DATAMATION® 74
October

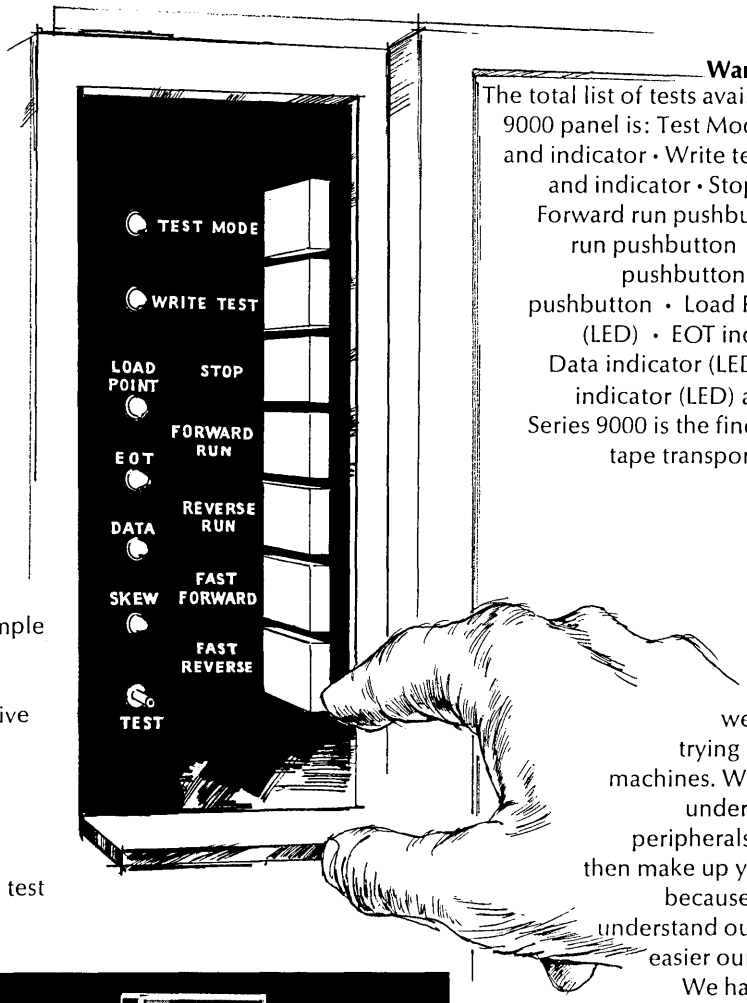
THE COMMUNICATIONS INTERFACE

Also: dp unions, archival storage, and economists on IBM

Series 9000 has a built-in off-line test panel. No other tape transport has it.

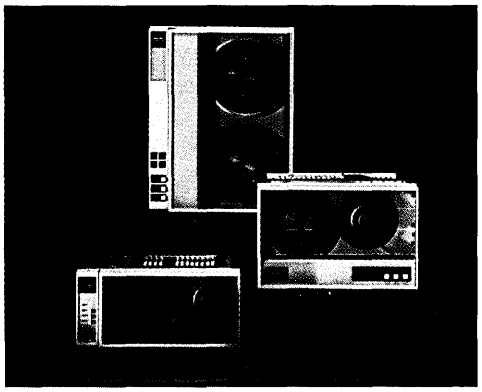
Here's how it works.

One big problem with synchronous tape transports is how to test them for various functions without tying up an expensive system. We have expensive systems at Kennedy Co.; we didn't want them tied up, so this was our solution.
All Series 9000 transports have an off-line test panel that allows complete functional checks with no interface connections. Any unit can be cycled both forward and backward, to check servo and direction commands. In addition, the basic read/write electronics can be tested by selecting the write test mode. This programs the write amplifiers to write an all "ones" tape. Data lamp lights verify that read electronics are processing the data.



We've kept it simple.
These tests allow the user to make a very simple test and determine whether the transport is functioning properly. It can be used in a receiving inspection test to eliminate expensive test equipment or in the field to allow fault isolation between tape transport and system.

Check that skew.
Another function of the test panel is a skew check on output read data. During the write test mode previously discussed, a skew check is made of all read data. If any channel reports back after a preset tolerance is exhausted, the skew light illuminates signifying skew problems. In conjunction with an IBM Skewmaster this light can be used to check mechanical and head alignment.



Want some more?
The total list of tests available on Series 9000 panel is: Test Mode pushbutton and indicator • Write test pushbutton and indicator • Stop pushbutton • Forward run pushbutton • Reverse run pushbutton • Fast forward pushbutton • Fast reverse pushbutton • Load Point indicator (LED) • EOT indicator (LED) • Data indicator (LED) • and Skew indicator (LED) and Test point. Series 9000 is the finest engineered tape transport in the world.

To sum it up,
we're not simply trying to sell you our machines. We'd like you to understand the tape peripherals we build and then make up your own mind because the more you understand our product, the easier our selling job is. We have a no-magic brochure on tape transports — write for it.

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CIRCLE 1 ON READER CARD

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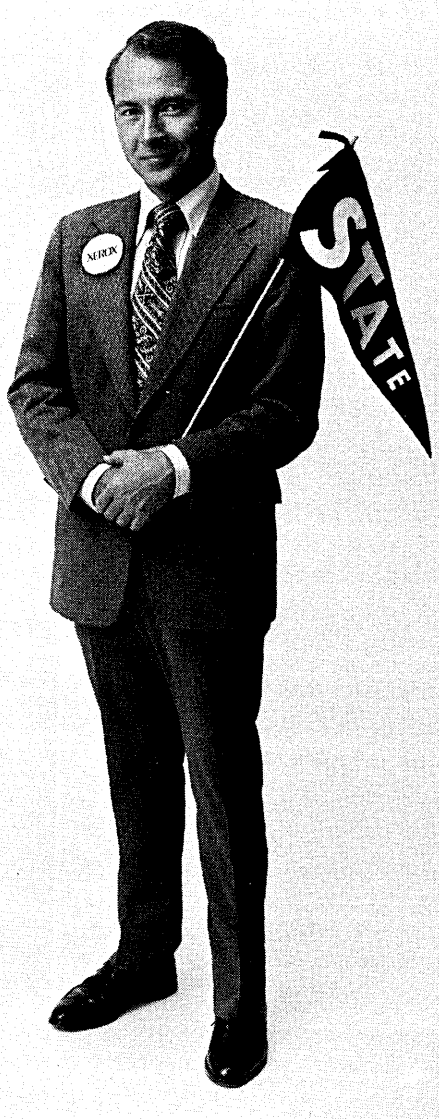

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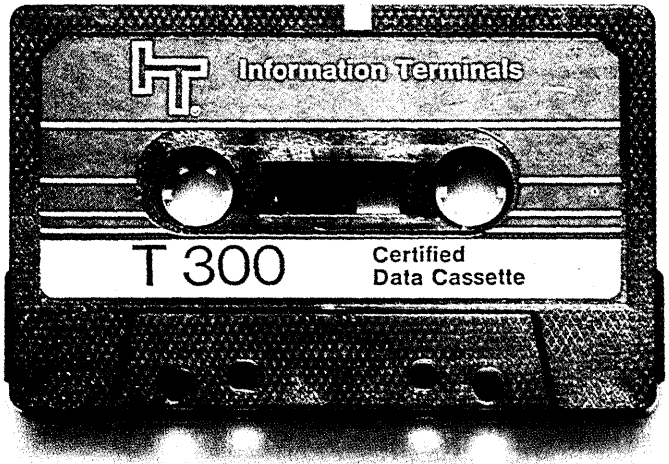
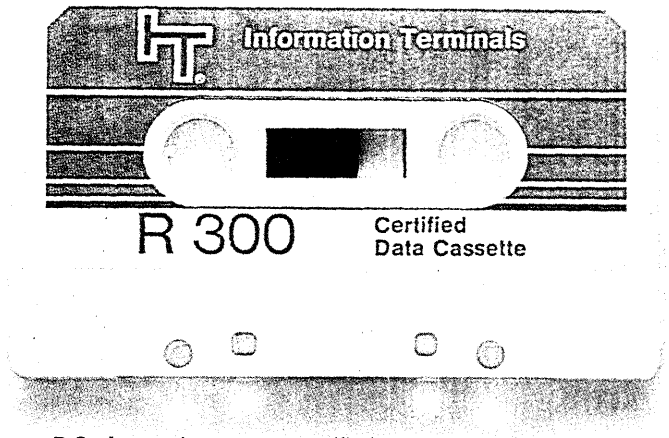


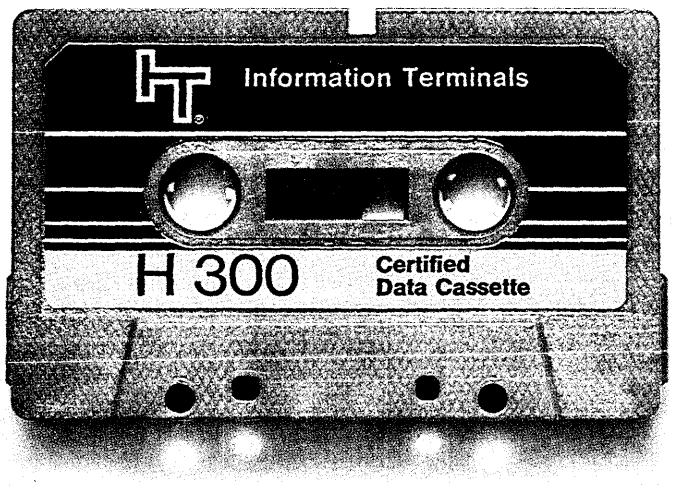
T Series: Has achieved worldwide reputation as the standard (ANSI and ECMA) against which the performance of all other cassettes is measured. More in use than any other digital cassette.

WP Series: High quality cassette for word processor or text editing systems using ten inches of clear leader and one-mil recording tape.



R Series: Lower-cost certified cassette, also meeting ANSI and ECMA standards.

NLT Series: Leaderless design for use in Wang or equivalent programmable calculators. Same high-performance features as T Series.



H Series: Operates in extremely hostile environments—65° to 160°F, where performance standards substantially exceed that of normal usage. Compatible with ANSI, ECMA and ISO standards.

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CIRCLE 5 ON READER CARD

DATAMATION 74®

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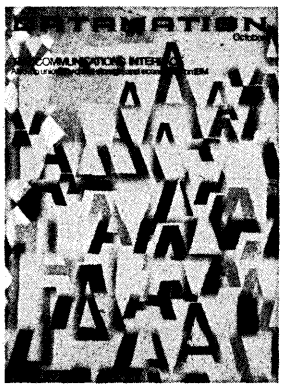

about the cover

Multiple translations of physical and conceptual representations of data occur at the communications interface, making it difficult to avoid distortion. Photographer Andy Cominos brings it into focus in an environment created by Clear White, Los Angeles.

DATAMATION

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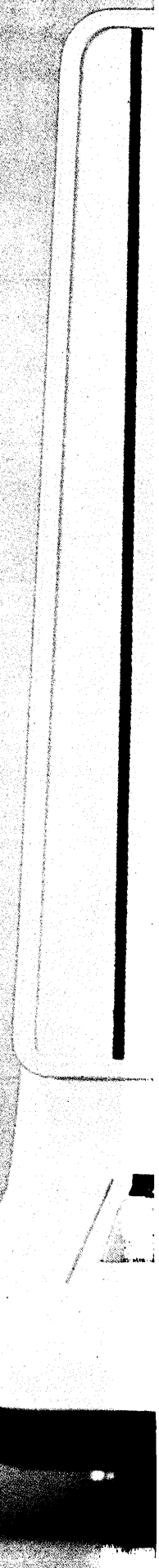

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CIRCLE 79 ON READER CARD

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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.

In fact, you can even change my software. Using a high-level programming language that makes it easy, efficient, and direct. I'll BLINK, DIM, [redacted] UNDERSCORE, VIDEO BLANK, [redacted] BLINK REVERSE -- you name it, I'll do it. Synchronous or asynchronous.

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

Like my hired help.

At OMRON. ↵ \ _

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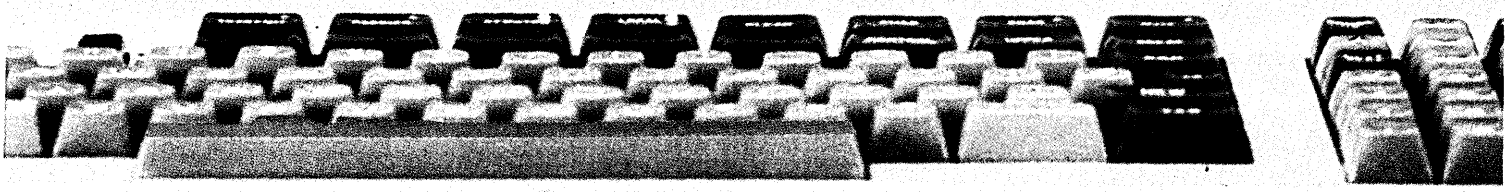

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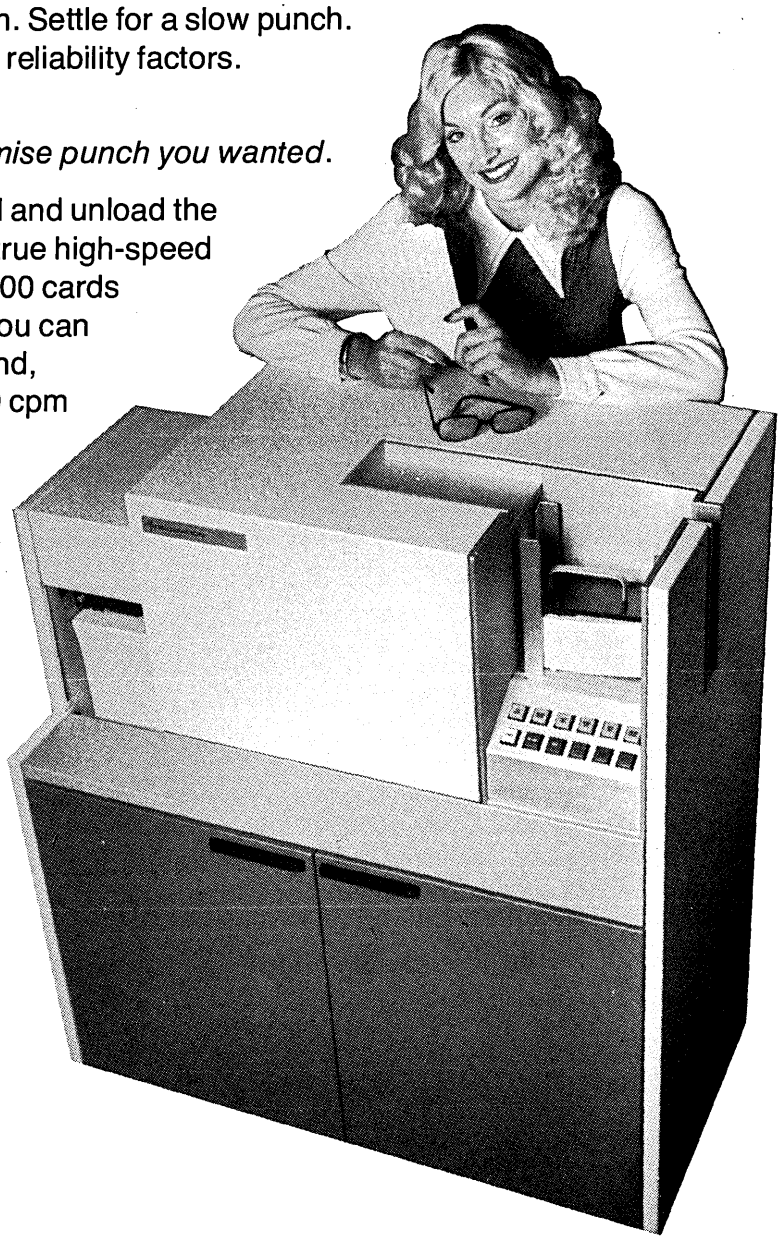

the card handlers

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calendar

NOVEMBER

Fourth National Conference on Computers in Clinical Medicine, Nov. 7-10, New Orleans. This year's meeting of the Society for Computer Medicine (SCM) will focus on such topics as: the use of the computer in health screening, medical data confidentiality, educational programs, clinical algorithms, health records, state-of-the-art reviews, and cost benefits. Dr. John Vincent Atanasoff, whose work at Iowa State Univ. in the late 1930s led to the development of the electronic digital computer, will be made an honorary member of SCM at the meeting. Contact: Dr. Keith Sehnert, 3839 26th St. N., Arlington, Va. 22207, (703) 525-1737.

29th Annual ACM Technical Conference, Nov. 11-13, San Diego. Approximately 2,000 people are expected to attend this year's work/study conference of the Assn. for Computing Machinery (ACM). The conference will include panel discussions on "Unpopular Ideas in Computing," a presentation of 98 papers, several tutorials, and the fifth annual computer chess tournament. Tutorials and workshops will be on such topics as "Security and Privacy: Their Effects on Computer Management" and "Computers and Society: Public Policies and the ACM." There will be special interpreter services for deaf attendees. Fee: $55, members; $80, nonmembers. Contact: Lyn Swan, ACM '74, P.O. Box 9366, San Diego, Calif. 92109.

Fifth Annual Canadian Computer Show and Conference, Nov. 12-14, Montreal. An exhibition and a conference program emphasizing accomplishments in Canadian data processing are expected to attract 8,000-10,000 attendees. More than 80 vendors, including some from Japan, will display their products in a 30,000 sq. ft. exhibition. Six conference sessions, organized by the Canadian Information Processing Society (CIPS), with assistance from the Data Processing Management Assn. (DPMA) and the Assn. for Systems Management (ASM), will treat the theme "Data Processing: A Canadian Industry." Fee: $45, advance registration for all three days. Contact: Canadian Computer Show and Conference, 625 President Kennedy Ave., Montreal H3A 1K5, Canada.

DECEMBER

American Bankers Assn. Payments System Policy Conference, Dec. 1-3, Chicago. About 500 top banking executives, representing banks of all sizes, will direct their attention to the theme, "Electronic Funds Transfer Systems (EFTS)—Decisions Needed NOW." Participants will discuss topics relating to the impact of EFTS, including the status and potential for Automated Clearing Houses (ACH), Point-of-Sale (POS), and Automated Teller Machines (ATM). Fee: $200. Contact: Francis P. Curran, Payments System Planning Div., American Bankers Assn., 1120 Connecticut Ave., Washington, D.C. 20036.

National Microprocessor Conference, Dec. 2-3, Boston. A "major national conference" on microprocessors is being sponsored by Arthur D. Little, Inc., the Cambridge, Mass. research and consulting firm, in conjunction with the New York Management Center. The conference aims to "combine an *objective* overview of a wide range of microprocessor technologies with detailed analysis of economic implications." It is directed toward product planners, senior engineers, and R&D directors, and should also be of value to market and corporate planners and those in charge of analyzing new investment and venture opportunities. Fee: $425. Contact: Marjorie Maws, Arthur D. Little, Inc., Acorn Park, Cambridge, Mass. 02140, (617) 864-5770.

1974 National Telecommunications Conference, Dec. 2-4, San Diego. Sponsored by the Institute of Electrical and Electronics Engineers, this conference will examine the theme "New Trends in Communications." Trends discussed in the 36 technical sessions will include: the implementation of computer networks, social effects of telecommunications, privacy, the wired city, the impact of the microprocessor on communication implementations, the increasing utilization of communication satellite systems, and new contributions to switching, wire communications, microwaves, and other technologies. In addition, about 50 exhibits will feature state-of-the-art communications and test equipment. Fee for full registration: $45, members; $55, nonmembers; after Nov. 15, add $10. (Limited registration, including admission to technical sessions and exhibits and a copy of the conference record—but no banquets—is $20 less.) Contact: Diane Huddleston, NTC '74, 10453 Roselle St., San Diego, Calif. 92121, (714) 453-7007.

Sixth National Transportation Data Systems Forum and Exhibit, Dec. 3-4, Washington, D.C. This forum and exhibit is sponsored by the Transportation Data Coordinating Committee (TDCC), a nonprofit organization created by shippers and carriers to coordinate the development of electronic data interchange between shippers and carriers (rail, motor, ocean, air, forwarders). National and international officials from industry and government will meet to assess the latest electronic data systems and communications technology that will support shipper/carrier data interchange. They will discuss electronic documentation, tariffs, rating, billing, tracing, processing, and payments systems, as well as standards for data interchange and systems interface between shippers and carriers. Fee: $75. Contact: Edward A. Guilbert, TDCC, 1101 17th St. N.W., Washington, D.C. 20036, (202) 293-5514.

Second Annual Business Systems/Product World, Dec. 3-6, New York. The show, which last year attracted 18,000 users, will explore the theme "Sales Year '75" with exhibits of products and systems in word processing, calculating and data processing, micrographics and records management, copying and duplicating, systems design, environment and furniture, and telecommunications. In addition, a series of seminars titled "Managing for Profit" will be presented by the Administrative Management Society, the International Word Processing Assn., and the Office Microfilm Management Assn., on the following subjects: office planning and layout, word processing, records management/micrographics, telecommunications control, and office security. Fees not yet determined. For conference information, contact: Frank Carberry, AMS, Maryland Rd., Willow Grove, Pa. 19090, (215) 659-4300. For exhibition information, contact: Rudy Lang, Prestige Expositions, Inc., 60 E. 42nd St., New York, N.Y. 10017, (212) 687-8877.

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

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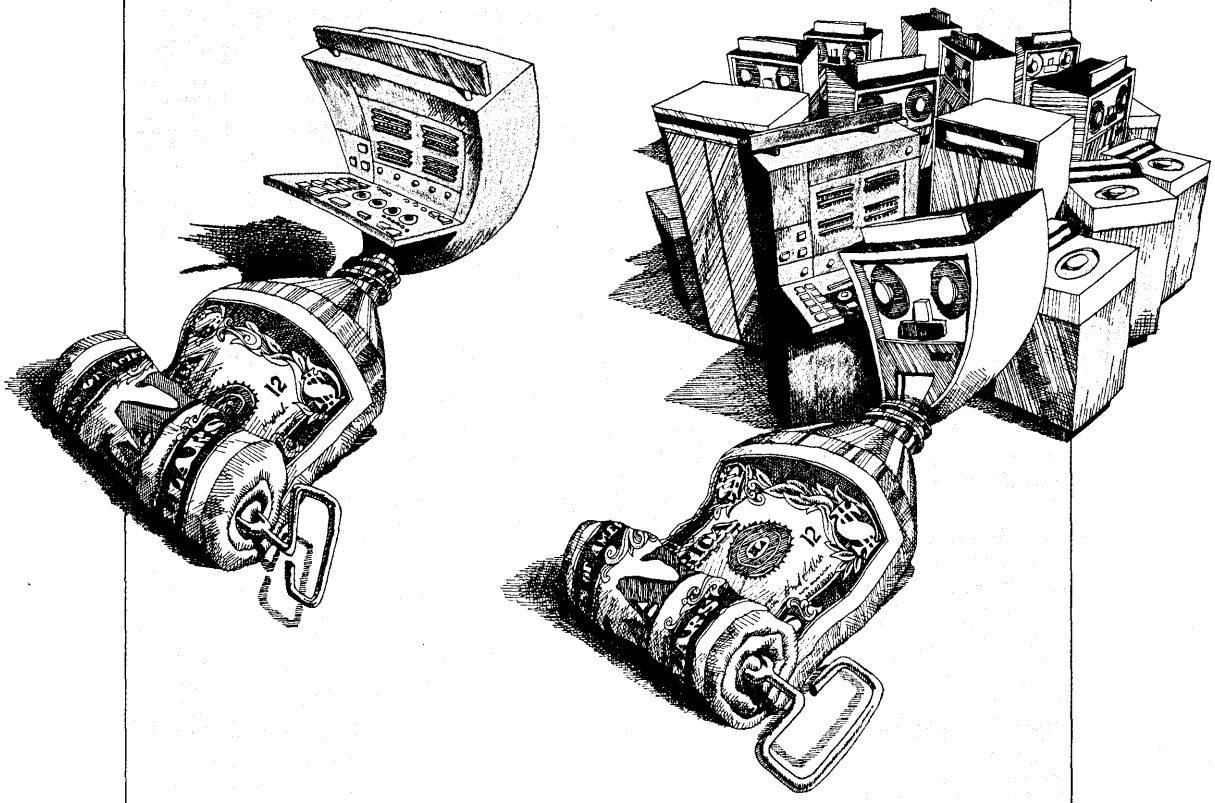

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people

THE TIME OF HIS LIFE

"I'm 76 years old and I'm having the time of my life," says Paul M. Pair, senior education consultant for Control Data Institute. And Pair has no plans for retirement. "I feel I have something to contribute."

His primary field is education. Since 1957 it has been edp education. He has been contributing to the fields for many years in many ways. A long-standing concern with professionalism, quality of performance, and standards

PAUL M. PAIR "How do you measure performance?"

. . . with "how do you measure the performance of people in our field?" . . . has led him to many of his current activities. He is secretary of the Institute for Certification of Computer Professionals (ICCP), having served as the representative of the Assn. of Educational Data Systems (AEDS) on the Computer Foundation Organizing Committee which organized ICCP. He is part of an ongoing effort sponsored by the Institute for Computer Sciences and Technology and the Assn. for Computing Machinery (ACM) working with the National Bureau of Standards to codify, define, and describe the job skills and knowledge needed in computer-related occupations and then to come up with some standard designations. "The way it is now," said Pair, "a person can go from a job with one job title to another that is basically the same but carries a different title and a different rank."

Last spring, Pair learned that a Chicago chapter was being formed by the newly-national EDP Auditors Assn. "I'm not an edp auditor and I never will be one," he said, "but I looked into the organization, found that it was concerned with standards and measurement, and decided, this is me." He joined and very quickly was named chairman of the association's Committee on Education and Training. At the auditing group's second national convention last June in Chicago, Pair delivered a luncheon speech on "A Program for Testing and Certification of Knowledge of Computer Personnel." His committee polled those attendees in any way concerned with hiring people on the kind of training they look for. He feels the results, when compiled, will be a valuable guide for colleges and universities on the kinds of courses they should offer.

Pair feels ICCP has come a long way in "opening the doors and minds of people in higher education." As the institute's secretary he opens its mail. "We're hearing from all kinds of new people from all over the free world."

Last month was a key one for ICCP, which had designated September "Project ICCP Month."

"It's the beginning of the school year," explained Pair, "and a good time to encourage people to prepare to sit for the Certificate in Data Processing (CDP) examination next February." Constituent societies were encouraged to help their members do this. Pair's group, AEDS, sent out 40-page packets to its 24 chapter presidents urging them to "go to work" and telling them how to do it.

Pair's career spans just about every aspect of education, starting as a high school teacher and subsequently a high school principal in Kansas. A native of Nebraska, he holds a B.A. degree from McPherson College, McPherson, Kansas, and an M.A. degree in education from the Univ. of Washington. From Kansas, he moved to Washington, where he was Superintendent of Schools first in Prosser and then in Kirkland.

He got into business education in 1940 when he met John Robert Gregg, the father of Gregg shorthand. He was director of Gregg's school in Chicago for 10 years, until it was acquired by McGraw Hill Publishing Co.

Pair's next effort was to found his own secretarial school, The Pair School of Business, in Chicago. "We began hearing and reading automation. Here we were training secretaries. We wondered, were these machines going to replace secretaries."

So he became the first franchisee for Dr. Vernon Patterson's Automation Institutes and founded Automation Institute of Chicago. This school was acquired by Control Data Corp. in 1968 and Pair became a senior staff consultant for Control Data Institute.

He's collected some firsts and some honors through the years. In 1961, he became the first private business school representative to become not only a member of but president of the National Business Education Assn. He served on its executive board the next nine years. In 1973 he was named Computer Science Man of the Year by the Chicago chapter of the Data Processing Management Assn. (DPMA) and in the same year was named Vocational Education Man of the Year by Goodwill Industries Rehabilitation Center. He has been listed in *Who's Who in America* since 1947 and in *Who's Who in Education* since 1954.

GOOD THINKING

Jeffrey D. Stein is a college freshman dropout who's been a student of computing ever since. Also a savvy practitioner.

He's the 33-year-old president and founder, in 1969, of On-Line Business Systems, Inc. of San Francisco, a company that began in an apartment with

photo: L. M. Ebbitt

JEFFREY D. STEIN The freshman who would work for nothing got $1.50 an hour.

people

a $2,000 investment and today has grown to a 60-person operation whose revenue approaches $2 million a year. The company develops and sells on-line services to businesses in the western U.S., and soon will expand its offerings nationally with a 370/145-based system capable of supporting 100 terminals. The offerings to 55 clients range widely from such routine business systems as order entry, accounts receivable, and general ledger to reservations systems and project control—all offered on-line. Stein says his company guarantees clients savings of a minimum of 30% not only in hardware and software development costs, but because of the efficiencies in doing processing in real time. The proliferation of desk and hand-held calculators has been getting people accustomed to doing their work in real time, says Stein of his service, which often is called on-line facilities management.

Getting his business going from a shoestring operation at a time when the venture capital market had dried up consumed a lot of Stein's time—but not enough for him to neglect professional society and educational activity. Stein has a CDP and once taught the CDP preparatory course in San Francisco. He's been active in the Assn. for Computing Machinery (ACM) and the Assn. for Systems Management (ASM) and recently was named chairman of the National Computer Conference Committee, a group that advises organizers of the National Computer Conference. Shortly after his appointment to the NCC post, Stein had a list of a half dozen ideas to improve the annual conference. Among them is a proposal to attract good speakers to the conference without the speakers having to prepare a paper. Stein thinks the conference should be opened to persons who simply would like to talk for 15 or 20 minutes from notes. They would talk during a day-long forum.

Of computer professionalism, he thinks the CDP is a useful means of judging the kind of computer person you're confronting, but it's just a beginning and has a long way to go before reaching the stature of a CPA or a law or medical license. The reason: "This industry is still in its infancy and the demand for computer people still is much bigger than the supply." He has great expectations for the work of the recently formed Institute for the Certification of Computer Professionals (ICCP).

Stein entered the computer business "without the faintest idea of what a computer was or what it was used for." While a freshman at Ohio State, he answered a newspaper advertisement for a part-time job in the computer center at Batelle Memorial Institute in Columbus, opened to junior or senior students with an A or B average majoring in engineering and statistics or math. Stein, a C-average freshman majoring in business accounting, talked his way into the job at $1.50 an hour "after offering to work for nothing." He then forwent college to go into computing full-time, working as the night supervisor at the IBM 650-based installation and spending days at the IBM education center in Columbus taking "every course they offered," including one of the first 1401 courses. Later, in San Francisco, he was the first to write a COBOL program under IBSYS, the IBM 7090 operating system.

He was a consultant and, before forming his company, was the director of R&D at Greyhound Computer Corp., where he and his company's co-founder Keith Davis began thinking of opportunities in the field of on-line computing services. The record shows that it was good thinking.

"THE VOICE OF THE USER"

The Data Processing Management Assn. (DPMA) needs ". . . to become more visible . . . and to let our voice be heard among manufacturers . . ." says DPMA's new international president, Edward J. Palmer.

Palmer, elected to the international presidency at DPMA's annual INFO/EXPO '74 conference in Minneapolis last June, is the assistant director of administrative data processing at Boston Univ. As such, he designs and implements computer systems for administrative work of 16 of the university's colleges.

EDWARD J. PALMER "A stance more responsive to the public."

He believes strongly in the need for DPMA to "take a stance more responsive to the public." He sees this as a two-pronged watchdog effort. "First we must look out for legislation and trends which could hinder our employers and, second, we should watch for opportunities to assist elected legislators in areas concerning dp where they need our expertise and assistance."

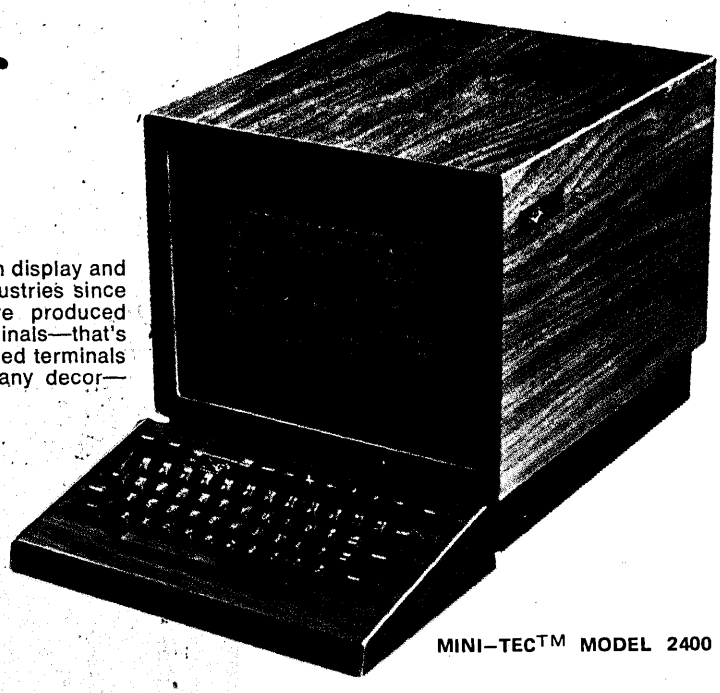
Palmer's data processing career of 22 years began with Boston's Metropolitan Transit Authority, where he first learned tab equipment, and continued with the Whiting Milk Company of Boston, where he set up an automated producers' payroll system, a method of paying milk producers. Following that he spent 14 years with RCA's Defense Products Div., during which he was in charge of installation and implementation of the division's first computer, an RCA 301, and its upgrading to a Spectra 70/45. He has been with Boston Univ. for the past 3½ years, having joined as a systems officer.

Palmer has been a DPMA member for the past 13 years, having become active, first at the local level, 11 years ago. A native of Tucson, he became a New Englander when he went to Boston Univ., from which he graduated in 1950, and where he met his wife. He likes New England although he admits, "It took some getting used to . . . I had to trade hot weather for cold weather and learned how not to fight the snow . . . but the change of seasons appealed to me . . ."

His big hope for DPMA, under his presidency, is that it "act as the type of association it should be, working through our monitoring programs as far as the old budget will stand, becoming, as it should be, the voice of the user." □

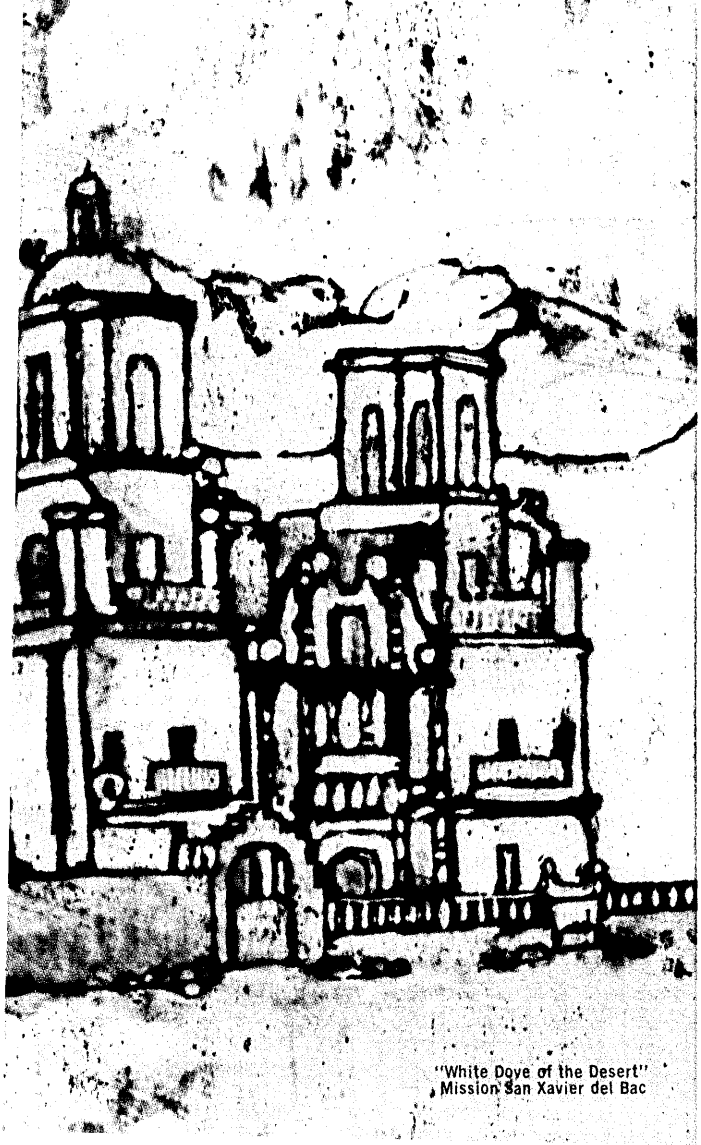
Stability Age Beauty

EC has profitably manufactured information display and ontrol products for computer oriented industries since 958—that's *"stability."* Since 1963 we've produced t terminals called DATA-SCREEN™ Terminals—that's *ge"* in a young industry. Our carefully styled terminals e compatible in any application, match any decor—at's *"beauty."*



MINI–TEC™ MODEL 2400

BEFORE YOU COMPARE TERMINAL PRICES... BE SURE YOU COMPARE STANDARD FEATURES



"White Dove of the Desert"
Mission San Xavier del Bac

MINI–TEC™ DATA–SCREEN™ Terminals include more features in their standard price than any other low cost CRT. Check this list and compare:

	MINI–TEC MODEL 2400
Buffered and conversational mode	Standard
1920 (80 x 24) character screen display	Standard
RS-232, TTL 20/60 mA current loop interface	Standard
Separate, low profile "curved" style keyboard	Standard
Full cursor control by operator and computer	Standard
Load and read cursor address	Standard
Reads lower case. – displays upper case	Standard
Tab feature and blink feature	Standard
Protect – display at reduced intensity	Standard
Space suppression by terminal logic	Standard
Switch selectable roll-up through 9600 baud	Standard
Externally selectable 110 through 9600 baud	Standard
Full/half duplex – externally selectable	Standard
Page or line transmit – externally selectable	Standard
Composite video output for remote monitors	Standard
115/230 VAC, 50/60 Hz – switch selectable	Standard
Vinyl or painted finishes	Standard
STANDARD PRICE	**$1495**
Optional - split baud rate	$45
Optional - rack mount chassis	$60
Optional - 16-key numeric pad on keyboard	$60
Optional - buffered hard copy adaptor for popular printers	$100 to $175

Only 4 low cost options – everything else including simplified keyboard created for non-technical operators and compact design that occupies less desk top space is included.

For information about this and 19 other DATA–SCREEN™ Terminals offering parallel, serial and teletypewriter replacement interfaces and priced from $995 contact TEC, Incorporated, 9800 North Oracle Road, Tucson, Az. USA 85704 (602) 297-1111

TEC® INCORPORATED

All prices in OEM quantities.

CIRCLE 31 ON READER CARD

For Multi-Applicatio
Multi-Location Business Data Processin

AGI
ASCOT GENERAL INDUSTRIES, INC.
Route Salesman Order Sheet

Omaha, Nebraska Date 9/30/74
Account Number 676
Ship to: UNIVERSAL IND. PRODUCTS
1010 N. 10TH STREET
OMAHA, NEB.
Bill to: SAME Ship Via: MTR. FREIGHT

Catalog No.	Quantity	Description	Price
216	6	WHEEL MOUNTS	39.40
45	10	BUSHINGS	127.60
23	4	ELEC. MTRS.	337.84

Salesman: HARRIS
Office: OMAHA, NEB.

ORDER ENTRY

AGI
ASCOT GENERAL INDUSTRIES, INC.
CHICAGO DIVISION WAREHOUSE
Inventory Status Report
For: SEPT. '74

Item	Catalog #	Qnty. as of 9/30	Qnty. Shipped During Month	Qnty. Received During Month
BEARINGS	0849	2,740	150	280
FLANGE	9647	10,183	2,140	—
PISTON	6314	1,628	85	500
MUFFLER	9218	6,423	176	2,000
FILTER	6216	8,048	1,045	—

INVENTORY CONTROL

AGI
ASCOT GENERAL INDUSTRIES, INC.
31747 Van Alstyne Chicago, Illinois 60666 (312) 748-9200
Invoice

To Universal Auto Products
1010 10th Street
Omaha, Nebraska 45215

Salesman	P.O. #	Job Description	Invoice Date	Invoice #
Harris	UI-453	Mixed	10/5/74	10284

Catalog #	Description	Quantity	Price
216	Wheel Mounts	6	39.40
45	Bushings	10	127.60
23	Elec. Motors	4	337.84
			504.84
	Sales Tax		25.24
	Shipping Charge		63.14
	TOTAL DUE		593.22

ACCOUNTS RECEIVABLE

AGI
ASCOT GENERAL INDUSTRIES, INC.

Date SEPT 30, 1974 FINISHING Department

		Op. No.	Acct.	Production Total Actual	Production Expected per Hour	Hours Expected	Hours Actual	Diff. Red-Loss R	Diff. Bl.-Gain B
61	OTIS	195D20	502	2800	375	7	8		
62	JONES	100625	502	2800			7		
64	LEE	101R26	502	2800			6		
67	DUNN	195625	502	400	400	1	1		
69	KIDD	105D21	502	200			1		

PRODUCTION REPORTS

Invoice
AARDVARK ACCESSORIES
116 N. Buchanan Street
Albany, N.Y. 06478

To Ascot General Ind.
31747 Van Alstyne
Chicago, Ill. 60666

Date Shipped: 9/20/74
Shipped Via: Motor Freight

P.O. #	Inv. #	Salesman	Office	Invoice Date
A-545	86452	O'Brien	Chicago	9/27/74

Items	Catalog #	Quantity	Cost
Wheel Bearings	674	100	$ 431.16
Bushing Seals	1040	500	101.13
Motor Covers	8241	200	1,624.18
		Sub-Total	2,056.47
		Sales Tax	N/A
		Shipping Charge	105.24
			$2,161.71

30 Days Net/2% 10 Days

ACCOUNTS PAYABLE

AGI
ASCOT GENERAL INDUSTRIES, INC.
Transportation Division
Overhead Analysis

Month SEPT.

Indirect Labor	Budget	Actual Expense	Over or Ur Budge
Supervision	775.00	756.00	(19.0
Trk. Drivers Helpers			
Shipping			
General Labor	405.00	171.22	233.7
Repair and Rework			
Idle and Lost Time		1.77	(1.77
Guaranteed Rate Cost	244.00	28.14	215.86
Overtime Bonus	75.00	32.98	42.02
Maint, Mchy, Equip.	150.00	38.26	(111.74
Vacations		46.00	46.00
Paid Holidays	1,649.00	1,074.37	574.6
Total			

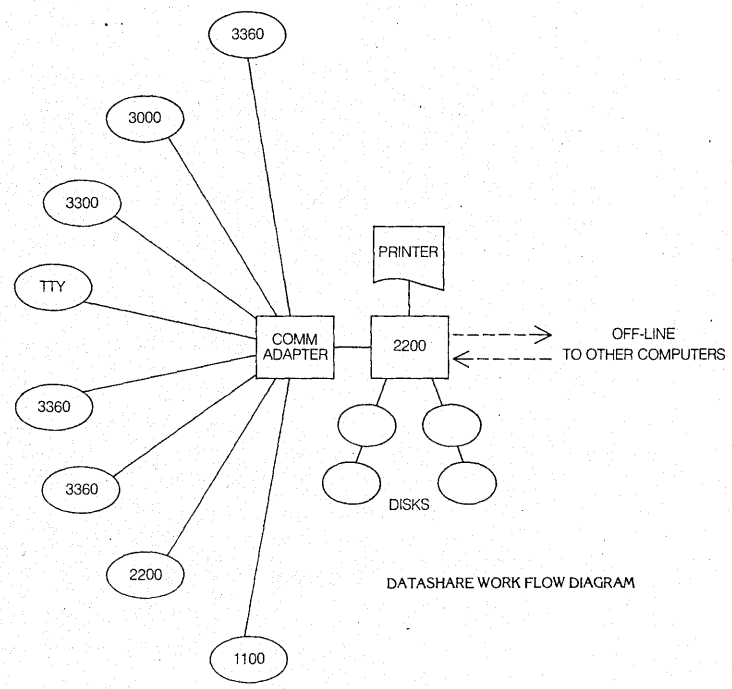
COST ANALYSIS

AGI
ASCOT GENERAL INDUSTRIES, INC.
Finishing Department
Time and Production

Date 10/5/74

Order No.	Oper. No.	Time Start	Time Finish	Time Elapsed	Labor or Piece Rate	No. Pieces	Cost
2068	31	7:20	12:00	4.8	2.30	350	8.05
2068	42	1:00	4:20	3.2	2.30	250	5.75
2069	37	7:30	12:10	4.8	2.30	350	8.05
2069	45	1:00	5.00	4.0	2.30	250	5.75

LABOR DISTRIBUTION



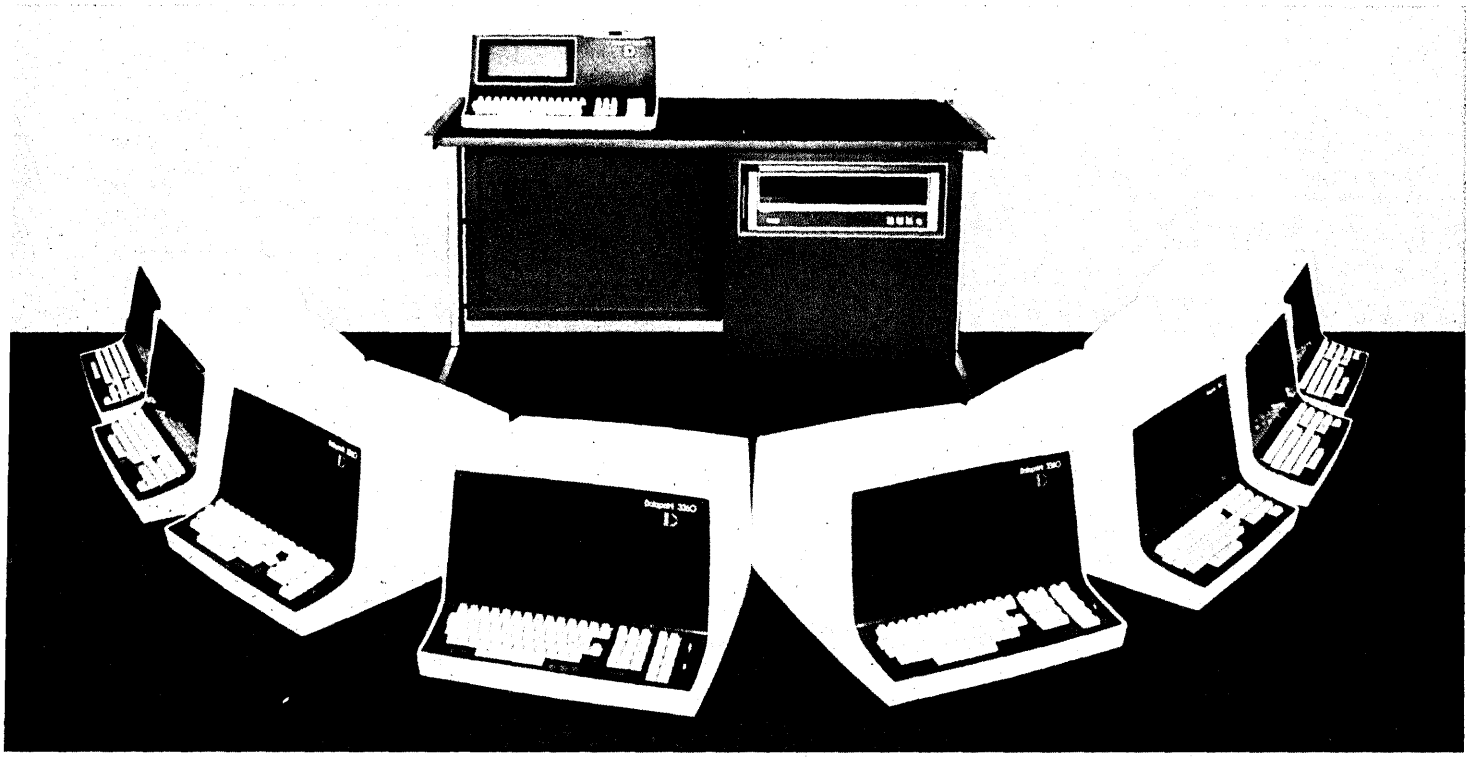
DATASHARE WORK FLOW DIAGRAM

AGI
ASCOT GENERAL INDUSTRIES, INC.
Finishing Division
Employee Time Sheet

Employee/Number	10/7 RT/OT	10/8 RT/OT	10/9 RT/OT	10/10 RT/OT	10/11 RT/OT	10/12 RT/OT	10/13 RT/OT	Totals RT/OT
BENNETT 6417	8 0	8 1	8 0	8 0	8 0			40 1
CARLYLE 8214	8 0	8 1	8 0	8 0	8 0			40 1
LANE 6743	8 0	8 0	8 0	8 0	8 0			40 0
POWELL 0643	8 0	8 0	8 0	8 0	8 0			40 0
PARKER 9118	8 0	8 0	8 0	0 0	0 0			24 0

PAYROLL

datashare



DATASHARE is the comprehensive answer provided by ıtapoint Corporation to the problem of providing a ılti-application business data processing and intelligent data try capability to multi-location organizations at a cost that's thin today's inflation-pinched budgets.

DATASHARE's big plus for users is that it permits the ll computing power of a Datapoint 2200 Terminal Processor be utilized at up to eight dispersed work stations. At those ations, operators using Datapoint 3300, 3360 or other atapoint terminals (with or without terminal printers) have ll access via either local wire connection or telephone lines the 2200's powerful internal computer and 128K of virtual emory for conversion, entry, processing and storage of data ɔm sales orders, accounts payable and receivable, employee ne sheets, inventory receipts and other important source ɔcuments. Under DATASHARE control, operators using rminals at these work stations can utilize programs stored a central disk memory unit to aid in entering data for ırticular applications and other processing requirements, dependent of and concurrent with, work going on at the other ations.

Physically DATASHARE is a master program stored in ıe central Datapoint 2200 processor which acts as controller ɔr data traffic between the work stations and the disk memory le unit associated with the 2200 where file and program data stored for each application and each work station. The)ATASHARE program also allocates the internal processing ower of the 2200 among these work stations in a manner kin to time sharing, so that each station functions as though had total command of the 2200.

The basic advantages of the DATASHARE approach for ıulti-location, multi-application data entry and processing equirements are flexibility — each operator can work upon applications independently of what's going on at other stations (although stations can also share data files and programs if that's appropriate) — capability — the full capacity of four 2200/2.4 megabyte disks is available to each work station for processing and storage of program and file data — and, of course, economy — each work station in effect enjoys the power and capability of a 2200 via a terminal that costs a fraction of the 2200.

The DATASHARE program also provides each data station with automatic file maintenance, simplifying user creation of, access to, and storage of, data files stored in central memory. The program optimizes use of available memory space as well as makes it simple to create, combine or alter files. Further, with its communications interfaces and numerous emulation routines, the Datapoint 2200/DATASHARE System can be readily integrated into most functioning computer/communications networks. In some cases the Datapoint 2200/disk system will be used to edit and pre-process source data captured at the remote work stations before sending it on to a home office computer facility. However, the 2200 will most often be used as the central processor itself.

With DATASHARE, you can enjoy a proven business data processing and intelligent data entry capability in each of eight work stations at a cost well below a conventional upgrade. Scores of companies are making use of this unique Datapoint package with outstanding results. For further information on DATASHARE, contact the sales office nearest you or write or call Datapoint Corporation, San Antonio, Texas 78284, (512) 690-7151.

Datapoint

ıme Office: 9725 Datapoint Drive/San Antonio, Texas 78284/(512) 690-7173 • **Sales Offices:** Atlanta/(404) 458-6423 • Austin (512) 452-9424 • Baton Rouge/(504) 926-3700 • Boston/(617) 890-0440
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ın Francisco/(415) 968-7020 • Seattle/(206) 455-2044 • Washington, D.C./(703) 790-0555 • **International:** TRW/Datacom—International/Los Angeles, California, TELEX 691286 (213) 475-6777
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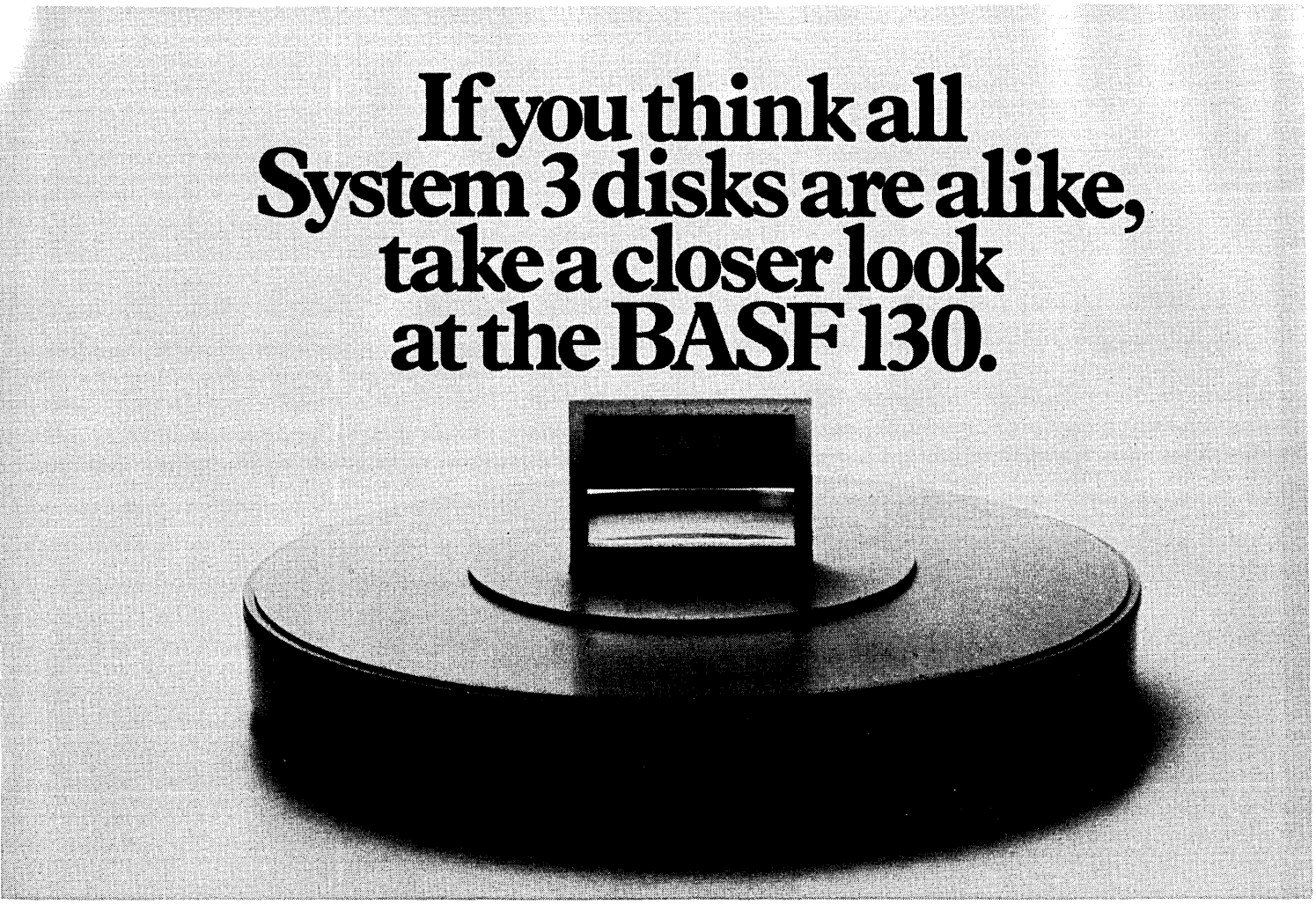
ɔndon (01) 903 6261 • Helsinki/(90) 5671 • Paris/581 12 70 • Hanover, Germany/(0511) 634 011 • Rotterdam/(010) 216244 • Tel Aviv, Israel/(03) 417170 • Milan/316 333 • Tokyo/263 3211
ıala Lumpur, Malaysia/21416 • Oslo/15 34 90 • Makati Rizal, The Philippines/877 294 • Singapore 10/378165 • Johannesburg/724 9301 • Stockholm/(08) 188295 • Lyss/Berne/(032) 844240

If you think all System 3 disks are alike, take a closer look at the BASF 130.



Because all single disk cartridges conform to certain industry standards, you might think they're all equal. They aren't. The important difference is the extent to which a manufacturer is willing to go in order to *exceed* industry standards. It's a matter of making a disk cartridge better than you really need, because there could be times when you need it. Let's look at a few superior points of the BASF 130 System 3 disk cartridge:

The binder that won't quit

As you probably know, magnetic coating doesn't stick to the aluminum disk all by itself. We use a special binding agent to produce an incredibly strong bond. The disk is sealed to prevent oxidation, so you can be sure the coating won't peel or flake off.

Our own coating process

As the trend toward higher packing densities continues, it becomes increasingly important to monitor the thickness of coating deposited on the disk. The problem is compounded by the necessity for progressively varying the coating thickness from the outside toward the inside of the disk, because packing density is greater as the circumference decreases. For those reasons, we've discarded conventional coating methods in favor of an exclusive process using our own BASF-designed equipment.

A polished performance

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

And to make sure . . .

We test our 130 disk cartridges to standards much tighter than those of the leading equipment supplier. If anything unpleasant should happen, we'd much prefer it happen here than on your drive. As a regular procedure, we do scratch tests to check coating thickness, impact tests to determine head crash resistance, detergent tests to check resistance to wear and temperature variations, and drop tests to make sure balance and alignment don't shift during shipment. We test to make sure our 130 disk cartridges are error-free.

Finally

Our 130 costs no more than other System 3 disk cartridges. You're already paying for BASF quality. . . you might as well have it. For more information on the 130, or BASF's line of computer tape, disk packs and flexible disks, write to BASF Systems, Crosby Drive, Bedford, Mass. 01730.

BASF

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

CIRCLE 12 ON READER CARD

LOOK AHEAD

COSTS DOWN, BUT PRICES ARE UP

> "While the cost of just about everything has risen dramatically in recent years, the cost of doing things by computer has been a noteworthy exception."

Thus reads an advertisement IBM published in the Atlantic Monthly and other general circulation publications in September--the month it slapped price increases of 6 to 8% on equipment, services, and maintenance. The move, at a time when 1975 dp budgets seemed likely to be kept at a standstill by cash-short managements, left many installation managers distressed. One, a banker who got wind of the impending increase and purchased a 370/168 two weeks before the Sept. 18 announcement, said he saved his installation $300,000 by the timing. Nevertheless, his maintenance costs will rise by nearly $1,000 a month. Others talked of having to decimate programming staffs just to keep within anticipated '75 budgets.

Even though the increase seemed to reopen opportunities for the lower-priced offerings of independent peripheral manufacturers, these suppliers were preparing to follow IBM's action with increases of their own (see below), even as IBM followed Univac's 6% increases by one day.

Earlier, Control Data had raised its prices 2-10%. Shortly after the Univac and IBM announcements, Honeywell, Burroughs, and other leading suppliers weren't commenting on their plans.

FEW ESCAPE IBM ACTION

IBM on Sept. 18 called up customers to present them with a price schedule that upped purchase, maintenance, and rental prices on smaller 370 equipment by 6% and on larger systems by 8%. The purchase price hikes went into effect immediately. Users who sought long-term lease plans to escape the new prices found they were out of luck unless their contracts started before Sept. 18. The lease price increases were to go into effect next Jan. 1.

Only the 360, 1130, and 1800 lines (and the early 370/155 and 165 cpu's) escaped the wide-ranging adjustments on products IBM had announced before this past summer. Even the ancient 2311 disc drive and the slow-moving 3650 retail store point-of-sale terminal were jacked up by 6%.

In its announcement--hand-delivered to the trade press by the company's public relations men in the form of a terse three-paragraph press release--the company said the increases applied to prices in the U.S. But there was speculation that it also eventually would apply, as in the past, to prices charged by subsidiaries overseas.

MOVING UP WITH THE UMBRELLA

Independent suppliers of peripheral equipment did well in the early '70s when budgets were tight and 10% off sometimes was enough to keep a project or a programming group intact. As budgets loosened, the independents, already simmering from IBM price reductions and scarce lease financing, had to offer a lot more even to make a presentation to a user.

But in the wake of the IBM price boost, some independents have opted to cling to the rising price umbrella rather than slip under it. Memorex last month announced price increases ranging from 4 to 15%, which followed by less than two months an average 5%

LOOK AHEAD

increase on lease and maintenance contracts. At Storage Technology, 6% price increases on rental equipment were announced after IBM's.

Despite these moves, Memorex vp George Dashiell figures he's still 7-20% below IBM's prices, depending on product and configuration, and STC's president Jesse Aweida estimates his Colorado company's prices still are about 12% off of IBM's on average. Calcomp raised prices 5-10% on products it sells to original equipment manufacturers, but not to end users, "until further study." A Calcomp spokesman said of the IBM action: "It's IBM's first price announcement in years that enhances our market position because, for a change, it isn't a price reduction."

DIAL A BILL

An on-line service that enables a consumer to pay his bills, not with checks but with a phone call to his savings institution, may surface this month in the Minneapolis-St. Paul area. It's an outgrowth of the In-Touch service originated in Seattle last year that lasted less than a year. Consumers will use push-button phones for direct input, or talk from a rotary dial phone to an operator. This could be a boost to savings institutions that by law can't offer checking accounts to their depositors.

INTERREGIONAL EFTS THIS YEAR

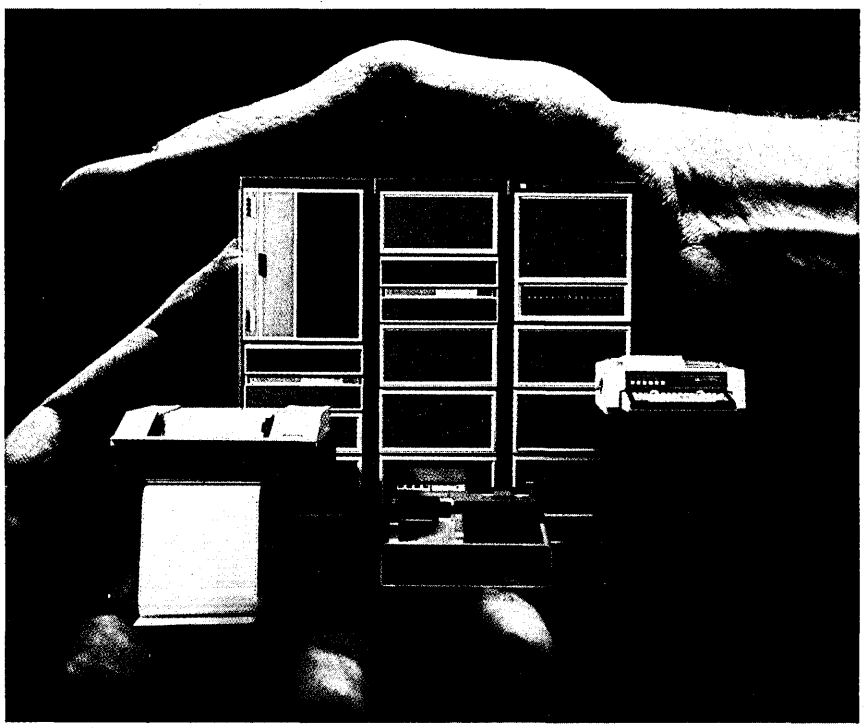
Eighteen charter members strong, the National Automated Clearing House Assn. got down to business this month, holding its first full board meeting Oct. 10, at which three committees were formed: systems/operation, legal/legislative, and education/communications. The group of regional Automated Clearing Houses, formed to facilitate interregional electronic funds transfer (EFT), anticipates the first interregional exchanges will take place before the end of this year. Charter members, 14 of which joined the four founding members from California, Georgia, New England, and the upper Midwest by an Aug. 31 deadline, represent virtually every section of the country. New ACH members are in New York City, Philadelphia, Baltimore, Pittsburgh, Pa., Columbus and Dayton, Ohio, Detroit, Memphis, Chicago, St. Louis, Kansas City, Mo., Dallas/Ft. Worth, Houston, and Portland, Ore. "The response was higher than we expected," said Frank Curran, American Bankers Assn. staff director of payment systems planning and NACHA secretary-treasurer. "There were a number of surprises, notably Memphis, St. Louis, Kansas City, and Portland." Curran said he feels announcement of NACHA's formation acted as a catalyst to ACH activity in a number of places. He expects two or three other ACH's will join NACHA before the end of the year.

DATASPEED 40: A DECISION FOR IBM

Teletype has solved its production problems with the long-awaited Dataspeed 40. If these reports are true and volume production starts before the end of the year, then IBM will soon be confronted with a tough decision: what to do about providing signaling and software maintenance for the Bell System product. Many believe the Mod 40 will become something of an industry standard, like Teletype's Model 33 line (more than 500,000 shipped).

IBM provides software and signaling maintenance for the Mod 33 but, now that the Bell System and IBM are bumping up against each other in more marketplaces, there are some who think IBM may not go along this time.

(Continued on page 130)



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

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

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

This innovation works for a living.

You do. So call us.

HP minicomputers. They work for a living.

HEWLETT hp PACKARD

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

*Domestic USA price only.

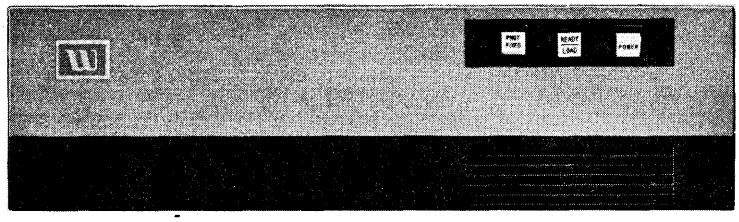
22416

WANGCO's low cost Series-N ...the non-floppy disc!

The Series-N, with flying head and hard-disc reliability, gives you 25, 50 or 100 megabit capacity, in a single, compact package . . . at *one-sixth the cost-per-bit* of floppy discs.

The Series-N, with one or two fixed discs, and with 100 or 200 tracks-per-inch capability, lets you fit its capacity to *your* system requirements, without compromise. For main memory extension, point-of-sales systems, software storage, process control programming . . . any application calling for small size, fast access and low cost, there is a Series-N model to fit *your* system.

In your system, the reliable Series-N costs little more than a floppy disc, because controller costs for the two are equal. But the far greater reliability of non-contact rigid disc technology will pay its way many times over. And in addition, you get far greater capacity in only 6 inches of a standard 19-inch rack.



Model	Capacity (Megabits)	Transfer Rate (KB/Sec.)	Recording Density (Bits/Inch)	Track Density (TPI)	Rotation Speed (RPM)
N-1211	25	1562	2200	100	1500
N-1212	25	2500	2200	100	2400
N-1221	50	1562	2200	100	1500
N-1222	50	2500	2200	100	2400
N-2211	50	1562	2200	200	1500
N-2212	50	2500	2200	200	2400
N-2221	100	1562	2200	200	1500
N-2222	100	2500	2200	200	2400

For more information call the WANGCO office nearest you, or write to WANGCO Incorporated, 5404 Jandy Place, Los Angeles, Calif. 90066. (213) 390-8081. TWX 910/343-6246.

WANGCO

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In Europe: WANGCO Incorporated, The Lodge, 362 Cranford Lane, Harlington, Middlesex, England. Telephone: 897-0202. Cable: WANINC
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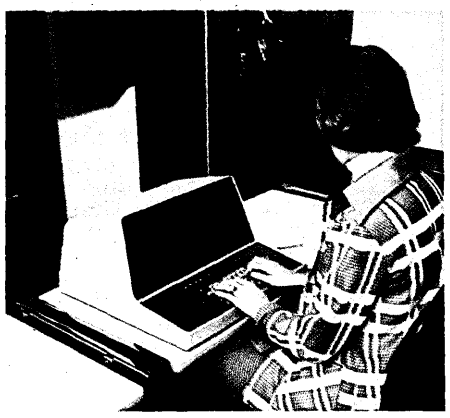

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letters

Misplaced decimal

I know we do things in a big way here in California, but the article "Orange County One Year Later" (Aug., p. 101) has to contain errors. Specifically, the cited per capita edp costs are off by what seems to be a factor of 100. I believe the true costs should be $2.57 and $2.43, respectively, for 1973 and 1974.

ROBERT AUSTIN
Naval Undersea Center
San Diego, California

Mr. Austin is correct. We regret the misplaced decimal point.

Thin warehouse

Hats off to Lancaster Telephone Supermarket, which seems to be able to operate its business from a 50 sq. ft. warehouse (July, p. 138). I can barely store my lawnmower in a space that small.

A. J. BERMAN
Canoga Park, California

Yes, but we didn't say how tall it is.

Philatelically yours

Since M. W. Martin's "A Gallery of Computer Postal Art" appeared in DATAMATION (Feb. 1973, p. 74), a number of stamp collectors have joined to form a computer study unit. This study unit is devoted solely to stamps and cancellations dealing with computers and computer-related subjects. A monthly news bulletin is sent to all members.

Future projects include a revision to Robert V. Boos's checklist (July 1973, p. 26), which will include over 110 stamps depicting personages involved in the development of computers, computers and related equipment, and computer-related events.

Any of your readers who are interested can receive a copy of the newsletter and details of the study unit by sending me a stamped, self-addressed envelope.

ROSS TOWLE
1003 S. Mattis, Apt. 1-8
Champaign, Illinois 61820

Structured programming

About Tenny's article, "Structured Programming in FORTRAN" (July, p. 110), I must say that the *only* high-level language which is not good for structured programming is FORTRAN. To my mind, FORTRAN is not a language but a collection of instructions. It has no structure and no possibility of separating data from process. To do structured programming in FORTRAN means only to try to organise a program written in FORTRAN.

MARIE-THERESE BERTINI
Institut de Recherche D'Informatique et D'Automatique
Rocquencourt, France

Grabber titles

Mr. Roach and I are delighted that Mr. Dorn chose our paper ["Collaborative Problem Solving Between Optimistic and Pessimistic Problem Solvers"] to be "grabber" runner-up among the papers at IFIP Congress 74 (July, p. 90). Indeed, such honor has never befallen us!

Clearly, you must have wondered how we could have escaped winning first prize [which went to Zadeh's "Fuzzy Logic and Its Application to Approximate Reasoning"]. The reason is quite simply that we used up our entry for first prize in last year's Third International Joint Conference on Artificial Intelligence.

LAURENT SIKLOSSY
University of Texas
Austin, Texas

Mr. Dorn replies: Keep trying and perhaps with additional effort you can win our prize next year—three days in Atlantic City to the winner and a week in Atlantic City for all runners-up.

Glossaries

In the Source Data department in June, Mr. Larson bemoaned the lack of an adequate glossary in the data processing field. I should like to call attention to an authoritative multilingual glossary which has been in general use for some years: *The* IFIP-ICC *Vocabulary of Information Processing.* The need for the glossary was recognized in 1959 at the International Conference for Information Processing. Development was sponsored by UNESCO.

The edition I have (1966) contains a foreword by Issac L. Auerbach and an excellent structure of interlocking definitions allowing definition of words in great detail and in terms of fundamental concepts. Of the nine terms used by Mr. Larson to judge the eight glossaries he could find, compatibility, EBCDIC, and response time are not in the 1966 edition.

Software, the basic term for which he was searching, is defined as: "programs and procedures associated with a data processor in order to facilitate its use."

"Programs" and "data processor" are further defined in such intermediate terms as "symbol," "instruction," and "table" until the fundamental concepts of "data item," "argument," "record," "field," "character," and, most important, "order" are used and defined.

Using the standard glossary watcher's glossary scale (GWGS), I would rate this volume as GWGS =9. A newer edition might rate even higher.

J. G. FOUNTAIN
Senior Systems Analyst
ARINC Research Corporation
Santa Ana, California

Drugstore data base

The article by Robert M. Curtice on "Some Tools for Data Base Development" (July, p. 102) is probably one of the best articles written describing data base dictionary concepts. He clearly describes the purpose and use of the data dictionary and points out the need for table driven editors . . .

I would like to invite attention to a package which, in addition to generating and maintaining the data dictionary, also contains a generalized editor that is transaction oriented. The system is LEXICON and was developed by Arthur Anderson and Co.'s Administrative Services Div.

This system . . . provides the facility for all front-end validation and eliminates bad transactions from getting into the data base. This latter point provides a solution to one of Mr. Curtice's major concerns of duplicate editing as the data follows downstream.

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JOSEPH R. DOWDLE
Data Base Administrator
Walgreen Company
Chicago, Illinois

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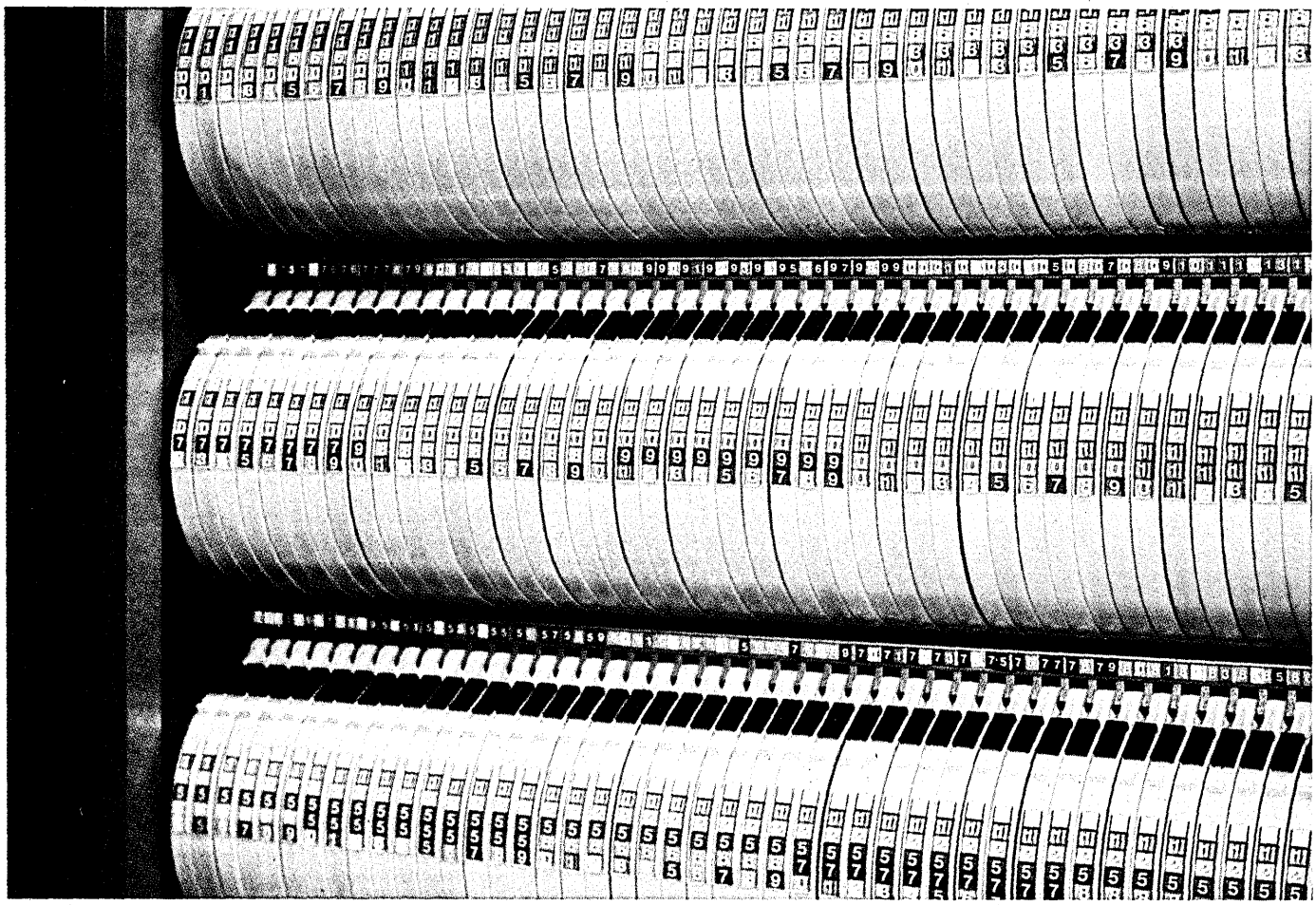

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books

Data Security and Data Processing
IBM Corp., White Plains, N.Y., 1974, 6 vols.

In 1972 IBM announced a study in data security. The results of that study are available from your friendly IBM representative, at no charge to customers, prospects, educators, and professionals, and for $32.20 to others. They come in six volumes (one with two parts) and are numbered G320-1370 through 1376.

Basically, IBM had arranged for a special set of modifications to OS/360 —collectively called the Resource Security System or RSS—to be installed at one of its locations, and by the State of Illinois, M.I.T., and TRW. In addition, Illinois was to review administrative aspects and economics, M.I.T. was to investigate user requirements and attitudes, and TRW was to explore operating systems and certification. The results of these investigations, plus the experience garnered in installing and using RSS, are reported in the six volumes.

The average dp manager won't find much of use in the reports. By reading between the lines he can find that adding security features to an existing system was not a resounding success. It made the system better, but a dedicated person with sufficient knowledge could still find loopholes. Further, the modifications were difficult to install and created hellish problems when implemented. The changes were not transparent to users, and required changes in existing programs. The changes resulted partially from the lack of applications standards in most shops, and partially from the total lack of a standards enforcement mechanism. When RSS was installed, the standards became mandatory. This caught several programs, including some of IBM's compilers!

Volume 1
Introduction and Overview

Volume 2
Study Summary

Unless your boss just came back from five years in a monastery, you will find Volume 1 worthless. It consists of 20 pages with big type and wide margins. The contents are much too general to be of use to a seasoned manager. Volume 2 is the "Study Summary." It is 25 pages of closely packed information that should be read by all dp managers. It tells what was attempted and, between the lines, reveals what was accomplished. IBM is to be commended for so candidly reporting what was at best a partially successful study.

The remaining volumes are individually reviewed below. They are of interest mainly to the serious student of computer security, the designer working for a manufacturer, or perhaps a systems analyst who is faced with the problem of retrofitting some piece of an existing system to gain a small increment of security in a very important area. As the reviews show, the study was more like a loose confederation of parallel activities. The four volumes are merely reprints of reports published by Illinois, M.I.T., and TRW. They are not edited to a consistent format, vocabulary, or audience. The reading is tough, the pearls are hard to find.

Volume 3, Part 1
State of Illinois: Executive Overview

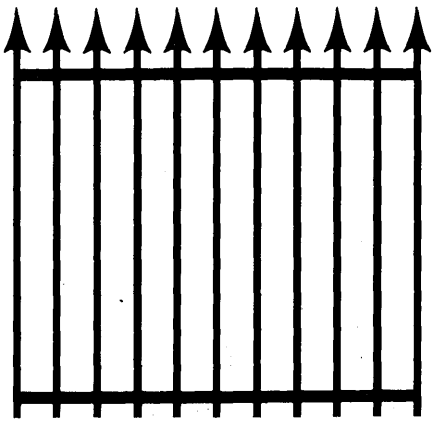
Volume 3, Part 2
Study Results: State of Illinois

The Management Information Div. (MID) of the State of Illinois was one of four external sites participating in the study. The MID effort is represented by Project SAFE (Secure Automated Facility Environment), which brought together specialists (computer specialists, lawyers, etc.) to address the overall problems of information privacy and specific issues in data security. The results of the project are presented in two parts.

Part 1 is a short overview addressing the need for privacy awareness of senior management. There is nothing new here. Basically, the case is made for information privacy. Some attendant concerns are listed, such as accidental disclosure and intentional infiltration; and a few recent "computer crimes" are described. The relation this document bears to its companion volume is unclear, and it is difficult to see the utility in yet another call to arms based upon already well-developed arguments.

The Illinois study was known to involve the implementation of RSS; so the title of Part 2, "Study Results," leads one to expect a report on RSS implementation and its successes and/or failures. Not so. Instead there is a lengthy discussion of the "Elements and Economics of Information Privacy," followed by a smaller section on "Recommended Security Practices." Indeed, the only significant reference to RSS is contained in an appendix outlining a study of RSS's impact on system performance. While RSS was not a main focus of Project SAFE, it was nevertheless surprising to find how little attention was paid to its impact on system security.

The section on elements and economics covers the educational, technological, and legislative aspects of the security issue. This breakdown works rather well, and the results are impressive both in depth and breadth. It is a thorough job, and this section would



serve quite nicely as a basic reference for a dp executive.

The economic discussion focuses on threat assessment, information valuation, and the costing of proposed safeguards. Its value is in the rather complete treatments of several example applications of table-driven systems engineering methodology.

The section on "Recommended Security Practices" apparently summarizes some of the specific measures adopted by the MID in its quest for an improved security environment. However, no mention is made of evaluating the effectiveness of these measures, a fact which severely limits this section's value. Nevertheless, the example afforded by a specific attempt to translate some of the concerns raised in the earlier section to an operating environment is instructive.

A major fault of the volume is its somewhat cavalier tone. All of the issues are discussed at a single level of

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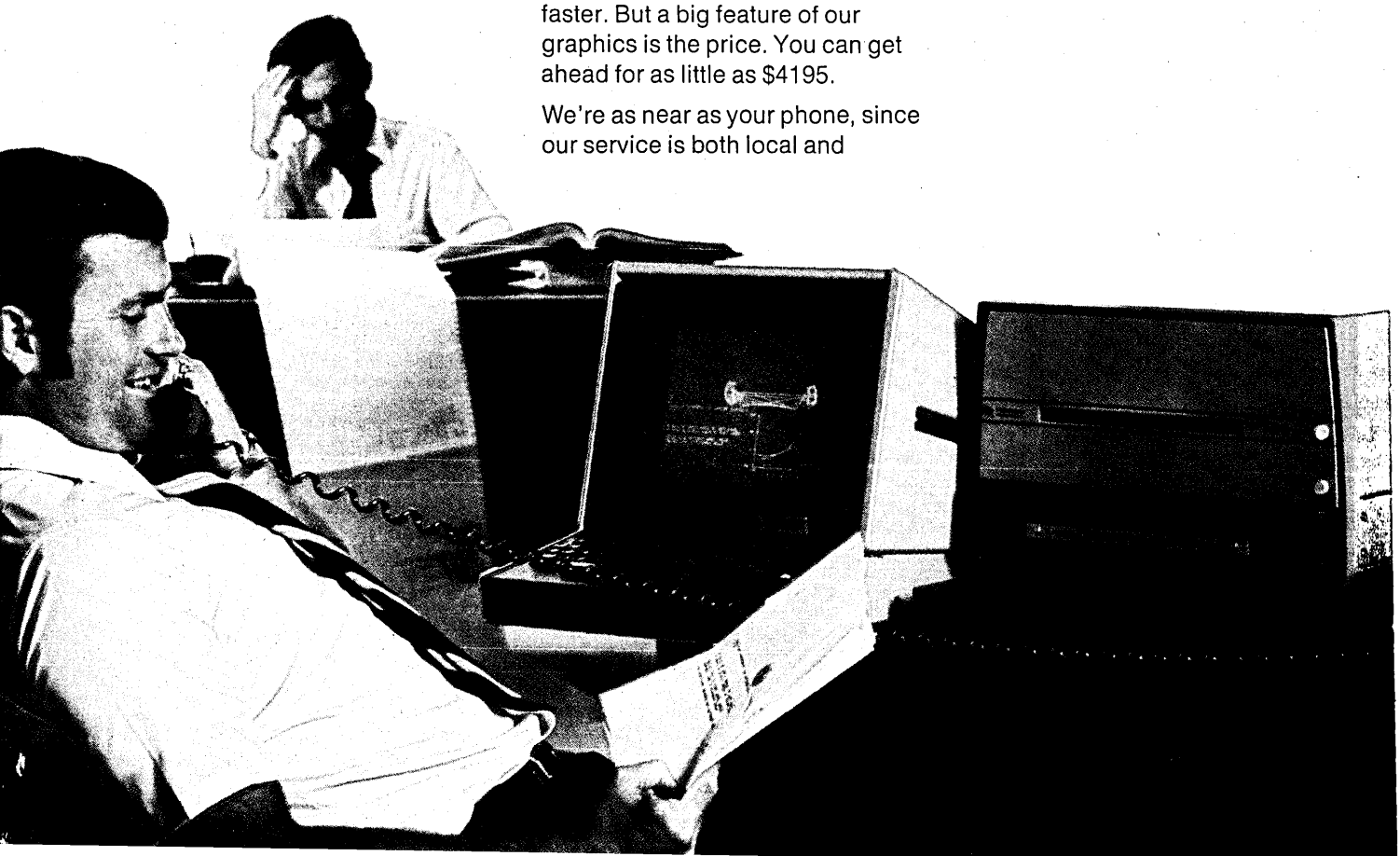


analysis which could lead the dp executive to believe that data security is at hand.

This study only gathers considerations which form the highest node of a complex tree of unresolved issues. Any success at attaining a workably secure information processing system is predicated on the resolution of these issues.

—Steve Glaseman
Mr. Glaseman has worked on data security for several years as a member of the technical staff of the Information Sciences Dept. of the Rand Corp. His past experience includes research in operating system performance.

Volume 4
Study Results: Massachusetts Institute of Technology

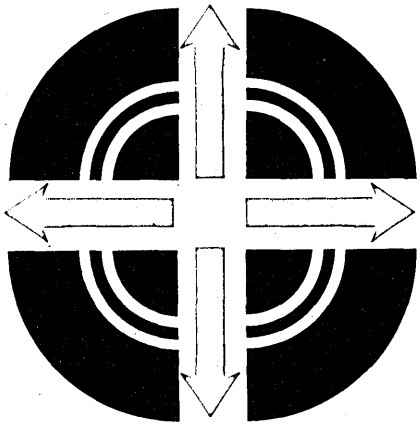
The M.I.T. study site report is a heterogeneous assortment of 11 papers (and an annotated bibliography) which address a scattering of topics in data security. The papers are dissimilar in almost every respect, and the volume suffers from a lack of uniform editing, cohesiveness, and focus. Moreover, it is inconsistent in its assumptions about its audience, in some cases assuming a detailed knowledge of OS/MVT and in others attributing to the reader a surprising naiveté regarding computer systems.

The first six papers examine some of the characteristics, attitudes, and security requirements of four diverse computing communities: the financial, medical, educational, and service bureau industries. They reveal that: (1) the security demanded by a user depends on his awareness of security threats; (2) the individual's proximity to the computer system (in terms of job) influences his awareness of the security problem; and (3) differences in awareness and approaches depend on the nature of processing and the perceived value of information being processed. The two papers on M.I.T.'s community also cover the Classroom Monitor System, which meets some of that environment's requirements.

One of the remaining five papers identifies some deficiencies in RSS and suggests improvements. The second argues for the virtual machine approach to security and isolation. The third briefly highlights some trends in data security technology. The fourth describes M.I.T.'s experience in running a data set access control mechanism under TSO. The final paper suggests representing the security environment as a network to facilitate selection of security system features.

Despite their diverse emphases, however, most of these papers are worth reading by those interested in security. The fact that the volume suffers from a lack of focus and depth, however, suggests that the study itself was not properly focused and there was little interaction between participants. It may be that the study objectives were too disparate. Finally, it seems that much of the information is of marginal *utility*, except perhaps for the manufacturer, though it could hopefully serve as the base for a deeper analysis.

—Dennis Hollingworth
Mr. Hollingworth is also a member of the technical staff of Rand's Information Sciences Dept. He participated in a 1970 penetration study of a heavily modified, "secure" IBM operating system, and in security studies of other major operating systems. He was the project leader in a study of the military's version of GCOS III.



Volume 5
Study Results: TRW Systems, Inc.

This volume contains five separate papers. The first, "Computer System Security Technology," is an overview consisting largely of excerpts from the others. "Threats and Vulnerabilities in a Computer System" covers security problems associated specifically with hardware, communications lines, operating systems, and personnel. "Requirements for Secure Operating Systems" lists 187 "requirements" followed by 261 "techniques" with tables purportedly relating the two lists. "Issues of Secure Computer System Certification," the fourth paper, addresses semantic, technological, and administrative issues and defines certification. Finally, "A Study of Automated Aids for Secure Systems" covers methods of developing testable software and test tools.

The topics will attract anyone interested in computer security, but the papers are written in an offhand manner; this is unfortunate since the subject demands such a high degree of intellectual precision. The terminology is misleading; for instance, "security" is defined in the second paper as the "protection devices and procedures for hardware, software, and data in the computer system." Even the illustrations are misleading; one from the same paper depicts a concentric maze representing security, implying that *each* level of protection must be penetrated to gain access to the secure system—which is patently untrue. The papers even make technically false assertions, such as "fault detection and isolation as well as error correction is far more important in software than in hardware."

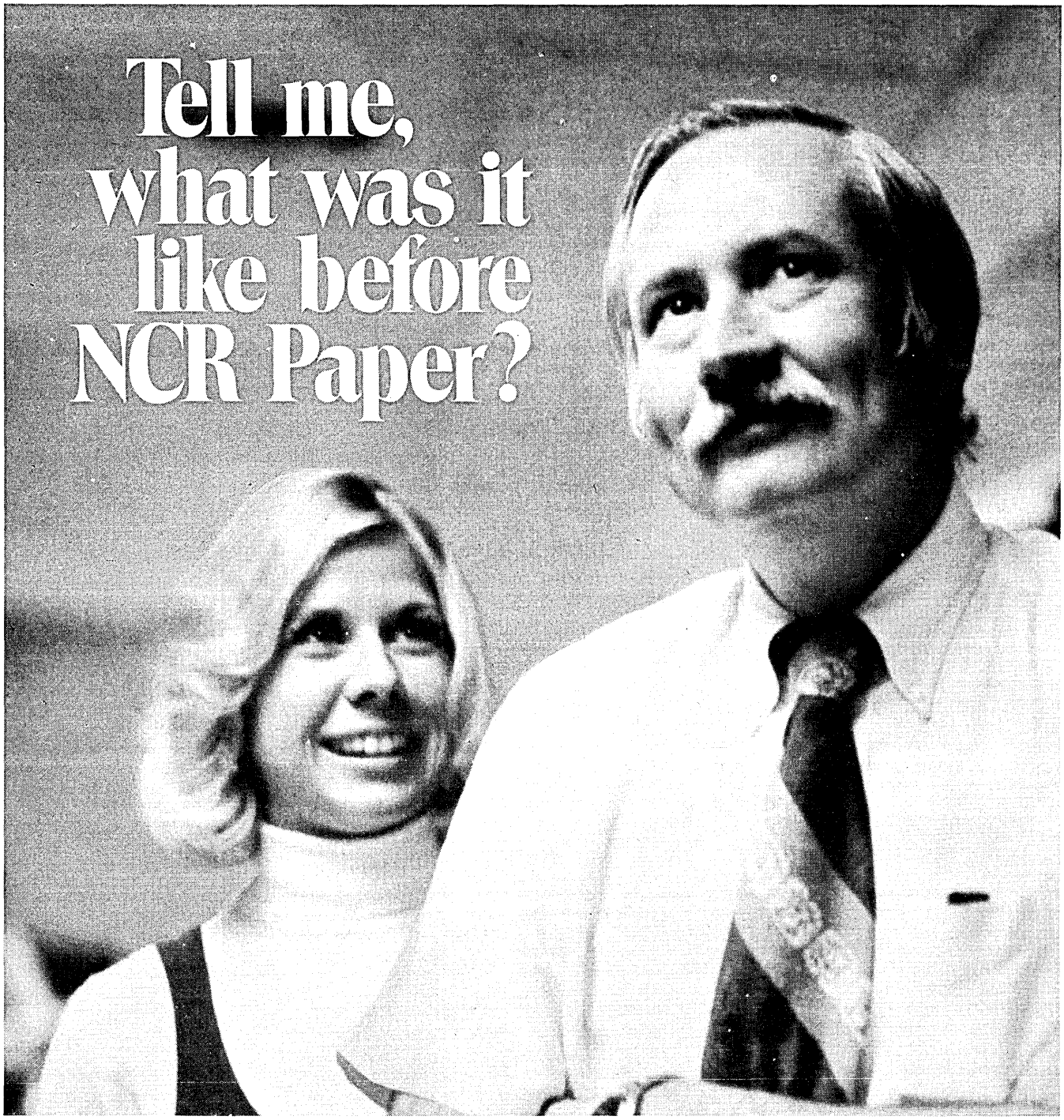
Paper four, on system certification, is an exception and I recommend it highly. Its careful style is in striking contrast to that of the other papers, particularly in the early sections. The later sections of the paper are somewhat less cogent, but I agree with the author, R. C. White, that the best and perhaps only possible context for certification is the system development project in which protection requirements, protection mechanisms, and the relation between these two are represented explicitly.

There is certainly merit in any attempt to collect as many as possible of the problems, issues, requirements, tools, and techniques relating to computer security. But although collection generally precedes analysis, these papers might have been more useful had more of the effort been allocated to the latter. I think that, with the exception of paper four, they will tend to confuse the layman and bore the professional.

—Jim Carlstedt
Mr. Carlstedt works with protection aspects of large-scale operating systems at the Univ. of Southern California's Information Sciences Institute. Formerly with Rand as manager of corporate computing and as multiaccess subsystems specialist, he also consulted for Datasaab of Sweden in the design of addressing, virtual storage, and access control mechanisms.

Volume 6
Evaluations and Installation Experiences: Resource Security System

Volume 6 is a collection of three papers written by staff members at IBM M.I.T., and TRW describing their experiences installing and using RSS. The title of the volume is "Evaluations and Installation Experiences," not "Evaluations and Study Experiences" as cited



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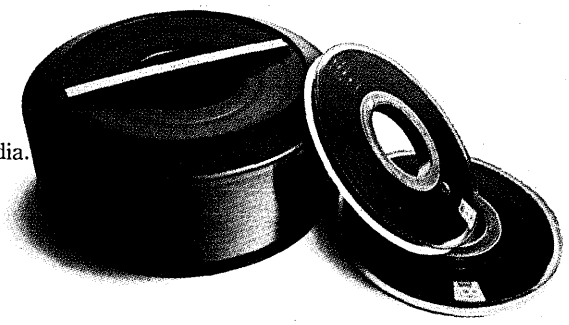

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in the preface and in external publications. This error is the least of the volume's difficulties.

The first report is by IBM, whose role was "to identify problems relating to the ease of use of RSS." For the purpose of the study, IBM installed RSS at its Federal Systems Center. The report lists 17 major design flaws in RSS identified as a result of difficulties encountered in the user and operations interfaces. The list includes the single security officer, the use of access control passwords, and the debugging and manipulation of authorization lists.

M.I.T.'s report attempts to describe RSS's impact on the dp center and the user community, that is, "how many existing programs stop working when enforcement (of OS rules and conventions) finally comes?" The report gives a chronological description of the installation of RSS, including statistics on crashes and sample job streams, and also details software problems encountered in running the system. This latter section, however, requires a familiarity with IBM terminology, since the text is replete with phrases like "SQS expansion—OC4" and statements like "The problem was invoked using the call command from TSO. RSS does not recognize the origin of members of the LINKLIB concatenation accessed with a specified DCB." The M.I.T. study concludes that most problems were in vendor-written programs that "did not adhere to OS conventions when they were written." These included IBM's FORTRAN and PL/1 compilers!

The TRW report begins with an RSS installation history, highlighted by statistics from sample job streams. Unlike the two previous studies, the TRW report also includes an evaluation of RSS security features, revealing several vulnerabilities which allowed penetrating RSS and taking control of the system. In Appendix E, RSS is evaluated with respect to TRW's 187 security "requirements" (listed in volume 5). Finally, the report includes a description of two programs written for the study, one which reports on violations and another which detects them. Again, the IBM jargon makes it difficult to read.

In the end, the volume summarizes the operational experiences of three separate organizations with an operating system that "was not generally available and is now obsolete." The results are of no interest to the general field, and, hence, the value of this study is questionable.

—Richard Bisbey

Currently doing research in protection analysis for USC's Information Sciences Institute, Mr. Bisbey has had extensive experience in data security, including a former position with Rand where he worked in the analysis of operating systems.

literature

Reference Cards

Pocket-sized reference cards containing revised and updated information for CICS/VS and a completely new card for IMS are offered, one of each free per installation, $1 per additional card. As handy referral guides to programmers and analysts, these cards provide information on system macro instruction formats, 4-char transaction dump codes, schematics of logical relationships between systems area, dispatch control area, task control area, etc. ONLINE SOFTWARE INTERNATIONAL, Hackensack, N.J.

FOR COPY CIRCLE 200 ON READER CARD

Software Honor Roll

As judged by their users, 20 proprietary software packages made the 1974 Software Honor Roll in Datapro's second annual user survey. Nearly 600 users responded, reporting on an average of 2.5 packages each. A total of 50 packages were rated by six or more users, including the 20 honored, of which 11 were "repeaters" from last year. The results of the user survey are contained in a 17-page report, *User Ratings of Proprietary Software,* which also features detailed comparison charts that pinpoint strengths and weaknesses of the 50 packages rated by six or more users, and of 83 other packages rated by from two to five users each. Price: $10. DATAPRO RESEARCH CORP., Delran, N.J.

FOR DATA CIRCLE 201 ON READER CARD

Minicomputers in Europe

Predictions are that the annual minicomputer market in Europe, at $157 million in 1973, will grow to $1 billion by 1983. According to a two-volume in-depth study, *Minicomputers in Europe,* the cumulative ten-year value should reach $6.3 billion, even though the chip computer, or microprocessor, "threatens many potential application areas for minicomputers."

Of at least 55 competing minicomputer manufacturers, Digital Equipment Corp. reportedly has the major share of the market, with Data General a strong rival. Germany emerges as the leading "consumer" of minicomputer products; and the leading applications throughout Europe will be in data communications, industrial control, business, and laboratory systems.

The study, evaluating the entire European minicomputer market picture, costs $495. FROST & SULLIVAN, INC., New York, N.Y.

FOR DATA CIRCLE 202 ON READER CARD

Time-Sharing

The *Directory of Time-Sharing Services,* a 300-page report, offers descriptions of over 100 companies, listing services offered, hardware available, prices, plus other relevant facts. Concise compilation of necessary data on each time-sharing company—whom to contact, availability, facilities, languages, locations, etc.—is featured. Price: $125. QUANTUM SCIENCE CORP., 851 Welch Rd., Palo Alto, Calif. 94304.

Programming Management

Computer Programming Management is the second volume in the Information Management Series; the first was *Data Processing Management.* Both "volumes" are actually subscription services for updating collections of articles on the subjects covered. Papers in this second volume cover management, environment, methodology, standard practices and documentation, and data base management. Charts, checklists, illustrations, and even reading lists are included. The price is $95 per year. AUERBACH PUBLISHERS INC., 121 N. Broad St., Philadelphia, Pa. 19107.

Computer Law Monthly

How can you protect yourself from computer-based fraud? How should you negotiate with a service bureau? What tax pitfalls are there in computer leasing and purchase arrangements? Answers to these and other questions dealing with the legal problems of data processing are discussed in *Computer Law and Tax Report,* a monthly publication which keeps its readers abreast of the latest court cases, tax rulings, accounting techniques, and key leasing and computer security developments. Price: $3 per month; the first issue is offered free. WARREN, GORHAM & LAMONT, INC., Boston, Mass.

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Nashua knows EDP labels from A to Z.

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

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

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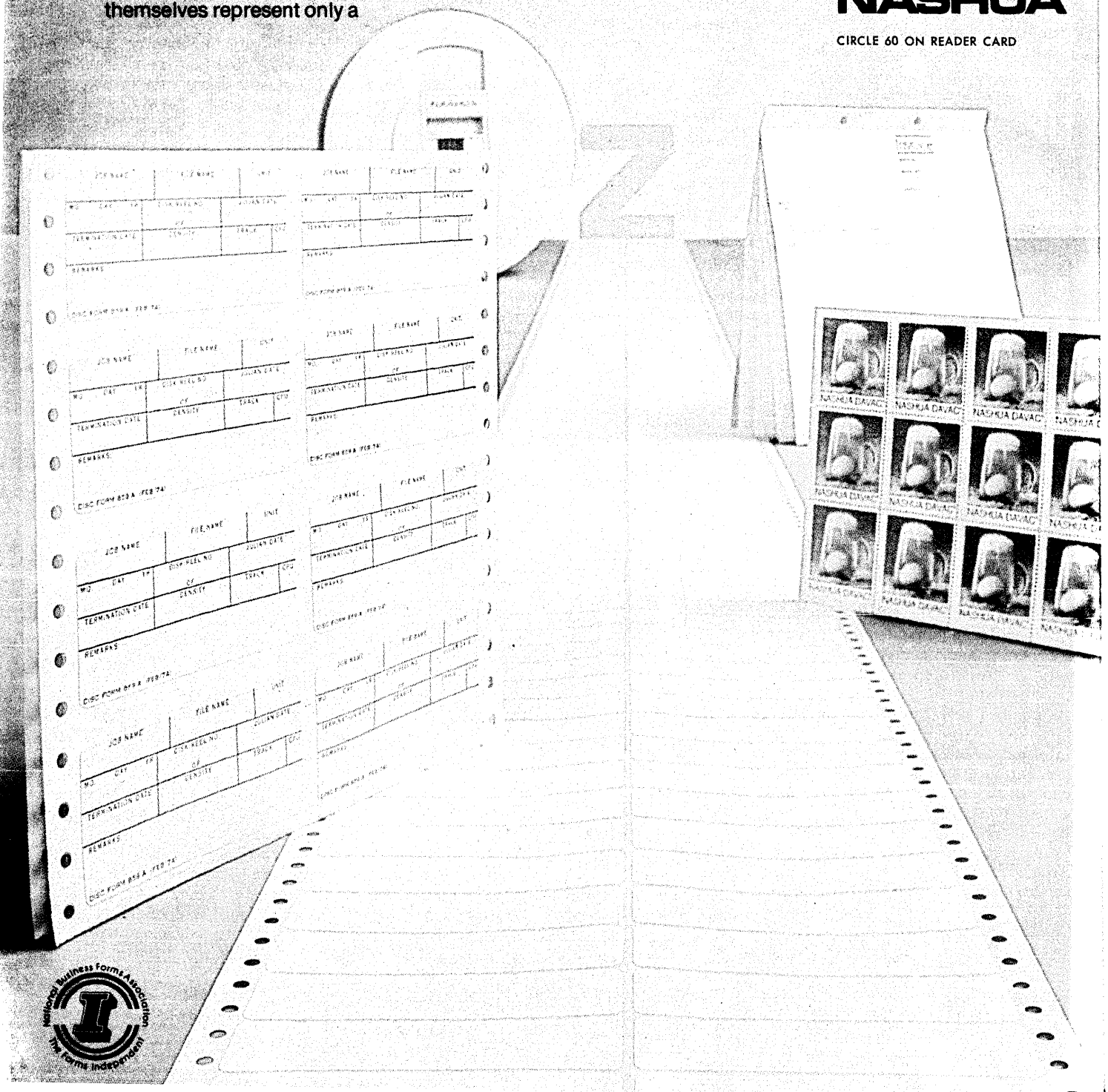

National Business Forms Association
We forms independent

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Computer Education
The first issue of *the computer educator,* a monthly news tabloid dealing with computer-related education and training, is scheduled for this month. Its goal is to help foster information interchange between users, vendors, and educators. News of computers, governmental regulations, and international developments will be covered. The rates are $6 per year, or $1 per issue. The first issue is offered free. INTERNATIONAL COMPUTER EDUCATION CENTER, Chicago Heights, Ill.
FOR COPY CIRCLE 204 ON READER CARD

Microfilm Sources
The *1974-75 Microfilm Source Book,* a 224-page volume, is a single-source reference guide to products and services in the microfilm industry. Sources of supply for every important microfilm service and piece of equipment—who makes or does what, where they are located, whom to contact, and likely costs—are easily found with the aid of a keyword index. Price: $26.50. MICROFILM PUBLISHING, INC., P.O. Box 313, Wykagyl Station, New Rochelle, N.Y. 10804.

Revised Standards
The National Microfilm Assn. has revised *Basic U.S. Government Micrographic Standards and Specifications.* In effect, all federal government standards and specifications—21, including the latest Mini-cats items—are to be found in this 426-page book. Prices: $10 ($8.50, members) for hardcopy; $2 ($1.50, members) for microfiche. NATIONAL MICROFILM ASSN., 8728 Colesville Rd., Silver Spring, Md. 20910.

Graphics Software
A six-page brochure describing more than 25 software programs for use with this vendor's interactive graphics systems is available. Included are descriptions of program generation packages, of operating systems, and of utility, applications, and test programs. The software allows users to create specialized application programs in FORTRAN, and is designed to operate with VECTORGRAPHICS 11 systems with some packages compatible with other 16-bit minicomputers used with the company's Series 3 terminals. VECTOR GENERAL, INC., Woodland Hills, Calif.
FOR COPY CIRCLE 206 ON READER CARD

Drying Service
Have your business records been accidentally soaked by defective sprinkler systems, floods, broken water mains, etc.? A drying and reclamation service is available to dry large quantities of paper, computer tapes, or other water-soaked material using a thermal vacuum process. Without high temperatures, chemicals, or lights, large or small volumes of wet materials can be dried in vacuum chambers of various sizes, with no harmful effects. MCDONNELL AIRCRAFT CO., St. Louis, Mo.
FOR DATA CIRCLE 209 ON READER CARD

Minority Businessmen
A 12-page pamphlet, aimed at facilitating the sale of products and services by minority businessmen to Raytheon Co., is available. The booklet includes an organization chart of the company's procurement function, a listing of company divisions with their plant locations and products manufactured, and a listing of purchasing locations with principal buyers' names, addresses, and telephone numbers. RAYTHEON CO., Lexington, Mass.
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Magnetic Filing Systems
A microfiche filing system that reveals 15 to 20 film headings at the touch of a finger, giving four-second retrieval and two-second return after use, is described in a brochure which also lists the complete line of Magne/Dex magnetic filing systems for microfiche, film jackets, and aperture cards. Instant visibility and instant access to any single fiche, anywhere in the file, is claimed. BUSINESS EFFICIENCY AIDS, INC., Skokie, Ill.
FOR COPY CIRCLE 211 ON READER CARD

TV Computer Course
"Making It Count: Computers and Computer Applications," a 10-week color telecourse, will be given by the Univ. of Washington over KCTS-TV Channel 9 beginning Oct. 1. A basic knowledge of computer hardware is the goal of the 20 half-hour telecasts, self-tests, and correspondence assignments. Included will be films produced by Boeing Computer Services. Continuing Education's Office of Independent Study, UNIV. OF WASHINGTON, Seattle, Wash. 98195.

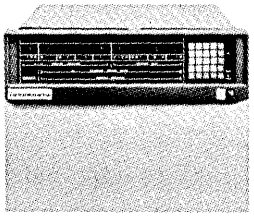
AMA's Management Course
Over 17,000 managers have attended this acclaimed managerial course since 1952, and now it will include Los Angeles among the cities where sessions will be held, along with Dallas, Atlanta, San Francisco, Toronto, and the American Management Assns. headquarters city—New York. Constantly being updated, the course now covers in four units of one week each: management dynamics, analytical tools of management, human resource management, and leadership laboratory. These sessions may be spaced over a 12-month period. Experts in their fields comprise the roster of lecturers and guest speakers, and the fee is $1,325 ($1,150 for AMA members). AMERICAN MANAGEMENT ASSNS., 135 W. 50th St., New York, N.Y. 10020.

Microprocessors
A three-day seminar giving a comprehensive introductory overview of microprocessors and microcomputers, with system applications, is aimed at project managers, system designers, and engineering personnel. No extensive prior knowledge of computer fundamentals is assumed. The price of $375 includes course materials and luncheons (discounts for groups of five or more). It will be held in Toronto, Dallas, and San Francisco in October; in Chicago, Washington, D.C., and Munich in November; and in Copenhagen, Israel, and Italy in December. INTEGRATED COMPUTER SYSTEMS, 12561 Appleton Way, Los Angeles, Calif. 90066.

Management Seminars
A series of one- to three-day seminars on a variety of topics relating the manager to the computer is scheduled for New York, San Francisco, Chicago, and Washington, D.C. Among the topics are computer contract negotiation, manager's guide to computer networks, how to develop data processing standards, and ANS COBOL efficiency techniques, plus three courses in structured programming and design. Prices for one-day courses run $185, for two-day $275, and for three-day $385. BRANDON APPLIED SYSTEMS, INC., 1611 N. Kent St., Arlington, Va. 22209. □

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

WITH UP TO A MILLION BYTES OF DIRECTLY ADDRESSABLE MEMORY.



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	24,925
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.

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.

The new Interdata 7/32.

We put our muscle where their myth is.

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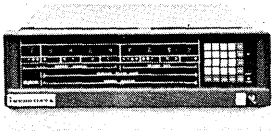
Boston – (617) 890-0557. Washington – (703) 525-4806. Philadelphia – (215) 436-5579. Orlando – (305) 851-6962. Chicago – (312) 437-5120. Detroit – (313) 356-5515. Dayton – (513) 434-4193. Kansas City – (913) 384-1606. Houston – (713) 783-3060. Dallas – (214) 238-9656. Denver – (303) 758-0674. Los Angeles – (213) 640-0451. Phoenix – (602) 968-2477. San Diego – (714) 565-0602. San Francisco – (415) 969-1180. Seattle – (206) 455-0680. Toronto – (416) 677-8990. Tokyo – (270) 7711. Sydney – 439-8400. London – Uxbridge 52441. Munich – 0811-8543887.

7/32 minicomputers scheduled for delivery July, 1974: On Time.

INTERDATA ANNOUNCES THE INDUSTRY'S FIRST $3200 MINICOMPUTER TO CHALLENGE THE NOVA.

PDP-11 PERFORMANCE AT A NOVA 2 PRICE.



Performance	7/16	Nova 2/4	PDP-11/05
Data word length (bits)	4, 8, 16	16	1, 8, 16
Instruction word length (bits)	16, 32	16	16, 32, 48
General-purpose registers	16	4	8
Hardware index registers	15	2	8
Maximum memory available (K-bytes)	64	64	64
Directly addressable memory (K-bytes)	64	2	64
Automatic interrupt vectoring	Standard	Not available	Standard
Parity	Optional	Not available	Special order
Cycle time (usec.)	1.0 or 0.75	1.0 or 0.8	0.9
Available I/O slots	4	2	2

Price	7/16	Nova 2/4	PDP-11/05
8 KB processor	$3,200	$3,200	$4,795
16 KB processor	3,700	3,700	6,495
32 KB processor	5,300	5,300	10,895
Multiply/Divide option	$950	$1,600	$1,800
Floating Point option	$4,900	$4,000 plus $1,000 for 2/10 configuration	Not available

Source: Data General Price List, Copyright 1973, and addendum dated 5/15/73. Nova 2/4 bulletin 012-000060, 1973. DEC OEM & Product Services Catalog, 1972. Auerbach Minicomputer Characteristic Digest, June, 1973. "How to use Nova Computers", 1973.

Minicomputer myths you can live without:

1. There is no such thing as a high-performance, low-cost minicomputer.

2. You have to choose between two extremes – pay a ton for a machine like the PDP-11 and save on software costs, or buy a cheapie like the Nova 2 and pay the price later.

All wrong.

Because now there's the Interdata 7/16 – an extremely flexible 16-bit OEM minicomputer that combines the best of both worlds.

It's easier to program than the PDP-11 because it has 16 hardware registers, up to 64K bytes of directly addressable main memory, 255 I/O interrupts with automatic vectoring to service routines and a comprehensive set of more than 100 instructions. That's a lot of muscle.

It's completely modular in design – plug-in options can be installed in the field to meet your specific application requirements.

Options like multiply/divide, programmers' console with hexidecimal display, power fail/auto restart, memory protect and a high-speed Arithmetic Logic Unit that includes floating point hardware. In fact, you can expand the low-cost 7/16 all the way up to the 32-bit Interdata 7/32.

Yet it costs as little as $3200. Just like the machines that give you the barest minimum. And quantity discounts can reduce that low price by as much as 40%.

So you no longer have to make the painful choice between good performance and good price. Or between hardware economy and software efficiency. Now you have a minicomputer that gives you both.

The Interdata 7/16.

We put our muscle where their myth is.

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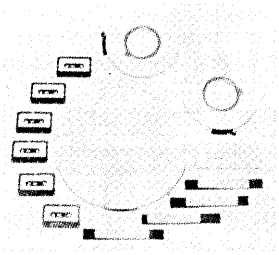
7/16 minicomputers scheduled for delivery February, 1974: On Time.

INTERDATA ANNOUNCES A KICK IN THE TEETH FOR SOFTWARE SKEPTICS.

SIX NEW SOFTWARE PACKAGES FOR THE INDUSTRY'S FIRST 32-BIT MINICOMPUTER LINE.



OS/32 MT	A super-fast real-time operating system with a file handler to optimize storage utilization or access time. A multi-programming, multi-tasking scheduler that finds the place for your programs instead of making you worry about it.
OS/32 ST	An easy-to-use, comprehensive 32-bit program development oriented operating system that takes only 32K bytes of memory.
OS/16 MT	A small—as little as 4K bytes—operating system with multi-programming and multi-tasking capability, ISA real-time FORTRAN extensions, and all the capabilities you need to cut the cost of implementing your system.
FORTRAN V	Full FORTRAN V capabilities, yet requires only 24K bytes compared to other piggish 56K-byte FORTRAN V systems.
Multi-User Extended Basic	A low-cost, powerful multi-user system utilizing Extended Basic language that can support 4 users with less than $10,000 of hardware. Can be expanded to support 32 users.
Utilities	A raft of utility software, including CAL, an assembler that optimizes your 16- or 32-bit code; EDIT, our new text editing package that simplifies maintenance of source files; OS Aids, new interactive debugging package that finds your program errors quickly and easily.

First came our new 32-bit 7/32 minicomputer. Up to a million bytes of directly addressable memory. Under $10,000.

And the new 16-bit 7/16. PDP-11 performance at a Nova 2 price.

Now for the skeptics who think minicomputers never have powerful software:

Six new software packages that let you do all the things the hardware was designed to do.

Getting Interdata software is easy. We don't hamstring you with high prices or a restricting license deal. We sell it for a reasonable price and then back it up.

It's all available on our own cassettes, too. Simple. Convenient. Compact. The way you need it.

Best of all, we've gone to great lengths to do something nobody else has ever done—protect your software investment. Any software package you buy to run on one Interdata processor has been designed to run on any larger Interdata processor as well.

So don't spend a fortune on software only to watch it go up in smoke two years from now. At Interdata, we worry about your software when we're designing our hardware.

That's something even a skeptic can get excited about.

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7/16 software scheduled for delivery February, 1974 and 7/32 software scheduled for delivery July, 1974: On Time.

INTERDATA ANNOUNCES THE RESULTS:

Over 100 companies have ordered 7/32 and 7/16 minicomputers.

Allan Bradley Co.
AAI Corporation
Amoco
American Business Computers
Auto-Trol Corporation
Astro Computing Services
Austron Inc.
American Wholesale Plumbing
Advanced Information Design
Australian Dept. National Defense
Barton Automation, Germany
Boeing
Business Research Asso.
Brookdale Community College
C.I.T., France
Con Edison
Coffield Electronics
Conversational Systems Corporation
Computer System Engineering
Comtec Data Systems
Dunegan/Endevco
Dallas Linotyping Company
Dymo Industries Inc.
Decision Inc.
Diversified Data Services & Sciences
Datawest
Dale Engineering
E.G. & G. Inc.
EMI Records, U.K.
Environmental Research
ETEC Corporation
First National City Bank
Federal Judicial Center
General Dynamics
General Electric Co.
Graphic Decision Inc.
Geometrics
Grateful Dead Productions
General Motors, Canada
Georgia Institute of Technology
Geoterrex Co.
General Motors
Grumman Aerospace Corporation
Harris Corporation
Hoffman-La Roche Inc.
ITT Semiconductors
International Computer Science
Informatica Nacional, S.A.
International Data Science
J.E.T. Technical Services
Kennedy Co.
Motorola
Moore School of Electrical Engineering
Monmouth College
Martin Marietta Corporation
McGill University
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Newark College of Engineering
National Research Council of Canada
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Perkin Elmer Corporation
Picker Corporation
Plessey, U.K.
Precision Instrument Co.
Protea, S.A.
PSE&G
Raytheon Co.
Reynolds Metals Co.
Ramtec Inc.
Rochester Institute of Technology
Rice University
Spectrotherm
Systems Engineering Labs, Inc.
Silicon Systems Inc.
Spex Industries
Scott Engineering
Social Automation, Finland
Spacecraft Incorporated
Sperry Rand
Transportation Technology Inc.
Teledyne Geotech
Telephone Account & Controls Inc.
Testdata Systems Corporation
Tymshare
Trinetics Research Institute
Tulane University
U.S. Life Corporation
United Aircraft
University of Wyoming
University of Arizona
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University of Kansas
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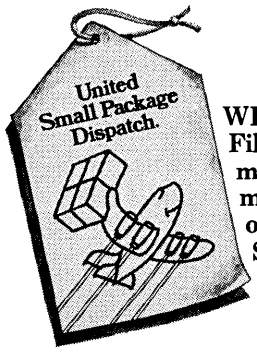
FOR BEST RESULTS: Contact Ron Paterson (201) 229-4040 for details on the 7/32. The 7/16. Our software. Or to join our list.

At 9:30 a.m., you learn you've got to get that shipment to your customer 2000 miles away...by evening. How?

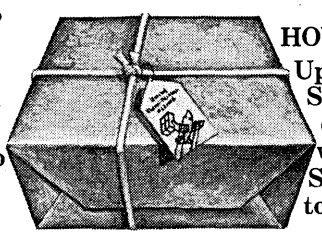
By United Small Package Dispatch.

HERE'S ALL YOU DO:

1. Take your small package to United's passenger check-in counter 30 minutes before flight time. Pay the charges.
2. Phone your addressee. Give him the flight number, arrival time, and receipt number.
3. Thirty minutes after arrival, the package can be picked up at the baggage claim area.



WHAT CAN YOU SEND?
Film, computer tape, medicine, advertising material, machine parts—or anything you forgot. Sample price: Chicago to New York, $20.



HOW BIG CAN IT BE?
Up to 50 pounds in weight. Size: 90 inches in total dimensions (length, plus width, plus height). Small Package Dispatch—to our 113 cities!

No. 1 in the U.S. sky

UNITED AIRLINES CARGO

Our latest addition.

The floppy disk drive. We didn't name it. Someone else did. But our new baby's the best one yet.

The CalComp 140.

What makes it better? The parents, naturally. Remember, CalComp is the leading independent producer of disk drives in the world. We made it big long before we made it small. And technology and experience are hereditary.

Our model 140 floppy disk drive holds 3.2 million bits of information. It has 6 millisecond track-to-track access time. And a transfer rate of 250,000 bits per second.

The 140 has a self-contained air system that keeps dirt off the head and the diskette and the moving parts. And of course, our floppy disk drive is compatible with IBM's diskettes.

We can deliver our model 140 in OEM quantities. We support our customers with the CalComp worldwide service network.

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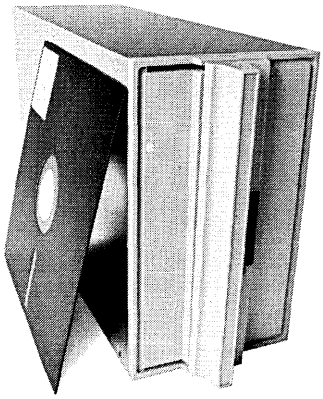

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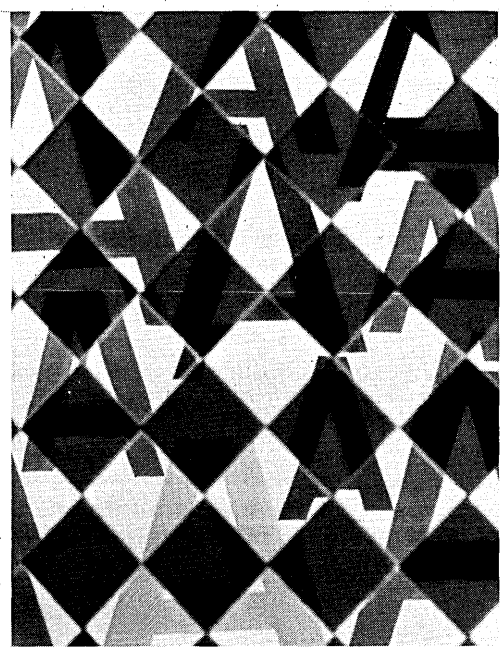
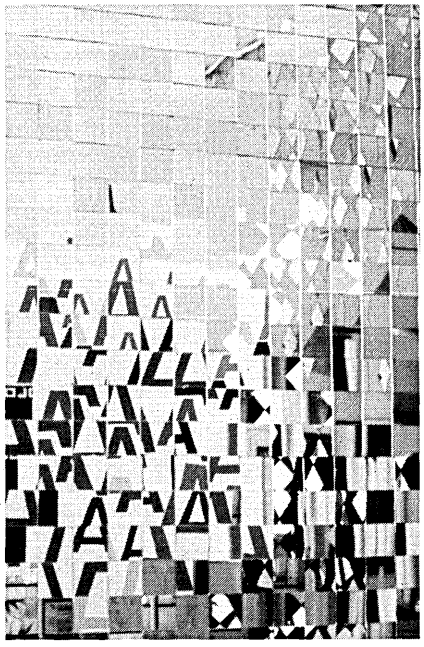
CIRCLE 50 ON READER CARD

By adding another bit to ASCII's seven, a 256-character code can be developed which will work for communications and for computer processing.

CHARACTERS IN A DIALOGUE

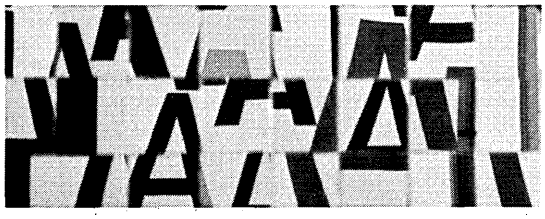
by John G. Fletcher





Photos, Andy Cominos; environments, Clear White, Los Angeles

The work reflected in this article was performed under the auspices of the Atomic Energy Commission. Copies of the tables are available from the Technical Information Dept., Lawrence Livermore Laboratories, Univ. of California, Livermore, CA 94550. Refer to document number UCRL 74264.



ABSTRACT

Wherein four persons of varied viewpoint converse upon an 8-bit, 256-character set recently adopted at the Lawrence Livermore Laboratory and upon its relation to recent work on the American national standard character code.

DRAMATIS PERSONNAE

Aplo
a naive practitioner of programming
Octo
an earnest designer of systems
Ibmo
a shrewd vendor of ware
Useo
a skilled user of computers

Octo: I am pleased to report that a standard character set and code has been chosen for the Octopus computer network at LLL (Lawrence Livermore Laboratory, Univ. of California). It is the American (National) Standard Code for Information Interchange (ASCII). Each character code is embedded in an 8-bit byte, the high-order bit being zero (since ASCII is a 7-bit code).

Useo: Why was ASCII chosen rather than some other coding scheme?

Octo: Primarily because, as you know, it is a national standard, made so by official decree of our federal government and agreement among computer equipment manufacturers. By selecting it, LLL becomes compatible with other installations. Moreover, the design of the code gives some evidence of the application of careful thought.

Ibmo: But surely this code is used only when transmitting between the various computers of the network and not for storage and other purposes within a computer. After all, it is only a code for information *interchange*.

Octo: Well, of course, certain devices already purchased were not designed for ASCII, and some computers are ill-adapted for the use of an 8-bit byte. These items are being serviced by software code conversion, but the intent is that, as time passes and these items become obsolescent, they will be replaced by items adhering to the standard. It would certainly be foolish to indefinitely bear the cost, inefficiency, and confusion occasioned by multiple codes.

Ibmo: In many quarters these matters are viewed quite differently. Hardware code translators are easily built with modern methods, and their moderate cost merely lubricates the economy. Confusion is hardly an issue since the subtleties of the coding scheme are cleverly hidden from the user behind language constructs and complicated operating systems: this is as the users prefer since they are generally incapable of grasping such matters.

Useo: You might be amazed to learn, Ibmo, that not all computer users would accept this judgment, nor do they casually dismiss a continuing cost, however moderate. But tell me, Octo, what was the basis for choosing the 8-bit byte?

Octo: This choice hinges primarily upon the belief that the current trend will continue in computer design to-

CHARACTERS IN A DIALOGUE

ward word sizes divisible by eight. (There is certainly no likelihood of a strong trend toward sizes divisible by seven.) Moreover, opportunity is left for a doubling of the size of the character set without in the meantime being unduly wasteful of storage space.

Ibmo: You are quite right that the 8-bit unit does seem to be in the ascendency, but one can never be sure that some presently obscure merit may not someday be detected in the 7-bit unit.

Octo: A chance that LLL must necessarily take.

Aplo: Although I have no quarrel with the 8-bit byte, I do find the choice of ASCII unsettling. I have become quite fond of A Programming Language, new and marvelous, which employs many unusual symbols requiring a special keyboard and special printers. I should think that the character set of this language would have been selected.

Useo: If such had been done, then I would protest. The ASCII set seems to be made up (with one or two curious exceptions) of those characters in widest use and surely must be satisfactory to a much larger group than is the set you describe.

Aplo: It may be that the great mass of users cannot appreciate the virtues of this new language and will insist on continuing in their conservative ways. If this be so, I urge that a second standard be provided for those of my persuasion.

Octo: But, Aplo, it would be quite expensive to supply a second network of terminals and printers; moreover, confusion and inconvenience would certainly be issues. Could not your language express the same concepts and operations that it does now with more conventional symbols? I know, for example, that it does not use certain common mathematical notations which most programmers and scientists find quite adequate. I see no reason for choosing strange characters when so many ordinary ones are available.

Aplo: This distinction between concepts and the symbols for them is not easily made by most people. If the designers of this new language chose unusual symbols, I, for one, say that those symbols must be accepted.

Useo: I fear, Octo, that persons holding Aplo's views are not easily swayed. Would it not be easier to use the eighth bit and expand to a 256-character set that includes the characters desired by Aplo? Such a set could also include Greek letters and other symbols for which many would find use. It might even be proposed as a national standard.

ASCII Plus One:

The characters in the preceding fanciful dialogue are purely fictitious, but any resemblance to real people, living or dead, is absolutely intentional. The Octopus network, of course, is real. It connects most of LLL's computing resources. The processing facilities include four CDC 7600's, one CDC 6600, and numerous smaller machines; the storage facilities include a 10^{12}-bit IBM Photodigital Store, an IBM Data Cell, and many discs; the I/O facilities include over 600 interactive terminals and over 100 television monitors, film output, and printing capacity exceeding 30,000 lpm. [1] Since textual information originated by or input into one part of the network may be stored, processed, and output by other parts of the network, the need for a standard is clear.

The standard chosen is ASCII. [2] (See Table 1, left half.) It is preferred over its rivals for two reasons. First, it is the national standard, so designated by the federal government and by agreement among computer equipment manufacturers. Second, it exhibits several points of superior design; for example, the letters are sequential and contiguous, which speeds up the sorting, selecting, and processing of alphabetic material. ASCII is universal throughout Octopus. The system does not intend to forever bear the inefficiency and confusion that would result if it used one code for transmission and another for storage and processing (an approach which, oddly enough, is strongly advocated by one major vendor).

Each of the 128 characters in ASCII is coded into a 7-bit byte. The Octopus standard, however, embeds each coded character into an 8-bit byte. This decision, which is based upon the belief that the current trend in computer design toward word sizes divisible by eight will continue, is in spite of the fact that no major computer in the network (until the first CDC Star 100 arrives later this year) can conveniently handle 8-bit bytes.

The universality of the standard throughout Octopus is, of course, a long-term goal, and not a present fact. Equipment purchased or designed before the adoption of the standard often employs 6- or 7-bit bytes and sometimes is not even based on ASCII. Such equipment is served by software conversion and, when it becomes obsolete, will be replaced by equipment adhering to the standard.

When contemplating a set of 128 characters coded into 8-bit bytes, the possibility of doubling the size of the set to 256 characters quickly comes to mind. At LLL, several considerations suggested that the possibility become a reality. First, the 95 graphic characters (i.e., characters which can be printed or displayed) available in typical 7-bit codes such as ASCII (space being viewed as a graphic) are insufficient to include all the symbols that are likely to occur in scientific and mathematical output. Examples are the Greek letters, certain mathematical operations and relations (such as integration and inequality), logical connectives, and arrows. Similarly, the set does not include all the special symbols of certain useful programming languages, such as ALGOL and (most notably) APL. Finally, the 33 control characters of ASCII do not include certain controls that are necessary or desirable for the operation of advanced interactive terminals. There are no controls, for example, for moving a cursor on a display in all four directions.

A larger character set is not the only solution to these problems. By using the code extension facilities of ASCII discussed below one can represent new graphics and new controls literally without limit. However, code extension protocol is complex, awkward for

a person typing at a keyboard, and requires more than one byte to represent a nonstandard character. Special interactive terminals and output facilities could be introduced into the network for the benefit of those using languages such as APL that employ highly nonstandard character sets. Some measure of additional expense, confusion, and (since the required terminal or output device is less likely to be nearby) inconvenience would accompany such a decision. Some of the more obscure ASCII controls (e.g., SUB) or those not needed in certain contexts (e.g., the communication controls) could be utilized for purposes other than originally intended.

LLL's Eight-bit Code

The general structure of the code table is based upon the intentions of the American National Standards Institute (ANSI), the body responsible for maintaining ASCII, in regard to 8-bit codes. The left half of the table is (with one exception) the same as 7-bit ASCII. Each of the two halves consists of two columns of controls followed by six columns of graphics. The character *delete* (DEL) is a source of difficulty: in 7-bit ASCII it is coded as 7/15 (that is, it is in column 7, row 15 of the code table), while in the LLL set it is coded as 15/15. In either case, it is the all-ones character (coded entirely as binary ones). It must have this coding in order to fulfill its intended purpose of anti-erasing (converting to binary ones) erroneous characters in certain media such as paper tape that cannot be erased (converted back to binary zeroes). In fact, the need for anti-erasure is the only reason for having a control in other than the first two columns of each half-table.

However, a case can be made for placing *delete* at 07/15 in the 8-bit table. By so doing, the 7-bit table and the left half of the 8-bit table are identical without exception. The thinking on this issue has gone through many stages in ANSI committees; at times, it was even thought that the character should be coded both ways. When the LLL set was adopted, the 15/15 placement was generally favored. Since then, ANSI opinion has swung toward the 07/15 placement. The expert opinion at LLL still favors 15/15, because the character seems rather superfluous if it cannot be used for anti-erasure.

A further conflict with ANSI thinking involves the character at 10/0 as well as *delete*. This conflict arises from ANSI code extension doctrine. [3] Seven-bit ASCII provides for the representation of graphics and controls other than those explicitly part of the set. In particular, any character of an 8-bit set should be representable within the 7-bit set. The fundamental mechanism is the *escape sequence*. The control character *escape* (ESC, 1/11), followed by any number of characters from column 2 (called *intermediates*) and then by a character from column 3 through 7 (called a *final*) except for the controversial 7/15, is interpreted as a single new character, usually a control. Escape sequences can be used for a wide variety of control functions. Of interest here are the two-character escape sequences (i.e., with no intermediates) consisting of *escape* followed by a single character from column 4 or 5. Such sequences are intended to represent within the 7-bit code the same control characters as appear in columns 08 and 09 of an 8-bit code. For example, ESC followed by G is the same as MRK.

Code extension for graphics is performed primarily with the use of the two control characters *shift out* (SO, 0/14) and *shift in* (SI, 0/15). These characters select between two modes. In shift-in mode the graphic characters from columns 2 through 7 of a 7-bit set represent the corresponding characters of columns 02 through 07 of an 8-bit set; that is, they represent themselves. In shift-out mode these same characters represent the corresponding characters from columns 10 through 15 of an 8-bit set. For example, in shift-in mode, the 7-bit code for D represents D, while in shift-out mode, it represents delta (Δ). However, *shift out* and *shift in* of course are not intended to affect the interpretation of *delete* (7/15). Neither do they affect the interpretation of *space* (2/0); *space* is used so frequently that it should be available in either mode and is therefore shift-insensitive.

		Left Half (7-bit code)								Right Half							
Row	Column / Octal Code	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
		000	020	040	060	100	120	140	160	200	220	240	260	300	320	340	360
0	00	NUL	DLE	SP	0	@	P	`	p	CD	PC	□	∞	∮	└	°	ρ
1	01	SOH	DC1	!	1	A	Q	a	q	ED	GP1	|	⊖	∀	∏	α	π
2	02	STX	DC2	"	2	B	R	b	r	DD	GP2	‖	⊕	Ð	◊	β	∫
3	03	ETX	DC3	#	3	C	S	c	s	ALT	GP3	£	⊗	Γ	Σ	γ	σ
4	04	EOT	DC4	$	4	D	T	d	t	CUR	GP4	¤	⇐	Δ	⊤	δ	τ
5	05	ENQ	NAK	%	5	E	U	e	u	SCR	SBS	¶	⇑	∃	Υ	ϵ	υ
6	06	ACK	SYN	&	6	F	V	f	v	PAG	ADS	¢	⇒	Φ	∇	φ	∂
7	07	BEL	ETB	'	7	G	W	g	w	MRK	SPS	†	⇓	Θ	Ω	θ	ω
8	10	BS	CAN	(	8	H	X	h	x	HC	ERC	⊂	∩	⇙	⊣	η	χ
9	11	HT	EM	)	9	I	Y	i	y	HS	ERL	⊃	∪	⇘	Ψ	ι	ψ
10	12	LF	SUB	*	:	J	Z	j	z	VC	CLR	×	∧	⇔	⇇	ξ	ζ
11	13	VT	ESC	+	;	K	[	k	{	VS	ML	±	∨	⊢	←	κ	⟨
12	14	FF	FS	,	<	L	\	l	¦	HON	MU	≈	≥	∧	↑	λ	⊥
13	15	CR	GS	-	=	M	]	m	}	HOF	MR	—	≠	⌟	→	μ	⟩
14	16	SO	RS	.	>	N	^	n	~	ESO	HOM	•	≤	¬	¯	ν	¯
15	17	SI	US	/	?	O	_	o	≡	ESI	MD	÷	√	⌐	↓	ο	DEL

{DEL relocated in 7-bit code}

Table 1. Lawrence Livermore Laboratory's choice for an eight-bit code to be used for data storage and data transmission.

However, so doing precludes standard use of the control, which may become desirable at a later time, and also creates confusion. Therefore, expanding the character set seems the best way to provide additional graphics and controls. Moreover, having the larger character set does not prevent the use of the techniques just mentioned where circumstances dictate.

The LLL 8-bit code is shown in Table 1. The coded values increase sequentially down a column, but increase in steps of sixteen from left to right. The 65 characters in columns 00, 01, 08, and 09 and at the bottom of column 15 are control characters, each identified by a two- or three-character mnemonic. These mnemonics are further described in Table 2. The remaining 191 characters are graphic characters and are intended to be printed or displayed. (The graphic character *space*, which is entirely blank, is identified by the mnemonic SP).

The reader may justifiably wonder at this point whether code extension has to be this complex. Apparently it must, because no one has yet devised a simpler, yet adequate, scheme. Further aspects of the doctrine are even more complex: they provide, for example, for the definition and invocation of thousands of alternative sets of graphics for either half of the code table, thus permitting ASCII to embrace all the national character sets of our planet, including those appropriate to languages such as Japanese and Chinese which use thousands of characters. However, such ramifications are not discussed here. Instead, we are concerned with the fact that the code extension doctrine provides no way within the 7-bit code to represent the characters at 07/15 and 10/0 of the LLL 8-bit set.

Disagreeing with ANSI

Current ANSI thinking tends toward solving this problem by ignoring it, in effect decreeing that an 8-bit set should contain only 94 (rather than 96) graphics in addition to those of the 7-bit set. No standard provision is made for representing the other two characters within the 7-bit set by code extension. The LLL view is that wasting two code positions is unconscionable. Furthermore, so doing constitutes an open and probably irresistible invitation to nonstandard behavior. Our proposal is that the two characters be represented in a 7-bit code by the two-character escape sequence, ESC followed by 6/0; this sequence would in shift-in mode represent the graphic at 07/15 and in shift-out mode, the graphic at 10/0. Such an approach constitutes only a marginal increment in the complexity of the code extension algorithm, which is already quite complex, and makes an 8-bit set fully representable within the 7-bit set.

Apart from these minor (although lengthy to explain) differences with present ANSI opinion, the LLL set may be viewed as *an* (not *the*) ANSI standard 8-bit character set. Current ANSI thinking lies in the direction of registering many character sets, each designed for a particular community of interest, and not to have a single 8-bit standard. The LLL set was designed with the intent of satisfying as broad a community of interest as possible, with the constraint that that community include LLL.

The new LLL graphic characters were culled from lists compiled by ANSI. [4] In addition to those needed for scientific, mathematical, and programming purposes, the set includes certain characters of commercial interest such as Pound Sterling, characters that resolve ambiguities intentionally included in the 7-bit set such as unbroken vertical, and a complete set of plotting symbols (horizontal line, vertical line, crossover, corners, and tee-shaped edges for outlining tabular data). After selecting 96 new graphics, it seems that, except for highly specialized applications, the bottom of the barrel has been scraped. Where possible, the characters were placed in the table so that characters in corresponding positions in the two halves have some similarity of appearance or purpose. To take just one example, where lower case Greek and Roman letters share the same upper case form, they

Control Characters

Code	Mnemonic	Name	Code	Mnemonic	Name
00/0	NUL	null	08/0	CD	command delimiter
1	SOH	start of heading	1	ED	edit delimiter
2	STX	start of text	2	DD	display delimiter
3	ETX	end of text	3	A_T	alternate
4	EOT	end of transmission	4	CUR	cursor
5	ENQ	enquiry	5	SCR	scroll
6	ACK	acknowledge	6	PAG	page
7	BEL	bell	7	MRK	mark
8	BS	backspace	8	HC	horizontal clear tab
9	HT	horizontal tab	9	HS	horizontal set tab
10	LF	line feed	10	VC	vertical clear tab
11	VT	vertical tab	11	VS	vertical set tab
12	FF	form feed	12	HON	highlight on
13	CR	carriage return	13	HOF	highlight off
14	SO	shift out	14	ESO	extended shift out
15	SI	shift in	15	ESI	extended shift in

Code	Mnemonic	Name	Code	Mnemonic	Name
01/0	DLE	data link escape	09/0	PC	parameterized control
1	DC1	device control one	1	GP1	general purpose one
2	DC2	device control two	2	GP2	general purpose two
3	DC3	device control three	3	GP3	general purpose three
4	DC4	device control four	4	GP4	general purpose four
5	NAK	negative acknowledge	5	SBS	subscript
6	SYN	synchronous idle	6	ADS	adscript
7	ETB	end of transmission block	7	SPS	superscript
8	CAN	cancel	8	ERC	erase character
9	EM	end of medium	9	ERL	erase line
10	SUB	substitute	10	CLR	clear
11	ESC	escape	11	ML	move left
12	FS	file separator	12	MU	move up
13	GS	group separator	13	MR	move right
14	RS	record separator	14	HOM	home
15	US	unit separator	15	MD	move down
			15/15	DEL	delete

Table 2. ASCII has only 33 control characters. The LLL set has 61, including new controls desirable for operating interactive terminals.

are similarly placed in the two halves of the table.

The new control characters were selected from ANSI-compiled lists [5] primarily with a view toward the interactive use of a computer-driven display, particularly for editing text. However, the definitions have been purposely kept somewhat loose, even ambiguous, to assure their utility in a variety of situations, but not so loose that it is not clear which control should be used for a given purpose in a particular situation. Again, an attempt was made toward a similarity of purpose between corresponding characters in the two halves of the table.

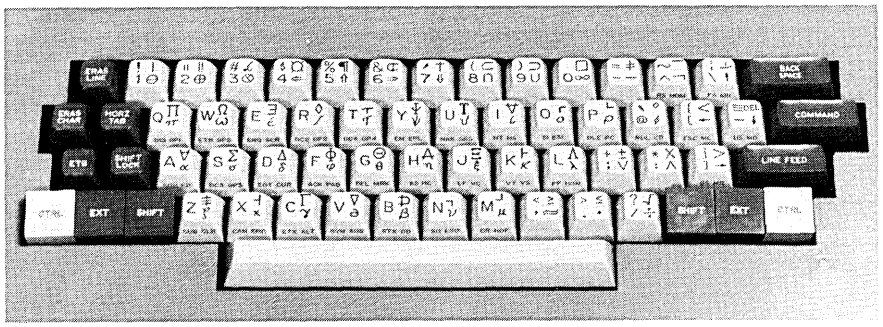


Fig. 1. An eight-bit code makes a 256-character set possible, but a keyboard for that many characters is intimidating.

Control characters

Some selections of controls may be worthy of comment. Many argue that move cursor controls should not be encoded into a character set since they are purely local to a terminal and are neither transmitted nor stored. This is a narrow view and applies only to certain interactive terminal systems. All interactive terminals on the LLL Octopus network, for example, operate in full-duplex mode. Every character typed at a keyboard is transmitted to a minicomputer concentrator which interprets the character and then sends an appropriate character or sequence of characters back to the terminal; of course, in many cases the character sent back is the same as the one received.

At first glance it might seem that some controls have identical functions; for example, *move left* (ML) and *backspace* (BS). This is not so. Characters such as *backspace* and *linefeed* (LF), collectively called *format effectors*, are intended to be included in stored text (which usually contains mostly graphic characters) in order to indicate how the text will be laid out on a display or printed page. Move controls are not so used. A person editing text at an interactive terminal types a *backspace* to make an alteration to the displayed text; he is indicating an impending overstrike. If he types a *move left* he is merely moving the selected cursor position left in order to carry out further editing (insertion, replacement, or deletion) at a new site in the text. Similarly, *linefeed* signals the beginning of a new line of text and *space* the insertion of a blank character, while *move down* (MD) and *move right* (MR) do not.

The LLL set assumes that during editing a typed graphic character is normally an insertion, rather than a replacement. Replacement can then be effected by an insertion combined with an *erase character* (ERC). Therefore, no special control is needed for character insertion.

Other characters of particular value for text editing at LLL include *command delimiter* (CD). This control indicates that the following graphic characters are not insertions but constitute a command to the editor that is too complex to be conveyed by a single control character, for example, a command involving the description of a pattern search. The character *mark* (MRK) is used after moving the cursor to call the attention of the editor to its new position. This is necessary if the cursor can be moved locally at the terminal without computer intervention, for example, with a joystick.

A 256-character keyboard

A final point concerns the problem of designing a keyboard for 256 characters. The LLL solution uses a standard keyboard for 128 characters, which has 48 typing keys, shift keys, and control keys. The 95 graphics of the 7-bit set and *delete* are generated by the 48 typing keys used with or without a shift key. The other 32 controls of the 7-bit set are generated by 32 of the typing keys used with a control key. (For convenience, *space* may also be generated with a space bar, and the most useful controls may also be generated with special "outboard" keys.)

To this keyboard is added a new key called the *extend* key (see Fig. 1). Depressing this key asserts the high-order code bit. The control, extend, and shift keys are arranged in a row with extend in the middle so that one finger may depress any one of the keys, or depress the extend key simultaneously with either one of the other two. The 191 graphics of the 8-bit set and *delete* may now be generated by the 48 typing keys used with neither, either, or both of the shift and extend keys. The other 64 controls of the 8-bit set may be generated by 32 of the typing keys used with the control key and with or without the extend key. Each typing key is marked on its top with four graphic characters (or DEL) and perhaps on its front with the mnemonics of two controls. Whether a person can use such a keyboard without going mad is not yet clear. □

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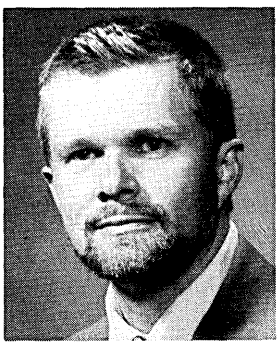


As the leader of the external systems group of the Lawrence Livermore Laboratory Computer Systems Div., Dr. Fletcher is responsible for designing and implementing all software for the Octopus computer network except for that used on the major time-shared mainframes. He is also a former member of the ANSI X3L2 committee.

Four technical parameters can be used to measure modems. Taking the time to learn about them pays off both in line reliability and dollars.

EVALUATING MODEMS

by Robert O. Ritchie

In December 1971 Los Angeles County's Data Processing Department began a program of replacing 2400bps telephone company modems with independently supplied modems. Before beginning the switch, we evaluated several brands of modems. Now that we have some operating experience, we know that our choice, and our evaluation procedures, were right.

The decision to make the move was the result of a fairly intensive economic study. One primary consideration was the raw monthly cost difference between telephone company modems and independently supplied modems. Another was the cost of lost operating time as a result of data circuit and modem outages. Only estimated costs could be applied to some factors because of their random occurrence and the varying amount of time lost.

Service from the telephone company was generally within their four-hour objective for repair and return to service, but for the County's critical online systems, like the Sheriffs Dept., the municipal courts, and the hospitals, this was considerably less than adequate. The goal of the County was to restore 98% of the data communication service in less than two hours after a trouble call was received. To do this required County employed technicians.

County technicians could also provide specialized services unobtainable from the telephone company. These include setting up both data circuit and digital (RS232) patch panels at various computer centers, installing special equipment not otherwise available, and putting tighter control over the inevitable finger pointing that goes on

Minimal Considerations for Evaluating Modems

For those users who have a small system or can't economically justify the tests that were made in this evaluation of modems, the following suggestions are offered:

1. Carefully and completely go through all the modem specification sheets *objectively*. If a vendor that is being considered doesn't publish a Bit Error Rate vs. Signal-to-Noise-Ratio, ask for it. If the vendor declines to furnish this information, scratch him from the evaluation list. To be sure, BER vs. SNR is not the only means to determine the worth of a modem. But it *is* a good figure of merit to use in evaluating the engineering philosophy of the manufacturer. Remember, a low BER at a low SNR is the objective.
2. A popular buzzword today is LSI (Large-Scale Integration). LSI offers many advantages. Most of them relate to manufacturing costs. Consequently, the original purchase price of an LSI modem may be somewhat lower than one that uses "last year's technology." A word of caution here. Check on the replacement cost of the LSI module before signing the purchase order, because if any *one* part of the LSI module fails, the entire unit must be replaced.
3. Make a list of features considered mandatory for the system being examined. Then, and only then, add the features that will be "nice to have." For example, several modems have means to remotely control both analog and digital loopback. This feature provides a means to quickly identify if the source of the problem being investigated is in the data communications and/or modem link, or the computer.
4. Thoroughly investigate the maintenance and service policies of each vendor under consideration. Third-party service contracts are sometimes less than adequate.
5. Get a list of local users of the modems under consideration from each vendor and contact them. This isn't the best way to check the vendor's *dis*satisfied customers, but it will provide some idea of his customer base.
6. There is reliable evidence that some verbal claims made by salesmen are not gospel truth. If he can't, or won't back up those claims with documentary evidence from the company he represents, beware.
7. If it's at all possible, check the selection of modems on those data circuits that give the most trouble, and allow the modems to operate at least a day in order to get some feedback on the number of errors made by each different modem.

One added suggestion. Without someone available that has his finger on the pulse of the modem industry, and an inside pipeline to the modem manufacturer's engineering staffs, don't rely completely on the results of a modem evaluation made in May as the basis for a purchase made in November. A review of the evaluation will usually be necessary to point out any major changes.

between the computer vendor, the terminal vendor, and the telephone company. Problems could be more easily pinpointed by County technicians who could then establish whether a problem was on the machine side or the communications side of the digital interface.

Results of the primary economic surveys showed that one data technician could be supported for each 40 modems (2400 bps), based on the raw cost difference between renting phone company modems and leasing from an independent supplier. This included a $20,000 outlay to equip a small laboratory with the tools and instruments needed to check out both modems and data circuits. These figures were all based on a three-year lease-purchase plan. Although the expected life of a modem is in excess of seven years, the shorter three-year period was used because of the technical uncertainty in the dynamically changing data communications field.

Our program has been, and is continuing to be, successful because both economic and technical aspects were taken into consideration.

The technical evaluation

The technical evaluation of the various 2400bps modems was the most challenging and the most rewarding phase of the project. The challenge was how to pick a properly designed modem that would overcome the multitude of limitations placed upon it by the transmission medium at a low enough price. The reward was the satisfaction of knowing the evaluation procedure resulted in both a technically and economically successful program.

Evaluating a modem isn't as simple as going over its specifications—on paper—and eliminating those that don't perform—on paper. The problem is what the specification sheets do not say! As an example, an ad for a modem may state, "Will work over unconditioned lines." What kind of unconditioned lines? Fifty feet of solid copper conductors? Five thousand miles of barbed wire?

What the ad forgot to spell out was the bit error rate, how many errors could be expected per million bits transmitted and received under certain specified conditions.

There was one objective way to separate facts from advertising claims. That was to actually conduct tests on modems from several different manufacturers under laboratory controlled conditions.

First, it had to be determined what the telephone company parameters are for their transmission medium. Then, which of these characteristics would affect 2400bps phase modulated modems the most, and finally, which of these could be easily duplicated under laboratory controlled conditions using instruments that would be used in day-to-day troubleshooting.

We used line specifications listed under FCC Interstate Tariff 260 as our standard for the transmission medium. Newly installed data circuits don't always meet either Tariff 260 or design objectives. *If* the common carrier can be shown it isn't meeting the tariffs, it will make every effort to do so; that is, *if* it can be shown *specifically where* it is not meeting them. This applies whether or not the customer is using Bell modems. County data technicians, using the same equipment as telephone company technicians, could point out whatever specific deficiencies existed.

There are 12 characteristics that affect data transmission (loss, loss frequency characteristic, return loss and echo, steady noise, impulse noise, envelope delay-frequency characteristic, frequency translation, phase jitter, phase hits, gain hits, dropouts, and non-linear distortion). Of these, four vitally affect the operation of a phase-modulated modem, and can also be easily simulated in a small laboratory with equipment used for everyday data circuit and modem troubleshooting:

Loss: This is sometimes called Insertion Loss or Attenuation Loss; both mean the same thing. The Bell System uses a 16dBm attenuation loss as standard under Interstate Tariff 260. This loss can vary by 4dB.

Loss-Frequency Characteristic: This is also known as Amplitude Distortion, Amplitude Response, and Frequency Response. Under C1, C2, and C4 conditioning, the loss characteristics get tighter and tighter. It will be well to bear in mind that the + and — dB figures are relative to loss; that is, a —3dB means there is less loss or more gain.

Steady Noise: This characteristic is more commonly known as Message Circuit Noise. Message Circuit Noise is the result of transmitting the wide band noise through a particular type of filter when measuring the noise. Tariff 260 does not mention noise. However, AT&T lists its administrative objective as follows:

Receive Signal — 16dBm or 74 dBrnC*

Allowable Noise—40dBm or 50 dBrnC

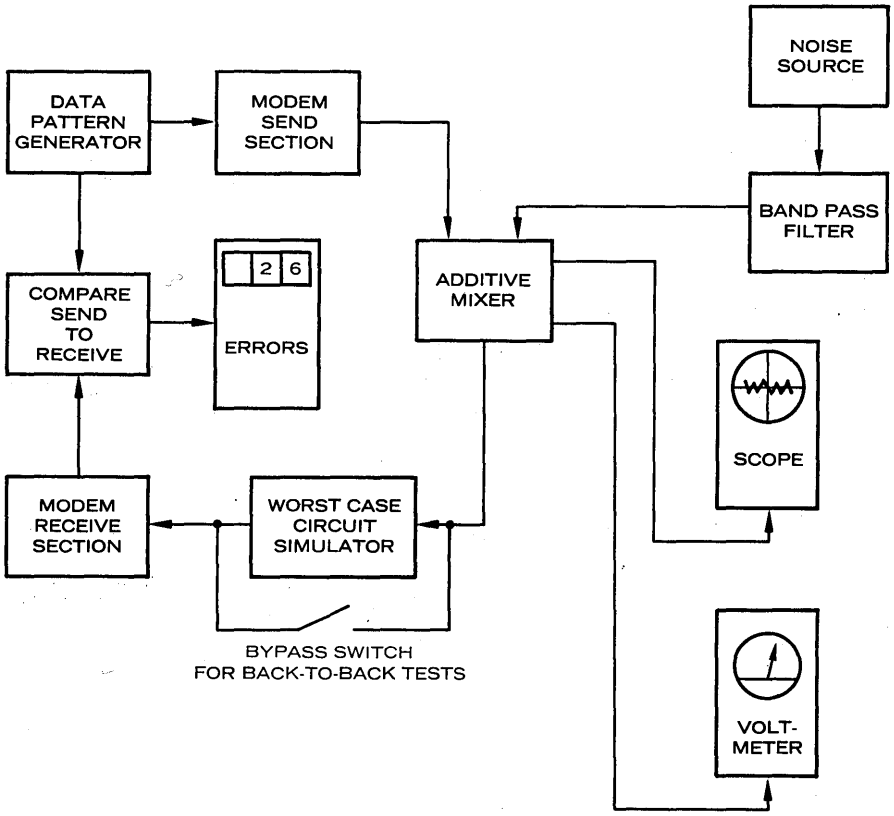


Fig. 1. This test setup was used to determine operating characteristics under various signal-to-noise conditions.

*Reference message circuit noise with a C filter is defined as zero at — 90 dBm and is labeled dBrnC.

Signal-to-noise ratio 24dB

Signal-to-noise ratio is a very important parameter in determining how well a modem operates. Noise can be easily generated in the laboratory and the filter used for C-Message Noise can be obtained as well.

Envelope Delay—Frequency Characteristic: This one is not under Tariff 260 for unconditioned data circuits but is tariffed for C-conditioning. Bell 201 series modems and the modems used by Los Angeles County are all synchronous phase-modulated 2400bps modems. This type of modulation-demodulation scheme is fairly sensitive to envelope delay distortion. The means of simulating a worst case type 3002 private line circuit is somewhat complex but there are companies that make such a device. The County bought one of these simulators to use in the tests.

In addition to testing each modem through the worst case 3002 circuit simulator, it was decided to run back-to-back tests as well. The back-to-back tests, made with a pair of modems directly connected, would show whether the County test setup agreed with other published data and also provide some insight into the design philosophy that went into each manufacturer's amplitude and phase delay equalizing schemes.

Because many of the County's 2400bps networks are polled systems, it was also decided to add a polling test. This test was to be made with and without the 3002 circuit simulator. (A 3dB bandwidth of 2700Hz, between 300Hz and 3000Hz, was used. Slope was 18dB per octave.)

In all cases, bandwidth limited noise was mixed with the data signal to provide a realistic evaluation and shorten the time required to make the required tests. Fig. 1 (page 49) is a block diagram of the test setup.

Nine modem vendors whose specifications on paper were the most thorough, and whose engineering background and production facilities seemed adequate, were chosen to participate in the test. Eight of those contacted supplied the County with two modems each. Neither of the modems from one company worked on arrival so they were not included in the test. One of the vendors makes an exact functional copy (from Western Electric schematics) of the Bell 201B. The 201B model was used as a benchmark for the others. The red curves on the Bit Error Rate (BER) vs. Signal-to-Noise Ratio (SNR) shown on Figs. 2 and 3 indicate the Bell 201B copy.

The sample size

The risks of using such a small sample to determine the characteristics of the entire modem population were minimized by the following:

1. Each vendor was asked to randomly select two modems from standard production units. This placed an ethical obligation on the vendor and considerable faith was assumed on the part of the County.
2. Many preliminary investigations were made of the available vendors. Only those who were capable of what we considered both technical superiority and economical stability were selected.
3. If the operational characteristics of each modem tested correlated with-

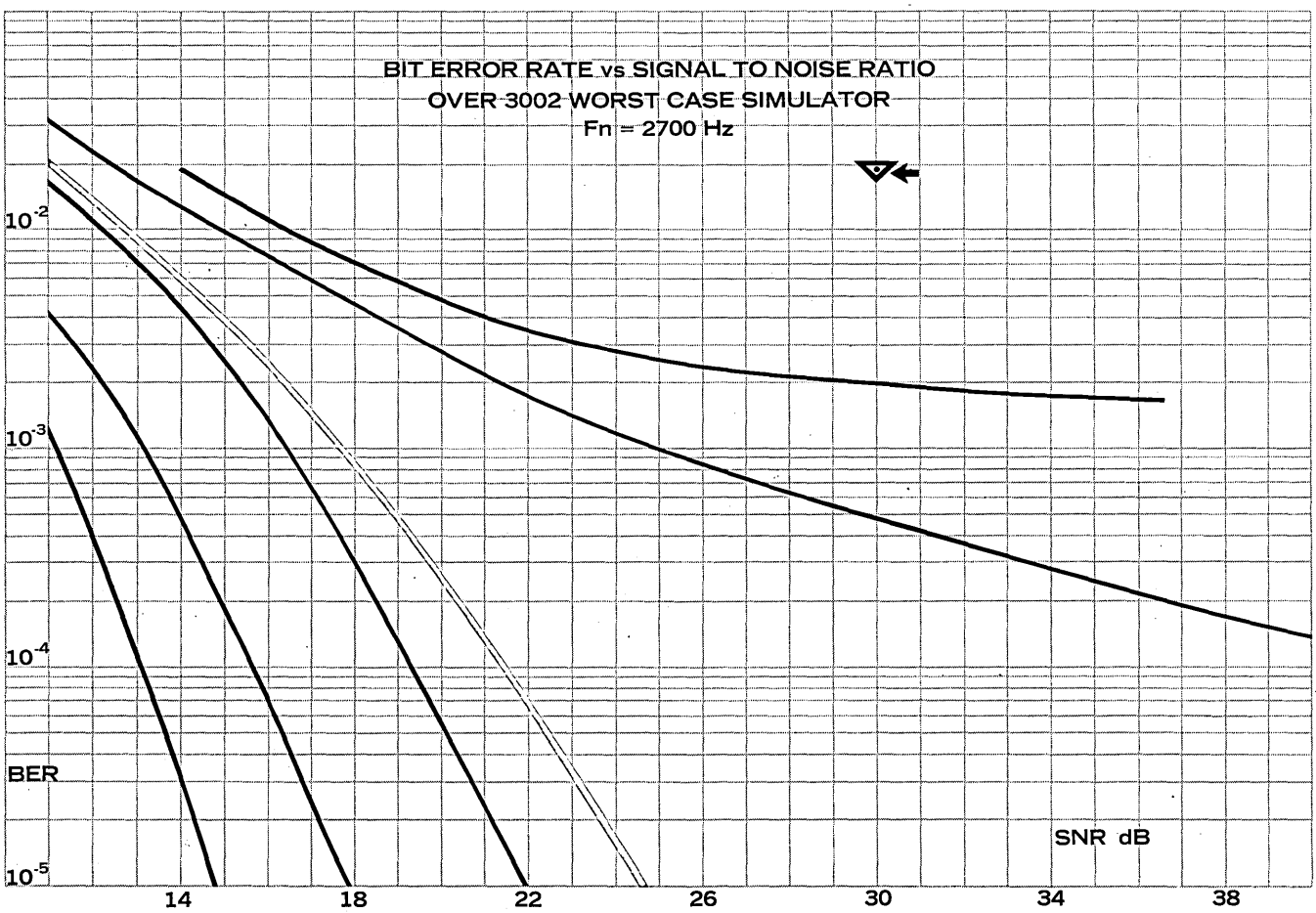


Fig. 2. Tests conducted with the worst case line simulator separated the modems by how well their line equalizers worked. The best curve is on the left. The Bell 201B equivalent is the fourth from the left.

in 2% of the other, then it was assumed the vendor's quality control was adequate. If they did not, then additional test modems were requested.

The last criterion eliminated one vendor when two additional units were tested and found to be radically different from the original two modems.

Tests were first conducted with the worst case 3002 circuit simulator in the circuit, see Fig. 2. This test separated the equalizer design philosophies, capabilities, and claims of the various modem vendors. The curve on the extreme left of Fig. 2 is the modem that outperformed all the others. The 201B equivalent is the fourth curve from the left (line in color).

Now note there are two curves and a triangle with an arrow pointing to it shown to the right of the 201B curve. If these modems had been placed in service over a worst case 3002 channel, the error rate would have been so high as to make them unusable. And they were advertised to be 201B compatible.

The position of the triangle indicates this modem made about two errors for every 100 bits transmitted at a 30dB SNR. As 30dB SNR is 6dB greater than the objective of the common carriers, no further tests were made on this modem.

The next curve below the triangle on Fig. 2 shows the performance of this modem was so poor that no further tests were run on it either.

Back-to-back curves were run on the modem whose curve appears just to the right of the 201B copy as it was difficult to believe this well-known manufacturer would design a poorly operating modem. The back-to-back curves (Fig. 3) confirmed the basic design was okay. What happened was their engineers had designed the equalizer sections using the mean values obtained from a Bell technical reference. This design decision did not compensate for worst case conditions. As this modem was in the upper price bracket, no further tests were made.

Three modems from another manufacturer were run through the tests because the results from the first two were drastically different from each other. The third modem was different from the other two! It was decided not to take a chance on committing the County to put 40 or more of them in service. The salesman finally admitted the units he had furnished were production engineering models and he couldn't deliver the 40 units when they were needed anyway. In a conversation with the salesman about six months later he said he thought most of the bugs had been worked out. This modem didn't really reach the general marketplace for almost two years!

This left only five modems for the remainder of the tests. Fig. 3 shows the results obtained from the back-to-back tests. The center curve (in color) is the 201B equal.

The curves generally follow the vendors' published specifications. The same modem that performed best over the worst case 3002 circuit simulator showed the best results in this test as well.

The horizontal or X-axis is the SNR in dB. The vertical or Y-axis is the BER. BER is expressed in errors per bit which may seem a bit awkward but it's the usual plot that is used.

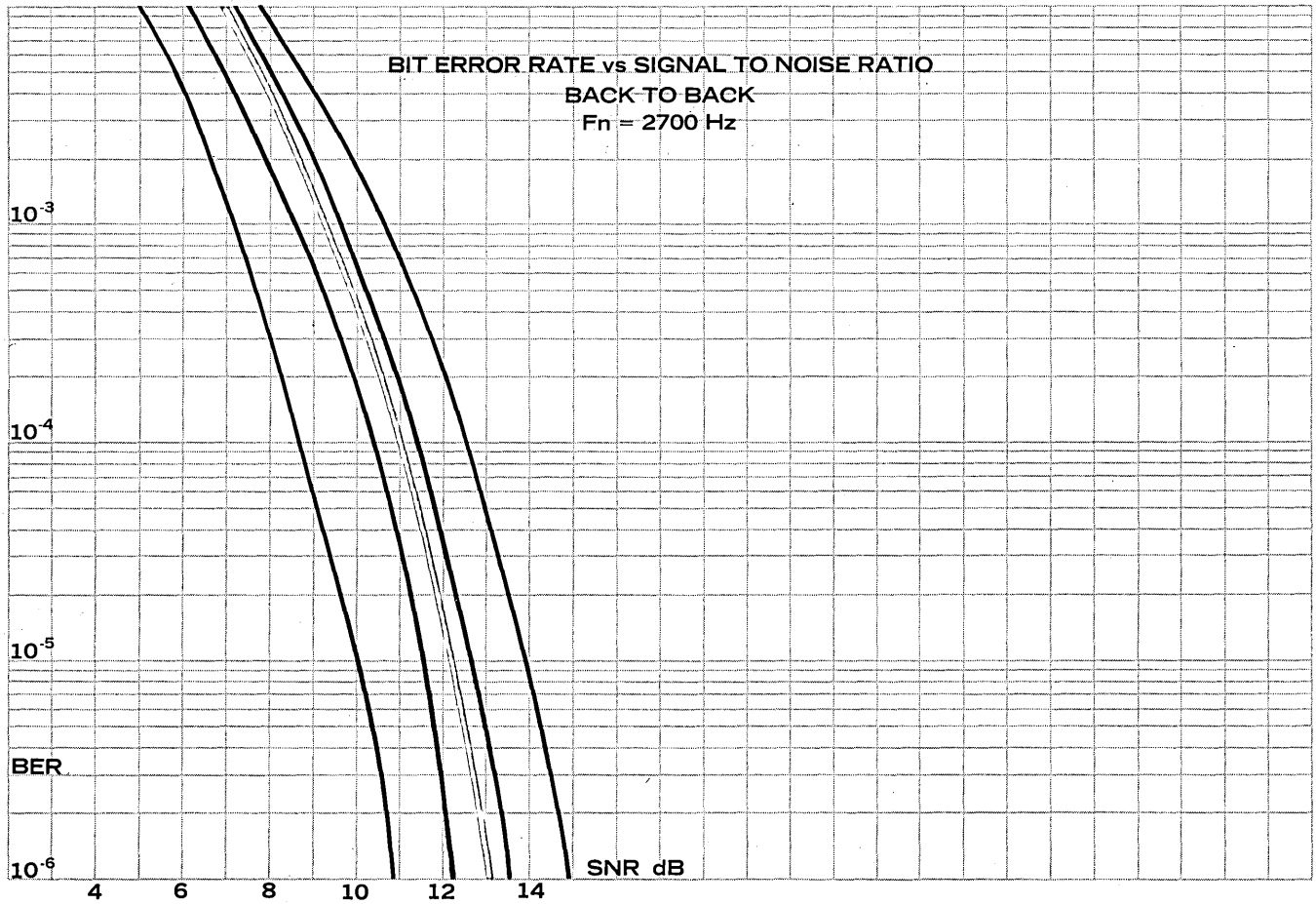


Fig. 3. The five brands of modems not eliminated by previous tests were then run in pairs, back-to-back. Although the curves look fairly close, the 201B modem, the middle line, is shown to make 40 times as many errors as the modem represented by the curve on the far left, when operating at a 12dB signal-to-noise ratio.

EVALUATING MODEMS

At first glance the spacing between the curves in the back-to-back tests, Fig. 3, indicates little difference between the five modems. But the difference in actual modem performance is considerable. At a SNR of 10dB the modem whose curve is on the extreme right had 200 more errors for a given amount of time than the modem whose curve is on the extreme left.

As an example, observe the leftmost curve. Take the same SNR of 10dB. Follow that line up vertically until it crosses the horizontal line marked 10^{-5}. Now 10^{-5} means this modem made one error while transmitting 100,000 bits; about one error every 40 seconds. Now go up the same SNR of 10 until it crosses the center (red) curve. This point indicates the 201B equivalent made four errors while transmitting only 10,000 bits, or one error while transmitting 2500 bits; 40 times as many errors as the first curve on the left. Transmitting at 2400bps, this would amount to one error about every second. Not a very acceptable error rate. And the worst performing modem, the curve at the far right, at the same SNR made two errors for every 1,000 bits transmitted, or almost five errors per second. A totally unacceptable error rate.

Of course a steady state SNR of 10 on a good data circuit is fairly rare but noise bursts are fairly common. The modem that operates with the lowest SNR will make the least number of errors when a burst of high energy noise hits the circuit.

The polling test

This test shows up any problems that software might tend to cover up. Most computers poll a remote terminal several times before reply errors cause a time-out, and then they go to the next remote terminal. It is highly desirable to have a modem answer the first polled inquiry without an error. The lost time appears to be small but if several tries by the computer are made in polling each terminal before a valid reply is received, or the computer times-out and goes to the next terminal, the entire system begins to slow down. Not much for each terminal, but seconds soon count up to minutes for even a medium-size polled system.

Fig. 4 shows a schematic and timing chart of a polled system. Note that it is a four-wire configuration. The central site transmitter polls each remote site (R1, R2, etc.) in turn, and acts as the "master." The remotes are "slaves." The sequence of events shows that R1 raises RTS (Ready To Send). CTS (Clear To Send) comes back in 8.5 msec and R1 then begins to send data. The central site modem detects that a signal is coming from R1 and, after a delay for synchronizing its clock and a delay to propagate the signal through the modem, turns on Carrier On (Carrier Detect). Any time after Carrier Detect comes up, the central site will accept data. If the central site doesn't receive a valid answer character, it will repeat the poll to the same remote. The number of times the central computer polls a particular remote site without receiving a valid character response and times-out is a function of the particular system's software. In the County's polled systems, the central site polls a remote nine times in about 1.2 sec. If a valid response is not received by the central site within this

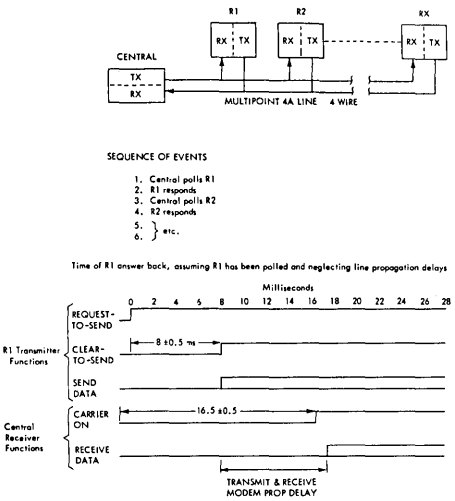


Fig. 4. Many of the Los Angeles County modems had to operate in a polled environment. This plot shows the timing sequence of a polled four-wire multipoint system. The remote site starts the sequence by raising Ready To Send signal. The central site master responds 8.5 msec later with a Clear To Send.

time, it will time-out and go on to poll the next remote site. In some cases, the computer will never poll R1 again unless the computer operator instructs the computer to do so from his console. Rather frustrating to the R1 operator who's trying to get in to the computer.

Of course failure of the polled modem, the poll*ee*, to synchronize with the modem doing the polling, the poll*er*, is only one of several reasons why a valid character isn't received by the central site. But eliminating just one source of error makes for a more reliable system.

Fig. 5, a photograph of an oscilloscope screen, shows a polling sequence. The upper trace is the modem Carrier Detect signal to the computer, saying in effect, "You can now receive valid data." The valid data being sent is the short trace at the center extreme right of the screen. But notice the faint trace just to the left and below the center cross marks. That's bad.

The bottom trace appears to be a solid line, but there should be a break directly below where the faint trace appears. This was due to exposure limitations of the film used. It took eight seconds for the exposure and the error was not continuous during this time.

In order to round out the evaluation, it was decided to make some amplitude and envelope delay curves of actual circuits. Results of these plots would supply information on how the modems should be strapped for actual use.

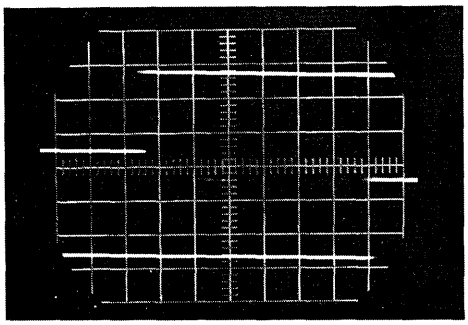


Fig. 5. An oscilloscope trace shows the polling sequence discussed in Fig. 4. The upper trace is the modem's Carrier Detect signal to the computer saying "you can now receive valid data." The valid data being sent is the short trace at the right center portion of the screen. The faint short trace just to the left below the center is a transmission error.

As a test circuit we used a four-wire unconditioned private line that runs between the West Los Angeles Municipal Court in Santa Monica to the Justice Computer Center in Downey, about a 40-mile run. The circuit end points are both in General Telephone & Electric territory with Pacific Telephone & Telegraph in the middle. But this line turned out to be well within C4 limits, though it is a so-called unconditioned circuit!

The final choice

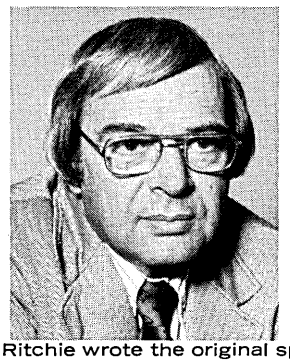
One of the many lessons learned from this series of tests was that it's almost impossible to make a good modem evaluation by putting various modems on a data circuit and trying them out, unless you know the exact characteristics of that particular circuit and how it relates to modem operation. All of the modems that were tested, even the poorest performer, would have worked okay on our "unconditioned" test circuit.

The modem chosen by the County was the one that operated best under all conditions. And it wasn't low bid either. The low bid modem was the one that had widely varying operating characteristics which would not have shown up if operated on our test circuit. It was also the one that didn't actually appear on the market until about two years later. The County's choice was the second lowest bid.

Almost three years later, those early modems are still operating with only an occasional part replacement. It looks as though they will continue to give good service for two to four more years. After December, 1974, the three-year leases will start to expire and the County will buy the modems for a nominal price. This will further cut operating overhead.

The original lease called for 40 modems with an option to obtain additional units under the same terms. Today, the County has about 120 of the 2400bps modems in service. In addition, there are about 20 4800bps modems. About 5% of these are kept as spares. Maintenance procedure is to replace a malfunctioning modem and repair it later in the lab. This procedure has enabled the County to reach its goal of restoring 98% of the data communication service from digital interface to digital interface in less than two hours after receipt of a trouble call. Three data technicians provide this service. Twenty-four hour response is handled through a rented radio paging service and at least one technician is on standby at all times.

Looking back, the time taken to conduct the tests has proven well spent, in terms of both line reliability and dollars. □



Mr. Ritchie wrote the original specifications and set up the test requirements for the Los Angeles County modem acquisition project while he was with the County's Data Processing Dept. He is currently a data communications engineer with the Dept. of Communications.

Simulation techniques and languages can be profitably used in designing, analyzing, and optimizing communications systems.

SIMULATING COMMUNICATIONS SYSTEMS

by Donald Ingerman

Simulation techniques and simulation language capabilities are extremely useful tools in the analysis of communications systems problems. They can be used throughout the analysis process from the determination of communications requirements through system design, operations analysis, and system optimization.

Though simulations are often associated with very large programs and gobs of computer time, this need not be the case. We can show through examples, without actually delving into the intricacies of the program designs, how simulation language programs of 100 to 200 statements have been used to solve complicated-sounding problems where there was no mathematical or linear relationship between the data being analyzed—problems which were not well-suited to math analysis.

Simulation can be accomplished in several ways depending on the nature of the problem:

- continuous
- discrete
- statistical

Continuous simulation techniques permit a digital computer to simulate the same types of problems that are solved on an analog computer, i.e., engineering problems with differential equations. The analysis of transient response in electronic circuitry is a typical application.

Problems that entail events such as sending messages or repairing equipment can be handled on a discrete or statistical basis. For a statistical analysis, it is necessary to formulate the problem mathematically and perform the appropriate math operations. Solutions can be reached analytically, or the statistical expression can be evaluated by means of Monte Carlo (simulation) techniques.

Discrete simulation entails formulating an event model that depicts the activities of the system to be analyzed; it is not necessary to formulate a mathematical model. A discrete simulator will use a combination of real system status data and Monte Carlo simulation at decision points. In a good discrete simulation, more decisions are made on the basis of system status than on Monte Carlo. This type of simulation offers more flexibility to develop a model that truly represents complex systems than do approaches requiring more rigorous mathematical formulations. The discrete model can be exercised to gain insight into a system's operations and to predict system performance under various constraints or operating conditions.

Although analysis of communications systems may utilize all three simulation techniques, experience has shown that discrete simulation can be used more effectively for the range of problems that face the communications manager. This series of illustrative examples outlines the use of discrete simulation for communications systems analysis.

Requirements analysis

Simulation techniques were used for requirements analysis in a recent study of a communications system for towboat and barge operations on major rivers of the inland waterways. The purpose of the study was to furnish the functional specifications for a system that would provide adequate communication between company offices and their boats. The method used would be appropriate to any communications network with portable terminals or mobile radios. Bear with me if it doesn't sound like everyday dp.

The study included simulating the existing system to identify potential problems and to determine the system's ability to meet future growth. Simulation was also used to evaluate proposed new systems under present and future communications loads. After the study started, it became evident that no real system existed—that is, there was no standard method of communicating between boat and office. Each towboat company had devised its own means to achieve some communication capability. This situation not only forced a change in analysis procedures but posed a rather serious problem in system design. Because there was no system, there was no source of traffic-intensity and call-distribution data required for the system design either through measurement of traffic levels or normal mathematical modeling.

There were some items of unrelated data concerning communications on the inland waterways: company office location, company calling patterns, and the boats that each company called. There was no way of determining where a boat was when a call to it was initiated. The available boat information consisted only of average speed and the general route on which the boat operated. A simulation of boat movements was developed; this used boat routings, average speeds, river-current effects, and towboat lock-transition-time distributions (for time spent in the locks on the river, admittedly not a *typical* data transmission problem). This model was tested using boat movements through locks and average trip times, and it was found to portray boat movements with reasonable accuracy. Company location and calling patterns were then added to the simulation, and traffic intensities and call distributions were obtained. The simulation was run for 60 days, with output every 10 days. The outputs—cumulative, daily, and average daily—were in the form of traffic intensities between coast stations and key cities along the waterways. Analysis indicated that the traffic-intensity and call-distribution data obtained were adequate for system design. This type of communications system simulation may not be classical, but it furnished necessary design data that could not be obtained by any other means at a reasonable cost.

Optimum network configuration analysis

Another area attacked in an atypical manner was the development of communications network optimization programs. Because of staff capabilities, time constraints (we had only a few *weeks*), and certain features available in simulation languages, multidrop network and multiplex network optimizing programs were written in GPSS/360. The features of GPSS/360 used advantageously were: set manipulation, list-processing capability, in-depth diagnostics, and machine independence. For example, it took only one instruction to rank-order all the terminals from a control point according to distance. The optimizing programs were developed readily by using the language's ability to search a set and make a decision in the same instruction, to reorder terminals easily according to changing criteria, to implement changes to the program conveniently, and to debug rapidly.

These programs are now being used to minimize the cost of data communications networks. Such networks can be multidrop, with more than one terminal per line; or dedicated, with one terminal operating on each low-speed line. In a multidrop network, the objective is to group the terminals on a "minimum cost" basis. In a dedicated network, the objective is to combine lines through the use of multiplexing techniques and to place the multiplexed signals on a voice-grade line. The optimizing programs accept as inputs the AT&T vertical and horizontal (V and H) coordinates,* a control point, line speeds, physical criteria (e.g., line loading, multiplex channel capacity), and cost information; their output is a "minimum cost" network.

In addition to the network-optimization capability, the program is capable of selecting an optimum control point. The optimization routine will operate with a given control point or choose a control point on the basis of the network's geographic center or center of gravity. Fig. 1 shows how much difference this can make by comparing monthly recurring costs for a particular multidrop network using the given external control point, the geographic center, and the center of gravity.

Actually, for network optimizations it is not always necessary to run a simulation. The simulation language was used here to develop a deterministic model to solve the problem.

Operations analysis

More classical methods of simulation are also used in the system design phase of communications analysis, from an in-depth examination of message length to overall network analysis. Models have been developed at both the micro and macro levels. An example of a micro-level analysis is the simulation of the Binary Synchronous Communications (BSC) protocol. BSC provides for control fields, text fields, and appropriate responses. The correct response to the first transmission in sequence will allow the next portion to be transmitted until the message is complete and accepted. Long messages promote maximum line utilization, but short messages minimize the effect of line errors. High line utilization is obtained when the messages are relatively long and the retransmissions necessitated by line errors are held to a minimum. The BSC simulation measured throughput and line-message utilization as a function of message length and error rate. Messages were generated in accordance with BSC, while errors were generated independently of the message generation in accordance with the error rate. At the end of each transmission, whether the transmission was data or control message, a check was made for an error. If there was an error, the block required retransmission.

Generally, the macro or network simulations are far more useful than the detailed micro analysis. These simulations usually represent a network or a message switch operating under load. Analysis of network simulation models can yield significant information concerning the operation of the network. In one recent project it was necessary to use parallel analytical and simulation models of a particular polled network. This was done to verify the simulation model for use in analyses that were too complex for the analytical model. The results of this parallel exercise were illuminating. The values for all parameters, except one, in both models tracked extremely well. The one exception, the message wait for a poll, was significantly greater in the simulation model than in the analytical model. An in-depth analysis eventually disclosed the reason for the discrepancy: the simulation model allowed queuing at busy terminals, while the analytical model always assumed that a terminal was available. The wait for a queued message was the entire poll cycle rather than one half the poll cycle, which is the normal average wait. Thus, simulation provides the

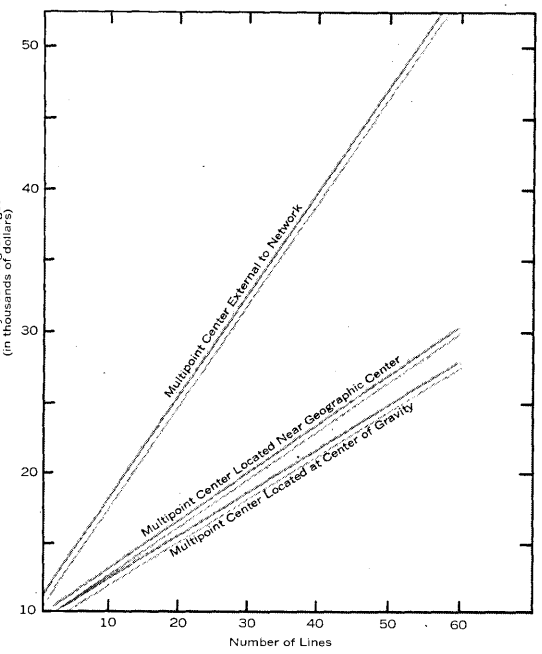


Fig. 1. A $25/run network optimization program written in GPSS/360 was used to compare the operating costs resulting from various node placements in this 60-terminal network.

*ATT/FCC Tariff No. 255

analyst greater flexibility in formulating a problem to represent the real world situation.

Network simulation models require, as input, information defining the system; this includes the number of lines, the transmission rate for each line, the number of terminals on each line, gross communications processor timings, line protocol, message lengths,

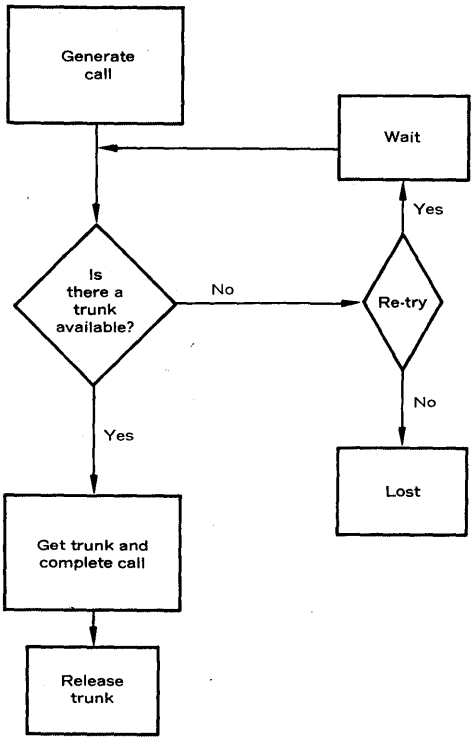


Fig. 2. A simple model of a telephone trunking system is adequate for investigating some call interarrival times, for predicting the number of lost calls, and for analyzing the effects of intermittent line outages.

and the message load on the system by terminal. The outputs of the simulation can be cpu utilization, buffer area required, messages processed, queues, and response time. These can be used to predict levels of service at different levels of loading. (A user with nationwide retail stores recently reported that his actual system response time is *exactly* the same as the value predicted by a simulation during the design stage of his project.) In addition, as system parameters change, their effects on system performance can be evaluated.

Another area that has been treated successfully by means of simulation is the analysis of telephone trunking systems. The systems under consideration are basically automatic switchboards with sequentially numbered lines. A call dialed into the trunk group will start at the top—or at the number dialed if not the first number—and search through to the end of the group to find an available line. It will take the first available line it finds. If no lines are available, a busy signal will be obtained. A simple general-purpose simulation model of a telephone trunking system, as depicted by the functional diagram of Fig. 2, was developed for analysis of special problems. These include investigation of a system when the interarrival times and/or the holding times are not exponentially distributed, determination of the number of calls lost with various retry rates, and analysis of intermittent line outages. The last two problems are of particular interest to industries that do a great deal of business through incoming telephone calls, such as airlines, insurance companies, and catalog sales organizations.

The problem of the intermittent line outage is difficult to detect. However, line-utilization statistics are available from a line monitor, and the expected-line-utilization statistics can be taken from the appropriate tables based on queuing theory. From these statistics, all suspect trunk groups can be simulated with various line outages to establish correlation.

An interesting aspect of the lost-call analysis was the relationship between having an all-trunks-busy (ATB) condition, and actually having a call placed during an ATB—a demand-exceeding-capacity (DEC) condition. The ideal, but unattainable, situation is to have 100% ATB and 0% DEC—that is, the trunks are always busy, but a call is never lost. With the simulation model, it is quite easy to obtain complete ATB statistics. These statistics include the number of times an ATB condition arose, the length of time all ATB conditions existed, and the distribution of the ATB times. A count of all times a DEC condition arose, which is a potential lost call, is also obtained. This analysis permits planning the number of trunks on the basis of DEC rather than ATB.

Summary

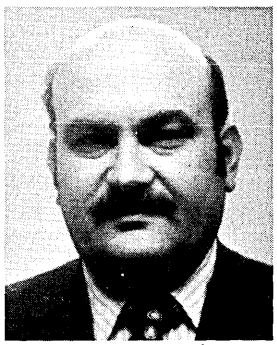
The computer resources required for the models described above are quite modest. The models have been developed and debugged, and most of them have been exercised on either an IBM 360/30 with 64K or an IBM 370/135 with 96K, both operating under DOS. The computer cost incurred in running the small problems has been about $25 each. For that amount one can study a 60-terminal network (see Fig. 2), either multidropped or multiplexed onto voice lines. Outputs will describe which lines should be left dedicated, which go on voice channels, the cost of the multiplexing gear, etc.

The large problems, run on larger computers such as /155s, have cost about $125 each. This was the approximate cost of running the towboat problem with 1200 boats, 13 node cities, and over 90 transmitter sites. These prices must be considered modest in relation to the information provided.

As mentioned, program sizes are small too, typically between 100 and 200 statements for the examples discussed. The towboat model took 125.

Simulation has proven to be a cost-effective method of communications system analysis. It has produced results with minimal development time and a reasonable expenditure of dollars and computer time. The short development time and the associated low cost are directly attributable to the use of a high-level simulation language such as SIMSCRIPT, SIMULA, or GPSS. GPSS/360 in particular offers a structured framework in which to operate; programming considerations are thus minimized, if not completely eliminated. The structure of the language permits rapid model development and quick and easy debugging, resulting in a usable product in a short time.

From the several examples provided, we have shown that simulation can be effectively utilized at different times in the systems life cycle and at varying levels of detail. Simulation represents a tool which the manager should consider using to provide the information he needs to make cost-effective decisions. □



Mr. Ingerman is a senior systems analyst in the Advanced R & D Group of ARINC Research Corp. where he is engaged in the simulation of communications and other systems. Prior to joining ARINC, he performed simulation studies for Bell Laboratories and the Norden Div. of United Aircraft Corp. He has also worked as a communications system engineer for Western Electric Co.

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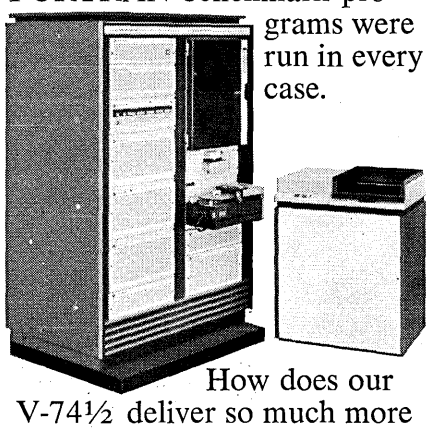

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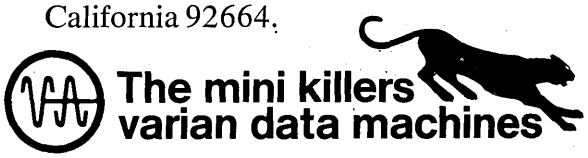

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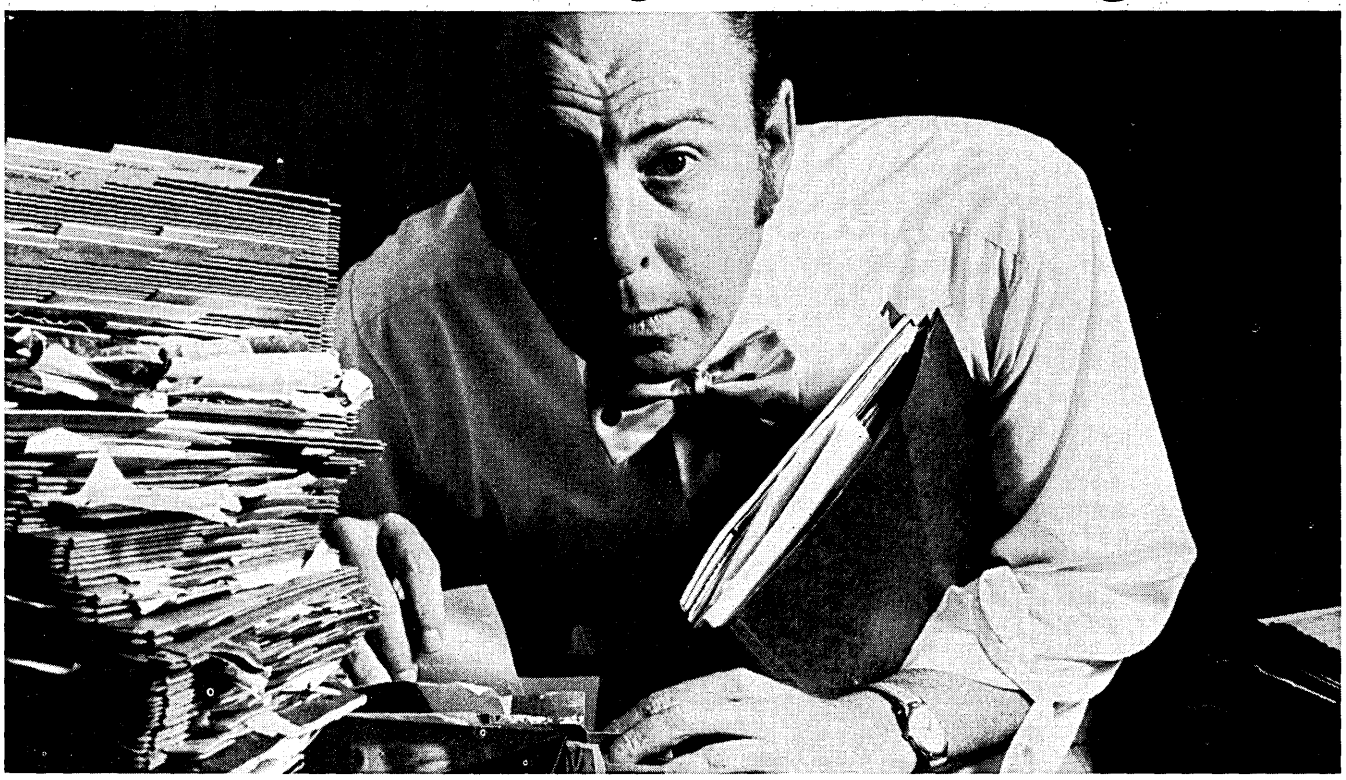

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As the industry gets older, and as job markets shrink, unions may look more attractive to dp employees, and management may have a whole new set of headaches.

UNIONISM IN DATA PROCESSING

by Bernhard Schwab and Mark Thompson

While unionism has traditionally been associated with the production floor and blue collar workers, in recent years unions have placed increasing emphasis on organizing office and white collar groups. Since the size of the blue collar segments of the labor force is destined to remain stable or increase slowly, unions are more frequently identifying nonmanual workers as a potential source of membership growth.

Led by the rapid unionization of clerical and professional workers in the public sector, white collar union membership has risen steadily in the past 5-10 years.

Until recently, jobs in data processing were thought to be relatively immune to unionizing. New and challenging jobs, bright and modern working environments, the opportunities offered by a job market where demand outstripped supply, and a work force comprised mainly of young people who were likely to reject union principles such as promotion by seniority, were thought to be enough to ward off efforts towards organizing dp departments. However, the job market and the data processing environment have undergone rapid changes in recent years which make the above argument much less convincing. We already have a number of unionized computer shops, with more likely to follow. What are the trends affecting unionization in data processing? What are the likely implications and consequences? And what must data processing management be aware of to face the challenges of such a changed working environment?

Conditions favoring unionization

Basically, unionization is attractive if the union can potentially offer benefits which are otherwise not attainable. Although unionization is associated with demands for higher salaries, workers frequently join unions because of dissatisfaction with job security, working conditions, or relations with management.

Changing patterns in the job market for computer professionals is one of the important factors affecting the issue. Since the mid-sixties boom days there have been drastic cutbacks in government contracts. Software houses have declined in number and decreased in size. Even major computer manufacturers have fallen by the wayside. Dp employees have become less able to change jobs to gain more challenging positions or higher salaries. Job security is becoming important, and employees in dp departments are making increasingly diligent efforts to protect their jobs, especially in those geographic areas such as the West Coast where job opportunities are no longer plentiful and the lifestyle is attractive.

Much of the glamor of the job and environment in computer work has worn off. While some employees' jobs have been upgraded as a consequence of dp, the job of a keypunch operator clearly retains all the drudgery of routine assembly-line work. As Ershov pointed out (see July, 1972, pp. 64 ff.) with growing dp departments there is a tendency for even programming and systems analysis to be regimented in almost an assembly-line manner, with resulting dissatisfaction and lack of job attachment. In other industries, workers faced with comparable conditions have expressed their discontent by joining labor organizations.

Personnel management practice may also influence the propensity of dp employees to unionize. As Brandon points out,

> ". . . the average data processing manager is unaware of the details of personnel management and the industry as a whole has done little to educate him."[1]

In the light of the above, it is not surprising that an increasing number of firms face prospects of unionization in their computer departments. Good personnel management can go a long way to reduce the prospects for unionization, although important factors such as job markets and the growth of dp within the firm may be outside management's control. If unionization is to become a reality, negotiations and planning based on informed judgment will be the key in minimizing its disruptions.

The legal aspect

Typically, a nonunion firm or department becomes involved with a union first through an organizing drive. If the employer has other unionized workers, their union may seek to

[1]D. H. Brandon, "Personnel Management: Missing Link in Data Processing," *Data Management*, 6 (June, 1968), 52.

expand by organizing dp employees. Many large unions composed primarily of blue collar workers, including the Teamsters, Communication Workers, and Oil, Chemical and Atomic Workers, attempt to expand their membership in this way.

Alternatively, the attempt may be made by white collar unions, such as the Office and Professional Employees Union, or a special organizing committee like the Assn. of Clerical and Technical Employees in Canada. From a union's point of view, organizing data processing not only brings in new members, but also increases the bargaining strength of an already existing unit, as a potential shut-down of computer operations may have serious effects on the employer.

In either case, the union tries to contact sympathetic employees in the group it is seeking to represent, asking them to sign membership cards. When the union has over one-third of the employees signed up, it may petition the National Labor Relations Board (NLRB) for a certification election. The Board normally conducts a secret ballot election to determine the employees' desires. If a majority of those voting favor the union, the NLRB certifies the union as the employees' sole legal representative.

The law prohibits management's intimidating workers in the free exercise of their rights to choose a bargaining agent, though the employer may state his views in a non-threatening manner.

Prior to an election, the Board frequently must decide whom the union may represent, i.e., the scope and composition of the bargaining unit. The NLRB has wide discretion in determining the appropriate bargaining unit, but rules on the basis of employees' community of interests. By law supervisors and professionals receive special consideration in bargaining unit decisions. Supervisors must be excluded from all bargaining units. Professionals may be included, but are allowed to vote separately, thus protecting a small number of professionals, with special interests, from being submerged in a large constituency of nonprofessionals. In practice, the Board examines educational qualifications closely in deciding which employees are professionals, generally demanding at least a university degree for professional designation. Beyond the legal requirements, the NLRB has a long-standing policy of not combining blue collar and white collar employees in a single unit for an election. The two groups vote separately and are combined in the same union only if a majority of each category of employee support a single union.

Similarly, the NLRB frequently grants separate voting status to technical employees, generally groups falling between professionals and clericals in terms of training required and discretion exercised. Therefore, where dp units are concerned, the Board must determine which, if any, employees are professionals, technical employees, or clericals, and whether dp personnel should be combined with other white collar employees.

During the last 15 years, the NLRB has derived a set of principles governing the composition of units of dp employees. In general, the Board has ruled that computer operators, keypunch operators, tape librarians, etc. are clerical employees. Where there are comprehensive units of clerical workers, these members of the dp unit probably will be included with other clerical employees. Conversely, where other office employees are not unionized, the Board will not approve a unit composed exclusively of dp clericals. Board decisions regarding programmers and systems analysts have depended much more on the specific circumstances of the case. In several instances, programmers have been excluded from a unit, being classified as professional or technical employees because of their educational qualifications, and because their salaries are much higher than the clerical staff, they have different hours of work, they advise management, or have separate offices. Less frequently, programmers have been included in clerical units when they had been selected from the existing clerical staff and given short training courses, or when they perform duties highly integrated with other members of the dp department, especially if the employer is a service bureau.

The place of the data processing department within an organization may also have an effect in this context. Where data processing employees are physically separated from other employees, the likelihood of other unionized employees trying to organize the data processing department may appear lessened. On the other hand, if these data processing employees should desire unionization, the probability increases that the NLRB may recognize them as a separate bargaining unit. How dp is organized can be of crucial importance to the employer. If the dp employees are included with other members of the work force, the union involved is likely to press for a single contract covering the whole bargaining unit, giving rise to problems discussed below. Where data processing employees are in a different union from other employees in the enterprise, the employer may face the prospect of having all his operations curtailed by a dispute involving a small number of union members in his dp department.

Salaries and security

Once certified, unions negotiate comprehensive agreements covering wages, hours and working conditions. Certain provisions found in most agreements covering salaries, job security, and management's right to assign personnel are likely to have special implications for the data processing department. In all cases, the employer should examine a contract to ensure that undue restrictions (inadvertent or intentional) do not hinder his dp operations.

The importance of functions performed by a group of workers will be a prime determinant of their bargaining strength. Many functions of data processing are now crucial to the operations of a whole firm, so a work stoppage by relatively few employees in a dp department could inflict sizeable losses to the organization. Management can act to mitigate the effects of a strike to offset the union's bargaining strength. Nevertheless, there will be cases where the *threat* of a strike could exert enough leverage to increase salaries and fringe benefits beyond a level which would otherwise have been attained. The direct costs of negotiating an agreement in terms of additional pay are probably easy enough to determine. With salaries already the largest single item of budgeted data processing expenditures in many dp departments, large salary increases will significantly alter total data processing costs. According to the figures given by McLaughlin (see Feb., 1973, pp. 61 ff.) for 269 firms surveyed, a 15% salary increase, for example, would produce a 6.67% increase in the department's total operating cost. This would correspond to an increase of over 100% in the average costs of software, data communications supplies, consultants, time-sharing services or training.

The indirect effects on salary structure and consequent adjustments throughout the organization may be even more dramatic. Salary administration techniques have been developed to attain a balance between salary level and such factors as degree of responsibility, educational requirements, skill requisites, and the efficiency of past job performance. Thus, unionized dp employees could attain large salary increases for themselves, thereby forcing the employer to make comparable ad-

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Virtually every union is concerned about the security of its members' jobs and seeks to negotiate various contract clauses to avert layoffs. Typical examples are: restrictions on the use of subcontractors, provisions for employees displaced by technological change, and the consideration of seniority in layoffs and promotions. In general, unions' concern with job security is directly proportional to the assessment of their members' risk of displacement. Indeed some dp employees may join unions because they fear redundancy. Alternatively, even dp departments not contemplating layoffs may be covered by comprehensive agreements covering larger work forces facing this problem.

Subcontracts and backup

Subcontracting part of its work is not uncommon in data processing departments, and the practice represents a major portion of the revenue of computer service firms. Input preparation, contract programming, and actual computer processing may be involved. Where job security is of concern, unions will seek to limit first the subcontracting of work which has been performed by union members in-house, and secondly any work which employees are capable of performing. The range of typical provisions includes:

"1. agreements that subcontractors will be used only on special occasions . . .;
2. guarantees against layoff for present employees;
3. provisions giving the union veto power over any and all subcontracting; and
4. requirements that the company prove to the union that time, expense, or facility considerations prevent it from allowing present employees to perform the work."[2]

In one agreement covering the unionized dp department of a major food processor and distributor, a very restrictive clause states:

"The company agrees that persons outside the bargaining unit shall not, for the duration of this agreement, perform work which is being performed by union members, except in case of . . . emergency . . ."

There are many collective agreements which do not contain any clauses restricting management's freedom in subcontracting, either because the union does not see it as a major issue, or because the union may compromise on this point to gain another concession. The point is that management should be conscious of this issue when negotiating an agreement, as a clause which at first sight may appear to be merely a reflection of a union's concern for job security can severely restrict managerial flexibility.

[2]A. A. Sloane and F. Witney, *Labor Relations*, 2nd ed., (Englewood Cliffs, N.J.: Prentice-Hall, 1972), p. 432.

Technology and seniority

Clauses concerning technological innovations which eliminate jobs are another common way by which unions protect the security of their members. Input data preparation is probably the area most likely affected in current data processing departments, with the possible displacement of keypunch operators through the introduction of more advanced technology. The more common clauses designed to protect employees in danger of losing their jobs through technological change are: severance pay, use of attrition to accomplish reductions in staff, and retraining programs. Each one is going to entail costs which will make the introduction of new labor-saving technology more expensive. In a department where, for example, data preparation accounts for a significant portion of the total budget, clauses of this type may be of importance, emphasizing again the need for planning when negotiating a union agreement.

The common union principle of introducing seniority into promotion can have wide-ranging effects if introduced into the data processing environment. Contrary to popular belief, unions seldom demand that the most senior applicant always be promoted. However, they do generally insist that seniority be given considerable weight in such decisions; the degree of importance given seniority is a point of bargaining.

Significant considerations of seniority formerly had little appeal to employees in data processing, since the field was new and dominated by young people who accepted a reward structure based on capabilities and performance. However, data processing in many organizations now has a history of over 10 years. The problem of the older employee who may feel threatened by younger colleagues with superior credentials can become real, thus potentially increasing the popularity of some seniority system.

While due recognition to experience and company loyalty as reflected in long service need not be all bad, the dangers are obvious: in a field characterized by an almost explosive rate of technological development and change, it may be difficult for a firm which is tied to a seniority clause through its union contract to attract capable and dynamic new employees. These employees will find an organization affording opportunities based on performance much more attractive. Further, with this protection there may not be the same incentive for employees with long service to keep up-to-date. Thus, the atmosphere within a data processing department could be affected significantly, posing serious new challenges to the data processing manager in terms of recruiting and motivation.

Unions frequently attempt to negotiate job descriptions or otherwise limit the ability of management to assign employees freely. Labor fears that the employer will try to undercut negotiated salary standards by shifting work formerly done by more highly paid employees to lower paid personnel. Another motive is the suspicion that some supervisors may use work assignments to discriminate subtly against some employees. Such restrictions are not universal and often arise from specific experiences that cause unions to seek their adoption. However, in the rapidly changing environment of the data processing department, with many employees capable of doing several tasks, limits on management's right to assign employees could seriously inhibit the efficiency of the operation. If job descriptions are negotiated, they should be broad enough to provide necessary flexibility in assignments, even if the employer agrees to give extra pay to employees working outside their classification. If there are restrictions on management's right to assign work, they ideally should not affect intradepartmental decisions, assuming dp operations are centralized in a single department.

Facing a strike

With a growing dependence on computers for many aspects of their operations, many firms will shudder at the thought of a strike in their computer department. For example, what would be the result if striking employees at United Air Lines rendered the computerized seat reservation system inoperable for a number of days? Losses to the company have been estimated as high as $1 million per day for the down period. Even if less dramatic, the penalty to the firm of a sudden shutdown in computer operation in most instances would range from moderately severe to catastrophic, unless proper

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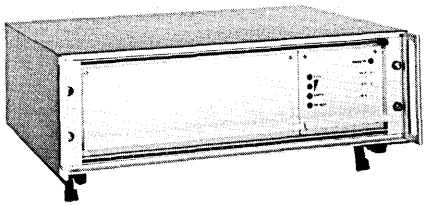

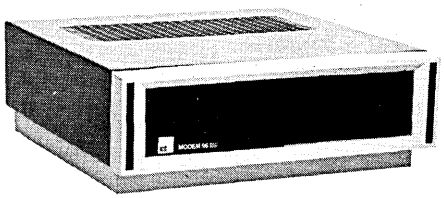

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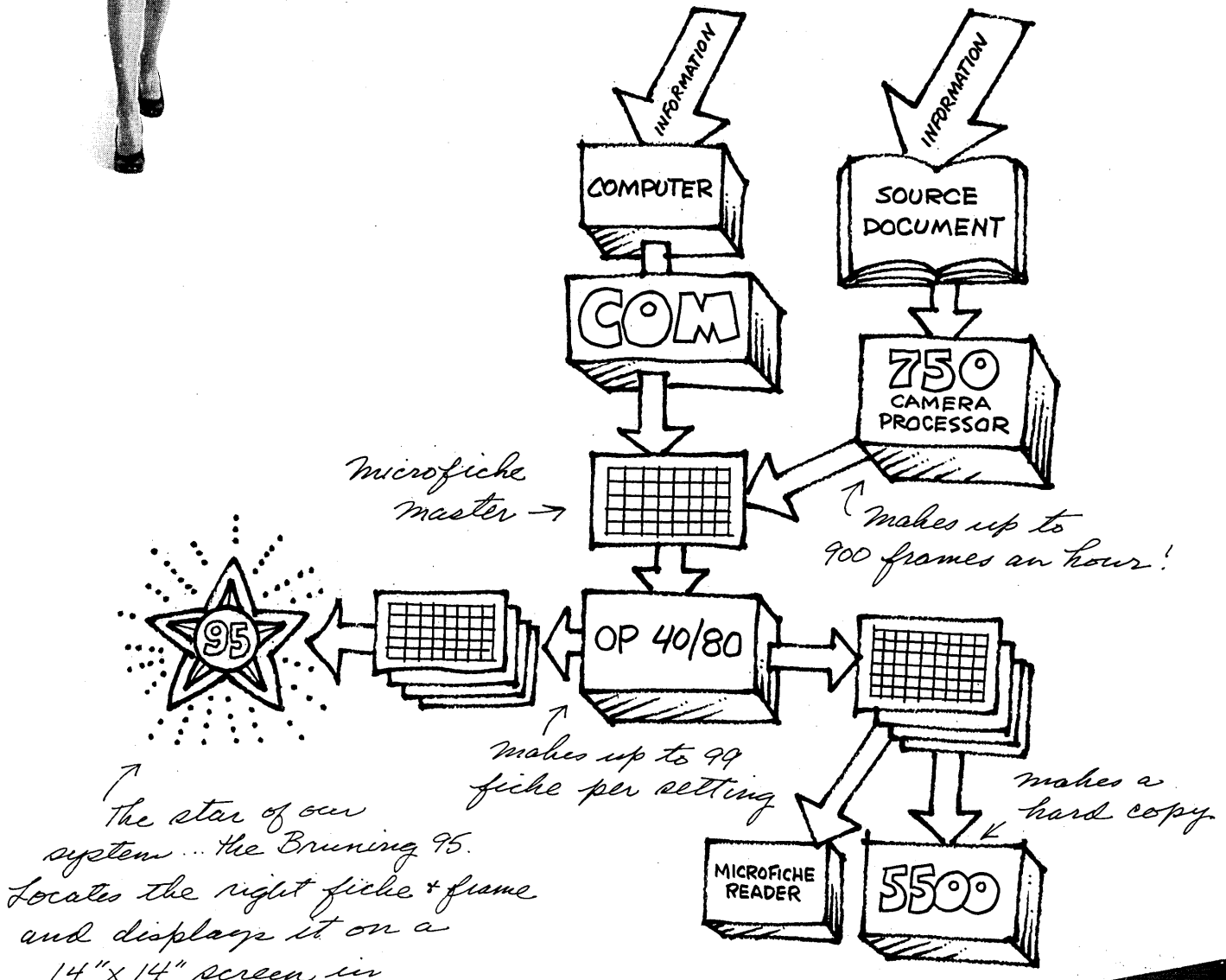

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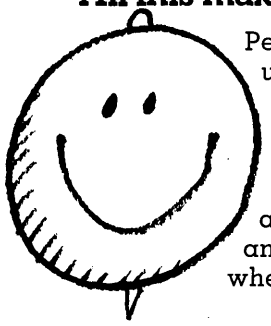

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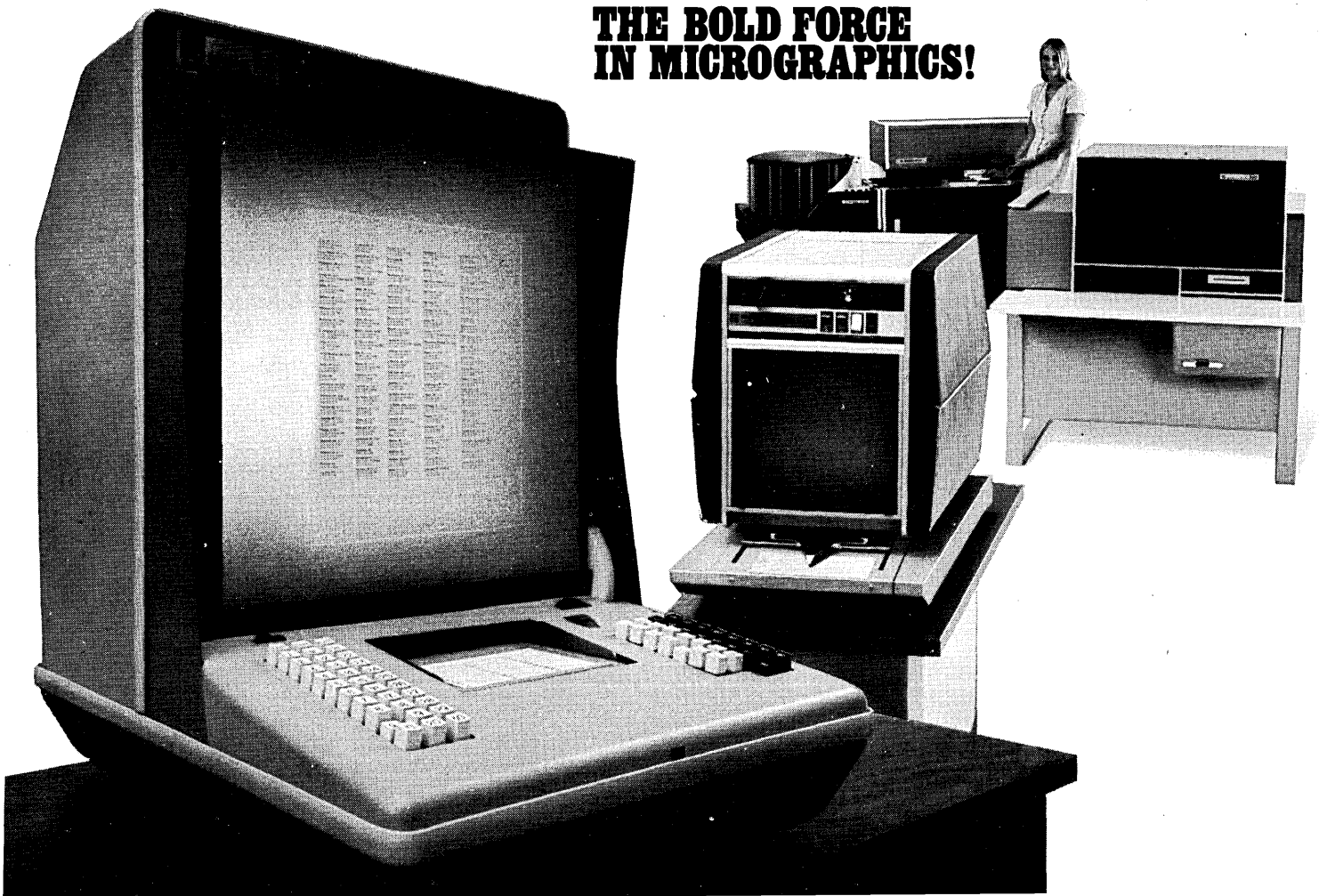

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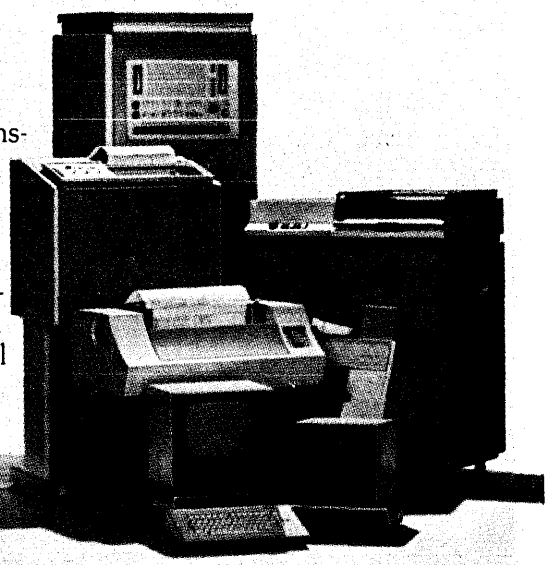

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precautions have been taken. What are some of the remedies available to management to mitigate the effects of a strike and, thereby, to strengthen its bargaining position?

In case of a strike, management usually prefers to continue its data processing operations. Where a single union of manual and nonmanual employees is involved, all union members in the bargaining unit will probably strike simultaneously, leaving the dp section to be run by excluded personnel, i.e., supervisors, professionals and technical employees (if any). Where two unions exist, one for production workers and another for office and clerical employees, practices regarding strikes and picket lines vary, depending on relations between the unions and negotiated contract provisions. Thus, an employer might be able to maintain full-scale dp operations in the face of a strike by manual workers, if office employees refuse to honor picket lines. On the other hand, a strike by unionized clerical workers could shut down all facilities except those staffed by excluded personnel.

In some environments, it may be possible for managerial and supervisory personnel to take over at least the essential parts of the operation, thus insuring that a minimum level of service is maintained. Whether this is possible will depend on the nature of the operations, and on the extent of union membership in the department. For instance, where a data processing department relies on a large unionized staff for input data preparation, it may be considerably more difficult to maintain service than if a few computer operators go on strike. Where there are several programmers excluded from the bargaining unit, basic operations might continue if they are familiar with the less skilled data processing jobs. In a small number of cases, unionized dp units have been able to handle high priority jobs during a strike.

In any case, if management and other excluded personnel are to handle at least part of the work in the event of a work stoppage, it is essential that such an emergency effort be properly planned and even exercised well before contract negotiations are close to a breakdown. At that time operators and others are unlikely to train back-up personnel willingly.

Back-up arrangements with other firms, like those used for other emergency shutdowns, are another avenue which can be pursued. However, some complications can arise. While the law permits an employer to send another firm work normally performed by the striking employees in the event of a strike, the striking union may picket the premises of this ally of the employer. If the back-up facility is unionized (and perhaps even if it is not), its employees may not cross the picket line or the customers may not enter the premises, in effect causing the work stoppage to spread to the assisting firm.

Back-up arrangements involving remote job entry via communication lines to a computer remote from the location of the dispute, even outside the country, appears much safer in this regard, although it may be more costly and difficult to arrange. The ready elimination of distance caused by the increasing integration of data communications and data processing has created a unique situation for computing, and this makes it possible, at least in principle, to escape the pressures of a local union to a degree not known in most other industries.

However, even if adequate back-up arrangements have been planned which eliminate most of the threat, it should be noted that feelings can become quite bitter and emotions will run high in strike situations. When a militant union sees its bargaining position eroded, the possibility of sabotage and other illegal actions on the part of disgruntled employees can become quite real. Thus, not only planning for back-up arrangements but also the issue of security, about which much has been written in other contexts, can take on new dimensions where a union enters the scene, and thorough preplanning for a contingency is just as important to mitigate the effects of down-time suffered from work stoppage as it is in the case of fire. The ability to mitigate the effects of a strike does not mean that management should take the threat of a strike action lightly, even if excellent plans are available.

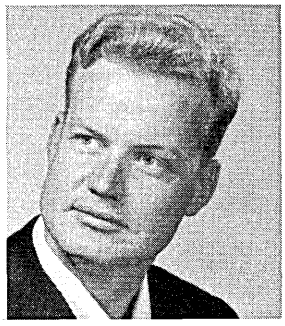
In the case of a fire, everyone suffers together, and very positive attitudes and a real team spirit tend to prevail in facing the challenge of recovering from the disaster. However, even after a strike has been settled, it can take a long time to recover from a confrontation in which hard feelings developed, and it can be a real challenge to rebuild an atmosphere which has been shattered by a breakdown in contract negotiations.

Conclusion

Good personnel management, in which employees feel that they are getting a fair deal and that there is real concern on management's side for their work and welfare and complaints, is no doubt the most important factor in keeping the union out of your data processing department; it is equally the most important factor in maintaining harmonious relations and averting the threat of strike in dealing with an established union.

Data processing managers who have often moved up through jobs with a predominantly technical orientation will have to pay increasingly greater attention and acquire greater expertise in the personnel area. They need not become experts in labor relations, as they will have personnel departments to assist them, but they will have to play an active role if unionization becomes an issue for their department.

The possible trend towards unionization will provide a changed environment with new challenges which may become even more important than the challenge posed, for instance, by rapidly advancing technology. The changes need not be all bad; it will be up to management to insure that they are not. □



Dr. Schwab, an associate professor on the faculty of commerce at the Univ. of British Columbia, has taught about unionism in executive programs in North America, Europe, and Asia. His major interest is in managerial implications of computers.

Dr. Thompson is an associate professor on the faculty of commerce, Univ. of British Columbia. He is currently researching changes in work values, and professional and white collar unionism. He has served on the staff of the International Labor Office, Geneva, Switzerland.

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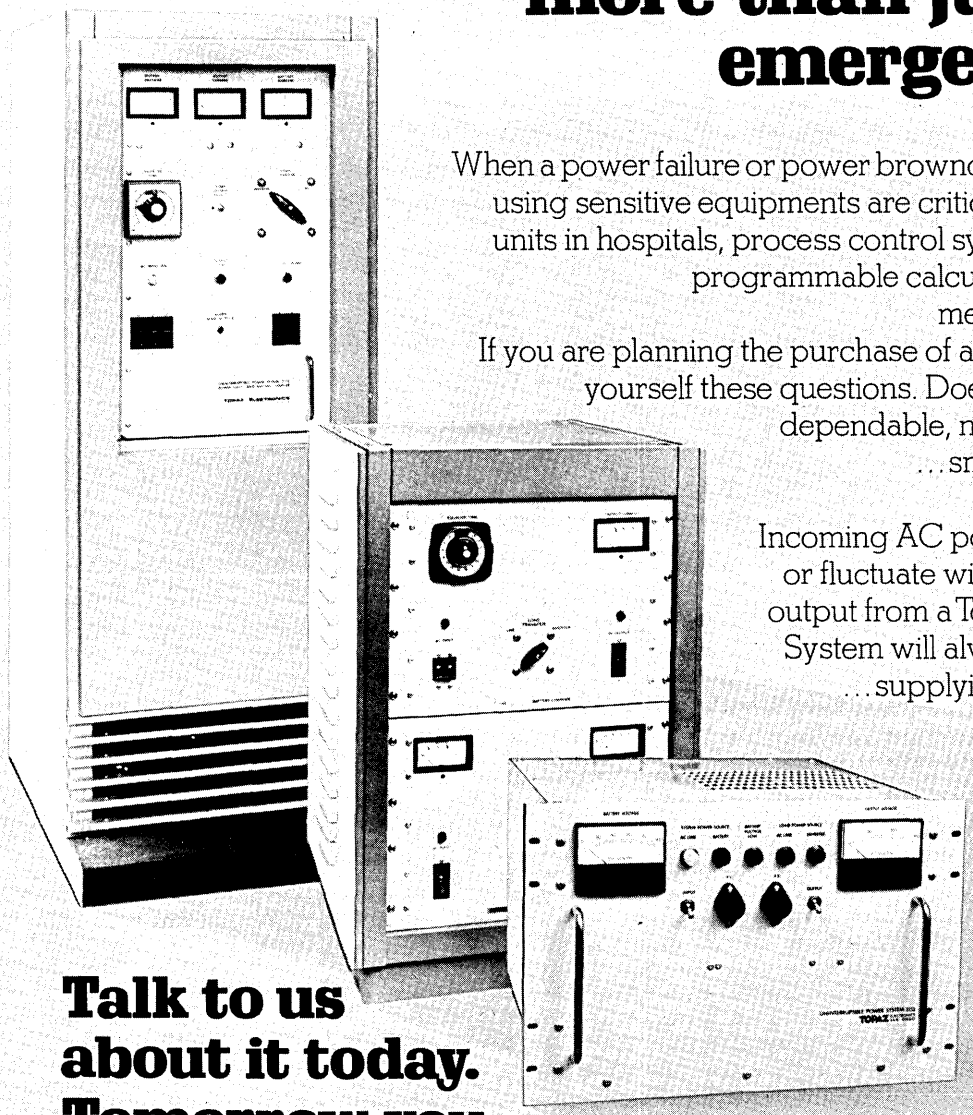

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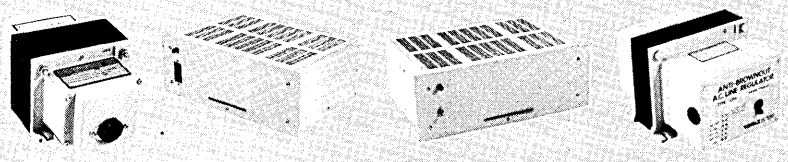

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CIRCLE 63 ON READER CARD

Frequency of access, content decay rate, and decay rate of the medium are only a few of the crucial factors determining storage reliability.

ARCHIVAL DATA STORAGE

by Sidney B. Geller

State-of-the-art techniques such as video, laser beam and electron beam recording, holography, and magneto-optics hold the promise of very high density data storage for archival purposes. Meaningful research in this area, however, cannot be performed without considering the total archival system which uses these new storage devices. A number of system factors such as total system capacity, media content density, and content accessibility and recovery must be considered in the practical development of an archival system. In addition, account must also be taken of system operating and content costs, reliabilities and lifetimes, and probable rates of obsolescence. Exotic storage devices which cannot operate outside the laboratory are of little value to the archivist.

In trying to point out the importance of these system factors, computer magnetic tapes will be used as an example. The same concepts, however, are equally applicable to all storage media. To clarify some of the ideas presented here, some new terminology is required, which will be defined as needed.

Storage contents

A few decades ago the quantity of stored data was sufficiently small so that it could be filed (encoded) and retrieved (decoded) manually. These data were typically in the form of fixed content storage materials such as legal and historical documents. Archival quality referred primarily to the long-term physical characteristics of the storage medium, which was usually paper.

In recent years the volume of stored data has expanded beyond the handling capacity of the alphabetically-oriented manual worker and the trend has been to encode the contents of the archives into machine readable form. For example, a document is represented by magnetized patterns on the surface of a magnetic storage medium such as computer tape. Since data is now encoded and stored in new energy forms on new media, all contemporary thinking concerning archival quality must therefore deal with the preservation and security of the entire system which acts as the carrier of the encoded information; this includes the information content and the information codes. An information loss can result for example from the loss of a unique code or decoder (such as a one-of-a-kind transducer).

Contents and decay rates

Information contents may be characterized as being "hard" (fixed storage) or "soft" (variable storage). Hard contents are here defined as those that tend to alter the media characteristics irreversibly: for example, holes (contents) burnt into a substrate (medium) by a laser beam (encoder), or patterns (contents) on a microfilm (medium). Soft contents are here defined as those which produce reversible changes in the medium, contents which may be altered or updated with no permanent change in the medium itself. Examples are magnetized regions (contents) on a ferromagnetic surface (medium), or spots on the face of a cathode ray tube. It is feasible to store both hard and soft contents simultaneously, as for example a laser beam hole recording into a substrate which has a ferromagnetic surface that can also be recorded on magnetically. This magnetic information may be useful for updating purposes or accessing the permanent hard information. Another example of a dual content medium is a plastic credit card with both embossed (hard) information and an auxiliary magnetic stripe for soft information.

The relative rates of decay of the medium and the information content, and their interaction, must be considered in an archival system. Media decay is the physical deterioration of the media, while content decay is the quantitative loss of stored information. Content decay may or may not be related to physical medium deterioration; it may be induced solely by external effects or by the methods with which the medium or the data is handled in storage or in actual operation.

There are two types of decay: static and dynamic. Static decay is deterioration of the medium or the content as a function of time when they are not being used in actual operation. Dynamic decay is the deterioration of the medium or the content as a function of time when they are being used in actual operation.

It is possible for hard contents in a medium which displays a high dynamic decay rate to have a shorter lifetime than soft contents in a medium with a lower dynamic decay rate. For example, compare the lifetime of information which is simultaneously stored in the form of hard contents on a phonograph record surface against the same information stored in the form of soft contents on a magnetic tape: to date, magnetic tape recordings outlast the phonograph record-stylus combination by orders of magnitude in actual operation. However, the static decay rate of the phonograph record is much less than the static decay rate of the magnetic tape medium and it therefore would be better for low use-very long time preservation. The high dynamic decay rate in this case is not necessarily an intrinsic characteristic of the medium (phonograph record) itself, but is caused by a basic system design limitation (i.e., mutually destructive medium and transducer). Excessive handling of a medium during the information retrieval process can accelerate decay. Soft contents are more sensitive to external environmental influences and may decay due to these. For example, temperature extremes can cause losses in magnetization levels on magnetic tapes.

Oddly enough, it is possible for a medium to decay more rapidly than its contents: an example would be the cathode ray tube on whose phosphor face a fixed image pattern is being continuously regenerated. After a period of time the phosphor may be "burned in" at the image bright points so that the phosphor face (medium) may be permanently damaged with a scar configuration containing the image pattern. A similar information burn-in phenomenon exists in the targets of video image orthicon transducers. This is a conversion of soft content into hard content and is a fail-

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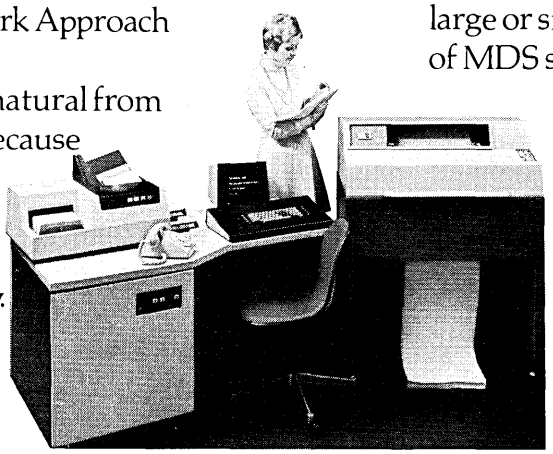

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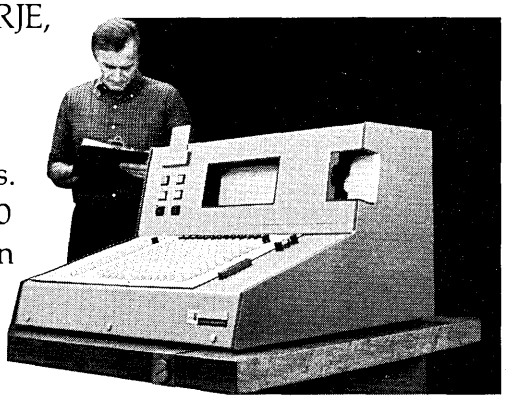

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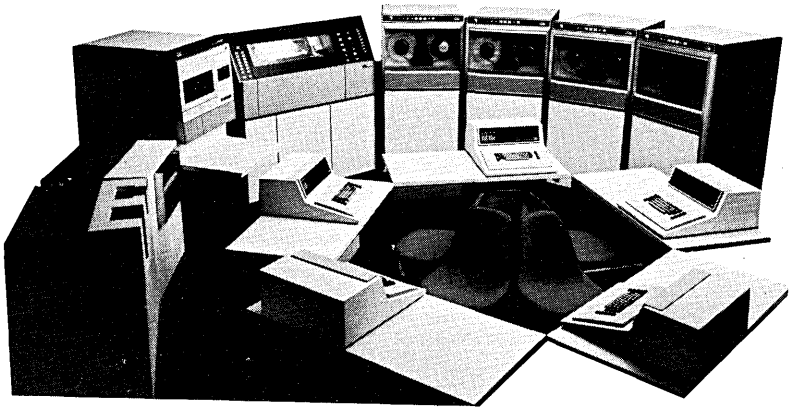

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ure of the medium (sometimes the end-of-life) without a loss of information content since the fixed information is recoverable. Another example of this soft-to-hard content phenomenon has been found experimentally in the case of certain recorded magnetic tapes with easily softened binders that have been stored for a considerable length of time in a very warm environment. The oxide particles in these tapes are physically turned or reoriented by the very small internal signal fields: this results in a low level but unerasable hard signal content when the tapes are read at normal temperatures.

The ultimate purpose of a particular archival application will determine the level of archival quality required. For short-term preservation of stored data which requires information updating, a soft content system is probably best, but for very long-term preservation a hard content system is obviously superior. Particularly in a long-term archival system, it is necessary to make certain that the information decoding keys themselves have long-term archival properties and can survive the aftermath of catastrophic events either natural or man-made a century hence. Redundancy and multiple repository locations are solutions for survival. A decision must also be made as to whether static or dynamic decay lifetimes should be the principal factor when choosing the storage medium.

Lifetimes

The concepts of lifetimes are closely identified with those of reliability. Reliability is the probability that a system will perform its intended function for a specified time under specified conditions. In the case of lifetimes for which reliable operations extend for a few thousand hours, a statistical concept such as the mean time between failures (MTBF) is a valid unit of reliability measure. However, at the present time there are no methods of mathematical statistics for use with extreme long life systems which must function reliably for 10 to 100 years.

The fact that there are two different decay rates, i.e., static and dynamic, tends to complicate the design of a valid archival experiment. Static lifetime tests are usually related to the medium and contents individually and can be performed sometimes on an accelerated basis. However, dynamic lifetime tests are more system-oriented and are considerably more difficult to define, design, or evaluate quantitatively, because there are many more interacting variables. The term "lifetime" is applied here to three different areas: system lifetime, media lifetime and content lifetime.

System Lifetime. By "system" is meant the total grouping of all of the interrelated components, the storage medium and the encoding/decoding schemes. System lifetime has:

- End-of-life due to obsolescence
- End-of-life due to the inability of the system to perform reliably beyond a certain time
- End-of-life due to loss of one-of-a-kind transducer or encoding/decoding keys
- End-of-life due to the breach of a highly secure system

End-of-life due to obsolescence indicates that there is a point beyond which it is no longer feasible to maintain a system in view of technological and possibly sociological advances which may have occurred. Failure to detect this end-of-life through periodic cost analysis and operational studies leads to inefficient and costly operations.

End-of-life due to the inability of the system to perform reliably beyond a certain time may be difficult to analyze and to correct because it may stem from both static and dynamic interacting causes which depend on system operation philosophies. This aspect of archival system lifetime should be considered through reliability studies at the very outset of the system design and development and not as an afterthought. There is an optimum point to which the system reliability should be developed; however, after this, further attempts at increasing the lifetime may result in increased costs beyond a reasonable level.

Storage Medium Lifetime. This lifetime is the length of time for which a medium can perform its storage function over the entire range of required environmental and operating conditions. It is not necessary for the medium to be physically damaged before it becomes ineffective for storage purposes in a particular system. It is often difficult to design a dynamic decay experiment which will lead to valid judgments about the probable end-of-life of the storage medium. Sometimes the dynamic test procedures will intrude their own characteristics into the results so that it is difficult to separate the cause and effect variables. An example of this type of problem appeared in an attempt to determine the effects on the "error-production" tendencies which existed between a tape transport system and a reel of magnetic computer tape [1]. It was found that the number of passes required for a single reel of tape to run to failure when shuttled among 10 similar production transports was quite different from the number of passes that were required to run each of 10 reels of the same kind of tape to failure on just one of these transports. This difference was attributed to the machine differences rather than the tape differences. However, these transport differences were not evident during their operation in actual computer systems.

Another example in which the dynamic operating mode affects the end-of-life is as follows: There is a difference noted in the rate of content loss (drop-outs) if a magnetic computer tape is shuttled over short segments or over an equal number of passes over longer segments of the tape. This is caused by the variations in debris production and distribution. Debris is caused by the friction between the tape and (a) the mechanical guidance system, and (b) the recording/reproducing head.

Although lifetime testing of a medium should be performed under conditions which are as similar as possible to the actual operating conditions, too often this is not a practical approach. This may be due to the expense or to the length of time which may be required for the test. Considerable care must be used when attempting accelerated lifetime studies because in many instances accelerated lifetime testing procedures yield results that are not valid because they are not truly representative of the actual environmental conditions in which the medium must function. As an example, by using higher temperatures we may wish to produce some observable heat breakdown of a reel of magnetic tape in a reasonable length of time; however, in such a test we must be careful to remain below temperatures that can produce phase changes in the material because heat effects are not cumulative for the tape. That is, no amount of heat below the critical value can produce a phase change in tape no matter how long the tape is subjected to that temperature.

The results of simulated and accelerated test procedures must always be examined carefully for anomalous effects. For example, it has been found in a head-tape wear simulation test that the relative wear results among a group of tapes vary and even reverse themselves dependent upon the substitute metal used to simulate the true head materials.

Content Lifetime. Content lifetime is the length of time for which the stored

information is retrievable. It is possible for the contents to remain intact in storage but to become irretrievable due to the loss of the encoding/decoding keys or one-of-a-kind transducers. As an example: the use of time-shared computer systems may increase the risk that unauthorized persons may gain access to confidential data banks. In order to protect these data, it may be necessary to encode them into a more cryptic form—this increases the probability of content loss through code losses. The loss of encoding/decoding keys has a finite probability of occurrence in a nuclear age. Redundant storage at diverse locations on different media is one method for protecting the contents. The end-of-life for soft contents may be brought on by second-order environmental effects. For example, under certain conditions external magnetic fields may obliterate magnetically stored information [4]. However, if the storage medium underwent no physical change as a function of time, and if the environmental and handling conditions were ideal, then theoretically the relaxation time of the magnetic tape signal is such that the signal content should be easily useful for 100 years.

The handling and recording procedures for a storage medium may have a direct effect on the content lifetime. Although these procedures are secondary to the actual archival system operations of storage and retrieval, they can influence the lifetime of the information content. The following example of this was described in a study made at the National Archives and Records Service (NARS) [2]. It was found that tapes which had been recorded at a density of 800 bits per inch (NRZI) and then stored without use for 18 to 24 months had a high incidence of data loss. This is believed to be caused by the deformation and stretching of the plastic tape materials by the high internal pressures which appear in a wound reel of tape and the fact that the 800 bpi (NRZI) recording mode is at the limit of the technology and is very susceptible to skew losses caused by the stretching. 1600 bpi phase encoded data is considered a better and more secure mode for archival storage purposes. It is recommended that a schedule of exercising which consists of winding and rewinding the stored tapes at regular intervals be instituted. This handling procedure reduces the content losses caused by the deformation of the tapes in storage. Many installations which maintain important tape records actually spend as much as $10.00 per reel per year on preserving the contents through such procedures as recopying of information. This procedure ensures an almost endless data lifetime [2].

"Uh oh! Looks like Valwood is easing out old Carrington."

Content density

Although not a problem in the past, a new factor which must be considered in archival quality analysis is that of information or content density. Due to the vast present day increase in stored data the quantity which can be stored per unit volume or unit surface area of the medium has become very important. Information density is a function of the physical dimensions required per unit content (or bit) as for example, a one-micron diameter (laser burnt) hole, a 10-microinch long magnetized tape surface region, etc. Density is also a function of the efficiency of the information coding schemes. The following are some factors (and questions) which relate to information density:

- Higher density storage systems will usually be subject to greater error rates which leads to more stringent requirements for error detection, correction and prevention as well as to more sophisticated encoding schemes.
- The registration difficulties increase with information density.
- Sophisticated encoding and decoding schemes may save considerable time and costs through their greater efficiency; however, it may be more difficult to recover information if the key to the code is lost.
- If density times speed constitutes a figure of merit for the system, then trade-offs must be made for maximum operating efficiency. The speed referred to here is the random access speed which is the speed with which any information units can be located. Consideration must also be given to the data rate handling capacity of the system, but this characteristic is simpler to achieve and to optimize.
- The total capacity of the system must be considered. That is, on the basis of density and speed of random access, what is the optimum total capacity for a system? Will additional subsystems yield more efficient operation than a single large system?

The quality or efficiency of a storage system has been given in terms of its total information storage capacity C

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HARRIS

COMMUNICATIONS AND INFORMATION HANDLING

CIRCLE 42 ON READER CARD

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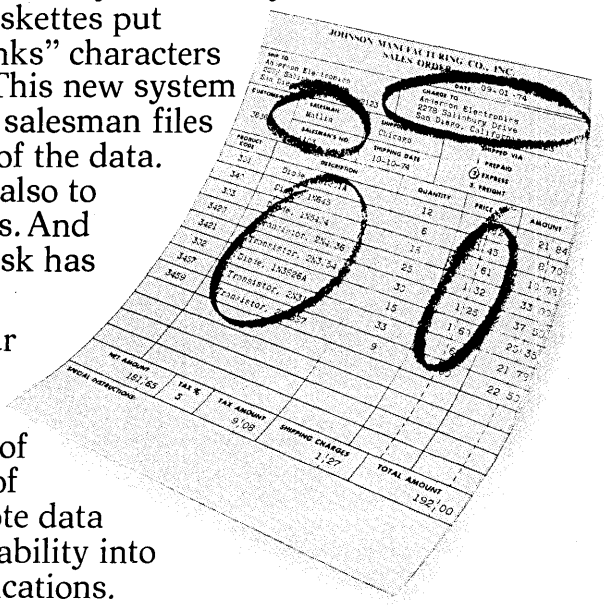
50% and guess data entry costs?

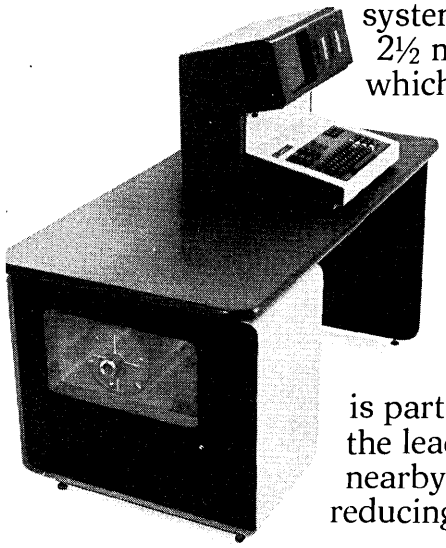
Costs are reduced and so are errors. Use of Sycor's 340 intelligent terminal with dual flexible disk in a typical order entry application can, in fact, reduce keystrokes by 50%.

And fewer keystrokes means greater throughput with fewer operators and a sharp reduction in error rates.

Our Model 340 with dual flexible disk may be used to automatically retrieve the kind of data that an operator would normally have to key-in. These two IBM-compatible diskettes put 500,000 "fill-in-the-blanks" characters at your operator's fingertips. This new system allows you to store customer, product/price and salesman files right where you need them most—at the source of the data. And you can use it not only to retrieve data, but also to maintain and update files—even generate reports. And you can do it fast... because the Sycor flexible disk has the fastest access time in the business.



Hard disk, too. For larger file applications, our Model 340 with its new hard disk drive performs all the functions of the dual flexible disk system, but with a capacity of 2½ million characters. All of which can extend your remote data base management capability into new cost-saving applications.



From the people who brought you intelligence. This new concept of remote data base management wouldn't be possible without the intelligence of our Model 340 and its powerful TAL programming language.

The Sycor 340 and its wide variety of peripherals is part of the family of intelligent terminals that have made us the leader in the field. For more information, contact your nearby Sycor representative. He's got all the answers for reducing your data entry costs.

SYCOR

times the content density capability D times its information access speed S (i.e., CxDxS). For example, various storage systems were described in terms of total information bits times bits per cubic centimeter of medium volume times bits accessed per second with the following results [3].

(1) Punched cards— (Stack of 2000) $CxDxS=10^7$
(2) Computer tape library (10^4 reels) $CxDxS=10^{11}$
(3) Microfilm library of typed pages (10^4 rolls) $CxDxS=10^{13}$
(4) Human brain and nervous system $CxDxS=10^{23}$

The longevity factors, reliabilities and cost factors were not considered here.

Maximization of these C, D, S factors may result in a misleading indication of system quality. For example, an extremely fast system, which must wait idly for input, is inefficient. A system with a high density capability but whose contents are difficult to access is inefficient, and a system with a large capacity that is unfilled is also inefficient.

Cost factors

The cost considerations for the storage of the vast amounts of stored data must be included in an archival quality analysis. Here are some general cost considerations that will weight the decisions:

- The cost of the total system, including the following:
  (1) Peripheral I/O devices
  (2) Research and development costs for the system and storage medium
- The number of operating personnel involved
- The quality and training required of operating and maintenance personnel
- The unit cost of the storage medium chosen
- The cost per stored bit (hard and soft)
- The information updating costs
- The cost of checking, locating, and replacing lost bits
- The cost of regular handling and recopying procedures

A cost analysis for a long-term magnetic tape storage system is given in Table 1 [2]. This table relates only to the handling costs per unit storage medium and does not include any other system components or parameters.

Estimated Costs of Long-Term Magnetic Tape Storage

Description of Cost Item	Prorated or Annual Cost per Reel (¢)
1. Building and facilities capital cost of vaults @ $60/ft²; 50-year life	3.3¢
2. Administrative space expense @ 30¢/ft²/year	0.8¢
3. Environmental control costs @ 57¢/ft³/year	9.5¢
4. Racks and shelving for canister-type containers @ $161 per 288-reel unit; estimated 10-year life	5.6¢
5. Handling and shelving @ 15¢; assume 50-year retention of file	0.3¢
6. Cleaning and rewinding tapes initially and annually thereafter, 1 operator @ $5/hr and 2 cleaner/rewinder machines	50.0¢
7. Inspection and test reading, 5-percent sample annually @ $5 per reel inspected	25.0¢
8. Recopying at 12-year intervals onto new tapes, computer time @ $5 per reel and new reel @ $5 assuming higher density recording	83.3¢
Total Annual Cost per Reel Stored	177.8¢

Table 1. The facilities costs are actually the smallest costs in a good archival storage program.

The feasibility and costs for converting the data contents into new forms on new storage media which are made possible by advanced technologies should be considered on a continuous basis.

Other archival quality factors

Archival (Data Bank) Security. This is a crucial area which is presently under intensive investigation [5,6]. The effects of improving data bank security on the archival quality and the integrity of the secured data should be considered. For example, complex multilevel codes can make the recovery of lost data both difficult and expensive, and increase the danger of severe data loss during catastrophic events. Different data modulation techniques may lead to various degrees of susceptibility to data loss due to both the physical media and data characteristics. Prior experimentation with these elements must be undertaken before they are used in an archival system.

Information Recovery. This is a process by which lost contents may be reconstructed and should be considered to be a figure of merit for the archival quality of a system. For example, recently a technique of neutron bombardment was developed as part of a method for retrieving an image from a photographic plate after it had completely faded. It cannot be known with any certainty when such resurrection methods can be developed, but the potential existence of such a method can be considered as an asset to archival quality.

Operational flexibility in an archival system can improve the content recovery capability. For example, in the case of a low level data signal it may be possible to increase the electronic system gain. Also, transport mechanisms with a sufficient range of adjustment may enable a marginally operating medium to function properly.

It is worthwhile designing improved recovery capabilities for encoding/decoding keys (such as algorithms) into the system. This might be accomplished by making these codes more easily reconstructible with cryptoanalytic methods. For example, the key to the data formatting on a reel of magnetic tape can be included at the beginning of each reel. An appropriate standard code can be developed for this use with each type of storage medium.

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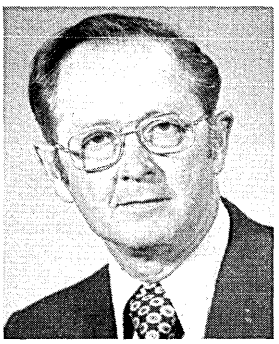
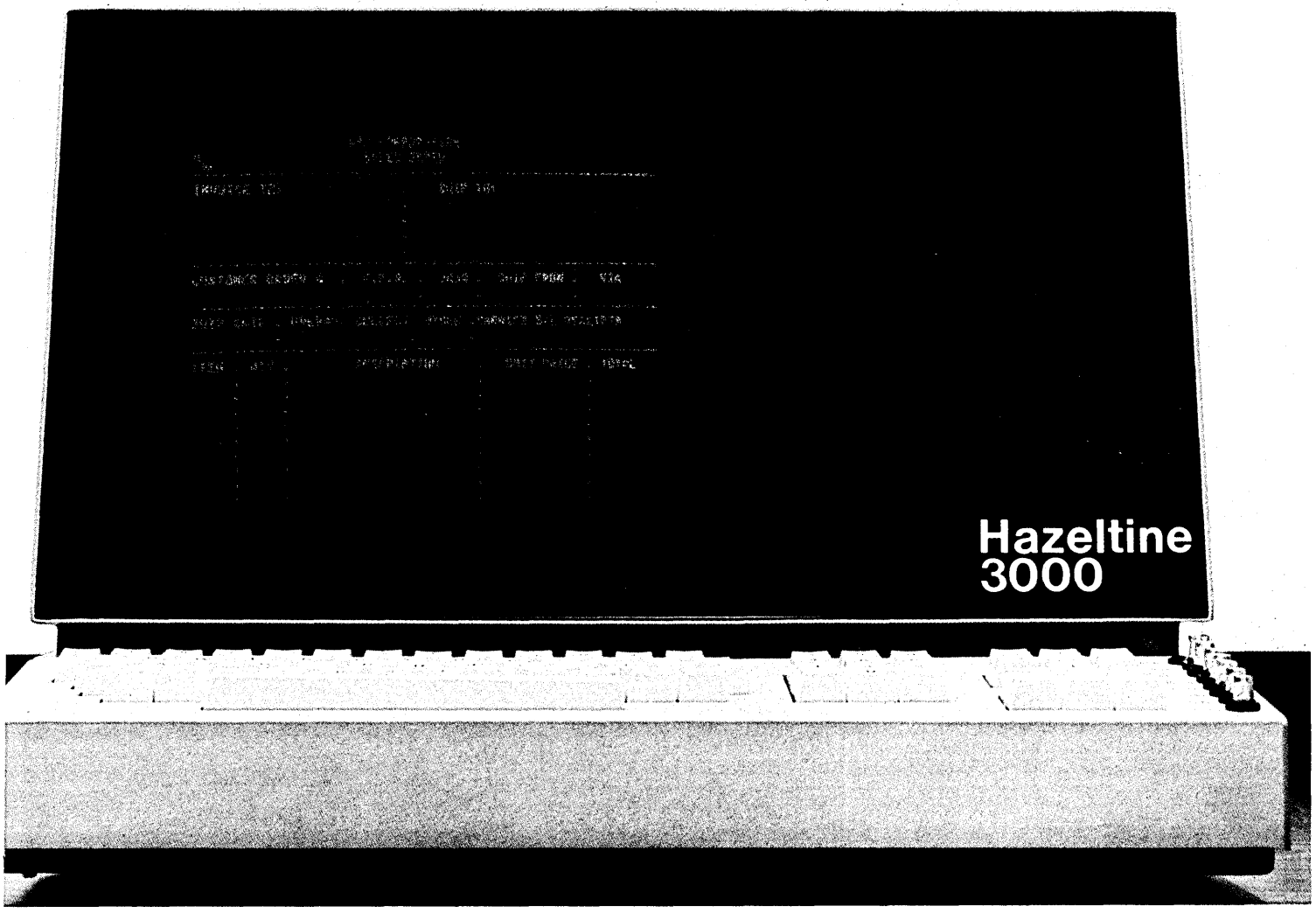


Mr. Geller is manager of the magnetic media lab of the Inst. for Computer Sciences and Technology at the National Bureau of Standards. He has participated in developing standard reference magnetic media and reference measurement systems, and has published papers on magnetic media and solid-state devices.

WE CALL IT THE HAZELTINE 3000



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The Hazeltine 3000 terminal has a programmable microprocessor-based communications interface that makes it compatible with communications disciplines of most computer manufacturers. It has the features that make communicating so much easier—powerful local editing capability, protected formatting with dual-intensity video, full-size 1998-character display, uncluttered moveable keyboard, and a full range of options. It's a "custom" terminal at an "off-the-shelf" price: $125 per month (12-month rental, maintenance included)...and it's backed by worldwide sales, service and technical support from the Company with a half-century of leadership in electronics and displays! Fantastic!

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CIRCLE 35 ON READER CARD

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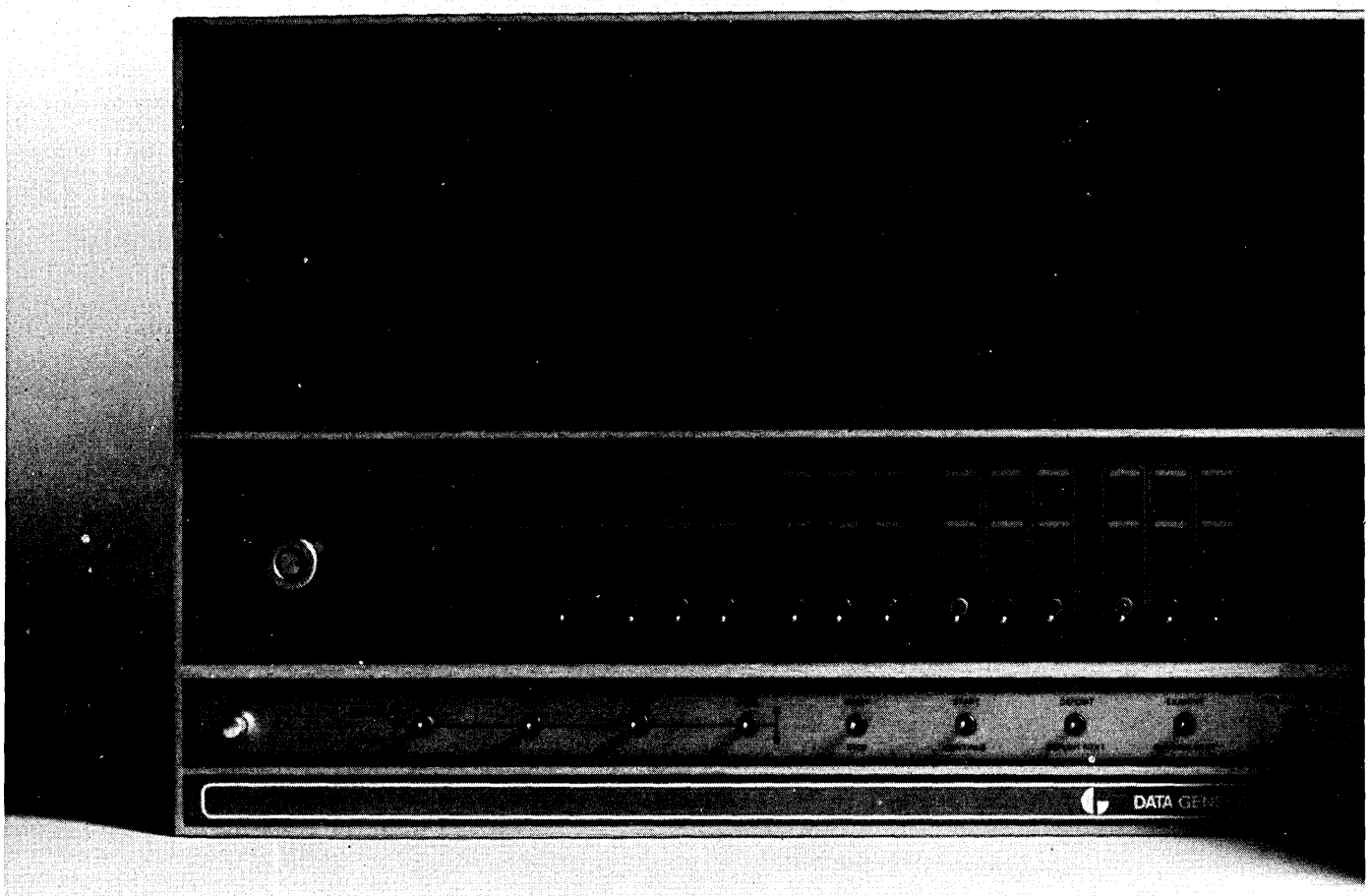
One good decision.



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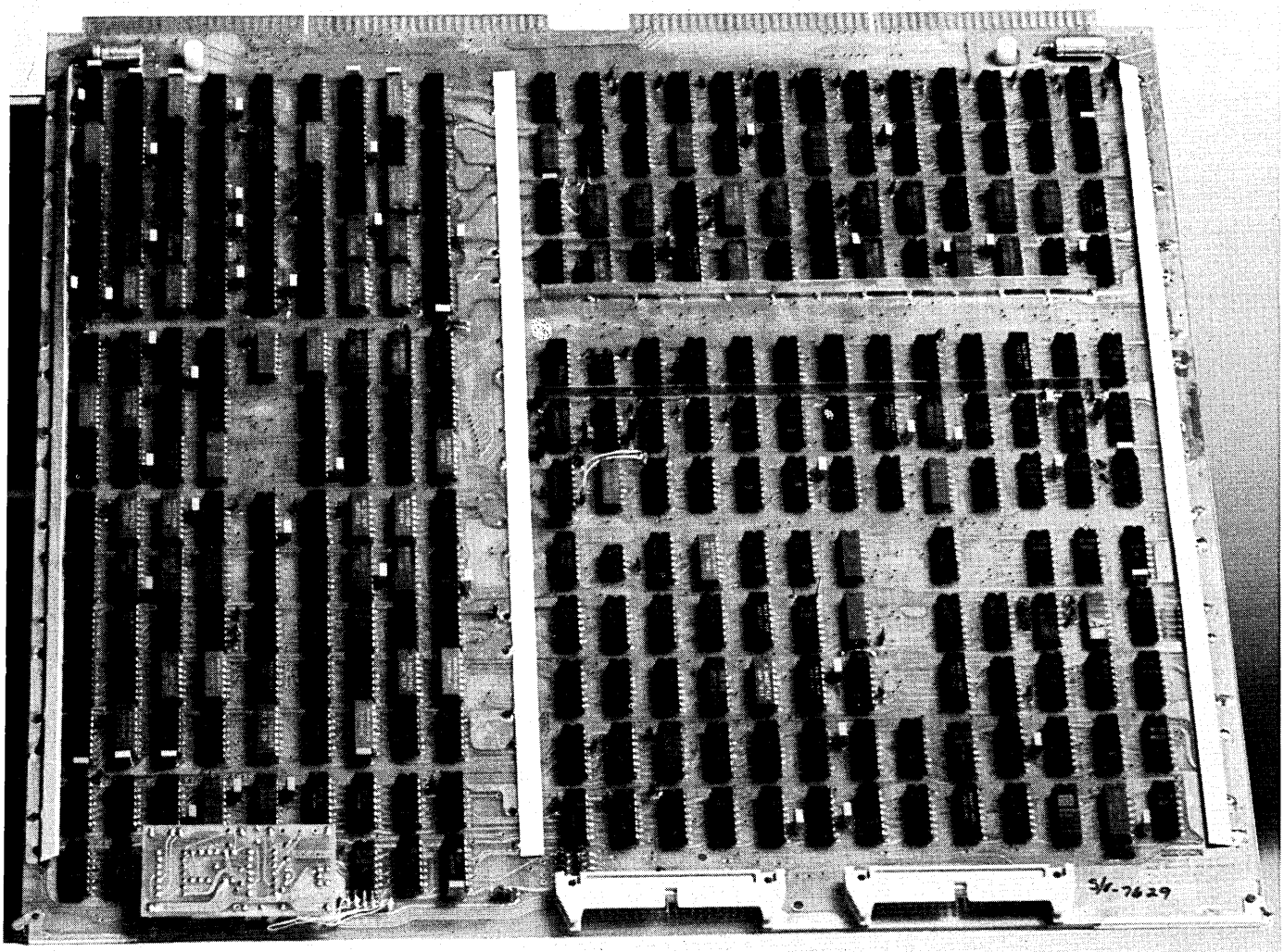

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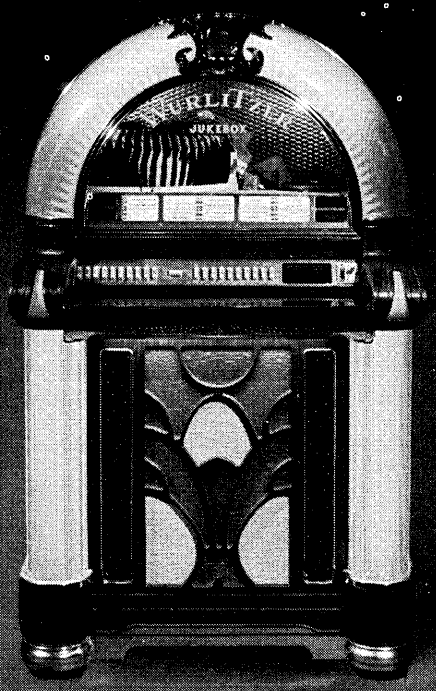
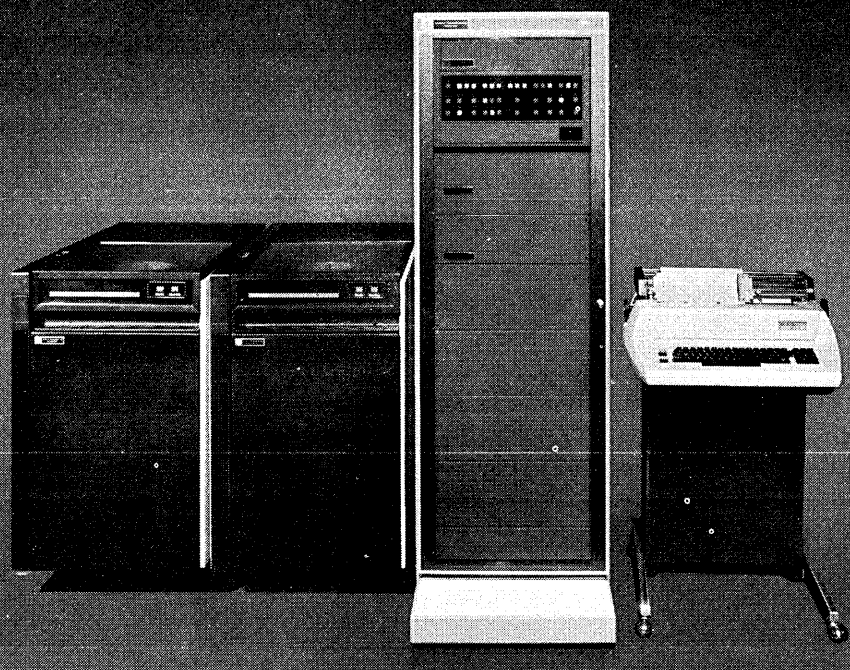


60 MINUTES~ONE DIME



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CIRCLE 8 ON READER CARD

Simply regrouping the comments cards
can make a program easier to read and maintain.
Thinking about how to regroup them
leads to better program structures too.

PROGRAMMING IN BOOK FORMAT

by Knut Bulow

At one time or another every programmer will have to look at someone else's code and try to understand what is happening and why each statement is where it is. In spite of imbedded comments, this is usually difficult and unpleasant. There is an alternative to the common method of writing and documenting a program which will make things easier.

Most well-written programs have a header containing: the title of the program, the author's name, the date it was written, the version number, the machine for which it was written, and the amount of memory used. There should also be a section near the beginning describing the program's function. Following this there is a mix of code and comments statements.

Each block of comments tells the major function of the code which follows, information which is often of limited value for small sections of code. What often is not documented is why that section of code is right there, and how it relates to the preceding code and to the program as a whole. Even breaking things down into subroutines doesn't help much. Though one may know what a subroutine is doing, it may not be obvious why it is doing that or in what sequence it must be called.

An alternative to this method of program construction and documentation is a form which has been in use for hundreds of years, the book format. Using the book format, a program can be written closely following the way a book is structured. A book has one beginning and one end. It has a title (name of program), an introduction (header information), and, most important, a table of contents followed by the separate chapters. Each of the chapters is written to be somewhat independent and to have a limited message. Something analogous to these last two parts, the table of contents and the chapter, should be adopted by programmers.

After the header information there should be a major section containing nothing but comments explaining each chapter of code and telling where it is located. A program in book format would look conceptually like this:

```
Program name
Header information
Chapter 1 name
        •
        •
  (chapter 1 description)
        •
        •
Chapter 2 name
        •
        •
  (chapter 2 description)
        •
        •
Chapter N name
        •
        •
  (last chapter description)
        •
        •
        •
        •
"Start chapter 1" comment card
        •
        •
  (chapter 1 code)
        •
        •
"Start chapter 2" comment card
        •
        •
  (chapter 2 code)
        •
        •
"Start chapter N" comment card
        •
        •
  (chapter N code)
        •
        •
      end
```

In a program in book format, find-

ing out what a routine does is easy. The header information will tell what the whole program does. The table of contents indicates major parts of the code and gives a rough idea of how the program as a whole works. Looking under each major "topic"—chapter—in the table of contents, one can find detail on the routine in question.

Maintenance of the program is simplified since it is possible to go directly to that portion of the code of interest. Also, any changes made in the given "chapter" of code would not easily have hidden effects on other parts of the program. (It is important that each chapter be written to be as self-contained as possible, with limited GO TO's branching to other chapters.)

The book format would not seriously affect other program writing styles now in use. Imposing book format should be equally beneficial to structured or unstructured code. Modular programs would be given increased readability. Top down programming and book formatting would also complement each other; the basic difference between them is that one describes what the other is doing; otherwise they have the same philosophy and goals.

The table of contents makes it unnecessary to have many comments in a chapter itself, and saves documentation time. It also makes life much easier for someone familiar with the subject of the program but not the particular code.

We have found that the time required to get "on board" with a program was cut to close to one-third using this format. And we realized savings in design time, too, since the design goals are not obscured by details in the logic development process. In the example program partially copied in Figs. 1 and 2, chapters 1, 2, 3, 4, 6, 7, 8, and 10 were identified from the program requirements; it was easy to develop each chapter to its present form nearly independently.

In summary, the main advantages of using book format are:

1. quicker logic development
2. easier maintenance
3. reduced time to gain familiarity with programs
4. reduced documentation requirements

Using the format at least doubles readability. It demands more comments, but requires less work in documentation overall. Coding is easier because the implementation requirements appear in plain English in the initial table of contents. In short, there are many advantages to be gained by structuring programs like books. □

```
C
C
C     THIS IS THE    M A I N    PROGRAM
C
C     WRITTEN BY  K. BULOW  ( COMPUTER GENERATION , INC.)
C     JUNE 19 1974
C
C     ON MACHINE   IBM 370-168
C
C     PLOT PACKAGE   S T A R E  IS USED.
C
C
C
C     THE MAIN PROGRAM READS IN MEASURED DATA,CORRECTION DATA AND
C     PREDICTED DATA. IT CORRECTS THE MEASURED DATA OR THE PREDICTED DATA
C     BY USING CORRECTION DATA SO COMPARISONS CAN BE MADE BETWEEN THE TWO.
C     CERTAIN VALUES ARE PRINTED AND PLOTTED.
C
C
C
C1    READ SPECIAL INFORMATION
C
C     INITIALIZE VALUES FOR CALCULATING TOTALS
C     READ SDC NUMBER AND START OBE AND END OBE NUMBER
C     SET UP A LITERAL ARRAY FOR LABELING HEADER DATA IN PROPER UNITS.
C     READ TEMPERATURE ,CABLE LENGTH AND EQUALIZER POSITION OF CRIGINAL
C     DATA
C
C2    READ IN NAME OF ORIGINAL DATA SET AND DATA.
C
C     READ IN NAME OF ORIGINAL DATA AND CHECK FOR VALIDITY.
C     SUM INDIVIDUAL DISTANCES.
C     READ IN DATA VALUES AND CHECK FOR NUMBER OF ENTRIES.
C
C3    READ IN NAME OF CORRECTION TO BE DONE OR VALUE TO BE CALCULATED.
```

Fig. 1. As usual, the title, date, and environment information fall at the beginning of the code in a program in book format, but a table of contents falls here too. The table contains the header information each section of code might otherwise have, and more.

```
      DIMENSION X(200,17),Y(200,18),NAME(11,2,17),JDB(10),AOEFF(10,2),
     *NOEFF(11,2,10)
      DATA JSTRIX/'*'/,IDB/'DB'/
      DATA IONE/'1'/
C
C1    READ SPECIAL INFORMATION
C
      ITOT=0
      TDIST=0.0
 1    CONTINUE
      ITOT=ITOT+1
      WRITE(6,5)
 5    FORMAT(1H1)
      READ (5,9) NO,IOBEFR,IOBETO
 9    FORMAT(3I5)
      IF(ITOT.EQ.1) IOBE=IOBEFR
      DO 6 K=1,10
      JDB(K)=IDB
 6    CONTINUE
      READ (5,90) TEMP,DISTAN,EQUAL
C
C2    READ IN NAME OF ORIGINAL DATA SET AND DATA.
C
      READ (5,10) ISTRIX,((NAME(J,K,1),J=1,11),K=1,2)
 10   FORMAT(A1,22A1)
      IF(ISTRIX.EQ.JSTRIX) GO TO 50
      WRITE(6,20)
 20   FORMAT(1H1,'ERROR  ******   DATA TC BE CORRECTED DOES NOT HAVE PRO
```

Fig. 2. The main body of the code is sparsely commented, but directly referenced to the table of contents.

Mr. Bulow, a senior computer analyst at Computer Generation, Inc., previously programmed for NASA at the Goddard Space Flight Center. He received his training in Norway.

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CIRCLE 41 ON READER CARD

IBM announces a comprehensive new approach to teleprocessing.

Teleprocessing—communicating with a central computer through remote terminals—has evolved rapidly in recent years. With it, numerous communications devices have come into use, including a variety of terminals, line control methods and programming support. Many of these elements are incompatible with one another, often requiring costly duplication of facilities.

Now IBM announces a landmark development for teleprocessing. It's called Advanced Function for Communications. And uses IBM System/370 computers with virtual storage, of which it is a logical extension.

This communications capability was formerly available only for specific industries. Now it is offered for use throughout business, industry, education and government to improve productivity and simplify the development of new applications.

The concept.

This new approach applies a unifying design to the entire teleprocessing function as System/360 did for the computer ten years ago. A combination of equipment and computer programs, Advanced Function for Communications permits users to move freely from one IBM terminal-based system to another with a minimum of application programming changes.

And since this approach establishes a clear separation between network management and user application functions, improved use of the network and a more economical framework for applications growth become possible.

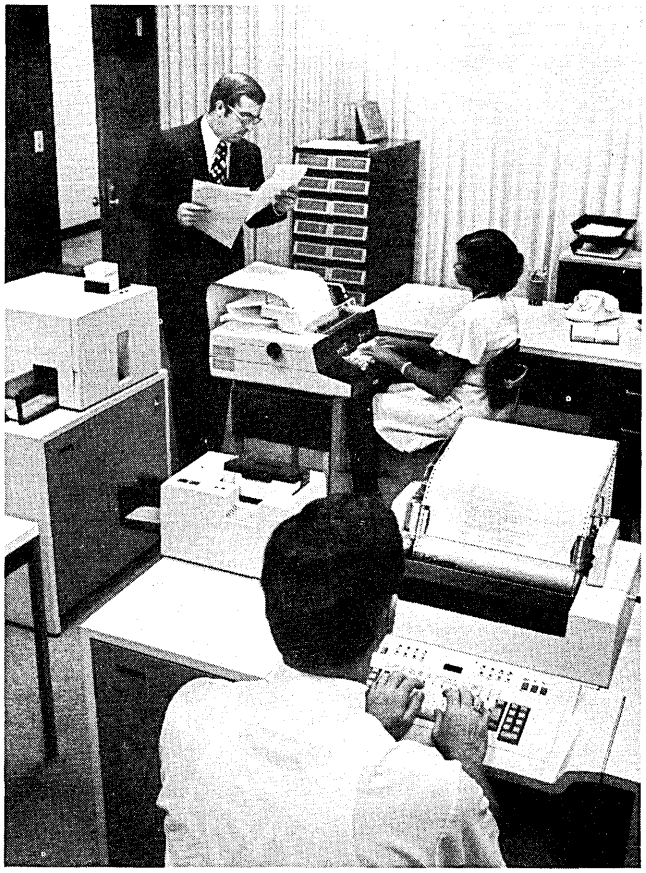
The programming.

With Advanced Function for Communications, one teleprocessing network is available for many uses. The network handles multiple on-line applications in a broad range of user environments. Terminals and equipment, on any line, can be shared among many different applications in the computer.

As a result, it is now possible for multiple terminals, on any line, to talk with different programs in the System/370.

This is accomplished by three major programming elements: the virtual operating system; the Network Control Program (NCP/VS) resident in the IBM 3704/3705 Communications Controller; and VTAM, the teleprocessing access method for System/370 virtual systems.

These programs work together to build a comprehensive terminal system on a single



A unifying design for data communications networks... an immense step toward fulfilling the computing potential of the Seventies.

line—using a common line discipline, a common network control program and a common access method. Networks can become easier to develop, easier to maintain.

Communications control functions are moved from the central computer and distributed into the network. This can reduce line traffic and thus lighten the load on the computer.

And because you can process more than one application on a single terminal, as well as have numerous terminals sharing a common communications line, you may be able to operate with fewer terminals and lines.

The equipment.

A family of terminals and communications products—most of which use advanced Large Scale Integration (LSI) technology—is available for use with Advanced Function for Communications. All utilize Synchronous Data Link Control (SDLC), a flexible, more efficient line control method. The sixteen latest additions comprise the IBM 3767 Communication Terminal, the IBM 3770 Data Communication System and new models of the IBM 3270 Information Display System.

The 3767 is a bidirectional keyboard-printer with a speed of 40 or 80 characters per second. It can be readily incorporated into existing configurations. Some of its uses include inquiry, inquiry and update, low-volume data entry, program test and debug, and problem solving. It is equally at home in the sales department, an insurance agency or engineering office, or in the programming department.

The 3770 is a group of four different operator-oriented remote terminals, combining a keyboard and printer with a modular selection of input/output devices and communications features. For example, the 3774 Communication Terminal, with a bidirectional printer with speeds up to 80 characters per second, can become a multimedia batch terminal by adding such optional units as a card reader, a card punch, one or two Diskette® storage devices, and a line printer.

Advanced Function for Communications. It can be an immense step toward fulfilling the computing potential of the Seventies, with its emphasis on data base/data communications systems.

For more information, contact your local IBM Data Processing Division office. Or write IBM Corporation, Dept. 83F-D, 1133 Westchester Avenue, White Plains, New York 10604.

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by
JACK L. LUDWIG

There was once a small but very adept S/370 user who had virtual analysts. It happened one DPMA day that he came to speak with the great Khan Sultan of the East, and to give himself false stature and faster access, he told this Khan Sultan that he employed a programmess who could quickly convert BTAM into CICS under VTAM. The Khan Sultan audio responded, "That is a biquinary treat which pleases me well; if your lead coder is as algorithmically clever as you say, log her onto my majestic CRT tomorrow that I may put her soft wares to the proof."

When the girl was brought to him, he led her into an old data room that was quite full of raw BAL from past and unending conversion jobs, and this avaricious Khan Sultan gave her a TTY 33 and third shift remote batch rates, and said, "Now set to work, and if you have not translated all this raw BAL to CICS when morning timesharers utilize my CPU, you shall forfeit your Viatron stock options." And he shut the door and left her there alone, logged on a 10 MEGA K PDQ2 with a BOS simulator.

And so lead coder was left there editing, and could not think what to do; she had no notion how to set to work to spin optimized CICS from raw BAL, and her distress grew so great that she began to loop as well as weep. Then all at once (25 nano-seconds anyway) the door opened, and in came a little macro, who parametrically said, "Good evening, lead coder, why are you looping and weeping?" "Oh!" she answered, "I have to create CICS out of BAL in the raw, and I do not have the specs." Then the little macro BALR'd, "What will you give me if I do it for you?" too eagerly. "My 407 wiring panel or my Univac II vacuum tube, or my Eccles-Jordan trigger, or my Programmer's Acronym Thesaurus, and my most treasured subscription to *Software Age*," said the frightened girl. "Fine," said the little macro, "I will take them all," and seated himself before the TTY and stroke, stroke, stroke! three times Pi and the tape was full; then he took up another batch job, and stroke, stroke, stroke! three times Pi and that tape was full; and so he went on 'til the morning, when all the BAL which was raw was taped, edited and translated, and all the lists were full of CICS.

At sunrise came the Khan Sultan, and when he tested

the CICS he was astonished and very much converted and rejoiced, for he was heuristically avaricious. He had lead coder taken into another BAL data room filled, much bigger than the last, and told her that as she valued her merit increase she must translate it all in one night. The girl did not know what to do, so she began to cry in a nested DO loop, when suddenly the door opened and the little macro again appeared and greedily said, "What will you give me if I xmit all this?" "The polystyrene THINK sign from my desk, ten orange write-protect-rings, an hour's free time on an IBM 650 or 705, a box of unpunched, pink trimmed 5081 cards and a Captain Video CRT secret membership code ring," answered the distraught girl.

So the little macro took the items, and began again to send the device stroking at high speed, and by next light all was made glistening optimized CICS.

The Khan Sultan was rejoiced beyond measure at the results, but as he could never have enough CICS on his multi-processor 10X sweet CPU, he had the lead coder taken into a still larger BAL data room and said, "This, too, must be translated in one night, and if you accomplish it, you shall become my project leader." For he thought, "Although she is but an S/370 user's lead coder, I am not likely to find any one more resourceful in the entire DPMA, nor in all of AFIPS."

As soon as the girl was left alone, the little macro appeared for the third time and said, "What will you give me if I translate the programs for you this time?" "I have nothing left (± 0) to give," answered the girl. "Then you must promise me your first drawn after you take charge of the graphic plotter," insisted the little macro. "But who knows whether that will happen," thought the girl; and as she did not know what else to do in her necessity, she promised the little macro what he desired, upon which he began to do his translate thing until all was sparkling CICS. And in the morning when the Khan Sultan came and found all done according to his wish, he caused the promotion to be granted at once.

In a year's time she brought forth a fine plotter into the world, and thought no more of the little macro; but one day he came suddenly onto her Video terminal, and demandingly said, "Now give me what you promised me!" She was terrified greatly, and offered the little macro all the remainder of her source data entry budget if he would only leave the first drawn; but the little macro emphatically said, "No! I would rather have something linear than all the treasures of OCR." Then the girl began to lament and to weep, so that the little macro had pity upon her.

"I will give you three prime shifts," said he, "and if at the end of that time you cannot tell me my *label*, you must give up the precious picture to me."

Thus she spent the whole night in thinking over all the labels that she had ever heard or coded, and sent a broadcast message through all the on-line network to ask far and wide for all the labels that could be cross reference listed. And when the little macro came to her next day (beginning with Jovial, Loboc, Algol) she repeated all she knew, and went through the entire list, but after each attempt the little and as yet unnamed macro said, "That is not my label!"

The second day the girl sent to inquire of all the timesharers what their IDs or systems were called, and told the little macro all the most unusual and singular labels, saying, "Perhaps you are labeled Synergism, or Algorithm, or Heurism, or even Symbolism or Euphemism?" But he answered nothing except the phrase, "That is not my label!"

The third day the remote batch regions came in, and related to her, "We have not been able to find one single new label; but as I passed fields of page thrashers, I came to an intense static area and near it was a little working set, and before this working set was churning a page table, and round the table executed a comical little macro, and he branched on one register and displayed,

"Today do I nest, tomorrow I loop'd,
The day after that, VTAM's stylus writes in;
And oh! I am glad that nobody scooped
That the label I am called is Dump*Old*Bits*Bin."

You cannot think how pleased the girl was to hear that label, and soon afterwards, when the little macro link-edited in and said, "Now Dearie, what is my label?" she said at first, "Are you referenced as Honey? Well?"

"No," he responded, "that is not my label."

"Are you called Mux?" she asked again.

"No," answered he, "that is not my label."

And she said without acronym, "Then perhaps your label is Dump*Old*Bits*Bin."

"The Devil made you say that, Flip-pity, Flop-pity name. The Devil made you say that Flipfloppity label," bleeped the macro, and in anger he cleared his sub-

routine linkage so fast that it went through the Wait list without his ID; then he seized his I Address Register with two Start I/O's in such a fury that he NO OP'd in two and there was an end of him.

He who is without name cannot be called upon. □

When not exercising his talents as a fabulist of data processing lore, Mr. Ludwig works as a senior systems engineer at Memorex.

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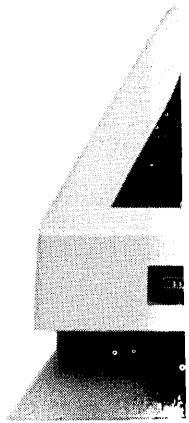

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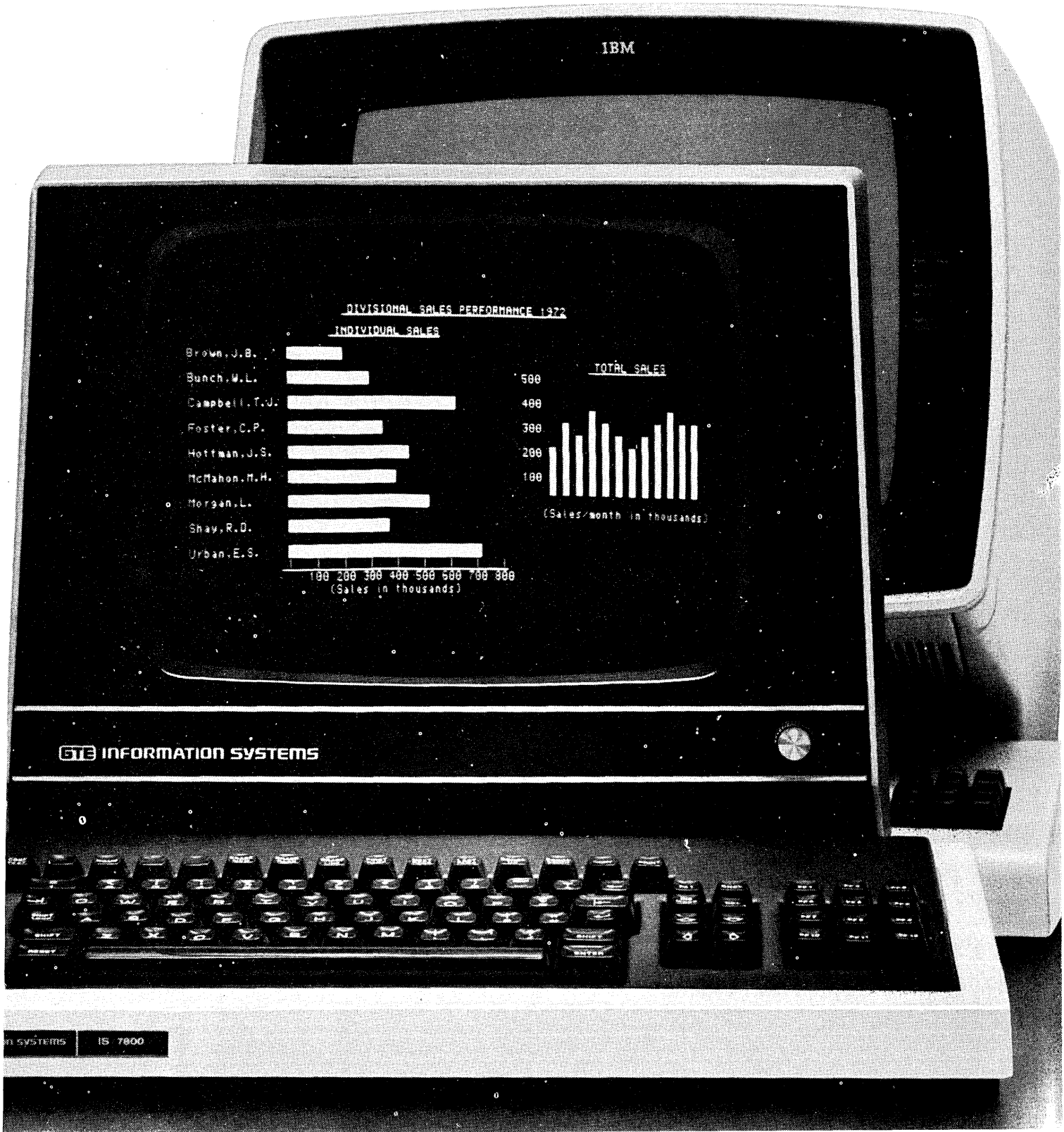

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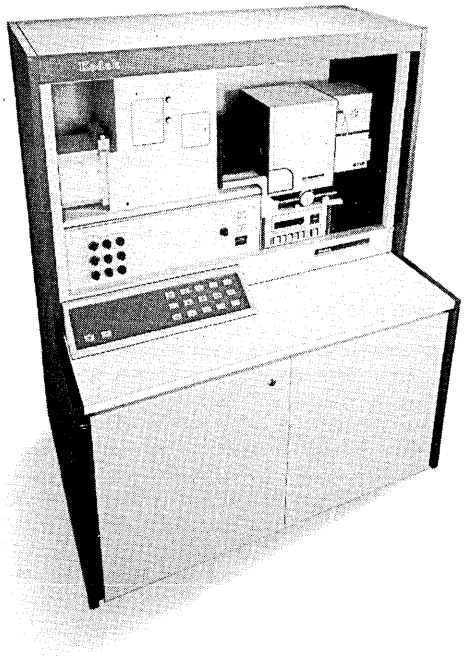

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An economist puts forth a feasibility plan
to break up IBM into several companies.
Others also favor restructuring.
IBM argues economies of scale.
Competition from AT&T?

THE BREAKUP OF IBM

by Angeline Pantages, New York Bureau Manager

Is it feasible to break up IBM?

Yes, says Harvard economics professor Dr. Hendrik Samuel Houthakker, who will testify for the Justice Dept. in its antitrust case against IBM which may go to trial early next year. Houthakker is a consultant to the Justice Dept. on the issue of relief and is the author of a plan to break up IBM, a plan developed primarily to show that "there was prima facie evidence of feasibility."

Houthakker, one of many economists who have spoken out on the complex issue of competition in the IBM-dominated data processing industry, actually has arrived at a definite number of companies into which IBM should be split. This figure came out in volume III of a 768-page pre-trial deposition taken last June. IBM's outside counsel Thomas Barr elicited the figure, but all parties went off the record, "in the public interest," and referred to the number in the record as "X" number of companies. The Justice Dept. already has indicated that IBM should be broken up into a discrete number of "competitive, balanced, broad line computer companies," in a plan for relief filed in the fall of 1972.

Barr may have given some hint of IBM's plan for defense against the six-year-old suit when he questioned Houthakker about future potential competition for IBM—specifically from the telephone company.

"Were you aware," Barr asked, "that there exists a company larger than the IBM company, which was ready, willing and able to enter the electronic data processing industry, but which is precluded from doing so by a wholly artificial barrier?"

"Are you familiar," Barr continued, "with the provision of the AT&T (consent) decree which prohibits AT&T and Western Electric from engaging in the (edp) business . . . Did you consider, Doctor, the possibility that that portion of that decree might be withdrawn and that AT&T and Western Electric would then be free to engage more fully in the . . . industry?"

"Are you aware," he continued, "that the officials of AT&T and Western Electric have testified under oath in this case that they currently have $750 million of EDT this year, most of which is in EDT hardware?" (It was not clear if the initials were in error or if "T" means terminals.)

Houthakker, in preparing his plan for the IBM breakup, said he'd rejected the idea that AT&T might enter the industry, even though it is one of the few that "could take the kind of loss that might be involved for the first several years." He said he clearly has no faith in the ability of a regulated monopoly to cope in the competitive arena.

X or X minus?

Asked why he decided "on X as the right number" of companies into which IBM should be split, "rather than X plus one or X minus one," Houthakker in his deposition said, "That was based on the notion that it is undesirable, unless there are other compelling circumstances, to break up individual plants."

Houthakker's scheme — which is only to show feasibility—is an outline, not more than 10 pages long, that contains "principles."

First, one "would want to avoid the breakup of individual establishments."

Then, "the individual successor companies should be competitive with each other." Completely competitive? Not completely, but these are "desirable features, rather than absolute requirements."

The companies "should be balanced domestically and internationally," meaning about the same size and about the same product lines.

They should have, roughly, "similar access to existing research and development facilities." The R&D facilities Houthakker was most concerned with are located in manufacturing facilities, which won't be broken up. Here it was explained that some of the successor companies would not have their own disc drive plant, some wouldn't have their own tape drive plant, etc. "The assumption was that after a period of time they would be induced to have their own disc drive, or tape drive facility; whatever it is that was lacking. In the meantime, provisions would be made for interchange of peripherals among the successor companies under certain restrictions."

Barr shot back, almost rhetorically, as seems to be legal practice: "Do you not understand, Doctor, that without designing the total system, it is, in effect, impossible to design, in any serious way, any major part of that system? . . . Do you think people can proceed along parallel lines and then, at some point, they'll just merge whatever they are doing?"

They went back to the plan. Houthakker would give these companies roughly equal employment. Each company would "have some representation in the high, medium, and low end of the general purpose spectrum."

Finally, the rest of the IBM company would also be subdivided among these X parts.

No time for cocktails

(During the discussion, Barr apparently slipped and gave the number. Justice Dept. attorneys warned those in the room not to let it slip out during cocktail parties, etc. IBM general counsel, Nicholas deB. Katzenbach, silent through the deposition, shot back, "We don't have time for cocktail parties.")

Houthakker noted his plan did not come to a definite conclusion on the division of the lease base. Responding to questions, he said it did not state the purpose to be achieved, the benefits to users or competitors, how it might increase or improve the competitive environment in the industry. There was nothing in it about the national defense or the balance of payments.

Houthakker stated, "It turns out that the contribution of IBM to our trade balance is comparatively minor . . . because most of the products sold by IBM abroad are also manufactured abroad." He estimated that the IBM contribution to balance of payments is "something in the order of a billion dollars per year," and that is only "moderately significant."

Although it is not in the plan, Houthakker feels that the split up will reinforce competition in the industry and lead to lower prices by reducing the profit margins presently captured by IBM. It might possibly lead to better products, but the effect would be "minor and unpredictable."

Noting that the Doctor didn't seem to know much about how products are developed, at least not in testimony, Barr asked how he reached that conclusion. The economist "argued it from a negative point, namely there is no evidence that the present structure of this industry does have a favorable or unfavorable effect on the quality of products." At least, Houthakker had no such evidence.

Had he tried to determine whether "breaking up IBM into X companies would in any way hinder the pace of technological development in the industry?" Barr again put Houthakker through his paces, asking him what he'd read, criticizing his "apparent" reliance on a thesis done by Gerald Brock while a graduate student at Harvard.

Suppose, Barr went on, IBM was broken up and 10 years from now, "one of those companies had 75 or 80% of the market for the same reasons" the economist had outlined as reasons for IBM's success? Should that company be broken up again into X parts? No, said Houthakker, because that would indicate there is a natural monopoly in the industry.

Had Houthakker studied whether that is true now? Somewhat, "primarily by trying to find out about economies of scale, because that would be the main reason for a natural monopoly. But the data for coming to a conclusion on economies of scale are very scanty."

Arguments are mind-boggling

This sampling, and it is a mere sampling, of the dialogue across thousands of pages in testimony and deposition of economists typifies the mind-boggling arguments that will be brought up before the idea of relief can even be addressed. The economic aspects of the case are like gristle. Difficult to chew and impossible to digest. Definitions are not clearcut at all. Monopoly. Competition. Market. Market share. Barriers to entry. Economies of scale. Brand loyalty. You become involved in whether rattles are in the same market with electric trains.

Barr's questions suggest that economies of scale, whether they are significant in IBM's dominance or not, are vital in this issue and its outcome. Two economists, testifying before the Senate Subcommittee on Antitrust and Monopoly of the Committee of the Judiciary, maintain that such economies are not the significant factors in IBM's dominance. Hence, they came up with ideas on the structural reorganization of IBM. Break them up, said Gerald Brock, now assistant professor of economics at the Univ. of Arizona, and economist Ralph E. Miller.

(Katzenbach, IBM general counsel, complained bitterly to the committee that these two witnesses, the only ones from the economic community, would expose the committee "to the Dept. of Justice's view with no opportunity for rebuttal by IBM." He said that Prof. Brock "recently completed, under the tutelage in part of one of the Government's principal experts (*presumably Houthakker*), a Ph.D. thesis on the computer industry which is an important source of the Government's theory of the case against IBM." Brock denied this. Miller, Katzenbach said, has worked in the Justice Dept. and has for some time been assisting in the preparation of the Government's case.)

Katzenbach's concern about a biased picture was well founded, since Miller would like to split IBM up into *no less* than six vertically integrated companies. Brock wants to split IBM by functions, making separate companies out of the productions of cpu's, peripherals, maintenance, and marketing functions.

Brock's solution comes from his belief that "lack of competitiveness in the main computer industry is a result of integrated systems selling rather than in concentration itself." The significant barriers to entry, says Brock, are raising capital, brand loyalty, and last, economies of scale. He finds economies of minor importance in hardware manufacture and most significant in systems software production; thus the integrated system has more economies of scale than I/O, minicomputer, service, and consulting firms.

But more significant is brand loyalty. A user chooses a vendor for a broad range of reasons, a decision that is "seldom perfectly rational"; and once he makes that decision, the lack of compatibility among systems deters him from converting to another vendor's wares. Others call this situation "risk aversion."

The subject of transfer or conversion costs is a critical one in the economic debate on monopoly conditions. Princeton Univ. economist William J. Baumol, in his pre-trial deposition, summarized that "the question is whether in fact this is something that has been imposed on the market as a device to inhibit entry or whether it was negligence on the part of the new entrant that he did not adapt his equipment to make it suitable for using the old software—or whether it is, in fact, to the consumer's interest that there be a variety of hardware systems each with their unique software."

$1 billion for entry

Brock also noted that capital needed is another barrier to entering the systems business, and a factor in exits as well. A popular figure is $1 billion, taken from RCA's write-off of nearly $500 million and its projection that it needed an equal sum to stay in the business.

Brock pointed out that because of the barriers to entry, "no new company has successfully entered the integrated systems business since 1960." Furthermore, he sees a dangerous trend among existing competitors toward concentrating on maintaining their current base rather than going to the massive expenditures of attacking competition. The attempts in the past to increase market shares have meant lower profits for IBM's systems competitors "than you would have expected." "If no firms made definite attacks on each other's customers through compatibility and lower prices, the industry as a whole would reach its maximum profit position. This would also be the worst position for customer welfare. It appears that the industry is moving in this direction since the exit of RCA."

He wants to break up IBM functionally to "prevent monopoly power from one segment from being spread into other segments . . . IBM could not use power in one area to manipulate standards or price ratios in order to fight competitors in another area. Neither could one activity subsidize another."

Some of Brock's ideas on the breakup included putting applications software with the marketing company, so that the user wouldn't have to "deal with too many people." The company making cpu's and systems software would not have to be barred at all—or for a short period of time, like two

years—from integrating applications software, peripherals, and the like, says Brock. A temporary prohibition might ensure that "they operated as a viable business and didn't just go out and merge together." (In other words, we have the dreaded integrated systems company again, sans marketing power?)

Components would go with the cpu company because of the increasing integration of processor functions on fewer and fewer chips. Brock's plan assumes "some sort of agreement and publication of standards to insure compatibility." Currently, "our difficulty is that IBM really does not see it within their own interest . . . to have perfectly accepted standards," an attitude he does not blame IBM for. With functional separation, it would be in the interest of all the companies to have standards to increase the market for their different products. Collusion would be avoided by the open meetings and published standards.

Brock doesn't think that offering integrated systems is the most efficient method nor that IBM is the most efficient company. "I think the reason for maintaining the entire systems market is in order to enhance product differentiation and market control, rather than because it is more efficient."

Miller agreed that brand loyalty is a principal factor in IBM dominance, a factor which falls under "stabilizing forces." Another factor is historical. IBM entered computing through the tabulating business.

Breaking IBM horizontally into six or more companies, Miller thinks, would result in improved product performance in the industry, a decrease in product differentiation, perhaps a decrease in marketing activity and in the kinds of support provided. He thinks more compatibility would result among systems manufacturers so that users would go the Heathkit route, seeking the best price and product.

Before getting into the division of IBM's computer operations, Miller would first cut away the noncomputer business (Office Products, etc.), the Federal Systems Div. ("which does mostly special purpose computer work"), and the small information systems such as System/3 (which are organized at present as a separate division from the main computer business).

Miller is not concerned about what happens to the peripheral and software companies, feeling it's not in the public interest to protect them. But he does think that once there is no dominance in the cpu business, the systems companies will opt to go to peripheral and other specialists so that they can spend their resources on improving cpu's, software, and a selected few peripherals. The mainframe vendors will fare well as a group, he says, although the smaller ones may specialize and some simply won't make it.

Why break IBM into six or more companies? Anything less would leave

Future Systems: Too Big for Anyone but IBM?

IBM's outside attorney Thomas Barr seemed to suggest during a deposition-taking session with economist Hendrik Houthakker that IBM may become a natural monopoly with its future systems. Following is the dialogue taken from the 768 pages of testimony in a deposition taken last June:

Barr: "If you concluded . . . that there were substantial economies of scale, such that no other company, except one of an equal size, could expect to design and develop the next generation of computer facilities, what would you recommend?"

Houthakker: "If the economies of scale were as large as you suggest . . . the indicated outcome would be regulation rather than divestiture."

Barr: "Yes, but you know regulation is something that the Congress of the United States has to do, and as far as we poor mortals are concerned, we can only concern ourselves with the situation that now exists.

"But you'd say that was a natural monopoly and, insofar as the Antitrust laws are concerned, it ought to be let alone. Is that the case?"

Houthakker: ". . . I would say . . . if there is, indeed, a natural monopoly based on very strong economies of scale, then divestiture is not likely to be a solution leading to more effective competition in the industry."

Barr: ". . . if divestiture occurred, it would destroy the ability to drive the technology, would it not?"

Houthakker: "I have no reason for agreeing with that statement."

Barr: "Well, suppose you got such reasons, Doctor. Suppose you learned, in the course of your studies, that in order to produce the next generation of computer systems, that it would cost in the order of magnitude of several billion dollars to design and develop those systems.

"Suppose you learned that to be a fact, and that only by the ability to spread that cost over a substantial base could any industrial enterprise take that kind of risk. What policy recommendation would you make in those circumstances?"

Houthakker: "I would have to make some kind of tradeoff between the benefits of developing such a new system versus the adverse consequences of monopolization."

Barr: "Suppose you believed that the next system—the next generation, if successfully developed and designed on the terms that I have indicated, would reduce the cost of computing by an order of magnitude, would that be of a significant tradeoff advantage to leave IBM the way it is?"

Houthakker: "One would have to know whether any of the existing companies in the industry are capable of developing a system of the kind you described."

Barr: "But I put it to you as an assumption; that it takes an expenditure of several billion dollars in order to accomplish that. If you believe that to be the case, do you believe that there is any other company in the industry that can make that kind of investment? Or to put it another way, that can take that kind of financial risk?

Houthakker: "Even though none of the existing competitors may be able to undertake a development of this kind singly and I'm just following your assumption without accepting it—it's conceivable that a merger of these companies might be capable of doing it."

Barr: "Yes, but that's something beyond our power to accomplish. Even Mr. Bernstein can't order companies to merge."

Lew Bernstein: (Justice Dept.): "And your hypothesis is something that we can accomplish, too."

Barr: "It is?"

Bernstein: "Sure."

Barr: "Why?"

Bernstein: "Because you're starting out with the assumption that that's the only way you can do it.

Barr: "I can prove that, Lew, beyond a shadow of a doubt." □

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the IBM companies each with more than 10% of the market (assuming IBM has 60% or more of this market). The Industrial Reorganization Act, which the subcommittee is discussing, "sets a four-firm concentration ratio at 50%," so breaking IBM into six or more pieces would amount to a ratio of about 40%, he says. These companies wouldn't all be equal, nor would survival be ensured for any one of them in Miller's plan.

That's regulation

Finally Miller is opposed to any government mandate "that all firms have compatible hardware and software." This amounts to regulation and "we get lots more chances to foul things up if we go into the regulatory business than if we go into structural reorganization business."

The committee asked Miller: "You intend in your reorganization to allow the others to impose their costs on their customers. Is not that mildly inconsistent?"

"No sir, it is not. The purpose of reorganization is not to punish IBM. The purpose of reorganization is to build a competitive structure in the industry."

There are numerous depositions and papers by economists. The most surprising deposition was of Lionel Epstein, the Justice Dept. economist who has been working on "refining" the definition of the markets IBM is alleged to have monopolized. These are the general-purpose digital computer system market and that market with attached equipment. It is painful reading. Epstein's understanding of the equipment in this market is, to put it mildly, suspect. He started out excluding I/O devices (and excluding some devices from being input or output devices, like printers) from the first, systems, market. Then he backed down, subsequently including only those cpu's and peripherals that came with the first installation in the basic systems market. It is both a confusing and terrifying deposition and one hopes he will go through a computer course if he is to further "refine" any market definitions.

Baumol, who may appear as an IBM witness, is good reading on all the things any term in economics applying to a monopoly may mean, and again, may not mean. (He is clearly a Libra, balancing the scales of definition to a minute degree.) It is most useful to quote him on relief. "Non-intervention happens to be a disease for which all known cures are worse. . . . I would agree that a market mechanism (*imposed by the government, such as divestiture*) has a great deal of virtue in comparison with regulation. However, one must beware of the wolf in sheep's clothing. The government allegedly created a mechanism that is all too often the appearance of competition which is achieved by destroying any element of competition. . . . The real danger, here you have aroused my passion, . . . is that the intervention creates the appearance of competition by producing a group of firms that are really constrained from true competition, and which are kept in a state of co-existence at the consumer's expense. Whether they can co-exist by their natural efficiency (and) by the quality of their product, they are protected to preserve the appearance of competition, . . . That is the way of . . . actually producing a cartel. . . . Beware of it. Be careful of what you do. . . . I would ask, even if there is monopoly power, how big are the losses that it imposes?" □

news in perspective

Organizers of INFO '74, the large user-oriented conference and show, say they're pleased with the paid turnout of 11,300 to the four-day event. But they admit there are ways to draw more persons to the exhibits. How they'll do this and what went on at the first such conference of its kind is reported on this page . . .

Prices going up? Not in the electronics business, says a government official who addressed the Western Electronic Show and Convention in Los Angeles last month, page 106. The auto industry could take a lesson from the electronics industry, says Dr. William Rowe. Electronics prices are going down faster than the auto industry's are going up . . .

Canada's telecommunications facilities are considered among the most advanced in the world, page 111. But the operators of that nation's digital network are involved in a hassle with IBM over interface issues . . .

Computer Communications, Inc. is another computer company to finally emerge from Chapter XI, and in pretty good health, page 118 . . .

Designers of management information systems shed technical questions for the more pertinent issues of matching their systems to user needs, page 120 . . .

Four companies selling file management systems set their sights on the proliferation of data base management systems, page 122 . . .

Burroughs' CE's go on strike in New York, but the users were holding up fine—even those with critical applications, page 125 . . .

Unidata, the European combine, announces additional machines in Paris show, page 126.

Conferences

Conference for Users Draws Sizable Interest

INFO '74 Organizers Plan a Rerun Next September

INFO '74, the first large-scale computer user oriented conference and exposition, attracted sizable crowds to New York's Coliseum during the first part of the football season, and many were looking for an analogy.

The searched-after similarity, of course, was for attendance figures, what with the news still fresh of startup professional football teams distributing free tickets in an effort to hike attendance at the games. There was none of that at INFO '74, however.

"We had an attendance of 11,300," said Richard S. Wolcott of conference producer Clapp & Poliak, Inc. "I regard that as a resounding success for a first-time show, and I've been involved in more than 10 first-time shows. All our figures are audited by the BPA—the Business Publications Audit."

While the show produced its share of disappointments—Clapp & Poliak promises to eliminate all or most from next year's event—INFO '74 generally achieved what it had set out to achieve: to emphasize the use of broad spectrum information systems. The show was sponsored by the American Management Assns.

The sessions were aimed primarily at hard-core edp users, whether they were technical types or management figures responsible for the edp function. Beyond that, there were technical sessions aimed at the more technically oriented edp users and at scientific users who employ, say, minicomputers. In addition, sessions were broken out into vertical industry segments for attendees from industries and backgrounds like insurance, hospitals, government, retailing, merchandising, and transportation.

Poor management

The tone of the four-day conference was set by keynote speaker Peter G. Scotese, president of Springs Mills, Inc., who made the now time-worn observation that millions of dollars are regularly being lost by industry because of poor management of their edp operations.

"Most of us have within our own organization examples of gross underutilization or unrealistic expectations with respect to our information systems," said Scotese.

"We know how to manage the pants off a marketing or manufacturing division, and we do. But we have let the mystique of electronic data processing keep us from managing that function with the same effectiveness . . .

"We have to forget the flashing lights and the bafflegab jargon and the bewildering speed and be managers. Data processing can be a high problem area."

Most of the sessions were crowded, but there were several complaints voiced—particularly by exhibitors anxious to attract attendees to their booths—that the sessions were held at scattered locations and that many sessions were bunched too closely together to allow conference attendees enough time to visit the booths in the Coliseum.

Clapp & Poliak took note of the complaints and said that next year's INFO '75 show—scheduled for Sept. 8-11 in the Coliseum—would see all the conference sessions held in either the Coliseum or the Americana hotel. Lincoln Center, which was used for some sessions this year, will not be used for INFO '75.

The problem will still remain of how to attract more session attendees from the Americana hotel to the Coliseum, an eight-block walk. Clapp & Poliak says that for INFO '75 it will spread out sessions that were bunched in two-day groupings into three-day groupings, with the thought that the extra time will give session goers more time to visit the exposition.

Nitty gritty of DBMS

One packed session at the Americana hotel was entitled "Acquiring a Data Base Management System" (DBMS). The session provided not only a broad introduction and overview of the complicated subject of data bases, but got into the nitty-gritty problems associated with

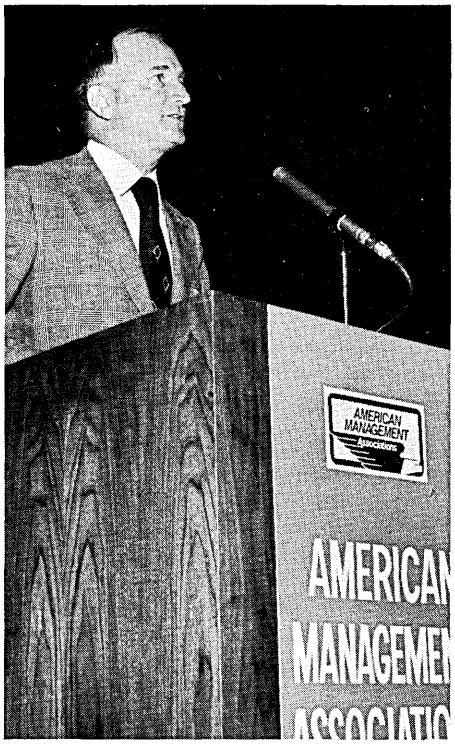
data bases.

At one point the session chairman, Dr. Peter B. Hill of the Burroughs Corp., was asked by a session attendee what was the biggest problem in acquiring a data base management system.

"I don't know," said Dr. Hill, and he paused for several long seconds. "There are so many. Probably getting the first application going."

Dr. Hill suggested that top management be warned early on in the process of acquiring a DBMS that it will be a long and drawn-out process before it can be made to work.

"Frequently they won't believe you," said Dr. Hill, observing that top management will naturally be suspicious that personnel in the edp operation are seeking "instant job security."



PETER G. SCOTESE
Forget flashing lights and bafflegab jargon

Another speaker, James Tillinghast, vice president of DBD Systems, Inc., of Long Island, N.Y., noted that data base management systems have been changing rapidly and at the same time improving. Generally, he said he now gives data base management systems a "B-plus" rating.

One problem that confronts a user considering acquiring a data base management system, Tillinghast said, is that there are simply so many systems to choose from. IBM alone, he noted, has so many data base management systems now that it is difficult to examine its systems alone. However, Tillinghast said he believes now that there is always one system that will satisfy the needs of any individual user.

Tillinghast added that he knows of only one DBMS that is available on IBM hardware that has also been accepted by the Codasyl Data Base Standards Committee: a system called IDMS, developed by B. F. Goodrich and marketed in the U.S. by the Cullinane Corp.

In another session on data base management systems, Lee R. Prescott, systems director at the Travelers Insurance Co., discussed some of the advantages and disadvantages he has encountered with his system. In observing that his installation had an ingenious technician—and he said other sites do too—Prescott said the technician decided he could improve upon the software that had already been developed for the Travelers' installation.

"The technician," said Prescott, "noted that the 'unloading' of data bases to an intermediate, portable, storable medium such as magnetic tape as the first step in a reorganization seemed to happen faster than would be expected of an application performing a 100% dense extract using the normal language interface to the DBMS.

"He then theorized that high ratio extracts might be subject to a significant increase in efficiency. The packages' vendor was kind enough to supply a user exit in the unload utility, of which particular extract logic for the desired application could be applied. The results were more favorable than could have been hoped for. If it just so happened that actual reorganization time had come around, so much the better.

"The point is that some of the inefficiencies of generalized DB software may be offset by ingenious exploitation of serendipitous capacities in the software heretofore unrecognized by its builders."

As for disadvantages, Prescott said data base systems usually require large and additional amounts of both cpu memory and secondary storage. He added that the cost is paid not in dollars alone, but also in the system's reaction time.

Large and complex

Turning to software, Prescott said that: "Generalized DBMS are large, and they are complex. New software releases entail traumatic and expensive regression testing of functions currently relied upon. Choosing to ignore new releases is not a satisfactory answer. First, such disdain exercised too often will soon leave you out of touch with technology. More important, the vendor will bludgeon you with the threat of withdrawal of support."

The bluntest talk at INFO '74 probably came from Harry T. Larson, director of engineering planning at California Computer Products, who painted a dismal picture of computer usage, calling it "the biggest ripoff that has been perpetrated on business, industry, and government over the past 20 years."

Quite simply, Larson sees the two parties that in many ways swing the most influence in an organization's data processing function—the organization's computer people and the computer companies that sell to the organizations—working in the end against the best interests of the organization.

Larson observed that the computer people, often possessing near religious belief in computers, tend to be understandably motivated to expand their

Managers of INFO '74 considered an attendance of 11,300 "a resounding success for a first-time show."

computer installations. The computer companies just want to "move that hardware," said Larson.

Is there any hope?

Larson feels that only top management can rein in the computer installation and make it effective, generally by applying classical management practices.

"I'm certain in my own mind," said Larson, "and I'm not alone, that the gravest problem facing the effective application of computers is the problem of managing computer programmers and analysts."

While saying that most edp people think they are doing fine, Larson indicated that a shift of able managers who are users of edp services—and thus have at least some familiarity with the edp function—to the edp operation would help improve the management of the edp function.

"The responsibility of the executive is clear—to weed out the incompetents," said Larson. "Knowledgeable and genuinely concerned professionals within the edp trade have estimated that if the

Nationwide EFTS "Prior to 1980"

At an all-day INFO '74 session on electronic funds transfer systems (EFTS), financial consultant R. H. Grant predicted that 500-700K point-of-sale (POS) terminals will be operating by 1980, and 200 million bank debit cards will be in use.

Consumers will rely on these cards—instead of cash, checks, and credit cards—to make one-third of all their purchases. In 1973, about 2.8 billion checks were written to pay for retail purchases. Based on current growth rates, there will be 4.2 billion similar transactions in 1980; 70% of them will be made with debit cards instead of checks.

Grant expects a nationwide network, capable of processing debit and credit card transactions, to emerge "prior to 1980." It will evolve from the networks now operated by National BankAmericard and Master Charge. These networks, which are now being expanded, will ultimately interconnect with "local, regional, and national networks of large retailers like Sears and Penney's, auto rental firms, oil companies, airlines, and credit card companies like American Express, giving near nationwide utility to both the bank credit and debit cards."

Although all banks aren't convinced EFTS will make paper checks obsolete, they realize this is a possibility, and so, "despite the unknowns," most of them will offer the new services, if only to protect their existing share of the market, Grant contended.

Besides competition, technology is also pushing the banks into EFTS, he added—basically by reducing system costs. He expects that "during the next five years, improvements in manufacturing techniques and the use of large-scale integrated circuitry (LSI) should improve reliability and costs by as much as 40%. Transmission costs should also be reduced through line-of-sight systems, satellite data services, and other anticipated developments. The greatest technological improvements are expected from rapidly changing minicomputer technology and the development of fourth-generation mainframes."

A bigger package

At the moment, POS systems are relatively expensive, and so they've been marketed by only a handful of the largest banks. One way of reducing these costs would be for banks to offer dp service bureau services to the retailer as part of the POS package. The terminal, and possibly the credit and check authorization services, could then be priced more attractively. Grant believes "many" banks will exploit this opportunity.

Besides costs, the growth of EFTS during the next several years will be affected by the competitive struggle between commercial banks and "thrift" institutions—mutual savings banks, savings and loan associations. This battle was discussed in detail by another speaker at the INFO '74 session, John W. Petrusky, senior vp of New York City's Dry Dock Savings Bank.

His basic point was that the thrifts can't survive unless they're able to offer funds transfer services which compete with commercial bank accounts. For, only by offering such services, insisted Petrusky, can the thrifts continue to attract enough deposits.

But commercial banks are vigorously opposing the thrifts' efforts to market competing services. Petrusky described how they are attempting to keep the thrifts from participating directly in the new automated clearing houses (ACH's) that are emerging across the nation. Four regional ACH's are already in business, at least 19 others are on the way, and a national automated clearing house has been organized.

It seems likely from his remarks that action by Congress, and by the federal agencies which regulate the banking industry, will be needed before this conflict is settled—all of which may delay development of EFTS significantly.

Automation outdated

Many thrift institutions "have the overall systems capability to make the transition" to EFTS, Petrusky added. But many don't, despite the fact that 90-95% of the thrift industry is computerized. The problem is that "too much of that 95% figure is in outdated systems. I don't believe the old IBM Model 30 Teagarden, NCR 315 CRAM, and Burroughs B300 online systems are going to make the transition into EFTS. And what doubly concerns me is that the banks with these systems may not be aware that their capability is obsolete, or if they do know, they may not have the resources—financial and technical—to change."

Another speaker at the EFTS seminar, banking consultant Helene Duffy, talked about "the state of EFTS readiness . . . with regard to reading technology . . . equipment interchangeability and the selection of algorithms in a shared environment, how to obtain a secure personal identification system, how to prevent security vulnerability in off-line and on-line terminal systems, etc. A body of standards and agreements is beginning to evolve in this field . . . which will make it possible to interchange system elements and provide a high level of electronic data transmission efficiency. But much remains to be done among financial institutions and between financial institutions and equipment . . . suppliers."

Some standardization has occurred, she added, but "overall progress has been less than speedy."

—P.H.

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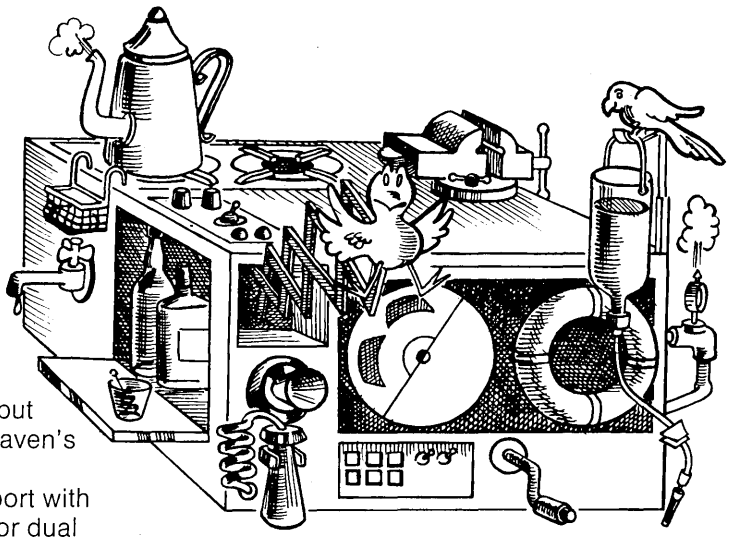

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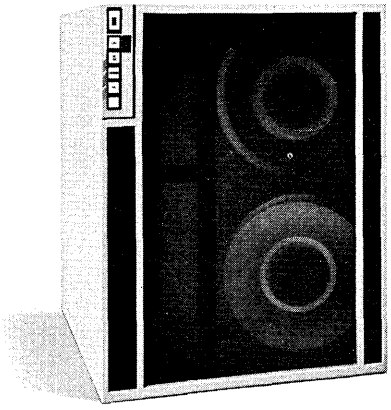

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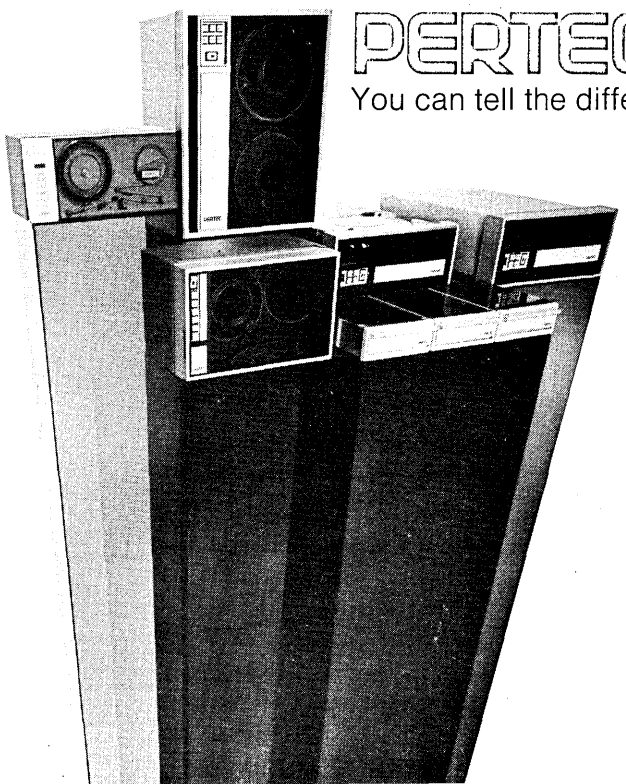

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CIRCLE 120 ON READER CARD

news in perspective

From Disappointment to Mild Optimism

For the exhibitors at INFO '74, the exhibition got off to a slow start and, while it didn't exactly end with a roar, exhibitor reaction turned from initial mild disappointment to what might best be described as cautious optimism by the time the four-day event closed.

The idea of the exhibit was to attract a wide exhibitor mix, and INFO '74 did precisely that—there were booths displaying just about everything from cpu peripherals and data base systems to microfiche readers and visual aid displays.

The biggest block of representation seemed to be time-sharing companies, which wasn't really surprising since that segment of the information processing industry has been booming.

"We are looking for the professional business manager," said an executive manning California's Tymshare booth. "And we are seeing a lot of them, but there could be more. Mostly we've been talking to vice presidents and presidents. We've seen few little guys."

Control Data was the only edp mainframe firm exhibiting, but the company was not displaying mainframe equipment. In fact, CDC had two exhibits on the fourth floor, if one counted its Service Bureau Corp. (SBC), acquired from IBM early last year.

Common complaint

CDC, however, voiced a complaint heard often at the exposition: that the exhibits on the fourth floor were not getting as much traffic as those on the third floor. INFO officials say the problem will be eliminated next year, because they have contracted to hire the first two floors of the Coliseum and they say that traffic flows through those floors more evenly than it does through the third and fourth floors.

John Moore, representing CDC, said the firm had picked up one oem order big enough to "make the show worthwhile," and he added that he doubted CDC would have made the sale if the company had not been at the exposition.

CDC also displayed its time-sharing operation, called Cybernet. SBC kept its IBM image—salesmen wearing white shirts for instance—and one SBC salesman expressed enthusiasm for the show. "We're getting good leads here," he said. "We're getting a better ratio of good leads than we get at most other shows. I think we're coming back next year."

James Egan, president of Egan Visual Inc., of Concord, Ont., Canada, said he was doing a "tremendous business" at the show. His firm offers office visual aids and office products.

Another exhibitor who found the exposition worthwhile was Kodak, which seemed to be getting a good play for its order entry system called Miracode system.

To the users

Lockheed was aiming directly at data processing users, and Barbara S. McLean of Lockheed's home office staff said she had been demonstrating Lockheed's System III—billed as an alternate to IBM's System/3—to several potential customers. The Lockheed system is marketed through dealers, but Lockheed used INFO '74 to reach end users.

Another manufacturer who seemed pleased with the position was Walter E. Muir, director of marketing of Cincom Systems Inc., which was marketing its TOTAL data base management system.

"This is our first show," said Muir. "And I think it's been worthwhile for us. You don't just sell a data base management system on the exposition floor. But we got several good leads from people with evaluation clout, who can get us in to the right people to make a demonstration."

Herbert J. Richman, vice president of marketing for Data General Corp., said he was disappointed at the opening day's activity at the Data General booth. Later, however, as the week wore on, activity at the Data General booth picked up substantially. Data General also exhibited at the WESCON conference on the West Coast the same week.

—W.D.G.

poorest performing 50% were dismissed, we would see no change in the rate of progress of edp development. For starters, I suggest shooting for a 10 or 20% reduction in edp labor costs."

Larson also issued a call to computer users to band together to protect themselves from abuses that are sometimes foisted off on them by computer companies. Zeroing in on operating systems as an example, Larson maintained that many operating systems changes are billed as "improvements" while in reality they fix earlier errors, omissions, or inconsistencies.

Larson suggested that users get together and charge the computer companies for their operating systems mistakes. Some large users, he noted, have gone to court over the issue.

Lively sessions

All in all, INFO '74 was favorably received by the attendees. Registration at the sessions was about 2,600—a creditable figure for any first show. Moreover, the type of session-goer appeared to be user-oriented and from management. Not only were the sessions well attended, but few attendees were seen leaving early. Many sessions held spirited question and answer periods.

There was some criticism of the show regarding its timing—e.g., that it conflicted with other computer-related conferences. Clapp & Poliak's Wolcott conceded that point, but he noted that there were certain tradeoffs that had to be taken into consideration.

"April and May and October are generally the best months for shows," he said. "But a spring show would have conflicted with the NCC (National Computer Conference) and the best exposition halls were already booked for October."

Wolcott made the observation that first shows are the time for trying out new concepts and, while he admits INFO '74 had some shortcomings, he noted that efforts are already underway to tighten up on the presentation of future INFO conferences. For instance, McCormick Place in Chicago has been booked by INFO for 1976 in late October. Not only is that considered a better date than early September, but the sessions and exhibits can be held at the same location.

While INFO balances the NCC in a calendar sense—INFO being held in the fall, the NCC in the spring—Wolcott said INFO will strive to be more user-oriented than the NCC, which has traditionally been more of an oem show. "But we still don't think we're competitive with the NCC," said Wolcott.

—W. David Gardner

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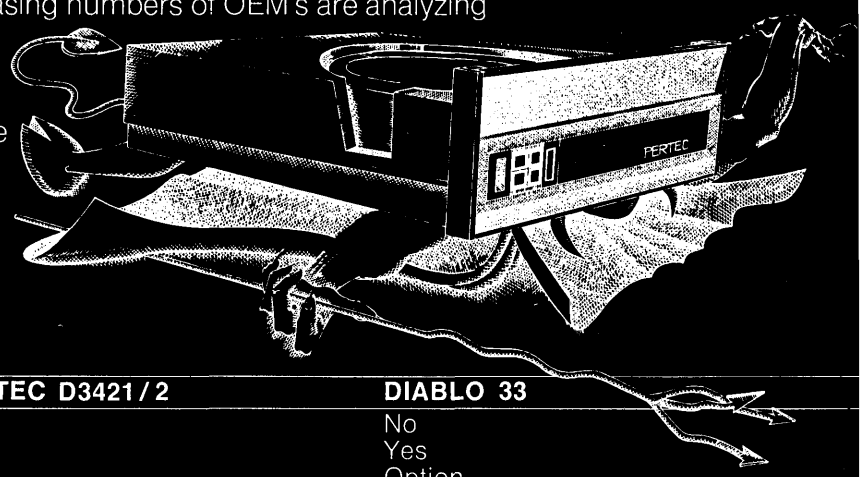
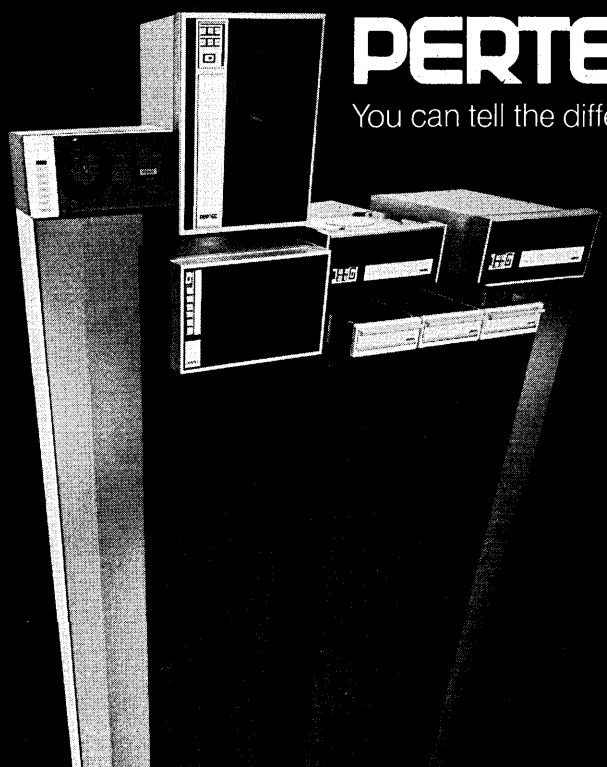


FEATURE	PERTEC D3421/2	DIABLO 33
200 TPI	Yes	No
100 TPI	Yes	Yes
2200 BPI	Yes	Option
Removable and Fixed Disks	Yes	Yes
Disk Rotation	1500 or 2400 RPM	1500 RPM only
Transfer Rate	1562 or 2500 KHz	781 or 1562 KHz
Access Time (msec)		
Track-to-Track	9	15
Average	35	70
Maximum	60	135
Track-Offset	Yes	No
Mechanical Sectoring	Yes	Yes
Electronic Sectoring	Yes	No
Daisy Chain Capability	Yes	Option
Unit Select Switch	Yes	No
Write Protect	Yes	Option
Individual Switch & Indicator for Each Platter	Yes	No
Air Filtration	0.3 Micron Front Intake	"Absolute" Type
Internal Power Supply	Yes	No
Dimensions	19" x 8¾" x 26" (rack mount)	17½" x 13" x 22⅞"
Slide Mounts	Provided with unit	Option



PERTEC

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CIRCLE 69 ON READER CARD

news in perspective

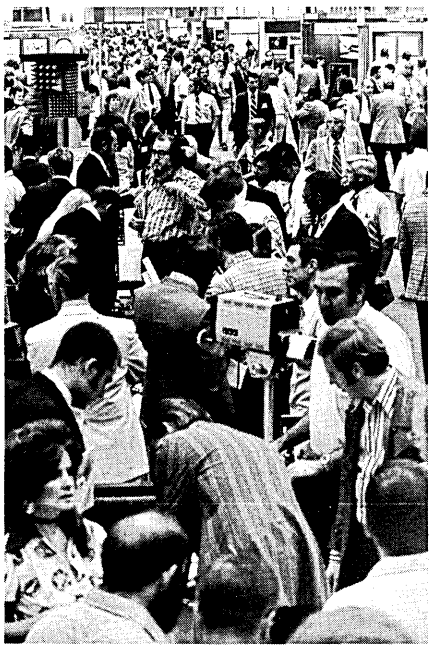
Electronics

Prices Spiral—Downward?

In these inflationary times, it's kind of nice to go to an industry convention and hear talk of prices going down instead of up.

This was the case at the 1974 Western Electronic Show and Convention (WESCON) in Los Angeles last month. Dr. William Rowe, Environmental Protection Agency, a participant in a WESCON panel titled "Quo Vadis Electronics?" went so far as to say that "Detroit (the automobile industry) could take a lesson from us (the electronics industry). Our prices are going down faster than theirs are going up."

And on the convention floor, a sellout with 547 exhibits, there was little indication of curtailed expenditures on the part of companies in the industry. Audited attendance of 28,212 was down only slightly from 29,631 two years ago, the last time the big trade show was held in Los Angeles. Massive booths selling company images, so prevalent in the WESCON shows of boom times, were missing. Exhibiting companies were selling goods, not image, and in many cases through representatives' booths rather than company exhibits. Most exhibitors were happy with the show and there was a general feeling on the floor of business being done.



Hard times? Inflation? You couldn't tell it at WESCON, where engineers seemed anxious to inspect with an eye toward buying exhibited items which, in many cases, were lower priced than their counterparts of a year ago.

The technology most responsible for the lowering prices, microelectronics, came in for a lion's share of attention. Keynoter Donn L. Williams, president, Electronics Operations, Rockwell International Corp., noted that "Today, most of us are involved in . . . or impacted by . . . that latest step in our technology . . the field of microelectronics: MOS/LSI . . . SOS (Silicon on Sapphire . . . Charge Coupled Devices and all the rest."

Four sessions on microprocessors and two on charge coupled devices (CCD's) drew standing-room-only audiences, whereas most of the sessions managed to fill only one-third of the Los Angeles Convention Center's massive meeting rooms.

CCD's timetable

"CCD's offer a direct answer to the problem of finding a cost-competitive, all electronic counterpart to rotating mass memories," said J. M. Chambers, RCA Van Nuys, in one of the CCD sessions. He said CCD memory devices probably will first be applied as direct replacement for rotating memories. "Airborne military equipment requiring extreme reliability will be among the first to exploit their advantages. As costs are reduced, CCD's will find their way into commercial memory systems. A new family of memories filling the access time void in the sub-millisecond region is another likely early application."

Applications for microprocessors were seen as virtually unlimited, although Robert F. Wickham, Creative Strategies, Inc., said the market "is initially production limited and served by only a few highly competent suppliers."

"As the market expands," he said, "doubling in size each year for the first few years, new suppliers enter the market but with varying degrees of success. Those who have previously been successful in the memory business have the greatest chance of being successful in the microprocessor game."

First year of volume

Wickham said some 200,000 microprocessor sets with a market value of $15 million were produced during 1973, the first year of high volume standard microprocessor production. This does not include captive production of custom devices by companies like IBM or

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news in perspective

NCR.

"One of the primary challenges and opportunities facing the electronics industry today," said Wickham, "is how to quickly and effectively utilize the low cost intelligence which is now available from the semiconductor industry."

He said the biggest problem in utilizing microprocessor hardware at the present time "is the same problem that has plagued the computer industry for many years—software." He offered these definitions to differentiate between microprocessors and microcomputers: "By microcomputer it is meant an assembly of central processor, program memory, data memory, and input/output control which functions as a computer . . . A microprocessor then is the cpu portion of a microcomputer and may be a single semiconductor device or several devices."

Rockwell's Williams said the field of microelectronics "opens up many vistas and poses questions which, to me at least, boggle the mind."

"Microelectronic devices constitute in themselves major systems and subsystems . . . containing literally thousands of functions in a product one-sixth of an inch square. This fact alone suggests a level of applications, and importance, that is magnitudes greater than anything we've seen before."

Compatibility question

This "tremendous scope of potential microelectronics applications—limited only by the vision of man," said Williams, "does raise the question of compatibility between profit, technology, and the common good."

As a partial answer to the question, he suggested an augmented role for the National Aeronautics and Space Administration (NASA), in which it would serve as a national research and development arm, federally funded but capable of working in harmony with the private sector.

The "common good" was a big concern of speakers at the "Quo Vadis" session. William K. Linvill, Stanford Univ., spoke of using electronics technology "to promote role mobility . . . to substitute information for energy." He emphasized that this cannot be done with electronics alone. "It takes people plus technology." He cited some early systems developed for computer-assisted instruction which "left the teacher out and were doomed to fail. We must utilize the computer as a tool and leave the human beings in."

Dr. Rowe stressed the need "to make social judgments at the same time we make technical judgments in attempt to assure that negative impact won't occur."

Another "Quo Vadis" panelist, William D. Walker, Tektronix Inc., Beaverton, Oreg., talked about growth. "What is growth for one industry is shrinkage for another. Electronics has never had a greater degree of opportunity and responsibility."

Where's the money?

Where the money will come from to fund growth was touched on in two sessions. In a session on "How to Prepare an Effective Business Plan to Raise Capital," four venture capitalists held out hope for the would-be entrepreneur. "There's plenty of money around, as much as or more than ever before," said Brent Rider, Union Venture Corp., an affiliate of Union Bank in Los Angeles.

Gene Kleiner, Kleiner & Perkins, Menlo Park, Calif., agreed there is a lot of money "but we're looking closer, we're cherry picking now."

Christian Hoebich, Hoebich Venture Management, Palo Alto, Calif., said venture capitalists are being more selective because they have other options that approach venture returns. But, he said, "any company that truly has merit and enough perseverance will get its money."

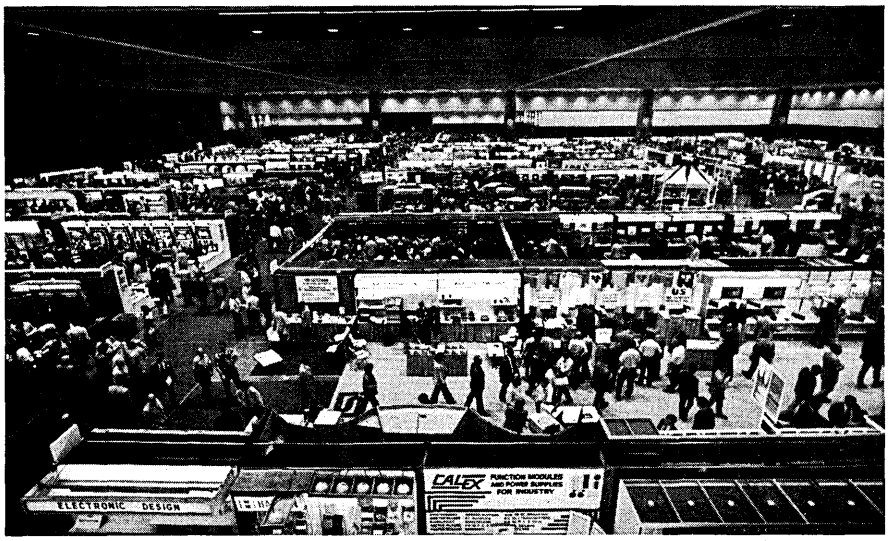
One questioner wasn't so sure. "I've listened to you tell me how to prepare a business plan. I know that only one in several thousand prepared that way will succeed. I want to know the secret. That's why I'm here." The rest of the audience demonstrated empathy with a rousing ovation.

The panel's answer: you have to have a good business plan plus a good business.

Another questioner wanted to know if venture capitalists are concerned with the length of a would-be entrepreneur's hair (panel members all had short hair). Burton R. Cohn, a private investor and president of Xynetics Corp., noted that the *Rolling Stone*, a phenomenally successful San Francisco-based newspaper started as a rock music publication, "was financed by short-haired San Francisco venture capitalists."

Scarce and expensive

More cautious about the availability of money was Tom Swegle, Wells Fargo Bank, Costa Mesa, Calif. "Money in all forms is scarce and expensive," he said. "Investors are not interested in risky situations." He foresees that "growth will have to come from bigger companies. We will see more acquisitions." Swegle spoke in a session called "Strategy of Crisis."

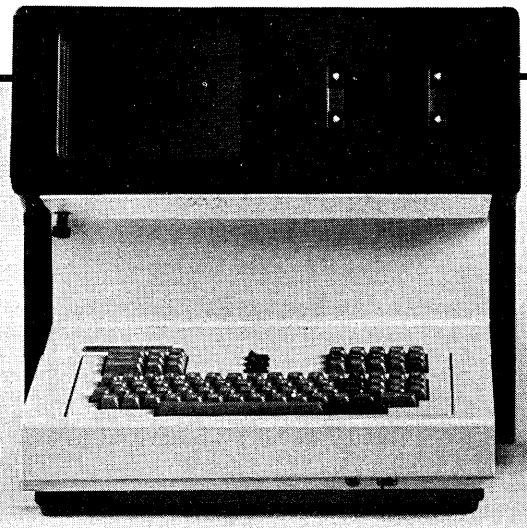


The Los Angeles Convention Center's show floor was sold out with 547 exhibits viewed by 28,212 registered attendees.

This was a session for which organizers had to switch planning gears in midstream. "When we started organizing this session in early '74," said session organizer Frank Burge, *Electronic Products* magazine, "we were up to our ears in the energy crisis, the parts crisis, the materials crisis . . . Since then we've pretty much forgotten about the energy crunch, and many manufacturers are now trying to figure out how to get rid of excess raw materials or finished goods inventory and price bombing returns."

As with any electronics conference, there was interest in new application areas. A session on "New Markets in

Precisely what are you looking for in an intelligent terminal?



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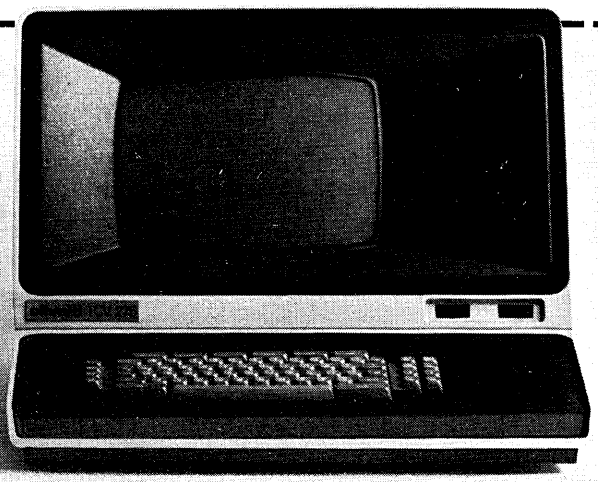
- ☐ For food manufacturing industry: entry of incentive payroll, quality control information—and many more uses.
- ☐ For ocean freight handling: bills of lading, arrival notices, billing, manifest preparation—and many more uses.
- ☐ To use in remote job entry applications—for payroll, accounts receivable, etc., etc.
- ☐ To use as an intelligent terminal, with powerful program control of data entry, flexible printing and forms handling capability, cassette output, high speed communications—and much more.



TCV 270 Series Video Display Terminal. Plug-to-plug compatible with IBM 3270 System, but with powerful additional programming features that give it greater capability.

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news in perspective

Agriculture," in which speakers from agriculture outlined what has been done and what needs to be done, so excited venture capitalist Kleiner that he told his session this is an area in which he would seriously consider investing. His fellow panelist Hoebich agreed. "This is a huge field with a small amount of automation so far and automation can make a big difference. It's virgin territory."

No privacy for cows

Anyone concerned about data banks and privacy could have come away from the Agriculture session pitying the poor dairy cow. Bliss H. Crandell, owner and general manager of DHI Computing Service, Provo, Utah, described a data base on cows his firm manages for members of the National Dairy Herd Improvement Assn. Data on each cow, he said, is collected daily and summarized monthly, and is used for breeding, feeding, and culling, and as a guide to other aspects of herd management.

Medical electronics was another area cited by the venture capitalists as one to which they would give preference. Union Venture's Rider put it at the top of his list.

In the "Quo Vadis" session Stanford's Linvill ranked it high, too. In urging the electronics industry to look at "un-met" needs, he listed health care, mid-career training, needs of old people, and early childhood training.

Digital Equipment Corp., which had one of the few large booths at the show, and was there to push its new Digital Components Group and to introduce its new LA36 DECwriter II, was enthused about the demonstrated potential of applications for the keyboard printer which can be hung onto any kind of computer. "Our booth has been crowded since the show opened," said a spokesman, "and interest was shown by a whole spectrum of industries and types of businesses. We had financial institutions, lease companies, end users . . . " DEC was expecting to sign its first major contract for the LA36 by the end of WESCON week and was predicting its first few major contracts would be with users of non-DEC computers.

DEC has geared up to produce 50,000 units/year of the LA36 and will sell them at $1,250 in quantities of 100, considerably under its DECwriter I which had lesser capability and would hang on only DEC computers. Again, prices coming down . . .

—Edith Myers

Communications

Canada: Interfacing A Network with IBM

In-house, they call it SINC (Synchronous Intelligent Network for Canada), but to forestall bad jokes, the acronym will be changed before the public unveiling.

Whatever it's ultimately called, SINC will be a 4-7 node, hybrid packet- and circuit-switched, common user network, stretching across the south of Canada and providing several priorities of data communications service on digital channels plus common code conversion, speed conversion, and error checking capabilities. The new system will be a follow-on to Dataroute, the world's first commercial digital data network, which Canada began operating in April '73.

SINC is to be offered in mid '76, but some sticky problems must be settled first.

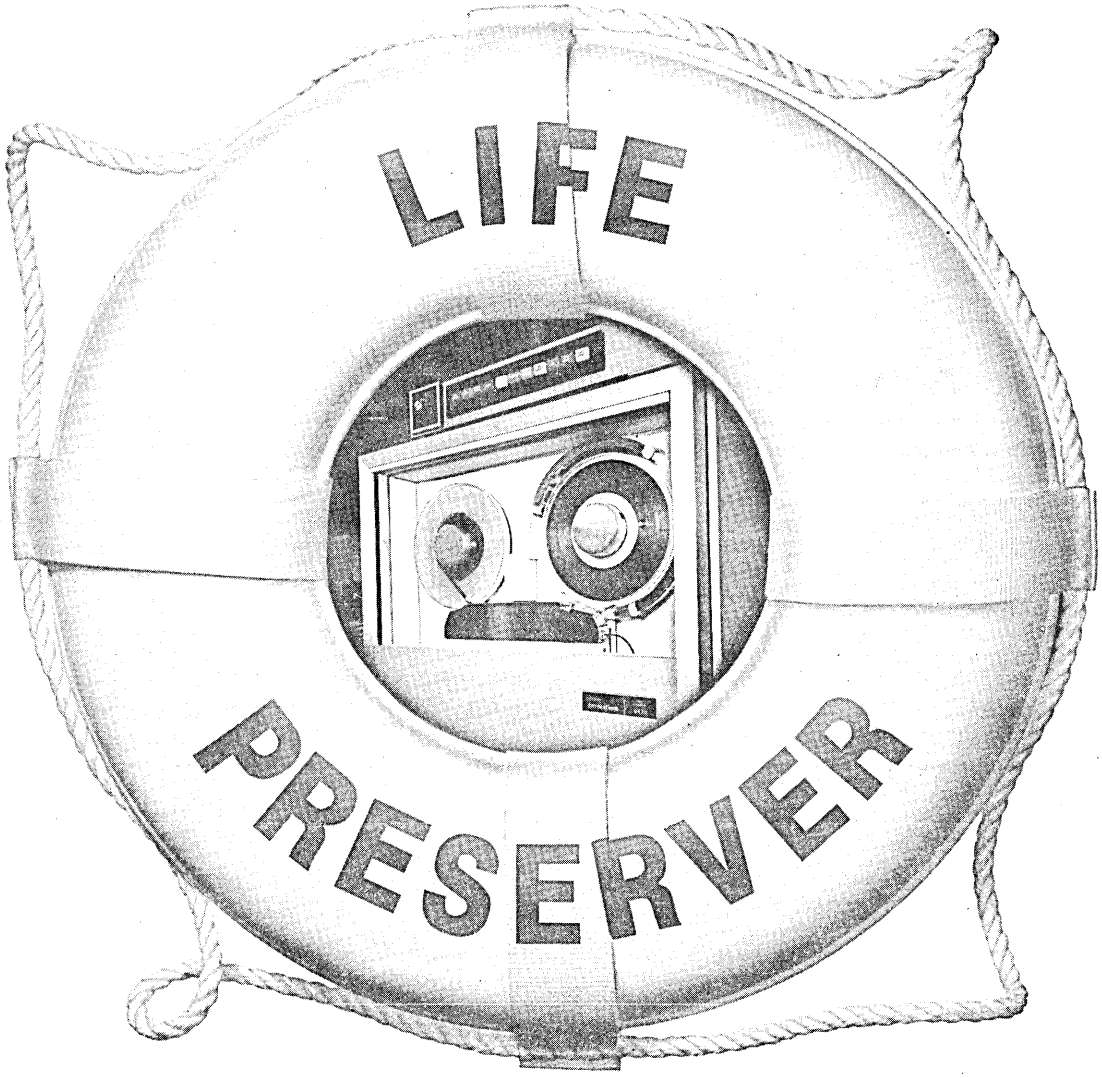
One involves the network interface. IBM and the Trans-Canada Telephone System (TCTS) have been engaged in earnest discussions for some time about interface specifications. TCTS, a consortium of eight Canadian telephone companies, is developing the new network. IBM, according to one estimate, has 60% of the computer installations in Canada.

IBM, according to a knowledgeable Canadian source, "seems unwilling" to help develop common communications protocols for the network. These protocols provide a way of addressing messages; acknowledging that they have been correctly received; reporting that links, nodes, or terminals are out of service; and performing several other control functions.

Common scheme

TCTS and the Canadian government want a common scheme, permitting any user—regardless of what make of terminal or computer he's using—to join the network. But that approach requires all the terminal and computer suppliers to employ compatible teleprocessing software. IBM traditionally has used proprietary software to keep its customers from looking at anyone else's systems. For example, all of IBM's recently announced terminals—for retailers, supermarket operators, and banks, among others—are designed to operate with synchronous data link control (SDLC), a bit-oriented protocol. Non-IBM terminals, by comparison, use character-oriented protocols.

These recently announced IBM sys-



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CIRCLE 48 ON READER CARD

tems also put most terminal communications software in the remote concentrator, which prevents a network like the one planned by TCTS from interfacing with the user directly.

"We want to supply the concentrator," explains Dave Horton, assistant vice president for computer communications planning with Bell Canada, dominant member of the TCTS consortium and chief developer of Dataroute (see accompanying story) and SINC.

"This arrangement," Horton adds, "allows independent users within the same geographic area to share the related hardware and software costs, including the cost of hot standby facilities. Since most users of dedicated systems can't justify this latter equipment, our approach offers increased reliability."

Significant savings

Horton says that if a user's terminals are widely dispersed, Bell will connect them to separate concentrators. "Here again, there is an improvement in reliability, because the concentrator can be placed closer to the terminal location, thus shortening the loop. In addition, by sharing loops among many users, communication costs for each one are significantly reduced."

If Bell supplies the concentrator, he adds, "we're sure the interface will remain compatible with several makes of computer and terminal equipment. Users of any individual system will then be able to communicate with others, which should lead to the sharing of data bases, excess machine time, and several other kinds of resources."

While this may be true, it also means that IBM, by not supplying the concentrator, loses a valuable piece of business. Even more important, interfacing with somebody else's concentrator means that the whole communications software chain linking an IBM remote terminal user to an IBM central processor must be substantially modified, to make it conform to a common standard. And once that happens, the user is in a position to replace his IBM hardware with another brand.

IBM is responding to this threat by promoting the idea that it, too, can offer "standardized interfaces."

In a recent speech to an insurance industry meeting in Toronto, G.P. Fusco, IBM's director of I/O systems marketing, explained that in the past, "IBM has developed over 35 teleprocessing programs. . .to support our various terminal products. . .All of these create some restrictions on attaching certain communications products to a central computer" and force the customer to maintain "multiple networks over multiple lines, with multiple access methods, creating overlapping expenditures." He added that IBM is now developing "one teleprocessing access method, one line discipline, and one family of terminal subsystems. . .We are trying to achieve a standardized interface at all the critical (points) in the system."

Standardization?

As this quote indicates, IBM's standardized interface differs markedly from Bell Canada's. Instead of connecting different makes of terminal/computer hardware to the same hitching post, IBM is tying up different job streams from the same user. Calling this "standardization" may be justified, but accidentally or by design it also confuses the basic issue and probably befuddles many users.

Meanwhile, discussions are continuing between Bell Canada and IBM regarding the network interface. It is Horton's guess that "we've informally agreed on at least half of the outstanding issues." He "hopes" a mutually-satisfactory interface spec can be completed by the end of this year. Horton adds that he's "encouraged" by a report that IBM is working with the Spanish telephone company (CTNE) to develop a common interface for a packet-switched network already in operation over there.

Another knowledgeable source says IBM may be amenable to some horsetrading. "They're currently trying to get the international standards organization (ISO) to adopt SDLC," he explains. "Possibly, if Bell Canada supports that effort, IBM will be more willing to let the TCTS network connect directly to IBM terminals."

Potentially, the most significant aspect of the Bell Canada-IBM negotiations is that two powerful groups—the phone company and the government—are jointly trying to break IBM's hammerlock on its users. This is one of the first times such pressure has been mobilized. And if the Canadians win, it will, at the very least, set a precedent for similar concessions elsewhere—in the United States, for example. Which would be a good thing, because no similar joint venture is likely to be mobilized in the U.S. The U.S. forum for such negotiations is the American National Standards Institute, but ANSI is incapable of making IBM do anything it doesn't want to.

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CIRCLE 40 ON READER CARD

news in perspective

Interconnection

In addition to network interfaces, Canadians are discussing interconnection of foreign attachments. While Bell in the U.S. remains adamantly opposed to certifying independently made terminals for use on the telephone network—preferring to insist that users of this equipment pay extra for connecting arrangements—Bell Canada supports

Dataroute Will Go DUV and More

Users of Canada's Dataroute digital transmission network are generally enthusiastic with what the promoters offered more than a year ago when the system became available. Meanwhile, in the U.S. AT&T's equivalent offering—Digital Data Service (DDS)—remains mired in a lawyer's battle at the Federal Communications Commission.

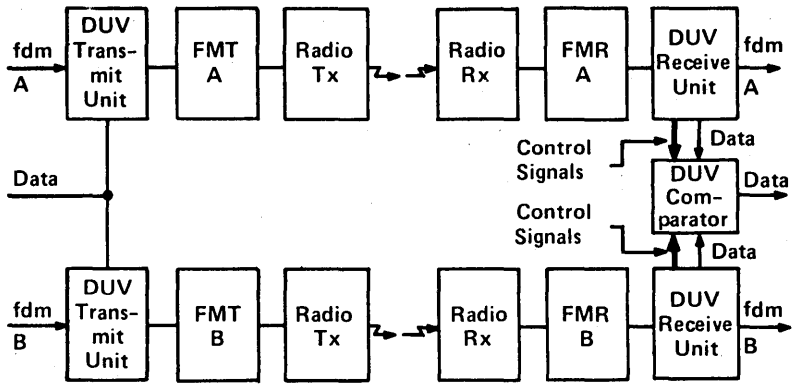
Essentially, Dataroute is a 48 KHz communications pipe with an effective 50 Kbps/channel data transmission capacity, running from coast to coast and interconnecting 19 Canadian cities. Point-to-point, multipoint, and multidrop service is provided. Sophisticated multiplexors, located in the major metropolitan areas, permit the 50 Kbps bit stream to be subdivided into lower-speed channels—as low as 110 baud. Access is through dedicated local loops, analog or digital, or through the dial-up network.

Dataroute's promoters apparently are delivering the substantial savings they promised over similar analog circuit charges. Users interviewed by this magazine reported some service interruptions during the first few months Dataroute was operating, and in some cases, these problems recurred during the first year, at least occasionally. But the consensus was that Dataroute now is operating adequately. Complaints are being handled promptly, the users say, and TCTS technicians seem to know what they're doing.

The operator of an on-line service bureau reported that he now pays $3,400 a month for service between Ottawa and Toronto, compared with $4,800 for similar analog service. It's a savings of 40% that has allowed the company to expand its operation farther into Western Canada.

By the end of this year, TCTS plans to transfer Dataroute traffic to a set of frequencies below the analog voice band (below approximately 534 KHz). This change will produce the same data under voice (DUV) configuration AT&T is planning to use for its DDS, but with a difference. Canada's network intends to operate a "parallel" DUV network, called "PDUV". Each message will be sent over two separate paths and the one having the best quality at the receiving end will be delivered to the terminal.

The PDUV network will increase the capacity of Dataroute substantially—from 50 Kbps/channel to 1.5 Mbps. And next year, when the first link in Canada's LD-4 buried cable goes into regular operation between Montreal and Ottawa, this capacity will be increased further. The cable has a capacity of 274 Mbps, which is to be shared between digital (PCM) voice and data traffic.



PARALLEL DUV: In this one-for-one protection configuration, two frequency division multiplexed signals and one 1.544 Mbps data signal are transmitted over two working radio channels. The comparator equipment then selects from the two decoded bit streams the one that has no bits in error.

establishment of "an impartial licensing authority" and "full public certification of terminal equipment." The introduction of competition into the terminal equipment field "is practical," adds the company, "because the losses in economies of scale are comparatively small and may be offset by the socially perceived advantages of competition."

This quote comes from a lengthy statement Bell Canada prepared late last year in response to two government "green papers"—one was entitled "Proposals for a Communications Policy for Canada," and the the other, "Computer/Communications Policy: A Position Statement by the Government of Canada."

Both documents contend that Canada's present scheme for regulating and delivering telecommunications services is inadequate. Several changes are proposed "for further discussion." Here are some of them:

- Certain telecommunications services, "especially in the field of computer/communications," might be offered by non-regulated suppliers.
- "Subject to appropriate conditions and charges," operators of on-line service bureaus should have "greater freedom than is now generally granted by the carriers to achieve operating economies and improve their operating efficiency." Specifically, the operators and their customers "might be permitted" to share transmission channels. The operators might also be permitted to install their own concentrators and multiplexors, and attach remote terminals directly to the switched network.
- Canadian communications carriers should be allowed to enter the computer services business through "an arms-length affiliate, subject to conditions preventing abuse of their privileged position."
- Government policies should encourage Canadian ownership and control of the nation's computer and telecommunications services.
- Federal regulation of these services should be increased. One way would be to give the government power "to prescribe the terms and conditions on which any new service may be offered to the public" as well as authority "to exempt. . .specified services from rate regulation."

In the U.S., most of these questions have been before the FCC for some time. There was the Computer/Communications Decision of 1971, which dealt with regulated vs. non-regulated suppliers, and the 1968 Carterfone Decision on foreign attachments. The question of whether independently made terminals can be attached directly to the dial-up telephone network still hasn't been resolved, and the same is true of most of the other major issues. Last June, the FCC began an inquiry aimed at determining whether common carrier subscribers should be allowed to share or resell channels. The origin of that proceeding can be traced back to 1969, when the commission decreed that sharing provisions of the Telpak tariff were discriminatory.

It is tempting to predict that the Canadians will resolve these questions faster than will the U.S., but that doesn't seem likely.

A communications act is likely to be introduced in the current session of Parliament. It contemplates vast changes in the way Canada's common carriers are regulated. But despite the use of general language to cover key points, there is still vast disagreement among the carriers, the provinces, and the federal government over this bill, so a lengthy fight is certain.

One section of the measure authorizes the carriers to set up separate subsidiaries to operate service bureaus. Norman Williams, president of the Canadian Assn. of Data Processing Service Organizations (CADAPSO) indicated in an interview that his organization doesn't believe the separation is adequate, and plans to present its views, in detail, to the legislature.

The federal government has established an interdepartmental working group to analyze each of the recommendations in the computer/communications green paper, and develop proposed administrative orders or legislative language to implement them. Dr. Hans J. von Baeyer, the chief coordinator of this effort, believes substantial progress has been made. But there is clearly a long road ahead. Each working group recommendation must be blessed by several groups inside and outside the government, and typically they have widely divergent views. Ultimately, they will probably agree, but the final result is likely to be a cosmetic consensus which doesn't really come to grips with key aspects of the problem.

—Phil Hirsch

MCI Wins Battle for Local Loops

Microwave Communications Inc.'s (MCI's) long battle to obtain local loops from AT&T on an equitable basis ended dramatically this month when the U.S. Court of Appeals in Philadelphia rejected all of the telephone company's counterarguments.

One major result of the decision will be to strengthen MCI's financial base, which has been rumored to be shaky. William McGowan, the company's board chairman, said recently that if the appeals court remanded the case back to the FCC for a full evidentiary proceeding, which was what Bell wanted, his company might not have the resources to pursue the matter.

The appeals court also indicated that Bell could be held liable for hamstringing MCI's efforts to obtain local loops in the face of earlier FCC rulings directing the phone company to be more reasonable. This could be significant because MCI has filed a treble-damage antitrust suit in Chicago against the telephone company, alleging a number of anti-competitive practices. One charge is that AT&T tried to persuade its operating companies not to interconnect with MCI.

Appended to the Philadelphia court's decision was an order directing AT&T to interconnect not only with MCI but with "other specialized carriers." Facilities for "presently and hereafter authorized services" must be provided under reasonable terms and conditions, and they must be "similar to those presently provided to Bell's long lines department." The order explicitly requires the phone company to interconnect with foreign exchange lines supplied by the specialized carriers, and also authorizes these carriers to service users of Bell-supplied, customer-controlled switching arrangements (CCSA's). AT&T has been particularly reluctant to permit these latter two types of interconnection.

Previous contracts

Another section of the order forces Bell to honor previously negotiated interconnect contracts with Western Union. AT&T had said earlier that, because of FCC directives requiring the phone company to interconnect with the specialized carriers, these contracts were no longer effective.

Actually, AT&T has been interconnecting with WU, the specialized terrestrial and domestic satellite carrier, since last May. Bell was forced to do this because of an FCC cease-and-desist order, which ended the phone company's resistance to an earlier Commission "request." But the question of prices, terms,

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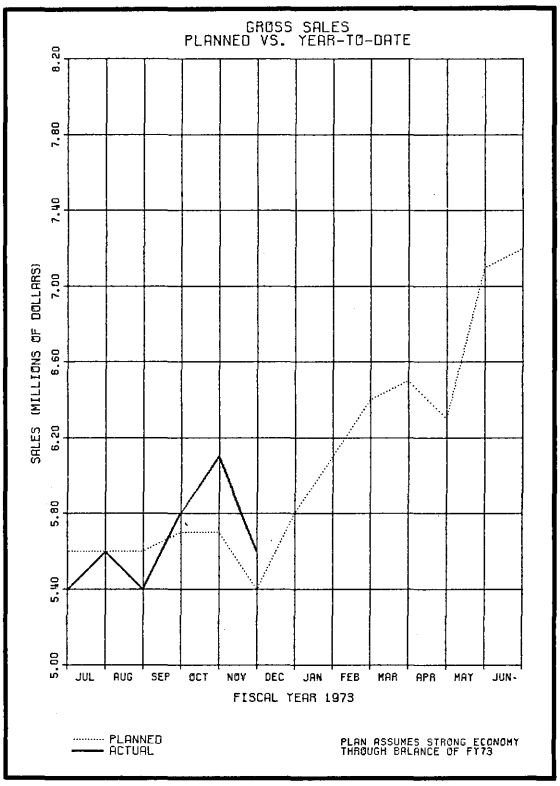

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GOULD

and conditions has been up in the air, pending the outcome of the case in Philadelphia.

Last August, AT&T filed a proposed interconnect tariff, which all of the specialized carriers, as well as Western Union, jumped on. MCI, for example, submitted an 83-page opposition statement. Knowledgeable sources believe that now, in view of the appeals court decision, the Commission will insist that the phone company remove the objectionable provisions.

MCI Board Chairman William McGowan said this month that his company's revenue, currently $500K/month, will hit $1.2 million/month "if, as expected, we install our present backlog of circuit orders."

The company recently became one of six specialized carriers chosen to supply circuits to Aeronautical Radio, Inc. (ARINC), which services the domestic U.S. airline industry. By the end of this month, said McGowan, "we will have 500 ARINC circuits installed, or scheduled for installation, and we expect to have 2,000 booked by the end of the year." He declined to estimate the value of this business, but an average MCI circuit is 400 miles long and earns 90 cents/mile.

Operating expenses

MCI has borrowed "about $50 million to date," said McGowan, and is paying about $800K/month in interest. Direct operating expense comes to $1.2 million/month. He said additional money would have to be borrowed, but the total debt shouldn't be "much above $60 million" by the time monthly revenue begins to balance monthly outgo.

McGowan declined to predict exactly when the balance would be reached, but his figures indicate that circuit revenue should equal monthly direct operating expenses within the next few months; by next spring, enough should be coming in to balance debt service charges as well.

MCI announced this month that it has reached an agreement in principle to utilize the microwave network of Western Telecommunications, Inc. (WTCI) "on a revenue-sharing basis." A "definitive contract" must still be negotiated, and the FCC must give its blessing; but if the joint operation is established, it will enable MCI to complete its network coast-to-coast. Presently, the system terminates in Houston. WTCI services Los Angeles, San Francisco, San Diego, Phoenix, and Tucson.

Companies

Life After The Mausoleum

A year ago, Computer Communications, Inc. (CCI) was operating under Chapter XI of the Federal Bankruptcy Act and was 78 people rattling around in a plush, 86,000 sq. ft. country club-like plant atop a hill in a pastoral eight acre site in Culver City, Calif.

Last month, out from under Chapter XI and operating from a compact, 50,000 sq. ft. plant in Torrance, Calif., the company, back up to 98 people, was about to report a profit of some $500,000 on sales of $4.7 million for the fiscal year ended June 30. The company went into and got out of Chapter XI in a record six months' time, but it seemed a lot longer to the employees who went through it.

The employees had, maybe fondly or perhaps prophetically, dubbed the old plant the Taj Mahal (the original was a mausoleum). The site was complete with tennis courts, a baseball diamond, and an aviary.

"Prior to July 1st last year," says president Raymond High, "we were dead but we wouldn't admit it. We reluctantly cut our staff from 149 to 78 (at one time, CCI was up to 240) and told the 78 we couldn't guarantee payroll for awhile." The company went for five weeks without issuing a payroll and lost only three people, a telephone operator, a stock clerk, and a customer engineer.

The firm filed under Chapter XI on July 1, 1973. Five weeks later it was thrown its first lifeline by Syn-Tech, a Rockville, Md. modem manufacturer. Syn-Tech put $136,000 into CCI, which enabled the California company to keep going and to meet its payroll including back pay. Syn-Tech proposed to invest up to $500,000 into CCI in exchange for 51% of the company. Actually, said High, the Chapter XI filing was done to implement this without the need for an audit or for SEC approval.

Creditors approved the Syn-Tech plan and it was set for a court hearing Oct. 24, 1973. In the meantime, says High, "the company had started to turn around. We were seeing light at the end

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of the tunnel."

Second suitor

Apparently Data 100, Minneapolis-based terminals manufacturer, also saw the light. Two weeks before the Oct. 24 hearing, that firm contacted CCI asking to present a plan. "We were obliged to listen to all plans," High said, "so we said yes."

Then came the hearing which High described as "like a Perry Mason novel complete with whispered meetings in the hall during recesses." Data 100 attorneys said they wanted their plan considered. Creditors decided they wanted to hear it and rescinded their approval of the Syn-Tech plan, and Syn-Tech withdrew its offer. It has since been repaid the $136,000 it put into CCI.

The Data 100 plan hung fire for a couple of months but there was one hitch. CCI's biggest creditor was Union

RAYMOND HIGH
Happy away from the Taj Mahal

Bank, to which it owed $2.1 million. Data 100 wanted the bank to write down $500,000 of this. Neither Data 100 nor the bank would budge. CCI's sales and earnings continued to improve. In December, says High, "we went to them and said: look guys, come to an agreement or we're going to file a plan on our own." That's exactly what CCI did in early January of this year. They granted creditors one share of CCI stock for every $3 of indebtedness and converted the $2.1 million bank debt to a five-year term note, on which they had paid $400,000 in mid-September.

Glamour years

How did CCI come on bad times? In part, said High, it was caused by acquisition of three subsidiaries during the "glamour years when it was the thing to do," all of which were subsequently sold at a loss.

The biggest loser was a company called West Cal Industries, which manufactured disc strates for NCR and did machine shop work for the aerospace industry. CCI acquired it for 110,000 shares of CCI stock then selling at $36/share. "Almost immediately after the acquisition," said High, "NCR didn't require disc strates anymore and the aerospace industry fell apart." CCI put $½ million into West Cal trying to keep it alive but gave it up in January 1973, selling it to a "private individual" for $240,000. "The worst is," said High, "he gave us a check for $13,000 as initial payment and then skipped town. Even the sheriff doesn't know where he is."

Another contributor to the decline of CCI's finances was a stock brokerage system it developed for its original underwriters, Blair & Co. Blair & Co. collapsed and CCI was left with a massive R&D effort 80% completed and no customer. The Mid West Stock Exchange ultimately purchased the system for $1.2 million, but High estimates that CCI invested more than $2½ million in it.

High is not reluctant today to talk about the bleak days before and after Chapter XI. Janitorial and gardener services were cut off and the company had to pay the telephone company in cash on a daily basis to keep that service going. "We stopped watering to keep the grass from growing and brought our families in on weekends to keep the place clean."

He's almost gleeful in describing a little subterfuge they used when visited by "money people" during that time. "We had so few people and so much space. We'd concentrate people in one area and, as our visitors moved on, we'd sneak them up another stairway. When the visitors reached the next area, there would be the same people. They never realized they were seeing the same faces each time."

This could only have been accomplished in the Taj Mahal.

—E.M.

Software

MIS: A Buzzword You Utter in a Whisper

Many industry buzzwords come and go quickly, while others linger on beyond their time. One that got a lot of attention a few years back but is more frequently uttered in a whisper today is MIS. Technologists in both hardware and software predicted great things with the computer-based Management Information System—that is, until it became apparent how difficult it is to design and implement such a system. This is not to say, however, that the effort has been abandoned.

Indeed, last month the Society for Management Information Systems (SMIS) held its sixth annual conference in San Francisco. The meeting, attended by less than 200 of the 750-or-so members, featured a refreshing emphasis on the human aspects of systems with nary a word about bytes or microseconds. Presentations by systems designers, bank presidents, and even a professional physician/psychoanalyst indicated the focus of MIS designers.

It has long been recognized that a major obstacle to the design of an MIS is the unstructured decision-making process of executives for whom the system is to be built. Perhaps for this reason, senior management personnel were invited to address the gathering. One of them was Madelaine McWhinney, president of the First Woman's Bank in New York City. She said she has known many systems people, and found them to be knowledgeable and dedicated people. But from her new perspective as head of a bank (that has received much national publicity but has yet to open its doors), she has become unhappy, annoyed, and baffled by systems and procedures she sees, and she knows those systems designers "wouldn't deliberately send me and others up the wall—but that's what they're doing."

Need a psychologist?

How do you get human engineering into systems? By communicating with people, she asserted. You must know the total flow of information within an organization, she added, and be aware of the impact of information on people. It may be, she continued, that you need a psychologist on the systems team.

Earlier that day, a practicing physician and psychoanalyst did address the group, drawing a parallel between an MIS department and the psychoanalyst and between the user and the patient. Dr. May Weber, who also happens to be the wife of SMIS president Gerald M. Hoffman, described the process by which a patient's thoughts are drawn out and explained the importance of being able to interpret what he says or does. In the same way, she said, the systems designer in "treating his patient" (the user) must take enough time in talking with the decision-maker, must ask more of him than his rational state-

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ment of need, and must convert the resistance he will have into an asset. This resistance, she added, is produced by the same intelligence as his need of your service.

Next Tuesday

Another view from the executive suite was offered by Dr. Robert G. Stevens, president and chief executive officer of Old Stone Bank, Providence, R.I. A former vp and MIS director at First National City Bank, Stevens said he never went in for quantifying information, for putting it on-line. Nor was he high on modelling and five-year plans. He said at Old Stone Bank he didn't start by trying to generate a five-year plan because they didn't have the data to do so. Instead, they tried to forecast what would happen by next Tuesday, and did this for each succeeding Tuesday until they had something on which to base a longer range plan. What followed was a monthly plan. The war room concept with numbers flashed on a screen would do the bank no good, he added.

Stevens referred to regularly performed functions, such as spending money, paying bills, and hiring someone, as rituals, noting, "I've found that information systems don't always help rituals held by a company." He said the failure to take into account the human factor, how people work in performing rituals, will mean the rejection of information systems.

Global MIS is gone

The large, ambitious MIS system, with on-line terminals on the desk of each executive, or the war room concept for strategy planning in the board room, is apparently not SMIS's bag. The so-called "global approach" has been a disaster, says the society's president Gerald Hoffman of Standard Oil Co. (Indiana), Chicago. "We don't feel the compulsion to talk about global MIS anymore," he explained. What's required instead, he added, is an outline of objectives and work on the detailed steps necessary to get there. He said the society perceived earlier that technical problems were being solved, so its concern was over what to do, not how to do it. It had to attack the strategic problems of MIS, deciding for example what problem to attack first.

Hoffman said the typical SMIS member is the senior systems executive in a company or organization, usually a large one. He said he was looking to attract as members that executive's boss—the vp of finance or administration—as well as his major users. A congregation of such a group, especially at the society's annual conference with its small gathering, could provide an ideal setting for profitable interaction.

A number of speakers referred to the need for greater involvement by management in the design of systems. People have been saying that for many years, too. But now they're also calling for more creative and farsighted management. Keep adding qualifications like that and the MIS effort will be doomed.

—Edward K. Yasaki

File Management: The Direction Is to DBMS

File management systems—the languages programmers and non-programmers use to retrieve information from computer files—now are becoming a widely used tool for accessing Data Base Management Systems (DBMS).

In recent years, four independent suppliers of file management systems have been offering interfaces to IBM's IMS and Cincom's TOTAL, and some are expanding their offerings to communicate with all systems. In fact, their literature now drops the word "file," referring to them as data management systems.

"Four years ago we made the decision to put all our eggs in the data base basket," says Don Sundeen, president and founder of Applications Software, Inc., Torrance, Calif., which sells a system called ASI-ST. Sundeen, who calls the decision a "bet-your-company" move, has reason to be delighted over the decision. A tiny, struggling software house in 1970 when the move was made, the 24-person firm in its fiscal year ended last June 30 did $1 million in business and expects to triple that figure in the current year. Sundeen says 85 of the company's 135 installed systems interface with data base management systems.

DBMS interfaces also are offered by Cullinane Corp. of Boston, with its CULPRIT package; by Program Products, Inc., Montvale, N.J., with Data Analyzer; and by Informatics of Canoga Park, Calif., with its MARK IV system.

Of MARK IV's some 800 installations, 50 communicate with IMS and 20 with TOTAL. This fall the company announced a Generalized Systems Interface (GSI) feature that enables the product to be used to communicate with any data base. Informatics' John Postley

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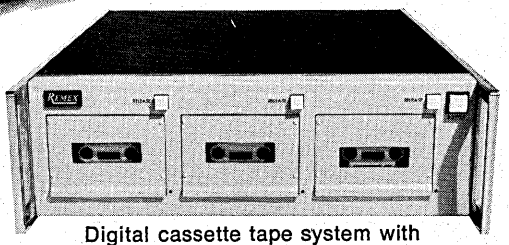

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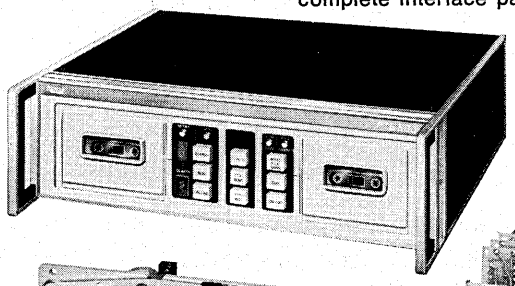

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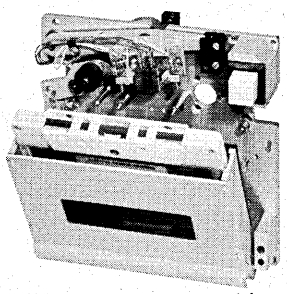

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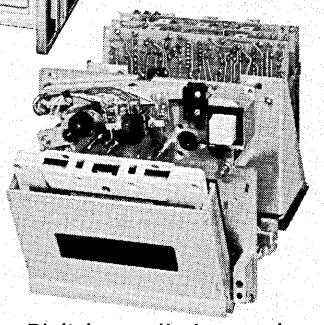

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says the new feature will find most of its use with such popular systems as IMS and TOTAL as well as IDMS, ADABAS and System 2000, but also will communicate with any user-written program or routine. Postley explains, however, that the interface is not automatic as it is with the present IMS and TOTAL offerings and that "some writing" would have to be done.

"Little language"

Kay Crosby, marketing manager for Program Products, Inc., said that company is developing a similar enhancement called Generalized Data Base Interface (GDBI), described as a "little language" in which a user would describe the kind of data base with which he wants to work. To users of IMS it would be transparent but users of other systems, such as TOTAL, would need "some language" with it. Program Products, which has some 120 installations, only recently offered a DBMS interface to IMS and has 10 installed.

John Cullinane, president of Cullinane Corp., said his company will not go the generalized interface route, but will offer "elegant interfaces tailored to specific systems" when there is a market demand. CULPRIT now communicates with IMS at some 40 installations and with TOTAL at 25. The product also interfaces with University Computing's RDMS at 25 sites and with IDMS at 10. IDMS, developed by B. F. Goodrich, is marketed by Cullinane, who has sold 14 systems and has orders to install another 20 over the next six months.

The varieties of file management systems offered by the four companies are multitudinous, as are the definitions of their use. ASI-ST and MARK IV can be used to update and manipulate files as well as generate reports, while Data Analyzer and CULPRIT are report generating packages only. (CULPRIT gets its name from its function of culling records from storage and printing reports from the files created.)

Yellow pad

The suppliers tout the packages as tools for both programmers and nonprogrammers. One says, for example, that a marketing manager can get fast access to information simply by writing down what he wants to know on a yellow pad. And a programmer can deliver files to the end user with much greater dispatch than if he had to write a program.

"Our biggest competition is not the other file management systems," says Postley of Informatics. "The competition is COBOL," meaning that the dp department has to be convinced that the file management systems might be more efficient than writing programs from scratch. Cullinane talks of a customer who wrote a 550-statement program in COBOL for a job that was done with CULPRIT's IMS package in 40 statements.

Although the big selling point for the products is that they put the nonprogrammer end user in direct touch with computer files (and if anything goes wrong all he blows is his own report, says PPI's Kay Crosby), Postley is enthusiastic about their use by programmers. "Look at a file management system as if it were a racing car," Postley says. "A marketing manager who isn't a programmer is able to use MARK IV to do things to files; but he doesn't do it as well as a programmer. You could get to work in a racing car; but a trained racing driver could use it to win the Indianapolis 500."

Although speed is a factor in any product of this kind, marketeers will debate that it is only relative. A facility of Combustion Engineering logs 8,000 runs of ASI-ST a month, more than the use of all other applications programs combined, and Sundeen attributes this to his product's throughput. But Postley of Informatics thinks the real concern should be with reliability. MARK IV, he admits, is slower, but what it may lack in speed it makes up for in error checking. While it checks errors in syntax and identifies and fixes them, other systems stop or dump when errors are encountered.

And there are other marketing arguments that users tend to "overbuy" when acquiring the MARK IV or ASI-ST products. A user will order a system that does file updating and manipulation, but find this function too complicated, and end up using an expensive system to do only report generating.

But there is complete agreement with Postley's observation that the stiffest competition is from prospects who still want to do applications programming in COBOL. Aware of this, Postley's company last spring began offering a COBOL program generator, called CL*IV.

—Tom McCusker

Labor Relations

Burroughs Strike Doesn't Bother Users

Although 185 Burroughs customer engineers from the New York Financial Branch were still on strike in mid-September (Sept., p. 145), users were not complaining.

"Things are running great," said Bill Walsh of the New York City Federal Reserve Bank. "We're getting maintenance from our regular supervisory personnel (from Burroughs) and from some additional personnel from I don't know where." Maintenance is critical to Walsh's operation, which has an on-line data base system running in real time on dual B 6700s round-the-clock, seven days a week.

The Burroughs CE's from the New York branch, which covers financial users in New York City, New Jersey, and Long Island, went on strike Aug. 26 to back up demands that the company negotiate a contract with Local #3 of the International Brotherhood of Electrical Engineers and formally recognize the local as their bargaining agent. The customer engineers voted to join the union last April. Local 3's John Crowley said, "The vote was overwhelming."

Crowley said the company and the union had had no formal communications at this writing, but he expressed hope they would have some soon. "The company has trumped up some kind of unfair labor practices charge it's filed with the National Labor Relations Board."

"I can't believe the equipment is being effectively maintained," said Crowley. He said Walsh's "additional personnel" were "strikebreakers they've brought in from all over the country."

Crowley was optimistic that the strike would achieve the union's desired result. He said in mid-September he expected it "would spread soon to Detroit and Los Angeles."

Burroughs' Hank Walch, manager of the New York Financial Branch, explained that the "additional personnel" were "supervisory, exempt personnel brought in from Burroughs' branches in other parts of the country."

One user commented that they (the supervisors) "appear more competent than the line CE's. They have a higher level of technical skill."

news in perspective

International

Unidata: Three More For Credibility

Almost more than business itself, Unidata, the European combine of France's CII, Holland's Philips, and Germany's Siemens, needs to convince the dp world that it is serious about competing across the board with IBM in the continental market. Once "belief" in the mind of the user is achieved, the European's preference for European equipment should guarantee Unidata reasonable market penetration. It's just possible that the European user would rather buy a third-generation "European" computer than anything IBM might offer in its next series, due out in either 1975 or 1976.

The mid-September announcement of three additional members to its first family of computers at the SICOB show in Paris is another carefully calculated move to achieve credibility. Though the systems—the 7.730, 7.740, and 7.750—are so far just a list of specifications (no deliveries before late 1975), one senses a gathering force that tends to create enthusiasm in user shops. The model designations are not easy to use or remember, but a Unidata spokesman points out that if one thinks of Unidata as "five points better than the IBM models every time," it's easy to see that the 7.730 will compete against the 370/125, the 7.740 against the 370/135, and so on. Ominously, RCA did much the same thing in numbering its across-the-board series of IBM-competitive machines.

The systems all have the following common features: virtual memory, with an address space of 16 megabytes; integrated circuit and semiconductor technology throughout; main memory sizes ranging from 48 kilobytes to 2 megabytes; built-in automatic test and diagnostic routines run from microprocessors; integrated cpu/memory (IBM does indeed set the standard around the world), perhaps to quash any add-on memory market that might evolve; automatic instruction retry; and a host of application software packages originally developed for the IRIS, P-1000, and 4004 systems that the new line displaces.

Multiprogramming

Deeper probes into the technology reveal Siemens-designed T^3L logic, compatible with T^2L logic, but with a Shottky diode added to hold noise levels down. This circuitry is being produced for Unidata by Texas Instruments, Motorola, and others. The memories are p-channel silicon gate technology using 1K chips. A more advanced 4K chip is in pilot production. The BS 1000 operating system for the series features multiprogramming on even the smallest models, remote job entry, automatic I/O spooling, data base processing, and data communication activity.

The 7.730 features memory expandable in several increments between 96 and 256K. Eight bytes of memory are referenced every 615 nsec, and the aggregate data rate for the system is an impressive 3 megabytes/second. Byte- and block-multiplexor channels are available on the new line.

The 7.740 is designed for use in somewhat different applications than the 7.730, where it can cope with relatively heavy batch workloads while running data communications tasks concur-

rently. It's claimed that the system's communications monitors and special data base software take advantage of the system's communication controllers. The 7.740 is expandable from 96-512 kilobytes, with the same eight bytes accessed during each 615 nsec memory cycle as the 7.730. The aggregate data rate is 4.5 megabytes per second.

More to come

The top of the Unidata line so far is the 7.750, with at least two models still in development that will probably compare to the 370/155 and 165 series. The 7.750 ranges in size from 128 KB up to two megabytes. There is apparently a choice in cpu architectures—one that accesses eight bytes during each 615 nsec memory cycle, or one that brings in 16 bytes. The aggregate data rate of 6 megabytes/second is sufficient to support hundreds of megabytes of disc storage and line printers as fast as 2000 lpm. The 7.730 and 7.750 machines will be built in Munich, and the 7.740 manufactured in Paris.

Pricing on the new equipment isn't yet available, but it's a foregone conclusion that the figures will be under comparable IBM numbers to tempt users away. There are also no benchmarks available for the new line, but Unidata realizes that they are needed—and that the lack of them has held down the number of orders for the 7.720 machine announced earlier this year. The European user is much more a tire kicker than his U.S. counterpart.

But when machines start showing up at customer sites next year, there could be a rapid change in IBM's 60% dollar penetration of countries like Germany and Italy.

—Michael W. Cashman

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Thinking Small: Univac's introduction last summer of the 90/30 signaled its entry into the smaller machine market, i.e., large System/3 10s (Aug., p. 124). To beef up its efforts in a market where it has little experience, Univac now has absorbed Sperry Rand's Remington office machines division, which sells adding machines, copiers, calculators, typewriters, and office supplies. Sperry Rand chairman J. Paul Lyet said the merger is a "logical step in the process to get maximum benefit from commonality in technology, the facilities, the people, and other resources" of the two divisions. An advantage of the merger is that Univac acquires Remington's marketing force of 2,500 with considerable experience in the small business systems field. A by-product was a considerable savings in salaries as some 200 engineers, programmers, and clerical workers were laid off shortly after the merger because of duplication of tasks. Heading the Univac division is Gerald G. Probst, who has been president of the division since 1971. M. E. Stanton, a former Sperry corporate vice president, becomes general manager of what now will be known as Univac's office products operations.

The Second Time Around: DPF Inc. has filed its second antitrust suit against IBM. The latest suit, filed in San Francisco, claims damages of $15 million and charges IBM with "predatory" price cuts th. devalued substantial amounts of peripheral equipment it owned in 1970. It is based on the Telex decision, and DPF has hinted it will drop the suit if IBM wins its appeal on the Telex case. The leasing company's first suit against IBM, filed in 1969, was a broad antitrust

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suit accusing IBM of monopolizing the computer business and taking anticompetitive actions against the leasing companies. It was dropped in August 1970 in return for IBM's reimbursing DPF, then in dire financial straits, for an undisclosed amount in legal costs, and agreeing to refinance a $42 million debt for IBM computers purchased from IBM.

Sanders Blames IBM: Sanders Associates Inc., Nashua, N.H., blamed IBM for a $19.1 million net loss it posted for the fiscal year ended July 26. The terminal manufacturer said it would file an antitrust suit against the giant in federal district court in Concord, N.H., seeking triple the loss and an undisclosed amount for previous losses and lost profit. Sanders said it experienced lower-than-expected new orders and "significantly" increased lease terminations in the fourth quarter which it attributed to IBM marketing techniques.

Leaving Leasing: Hudson General Corp., which has an antitrust suit pending against IBM based on the Telex case findings, said it is getting out of the computer leasing business. The firm said it would "hereafter emphasize the orderly sale and disposition of such equipment over the next three years." As a result of the move, the company will charge $2 million to operations for its fiscal year ended June 30 to adjust the carrying value of computer equipment to an estimated realizable value of $10.5 million. In the nine months ended March 31, Hudson General had a net loss of $79,000 on revenue of $31.6 million. The company said its decision to get out of leasing was made because of "anticipated difficulties in the releasing of such equipment because of competitive and economic conditions."

Major Orders: Scan-Data Corp., Norristown, Pa., said it has received orders for more than $3 million worth of its new Model 2250/2 key entry system. The bulk of the business is accounted for by two major orders from Automatic Data Processing, Inc., Clifton, N.J., and Blue Cross/Blue Shield of Florida, Inc., Jacksonville, Fla.

In Its Own Name: Data Dimensions, Inc., Greenwich, Conn., which for several years has been marketing portable terminal, an automatic terminal with equipment for a variety of manufacturers, said it will buy several models of an NCR terminal family which it will market under its own name. The terminals will be labeled the DDI 200 Series and will include a lightweight portable terminal, an automatic terminal with a magnetic tape cassette storage feature, and several other types of terminals.

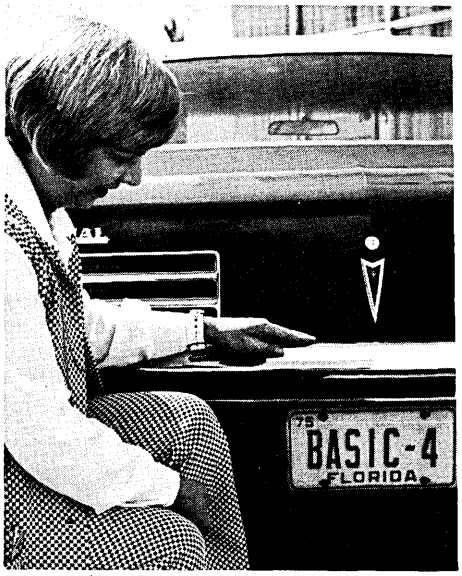
Network Controller: The Canadian airline Air Canada will install dual Collins C8562 processors early next year to control the airline's communications network. Under a $2 million contract, the new system, called a "network controller," will integrate several formerly separate communication and computer functions. The airline currently uses two networks: the ReserVec II, a medium-speed network, and a teletype slow-speed network leased from Canadian National Telecommunications. With the Collins systems, all data communications will be handled by a control computer interposed between the field network and the Air Canada computer centers in Winnipeg, Toronto, and Dorval, near Montreal.

European Mini Market: The European minicomputer market should reach $1 billion by 1983, say market research specialists Frost & Sullivan, Inc. The New York City based firm said the cumulative total value of shipments in Europe will come to $6.3 billion over the next ten years. The company said the mini market in Europe totaled $157 million in 1973. A Frost & Sullivan study, "Minicomputers in Europe," projects the gains "notwithstanding that the chip computer, or microprocessor, threatens many potential application areas for minicomputers." The study says at least 55 minicomputer manufacturers are competing in Europe.

Data General Looks Up: Data General Corp. said it expects to report profits of from $1.15 to $1.25 a share for the fiscal year ended Sept. 28, up from 83 cents a share the year before. The minicomputer manufacturer expects sales in the latest fiscal year to be between $80 million and $82 million, up from $53.3 million.

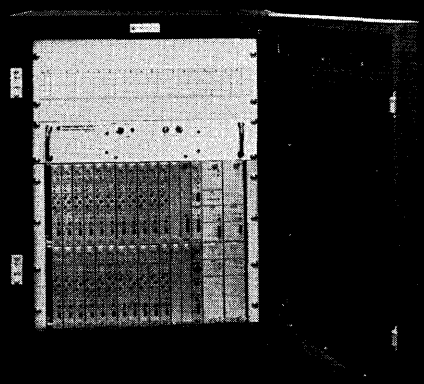
Small and the Big of TI: Texas Instruments, Inc., known widely for its fast-selling hand-held calculators, is doing well in the monster computer business as well. It's been awarded a contract to install its advanced scientific computer (ASC) in the Naval Research Laboratory in Washington, D.C., and expects payments of more than $23 million over a six-year period. The system will be installed within a year and a half. Other ASC systems are used by the National Oceanic and Atmospheric Administration for long-range weather forecasting and by the Army for ballistic missile research. TI operates an ASC in Amstelveen, Holland, and two in Austin, Texas, for seismic research and is building another in Austin for use by the company.

Advertising-Minded: The State of Florida recently allowed motorists to buy personalized automobile license plates. Ruth Rosow knew right away what she wanted. Her husband's company, Rosow Information Systems International of Miami, had just become Florida distributor for Basic/Four Systems, the California-based manufacturer of the small business computer. For the next three years the firm has a mobile billboard for the price of an auto tag.



Pity the Poor Insurance Clerk: "The administrative and paper work processing operations of an insurance company truly represent its 'factory.' If it were possible to fully automate, the insurance company would consist of nothing but a computer, a couple of executives, and a whole lot of salesmen," says a Frost & Sullivan, Inc. report just out. The market research firm's study, "The Markets for Insurance Computer Systems and Services," predicts the insurance industry within the next 10 years is likely to become "the single most computerized segment of the U.S. economy." It says the value of computer systems, peripherals, software, and related services sold to the insurance industry, now at $600 million a year, will exceed $1 billion by 1978. It also predicts a "rapid upsurge" in shipments to the insurance industry of computer systems selling for less than $200,000. □

INTRODUCING THE NEW CHAMPIONS OF DIGITAL COMMUNICATIONS!!



General DataComm's Model 1251
High-Speed Digital Synchronous Time-Division Multiplexer

The TDM designed for compatability with the new digital communications networks, General DataComm's Model 1251 is available for sale and delivery now.

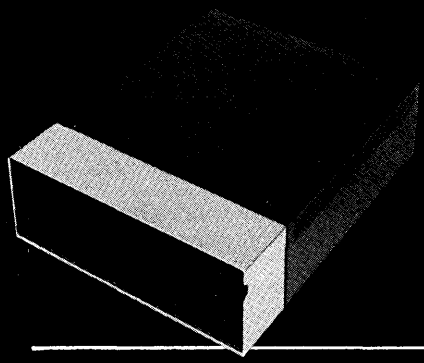
Model 1251 gives you the ability to multiplex as many as 62 channels of synchronous data having mixed rates ranging from 1200 to 19,200 bits per second and to transmit the composite output at any rate up to 256 Kbps.

But speed alone does not tell the whole story. The 1251 is superior to outmoded multiplexers in its:

Flexibility — permits maximum combinations of modem and terminal equipment in the same system.

Superior Diagnostics — on-line monitoring of each data channel, remote channel testing, automatic fault alarm.

Plug-in Maintainability — no need to interrupt operation of all channels to replace one card.



And the 2400 bps Modem with all the diagnostics — General DataComm's Model 201

At first glance, General DataComm's new Model 201 might seem like anybody else's Bell-compatible 2000/2400 bps modem. That's where the similarity ends. Nobody else has synchronous 201 modems with the complete remote and local diagnostics offered by General DataComm.

Working from your communications center, you can instantly spot troubles anywhere on your data network and instruct local operating personnel how to make on-the-spot repairs, using plug-in cards.

GENERAL DATACOMM — the one name you need to know for all your data communications hardware needs.

The completely Bell-compatible line of hardware from General DataComm includes everything you need for data communications systems using any common carrier lines, including the new ultra-high-speed digital networks.

High-Speed Digital Synchronous TDM's • **Asynchronous TDM's** • **Frequency Division Multiplexers** • **Synchronous Modems** • **Asynochronous Modems**

And never a worry about interfacing. General DataComm assumes full responsibility for network integration.

General DataComm Industries, Inc.
131 Danbury Road, Wilton, Connecticut 06897 (203) 762-0711 TWX 710-479-3210

member of IDCMA

CIRCLE 6 ON READER CARD

LOOK AHEAD

(Continued from page 18)

Meantime, there are persistent rumors that IBM's private automatic branch exchange (PABX) systems, now installed in about six nations overseas as the models 2750 and 3750, will be unveiled in the U.S. early next year. There is even word of some U.S. customer test installations.

CONSENT DECREE TALK PICKS UP

Consent Decree talk, unheard of just a few months ago, has been picking up. IBM, of course, has been interested in an out-of-court settlement right along. It's difficult to figure out what the Justice Dept. wants and, from the way it's been handling the case thus far, it appears possible that the government itself doesn't know what it wants.

But IBM's competition, increasingly under pressure for lack of financing in the wake of the virtual collapse of the stock market, may ask for relief in a Consent Decree. The Computer Industry Assn., for instance, is beginning to talk about a Consent Decree. Eugene K. Collins, Wall Street analyst for Evans & Company, believes that IBM could make "important concessions" to the Justice Dept. and still remain strong and in control of its destiny. "Since the Justice Dept. suit was filed almost six years ago," says Collins, "IBM's industry position has strengthened not only in terms of the structure of the industry as we know it today, but also in the context of the possible structure of the industry in the late 1970s and 1980s."

The reason is relatively simple: with a few exceptions, IBM's competition is slowly strangling due to severe capital shortages. Cash-rich IBM with more than $3 billion cash reserves has no such problem.

IBM FRIEND IN THE WHITE HOUSE

IBM has a new friend in the White House. His name is Phillip E. Areeda and he is President Ford's new counsel. Last year, as a Harvard Law School professor specializing in antitrust law, Areeda was in great demand by Wall Street in the wake of the Telex decision. That decision, of course, went against IBM. Flabbergasted Wall Street analysts who had been recommending IBM stock for years scurried to attack the decision of the case they had been ignoring.

The most prestigious voice to be raised against the decision was that of Areeda. His criticism of the Telex decision was widely publicized at the time. Areeda felt that many of the key parts of the judge's decision would be reversed on appeal.

RUMORS AND RAW RANDOM DATA

Those who had been awaiting IBM's announcement this fall of a low-end business-oriented machine known as the System 2 may have to wait a little longer. The company now is understood to be planning an announcement after the first of the year...Computer Communications Inc. is about to announce the CC 80 communications processor, a MOS version of its core memory CC 70. Although the new version cuts cycle time to half a microsecond from 1 usec and ups memory addresses to 512K from 64K, the price is the same..,A Los Angeles banker, who happens to be an IBM shareholder, said his IBM sales rep took the bank dp staff to lunch the day of the price increase announcement and presented each with a letter. "The others said their letters read 'Dear Customer--we regret to inform you.' Funny, I told them, mine starts out: 'Dear Shareholder, we know you'll be delighted to hear...'"

Computer service is an on-line, real time business. We're on-line. And we're on time.

Maybe you've been through the hassle of dealing with mix'n'match service groups for your mix'n'match system. Or maybe you've been working with a single company that's not responsive enough. Either way you know what a service company shouldn't be. And what you think it should be: On-line and on time.

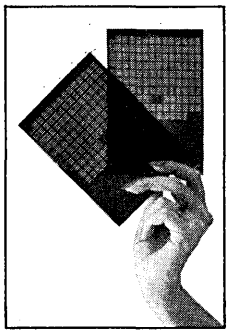
That's what we are. We're already handling all the service for 89 mix'n'match system users from our world-wide network of service offices. On time. One happens to be a major international airline. The others run the gamut from a government agency to a brokerage firm.

There are a lot of reasons why using us as a single source for all your computer service makes sense. One-call convenience. Technicians with the experience and the training to service and maintain every part of your system. And more, all adding up to lower cost of operation and maintenance, with fewer headaches.

You know what you want from a service company. We've got it. Why don't you get our full story, from Mike Salter, Commercial Marketing Manager, Raytheon Service Company, 12 Second Avenue, Burlington, Mass. 01803. (617) 272-9300.

RAYTHEON

CIRCLE 71 ON READER CARD



NCR COM gives you fiche completely cut and dried.

That means savings to you.

NCR's Microfiche Recorder/Processor is the first to give you fiche completely cut and dried. There's no chemical handling because all the film is processed right within the system. You just plug it in. There's no added expense for a darkroom, plumbing, additional processors or extensive training.

NCR software is another plus feature. With little or no change to up-and-running programs. You save on programming costs and eliminate delays. These software programs are compatible with most mainframes, too.

Service and support? NCR's worldwide network of over 18,000 service specialists, along with a complete line of microform supplies, is the best you can get.

COM is a good thing. And NCR makes it that much better. Get all the facts from your local NCR representative. Or write directly to COM Systems, NCR, Dayton, Ohio 45479.

NCR
Complete Computer Systems

IT PAYS FOR ITSELF AND THINKS FOR ITSELF.

MINIPLUS:
The complete message switch.

MINIPLUS comes with the RCA Glōbcom communications team to analyze your needs and recommend the most efficient network configuration, free of charge.

They'll provide whatever peripherals you need, tailor a software package that doesn't turn into a surprise package later on. Even marry your circuits (any combination of simplex, half-duplex, full-duplex, telex, TWX, Dataphone). When it's time to order lines, RCA will interface with the telephone company and, if requested, negotiate with foreign carriers on your behalf.

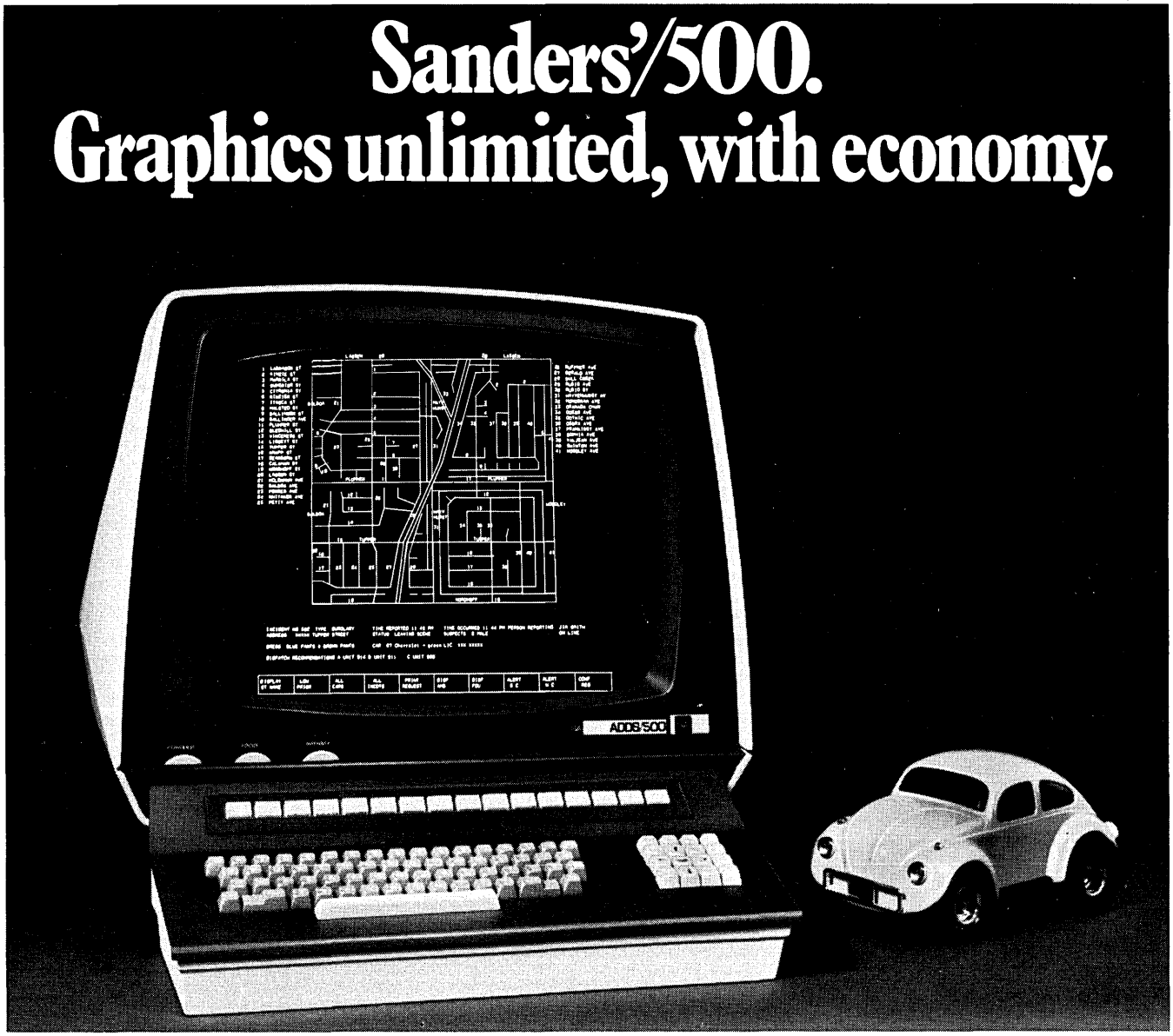
The result? MINIPLUS can save you more than enough to pay for its installation and operation. (MINIPLUS can even be installed on our premises to save you up to half on your total system overhead.)

MINIPLUS can be used as a self-contained message switch, front-end processor to large data processing systems, or a concentrator/deconcentrator for complex switching systems.

Details? Contact: Tony Annibell, RCA Global Communications, Inc., 60 Broad Street, New York, N.Y. 10004. Phone (212) 363-2270.

RCA Global Communications

Sanders'/500.
Graphics unlimited, with economy.



Sanders'/500 graphic display system offers state-of-the-art technology and performance you'd associate with high cost. Contrary to expectation, you can buy the basic system, complete with minicomputer, to suit your budget.

The Sanders'/500 graphics display is an interactive, computer-driven system that functions on-line or stand-alone. Its "building block" components, including up to four display terminals, can be configured off-the-shelf to achieve custom designs. And it interfaces with general-purpose digital computers.

Applications? Unlimited: LSI mask making, automated flight testing, simulation and training, pattern layout, land-use management and broad creation of computer-aided designs.

There's much more. Get the full story from Sanders Data Systems, Inc., Graphic Systems Marketing, Daniel Webster Highway-South, Nashua, N. H. 03060. Call (603) 885-5280.

Sanders...the intelligent answer

European Sales Offices: Sanders Data Systems, Ltd., 51/53 Brick Street, London, W1Y 7DU, England; Sanders Data Systems, GmbH, 6 Frankfurt am Niederrad, Rennbahnstrasse 72/74, West Germany.

hardware

Off-line

The clever use of a Varian 620 L minicomputer has enabled the Mother Lode Bank in the Sierra-Nevada foothill town of Placerville, Calif. to implement a number of sophisticated teleprocessing applications on a pair of second-generation Burroughs B-500 mainframes. The mini overcomes the B-500's limitation of communicating with its peripherals only in 28-character messages, requiring constant cpu interruption for handling message overhead. Messages are buffered by the 620 L until they are completely assembled, and then transmitted back and forth between crt terminals and the B-500. The 620 L/B-500 combination is used to support on-line account status terminals and interbranch message activity.

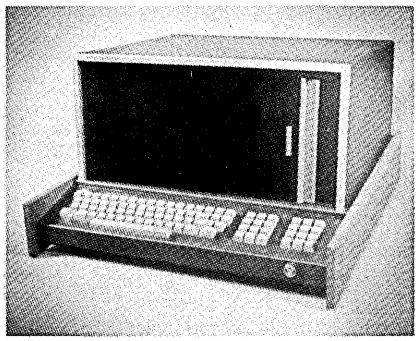
All remaining MRX 40 and 50 computer systems have been purchased from Memorex Corp. by American Used Computer Corp., who trucked the 20 cpu's and assorted peripherals 2,600 miles to the firm's Boston, Mass. headquarters. The computers, of which approximately 50 installations remain from Memorex's original base, are highly regarded by customers. American Used Computer is offering dramatic discounts on the equipment (roughly 80%), and one can pick up a 48K cpu, with roughly the power of a 370/135, for only $25K. Systems with a 700 lpm printer, tape drive, and card reader are only $39K. The catch is that there is no continuing software support for the systems, but Memorex will still do the hardware maintenance. It would seem that the systems are an unusual opportunity for installations capable of developing and maintaining their own software to obtain a good system at bargain basement prices. American Used Computer can be contacted at (617) 261-1100.

The Cummins-Allison Corp., Glenview, Ill., points out that not one in 50 U.S. corporations uses paper shredders to render potentially "interesting" corporate and personal information worthless. Since anti-pollution laws forbid burning such material, it's certain that tons of personal information is simply thrown away every day.

Crt Terminal

The 3780 combines a relatively old product (a crt terminal), a relatively new one (a floppy disc), and a very new one, the powerful Intel 8080 microprocessor introduced in our July issue (p. 146). The resulting system can be used as a key-to-floppy data entry system, as an intelligent terminal with local data storage, or as a complete standalone data processing system in some environments.

Up to 64K bytes of memory can be directly addressed by the cpu, which features stack architecture, binary and decimal arithmetic, 512 I/O addresses, etc. The 16-line by 80-character crt format displays both upper- and lower-



case characters. There is a complete set of editing function keys on the full ASCII keyboard. A plug is provided for directly attaching a printer or tty.

Though the 3780 (a bad number choice, we think, as it can be easily confused with IBM's RJE terminal) will be initially offered principally to software houses, it comes with a software complement of a floppy disc operating system, assembler language, and editor. Considering the marketing orientation, the $15K price of the system may not mean much. Four months delivery is quoted for the 3780. THE ISYS CORP., Columbia, Md.

FOR DATA CIRCLE 251 ON READER CARD

Arithmetic Processor

Performance of the Interdata 7/16 minicomputer can be dramatically increased with the addition of the High Speed Arithmetic Logic Unit, claim the developers. The unit is expressly designed to process hardware floating point, signed multiple/divide, list processing, and privileged instructions typically 50% faster than "stock"; but as a bonus, standard instruction times decrease by one-third or more, says the manufacturer. Register-to-register loads are executed on the 7/16 in 750 nsec when equipped with the HSALU, compared to 1.5 usec without it. The device runs in conjunction with the Real-Time Operating System (RTOS) monitor. The HSALU is priced at $4,900. Shipments have begun. INTERDATA, INC., Oceanport, N.J.

FOR DATA CIRCLE 255 ON READER CARD

370/155 Performance Boost

The Accelerated Storage Adapter (ASA) for IBM 370/155 systems is a modified storage adapter that can take advantage of faster memory, which can then be added to the system. Users with a large investment in IBM 3360 core boxes can also use the ASA to increase memory performance, but some program restructuring will be required to place often used routines in the new, faster memory. The Fabri-Tek memory's access time is more than 50% faster than the stock IBM unit, with the full cycle time approximately 40% faster. Luckily, benchmarks from the first ASA installation are in. Running IMS remote terminal jobs, average transaction times decreased by 20%, and the cpu active time decreased by 23.9%. On batch processing, the cpu active time with new memory decreased 15.8%. These figures were derived from the same job stream, which was run twice, before and after ASA installation. The ASA by itself costs $76K. Together with a megabyte of core, the combination is priced at approximately $225K or around $6K/month on a two-year lease, not including maintenance. FABRI-TEK INC., Minneapolis, Minn.

FOR DATA CIRCLE 254 ON READER CARD

Hand-Held Terminal Coupler

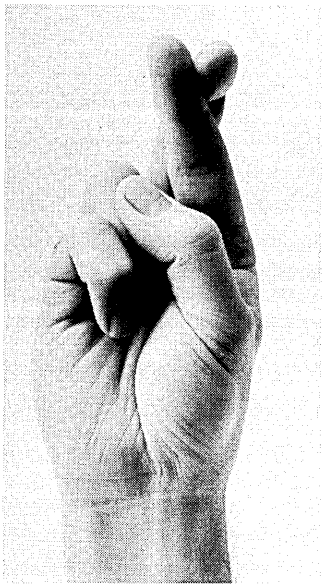
Termiflex Corp. has come out with an acoustic coupler/carrying case for the hand-held on-line terminal that was one of the attention getters at the recent National Computer Conference. The total weight of the package is only five pounds, including the terminal. The 103-type modem allows the HT terminal to communicate at 10, 15, or 30 cps from its 1,000 character scrolling memory. Information is entered into the HT through a full ASCII keyboard.

Congratulations: you didn't have a computer fire again last year.

You're one of the lucky ones.

Unfortunately too many companies last year did suffer major business interruptions due to fires in or near their computer rooms.

What's even more unfortunate is the fact that a lot of the damage, clean-up and downtime could have been avoided.



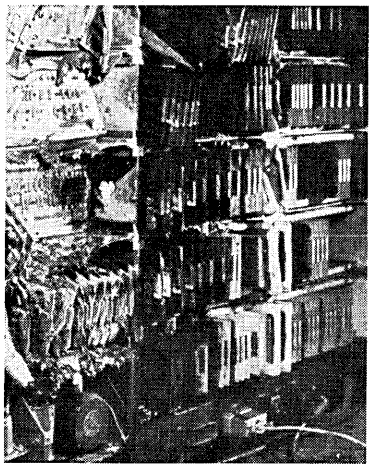
Days of Downtime vs. a Few Seconds of Halon

These companies could have been protected by a high speed Fenwal Halon Fire Suppression System.

The system that snuffs out fires dry. Just seconds after they start.

And lets you get right back to work. No wet mess to clean up.

With some systems you've got



to evacuate a room before the extinguishing agent can go to work.

But because Halon 1301 is harmless to people, it can start snuffing out the flames immediately. Which gives you the fastest jump on the fire.

With ordinary systems there's usually at least 48 hours of clean-up before your computer can go back on line.

With a Fenwal system there's virtually no clean-up, no shorted-out wires. No electrical shock hazards. No damage to tapes or records.

Fenwal's unique, modular system permits rapid agent discharge and easy extension of existing systems.

Why Push Your Luck?

The consequences of a computer fire are a lot more devastating than you might think. Despite all the precautions you take.

At Fenwal we've got documented proof that our Halon Fire Suppression Systems are *the* solution to the damage and downtime of computer room fires.

It's proof you can see for yourself. In a film called "The Fireaters".

We think it will convince you that you need more than luck to keep your computer in business.

To arrange a viewing, call us at (617) 881-2000. Or write to Fenwal Incorporated, Ashland, MA 01721. A Division of Walter Kidde & Co., Inc. Our local, service-oriented distributors are listed in the yellow pages under "Fire Protection".

FENWAL

Nobody in the world has more experience in fire and explosion suppression systems. FM Approved – UL Listed

hardware

The acoustic coupler/carrying case lists for $480. A power supply for the terminal is available for $160. The HT terminal is still priced at $1,570. TERMIFLEX CORP., Nashua, N.H.

FOR DATA CIRCLE 252 ON READER CARD

OCR System

The Alpha II optical character reading system is a natural extension of the manufacturer's Alpha system, offering twice the speed of the former at only a 30% increase in price. The "II" reads 120 characters per second, or 1200 words per minute, from automatically fed documents having dimensions ranging from 11 x 11 inches down to 4 x 6 inches. In addition, individual documents measuring 11 x 26 inches can be hand fed through the device.

Other features include: accuracy on the order of one error in 25,000 characters; self-programming using header sheets; editing systems; and up to four separate code conversion tables. The II recognizes OCR A and B fonts, Perry, IBM 199, Courier 12, Prestige Elite, and OCR B in any accented usage, such as in the French language.

The basic price of $42K includes one font, paper tape punch, and all supporting software. Options include a number of interfaces, including RS232, additional fonts, and full page buffering. COMPUSCAN INC., Teterboro, N.J.

FOR DATA CIRCLE 256 ON READER CARD

Floppy Disc

The SYKESdisk is an asynchronous and IBM-compatible flexible disc system. Dual sector buffers permit easy connection to unbuffered devices which transfer data asynchronously, as in data communications and data collection applications. Connected to a minicomputer, the flexible disc system can operate at any priority level, and doesn't require an I/O region in memory. Single and dual-drive systems are available complete with controller, minicomputer interfaces, and software. The unit price for the drive is $2,691 in quantities of 10. Deliveries are underway. SYKES DATATRONICS INC., Rochester, N.Y.

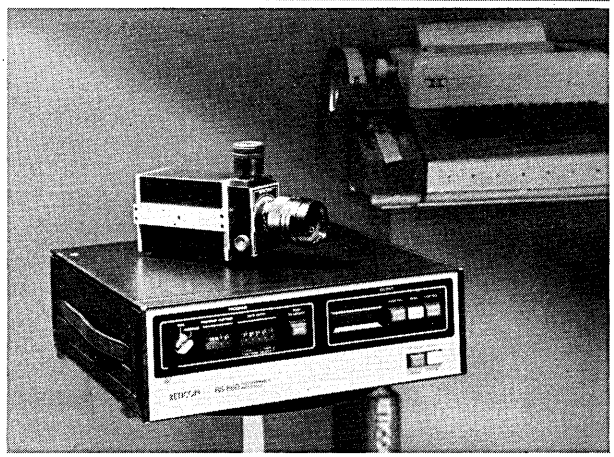
FOR DATA CIRCLE 258 ON READER CARD

Data Entry System

By combining a 3- to 8-station data entry system with a 2780-type IBM remote workstation (kind of a batch terminal, but without card support), CMC is making it rough for installations to continue justifying the use of separate devices in the preparation and processing of data—and even the punched card itself. With the 5780, data is keyed at the video stations under the close scrutiny of the programmable shared processor. It is then automatically organized, edited, balanced, and reformatted for disc storage. Data can then be transferred, at the supervisor's command, from disc to magnetic tape or to a communications line for transmission and processing to a host computer that understands bisynch line discipline. After processing, output can either be spooled to a tape unit on the 5780 for subsequent printing, or printed on the line printer directly.

The hardware consists of a new key-entry subsystem (the CMC 3), a bisynch controller for operation at speeds up to 4800 baud, a choice of either a 115- or 300-lpm printer, disc storage for 6,000 112-character records, and the 7- or 9-track tape drive. Standard systems also include supporting software. A 3-station set-up with the low-speed printer is priced at $36,800, or $965/month. The price goes to $44,800 for the higher-speed printer, or $1,145/month. Options include 19.2 kilobaud communications capability, more key stations, more disc storage capacity, data editing and reformatting software, and the tape unit.

product spotlight



Intelligent Camera

Microcomputers are starting to find their way into some finished systems, and the Smart Camera System is one of the most unusual applications seen so far. Its obvious applications are in the field of production control, but it would seem that there are a large number of other (unknown) applications that have just been waiting for a product like the Smart Camera. Artificial intelligence is one possibility.

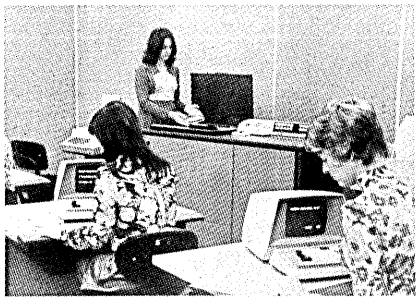
It's based on this manufacturer's solid-state image sensing camera. The Intel MCS 4 microcomputer is used to endow the camera with intelligence. In its simplest form, the system could be used to inspect parts passing through the camera's field of view and display their critical dimensions in engineering units (inches, mils, millimeters, etc.). More sophisticated systems would include segregating articles into ten different categories and providing relay closures to guide them to specific bins. The system can compare its preset tolerances and give pass/fail indications.

Inherent in the design of the solid-state camera is its ability to measure objects ranging in size from a fraction of an inch to several feet long, with less than one mil tolerance. Two cameras could be used to measure objects of almost any size.

Output from the controller is BCD, available in either serial or parallel format. The camera itself generates TTL-compatible output, so system designers can obtain just the camera portion of the system. The camera itself, with a 64-diode array, is priced at $1,200. Add the Intel microcomputer and the ability to categorize objects and the system price is approximately $5K, depending on specific requirements. A tty interface is priced between $500 and $600. RETICON CORP., Mountain View, Calif.

FOR DATA CIRCLE 250 ON READER CARD

hardware



Delivery of the 5780 will start by the end of the year. COMPUTER MACHINERY CORP., Marina del Rey, Calif.
FOR DATA CIRCLE 253 ON READER CARD

Flexible Disc Media

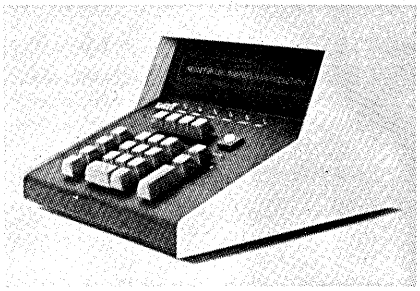
The Quadronix flexible disc is certified to be 100% error free and fully compatible with IBM 3740, 3540, and similar flexible disc drives. Each disc is packaged in a self-cleaning jacket, with each jacket and disc housed in a storage sleeve. Indexing is provided for convenient filing, and color-coded labels are also provided. Ten discs are packaged in a storage container, and individual disc mailers are also available. The media life is quoted as 3,500 hours, or one million revolutions per track. The price is $8 in quantities of 1 to 9, dropping to $7 for orders ranging from 100-499. WABASH TAPE CORP., Des Plaines, Ill.
FOR DATA CIRCLE 264 ON READER CARD

Microfilm Viewer

The Criterion Mini-Max Microform Viewer's name is bigger than the product. It's a portable unit that can be used to scan all microfiche and aperture cards ranging in reduction sizes from 18X to 48X, weighing in at only 13 oz. It operates on three double "A" batteries, and can be optionally equipped with a wall current/recharger accessory. It's priced at $48. The unit will be in production before the end of the year. CRITERION MICROGRAPHICS, INC., Chadds Ford, Pa.
FOR DATA CIRCLE 265 ON READER CARD

Data Entry Terminal

The TR-10 consists of a calculator-style 10-key keyboard, with room for 10 additional customer selectable option keys, alphanumeric or special function, at no increase to the basic $875 (in quantities of 50) price. The attractively packaged unit also features a 32-character buffered gas discharge display, with a second display line optional. The unit operates in switch-selectable modes of on-line and off-line, half- and full duplex, at speeds from 110 to 1200 baud. The standard transmission protocol is RS232 and tty for the ASCII characters, with EBCDIC and



even Correspondence codes optionally available. Other options include formatting and interfaces to cassettes, printers, floppy discs, or other similar devices. Delivery is quoted as 30 days, depending on specific functions required. The TR-10 is also available without the gas discharge display feature. VMF INDUSTRIES, INC., Bay Shore, N.Y.
FOR DATA CIRCLE 257 ON READER CARD

Vistar/GT

Lowest price per character!

Infoton

The high quality Infoton Vistar/GT has the lowest price per character of any silent interactive display terminal available from a major independent manufacturer!

Every one of its features is user-oriented... switchable data rate to 9,600 BTS...easy to read 9″ x 7″ nonglare screen... 80 x 24 screen capacity ...optional rack-mount version...TTYcompatible... current loop and RS232C interfaces...full and half duplex...local and on-line operation.

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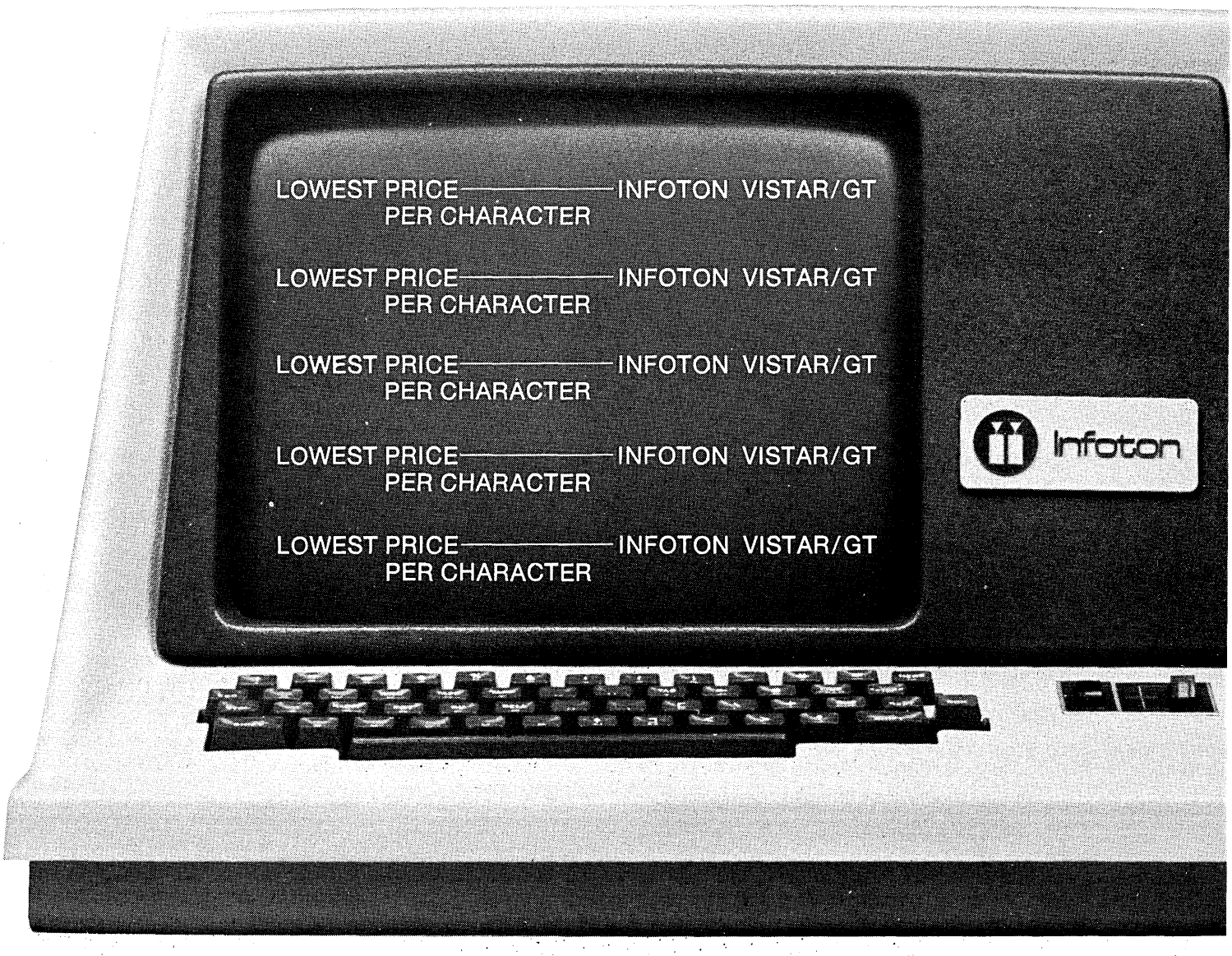
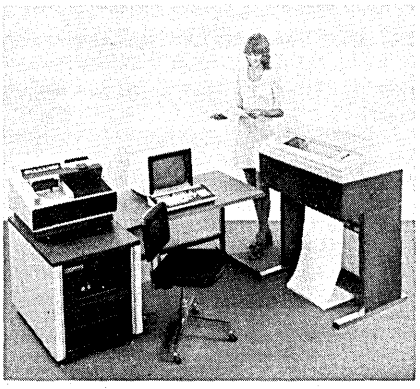


hardware

Remote Batch Terminal

Four-Phase's remote batch terminal typifies an emerging new breed of products that are more flexible in operation and easier to use. At the touch of a few keys, the operator can make the system function as an IBM 2780, 3780, or HASP remote workstation. Disc



spooling, a standard on the system, makes it possible to input jobs from the 300 or 600 cpm card reader to disc, output another job from the disc to the 300 to 1800 lpm printer, and receive or transmit a third job over a 9600 baud line, all simultaneously. A 2.5 megabyte disc is used to support the spooling function. The manufacturer's key-entry system can optionally be integrated into the terminal operation—much like CMC's offering, featured elsewhere in these pages.

The same "engine" is used in the remote batch system as in the key-entry systems, which means that COBOL, RPG, sort, assembler, and a disc operating system are available without charge for the terminal, as are data editing and utility programs. A system with the low-speed peripherals rents for $1,140/month on a one-year lease. FOUR-PHASE SYSTEMS, INC., Cupertino, Calif.

FOR DATA CIRCLE 259 ON READER CARD

Datapoint Peripherals

The popular Datapoint line of intelligent terminals can now be outfitted with three new peripheral subsystems to enhance its processing capabilities.

A floppy disc system is offered the 1100, 2200, and 5500 model users that generates and reads cassettes interchangeable with IBM's 3741 device. One-quarter million characters are then on-line to the Datapoint terminal, accessible in an average latency time of

83 msec. The drive architecture features four 256-character buffers corresponding to sectors on the disc, giving a 1024-character addressable buffer, which should aid programming considerations. The diskette drive leases for $110/month, with maintenance, on a two-year contract.

FOR DATA CIRCLE 260 ON READER CARD

Model 2200 users are offered a 2314-type disc storage system with 20 megabyte capacity for management of very large files. The controller contains 16 sector buffers, each sector randomly addressable by the software. Two discs can be attached to each 2200 processor. The average access time is 35 msec, and the transfer rate is right

around IBM's old spec of 312KB/sec. One disc/controller combination (with all the controls necessary to append a second disc) rents for $672/month, including maintenance, on a two-year lease.

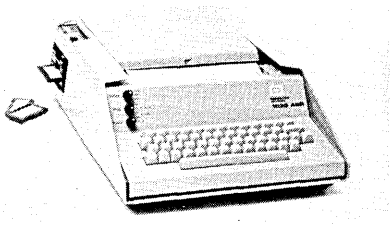
FOR DATA CIRCLE 261 ON READER CARD

Bulk storage problems are eased on 2200 and 5500 terminal models with the addition of a 1600-bpi tape subsystem. The buffered (2K) unit is written and read asynchronously. Housed in an office-style console, the tape unit rents for $371/month on a two-year contract, including maintenance. DATAPOINT CORP., San Antonio, Texas.

FOR DATA CIRCLE 262 ON READER CARD

ASR Terminal

An automatic-send-receive version of this manufacturer's 1030 Teleterm has been introduced. A small cassette drive has been built into the side of the 1030 that now enables the terminal to perform most tty ASR functions. A separate cartridge is used for reading and writing at switch-selectable speeds of 10, 15, or 30 cps. Storage capacity per cartridge is 24,000 characters. "Fast" forward/reverse commands are translated into 3 ips tape movement. The terminal is priced at $3,900, with deliveries slated to begin before the end of the year. COMPUTER DEVICES INC., Burlington, Mass.



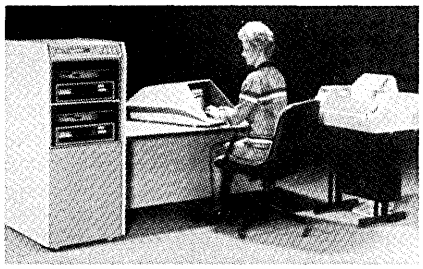
FOR DATA CIRCLE 263 ON READER CARD

Small Business System

The Datasystem 340 is being marketed by a group of ex-IBM people operating in the shadow of IBM's Data Processing Div. headquarters. It isn't IBM gear they're using to oust S/3 installations, however, it's Digital Equipment-based systems. The firm has six installations so far, and counts Union Carbide, Pan Am, and the Avis car rental business among its customers—though not necessarily in small business systems. The firm also does work on 360 and 370 software.

The DEC DataSystem 340 is built around a PDP-8/e minicomputer and Digital's COS-300 commercial operating system. Corstar's main function is to solve customer application problems with its 22-man programming staff. The firm has a number of standardized software programs that are found in any accounting area, but has also coded such unusual applications as scheduling a fleet of ocean-going cranes (the mechanical sort).

The basic system, priced at only $38K, includes the PDP-8, 16K of memory, one crt terminal (up to eight can be attached), a high-speed serial printer, and 12.8 megabytes of disc capacity shared among four drives. There is considerable room for expansion: up to 64K of memory, card readers, tape drives, etc.



For the time being, Corstar will con-

hardware

centrate on the northeast corner of the country, but there are plans to expand nationwide. Deliveries are on the order of 3-4 months after purchase. CORSTAR BUSINESS COMPUTING CO., INC., White Plains, N.Y.

FOR DATA CIRCLE 266 ON READER CARD

DEC Peripherals

Two new mass-storage peripherals are available for PDP-11s, one a disc, the other a tape drive.

The RJP04 disc system consists of a controller and one 44-megaword disc. Two controllers can be used to share 28 msec access to up to eight drives. The transfer rate is a very quick 2.5 usec per word. The starting price for the RJP04 is $32K.

FOR DATA CIRCLE 267 ON READER CARD

The TU16 tape subsystem reads and writes "industry compatible" 1600-bpi tape at 75 ips, yielding a transfer rate of 72,000 characters per second. That's twice the speed of Digital's previous high-speed tape drive. A self-clocking feature has been designed into the TU16 so that recording does not depend on precise tape alignment, and a watchdog timer allows the subsystem to recover from bad tape areas. The TU16 is priced at $8,500. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 268 ON READER CARD

Small-Scale Systems

Singer has restructured the packaging of its unique operating-system-less line of small business systems into four field-upgradable models that should be

even easier to sell. (Singer claims an impressive 2,000 System Tens installed since late 1970.) All models use the same System Ten 6-bit processor with a 3.3 usec cycle time.

The 110-1 and 110-3 models feature 20,000 characters of memory and one I/O channel for connecting 2 four-million-character disc packs. The 110-1 uses a workstation for interactive communication with the processor and production of output on a serial printer at up to 25 cps. This model is priced at

The cold facts about Microdata.

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Microdata recently introduced a new virtual-memory computer system called REALITY™ – a low-cost distributive data base management system for real-time business applications.

We started by developing powerful new multi-programming system software and then designed the system architecture to support it. The ENGLISH™ language software makes REALITY so easy to use, anybody who speaks ordinary English can operate it. The system is also fully compatible with RPG II.

Reality in more ways than one.

We believe having a good grasp on reality means knowing who you are, what you've got, and where you're going with it.

We've spent years telling people that a microprogrammable minicomputer will outperform any expensive general purpose machine on any given job. We've consistently supported microprogramming. And now it's paying off.

We've got over 6,000 minicomputers in the field, and we're breaking into diverse new markets every day. Our horizontal marketing base is expanding at an unprecedented rate, and the vertical integration of our manufacturing is virtually complete. In addition to our OEM minicomputers, we're now building a new series of miniperipherals, a new high-speed microprocessor, the complete REALITY system, and our own printed circuit boards, core plane memories, and power supplies.

Strength in depth.

Recent developments have accelerated our evolution. We're doubling our plant size, establishing a coast-to-coast dealer organization for REALITY, setting up a nationwide network of sales representatives for peripheral products, strengthening our direct sales force, expanding our national customer service force, increasing what is already the world's most experienced staff of microprogramming experts, and adding several key executives to our corporate management.

You still don't know enough.

We know who we are, what we've got, and where we're going with it. We always have. If we look new to you now, perhaps it's because you didn't know enough about us in the first place. We'll be happy to tell you anything else you'd like to know.

If you're looking for a supplier of minicomputers, peripherals or computer systems, see the company that offers more than meets the eye.

See Microdata.

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hardware

$25K. The 110-3 differs by having a crt terminal instead of the workstation, and is priced at $34,800.

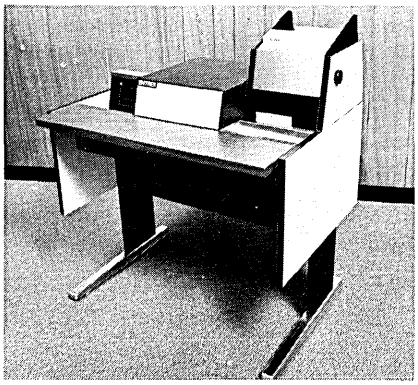
The 110-4 features 30,000 characters of storage, two I/O channels, and the disc drive. Input/output peripherals consist of the crt from the 110-3 and the model 52 100-lpm serial printer. This configuration, priced at $43,-300, can be expanded with 10,000 more memory words, two more I/O channels, two more crts, and a 200-lpm printer.

The 110-5 sells for $66,600 and includes two crt's, 40,000 words of memory, and 20 million characters of disc storage space. Systems software is bundled on the systems, with specific application packages priced between $3-8K. THE SINGER COMPANY, Business Machines Div., San Leandro, Calif.

FOR DATA CIRCLE 269 ON READER CARD

Optical Scanner

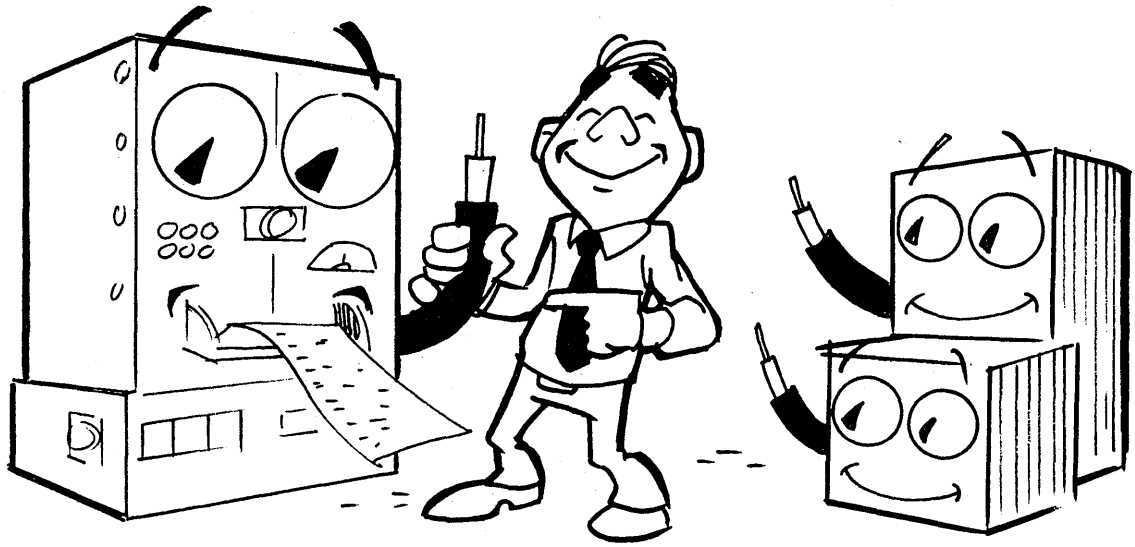
If the model 720 optical document scanner can live up to the claims being made for it by its manufacturer, some kind of breakthrough has been made in this type of device. The 720 *promises*



3,200 character per minute performance with a reject rate of less than one in 10,000 and a substitution rate of less than one in 50,000—all for $28,320, or $680/month under a three-year lease. The catch, if there is one, is that it attaches only to the firm's model 480 key-to-disc system.

Documents ranging in size from 3½ x 3½ inches up to 9 x 9 inches are read at the rate of 10 ips. A maximum of 64 characters can be read from one document. For applications such as government tax billing, business order processing, subscription fulfillment, and processing of manufacturing movement tickets, the performance is equated with that of 20 key entry operators. The 720 reads OCR A, size 1, the numbers 0-9, and vertical bar. IBM

Is your system wiring a twisted bag of worms ?



THERE'S A SINGLE LINE SYSTEM THAT DOES MORE AND CAN COST YOU LESS !

Growing systems require extensive communications wiring with the increasing numbers of processors, sensors, controllers, keyboards and displays. Multiple twisted pairs merely compound the problem. And, each I/0 device you add just increases the growing bag of worms.

At ISI we have a single, wideband coaxial cable system that handles hundreds of data communications devices, plus voice communications and several channels of closed circuit TV. That's just a bit more than you'll get with a twisted pair. And, it costs less to install.

We offer — on a single cable — frequency division multiplexing, 1000 full duplex channels and time division multiplexing within channels. Maybe we can help you get the worms out of your system as well as the wiring.

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MAN-MACHINE SYSTEMS

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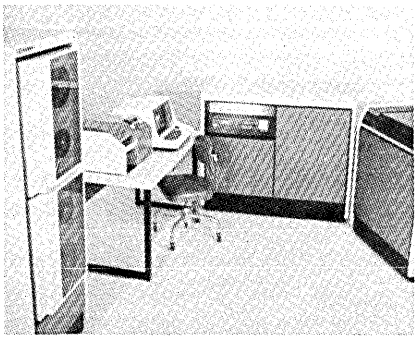
hardware

1428, OCR B, and E 13 B fonts are planned for next year. ENTREX, INC., Burlington, Mass.
FOR DATA CIRCLE 270 ON READER CARD

Remote Commo Processor

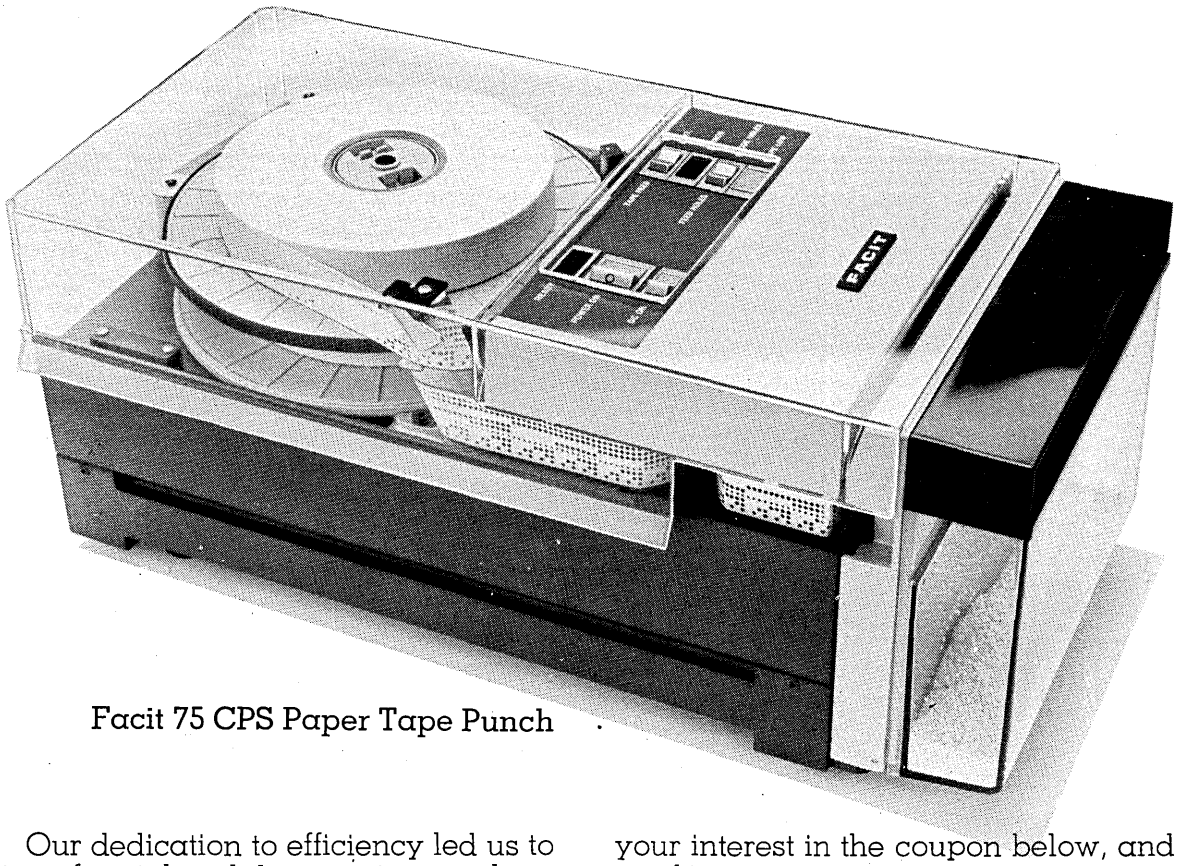
Calling the COPE 1600 a remote communications processor instead of a remote batch terminal seems justified in this case, despite the risk of adding a new buzzword to our already overcrowded lexicon. The 1600 consists of a 16-64K 16-bit communications-oriented minicomputer with 104 instructions to support its own multi-tasking operating system called COS (Communications Operating System). This allows the system to do such unusual things as talking to two different computer systems at the same time by running two emulation programs simultaneously. Up to 16 slow-speed (up to 9600 baud) asynchronous lines gain access to memory via an I/O multiplexor, while up to four high-speed synchronous lines (as fast as 50 kilobaud) have direct-memory-access privileges. The list of emulators and line protocols includes IBM 2780/3780, Univac 1004, CDC User 200, and HASP/multileaving, and support for the Univac 9300 is planned in mid-1975. Bisynchronous



and SDLC lines are serviced.

Peripherals available for the COPE 1600 include card readers ranging from 150 to 1200 cpm capabilities; a 200-cpm punch; line printers ranging in speed from 300 to 1500 lpm; up to 29 megabytes of disc storage to support spooling; 7- or 9-track tape drives, etc. A 1600 with a 300-cpm reader, 300-lpm printer, console, and 9600-baud bisynchronous communications capability will rent for approximately $1,400/month, including maintenance, on a one-year contract. First deliveries are slated for next February. HARRIS CORP., Data Communications Div., Dallas, Texas.
FOR DATA CIRCLE 271 ON READER CARD □

Our dedication to efficiency led us to some of the most advanced peripheral data equipment in the world.



Facit 75 CPS Paper Tape Punch

Our dedication to efficiency led us to a line of peripheral data equipment that can do just about anything you could ask. Complete products or sub-units featuring top performance and long service with a minimum of maintenance requirements.

In fact, we honestly feel that no other OEM manufacturer offers a better performance to price ratio.

Our dedication to efficiency led us to a line of products that are expanding swiftly from alphanumerical page printers, strip printers and 75 CPS and 150 CPS tape punches to punch mechanisms, readers, input/output typewriters and numeric printing units.

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Before too long you could have some very dedicated people at Facit, and a very efficient product, working for you.

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I'd like to dedicate myself to efficiency. Please send me all the information you have on Facit Peripheral Data Equipment.

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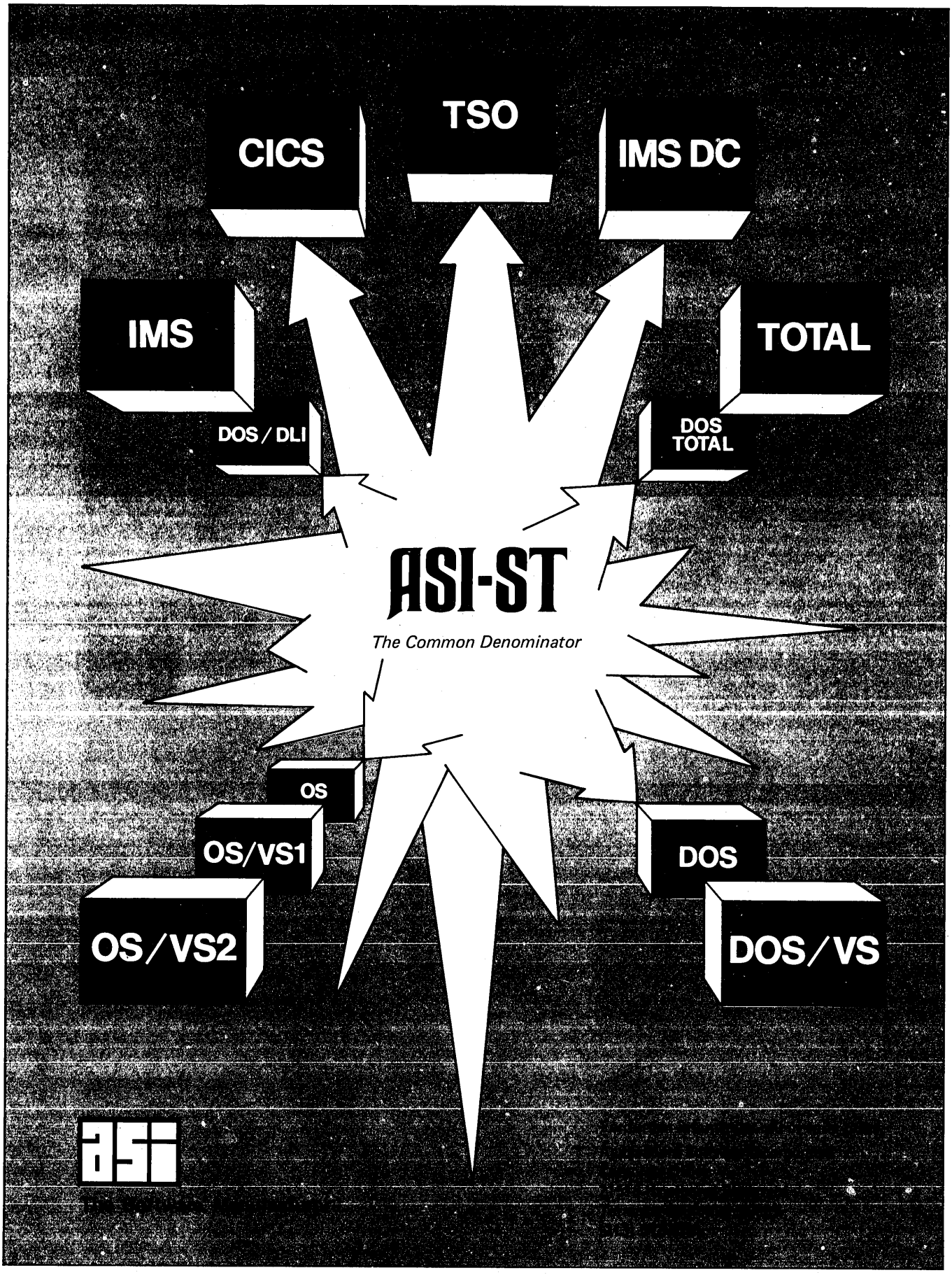
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IMS
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OS/VS2
DOS/VS
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software & services

Updates

Since 1971, ALCOA has provided a valuable service to builders and users of FORTRAN compilers by supplying them (through Purdue University) with programs to test how closely particular compilers conform to the ANSI x3.9-1966 standard. ALCOA doubts that it will be in a position to continue supplying validation tests for the new FORTRAN standard that ANSI is working on. ALCOA thinks that ANSI should henceforth supply validation tests with any new standard it develops. If you agree--and if the ALCOA tests have benefited you--you are urged to write Mr. Frank Engle, Jr., Chairman of the ANSI FORTRAN Committee, 179 Lewis Rd., Belmont, Mass. 02178.

Users' attitudes have changed to the point that they now consider what is available on the software market before plunging into development of new systems, reported Werner Frank, executive vice president of Informatics, in a talk at IFIP 74 in August. An international panel of software heavyweights, of which Frank was a member, was exploring the impact on the user community of both systems and applications software.

Carnegie-Mellon University, the birthplace of many unusual computer applications, is now working on a PDP-11 system that might prove to be a real boon to architectural engineers and designers. The heart of the system is a new language that allows designers to easily try new design plans, such as different size support beams, and obtain an analysis of the impact of the change on the structure, even to the point of ascertaining whether the proposed change conforms to building codes.

While not exactly jumping into the software package market with both feet, two Bell Labs researchers have nevertheless developed a computer program to help proofreaders catch typographical errors before they show up in print. DATAMATION pledges to follow this development to see whether it would make it possible for us to bring you a magazine with even fewer mistrakes in it.

RPG Aid

EXIT-HELPME is a small computer program offered to IBM 360/370 users of the RPG programming language, that prevents the computer from prematurely terminating a run due to invalid information being given to it (data checks) or unresolvable program conditions (program checks). Instead, HELPME causes execution to be temporarily suspended, and requests the machine operator to decide which of various alternative actions will resolve the exceptional condition. The package can be used either as an operations aid, with instructions for what action to take if a program bombs in the middle of the night, or as a rationalization for not building extensive restart procedures into the source program. The EXIT-HELPME command is a macro inserted into the program stream that transfers control to the computer console.

Fourteen program interrupts are isolated, including collating sequence, undefined record type, record sequence, no record found, halt indicator condition, ISAM overflow, duplicate ISAM, and the seven program checks. Options of the computer operator include bypassing the errant data, accepting it, altering the computer's memory, forcing normal end of job, or terminating the problem job. The program sells for $250 and comes with a 90-day warranty. DATA UNIVERSAL, Teaneck, N.J.

FOR DATA CIRCLE 281 ON READER CARD

PDP-11 Operating System

It certainly is a buyer's market for replacing Digital Equipment's standard operating systems, with all the alternatives introduced recently. This one's principal advantage is that it is very easy to get it to support foreign devices: all that is necessary is to write a software driver to get it running.

TAG-11 is offered as a replacement for DEC's DOS monitor. Though it is not a tasking system like RSX-11D, it is capable of handling real-time applications, too, say its developers. The heart of TAG-11 is an executive program consisting of a keyboard monitor and one overlay. These are brought into memory only when needed. The resident executive contains all I/O logic, system tables, and the nucleus of the error handling and file open/close routines. The overlay from the system device handles the bulk of device errors, command string decoding, and file opening/closing. TAG-11 requires a minimum of 12K words to support batch processing.

Additional features of TAG-11 include the ability to initiate program loading under control of an abbreviated core-resident directory rather than a time-consuming overlay and directory search. Additional speed and direct loading capability is provided by the ability to store files in core-image form. Six other programs are part of the TAG-11 package: a text editor, a

software spotlight

Machine Utilization

The console operators of OS- or VS-equipped IBM systems are hamstrung in their ability to efficiently manage system performance by a lack of visibility into exactly what the system is doing. There are facilities for displaying on the system crt what jobs are active in the system, but there is no information readily available as to how much of the total system's resources are being used.

The LOOK command eases this problem. The operator can look at cpu activity and find out how much of the cpu is being utilized by a particular job step, whether the job is waiting for an I/O request to be fulfilled, etc. Similarly, "LOOKing" at I/O activity reveals which files on which packs on which channels are in use, how busy each file is, and even (if desired) the average disc arm movement on the pack, given in cylinders. Ideally, the operator would cooperate with the system scheduler and determine whether the priorities of some of the jobs should be changed to force them through the system quicker, whether a certain job should be cancelled to free up the system, whether a reallocation of disc packs should be undertaken, etc. The LOOK command is priced at $800 and is supplied in object deck form. PROGRESSIVE SOFTWARE, New York, N.Y.

FOR DATA CIRCLE 280 ON READER CARD

software & services

macro assembler, a linkage editor, an on-line debugging package, a peripheral interchange program (for file maintenance), and a device packing routine (PACK) which dynamically manages storage allocation.

TAG-11 is priced at $900, including all supporting documentation. A FORTRAN compiler for use under the system is priced at $600. THE APPLICATIONS GROUP, Davis, Calif.

FOR DATA CIRCLE 283 ON READER CARD

Remote File Inquiry

A remote file inquiry (RFI) system developed to support operations at the Kennedy Spacecraft Center is being made available through the COSMIC public domain software clearinghouse. RFI is set up to handle as many as 99 tty-type terminals in its present form, operating asynchronously at 110 baud. A 360 model 40, 120K bytes of memory, the OS/MFT operating system, two 2314-type discs, and at least one tape drive is the minimum configuration.

An English-like free form query language is used to maintain and interrogate user-definable data files. Each inquiry sentence is composed of five functional parts: a function name or file ID; an optional title phrase used to provide report titles; the verb phrase; the object of the qualifier phrase; and an optional sort phrase giving the capability of sorting the selected data in ascending or descending order. There are commands for printing out records that meet certain selection criteria, totaling numeric fields, adding and deleting records, etc. A five position code, easily changed by the terminal operator, is used to control access to each file. Separate codes can be provided for reading and updating, if required. RFI, reference number KSC-10837, is priced at $1,250. COSMIC, Athens, Ga.

FOR DATA CIRCLE 282 ON READER CARD

Inventory Management

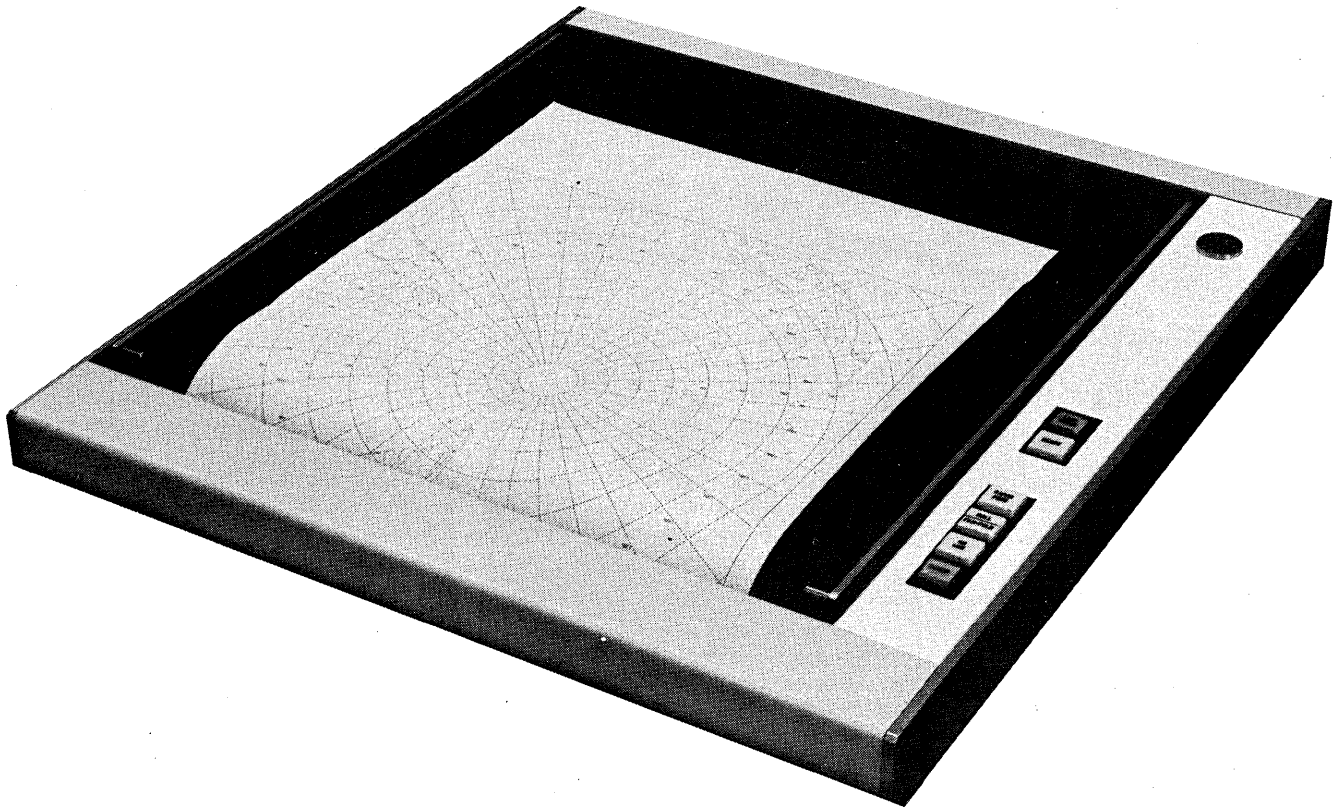
SIMPLE is an inventory management program originally written for the steel distribution industry, but it's claimed that the package can be modified to serve almost any inventory application. SIMPLE (Systems Information for Managing Process & LIFO Evaluation) is also claimed to be a money saver due to an accounting orientation that manages inventory on a last-in, first-out (LIFO) basis that has numerous tax advantages.

SIMPLE runs on a 24K IBM System/3 It'll run on a smaller cpu, but it's not recommended, as overlays will slow processing considerably. Approximately 320 tracks of 5444 disc storage are required to hold master files for product description, customer information (for up to 3,200 customers), the inventory master, with provision for 984 unique product types and specific identity numbers, and working storage.

The first report generated by the system is an invoice proof. At this time all discrepancies are noted by error messages such as "balance-on-hand too low" or "item not found," etc. This is to insure that the system doesn't produce a meaningless run, by allowing time for clerks to check into the problems that have been flagged. Subsequent reports include recap totals per month for each type of sale, i.e., by customer, project, or salesman; a year-to-date total; and a recapitulation report. These reports include items such as total sales, total cost, resulting total

INTRODUCING STATOS BI-SCAN.*

It blows other hard copy right off the map.



The new Bi-Scan™ writing head in Statos 33 family of printer/plotters gives you sharper hard copy output than any standard electrostatic computer peripheral in the business.

In fact, a 250% improvement in contrast. It does this with a simple but unique staggered-styli design. Each stylus is 60% larger in diameter so that the dots actually touch to produce extremely clear printing or plotting.

But Bi-Scan is just one of the exclusive features that makes the Statos 33 family of printer/plotters the best cost/performance buy around.

Other features you'll like include automatic control electronics to simplify interfacing, make programming easy, and take a big load off the computer. A dynamic toning system to guarantee even toning at all operating speeds. And a choice of four widths: 8-1/2 inch, 11 inch, 15 inch, and the super wide 22 inch (ideal for weather maps, seismic charts, or D-size drawings).

Whatever your requirements–alphanumerics in any language (even Chinese), graphics, or graphics interspersed with words–there's a Statos printer/plotter for you. And they're priced right.

For details on how Statos 33 units relate to your application, call Dave Sloan (415) 493-4000. Or write Varian Data Machines, 611 Hansen Way, Palo Alto, CA 94303.

varian data machines

*Bi-Scan Patent Pending

software & services

profit, total tonnage, average selling price, average cost, average profit, and gross profit percentage.

The system is offered in three plans. As is, without programming or systems support, but with source decks, listings, object decks compiled to specification, and documentation of input, it costs $20K. With 200 hours of systems and/or programming support, it costs $25K. For modifications above the 200 hour level, work is charged at $26/hour plus materials, not to exceed an additional 200 hours of modifications. DELTA STEEL, INC., Houston, Texas.

FOR DATA CIRCLE 287 ON READER CARD

Assembler Debugger

SYMBUG-A is a conversational symbolic debugger that operates as an execution time support package under IBM's Conversational Monitor System and VM/370 operating system. Using English-like commands, the programmer can examine and change data, and even patch the program on either the symbolic or source statement level. The package can be used under any of three conditions: when a program interrupt occurs; when a pre-established breakpoint or execution interruption is encountered; or when an attention/break interrupt is forced by the user. At that time the user can perform a number of different operations, including execute one or more assembled instructions; set, erase, and list program breakpoints; etc. SYMBUG-A is priced at $7,500 and can be installed in less than one day. Lease and rental plans are also available. STANDARD DATA CORP., New York, N.Y.

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Graphic Terminal Support

A package of communication protocols required to support Tektronix 4010 and 4012 on Hewlett-Packard BASIC/2000F time-sharing computer systems is now available from H-P. The 20311A package is a combination of two BASIC language subroutines. The primary routine provides complete control of all terminal functions and adds graphic presentation facilities. A higher level plotting package uses the primary subroutines to draw and label graphs, and scale and plot data using simple commands that don't require the user to have detailed knowledge of terminal protocol. The graphics support software is priced at $500. H-P does not supply the Tektronix terminal. HEWLETT-PACKARD CO., Palo Alto, Calif.

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Microprocessor Programming

An assembler and a simulator for Intel's 8080, 8008, and 4004 series of microprocessors have been developed to ease programming considerations on these devices. Written in FORTRAN IV, the programs can be readily set up to run on virtually any computer supporting FORTRAN.

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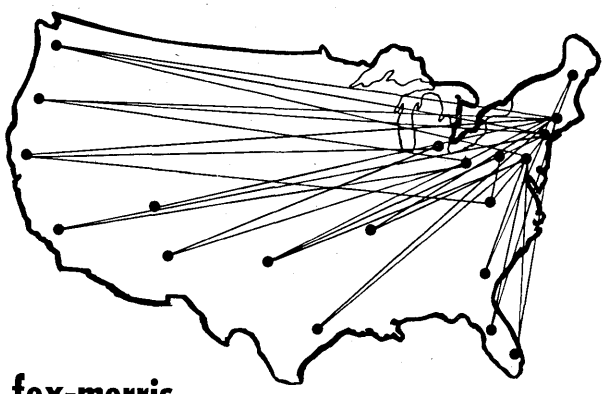

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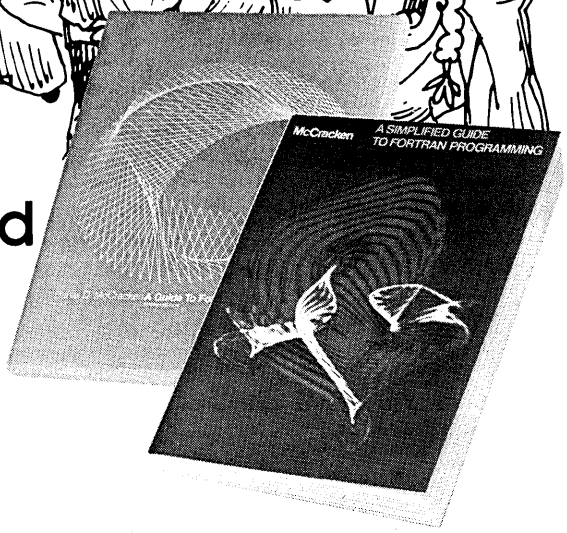

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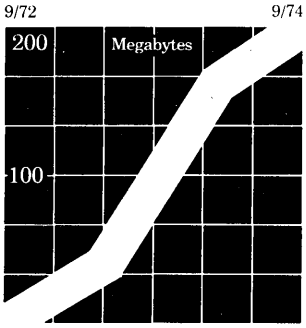

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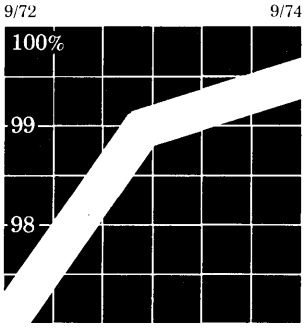

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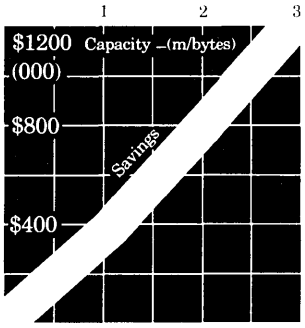

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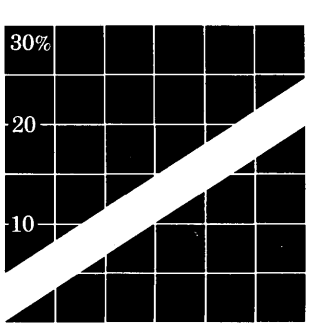

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PARALLEL PROGRAMMING

Is it a waste of scarce programming resources to continue our historic practice of coding source programs only once, using a single programmer? Computer people learned long ago that it is often cheaper and more reliable to duplicate expensive computer hardware, than it would be to try to get the same result from single hardware units. Computer people are beginning to realize that, in designing input codes and file structure, it usually gives us high efficiency and reliability at low cost if we design useful redundancy into the data, instead of trying to get rid of all redundancy. Almost all of nature and science demonstrates that systematic redundancy is the key to efficiency. Is it then possible that program coding methodology could make use of some systematic redundancy concept? I was surprised to find that the answer apparently is "Yes"!

Dual coding begins with the simple basic idea that a program or a module should be produced in two independent source code versions. The versions may be produced by two independent programmers, by independent teams, or by the same programmer working in different languages. The programmers may choose independent designs (one structured, one top-down, for example), the compilers and machines chosen may be different, as may the initial test data. During testing of the final version, however, identical inputs should result in identical outputs. The program specification (which should not be a detailed flowchart) should be common to both modules, but there may be some room for making dual program specifications. The major objective of any difference introduced should be to increase the probability of detecting errors, problems, or inefficiencies through measuring differences of output, space, timing, or production costs.

Obviously, errors introduced simultaneously to both projects (such as errors in initial program specification) cannot be caught by this method, unless one of the coders reacts and codes the "correct" logic, based on common sense or on his understanding of the problem. One major hope or assumption is that many errors are of "random" spacing and nature. It is not intended that this concept alone will cure all

programming problems. No technique will do that. Certainly this technique needs to be combined with top-down, structured team programming, using well-designed redundant data structures as an aid to detecting and correcting operational errors.

When we recognize that the source coding effort today is only 5% to 20% of any programming project, then doubling this effort has a small maximum worst-case penalty. Indeed, we know from the experiments of Weinberg and others that there are great productivity differences between programmers (on the order of 26 to 1), and that motivation has a substantial effect on programmer performance. Obviously then, two parallel programmers will be highly motivated, like two 100-meter sprinters, to perform at their best. In any case we will soon learn who the most productive programmers *really* are, and this alone may justify dual coding. If both teams of programmers are twice as effective (which I consider realistic, even conservative), the cost of dual code is zero!

Next we should consider that one of the classic programming problems is the endless testing (30,000 years in simple cases) necessary in order to test all theoretically possible program logic and data combinations. This is what makes high-reliability software so expensive. If we could find some way to detect subtle errors as they occurred, and stop the computer before any damage was done, then we wouldn't have to test so many wasteful cases. Dual code run in pseudo parallel (run one module and then the dual copy and compare outputs) offers a way of simplifying testing and retesting for side effects after a maintenance change. The use of parallelism can be gradually reduced to a sampling level when confidence is gained through successful use for extended periods. We can put programs and changes on the air faster and with less total machine time this way (otherwise we won't do it). If one module should blow up, the other can take over until the module is repaired. The switchover may be automatic or manual.

The possibilities which systematic use of this technique offers us for testing people, programmer organization methods, programming techniques, etc., is very promising. We have never had such a simple measuring tool in this business.

Space doesn't permit a full listing of the practical experiences with this technique, but let me mention them briefly. Univac used it successfully for a 20,000-statement (times two) military operating system. The Univ. of Warsaw used it for scientific problems (even triple coding, rather than running expensive test cases). NASA and Vandenburg are reported to use it for life-critical systems, and Finnish Silja Lines Bookia Real-Time System used it to achieve immediate repair of a critical real-time module while the failing module took two weeks to repair. IBM France (M. Rault) reports using it for engineering design problems (APL-plus, then a FORTRAN version) and compares it to the electronic test concept of having a "reference" machine. Lastly, Dr. E. Dijkstra reported to me that he used it (with Zwanefeld) when writing the world's first ALGOL compiler (they found 20 differences between two versions) and later for the now famous "THE" Operating System (using two teams of two people). Dijkstra said that he considered it the only natural way to program, and also remarked (with irony?), "Doesn't everybody program that way?" Do *you* still practice "Cyclopic Programming"?

—Tom Gilb

Mr. Gilb is a respected, internationally known data processing consultant working in Norway. He has authored many books; the most recent, "Reliable EDP Applications Design," was reviewed in the August issue.

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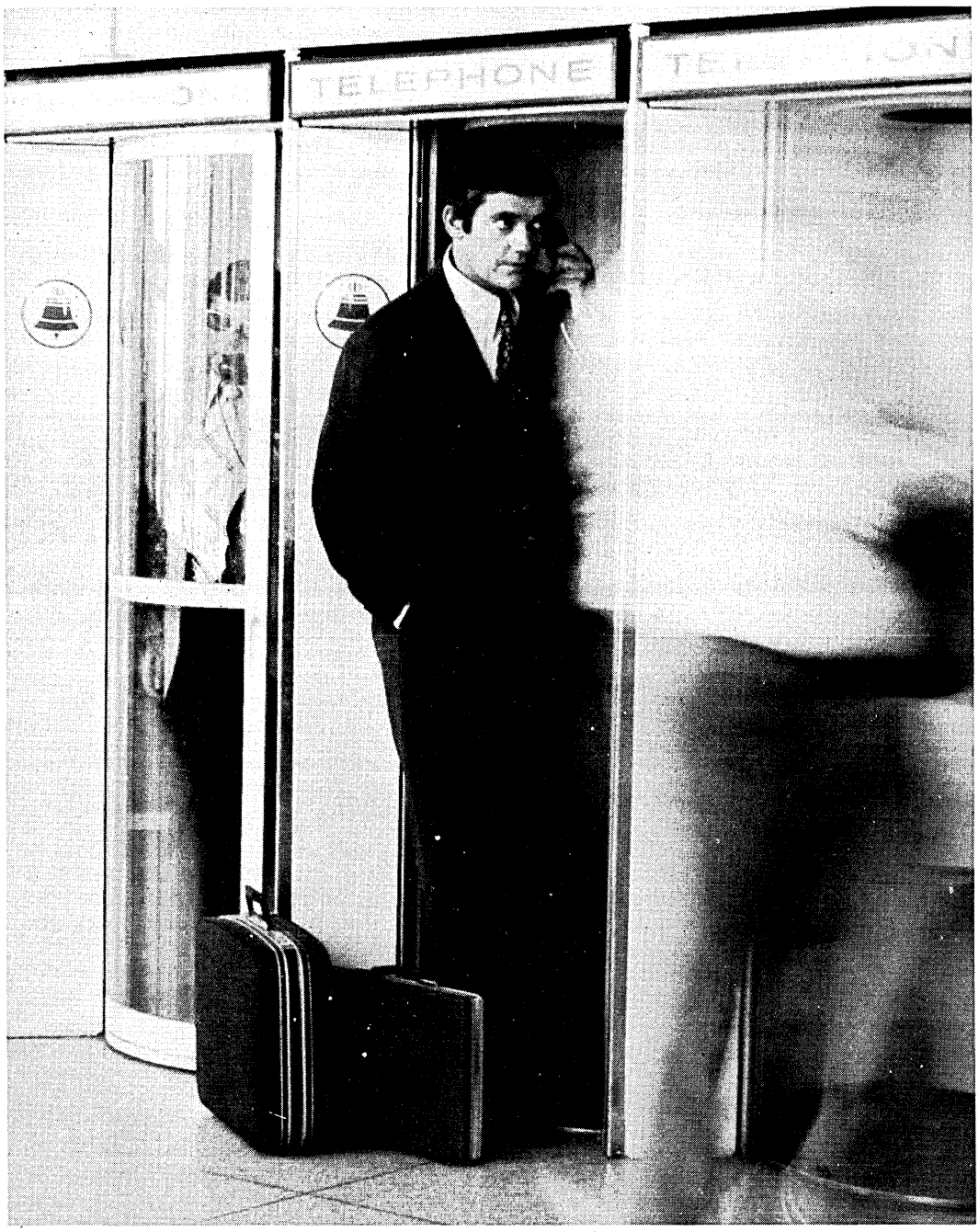

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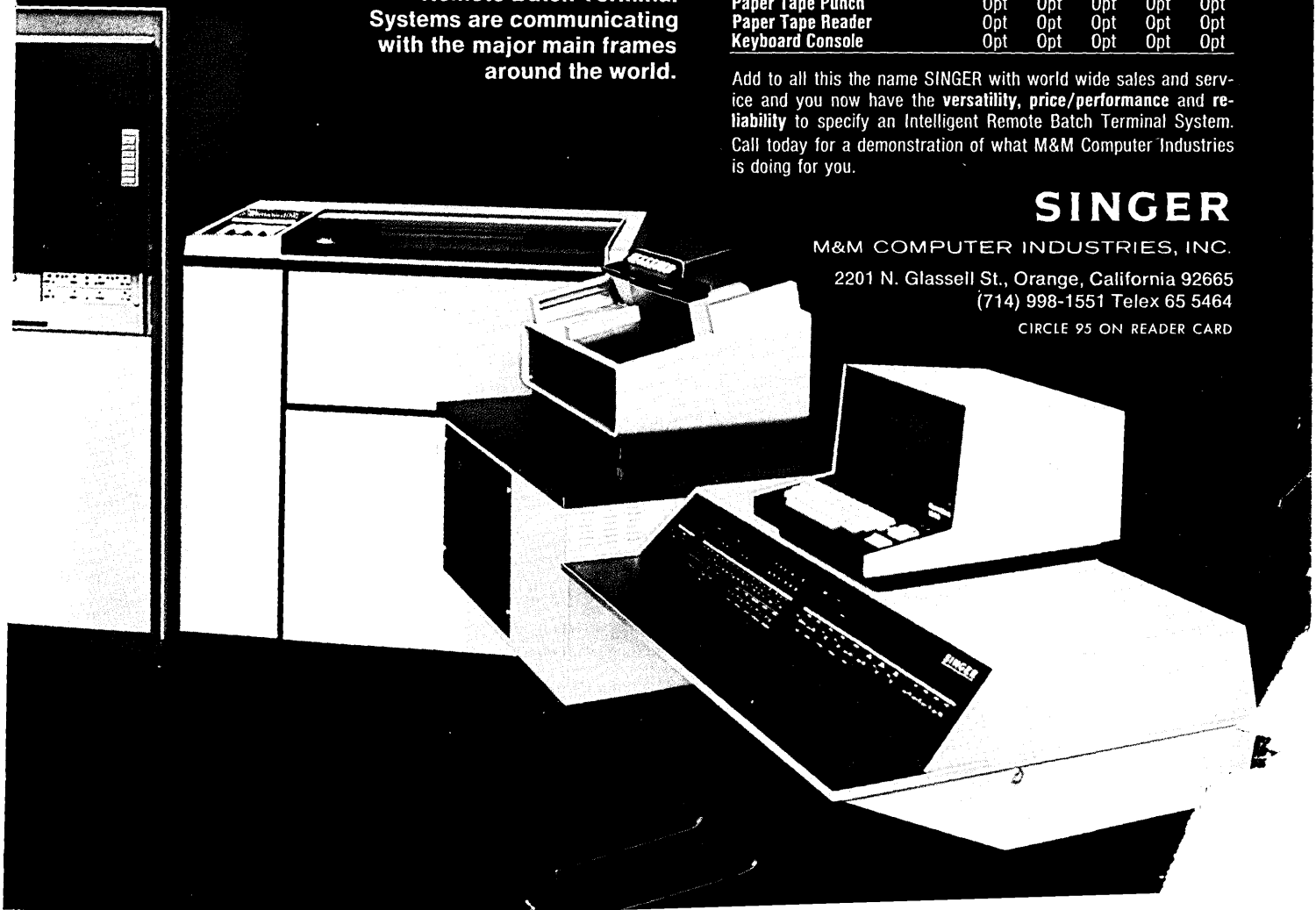

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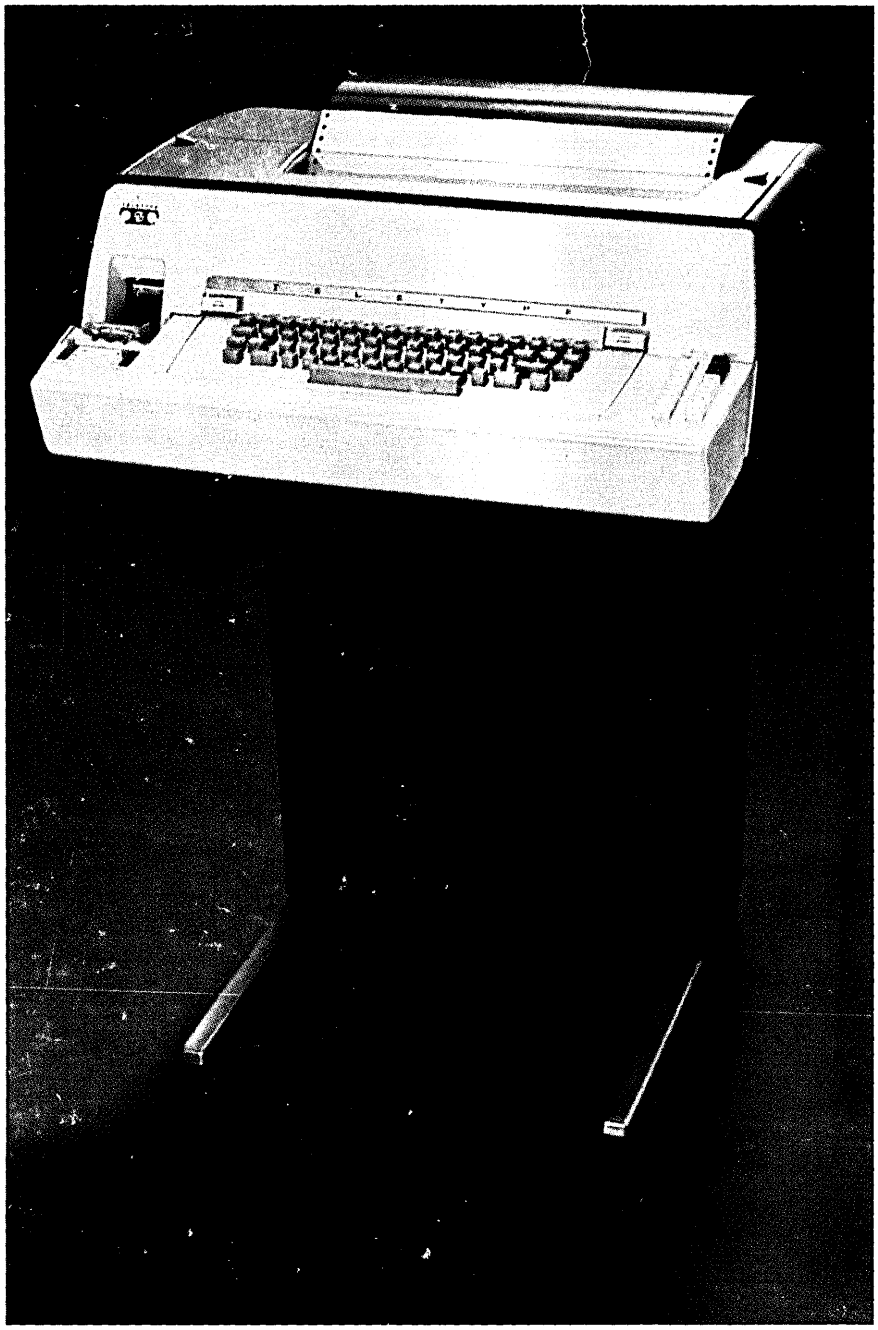

Teletype is a trademark registered in the United States Patent Office.

Just because you need big machine features, you don't have to pay big machine prices.

Not when you've got some alternatives: the Teletype® model 38 series terminals. They offer a lot of features. For only a little money.

Standard equipment on all model 38 terminals is a 132-character printing format on a 15-inch wide platen. Upper and lower case is also standard. So is two-color printing.

Speed? 100 words per minute. If you need more—up to 2400 wpm—the model 38 interfaces with the Teletype 4210 magnetic tape data terminal.

There's more, too. Like plug-to-plug compatibility with the model 33. So you can update your system without changing it.

The new Teletype model 38 series terminals. Where else can you get so much for so little?

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

That's why we invented a new name for who we are and what we make. The computercations people.

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For more information about any Teletype product, write or call: TERMINAL CENTRAL; Teletype Corporation, Dept. 81V, 5555 Touhy Avenue, Skokie, Illinois 60076. Phone 312/982-2500

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