/computer center with a capacity for over a half-million messages per day. There was no existing building which had to be remodeled to accommodate new equipment. We had complete flexibility to design and install air conditioning, power, and grounding systems.

The first problem at the outset in the design for the center was to specify power and air conditioning requirements for a system not to be cut over for two years. However, since the building had to be built, these requirements had to be identified early. An estimate was made of what the ultimate equipment configuration would be, and based on this estimate, the total power and air conditioning requirements were figured. The estimates turned out to be conservative.

Details of the complement and configuration of a Phase II center are shown in Fig. 1. At Middletown we have three Univac 1108s and three 418-IIIs connected through intercomputer couplers. The front-end equipment consists of C2000 preprocessor multiplexors of our own design. Traffic from a C2000 preprocessor is fed to

the 418-III for input to the 1108 processor. Two pairs of machines are always on-line, another stands by as a backup machine and can be used for off-line batch processing.

Tied to the 1108s through Shared Peripheral Interfaces (SPIS) and transfer switches are twelve 432 drums, twelve 1782 drums, six Fastrands, 35 tape drives, four 1004 processor printers, and two Data Products printers. There are three C2000s tied to the 1108 to accommodate traffic from international carriers and public telegrams phoned into central telephone bureaus. Each 418-III's peripherals consist of a Univac 6C tape drive, three unitized channel storage subsystems, and 16 C2000 preprocessor multiplexors. The C2000 front-ends are arranged in four groups of three, each group backed up by one reserve C2000 which can be switched in and out of the group by a peripheral device line switch (PDS) also designed by us.

The entire equipment complement is controlled by Teleprocessing's master console (L1000) providing for display and control of the site's configuration. Any cpu or peripheral can be switched from this master console, allowing configuration changes with relative ease. The console also monitors environmental conditions such as temperature and humidity, and special fault and warning signals from the computers and peripherals.

Power generation

Power requirements were estimated at 700 KVA plus contingency for expansion. On this basis, 800KW diesel generators were specified. Three 800KW diesel generators were ordered with the idea that one unit would drive the computer equipment, the second unit drive the housekeeping load or be a standby in the event the first one malfunctioned, while the third could be down for maintenance. The total equipment load now is under 400 KVA which can create an undesirable situation since running a generator under too low a load can result in increased maintenance difficulties. In this case, the high estimate was partly due to the still undefined system design. Only about 25% of the overage can be attributed to unknown system factors, the other 75% must be attributed to ultraconservative power consumption figures provided by Univac. Univac had not completed the power-consumption tests they were conducting in time for us to use the results.

The facility designer should learn from this experience not to depend on available documentation but to plan on submitting his best estimate of the equipment, either with or without power estimates, to the computer manufacturer for concurrence. Naturally, since power requirements were overestimated, so were air conditioning requirements.

Fortunately, the Middletown facility was designed to accommodate future expansion. The computer center has an expandable wall, the five acre plant site can be readily expanded to nearly 200 acres. Any future expansion could easily be absorbed by present power and air conditioning equipment.

There are many trade-offs which confront the site designer early in the preconstruction period, for example: (1) Should the center operate on commercial power or by auxiliary diesel generators? (2) If diesel generators are used, what fuel? (3) Should the equipment be capable of operating on natural gas as well as on diesel fuel? (4) Should air distribution be overhead, underfloor, or a combination of these?

Auxiliary power

If reliability is not a consideration, then utility power is least expensive—that is if there is no energy crisis. Since InfoMaster was to be tied to 100,000 terminals throughout the country, and since it would be initially switching 250,000 messages/day with a goal of doubling that figure, reliability was of paramount importance. Since the Middletown center was planned to be on-line seven days a week, 24 hours a day, the decision was made to use auxiliary power.

The question arose: Why not have the auxiliary equipment available for power failures, but operate normally with utility power? At the time, this was not the most economical approach.

When the utility company servicing Middletown was advised that the facility would require 800KW, they indicated this was more power than was available in that entire area. Therefore, in order to provide utility service for the center, a monthly electric energy demand charge was imposed, regardless of whether the center used the utility power at any given time. This was necessary to have utility power available as an additional standby.

Looking at the costs of auxiliary power versus commercial power (Fig. 2), the least expensive approach was to run one 600KW generator on dual fuel, diesel or natural gas, to drive the entire facility at a cost of $7,100/month.*

INFOMASTER-PHASE II HARDWARE CONFIGURATION

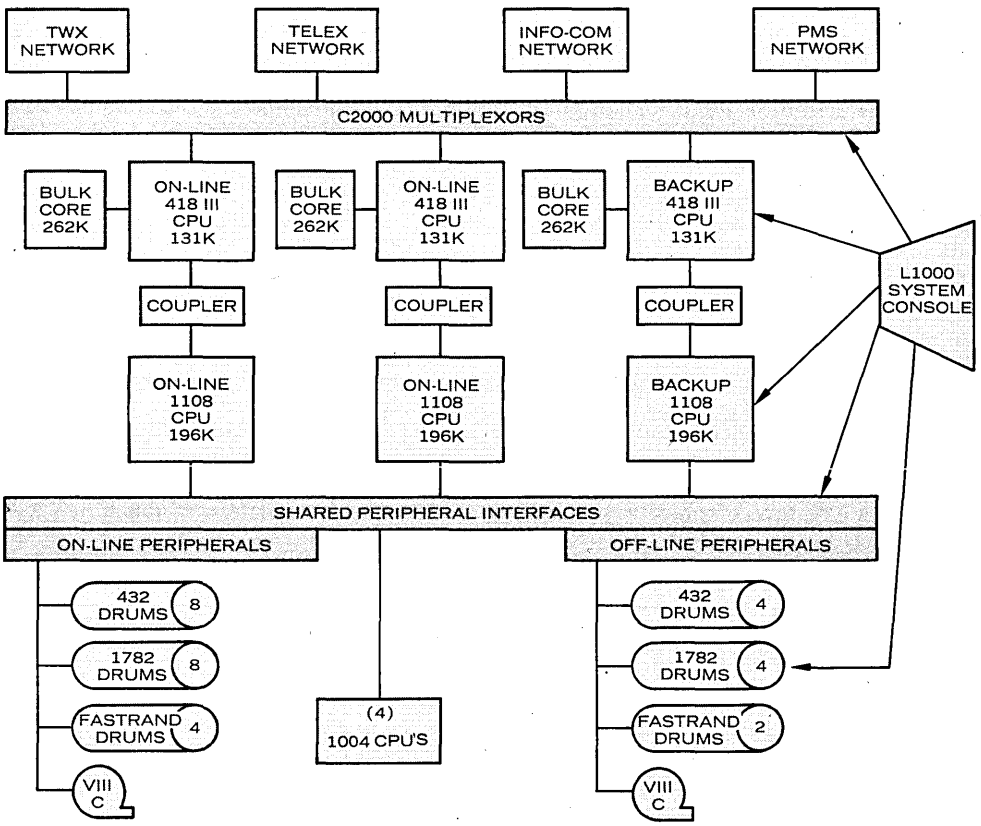
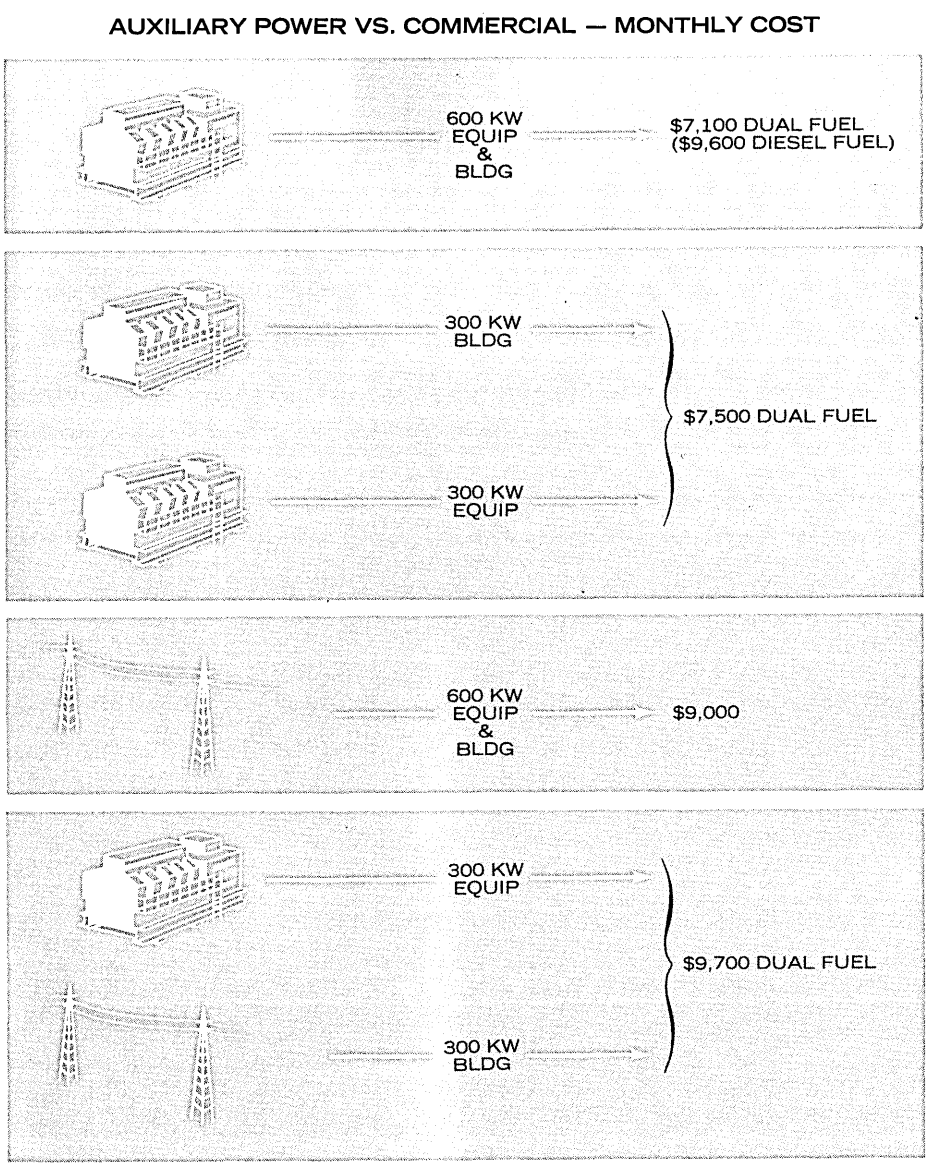


Fig. 1. InfoMaster centers are designed to accommodate over a half-million messages per day on TWX, Telex, telegram, and specialized business message service networks. The centers have three sets of Univac 418s and 1108s.

*See note on all costs at bottom of Fig. 2, opposite page.



*NOTE: These cost figures were valid prior to the recent energy crisis. For comparable costs today, the figures must be adjusted in accordance with actual fuel costs now being charged.

Fig. 2. In choosing between on-site auxiliary generators and commercial utility power, several trade-offs must be made, especially between the monthly costs shown and reliability. Dual on-site generators appear to be the best choice for a site of this size.

Running purely on diesel fuel would cost $9,600/month. The least expensive approach was a single generator using dual fuel. This, however, was not the most reliable approach; any problem that took down the generator would most assuredly knock the system off the air until the second engine could be started and power transferred.

The next approach was running the computer equipment on one generator and the housekeeping load on the second generator using dual fuel. This costs approximately $7,500/month. To run the entire building and its equipment on utility power would cost about $9,000/month. Each approach includes the $1,600/month electric energy demand charge.

The fourth and most expensive approach was to run equipment on one generator and the building load on utility power. This costs about $9,700/month. It appeared that the optimum approach considering both reliability and economics is to run one generator for the computer equipment and the other for the housekeeping load with dual fuel.

The ultimate in power reliability is an Uninterruptible Power System (UPS). UPS provides well regulated power and is 100% uninterruptible regardless of a utility failure or a failure in auxiliary power generating equipment. The second InfoMaster facility, in Bridgeton, Missouri, will have an uninterruptible power system.

Air distribution

The air-distribution system for the center has the air supplied into an over-head plenum. From there it is pumped down through the ceiling and dispersed into the room to provide the required ambient environment. It mixes with the right amount of outside air and is returned to the air handlers and cooling coils.

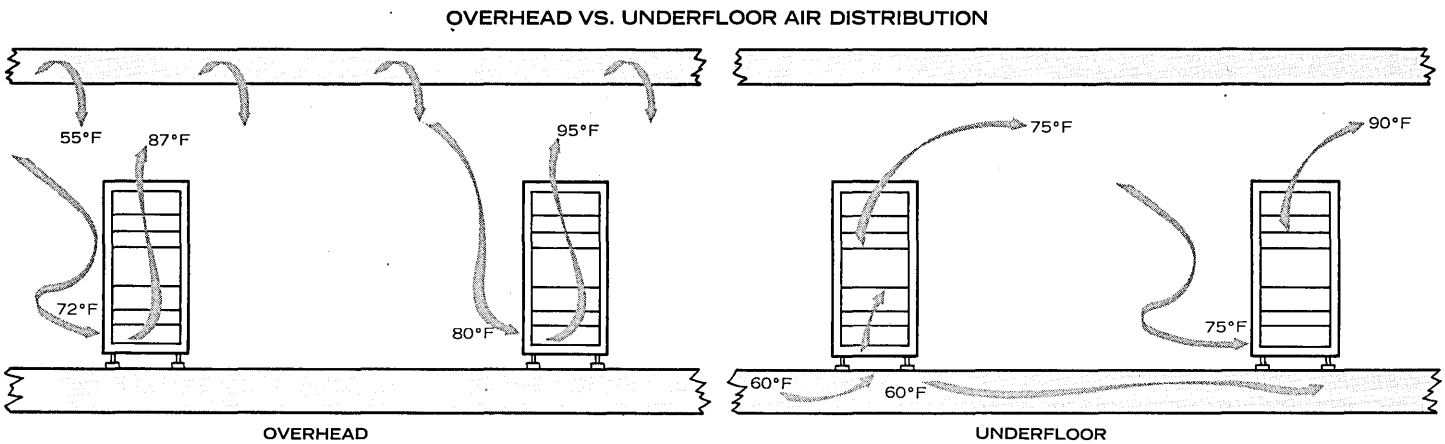


Fig. 3. How air is to be distributed is a separate problem. Overhead and underfloor plenums each have advantages. Underfloor ducting, for instance, is less susceptible to bad effects from short-circuiting (where the exhaust of one piece of equipment is swept into the intake of another).

Overhead air systems have both advantages and disadvantages. In an overhead system the air enters the equipment at the nominal room conditions. If the computer room is to be maintained at 72°F. and 50% relative humidity for operator comfort, that is how the air enters the equipment for cooling purposes. Normally, this should not present a problem if hot spots are avoided.

On the other hand, an underfloor system can provide air to the equipment at 55°F. and 95% humidity. This is not acceptable for Univac equipment; the 1108 requires cooling air no lower than 60°F. and no higher than 70% humidity.

Therefore, when using underfloor cooling the air must be reheated prior to entering the plenum to raise its temperature to specifications. Alternately it can be united with room air before the air enters the equipment.

For equipment that is temperature-sensitive and requires cooler air, an underfloor supply can work well. The underfloor system requires better filtering since the likelihood of dirt entering the false floor is greater, unless the floor panels are sealed tightly. Normally, with overhead systems, operator comfort is better and there are fewer complaints about cold air at ankle level. The overhead system normally results in more pronounced hot spots than the underfloor system. An underfloor system is less susceptible to the effects of short-circuiting of air; that is, the exhaust of one equipment swept into the inlet of another (Fig. 3). Although this can happen in an underfloor system, the exhaust could be around 10° colder than the same exhaust in an overhead system. The overhead system results in the equipment being affected by changes in the ambient conditions, whereas, the underfloor air distribution system can accommodate ambient changes with little effect on equipment cooling.

It becomes obvious that the decision to use ceiling or underfloor plenums is not obvious. The trade-off that the facility designer must consider is which approach offers more advantages (or less disadvantages) for his particular application. These relative advantages and disadvantages are listed in Table 1.

	OVERHEAD	UNDERFLOOR
MAY REQUIRE REHEAT OF SUPPLY AIR	NO	YES
GREATER OPERATOR COMFORT	YES	NO
MAY REQUIRE SPECIAL FILTERS	NO	YES
MORE SUSCEPTIBLE TO HOT SPOTS	YES	NO
AIR SHORT-CIRCUITING PROBLEMS	YES	NO
CHANGES IN AMBIENT EFFECT EQUIPMENT	YES	NO
LENDS ITSELF TO ACOUSTICAL TREATMENT	NO	YES

Table 1. Overhead vs. underfloor plenums.

Air conditioning

A facility designer needs to determine the approximate air conditioning capacity required prior to performing the rigorous calculations. A rough estimate may be made in minutes by using the following rules of thumb.

- Each KW of equipment power consumption results in 3413 BTU per hour heat load.
- The other heat sources (lighting, outside air, conduction, radiation, etc.) can be estimated at 30 BTU per hour for every square foot of floor area. This assumes standard construction materials and techniques and one air change every hour for ventilation.
- The heat output from people can be assumed to average 300 BTU per person per hour.
- 10% contingency is added to account for fan energy, duct losses, and leakage.
- 10% is added to account for latent heat gains.

This approach should be accurate to within 20% provided there are no unusual conditions.

The Middletown computer facility

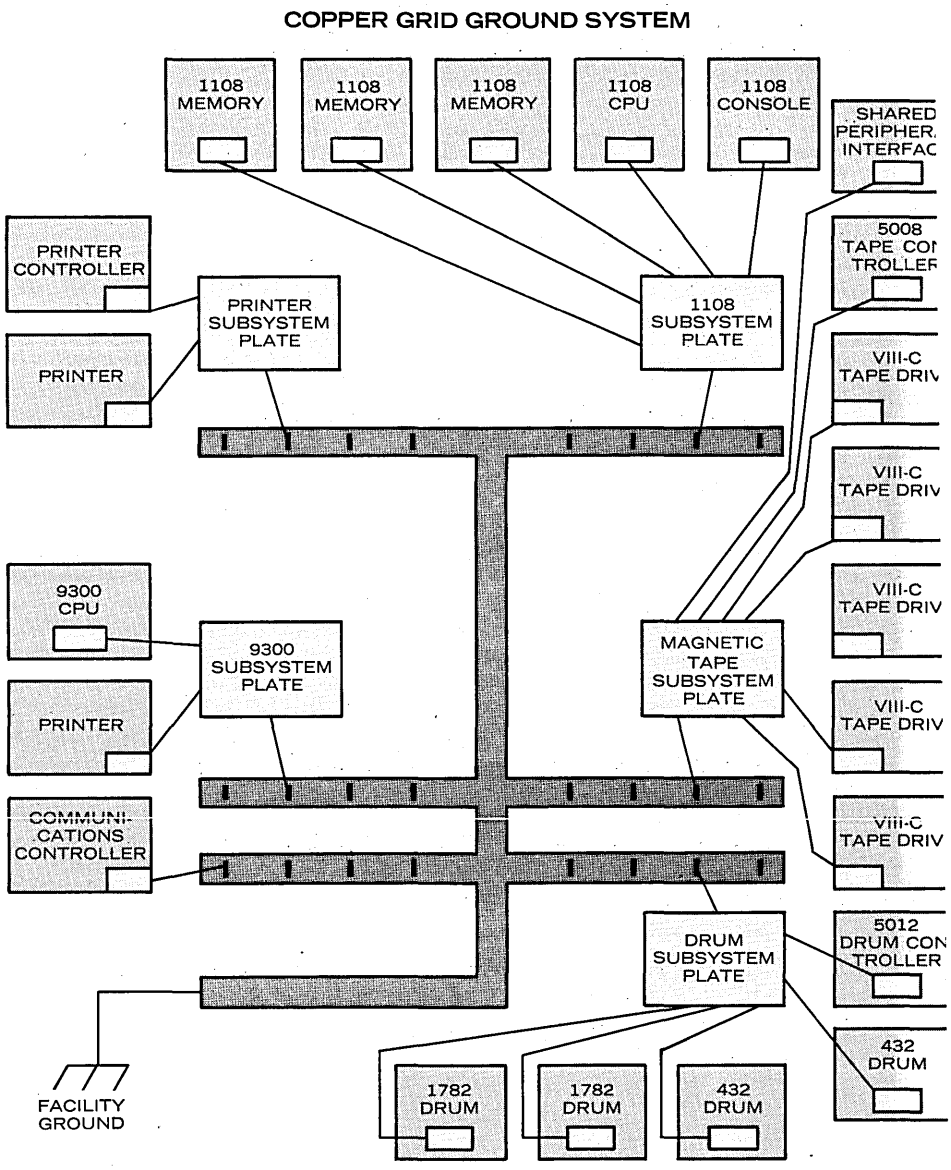


Fig. 4. Most electrical grounding systems have a single large central plate to which the subsystem plates attach. A central grid system like this one works better, but must be installed before other cabling, making it a poor choice for existing facilities.

was designed for an equipment load of approximately 630 KW. The computer center occupies 17,000 sq. ft.; the remainder of the conditioned office space occupies 23,000 sq. ft. The estimated total tonnage (BTUs divided by 12,000) cooling capacity required was 340 tons; the actual capacity installed was 330 tons.

Grounding

A computer signal reference ground system will reduce the possibility of unwanted electrical transients interrupting the operation of a computer system. It is built by establishing a common signal reference for each computer system module. Connecting all common signal references to earth ground provides a shunting path for most electrical transients.

In March of 1970, Univac was asked to provide the criteria for a systems grounding plan for the Middletown center. Univac responded by formulating a new grounding philosophy called the "copper grid system." This system differs dramatically from the standard Univac grounding method.

In a typical 1108 computer system signal reference ground scheme the signal reference or logic ground for each module in a subsystem is connected to a subsystem ground plate, and each subsystem ground plate is connected to one main system ground plate. The system ground plate is normally connected to the facility ground at a common point where the AC neutral and building safety ground are joined. All electrical connections are terminated by lugs; insulated copper wire is normally used to connect all subsystems. This grounding method has been in effect for a number of years.

The main difference between the two grounding systems is the use of a copper grid instead of a system ground plate. Fig. 4 illustrates the identical equipment with a copper grid in place of a system ground plate. The grid is a thin sheet of copper installed on the computer room subfloor. It is insulated by plastic sheeting and has brackets soldered on to make electrical connections. Each equipment subsystem is connected to a subsystem ground plate; the subsystem plates are connected to the copper grid. In some instances where a single cabinet comprises a subsystem, the cabinet is connected directly to the grid. All connections are made with lugs and insulated wire. The joining of the copper grid to the facility ground is made in a similar manner as when the systems ground plate is used.

The advantages of the copper grid system are:

1. The copper grid provides a lower impedance path to ground for a larger spectrum of transient frequencies which reduces the number of computer system interruptions caused by unwanted electrical transients.
2. The copper grid system is more desirable for larger computer installations having multiple cpu's and switched or shared peripherals subsystems because a systems ground plate would produce a complicated array of grounding interconnections between the equipment and ground plates. This is not desirable since transient noise generated from one system could be introduced into other systems.

The disadvantage of the copper grid system is that it is necessary to install the copper grid on the computer room subfloor prior to the installation of any obstructions such as power or computer cables. The most desirable time to install the grid is when the false floor is being installed. It would be difficult to install the grid in an existing facility.

At the InfoMaster facility at Middletown, we found that the copper grid system thus far has proven itself superior to a main systems grounding system. The second InfoMaster computer facility will also have a copper grid system. We attribute the success of the copper grid grounding system to Univac's research in this field and the expertise provided by Univac for these installations.

Acoustics

Even with only part of the complete complement of equipment installed at the Middletown computer center, a problem existed with the noise level. When the entire center was up and running, the average sound level was 78db, a level not only disruptive to conversation, but also impairing operator efficiency. This occurred even with the equipment laid out with acoustics in mind, segregating high noise contributors in one area to minimize the effects of sound rebound and using sound absorbing material wherever possible. The most effective surface to treat with sound absorbing material, the ceiling, could not be treated because it was perforated to provide the conditioned air.

The sound level was reduced to 71db by use of floor and wall carpeting and by acoustic kits for the 1004 printers.

Serious consideration should be given by the facility designer to the use of carpeted computer floors. This not only helps reduce sound levels, but is aesthetically appealing as well.

Static electricity

It is not unusual in facility design to find the resolution of one problem becoming the direct cause of an entirely different problem. So it was with carpeting to reduce sound levels.

Even though the carpeting was specifically selected for anti-static properties, with metallized filament woven into the fabric, the center experienced static electricity problems shortly after its installation. This problem not only annoyed operators, it also caused data errors and blown components (silicone control rectifiers) in the operator's console.

Since anti-static chemicals and metallized casters on console chairs did not help, the solution was to maintain the relative humidity above 50%.

Conclusion

I have attempted to summarize our five years of experience in facility and site planning. The most important things learned from these experiences are:

- to start facility planning concurrently with system design.
- to try not to oversize plant equipment.
- to maintain close contact with the computer vendor.
- to try for identification and resolution of potential problems such as acoustics, static electricity, and grounding.
- if high reliability is a must, to consider the use of backup equipment.

Finally, the importance of proper site planning should not be underestimated; it is as much a factor in successful operations as any other design discipline. □

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"Upgrading" with peripherals, memory, and packaged software from independents can yield better throughput and lower costs than acquiring a bigger mainframe.

GETTING MORE FROM YOUR COMPUTER

by Nathan Hod and John G. Burch, Jr.

MANY ORGANIZATIONS are getting computer indigestion. They have not had the time, and in some instances, the capability of obtaining and digesting the full potential benefits of their present computer systems because vendors are ever setting the table with new and seemingly succulent delights. The resulting situation is a continuous influx of new and more complex computers to the dp center, because managers so often equate effective use of the computer with acquisition of a new one. The real test for management is striking a balance between managing overall systems (e.g., financial, operations) and exploiting the latest technology.

The problem

The information systems manager does not have the same problem that managers in production do, for example, because there is very little absolute degradation of a computer system over a long period as there is with most mechanical devices. However, it is difficult to find "old" computer installations in many organizations. It is even more difficult to find new computers used both efficiently and effectively.

With respect to costs, in some companies computer budgets have had a 40-to-one growth over the past decade. In other companies, revenue has increased at an annual rate of 10 to 12%, while budgeted costs for computer processing have jumped to over 30% a year. Yet in spite of all this increase, some companies would be economically and operationally better off if they were still using an earlier computer system.

In addition to failing to exploit the full potential of one computer system before acquiring another, there are also these dysfunctional effects accompanying the new acquisition:

- the change can be too fast for smooth assimilation of new operations into the organization;
- the conversion may cause disruption, general confusion, and costly human errors;
- changes in job relationships may cause human shock.

Rethink the system

Even if it appears that the capacity of the current computer is approaching saturation, the information systems manager should ask two questions: Are we using the full potential of the computer? Are there areas of the system that can be streamlined?

Regarding the second question, there are, for example, a number of business and nonprofit organizations producing monthly, and sometimes weekly, bound copies of printed pages 8 to 12 inches thick, which no one ever uses!

A key to full computer utilization is cost-effectiveness analysis which would encompass the entire information system, and not just the computer alone. First, the overall information system must be put into shape. Steps should be taken to find out what the users need, and when and where they need it. Improvements in the organizational structure may be needed, and quality standards, documentation, and maintenance procedures should be established. Security procedures and processing controls should be implemented. And finally, a monitoring procedure should be installed which insures that the system is operating in accordance with established procedures. After these things are accomplished, and only at that time, should a determination be made on a cost-effective basis about what kind of computer configuration is required to support the system. Chances are that the present computer, if utilized properly, is more than adequate to meet system requirements.

A case in point

A year ago, a medium-size manufacturing company in New England faced a decision on future systems develop-

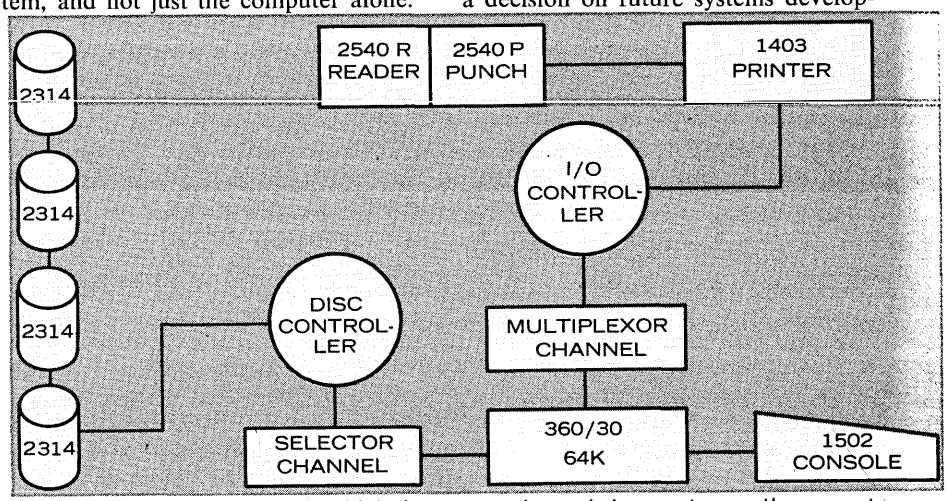

Fig. 1. The "before" situation in which the company's needs have outgrown the current system's capacity.

ment. The basic questions were:

Where are we?

Where would we like to be?

How do we get there?

The company's hardware configuration at the time was as outlined in Fig. 1. This configuration operated in two partitions—background for production and foreground for a spooling system. For software, the installation used COBOL and ran under DOS Release 26 (the final IBM enhancement for the 360 DOS supervisor). The 360 was used 24 hours a day, five days a week, and serviced the following applications:

1. accounting
2. material and inventory management
3. work scheduling and control
4. order entry and marketing statistics
5. budgets and forecasting
6. cost control

At the time, it was evident that the company was experiencing problems in information flow and responsiveness in three major areas: order release, inventory movements, and in-process work control. The following objectives were established for achievement within one year:

1. On-line order entry
   - to speed order processing
   - to improve customer service
   - to reduce the expense of marketing services
2. On-line inventory movement
   - to speed information flow between warehouse and production location
   - to eliminate voluminous paper flow
   - to make information available at a time when corrective action is still possible
   - to improve controls
3. On-line work scheduling and control
   - to report performance by employees every two hours
   - to provide foremen with timely feedback of significant variances from standards
   - to provide machine utilization and performance information

By achieving these objectives, a base would be established for application of sophisticated management science models (such as forecasting) to be used in production and materials requirement planning. Once the objectives were set and the system designed, the question arose: What kind of a computer configuration is required to support the system on a cost-effective basis? Obviously, the computer had to possess the following characteristics to meet system requirements: (1) multiprogramming capability, (2) on-line capabilities, (3) reasonable speed, (4) reasonable capacity, (5) reasonable cost, and (6) room for expansion.

A study was initiated in the data processing dept. to recommend hardware. The results of this study listed three mainframe alternatives:

1. To upgrade and utilize the 360/30 more effectively. (This alternative was the least expensive but would force a conscientious use of resources and would pose some constraints on the projects.)
2. To upgrade to a 360/40 or 360/50. (This alternative was more expensive and would require careful conversion and installation planning.)
3. To convert to a 370/125 or an equivalent. (This alternative would require both the greatest cost and more stringent conversion and installation planning. However, such a computer promises the largest room for expansion.)

The decision was made to select the first alternative for the following reasons:

1. No major conversions were required, which would free the professionals to spend more time on improving the overall system applications, procedures, and operations.
2. The company's information system professionals wanted to challenge the 360/30 capacity and constraints.
3. It was the least costly alternative.
4. It is not the speed or performance characteristics of equipment components that is important, but how the entire information system is performing.
5. Finally, why bother to convert to

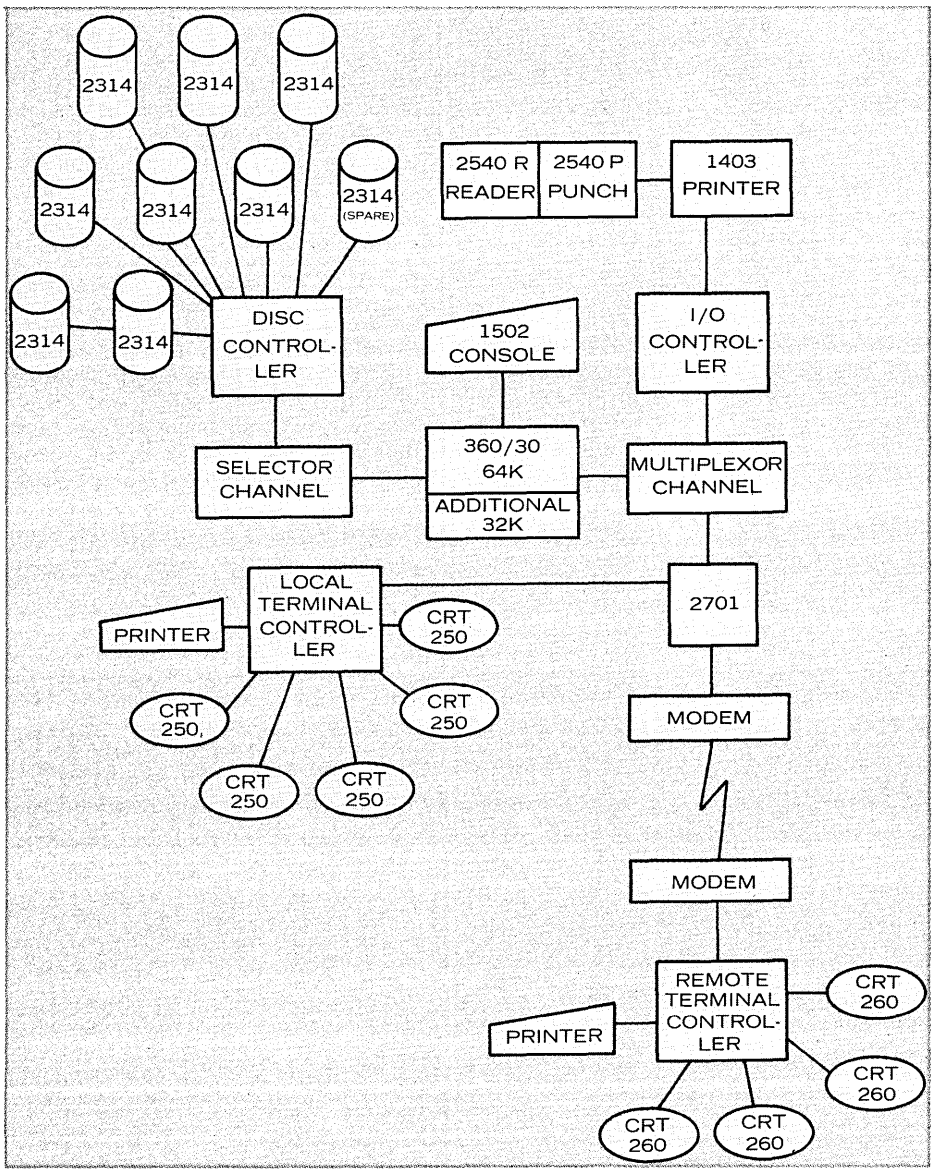

Fig. 2. After upgrading with additional peripheral equipment and memory, the refurbished "old" system operates at a fraction of the cost of a new one.

a new computer configuration, with its inherent cost and disruption, while a backlog of applications is still on the drawing board?

Once the decision was made, things started rolling. Project leaders were assigned to each of the applications defined earlier. Upgrading the 360/30 and installation of system design application were spread over a four-month period. On the computer side, the major upgrading features were installed in the following order: (1) installation of additional 32K of core supplied by CIG Computer Services, Inc., (2) implementation of the communications network, and (3) addition of disc capacity.

The present upgraded 360/30 configuration is represented in Fig. 2. Five 2314 Memorex disc drives were added, and some of the sequential files were converted to direct access and index-sequential. The overflow area on ISAM files was reduced from the standard four tracks per cylinder to one track per cylinder. Logical files were organized so that no pack mount or dismount is necessary at any given shift.

A package called "Datamacs" was also purchased, which is a revolutionary automatic test data generator. The programmer, using a language similar in syntax to COBOL, places control cards in his source deck, then follows his normal pattern of compiling and testing. This procedure in effect means that no program testing is done on real files; however, sufficient test data is generated for testing purposes.

When terminal selection took place, the choice at first appeared to be IBM 2260 or 3270. An interesting terminal manufactured by Courier Terminal Systems, Inc. was found (Model 250 for local mode and 260 for remote mode) which is plug-to-plug and program compatible with the IBM system; however, Courier offers many of the special features (e.g. editing, format mode) found on the IBM 3270 but for the price of the IBM 2260. All the terminals which are located within 2,000 feet of the computing center run in local mode; those which are further away, in the warehouse, for example, run in remote mode. The TP system (written in BAL) is designed so that from a programming point of view there is no difference between a local or remote terminal.

Primary core storage of 96K is divided as follows:

- 12K supervisor
- 54K background to compile ANSI COBOL
- 6K foreground 1 for Spooler
- 24K foreground 2
  - —On-line partition
  - —TP system which requires 6K
  - —Application programs which require 18K

The spooler used is SPRINT which starts with a minimum 4K and goes to a maximum 12K. This program dynamically allocates disc buffers, and is completely self-relocatable. SPRINT runs simultaneously with the user program. Reading, printing, and punching are "trapped" by SPRINT and read, printed, or punched in its partition, allowing the batch job partition to run at disc speed. This operation increased throughput by 70 to 80%.

The TP monitor purchased from Programming Methods is called MINICOMM, and needs neither BTAM nor QTAM in the DOS supervisor. As many as 99 different crt application programs may share the same core within a partition. MINICOMM occupies 6K of F2, and relieves the application programmer of all the device-dependent considerations of the crt terminals by doing all of the reading, writing and error recovery work. MINICOMM maintains its own high speed roll-in/roll-out library of user application programs on disc. This facility increases the speed of processing and eliminates the constant contention for the DOS logical transient area.

Final remarks

The company found that in renegotiating its third-party lease the cost of the original equipment could be reduced by 20%, which made the costs of the new configuration, though higher, less painful. Computing power has increased by 50% at an increase in cost of 30%. (Going to fourth-generation equipment would have driven the costs up by 70-80%.)

Today, with one project completed and others in the test phase, response time on terminals is good, and both information flow and speed have improved. Cpu utilization has gone up, but is still not at full capacity; this is also true of channel utilization. And the company thinks there is still a long way to go before reaching full capacity.

If the promised performance enhancements of new computers—such as throughput, reduced overhead, simple system conversion, and more user oriented software systems—are proven through benchmarks and other hard-nosed analysis, then it is possible that the acquisition of a new computer could show a better cost savings than one's present computer. However, we suggest that the analysis should be based on a conservative attitude which ignores rosy predictions by salesmen.

For us, members of the information systems profession, it is always interesting to challenge a machine and get the maximum from it. Why then rush to get the newest equipment when the old equipment is still performing? This question is particularly applicable when, in many organizations, adequate systems analysis has not been performed first, and a rigorous effort has not been made to fully exploit the current configuration. □

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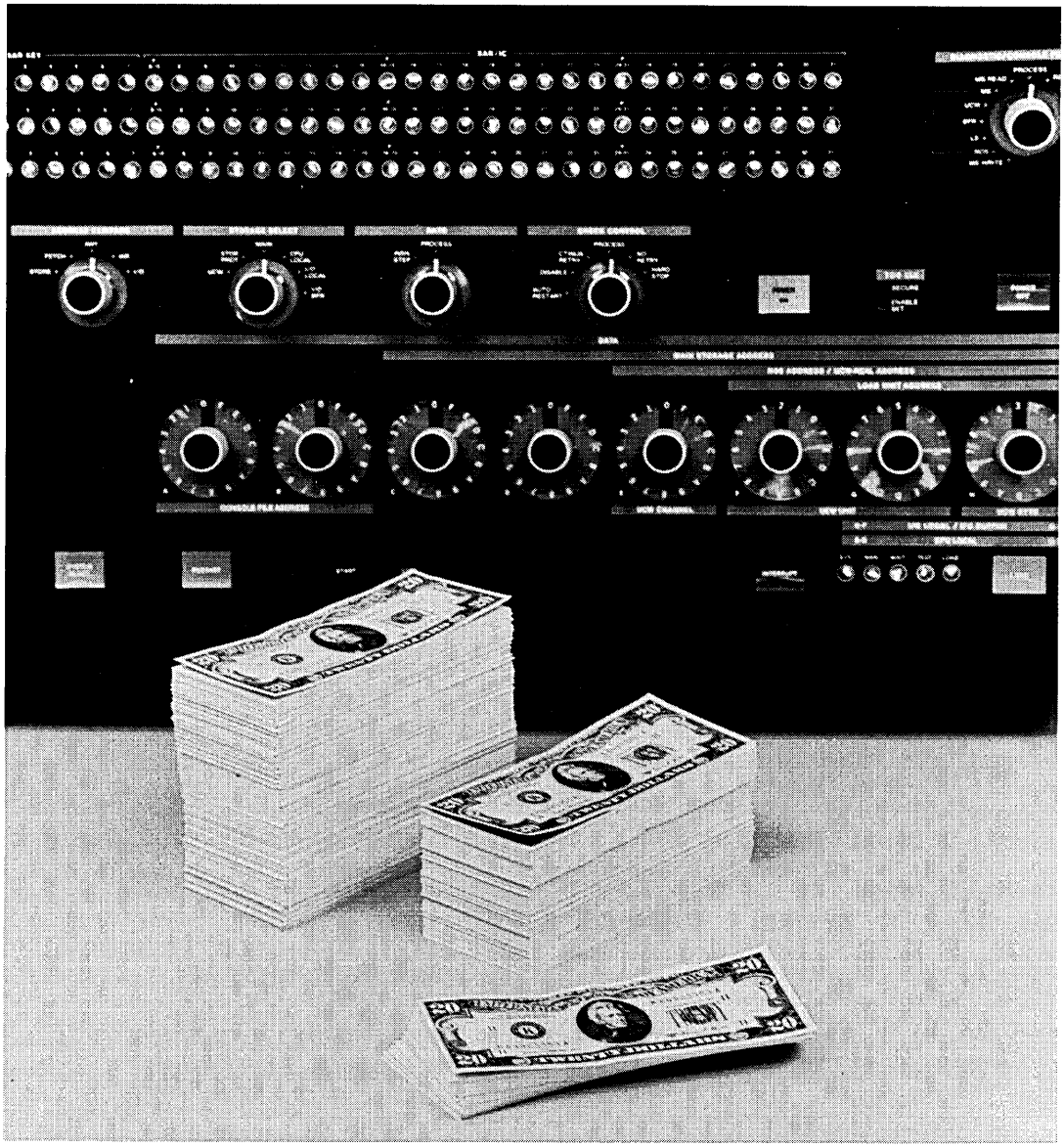

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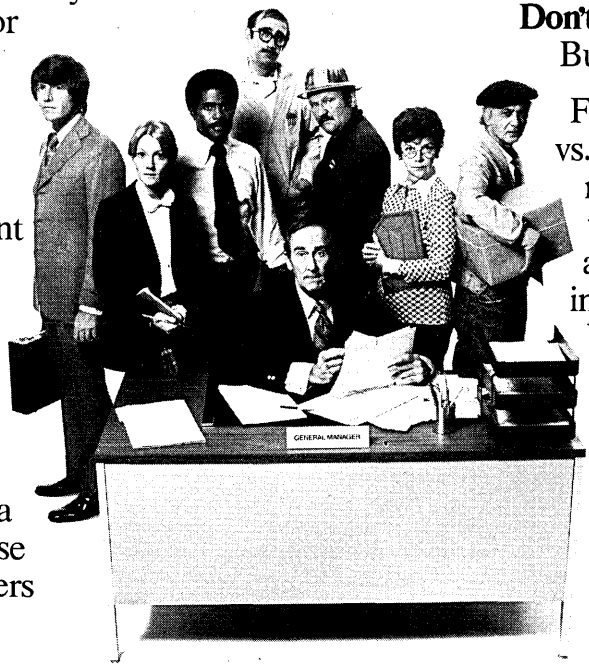

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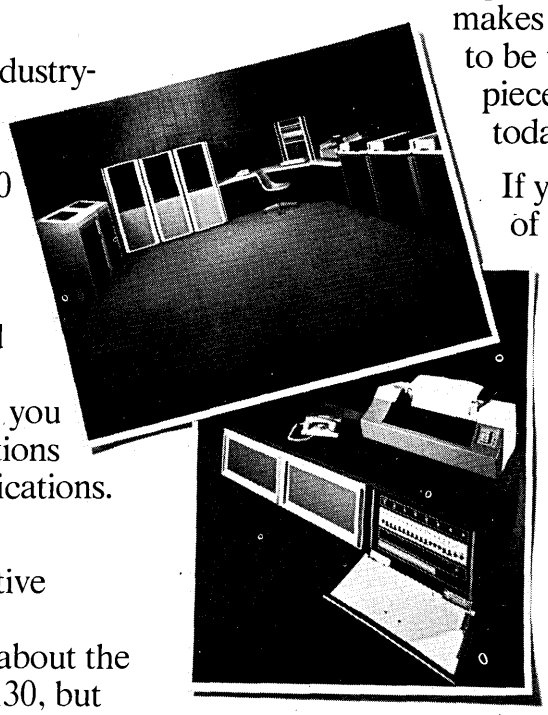

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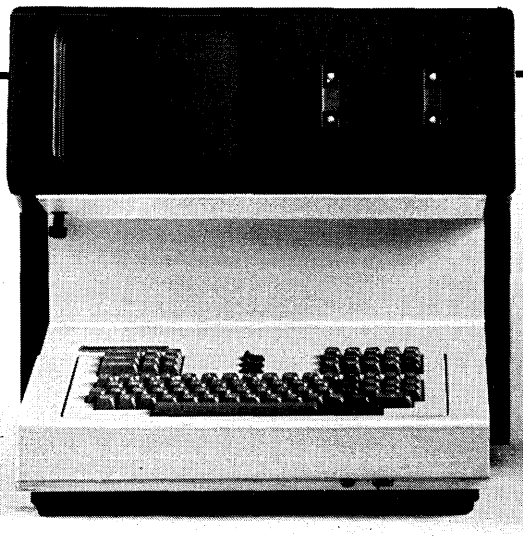

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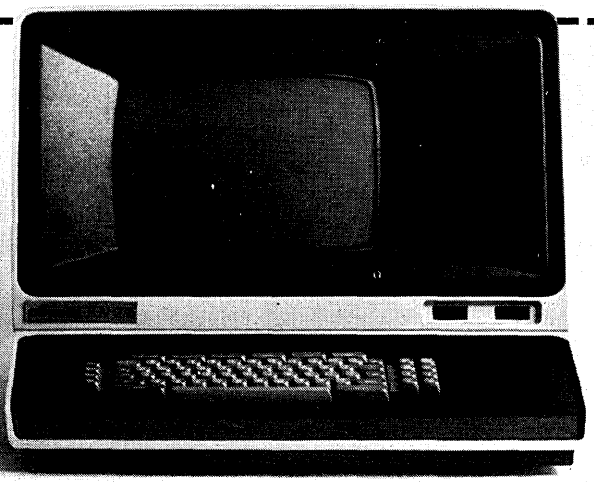

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Their influence over data processing makes the attitudes of controllers important. At present, the controllers don't feel anyone makes really good use of computers.

WHICH DEPARTMENTS USE THE COMPUTER BEST?

by Charles Waldo

The title of this article was one of the questions asked controllers of 150 large and medium-sized companies (with average 1972 sales of $425 million) involved in a variety of manufacturing, retailing, and service endeavors. The question was one of a number included in a mail survey designed to detect changes in the role and responsibilities of the corporate controller, especially in the controller's relationships with the computer and his firm's management information system.

Why were controllers chosen for this survey? Historically, the computer/systems efforts of most companies have "grown up" under the controller or somewhere else within the finance function. In fact, 50% of the controller respondents stated the dp function is now assigned to them although all had someone else overseeing the day-to-day operations. Additionally, because accounting departments, large inputters and users of computer data, are almost always responsible to the controller, he is vitally concerned with improving the effectiveness of this versatile but high-priced tool.

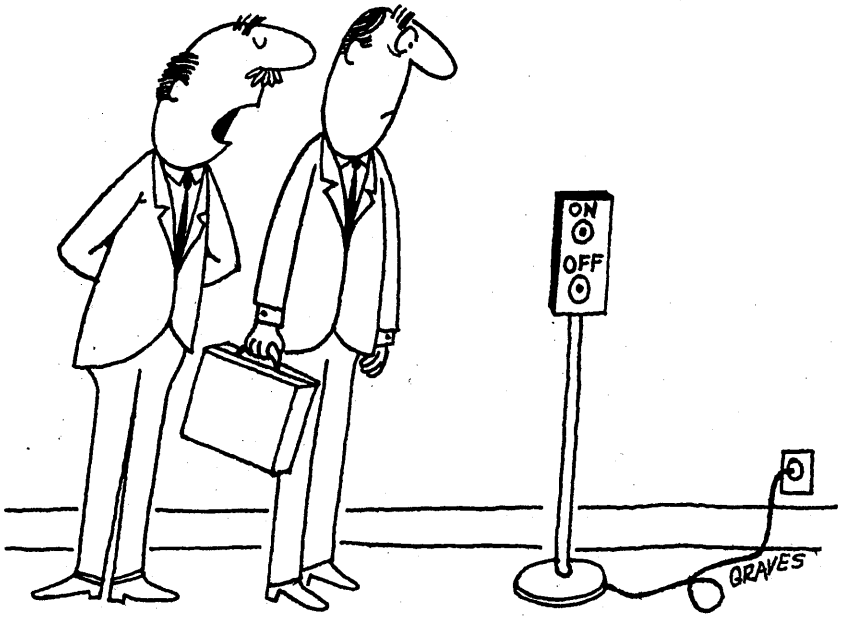
The controllers, all members of the Financial Executives' Institute, were asked: "Which department(s) (if any) in your firm uses the computer best for:

short-range planning
long-range planning
control of operations
day-to-day decision-making
major decision-making
automation of jobs previously done manually"

Parameters for the term "best" were not spelled out for the controllers, so exactly how each interpreted its meaning for his particular situation is not really known. However, Table 1 shows that most seemed to feel, whether the

Management Task	"Best" Departmental User
Short-range planning	Controller/Finance (43%) Manufacturing (32%)
Long-range planning	Controller/Finance (40%) Manufacturing (21%)
Control of operations	Manufacturing (43%) Controller/Finance (24%)
Day-to-day decision-making	Manufacturing (54%) Controller/Finance (24%)
Major decision-making	Controller/Finance (48%) Manufacturing (20%)
Automation of jobs previously done manually	Accounting/Controller (54%) Manufacturing (25%)

Table 1. The 150 controllers surveyed had definite ideas about who "best" used the computer, although they were not pressured into defining their criteria for judging. As can be seen, they rated themselves highly.



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feeling was subjectively or objectively based, about the same way as to the "best" computer users. The number in parenthesis behind each department indicates the percentage of controllers who "voted" for that department.

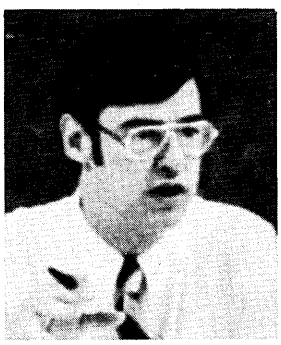
The results show that the business functions of Finance/Accounting/Controller and Manufacturing were felt to be the best users of the computer in each category. Almost down at the bottom of the list was "Top Management." Marketing and Long Range Planning Departments, which would seem to be perfectly suited for prime use of the computer, did not fare well either. Perhaps the respondents were biased or just more familiar with their own operations, but they did see themselves in a very favorable light; the results, however, were not unanimous. Unfortunately, too many controllers concluded as did one: "No one uses the computer very well around here."

Other parts of the survey attempted to find out what the controllers felt were the chief hindrances to maximizing the effectiveness of the computer. Here are the main problems as the respondents saw them:

1. A big problem, 45% of the controllers surveyed said, is "putting prime emphasis on the computer as a data processing device rather than as a planning and control tool." One respondent remarked, "In spite of the increasing volume of data inputted and reports generated, too much of our planning is done on the basis of intuition and hope, and too much of our attempts at control come after the damage is done."
2. "Failure to properly evaluate the profit contribution of edp systems versus their costs" is believed to be a prime problem by 50% of the controllers. Costs are relatively easy to assign, but what about benefits? How does one measure the marginal profits presumably added by new or more current reports? A controller asked, "How do you go about capitalizing the cost of a new report?"
3. A big need for "better edp planning, organizing, setting of objectives, and control" is seen by 73% of the respondents. Just plain better management tactics are indicated here.
4. "Lack of top management involvement, understanding, or encouragement" was alleged by 75% of the controllers. As in other situations, if the president and other top managers don't get behind a program, it won't go far. Perhaps some managements see too much of the costs and too little of the benefits of computers (see point 2 above).
5. The biggest and most frequently mentioned problem area bore that all-encompassing title, "poor communications." Fully 80% of the respondents said getting other departmental personnel to define and articulate their present and future dp needs is a major challenge. Potential users don't know enough about the computer and its characteristics, and, at the same time, systems managers don't understand enough about the needs and problems of the line departments.

Line operations and systems groups must become better acquainted with each other. The controller of a very large retail chain remarked, "The present head of our edp systems group does a good job of walking the narrow line between the merchandising and operations departments and his own staff. Others before him were not quite so adept and could not seem to understand or adapt to the tremendous pressures in today's retail world under which our people must perform."

Here are the characteristics which controllers believe a successful dp department manager must possess: first, he must be a solid manager and administrator; second, he should have a broad business background and a working understanding of his firm's total operations and its competitive environment; and third, he must be a capable technician, able to stay up-to-date with rapid changes in hardware and software. Last, and maybe most important, he must be a good communicator and somewhat of a salesman, able to sell other departments on the use of the computer as a valuable control, planning, and decision-making tool. □



Mr. Waldo has been a business consultant, and worked for eight years in various marketing and staff positions for Sherwood Medical Industries. Presently he is an asst. professor of business administration at Hanover College in Indiana.

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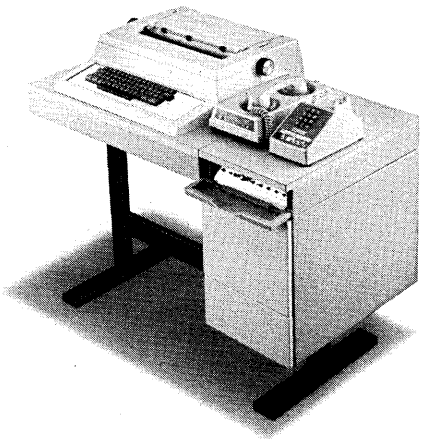

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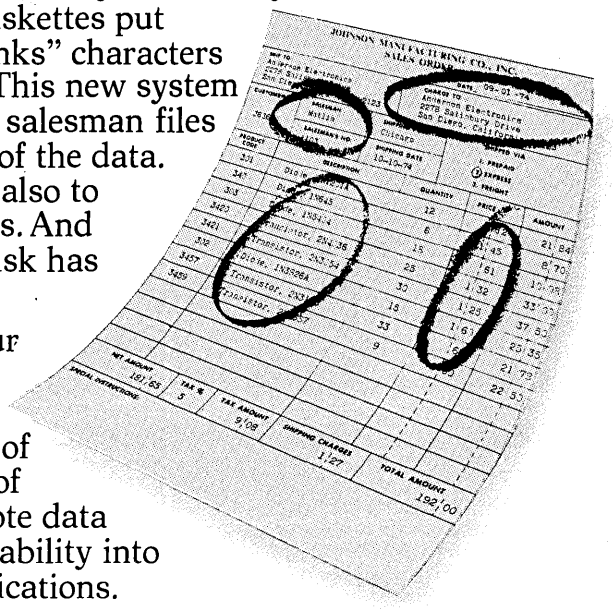

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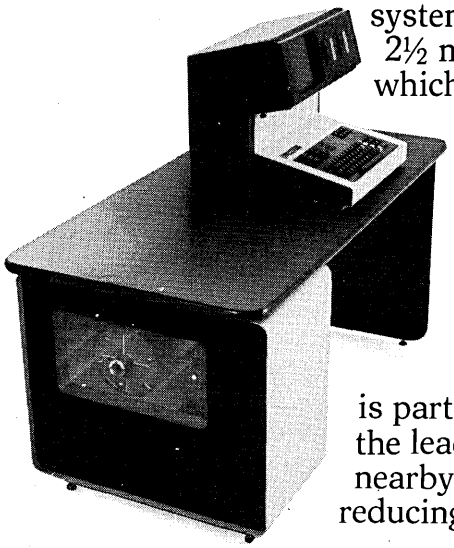

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Wherein one Megma, Chief Systems Designer and High Priest, is brought to understand the advantages of Structured Programming.

A Socratic Dialogue

by Dennis P. Geller

The following translation was provided by a member of the department of archeology of the university to which the author is attached. Mr. Geller kindly allowed DATAMATION *to reprint it in view of its important historical perspective on the early concepts of computation.*

Megma: Socrates, I would speak with you.

Socrates: Yes, Megma? I am always glad to speak with you. How can I help you?

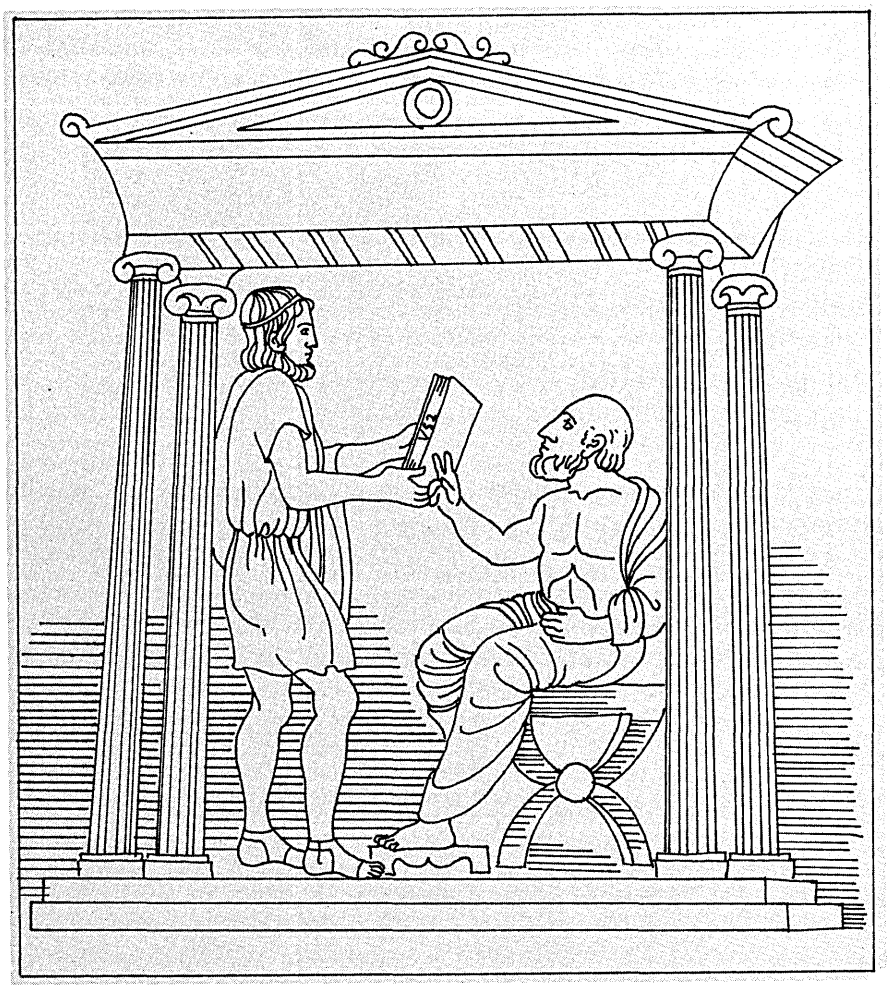
M: Socrates, I heard you the other day in the agora, speaking to the children about Structured Programming.

S: Yes, that must have been yesterday. I would be anxious to know what you thought of it.

M: Socrates, I have no wish to offend. Yet I must speak my feelings.

S: Indeed, Megma. Whose feelings can we speak, if not our own?

M: I must question your teachings, Socrates. For, while you can always be very persuasive, I cannot agree with your teachings on this one subject.



The documentation shows the "ideal" program, Socrates, not the real one.

S: Pray, enlighten me, Megma. I am often wrong, and it is only by discussions such as these that I can correct my errors.

M: Socrates, I see advantages to Structured Programming. It makes for readable code, and perhaps for code that is easy to modify, as you claim. Although I must admit that I have not verified this, as my code never needs modification. Where I cannot be content, however, is when you suggest that these ideas can be put to use in real-life programming situations. It is clear that the very techniques which you profess are incompatible with efficiency. Surely you do not argue that we should sacrifice efficiency for beauty in this case. That argument is acceptable for the arts, but certainly not for more mundane matters. The Pythagoreans teach us that there is much beauty in a triangle, but you would not suggest that we make our wagon wheels from equilateral triangles.

S: Megma, you ask many questions at once. May I respond to one at a time, or shall I answer all at once?

M: As you wish, Socrates.

S: I thank you. I am quite happy for you, that your code never needs modification. You must indeed be blessed by the gods. And yet, was it not you who wrote the program which answers the questions put to the oracle at Delphi?

M: Indeed, it was. That was done at the request of the oracle itself. The order was transmitted to me by the priestess, Eliza.

S: A rare honor. Was it not decided recently that the oracle was pro-

viding responses which were too depressing?

M: Yes. And it was necessary to revise the program, so that the answers were more cheerful. That was last year, Socrates, and everyone in Athens knows about it. I fail to see where you are leading.

S: Then please bear with me. If this program needed to be revised, then was that not a modification?

M: To be sure.

S: But you told me that your programs never needed to be modified. I must admit that I am confused.

M: I apologize, Socrates. You philosophers are always so precise. I meant that *I* never had to modify my programs.

S: But then, how were these revisions done? Did the oracle itself dictate the correct code to you?

M: Now I know that you are jesting, Socrates. We are all aware that the oracle has not passed the Turing test and could not be trusted to reprogram itself. I simply gave the job to my assistant, Kobol. You know him, I am sure; he was in the group to which you were lecturing.

S: Yes, he joined my group just this past month. By the way, Megma, I see that you are unfamiliar with my methods. I never lecture, as I am far too ignorant. My purpose in forming these groups is only to ask questions, so that I can learn from others.

M: A strange idea, Socrates. I, for one, have no such need. As a chief systems designer and high priest, it is to me that people come for knowledge.

S: Yes, I see that. But, to continue, I was speaking to Kobol and he told me that your code was as excellent as anything he had ever seen. He said that it was fast and almost error-free. But he was surprised when you gave him that job, for he found that he had to rewrite many parts of the system without being able to make use of your code.

M: Did he tell you why, Socrates?

S: He did. It seems that your code was so efficient that it was hard to see where to make the patch. And since it was written in the oracle's own language, he could not tell to what use you were putting many of the registers, or even what the logical flow of the program itself was.

M: I must admit that I never did finish the documentation. But what is the point? Why do we have assistants, if not for such tasks?

S: I hope to be able to answer that question, but first let me ask another. What did you do before you were wealthy; surely there was a time when you had no assistants. How did you manage then?

M: Well, Socrates, my first job was in Sparta. I was hired by the government there to write the program which chooses their king. After I wrote the program, I took my earnings and came to Athens. So there was only one time when I could not afford assistants. As you know, the government in Sparta paid very well in those days.

S: Yes, but now they have fallen on leaner times. I understand that they now have two kings.

M: That is true. It happened soon after I left. I've always wondered why.

S: I was trying to see if there was ever a time when you yourself had to do the work that you now give to your assistants. I see, though, that you became rich too quickly for that to happen. Let me try a different approach. Is your business doing well?

M: Indeed, it is.

S: Is there ever a time when you have too much to do?

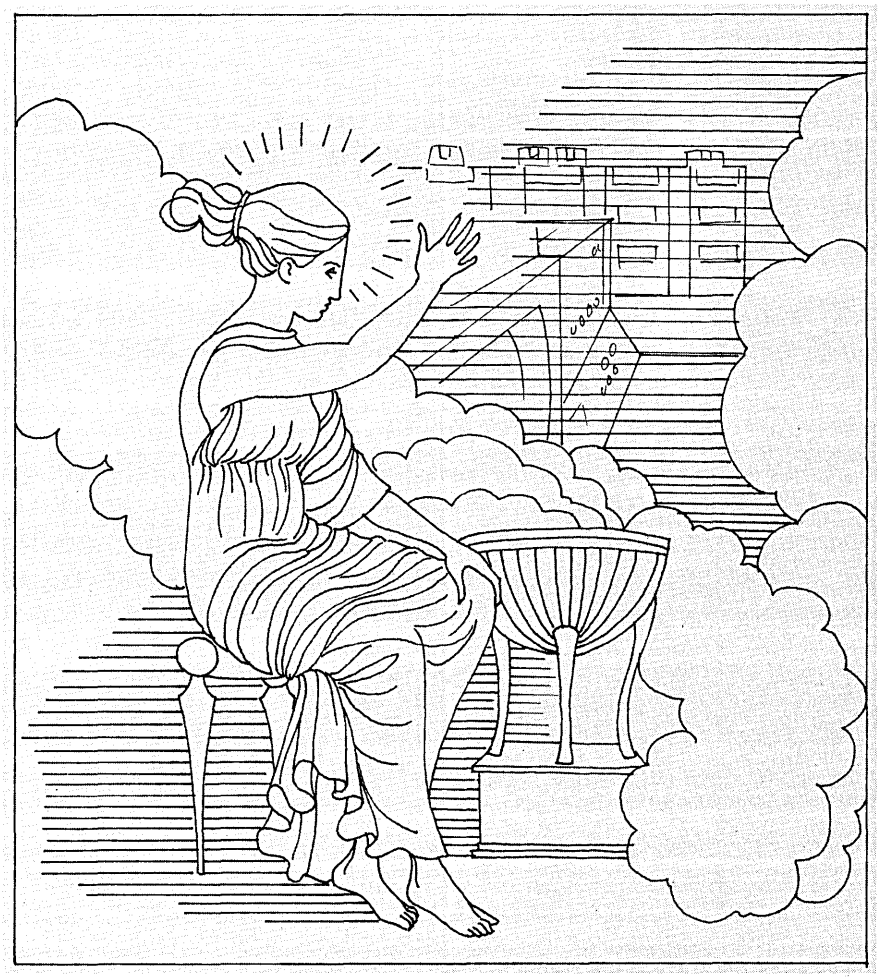
M: In truth, Socrates, that does happen. Right now, in fact, I am behind on a large project.

S: Do you know how this happened? I assume that you do not like to miss deadlines.

M: I do not. It is a strange coincidence, but Kobol is involved in this, too. It took him so long to finish that project we were discussing earlier that I could not start him on this one.

S: You mean to say that if he had been able to modify the program in less time you would not be so far behind today?

M: Yes.



The program for the oracle at first produced too many depressing responses.

A SOCRATIC DIALOGUE

S: Would you say that he is a backwards assistant, or that he shows some small talent?

M: More than that. He is perhaps the most talented assistant I have ever had.

S: So that it was not due to his stupidity that the modifications took so long?

M: I cannot see how that could be the case.

S: Where, then, could the problem have been?

M: I do not know, Socrates. Can you enlighten me?

S: Perhaps you do know. If the fault was not with the programmer, or with the modifier, then what can be left?

M: I know you do not want me to blame the machine, Socrates.

S: Indeed, I would never suggest that anyone blame the machine.

M: But then, I don't—oh, I see, you are suggesting that the program itself could have been at fault.

S: I suggest nothing, Megma. What do *you* think about the program?

M: I see now, Socrates, how the program must be the culprit. For we cannot blame my assistant, and I trust that I myself am above suspicion.

S: No such suspicions ever entered my mind.

M: Yes, I see now that some programs must be easier to modify than others. Of course, there is a price that we must pay for efficiency, and that is unmodifiable programs.

S: Slow down, Megma, you think too quickly for me. We have, I think, agreed that the program must have been especially difficult to modify. But why do you then state that a program cannot be both efficient and easy to modify?

M: But surely it is clear to you, Socrates. The two cannot coexist in one program. Let me reason as you so often do, by analogy. Consider the new confection that was introduced last year, the dark food that they call chocolate. And consider also another food, milk, with which we are all familiar. Surely you see that efficiency and modifiability are like these two in being exactly opposite: one is dark and one is light; one is hard and one is soft. Certainly it is impossible to conceive of combining the two in any way.

S: I grant what you say about foods, Megma, but I do not find the analogy a strong one, upon which we could build a tall argument.

M: Explain to me, Socrates, how a program can be both modifiable and efficient.

S: I cannot do that as easily as you can ask it. I fear that I do not know enough to convince one as expert as you are. I do not disagree with you, as you seem to think. Perhaps you can explain to me in clearer terms what it is that makes the two incompatible.

M: I will try, Socrates. A program, to be efficient, must run quickly. It must use the best instruction at each step. It must use its storage without waste, never using two registers when one will do.

S: I will grant that this describes efficiency in programs.

M: To be modifiable, I see that a program must be structured, as you were teaching the students. But such a program, by your own admission, must be readable. It must be easy to see why things are being done at all times.

S: Yes, I am in agreement. But I fail to see the contrast. When you talk about efficiency you talk about the ways that the machine uses the program. When you talk about modifications, you refer to the programmer. Where is the conflict?

M: I can see why you are confused. Perhaps an example might help you. In the same program we were discussing earlier, for the oracle, there were many patches. It was necessary to write the code in the oracle's own language, and then, as errors were found, I had to add many patches to correct for them. I am sure that you understand, as any programmer would, how this makes for code which is not suited for mere mortals to read easily.

S: I see what you mean. But did you not say that you had intended to document your program?

M: I said that.

S: Can you see that the modification task would have been easier if the documentation had been prepared?

M: I cannot see that yet, Socrates. For the documentation would have shown the "ideal" program with actions in logical sequence. This would not help anyone read the code with all its patches.

S: Megma, think on what you just said. There is an inconsistency there which I would not expect of an expert programmer such as yourself.

M: Socrates, I do see it, and my face is red. You mean, of course, that I should document my programs as they actually are, not as they should be. This is a great revelation to me, Socrates. I am sure that it will help my business tremendously. I cannot know how to thank you.

S: Wait, Megma. I feel that I deserve no thanks at all, for I have been such a failure at explaining my thoughts to you.

M: Socrates, that is not so. I see things much clearer now.

S: Perhaps you do, but what you say does not indicate that to me. Unless, perhaps, it is just my stupidity intruding again.

M: Socrates, if what I say sounds wrong to you, I beg you to tell me how. Were we not trying to see how code could be produced which was both efficient and modifiable? And did you not make it clear to me that if I documented my code well, it could be both?

S: There is truth to what you say, but I fear that you are like the Persians, who were so intent on traveling through the pass at Marathon that they did not see our soldiers on either side.

M: Then show me how I err, Socrates.

S: You do not err, Megma. You are just not paying heed to your own words. You said that the documentation you now have shows the ideal program with actions presented logically. And you also said that the real program has many patches which make it much different from the ideal.

M: I said that, Socrates.

S: Where my understanding fails me, Megma, is in this: why does the code not look more like the documentation?

M: Now I am lost, Socrates. I cannot comprehend what you are saying.

S: It is simply this, Megma. Could not the code itself be made to proceed in logical ordering? Could not similar actions be grouped? In other words, if you can write the documentation to show how the actions should go, can you not write the code that way as well?

M: Now I perceive what you are saying, Socrates. It is an understandable mistake for a lay person such as yourself. Not being a programmer, you do not know how code is written. First, I write a rough outline of the final program. This is, you might say, a first approximation. Then I test this code. Every time I find an error, I put in the patch which corrects it. Thus, when I am done, the final code is not in logical sequence as you would like to see it.

S: But, can you—

M: I know what you are going to say, Socrates. Why not rewrite the code, so that it mimics the documentation? Socrates, you must know that we programmers have a religious law, that we shall not touch working code.

S: That is not what I meant to ask, Megma. Rather, it was this: Could you not write the completed code at once? Let me ask, do you put in patches to correct for syntax errors?

M: No, Socrates, we do not. It is only logical errors which require patches.

S: Would it not be possible to write code so that there were only syntax errors on your first approximation? Would that not be a way to achieve our goal, and blend modifiability with efficiency?

M: I now perceive a great light, Socrates. Is it what you are suggesting that to take more care in the design of the program is a way to achieve our goal? I see that this is one way out of the difficulty. For, if we devoted more time to designing our program, before coding it, then we might get, to use my analogy again, a sort of chocolate milk.

S: And would not the time lost in design be made up when it came to debugging?

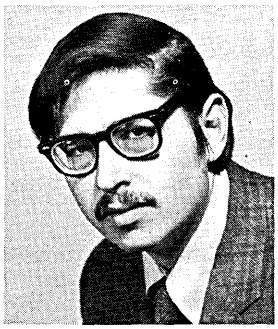
M: I perceive that it would indeed, Socrates. This has been an enlightening talk to me, and I must rush off to think about what we have said.

S: I was only too glad to talk with you, Megma.

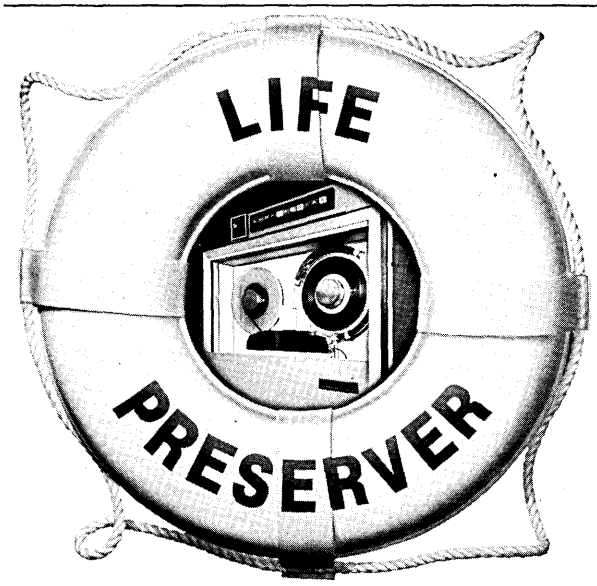
M: I am afraid that our talk was not satisfying to you, Socrates?

S: Why do you say that, Megma?

M: Well, we were going to talk about Structured Programming, but all we ended up doing was talking about how I could write better programs. Perhaps some other time we could talk about what you want. □



Dr. Geller is an assistant professor in the School of Advanced Technology of the State Univ. of New York at Binghamton, where he claims to have recently modified the PL/1 compiler to accept the COME FROM statement. He is also a member of EthnoTech, Inc., a consulting consortium specializing in continuing education for programmers, and the author of "Structured Programming in APL."



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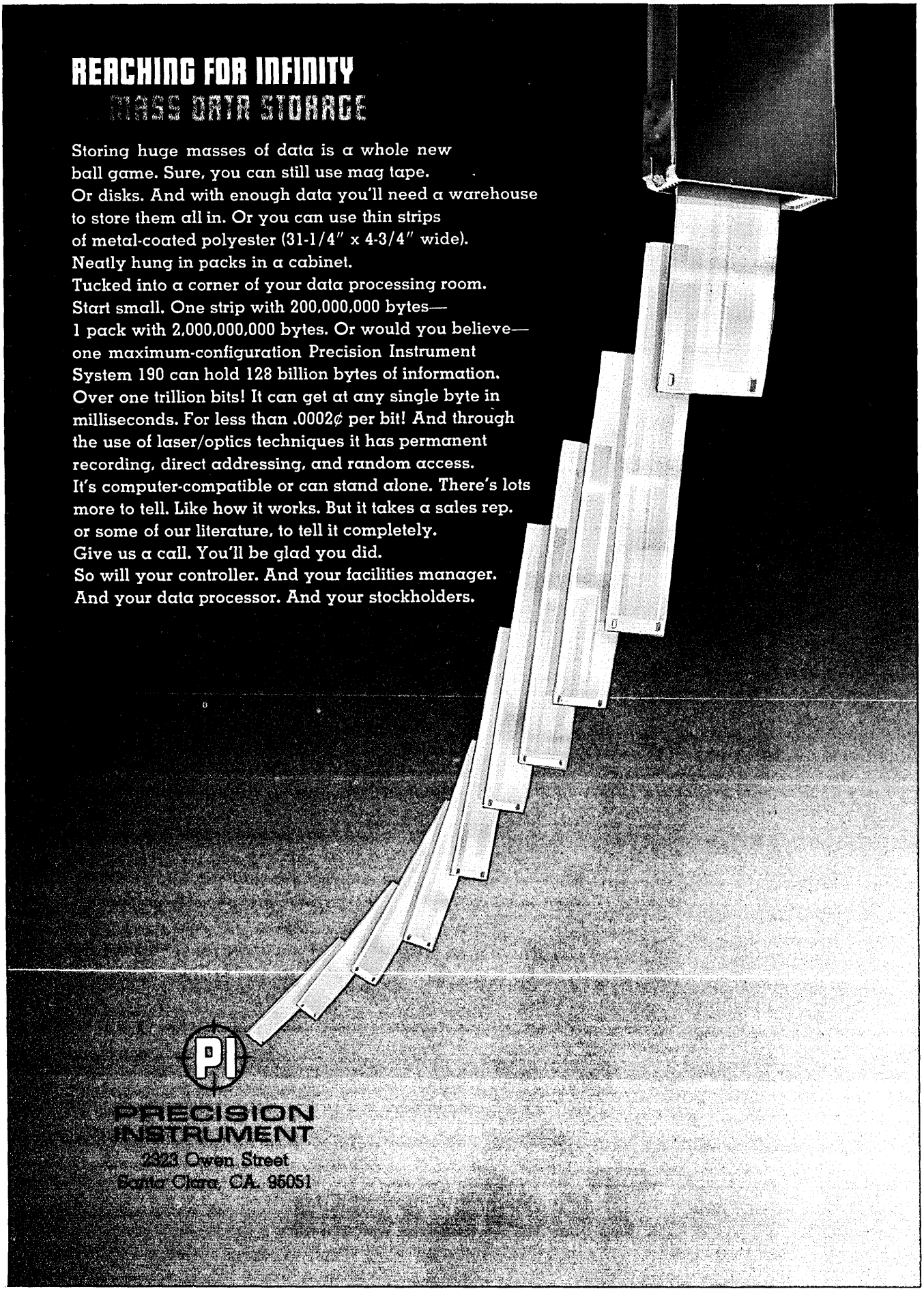

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By overlaying contemporary hardware on an obsolete telephone network, GM built what may be the world's largest teleprocessing system.

GM'S PARTS ORDERING SYSTEM

by David A. Barr

As most car owners know, the problem of getting parts for a recalcitrant automobile when the dealer's out of stock can often be an exercise in frustration, frequently compounded by long periods of anxiety. To expedite the parts ordering process for customers served by more than 4,500 participating dealers throughout the country, General Motors Parts Div. has built a nationwide multiplexed data communications network which some observers believe may be the world's largest teleprocessing system.

Called RAPID (for Remote Automatic Parts Input for Dealers) the GM teleprocessing network brings eight IBM 360 computer systems located in four regions and a 370 computer, located in Flint, Mich., to the parts departments of GM auto and truck dealers.

Now accommodating more than 4,500 terminals spread across the nation, and capable of being expanded to handle a total of more than 12,000 in the months to come, this massive data network evolved from overlaying contemporary communications technology on an older, established framework.

In this respect, the GM team assigned to deal with the RAPID project had to consider two important factors: First was the fact that each General Motors division is an autonomous profit center which must weigh all aspects of investment, risk, and return on investment before embarking on any project. (The present General Motors Parts Div. which holds responsibility for RAPID operations, represents the amalgamation of separate parts organizations which previously served the five GM auto divisions and the GM Truck and Coach Div.) Second was the obvious need to make the best possible utilization of a nationwide system which was already operational, using leased telephone lines, foreign exchange (FX) lines, and a few low-speed asynchronous time-division multiplexors.

Briefly, the objectives outlined by the GM RAPID team were to:

1. reduce total data communications costs.
2. improve network reliability
3. improve network manageability
4. create a framework for orderly growth and change.

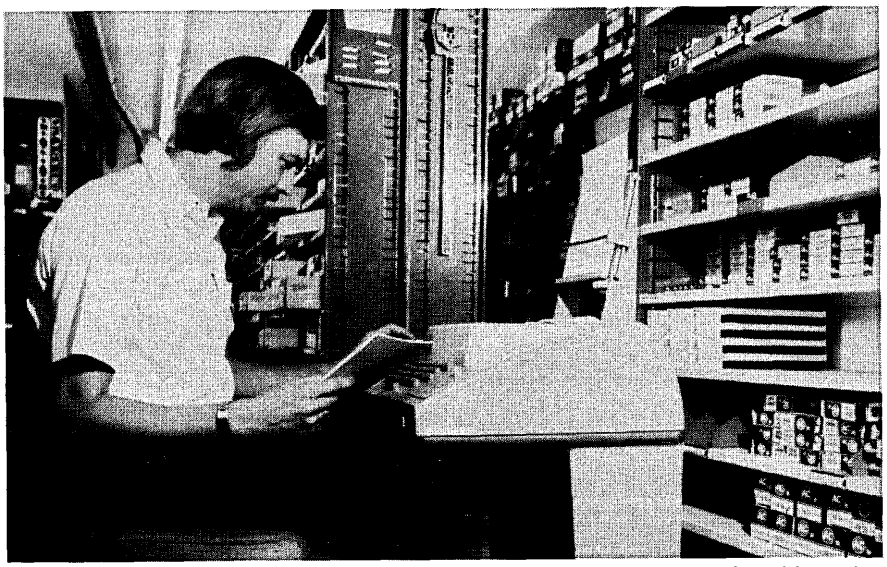
Concentrators vs. multiplexors

With these objectives in mind, there were two principal approaches that could be considered as means of optimizing the network, its computer resources and most of its communications facilities. These were, simply, the use of either programmed concentrators or sophisticated, time-division multiplexors to facilitate the handling of data traffic moving from thousands of terminals into 28 parts distribution and remote job entry centers, and from there into four major regional processing centers, and from there, in some cases, to a central processing site.

The application of concentrators to the problem would have required a major undertaking in rewriting existing software and upgrading a large number of RJE terminals, because the applications software had evolved over a number of years and had been highly optimized for its cpu/terminal environment.

But the applicability of time-division multiplexors was also questioned because the existing communications system used two synchronous communications line protocols, binary synchronous and STR (6-bit transcode), which would have to be intermixed with asynchronous protocol. In addition, the system had been optimized for the terminal-modem-phone line-modem-270X environment which presented some very tight timing constraints.

Analysis indicated that time-division multiplexors, which would not only accommodate existing protocol and simultaneously handle synchronous and asynchronous data traffic but would also operate nationally synchronized in a "masterclocked" mode to minimize network delays, could be implemented quickly and meet all of GMPD's objectives.



Terminals in 4,500 GM parts departments are the base of a communications hierarchy which includes 29 cpu's at parts warehouses, at least eight more at four regional centers, and one at the GM Parts Div. headquarters in Flint.

The RAPID system now accommodates anywhere from three to four million orders for individual parts received each month from dealers who have elected to be plugged into the network through teleprinters installed in their parts departments. These dealers are now able to advise their customers as to the availability of parts for their vehicles within one hour, and they can fill any order from parts stocked in parts warehouses within 24 hours. In addition, parts that must be shipped from the headquarters facilities in Flint are in the dealers' hands within as little as four days.

In some cases, dealers enjoy the same-day delivery of parts shipped from warehouse or distribution centers located 40 miles or more from their shops. They also frequently have orders filled only a few hours after the parts managers submit their orders.

There are additional benefits for dealers as well as car owners. For example, the network serves to expedite warranty service because, in addition to submitting parts order entry data, dealers are able to transmit warranty claims information directly to the GM Parts Div. This service provides dealers with immediate verification of GM acceptance of a claim for warranty service, and they can receive credit for parts issued under warranty service within four or five days, instead of four to six weeks. This not only eliminates potential delays on warranty service for new car owners but also eradicates dealer bookkeeping problems.

At least 38 mainframes

As it stands today, the RAPID teleprocessing network is overlaid on an organizational alignment of parts warehouses called Parts Distribution Centers (PDC) and data processing centers called Area Processing Centers (APCs).

The PDC is a parts warehouse serving GM dealers in specific geographic areas. The network links 29 of these centers with its 4,500-plus participating dealers. Each PDC is equipped with an RJE terminal, either an IBM 360/20 or an IBM 1130 processor with several 110 bps autoanswer dial-up ports; the number of the ports available at any PDC depends on dealer traffic for a given distribution center. The 360/20 processors use STR communication protocol (6-bit TRANSCODE), a code which preceded the IBM bisynch protocol used by the 1130 processor. Asynchronous data bound for the Area Processing Centers from the dealer terminals and synchronous data from the RJE terminals at the PDCs are multiplexed and cascaded to an APC over a single telephone line by Computer Transmission Corp. 2100 Series time-division multiplexors, which are installed in the PDCs and APCs (See Fig. 1.)

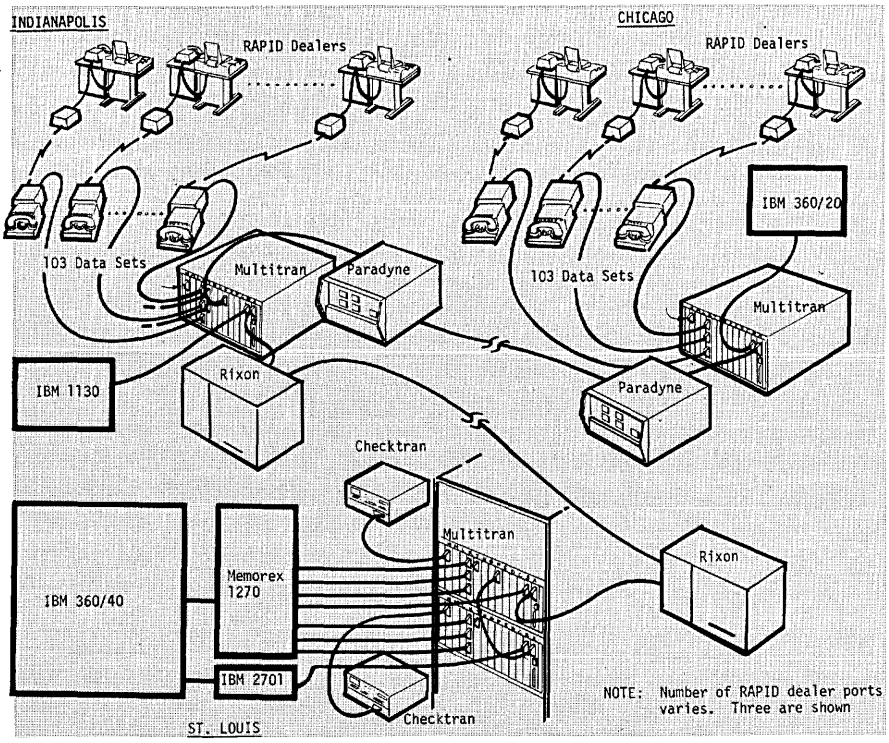


Fig. 1. A dealer's parts order is routed through his nearest parts distribution center, such as in Chicago or Indianapolis, to an area processing center, such as the one in St. Louis. The APC checks all its local distribution centers for the parts and may forward the order to the division's headquarters cpu in Flint.

The Area Processing Centers are regional centers equipped with either two IBM 360/40s or a 360/40 and a 360/50 which are on-line to the IBM 370 processor at the Parts Div. headquarters in Flint, via a 4800 bps telephone line, using bisynch protocol. (This 370 processor is not directly accessible by dealers, although it may be made available to them in the near future.) There are four Area Processing Centers in RAPID, each of which provides the order processing support for a group of PDCs. APCs are located in Atlanta, Oakland, Calif., Newark, and St. Louis.

For dealers, the network's operation is transparent. For all intents and purposes, each dealer has direct access to the APC computer, and the parts service man who actually places the order needs no specialized training to communicate with it.

Typically, parts department personnel prepare their orders on paper tape on the tty, then dial a local number to reach the distribution center which regularly supplies their parts. Incoming data from dealers is multiplexed along with RJE data for the PDC. This combined data stream is transmitted to an APC through a single modem over a leased telephone line operating at either 2400 bps or 4800 bps, depending on the number of computer ports provided.

In some cases, 7200 bps lines are used for tandem operations. In this situation, traffic from one PDC is routed through a second PDC, instead of going directly to the APC. Data from both PDCs are multiplexed and transmitted in tandem to the appropriate APC, to provide line savings.

At the Area Processing Center, another 2100 Series Multitran demultiplexes incoming PDC data streams, routing the traffic to the center's 360/40 processors through either a Memorex 1270, an IBM 3705 or an IBM 2701 communications controller.

The RJE data from the PDCs are also demultiplexed and either routed to one of the APC computers for processing or sent on to GMPD headquarters at Flint.

After receiving the parts orders from the dealers, the APC automatically checks stored data on the inventories contained at all the PDCs within its region to determine if the needed parts can be supplied by any of these centers, starting, of course, with the PDC nearest the dealer, then moving on to the next closest, and so on.

If an order cannot be filled from one of the distribution centers within an APC's jurisdiction, the APC processor forwards unfilled portions of the order to the central 370/155 processor at

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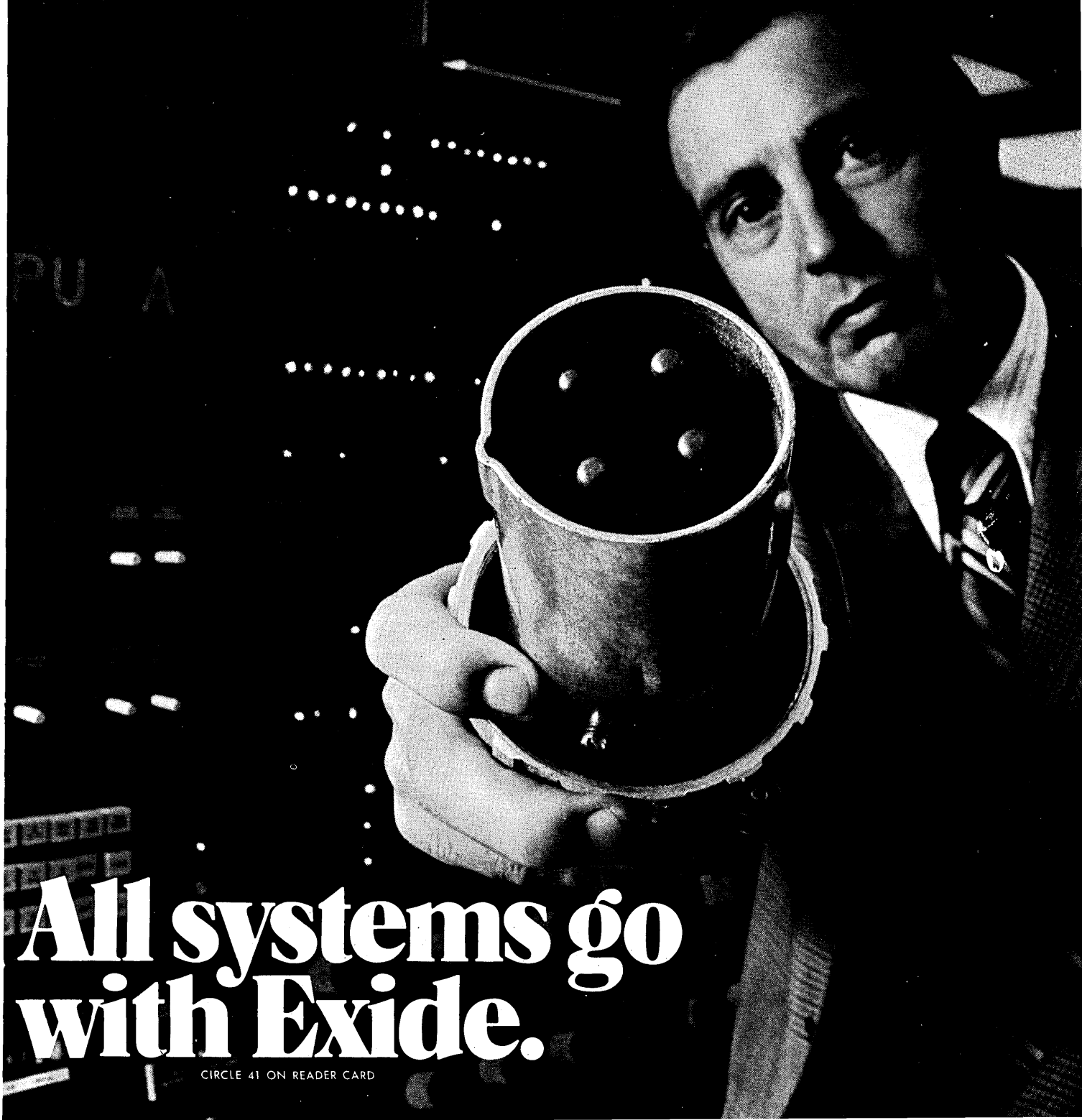

All systems go with Exide.

CIRCLE 41 ON READER CARD

Flint, which in turn automatically determines if the needed parts are stocked at other locations, such as the Michigan parts plants. The GMPD processor will also survey other APC processors if necessary, so that wanted parts may be shipped from an APC area other than that serving the ordering dealer.

Occasionally, a desired part may not be stocked in inventory, in which case GMPD headquarters calls for the part to be manufactured and dispatched to the dealer originating the order. The dealer is notified of the scheduled delivery date.

Once a dealer's order has been processed through the network, the APC automatically transmits answerback information to the dealer's terminal via OUTWATS (Bell's outgoing wide area telephone service). The answerback contains such data as the packing slip number and detailed information concerning all the parts ordered, including where the parts are being shipped from, whether the part number has been changed recently, and if so, the new part number.

The built-in feature for updating parts numbers provides the dealer with an additional advantage. For example, in cases where parts numbers have changed and the dealer's order cites outdated numbers, the APC automatically updates the number and notifies the dealer in the answerback. In many cases, dealers have found needed parts in their own stockrooms after being made aware of such changes.

Continuous error-checking is another built-in feature of the network. RAPID incorporates a trouble-shooting system which monitors all network components, isolating and identifying faults which might crop up between APCs and PDCs. This involves the application of Checktran test sets which are installed at all four APCs to test network components concurrent with (and transparent to) data being transmitted, continuously looping signals to the PDC multiplexors, monitoring errors by time periods on communications lines.

However, there are several far-reaching advantages for all concerned with RAPID operations, including obvious benefits to dealers who no longer need maintain extensive stocks of low-volume, big-ticket parts.

Another benefit for General Motors is the savings realized in equipment and telephone line costs, through having the multiplexor equipment use existing hardware and software. For example, the multiplexors incorporated into RAPID are flexible enough to handle any communications code, such as the outdated STR protocol, as well as any facility speed. In addition, supplementary multiplexor modules can be added at any PDC or APC installation as the need arises. The multiplexor network also alleviates the need for multiple telephone lines to serve tty and RJE traffic between PDCs and APCs.

12,000 phone lines?

Equally significant is the fact that the alternative solution to the implementation of a multiplexed network carried implications of heavy expenditures for manpower as well as telephone lines and equipment.

The alternative available at the time RAPID evolved was simply having people call in and give their orders over the telephone. Because RAPID was being geared to handle 75% of the volume from 12,000 dealers, this approach would have entailed massive expenditures and facilities not only for communications equipment but for the people required to answer those telephones and process the orders as well.

Originally, however, RAPID began as a test program comprising a few dealers in a limited area, using private telephone lines and some asynchronous multiplexed 1200 baud lines for the teleprinter traffic, and two networks, one for tty input and one for WATS out. However, this was long before the evolution of the GM Parts Div. and the advent of integrated digital communications serving dealers for all divisions.

The first field-testing of the initial concept began about six years ago, using some GM dealers in Newark. About a year later, the service was offered to all Newark area dealers.

At that time, RAPID was still basically a short-range tool, and participating dealers for some time to come resorted to the telephone to place orders and receive either confirmation or information on how the various segments of the order might be accommodated—by manufacturing or searching through distant parts inventories.

However, RAPID spread quickly throughout the East, gaining about 50 participating dealers a month.

Up to 1969, parts distribution was under separate car division control. In 1969, and continuing through 1974, these responsibilities were consolidated within the newly organized GM Parts Div.

With the creation of the division and a nationwide distribution system, GM addressed the problem of data communications between dealers, PDCs and APCs.

The decision was made to seek an alternative to the private telephone lines; the limited-performance, low-speed asynchronous multiplexors and, eventually, the tty-in, WATS-out networks.

By fall of 1973, previous multiplexing equipment had been replaced, redundant lines eliminated and bidirectional communications provided on all lines.

The network was built in a very short time. First installations were made approximately nine weeks after the order was placed by GM, and the final phase was completed eleven months from the date of the order.

The GM RAPID project team consisted of only three members of the GMPD computer operations department staff. This was probably the key factor in the success of the project; these people were deeply involved with the users, understood their problems, and were able to effectively communicate with them; this was vital considering the myriad of small, but annoying, logistical and technical problems that could (and did) occur in a conversion of this magnitude.

The resulting network made use of existing equipment that included data sets from four different manufacturers, a variety of central processing units and communications processors, along with synchronous and asynchronous terminals and telephone lines of varying data speeds.

Plans are now being considered to provide telecom links between dealers and the Flint cpu, via PDC and APC multiplexors, and to enable the APCs to make return calls to dealers and the PDCs they service via the multiplexed links, instead of through WATS lines, thereby further reducing long distance calls. □

Mr. Barr is vice president, marketing, for Computer Transmission Corp. (TRAN). His previous positions were with Honeywell in systems and sales, with Drakes Hotels as director of management information, and with Executive Computer Systems as director of customer operations and product development.

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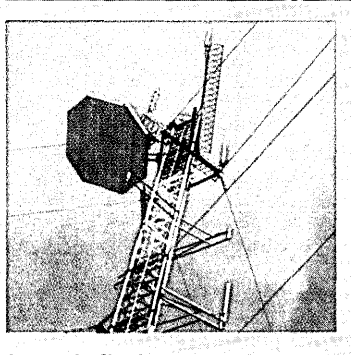

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WHO NEEDS A COMPUTER?

by H. Lawrence Abbott

Today's manager needs timely and accurate information to base his business decisions and corporate strategy on. The data processing function primarily has the responsibility to provide this service to management. Unfortunately, although the promise of data processing may be great, the actuality is often not.

We at Crompton & Knowles' Chemicals Group have gone through a very exciting and rewarding experience for the past thirty months—namely shifting our dp activities to a computer organization with Remote Job Entry (RJE) service. You might say that we have a 360/85 computer in our office and love it. With it, we can provide management with needed information in very little time. Furthermore, we use the computer when we want to, and as much as our needs demand. I consider this "demand processing" to be one of the most promising developments in dp today. In the future, I think we shall see more large computer utilities servicing many small-to-medium sized users with RJE for everyday commercial work. And the user will find RJE more economical, in most cases, than having an in-house computer.

Our applications

Previously, our company was known as Intracolor, and was owned by CIBA/Geigy. (It was sold to Crompton & Knowles in 1971.) Intracolor supplied dyestuffs and chemicals to the textile, paper, leather and other miscellaneous industries such as soap and detergent manufacturers.

As part of the CIBA/Geigy organization, our applications were processed on the parent company's System/360 Model 50. This was a DOS system with 256K, 2314 discs, two 1403 printers, two card readers and eight tape drives. We were not especially advanced in the state of the art, but we did have an excellent working relationship with our parent company, although it was 32 miles to the data center. Submission procedures were straightforward with keypunch sheets and computer paper tapes sent by mail from locations at Fair Lawn, N.J., Providence, R.I., and Chicago, Ill. Response from our corporate group was good and turnaround was acceptable, but there were always a number of reruns. Also, when we had specific large projects to be handled, we often had conflicts of priority at the corporate dp location for systems analysis, programming, and extra computer time.

Costs were, of course, charged back to the Intracolor Div. We spent about $7,000/month including charges for, among others, maintenance programming, systems analysis and programming, and computer use. As a result, we gained a good understanding of our out-of-pocket dp costs, which were lower than those charged on the open market.

Listed below are most of the applications handled for us by the corporate computer, accounting for over 300 programs. The list shows the volume of reporting as well as our division's dependence on these reports. (Many of these systems were quite sophisticated when they were installed in 1967 to 1969.)

Daily
- sales processing
- file maintenance
- accounts receivable update
- inventory update
- purchases update

Weekly
- inventory reporting and tracking sales vs. forecast
- accounts receivable report
- trial balance (A/R)

Monthly
- open purchase orders and purchase variance
- accounts receivable trial balance and critical accounts
- accounts receivable statements
- financial sales closing and cost reports (5)
- financial inventory closing, cost and transaction reports (10)
- sales history and analysis reports (11)

Quarterly & Miscellaneous
- purchase order writing
- sales forecasting and requirements (4)
- distribution system replenishment report
- customer potential
- customer profitability
- salesmen's call reporting
- sales budgeting

Prior to the sale of Intracolor, our department looked after product and customer file maintenance, and control of data flowing to the computer center. In addition to regular reports, we furnished management with special reports such as on annual purchases, sales tax, and royalties. We were not involved in payroll, accounts payable or general accounting since these were corporate systems.

Our dp staff consisted of a supervisor of business information who maintained the division's product master and handled all sales analysis, a systems information coordinator (I/O), and a recording clerk/typist who was responsible for maintaining the customer files, and I. When we learned our division would be purchased but not who the purchaser would be or what his dp capabilities were, we couldn't make long range plans other than to prepare for a move to another data center. We did hire a programmer/analyst, however, who would be responsible for this move.

Buying time

When Intracolor was purchased by Crompton & Knowles on Nov. 1, 1971, we had approximately two to three months to prepare for the transfer to the new data center. Some tough, important decisions had to be made quickly. The Chemical Group, which we were to join, had a facility at Reading, Pa. with a 16K Honeywell 115 and five tape drives. This installation did accounting, accounts payable, payroll, manufacturing inventory control, bill of materials, accounts receivable, sales analysis and billing. There was little possibility of quickly expanding this installation to handle our sales, inventory, or A/R. As a consequence, we were faced with a very pressing question: What shall we do with our existing workload?

We decided to split the workload into three components. The first involved shifting our accounting and accounts payable into the system's stream at Reading, and this was easily accomplished. The payroll was farmed out to a payroll service. But for the balance of our work—principally the accounts receivable, inventory control forecasting, sales budgets and sales analysis—we considered renting time or using a service organization. We wanted to set up a viable dp plan which would stand the test of time and allow ample oppor-

tunities for applications. Using computer utilization reports, we mapped out our computer time requirements load, excluding accounting, payroll, and accounts payable. This amounted to 80 hours of 360/50 time per month, but on a day-to-day basis, it varied from a half hour to eight to ten hours a day at month-end. (We still do about one-third of our month's billing, for example, in the first week of the month.) This bumpy load was of concern to us and would later be a factor in our decision to go to RJE.

We knew we would need to augment the existing staff, and planned to hire a computer operations coordinator and one keypunch operator only, since our major card input comes from a tape-to-card converter. Both were to start work Jan. 2, 1972. We also arranged to fill the programmer position in March.

By mid-November, we were in a position to search for dp services that would help us meet our tight deadlines and provide a good enough level of service so we would not need our own computer installation. We had a program, our financial inventory or '200' stream, that we wanted to use for benchmarking purposes. (It consisted of 13 programs, used both tape and ISAM files, and took 1½ hours on the System/360 Model 50.)

At the time of Intracolor's sale, Crompton & Knowles retained a consultant to review the existing corporate effort. Since we were actively benchmarking the '200' stream at local System/360 Model 30, 40, and 50 installations, the consultant suggested we consider RJE. We contacted SDL for this since CIBA/Geigy had previously used them. (SDL is an Ottawa-based company which offers services using a 360/85.) We did not fully understand on-line RJE and were apprehensive about dealing with an organization whose computer was so remote from our own location. However, the fact that SDL had a New York office with representatives, technical counselors, and a back-up 360/20-type terminal allayed our fears.

Advantages over batch

After the initial meeting and presentation, a schedule was established for benchmarking. Since we were a DOS operation, we tried our programs under OS using a DOS simulator. The results were most encouraging: 13 minutes run time compared to 1½ hours. The resulting costs, particularly of the benchmark, reassured us that RJE was the right approach. There were also these other favorable considerations:

1. Since demand was bumpy, we would not have to worry about prescheduling time.
2. With a terminal on our premises, we would have the equivalent of an in-house computer without the personnel and site costs.
3. We would be in complete control of our runs and not dependent on a disinterested operator to run the jobs correctly.
4. We could devote our limited personnel resources to applications (once converted) rather than operations.
5. Turnaround time would be fast with the large computer.

Once the decision was made to go with SDL, orders were quickly placed for a Badger DTS-100 terminal and 2000 baud reverse FX (foreign exchange) line to Ottawa. The dataset, terminal and line were all scheduled for delivery in mid-January, and in the meantime, we used the vendor's data center in New York City. The reverse FX line proved handy since we could go off-line with the terminal and, for the price of a local call, talk to the technical counselors or console operators in Ottawa.

The conversions

There was a great deal of initial detailed planning to do. Essentially, we divided our operations into daily, weekly, biweekly, monthly, quarterly and semiannual program streams, and attacked the conversions in that order. This gave us some maneuverability since we could keep our monthly processing and year-end quarterly processing at the CIBA/Geigy data center until the end of January.

Because our terminal and line were not scheduled to be operational until Jan. 21, our systems/analyst, the operations coordinator, an outside consultant/programmer, and I went to Ottawa for a week of formal JCL and introduction to OS instruction.

By the end of January, conversion of the daily and weekly programs appeared in order, and we arranged to have the ending files copied and delivered by hand to Ottawa. We planned to implement and run using the DOS simulator. Since our programs contained many console messages that had

Monthly $ Effects of

JUNE 1973					
At Fair Lawn			At Reading		Total
leased equipment	300 lpm terminal	$1,176	Honeywell 115	$4,223	
	data entry	521	data entry	278	
		$1,697		$4,501	$ 6,198
high-speed service	systems activity	$2,873	—		
	systems occupancy	2,083			
	operator activity	331			
	software usage	85			
		$5,372	—		$ 5,372
low-speed service	—		—		
	—		—		—
storage	tape	$ 279	—		
	on-line	1,140	—		
		$1,419			$ 1,419
			Total Service from SDL		$ 6,791
			Total DP Costs		$12,979
No. of jobs processed/month by SDL (b)					841
cpu plus I/O time					13.7 hours
cpu time					1.5 hours

(b) normally 2 million lines/month are processed

Table 1. Costs were lower after consolidating the Fair Lawn and Reading RJE centers, even though more work was being processed and additional low-speed services had been added. Some of the difference might have been due to an abnormally low level of use by

to be removed anyway, we estimated it would take only two to three days longer per program to convert to OS and save the simulator overhead. So we converted to OS, except for the '200' stream which SDL had used for the benchmark.

Some glitches

Transition was extremely smooth, and things went well until the end of February. Then it happened! Suddenly inventory appeared in the wrong product and at the wrong location. The balancing programs indicated everything was fine, but this was obviously not the case! After we worked on the problem unsuccessfully at our end, the vendor brought in one of its technical experts from Toronto. What happened was that the DOS COBOL F programs when compiled for OS caused changes in several of the symbolic keys as they were being built by the program. As a consequence, when the file was being written, the product reference may not have been on the proper product or location. By the time this problem was fixed, it was the end of March and we had to rerun February and March data to correct past errors. With access to a System/360 Model 85 and its tremendous capacity, we did these reruns in a week and a half. The availability of fast turn-around, on both compiles and regular processing, allowed us to meet our schedule.

Another problem occurred each month. We had trouble with the '200' stream under simulation. Since this was a program problem, we decided to convert the program that gave us the problem so that by year-end, the '200' stream would also be OS. Admittedly, our conversion costs were considerable because we were converting "on the run" with only half the programs run in parallel.

We had only two programmers, both new to the company, and programs four to five years old that were not efficient on the third generation computers. During the conversion process, we had the usual requests for information not covered by our library of report programs. For these, we relied on a retrieval and data base package called DATAMAN that was available from SDL. Once our files were defined, we were able to write a new retrieval report, debug it and have it working in about an hour with the 85's fast turnaround. Other packages such as WATFIV helped in debugging several FORTRAN programs.

Having made the transition to an outside organization, we were then able to get on with the serious business at hand. The supervisor of our systems programming section headed the conversion effort. He determined from the detailed accounting statistics from the 85 that there were a great many inefficiencies in our programs. As a consequence, we were paying quite a bit more to run the jobs than we had anticipated. ACCOUNTPAK, the service's billing algorithm, provided us with weekly accounting statistics which allowed us to pinpoint those jobs that were most costly to run. It was then an easy matter to concentrate our attention on optimizing these particular jobs. The results were gratifying.

Just as we were getting our heads above water with the conversion to OS, management decided to unify the Althouse Div. (at Reading) and Intracolor into the Dyes and Chemicals Div. We proceeded to eliminate redundancy between the operations. All sales analysis and history, accounts receivable and distribution inventory work was consolidated into the Fair Lawn SDL operations, and the payroll system at Reading was revised to include the former Intracolor payroll on Jan. 1, 1973.

By the end of September, conversion of all daily, weekly, monthly and quarterly programs was completed. In addition, we added one or two new systems, combined operations with the Althouse Div. and absorbed their sales history, accounts receivable and finished goods inventory files. Even with this added volume and programming changes, we began to reap the true benefits of our RJE operation during the fourth quarter. We contracted for a terminal plan and pegged our monthly payment at $9,000.

To our great pleasure, we began building credits of $500 per month. As we reviewed our costlier jobs, as identified in the charge by ACCOUNTPAK for each job, we were able to make additional changes to further reduce our operating costs. We then approximated the costs charged by CIBA/Geigy which, incidentally, could not have been matched by local computer installations just selling machine time.

It was at this point that we looked at the $4,200 monthly rent for the H115. A technical representative estimated that we could convert these programs in four man-months and run at an estimated cost of $1,900 to $2,950 per

Consolidating RJE Centers

JUNE 1974					
	Fair Lawn Accounts		Reading Accounts		Total
	600 lpm terminal	$1,761	—		
	crt (low-speed)	110 (a)	data entry	$ 625	
		$1,871		$ 625	$ 2,496
high-speed service	systems activity	$2,216	systems activity	$ 916	
	systems occupancy	1,527	systems occupancy	752	
	operator activity	291	operator activity	123	
	software usage	35	software usage	13	
		$4,069		$1,804	$ 5,873
low-speed service	terminal connect	$ 285	—		
	systems activity	56			
	systems occupancy	35			
	I/O	14			
		$ 390	—		$ 390
storage	tape	$ 326	tape	$ 96	
	on-line	1,442	on-line	559	
		$1,768		$ 655	$ 2,423
			Total Service from SDL		$ 8,686
			Total DP Costs		$11,182
No. of jobs processed/month by SDL (b)					960
cpu plus I/O time					15.4 hours
cpu time					1.7 hours

(a) low-speed service not available in 1973
(b) normally 2 million lines/month are processed

systems personnel in June 1974, but the conclusion of more jobs for less money is accurate in spite of this abnormality.

month. With the cost of a terminal at $1,100 and communications figured at $500 per month, our estimated costs could be slightly higher than that of the in-house machine. Conversion would involve an extra expenditure for training and parallel running of about $15,000. Having Reading on RJE also would give us the following additional advantages, which we felt would more than offset any added costs:

1. reduction in overtime
2. earlier month-end closings
3. the ability for each installation to produce reports for themselves as well as to route print to the other terminal
4. the ability to originate input at either terminal for use in the other's programs by creating a data set at SDL for common use (This beats sending cards by mail at month's end.)
5. the opportunity to upgrade our entire system to third generation computer usage.

We started conversion in May and on Oct. 1 shipped out the H115, leaving a Series 74 Data 100 in its place. (The Fair Lawn Badger terminal was replaced with a Data 100 terminal in spring of 1973.) The job took five man-months. Accounting reclaimed one programmer, but the section chief kept the shop running smoothly and converted the systems almost single-handedly.

By year-end, we proved that this was a good decision. Running costs had been a little higher at first, due to extensive debugging, but we had most programs 'fine-tuned' to acceptable cost standards.

As we began preparing 1974 budgets, with the energy crisis beginning, we started to look at possible cost savings and other efficiencies of operation. An obvious one was to combine the Fair Lawn and Reading operations, and eliminate some redundancy in operating personnel and unit record equipment. With the controller's office and all manufacturing located in Reading, that city became the logical choice for our new computer information center. Fair Lawn's center would be closed.

People problems

Although five people were asked to move, all declined except myself, and we had to replace our programming staff and one person in operations for a net savings of 2½ persons. To carry the heavier print load, we replaced the two Series 74 DATA 100 terminals with one 600lpm Series 78 and a 4800 baud leased line at Reading.

Beginning in mid-December, we targeted April 19 as the move day, but by late February, we lost so many of our personnel that we moved on March 15.

Fortunately, documentation was good and the Reading personnel extremely competent so that transition went without a hitch. Now, the operation has become even more efficient. Our costs (exclusive of personnel) are less than a year ago, even with the addition of the low-speed terminal and service in 1974 (see Table 1).

The results

Our original communications facility was a 2000 baud, reverse FX line. Since we were printing about 1.25 million lines per month, we converted to a 2400 baud, full-duplex line in May, 1972, and to 4800 baud in April, 1974. Should our volume require, we can upgrade the terminal and line to 9600 baud. We are in complete control of our costs and can relate them to development, standard operation, and storage charges. We maintain a 150-reel tape library in Ottawa plus considerable on-line storage for our main files and object library. The production control and library systems at SDL take care of almost all librarian duties at relatively low cost. At the moment, our costs are within the original benchmark estimate even with new applications added.

We use the overnight 15% discount processing as much as possible, and in 2½ years we have used the ultra-priority daytime rate only 10 to 15 times. This kind of control allows us to grow in orderly, planned fashion. We can cut back when necessary, and zero in on and improve these programs which are most expensive. In addition, without the available speed for running our programs, we could never meet the two-day month-end closing schedule required by Reading.

The vendor also helped us to arrange Computer Output Microfilm (COM) facilities for putting some of our reports on microfiche. They coordinated this with COR Systems in Montreal. Now we have a report which is on tape; the tape is flown to Montreal, the microfiche is made and mailed to us in Reading. This takes three work days. Having a 1600-page report on 8 fiche (4″ x 6″) saves us print time, paper, and storage space. Besides, the users like it.

Some applications on our drawing boards may require a mini-intelligent terminal to be used as a concentrator or processor for editing functions off-line, and as a communicator to the computer site. In any case, we would always consider using RJE to a big computer as a must for development work, testing and debugging. In addition, a study showed that our break-even point for an in-house computer would be reached in late 1975 at the earliest. We continue to better our long-range projected costs and see no reason for an in-house system at this time.

We are firmly committed to RJE and anticipate that it will satisfy our requirements into 1975 and possibly through 1976. On completion of a feasibility study with three mainframe vendors, nothing in their proposals enticed us to commit all our resources to one slower in-house computer, with all the added costs and personnel problems that would bring.

Advantages over in-house

In making this feasibility study, we considered the following list of advantages of RJE over an in-house computer.

1. no site preparation costs or air-conditioning requirements
2. lesser space requirements
3. minimum operating personnel required
4. no capital investment
5. no maintenance cost
6. no special training needed
7. no tape and disc librarian required
8. no operating systems programmer required
9. variable cost by volume rather than fixed overhead cost
10. no long-term binding contracts
11. no computer "scheduling problems"
12. most powerful equipment available for performance with latest peripherals and versions
13. elimination of idle computer time
14. fast recovery if reruns are required
15. availability of many software packages at low royalty surcharge costs
16. many utilities available at no cost

A comment about service levels: When first going on the system in January, 1972, the service level and turnaround time was exceptional. COBOL compiles printed out within 1-2 minutes after the last card. Production work took a few minutes longer because of tape mounts. Then, as the number of jobs the vendor's system was handling increased from 2,000/day to 3,000-3,500 in June, 1973, turnaround slowed to 5-15 minutes. However, with the addition of a 370/155 in December, replaced by a 158 in June and a 168 in August,

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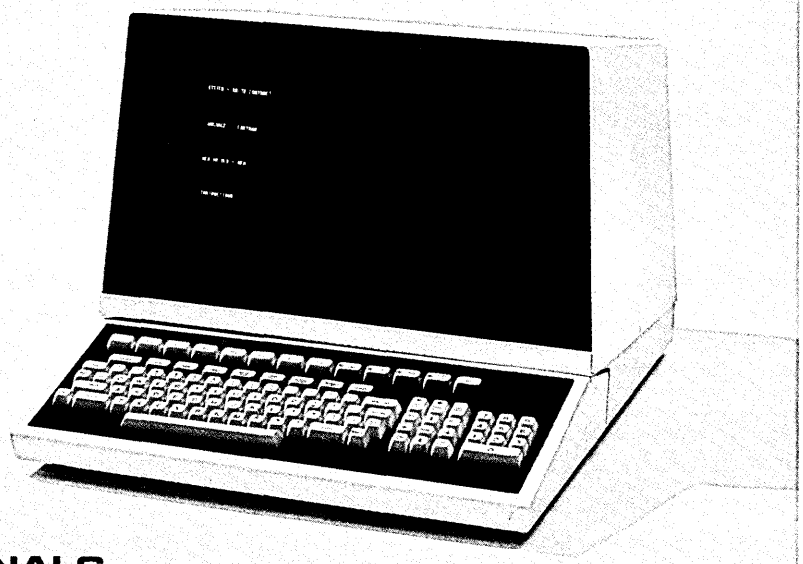

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Reliability has also been excellent —higher than most in-house systems. Since night jobs are entered during the day, in chains when necessary, no second shift is required for the same production.

With the advent of 3330's in 1972, a disc sort utility was provided which increased production considerably. We like OS also and doubt that we would ever revert to DOS.

Savings

From Table 1, our cost savings in the Fair Lawn system stream alone are apparent. Although we added several new systems since June 1973, we also improved efficiencies in the system. This efficiency improvement may be due to a very low rate of systems use for development work, compiles, and debugging, during June 1974. Under normal operations, we found that a programmer accounts for about $500/mo. of computer charges.

The equipment consolidation has reduced our monthly rentals from something like $6,200 a month over a year ago down to $2,500. When savings from our systems and application program activities are added, we are more than happy with the overall financial saving.

We get excellent assistance from our vendor, plus outstanding turnaround at an attractive price. Additionally, we have access to an extensive range of software including DATAMAN, MARK IV, TOTAL, and unique utilities, and we are continually encouraged to optimize and further reduce the costs of running our jobs. From a cost-allocation viewpoint, we have extremely good control since we are able to charge back to the user groups the costs associated with their programs, furnishing detailed documentation on those costs. Our management is also pleased with the day or more speed-up in month-end closings and delivery of reports.

Conclusions

That is our story. We defined management's requirements in terms of their needs—performance at a realistic and controllable price; reports that are timely and accurate. In short—value for money.

The RJE user gets big computer speed at small computer costs, expensive software packages for a fraction of the usual cost, and he never needs to worry about idle capacity or hours waiting to schedule a time slot. He can control costs by limiting on-line storage and using overnight processing. And finally, he enjoys the advantages of in-house computing with few of the disadvantages.

In summary, I feel that RJE, with one of the large computer utilities, is the most viable and economic approach to computing for the small-to-medium size user. □

Currently the manager of the computer information center for Crompton and Knowles Chemical Group, Mr. Abbott originally came to CIBA in 1966 as manager of inventory and distribution, then moved to manager of information services when the sale of his division to Crompton and Knowles became imminent.

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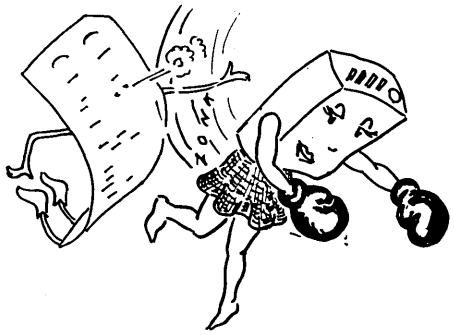

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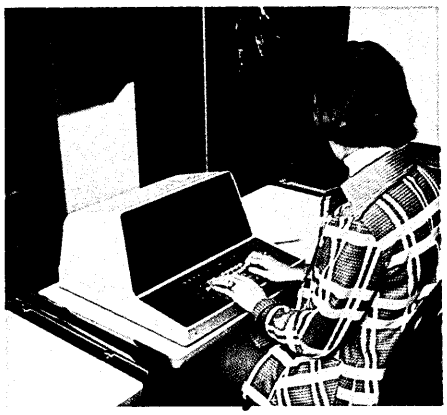

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Canada and Japan presently lead in telecommunication technology, while other countries attempt to catch up.

INTERNATIONAL CONFERENCE ON COMPUTER COMMUNICATION

by Paul Armer, Contributing Editor

The second International Conference on Computer Communication was held in Stockholm on August 12-14, following the joint IFIP 74/MEDINFO 74 meeting. The setting was the same —the International Fairs and Activity Centre, south of Stockholm. Attendees at IFIP and MEDINFO exceeded 4,000, and counting exhibition personnel, some 5,000 people milled about the conference center that week. ICCC 74 drew about 800 registrants and had no exhibit—the atmosphere was almost eerie after the mob of the previous week. But though fewer in number, ICCC attendees were just as enthusiastic as, and looked much like, those of IFIP. However, it was easy to spot the politicians and government employees who also turned out for ICCC. Communications are regulated almost everywhere while the computer industry in general is not; consequently ICCC drew a much higher percentage of bureaucrats and government technical experts than did IFIP. This was especially true since communications facilities in Europe are often not only government regulated but also government run—usually by the Post Office.

ICCC is held every other year, compared to IFIP's three-year cycle. The first such conference met in Washington, D.C. in October 1972, and the next will meet in August 1976 in Toronto, just after the Olympic games. ICCC has no member societies nor individual members. Rather, it is a floating crap game with no fixed meeting place or agenda, and covers topics which neither IFIP nor any other international group seems to deal with adequately. It is a nonprofit corporation, incorporated in Washington, D.C., and run by a self-perpetuating international council, whose president is Dr. Stanley Winkler. There is no paid staff or bureaucracy, and each conference's national organizing committee is given considerable autonomy in making conference arrangements. The program committee has representatives from many countries. ICCC publishes no journals other than its conference proceedings, although it is considering several publishing options. There are no technical committees; however there obviously are committees to put on conferences, and at times, to form ad hoc committees. For example, at present ICCC is exploring the notion of providing workshops for developing countries.

Of the three conference days, more than half the time was devoted to a single stream of sessions consisting of welcoming addresses and amenities, a keynote speech, five invited speeches, and two panel discussions. The bulk of the papers given were therefore crowded into four parallel sessions on the second day and half the third day. This scheduling angered some of the attendees, especially the speakers, when as many as five papers were shoehorned into a 90-minute session.

Telecommunication policies

The keynote address was given by R. E. Butler of the International Telecommunications Union (ITU) in Geneva. ITU attempts to allocate frequencies, develop standards, and, in general, coordinate communications at the international level. Butler reminded his audience that telecommunications is more than 100 years old; ITU itself was formed in 1865. About 30 billion dollars is invested each year worldwide in meeting conventional telecommunications needs.

Butler stated the obvious: "the time has come to recognize that it is of national and international interest to agree on certain principles and policies on computer communications . . ." And ITU has had a committee at work which agreed that a world-wide Integrated Services Digital Network (ISDN) would be ideal, but the ideal is not achievable at this time since each country goes its own way. So committee members have agreed to disagree until 1976 at least, and will try to keep each other informed of their countries' plans and developments.

Butler pointed out that no country has yet fully developed communications policies nor has plans to deal in an integrated manner with both traditional and new (i.e., digital) telecommunication services. He gave kudos to Canada and Japan for being further along than other countries. He was mercifully silent about the U.S., where the communications satellite was invented but where commercial domestic utilization is hamstrung by our bureaucracy and special interests.

Technical aspects

Butler emphasized that several technical directions are possible. There are questions about the extent to which data transmission should be integrated with regular telephone service (the big boys refer to that as "telephony"). While the integration is technically feasible, integration cannot be permitted to increase telephony costs. And just what technology should be used was a much debated topic at the conference. The two positions most often advanced for networks are packet switching (a la the ARPA network—see the March issue) by which a fixed number of bits are packaged together and the "packet" is pushed around the network until it reaches its destination. Thus a long message is broken up into a number of packets. Packet switching is actually a subset of the store-and-forward network idea. In this more general concept, packets can be of any size rather than fixed.

The other position is that of circuit switching, akin to the way the present telephone system works. That is, if a message is to go from A to B, a virtual pipe (direct connection) is electronically put together from A to B and all the bits in the message are spewed down the pipe consecutively without interruption.

The disadvantage of packet switching is the cost of the hardware/software to do the buffering and processing of the packets. The advantage is that much greater line utilization is achieved. Neither scheme is in the position at the moment to satisfy the whole range of demands equally well.

Canada's policies

The conference was told about the national plans (sometimes "thinking" or "wishing" would be better words than "plans") of a number of countries. Descriptions of what is taking place in Canada (where they've had a

domestic communications satellite for sometime—using U.S. technology—and the world's first digital data network) and Japan, received a special place in the program since no other sessions were scheduled while they were being given. Similar treatment was given to a survey of Western Europe.

Canada has an interdepartmental committee concerned with computer/communications policy with representatives from 40 government departments and agencies. It has a permanent full time chairman, a steering committee, and a permanent secretariat attached to the Department of Communications. The committee has identified a number of key policy issues:

- Should telecommunications carriers be allowed to provide computer services too?
- Alternatively, should computer service bureaus be allowed to provide communication services also?
- Should private networks for user organizations (e.g., airlines) be allowed to proliferate, or should there be a common user network shared by all, large and small?
- Is there room for several independent public networks, and, if so, should there be a requirement for compatibility and/or interconnection?
- Should import duties be applied to hardware, software and data in order to encourage domestic capabilities in these fields?

Canada has plans for a hybrid packet and circuit switched network scheduled to begin operations in 1976.

Elsewhere

Japan has decided that the management of its data transmission network will be in the hands of its common carrier monopoly with a tariff system separate from the telephone rates. The Japanese seem headed for a hybrid approach as well, since they believe that each scheme has its own appropriate application region, although the area where circuit switching shines (long duration calls greater than three minutes in length with high traffic intensity per terminal) is comparatively small. It is the latter fact which leads packet switching advocates to argue for a pure packet system.

France has an experimental packet system under construction (called RCP), due to become operational in January 1975. They are also planning a separate circuit switched system for future implementation. The British Post Office hopes to have an experimental packet switched service (EPSS) operational by mid-1975. Spain has had a packet switching network (2 nodes in Madrid and Barcelona with some 500 terminals) in operation since 1971.

The Nordic countries (Norway, Finland, Sweden, and Denmark) have decided that there is virtue in cooperation and are planning a joint network which they describe as being circuit switched but having a packet switching capability. Specs are due soon. The *Deutsche Bundespost* of the Federal Republic of Germany has decided to go the circuit switch route.

"Now, this company will not try to influence your vote in the coming election. I want to make that perfectly clear."

© DATAMATION

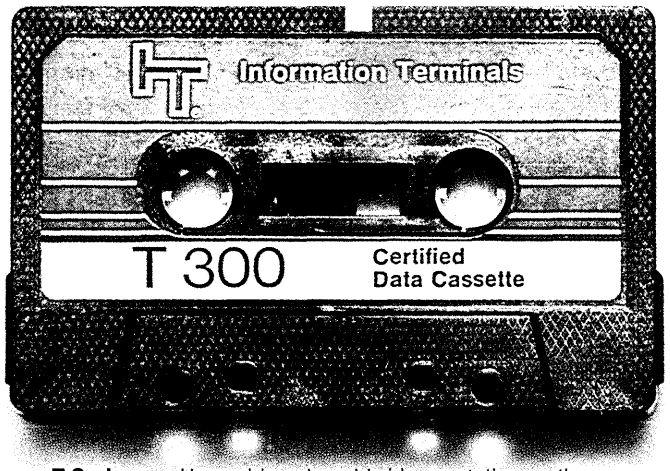
Other topics

Since the telecommunications industry has, in general, failed to keep up with the technology and demand with respect to data communications, several new organizations have put together their own systems, some international and some national. The largest of these is the international packet switched system SITA (Société Internationale de Telecommunications Aeronautiques), which runs for some 170 airlines. Another international system in the planning stages is SWIFT (Society for Worldwide Interbank Financial Telecommunications). It will have more than 235 member banks in 13 European countries, the U.S., and Canada. Within Sweden, the Swedish Power Generating Stations are constructing a store-and-forward system.

Lest the reader get the impression that there were no papers from the U.S.—46 of a total of 74 were from the U.S. while only one highly theoretical paper was from the USSR, and none came from developing countries—the conference heard about Ma Bell's Dataphone Digital Service, Western Union's International Digital Data Service, and Computer Sciences' INFONET System. Bell's Dataphone Digital Service is functionally discrete but physically integrated with the Bell System's existing telecommunications facility network; it's referred to as "digital under voice" and is circuit switched.

Although it wasn't on the program, it was most interesting to learn that the charges of American Packet Communications Inc. will be based on the number of packets sent regardless of distance. Now there is a harbinger of the future.

Most of the 46 papers from the U.S. originated from universities, consulting firms, or government agencies. Of the 10 which came from companies with a commercial stake in the future of digital communications, four were presented by IBM'ers with the balance being made up of one each from AT&T, Western Union, RCA, ITT, Hughes, and Computer Sciences. Besides, three European IBM'ers were also on the program. Will IBM come to dominate the digital communications field as they do the computer field? They appear to be working harder and probably more intelligently than their U.S. competitors. And if one were to look for an indication as to how they are betting in the packet vs. circuit switching game, there were two papers from their lab in Rüschlikon in Switzerland describing an integrated system which would support both packet and circuit switch traffic. □



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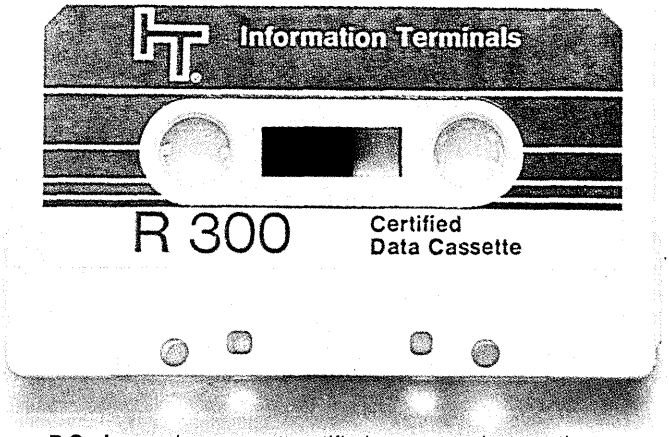

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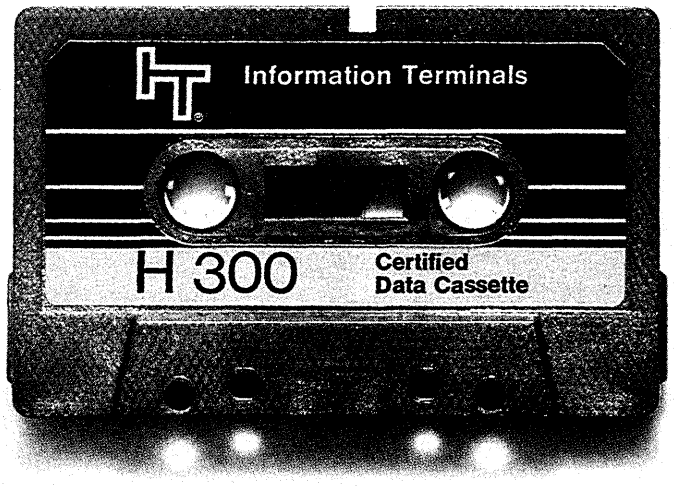

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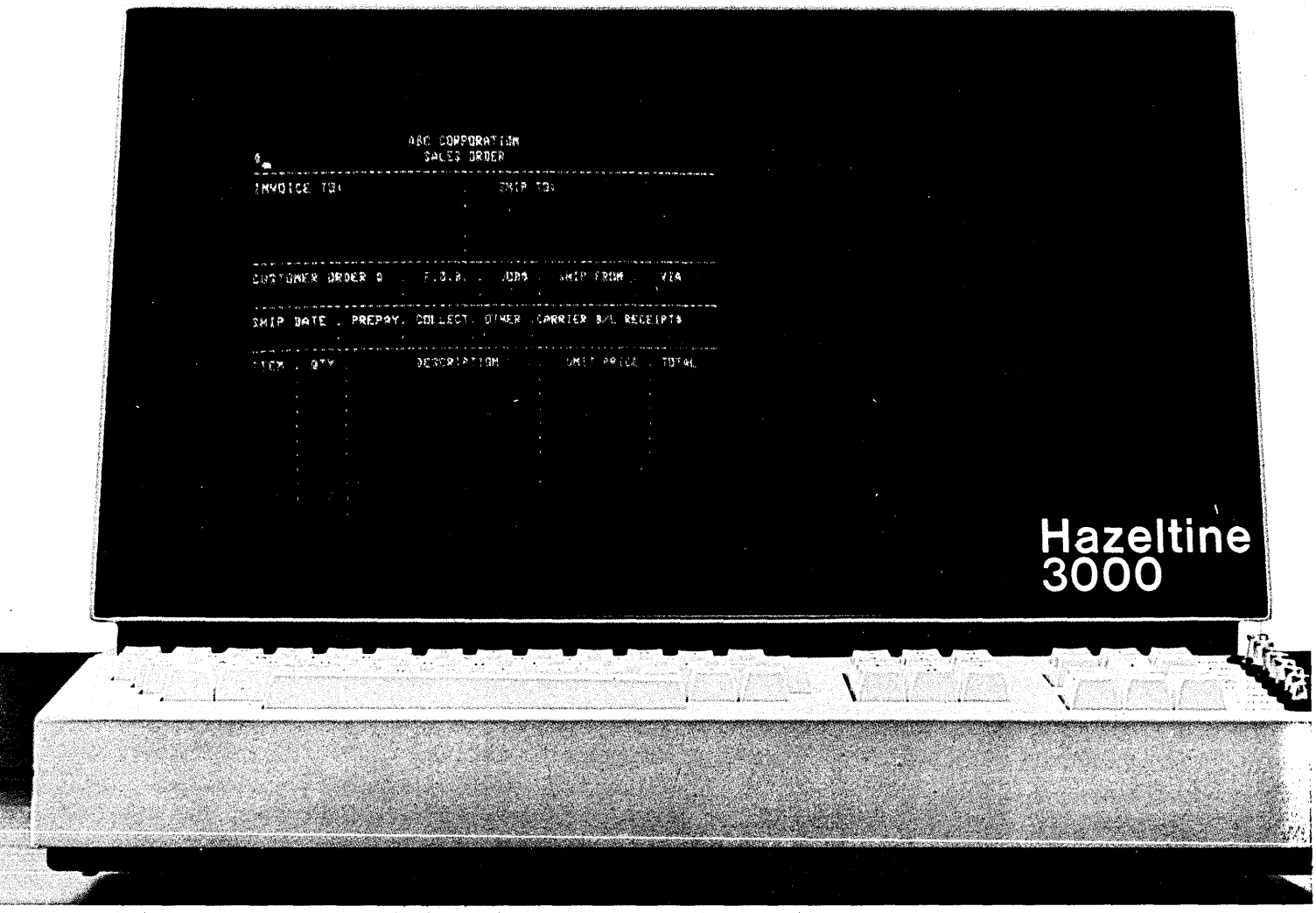

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news in perspective

Interviews with users of IBM's virtual storage (VS) operating system indicate that VS can increase (and decrease) throughput; that VS is more efficient in its management of real storage than OS; and that the longer you run under VS, the better your experiences. These and other results of a survey of VS users are reported on this page. . . .

A Justice Dept. comment on a proposal by the Securities and Exchange Commission for development of a computerized system for securities transactions precipitated a bit of a battle between the New York Stock Exchange and vendors of on-line securities information services, page 102. It also indicated the Ford Administration is going to go along with Congress in favoring more competition in the way securities are traded. . . .

We're a long way from voting by telephone but computerized vote counting played a bigger-than-ever part in this month's general election, page 106. . . .

Funny little symbols proliferating among supermarket items herald a faster-than-expected move toward automated checkout in spite of some opposition in Washington, page 111. . . .

Speakers at a Computer Law Assn. meeting in Washington tossed about the pros and cons of privacy legislation, page 112. Rep. Edward Koch said of the bill he authored with Rep. Barry Goldwater, Jr., "I am as proud of that as anything I have ever done in the Congress.". . .

IBM introduced its long awaited 3850 cartridge mass storage system, page 118. User reactions to the gargantuan system were mixed. . . .

ICL has introduced its New Range and now is free to go on with its profitable business in current models, page 120. New Range is equipped with ample changeover aids. . . .

Software

VS Users Find Throughput Balances Higher Overhead

At Least That's the Case for Some in Recent Survey

A survey of users of IBM's virtual storage (VS) operating systems shows clearly a wide diversity of experiences, probably about as diverse as the users' experiences with the OS that preceded the change. Some admit to having problems with high paging rates, easily reaching that point at which the computer is said to be thrashing. Others have avoided this bottleneck. Some acknowledge having a high system overhead, but feel their higher throughput more than compensates for this.

At a 370/145 installation in the Midwest, running under VS1, a site that insists on anonymity, they got around the overhead problem by enlarging the 256K of main memory to 512K. At the lower increment, a spokesman says, their overhead "was fantastic. It must have run 70%, 80%. But once we opened up real memory the paging rate went down and our problems went away." At another 145 installation, this one running under VS2 Release 1.6, cpu utilization measured over two 30-day periods was said to have moved from an average of 63% to 95% after VS was installed. "I'd say there's a bit of overhead in there," a systems programmer says with understatement. "And our throughput has probably declined about 10–15%."

At Skelly Oil Co. in Tulsa, Okla., they're running VS2 Release 1.7 on a one-megabyte 158, an upgrade from a 155 under MVT. A spokesman there says he's very pleased with VS. "I think we've been able to do things with this one that we could never have got to with MVT. We brought up an RJE (remote job entry) network that we had difficulty even selling the idea of before—and are supporting about 13 terminals now." They frequently run a reservoir model that requires a lot of core, a job that purportedly couldn't be run without VS. But with the intention of making this and other jobs run better, they're planning to upgrade to at least 1.5 megabytes, considering even going to two megabytes next year.

Virtual storage is IBM's name for what Americans originally referred to as virtual memory. An early implementation of it was on the Burroughs B5000, which means some people have approximately 10 years of experience with it. But it was not until IBM began delivering some of its System 370s that the concept of virtual and real memory got wide exposure. Currently VS is available in one form or another on the 370 models 115, 125, 135, 145, 158, and 168, as well as the 155 and 165 with the DAT (direct address translation) box.

Indicating the extent to which more IBM users will be migrating from the use of OS, the operating system for 360s, to OS / VS on 370s is a recent market study by International Data Corp. Earlier this year IDC found that "IBM will generate a growth rate in excess of 50% in numbers of 370 systems installed this year." The study also forecasts that by the end of 1976, total 360s and 370s installed will reach almost 19,000, and during that period the number of 360s will decline by 45%. Foreseeing an increased user emphasis on very large and very small computers, IDC estimates that 158s and 168s, both of which feature VS, will account for more than half the total dollar growth in 370s between 1972 and '76.

How they migrate

Available to 370 users are VS1 and VS2, the latter having a few more features than the former. It is difficult to specify the conditions under which a user should opt to run under one and not the other. But generally speaking those who ran under OS/360 MFT (multi-function tasking) migrate to VS1, while those with OS/360 MVT (multi-variable tasking) go to VS2.

Some 360 users opt not to make the conversion to a 370, what with their enormous investment in 360 hardware. (September, p. 122) And some with 370s continue to run under OS rather than VS, even though this newer system is available to them.

But there's a California utilities company that late last year switched from a 155 under MVT Release 21.7 to a two-

megabyte 158 under vs2 Release 1.6. The dp manager who asks not to be identified says they got their MVT to a point where they would go for months without an unplanned IPL, compared with some 75 fixes that the staff had to perform in the first couple of weeks under vs2.

"There's no doubt about it, vs does add to your overhead, but . . ." he says with a shrug. "We have the type of profile that says don't go to vs, because we're running such a high cpu utilization anyway. We chose to go because we knew that's where all the enhancements would be."

For the first five weeks with vs, he adds, they had four or five unplanned IPLS a week. Now it's down to one a week, still not as reliable as MVT was.

In small bites

Those who are making their initial plunge from MVT to vs2 should go first to the older Release 1 "before they try to bite off Release 2," says the spokesman for Skelly Oil. "It's much better to get your feet wet in a simple system before you jump into the middle of all the rest of that," he adds. At Skelly, whose spokesman asked not to be identified, a one-megabyte 158 is running vs2 Release 1.7. The plan is to upgrade to at least a 1.5-megabyte system next year, possibly going up to 2 megabytes. And they're trying to get Release 2 of vs2, which purportedly will not be out until next January. In contrast to the minimum of 256K bytes of main memory required to operate under MVT, the user needs at least 768K with vs2-2.

Some advice for the smaller shop is offered by C. R. Gibson, manager of MIS at Information Handling Services, Denver, Colo. They have a 320K model 135, enlarged early last summer from 240K (vs users typically find they need more main memory than anticipated). Gibson talks about his dislike of changing software and his preference for staying with OS-MFT. "Unless you have some extensive experience with OS, I wouldn't even recommend thinking about vs," he says. "DOS shops certainly shouldn't even be thinking about vs because they will not utilize the benefits of the system, most of which are in OS."

He explains they went to vs only so they could run batch jobs simultaneously with CICS, a data communications monitor that allows file accesses, on a small machine.

What to gain

"Anytime you're going to change software," he adds, "the primary question is one of necessity. If you can get along without doing it, I would very much recommend doing so. Unless there's some great performance benefit. But there isn't under vs. I mean, you're not going to take a 500-hour shop and cut it to 400 hours. You might cut it to 480, but before that you're going to run 700 for a couple of months." Gibson acknowledges that in moving from DOS to OS one can get added features. "But the benefit of a vs system is simply that you can use a lot more core than you have."

Gibson's operations manager, Fenton Miller, adds, "As far as I'm concerned, the only reason to be on vs is to get to VSAM (said to be an improved access method over ISAM) and some of the goodies that are becoming available. From an operational standpoint, there's no big advantage to being on vs1." He adds that there could be some significant advantages to being on vs2 with a larger machine, saying: "In the case of a machine as small as ours, it appears to me that to do the job right we almost have to be at zero paging."

Larry Ebbitt, senior systems programmer at On-Line Business Systems in San Francisco, thinks the small 135 and 145 shop should get a significant improvement in throughput by running under vs—if it approaches the conversion intelligently. In the early stages after its migration, OLBS is said to have experienced a 10% increase in throughput with vs, a figure that could have been higher had they not spent so much time with early bugs in the software.

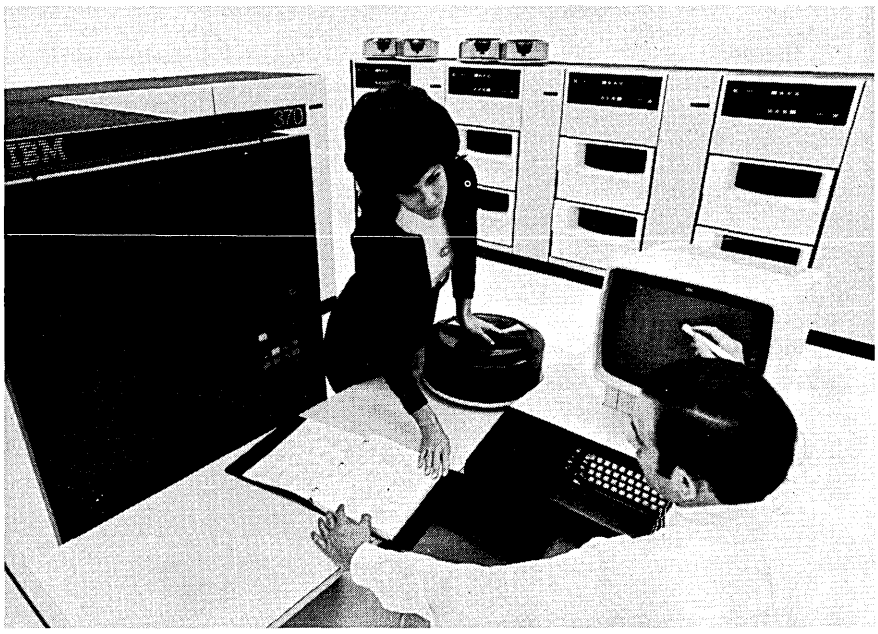
"I think our 10% was modest as hell," Ebbitt exclaims. "The major question such (smaller) shops should ask is, what's it going to buy them? If they're running really well with MFT, if they're not running out of storage, and they're happy with their cpu utilization, then it would buy them relatively little. But if their job stream has become bigger than their machine can handle—say, they have a 256K 135 with cpu cycles left but can't run enough jobs at one time—and they have a 24-hour work cycle that won't satisfy their needs, then they can probably go to vs1 and add one or two partitions and get that job done without going to a larger machine. But they must examine whether one or two partitions will do the job for them."

Ebbitt adds, "If they jump right in and begin running six partitions where they had been running two or three, and intend to generate a 4-megabyte system with 256K, they'll probably be worse off than they were before."

He also says there's a big payoff in relatively large applications, particularly the scientific shop using FORTRAN and PL/1 with a lot of arrays. Whereas such a user may now be putting part of his arrays in his program, part out on disc, with vs he can put them all in his program.

Shun subroutines

In the matter of programming standards under vs, Ebbitt recommends against the use of subroutines, saying it is better to have small pieces of coding repeat themselves in the program as



MODEL 158: IBM announced the 370/158 and other machines with virtual memory nearly 10 years after Burroughs offered concept with its B5000. But it wasn't until IBM began deliveries last year that the concept got wide exposure. Some see 158s and 168s accounting for more than half total dollar growth of entire 370 line.

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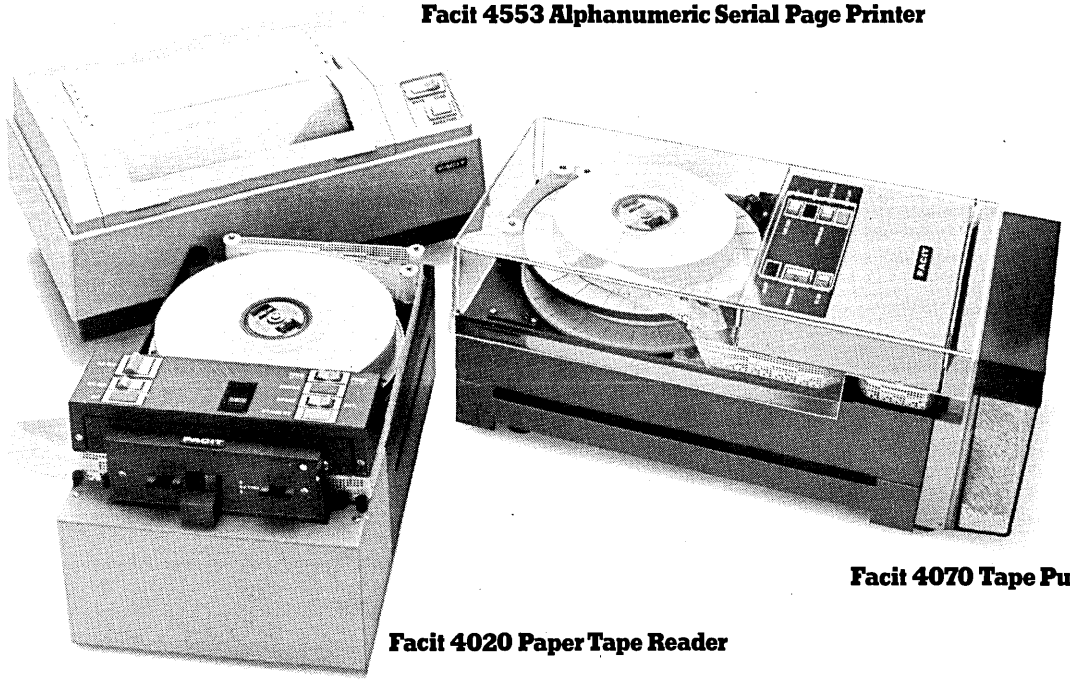

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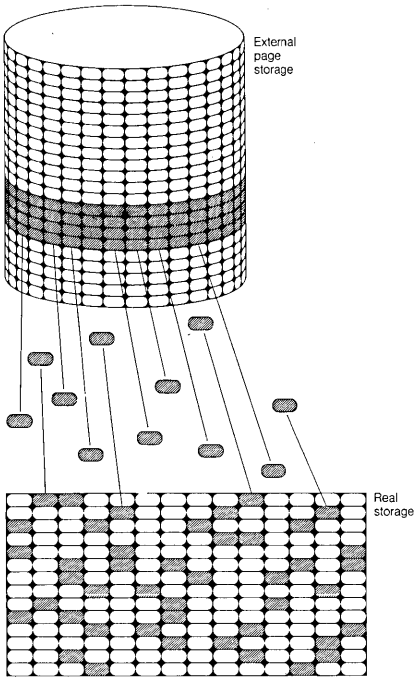
they occur. The name of the game, apparently, is to eliminate page faults.

"It turns out that structured programming is quite a boon for the virtual environment," he observes. "There are things I used to do (in writing programs) that I don't do anymore, because they're bad in the virtual environment." In assembly language programming, he explains, one should be careful in the use of literals. "You use constants instead, so you can keep them close to where they're referenced."

Didn't change programs

At Information Handling Service, they've gone to structured programming since the change to VS, but IHS's Gibson adds, "We were a very modular programming shop to start with." He says they didn't have to change any of their old programs. (Other shops report having instituted no change in their programming standards.) At the time of their conversion from OS to VS, they ran some tests at IHS and found that individual programs might run slower under VS—but overall throughput was said to be much greater. Gibson says they ran similar job streams under both OS and VS. One such mix ran two hours and 40 minutes under OS, but about an hour and 45 minutes under VS. That was a mix of 10–15 jobs.



PAGING PROBLEM
Users seek more real memory so paging rate will go down

However, the execution time of a job stream can be misleading. A West Coast utility company had a benchmark that consisted of some 32 jobs. Under MVT its execution time was some 56 minutes, while under VS2 it was closer to an hour and a quarter. But a closer examination showed the longer jobs ran longer and the shorter jobs ran more quickly. "Job 28, say, under VS started like 28 minutes into the benchmark, compared with 43 minutes into the benchmark under MVT," says the center's dp manager. "And it completed sooner, so we were getting more work through the machine." At a number of VS installations, this is the attitude: the increased throughput makes up for the overhead or the high paging rate or the added increment of real memory required.

As with everything else, there's also no agreement on the ideal ratio between real memory and virtual memory among those contacted for this story. This is confirmed by IBM's Richard M. Lonergan of the firm's educational facility in San Francisco. He says he has encountered sites where things were "super" at a 4:1 ratio and others not working at all at 2:1. He adds that the ratio is dependent on the operating system, the use of such things as the time-sharing option (TSO).

Still, a few things become evident after interviewing a number of VS users. Depending on the types of jobs run, VS can increase (and decrease) one's throughput. Too, VS is said to be more efficient in its management of real storage than OS. The longer you run under VS, generally speaking, the better your experiences. But it's also expensive. "I don't know how you determine the costs (of going from OS to VS), but just put big dollar signs on it," says one user. No one else could venture a guess on this expense. But Larry Ebbitt of On-Line Business Systems says, "Happiness is a large chunk of cash for more real memory, so you can watch the paging rate go down."

—Edward K. Yasaki

Wall Street

Automation: Conflict With Fixed Interests?

The Ford Administration seems to be going along with Congress in favoring more competition in the way securities are traded.

First sign of the Administration's attitude is in a recent Justice Dept. comment on a proposal by the Securities and Exchange Commission (SEC) to develop a composite, computerized system for processing and disseminating securities buy and sell offers to all traders. The proposed order, issued last summer, would require all traders to exchange bid-asked quotations on a "real-time, current and continuing basis."

The order has precipitated something of a battle between the New York Stock Exchange (NYSE) and vendors of on-line securities information services. The issue: who will provide quotations covering securities traded on the Big Board—the NYSE or the vendors?

The SEC has asked interested parties for their comments and the "self-regulatory" organizations—National Association of Securities Dealers (NASD), and the New York, American and regional stock exchanges—were asked to develop specific systems plans. The commission added that if these organizations failed to come up with a suitable plan by Feb. 1, 1975, vendors of securities information services and/or equipment could submit proposals.

To no one's great surprise, the New York Stock Exchange said the commission should not adopt the order, which is known officially as "revised proposed rule 17a-14."

The NYSE's opposition is understandable. It controls, exclusively, the distribution to securities traders of bid-asked quotations covering securities traded on the Big Board and earns substantial revenue from the service. If the SEC's proposal is implemented, NYSE would have to share control with other market operators, the commission would gain significantly greater supervisory authority, and NYSE's present earnings from distributing bid-asked quotations probably would decline substantially.

Central market element

The system proposed by SEC is merely one element of the "central" securities market Congress has been promoting for several years (April 1973, p. 108). In such a market, any registered broker or dealer could buy or sell any security. He no longer would have to be a member of the New York Stock Exchange, for example, to trade NYSE-listed stocks with other exchange members. Buyers and sellers would be able to make more profitable trades as a result, and a variety of preferences now enjoyed by insiders would be eliminated. At least, this is what central market proponents claim. But the NYSE now collects a hefty

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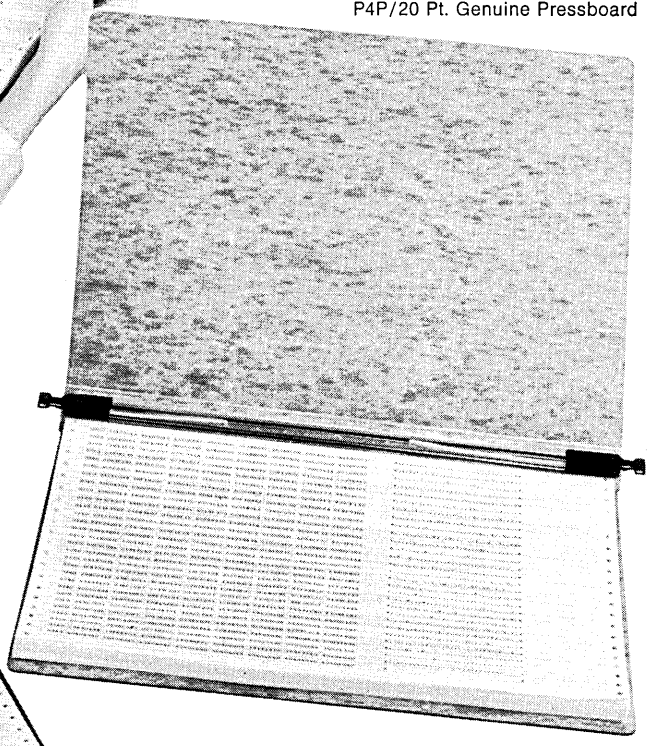

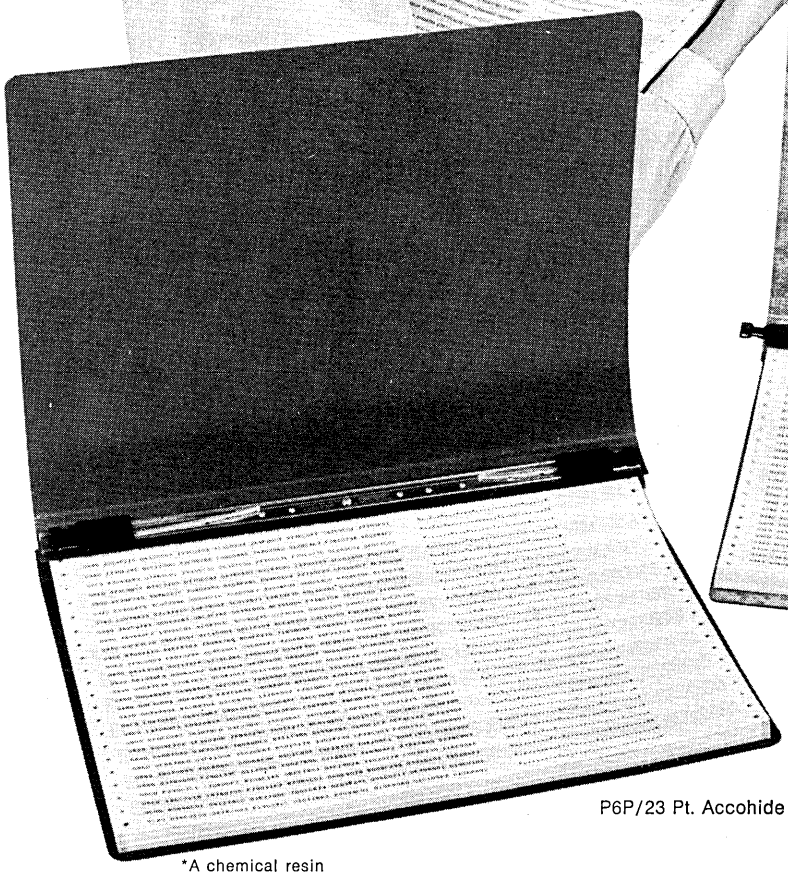

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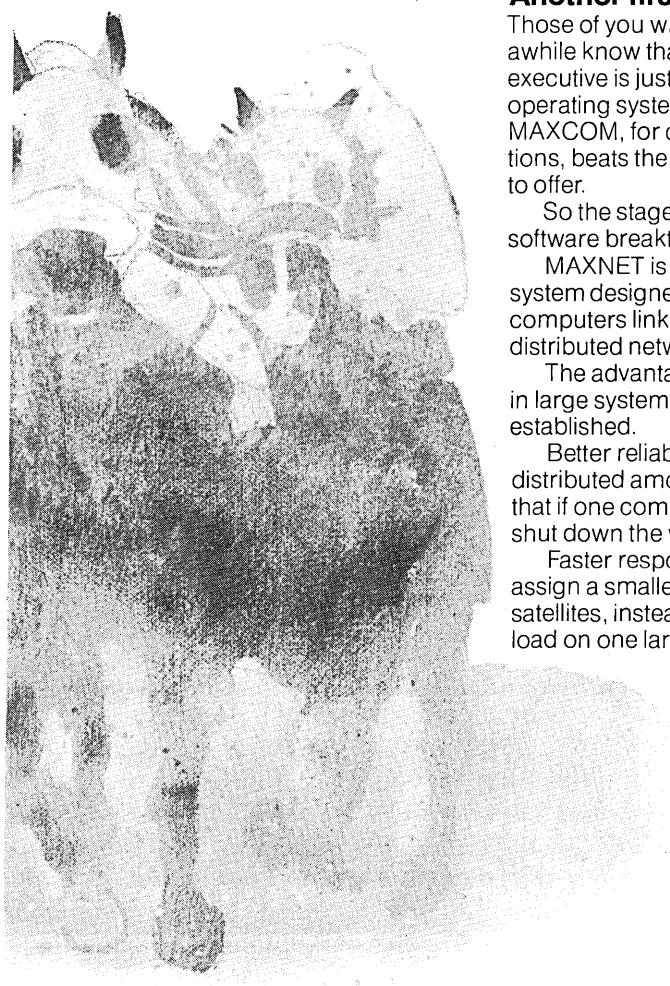

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CIRCLE 63 ON READER CARD

fee for renting seats on the Big Board, and has been reluctant to accept the central market concept because it would make these seats far less valuable.

Despite this opposition, legislation authorizing establishment of a central market is now approaching a final vote in Congress.

The first major step toward implementation of the scheme has been taken: last month, the New York exchange, in cooperation with operators of other securities markets, began offering a composite last-sale transaction tape to the nation's securities traders. But the tape encompasses only a small number of securities, and the service is to be provided on terms which for the most part were specified by the NYSE. So the exchange seems to have lost little if any leverage.

The issues

Issues still to be resolved concerning the SEC proposal for a composite bid-asked quotation system include: who controls the price of the service; whether independent vendors will be able to process as well as distribute bid-asked quotations in competition with NYSE and other market operators; and the amount of federal regulation.

The Justice Dept., in its response to the SEC request for comments, has urged the commission "to consider selecting processors (of bid-asked quotations) that would function independent of any self-regulatory organization."

"We do not believe the self-regulatory organizations, acting on behalf of their membership, will necessarily have the same economic incentive as an independent processor," the Justice Dept.'s statement contends. It adds:

"Not only has the exchange community been slow to institute technological innovations in a non-competitive environment, but automation may be in direct conflict with the "fixed" economic interests of certain segments of the exchange community. If the operation and future development of the automatic quotation system is left to competing, independent entrepreneurs, the brokerage industry would be better assured of economic prices, quality service and the most technologically advanced equipment."

Wants competitors

The Justice Dept. also advocated development of multiple, competing systems for processing and distributing bid-asked quotations. It said that service vendors, as well as the self-regulatory organizations, should be allowed to perform the processing function. It adds that if the commission decided, instead, to make processing a monopoly, the "monopoly processor should be barred from competing at the vending level." A basic aim of these recommendations, the Justice Dept. indicated, is to eliminate the "pervasive SEC regulation" that would be needed if competition were restricted.

Several other respondents also worried about restrictive regulations.

Bunker Ramo criticized the commission for insisting that all terminals attached to the bid-asked quotation system must be capable of displaying all competing quotes and identifying the market each comes from. The company contended that many users can be served adequately by a cheaper terminal capable of displaying and identifying only the highest bid price and lowest offer price. It added that the SEC terminal requirement would "render obsolete a large number of existing systems and brokerage office display devices."

Second fiddle

GT&E echoed this argument, and also objected to the SEC's decision allowing NASD and the exchanges to submit their system plans first. "The quotation vendors should definitely participate in specifying displays," GT&E added. "The various methods of ranking quotations of market makers in a security . . . all have different cost considerations . . . which must be taken into account with other considerations if a viable system is to result."

Autex, a major vendor of securities market information, said "the rule should certainly make it clear that the intention of the commission is for quotations to be available to all broker-dealers on a fair and non-discriminatory basis.

"Language should also be included that no plan will be accepted unless restrictions imposed by self-regulatory organizations, including insupportable proprietary claims to quotation data, are eliminated," Autex said.

The easiest way to resolve all of these complaints would be to adopt the Justice Dept's prescription, encourage maximum competition among suppliers of bid-asked quotation services, and let the market, rather than the SEC, control price, quality, the kinds of hardware and software offered, and other controversial features.

That approach isn't probable, given the SEC's historic sympathy for the views of the New York Stock Exchange. But it's possible the commission will become less solicitous than it has been. The Justice Dept. comments represent the first statement of the Ford Administration on the central market. Clearly, the White House, as well as Congress, favors far greater competition than NYSE does.

—Phil Hirsch

Vote Counting

The People's Choice . . . Some Anyway

Long before the dust settled on the political races in this month's election, computerized vote counting was way out ahead in terms of acceptance and extent of use.

It's a long way from predominating in U.S. voting precincts yet, but it's creeping up. And a quick tap of vote counting officials in mid-October indicated public confidence in the computer as vote counter also is creeping up.

"Controversy is built into computerized vote count systems," said one, "because voting is where government starts, but this year nobody seems fearful, not even candidates."

The most popular form of automated vote count systems is the punched card system. The biggest supplier of punched card equipment for vote counting is Computer Election Systems, Inc., Berkeley, Calif. Donald Dunbar, CES president, said his company's equipment was installed in some 15 to 16% of the nation's voting jurisdictions for this year's general election compared to 13% in 1972. This increase could be due, in part, to the fact that punched card voting is legal in 31 states this year, up from some 25 in 1972.

CES systems were used this year in 250 jurisdictions in 27 states. The basic systems use a generalized COBOL program and have been used with DEC, Control Data, IBM, Honeywell, Burroughs, NCR, and Sperry Univac computers.

Los Angeles county, the nation's largest voting entity, with more than 3 million ballots cast in the average general election, has been using the CES votomatic systems since 1968. This year the county tried something new. Where it had used IBM 360/20s to transfer data from the punched card ballots to tape to be run on the summary computer, an IBM 370/155, this year it used CES system 770s equipped with Documation card readers, for a "significant" increase in throughput.

New products

Similar systems were used this year in Seattle, Stockton, Calif., and Phoenix. Seattle, along with Chicago, tried out another new CES product this year, a

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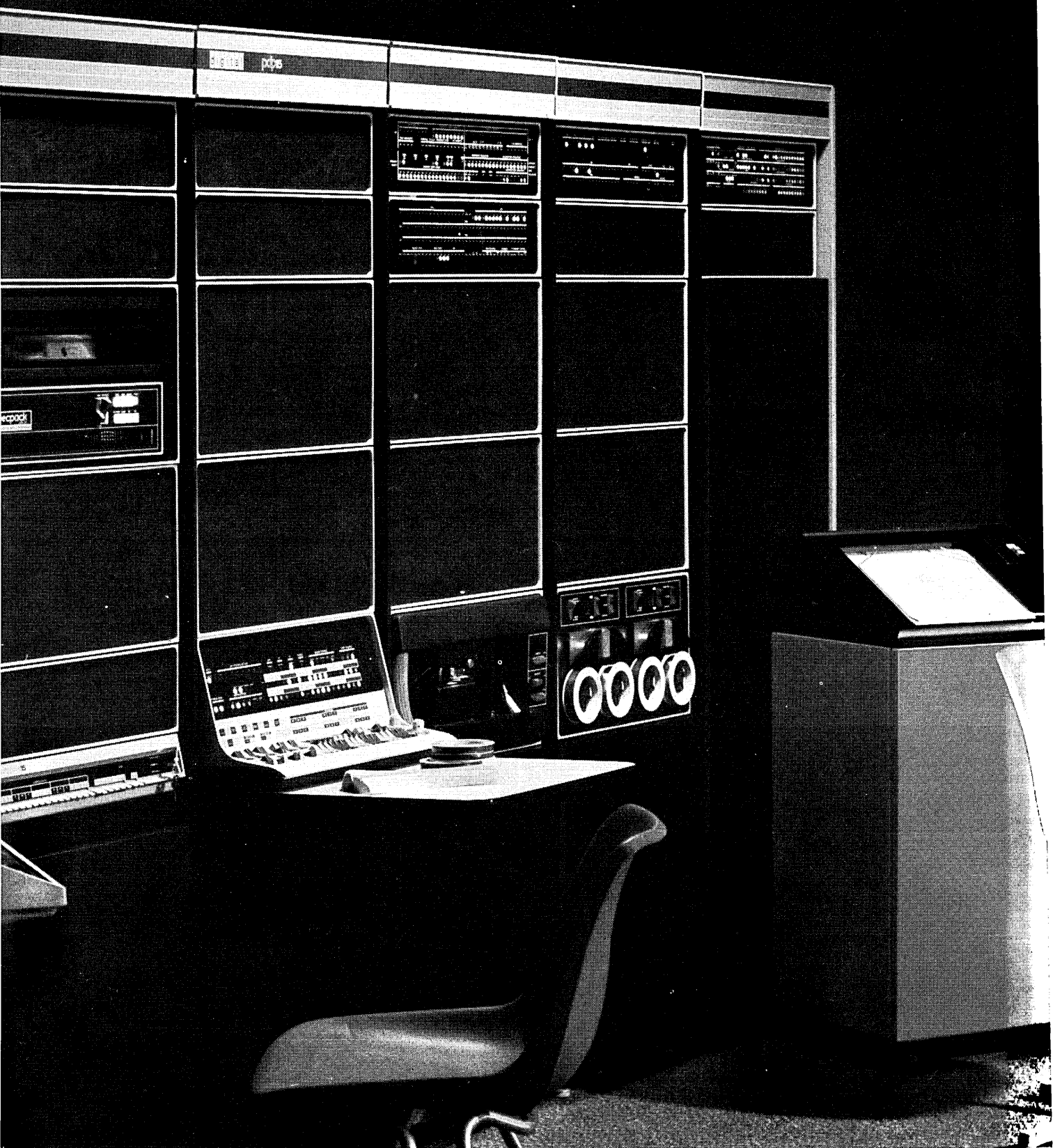

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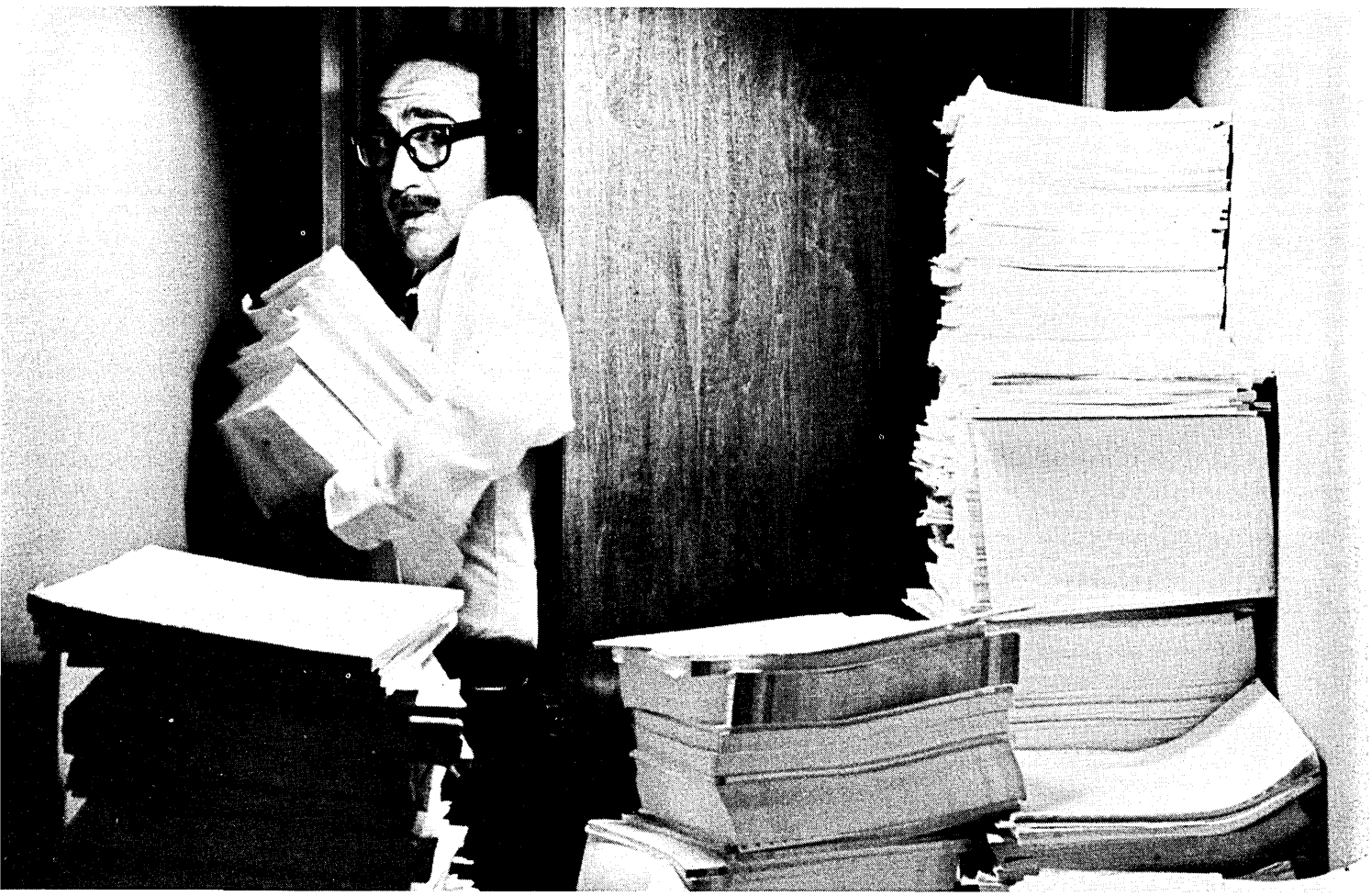
CIRCLE 50 ON READER CARD



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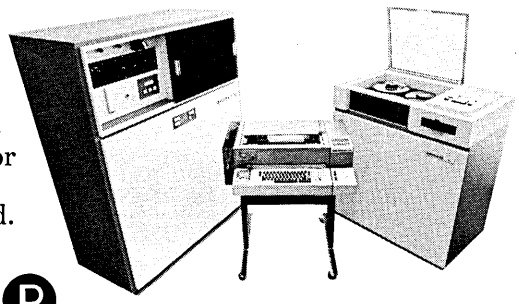

CALCOMP

CIRCLE 31 ON READER CARD

precinct ballot counter, on a pilot basis. These units, Dunbar said, will sell for less than $1,000 apiece. They are composed primarily of card readers and strip printers and enable precinct officers to tally ballots right in the precinct at the end of election day. The totals can be turned over to central counting centers in strip tape form.

Still another relatively new CES product, the System 330, based on a Data General Nova minicomputer and primarily designed to count ballots for small jurisdictions without access to big computer systems, was used this year in some 100 jurisdictions, mostly with fewer than 250,000 registered voters.

Data General mini's are the basis of another vote counting system that saw a considerable increase in use this year. It's the Datavote, produced and marketed by Diamond International, a heavy supplier of paper ballots for many years which gives it a leg into the market and a reason to want to supply its needs whatever they might be. Diamond's Dave Fry estimates the company has about $2 million worth of Datavote equipment installed in such far flung places as New Jersey, Alaska and Hawaii.

The Datavote system originally was designed and put together for Diamond by Standard Logic Systems of Santa Ana, Calif., which still provides some software and support. Diamond now buys the computers directly from Data General and assembles the systems in its own facilities. Fry said systems range in price from $26,000 to $170,000 for a multi card reader system. In some precincts, he said, Datavote units are used in tandem with CES equipment.

Fry said Diamond has been actively marketing the Datavote systems for only a year although they have been around since 1968 and have been used in the entire state of Hawaii since that time.

Names on the ballot

He mentioned as an advantage of the Datavote system the fact that the names of candidates are printed right on the punch card ballot which makes them legal in some states where other punch card systems, where the names are in an accompanying booklet but not on the ballot, are not. Also, he noted, Datavote cards are not pre-punched, meaning there are no pre-scored indentations around the punch areas which he feels eliminates danger of chad.

CES' Dunbar sees the total voting precinct marketplace in the U.S. as shaping up this way this year: CES, 15-16%; lever machines produced by Shoup and by Automatic Voting Machines Corp., 60%; paper ballots, 20%; and the remaining 4-5% split among Datavote, Cubic Corp.'s Votronics, and Gyrex (formerly Coleman).

The latter two systems have been around the longest but have never come into widespread use. One satisfied user of the Votronics system is California's Alameda county which has been using it since 1966. The system uses hand marked ballots marked with a special black ink. These are fed into a unit which optically scans them then stores totals on a drum memory. In some cases summary paper tapes are prepared for the final tallies and in some cases units are on-line to a computer, a 370/155. Jim Riggs of the Alameda County Registrar of Voter's office, said Alameda county has had no problems with the system. Software used is a county modification of basic Cubic Corp. software.

Riggs said he understands California's Contra Costa county had some problems with a Votronics system it tried to use initially on-line to a computer but the problem was software, not hardware.

The Gyrex (nee Coleman) system is in use in only two jurisdictions this year, Orange County, Calif. and Multnomha County, Ore. Orange County Registrar of Voters, Jim Mayer, is not unhappy with his equipment, only with the amount of it. "We have the same equipment used to count 300,000 ballots in 1964," he said in mid-October, "and today we have 600,000 registered voters. We'll probably be the last California county reporting in the November election." The Gyrex system, like the Votronics system, uses optical scanning to read ballots.

Another system using optical character recognition, one which utilized a laser for the OCR, produced by Control Data Corp., was used by the District of Columbia in the 1972 Presidential elections. The D.C. Board of Elections last month cancelled its contract with Control Data for counting this year's general election returns following a dispute between the board and CDC over responsibility for a breakdown in counting procedures for the Sept. 10 primary.

Someday there may be crt's in polling places where a voter can vote with a light pen or maybe there'll be voting from home by telephone using voice print identification techniques, but for now, both producers and users of computerized voting systems are satisfied that both use and acceptance is spreading.

—Edith Myers

Retailing

UPC Moving Faster Than Expected

Those funny line symbols that look somewhat like distorted piano keyboards are proliferating so fast in grocery stores that even their sponsors are surprised.

They're the grocery industry's Universal Product Code (UPC) selected as a standard by the industry in April 1973 for source marking of supermarket products. The unexpectedly rapid implementation of source marking will open up a potential $7 billion market for systems which will scan the UPC at checkout stands, faster than was expected.

Distribution Code Inc., Washington D.C., which is implementing and administering the UPC, was predicting last spring that 50% of supermarket items would be source marked by the end of the year. Now the firm is looking for 65-75%. Three firms, Hunt Wesson, Green Giant, and William Wrigley Jr. Co., are anticipating 100% source marking of their products by year end.

John Strubbe, of Kroger Co. in Ohio, chairman of the grocery industry's UPC Council, is more conservative than Distribution Code. He looks for 65% source marking this year. But he's pleased. "It's going much better than we expected it to go both in terms of source marking and in terms of the amount of equipment being offered by responsible computer companies. When we started this effort we weren't even sure there'd be one company offering equipment. Now there are eight or nine."

Strubbe's pleased. Distribution Code is pleased. Jay Beck of The Beck Engraving Co., Inc., Philadelphia, one of many companies selling film masters for source marking is pleased. Sale of film masters "started out slowly but now the momentum is building up," said Beck, "and I expect them to continue at a fast pace through next year."

Pass along what?

Not so pleased is Sen. Frank E. Moss (D-Utah). Sen. Moss, Chairman of the Senate Commerce Subcommittee on Consumers, has asked President Ford's Economic Summit Conference to "investigate the potential inflationary effect of this substantial investment at a time of high interest rates, tight money, and marginal profits." He is concerned that costs to the grocery industry for implementation of the UPC, which he sees as a possible $3 billion, could be passed on to the consumer."

"I think he is misinformed," said Strubbe of the Utah legislator. The gro-

cery industry today is operating on a less than 1% profit margin. "Our ability to pass along our current increased costs to consumers is severely limited," he said. "We're not going to install these things unless we can save money and hold costs down." Strubbe is convinced that scanning will hold costs down. He's also convinced that another of Sen. Moss' fears, that the use of laser scanners has the potential for high energy consumption, is without foundation. RCA, IBM, and others who have developed scanning systems, he said, did a lot of competitive evaluation of scanning technologies and decided lasers were clearly economically the best.

As for the cost of the source marking itself, Beck's company charges from $15 to $25 for one film master for the UPC, sold to packagers of grocery products. In producing the masters, Beck Engraving works with Philco-Ford Computer Services, and The Max Levy Co., an 88-year-old firm with a background in the manufacture of precision images in glass, originally used for photomechanical glass halftone screens.

A manufacturer who wishes to source mark applies for membership in the Universal Product Code Organization through Distribution Code. At the end of September the organization had 1900 members representing combined sales of $65 billion annually. Distribution Code issues members a manufacturer's code which is the first five digits of the UPC. The manufacturer uses the last five to identify the various products in his line.

Computer generated

If a manufacturer selects the Beck firm to produce his film master, he turns his code over to Beck which sends the code numbers to Philco-Ford via a terminal in its data processing department. A Philco-Ford computer program calculates the coordinate geometry of UPC master bar modules representing the code and computes the correct module check character digit. The magnetic tapes thus generated are delivered to The Max Levy Co. The tapes drive a Levy Autograph Engine, a $750,000 optical plotter that produces a chromium-on-glass master image of the code in nominal size. It is precise to .0001 inch. The glass master plate is transferred to Beck for manufacture of the film master.

Beck said there are "all kinds of methods" for producing film masters but he believes computer generation is "the only way to go." He feels firms taking this route are the most successful.

Distribution Code, in addition to upping its predictions for source marking, has increased its prediction for scanning installations. In August it was looking for 20 to 30 full blown supermarket scanning system installations within six to nine months.

Strubbe of Kroger, which tested Sperry Univac's Accuscan system (April, p. 149) for one and one-half years when it was still the property of RCA, said his stores have no scanning systems installed to date but "we definitely will have one or more next year." He said Kroger already has agreed to evaluate IBM's 3660 grocery store system. "And we definitely will go with several others next year."

In addition to IBM and Sperry Univac, firms offering grocery store point-of-sale systems are Bunker-Ramo, NCR, Singer, MSI Data Corp., National Semiconductor Corp., Litton/Sweda, and Data General/Dymo.

They're all counting on the market to develop, in spite of Sen. Moss. To another of the Senator's concerns—that the elimination of the need to stamp a price on each package would be a disadvantage to a careful shopper who keeps track of how prices are increasing—a consumer responded, "prices are changing so fast today what's stamped on this week's package means nothing next week."

—E.M.

Privacy

All That's Missing In the Legislation

The pros and cons of privacy legislation now making its way through both houses of Congress was the primary subject of discussion by speakers at the Computer Law Assn.'s fall meeting in Washington, D.C., last month. One speaker was Rep. Edward Koch, who, along with Rep. Barry Goldwater, Jr., introduced an omnibus privacy measure into the House of Representatives. That bill got hung up in the House Judiciary Committee but another, HR 16373, introduced in the House by Rep. William Morehead with Koch and Goldwater among its co-sponsors, was to appear on the House floor for a vote the day of the CLA meeting, but instead got lost in the shuffle of other pre-recess business and won't be seen again until the House reconvenes after the November elections.

Rep. Koch said of HR 16373, "I am as proud of that as anything I have ever done in the Congress." Still, he did concede that the bill "is not as good as it could be," adding that very rarely does legislation go through Congress that is as good as it could or should be. The bill provides that individuals be allowed access to information about themselves in record keeping systems; that they be permitted to correct an inaccurate record; that they be able to prevent information from being improperly disclosed and that reasonable precautions be taken by the custodian of data files to assure that data is reliable and not misused.

Rep. Koch said a similar bill, introduced in the Senate by Sen. Sam Ervin as SB 3418, includes a provision for establishment of a Federal Privacy Board to oversee governmental agency privacy protection. HR 16373 provides that each agency make and publish its own rules and regulations. "There is no uniformity in the House bill," Rep. Koch pointed out, "so there will be an amendment offered on the House floor to establish a Federal Privacy Board." Another difference between the two bills is that the Senate bill requires the government to discontinue its practice of selling mailing lists. The House bill is silent on that issue.

A short five years

Rep. Koch first introduced a bill on the privacy issue in 1969. He told the CLA meeting that he was amazed to see such legislation reach the point of enactment in such a short time. "Five years is not a lot of time in the Congress, unfortunately," he commented. The Congressman's initial purpose of sponsoring the legislation was to limit information gathered on individuals. "I am fed up with the government's involvement in the private lives of people past the point of balance," he said.

Estimates of the cost of compliance with HR 16373, made by the Office of Management and Budget, run between $200–300 million a year with a one-time start up cost of $100 million. The five year estimate ranges from $1.1–$1.6 billion, which according to Koch is "a lot of money, but worth every nickel."

Questions concerning possible serious omissions by the bill and other current privacy legislation were raised by another speaker, Susan Nycum of MacLeod, Fuller, Muir & Goodwin, principal legal consultant to the Stanford Research Institute, NSF sponsored, Computer Abuse Project. She pointed out that the bills lack a reporting or feedback mechanism, something similar to special reports required by the comptroller of the currency from banks which have been robbed. "Information contained in that data base has been contaminated, and there is no guarantee that it is the same as it was before intrusion," she told CLA members.

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When we introduced the SPC-16, we promised it would be the world's most powerful, versatile, cost-effective family of minicomputers.

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The SPC-16 isn't the lowest priced hardware you can buy. But it will give you the lowest cost solution.

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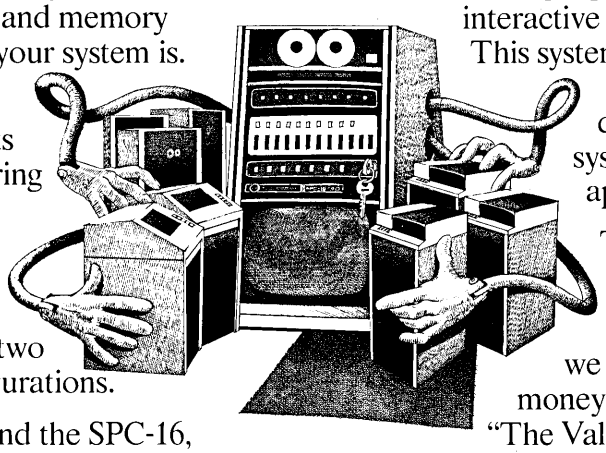

Six mighty minis.
The SPC-16 family consists of six minicomputers offering a choice of three memory cycle times (800ns, 960ns and 1440ns), memory expansion to 128K using efficient 16K boards, and two different packaging configurations.

If you build a system around the SPC-16, it will do more work for less money than any other system you could build.

And that translates into more profits.

We know it for a fact. In the past few years, we helped a lot of OEMs get the edge on their competition by designing our product into their products. We helped a lot of end users solve a lot of tough, tight-budget applications. And, we produced some cost-effective systems of our own.

Two hard working systems.
Take RTOS II for example. It's a multi-programming system offering real-time event driven foreground processing concurrent with background job development and computation.

You couldn't buy a better price/performance solution for applications such as process control, data acquisition, laboratory research, material handling, communications or overall manufacturing automation.

We also built a powerful disk-based general purpose system around the SPC-16. DBOS II lets you do more computation with less memory, in far less time, at a lower price than any system on the market. It offers both scientific and commercial languages and a combination of interactive and batch operation. This system is perfect for service centers, research and development groups and system house dedicated applications.

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To really appreciate how much power we can deliver for your money, write for our book "The Value of Power." It will give you the facts to back up our claim: If General Automation can't make your system do more work for less money, nobody can.

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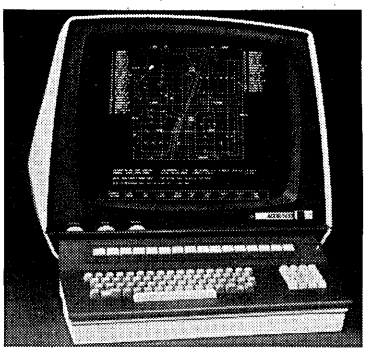
POWERFUL MINICOMPUTERS BY GENERAL AUTOMATION

Sanders/500 Graphics: the answer to a utility's nightmares.



Storm damage to overhead wires. Uprooted buried cable. Ruptured water lines. New-construction planning needs. Hundreds of maps and drawings to be updated by yesterday. Paperwork. Paperwork.

Sanders/500 interactive computer graphics can help you cope with these nightmares. This advanced turnkey system expedites distribution network maintenance, emergency repairs, new-facility location. It digitizes source data into geographical information systems and thematic maps that show densities, gradients, relative magnitudes and spatial relationships on a CRT screen. Data can be edited, updated or retrieved in high-resolution hardcopy form in seconds.

The system automates drafting and mapping—can save hundreds of man-hours per project.

A demonstration tells it all. *Write Sanders Data Systems, Inc., Graphic Systems Marketing, NHQ 1-379, Daniel Webster Hwy.-So., Nashua, NH 03060. Or call (603) 885-5280.*

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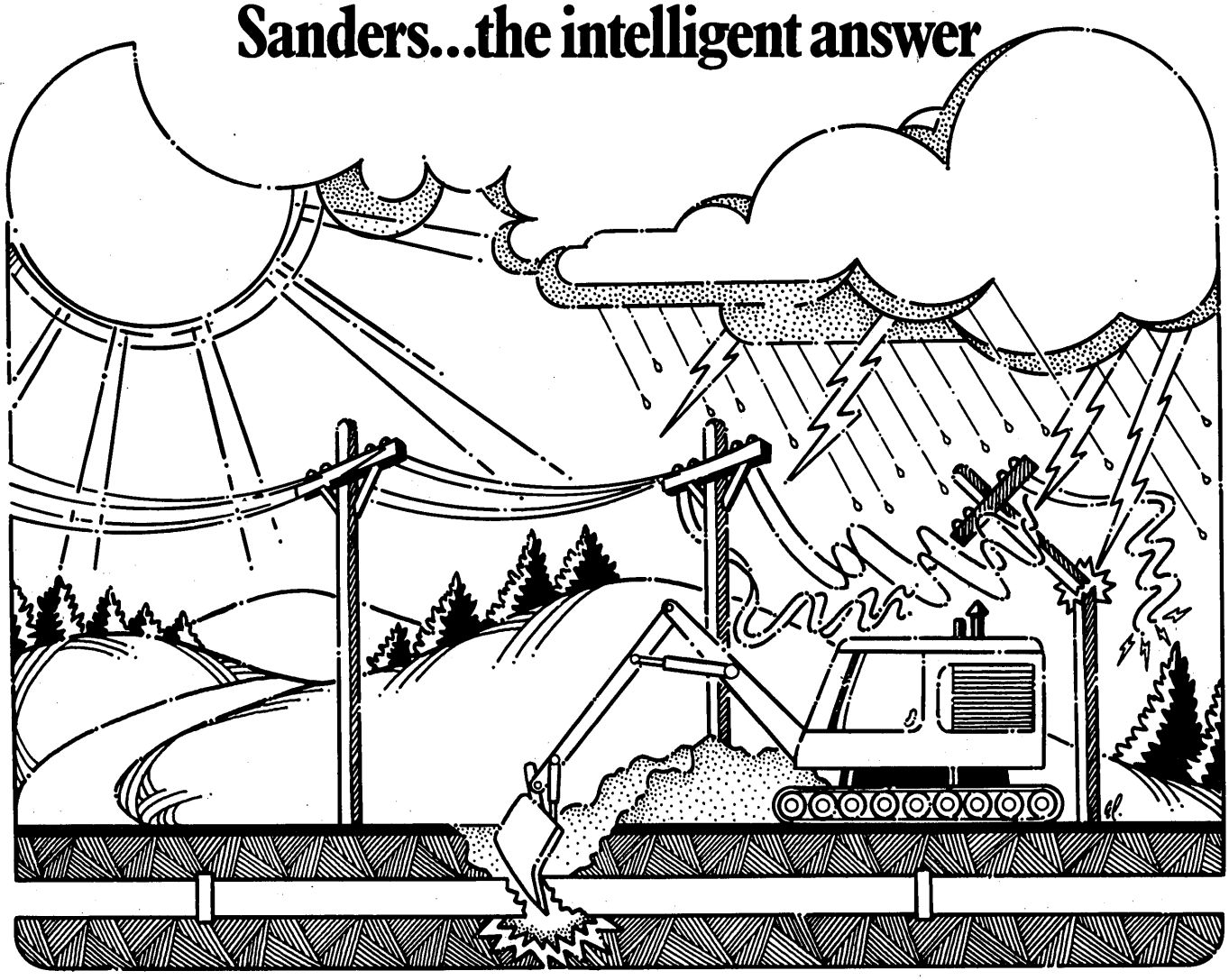

European Sales Offices: Sanders Data Systems, Ltd., 51/53 Brick Street, London W1Y 7DU, England; Sanders Data Systems, GmbH, 6000 Frankfurt/Main, Rennbahnstrasse 72/74, West Germany.

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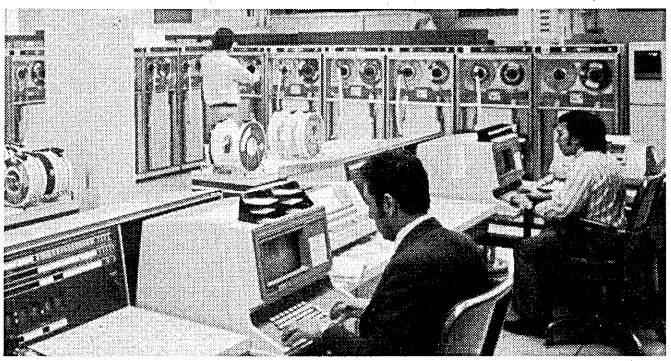

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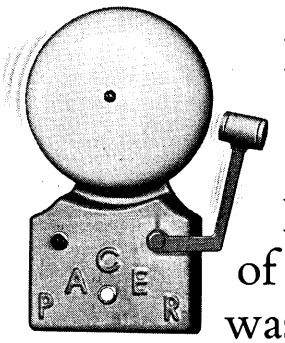
The Bully.

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



Round 1.

This is the tale of one tough terminal.

It seems like a month of Sundays since ADDS was just a new kid on the block. Back then, all we had were big ideas and a reputation to earn.

Well, we earned it. And the story of our new 980 TTY compatible terminal is a good example of how.

A Technical Knock-out.

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.

But the Bully goes an extra round.

A very famous fighter would 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!

Besides all that, if you please, protected formatting; graphics and function keys!

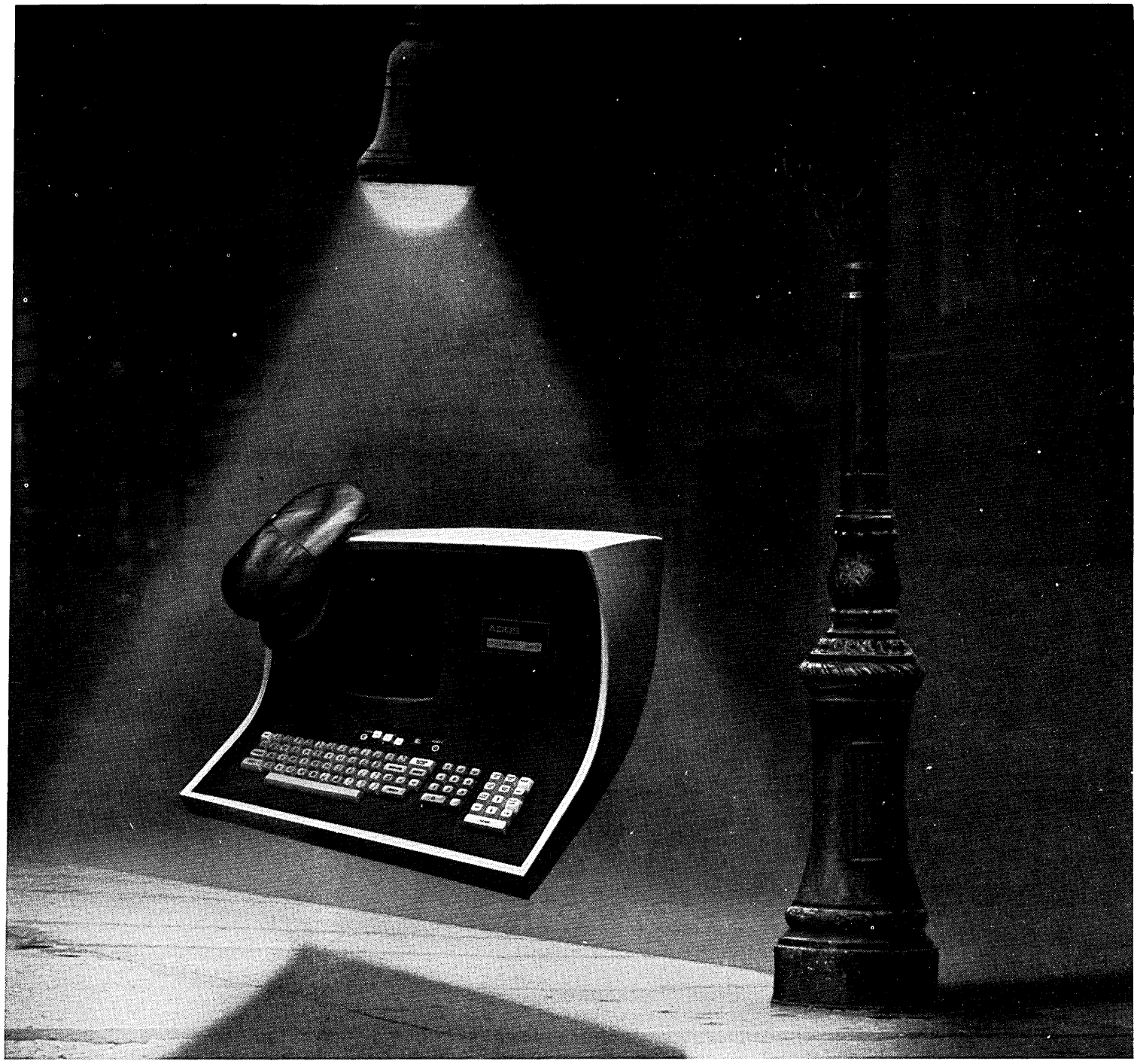
Printer and cassette ports, and just in case, current loop as well as EIA interface!

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



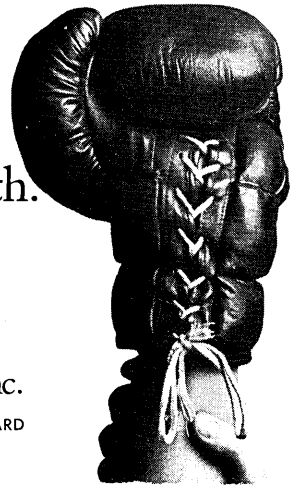
cost you an arm and a leg, hold on to your socks. $2800. Everything included. With OEM discounts of over 30%. Need we say more?

The Title.

We think we've got one unbeatable terminal in our corner. If you'd like some more information, or even a ringside seat demonstration, call the Bully's manager at 516/231-5400. Or write Applied 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.



ADDS
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CIRCLE 11 ON READER CARD

news in perspective

Vague on penalties

She also criticized the legislation for not spelling out specific penalties for criminal activity towards the perpetrator of unauthorized or criminal access to computer systems. The custodian of the data base, in many cases, is being held absolutely liable for providing protection, Nycum said. Further uncovered areas cited included the absence of guidelines as to what levels of protection should be instituted and what constitutes a regulated data base in terms of size. Nycum commented that to date, efficient methods to apprehend the computer criminal are unavailable, so that most of those caught today are either "stupid or unlucky." Such apprehensions are "by accident, rather than because someone set out to audit or detect what had occurred," according to Nycum.

Voicing support of privacy legislation was Douglas Metz, deputy executive director of the Domestic Council Committee on the Right of Privacy. He warned that if Congress does not enact some form of privacy legislation by the end of the current session, President Ford will issue an executive order to enact similar measures. "It will include definitive guidelines for government agencies and establishment of access rights, the challenge rights for the citizen," he told the audience.

Metz also reported that the Domestic Council Committee is moving ahead on recommendations made to it in July by interagency task forces it had appointed. One recommendation, that the Federal government establish policies and procedures to insure the establishment of privacy safeguards in new telecommunications and data processing systems or substantial modifications to existing systems, has been expanded. The mandate to review all existing systems of the Federal government, a massive undertaking, has been added. The Office of Management and Budget is now clearing with government agencies interim guidelines for such privacy screening.

Banking information

Additional privacy legislation sought by the Domestic Council Committee would provide further restrictions on federal, state and local officials' access to bank information. Such legislation would amend the Bank Secrecy Act to require court approval for record examination and notification to individuals that access to their bank records is sought. Metz said that a planning committee will meet to arrange a December conference for state and local officials to acquaint them with privacy issues. The meeting will seek to avoid potential conflicts between federal, state and local legislation.

The need for more action at the local level by privacy enthusiasts was also expounded by another speaker, Alan F. Westin, professor of law and government at Columbia Univ. "One of the major places where we should be working where we are not is at the local level, because the Congressional legislation, no matter which of the bills manages to emerge, is not going to touch local data bank activity unless it is part of some kind of interstate federally supported network," Westin noted. "And that can only cover a minor part of the large scale files about people that are being kept."

In contrast, the greatest amount of actual passage of legislation and other activity has taken place at the state level, Westin told CLA members. He cited a survey which reveals that between 1973 and 1974 state legislatures have introduced 101 privacy bills. As of September 1974, 35 privacy measures had been adopted. Eight states had created study commissions to look into privacy and data collection, which Westin predicted will result in still more state privacy legislation in the future.

The private sector

An opponent to privacy legislation as it is now drafted is Francis M. Gregory, Jr., of Sutherland, Asbill & Brennan, a Washington, D.C. law firm. He said more information about private enterprise and the way it operates with regard to handling information is needed by Congress before privacy legislation is adopted. "The greatest danger for private enterprise in the entire privacy area is legislation through ignorance," he warned. Gregory cited the lack of Congressional hearings on the activities of private industry in privacy related areas. "The Committees recognize that, which is a principal reason why the current version of SB 3418 in the Senate does not cover private industry other than covering to some degree government contractors or private industry working with the government."

Gregory complained that "no Congressman interested in anything except immediate retirement will vote against a privacy bill—the abolition of Mother's Day is more likely." Therefore, he continued, any input to be had by the private sector into Congressional determinations involving privacy has to occur "somewhere down the legislative line." Private enterprises with interests in privacy must provide input at the initial stages of consideration of legislation. He predicted that any privacy bill reported by a committee will be enacted. Gregory also urged that the economic cost of potential legislation be carefully considered, adding that the dollar figure in HR 16373 "gave me a little bit of pause."

Dr. Ruth M. Davis, director of the National Bureau of Standards' Institute for Computer Sciences and Technology, questioned the practicality of a provision in some legislative proposals that would require maintenance of records of certain access granted to information files. Still to be determined would be how many persons are allowed access, how often, how much detail would the record contain and how quickly would the system manager have to respond to a request by an individual to see that record.

By recording only a small number of accesses to a file (one access every nine months for each person's record, for example) would cause the file to double in size every seven years with a corresponding increase in data storage and operating costs. "Therefore, unless reasonable retention periods are permitted by law and established, these costs could become quite burdensome to the individual computer installation," she pointed out.

Dr. Davis thinks the costs of confidentiality and security of information in automated information systems are not well understood, well documented or well quantified. Significant changes in the way personal data systems are designed will have to be made to respond to private concerns embodied in part in proposed legislation before Congress. "An important action that needs strong support now is the determination of the costs of individual privacy and decisions on how to allocate those costs," she said. The next meeting of the Computer Law Assn. will be held March 20, 1975, in Washington, D.C.

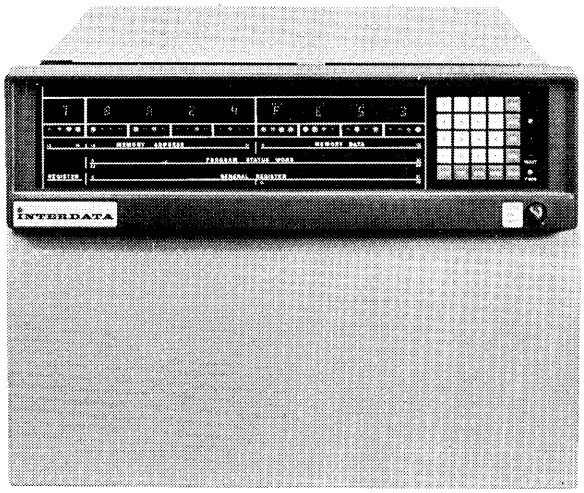
—Pam Evans

Peripherals

A Mass Market for Mass Storage?

With user reactions ranging from "it's the first true technological advance in mass storage in years" to "it would cost our installation nearly twice as much per month to use it", it's clear that IBM, with its 3850 cartridge mass storage system, has introduced yet another controversial product. The system uses a fist-sized data cartridge as the basic storage medium, with each cartridge (one user thought they looked like Coors beer cans) storing 50 million characters of information in 3330 format. When a

INTERDATA ANNOUNCES THE INDUSTRY'S FIRST 32-BIT MINICOMPUTER FOR UNDER $10,000.



Performance	7/32	Nova 840	PDP-11/40
Word length	32	16	16
Memory speed (nanoseconds)	750	800	900
Maximum memory capacity (bytes)	1,048,576	262,144	262,144
Addressing range (bytes)			
Direct	1,048,576	512	65,536
Relative	±16,384	±256	±32,768
Indexed	1,048,576	65,536	65,536
Double indexed	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 (usec)	6.5	47.5	46.5

Price	7/32	Nova 840	PDP-11/40
32 KB processor	$ 9,950	$12,930	$15,345
64 KB processor	14,450	19,330	26,925
128 KB processor	23,450	35,630	44,725
256 KB processor	41,450	61,230	80,825
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, 1972. Auerbach Minicomputer Characteristic Digest, June, 1973. "How to use Nova Computers", 1973.

With up to a million bytes of directly addressable memory.

Minicomputer myths you can live without:

1. There's no such thing as a 32-bit minicomputer. 2. Minicomputers have an absolute 64K addressing limit. 3. The only way to even access more is to resort to some sort of hardware kluge with a hairy software scheme that'll cost you an arm and a leg.

All wrong. Because now there's the Interdata 7/32– a powerful new 32-bit minicomputer with main memory expandable up to a million bytes and direct addressing up to 16 million bytes.

Big it is. But hairy it isn't.

Because it's simple, straightforward and efficient. And it's the industry's first uncomplicated extended-memory software environment.

Backed up by a lot of hardware muscle like thirty two, 32-bit registers, 1024 I/O interrupts with automatic vectoring, 239 instructions. And a lot more. All of which would lead you to expect to pay a lot more money, right? Well, that's also a myth.

The software muscle is all there, too. A new FORTRAN V compiler. An optimizing assembler called CAL. And the first extended operating system that's both powerful and simple – OS/32. Plus all the other field-proven Interdata software – it's all compatible.

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user program on a 370 145-168 model calls for certain files, or portions of files, a modified version of the 3330 disc controller (called the 3830 Model 3) determines which cartridges contain the information. A cartridge accessor is then instructed to retrieve the cartridges and mount them on a read/write station. The cartridge is then opened, and the 3x770-inch tape strip's contents are transferred to 3330 discs, a process called staging. After processing is completed, only altered records are written back to the cartridges.

The system is gargantuan in size. A minimum system of 35 billion characters can be expanded through several models up to a maximum of 472 billion bytes. That's roughly equivalent to having 4,720 3330 packs on-line, or enough storage to give every living human being 130 bytes of storage.

Still another way to comprehend the system's size is to say that it approximates a tape library containing 47,200 reels of tape—of which there are a significant number—and that is the market IBM is going after. Many large installations had been briefed on the 3850 within days of the announcement. The Federal government, with prodigious tape libraries in many departments, might seem a likely candidate for the 3850, but initial reaction at the Social Security Administration was subdued. "So they've finally announced the pigeon coop," said one dp official, who has been busy evaluating potential mass storage systems and wished to remain anonymous.

Ampex for flexibility

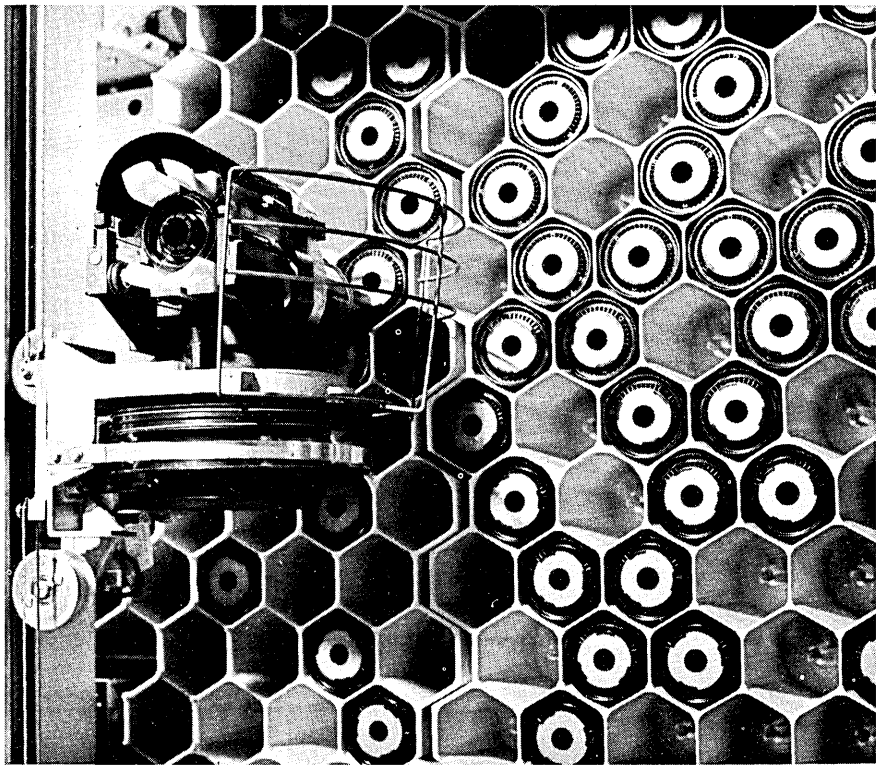
"I think it might be a very good system for installations running only one or two mainframes," he adds. "Here, we have to be flexible enough to run any job on any one of 17 cpu's. That can't be done with the IBM device. We've come to the conclusion that the best solution for our particular needs is an Ampex Terabit Memory that Westinghouse is willing to interface to all our computers by using DEC PDP-11 minicomputers."

Talks with other users makes it apparent that there are other potential problems for IBM in marketing the 3850. One source, the dp director at a "highly integrated manufacturing firm" based in the midwest, shared these thoughts: "Maybe we're unusual, but most of our files are set up in sequential order, and we can load sequential files into our 370/158 faster using 6,250 bpi tape drives than from 3330 discs. And the product wouldn't completely replace tape drives anyway. The IBM salesman, in figuring out how much a 3850 would cost us admitted that we'd probably want to keep roughly six tape drives and controller. The price increase would be $19K/month! And that doesn't even take into consideration conversion costs from tape to disc format!"

Other users were concerned with different aspects of the 3850. "It's not a comfortable thought that if the 3850 goes down, I can't walk in and grab the cartridges I need to continue processing," said one. Along similar lines, another user was concerned with potential security problems despite the fact that the 3850 can be located up to 200 feet away from the computer and be equipped with special features to detect the presence of any foreign magnetic device, to sense fire and fumes and to trigger a user-supplied fire suppression system. Access to information in the 3850 is controlled through password protection programming.

It will be interesting to see how well the 3850 sells, as no installation contacted after the announcement considered it *the* solution to its particular problems. Still, those IBM marketing men do have ways. . . .

—Michael W. Cashman



WHAT'S THIS? Inside the starship Enterprise's photon bomb magazine? No, this is a view of the IBM 3851 cartridge storage device. At left is one of two accessors in each system that move cartridges to read/write stations and return them to the "pigeon coop." A minimum 3850 system capable of storing 35 billion bytes rents for $12,455, plus $4,240 for the modified 3330 disc controller required.

International

ICL's New Computers: Half a Range Ahead

ICL's apocryphal new range of computers became ICL's real New Range, alias 2900 series, last Oct. 24.

By announcing the long-discussed products, ICL thereby gained the freedom to go on with its profitable business in the current models for several more years, since New Range comes equipped with ample changeover aids and a splendid communications processor for use on any range. Like other announcements these days, New Range carried the guarantee to users that the only surprises in the future will be pleasant ones—there are obviously a few mid-life kickers built into the tidy circuits. But ICL's promises are retroactive to users of the old 1900 and System 4 ranges as well. Both will be developed and manufactured until the very late '70s, and supported well into the '80s.

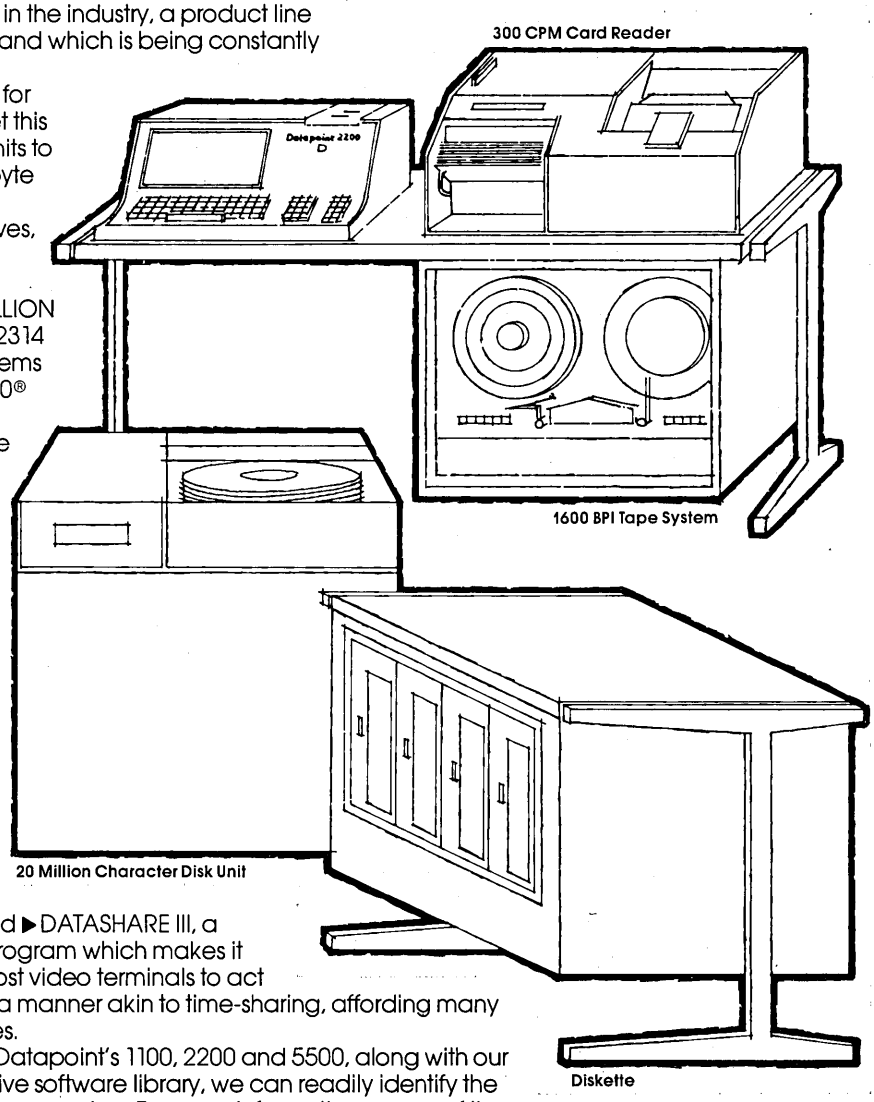
ICL's new team is intriguing—ex-IBMer Tom Hudson (chairman), ex-Univac Geoff Cross (managing director), and a team of key men that not only includes ex-Univac stars but has found some stars from among the

More good reasons for Datapoint leadership in dispersed data processing

Datapoint Corporation continues as the leader in dispersed data processing because we offer the best and broadest product line in the industry, a product line incorporating both hardware and software and which is being constantly expanded and improved.

Hardware—the user requirement here is for increased mass memory capability. To meet this need Datapoint has added two new disk units to complement its well established 2.4 megabyte cartridge disk system. They are: ▶ A new DISKETTE memory with up to four diskette drives, each offering over 256,000 characters of storage and interchangeable with IBM 3741 diskettes; and ▶ a new high capacity 20 MILLION CHARACTER DISK which utilizes a standard 2314 type disk pack. These new disk memory systems may be employed with either Datapoint 2200® or 5500 processors.

In addition, Datapoint is making available ▶ a new industry-compatible 1600 BPI 9-CHANNEL MAGNETIC TAPE SYSTEM to meet the need for high density bulk data storage, and ▶ a new 300 CPM CARD READER for remote batch and remote job entry applications.



Software—another major factor in Datapoint's leadership in making dispersed data processing a commercial reality has been our emphasis on, and success at, creating user-oriented operating software and programming languages. Recent additions to Datapoint's extensive software library include ▶ a DISK-BASED DATAFORM LANGUAGE for use in intelligent data entry applications; ▶ the RPG II LANGUAGE with Index Sequential Access Method (ISAM), and ▶ DATASHARE III, a new version of the Datapoint 2200 control program which makes it possible for as many as eight remote, low-cost video terminals to act and function as 2200 terminal processors in a manner akin to time-sharing, affording many operating economies and other advantages.

With our trio of dispersed processors, the Datapoint's 1100, 2200 and 5500, along with our expanding family of peripherals and extensive software library, we can readily identify the reasons for our leadership in dispersed data processing. For more information on any of these new products, and on Datapoint's total family of dispersed processing systems and peripherals, contact the sales office nearest you or write or call Datapoint Corporation, Attn: Marketing Administrator, San Antonio, Texas 78284, (512) 690-7173.

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news in perspective

ragbag of Ferranti, Powers-Samas, Elliotts and half a dozen others that were forcibly welded together through eight mergers to become Britain's single computer company in 1968, with government midwifery.

It was obvious that the ICLers had picked up some techniques from IBM for the first major launch in ten years. The slogan, for example, preempts IBM's FS range, still under wraps: "YOUR FUTURE SYSTEM" blares the motto in two-foot letters on the podium at ICL's system development lab in Bracknell, near Windsor Castle.

DELIVERY IN DECEMBER: ICL's 2970 system with operating console, order code processor at left and all the peripherals. Introduced last month, the first delivery is next month.

Business as usual

Partly because ICL's original brilliant announcement strategy for New Range was to have no announcement (a strategy somewhat bruised by 1970 testimony to a Parliamentary subcommittee about "Project 52"), the ICL happening was somewhat more low-key than usual for the industry. There were less fancy brochures—though a two-foot stack of user documentation was available—no pretentious ads, and a business-as-usual flavor, though one could detect jubilation and optimism, at a time when the company had just reported record revenues—well over $500 million—for the 1974 fiscal year.

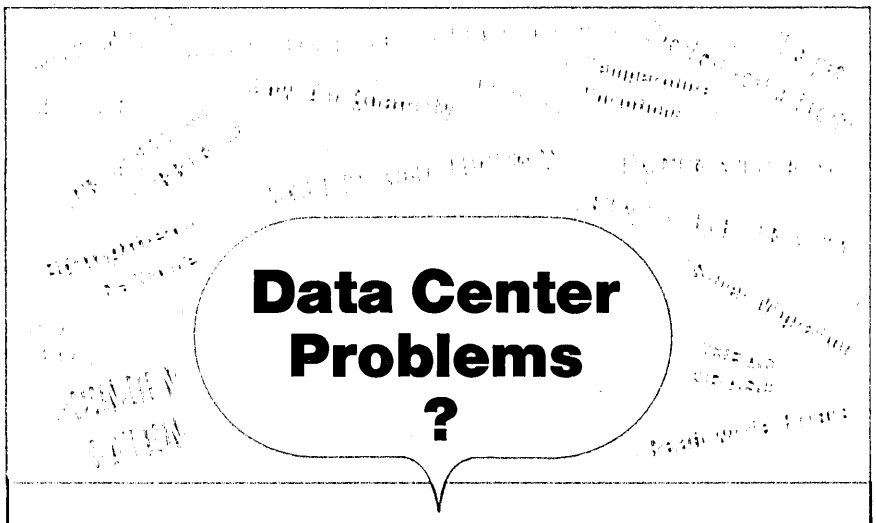
By a happy accident and a happy mishap, the company was able to show real machines. "You can go downstairs and kick it if you like," said one cheerful marketeer, so the first-time viewers at the launch duly traipsed into Europe's largest computer room at Bracknell, and kicked or stroked production model 11 on the big £2½ million 2980 model, and production model 15 or so on the smaller £1 million 2970.

The accident, from an announcement viewpoint, was the 1968 merger that created an ICL with two incompatible product lines (one of them, the IBM-compatible System 4, very popular in Eastern European countries). From that point on, plans for a New Range were absolutely necessary, even though they were out of step with IBM and everybody else in the industry and thus unable to fit in with the Unidata products. The happy mishap was of course the ill-fated non-announcement strategy, by which several years of embarrassing silence could be followed by a credible and creditable revelation in October, with first delivery of the 2970 scheduled for December—ICL's inadvertent answer to the old paper tiger phenomenon.

Not only was the machine at the announcement real, but ICL's entire specification was a real and visible computer—"the architectural model". All New Range specs were based on this full-scale model, and changes were first made on the physical machine, then checked and incorporated in the paper descriptions, which had to match exactly—a reversal of the usual specification process and a living symbol within ICL that there really WAS a New Range, during all the years the press kept demanding an announcement.

Virtual virtuosity

The New Range itself is pleasant for its modularity as well as its compati-



Free Handbook Has Answers

"Process Cooling for the Data Center Environment," published by the world's leading manufacturer of computer cooling equipment, is now in its third printing. Covers such subjects as problems caused by wrong environment, economics of the proper system, and design criteria. Get a copy free from your local EDPAC sales representative, or by writing direct to AC MANUFACTURING COMPANY, Old Cuthbert & Deer Roads, Cherry Hill, N.J. 08034. Phone: 609-428-9800.

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PROCESS COOLING FOR COMPUTERS

47

CIRCLE 87 ON READER CARD

To fiche, or not to fiche: that is the question: NCR Data Centers is the answer.

William Shakespeare wrote more than 102,000 lines of verse in his plays and sonnets. Yet, these volumes of dialogue can be held in the hand of this actor, thanks to COM.

You may not want to put the works of Shakespeare on Micro-fiche, but you can see the advantages of COM in your business.

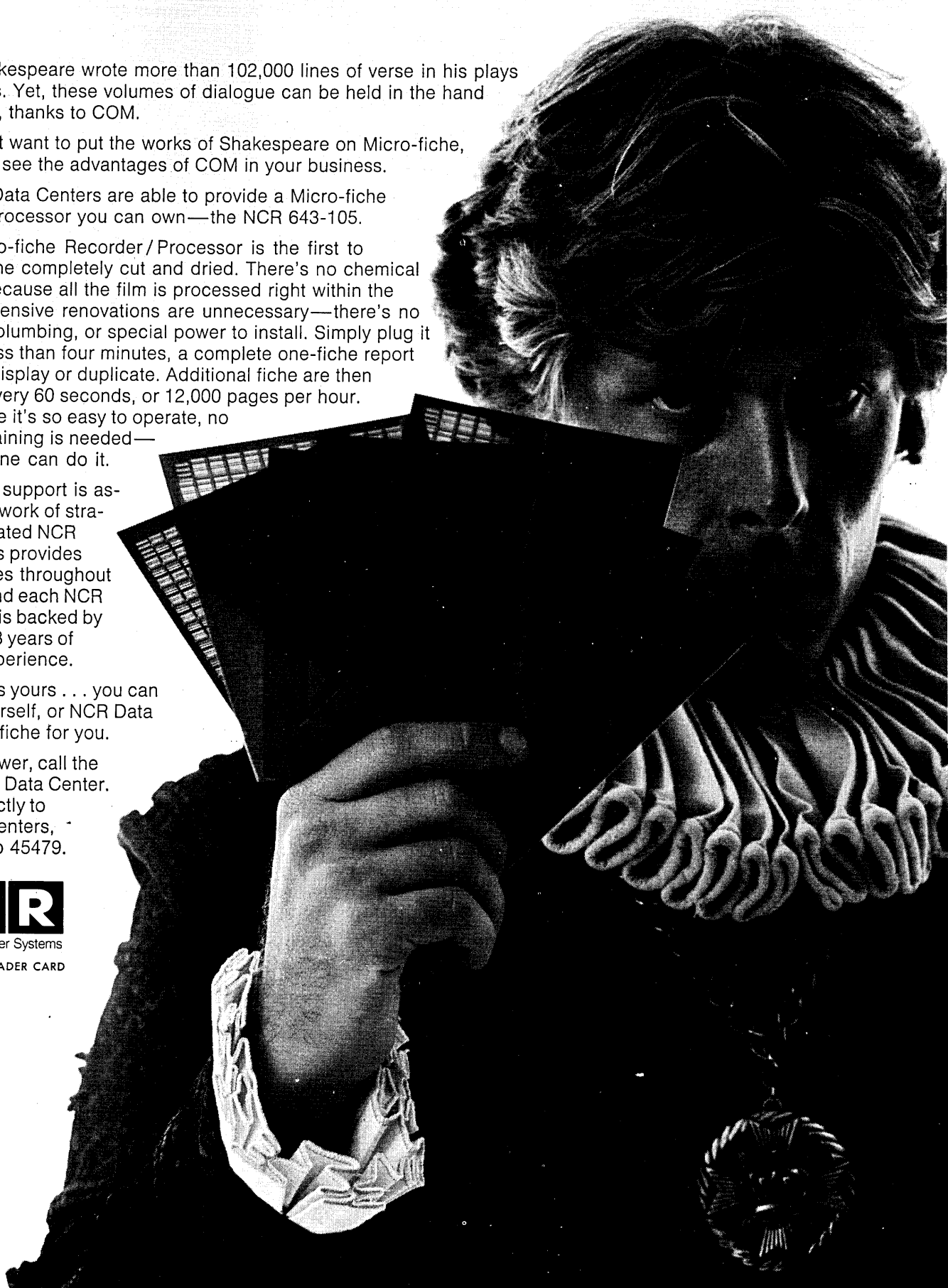
Now, NCR Data Centers are able to provide a Micro-fiche Recorder/Processor you can own—the NCR 643-105.

NCR's Micro-fiche Recorder/Processor is the first to produce fiche completely cut and dried. There's no chemical handling, because all the film is processed right within the system. Expensive renovations are unnecessary—there's no dark room, plumbing, or special power to install. Simply plug it in, and in less than four minutes, a complete one-fiche report is ready to display or duplicate. Additional fiche are then produced every 60 seconds, or 12,000 pages per hour. And because it's so easy to operate, no extensive training is needed—almost anyone can do it.

Service and support is assured. A network of strategically located NCR Data Centers provides COM services throughout the world. And each NCR Data Center is backed by more than 88 years of business experience.

The choice is yours . . . you can fiche for yourself, or NCR Data Centers will fiche for you.

For your answer, call the nearest NCR Data Center. Or write directly to NCR Data Centers, Dayton, Ohio 45479.



NCR

Complete Computer Systems

CIRCLE 32 ON READER CARD

bility. Both the hardware and software were designed from the first in sensible pieces—a top-down kind of systems thinking that impressed the new technical people when they swept in with the Hudson/Cross team in 1972. The System B operating system at the heart of New Range uses virtual virtuosity to build protection into any combination of code, data, and communications. Environments are changed easily by creating new virtual machines. In the event of something going wrong, it can isolate the affected parts and log and analyze the errors, creating a new virtual machine from other parts of the system to carry on working.

small computer in a simple little tabletop box, costing as little as $12,000 (with 8K and one crt), but it can connect to any of the ICL machines, or any other machine, for terminal handling, concentrating, or even remote job entry work on a modest basis. It is a range independent device, with up to a megabyte of (range independent) storage and intelligence. Its innards are, according to Mack, "Well ahead of IBM"—similar to the 2903 technology that has attracted so many new users. A single card holds the entire cpu, with all modern conveniences including lots of registers, some interrupts, and odds and ends of rams and proms.

SOME OF THE STARS ON ICL'S TEAM
Geoffrey R. Cross, 40, Brian O'Heron, 36, and Ed S. Mack, 38

Product development director Ed Mack gets credit from Geoffrey Cross for saving the company at least a year and a half on New Range software development. Although the old ICL group had designed New Range, it was after the new team came in that software development was cut down into manageable projects that could be separated, then put back together again sensibly. While Mack sorted out the puzzle of modularizing the software development, ICL's director of New Range programs Brian O'Heron built in a matrix organization for project management, with checkpoints and occasional uproar, imposing an American style and momentum on the indubitably British project.

At the New Range announcement it was clear that Mack's enthusiasm encompassed hardware as well as software. The product that captured his imagination most was the little 7500 communication system—the "leading edge" of an airplane wing encompassing 2970/80, 1900/System 4, and the highly successful little 2903 system that has already contributed to ICL's current optimism by bringing in 750 orders—three-fourths of them from users new to ICL, and almost two-thirds of them from users outside the U.K. The 7500 is a

If ICL's technology is as advanced as New Range seems to imply, several observers wondered why the company (whose parents Plessey and GEC are already in the components business to some extent) doesn't go into the components business for itself instead of depending on the vagaries of American suppliers, which have several times held up New Range production. That may be another question that is easier to resolve in the post-announcement euphoria than it was in Cross's two and one-half year uphill battle to gain credibility for ICL.

Technical details of the big New Range machines are impressive. Although the technology is still short of full LSI, it's half-a-range ahead of almost everybody else these days, and designed so full LSI can be added without changing range when it becomes feasible. Both the 2980 and the 2970 can have one or two central processors and store access controllers. The big machine handles from one to eight million bytes of main storage, working at 600 nanoseconds for 16 bytes for a peak data throughput of 16 million bytes per second per Store Access Control (SAC). It can handle 16 trunk links (controllers) per SAC.

The cheaper 2970 has main storage from three-quarter to six million bytes, at 500 nanoseconds for eight bytes, and only eight trunk links per SAC. The range of peripherals includes all existing 1900/System 4 models, plus the CPI range from ICL's forthcoming venture with CDC and NCR, not to mention a few new printers, card readers, paper tape equipment and so on. The crt terminals are handsome and easy to read and use, but ICL will depend on other suppliers to furnish the special terminals for production control/manufacturing, retail/distribution, and banking applications that constitute the main target industries in most countries.

The U.S. with 2903

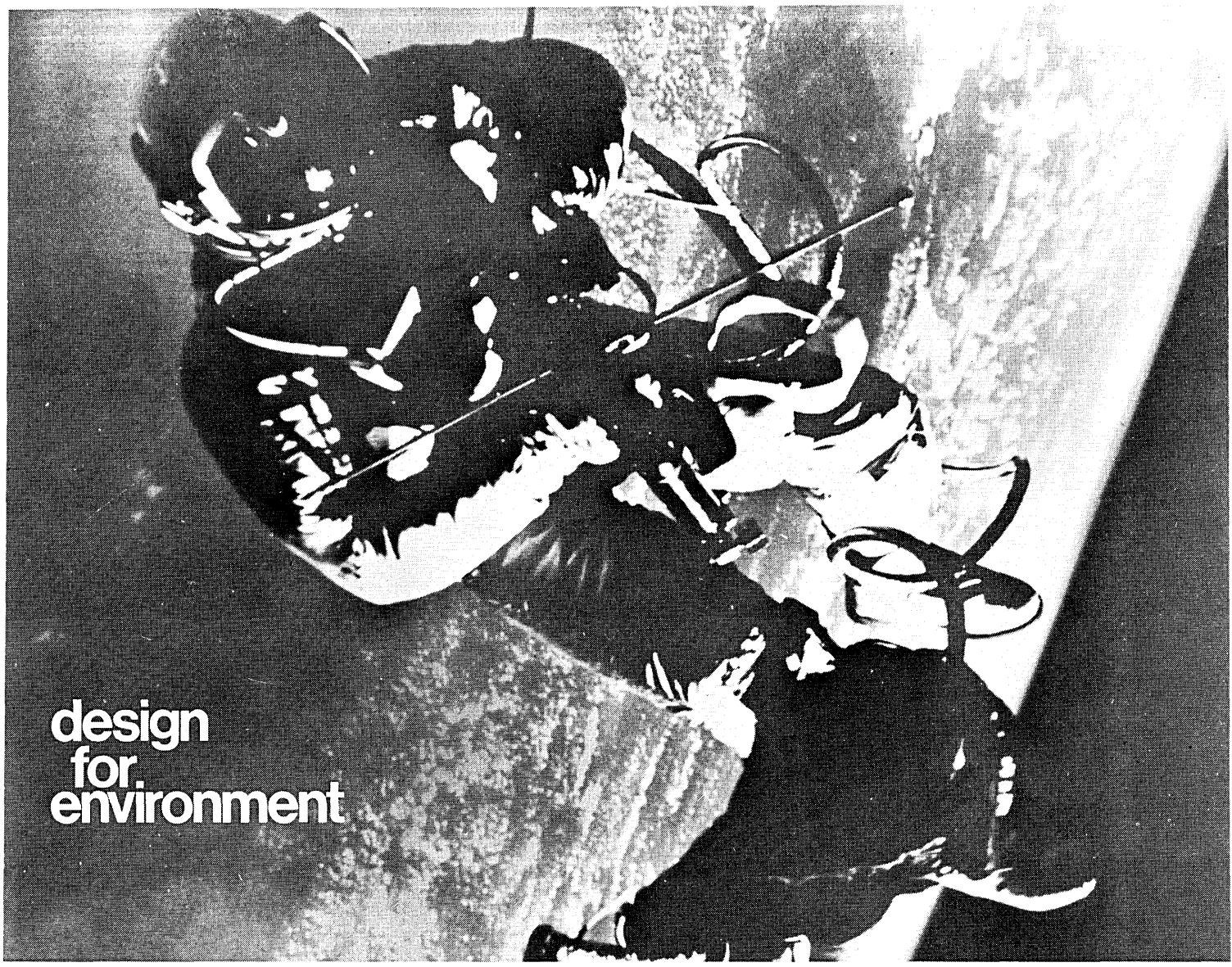
The American thrust will, for the time being, concentrate on the tried and true 2903, pointed particularly at the financial marketplace in the New York area. This month chairman Tom Hudson officially opens ICL's new 2903 marketing/service center in New York, and it is understood that ICL already has a few 2903 installations up and running in the area. Eventually, acceptance of the 2903 might lead to other New Range offerings in the U.S., probably after some of the smaller machines between 2970/2980 and 2903 have been unwrapped.

New Range support and software have been unbundled to a large extent, though System B, data management software, utilities, and essential documentation are included in the orginal price tag. Languages (for which there will be a charge) include COBOL, FORTRAN, ALGOL and interactive BASIC, plus a full package of file and source code converters for both 1900 and System 4 machines, as well as hardware emulators. The 2900 application systems, in addition to existing range(s) systems, are pointed at the three target areas, with particular emphasis on manufacturing, where ICL's NIMMS has already built a body of devoted followers.

The most visible manifestation of New Range's reality—besides the refreshing ability to see and "kick" the production models—was the announcement that ICL has already booked about £21 million worth of orders (for 17 systems) from a variety of commercial and government customers.

Cross maintained with absolute assurance that his company would be known by its deeds rather than its predictions—and with equal assurance pointed to the 25% per year growth rate and reaffirmed the prediction he made in 1972 (when ICL's orders were about £106 million, or $255 million) that ICL would double by 1976. From the current results and the current ambience around ICL, he may make it a year early.

—N.F.



MARK IV System/270 for Virtual Storage.

Design—

The new MARK IV/270 is the only high-level language system designed specifically for VS users. The MARK IV System now takes advantage of the inherent capabilities of VS for optimized storage allocation.

Compatibility—

Introduced in late 1973, this new model of the MARK IV System is now in use on IBM System 370 equipment in 20% of the more than 800 world-wide MARK IV installations. All existing MARK IV programs are fully compatible with the new model. MARK IV/270 is for IBM OS/VS1, OS/VS2, and DOS/VS, and fully supports the new Virtual Access methods.

Throughput—

All of the proven automatic programming and file handling efficiencies of MARK IV are added to the power of Virtual Storage. Available now with on-site support, training and documentation.

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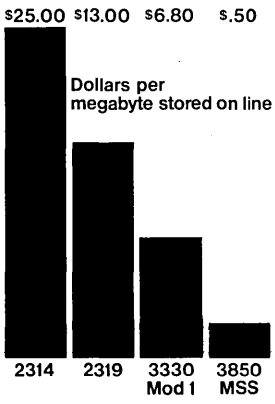
CIRCLE 40 ON READER CARD

New IBM system gives direct access to massive amounts of stored data.

It combines the economy of tape processing with the flexibility of disk.

It can put unprecedented volumes of data—from 35 to 472 *billion* bytes—on line to the computer.



It can end practically all manual handling of tape reels and disk packs and greatly lower the cost of maintaining a library.

And it can dramatically reduce the actual monthly cost for storing a megabyte of data down into the 20-to-50 cent range.

In essence, the IBM 3850 Mass Storage System is for organizations that need computer access to vast numbers of different records. The 3850 acts like a very large lending library for IBM 3330 Disk Storage. Data stored in the System's data cartridges is temporarily transferred to the disks for direct computer use. The system runs automatically, with practically no manual intervention required.

For large installations

With its massive amounts of economically stored data on line, the 3850 is well suited to a variety of large organizations.

Among them may be banks, for check records; utilities, for engineering records; manufacturers, for sales history data; organizations referencing lengthy texts, such as medical records; and many others.

Such users can benefit from the new accessibility of their files. At the same time, they can hold down costs through reduced tape and disk inventories and handling, as well as more efficient computer system use.

Because it vastly reduces the cost of storing data, the 3850 can improve productivity by removing restraints that may have hampered the start of new applications. Conversion of existing installations to 3850 storage is essentially a tape-to-disk procedure, with few or no programming changes necessary.

Improved physical data security is another benefit, since extensive data files formerly in library areas can now be contained in one place. Other safeguard options are intended to bar unauthorized system use through user defined passwords; prevent unauthorized alteration or removal of data, and limit access to data to one user at a time.

One or two 3850s can be linked to as many as four virtual storage IBM System/370 computers, Models 145 through 168.

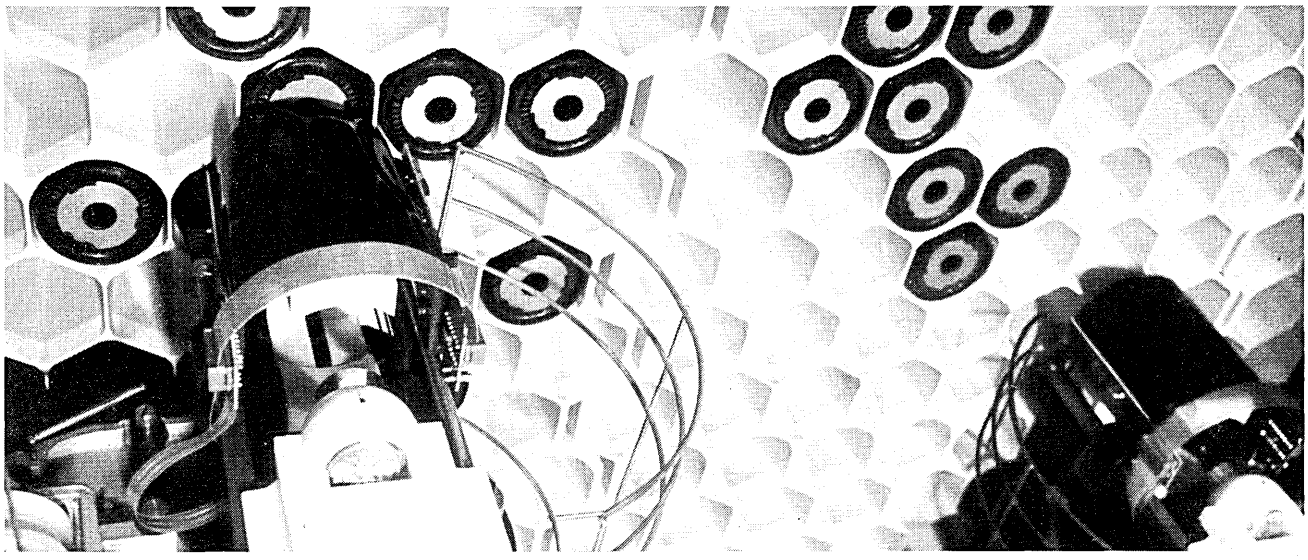
Not so long ago, the introduction of virtual storage provided greatly increased storage capabilities for System/370 computers. And Advanced Function for Communications, which is a logical extension of the virtual storage base, provides one teleprocessing network for many uses. Now the 3850 Mass Storage System extends the virtual storage concept to direct access storage devices.

Virtual Storage, Advanced Function for Communications, the Mass Storage System—three powerful links to the computing potential of the Seventies.

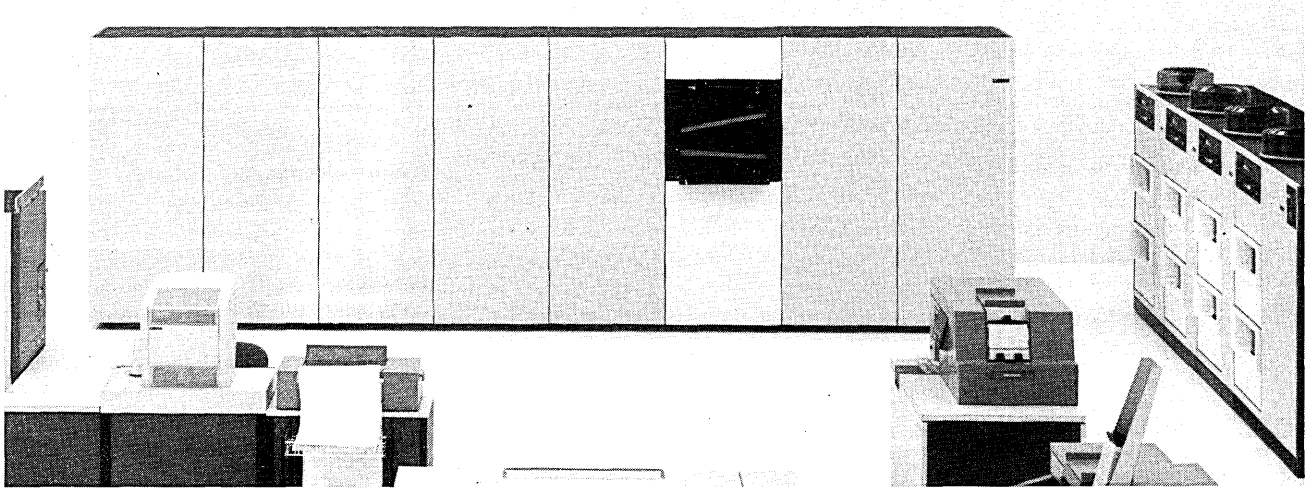
For further information, contact your local IBM Data Processing Division office. Or write IBM Corporation, Dept. 83F-D, 1133 Westchester Ave., White Plains, N.Y. 10604.

IBM®
Data Processing Division

The IBM 3850 Mass Storage System uses a new data cartridge, approximately two inches in diameter and four inches long, which can hold up to 50 million bytes. Two cartridges have a storage capacity equal to that of an IBM 3336 Model 1 Disk Pack—100 million bytes.



Inside the system, the cartridges are stored in a "honeycomb" of cells. When data is needed for processing, a cartridge is removed from its cell by an automatic mechanism and the data is temporarily read onto an IBM 3330 Disk Storage for computer use.



The IBM 3850 Mass Storage System, shown at the far end of this room, is linked to the IBM 3330 Disk Storage (right), which in turn is on line to a virtual storage IBM System/370. Maximum capacity of the 3850 system is 472 billion bytes.

News in Perspective
BENCHMARKS . . .

FTC Opposed IBM-CML Plans: IBM's plans to enter the domestic satellite business with Communications Satellite Corp. have come up against opposition from the Federal Trade Commission. The FTC has asked the Federal Communications Commission, which is reviewing the proposed joint venture, to deny a Comsat-IBM application. The Trade agency said the IBM plan could have "a serious anticompetitive impact in various communications-data-processing markets. IBM's plan is to enter the satellite communications field by taking over 55% of CML Satellite Corp. Comsat, Lockheed Aircraft Corp., and MCI Communications Corp. currently own equal shares of CML. MCI and Lockheed have proposed sale of their interests to IBM and Comsat.

Where's the Business Plan?: The price of money and equity market conditions have upset a lot of business plans—particularly those of computer vendors whose products are mostly on lease. Computer Machinery Corp., the key to disc manufacturer, had to pour cash into its European operation when its borrowing capacity overseas was sharply curtailed. Then it ran into bank borrowing problems in the U.S. and these were aggravated by a decline in cash-producing third-party leases. This resulted in a "substantial" third quarter loss that forced the company to reduce its U.S. work force 10%. The company, which in three years has boosted revenues to $53 million from $3 million, thinks it might be able to recover its losses in the fourth quarter if a third-party leasing deal it was negotiating is successful.

Not Enough: Business is good, but not good enough, for Computer Automation, the Irvine, Calif., manufacturer of minicomputers chiefly for oem markets. The company has reduced its work force to 360 from 430, but hopes to rebuild, "if the economy doesn't go to pieces," said president David H. Methvin. Revenues in the first quarter of its 1975 fiscal year were up 30% over the same period last year, but earnings dropped 50% because it had increased its staff to meet an anticipated higher level of business. The company looks for another growth year, but one that will lag behind the previous year when its sales rose 13%.

Merger Partner Sought: Problems in raising capital and interest costs on loans caused two-year-old Intelligent Memory Systems, Santa Ana, Calif. to close its doors last month and file for protection under Chapter XI of federal bankruptcy laws. President Calvin Lee, who had been a founder of General Automation, said the company had stopped production, terminated its work force, failed in its negotiations for a moratorium with creditors, and was seeking potential merger partners. The firm had been making and marketing head-per-track, fast-access discs for minicomputers and microprocessors. It had some 40 employees.

Honeywell Elevates Spangle: Clarence W. Spangle, 49, an executive vice president with responsibility for Honeywell Inc.'s computer operations, was elected president of Honeywell Information Systems. He continues as an executive

vice president of the parent firm. HIS contributes about half of Honeywell's $2.4 billion in annual sales. Spangle has been with Honeywell since 1947. He was named vice president and general manager of the computer business in 1965 and had an active part in 1970 in Honeywell's acquisition of General Electric's computer operation, an acquisition which gained Honeywell the No. 2 spot in computers.

AT&T Rates Deemed Too Low: Rates filed last March by AT&T for its Dataphone digital service have tentatively been labeled too low by the Federal Communications Commission. The rates asked by Ma Bell are about half those charged by competitors. FCC hearings on the proposed rates will go on for about a year, it is anticipated. In the meantime, the agency will allow AT&T to offer its new service in five cities but at rates higher than those the phone company has proposed. A decision on the temporary rates was expected late last month.

Counterclaim: Although felony charges were dropped for lack of evidence against six of ten persons indicted in 1973 for the alleged theft of drawings and specs from the IBM plant in San Jose, IBM is still sticking to its charges against one of the six. He's Philip J. Kronzer, vp of K&K Manufacturing Co. of Campbell, who last summer filed a $161 million suit against IBM for malicious prosecution (August, p. 113). The company has filed a counterclaim in San Jose federal court in which it reiterates most of the charges that claim Kronzer and his company misused secret IBM documents. Kronzer's company also is named in the countersuit which asks that damages be set at a later date.

Xerox Into Word Processing: Xerox Corp. has gone up against IBM in still another area, word processing. It introduced last month an electronic typing system that operates automatically up to 350 words per minute. The Model 800 system comes in four variations and runs about twice as fast as comparable IBM systems, according to the copying machine giant. Lease prices for the new system range from $210 per month. Xerox, at first, will offer systems only through lease. First deliveries will be this month in Dallas and Houston. The system was test marketed in Dallas. The Model 800 operates automatically from data stored on magnetic tape or magnetic cards. It prints with a rotating wheel that moves across the paper carriage, rather than with individual type bars or the revolving Selectric ball that IBM introduced in 1960.

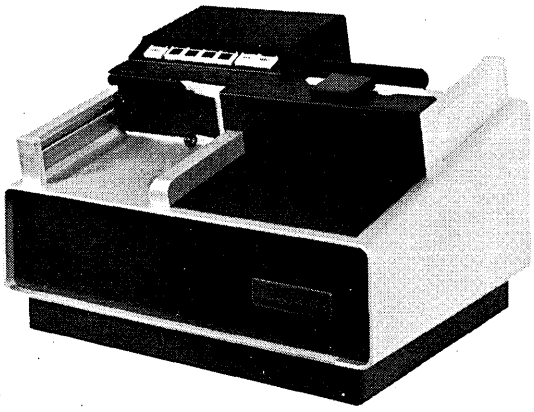
POS for TRW: TRW Inc., already heavily into automated retail credit authorization, has plunged into the retail point-of-sale (POS) market through an agreement with The May Department Stores Co. under which it will assume responsibility for the manufacture, maintenance, future development, and worldwide marketing of the May company's Mark 2000 electronic POS communications system. The System was developed for May by a subsidiary, Systems, Science and Software (S^3), La Jolla, Calif.

Easy on the Eyes: Dr. Richard Hopping, a consultant to the Society for Visual Care, says personnel working in climate-controlled computer rooms may have healthier eyes than their counterparts working in other locations. The cooler temperatures and higher humidity required in computer rooms, he said, have a beneficial effect on the eyes. "High humidity and cooler temperatures alleviate some discomfort for those individuals who have a lowered tearing and blinking rate. While warm, dry air tends to make the eyes' naturally moist lubricating surface evaporate, the computer room climate allows for much greater moisture retention." □

Documation makes 36 models of vacuum system card readers.

Each reader has more than 1,000 parts.

85% of all those parts are interchangeable... and proven.



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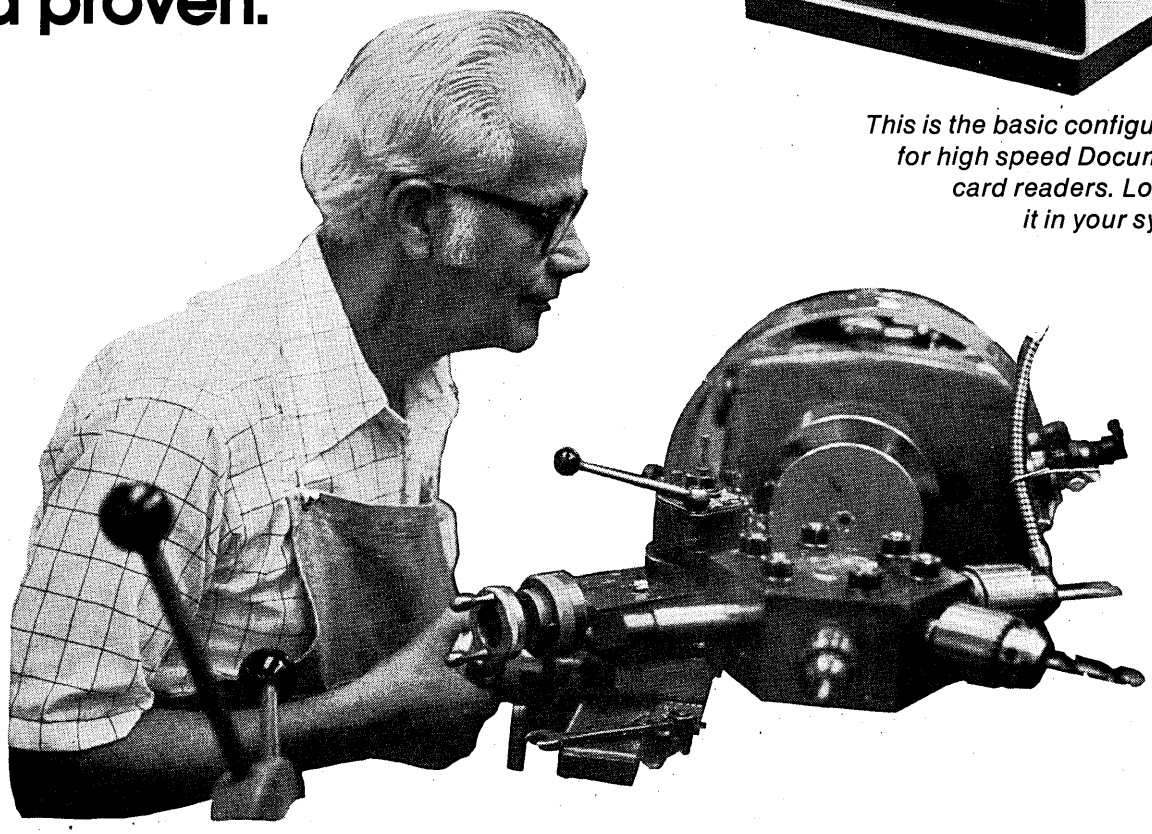

That's one of the design reasons why Documation readers have such a good track record for continuous duty and little or no maintenance. And all 36 models of the Documation vacuum system card readers are plug and signal compatible from 285 to 1,200 cards per minute.

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CIRCLE 37 ON READER CARD

LOOK AHEAD

(Continued from page 18)

RETAIL STANDARD CALLED UPC COMPATIBLE

The National Retail Merchants Assn.'s identification standard, announced late last month at the NRMA's edp conference in Quebec, can definitely be compatible with the grocery industry's UPC (see p. 111), said one member of the committee which helped develop the standard during an eight year research and development effort. "The numbers across the bottom of the bar code, now in OCR font B, only have to be changed to OCR A, moved down, and where necessary expanded." The retail OCR-A Size I type can accommodate from 20 to 25 characters. The grocery code currently is limited to 10.

NEW TENANT FOR THE TAJ MAHAL

Information International, Inc., moved last month into the "Taj Mahal," a plush 86,000 sq. ft. plant atop a hill on an eight acre site in Culver City, Calif. The naming of the plant after a famed mausoleum was the work of employees of Computer Communications Inc. which vacated the plant last summer after almost expiring there (October, p. 118). Triple I's financial vp, Terry Taugner, hopes his company will "change the luck of the building" (the first occupant was a division of the Schick razor company which was dissolved) and isn't bothered by the fact the "Taj Mahal" sits next to a Los Angeles cemetery. III, a 230 employee developer of computer-based microfilm and printing systems, has spent some $250,000 remodeling the posh facility which is equipped with outdoor tennis courts, a baseball diamond, and an aviary. The firm hasn't decided if it will resurrect the tennis courts, recently paved over by the building's owners. Taugner thinks there are at least 160 baseball players "of triple I caliber," so the diamond probably will be used. As for the aviary, which Taugner says is without birds ("the previous occupants may have eaten them during hard times"), the company will use it if it finds an appropriate bird. He thinks a contest among employees ("the first prize is a week in Philadelphia") might be a good idea. It could be a Condor, he warns.

RUMORS AND RAW RANDOM DATA

We hear the processing language on IBM's FS (future system) will be APL. Which prompts one wag to ask: "Is that the language the Arabs speak?"... We also hear IBM salesmen were asking this question last month following rumors that a consortium of Arab oil interests were going to buy IBM: "Do you suppose they'll require salesmen to make calls on a camel to save gas?" To which one replied, "That might be a good idea. Camels have virtual store too"...The ACM says its membership this year was 28,315, down slightly from 28,675 the year before. Yet, other ACM sources continue to boast that new memberships rise by 8,000 every year...Since no one else will listen to them, Artificial Intelligencers in the San Francisco area are planning a regular series of local meetings of inner circle-ites. No doubt, one topic of discussion will be where to get funding...Those bright people at Informatics (800 installations of Mark IV file management language) now are coming out with six applications products written in Mark IV, the first being an accounts payable package already installed at six customer sites. The company claims the product adapts to the way the customer arranges his input instead of the other way around...The eight-year-old Honeywell Computer Journal published its last issue this summer. The death of the journal, described as an economy measure, had to be a surprise to the staff whose editorial in that final issue reads, "Our cover is the first in a new series that will feature the avocations of people in the computer industry."

the centronics phenomenon:

a printer that makes large-letter labels, bar codes—and regular printouts, too.

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2	1	PAPER RECEIVING TRAY	5 #
3	1	101 PRINTER STAND	45 #
		TOTAL WGT	230 #

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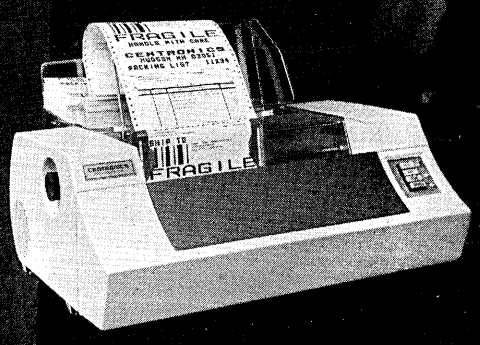

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hardware

Off-line

The communications front-end for Honeywell equipment featured in our August issue (p. 127) does not affect the integrity of the mainframe, and Honeywell has not balked at its installation so far, the manufacturer wishes us to point out.

Free while they last to Nova 1200 and Digital Computer Controls D-116 users: a paper data lamp decoder template that affixes to the front panel to provide systems programmers with interpretations of the computer's lamp indicators. Contact Digital Computer Controls, Inc., 12 Industrial Road, Fairfield, N.J. 07006, (201) 227-4861.

Microprocessors may have an unexpected positive impact on the utilization of minicomputers says Dr. William S. Meisel, Manager of Data Sciences Division of Technology Service Corp., Santa Monica, Calif. While microprocessors have been touted as a threat to minis, Meisel thinks the micros and the minis may team up together to take business away from larger computers! "In certain dedicated applications, microprocessors may be able to absorb a sufficient preprocessing burden to allow the main processing to be handled by a smaller computer," says Meisel.

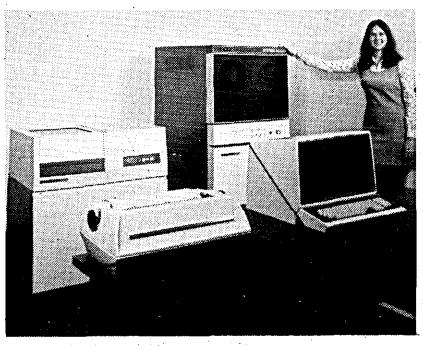
Remember the F-111 fighter bomber with its manually movable wing that allowed it to take off from short fields (straight wings) and still exceed Mach 2 when the wings were swept back? The Grumman Corp. has improved on the basic concept. An aerospace computer has been installed in the F-14 Tomcat fighter (just now becoming operational with the Navy) that continually and automatically adjusts the wing settings to optimize the performance of the craft to whatever maneuver the pilot calls for. Interestingly, a plane with the same performance characteristics, but without the movable wings and computer, would have weighed 1,700 pounds more than the F-14, and cost the Navy $200K more per plane, says Grumman.

Analysis of existing earthquake computer codes in a form usable by structural engineers is underway at Systems, Science & Software, San Diego, under a contract from the National Science Foundation.

Computerized Filing

One day, all our office files, including paper files, card files, tape and film files, will be on-line, and the System 5000 is one of the most serious attempts to come up with such a system to date. Up to 32 users can be accessing the 5000, simultaneously creating, modifying, and interrogating information files through microprocessor-equipped crt terminals that perform the users' commands. One of the system's best features will probably hold down rapid market acceptance: all software will be generated by the manufacturer, and the user won't be able to "get his hands on it" (i.e., clobber the logic). The initial applications discussed are accounts payable, purchase orders, blueprint record files, bank customer (DDA) files, and bad debts. Next up are BOMP, manufacturing inventory control, job shop management, and product distribution routing.

Instead of a high-level user language, the user uses commands such as "UR" for update record. The microprocessor, in conjunction with a 64K



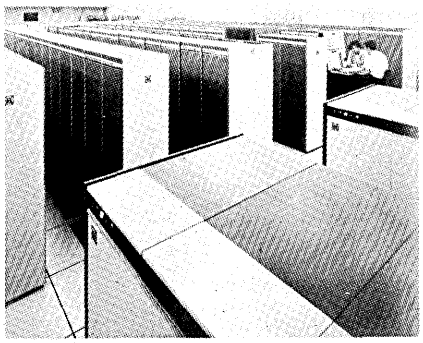
word minicomputer and disc file, can then access up to 140 information files containing as much as a million records. A maximum of 11 files can be open at any one time, but only one particular file is open to a user at a time, making file mergers difficult at best; but the types of files mentioned in the first software releases are seldom merged anyway. A 25-megabyte disc drive is standard, as is a tape drive for data logging and control, and security features to control access to sensitive files—a good idea. Hard copy printers are available for the terminals.

The developers are the first to admit that the 5000 will have some initial image problems, trying to be all things to all people. But they are willing to listen to suggestions for specific software and hardware capabilities to make the system cost effective in specific applications. A typical system, consisting of a minicomputer controller, disc, and two operator stations rents for $1,878/month on a three-year lease, or can be purchased for $84,450. INFOREX, INC., Burlington, Mass.

FOR DATA CIRCLE 271 ON READER CARD

Multiprocessor Systems

Burroughs, which has offered multiprocessor machines for years, has added a new top of the line model oriented toward very large scale scientific and commercial applications. The 7700 looks big enough to be a descendant of the Illiac IV, but Burroughs



spokesman say that, if anything, the Illiac IV was designed after the B 6700 and B 7700 models. Some heritage.

Essentially, the four models of the 7700 are upgraded processors from the previous 7700 models. One starts to build on one cpu and on one I/O processor with 24 channels. From there, there's a choice of a multiprocessor model 7760 with two I/O processors, each with 24 channels; a triple processor, two I/O model 7770; and the 7780 with four cpu's and two I/O processors. All model changes can be accomplished on-site up to and including an eight cpu machine for which there's no model number yet. The basic architecture of the machine remains 48-bit words, but there are byte-oriented instructions. The memory sizes go up to 6,291,456 bytes on the series, with memory interleaving techniques yielding effective access times on the order of 88.5 nsec. The processors have small cache memories (6 kilobytes) that run at an effective rate of 42 nsec per byte. In this cache

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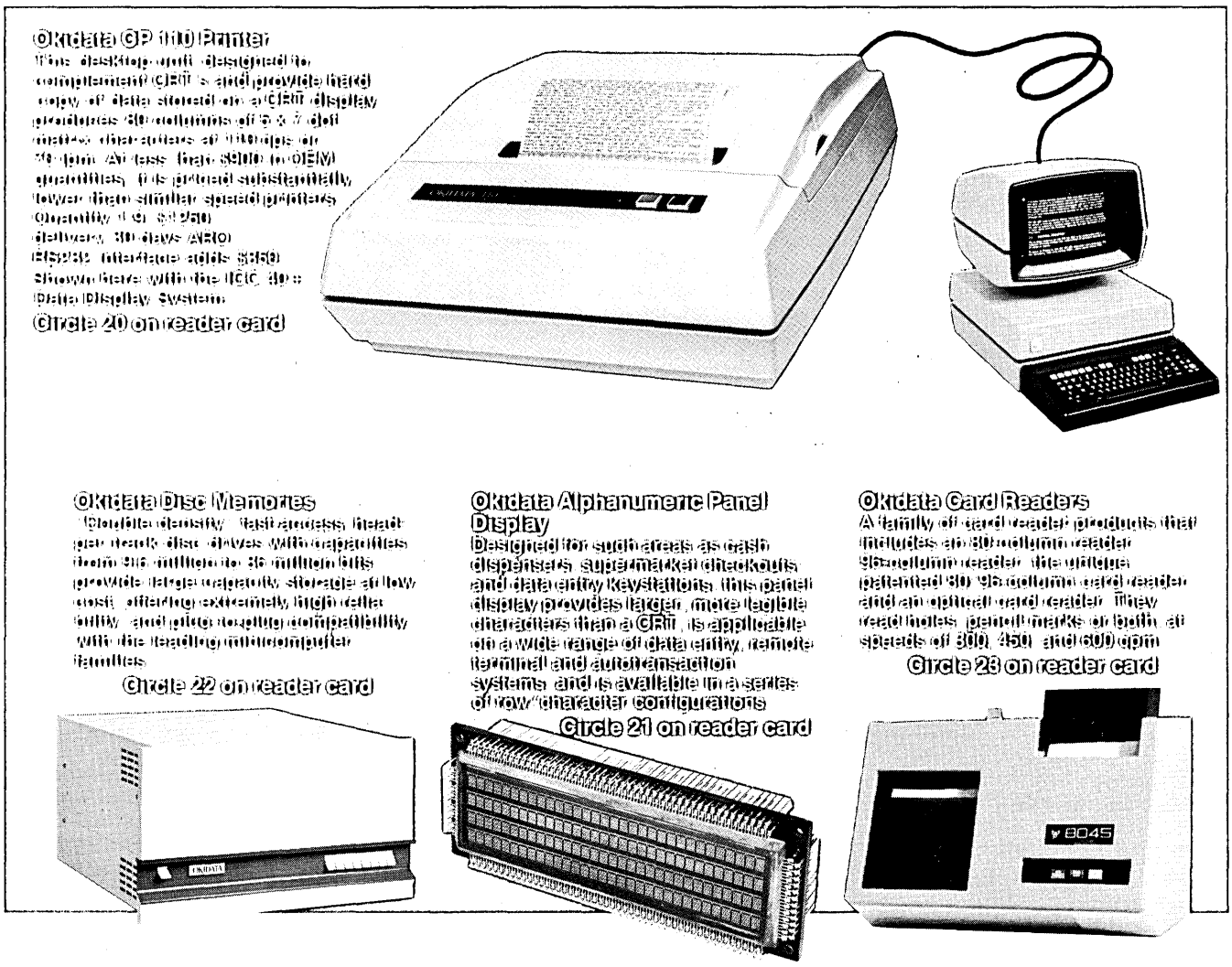

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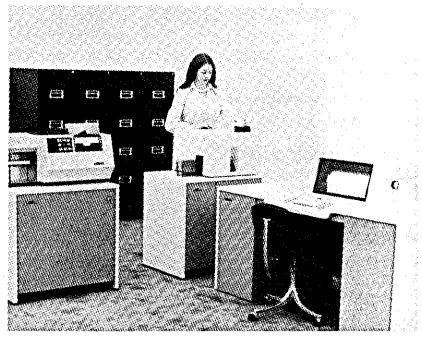
memory are held program units that are segmented by logical unit (entire subroutine or program nucleus) as opposed to having a fixed page size, a la IBM. Some new instructions have been added, mostly vector mode operators, and others have been modified to take better advantage of the 7700's inherent speed. Burroughs can now boast that they have a product line ranging from the equivalent of a 370/135 through a 370/168 that is completely object code compatible. The machines are high-level language computers (you can't even obtain the assembly language!) that support COBOL, ALGOL, FORTRAN, PL/1, BASIC, and APL. A starter set 7750, with 250,000 48-bit words (about equal to 1.5 megabytes), eight tape drives, a billion bytes of disc storage, and data communications features lists for $3,760,000, or $80K/month on straight rental. The new models are available for immediate delivery. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 276 ON READER CARD

Two Terminals

IBM's recent terminal announcements have really been good for users (its users, anyway) because they all can use a common communication technique, SDLC, synchronous data link control. The 3767 communications terminal and the 3770 data communications terminals are no exception. While the 3767 can work with start-stop communication lines, and the 3770 can use bisynchronous communication lines, it's clear that IBM's plan is to get most, if not all, its terminals talking the same language with



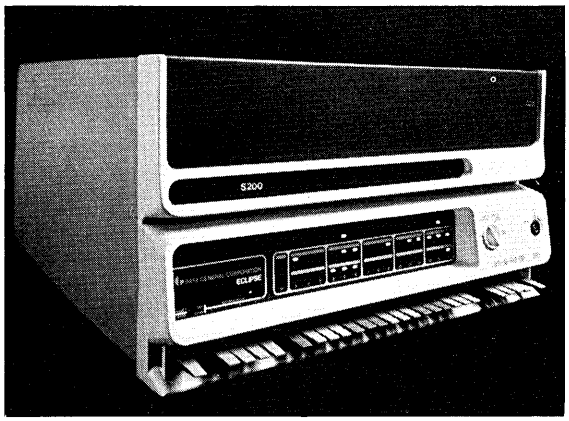
common protocols, which benefits practically everybody.

The 3767 is basically a high-speed keyboard/printer terminal for interactive applications. It uses a bidirectional matrix printer with speeds of 40 and 80 cps. A 512-byte buffer is optional on the 40-cps unit (standard on the higher-speed model) to allow editing of data before it is transmitted. Several other interesting options include an off-line calculator package that can do such complex computation as square root, logarithmic, and trigonometric functions; and a security key/lock and magnetic stripe card reader to control access to the terminal and its associated computer. The 3767 operates at up to 2,400 baud to 370 models 115 through 168 equipped with VS or VM operating systems. Basic 3767s rent for $189/month and go up to $336/month.

The 3770 essentially uses the 3767 as a component in a larger system capable of handling various combinations of peripherals such as floppy discs, card readers and punches, and has two 256-byte buffer memories for temporarily storing keyed data. The largest model of the 3770, the 3775, can have two flexible disc drives and a 120 lpm belt printer instead of the 80-cps unit. Basic 3770 models rent for $268, and can be expanded with various peripheral combinations up to $786. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 277 ON READER CARD

product spotlight



New Minicomputer Line

One of the best kept secrets in the rumor-filled minicomputer industry was that Data General had been refining the architecture of a new line of minis for the past several years. The new series, called the Eclipse line, is clearly revolutionary in the minicomputer. Such features as cache memories and substantial built-in error correction mechanisms promise users and systems designers both increased performance and reliability.

As in the Nova series, the Eclipse series is basically 16-bit design, but when ordered with error checking and correcting (ERCC) core and semiconductor memories, the memory word lengths are actually 21-bits. A hardware encoder uses the extra five bits to make an arithmetic computation on the 16 data bits when they are written into memory, and again when they are read out. If the encoder detects a disagreement on read-out, an error code is automatically generated that specifies where the error is, and the memory corrects it.

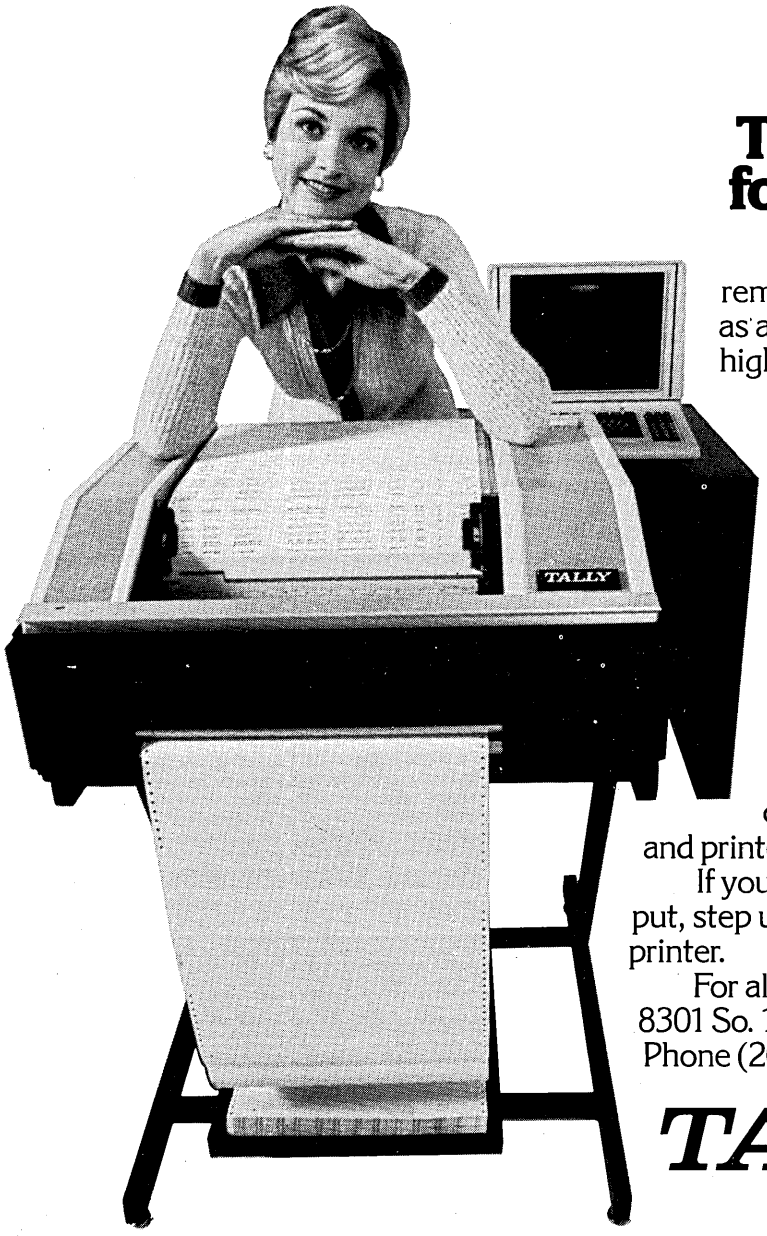
There are two models in the initial Eclipse announcement. The S/100 is an oem version capable of addressing 64K bytes (32K words.) The S/200 is a larger model for use by system builders or sophisticated end users. This model can address up to 256K bytes of memory.

The memory offerings are probably the most interesting features of the Eclipse line. Standard core, error correcting core, standard semiconductor, and error correcting semiconductor memories are offered, the former with 800 nsec cycle times, and the latter with 700 nsec performance. The two types of memories can be mixed on the system. The 16K byte semiconductor memories come with a 16-word array of 200 nsec bipolar memory that will "usually" hold the next portion of data the cpu desires. If the data is not in the cache, the location is loaded from main memory; the cache is purged and loaded with the addressed word plus the data from the three adjacent memory locations—very much like 370/155 and 165 systems, but on a smaller scale. An added feature is that the memory chunks can be interleaved, which boosts any memory complement's apparent performance by as much as 45%.

Available in February, an S/100 with 32K bytes of standard core is $9,200, $11,200 with error correcting core; $10,700 with standard semiconductor, and $12,700 with error correction logic. An S/200 system with 32K bytes of error correcting semiconductor memory is $22,300, with correspondingly lower prices for the other memory choices. DATA GENERAL CORP., Southboro, Mass.

FOR DATA CIRCLE 270 ON READER CARD

COMMUNICATIONS PRINTER



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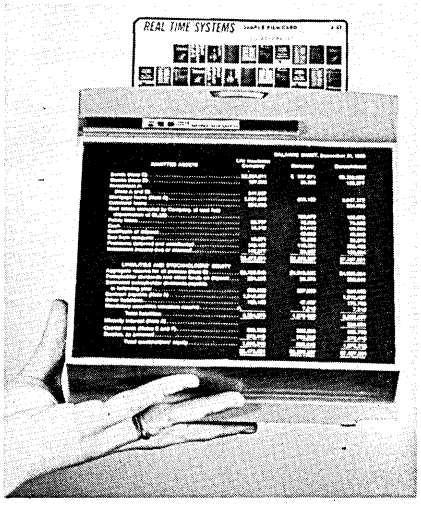
Microfiche Reader

The Mini-Reader weighs only two pounds, costs only $25, and is powered with either a standard 110v wall outlet or a 12-volt cigarette lighter attachment ($5 extra) which should make it



popular with microfilm users. The reader is billed as accepting every type of microfiche. NATIONAL MICROSALES, Stratford, Conn.

FOR DATA CIRCLE 286 ON READER CARD

Small Biz System

The Datasystem-535 is the smallest member of DEC's PDP-11 based business computing systems. The standard system comes with 96K bytes, two 2.4 megabyte discs, the CTS-500/E commercial time-sharing software package, a DEC-writer terminal and provisions for the addition of up to three additional terminals. It will also support a 300 lpm printer, a mag tape unit, and 2780-compatible communications. The $54K price seems like a good one. There isn't any direct applications software support, but the system is really oriented toward large corporations

with their own programming staffs and systems assemblers planning to invade the small business market. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 285 ON READER CARD

Fastest Microcomputers

The 3000 series of all-bipolar LSI computer circuits is every bit as significant as the MOS products Intel introduced several years ago, and that are now found in hundreds of different types of products. The 3000 product line solves about the only problem the MOS products had: they were inherently limited to relatively low-speed processing, which limited their applicability.

Nothing slow about the 3000 stuff, however. It can be made to run as fast as 8 *million* microcycles per second. For simple instructions such as adds or subtracts, which might require six or seven cycles, the throughput of the 3000 is still over one million instructions per second. The term microcycles refers to the actual clock cycle of the circuitry, with from one to a large number of cycles typically required to accomplish an actual instruction.

The 3000 series basically consists of a central processing element (CPE) and a microprogram control unit (MCU). Each CPE is a 2-bit-wide slice of a computer. One simply adds CPEs to create the word length of your choice. The MCU is responsible for selecting designer-encoded instructions from the 3000's memory chips.

The primary markets for the 3000 series will be all the minicomputer manufacturers, where Intel will try to coax them into abandoning such familiar forms of logic as TTL (transistor-transistor logic), an industry staple for years. For these manufacturers, the cost of the MCU and eight CPE components (sufficient to build one 16-bit mini) is under $200 in quantities of 100. For system development work, Intel supplies a kit containing design information and all the LSI blocks and microprogram memory circuits needed to build a large, complex system. The kits cost $720 each. This development, at these prices, will almost certainly lead to end user products that are cheaper, more reliable, and smaller than anything our industry has witnessed up to now. INTEL CORP., Santa Clara, Calif.

FOR DATA CIRCLE 272 ON READER CARD

System/3 Model 8

The System/3 Model 8 is the maverick of the Munchkin machines as it does not support card I/O. The new model can be used for batch processing using a directly-attached 3741 data entry station, or for on-line processing by attaching a 3270 intelligent terminal for data entry and inquiry. The memory sizes for the new machine range between 16 and 64 kilobytes in four configurations that run at the same speed and the same instruction times as the

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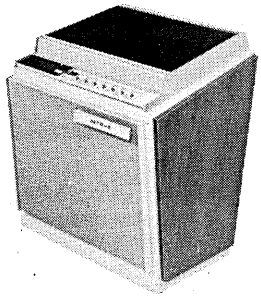

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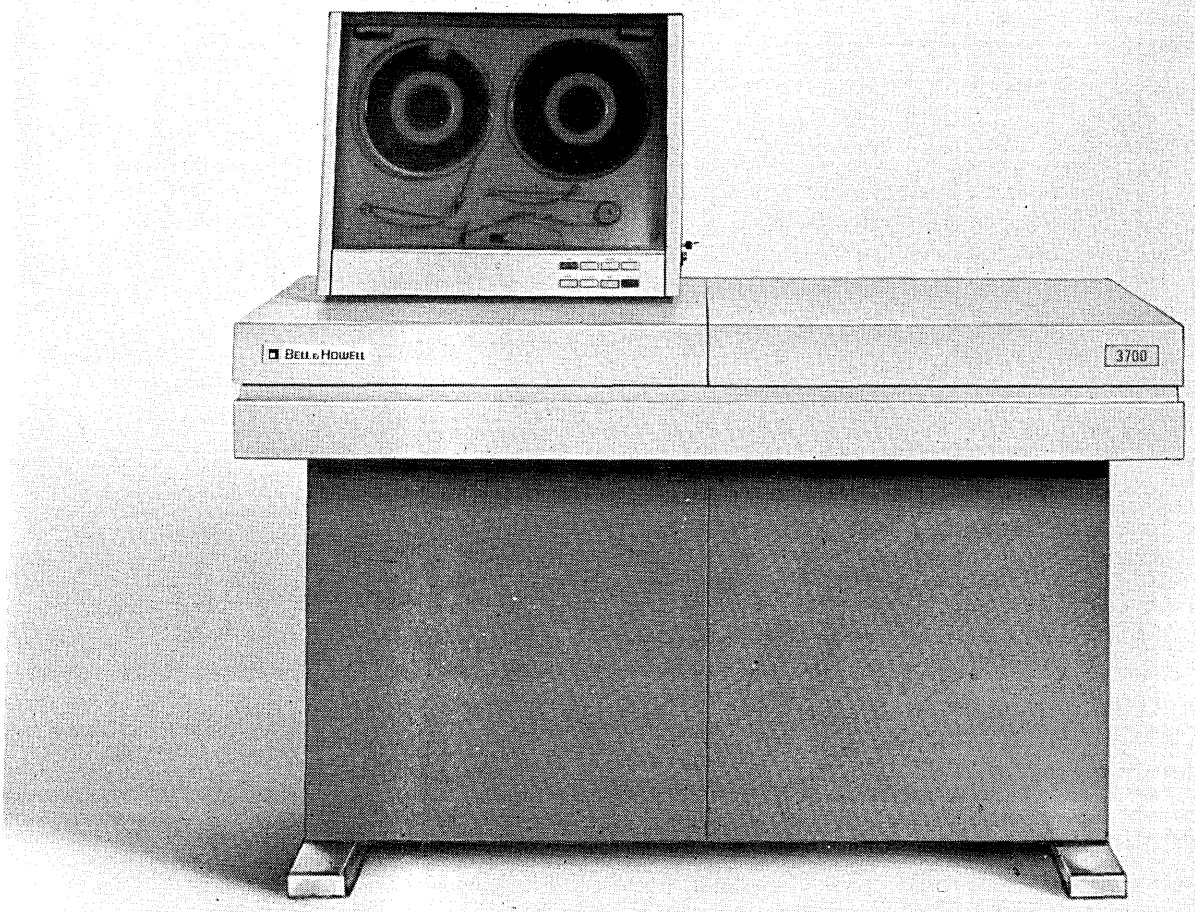

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larger model 10. Another new wrinkle on this particular model is an integrated communications adapter which permits one remote and two local communications lines to be connected. The model 8 also supports bisynchronous transmissions.

Another major feature missing from the model 8 is support of the large disc units (5445s) that model 10 users have come to know and love, but the 8 is obviously intended to come into installations and applications that won't require one for some time. By that time IBM might offer 5445s on the 8. A 16K system with a 4.9 megabyte 5444 disc, 2741 work station, and 200 lpm printer comes in at $1,849/month, or $72,075 on purchase. First delivery is June, 1975.

IBM also announced that the largest System/3, the model 15, can now handle the 3340 disc subsystem, offering users up to 164 megabytes of on-line storage—roughly twice the maximum capacity of 5445 configurations. First delivery of this feature is also next June. IBM CORP., Atlanta, Ga.

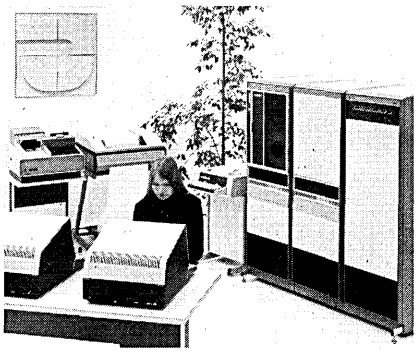
FOR DATA CIRCLE 273 ON READER CARD

Small-scale Systems

With the software problems of the original 3000 announcement solved, Hewlett-Packard has brought out four new models, called the 3000 CX series, to do battle with competition such as DEC's DataSystem offerings. With advanced features like virtual memory, stack architecture, and a new version of the operating executive called MPE/C, the CX looks like an able competitor. H-P has *demonstrated* simultaneous processing in batch, remote batch, time-sharing, and real-time modes to users, who can choose from FORTRAN, BASIC (compiler and interpreter), RPG, COBOL, and an ALGOL-like assembler called SPL, for processing. Additionally, the 3000 systems have been outfitted with decimal arithmetic and I/O spooling features to better equip them for business processing.

There are four models. The 50CX comprises a 96K processor, 5-megabyte disc, 800-bpi tape unit, console, and 16-port terminal controller. Included in the $99,500 price are the operating system, basic utility software such as a text editor, SORT/MERGE, and the SPL language.

The 100CX adds a 600-cpm reader, 200-lpm matrix printer, and doubles the disc storage to 10 megabytes. This configuration is priced at $129,500. Options include FORTRAN IV with ex-



tended precision floating point instructions, RPG and decimal arithmetic, a full BASIC compiler, and a BASIC interpreter for time-sharing users.

The 200CX is a 128K cpu model

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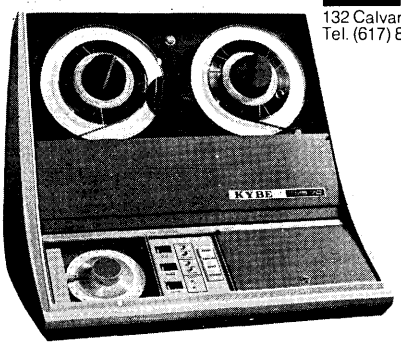

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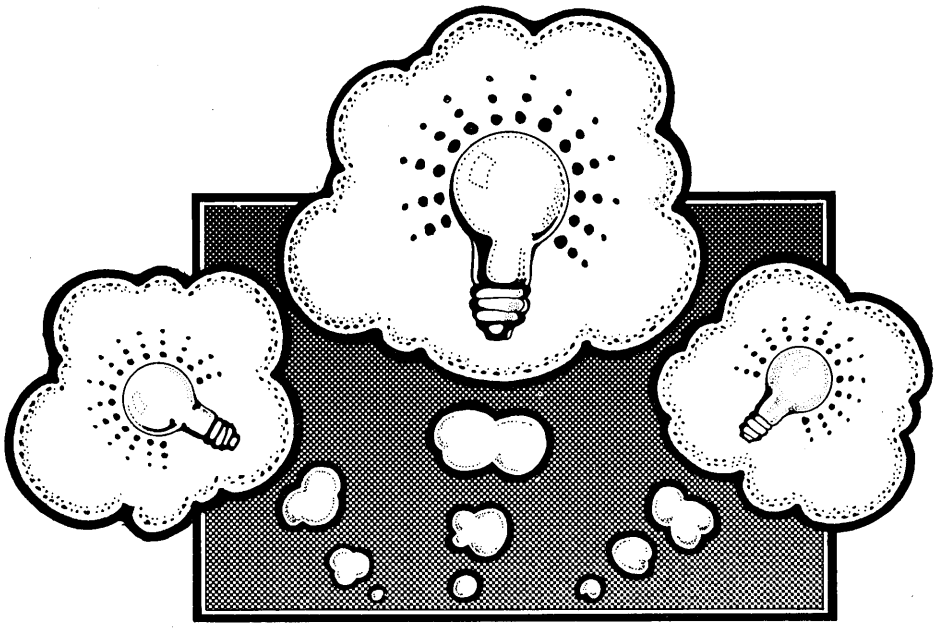

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with a 2-megabyte swapping disc and 47 megabytes of disc file storage. The price is $171K. Options include COBOL, real-time data acquisition capability, and data base management software.

The flagship of the line is the 300CX —which sounds more like the name of a motorcycle. The principal difference between the 300 and the 200 is a 1250-lpm printer and combination card reader/punch. This system is priced at $203,500.

One of the 3000 CX series' best features is its ability to communicate at high speeds to other manufacturers' equipment, acting as an IBM 2780/3780 terminal, or to other 3000 members. This capability will insure its consideration for networking applications. First units of the 3000 CX family go to the field in the first quarter of next year. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 290 ON READER CARD

System III Crt

The manufacturer of the System III competitor to IBM's System/3 has developed a crt terminal that functions as a second workstation simultaneously with the master video console. The auxiliary terminal functions in the foreground mode of the dual-partition system, allowing one function to be run from the master console (such as batch stream processing), and another application to be controlled from the auxiliary. The subsystem, including crt, keyboard, interface, cables, and support software is priced at $4,325. LOCKHEED ELECTRONICS COMPANY, INC., Los Angeles, Calif.

FOR DATA CIRCLE 281 ON READER CARD

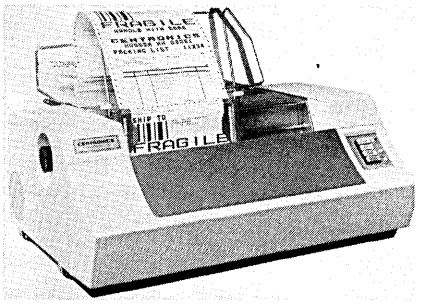
Faster Mini Fortran

A combination hardware/software package is offered Data General Corp. Nova mini users that is said to endow any Nova model with FORTRAN IV performance on the order of Data General's FORTRAN 5 offering. A floating-point processor is the key, replacing software subroutine calls with hardware execution of floating-point real and complex arithmetic. A single- or double-precision REAL add is performed in 6.7 usec. The processor is priced at $4,500, and the supporting software is $500. FLOATING POINT SYSTEMS, INC., Portland, Ore.

FOR DATA CIRCLE 282 ON READER CARD

Variable Font Printer

The 101S is another variation of the wildly successful 165 cps serial printer. This particular model's claim to fame is that it is capable of printing alpha-numeric characters in any size across 132 columns of multi-form stock. The larger letter, numbers, and bar coding are especially suited for materials han-



dling and warehouse system applications across many industries. Characters larger than the standard one-tenth inch are formed by assembling character sections or segments to make up any desired character under the control of a software routine. The 101S is priced at $4,495 and is in production. CENTRONICS DATA COMPUTER CORP., Hudson, N.H.

FOR DATA CIRCLE 283 ON READER CARD

Nova Communications

A programmable interface for Data General Nova computers allows up to eight data terminals or computers with varying baud rates or code structures to communicate directly with the mini. Transmit and receive rates are individually software programmable from six to 12,800 baud. The MCPI-1 is compatible with RS-232 modems, and features unattended send/receive operation. The 15 x 15-inch pc board slips into the Nova and uses the existing power supply. In quantities of 25 it's priced at $2,110/each. METRODATA CORP., Seattle, Wash.

FOR DATA CIRCLE 280 ON READER CARD

Mid-size System

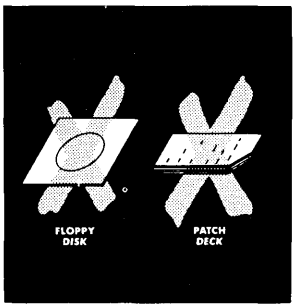
While perhaps not quite as exciting as the very large-scale B 7700 processor Burroughs recently announced (also featured in this section), the B 4790 is the newest offering in the manufacturer's bread and butter line-up, a medium-scale computer renting in the range of $25-90K per month. Current model 4700 users can think of the machine as having double the processing speed, due to memories that are twice as big and twice as fast as the 4700, with double the transfer rates on twice the number of I/O channels, 40. The byte-oriented machine pulls two bytes each 250 nsec from bipolar memory, and even has time left over to do error detection/correction checks on incoming information. A new, stronger I/O channel called the type B is capable of fetching one byte every cpu cycle, yielding an aggregate chan-

Progress Report:

370/STOR 145

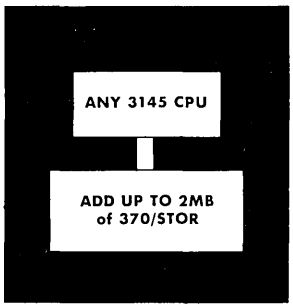
IT'S THE THINGS THAT ARE DIFFERENT THAT MAKE THIS MEMORY SO SUCCESSFUL.

370/STOR 145 is an expansion memory for IBM 3145 processors. In less than a year, it has become the dominant product in its market. Why? For one thing, security. Model 3145 users know Cambridge is the only independent supplier that designs, manufactures, sells and services the systems we install. For another, performance. 370/STOR 145 is different from any other 3145 add-on memory; and it is these differences that make it attractive. For example:



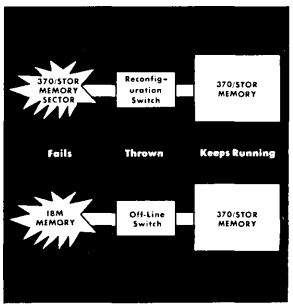
NO FLOPPY DISK MODIFICATION

A user can add 370/STOR 145 memory, in any size increment, without tampering with the console file. No patch decks are required, ever. So what happens on your "floppy disk" is between you and IBM. Cambridge doesn't get involved.



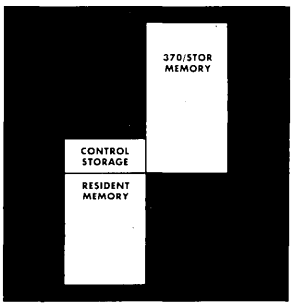
NO CPU ALTERATION

370/STOR 145 installs directly to your 3145 processor. No wiring changes. No model changes when you expand memory beyond your current model's capacity. That means Cambridge can increase your model 3145 memory to a full two megabyte capacity without any CPU alteration.



UNIQUE MEMORY PROTECTION

370/STOR 145 detects and corrects all single-bit errors, and detects multi-bit errors. So do other 145 memories. So to be different we add a reconfiguration switch to let you dial out failed 370/STOR memory, *plus* an off-line switch to dial out failed IBM memory. Either way, you keep running.



HIGHEST MEMORY ADDRESSING

Even IBM must change address lines when you add its memory. But not Cambridge. 370/STOR 145 is directly addressable up to 2048K without any change. It floats on top of any IBM address level. That's the secret of our modular expansion, lack of CPU alteration, and freedom from console file tampering.

CAMBRIDGE.

A good place to put your information.

cmi Cambridge Memories, Inc. 12 Crosby Drive, Bedford, Mass. 01730 (617) 271-6400

Contact our sales offices for further information: Boston (617) 271-6400 • Hartford (203) 633-8714 • Philadelphia (215) 295-1186 • Columbus, O. (614) 459-0154 • Kansas City (913) 371-3352 • Atlanta (404) 252-1382 • San Francisco (415) 692-4806 • New York City (201) 947-0184 • Rochester (716) 637-2229 • Chicago (312) 449-5260 • Detroit (313) 557-4080 • Washington, D.C. (301) 657-9015/6 • Dallas (214) 231-4804 • Los Angeles (213) 822-1166 • Charlotte, N.C. (704) 568-1787.

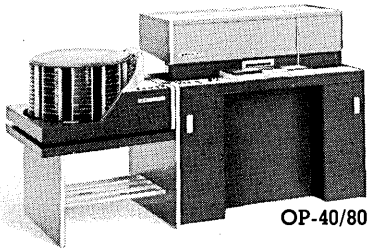
Why Bruning makes more kinds of microfiche duplicators than anybody.

There are no easy answers; no one or even two microfiche duplicators are right for everybody.

So we make six. They vary in speed, type of input, kind of process and degree of automation. They are alike only in the high quality of duplicates they deliver; sleek functional appearance; and in easy, pushbutton operation. All fit right into any office environment.

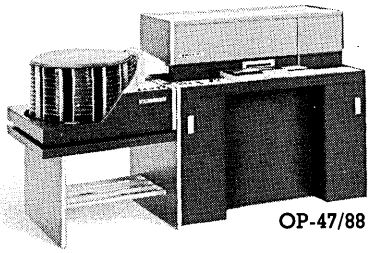
Plus, any Bruning microfiche duplicator can be linked with an optional automatic collator to deliver either collated or separated sets in order of master input.

All Bruning microfiche duplicators produce cut microfiche to meet or exceed all industry standards – from either cut or roll master input.



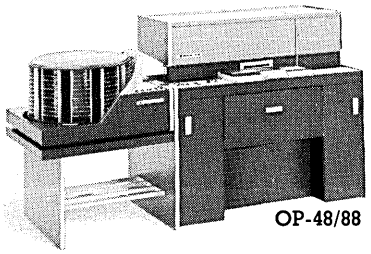
OP-40/80

Bruning's OP 40 uses diazo film to deliver up to 720 cut fiche per hour from cut masters.



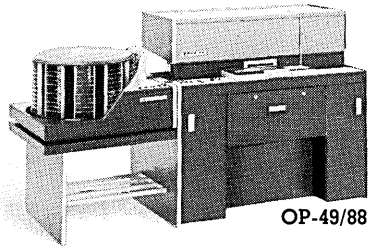
OP-47/88

Bruning's OP 47 delivers up to 900 cut fiche per hour from fiche masters using vesicular film.



OP-48/88

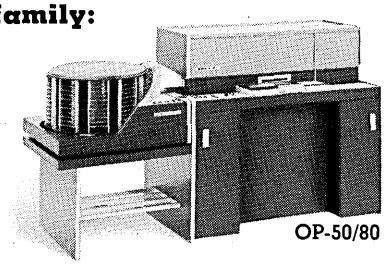
Bruning's OP 48 uses vesicular film to deliver up to 900 cut fiche per hour from cut or roll masters.



OP-49/88

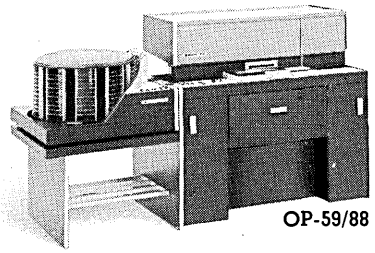
Bruning's OP 49 delivers up to 750 cut diazo fiche per hour from cut or roll masters.

Two new additions to our family:



OP-50/80

Bruning's OP 50 delivers cut diazo fiche at the remarkable rate in excess of 1400 per hour from cut masters.



OP-59/88

Bruning's OP 59 uses diazo film to deliver in excess of 1400 cut fiche per hour from cut or roll masters.

We got to be number one in microfiche duplication by meeting or exceeding your needs. Now, we're working on tomorrow's needs.

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THE BOLD FORCE IN MICROGRAPHICS!

ADDRESSOGRAPH MULTIGRAPH

BRUNING DIVISION

CIRCLE 27 ON READER CARD

nel rate of 8 megabytes/second, which would seem adequate. Memory sizes range from 300,000 to 600,000 bytes.

A new systems and communications processor with its own memory (8-96K) can be expanded to handle up to 32 communication lines running at 9600 baud. Up to eight B 774s can be attached to the B 4790, and the new commo processor also hooks to the B 2700, 3700, and 4700 mainframes. A 16K unit for supporting 4 asynchronous 9600 baud lines rents for $950/month and sells for $42K. A basic B 4790 computer computer with 300,000 bytes of memory, file protect memory, and 16 I/O channels rents for approximately $25K/month. First deliveries will be about this time next year. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 274 ON READER CARD

Crt Terminal

The Uniscope 200 might have the clearest character display in the industry, which should ease operator eye strain and possibly reduce errors. It is available in 24 line by 64-character and 24 line by 80-character versions. Each 7 x 9 dot matrix character appears unusually well defined on the green phosphor screen. A magnetic

tape cassette unit, capable of storing 1.4 million characters is optional, as is a 30-cps hard copy output device. The Uniscope 200 sells for $4,128 and rents for $121/month. It is compatible with the earlier model 100 Uniscope. UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 284 ON READER CARD

Card Reader

This manufacturer, which has an enviable record of building good low-speed card readers, has now introduced a 1,200 card per minute reader with large input and output hoppers that should be just what large computer centers need. The M6000 features a 6,000 card capacity input hopper, and two 8,500 card output hoppers. It's only offered to oem's now (at $10,-450), but there must be a number of end users that could use the large hopper sizes—especially if the unit is as reliable as previous offerings from the firm. DOCUMATION INC., Melbourne, Fla.

FOR DATA CIRCLE 287 ON READER CARD

System/3 Peripherals

This manufacturer's line of 96-column card peripherals can now be attached on-line to IBM System/3 Model 6 computers, allowing users to input cards at 300 cpm and punch them at 120 cpm, much faster than the stock IBM 5496 data recorder. The on-line data recorder rents for $245/month and sells for $9,500, with monthly maintenance of $68.

FOR DATA CIRCLE 288 ON READER CARD

The model 1070 Data Reporter is a 100 cps serial printer that can be used to print listings of all data transmitted or received through the manufacturers

CUE
ANOTHER IDEA FROM GEORGE & CHARLIE

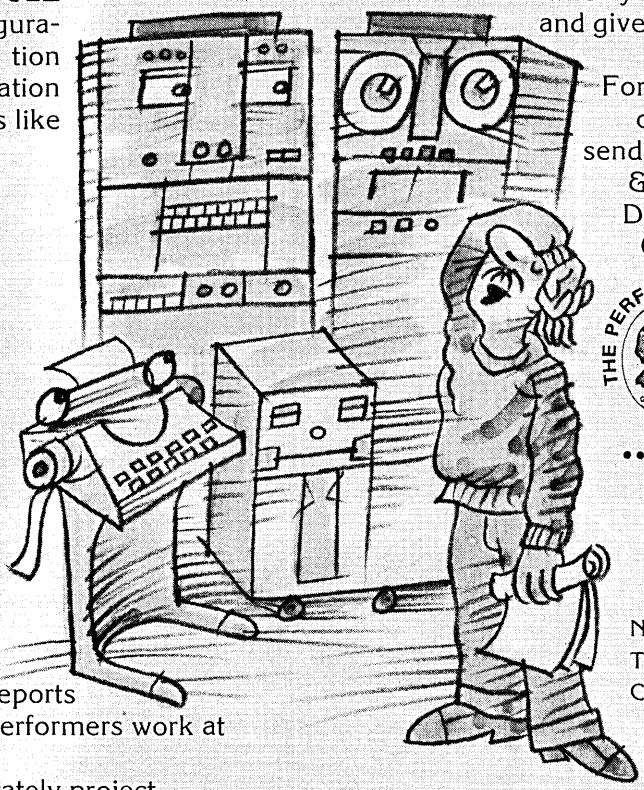
CUE your system to perform better

CUE (Configuration Utilization Evaluator) is like a script to a successful Broadway play. It helps you make your DP operation the hit of the company.

CUE gives you a backstage view of how your system and resources are performing. It isolates hardware and software bottlenecks.

CUE measures and plots CPU, channels, devices, SVCs, queues, head movements, VS paging, and lots more. You get clear, concise reports to make your system performers work at their best.

CUE helps you accurately project when you will need new equipment and gives you the solid documentation to justify the expense.



For more information on CUE, our computer system script, send the coupon below to Boole & Babbage Inc., 850 Stewart Drive, Sunnyvale, CA 94086. Or call us at 408-735-9550.

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My system performance just bombed in Boston. Please send me information today on CUE so I can get ready for Broadway. CUE is available for OS and VS on IBM 360/370.

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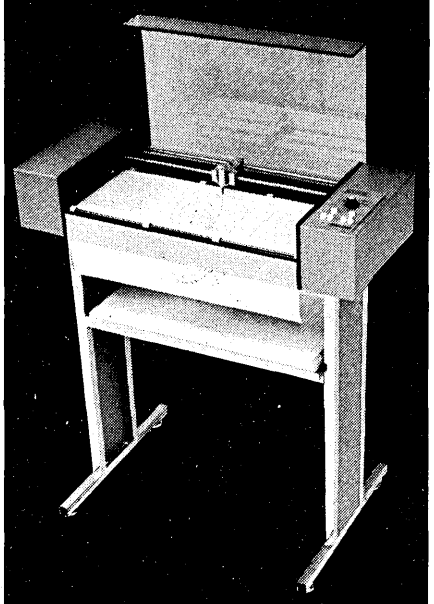
CIRCLE 92 ON READER CARD

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 COMPLOT).
- 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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CIRCLE 90 ON READER CARD

hardware

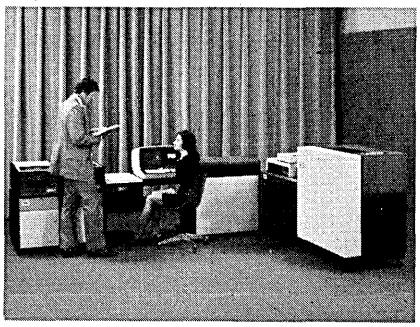
96-column card gear to generate card-based reports, lists, labels, and other output not worthy of the System/3's cpu time. The reporter rents for $130-205 per month depending on model (80 or 132 print positions) and length of lease. DECISION DATA COMPUTER CORP., Horsham, Pa.

FOR DATA CIRCLE 289 ON READER CARD

Order Entry System

The SPIRIT system marks a change in the manner NCR has previously marketed its systems. Based on a 1.2 usec 16-bit mini related to the controller that first showed up on its point-of-sale systems, SPIRIT (Sales Processing Interactive Real-Time Inventory Technique) is the first of a line of dedicated application systems that will be offered to very specific, though very large, markets. Complete turnkey software packages are in the final stages of checkout that will permit SPIRIT to perform order entry and registration, invoicing, shipping and inventory control functions for smaller wholesalers, distributors, and manufacturing companies.

The system is organized around five master files: an inventory master file, a customer master file, a vendor master file, a discount matrix file, and an order status file. These files are continually updated as information is entered during the course of the business day. Management thus has access to up-to-the-minute customer account records and order and inventory status. The day's on-line transaction history can be combined with off-line runs to



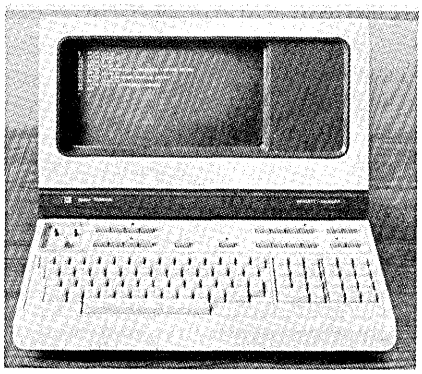
generate other common business reports such as accounts payable, accounts receivable, and general ledger reports. Flash reports are automatically generated that are a resumé of the day's business.

The 32K mini (expandable to 64K), a 9.8 megabyte disc unit, card reader, and line printer (choice of 125, 200, or 300 lpm models), and one crt terminal is priced at $39,750 and rents for $1,285/month. SPIRIT goes to first customers in the first quarter of next year. NCR, Dayton, Ohio.

FOR DATA CIRCLE 275 ON READER CARD

Crt Terminal

We're told the 2640A wasn't named after its price ($2,640 for six units), but it wouldn't have been a bad idea: the microprogrammed terminals appear to offer a lot of powerful features at a very low price. A 5 x 10-inch crt screen is used (the manufacturer saw AT&T's Dataspeed 40 and liked it) as the heart of the system, organized as 24 lines of 80 7 x 9 dot matrix characters displayed in a 9 x 15 character cell, which aids resolution. More than 400 lines of data can be viewed 24



lines at a time by scrolling the 2640. Other features include self testing, plug-in character sets, dynamically allocated memory, inverse video, protected fields, etc. Having seen the terminal demonstrated, it doesn't seem like the vendor has left any conceivable option out of the order specification book. The interface is RS-232C at switch selectable rates up to 2400 baud. First units go to the field during the first quarter of 1975. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 278 ON READER CARD

Designers' Interface

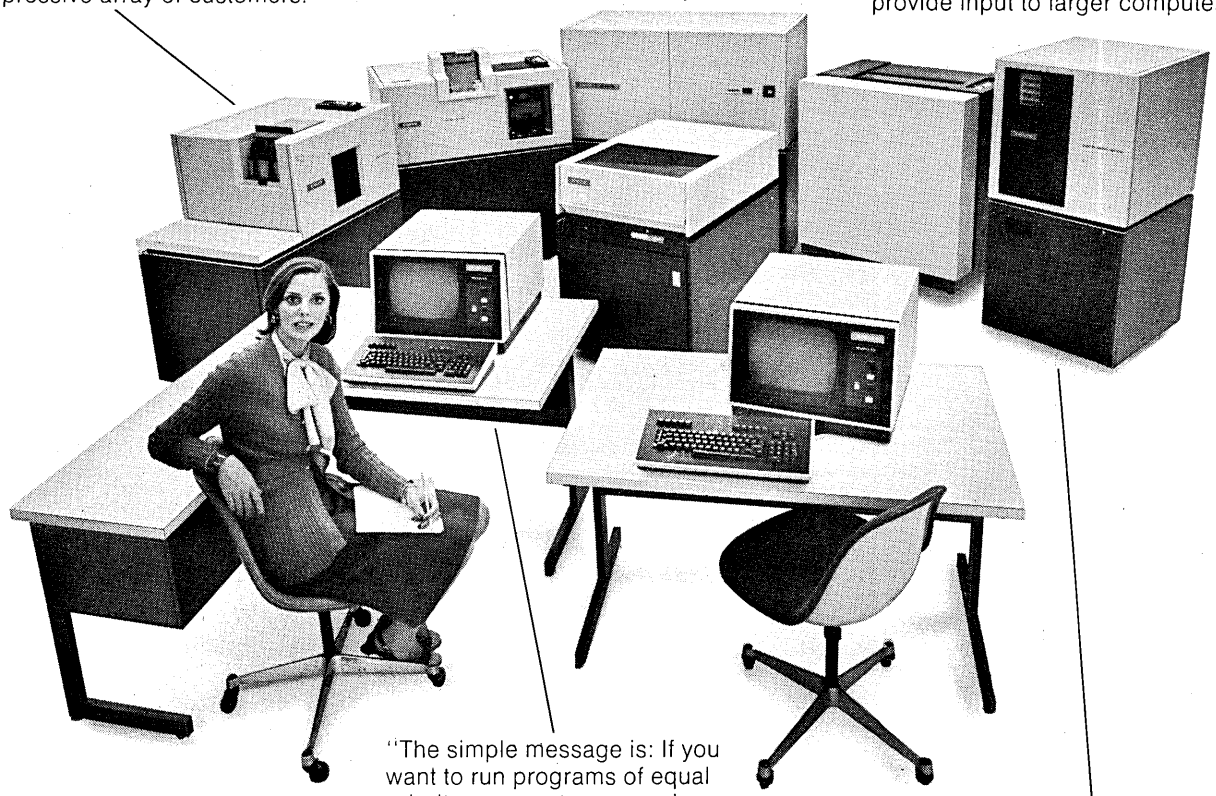
The MDB-11C general-purpose interface module is offered as an alternative to Digital Equipment's DR11C or M105/782/786 product combinations. It allows system designers to interface virtually any peripheral to the PDP-11 Unibus, the developers claim. The module has 16 available device address selects; four selectable interrupt control levels; two 16-bit I/O registers; a selectable control/status bit; and 20 wirewrap positions available for the engineer's particular logic, capable of handling 14-, 16-, 24-, or 40-pin devices. The price is $390. MDB SYSTEMS, INC., Orange, Calif.

FOR DATA CIRCLE 291 ON READER CARD □

AN INDEPENDENT EVALUATION SERVICE WROTE THIS AD:

"In a world where the relationship between operating system software and hardware is finally being understood and developed, Singer has produced an operating-system-less computer that not only is selling very well, but has an impressive array of customers."

"System Ten by Singer is a small-to-medium scale business computer used both by small businesses that do not need or cannot afford large computers, and by very large organizations with scattered work locations needing a network of on-site terminals to provide input to larger computers."



"The simple message is: If you want to run programs of equal priority, or remote processing, or with a remote job entry terminal, there probably is no system better able to give equal weight to all jobs."

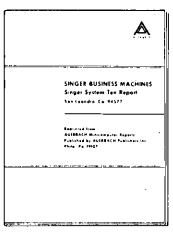
"What characterizes the system in almost all cases is its comparatively modest cost and its flexibility and ease of operation."

"System Ten is flexible. It provides time sharing and on-line information storage and retrieval with up to 20 simultaneous users and 200 I/O devices on one system.

It can serve as a remote processor and I/O terminal for a larger central computer such as an IBM/360 or IBM/370. System Ten can combine batch processing with time sharing operations and offers multiprogramming."

For your free copy of the complete AUERBACH Report on System Ten* by Singer, write: The Singer Company, Business Machines Division, Thirty Rockefeller Plaza, New York, New York 10020.

SYSTEM TEN COMPUTER BY SINGER



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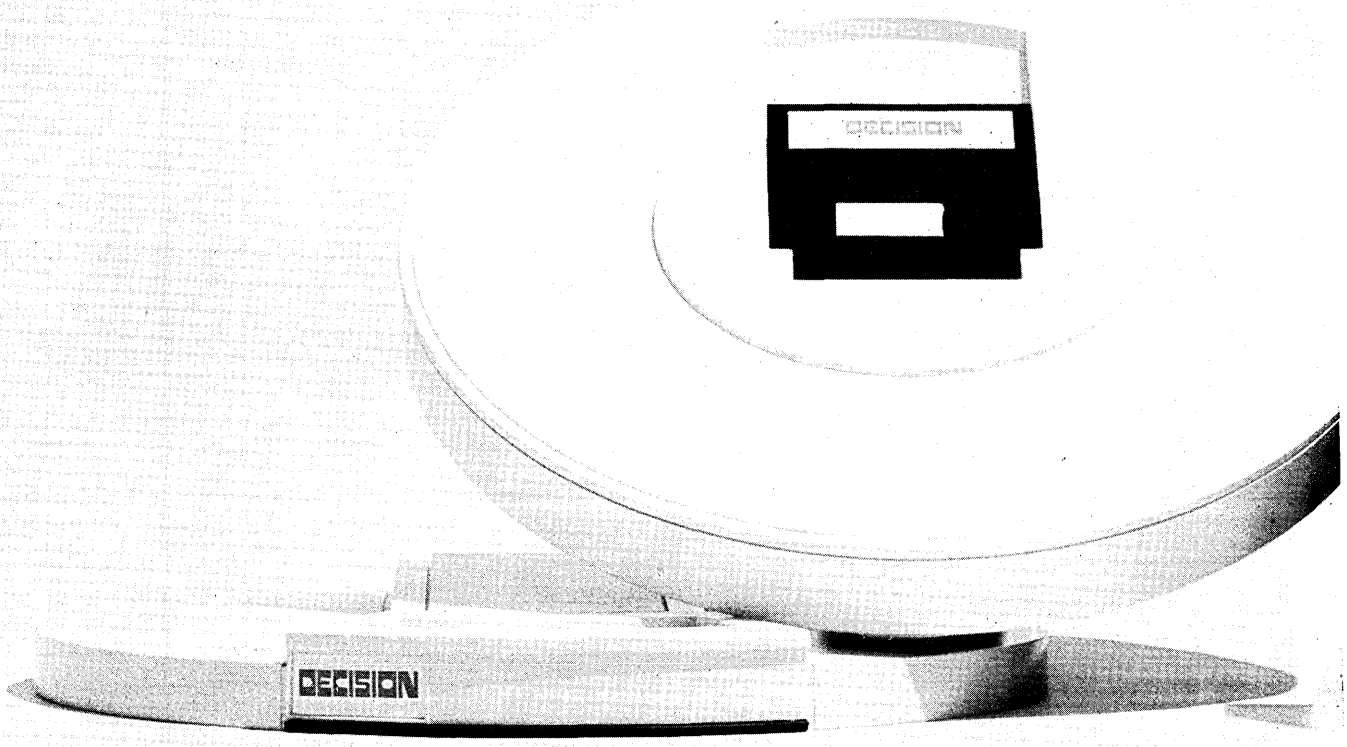
One good decision...



The minicomputer world is ready for more flexible, more economical and more compact random access data storage.

Some of the devices, however, aren't quite ready for the minicomputer world. Some drives lose valuable data. Some simply don't work when you get them. And some even overheat, smoke or worse. Problems you don't need; solutions you do.

Which explains our entry into the disk drive business.

Introducing the DECISION 4300/4400.

The new DECISION disk drives have the most desirable features of most other disk drives. Dual disk configurations. Front or top loading. 1500 or 2400 rpm. 100 or 200 track-per-inch densities. Industry standard interfaces. Up to 10^8 bits of on-line storage per drive; unlimited off-line using IBM 5400, 2315 or equivalent removable cartridges.

They also have one important feature that's quite different than most other disk drives.

They all work.

We know our disk drives all work, but not just because we designed and built them for data reliability. We know because we performance test them *after* as well as during assembly. For a minimum of 168 hours and 10^{10} bits of data transfer. Each and every drive.

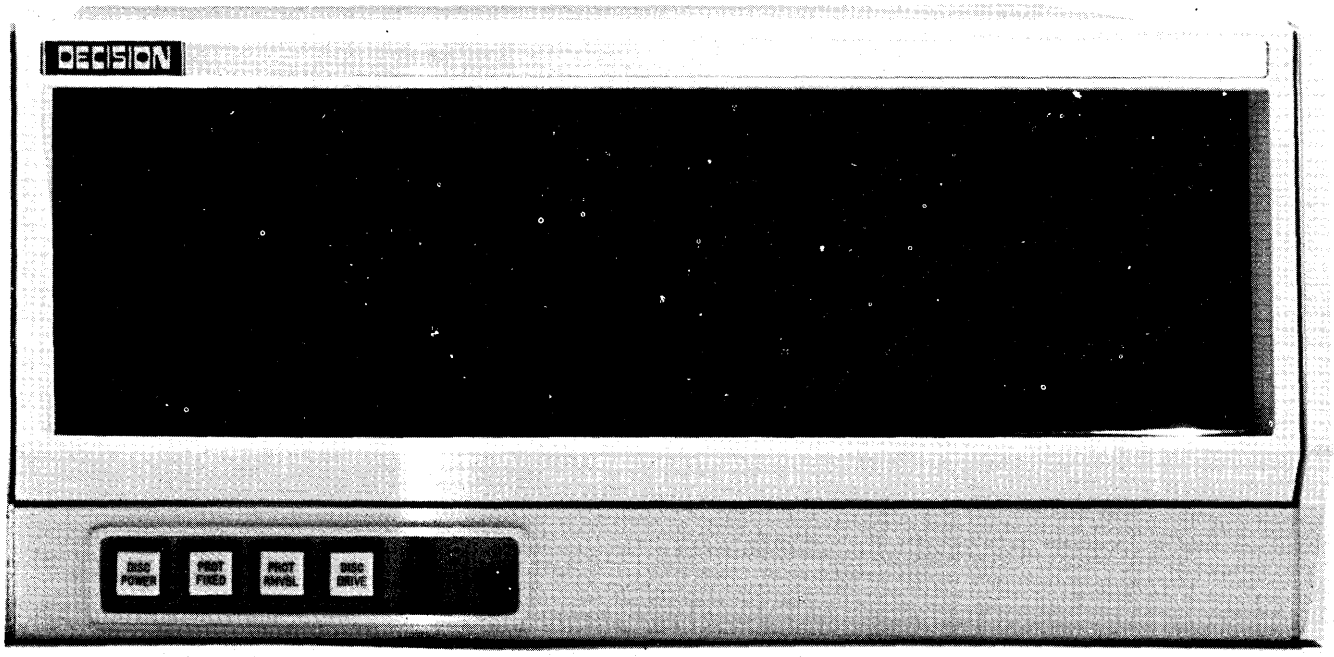
And we know they'll keep working because we built in a unique air cooling and filtration system that operates continually whether or not the disk is being rotated.

The resulting dependability puts them in the same class as other DECISION products.

Controllers a user could love.

The controllers we make break all the rules. Instead of putting them in attractive boxes, for example, we build them on PC-boards so they'll fit right inside the mini-computer. And they're designed by

calls for another.



software and hardware people working together.

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We make peripheral systems that come in all shapes, sizes and kinds. Complete with controllers, drives, power supplies, cables, terminators, diagnostic and operating software and complete documentation. In fact, we'll even supply the minicomputer—all you have to do is plug it in and run.

Eye on the future.

DECISION is continuing to expand its family of advanced optical data entry systems. Like our OCR 7600 optical character recognition systems, and our OMR 6500 optical mark reader and mark capture systems.

This is just the beginning.

And speaking of the future, the new DECISION disk drives are just the first of a series of solutions you'll find equally interesting.

The minicomputer world is ready for a company like DECISION.

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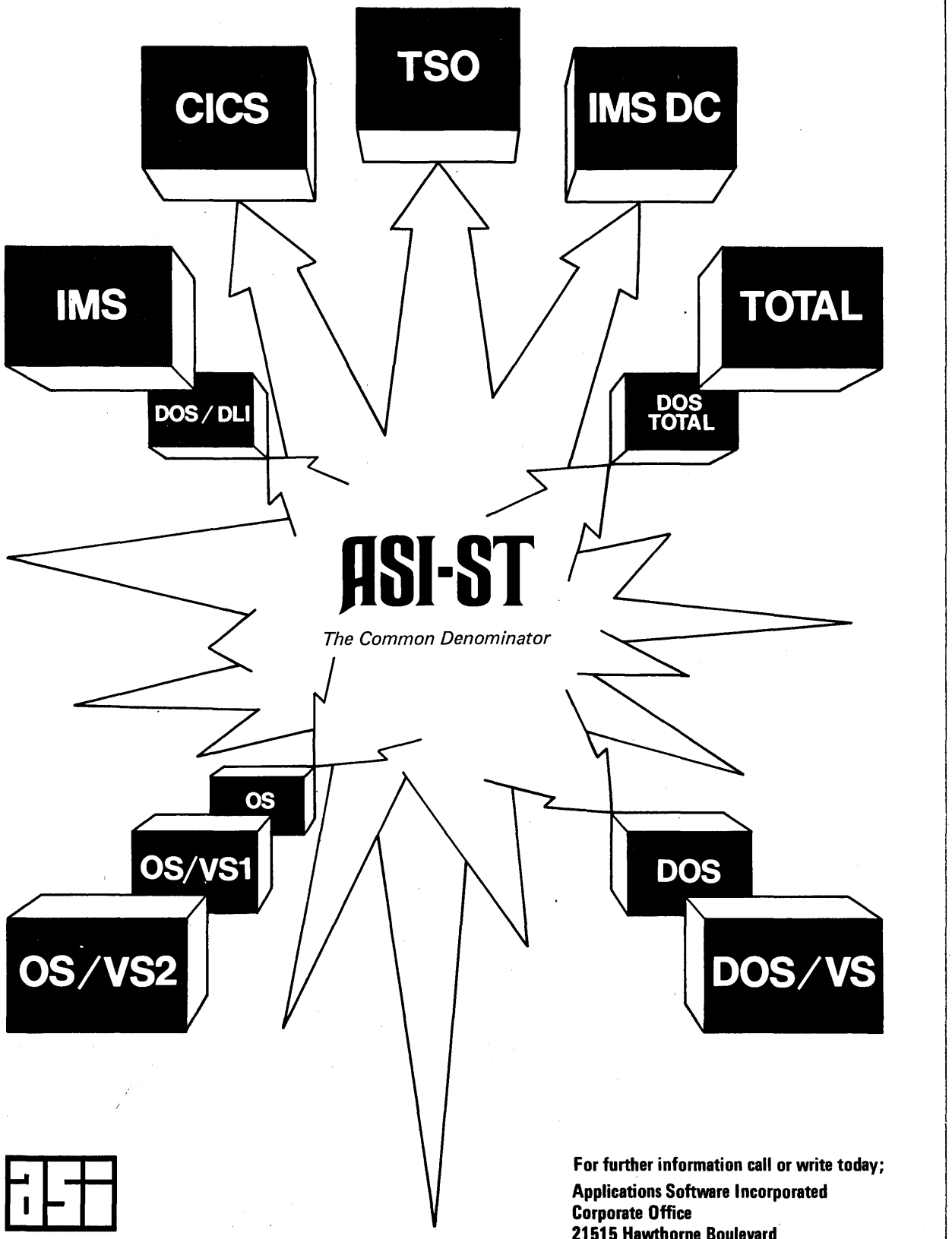

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Updates

A report entitled "Improvement Needed in Documenting Computer Systems" has been turned over to Congress by the Comptroller General of the U.S. which is a sorry reflection of the state of the art in our profession. In it, 710 Federal edp personnel and auditors from 70 computer installations from around the world were asked to cite specific examples of problems and additional costs to their agencies incurred because of inadequate documentation. In 127 cases, entire programming systems had to be redesigned; 233 respondents said that programs had to be rewritten; 478 said that excess time was required to modify existing programs; 341 said they had difficulty in evaluating internal controls; 272 replied that inadequate documentation caused management review problems; and 428 stated that delays in completing assignments were caused. The report carefully sidesteps the issue of how much money faulty documentation cost the fed, but "in view of the number of cases, we believe it would be high".

To help city planners anticipate problems produced by the arrival of a new industry in a small town, Univ. of Utah researchers constructed a computer model describing hundreds of parameters, including trade relationships, migratory habits, national and statewide economic trends, housing characteristics, etc. The model, SAFE (Small Area Forecasting and Evaluation) will be used to assess what might happen to energy rich southeastern Utah as it develops. Several other states have expressed interest in the model, most notably Oregon.

First Data Corp., Waltham, Mass. has introduced a time-sharing billing algorithm we think makes sense: a flat $10/hour connect time (plus a mass storage rate) with no separate charge for cpu or I/O usage.

When the canoe paddle was swiped at this year's SHARE OS/MVT-MFT meeting in Chicago, (see Sept., p. 122), resourceful systems programmers quickly came up with another paddle. And true to form, it was quickly dubbed "version 2".

Purchasing Control

A computerized purchasing control system developed in conjunction with a Connecticut-based manufacturer is now commercially available to small and large manufacturing companies. The package is set-up for IBM 360 and 370 systems, but it's written in ANSI COBOL and could conceivably be readied for duty on other systems. It's claimed that the system offers purchasing departments the best of two worlds: the buyer keeps such judgment decisions as vendor selection, yet gets the support of a full-scale recordkeeping system.

A number of useful reports are generated in addition to standard recordkeeping functions. Buyers receive a weekly materials status report that summarizes all outstanding orders by part number. One or more times a week, the system produces a special extract from the materials status report that details all orders that are late, orders expected during the current week, and orders expected in the coming week. Combined with past history performance, a buyer should be able to judge exactly where follow-up is necessary. Two additional reports generated are the vendor summary report, and the part number summary. The summary report shows the part number for each item a vendor supplies (quantities, year-to-date, projected, last year, and comparisons on cost, and rejection rates), and the vendor summary gives details on all vendors for each part number. An accounting summary is also generated, and the system can also be made to generate purchasing orders.

The purchasing control system is priced at approximately $15K, with additional charges for modifications beyond 40 hours of systems time. DECISION CONCEPTS INC., New York, N.Y.

FOR DATA CIRCLE 261 ON READER CARD

Data Capture

FREND is the name of this on-line data entry system that is being used to arrest incoming monetary information for a major credit card association in its first installation. The idea behind the package is that there is a great deal of commonality of on-line batch capture and reconciliation systems. FREND is used to capture monetary details in large-scale on-line systems (30 or more terminals) which are displayed and reconciled with adjustments to a batch header. On-line access to related master and summary files allows additions, updates, and various information displays.

FREND operates under OS and DOS operating systems on IBM 360 and 370 systems and running the CICS (Customer Information Control System) package. Inputs are accepted from crt terminals, cards, tape and disc drives. Typical detail transactions are sales, returns, payments, credits, checks, deposits, cash advances, and inventory entries. The package is priced at $50K, with installation time varying from 30-90 days depending on applications. QUANTRA DEVELOPMENT CORP., New Rochelle, N.Y.

FOR DATA CIRCLE 262 ON READER CARD

Enhanced APL Service

This firm, a six-year vendor of APL time-sharing services, has taken IBM's recent "shared variable" APL release and added its own enhancements. The souped-up version, PCS/APL, features "picture" formatting of output, automatic tab-setting, error trapping, remote job entry, crt terminal support, and what is claimed to be the world's largest public library of APL application programs. An additional modification is a shared file system with easy to use commands for inserting/deleting records, generating files, etc.

The service is offered for $10/connect hour, 40¢ a cpu second, and a penny a day per thousand characters of disc storage. In-house installations can be negotiated. PROPRIETARY COMPUTER SYSTEMS, INC., Van Nuys, Calif.

FOR DATA CIRCLE 263 ON READER CARD

RPG Testing/Documentation

RPG II CODALYZER is an unusually thorough documentation package. The package takes a successfully compiled program and produces a separate text description of the processing and output for each sequential input record type in the context of the RPG cycle. Each conditioning indicator is defined in terms of its meaning, and conditionally set indicators are described with their setting conditions.

This level of analysis has made it possible to uncover unexecutable code in CODALYZER's first installations. Addi-

software & services

tionally, other logic errors such as indicators set by unexecutable code that are tested by executable code have been uncovered, as have errors in overlapping fields.

The documentation is generated in a book format complete with title page and table of contents on 8½ x 11-inch forms for standard binders. RPG II CODALYZER is leased for $.02 per source statement and requires a billing program to be run each month. SYSTEMS DESIGN PRODUCTS CO., Houston, Texas.

FOR DATA CIRCLE 264 ON READER CARD

PDP-11 HASP Workstation

The HASP-11 software package makes it possible for PDP-11 model 40 and 45 minicomputers running Digital's RSX-11D operating system to communicate with any IBM system running under the popular HASP spooling technique, or to another PDP-11 equipped with HASP-11. HASP-11 is billed as having the full complement of HASP features so that all terminals and HASP datastreams are supported.

Among the principal features of HASP-11 are the capability of concurrently transferring up to 15 data files plus two console message files; complete use of standard HASP data compression techniques; software cyclic redundancy checking; support of EBCDIC and column binary character sets; 2- or 4-wire capability; and wide bandwidth support available using DEC's DQ-11

software spotlight

PDP-8 Virtual Memory

One of Digital Equipment's larger oem customers has developed two versions of a hardware/software package that equip the venerable PDP-8 minicomputer with true virtual memory management capability. Called ETOS/8, the product consists of four pc boards inserted into PDP-8 E, F, and M models, and supporting software to provide users with a 32K OS/8 time-sharing environment.

The first version, tested at five field sites and available this month, supports five or six users with "reasonable" response times. Background batch processing and detached job support are also provided. Languages supported include extended BASIC, assembler, FORTRAN, and the vendor's own COBOL/8. The page size of the standard system is 8K words.

An extended version, ETOS/8E features automatic job segmentation and memory management (512 word page sizes) and the ability to add additional real storage up to 64K words to the PDP-8. The extended monitor is designed to run as many as 32 simultaneous users.

The virtual systems will run in 16K of memory (the monitor requires about 8K) but as in all virtual systems, the better the ratio of real to virtual memory, the better the paging performance. At least 24K is recommended for systems supporting more than six users. The extended version is due out Dec. 1, and is priced at $4,950. The standard system is set for $3,150. EDUCOMP CORP., West Hartford, Conn.

FOR DATA CIRCLE 260 ON READER CARD

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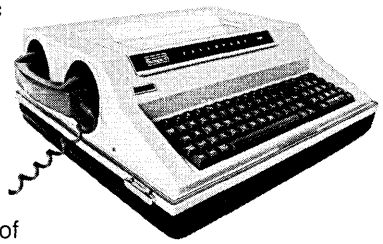

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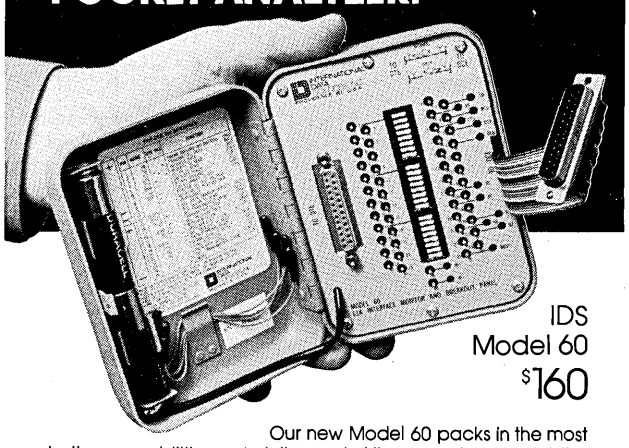

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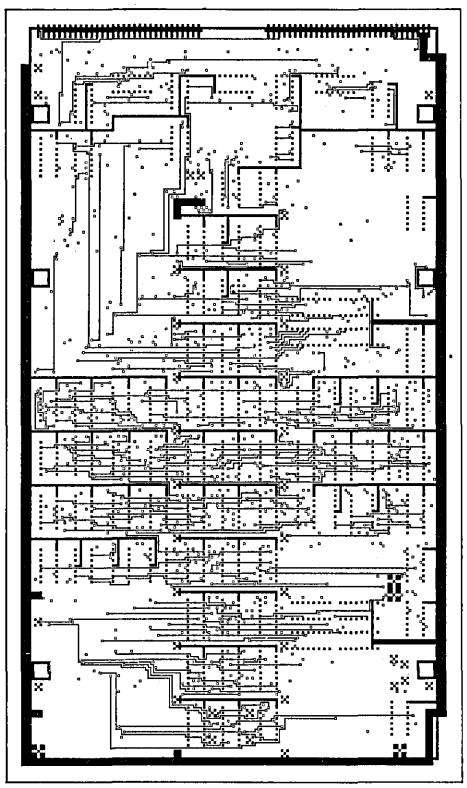

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To learn more about Gould electrostatic printer/plotters – get in touch with Gould Inc., Instrument Systems Division, 20 Ossipee Road, Newton, Mass. 02164 U.S.A., or Kouterveldstraat 13, B 1920, Diegem, Belgium.

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line adapter. HASP-11 is currently capable of supporting 4800 baud lines, with 19,200 baud capability being planned, as is support of IBM's new SDIC transmission discipline.

HASP-11 requires at least a 44K memory system, standard RSX-11D peripherals, a DP-11, DU-11, or DQ-11 synchronous line adapter, and a KL-11 clock. The price is $3,500 for the first processor, including one-year warranty, operation and installation documentation. Each additional processor is $1K. OREGON RESEARCH INSTITUTE, Eugene, Ore.

FOR DATA CIRCLE 265 ON READER CARD

Terminal Emulator

An emulation package has been developed that makes this manufacturer's line of remote batch terminals behave as if they were Burroughs DC 1100 units. Thus equipped, the M&M terminal can communicate with all Burroughs systems ranging from the B 2500 up to and including the B 7700 systems at line speeds up to 50 kilobaud. High performance peripherals such as an 1800-lpm line printer and a 1200-cpm card reader are easily supported on the terminal. There is no charge for the emulator. SINGER-M&M COMPUTER INDUSTRIES INC., Orange, Calif.

FOR DATA CIRCLE 268 ON READER CARD

Nova Sort Routine

A general-purpose, alphanumeric sort program is offered for use on the Data General Nova line of 16-bit minicomputers. There is no limitation to the number of cards or records that may be sorted other than the amount of space available on one disc. The data can be on cards, disc, or magnetic tape, and sorted output can be directed to the line printer, to disc, or to the magnetic tape. The record length may be fixed or variable up to a maximum of 160 characters per record. The data may be sorted on up to five separate key fields. A single control card is used to direct the program.

The program runs under RDOS, and is written in FORTRAN IV. It's supplied in source form on either a paper or magnetic tape. An 8K partition is required to support the package. It's priced at $195, including supporting documentation. HYCOM, Santa Ana, Calif.

FOR DATA CIRCLE 269 ON READER CARD

TOTAL Maintenance

Touché! Cincom Systems has done such a good job selling the TOTAL data base management system against IBM's Information Management System that it has become a "relevant market" to this software house, which has designed a package to enhance TOTAL! TUMS, for Total Utility Maintenance System, performs six basic functions on TOTAL systems. It dumps TOTAL datasets to backup tapes; reloads datasets to disc from a backup or source tape; prints data sets in vertical hexadecimal character format (no TOTAL control records, no blank records, just data); builds data sets from card input; deletes records from TOTAL data sets; and validates the set. Keys are used to direct TUMS. The package is hailed as being very useful in reorganizing TOTAL data bases when changes in device types, record sizes, block sizes, expanded files sizes, or other data sets are required. The package can be installed in five minutes (it's claimed) on TOTAL 4-7 versions running under DOS, OS, or VS. The price is $2,500, and a 15-day free trial is offered. NATIONAL COMPUTING INDUSTRIES, Atlanta, Georgia.

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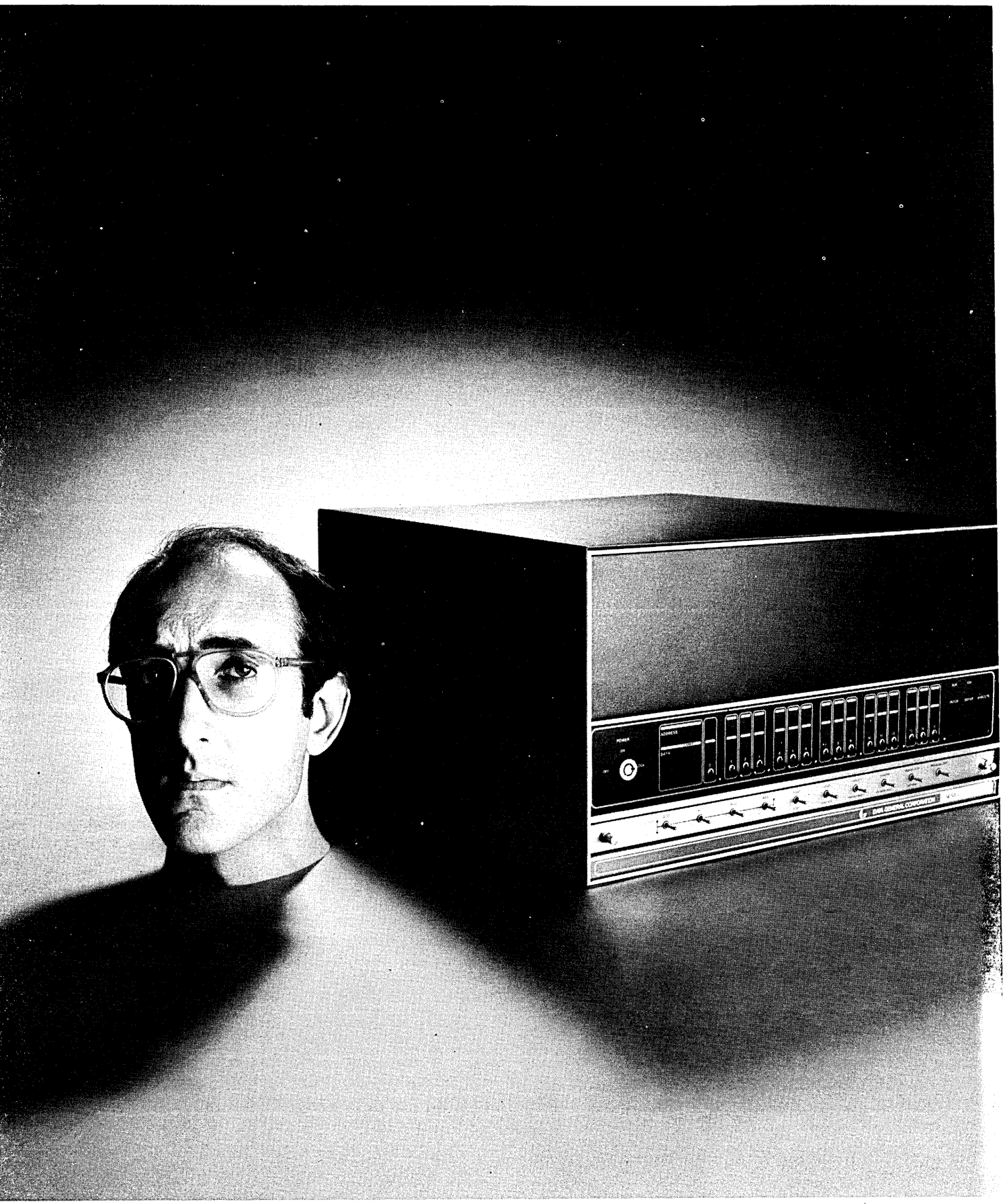

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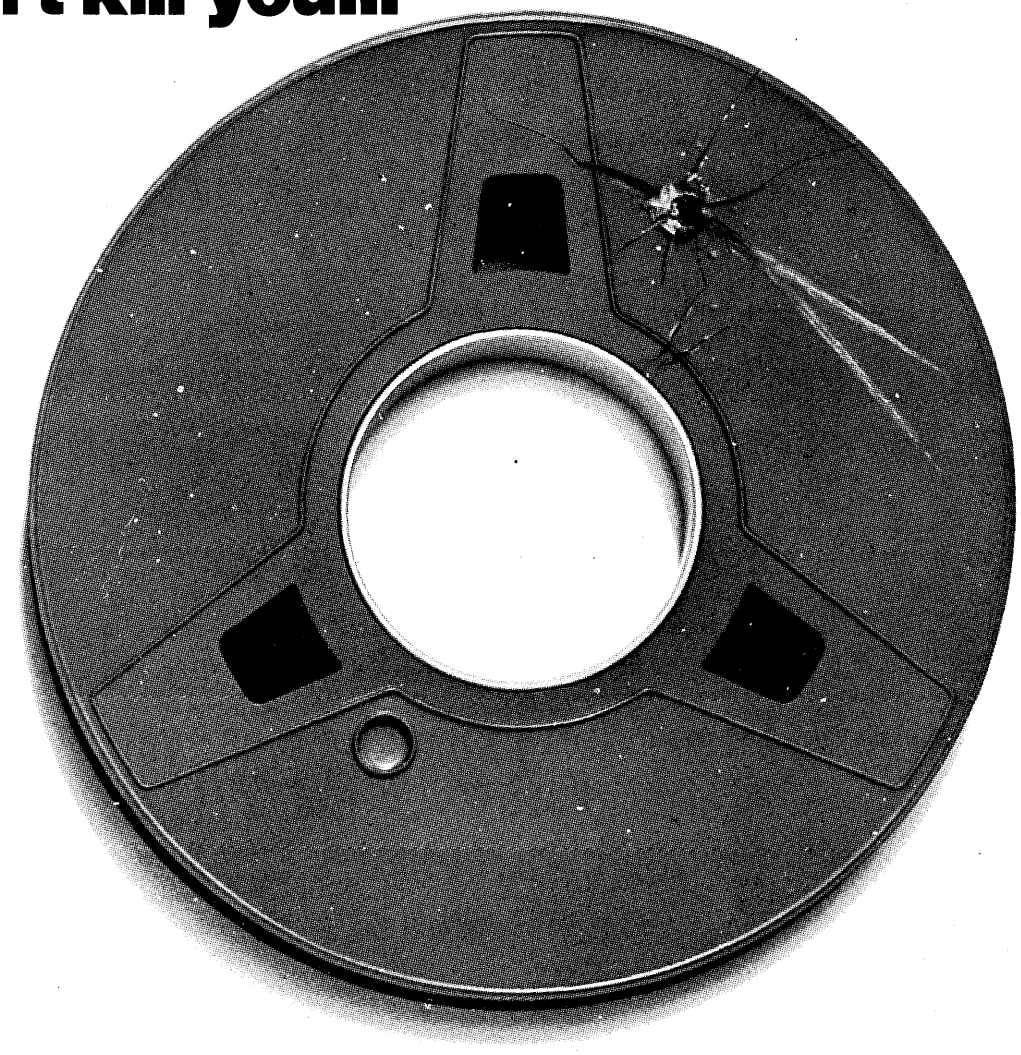

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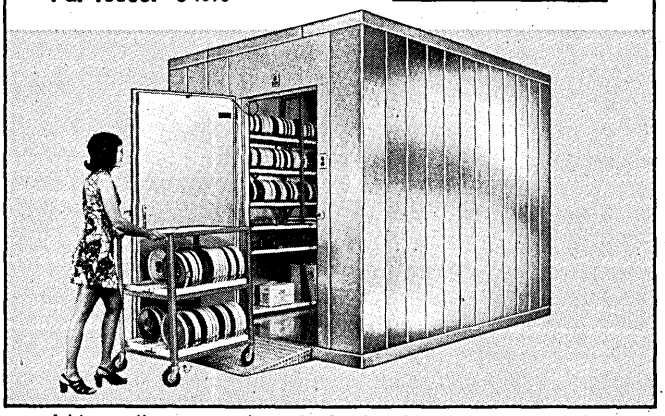

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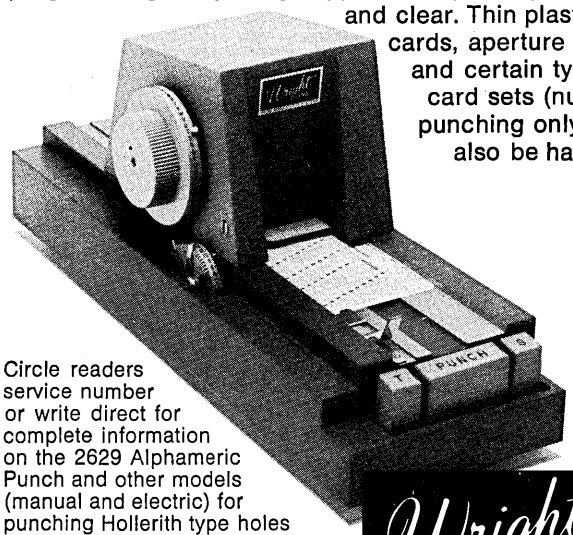

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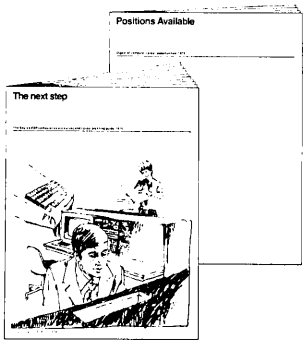

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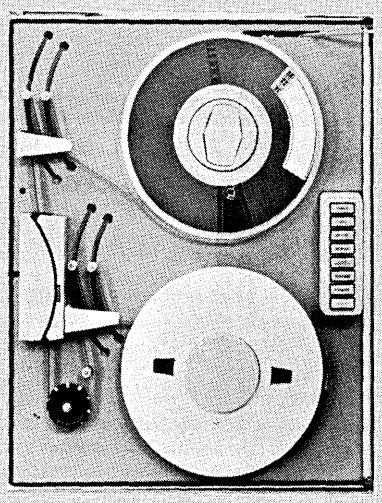

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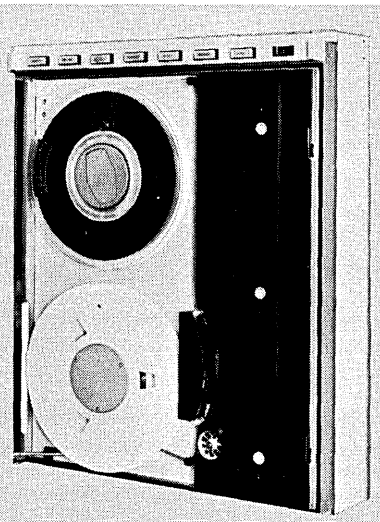

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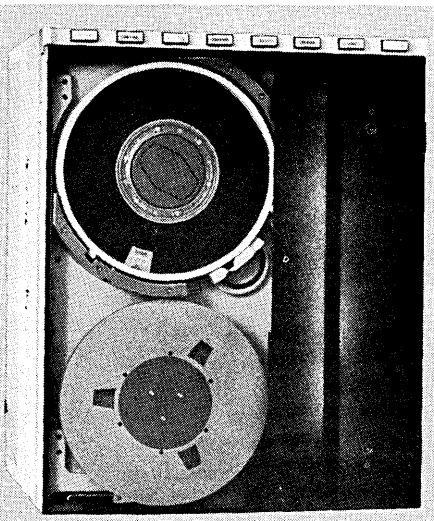

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THE BURNOUT THEORY

To the long list of philosophies being applied to the productivity and management of programmer/analysts, including both the Peter Principle and the Inverse Peter Principle, I would like to include one I call the "Burnout Theory."

The theory is as follows: After two years on a system a person reaches a productivity peak. He experiences "Burnout." The only way to improve productivity further, assuming a promotion is not available, is a lateral move to a different system.

The theory was developed in a large data processing shop (about 100 programmer/analysts) where unusually rapid growth (over 100%) and consequent major personnel changes and responsibility changes have occurred over the past three years. Most of the personnel maintain major data processing batch systems consisting of 30 to 100 programs, 20 to 60 different reports, and one- to five-hour run times. Programmer/analysts spend their time generally on the following activities: defining, programming, and implementing enhancements resulting from user requests; explaining system processing logic to users; debugging abends; training; converting to new equipment or operating systems; and administration.

Why is the theory important? The Burnout Theory attacks boredom, fights complacency, dispels data processing mysticism, and more importantly, increases department productivity by developing more experienced data processing professionals. For example, take a man who has worked six years on an Accounts Payable System. No doubt the man feels very comfortable; but how receptive is he to new concepts? Does he freely explain the intricacies of the system to fellow workers? Has he become complacent?

"Mysticism" is a term used here to explain a data processing system which is believed to be extremely complex. The tools of mysticism are undefined terms and outdated documentation. These tools are used to imply that the processing logic of a system is much more complex than it really is. A system is mystical when only one individual in an organization has the experience required to maintain it. The Burnout Theory proposes that mysticism can be dispelled by a planned rotation of responsibilities.

The theory promotes productivity by providing a constant challenge to an individual and by providing him a broader base of experience. Consider the careers of Mr. Burnout and Mr. Productivity as outlined below:

Mr. Burnout:	
Program Training	1 year
Develop & Maintain Manufacturing System	6 years
	7 years
Mr. Productivity:	
Program Training	1 year
Maintain Cost Accounting System	2 years
Maintain Personnel System	2 years
Develop and Maintain Marketing System	2 years
	7 years

Now, the question is: Who would be the best man to redesign a new Manufacturing System? The theory emphatically states that Mr. Productivity is the man.

Most data processing management philosophies state that delegating responsibility and challenging people is of prime importance. The theory concurs, but also states that change is the key to productivity. Implementing the theory is a positive way to improve productivity.

The theory can only be implemented by positive management action. In other words, if you ask a person if he or she would like to make a lateral move, nine out of ten times the response will be negative. Reasons given will vary:

The other system has too many problems.
No one else knows my system.
I don't know anything about Accounts Payable.
I know my system users.
I don't want to change.

Another response to a lateral move may be: Isn't my work satisfactory? This question deserves an answer. The response is: Yes, your work is satisfactory; however, you have been on the system two years and it is time to take advantage of the benefits offered by the Burnout Theory.

It is not easy to insist on rotating people after two or more years on a system. Users will complain and efficiency will decrease for one to three months. Implementing the Burnout Theory requires a conviction on management's part and a belief that the benefits to individuals far outweigh short-term disadvantages.

—James R. Johnson
Mr. Johnson is a section manager in the production control systems and programming dept. at Hallmark Cards, and a CDP certificate holder.

AN OPEN LETTER ON COBOL STANDARDS

In addition to significant new features, the revised American National Standard COBOL (approved on May 10, 1974) incorporates a number of substantial changes relative to its predecessor standard (ANS COBOL 1968, X3.23-1968). Some members of the data processing community were given early warning of these discrepancies by the following statement of intent which appeared in COBOL Information Bulletin No. 16 (CIB #16) of July 11, 1972 published by "X3J4," the COBOL standardization committee of the American National Standards Institute.

> "There will be areas of incompatibility between X3.23-1968 and its revision which will require conversion of programs in some cases. (If the language is to grow and become more powerful, there will be cases where the new language feature may contradict the old.)"

Appendix B (Section 2.3) in the draft of the revised ANS COBOL lists 43 substantive changes to X3.23-1968. These are differences which "could impact existing programs" and, as a result "some reprogramming may be needed. For example, where the semantics or syntax of an existing verb were changed."

In addition there are 12 other changes affecting language features whose exact meaning was implementor-defined in X3.23-1968. For these items, the impact of the change on existing COBOL programs will be determined by differences in specific implementations of the old and new standards. Finally, the specifications for the entire report writer module were rewritten to correct the numerous omissions and inconsistencies in the original specification. The new specification is definitely better but it *is* different. Thus there are 55 substantial inconsistencies between the old and new standards, even if we omit the infrequently used report writer feature. Also, the number of non-substantive changes has yet to be officially counted. But the result is that many existing COBOL programs, written to conform to the old

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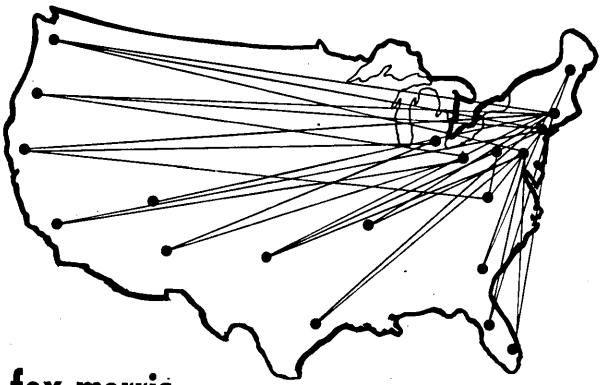

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standard, will *not* conform to the specifications of the new standard.

Computer manufacturers are already under pressure to supply compilers to federal government agencies which support the new standard and which detect, and diagnose, all attempts to use language features which do not conform to the new standard. Thus the principal suppliers of COBOL compilers are going to furnish support for the new standard presumably at the expense of dropping support for the old COBOL standard, since the latter is no longer an American National Standard.

Even if a compiler developer wished to provide a compiler which supported both the old and new standards, the presence of 55 substantial inconsistencies between the two versions would require support of both versions of the language and support of a user-supplied parameter to specify which version to use for each compilation. Moreover, use of the old standard is really use of a non-standard.

In summary, there are significant differences between the old and new standards. These differences have automatically rendered nonstandard many COBOL programs written to conform to the old standard. Unfortunately, no one has taken the trouble to determine the cost of revising these programs to bring them into conformance with the new standard. (Sorry, but "automatic" source language-to-source language translations will help only with the trivial, syntactic differences.) What stands out in sharp relief is the arrogance of ANSI's X3J4 committee when it acted to depreciate user investments in COBOL programs which conform to the old standard but violate the new one. For those of you whose COBOL programs were devalued without your explicit consent, we offer our sympathies. We hope you will act to prevent the repetition of such capricious (but unmalicious) meddling with your software investments.

In spite of the extensive changes, the new standard still includes most of the language defects of the old standard. These well-known language flams include:

a) the hazardous ALTER statement
b) non-local GO TO statements
c) the lack of explicit arguments for the PERFORM statement
d) poor definition of scope rules for the PERFORM statement
e) ability to "fall-through" the procedures comprising the scope of a PERFORM statement
f) the overworked, multipurpose BLOCK CONTAINS clause
g) USE procedure side effects
h) the ill-specified COBOL communications feature

Certainly if arbitrary language changes were in order in X3J4's activities, some effort should have been devoted to cleaning up the glitches in the language.

—David A. Nelson
Mr. Nelson worked on Codasyl committees as far back as 1960. He has been the chief compiler designer on five COBOL projects: for the Univac III, Philco 2000, RCA 3301, RCA Spectra 70, and Univac Series 90.

CODASYL HAS FAILED COBOL

The Codasyl committee, in coming up with a new proposed COBOL standard now nearing adoption, has left itself wide open for criticism, based on what it has produced.

It seems to this reviewer-implementor that the chief problem with COBOL has always been (since 1959) the atrocious explanations of language features. Other problems stand out, too: the poor judgment in specifying content of minimal COBOL modules for compilers on small machines or

minicomputers; an inability to consistently purge features of dubious practical value; and an absolute refusal to provide examples of program coding as an integral part of the official language definition.

With respect to the proposed revision to ANS COBOL, it is my opinion that the segmentation module is nearing obsolescence. Virtual memory philosophies tend to obviate the need for awkward programmer-planned overlay schemes in today's larger systems. In minicomputers, use of larger memories is now common. Also, the use of interpretive object code (which is natural since the instruction sets of these machines have poor decimal- and character-handling capabilities) makes main memory utilization extremely efficient. So either way, there is little real need for a segmentation scheme within the COBOL language. This reasoning is strengthened even further with the availability of interprogram communication capabilities (call and exit program) and the welcome trend to modular and structured programming techniques.

A new optional language module, DEBUG, is included. It seems to be a very much overblown design, yet strangely limited and inflexible in some respects, such as its "special register" DEBUG-ITEM which allows for presentation of three four-digit numeric items (DEBUG-SUB-i) plus one character-string, DEBUG-CONTENTS (length depends on context of usage).

A far better and simpler technique was originated by R. L. Johnsen, Jr. for IBM 7094 COBOL in 1963, and carried into System/360 COBOL F; the concept of a debug packet appended to a source program for compilation as an adjunct to a specified procedure name. No preassigned reserved words were required. The chief advantage of this approach is that coding for debugging purposes need not be distributed throughout a program, as with the new DEBUG module of the proposed standard.

Also, I have long thought that the inclusion of *both* subscripting and indexing in the minimum level of the table handling module is a serious mistake. It seems axiomatic that a minimum level ought to avoid functional redundancies. In fact, the inclusion of the indexing concept, apparently intended to enable optimization of index register usage, seems to be a machine-dependent orientation at variance with the principal objectives of COBOL. I do not believe that great payoff in cpu time savings is actually realized in the typical case where indexing is used; most inefficiencies can be traced to unwise overuse of subscripted references where, with proper training, better technique could reduce the proliferation of repetitious subscripted references.

The new standard has killed the EXAMINE statement, in favor of a syntactically more complex INSPECT statement. Undercutting more than 10 years' investment in COBOL coding throughout the world is a questionable decision, at best. The reasoning that INSPECT is more powerful (and therefore better) does not convince me that the change will be or should be well received by users. INSPECT is designed for intra-item tinkering of a nature not much in demand, tinkering which can be better achieved by redefinition and subscripting or indexing approaches, whenever peculiar or esoteric requirements exist.

The new standard permits an 01 level item in working storage to be redefined by a succeeding item of greater size, so that additional uninitialized space must be allocated as a result of the redefinition. This is objectionable to me for, while it can be done, there is little justification for doing it. It merely makes a little problem for the implementor. The biggest objection to this feature is that the word "REDEFINES" now acquires a character more like FORTRAN'S EQUIVALENCE statement, in which memory allocation is done belatedly. Formerly, in COBOL one could clearly identify unredefined working storage as generating space reservation as successive elementary items were encountered, and redefinitions represented merely subdivisions of extant

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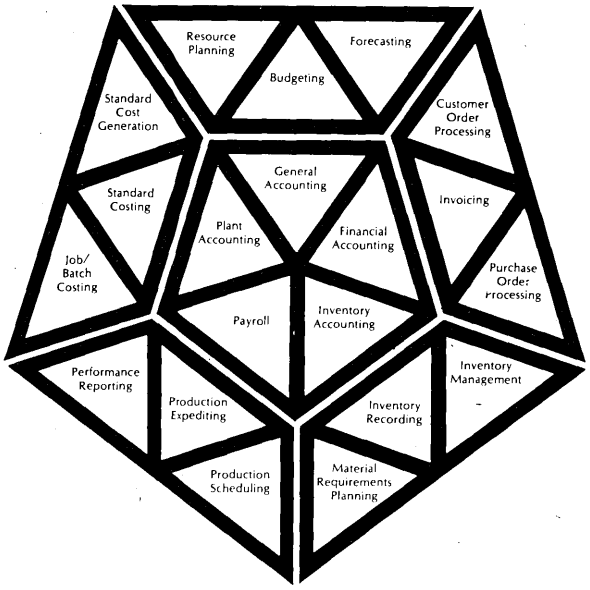

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the forum

space, such as an alternate view of some record area.

I earlier cited poorly written explanations of COBOL features as the root of misunderstanding (and, as a result) of variances among implementations. A specific deficiency appears in the new INDEXED I/O module (INX), where the functions served by record key and alternate record keys are given very spotty treatment. In particular, it appears that record keys must be within the records of a file, but at other times, to achieve random retrieval one must preset their values. This appears to require moving a value to an FD buffer prior to a read (which may in fact be prior to *any* read) and this has always been illegal in the past. (It still may be. The point here is that the Codasyl proposal is ambiguous, or at the very least does not generate confidence in the reader. And without confidence in what the implications of a feature are, neither implementor nor user can do a good job.) This is a dramatic instance in which a good writing job is necessary.

An item in DATAMATION (June, 1972, p. 87) noted the departure of Howard Bromberg from the COBOL "standards scene." The story noted that Mr. Bromberg believed full-time professionals should be engaged in producing dp standards. My friend Dave Nelson says that same recommendation was made by Mr. Roy Nutt around 1960. I don't know how to achieve that goal, but it ought to be an ideal worth holding. The failure of Codasyl's stewardship of COBOL is becoming a scandal in the dp industry.

—Kenneth P. Seidel

Mr. Seidel has been involved in writing COBOL compilers since 1962, when he worked on one for the IBM 7094. He was part of the original management of the IBM 360 COBOL F project, and now specializes in writing compilers for minicomputers.

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DTC	Good—excellent. Simple, compact. 4-screws to replace any modular component.	Excellent. Easy access to all major components.	Excellent. Diablo printer. Users confirm low trouble incidents. *750* in field.	Very good. All systems function well.	Excellent. Small. 90 lbs. Castors.	1
B	Fair—Power supply large, difficult to replace.	Fair—good. Large power supply and excessive cabling.	Depends on whether Qume or Diablo printer is used. None in field.	Good	Good	2
C	Fair—good. Large, complicated power supply difficult to service.	Fair—good. Large, heavy, difficult to move and take down.	Fair—good. Modified Diablo printer. Approx. 400 in field.	Good	Very large and bulky. 250 lbs.	4
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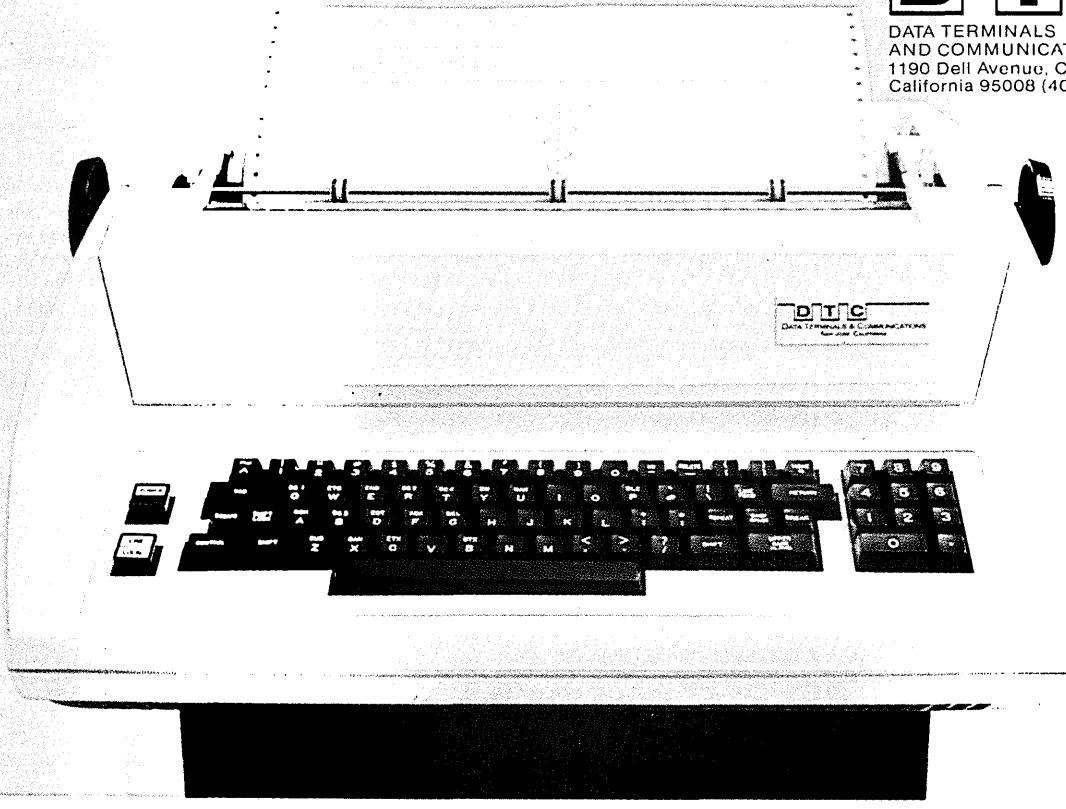

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