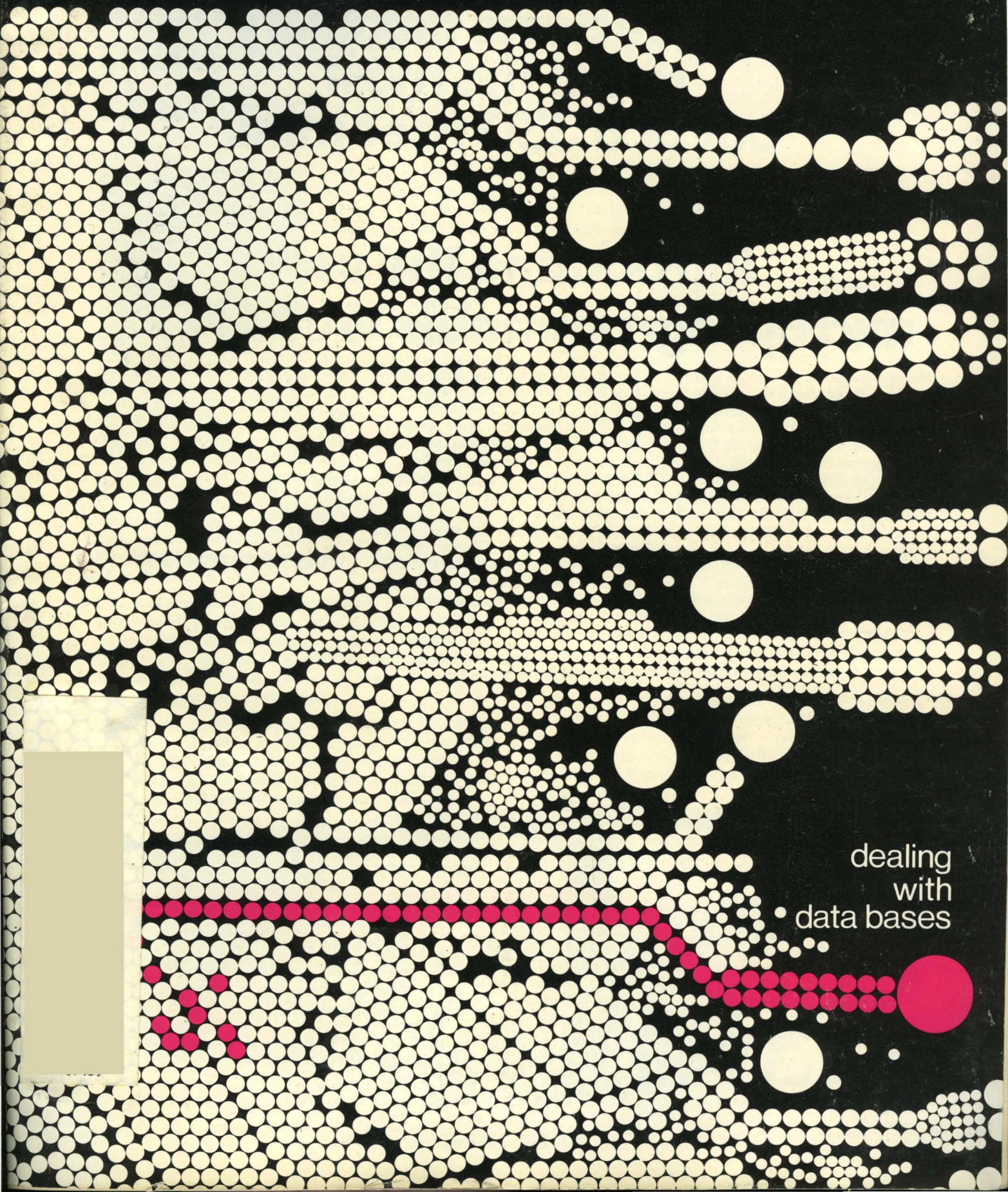
DATAMATION '72®

July



dealing
with
data bases

It takes architectural flexibility to get the most out of a 330 nsec mini.

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Microprogramming you can get your hands on, coupled with the speed to make a big difference in computing power. That's the VARIAN 73. An all new approach to minicomputer design and performance. It starts with architecture. Extendable. Multiple processors interleaved for incredibly large capacities and speeds. With expandable memory and multiple busses.

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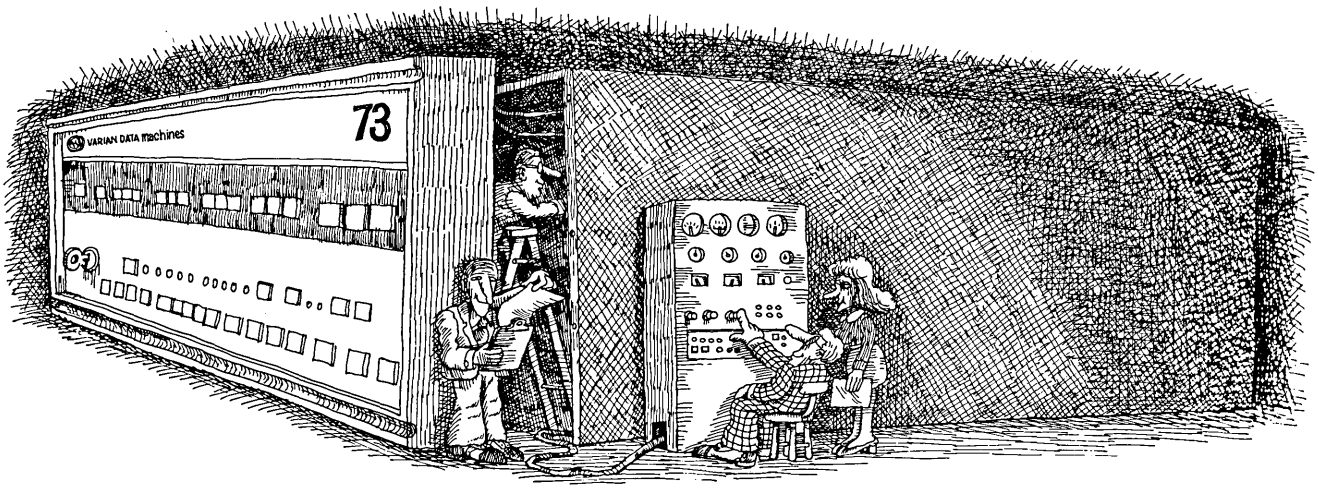
We've built in a dual asynchronous memory bus with a total information bandwidth of over one hundred million bits per second. Configure a system by connecting processors and dualport memories to the multibus and you've got a giant multiprocessor. The software package which is available right from the moment of introduction of the VARIAN 73 is enough to make most other minis look naked. Peripherals? VARIAN 73 has every option in the book. Send for the book. Varian Data Machines, 2722 Michelson Drive, Irvine, California 92664 (714) 833-2400.

varian data machines



CIRCLE 1 ON READER CARD

TALLY DATASCRIBE...

to dramatically increase data transmission throughput without changing modems.

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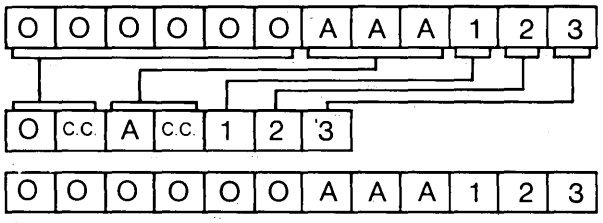
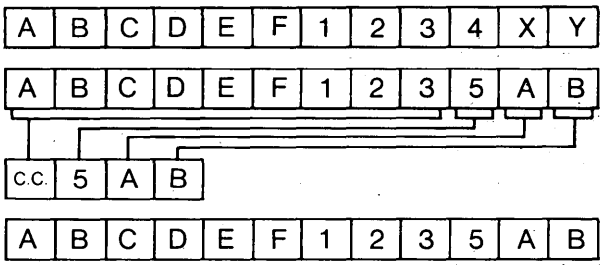
Tally Datascribe couples an innovative hardware technique with reverse channel and a double buffer to give you actual throughput of 170 characters per second from a 1200 Baud modem. This compares to something less than 120 characters per second using other techniques. Your data rate triples using 3600 Baud modems.

The real time-saving story continues! Tally's unique hardware data compression feature automatically delivers phenomenal throughput benefits. Essentially, Tally data compression eliminates the transmission of redundant information over phone lines. And there's no software in the deal.

With serial data compression, groups of consecutive identical characters are not physically transmitted . . . but are reconstructed to their original image at the receiver. This feature is especially useful at the input terminal when a computer is not available for editing.



Parallel data compression provides hardware duplication of redundant data appearing in consecutive records. Data transmission times are dramatically diminished. Ask Tally for further information.



In actual benchmark tests, Tally sent over 210 80-character records per minute compared to 70 80-character records per minute by standard methods (the competition).

By using a 3600 Baud modem, you can triple those rates. In fact, a 3600 Baud modem interfaced to a Datascribe delivers a minimum throughput of 500 characters per second on up to 1200 characters per second, according to the amount of data compression. For accurate data, Datascribe offers four kinds of error checking features during transmission.

It makes good sense to transmit with Tally. Typical users get throughput speeds 2½ times faster than the expected speed from their modem. Prove it to yourself. Contact your local Tally man and ask him to perform a benchmark test on your data. *It's an eye opening experience.*

Tally Corporation. 8301 South 180th Street, Kent, Washington 98031. Phone (206) 251-5500. In New York, (212) 490-2430; Chicago, (312) 298-6710; Atlanta, (404) 633-1991; Los Angeles, (714) 542-1196; San Francisco, (415) 989-5375.

TALLY

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MODELS 22+, 30+, 40+, 50+, 65+

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Hundreds of companies, including:

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Litton	English Electric (England)
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And yes — even IBM!

Now you can capitalize on this expertise, as this growing list of 360 customers and users are doing:

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We back our products, and you can be sure we're going to be here to service your 360 memories — and provide spare parts — for as long as you need. And furnish your next generation memories as well.

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Our complete, high-performance line:

MOD 22+ expands main memory of 360/22 to 64K bytes.
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FABRI-TEK INC.
MEMORY PRODUCTS DIVISION

CIRCLE 15 ON READER CARD

DATAMATION®

JULY, 1972
volume 18 number 7
This issue 112,043 copies

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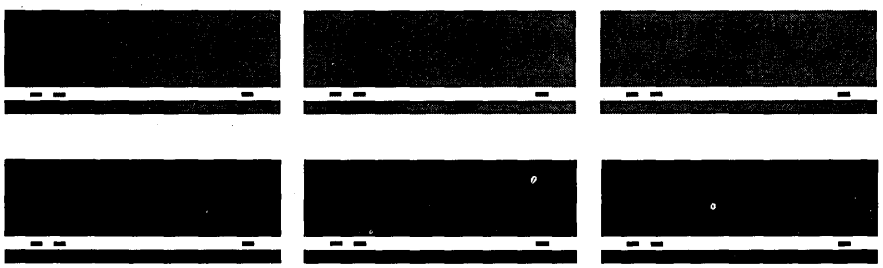

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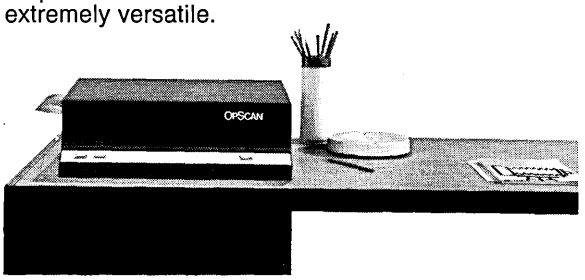

CIRCLE 99 ON READER CARD

DATAMATION

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360/CORE
FROM CAMBRIDGE MEMORIES IS WINNING ALL THE BIG ONES.

Our *compact* 360/CORE replacement or expansion memory for System/360 computers offers you more and saves you more than any other system. That's why our *compact* 360/CORE is winning big government contracts, lessors' contracts, and with individual users as well.

IT'S COMPATIBLE-PLUS.

360/CORE is fully 360-compatible – plus it's upward and downward compatible and model to model compatible, all in the same box. That means fast on-site installation, fewer spare parts and minimum servicing and interruptions.

RECENT 360/CORE WINNERS

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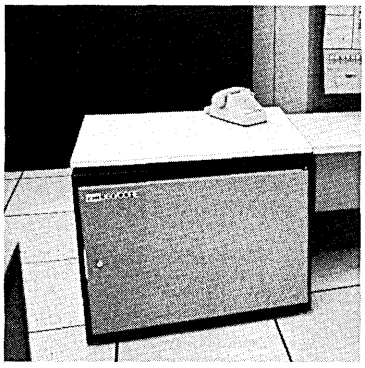
U.S. Navy	8 Models 30, 40, 50
Leasing Companies:	
Randolph	Multiple Models 30, 40, 50
DPF	Multiple Models 30, 40, 50
Diebold	Multiple Models 30, 40, 50
EDP Resources	Multiple Models 30, 40, 50

And a growing list of individual 360 users.

*Largest add-on core award in history

IT'S ULTRA-COMPACT.

360/CORE is available in a desk high unit, as well as in a 5-ft. high "tall boy." In one desk high cabinet we store 128K bytes plus "bump" (auxiliary) storage. And our desk-high is available for all models – 22, 30, 40 and 50. That means we take less floor space, provide your operators with precious counter space, and increase the efficiency of your computer room operations.



IT'S COVERED.

360/CORE uses the latest advanced core technology. That means more core in less space, plus maximum reliability. Then we back that with the best, most qualified field maintenance available. Fast. Knowledgeable. Expert coverage. In addition to our own 360/CORE specialists, we also have contracted with *both* Comma Corp. and Honeywell to give the best and broadest national maintenance coverage available.

THE COMPACT 360/CORE LINE

Expand or **replace** memory on your System/360 whether it's owned, rented or leased:

CMI Model	IBM Model	Expansion to:
CC22	360/22	64K bytes
CC30	360/30	128K bytes
CC40	360/40	448K bytes
CC50	360/50	1024K bytes

IT'S FROM CMI.

360/CORE is a product of Cambridge Memories, Inc., a company young enough to care, but old enough to have over 5,000 memory systems in operation. Our products include add-on memories for minicomputers (we were first), MOS semiconductor memories (again, CMI was first) and a full line of advanced memory systems in wide use by OEM manufacturers. We have a fully staffed R &D department that has developed some of the newest, most advanced technologies available, including a domain tip technology we call DOT. This promises low-cost, high-speed, all-electronic mass memory for future computers.

360/CORE is the winner in the 360-compatible core market. Contact our nearest sales office and let us tell you why. Or jot a note to Dick Baker, director of end-user marketing.

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Burroughs announces three powerful computer series and a fifth major advance in system software

Important news for every user of medium-scale computer systems. Burroughs 700 Systems family is expanding, with —

More powerful and productive computer systems

The B4700 Series: Five additional models with up to 100% more input/output potential than current models . . .

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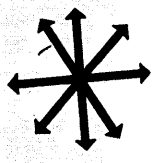
- Parallel multiprograming and shared disk file processing.
- Data communications processors for greater efficiency and line-handling capacity.
- Powerful terminal systems for application in business, industry, finance and government.

A more powerful and productive master control program

Tests indicate that MCP V increases throughput performance 10 to 20% both for new systems and currently installed systems. MCP V is now available for *every* Burroughs medium system. Based on more than six years' successful field experience, MCP V confirms Burroughs leadership in control program technology.

Burroughs puts you ahead with cost/effective systems that do more and cost less to install, program and use . . . keeps you ahead with systems that keep on doing more and costing less as they expand to meet growth and change in your data processing operations.



Look Ahead

WHAT'S NEXT IN LUCRATIVE 3330 MARKET?

Variations on a theme of the 3330 disc drive reportedly are being worked on by IBM. Industry sources mention such code names as Midas, Apollo, and Iceberg, referring to disc drives with half the density of the 3330, and double, and four times its capacity. But independent suppliers, nonplussed, must await official word from the Godfather.

They deny there's a race on, but the independents' rush to get first units of 3330-compatible systems in the field continues. Both Telex and CalComp slate July shipments of test units, while Memorex looks to an October date, and ISS, which is supplying Telex, merely says it'll be this summer. We hear Ampex will begin production deliveries next spring, although they've yet to announce their entry into this competitive market. According to Quantum Science president Murray Disman, the 3330 represents possibly the second highest revenue-grabbing product in history, trailing only the jumbo 747 jet plane. Currently, however, IBM is reported lagging behind its shipment schedule.

The independents further cast doubt on the efficacy of fitting 3330s to 360s below the mod 65. At least the use of a buffered controller to make this possible takes its bumps from some. "The market isn't big enough for a buffered controller," says one. "I don't think we'd take that approach," says another.

TELETYPE GIVEN OK FOR CRT TERMINAL

Full-scale production of a crt-equipped terminal may begin this fall at Teletype Corp., Skokie, Ill. Its parent, AT&T, which gave the go-ahead in June, says it hopes to have units out in the first half of '73. It declines to disclose the specs "for competitive reasons." Teletype already has made about 1,000 crt terminals--called Communications Display Terminals (CDTs)--in use throughout Bell system companies (Dec. 15, '71, p. 7). The new product, which may be called the mod 40, is expected to be a scaled-down version of the CDT, having a 120-cps printer, the crt, and a keyboard all in one package, selling for about $3K.

TRILLION BITTER GIVEN AN A+

Ampex is elated with the performance of its Terabit Memory System, which passed the preshipment acceptance test by a wide margin over customer specs. The system ran for 220 continuous hours with 98.3% uptime, where greater than 90% was required. There were to be fewer than 2.5 rereads per 1,000 blocks (of a million bits each) read, and the average was 0.37. In a test of the number of times the head could be brought down to the tape to access a given block without evident effect on the data, Ampex scored almost double the spec. To the firm's dismay, however, it encountered no unrecoverable errors in 1.4 trillion bits, when fewer than one in 20 billion would've been okay. Ampex hopes that one didn't occur that went undetected.

The unique TBM system is an erasable and updatable memory with a 3-trillion-bit capacity. It uses videotape. Industry rumor is that the secretive National Security Agency is the buyer, although Ampex won't comment. But the first system, being delivered later this year, has an on-line capacity of 1.2 trillion bits and throughput of 24 million bits per second.

Look Ahead

COGAR CORP.: GOOD RECEPTION TO SYSTEM/4

A brighter note in the fortunes of financially troubled Cogar Corp. is the performance of its small-business-oriented computer, the System/4. Keane Associates, the New England software house which announced the computer six months ago, says it's already installed 50 systems having a "wide range of applications." President John F. Keane says he's finding many small pockets of dp applications in large companies.

Cogar's president, George Cogar, says more than 100 systems have been installed in Europe, where Resyme A. G. of Switzerland markets it in Germany, Switzerland, and Austria and where Unicard sells it in France and Belgium. This early sales performance has enabled the company to pay off the tooling expense and go into the black--at least for this product.

At writing, though, Cogar still had deep problems with its semiconductor memory operation, which virtually had been shut down; trading in its once high-flying stock was suspended, and creditors were pressing.

WHERE WILL THE $40 MILLION GO?

Much of the $40 million IBM said it will spend on data security will be used to test a resource security feature of an operating system at the OS 21 level. Al Pfaff, IBM senior engineer, data security and privacy, said the resource security feature first was developed at the OS 18 level for the Wimmix system, but when offered commercially it received only six orders. So IBM went a step farther, taking the feature to level 21 "on an experimental basis."

The tests will be made on 360s and 370s at MIT and three other installations--a think tank, a commercial shop, and internally at IBM. The company wants to learn more about the adequacy of the security, its overhead, and user impact--and if the world is really ready for such a "hardened" system.

DEC STILL USES RIFLE TO MARKET NEW LINE

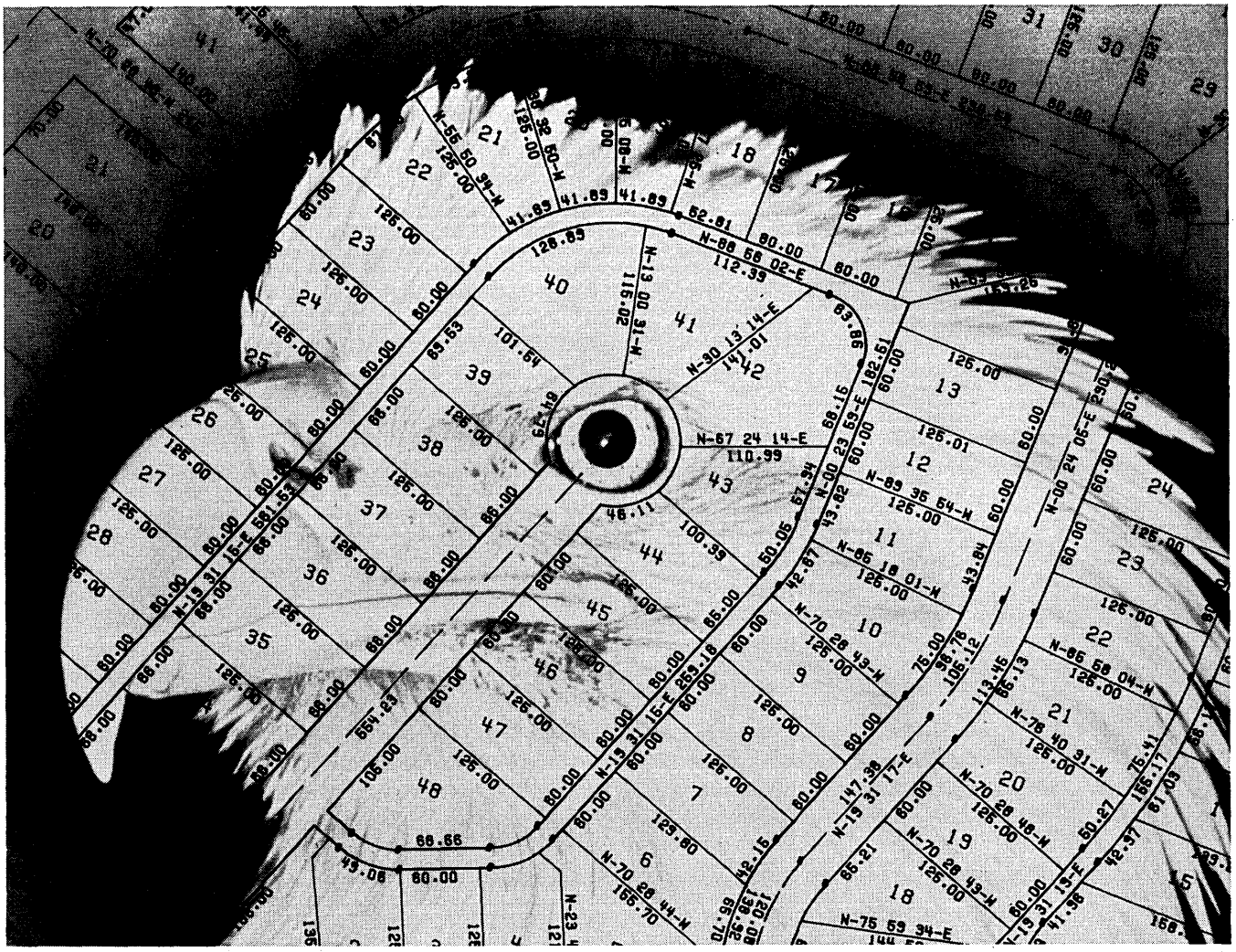
Although it hasn't met quota with its new DECsystem-10 line, Digital Equipment Corp. says it's at least cleared an all-important hurdle for any new product--the credibility gap. It says its DEC-10 installation at Maynard, Mass., no longer is swarming with potential customers worried about whether DEC could really make the product.

We hear the company will sell 40 systems this year--and follow its time-worn, and successful, marketing method of selling to sophisticated users in the education, scientific, and industrial markets where it's been so successful with minicomputers. One example: A recent visitor at DEC noticed three systems lined up ready to go to customers in publishing, a field in which Digital has long been a powerful force.

LUCKY IN BUSINESS...

Fletcher Jones' exploits in horse racing aren't confined to the troubled venture in computerizing the New York Off Track Betting system. Last month the chairman of Computer Sciences Corp., Los Angeles, dropped $100,000 at Hollywood Park where his six-year-old mare, Typecast, lost by a head to a four-year-old filly named Convenience in an exciting winner-take-all mile-and-an-eighth race. But Jones, the master of Westerly Stud, a 4,000-acre ranch near Santa Barbara where he raises horses and has built a

(Continued on page 123)



The Plotter With an Eagle Eye. It Stops Errors Dead.

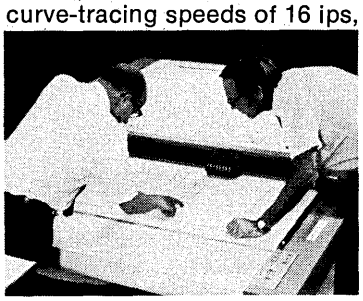
The unique DATAPLOTTER 430®. It's truly the only plotter that spots and stops drawing errors before they're made. Because it's the single plotter with an eagle-eyed predetector.

When our machine senses an anomaly coming up—say, some hash or a bit of bit drop-out—the pen lifts. Everything comes to a dead halt. Even physical disturbances and bothersome static electricity are caught before they are committed to paper. All automatically.

Then, when you're ready to start again, you just back up to the trouble spot. The DATAPLOTTER 430 picks up from there. You won't be able to tell where the retracing began. And you've saved your drawing, your manpower plus your computer time, something you couldn't possibly do on any other plotter.

This predetector is just one feature that engineers find valuable in applications such as mapping, subdivision platting, topo and contour drawing. Even on linen or for direct reproduction masters. Needless to say, we have program packages ready and waiting for these and other applications.

So we think it might just prove your foresight to learn about all the other advanced features we've built into the DATAPLOTTER 430. For instance, resolution to .001 inches, smooth-line curve-tracing speeds of 16 ips, compatibility with a wide variety of computer systems, not to mention new EAI computer-based civil-engineering systems. And we could go on, but that's what brochures are for. Write for ours. Or better yet, why don't you telephone us for more information today.



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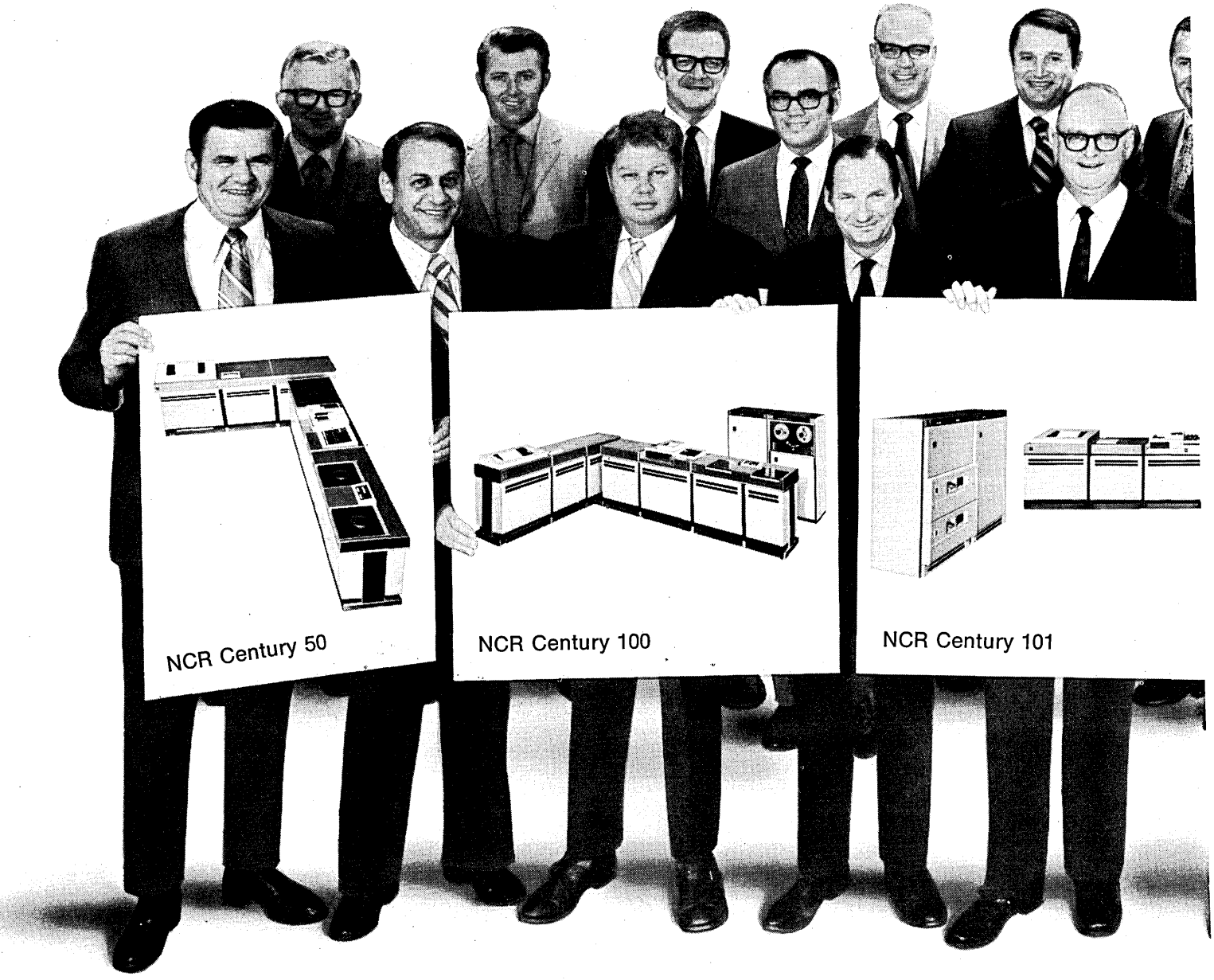
The NCR Century



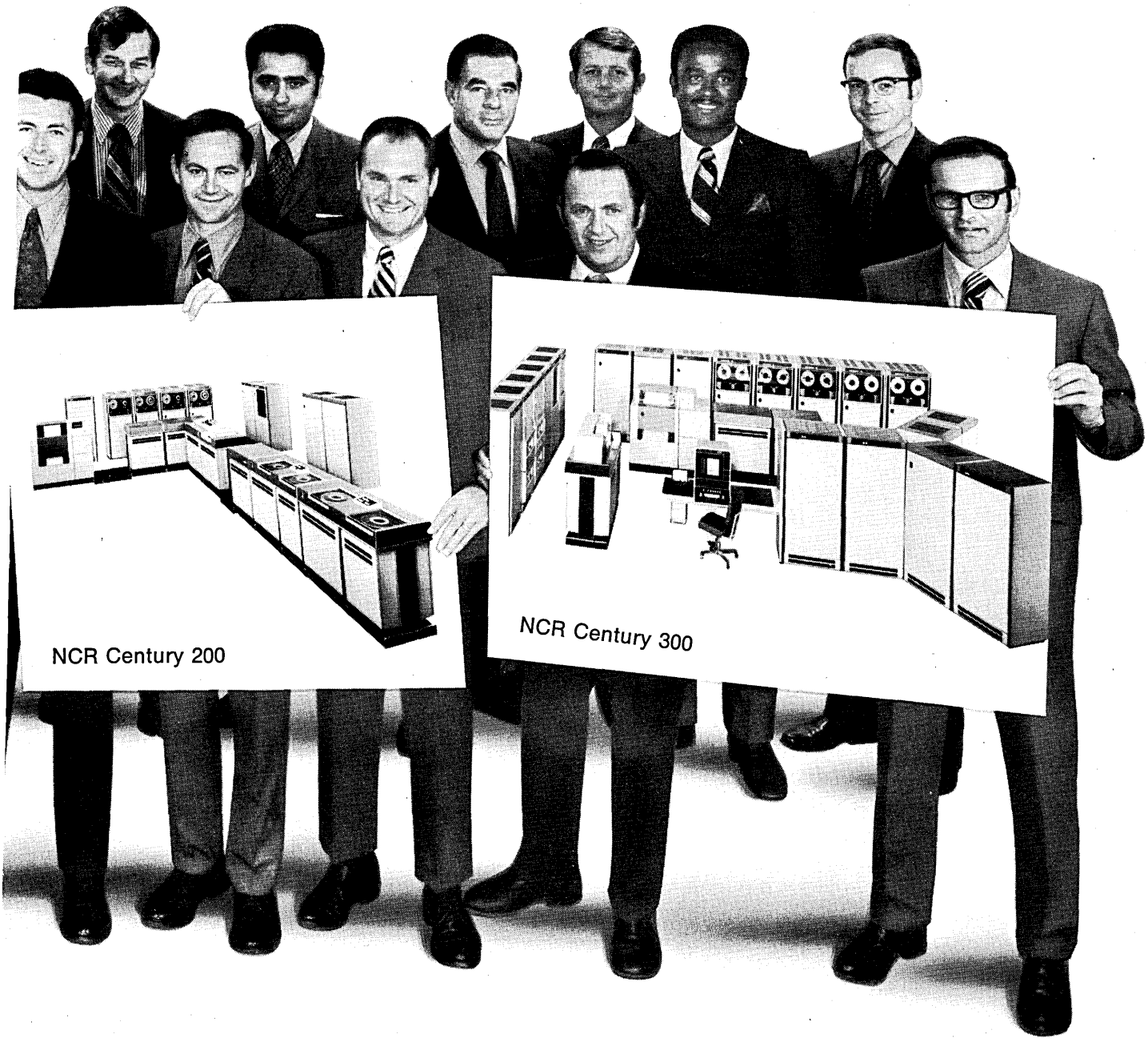
The NCR Century 50. A powerhouse for small businesses. Designed for businesses that couldn't afford a computer system before. A small business computer. Yet the only thing small about it is the price. Price it and see. (Now with communications capabilities —so larger businesses can use it at remote sites.)

The NCR Century 100. Our most popular. Popular because it's a medium-size computer and most businesses are medium-size. Popular because it's been proven again and again in all kinds of applications in all kinds of businesses. Including businesses like yours.

The NCR Century 101. Just released. More than just another computer, it's a low-priced processor teamed with high-speed, high-capacity optional peripherals. It promises more performance than ever in the small-to-medium range, with options like high-speed memory, large-capacity disc system, fast printers, and communications.

The NCR Century 200. A workhorse for businesses on the grow. Main memory up to a half million bytes. A 1500/3000 lpm printer. With a vast number of programs, applications and communications possibilities. A big business computer system with a not-so-big price tag. Designed to help you grow bigger . . . profitably.

family and friends.



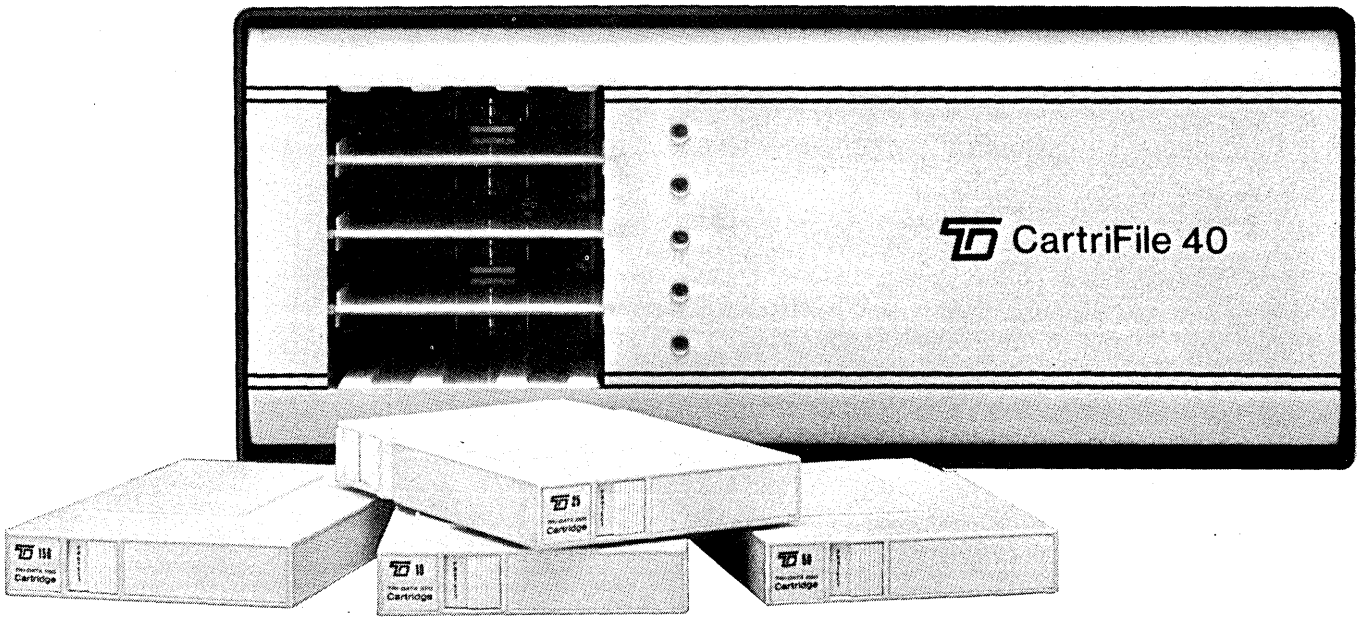
The NCR Century 300. Our biggest and most advanced. Designed for on-line and multiprogramming. There aren't too many information processing jobs around too big for it to handle. And, like every other NCR Century computer system, it's compatible with its smaller brothers. So, wherever you start, you'll have a hard time outgrowing us.

And behind every NCR Century computer are thousands of NCR support people like the 23 you see here. Experts in retailing, manufacturing, banking, you name it. Experts in systems design, programming, applications, software. Experts with NCR's 86 years of business experience behind them. Experts who know your business as well as they know NCR's business—computers.

When you're ready to talk computers and terminals, talk to the people at the computer company that talks your business language: NCR.

NCR
Computers
& Terminals

MANY-TAPE MINI



Put these FOUR mag tape drives to work and you'll add real flexibility and power to your minicomputer system. Each drive in the CartriFile® 40 is independently controllable—and reads or writes up to 18,000 bits per second. You can use each drive by itself or in combination with the others.

CartriFile 40 comes complete with electronics (read, write, and controller) plus integral power supply. Also, interfacing, cables, and basic software for all popular minicomputers.

It operates with convenient, single-tape cartridges: new Tri-Data 1000 Series. These are available in 10-, 25-, 50-, and 150-foot lengths. With four 150-foot cartridges, the system can store nearly 13 million bits.

And the price? You'll like it. Only $4950 with interface; $3015 in small OEM quantities (without interface).

Get all the facts on the "many-tape mini"—CartriFile 40.

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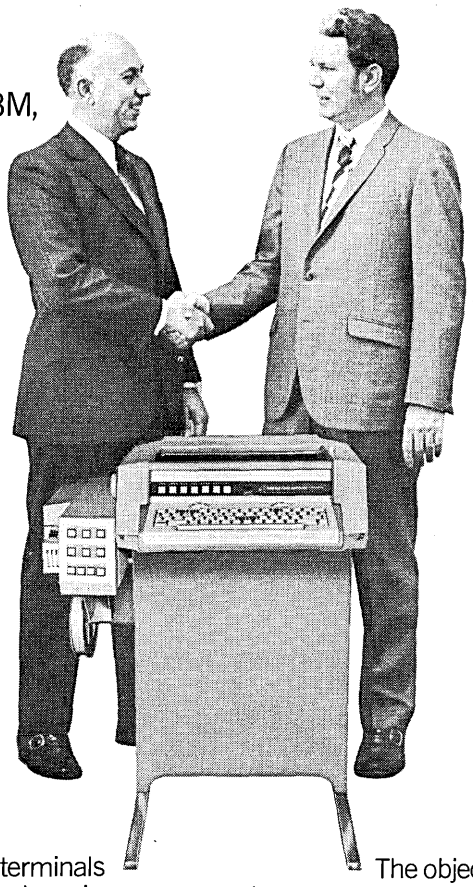
Phone (415) 969-3700 / TWX 910-379-6978

CIRCLE 14 ON READER CARD

Tom Watson does it again, with another way to reduce time-sharing costs.

"Tom, who doesn't work for IBM, now brings you an ASR version of our EDT-300 data terminal."

Z.V. Zakarian, president
Western Union
Data Services Company



Our new 30 c.p.s. data terminals in the KSR model are already saving money for our customers.

Now we offer an ASR configuration for greater flexibility.

Both models can cut in half the cost of computer connect time, compared to 10 c.p.s. terminals.

They lease for as little as $125 a month. (You can figure out how much you'll save on your monthly time-sharing bill.)

These high-speed terminals can also reduce your telephone line costs, not to mention freeing up needed lines.

Minor advantage: they are very quiet machines.

The EDT-300 was developed by General Electric working with Data Services Company.

The objective was reliability. (After all, maintenance is our responsibility.)

The objective has been realized. This is the most reliable 30 c.p.s. electronic printer available. But since we have yet to achieve perfection, it's backed by Termicare,™ our centralized diagnostic, maintenance and support service for all our terminals.

There are EDT-300 models for acoustic coupling, Data-Phone* or data access arrangements.

And of course we still offer our range of Model 33 and 35 data terminals.

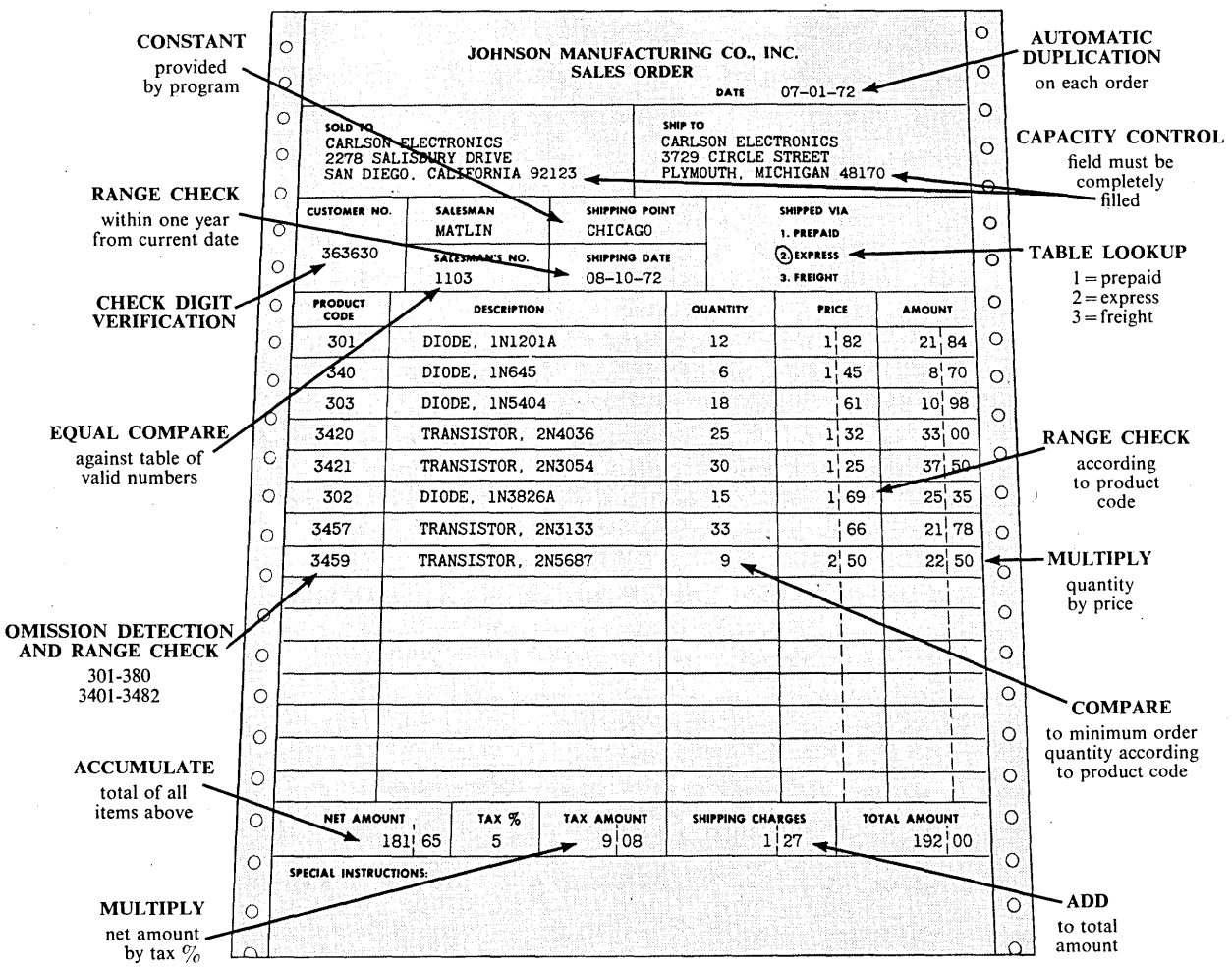
For information please call Tom Watson, toll free at 800-631-7050 (New Jersey 201-529-1170). Or write Western Union Data Services Company, 16 McKee Drive, Mahwah, New Jersey 07430.

*Registered trademark of AT&T.

western union data services company

CIRCLE 22 ON READER CARD

ERROR-FREE ORDER ENTRY FROM SYCOR.



User programmable with T.A.L. (Terminal Application Language)

CRT for display and edit of labels, data and error messages

Cassette storage of control formats and data (400,000 characters)

1200-4800 baud IBM compatible binary synchronous communications

Unattended communications and remote control of peripherals

30 cps to 200 lpm printing on 132-column multipart forms

Proven capability—3700 Sycor Terminals already installed

SYCOR INC

100 Phoenix Drive Ann Arbor, Michigan 48104 (313) 971-0900

The Sycor 340 Intelligent Communications Terminal.

Calendar

EVENT/SPONSOR	DATE	LOCATION	CONTACT	COST
	AUGUST			
Symposium on Computer Education for Developing Countries	**6-12**	Rio de Janeiro	L. C. Martins The Rio Symposium C. P. 38015—ZC-20 Rio de Janeiro-Gb, Brazil	$70
ACM '72	**14-16**	Boston	Elden M. Levine 36 Parramatta Rd. Beverly, MA 01915	$40, members $65, others
5th Int'l. Seminar on Telecommunications	**20-31**	Jerusalem	ILTAM P.O. Box 7170 Jerusalem, Israel	$350
Computer Image Processing Short Course & Seminar	 **21-23** **24-26**	Columbia	Prof. Ernest L. Hall Dept. of Electrical Eng. Univ. of Missouri Columbia, MO 65201	 $300 $35
Urban and Regional Information Systems Assn. Annual Conference	**29–Sept. 2**	San Francisco	Donald S. Luria URISA 901 Elizabeth Ave., 100 Charlotte, NC 28204	Not yet available
	SEPT.			
Society for Management Information Systems 4th Annual Conference & Workshops	**7-8** **6**	Montreal	SMIS 18 S. Michigan Ave. Chicago, IL 60603	$200, members $230, others $75/$125
IEEE Computer Society Conference: COMPCON 72	**12-14**	San Francisco	Rowland C. Fellows IBM Corp. Monterey & Cottle Rds. San Jose, CA 95114	$40, members $50, others
Western Electronic Show and Convention	**19-22**	Los Angeles	WESCON 3600 Wilshire Blvd. Los Angeles, CA 90010	$5
Nat'l. Retail Merchants Assn. Annual Information Systems & Telecommunications Conference	**24-28**	Miami	NRMA 100 W. 31st St. New York, NY 10001	$125, members $175, others
ACM/IEEE 5th Annual Conference on Microprogramming	**25-26**	Urbana	L. A. Hollaar, Registrar Dept. of Computer Science Univ. of Illinois Urbana, IL 61801	$75, members $85, others $55, students
Communications Systems Management Assn. Meeting	**26-28**	Chicago	CSMA-NCW 1102 West St., 303 Wilmington, DE 19801	$25, members $35, others
	OCTOBER			
SEARCH/LEAA Int'l. Symposium on Criminal Justice Information and Statistics Systems	**3-5**	New Orleans	SEARCH Symposium Calif. Crime Technological Research Foundation 1927 13th St. Sacramento, CA 95814	None
American Records Mgt. Assn. 17th Annual Conference	**23-25**	Atlanta	ARMA P.O. Box 66 Clarkston, GA 30021	$100, members $125, others

Microdata gives you a new kind of minicomputer

The Twin Mini doubles throughput for just a few dollars more

Put two microprogrammable CPU's with separate control memories and I/O facilities into a Micro 1600 cabinet where they share a common core memory. That's the idea behind the Twin Mini. And it works wonders. For the first time, core memory is used so efficiently that your throughput rate is more than double that of other CPU's. Applications which normally call for much larger or more expensive computers can now be handled simply and economically by this effective combination of Micro 1600 parts.

You show us your requirements. We'll show you how to build a system with unmatched processing power per dollar. Your system may fit into a single Micro 1600 cabinet or overflow into two. Either way, the performance will match our claims or your money back. Find out how easy it is to do business with Microdata. Write for details.

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We come in as many low-speed forms as your problems do.

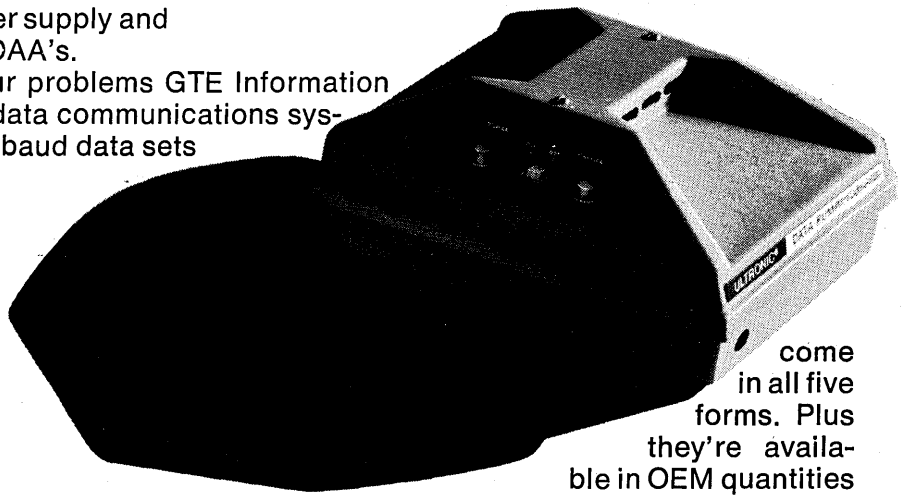
Sometimes you need a 300 baud originate-only acoustic coupler.

Other times you want a hardwired version. Or an answer-only model with its own power supply.

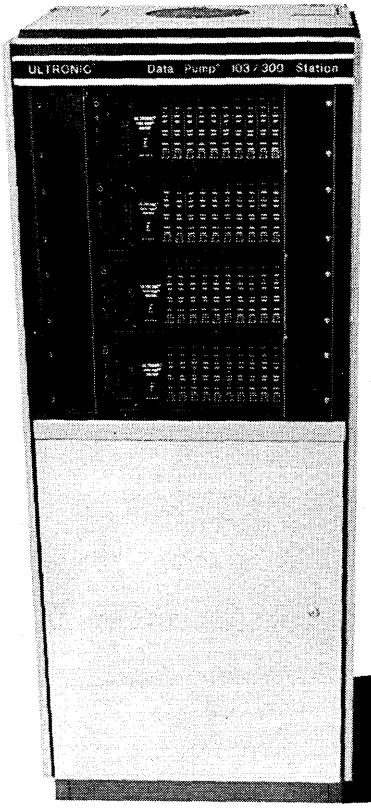
Then again, maybe the only thing that will do is an answer-only nest that holds up to ten data set cards along with a common power supply.

There are even occasions when the best thing would be a 300 baud answer-only facility that holds four ten-card nests with power supply and mounting space for up to 40 DAA's.

Whichever one solves your problems GTE Information Systems, a total supplier of data communications systems has it. Our Ultronic 300 baud data sets



come in all five forms. Plus they're available in OEM quantities as complete units or as plug-in circuit boards.



Whatever the form, all Ultronic data sets are end-to-end compatible with telephone company equipment.

And they've got plenty of diagnostics to help you pinpoint trouble whenever it occurs.

All that, and a nationwide service system, too. There's a GTE Information Systems service representative within 50 miles of over 90% of all the computer installations in this country.

So bring us your problems. We've got the data sets to solve them. Not to mention FDM's, TDM's, and video terminals.

We come with as many different machines as your problems do.

GTE Information Systems, East Park Drive, Mt. Laurel, N.J. 08057.

GTE INFORMATION SYSTEMS

CIRCLE 74 ON READER CARD

Effective data systems have communications built in. Not built on.

Since most computers are linked to other computers through the telephone network, and send and receive data that way, it makes sense to involve telephone people early in the planning of your system.

And it can save you time and money.

Because a Bell System data specialist knows the latest developments in data communications, he'll assist in selecting the communications services that will enable your system to work most effectively.

So when you first begin to make new data plans, call your local Bell Company Communications Consultant.

He'll come to talk with you.

And it won't cost you a cent.

We are continually looking for new ways to improve our service.

This time, by helping you plan your data communications.

AT&T and your local Bell Company.

Letters

Iceberg

The Wizard Project comprised four major phases—design, code, test, and install. The 20,000 work units quoted in your May Look Ahead column (p. 7) represent only the coding phase—not the whole project as is stated. The entire Wizard development totals approximately 250 man-years.

EUGENE JONES
Avis Rent A Car System, Inc.
Garden City, New York

Farmers market

Your recent columns about overtime pay for programmers have provoked several remarkable statements by employers in our industry. For example, the "Speak Up" column of IBM's FED News (March 25) contains the following interchange:

"Q. A recent article in DATAMATION magazine stated that 'computer programmers and systems analysts are not professionals, according to a revised ruling by the Wage and Hour Div. of the Labor department.' Thus, it goes on to say, 'they are not exempt from receiving overtime pay . . . '

"A. The DATAMATION article is not entirely correct. Under Wage and Hour Div. regulations, employees may qualify as 'exempt' under one of several categories—'professional,' 'administrative,' or 'executive.' Whether a particular employee is exempt, and under what specific category, is a highly technical and legal question. The Wage and Hour ruling said that the 'professional' exempt category was not the appropriate category for programmers and systems analysts, but they may qualify under the 'administrative' exemption. However, we have always felt and continue to feel that our programmers and systems analysts are professionals in the broadest sense of the word."

This statement that IBM is searching for a new way to avoid paying for overtime was especially interesting since the same column contained the following statement in answer to another question:

"A. All IBM employees are expected to work a reasonable amount of overtime."

I have a few suggestions and comments that may help to solve IBM's problem.

First, the comments.

1. The use of the word "exempt" is misleading. Usually "exempt" indicates a situation which is desirable; e.g., tax exempt. The opposite is true in this case. The word "protected" would be much more appropriate since the Wages and Hours Act was enacted to *protect* employees from being exploited by their employers.

2. The notion that professionals need not be paid for hours worked is ludicrous. Try explaining it to your psychiatrist. He'll tell you you're crazy. My dictionary offers this definition for professional: "Participating for gain or livelihood in an activity or field of endeavor often engaged in by amateurs." How appropriate! Obviously, professionals get paid—amateurs don't!

Now the suggestions.

Since IBM is determined to avoid paying for overtime work, as I see it, it has three alternatives:

1. Don't ask employees to work overtime.

2. Hire amateurs, not professionals. (Some cynics have suggested that this is common practice in the industry.)

3. Reclassify programmers and systems analysts as "farmers." This offers two advantages:

   a. Farmers are accustomed to working from morning 'til night without raising ugly questions about overtime pay.

   b. Farmers are accustomed to dealing with manure.

WINTHROP O. TERRAPIN
Greenwich, Connecticut

Ever onward

In reference to your May article on Robert W. McGrath's IBM Alumni Directory (p. 139), I should like to correct an inaccuracy. We suffer much in the computing business from a lack of sense of history, but I'm sure in the case of the IBM Song Book the IBM Corporation would not wish to have history rewritten.

Your article implies that the song book was "quietly phased out" "in the late '40s." This is simply untrue, for when I went to IBM Sales School in 1957, I was given—as *Song Leader* of my class—a copy of Form No. 20-8798-0-10M-51-P, The IBM Song Book. The "51" in the form number implies that the printing date was 1951, and though I believe the books were no longer being *printed* in 1957, they were very much in active use in Sales School. They were collected very carefully at the end of each class, and we were cautioned not to talk of them to "outsiders."

By some error, my Song Book was mailed home with my other books from Sales School, and I was so afraid to compromise IBM security that I locked the copy away rather than risk sending it through the mails. Over the years, I have had much pleasure in bringing it out late at night and reflecting on the stirring words and sentiments.

Incidentally, you failed to mention the most stirring of all, Ever Onward, the IBM Rally Song. If Mr. McGrath doesn't have this proud piece in his version, I'd be happy to make it available, though I'm sure IBM would supply you with a copy—unless the Song Book is still secretly in use.

G. M. WEINBERG
Binghamton, New York

Easier said than read

IAPREESHEEAYTDRAHBERTJAYRAHBIN-SUNZLETREGAHRDEENGKUMPYEWTREY-EZDPROSSESSEENGUVSPEACHFONEEMZ (APRILISHUEPAYDGETWENTYWUN) BUTARENTLETRZORTELEGRAMZBETR-ANDMAWRKAWSTEFEKTIV?

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Mr. Robinson replies:
Probably not.

Competitive cooperation

I have read with great interest your three articles about networks in the April issue. I've been working on this subject for quite some years, but look upon the future networks development from another, but very important, angle.

To describe what I'm thinking of, I will give you some of the most important elements of a speech I delivered at the NordDATA conference in Helsinki last month, "Enormous Possibilities with BRIDS." BRIDS is Branch and Regional Integrated and Decentralized (Data) Systems.

Companies producing and/or selling the same and/or similar products or services should agree on building computer networks. They could still compete, but agree on exchange of

statistical data for control, trends, and forecasts. They have to agree on the same "product language," that is, the same coding system for the products and services.

They can, but do not have to, agree on the same terms and/or prices, and compete in product development, qual-

We've Been Plotting Behind Your Back.

Maybe you haven't heard (we haven't beat our drum much) but Zeta has been the quality leader in small plotters since 1969.

Now we've got a big drum — the Zeta 3600! 36 inches wide, it's bigger, faster and more economical than competitive units. It offers speeds up to 1800 increments per second on or off line, and 810 increments per second remote.

The 3600 series joins a proud family. The *Zeta 230* series — ideal for time share users — gives sharply increased plotting speeds and does it over *standard voice-grade telephone lines.* The *Zeta 100* series, with speeds up to 450 increments per second, delivers low-cost high-performance plotting for general use.

The plot's really simple. Just write. You'll get the full story on today's most advanced off-the-shelf plotting systems.

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ity, service, and organization. They can agree on specializing on different major products and/or product groups.

Today we have data processing *in* the companies. Tomorrow we will get the data processing *between* the companies, and between means both horizontally and vertically. Between the manufacturers for exchange of specialties, programs, and data. Between the manufacturers and trade for inquiry, orders, billing, and accounting.

These networks can start a new trend in political and economic thought. The optimal mixture of competition and cooperation, integration and decentralization, balanced growth or zero growth if that is needed.

As Americans, you will fear the reduction of competition, but living in a European, social-democratic state between East and West, I do mean this is the right way to go in order to create a new converging system that can be used both in the East and the West—on both sides of the Iron Curtain and in America.

HANS LUNDER
Olso, Norway

Hard to take

Re your article, "Unions Step Up DP Organizing" (May, p. 114): DATAMATION has been on top of this development, and the union organizing item and your research report "Getting Out" in the May issue (p. 80) are recommended reading.

For, if after all is said and done, and we become union-label clerks or managers with no place "up" to go, then getting out may be the only honorable option left. I'm not anti-union, but I find that option hard to take after nearly two decades of being used as an "important member of the management team."

And, meanwhile, our dues-collecting professional organizations continue to compete with one another, their only joint effort to date a nebulous federation primarily engaged in raising more money through useless Joint Computer Conferences.

THOMAS E. O'CONNOR
Mountain View, California

Medical diagnosis

It is hard to know from Dr. Lindberg's conference report ("Technology and Health Care Systems in the 1980s," May, p. 103) which papers might have taken issue with the concepts presented by Ms. Newitt and Ms. Somers. However, I suggest three considerations for HSMHA, Mr. McGruder, and the medical technology community before accepting that further increases in technology "almost inevitably, lead to further increases in cost."

1. Exploit fully the use of minicomputers to implement medical automation aids. This means that medical people must accept, as equals, those computer scientists who are willing and interested in looking at nongrand and nonelegant, but practical applications of automation technology. This also means that financial support for program development must not be related to the cost of the hardware, since a well designed but compact mini-program may have an original (one-time) cost in the same range as that of a big, inefficient, everything-for-everybody computer program.

2. Recognize computers for what they do well and exploit that (i.e., repetitive data processing); avoid intellectual elegance for its own sake (when it can be recognized). For example, a computer may be able to extract, relatively easily, the few abnormal EKG's from the many normal ones (thus easing a physician's searching task). Almost any physician should be able to beat a computer hands down on diagnosing the abnormal cases. Recognize the difference between feasibility and reasonability; implement the reasonable and delay the feasible but nonreasonable until later (i.e., when it becomes reasonable).

3. Functionally analyze the total job to be done with automation as a new resource; don't just automate the present procedure as it is. Airplanes do not flap their wings like birds; the technology was applied in a different way to get a more satisfactory result. Present procedures are fine for manual methods perhaps, but may not be a good marriage between people and automation.

JOHN A. KEENAN
The MITRE Corporation
Washington, D.C.

The writer is a former instructor in medicine at the Univ. of Wisconsin specializing in computer applications in laboratory medicine.

Alive and well

I have been a recipient of DATAMATION for the past 10 years, through a name change and several job changes. There have, until now, been no problems or interruptions.

In January of this year I left RCA (as did a number of other people) and, leaving, gave both a home address and a new business address. However, RCA, with the same dubious professionalism which characterized its entire close-down operation, has seen fit to mark mail addressed to former employees "unknown at this address" and return it to the sender.

As a result, I failed to receive my reverification form and have been dropped from DATAMATION's mailing list. This can easily be rectified, but I am concerned by the overall impact of RCA's policy.

Perhaps your publication of this letter would serve to assure our professional colleagues that we have not intentionally "dropped out" and that we will be back in touch as time and circumstance permit.

MARJORIE L. GREEN
The Equitable Life Assurance Society of the United States
New York, New York

Calculators vs. t-s

When discussing desk-top calculators, one usually keeps in mind the fact that a calculator is most often compared to an on-line conversational terminal, not a minicomputer. Calculators are basically off-line terminals. If a time-sharing service (in-house or commercial) is too expensive, inaccessible, or unreliable, then a calculator may indeed be useful in some instances.

Mr. Paul Asmus' article, "Calculators vs. Minis" in the April issue (p. 55), was most interesting if one wished to know what a Hewlett-Packard 210B desk-top calculator can do. Many of his points in comparing them to minis were well taken. However, he seems to have overlooked both the calculator's and the minicomputer's glaring weakness—the inability to practically and economically save data in a file for later analysis and/or retrieval.

His continuing implication that using a computer means using a minicomputer in a "batch mode" is misleading to those who wonder why computers are any better than calculators. Further, there is little point in assessing a calculator's ability to work in the area of data acquisition and analog signal processing. Any degree of sophistication beyond the most trivial is far beyond its capabilities.

No doubt his neglect to compare calculators to a time-sharing service is in part due to Hewlett-Packard's weakness in this area. In one or two years, if the new HP3000 series works, his article will likely be titled, "How a Hewlett Packard Desk-Top Calculator Can Be Interfaced to a HP3000."

DENIS J. PROTTI
The University of Manitoba
Winnipeg, Manitoba □

DATAMATION welcomes correspondence about the computer industry and its effects on society, as well as comments on the contents of this publication. Letters should be typed if possible, and brief. We reserve the right to edit or select excerpts from letters submitted to us. Write to 94 S. Los Robles, Pasadena, CA 91101.

Now...an advanced, low-cost solid state system for hi-efficiency source data collection and transmission.

Monarch Portable Data Recorder MDR-2100 System

Seven important advantages for retailers, wholesalers, and manufacturers have been combined in Monarch's remarkable MDR-2100 System. Here is on-site portability, solid-state reliability, operating simplicity, system flexibility, purchasing and operating economy, and effective error protection.

Three units make up the system: the Monarch portable recorder, data transmitter, and computer-compatible magnetic tape receiver.

With this equipment, retailers reduce order writing time, speed deliveries, reduce out-of-stocks and back room inventories, dramatically cut errors, and transmit more information to headquarters.

Wholesalers can reduce key punching, end mail delays, ship faster, cut warehouse inventories, and build customer loyalty.

Manufacturers will find the system capable of efficient data collection for dozens of production, warehouse, and sales office applications.

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Please see that I receive your fact file describing the MDR-2100 System for low-cost electronic ordering and inventory control.

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Monarch Marking Systems

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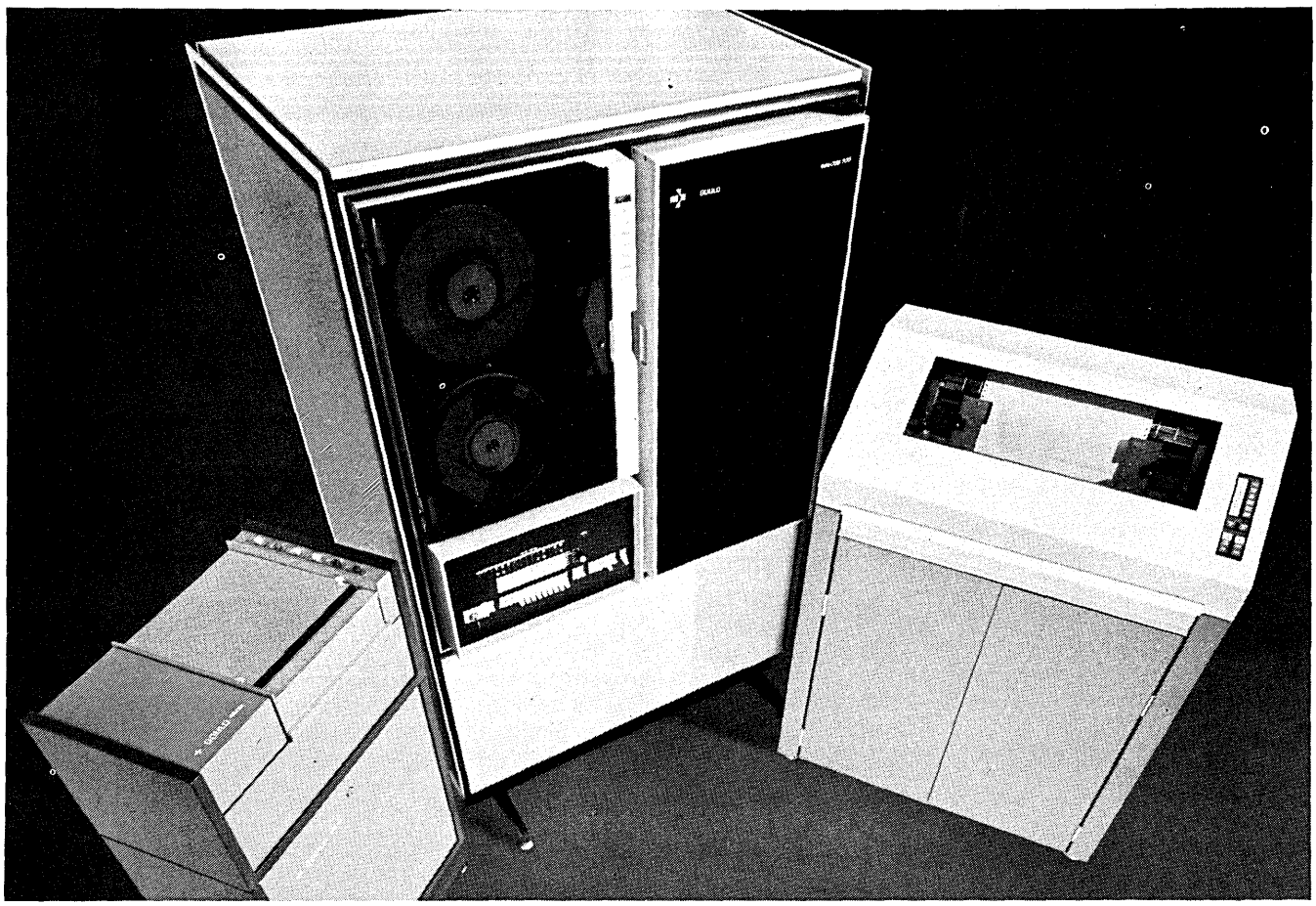

Only Beta COM gives you the greatest COM system utilization possible. And reduces your operating costs as well.

Many people are already using programmable Beta COM computer output microfilm systems because they reduce costs, give better quality and provide more versatile output.

And now Beta COM offers you the option of two peripheral printers. Which makes it the most flexible system going. One that can significantly reduce the cost of producing readable film, paper copy and graphics.

Model 980, the non-impact electrostatic printer, prints at 3000 lines a minute. Model 920, the impact printer, at 600 lines a minute.

The applications are numerous. For example: Off-line printing. Simultaneous selective printing on microfilm and paper. Exception report generation. Quick proofing of COM data. Program listings and tape dumps. Graphics.

What's more, you also get complete flexibility of software selection. So you can choose the media output you want. And since hardware and software are priced separately, you pay for only what you need.

For more details on the unique Beta COM system, write or call Gould Inc., Data Systems Division, 20 Ossipee Road, Newton Upper Falls, Mass. 02164. Telephone (617) 969-6510.

ADVANCED DATA HANDLING SYSTEMS

GOULD

DUO 360/370 shrinks OS manpower conversion costs up to 90%.

Going from DOS to OS is a battle.

For one thing, programmer manhours are monstrously inflated by the need to reprogram everything from DOS. With DUO 360/370 you get *OS results* without reprogramming.

For another, OS test time is an obstacle. DUO cuts it by as much as 90%.

And in the conversion, departmental morale suffers heavily. DUO removes the pressure, by removing the need to reprogram everything at once.

What is DUO 360/370? Some kind of knight in shining armor?

If you're captured in the OS conversion process, it is. Because DUO permits most DOS object programs to fully access OS *facilities without reprogramming*. Your DOS supervisor is not needed. And that makes DUO unique in the marketplace.

It's been in operation at blue chip companies across the nation for over a year now. Try DUO 360/370 free, on your own computer, and prove it for yourself. Simply call me, Sterling Williams, Product Manager, (214) 637-5010, or write.

Gentlemen: I'm interested in a free trial of DUO 360/370 on my equipment.

☐ send me more information
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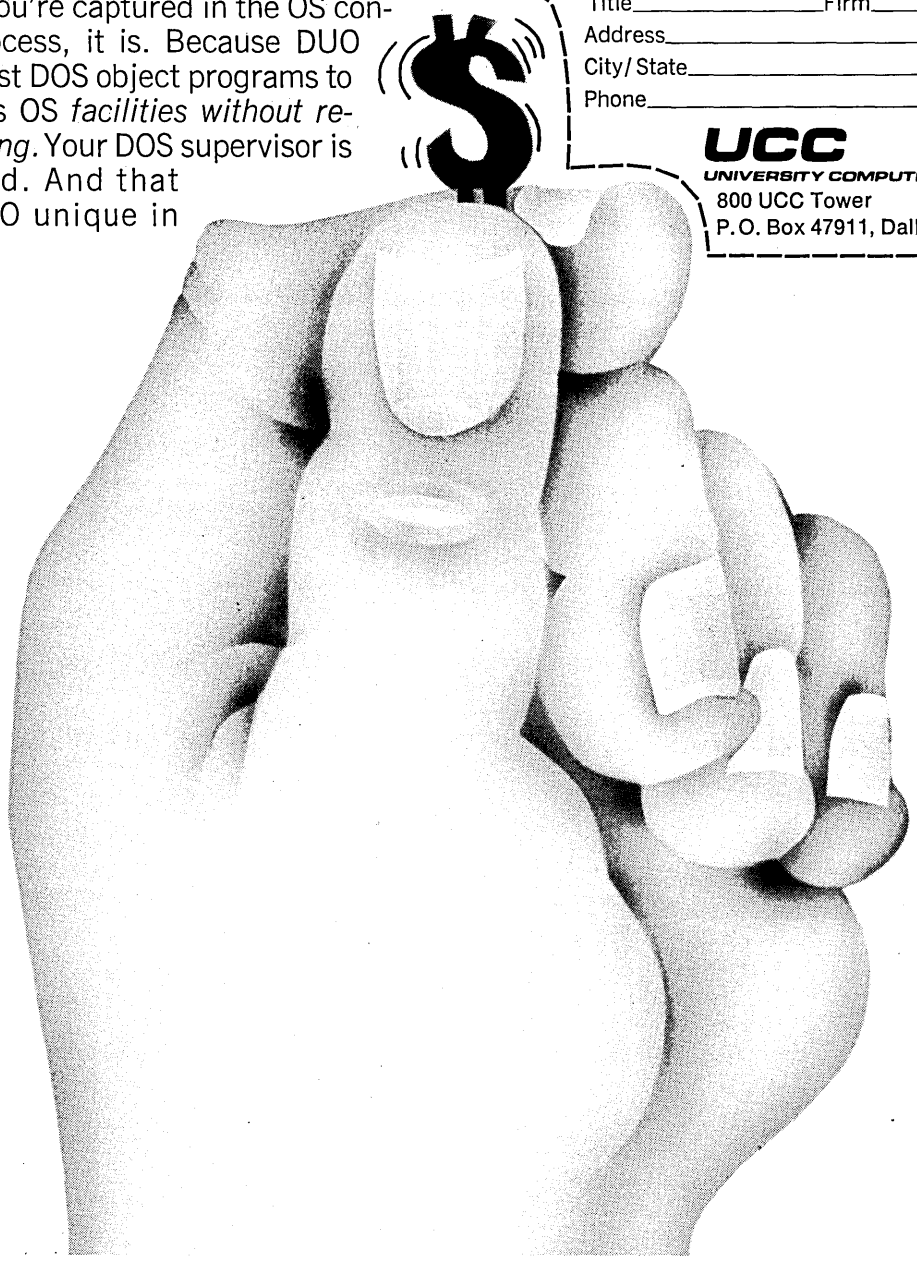


It's as current as a PDP-8.

These days, a computer has to keep up with the times.

Like PDP-8. It's still the most popular minicomputer ever made.

Because we keep thinking about our computers long after we put them on the production line.

We keep making improvements as we go along.

Keep developing new options. And new software.

Like OS/8, a 4th generation operating system with a new set of math routines that go 4-5 times faster than the system it replaces.

And COS/300 the new data management system for the PDP-8.

And DEC/X8, a totally new concept in systems exercisers.

And RTPS, the realtime FORTRAN IV that's faster than the giant computers.

Lower cost DECtape. Lower cost DECdisplays. Low cost DECwriters. Low cost DECmagtape. Low cost DECdisks.

Of course, there are some things about the PDP-8 that naturally keep it up-to-date. Like the OMNIBUS® structure that lets you plug in everything. Anywhere. In any order. At any time.

And nobody is as careful as we are. Nobody tests their computers as much as we do. Nobody uses computers to build computers like we do.

Which should help to explain why PDP-8 is the most popular minicomputer ever made.

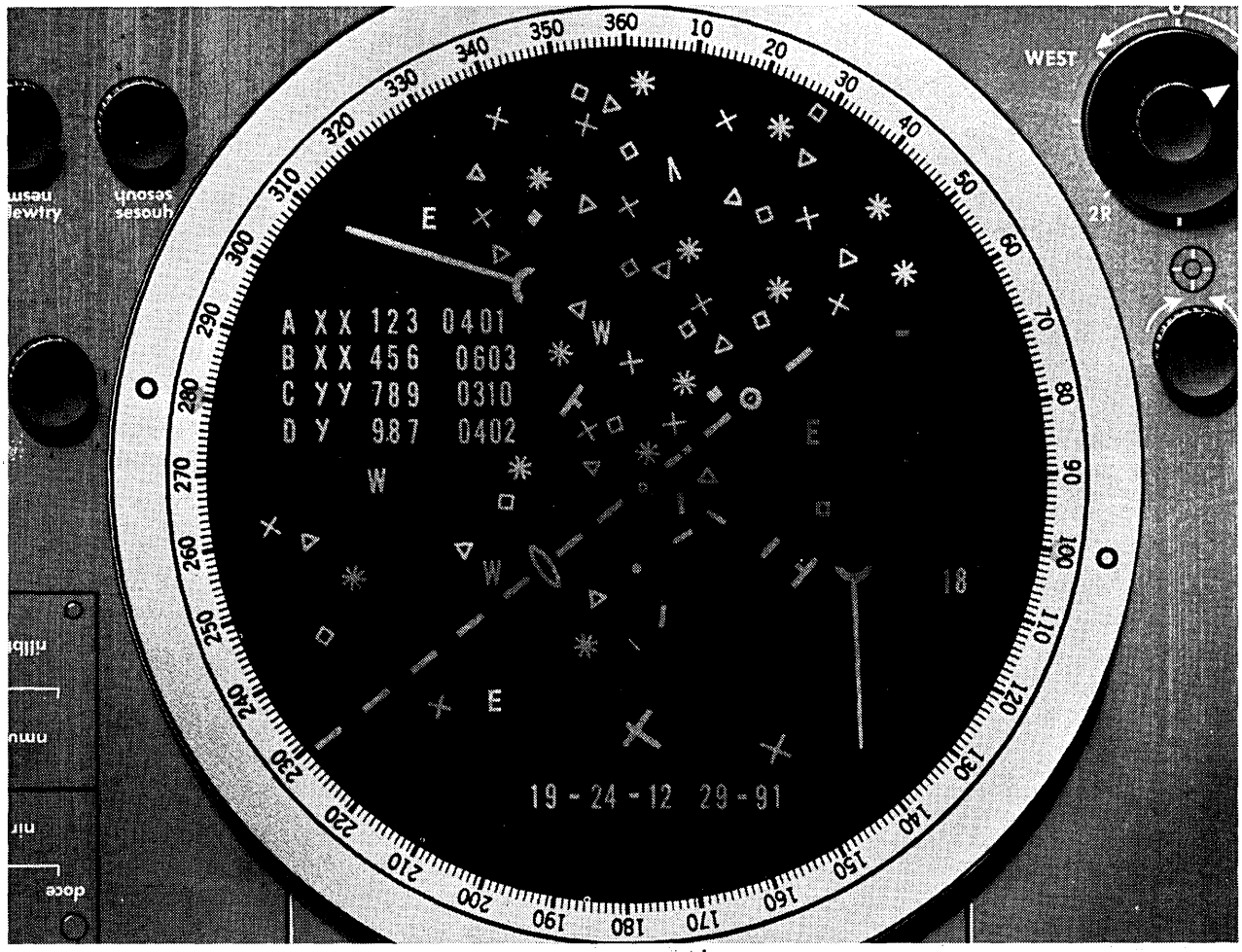
Read all about it.

Write Digital Equipment Corporation, Maynard, Mass. 01754. (617) 897-5111. European headquarters: 81 route de l'Aire, 1211 Geneva 26 Tel.: 42 79 50.

digital

CIRCLE 32 ON READER CARD

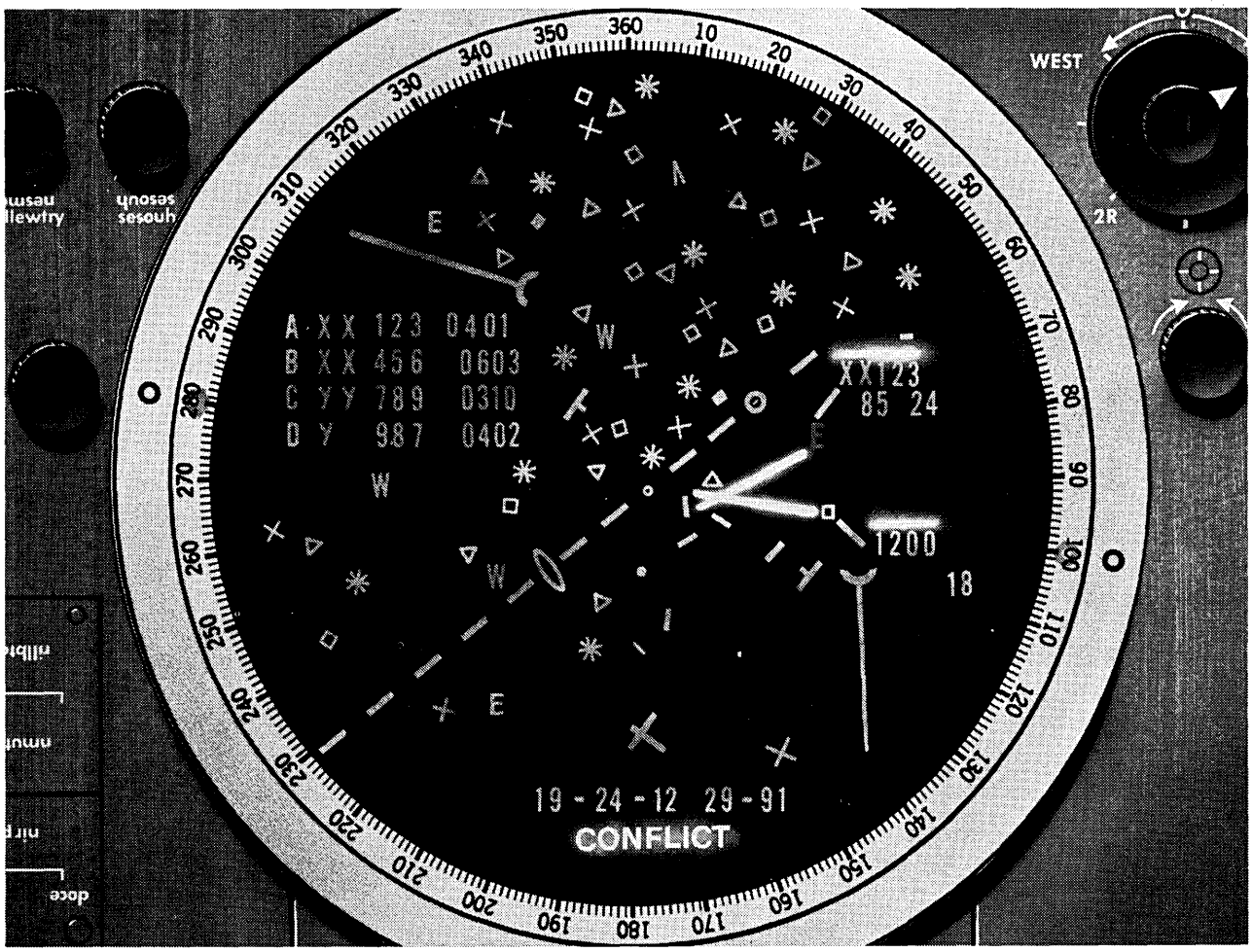
Can you find the aircraft headed for collision?



Goodyear STARAN: It's a new way

The STARAN™ computer helps air traffic controllers achieve better management of controlled aircraft by automatically tracking *all* the aircraft in the sky. With STARAN, reliable ground-based conflict prediction and resolution is now practical and economical—no costly equipment is required in the aircraft. Truly, STARAN is a new computer tool—available now—to enhance air safety and to relieve costly congestion.

STARAN can.



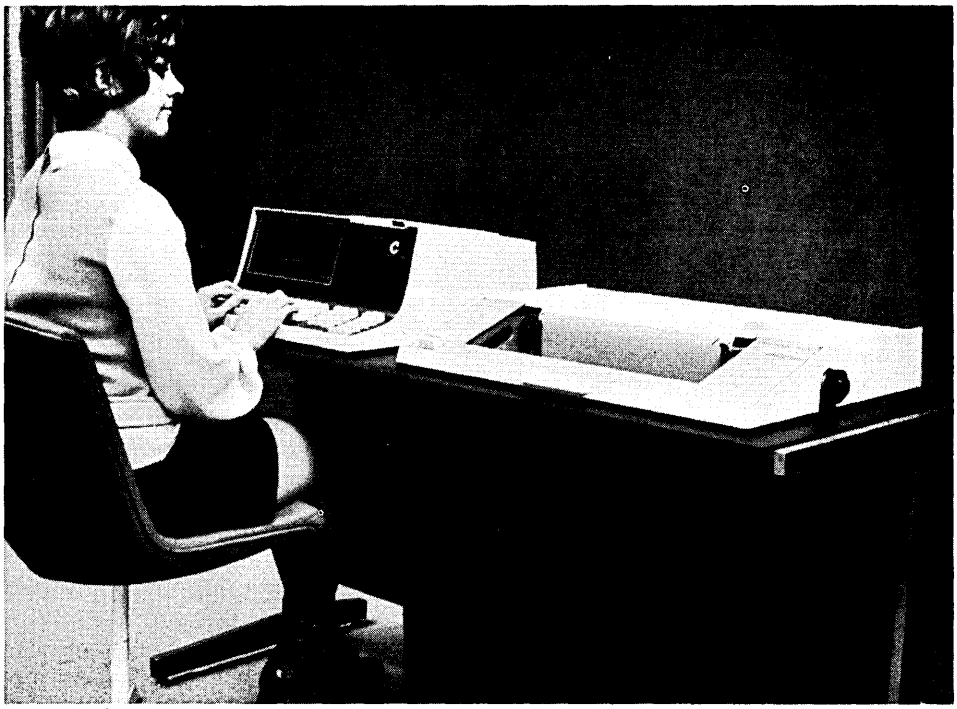
# of thinking for air traffic control.

STARAN is an associative array processor—"a new way of thinking." STARAN uses *content addressability* to eliminate slow, word-by-word searches of data memories, and *array arithmetic* to process thousands of data streams simultaneously.

The STARAN computer has already proven its capabilities in operation at McGhee-Tyson Airport in Knoxville. But most important is what STARAN can do for you. To find out, call Wayne Brubaker, 216-794-3631, or write Goodyear Aerospace Corporation, Department 911 PPS, Akron, Ohio 44315.

GOODYEAR AEROSPACE

the best way to get source data converted and entered into a large computer is with a small computer



more than 500 Datapoint 2200's are proving that every day

Source data conversion and entry into a central computer continues to be a major hangup in many organizations, especially commercial and business activities where the volume of incoming data mounts ever higher. A growing number of savvy data processing managers have found a cost/effective way out of this dilemma.

More than 500 Datapoint 2200's have been shipped by Computer Terminal Corporation, primarily for use in data conversion and entry applications. This unique system—actually a powerful general purpose computer integrated with a CRT data terminal—makes possible delivery of *error free data* to a large central computer, on- or off-line, in just *one* handling, while the Datapoint's programmability allows easy adaption to a multitude of applications. Results: lower handling costs, smoother processing runs, and the ability to meet changing data needs swiftly.

Consider these Datapoint features:

- A full general purpose processor with push-down stacks, 14 registers and interrupts
- Alphanumeric keyboard and CRT display
- Dual digital cassette tape drives for on- or off-line use
- A full range of plug-in peripherals, including impact and line printers, tape drives and disc
- Complete operating systems and the comprehensive DATABUS high-level language; also interface software for most major computers
- Attached communications adapter for Bell 103, 202 and binary synchronous interface

The Datapoint 2200 is *proven in use. It's a complete computer/terminal system, communications oriented* and ready to go to work in your shop *now.* For more information and for a free copy of our systems book, "The Datapoint 2200: The Business Mini Computer," write or call the Computer Terminal office nearest you or contact corporate headquarters.

Datapoint 2200

THE BUSINESS MINI COMPUTER

Computer Terminal Corporation

Home Office:
9725 Datapoint Drive/San Antonio, Texas 78284/(512) 696-4520

Field Offices:
Boston/(617) 359-4296
Chicago/(312) 671-5310
Cleveland/(216) 831-1777
Dallas/(214) 637-4166
Denver/(303) 244-2451
Detroit/(313) 557-6092
Houston/(713) 626-0010
Los Angeles/(213) 645-5400
Minneapolis/(612) 771-4926
New York/(212) 759-4656
Portland/(503) 289-9655
San Francisco/(408) 732-9953
Washington, D. C./(301) 587-3910

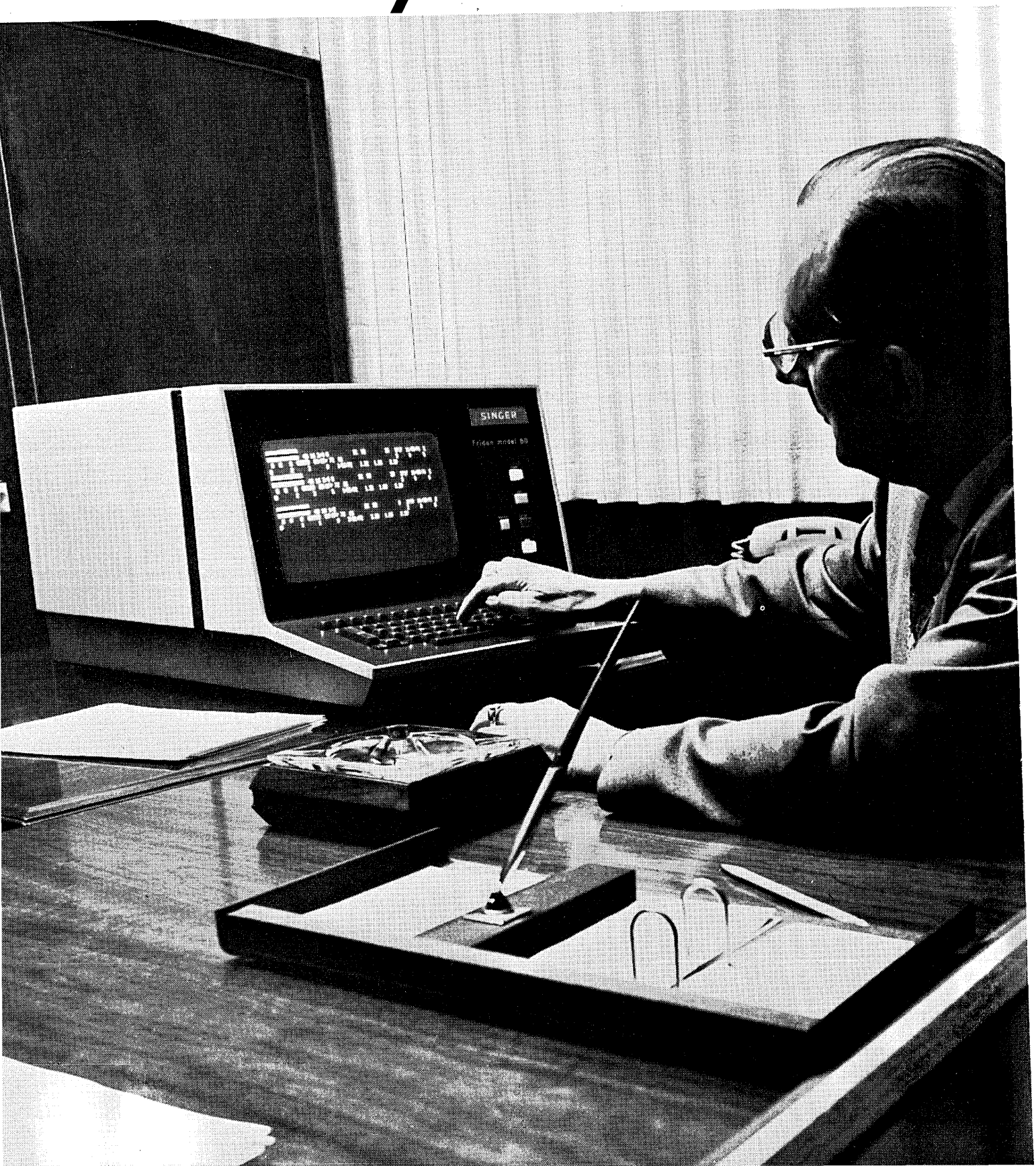
International Representative:
TRW Communications/Toronto, Ontario, Canada/(416) 481-7288
TRW Communications/Lyss/Berne, Switzerland/Telex: 34446
TRW Electronics-International/Los Angeles, California/Telex: 674593

"Mini-based systems are potentially the brightest and most flexible of the intelligent terminals....If the minicomputer function is replaced by true, low priced components, watch out.... There will be no reason to have any but such an intelligent terminal."

EDP Industry Report.

Turn the page.
And watch out.

Singer offers just such an intelligent terminal system: System Ten.



A true stand-alone terminal system.

SYSTEM TEN* computer by Singer offers you multi-programming capabilities. Up to 20 functions simultaneously.

The data base is both broad and flexible. Direct access storage from 10 to 100 million characters is available. Core storage in increments of 10K, from 10K to 110K.

This is the perfect processor for remote locations because of its basic operating simplicity.

No technical management is needed to operate or even oversee it. So there is *no* staffing up of technical people in your remote locations.

Since ours is an operator interactive system, there are none of the operational headaches of a punched card system to put up with.

The SYSTEM TEN computer can pre-process all those jobs that now seem to strangle your keypunch-to-mainframe system. It can edit, format, and summarize data — on the spot. As well as perform a great many day-to-day functions without using your central mainframe at all: billing, accounting, payroll, sales reports, and inventory control.

And the system can handle any peripheral equipment you need: line printers, CRTs, paper tape, typewriter I/O, POS and data collection devices, disc drives, card readers and punches. It can also interface with the 4300 Magnetic Data Recording System by Singer.

A true intelligent terminal.

Match our IQ against any other system you can name.

SYSTEM TEN computer operates in synchronous mode, from 2000 to 9600 bps.

It can operate in OS, DOS, and HASP environments.

It operates in asynchronous mode from 110 to 1800 bps.

You can have it with optional automatic dial too.

SYSTEM TEN computer will also act as a point of sale data collection system, with MDTS* computerized cash registers by Singer. These terminals, like the other peripherals, can be located up to 2,000 feet from the CPU, connected via simple two-wire connections.

As you can see, SYSTEM TEN is no simple I/O station.

It offers direct access storage. It's flexible. Simple to operate. With multi-programming capabilities.

And it is backed by a nationwide maintenance service. Singer branch offices and field engineers in most major cities. And in hundreds of other cities too. We know how important service is to you in a remote processing operation.

Now, what about price?

With a remarkable price/performance ratio.

What have you been paying for "semi-intelligent" terminals and keypunch machines?

What have you been paying in mainframe time to edit, format and balance data?

When you compare those costs to the the cost of a SYSTEM TEN computer installation, you'll understand why we use the word "remarkable." And you'll understand why over 300 SYSTEM TEN computers are now installed.

A comparison, system against system, is only a telephone call away.

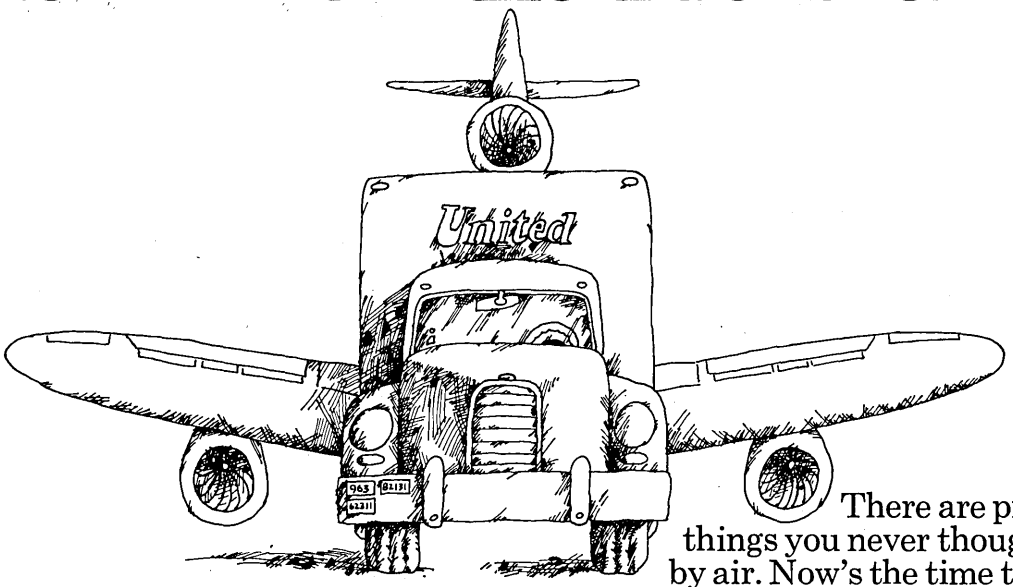
For complete information, call your local Singer Business Machines office. Or write: Singer Business Machines, San Leandro, California 94577.

System Ten by SINGER

SINGER Consumer Products, Industrial Products, Aerospace & Marine Systems, Business Machines, Education & Training Products.
***Business Machines Division**—producers of calculators, mailing equipment, computer systems, data transaction systems, billing/accounting systems, graphic arts equipment.*

CIRCLE 93 ON READER CARD

Now United offers such low container rates, you can hardly tell us from the truckers.



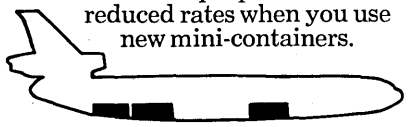
There are probably some small things you never thought of shipping by air. Now's the time to think about it. Because every United passenger plane now carries containerized freight below deck.

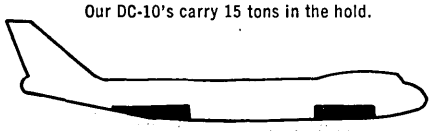
This means, when you ship in a container, you now get a special rate.

Besides saving you money, containers also provide the utmost in security. Your shipment gets there. Especially when you ship on United. Because we're the people with the best record for safe handling in the industry.

It's a whole new sky. So find out how our rates and security can be tailored to your needs. Just call a friend. United.

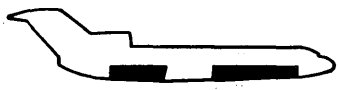
Every United jet carries cargo.
And our people can offer reduced rates when you use new mini-containers.


Our DC-10's carry 15 tons in the hold.


Our 747's carry 17 tons in the hold.


Our DC-8's carry 10 tons in the hold.


Our 720's carry 10 tons in the hold.


Our 727's carry 6 tons in the hold.


Our 737's carry 6 tons in the hold.

Friends let you ship more for less
in these Jumbo Jet containers. Ship up to 3,100 lbs. in each for the cost of 1,260 lbs.

United Air Lines Jet Freight *No. 1 in the U.S. sky*

©United Air Lines, Inc. 1972

For Mohawk CIRCLE 24 ON READER CARD→

SYSTEM 2400 HAS GROWN.

AGAIN.

MDS has multiplied the options. Again.

We've doubled available core capacity to 65k and given bigger units one microsecond speed.

Which means more muscle, now or later, to get work in, out, and off your mainframe at friendlier costs.

So come at System 2400 with all your problems at once. Communications. Data entry. Off-line processing. Today, you can configure more of a good thing.

We invite you to turn the page and see what's new from the peripheral power, MDS.

For openers, you can justify System 2400 from MDS for the money you'll save on communications terminals alone.

From $500 to $1000 per month per terminal.

That's compared with IBM rentals, and you can take us to any comparison you like. System 2400 talks to all mainframes.

But don't stop with communications.

System 2400 can save you the people headaches when you centralize your mainframe.

Like local managers losing control of their data.

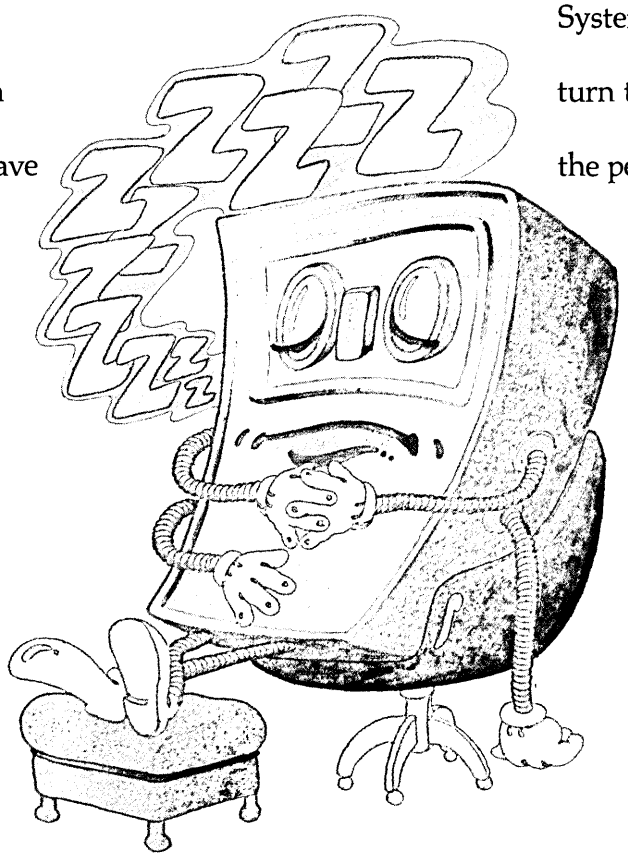
Like firing trained key operators in one city, only to have to hire and train new ones in another.

System 2400 is the one communicator that can combine volume key entry, plus off-line sorting, printing and editing.

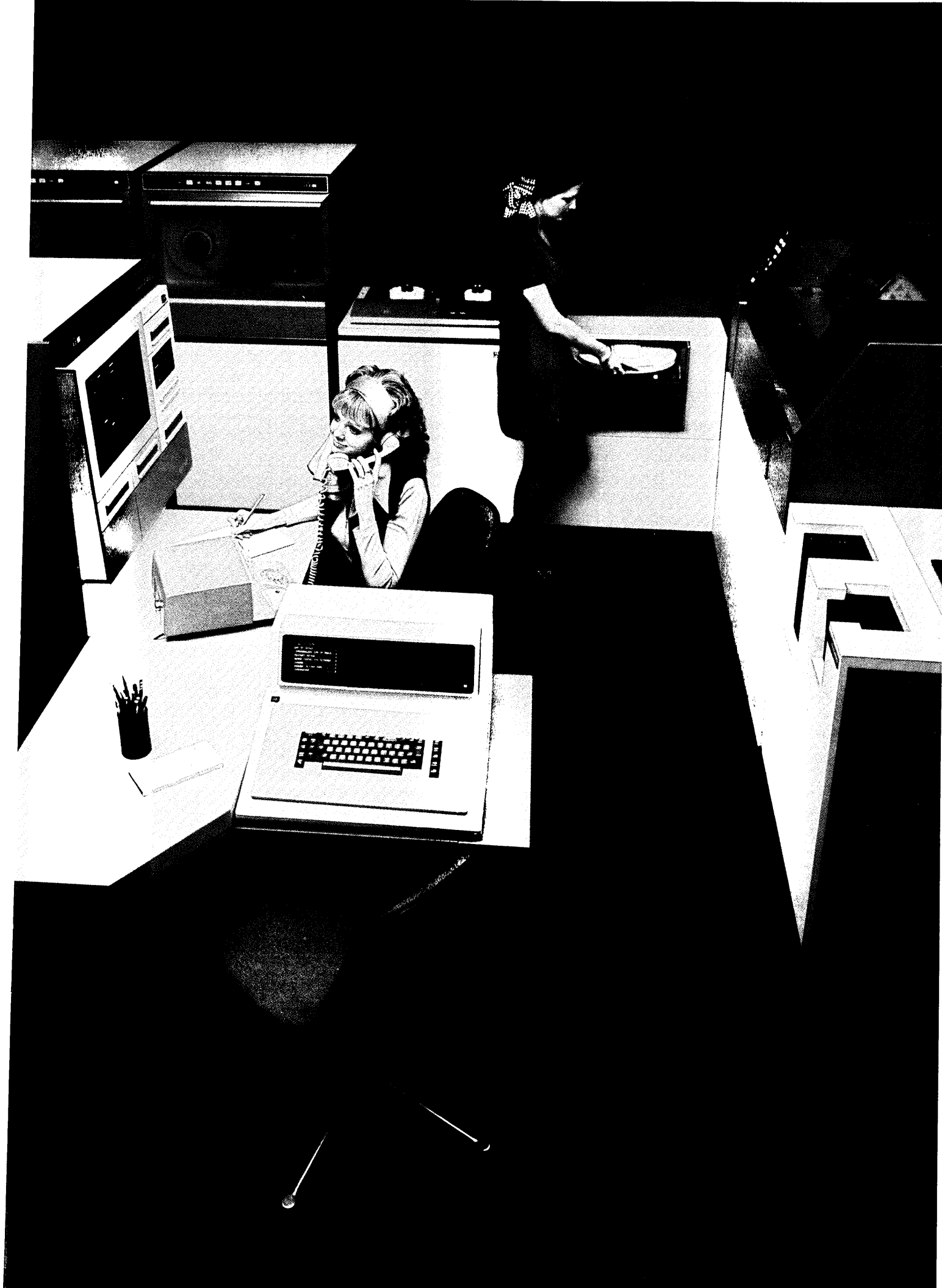
It's all in how you configure it, and you can configure a lot with the expanded core capacity now available. What's more, disc communications can now be part of the System 2400.

Again, we invite you to turn the page.

There's more from the peripheral power, MDS.



If all your communications terminals do is communicate, you could be shortchanged.



Rest easy.

MDS isn't talking needless extinction where you really need a piece of paper.

But on volume entry, you don't.

Eliminate the pokey old punchcard, go directly to magnetic media, and you can save a bundle.

MDS grew out of this simple idea, and the newest in a full spectrum of key-to-tape capabilities is the 2400 Key Display System.

The tutorial CRT tells inexperienced operators what to do, and at the same time, lets them see they're doing it right.

The result can only be quicker, cleaner data entry, especially where operators deal with many kinds each day.

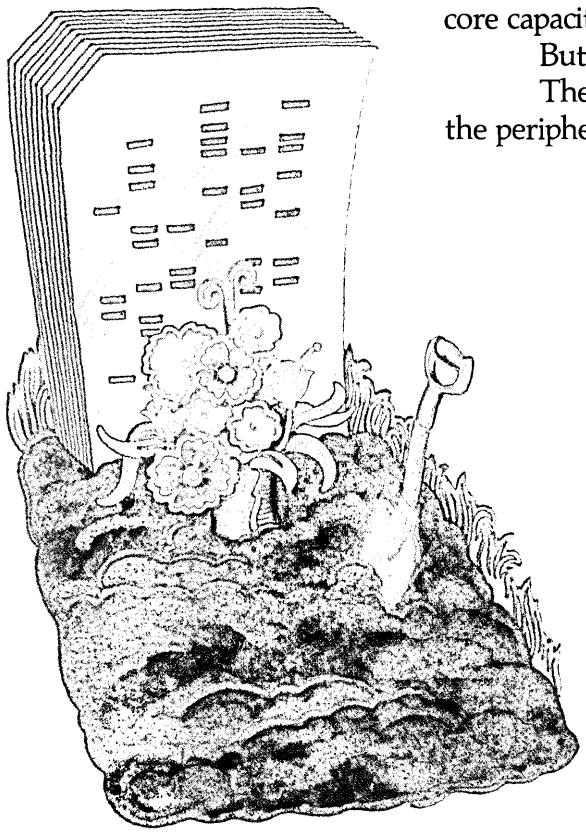
We've got plenty of track record to prove our point. You'll boost throughput and discover friendlier costs both for equipment and people.

But the nice part is this. System 2400 can be anything you ask it to. A dedicated cluster of up to 20 stations. A remote communications terminal with data entry capability. An add-on to peripheral processing.

And now, with boosted core capacity, all of the above.

But turn the page.

There's more from the peripheral power, MDS.



You've never had a better reason to eliminate the expensive middleman, the punchcard.

Shocking fact. All too many of today's big mainframes spend as much as 80% of their time not computing.

Expensive, when you think about it. All that sorting and printing and editing.

System 2400 can be configured to do all that kind of clerk's work. At peripheral equipment rentals instead of at mainframe prices.

We believe there are a surprising number of companies with large data operations that could be saving $100 per hour or more, compared with the options. A bigger mainframe, another mainframe, or more shifts.

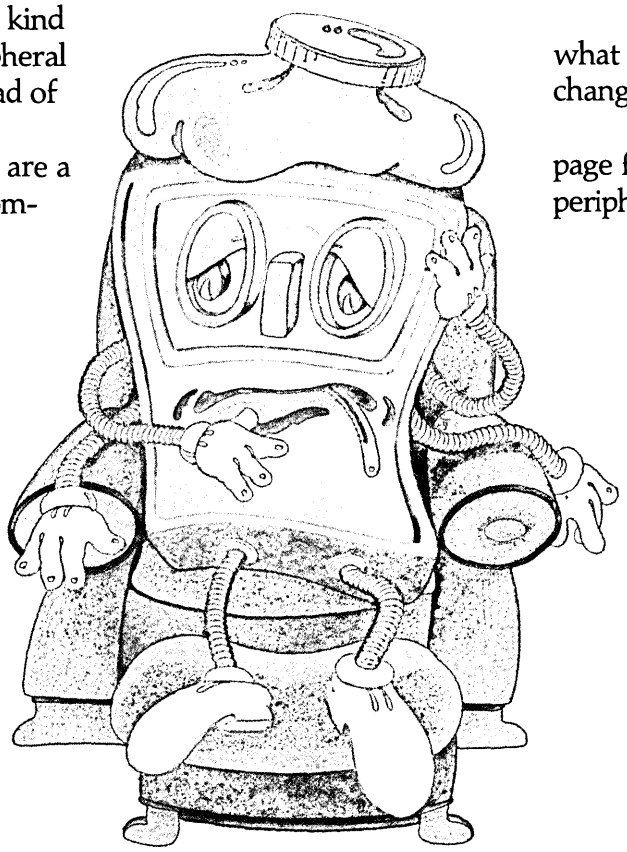
Hardware?

We've expanded our lineup of printers, tape, disc and card equipment. New are a series of tape drives to 75 ips, a dual-disc unit, paper tape read-and-punch equipment, plus a new matrix printer.

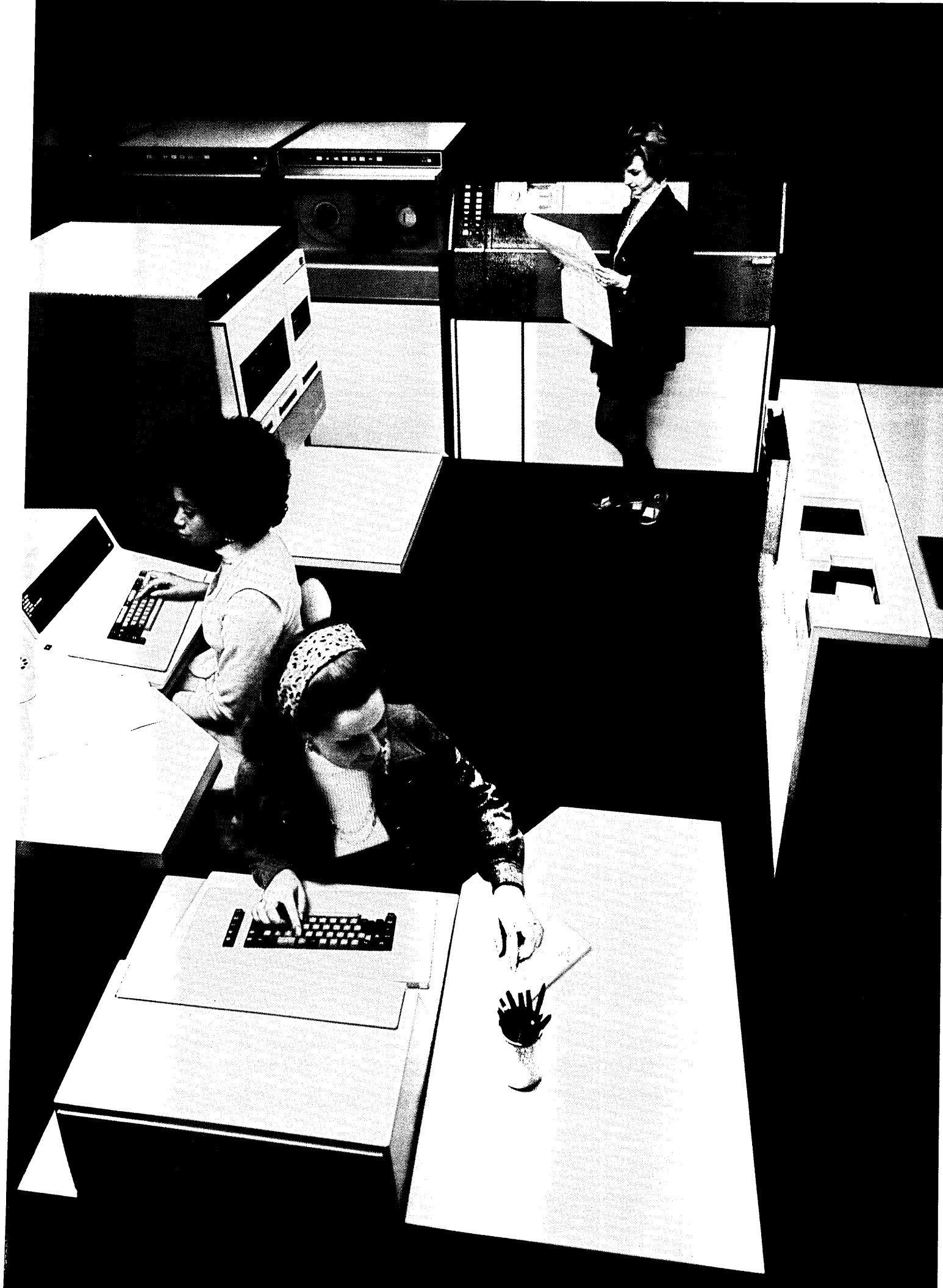
You can add key-display data entry and communications.

In short, you can have what you need now, and change your mind later.

Again, please turn the page for a word about the peripheral power, MDS.



You'll get more out of your overworked mainframe by putting less in.



System 2400 has evolved rapidly since its introduction February 15, 1971.

But then, our company, Mohawk Data Sciences Corp., has evolved rapidly since its beginning in 1964.

In eight years, we've come from scratch to be the largest independent maker of peripheral equipment and systems.

We did it, the old-fashioned way. By doing computer users one better. In key-to-tape data entry. In plug-compatible peripherals. Now in satellite systems.

Fact is, four out of five companies that top *Fortune's 500* list are our customers. So are more than 40% of the total 500.

Unabashedly, we say this makes us the peripheral power. So fair warning. We're out to earn your business the only way that makes sense. Price/performance/service.

Reason enough to hear us out? Return the coupon, call our nearest office or call MDS Domestic Marketing Dept. 20 at (315) 867-6610.

We'll send the MDS man near you, which is easy, because there are over 2000 MDS sales and service people in the field.

MDS®

Domestic Marketing Dept. 20
Mohawk Data Sciences Corp.
Herkimer, N.Y. 13350

Tell me more about System 2400
- ☐ for communications
- ☐ for data entry
- ☐ for peripheral processing
- ☐ for all of the above

Name

Title

Company

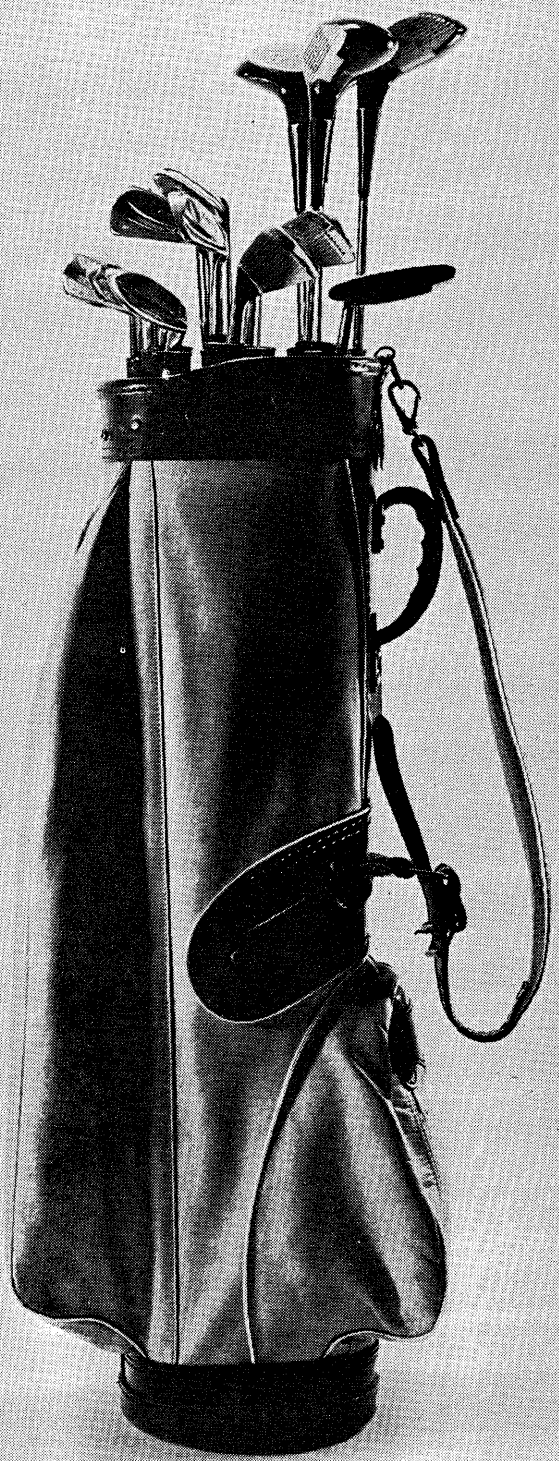
Address

City

State Zip

The making of the Peripheral Power.

the compatible **FACOM** family computers for every purpose



We always had our own ideas about designing computers. We realized that too many computers on the market were made expensive by too many features, features you had to pay for and possibly never used. So we designed the unique mini model FACOM R-E, a paragon of performance and economy.

On the other hand, computer needs grow as business grows, and we designed systems that can grow right along with demands. Take our FACOM 230-25, for instance, which speaks about every computer language available, and features multi-level interruption and memory protection when working on different problems concurrently.

And for those who have big requirements from the start, we designed a huge time-sharing system, the FACOM 230-60.

All in all, we can offer 14 basic models, and for each model a choice of the latest peripherals and complete software packages.

So whenever you need a compatible computer, take a look at our FACOM family. Every model is a paragon of performance and economy.

FUJITSU LIMITED
Communications and Electronics
Marunouchi, Tokyo, Japan

MAIN PRODUCTS □ Telephone Exchange Equipment □ Carrier Transmission Equipment □ Radio Communication Equipment □ Space Electronics Systems □ Auto Radios & Car Stereos (TEN) □ Electronic Computers & Peripheral Equipment (FACOM) □ Telegraph & Data Communication Equipment □ Numerical Control Equipment (FANUC) □ Remote Control & Telemetering Equipment □ Electronic Components

The data base must be viewed as a collection of installation-owned data which fulfills the requirements of all applications which access it and which must be structured to model the natural data relationships that exist in a company

Basic Concepts in Data Base

The design and implementation of a data base management system is one of the most elusive and complicated projects in software development. The software graveyard is filled with data base management systems. These systems have all died by abandonment in quiet corners of software shops. Some data base management systems operating today are kept alive only by vendor executive edict and the zeal of marketing representatives. Today, there is a continual emergence of new data base management systems—many of which, like some ancient cities, are built on the rubble of previous devastations.

Data base management is currently a hotly debated subject, filled with controversy, emotion, and covert vendor manipulation. Many users and vendors who are not involved in the debate are nonetheless interested and concerned about the subject.

How did we go wrong?

The Conference on Data Systems Language (CODASYL) was organized in 1959 in response to the need for a common business oriented language (COBOL), designed to be independent of any current or future make or model of computer and which would reduce the cost of program creation, maintenance, transferability, and documentation. COBOL allowed the user to define data and procedures to exactly fulfill the processing requirements of an application. The original COBOL specification assumed serial processing of data, provided by existing magnetic tape technology which is an acceptable approach in many applications.

However, the implementation of more sophisticated business applications combined with the development of disc and drum technology showed the shortcomings of serial methods and emphasized the need for new methods of data storage and retrieval on direct access devices.

The onslaught of third-generation hardware and software in 1964 diverted considerable software resources into development of viable operating systems and language compilers at the expense of data base management system development. The primitive access methods provided by many vendors greatly influence the design, implementation, and performance of many advanced applications. As a result, many applications require additional sort/merge programs, greater data redundancy, and repetitive entry of input data.

Clearly, the need exists for a data base management system to provide: control of data structure, comprehensive language for data manipulation, adequate execution performance, and system integrity.

Note that the basic needs have not changed; only the hardware technology and application requirements have changed. Failure of a system to meet user needs in any of these functions leads to the ultimate abandonment and/or replacement of the system so affected.

A new way out of the morass

Acceptance of the April '71 report of CODASYL Data Base Task Group (DBTG) by the Programming Languages Committee in May 1971 for inclusion in the COBOL Journal of Development language specifications marked the culmination of six years of effort by many knowledgeable software developers and users to produce a language for the description and manipulation of data stored within a data base. The language specifications for describing a data base are designed to be independent of any programming language.

However, the language specifications for manipulation of data are designed to be used as an extension of existing programming languages. Like any new language specification, the DBTG report needs refinements which can be created only by implementation and use of the language. As it stands, it offers significant advantages over currently available data base management systems. It represents a giant step in the right direction. The subject of data base management systems, data base data description, and data manipulation covers a wide range of topics of varying complexity. However, the basic concepts of a data base management system are not difficult to under-

Management Systems

by Richard F. Schubert

stand.

This article will briefly describe the philosophy and terminology of the DBTG languages and give examples, wherever appropriate, of B. F. Goodrich Chemical Co.'s implementation experience on IBM hardware. All of the concepts and languages have one thing in common: the data base. It is important, therefore, that a basic understanding of the elements of a data base be obtained. The definitions and descriptions in this article are only an introduction to the subject.

A convenient starting point in the discussion of data base management systems is to describe the concepts and elements of a data base.

Data base concepts

In its most primitive form, a data base is a centralized collection of all data stored for one or more related applications. Current direct-access hardware technology permits data for many applications to share the same storage device. This in turn makes it possible for two or more applications to use a common, single source of data and thus eliminate the cost and complexity of data redundancy. Once data has been integrated, a need arises for the ability to structure data in a manner which meets the requirements of each application. An application requirement may be to access only a specified portion of data in the data base and thereby remove data required by other applications from view. Furthermore, all applications may not be written in the same programming language. This in turn requires that the data and its description be independent of any programming language.

Data independence and the separation of data description from the restrictions and conventions of any programming language allow centralized data base maintenance, protection, and control over physical aspects of the data base.

A data base then can be viewed as more than an ordinary collection of data for several related applications. The data base must be viewed as a generalized, common, integrated collection of company or installation-owned data which fulfills the data requirements of all applications which access it. In addition, the data within the data base must be structured to model the natural data relationships which exist in a company.

Data base elements

The three elements of a data base are: physical storage structure, data and control information contained within a data base, and logical relationships among data stored within the data base.

Terminology and definitions used will be based on the April '71 report of the CODASYL Data Base Task Group and an implementation of a subset of the DBTG specifications produced by B. F. Goodrich Chemical Co. called Integrated Database Management System (IDMS).

Physical storage structure

The physical storage structure of a data base can vary considerably depending on the design of the direct access storage device and the manufacturer of the machine. In this discussion, let us assume that an entire integrated data base is contained in a single disc unit.

The single disc unit contains 404 cylinders (or arm positions). Each cylinder contains 19 tracks (or recording surfaces), each of which has capacity for four 3,156-byte blocks of information. Thus, the physical data base is subdivided into 404 x 19 x 4 = 30,704 contiguous blocks. Each block of information is called a *page* and is the unit of physical data transfer between the data base and main memory of the system. The pages are numbered in consecutive order beginning with the first block in the first track of the first cylinder and ending with the last block of the last track of the last cylinder. The page numbers will range from 0 through 30,703. In this manner, every page has a unique number identifier and occupies a known location within the data base.

An *area* is a named subdivision of a data base consisting of a given number of contiguous pages. The area defined for the BFG on-line order processing

system (TOPSY) and the area for payables, raw material inventory, and engineering stores system (PRESTO) is defined as follows:

	EXTENT	
Area Name	*Low Page*	*High Page*
TOPSY	4000	12999
PRESTO	13000	19000

Thus the 9,000-page TOPSY area begins at page 4,000 and continues to the page numbered 12,999. A user program which requires access to information stored within the TOPSY area must execute a statement which declares the type of data base operations to be executed and whether concurrent access by other independent programs is allowed.

Contents of a data base

The smallest unit of named data in a data base is a *data item*. In addition to a name, a data item has other attributes which define its type and length. A data item may be described by

```
CUST-NO          PICTURE X(11)
```

where CUST-NO is the name of the data item and the X(11) picture indicates that the length of the item is 11 bytes and may contain any character in the machine's character set. An occurrence of a CUST-NO data item would have a value such as 71320601011.

A *record* is a collection of one or more data items. A record description consists of its name followed by the names and attributes of all data items included within the record. The record named CUSTOMER contains the data items:

```
CUST-NO          PICTURE X(11)
CUST-NAME        PICTURE X(32)
CUST-ADDR        PICTURE X(32)
```

where CUST-NO is the identification number assigned to the customer followed by the customer's name (CUST-NAME) and address (CUST-ADDR). Any reference to the CUSTOMER record implies reference to all data items within the record. This description may be considered a model or template for the CUSTOMER record type wherever it appears in the data base.

An *occurrence* of a CUSTOMER record type exists when a value for each data item exists within the data base. Three occurrences of the CUSTOMER record appear in Table 1.

CUSTOMER RECORD	CUST-NO	CUST-NAME	CUST-ADDR
Occurrence #1	71320601011	H. Martoyal Inc.	689 Pennington Ave.
Occurrence #2	81182803003	Texoil Inc.	P.O. Box 1608
Occurrence #3	87580701001	Weathering Co.	P.O. Box 310

Table 1.

The distinction between a record type and a record occurrence is important. Note that any number of CUSTOMER record occurrences may appear in the data base, and each occurrence will contain a string of characters which are defined by the CUST-NO, CUST-NAME, and CUST-ADDR data item description.

Physical placement of records within a data base is controlled by specification of one or more areas in which record occurrences may be stored. In addition, one record type may be stored close to another record type to improve execution performance of the system. Any number of record types may be specified within any given area. Unless otherwise restricted, any number of record occurrences may appear for any given record type, subject to the total physical storage space limitation of the specified area. In addition, an occurrence of any record type specified for an area may be stored in any page in the specified area.

In addition to record occurrences, the data base also contains system information used to control access to each page, provide audit trail information, and inventory available space on each page.

Logical data relationships

The most common and familiar type of data structure exists within a record type. The CUSTOMER record type is an illustration of intrarecord data structure where the CUST-NO, CUST-NAME, and CUST-ADDR data items have an implied logical relationship to each other by their appearance together within the same record. Intrarecord data relationships are largely determined by the data content of the record and the meaning imparted to it by logical procedures within the application program. Intrarecord data structure is an important and useful capability which is essential in all data base applications. The additional provision for a flexible method of establishing relationships between record types is essential to fulfill the complete data structure requirements of an integrated data base.

Logical relationships between two or more record types are established by the *set* mechanism. The set establishes a logical relationship between two or more record types and is, in effect, a building block which allows various data structures to be built.

Fig. 1 is a representation of a set occurrence which includes three record occurrences shown by rectangular boxes. A set must have only one record type which functions as *owner* of the set. In addition, a set must have at least one record type which functions as a *member* of the set. Fig. 1 shows one owner record occurrence and two record occurrences which participate as

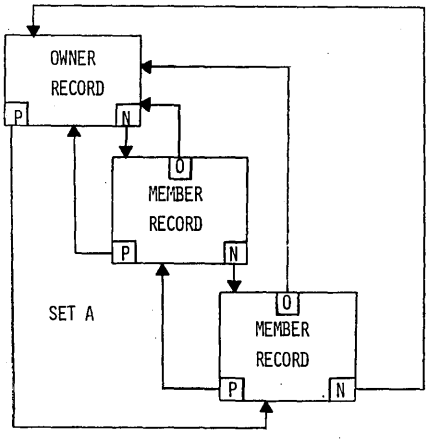


Fig. 1. Set occurrence with next (N), prior (P), and owner (O) pointers.

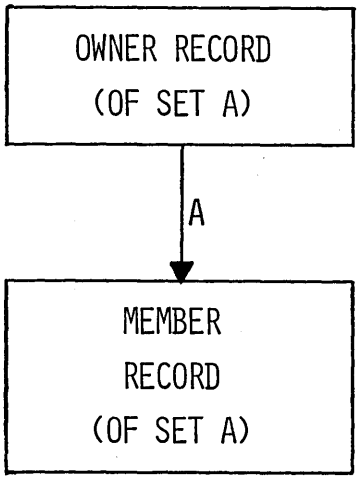


Fig. 2. Set representation.

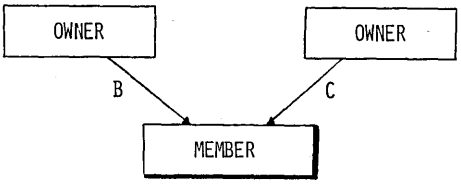


Fig. 3. Record type as a member of sets B and C.

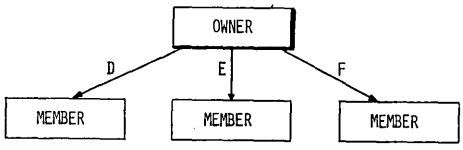


Fig. 4. Record type as owner of sets D, E, and F.

members. One possible implementation of the set mechanism is to use pointers which are included with the data as part of each record occurrence. The owner of the set contains a pointer marked "N" (next) which identifies the first member record occurrence.

The first member record occurrence also contains a pointer marked "N," which identifies the second member record occurrence in the set. Finally, the last record occurrence contains a pointer marked "N" which identifies the owner record. Taken together, all of the "N" pointers form a ring structure which is commonly called a chain. Moreover, the "N" pointers establish a logical chain order in the *next* direction.

The pointers marked "P" (prior) establish a logical chain order in the *prior* direction. The owner contains a pointer marked "P" which identifies the last member record occurrence in the set. The last record contains a pointer marked "P" which identifies its logical predecessor which in turn points to the owner record occurrence. In addition, each member record occurrence may optionally contain a pointer marked "O" which identifies the owner record occurrence. The next and prior chains along with owner pointers are considered as a model or template for all occurrences of the set named "A." Note that a data base may contain any number of owner record occurrences which in turn may have any number of member record occurrences.

Since the set mechanism can be used to build complicated relationships between record types, an abbreviated "shorthand" set notation is needed to simplify the graphical representation of data structure within the data base. Fig. 2 shows the owner record type as a rectangle with an arrow pointing to the rectangle representing all occurrences of the member record type.

The arrow is the shorthand equivalent of all next, prior, and owner pointers shown in Fig. 1. The name of the set (A) appears next to the arrow. The general rules for this representation are: The tail of the arrow touches the record type which is the owner of the set; the point of the arrow touches the record type which participates as a member of the set.

The set mechanism is a basic building block which can be used to construct complicated data structures. There are four basic rules for the formation of set relationships between record types:

1. Any record type may participate as a member in one or more sets. Fig. 3 uses the shorthand set representation described in Fig. 2 to show a record type which is a member of two sets, B and C.

2. Any record type may be the owner of one or more sets. Fig. 4 uses shorthand set representation to show a record type which is owner of three sets, D, E, and F.

3. Any record type may participate as a member in any number of sets, and also be owner of one or more other sets. Fig. 5 shows a record which participates as a member of set G and also is owner of set H. This is the representation of a hierarchical data structure.

4. A set may have only one record type as its owner but may have one or more record types as members. Fig. 6 shows two record types which participate as members of set J.

These four basic rules are used to design data structures which meet the overall requirements of an integrated data base. Fig. 7 illustrates the type of data structure which can be described with these rules using the shorthand notation described in Fig. 2. This structure is a portion of the B. F. Goodrich Chemical Co.'s on-line order entry system called TOPSY.

A complete description of data items included in each of the 34 record types and the structure provided by the 31 set types is beyond the scope of this

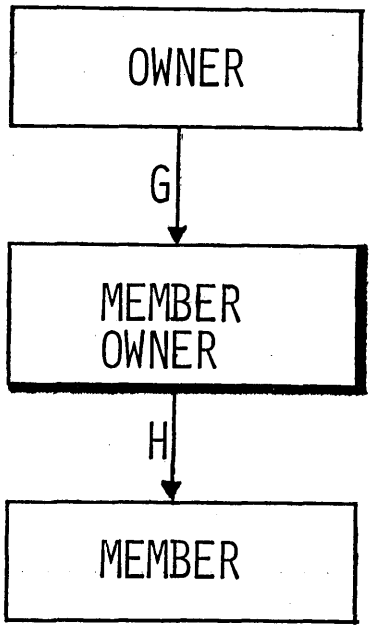


Fig. 5. Record type as member of set G and owner of set H.

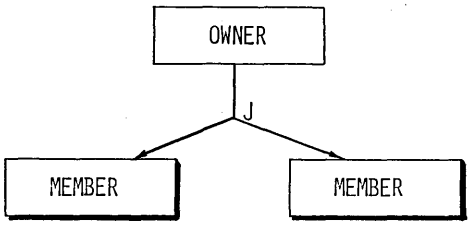


Fig. 6. Two record types as members of set J.

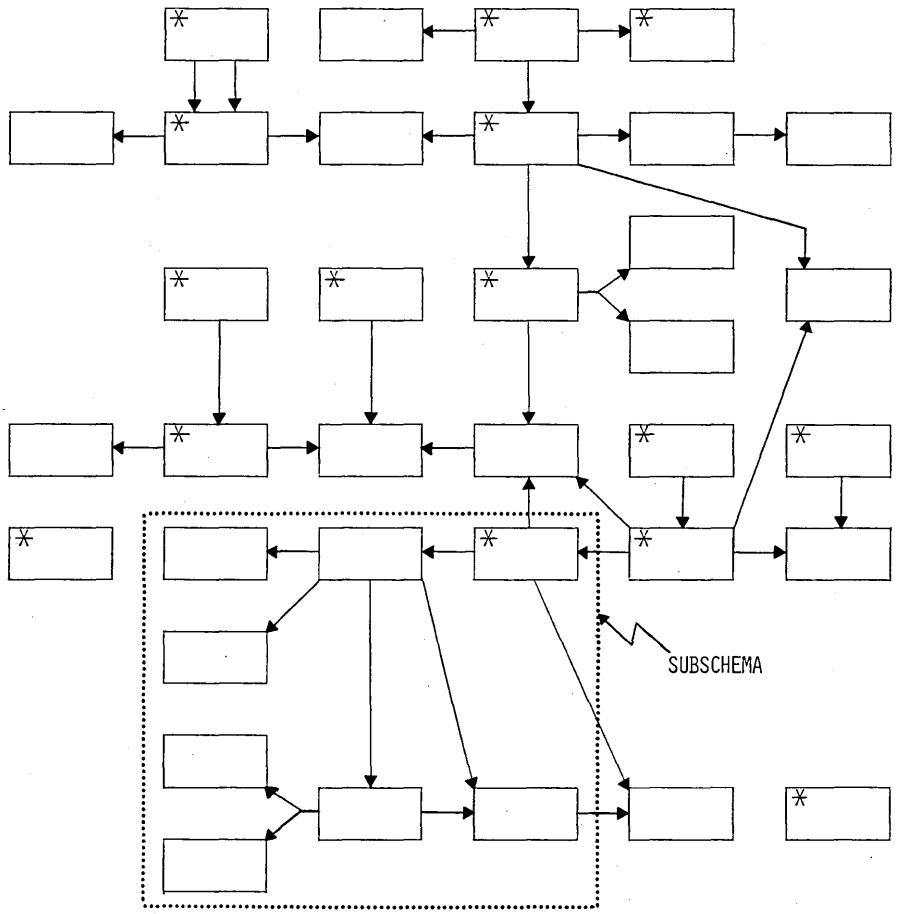


Fig. 7. B. F. Goodrich Chemical Co. on-line order processing system (TOPSY) network data structure.

article. The design of this part of the data base required considerable analyst effort over a six-month period. The objective was to provide an optimum balance between the data structure requirements of all applications which access the data, and execution performance. This structure has allowed the implementation of applications which would be impossible under the data structure restrictions imposed by nearly all currently available data base management systems.

Schema and subschema descriptions

A definition of the concepts of a schema and subschema will complete the description of the elements of a data base.

A *schema* is a complete description of all elements of a data base. It includes the names and descriptions of all areas, data items, records, and sets which exist in a data base.

A *subschema* is a logical subset of the schema which names only those areas, data items, records, and sets which are accessed by one or more specific programs. The concept of a subschema is important because it provides a measure of data privacy and programming convenience by "removing from view" all of the other areas, data items, records, and sets not included in a given subschema. A measure of data independence is achieved in that certain changes may be made at the subschema level to provide compatibility with existing programming language conventions. However, a subschema must be a consistent and logical subset of the schema from which it is obtained.

In any data base there is only one schema, but there may be any number of subschemas. The TOPSY data structure in Fig. 7 is a large subschema which would not normally be used in its entirety in one processing program. A subschema of more reasonable scope is shown by those record and set types included within the dotted area at the bottom of Fig. 7. All records and sets outside the dotted area are removed from view of the program which invokes the subschema shown.

Data base languages

The common approach of data description, followed by most programming languages in current use, is to include the data description in the same program as the procedures which access the data. The files are frequently designed to optimize processing for only a few programs. Other programs which require access to the same data frequently require extraction of redundant data and sorting to create a file which is then optimized for processing by a few more programs. Moreover, the data files reflect the data formatting characteristics of the language used to create the file. The use of more than one programming language to access the same data normally requires data conversion from one format to another. The cost of handling ever-increasing volumes of data combined with increasingly complex processing demands have created the urgent need for a method to create and manipulate a data base which is common to all applications but independent of any particular programming language.

The required separation of data base description from the programs which access the data, and the need to provide access by multiple applications, has created the need for new languages and the extension of existing programming languages.

Device media control language

The DMCL is a language which is used to assign and control physical space for the data base. It includes the specification of number of cylinders required for the entire data base, page size, number of pages per track, amount of page storage space in main memory, and other physical aspects of control. In the IDMS system, DMCL is handled by Job Control Language statements and generated parameters furnished to the Database Management System before the data base is created.

Schema data description language

The schema DDL is used to name and describe the attributes of all areas, data items, records, and sets included in the data base. The schema DDL compiler processes free-format DDL statements for areas, records, and sets to produce an object schema description of the data base which is stored in a specific area of the data base. This object description is then available to other compilers and processors in the system.

Subschema data description language

A separate subschema DDL is required for each processing language which accesses the data base. Each subschema DDL is used to select only those areas, data items, and sets which are required by one or more specific programs. Provisions are made for renaming of areas, items, records, and sets to conform to the naming conventions of a specific language. The subschema DDL compiler accepts free-format subschema DDL statements and produces an object subschema which controls access to the data base and provides the required data interface during program execution.

The DML is designed to provide data base access capabilities to an existing programming language. As such the DML may be viewed as a language extension which conforms to the syntax of the host language. The schema DDL and DML specifications included in the April '71 report of the Data Base Task Group are designed for COBOL and as an example for development of subschema DDL's and DML's for other languages.

The DML functions can be grouped into control, retrieval, and modification categories.

Control. Control statements are used to obtain access to an area within the data base. The OPEN statement announces the user's intention to begin processing within one or more specified areas of the data base. When access is established by the data base management system, retrieval or modification statements may be executed. The CLOSE statement announces completion of processing in the specified areas of the data base.

Retrieval. Retrieval statements are primarily concerned with locating data in the data base and making it available to a program. This is where the greatest language flexibility is needed because of the different data access requirements of all applications which process the data. The DBTG language specifications provide a variety of methods for access of record occurrences within a data base:

1. Direct access of any record occurrence in the data base is possible provided that its system-assigned unique identifier is known. This type of access is independent of any set relationships associated with the record.

2. If specified in the schema DDL, a record type may be stored and retrieved based on the value of one or more data items contained within the record. The data base management system uses the data item value to "calculate" (CALC) the position within the data base to store each record occurrence. To retrieve a record occurrence, the user must furnish the value of the specified data item before execution of the retrieval statement. Any number of record types in the schema may be defined with a CALC location mode regardless of the set relationships associated with the record. This capability allows as many entry points into the data base as needed by the applications associated with the data base. The BFG TOPSY subschema illustrated in Fig. 7 contains 14 CALC entry points, indicated by asterisks.

3. Record occurrences may be accessed through their participation in one or more set occurrences. Once a

record occurrence has been retrieved, the sets in which it participates as either owner or member provide an access path for retrieval of other associated record occurrences. With this capability, an application program can access related data by stepping along the pathways through the data base provided by sets.

4. Records which participate as a member in a set may be specified as ordered in either ascending or descending sequence based on one or more data items contained within the record. Access of a specific record occurrence in an ordered set is accomplished by furnishing the values of the sort-key data items before execution of the retrieval statement. In addition, a non-ordered set may be automatically searched to find a record occurrence with data item values matching values supplied by the program.

5. All occurrences of any record type may be accessed by a complete scan of an area starting with the first page and ending with the last page in the area. This method of access is independent of any other set relationships or location mode.

Modification. Modification statements result in a change to the contents of the data base. Changes include the addition of new data, modification of existing data by replacement of data item values, or deletion of data which currently exists in the data base. Modification statements are also provided which permit participation of existing record occurrences in specified sets to be established or removed.

Self-contained systems

A self-contained system provides data base access and data display capabilities through the use of a simplified, high-level language, designed to be used by nonprogrammers. The language provides considerably less flexibility than a language such as COBOL, but is easier to learn and use. Such a language would allow a simplified method of describing the format and content of a report for display on a video terminal or a printer. A simplified method of describing the criteria for selection of data to be used in the output report allows users to quickly and easily obtain the desired information in an acceptable format. These languages are nonprocedural in the sense that the user is not required to specify input/output commands or the precise logical sequence of operations required to produce the desired output.

The simplest and easiest to implement form of a self-contained system is provided by a data base inquiry program written in COBOL using DML statements. After the data base is designed, it is possible to formulate many "canned" reports which are useful to many users. To operate the system, the user must enter a code to select a specific canned report followed by data values required by the inquiry procedure. The procedure then uses the input to access the data base, formats the output report, and transmits the report to a display device. A typical application would allow an accounts payable department employee to enter a code followed by a vendor number and immediately receive a display of information related to unpaid invoices for that vendor.

The need for both self-contained and host (COBOL/DML) languages which provide access to the same data base was clearly recognized by the DBTG. The specifications for the data description and data manipulation languages have provided the necessary solid foundation for the development of many different types of self-contained systems—each designed to fulfill specific user needs.

Data base administration

The creation of new languages for data description combined with the responsibility to design a common data base which satisfies the data requirements of many applications has created the need for a new function of data administration to augment the functions of systems analysis and programming.

Data base administration is accomplished by one or more technical experts who are knowledgeable in data base design and creation, operation of the data base management system, and the use of one or more data manipulation languages. The data base administrators must also be capable of working well with systems analysts, programmers, and computer operations personnel. The duties of data base administrators are to:

Work with systems analysts to determine application data requirements;

Aid programmers in the most effective techniques in the use of DML;

Specify the content and structure of the data base;

Create subschemas as required by applications;

Maintain documentation of the data base schema and document subschemas for programmer and analyst use;

Establish appropriate operating recovery and rollback procedures to preserve the integrity of the data base in the event of either hardware or software failure;

Evaluate data base loading and program performance characteristics to recommend improvements;

Supervise the addition of new areas, data items, record types, and set types to the data base;

Initiate data base restructuring whenever it is needed to provide additional physical space or changes in data structure;

Establish appropriate constraints in the use of DML statements for each subschema.

Conclusion

The most significant development in data base management in recent years was the acceptance of the April '71 CODASYL DBTG report by the CODASYL Programming Language Committee. The subschema and data manipulation language specifications are being prepared for final approval and inclusion into the JOD COBOL specifications. A new CODASYL Data Description Language Committee (DDLC) has been formed for development of a common data description language based on the DBTG schema DDL. These important events combined with the experience and insight now being gained through use of early implementations of the DBTG specifications will lead the way out of the current data base morass. This ultimately will be good news for users.

In the author's opinion, the following publications present an excellent overview of data base design, data base management systems, and current opinions on the subject.

1. *Feature Analysis of Generalized Data Base Management Systems,* Association for Computing Machinery, 1133 Avenue of Americas, New York, N. Y. 10036, May 1971, $8.

2. *Report of the Codasyl Data Base Task Group,* ibid, April 1971, $7.

3. "The Debate on Data Base Management," *EDP Analyzer,* Canning Publications Inc. 925 Anza Ave., Vista, Calif. 92083, Vol. 10, No. 3, March 1972, $5.

4. Lyon, John K., *An Introduction to Data Base Design,* John Wiley & Sons, Inc., New York, N.Y., 1971. □

Mr. Schubert is manager-information systems programming and operations for B. F. Goodrich Chemical Co., Cleveland. He served on the CODASYL Systems Committee from 1963 until this year and has been a member of the CODASYL Data Base Task Group since 1970. His BS in chemical engineering is from Cleveland State Univ.

Where to look before you leap—at the costs in money and talent compared to the expected advantages for the organization

Data Base Hazards

by Albert C. Patterson

The proposals to the management of enterprises these days which advocate the establishment of data bases (DB) and the installation of data base management systems (DBMS) are at best misleading. The DBMS can easily be nothing more than an expensive toy for systems programmers and for technicians who seek an aesthetically pleasing, if uneconomical, solution to data storage and retrieval problems. The DBMS has captured the imagination, and sometimes the fantasy, of many influential figures in the data processing world. With a blinding, sensuous flash, DBMS concepts have caught us up in fascination while sometimes obscuring the real, practical issues of dp.

Conscientious, thorough appraisal of the true, quantitatively measurable benefits of using a DBMS must be performed if we are to make a rational evaluation. Much understanding has been camouflaged in DB proposals by jargon. Definition of terms is essential to comprehension.

There are many misconceptions about how a DBMS is installed. Many suppose that a DBMS is a turnkey operation. Some blue Monday morning the data processing director comes to work, decides he cannot face any more problems and decides to install a DBMS before coffee break. Still others suppose that when you install a DBMS, every application uses it immediately: presto, massive conversion and probably instant failure.

What the DBMS actually will do for you once it is in is often misconstrued. One perplexed data processing director suggested eliminating application programming costs from the budget now that the DBMS was being installed.

There are many advantages to using the DBMS approach to data management, but a company must install a DBMS for the right reasons, in the right way, with complete understanding so that in five years they can look back and say, "Yes, we did the right thing in going with DBMS" rather than "We've been hoodwinked again by the well-meaning technician beckoning to us so alluringly from the other end of the primrose path."

What must first be established are definitions of the general DB terms and expressions and then arguments in favor of and against the DBMS approach must be identified to create a clear understanding that nothing is everything—that DBMS is not a panacea though it may solve many problems.

Typically, organization politics will, at the start, preclude any large-scale data sharing and data integration.

A DB is a collection of data among which an enterprise wants to maintain relationships. It is most probable that an organization will have more than one data base. It is not necessary to integrate all data into one DB, nor is it necessary to integrate all data at once. Start off small, with one application, see how well the DB approach works in your environment, and allow the DB to evolve into an integrated corporate DB. Let it evolve or grow only as fast as the introduction of new data into the DB can be economically justified.

The DBMS is a combination of staff, software, and hardware functions responsible for providing access (storage and retrieval) to the DB. It is only that. It is not a management information system (MIS). An MIS is an application program to the DBMS, and it converts data provided by the DBMS into information which the end user can interpret. So, the DBMS provides data; the application program translates data into information.

While certain software packages are available which combine both DBMS and teleprocessing (TP), it is unnecessarily complicated to consider both functions simultaneously. It should be borne in mind that TP can exist without DB, and DB can exist without TP.

Yet another point of confusion appears in the discussion of the size of a DB. The DB probably does not contain all the data of an enterprise. The number of DB's that an installation maintains is primarily determined by how that installation views data and how it wants those data related. Typically, organization politics will, at the start,

preclude any large-scale data sharing and data integration.

A common misconception of a DB is that it must be entirely on-line. Depending upon the particular implementation of the DBMS, this may or may not be true. The confusion here started because a clear distinction was not made between DB and MIS and other inquiry-type applications.

There are other reasons why misunderstandings arose. The dp professionals introduced the scheme, not the businesses' managers. The solution proposed was aesthetically and philosophically pleasing to the dp professional and to the layman. To the dp professional there was an equally strong allure to explore the outer limits of technology, possibly to the extent of being trapped in the Tinkerer's Syndrome in which one is always asking, "What new gadget can I add to this masterwork, the DBMS?" Managers, on the other hand, are always asking, "How will it make more money for the enterprise?"

We must identify those arguments which allow DBMS justification on a current basis, while at the same time we clear up misunderstandings. A data base is not a panacea for the shortcomings built into dp systems over the past five or ten years. But it may be a way to keep us from painting ourselves into a corner similar to the one we now find ourselves in.

There are many cogent arguments in favor of DBMS, most of which are covered by Mr. Schubert in this issue. Without repeating those arguments, in favor, let me introduce arguments against DBMS for the purpose of forcing you to consider negative aspects of the concept before you dive headfirst into what may be an empty pool.

Contrary to the understanding of some, there are significant arguments against the installation of a DBMS. It may, in certain instances, be more economical to at least defer the use of a DBMS in favor of preserving the *status quo*. Such a statement may be considered heretical in certain quarters but is nonetheless demonstrably true.

First, an installation must consider the costs of installing and maintaining a DBMS. To reach a decision in favor of a DBMS, the organization must then determine that in some way those costs are offset by realizable benefits.

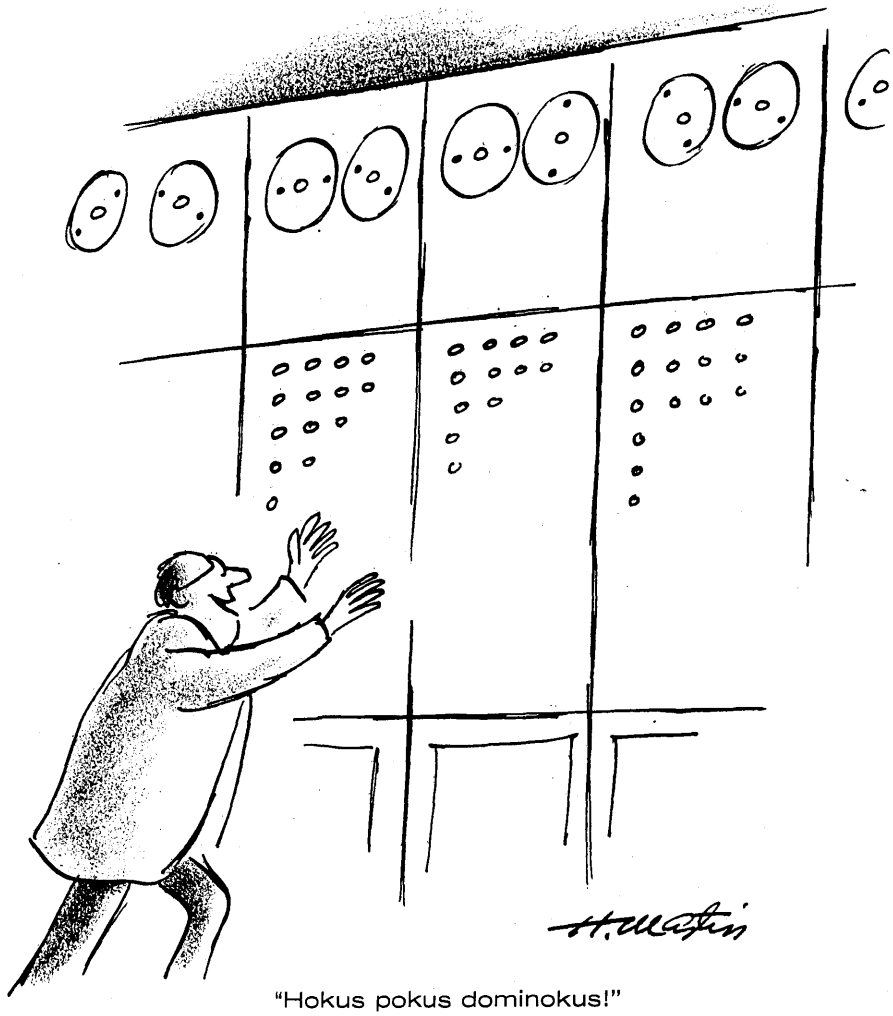
Political and economic costs are incurred when propaganda is created to introduce the DBMS. Further expenditure is needed to develop and administer training courses. This expenditure may often be somewhat, but never entirely, mitigated by the vendor's contribution to the teaching effort as part of the package cost.

Any generalized solution implies inefficiencies not found in properly implemented specific solutions. The DBMS is no exception. Depending upon current volume of redundant data and upon the degree of husbandry present in current files, space inefficiency is a phenomenon one can reasonably expect in a DB. Just as some file organization packages are more frugal with space than others, so too some DBMS's utilize space more efficiently than others. But as a general rule, unless your current files are very poorly designed or you have an unusually large volume of redundant data, you will most probably experience increased space requirements. Perhaps the preceding qualified statement needs further elaboration. The increased space requirement will occur initially—that is, with the first few applications installed under the DBMS. As more and more applications run for the cover of the DBMS and a truly integrated system begins to take shape, space requirements should begin to lessen, maybe even substantially. This phenomenon may be referred to as the economy of scale. Because we are talking about immediate advantages of a DBMS, however, we must conclude that at first blush the DB approach will cost somewhat more in space than do our current systems' files.

> A new political/technical function will have to be set up to support the DBMS. This will cost you some of your finest talent in both diplomacy and technology.

Yet another inefficiency will most likely be found in execution speed. Again, the generalized, as opposed to the customized, solution is necessarily interpretive and hence requires more execution time. Too, the generalized data organization schemes of a DBMS will probably not address an individual data organization problem as specifically as a tailored solution would.

Risk also rears its head. Will the system work at all? If it does work, will it work well enough to justify its cost? The risk factor can be substantially reduced by careful, intelligent planning —a rare bird in the dp aviary—and by using a phased implementation plan taking advantage of the concept of evolution. While one woman may be able to produce a baby in nine months, nine women cannot, today anyway, produce a baby in one month. The DB system must be allowed to grow in a



"Hokus pokus dominokus!"

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carefully controlled environment at a natural and subsonic rate. And as it grows it must prove itself on a step-by-step basis. If this philosophy is not adhered to, you may find yourself placing all your eggs in one basket—that has no bottom. Another argument in favor of this philosophy is that you are not committing your entire data collection to organization and management under a technology that has advanced only as far as today. If you do a wholesale implementation of DBMS today, you will be required to do a wholesale conversion tomorrow if you want to take advantage of any new technological developments. Someone once said that fools rush in where angels fear to tread. Let us be angels.

A new political/technical function will have to be set up to support the DBMS. This will cost you some of your finest talent in both diplomacy and technology. The function is variously referred to as Data Base Administrator (DBA) and Data Administrator (DA). The DBA is the custodian of data in the DB. He is not the owner of data—the user owns the data. The DBA is a staff function and will vary in size and hence cost depending upon the size of the DB's, the number of them, the size of the organization, and the way in which the installation chooses to define the functions. In any case, the DBA is responsible for defining, protecting, and maintaining all data in the DB and is responsible for the DBMS as well. He is a mediator/arbitrator of disputes when the DB becomes integrated or shared across functional boundaries. He is a negotiator with users and DP professionals in the Herculean task of providing the most reasonable compromise for efficient data access. This nontrivial function has a concomitant nontrivial cost in terms of money and talent. But the DBA function must be successful, for it is the only foundation upon which an orderly and economically justifiable DB can be built. Are you convinced you have the supermen to staff the function?

If you do, perhaps some of the other costs associated with installation will not be significant. Just to determine whether DB is the way to go for you will cost plenty. Then you must expend more dollars in the planning activity. What will you do, how will you do it, who will do it, which applications go on first? If the evident emotional appeal of DB is as strong as it appears, there will be a real battle among applications to be first. Battles cost money.

Then you must assure that the DBMS is properly installed (practically and philosophically) or you may find that the organization rejects the transplant. Advocates of the *status quo* will be on hand to cheer this process along. ("See? I told you so.") The insurance against this is making sure in advance that you are installing the DBMS for the right reasons and that everyone knows and understands what those reasons are. Therefore, you must control the expectations of the organization: this can be accomplished through indoctrinating propaganda, education, and above all by keeping the constituency apprised of and involved in the deliberate and intelligent planning you have been engaged in.

If you do not install a new system as the first of your DB applications, you will have an instant conversion problem on your hands. In any case, the evil day of conversion on some scale cannot be postponed indefinitely. Eventually there will be conversion costs if the DBMS was worth bringing in at all. So you must ask yourself if the DBMS can have wide enough economical applicability to justify the expenses already outlined. Testing and debugging costs of new systems or conversions under the DBMS will be difficult to determine. Are the perceived benefits of a DBMS worth the known costs plus the risks?

Just to determine whether DB is the way to go for you will cost plenty.

One readily apparent cost is the lease/purchase of the DBMS. This needs no further elaboration, but remember that if you buy, be sure you get all future enhancements as part of the deal or for a nominal charge. Do not allow yourself to get locked in to today's technology when tomorrow's is not far off.

Maintenance costs must also be figured in. Reliability of product and likelihood that the vendor will still be in business and sympathetic (also helpful) when you need him are paramount considerations.

Perhaps many of the problems mentioned here can be avoided by the expedient of writing your own DBMS. Intuitively one can articulate myriad arguments against in-house developments, but perhaps yours is a special case. It is certainly an alternative to be studied.

But do you need a DBMS at all? Do you need data relatability? How much will you save, and specifically where, if you install a DBMS? Will you be able to take on more business as a result? Will it be profitable business? How, in brief, will your net profit be affected by the installation of a DBMS? How will it be affected this year? Next year? Five years from now? How will it look if you do not install a DBMS?

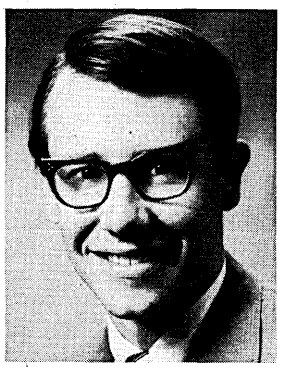
Then there are the minicomputers; they're good and they're cheap. Maybe the whole idea of a centralized computer function is wrong for you. Maybe each functional unit should do its own processing with minis. If that is true, the kind of DBMS discussed here has no place. How much is data relatability worth to you if it is in fact more profitable for your enterprise to do data processing with minis in the functional divisions themselves?

What have you concluded from this discussion? Hopefully, you have concluded that there is a great amount of thoughtful questioning which must precede any decision.

There are installations and applications which are appropriate for a DBMS. There are others where to force a DBMS solution would be uneconomical. Intelligent analysis considering at least all the points mentioned earlier will reveal which are appropriate DBMS applications and which are not.

A DB and a DBMS can be justified for many different reasons, depending upon the needs of the particular organization. Make sure that you have properly identified the real reasons a DB approach is appropriate for you. Be sure there are justifications which are currently realizable as well as paybacks which accrue over the years. Advertise your reasons. Share your reasoning and be sure your organization shares the same perception of DB benefits, both long and short range, with you.

DBMS is not something of the future. It is here today. It can provide advantages today and in the future. Base your proposal primarily on currently realizable advantages or run the risk of losing your organization's support as it becomes impatient and disillusioned when benefits as it perceived them (which are not the ones you thought you presented) are not forthcoming in the timely way it expected. □



Mr. Patterson is assistant vice president and manager of the advanced systems group, Bankers Trust Co. He is a national lecturer for ACM, a member of the GUIDE data base requirements committee, and a member of the data description language committee of CODASYL. He is also a lecturer on data base concepts at NYU.

Starting from scratch, the staff of Datamation's EDP Industry Directory assembled a data base for publication. Here's how it was done—including the problems and lessons learned

Building a Data Base

by Richard A. McLaughlin, Associate Editor

When the management first asked us to produce a directory of edp products and services, we turned to long-time adviser Bob Patrick, who helped devise an entirely new kind of reference book. The goal was to provide the harried data processing manager with a single source to screen the enormous amount of information on thousands of dp-related products and services from more vendors than he could possibly deal with—especially since the arrival of compatible peripherals in the marketplace. To do this called for assembling detailed descriptions of the hardware, software, and services available throughout the U.S. Then the problem was to arrange this data, in a compact format, for side-by-side comparisons of what is offered—by whom and for how much. For this issue featuring data bases, we thought it might be useful to others if we described how we went about assembling our data base—with emphasis on the problems and mistakes that may be avoidable by learning from our experience.

Publishing DATAMATION is a business. In many ways it is like any other business. Even the data processing problems we wrestle with are much like anyone else's, with one exception . . . that of maintaining a reliable data base of the companies, products, and services in our industry.

In the past we have maintained all our files on products and services manually. When the magazine ran a survey article, the data for it was collected by hand and sent off for typesetting just as other articles were handled. But when, in 1970, we went to take on the whole industry in one massive survey, we had to give up our medieval methods.

This is the story of how, after 12 years of writing about computerized data bases, we finally automated our own. In telling the story candidly we must admit to quite a few errors, so this piece is not intended as a "how to do it," but more as a "how *we* did it." Hopefully you will be able to draw some conclusions about how to do the same thing better in your own shop.

This publication would be a huge job, it turned out, because we accumulated more than 20,000 products and used up nearly 400 pages of small type describing them. Since it seemed from the start too big a project for production by conventional typewriter-to-manual typesetting methods, the catalog was to be photocomposed from computer-generated entries. It was also to be constructed of all new data, data verified by the vendors themselves, not just taken from the magazine's paper files.

It sounded like a great idea, and it seemed fitting that a data processing publication should be produced by data processing means.

Data collection

We decided to send detailed questionnaires to companies in our industry, knowing in advance that this kind of data collection is tough. Frequent address changes, acquisitions, mergers, and Chapter XI bankruptcy proceedings are common to all industries but especially prevalent in this one. Still, we assumed that the magazine's stature and offer of free publicity would encourage responses from the vendors.

That was both our first assumption and our first mistake. Because of the detail needed in the product descriptions, the questionnaire became formidable. Since no one had done this before, we didn't know for sure which vendors offered which products. And since we didn't want to miss any products, we sent every vendor every questionnaire page.

We soon realized that we were in for a campaign of nagging letters and many hundreds of pleading phone calls to prod the marketing managers into some kind of action, but we forged on.

Assuming that some kind of keyboarding was to be done, we added identifying numbers to each data element or box on each of the 68 pages of the resultant questionnaire pamphlet. Of course, each product category was assigned a number too. This seemed to be as much as we could do without knowing what kind of an input mechanism we would use.

Designing a source document before deciding on an input mechanism is admittedly not the best way to do things, but time constraints left us no choice. We could not settle on the mechanism until we had settled on a service bureau to do our processing. (And we did not have the staff or facilities to do this large a job ourselves.) Also, we could not put off the mailing of the questionnaires if we were to meet our 1971 Spring Joint publication deadline.

Selecting a vendor

Now, photocomposition is not a new game, and there are many service companies that offer it. We expected that our job would be to choose from among shops in the Los Angeles area that had done work similar to ours.

So we mailed out screening letters to several photocomposition service companies, asking questions about their staffs, their equipment, and their software capabilities. We also asked for sample pages from similar catalogs or books they had produced.

We soon learned that, with some simple exceptions like alpha ordering of print records, all of the vendors were using their photocomposition systems simply as replacements for manual typesetting operations. That is, they keyboarded a line of text, then displayed it. But we wanted to key only the variable data from the questionnaires, to store repetitive words and lines, to sort the product records by performance parameters imbedded in their descriptions, to set up cross-references between different kinds of listings, and *then* photocompose. In our context, the display process was largely incidental to the editing and processing that would precede it.

No one seemed to have done any of

this before. Many, however, were willing to try it . . . on our money.

After reviewing the answers to our screening letters to the service bureaus —even to setting up a matrix of weighted data and scoring the responses—we visited many of the shops. It was clear from the responses that nearly half of the vendors did not have the vaguest comprehension of what we were describing. We didn't have time to explain, so we sent them nice thank-you's and visited the others for Phase II of our selection process.

During our on-site inspections we looked for several things, but put special emphasis on three. These were: (1) how well the flow of work through the shop was controlled; (2) how their chain of project responsibility worked; and (3) how impressive were the individuals being assigned to our project.

Back in our own offices again we mulled some more, finally deciding on the single vendor that had suggested cost-saving modifications to our proposed system. While we then hurriedly shifted into our contract-negotiations mode, the questionnaire responses were already beginning to pile up.

Design considerations

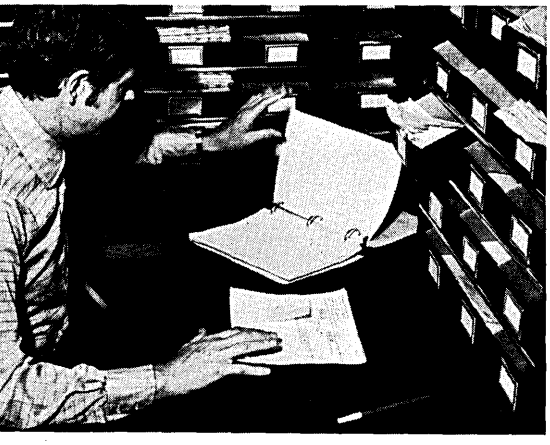
At this stage our application began to look more conventional. We had a room full of source documents and a pressing need to quickly get them into machine-readable form. Still, we had several problems to consider before we could begin input. We had to estimate the size of the completed data base, determine how often the data would be accessed and how often it would be updated, estimate the volume of transactions, determine the amount and kind of back-up and checkpointing required, and make some trade-offs between processing speed and programming efficiency.

Figuring out how big the data base would be was tough. When working with inventories or parts lists you probably have better counts. No one had ever gathered up all data processing hardware, software, and services into one place before. We figured on up to 10,000 vendors with 35,000 products, but, after pulling out branch offices, ended up with about 2,500 vendors with over 20,000 products (representing about three million characters in compacted form).

Our only true "access" of the data was to be a one-shot photocomposition pass at the end of the project. We would do this only once each year so the update cycle could be determined by how large a batch we wished to work with. We settled on a weekly update cycle with tape as a storage medium.

Grandfather file retention is, of course, easiest with tape files, as are restarts after an abort of an update. Also, by sorting our update transactions to the same sequence as our master file, we knew we could take advantage of tape's high serial transfer rates.

Generally speaking, we were in good shape with our tape-based system, as our volume of transactions was to be quite high for most of the life of the project—in the neighborhood of a half million characters per update including overhead. But this put us in a corner if we ever had to update only a few records at a time, as happened near the tail end of the project when we were polishing up the rough edges for a production pass.



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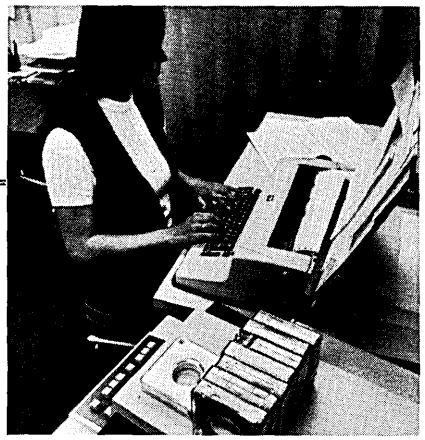

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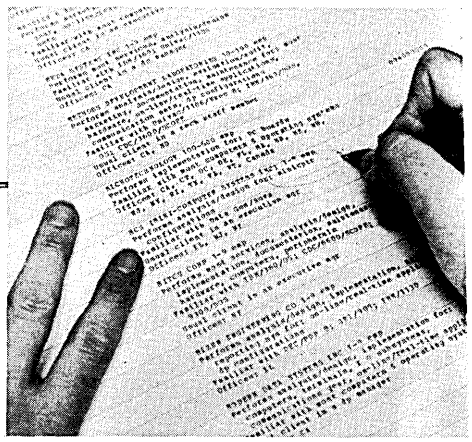


3

We were initially confident that we could establish and live with a "cut-off" date after which we would no longer consider the expensive, smaller updates. But last-minute discoveries of serious errors in product descriptions "everyone" was sure to notice forced at least one extra update, as did the omission of one advertiser's most impressive product.

There are trade-offs to be made between processing speed and programming effort which are generally decided by the number of times a program is to be run. These trade-offs affect even a tape system, where you must decide whether to use fixed or variable length records, and whether to use fixed fields.

We chose variable format, fixed-length records, primarily for speed in coding. (We ended up with about 32 interlocking programs—about 15 boxes of cards—checked out in eight months.)

Data entry

Our vendor, Alphanumeric Publication Systems in Los Angeles, used MTST (Magnetic Tape/Selectric Typewriter) keyboards and a Digi-Data converter to pool the tape cartridges from the MTSTs onto 9-track reels. Each keyboarded line was sight-verified by a second operator and corrections were keyed over the top of bad data. The system had been working well for years with normal text streams, but we were to test its limitations with our coded data. As it turned out, we used the MTSTs as if they were upper and lower case keypunches.

To keep track of the data being keyed, and to be able to reference individual records for updating, we assigned each vendor a six digit ID number. We used that number for the vendor record itself, and to identify all of that vendor's product records. In addition, the format of the questionnaires gave us 62 numbered product categories. Finally, to distinguish between two products from the same vendor which also happen to be in the same category, such as two digital computers from IBM, we also assigned a six-digit product reference number to each.

This gave us lots of numbers to work with, insuring that we would be able to address each product uniquely—but also insuring that we would incur a terrific data entry overhead. We learned that each transaction to a product record, even if it were a one-character change in spelling, would have to carry 18 characters of record identifier (six digits for vendor ID, two for product category, six for product

reference, and four to identify the data element within the record) plus any update command.

In six months we overran our keyboarding estimates by 200%.

Data editing

We gauged our editing requirements as something less than those of a banker, whose mistakes involve money, and much more than those of a statistician, who can afford to throw away a couple of data points.

We had chosen to put our file of product records in order of vendor ID number within product category, beginning with digital computers and working back through chilled water air conditioners. In editing, we wanted to know whether we had the same product on the file twice, whether we had the same vendor on the file twice, whether we were trying to add a data element to a non-blank field, or to change an element that was not present, etc. We also wanted to check the lengths of fields we knew to be fixed.

We considered the use of an "is-was" listing to show every update transaction, but decided that good diagnostics built into the editing pass would make the is-was list redundant.

We then decided, somewhat arbitrarily, to also keep the vendor's name, not just his ID number, in every product record. To avoid rekeying it every time we entered a new product, we set up the file of vendor descriptions on disc, and referred to them by company number. Then we could pull off the company name from the disc record and plug it into the product record as it went onto tape.

This may have saved us keyboarding, but it led to separate programs for updating and listing the vendor and product files, nearly doubling our programming needs. Some savings.

Report generation

The MTST input, when not backed up by an audit trail of updates, leaves you feeling blind. To compensate for the lack of visibility in updating, we built highly structured printouts. We tried to develop worklists based on a data processing conception of data display rather than our intuitive publishing conception of text display. We called for pages of tabular printouts that carried column identifiers for each product attribute across the top of each sheet; the data appeared in neat columns under the heads.

It all sounded great. We could edit all the records in a category for one attribute at the same time, checking for consistency and range of data as we went. (In the tape drive category, for instance, someone claiming a drive transfer rate of 1200KC rather than 120KC stood out boldly.) But we couldn't even guess what the product descriptions would look like when we put text around the data fields as we would have to before actually producing a book.

We knew that our questionnaires and data fields were going to change from year to year as products changed, so we asked that any reports produced from our files be table-driven. The vendor, fearing what the costs of building a special-purpose report generator would look like in contrast to its fixed-price bid, hard-coded the report formats instead. Not having control over the *manner* in which the vendor fulfilled his obligation to us, we were painted into a corner. When we went to use the reports in our second year of operation, for the 1972 issue, we were nailed with a programmer/clerical charge of $1300 just to change the titles on the report columns . . . plus the fees for reformatting the data itself.

We think, from this experience, that the publishing world has something to offer the data processing community when it comes to visual editing. For when we fell back on our own way of doing things—of printing the data just as it was to appear in the end product rather than in highly structured tabularized reports—things went much more smoothly. It was possible, for instance, to produce a report generator that stuffed the right words around our data, just as they would be placed in the printed directory. This, in turn, was easier to edit. Also, instead of editing with programmers and coders, we turned to the editors and proofreaders who produce DATAMATION Magazine. We suggest that the industry make a place for such people, because programmers make poor editors and the people who originate data generally are not helpful in verifying the data base either. Professional proofreaders work very efficiently and very objectively.

Updating

We were able to convince the keyboard operators (this was no small task) that they could key directly from the tabular reports if we marked them up carefully. To do this, we had to come up with a simple set of update commands . . . an "A" for add, "C" for change, and "D" for delete.

We even got as far as implementing the right sort order for the updates . . . deletes first, then adds, then changes. We made only one error here; in implementing the change command we should have made it a "replace" command, meaning approximately "put this in there whether there is another element already in the slot or not." We were often to have our simpler "change" command rejected because the field was blank. In the final evaluation, when you make a change you do not care what was there previously, only that you are operating on the right field of the right record.

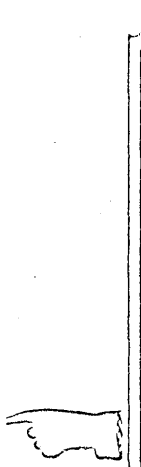
String commands and global commands, such as those that allow for operations like "change all 'characters per second' strings to 'cps' " are beautiful, but we didn't have time to develop any. We ended up using people to do the simple, repetitive things instead of the machine. Brute force is almost always the wrong method, but it works.

Controls

We made a lot of mistakes in the first year of the project, but none so large as the one we made in setting up controls. With almost any data base updating, there will be a lot of paper shuffling. Certainly several people will have to handle the same data, even if it is all done on-line.

As mentioned, our source documents were questionnaire pages. These were to be handled by our mail clerks, by technical editors, by a courier, by keyboard operators, by another courier, and by our clerks and editors again. That would be the end of their travels unless there had been an editing or keyboarding error, in which case they went around again. We should have seen it coming.

The vendor designed a transmittal form on which could be entered the



1 Incoming questionnaire forms were sorted into bins by product category. Phil Gallo, one of the Directory's technical editors, is shown reviewing the forms from one of the categories.

2 Data entry was done with IBM MTST (Magnetic Tape/Selectric Typewriter) units. In our application they were used something like upper and lower case keypunches.

3 We had much more success in editing the data base after we switched from the highly structured tabular reports to textual ones.

exact count of each product category being sent to them or back to us. We really tried hard to count accurately, and to keep the batch of input forms together with the cartridges keyed from them and also with the worklists and diagnostics resulting from that update batch.

Our first sign of trouble was when we sent in several batches of data forms and got nothing back. We had a wall of questionnaire forms at our backs, coming from all over the country, but we wanted to see some output before we sent more of them to the input operation.

There was a sinking feeling I'll never quite forget when, on walking into the vendor's input area, we found the project manager sitting in the middle of the floor with little stacks of our forms around him. He was trying desperately to determine which sheets had been keyboarded, and to put them back into their original batches.

We learned several things from this, including: (1) people can't count, so use a numbering stamp; (2) make the people in the keyboarding area verify your counts *before* they start keying; (3) no matter what your input media looks like, there is a way to identify each cartridge or reel or deck externally and internally with a reference to the numbers you put on the source documents with the number stamp; (4) even if it comes out looking like a diagnostic on the listings, there is a way to identify each worklist with the numbers from the internal labels of the cartridges or other input; (5) there are places on transmittals and transmittal logs to put all these numbers; and (6) it is worth doing all of these things, without taking any shortcuts.

Putting a sufficient level of control on a data base project takes more thought than you will want to give it, but it's one hell of a lot cheaper and less time-consuming than *not* doing it.

Processing

We performed basically four kinds of operations on our data base after we considered it built and before we photocomposed. We sorted the products in order of performance characteristics, generated multiple records for some kinds of data to help readers find things faster, expanded the compressed records into readable English statements, and set up the cross references between the product records and the vendor thumbnail sketches.

We added a sort key to the front of each record in order to put the performance criteria into fixed positions. For example, we wanted to order the

ANCHOR SYSTEMS INC
140 Cedar St New York, NY 10016
(212)571-0905 Established 01/70
1-25 employees, $100K-$500K in sales
Offices: NY
Products: VII-180, VIII-222, VIII-247, VIII-266

ANDERSON JACOBSON INC
1065 Morse Ave Sunnyvale, CA 94086
(408)734-4030 Established 04/67
100-500 employees, $1-$5 million in sales
Offices: CA, DC, GA, IL, MI, MN, NJ, NY, OH, PA, TX
Products: II-45, II-48, III-80

ANICAM INC
6331 Homewood Hollywood, CA 90028
(213)465-4114 Established --/48
1-25 employees, $100K-$500K in sales
Offices: AZ, CA, CO, NY, OR, UT, WA
Products: VIII-247

ANKER DATA SYSTEMS
Sub of Anker Werke
2021 Swift Dr Oak Brook, IL 60521
(312)654-4540 Established 06/59
100-500 employees, $5-$50 million in sales
Offices: AK, AR, AZ, CA, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NB, NC, ND, NH, NJ, NM, NV, NY, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VA, VT, WA, WI, WV, WY, Canada, Europe, Orient

ANN ARBOR COMPUTER CORP
Sub of Jervis B Webb Co
415 W Huron St Ann Arbor, MI 48103
(313)761-2151 Established 01/65
25-100 employees, $1-$5 million in sales
Offices: MI
Products: VIII-203

APPLICATION DATA ENTERPRISES INC
5345 W 102 St Los Angeles, CA 90045
(213)641-3570 Established 05/69
1-25 employees, $100K-$500K in sales
Offices: CA
Products: VIII-222, VIII-247

APPLICATIONS CONSULTANTS INC
3431 W Holcombe Blvd Houston, TX 77025
(713)666-1777 Established 08/68
1-25 employees, $100K-$500K in sales
Offices: TX
Products: VII-177, VIII-222

APPLICATIONS SOFTWARE INC
21515 Hawthorne Blvd Torrance, CA 90503
(213)542-4381 Established 01/67
1-25 employees, $100K-$500K in sales
Offices: CA
Products: VII-162, VII-164, VII-166, VII-168, VIII-222
See advertisement p. VII-163 and Green Pages.

APPLICON INC
83 Second Ave Burlington, MA 01803
(617)272-7070 Established 05/69
25-100 employees, $500K-$1 million in sales
Offices: CA, Europe, Orient
Products: IV-105

APPLIED AUTOMATION INC
Sub of Phillips Petroleum Co
Pawhuska Road Bartlesville, OK 74004
(918)336-0250 Established 07/68
100-500 employees, Sales figures not given
Offices: CA, CT, DE, IL, IN, LA, MA, MD, NJ, NM, NV, NY, OK, PA, TX, Canada
Products: I-27

4
5

BATCH TERMINALS
(in order of increasing speed)

Under 2400 baud

DACONICS CORP 2909 ART
Plug compatible IBM/2848
Programmable, with buffered 1200 baud line interface and 300 lpm printer, 225 cpm card reader, punched tape, mag tape, keyboard, crt, disc or drum, plotter
Requires IBM/2701 controller
$15,500 to $35,500 (Maint $125/month) 11/70

TALLY CORP Datascribe V600/V800
With buffered 1200 baud line interface and 600 lpm printer, 300 cpm card reader, punched tape, mag tape, keyboard
$8000 to $21,000 (Maint $20/month) 11/69

INSTRUMENTATION TECHNOLOGY CORP (ITC) 9033
Programmable, with buffered 1800 baud line interface and 1000 lpm printer, 60 cpm card reader, card punch, mag tape, keyboard, crt
Requires IBM/2701 controller
Sales are to OEM only 09/69

SYCOR INC 340
Logic compatible IBM/360/30 and IBM/370/135
Programmable, with buffered 2000 baud line interface and 100 lpm printer, 200 cpm card reader, card punch, mag tape, keyboard, crt and magnetic cassette
$6600 to $20,000 (Maint $25/month) 12/70
See advertisement p. III-93 and Green Pages.

2400 baud

4800 baud

COMMAND SYSTEMS CORP Batch Terminal
Logic compatible SCC/DCT-132
Programmable, with buffered 4800 baud line interface and 1200 lpm printer, punched tape, mag tape, keyboard, crt, disc or drum, plotter
Sales are to OEM only

CDC TERMINAL SUBSYSTEMS DIV 200
With buffered 4800 baud line interface and 300 lpm printer, 330 cpm card reader, keyboard, crt, plotter
Requires CDC/6671/3316 controller
$NG (Maint $NG/month) 12/67

DIGITAL INFORMATION DEVICES INC 3700
Programmable, with buffered 4800 baud line interface and 600 lpm printer, 500 cpm card reader, mag tape, keyboard, crt
Requires DID/3700 controller
$NG (Maint $NG/month)

INTERNATIONAL BUSINESS MACHINES CORP 2780
With buffered 4800 baud line interface and 240 lpm printer, 400 cpm card reader, card punch
Requires IBM/2701 controller
$29,875 to $44,000 (Maint $180/month)

MAXSON ELECTRONICS CORP 2011
Plug compatible IBM/2740 and IBM/2780
Logic compatible IBM/2740
Programmable, with buffered 4800 baud line interface and 600 lpm printer, 100 cpm card reader, keyboard, disc or drum and tape cassettes
Requires IBM/270X controller
$12,000 to $19,000 (Maint $75/month) 07/71

tape drives by number of tracks, and by transfer rate, and by vendor name. So we pulled these items from inside the variable format product record to put into the fixed format sort key at the front of that record. Actually, up to six criteria were used for sorting, so the keys became quite long. Of course we used the same length key for every product category so we only had to sort once.

For products or services that logically fit into two categories, it was convenient to generate multiple records for specific product or service categories while building the sort keys. By changing the sort keys only slightly between two copies of the same record, we could force the two listings into different parts of the book. (We ran a product in more than one section so the reader could find the same controller, for instance, by looking up "card reader controllers" or "card punch controllers," if it operated as either.)

After the sorting and generation of multiple copies of records were done, the data base was nearly ready to be photocomposed. At this point we had all of the abbreviated records in the right order; all that was left was to expand them into readable form. We did this by building a master tape that represented one "maximum" product description for each product category . . . but had no data filled in the blanks. As we read the real records past the core image of this master record, we could pull off the pertinent text and punctuation.

After the text stream had been thus prepared, Alphanumeric's proprietary software took over, horizontally justifying each line, vertically justifying each column, then adding page numbers and titles. The display was handled on Alphanumeric's own APS-3, which is capable of putting out full-size pages, in black and white or on negative film.

It wasn't until after the product chapters were prepared for photocomposition that we could do the cross-referencing we desired. The pagination program determined the page number of each page—accounting for blank pages that would later be filled with advertising—as it went. By scanning the pagination tape, picking up the product page numbers, and storing them with the vendor thumbnail sketches on disc, we could add to the assembled data for the company index the actual page references . . . showing the page numbers on which the company's products are listed.

The output from all these machinations belies the complexity of the operations that produced it. It really doesn't look much different from the way it would if it had been simply typeset by hand.

Project control

Starting with an idea we thought would sell, we built the questionnaire, gathered a staff, set up an organization, produced a set of computer programs, finished the data base, photocomposed and printed the book in nine months. We don't have to tell you that we spent most of our time fire-fighting, or that we tested and documented as we went along.

We never did learn some things, such as how to estimate programming costs really well. It always seemed we spent twice what we expected to on code (a terrible way to estimate, but better than whatever it was they used on the Air Force's C5A).

Two project management things we learned the first time around did help when we cycled the system again for the '72 book, though. One was that we just couldn't run the last test case of any program with real data behind it and call it production. Sounds obvious, doesn't it? But when you are on tight schedules, the temptation is great, especially with "little" changes (and we found there are no "little" changes).

The other was that making long, detailed PERT charts was helpful in visualizing our problems, but that they changed too often to use them for project control purposes. We used "dependency" charts, which can be thought of as simplified versions of PERT networks without all the time estimates. Although these also changed too often, at least they were simpler to draw and update. Even simpler line charts would probably be better, and we will look at other kinds before starting up again.

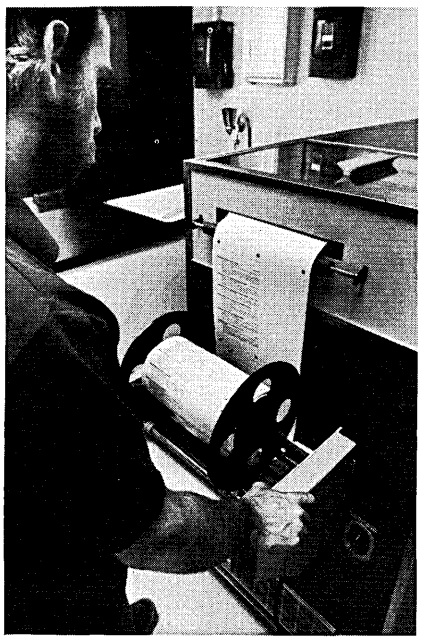
About the only consolation we have for the mistakes we made and 30-hour days we put in is that the system worked. We would do it differently if we could do it from scratch again, but we can't.

In another way our nine-month project is like a full-term pregnancy . . . we're glad we did it and happy with the result, but we're glad it's over too. □

4 A page from the product listings of the Datamation EDP Industry Directory illustrates the level of detail in each product description and how the entries are sorted by performance parameters (in this case maximum transmission rate).

5 Six more job steps were required to add the product page references to the company index listings for each manufacturer, but without them, finding one product or service out of over 20,000 would be tough.

6 Jerry Shaw, far right, President of Alphanumeric Publication Systems Inc., explains the operation of the APS-3 photocomposer to the author, rear, while an APS operator loads the media cartridge.



7 Output from the APS-3 is in fully composed pages, with page numbers and chapter titles. After development the media needs only to be sliced into 8½ x 11 format.

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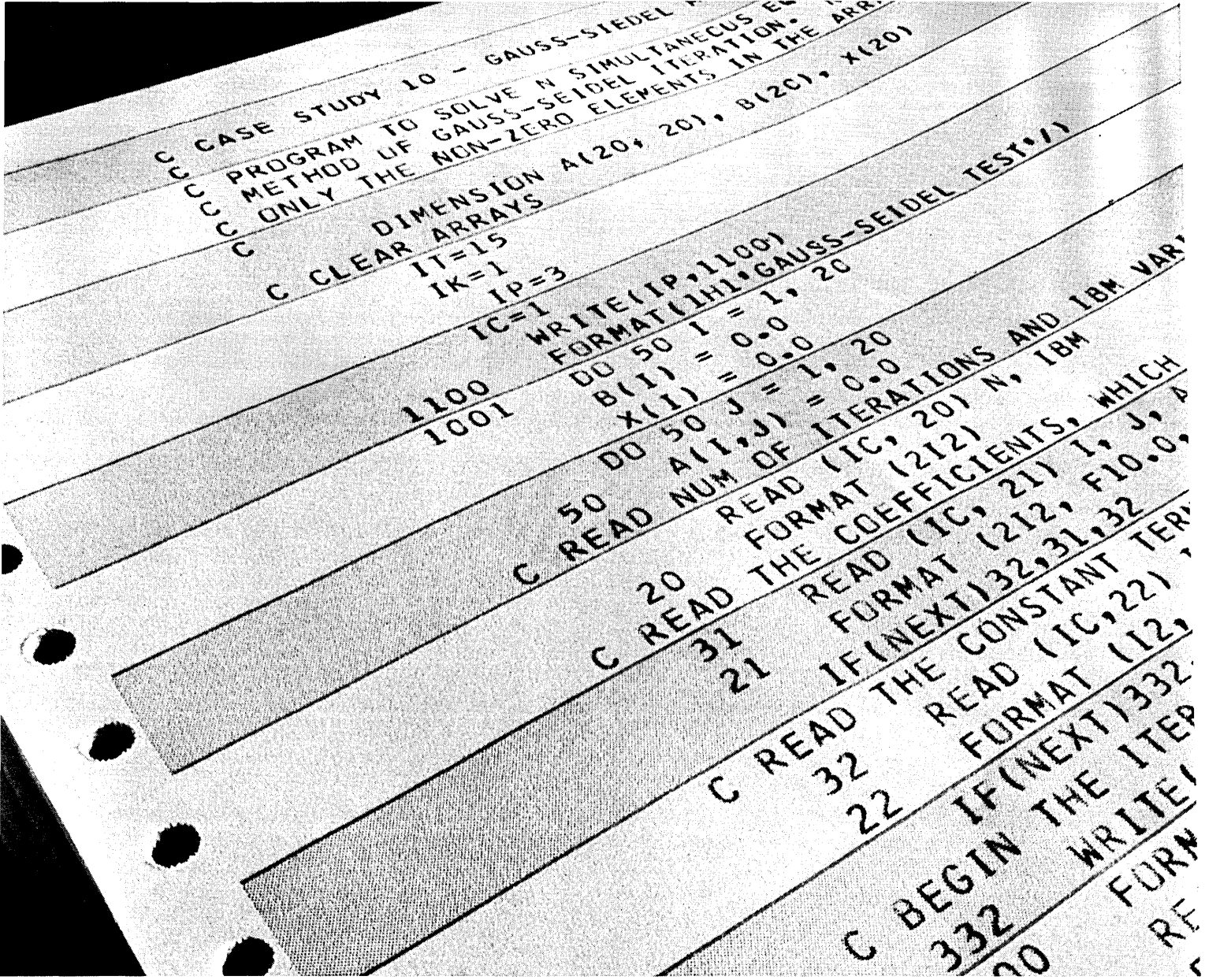

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No attendance records, but Atlantic City saw a businesslike conference with exhibitors generally pleased by the seriousness of the customers

The SJCC

The Joint Computer Conferences have long served as something of a bellwether of the computer industry and the signal transmitted at this year's Spring Joint Computer Conference in Atlantic City is that the industry is in the midst of an identity crisis. Keith W. Uncapher, AFIPS president, summed up the situation in his presidential address:

"The fact is our field lacks focus. We have no relevant data base of our own. We lack a unified voice and a common purpose."

Indeed, the fact that the technical quality of the conference sessions was widely acclaimed and that the overwhelming majority of the exhibitors voiced delight at the traffic they received at the show only seemed to underscore the paradox of the SJCC: both attendance and the number of exhibitors were down sharply.

Total attendance was down to 13,859 from 21,360 the previous spring (although paid attendance was up) while the number of exhibitors fell to 144 from 195. But, in many ways, the exhibitor drop tells the real story because the drop in exhibitor guests accounted for most of the drop in total attendance, too.

AFIPS, however, was aware of the trends well before the show and had already taken steps to attempt to reverse the trends. For one thing, upcoming Joint Computer Conferences will be held closer to major population centers in a move designed to attract more attendees. Thus, the SJCC next year will be held in Philadelphia while this fall's conference has been moved from Las Vegas to Anaheim. In another measure, AFIPS is moving to tailor its technical sessions to appeal more to end users.

More than anyone else at Atlantic City this spring, though, it was Uncapher who placed both the data processing industry and its Joint Computer Conferences under a microscope and focused in on the problems and challenges facing the industry.

"Abstract discussions about the state of our art have little relevance," said Uncapher. "The nanosecond has lost much of its sex appaal. We can no longer afford to stand back and worship our technology. For the computer has become vital to a host of services basic to our economy, and our general well-being. . . . At 21, the computer has reached the age of maturity. Its industry can no longer progress by intuition, or by letting things happen."

The technical sessions appeared to be as well-attended as ever. The exhibits area, however, was not as crowded as in earlier years, but most of the exhibitors found this to be something of a blessing.

Fewer lookers, more buyers

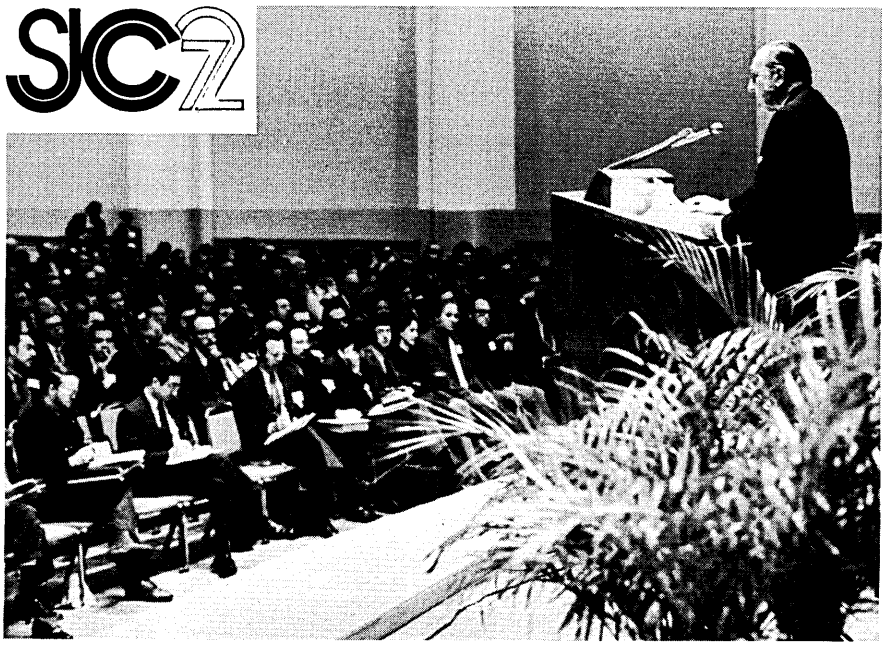
"If we get one-half the space for exhibits and one-quarter of the customers, it's all the better for us," said Bruce Elmblad of Inforex, a data entry firm that exhibited. "There are less tire kickers that way. Too many people worry about total attendance figures, but I've found in past shows that when you get a lot of traffic you can't always handle potential customers."

One marketing man who commented on the exodus away from the conferences of traditional exhibitors like IBM, Honeywell, Digital Equipment Corp. and Hewlett-Packard was Herbert J. Richman, vice president of marketing for Data General Corp., a minicomputer manufacturer. "I hope these guys never come back," said Richman. "We got tremendous exposure at the show and the people we saw were really qualified. There were very few students, for example. We saw many traditional end users—the guys who buy big minicomputer systems."

Data General introduced its new Novadisc at the show and Richman said his company booked a considerable amount of business on the convention floor. Another booth that was particularly active was Cambridge Memories, which formally introduced its moving magnetic memory called DOT. The company hopes that many firms will design its product into discs.

One of the more intriguing products was a terminal printer produced by Data Interface Associates of Danbury, Conn. The 25-pound unit features a magnetic belt running the width of the 80-character carriage. After a line is encoded in 10 x 12 matrix font, the tape is sprayed with magnetic ink, meets the paper and moves on. Printing speed is said to be 240 cps.

In a remote and poorly publicized room upstairs was a collection of devices intended to make the computer available to the physical handicapped.



Keynote address was given by IBM board chairman T. Vincent Learson.

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Now, look at the mechanics and electronics. The entire unit is so simple, there is practically nothing to break down. Because we disengage the read/write head after one revolution with no commands and the drive motor after three revolutions with no commands, the life of the unit is virtually limitless. Finally, this outstanding disk drive is available in OEM quantities for as little as $500! We can't imagine why anyone would use a cassette drive when they can get a disk drive like this. Let us send you complete details. Call your local Potter Representative or write to Potter Instrument Company, Inc., 532 Broad Hollow Road, Melville, N. Y. 11746, Phone 516 694-9000.

POTTER. A lot more than less expensive.

One of them, the Optacon, lets blind people feel the printed page. It consists of a hand-held camera that reads the lines as the student passes it over them. The visual data is converted into impulses that are felt on the index finger held in a small box. A visual display unit for use by a teacher is also available. The unit is made by Telesensory Systems Inc., Palo Alto, Calif.

There was even a touch of poignant nostalgia at the show in the form of an exhibit sponsored by the RCA Service Co. RCA, of course, dropped out of the mainframe computer business last fall and one RCA employee at the booth said many convention-goers commented on the demise of the mainframe operation—most jokingly, but a few bitterly. One man at the RCA booth said RCA's business at the convention was "fair" and he added that the operation had signed up several orders for Teletype leases.

Most sellers happy

AFIPS made a random survey of 57 exhibitors and found that 46 of those polled were very enthusiastic at the response they received at the show, that another 8 were pleased, and that only 3 voiced negative feelings. In spite of the fact that the number of exhibitors at the show was down, AFIPS officials noted that 35 exhibitors signed up for the conference in the eight weeks preceding the conference— a sign that was interpreted as indicating the exhibits picked up as the economy began to turn around.

In another development at the conference, T. Vincent Learson, chairman of IBM, revealed in the keynote address that IBM is committing $40 million to establish four data security installations—three at user sites; the fourth at IBM.

"The study centers," said Learson, "will be located at installations where the IBM Resource Security System will be installed. That is a programming system which permits users of multiprogramming to prevent unauthorized access to files. This system will be fitted to IBM's OS release 21 and tested in a controlled security environment through the end of 1973."

The sessions

One of the conference's most provocative papers was presented at the data communications session by Robert E. LaBlanc and W. E. Himsworth, of Salomon Brothers, a leading investment counseling firm. They predicted the makeup of the communications industry "in the coming decade will be shaped more decisively by financial constraints than by any other factor."

Much of the paper consisted of a statistical analysis showing that communications firms—AT&T, plus the long-established lesser lights like Western Union, plus the newly emerging specialized carriers and CATV operators, and the yet-to-emerge domestic satellite operators—will need $7 billion per year in new capital by 1975, and $10 billion annually by 1980.

"In the coming decade, with increasing (capital) demands from all sectors of the economy, the (communications) industry will have to make itself relatively more attractive . . . This means good balance sheets, 'clean' accounting practices, attractive rates of return, and . . . growth in earnings per share."

The authors also predicted that, in 1980, Bell "will continue to dominate data communications . . . we think you will see many more (Bell) services geared to the data user." Also, "full-scale development" of two-way CATV will be postponed "until the late '70s or early '80s"; Datran "can be providing about 10% of the data communications traffic by 1980," but the "competitive response" of the long-established carriers will prevent MCI and other point-to-point service suppliers from becoming a "major" factor.

At a session devoted to "The Computer in Government," R. T. Chien of MIT, P. B. Maggs and F. A. Stahl, Univ. of Illinois, argued that more research on artificial intelligence is needed before computers can do an effective job of legal analysis. Their paper was entitled "New Directions in Legal Information Processing."

One major research goal is development of a scheme for representing the logical and grammatical relationships of natural language in a more machinable form, said the authors. Other goals: machine-assisted consistency-checking and consequence-finding systems; automation of the Socratic method of legal instruction; and conversational computer techniques permitting lawyers to obtain information from clients and witnesses. Present computer systems developed for legal recordkeeping, legal information retrieval, legislative bill drafting, and legal education "have fallen short of major impact because they have been by their nature unable to deal with the verbal and logical complexities of the law."

Geographic information systems were also covered at this session. Robert Amsterdam, Richard Andresen, and Harry Lipton, of New York City's Office of Administration, described available software and some applications. The latter ranged from SPRINT —a system used by the New York City police department to correlate incoming police calls, in real-time, with the nearest street intersections—to computer-generated maps showing, for example, the concentration of hospital outpatients by city health district.

Power to the Computer Industry

In the first AFIPS presidential address—it could set a dangerous precedent—outgoing president Keith Uncapher called for the establishment "of a central office in Washington to provide a focal point for the entire computer field." Its function: "To enable the computer field to speak with a single voice, to help us establish where we are, where we want to go—and what we have to do to get there."

New AFIPS management includes Walter L. Anderson, president (left) and Robert Kudlich, vice president.

The main purpose of such an activity, Uncapher made clear, would be to help the government and the nation correct the fact that "information processing has not yet been accorded within government itself the status it deserves."

Delicately sidestepping the issue of what organization(s) would direct and control this new national focal point for the industry, Uncapher said, "Such an office must be ecumenical in its activities and sensitive to divergent views. Whether it is established by AFIPS, or by others, is of less importance than that it be implemented promptly and in a meaningful way."

Uncapher, who declined to be nominated for the usual second term in office, was succeeded as AFIPS president by Walter L. Anderson, president of General Kinetics, Inc.

Also elected to the AFIPS board were Robert A. Kudlich, vice president; Richard B. Blue, secretary; and George Glaser, treasurer. □

The SJCC

At the session on installation management, Ronald M. Rutledge, Carnegie-Mellon Univ., predicted that the next computer generation will be characterized by "low cost mass secondary storage so inexpensive and efficient that tape drives will become uneconomical to use in many cases. Telecommunications will be reliable and economical, so that we will not hesitate to use a computer at the opposite end of the country. Time-sharing systems will work reliably. No one will take note of using a system with several hundred people on it." Also, there will be much greater use of management information systems and distributed data bases, "manufacturers may actually supply (system performance) measurement facilities as parts of the standard systems," and every large cpu will be linked to "numerous" minis dedicated to specialized functions.

Among the installation manager's continuing problems, said Rutledge, is personnel. "Unfortuantely, evaluating programmers remains in a state of witchcraft." But he indicated that a policy of hiring fewer programmers and paying them more reduces the problem compared to employing a larger, lower-paid staff.

Another problem is that "in most organizations today, installation managers don't have enough administrative authority to properly discharge their technical responsibilities. Getting the installation manager into the executive suite, he added, "is one of the toughest challenges to be met if our organizations are to receive the proper benefits of our technology."

Undoubtedly the happiest session —and perhaps the most inspirational—was "The Computer as Supertoy." Chaired and led by ebullient Seymour Papert of MIT, the session indicated that computers can help make learning fun.

Papert described his attempts to create a Mathland . . . a place where any child can learn the rudiments of that language, just as a child in France learns French. He showed a film of Eskimo children playing games that teach them the elementary skills required in fishing. Then he showed films of American grade-school children learning how to formulate natural-language instructions to a computer that directed "a turtle" to draw things.

Said Papert, "We called it a turtle because that's a better word for peripheral or computer-controlled device." The turtle has a pen and wheels. The students learn to create subroutines, and to combine these into complex forms. Says Papert, "They learn angle talk."

Marvin Minsky, also of MIT, elaborated on the toys of the future, and how they can offer the student a mechanism for describing procedures, so that he can analyze his work and diagnose his mistakes. Patrick Suppes described some of the educational work at Stanford.

A high point of the conference and perhaps of the JCCs of the past decade was the talk on "Aesthetics and the Human Factor in Programming" by Dr. Andrei P. Ershov of the U.S.S.R. Siberian Academy of Sciences in Novosibirsk. The internationally known computer scientist, who has made many contributions to programming through his work, received a standing ovation for his contribution, in words, to the understanding of the profession and its individuals. (The complete text of his talk appears in the following article.)

In summing up the show, one reporter who had just returned from the Hanover Fair in West Germany—where the hundreds of exhibitors from all over the world included such former JCC stalwarts as NCR, Burroughs, Univac, and even IBM—said that "coming to this show after that one is like going to an underdeveloped country."

But with changes in the wind—the move to population centers, possible once-a-year five-day conferences, more industry and user orientation—the consensus seemed to be that this affair in Atlantic City was "the last of the old shows." It's time to look forward to the new. □

Aesthetics and the Human Factor in Programming

by Andrei P. Ershov

In order to give wide circulation to Dr. Ershov's talk at the Spring Joint Computer Conference, we are publishing the complete text here. It is also being published in the July issue of Communications of the ACM, which commemorates that organization's 25th year and complements the Silver Anniversary activities of the 1972 ACM annual conference in Boston, Aug. 14-16. The anniversary issue features articles focusing on the future of the computing scene. The ACM president and past presidents comment on the future of ACM and its relationship to information processing, while their remarks are balanced by contributions from a number of industrial leaders, who join the association in looking ahead to its next 25 years.

I must admit that when I received the invitation to appear at this luncheon, my first impulse was to find out who before me had been honored with a similar invitation. I found in a list of preceding banquet and luncheon speakers three famous writers, two Congressmen, one general—but hardly a representative of our own computer profession. Probably that was not accidental: the rapid and extensive development of our industry has inevitably increased the number of its peripheral contacts, the consequence of which has been a growing interest in the outside world. However, it is obvious that in order to cope with the serious problems of our profession, we must not only look at ourselves in the mirror of public opinion, but must also probe inside ourselves. I shall therefore allow myself the liberty of bringing to your attention some observations concerning the human factors vital in programming.

I begin with the following remark: the present is a time of difficulty for programmers. The volume of work to be done is increasing; wages less so. The romantic aura surrounding this inscrutable occupation is, if it ever really existed, beginning to fade. Software houses are melting like snow in spring. Professionals accustomed to being strongly in demand now find themselves waiting on the books of the employment agencies. Even the claim of programmers to be a special breed of professional employee has come to be disputed. Still more significantly, authority over the freewheeling brotherhood of programmers is slipping into the paws of administrators and managers—who try to make the work of the programmers planned, measurable, uniform and faceless.

> Of course, this is a mythical person, but who said that our profession can do without myths and fairy tales?

I do not mean to deplore this tendency. I myself have for a long time been related to programmers as an administrator and, as such, contribute by providing background support to the systematic organization of their work. As an administrator, I may remark that the network of relationships

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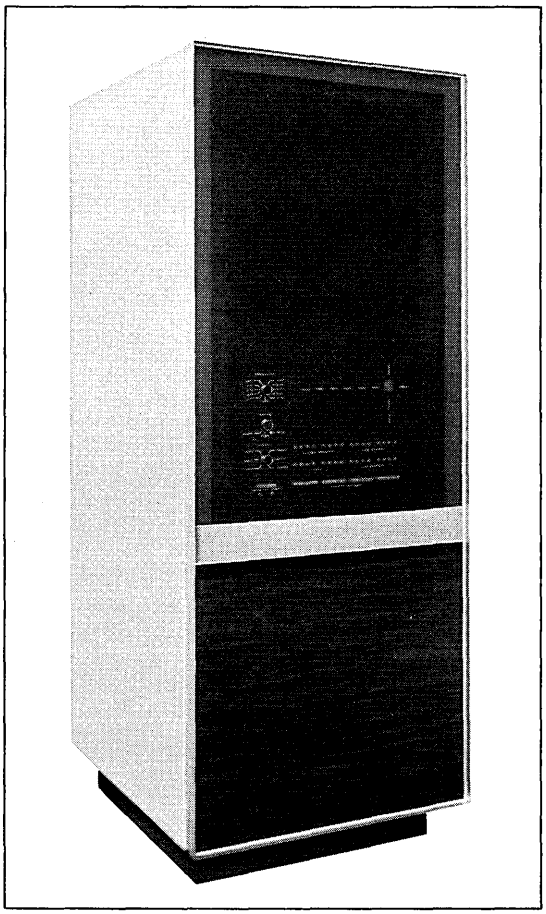

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connecting programming to the world at large has not yet reached maturity.

Consider, for example, the proliferation of software houses during the last decade. A small software house, which at its smallest might better be called a software hut, will often be nailed together in the course of several weeks by a group of able programmers, who may perhaps plan on leaving a large organization in which they have received their initial experience. What motivates such an initiative? In many cases, a mix of profit-thrust and of a somewhat unrealistic desire to break free of excessive supervision, accompanied, of course, by some particularly interesting and useful technical software idea. However, only those groups have survived in which initial motives were quickly subordinated to tough economies, and in which hierarchical interpersonal relations and strong discipline were imposed—in a word, all of those things reconstructed which originally will have driven a software group from its parental roof. The history of such enterprises can at times be reminiscent of the adventures of the three little pigs: the brotherhood of programmers finally winds up in a well-fortified software house, but not until a fraction of them are swept away by the wolfish wind of merciless commercial pressure. Do not think here that I refer exclusively to American reality; I have more direct personal experience in this connection.

Thus, the subordination of programming to big enterprise is an unavoidable fact. However, I see a certain danger in converting programmers into what is simply a highly paid subgroup of the working class. If such a tendency is to be resisted, a programmer must find some system of inner values in his specialty, values which can help him both to assimilate industrial working methods and when necessary to transcend them.

This last remark brings me to my second theme: that such a system of values is objectively inherent in programming. Since, however, these values are not fully conscious, they require explanation and defense. The value system to which I allude has many bases, of which the most material, perhaps, is the professional status of the programmer (and I speak here of programmers in a broad sense, including systems analysts). I shall, however, in this address emphasize not material issues, but shall concentrate on the aesthetic or emotional aspect of programming, and discuss not the compensation which comes to a programmer when he goes with his products out into the marketplace, but the moral forces which affect him when he is left alone with his program and his computer.

You may, of course, ask me: is it worth discussing this non-material aspect of the situation? I answer that it is, and only in part because programming has become a massive human activity.

In my opinion programming is, for at least the following three reasons, the most humanly difficult of all professions involving numbers of men.

1. Programmers constitute the first large group of men whose work brings them to those limits of human knowledge which are marked by algorithmically unsolvable problems and which touch upon deeply secret aspects of the human brain.

2. A programmer's personal push-down stack must exceed the depth of 5-6 positions which psychologists have discovered to characterize the average man; his stack must be as deep as is needed for the problem which faces him, plus at least 2-3 positions deeper.

3. In his work, the programmer is challenged to combine, with the ability of a first-class mathematician to deal in logical abstractions, a more practical, a more Edisonian talent, enabling him to build useful engines out of zeroes and ones, alone. He must join the accuracy of a bank clerk with the acumen of a scout, and to these add the powers of fantasy of an author of detective stories, and the sober practicality of a businessman. To top all of this off, he must have a taste for collective work, and a feeling for the corporate interests of his employer.

In programming, the use of assembly-line organization can destroy the intellectual work-satisfactions which motivate programmers . . .

I know that to overcome these difficulties, great emotional effort is required, which can be provided only through conscious deliberation and a positive inner attitude. If an Arthur Haley wrote a novel, "The Computer Center," it would surely rank as the most engrossing of bestsellers!

Which brings me to my next thesis. An understanding, a feeling for the aesthetic of programming is needed, and not only as driving force for the programmer: it is necessary for those who manage programmers, and especially for those who educate and train them. Let me cite some of the hard organizational dilemmas whose solution can only be reached if we take account of all the aesthetic factors which have been noted:

Is it necessary, is it possible to organize software development using an assembly-line approach?

Is it possible or necessary to separate the design of large programs from their implementation?

In organizing software projects, which are more difficult to find (and why)— managers or performers?

How can the elite and the mass character of systems programming be harmonized?

What individual capabilities should we look for in the programmer? Are these qualities specific enough that we can take them into administrative account?

How should programmers be trained? By cultivating a "world view" (in universities) or by emphasizing "job-related" skills (in technical institutes)?

All these questions are only part of the general problem of software management. I shall, of course, not ruin your digestion by attempting a systematic analysis of this very convoluted problem. Let me undertake, however, to make a few personal comments in an attempt to relate these organizational problems to an analysis of the human factor in programming.

First, a comment concerning assembly-line methods in software development. I personally consider the assembly line a most diabolical invention. True, it raised productivity to an unheard-of level. At the same time, however, it gave the labor situation a faceless character to an extent not previously known. In programming, the use of assembly-line organization can destroy the intellectual work-satisfactions which motivate programmers, and the contradiction between the monotony of work so organized, and the difficulty of a programmer's work, can bring about neurosis. Imagine a man who is compelled to work exclusively at solving crossword puzzles, eight hours a day, five days a week, 50 weeks a year, and you will understand what a programmer specialized in the writing of some narrow class of program components faces. Surely, therefore, to increase programmer productivity by the division-of-labor principle, i.e., by breaking down the programmer's task into elementary operations, is far from a simple matter.

Concerning managers and implementers: a manager's ability to deal with a technically specific work force is often limited. Often, a project manager will prefer to assign implementation responsibility to a young specialist just two or three years out of the university, rather than to a person with much more substantial experience. Does this not indicate a preference for the easy plasticity of a young man, an attempt to avoid grappling with a more mature and resistant 33-year-old family head?

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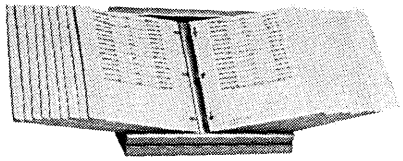

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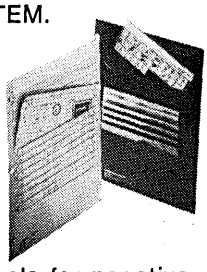

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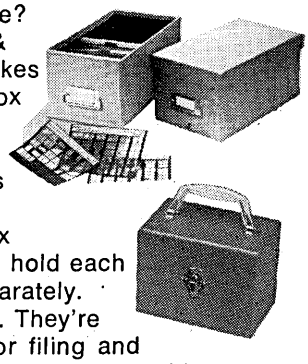

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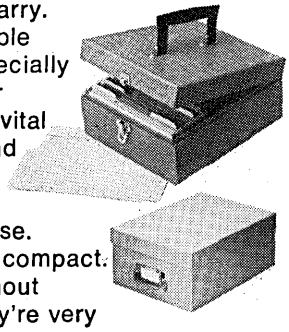

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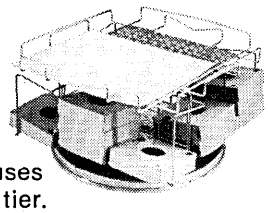

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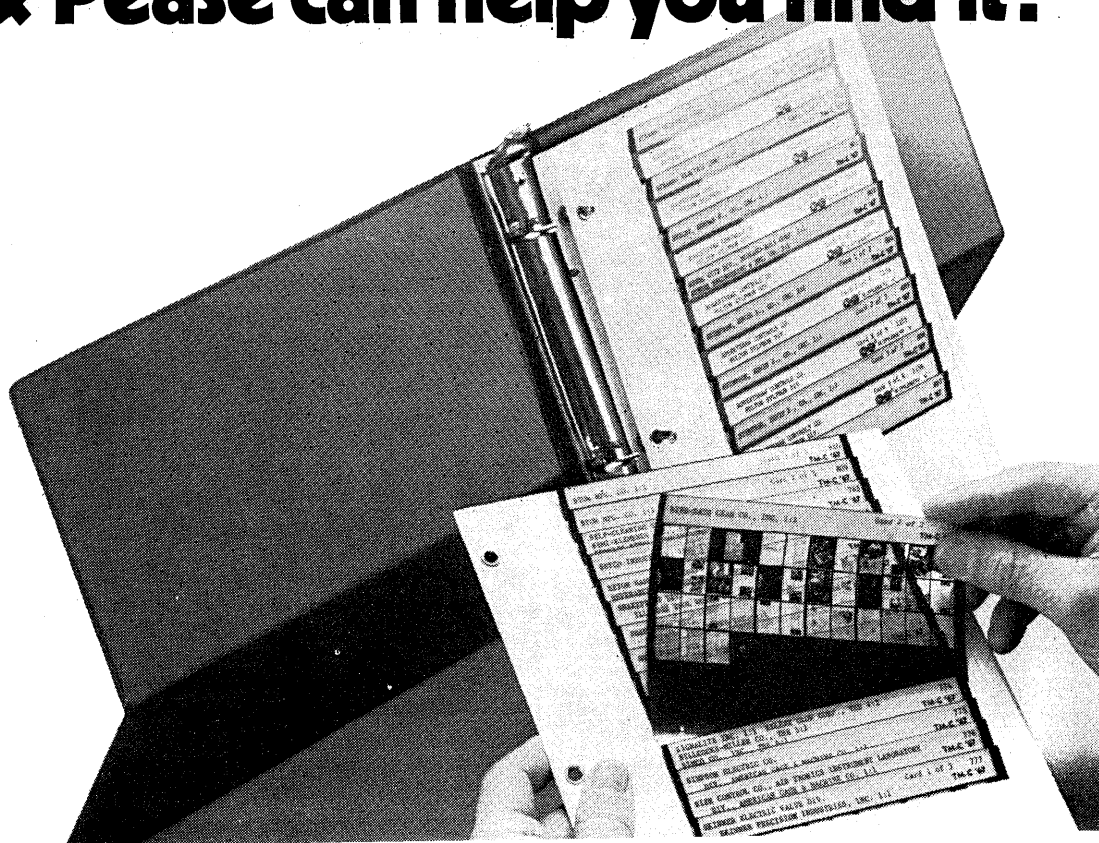

CIRCLE 17 ON READER CARD

The Human Factor

Does it not also show that we don't know how to enhance the professional dignity of an implementer, how to help him avoid losing ground with age, how to keep him useful, not only for the manager with whom he must work, but for himself and for his future managers?

Concerning "world view" versus "job skills," the problem is of course not only that of estimating the optimal ratio between PhDs and software technicians, though this problem raises staffing questions which have faced many managers. The essence of the problem is that programming requires of a man a certain attitude, a certain moral preparation for his duty. The programmer is the linchpin of a second industrial revolution; as such he must possess a revolutionary way of thinking.

That programmers are an elite group is quite evident to me. In this respect the activity of programmers represents a significant challenge to humanity as a whole; a challenge which I hope will be accepted. I will return to this thought below.

I now may restate the central thesis of my speech and affirm that programming embodies rich, deep and novel aesthetic principles on which is based the inner relationship of a programmer to his profession, which give him both intellectual and vivid emotional satisfaction. This aesthetic has roots in the creative nature of programming, in the difficulties which programming overcomes, and in the social significance of programming.

To define the core aesthetic of any professional activity is not a simple task. Such an aesthetic is realized by a set of subjective attitudes which link professionals together.

I quote here the Russian proverb: "One fisherman recognizes another fisherman from afar."

A professional aesthetic influences and is influenced by the ethical code of a profession, by the technical subject matter of the profession, and by the profession's juridical status. The account of the aesthetic components of programming which I shall now try to give will accordingly also have a subjective and preliminary character. I begin with some remarks concerning the inner nature of the programming aesthetic.

The creative nature of programming does not require special proof. Indeed, I may assert that in its creative nature programming goes a little further than most other professions, and comes near to mathematics and creative writing. In the majority of other professions, even when putting the tiger in the tank, we only tame the forces of nature. We simply use physical and biological phenomena, hopefully in a cleverly economical way, but without understanding their innermost princip'es. In programming, however, we go, in a certain sense, to the root. One of the theses of modern epistemology states that "We understand what we are able to program." This phrase vividly characterizes the maximalism of our profession.

Another very important aesthetic characteristic of programming is that exceptionally high accuracy is demanded of its finished products. Of course, this is characteristic of much engineering. However, programming requires accuracy going beyond that needed in other types of engineering. There exists a striking contrast between an almost finished and a fully implemented and debugged product. This requirement for 100% fulfillment is the source not only of some of the programmer's most frustrating difficulties, but at the same time gives rise to some of the deepest satisfactions of his work.

Intelligence itself is manifest in the perfected machine-program combination. The programmer plays a full trinity of roles in this familiar miracle. He feels himself to be the father-creator of a program, the son-brother of the machine on which it runs, and the carrier of the holy spirit which infuses life into the program/machine combination. This triumph of intellect is perhaps the strongest and the most characteristic aspect of programming.

In using a machine, an honest programmer displays one more peculiarity. He relates to it as a good jockey relates to his horse. Knowing fully the possibilities which the machine affords, he will nevertheless not allow himself to indulge in a personal intellectual laziness implying reckless expenditures of computational resources. This essentially aesthetic relationship of the programmer to his work constitutes a most effective safeguard against the mindless accumulation of software inefficiencies, which, though it might not raise any special objections on the part of companies which sell machine time, would cheat the consumer and lose us the full power of machines.

A second group of aesthetic issues relates programming to its social and public functions. On first meeting and attempting to analyze a social phenomenon of grand scale (and the coming of the computer onto the historical scene is without doubt such a phenomenon) we search for historical analogies broad enough to give us a basis for extrapolation and prognosis. It is in this sense that we speak of the advent of the computer as a second industrial revolution characterized by the industrialization of intellectual work. Another analogy on the same scale may be offered for the profession of programming. The progressive expansion of software is, it seems to me, comparable in many ways to the phenomena set in motion by the invention of printing. The accumulation of books, each one embodying its author's view of the external world, broadened a social process of understanding. In the same way, programs and data banks accumulate informational and operational models of the world, and allow us not only to influence but also to predict the world's evolution, giving us in this way an unheard-of power over

Dr. Ershov, right, accepts educational game from Jacob Schwartz, technical program chairman.

nature.

To be a good programmer today is as much a privilege as it was to be a literate man in the 16th century. This privilege leads the programmer to expect recognition and respect on the part of society. Unfortunately, such an expectation is not always realized. Let me say that if this recognition is to be granted, work is required on both sides. On his part, the programmer must accept a general ethical principle applying to all professionals, but having a special interpretation for programmers. Three main attitudes to work may be distinguished: work for work's sake; work for money; work for a goal.

In the programmer's world the first two motivations occupy first place, though it is the third that should be most absolute. Therefore, I wish to say that the programmer can achieve a fully harmonious relation with society only when loyalty to the goal of which his programming is only part is integrated into his inner attitude.

In speaking of the social functions of programming, I cannot avoid observing that an unsolved technical problem, namely that of giving programming a cumulative effect, stands as an obstruction to the realization of programming's full social impact. To solve this problem is a very complicated task but an absolutely necessary one. The spectrum of opinion about it is boundless. Some say that only a tiny part of presently working programs are of lasting value; others say that OS/360 is already an immortal system of programs. To relate this question to the theme of my talk I want to say that enabling the programmer to see his product as having long-term and stable use will have a decisive effect on his professional self-view.

Allow me now to move on to consider some of the other problems enumerated above.

First, a few words concerning individual abilities in programming. We hold before us, we need, an image of the ideal programmer. Of course, this is a mythical person, but who said that our profession can do without myths and fairy tales? Every one of us must have at least once seen or heard about a wonder programmer from whose programs not one instruction can be deleted and who writes a thousand of bug-free instructions a day. It is in the nature of man to seek for ideals and examples. Precisely to provide such a reference point I will add a remark to the continuing discussion of "prima donnas" in programming. To declare them flatly undesirable is at the very least short-sighted. I have been lucky enough in my life to meet several such prima donnas who, despite all their individuality and extravagance, made priceless project contributions, especially in difficult situations. So I definitely advocate complete recognition and full exploitation of the broad scale of individual abilities in programming.

Let me now go on to discuss the relationship between design and implementation in software. Conflicting forces affect this relationship. Managers responsible for major projects seek ways to formalize the distinction between design and implementation, hoping to allow the task of implementation to be shifted from one hand to another in an administratively convenient way. On the other hand, the work itself offers terrific resistance to such a division. Let me say that a correct resolution of these conflicting forces is impossible without taking into account vital human factors and the aesthetic needs which they imply (needs which create obstacles to the implementation of passively received ideas). Moreover, to give one's own technical project into strange hands is equivalent to sending one's children to a boarding school. Such an action, even if it becomes necessary, is still full of loss.

. . . to give one's own technical project into strange hands is equivalent to sending one's children to a boarding school.

I have, in developing my argument, characterized programmers as an elite, and have stressed the very special nature of programming and the far-reaching demands it makes upon limited human ability. In winding up I would like to return to this issue and to view it differently. When I was last in the United States, in 1970, I was very much impressed by the new ideas in the education of children developed by Marvin Minsky and Seymour Papert of MIT. Minsky and Papert threw overboard the cliche that children learn subconsciously by imitation. They proved that men learn best when they form flow-charts of action in their heads, when subroutines are separated out and informational connections traced. Using the problem of juggling with two balls, and appealing to my abilities as a programmer, Professor Papert taught me in ten minutes what I myself wouldn't be able to learn in several hours, thus converting me to his faith forever. This shows that man can greatly strengthen his intellect, if he is able to integrate into his nature the habit of planning his actions, of working out general rules, and of applying them to concrete situations. To organize rules; to express them in a structured way; in other words, to program.

In past ages, the ability to read and write was considered a rare, God-given gift, the destiny of a limited group of the specially chosen. In the present age of general literacy, we perceive reading to be a universally attainable accomplishment, but we are tempted to single out a new elite group, who become arbiters between the lay generality of mankind and the arcane informational model of the world hidden in the machine. Is it not, however, the highest aesthetic ideal of our profession to make the art of programming public property, and thereby to submerge our elite exclusiveness within a mature mankind?

I must ask the audience to forgive my high-flown style. General literacy was the accomplishment of an historical millenium. To accomplish the further step which I have projected, much less than a millenium will be needed, even though we are far from the projected goal. Of course, far more prosaic and pressing problems surround us. Nevertheless, every programmer, even when he is merely leafing through a manual or fumbling to find the right key on a terminal, contains within him a boundless depth of thoughts, desires and emotions. I am thoroughly convinced therefore that the colleagues and managers of a programmer must understand his professional motives and perspectives.

I have in my remarks discussed certain current problems connected with the human factors in programming. Perhaps a still more important problem has been neglected. At present we limitlessly recruit young people into programming, promising them the sky. However, human generations change much more slowly than machine generations. We, as innovators, must learn to keep a 50-year-old programmer as useful as a new recruit. In 30 years we'll have a million such programmers. Presently we must admit that we don't even possess an approach to the utilization of veteran programmers under modern conditions of change and instability, that we do not know how to make the profession of programmer lifelong and leave its practitioners with a comfortable feeling of personal security.

I would like to express my gratitude to the organizers of the conference, and especially to Dr. Jack Bertram and to Professor Jacob Schwartz for affording me the honor of appearing at this conference. I thank you. □

Dr. Ershov is a professor at Novosibirsk Univ. and a corresponding member of the U.S.S.R. Academy of Sciences. He is known internationally for his work on the ALPHA and BETA programming systems and is the author of many scientific papers.

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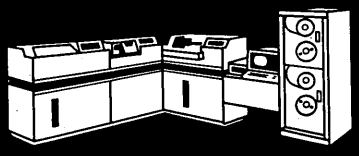

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CIRCLE 47 ON READER CARD

What are the inherent characteristics of a good program and how can the designer make sure they will emerge in the finished product?

Designing Reliable Software

by Jerry L. Ogdin

We've had too many spectacular flops. I have found that most failures can be traced to galloping optimism among the edp staff. Recently, I traced a near-calamity to just this cause. Upon investigation, I found that the systems analysts and programmers were all suffering under some delusions of what happens to systems after cutover.

We learn theory, but we implement practice. This discussion is about practice. *It is about what really goes on out there in the cold, hard world—outside the cozy den of article authors.*

This paper will try to disabuse you of some of your more cherished notions about what happens to computer programs. A second paper, to appear in a later issue, will offer some suggestions on how to overcome our design myopia.

We can look at two programs, ostensibly similar, and find that they accomplish the same desired function. Yet, we will say that *this* program is a good program, while *that* one is a bad program. But we don't always know why. It is, at present, a matter of professional judgment. Many people might label both of the programs good, merely because they execute successfully. But good programs are more than that. Good programs are easier to write, cheaper to implement, and more amenable to modification than bad programs. It seems to be a fact that good programs are designed before implementation. Bad programs are usually just coded and then appended to without regard to any overall preconceived structure.

There are two kinds of programming done today: specialized and generalized. Present five problems to the specialized group and each problem will be solved individually. The generalized group will propose a solution to the single problem that underlies the original five. The former group will probably step immediately into the implementation of a solution for the first problem. The latter group will first think about the problems and then design a more generalized solution. The *designed* software will exhibit a great commonality of functions and a large percentage of shared software resources.

> To design a system that is to satisfy all perceived and projected needs is to avoid the realities of our world.

Most computer programs are merely coded, not designed. It is characteristic of the way most programmers learn their craft. They are taught the detailed idiosyncracies of a particular language or computer instead of proper design principles and practices. There is little literature on the technique of program designing. That might be because there are too few who agree on appropriate methodology or technique, or simply a reflection of the reluctance for programmers to document their work!

Most practitioners of the art and science of computer programming are blithely unaware of the proper design techniques. Most programmers, in fact, have little or no appreciation of the fundamental truths about the business in which they are engaged. The author has been consistently amazed that fewer than one in a thousand programmers and analysts asked to define a "debugged computer program" could do so in any regular, consistent and valid way. Most specialists in the computer industry are so busy doing things the wrong way ("Why is it that we never have time to do it right, but always have time to do it over?") that they never learn how to do it right.

Proper program design minimizes the effort required to accomplish an objective and returns more than the invested time and effort. Fig. 1 (page 72) summarizes some estimates that I've gathered for several programming jobs.

Fig. 1 divides programs into two stylistic classes. "Coded" programs are those in which the implementors began coding early in the project. Before 10% of the total project elapsed time had been used, some code was evident. "Designed" represents the class of programs designed before coding. Typically, coding didn't begin until near the halfway point in the project. The units of measurement of Fig. 1 can be read as man-days, man-weeks, or any other units. The information is probably not

valid for programming staff sizes on a particular project in excess of 10.

Even coded programs have some preliminary design accomplished before coding begins, however slight and superficial. The designed program, on the other hand, has a large percentage of effort applied at early stages that is not "visible." If the management measures programmer performance by numbers of statements produced, the less successful alternative is actually encouraged. When programs are designed first, the total implementation cycle consumes less time and fewer resources, but the product "visibility" to management is very low early in the implementation cycle (see Fig. 2).

The designed program has at least a five-to-one edge over programs that are simply "coded" in the ease with which major and minor changes can be made. The more major the change, the greater the advantage. This basic fact dispenses with the argument that programs in an R&D environment cannot be designed.

The real benefits begin to accrue after the program is placed into production use. Programs are not static. Eventually, changes will have to be made. These changes fall into three categories:

1. Error correction
2. Efficiency improvement
3. Program extension

	"Coded"	"Designed"
Program design	5%	35%
Program implementation	45%	10%
Debugging	50%	35%
Subtotal:	100%	80%
Maintenance over life	25%	5%
Modification over life	50%	10%
Total:	175%	95%

Fig. 1. Effort applied in poor and good programs.

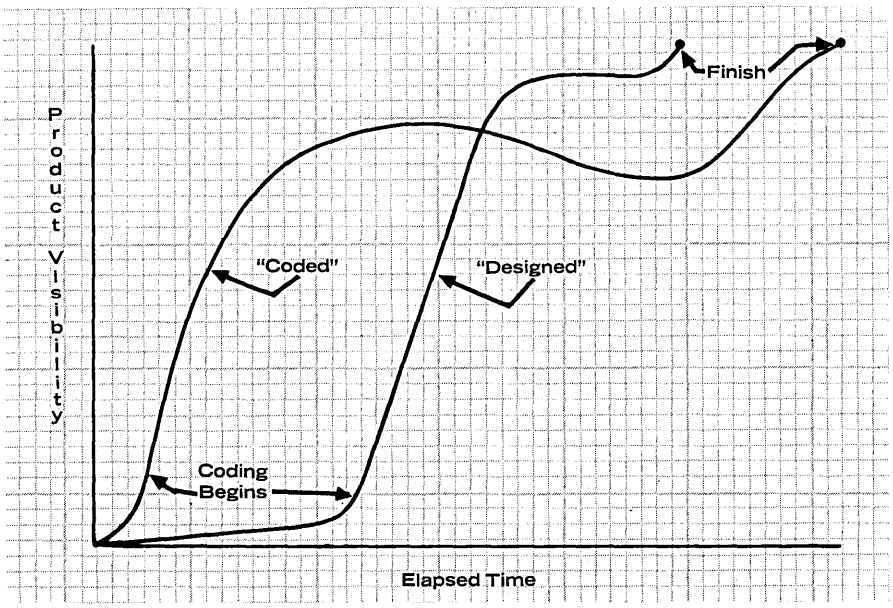


Fig. 2. Product visibility and delivery for programs implemented two ways.

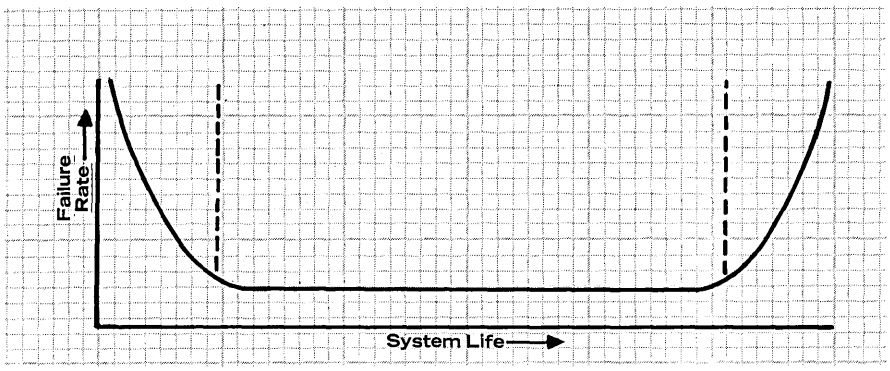


Fig. 3. Reliability history of systems.

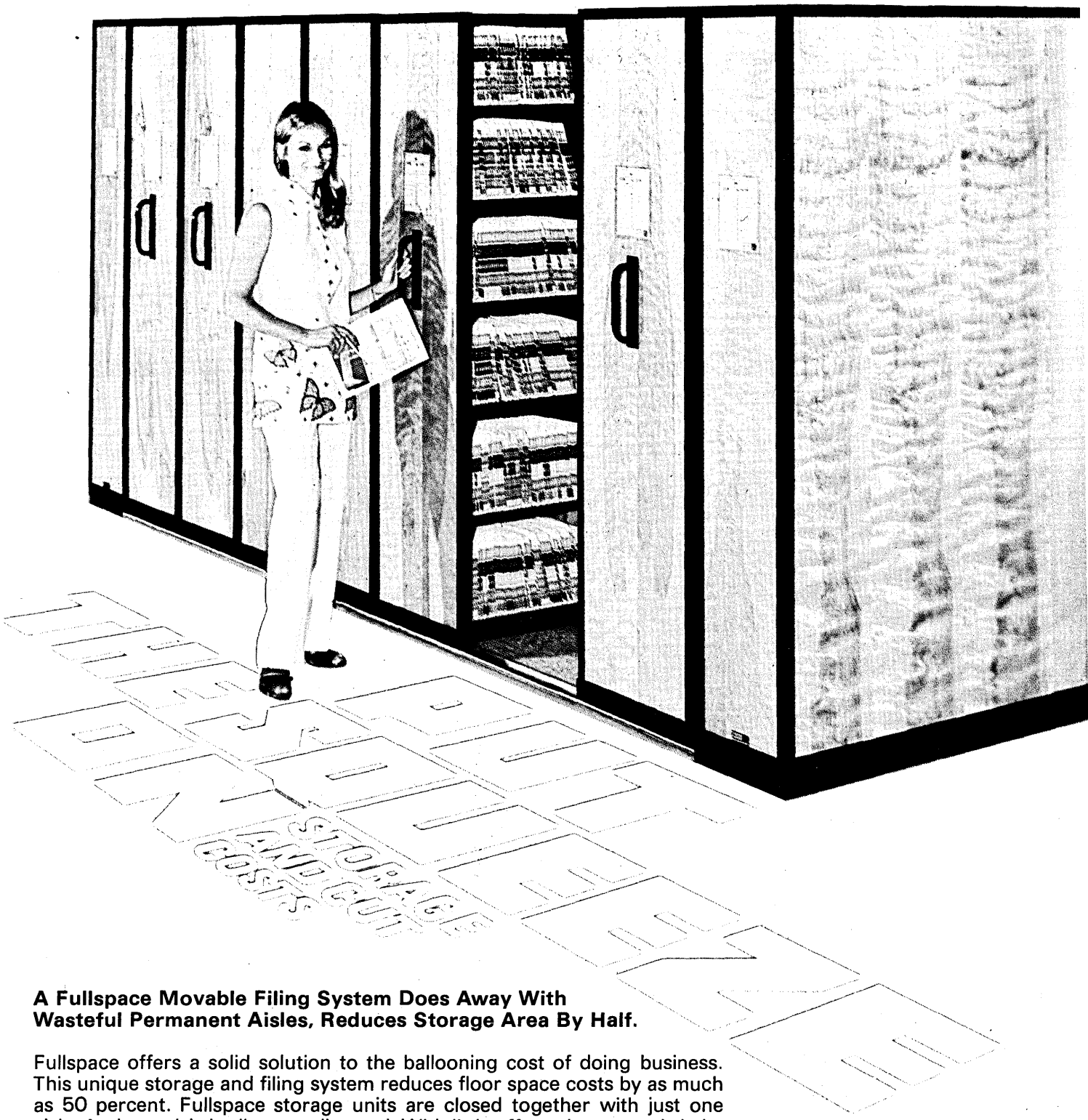
I like to separate the activities of program maintenance and program modification. Maintenance is the continuing process of keeping the program running, or improving its characteristics (the first two categories). Program modification has as its objective the adaptation to a changing environment. A program may need modification because of new hardware resources or new user demands. Modification might be extensive if the proposed change represents a radical structural change in the program.

Most programmers tend to think in terms of the programming language at hand. This forces unnecessary restrictions on the design of programs. The popular programming languages tend to get in the way of proper program design. Languages like COBOL, PL/I, FORTRAN, BASIC and their derivatives can bias constructive thinking away from fundamentals. All of these languages were designed before principles now accepted were common knowledge. The closest language, without a doubt, to a real program design notation is ALGOL. The APL language runs a close second. Unfortunately, too few programmers know these languages, and adequate compilers for them are few in number.

The primary purpose of a programming language is to completely describe a program to a compiler. Only of secondary importance is the formalized communication among programmers separated by time, space and concept. The sole purpose of a programming design notation is the communication between the author and other technicians. Therefore, a program design notation need not be inherently unambiguous and rigid. Any notation whatsoever can be used, as long as the author defines potentially ambiguous usage as it occurs. A bastardized version of ALGOL has been used by many authors of texts and teaching materials.

Another roadblock in the design road is the need for discipline. The program and system designer must maintain high discipline to stick to the proscribed regimen. Once a technique is chosen it should not be abandoned as the deadline for cutover looms near. Changing technique, or indulging in uncontrolled *ad hoc-ery*, will merely delay the project even further. A design strategy is like a diet—it doesn't matter which one you use. They all work if adhered to, some better than others. Any design strategy is better than none at all, because of the requirement for discipline.

The objective of a computer program is the specification of a procedure to be performed to reliably accomplish some goal. Now engineers



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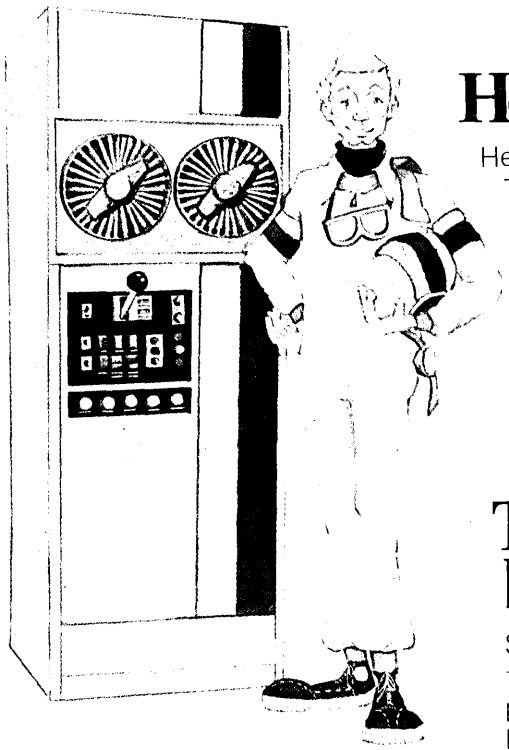

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CIRCLE 34 ON READER CARD

recognize that the reliability of a system varies with time, as shown in Fig. 3.

The first part of the curve is the "infant mortality," and shows the discovery and correction of defects in the system. The mid-range is the "useful life," and some defects continue to appear, but irregularly. The final stage can be called the "death throes" during which multiple failures occur due to wear-out, or repairs begin to cause subsequent failures.

While most software system designers recognize and admit the infant mortality and useful life phases, few understand that the terminal deterioration phase also exists. This lack of understanding comes from the assumption that a program, once written, will not deteriorate. However, programs do not exist in the unchanged state indefinitely. And, more importantly, this fact is true only for successful systems —the others perish.

Any new program has a declining failure rate in the early part of its life. At some point, the rate of failure decreases to an acceptable level, and the program becomes "operational." As an operational program gains the user's confidence, it graduates to being successful. If the program never gains the confidence of the user, it usually "dies."

Some maintenance programming is usually performed on an operational system. Residual bugs, left over from the final testing cycle, may have to be exorcized. Some minor improvements might be made to speed execution time or take advantage of newer software resources. Some of these fixes may introduce errors of their own, but because there is a standard to fall back upon (the previous version), little damage is done.

When a successful program is used, the user begins to better appreciate the things that the system can do. Usually this culminates in the user discovering functions that he'd like to see performed—functions the program was not designed to do. When this happens, the program is modified. Once the program is changed, the number of failures suddenly increases, and then decreases as the newly created bugs are eliminated (see Fig. 4). It may not be possible to fall back to the preceding version of the system, because new data formats are used, procedures have been changed, etc.

Now, people have the habit of forgetting pain and trauma rather quickly. After the user has survived the first software modification, he is emboldened. He then requests another . . . and another . . . and another. As more and more changes are introduced, the history of failures usually looks like Fig. 5.

As an industry, we've been lucky so far. For the major jobs in the shop, the point of ever-increasing failures has usually coincided with the introduction of a new computer (point A, Fig. 5), requiring total reprogramming! With 20/20 hindsight, the subject program has been redesigned and re-implemented, and that starts the entire life cycle all over again.

Design strategy

As data processing management matures, there is less incentive to replace the installed computer just because a newer one is available. The problem, then, is to design programs and software systems that exhibit longer useful lives by withstanding the inevitable climate of change.

There are two ways to view program and software design:

1. The system can be designed to satisfy all perceived and projected needs, or
2. The system can be designed to be changed.

To design a system that is to satisfy all perceived and projected needs is to avoid the realities of our world. A system designed to be all things to all users is bound to fail, unless your crystal ball is infallible. A system of this kind is designed with the unstated objective of eliminating the need for future changes and modifications. Practical experience dispels this notion among good systems analysts and programmers. Too many specialists, though, don't stop to think about what they are doing, and perpetuate their mistakes of the past through successive systems.

A program will probably be represented by several different versions during its entire lifetime. Whether those versions exist in parallel or series is not important to the design. What is important is that each version represents some change from another version. If the program designer tries to define a program that will never need changing, the program will probably be difficult to change. And, since the designer will not likely design the "ultimate" program (one never requiring change), then change will be inevitable, and inevitably difficult. However, if the designer is aware that he is designing one of a family of programs, then the design will probably include provisions for later change, making that change easier.

If a system or program can be designed to be changed, then it is possible to define some subset that is small enough to be manageable, and the balance of the project can be founded on that subset. It is safe to say that an

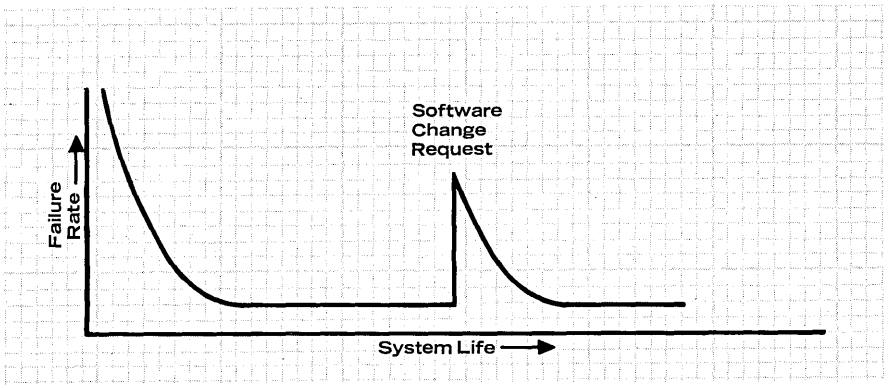


Fig. 4. Reliability history of software and programs.

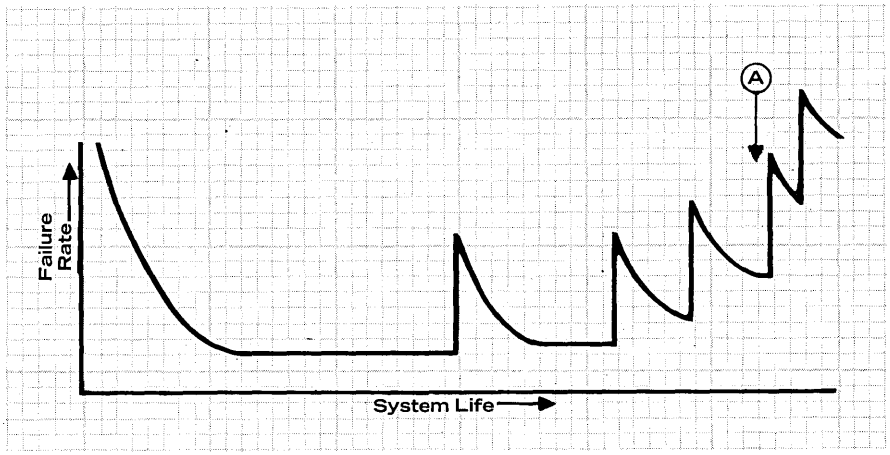
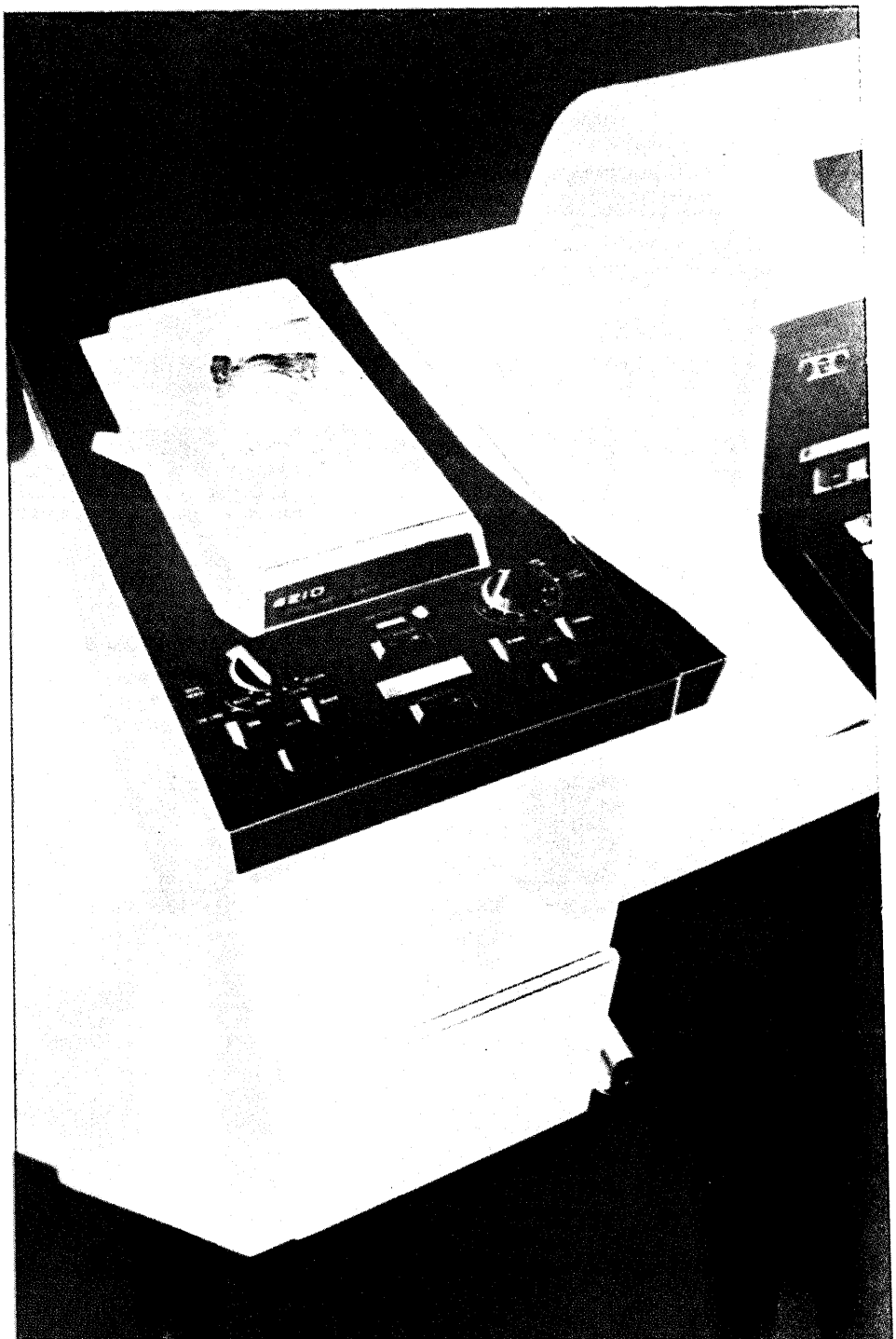


Fig. 5. Reliability of most software systems.

When we designed the 4210, we didn't stop with speed, economy and control.



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Our 4210 offers ease of operation, too.

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inefficient program is better than none at all for computerized applications. Then, a user's most pressing needs should be satisfied with a subset of the whole eventual system. The rest of the user's needs can be satisfied by increments to the programs and system. An additional advantage will be found here: The most successful systems have been those with limited initial goals. Too ambitious systems are seldom successfully implemented. A limited objective, properly implemented and correctly modified based on operating experience, is likely to be achieved.

Manufacturer-supplied operating systems are typical examples of a poor design philosophy. The manufacturer has a different goal in design and implementation than the user has. The manufacturer would like to build one operating system that will be an adjunct to machine sales. Efficiency and changeability are given minimal consideration by the manufacturer. The objective of such systems is, clearly, to be "all things to all people." In all too many cases the system is merely equally inefficient and intractable for all. And the errors are legion. In OS/360, each release was said to have contained about 1,000 errors, and the number appears constant.

Programs are designed in one of two popular ways: "bottom-up" or "top-down." The bottom-up scheme starts by defining elemental building blocks like subroutines and data structures, and gradually increasing the complexity of combinations until the eventual program is complete. Strict adherence to this approach means that the system designer is confident in his ability to predict the utility of a component before it is actually used.

In the top-down method, the system designer defines what each component is to do, rather than how it is to be done. The approach means starting with the specification of the eventual system, and breaking that into a set of smaller sub-specifications, and repeating the process until independent components are specified. In the top-down approach, the designer is predicting that the specifications can be met through some practical technique.

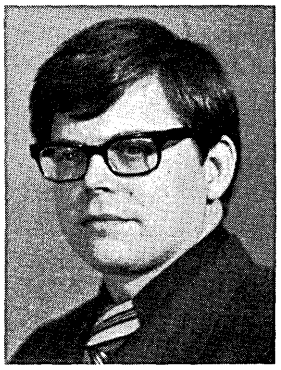
It is rare to see any design progress exclusively from the top or bottom. In the top-down method, the designer is applying his own experience about the likelihood of being able to write a program to accomplish some function. In the bottom-up method, on the other hand, the designer must keep the overall system's specifications in mind at all times.

In practice, most programs are developed using both techniques alternately. Whether consciously or not, the designer begins with a top-down method, by investigating the proposed system and formulating some picture of what the system will look like. If the designer steps immediately to the specification of building blocks of code, we may get the impression that his method begins with bottom-up.

Even adherence to the top-down technique does not preclude bottom-up methods from being used. Once the design has progressed to its lowest level, the program implementation can begin. However, there will likely be specification errors at this point, or design flaws that have not taken certain considerations into account. So, usually at this point a bottom-up design modification begins in which changes in the smallest components' specifications are propagated upward in the system design. At some point, the system designer may then again modify one of the specifications, again propagating a specification change downward. Thus, in practice, the system design strategy oscillates between the top-down and bottom-up techniques.

The distinction between design and implementation is unclear. It is *not* possible to specify a system and then turn the system over to a programmer for separate implementation. There must be a continuing dialog between the eventual user, the system designer, and the programmer. This is one reason that programmers' utility programs are usually so well implemented: the eventual user, the system designer and the programmer are all the same person!

(In a later issue, Mr. Ogdin will offer some specific suggestions of how to resolve these problems.) □



Mr. Ogdin is a consultant to The Institute for Advanced Technology in Washington, D.C. In 14 years he has accumulated a diverse background in systems development and programming, including experience with real-time, time-sharing, and communications-oriented systems as well as computer language processors.

If you know how, a do-it-yourself computer project can be the ultimate in cost-effectiveness

Recycling a Computer

by Charles E. Cohn

The rapid advance of computer technology has given rise to a thriving market in used computer equipment. At present, this market is limited to equipment that has been under continuous factory maintenance and is in perfect working condition. Our experience described below should indicate that good results can be obtained from equipment carrying a considerably less auspicious pedigree.

Late in 1969 we were looking for a computer to automate our equipment for counting radioactive foils.[1] (These foils are made radioactive by exposure in experimental nuclear-reactor assemblies, and are one means for studying the properties of these assemblies.) The equipment consists of four automatic sample changers of the type shown in Fig. 1, together with associated radiation-counter electronics. Previously, the data-collection and control functions were performed by wired-program systems[2] working into IBM 526 card punches. The limited capabilities of these systems indicated the desirability of a stored-program computer that could perform some error-recovery and data-preprocessing functions.

We looked at a few minicomputers, but an offer of particular interest was tendered by the Computer Control Division of Honeywell (now part of Honeywell Information Systems). This involved three used DDP-24 computer mainframes that had been returned from rental, one having 8K memory and the other two having 4K, offered as is at a price of $10,000. All of these machines had been partially cannibalized and none was then operative by itself. A Selectric typewriter, a paper-tape reader, and a paper-tape punch were included. The idea was to assemble, from these, one working computer having 16K memory.

We considered this a highly attractive offer for the following reasons:

1. A new minicomputer having the same complement of memory and peripherals, but with only a 16-bit rather than the DDP-24's 24-bit word length, would have cost a minimum of $30,000 to $40,000 at that time. Even a minimum system (4K, Teletype printer) with severely limited capabilities would have cost $20,000.

2. When new, the price of a DDP-24 with the planned complement of memory options and peripherals was $136,000.

3. We already had a DDP-24 system with card reader and line printer that we had been using for general experimental assistance.[3] We would be able to compile and assemble programs for the new machine on that existing system with the aid of the card reader and line printer, which would be a tremendous convenience. If we were to buy a minicomputer, we would have had to compile and assemble programs with paper tape and typewriter, which would be a time-consuming and cumbersome process.

4. Five years of experience with the existing system, including in-house maintenance, had given us a thorough understanding of both the hardware and software of the DDP-24. We had learned how to obtain highly reliable operation and had brought the software to a degree of refinement well beyond what was originally provided.

This plan, as all such, did of course

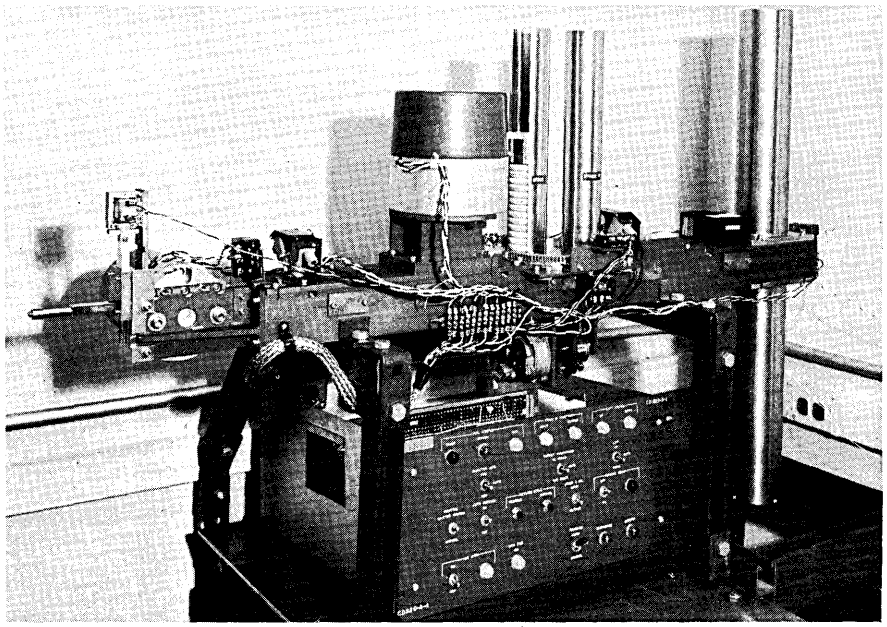


Fig. 1. Automatic sample changer for radioactive foils.

1. G. S. Stanford, "Techniques for Processing Large Quantities of Foil Counting Data," International Atomic Energy Agency, Proceedings of Conference on Radiation Measurements in Nuclear Power, Berkeley, England, pp. 376-382 (Sept. 1966).
2. K. E. Plumlee and M. T. Wiggins, "Automatic Foil Activity Counting Facility and Data-Reduction Program," Argonne National Laboratory, ANL-6628 (1962).
3. C. E. Cohn, "Automated Data Analysis and Control for Critical Facilities," *Use of Computers in Analysis of Experimental Data and the Control of Nuclear Facilities*, U.S. Atomic Energy Commission Document CONF-660527 pp. 49-66, (May 1967).

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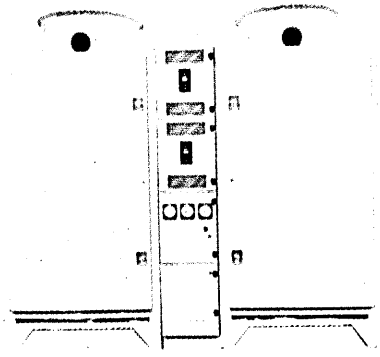

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CIRCLE 62 ON READER CARD

involve some disadvantages, but these were relatively minor. The DDP-24 is a second-generation machine, but that in itself is no drawback. It is accompanied, however, by much greater physical size and power consumption, and slower memory cycle, than new machines. On the other hand, we anticipated reliability every bit as good as with these. (Since there is no known wearout failure mechanism for semiconductors, a solid-state computer should last indefinitely with only random failures.)

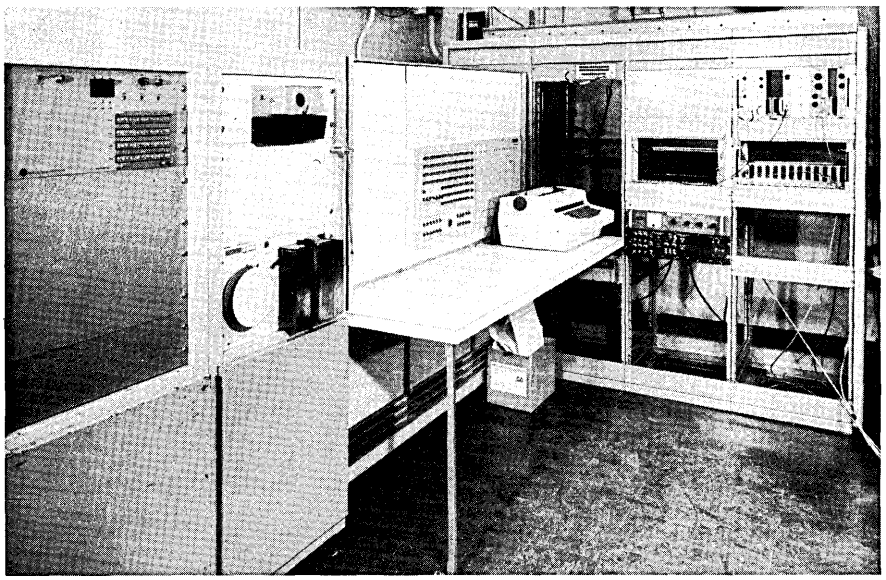

Fig. 2. The "new" computer and some of the instruments with which it will operate.

The physical size and power consumption were no particular problem for us. The planned location for the computer had adequate space, power wiring, and cooling capacity since it was originally built to accommodate vacuum-tube instrumentation.

Slow but efficient

The DDP-24's cycle time of 5 microseconds is considerably slower, to be sure, than those of the new minicomputers. However, the inefficiencies introduced by the short word length of the latter eliminate much of their speed advantage in performing actual computational tasks.[4]

Many people, surely, would shudder at the riskiness of such an undertaking. But where, really, was the risk? We were told by Honeywell that the machines were returned from rental in operating condition, and that they had suffered no physical damage. This was supported by as visual inspection of the machines at Honeywell's warehouse, including a particularly close look at the most critical components, the memory core stacks, beneath their covers. In any case, we had no reason to disbelieve Honeywell, as we could not see them jeopardizing future business with our organization for the sake of such a small sale.

(In a sense, Honeywell was taking a chance on us, too. Their risk was that we would not be capable of completing this undertaking successfully, and that the ill will arising from such a failure would be projected back upon them.)

The machines were delivered just at the close of 1969. It took one man-week of staff time and one man-month of technician time to assemble one computer that could pass all diagnostics in a 16K configuration. (Most of the latter time was required just for the wiring of the memory expansion.) Some vital components that were not present had to be purchased separately at an additional cost of $942. With the miscellaneous parts and supplies that were needed, the total material cost came to less than $12,000.

Valuable leftovers

After the assembly was complete, there were a large number of parts left over. These included four logic power supplies and over 800 assorted circuit boards originally priced at close to $100,000. These serve as a source of spares and as a supply of material for constructing interfaces to experimental equipment. However, some of them were used to add a full set of optional index registers to both the new and the existing machines and an eight-level priority-interrupt system to the new machine. Honeywell kindly made available the logic prints for these options.

We also installed two modifications that had already been proven on our existing machine to yield greatly increased reliability. One of these involved removal of the existing rack blowers and installation of fans arranged to place the cooling air flow between the logic boards where it was needed. The other involved changing the fixed-resistor networks that control the memory inhibit currents to make them as large as the read and write currents and thus increase memory operating margins. Reliability and maintainability were further advanced by a revealing method we developed for testing logic circuits.[5] A CAMAC crate controller[6] was designed and installed to aid in interfacing the binary scalers that are needed to acquire the counting data.

Up until now, further progress in implementing the application has been somewhat slow owing to budget and manpower limitations. However, the system is starting to take shape, as can be seen in Fig. 2. We plan shortly to install a magnetic-tape unit with a CAMAC-compatible controller[7] to perform the bulk of the data recording. □

(Acknowledgements are due to Mr. W. R. Riihimaki for his fine workmanship in assembling the computer, and to Dr. Alexander B. Long and Dr. George S. Stanford for initiating the application and for their assistance in evaluating the proposal.)

Dr. Cohn is an associate physicist in the Applied Physics Division, Argonne National Laboratory, with which he has been affiliated since 1956. He has done work on noise analysis in nuclear reactors and on the application of computers to nuclear reactor experiments. He has AB, MS, and PhD degrees in physics from the Univ. of Chicago.

4. C. E. Cohn, "Speed Tests, Costs, and Word Length," *Datamation*, Vol. 17, No. 20, pp. 26-29 (Oct. 15, 1971).
5. C. E. Cohn, "Oscilloscope Test Method for Logic Elements," *Review of Scientific Instruments*, Vol. 42, 881 (June 1971).
6. C. E. Cohn and S. J. Rudnick, "CAMAC Crate Controllers for the Systems SEL-840 and Honeywell DDP-24 Computers," Argonne National Laboratory, ANL-7886 (Feb. 1972).
7. M. G. Strauss, F. R. Lenkszus, R. Brenner, J. J. Eichholz, R. N. Larsen and R. T. Daly, "Computer Controlled CAMAC Systems at Argonne." *IEEE Transactions on Nuclear Science*, Vol. NS-18, No. 2, pp. 46-52 (April 1971).

News in Perspective

Univac has a firm grip on the RCA customer base it acquired six months ago, page 85, with attractive financial incentives and prompt delivery of promised software enhancements . . .

"They were all over the place," says a state official of Univac's successful effort to knock down a plan to cut its share of California's computer business, page 85 . . .

William Anderson comes to Dayton as NCR's new president, page 85. It all started in a POW camp . . .

What's a "basic operational program"? It's anybody's guess, as noted in a report on the state of California's latest legislation on taxing software, page 92 . . .

A delegation of Chinese computer specialists toured Canadian computer installations, visited a computer show, and were favorably impressed, page 94 . . .

Look for federally funded criminal justice information systems to be given a long, hard look by legislators next year, page 95. Among the issues: privacy and wastefulness . . .

There are some 300 deaf or hearing-handicapped persons in the computer profession. On page 97, they assess their handicaps and look to the future.

Standards

Embattled Codasyl Group Now Sees Support for Data Language Report

For a thorough introduction to the technical "debate on data base management," we heartily recommend Dick Canning's fine 15-page article in the March 1972 *EDP Analyzer*. For the irrationalities and politics behind the data base embroglio, read on.

At the heart of it all is the Codasyl Data Base Task Group (DBTG) report of April 1971. Very generally, it is an approach to the development of data base management systems, specifying in a tome of six years' work three elements: a data description language (DDL) independent of any programming language, a COBOL DDL, and a COBOL data manipulation language (DML). It is important because, as the only set of specifications cooperatively developed by users and vendors, it raises the questions *today* on whether the computer community should adopt one common approach, or more, for data base systems; when it should do so; and what the approach(es) should be. Some wheels are in motion to develop further the DBTG effort into a common — if not standard — approach. And there are opponents who seek to throw a wrench into those wheels, or at least to slow them down.

In the last year the voices of the honest debators have been drowned out by the bellowing of political animals with less than purely technical motives, by the primal screams of those with never-forgotten childhood hurts, and by the squealing of the uninformed. Weary participants on both sides are calling for order. There are just a few glimmers of hope that it is coming, but to understand them requires some knowledge of the play behind the technical scenes.

Cobol worship

An amalgamation of opinions on that play (few wanted to be quoted) sounds something like this: *Codasyl is a group of COBOL-worshippers who are seeking to gain more power.* Now Codasyl, under which DBTG was formed, is a volunteer group, one of whose original tasks was the development of what became standard COBOL and its extensions. It has since added other work, mainly data base study and specifications. Many of those who have participated feel it is a free, informal group open to any membership application (as long as there is room) and conducive to serious technical work. Others see it as dictatorial and political, staffed by rich companies who can afford to commit one or more people to its committees, and exercising too much power over the American National Standards Institute (ANSI).

Some of this animosity traces back to Codasyl's role in obliterating IBM's commercial translator COMTRAN in favor of COBOL. The COMTRAN proponents, and others, fear that Codasyl will rush the DBTG specifications into standardization. DBTG's work is incomplete and imperfect, they claim, and they dread what will happen if the industry locks into a premature decision. Proponents say that adopting DBTG's work as a common approach (not as a standard) will establish a foundation and curtail the multiplying of incompatible systems.

Their own journal?

The opposition suspects skulduggery, pointing out that ANSI "generally automatically approves" as standard the COBOL extensions proposed through the *COBOL Journal of Development* (JOD), a strangely powerful document. The Data Description Language Committee (DDLC), which is one of the Codasyl committees evolving from DBTG, has now taken steps to publish its own "Journal of Development." Is this a harbinger of premature standards to come? they ask. We are told ANSI itself is, like the federal government, currently at a standstill on the report. It is considering establishing two committees, one to review the COBOL portion of the DBTG work and another to review all data base systems.

Some in Codasyl are upset with the latter, calling it a step back to the beginning. Final shots at Codasyl are that its COBOL character taints all who participate, and it should not be charged with further development of the programming-language-independent data de-

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DIGITAL COMPUTERS

scription language, now under the DDLC, since it can't be impartial.

Power and profit

Participants in that committee, few of whom were ever involved in the COBOL power struggle, choke on this one, calling it "irrelevant and idiotic — Codasyl is not Svengali." As for the COBOL DDL specifications, they are supposed to interface with a variety of host languages. This facility has begun to be tested in implementations such as those at B. F. Goodrich Chemical Co. (described in this issue), using COBOL, and at the Univ. of Edinburgh and the Univ. of Wisconsin Medical Center (both using FORTRAN).

Another body of opinion says that IBM has caused the emotionalism and is against the DBTG approach because *it is an insidious company of profit-worshippers seeking to gain more power.*

Actually IBM worked quite diligently on the Data Base Task Group, committing two or three people to it at all times and submitting more than 70 proposals for change, most of which were incorporated. But when the report was taken to the programming language committee of Codasyl to which the DBTG reported for approval, IBM voted "no" on the COBOL elements of this spec. And poison seeped across the land.

IBM was accused of being against anything that would lead to increased user independence from hardware and of general "foot-dragging on standards." It is said IBM particularly didn't like DBTG's work because much was based on the General Electric System Integrated Data Store developed by Charlie Bachman.

IBM logically explained that it had been against some of the basic concepts of the effort, but had nevertheless felt obligated, as long as those concepts were frozen, to participate in the improvement of the approach . . . as it had always done in such developments.

But just as logically, even casual observers see that IBM is committed to competing for 100% of the business, which is hardware sales, and it tries to keep an edge by making the competition follow its lead. A common or standard approach to data base development, especially one that doesn't coincide with IBM's already-implemented efforts, is not completely in IBM's best interests. IBM is supposed to be interested in keeping its users locked into systems like its IMS data management system and subsequent IBM developments. And these may be an amalgamation of three systems — IMS, CICS, and GIS. Still, if DBTG or another IBM approach is universally adopted, IBM is expected to implement it. Univac has announced one implementation of the DBTG approach. Honeywell, CDC, NCR, Xerox, and ICL are all said to be working on it.

Some IBMers say that their employer may be sorry that it has drawn so much attention to DBTG since some of its IMS users are trying to keep parts of their systems separate to prepare for an ultimate conversion to other systems.

User dupes

Not only did IBM's "no" draw attention, but so did the "rather emotional" delivery of IBM representatives who presented IBM's position paper around the country. The industry was equally startled by the loud anti-DBTG outcry from various members of IBM user groups, SHARE and GUIDE. This is where we get to the allegation that *SHARE and GUIDE are dupes of IBM, which is leading them around by the nose.* These user groups diligently worked to develop a set of requirements, published as the "Data Base Management Systems Requirements, Nov. 11, 1970," available from SHARE in New York.

The argument was that the DBTG specifications didn't meet these requirements. The counter argument was that the users had developed a "wishbook" and not all their requirements were implementable. In fact, some say IBM's System Development Div. has made two aborted attempts to develop that dream system.

Although very real disagreements have been clarified since then, there was a curious character to the initial outburst. Some of the most outraged had not even read the DBTG report, and a few SHARE and GUIDE members admit that not many have read it even today. Also, strangely, DBTG chairman Tax Metaxides, who has been the target for many stones and "too little credit," submitted to a thorough questioning at a GUIDE meeting in San Diego, but the user group did not see fit to publish a transcript of the meeting for its membership.

This kind of behavior has led some to believe that "many users were merely parroting what IBM told them," and that IBM's cadre of workers on the GUIDE/SHARE report had really been the authors. This charge stings the user/workers on the report who readily admit IBM had its influence but insist the users had done it their way. And they'd prefer that the uninformed on both sides kept quiet.

Some of the sticks and stones are being cleared away — not all. Rational documents of comparison and criticism are being produced, such as "An Assessment of How the Codasyl DBTG Proposal Meets the GUIDE/SHARE Requirements," by T. William Olle (available from the Norwegian Computing Center, Sorskningsveien, 1b, Oslo 3, Norway); and the Everest-Sibley critique of the G/S requirements, available from ACM in New York. Olle, formerly of RCA, was chairman of the committee that wrote the original Codasyl data base report.

Metaxides plans to develop in-depth courses and to write a book on the report and its philosophy, which Dick Canning recommended would answer many arguments. Leaders of GUIDE and SHARE are talking to Codasyl head Jack Jones about some form of membership on the various data base committees to communicate their work and proposals. These user groups also plan to respond to criticisms of their report. IBM work on the current DDLC is said to be "harmonious," though some are skittish about the implications.

The proof of the extensibility and open-endedness of the DBTG effort will be in the implementation; these days even the greatest opponents are willing to reserve some judgment until then. And Codasyl is eager to get implementers together; any doing a DBTG implementation or some form of it are asked to send information (organization, contact, scope of work, status, host language) to Codasyl, P.O. Box 124, Monroeville, PA 15146.

In addition to those noted above, the Air Force, Univ. of Michigan, and Bell Telephone Laboratories are doing implementations of the report. Those who have indicated "great interest" are Philips, Nippon Electric, Technion, Israel Institute of Technology, and the Complex Computer Control Institute in Moscow. Finally, Burroughs, which voted "no" with IBM, is drawing up the specifications for its own implementation. Xerox has since in effect reversed its "no," and RCA's "no" doesn't count.

—Angeline Pantages

Mainframers

Univac: Six Months Later All Is Well

"Six months is too early to tell, but it looks good."

That's the opinion this summer of John C. Butler, 38-year-old head of Univac's Series 70 Operations, the group formed to hold hands with the 500 customers and their 1,000 computers his company took over from RCA for $70 million at the end of last year. Also assessing the value of the acquisition, Joseph J. Kroger, newly appointed 37-year-old head of the company's Americas Div., is even more enchanted.

"It will go down in business history as the buy of the century," Kroger said in an interview in May, a week after his appointment to head that 5,000-man division after the sudden departure of Geoffrey Cross to join ICL (June, p. 96).

In those six months Univac has lost less than 5% of the RCA customer base — "way beyond our fondest expectations," says Butler — and could very well exceed the goal of J. Frank Forster, chairman of Univac's parent Sperry Rand, to hold on to 50% of the RCA customers by the mid-'70s.

Moreover, the RCA buy took Univac strongly into the state and local government market, a field which it hadn't penetrated to any great degree, and where RCA drew some 17% of its revenue, and into the education market, which represented 8% of RCA's revenue. Kroger said both are rosy markets for Univac, particularly local government and education where federally funded programs abound.

RCA's largest market was in manufacturing, providing a fifth of its revenue. But Univac had a large slice of manufacturing also, and Kroger said this is where Univac's main marketing thrust will be.

Kroger, who formerly headed Univac's central U.S. area from Chicago, said an example of this thrust was the replacement of an IBM 360/40 and 50 with a Univac 1106 at the Kellog Co. in Battle Creek, Mich., for use in a manufacturing environment. Kellog selected the 1106 for its communications capability, and part of the $3 million buy includes use of Univac 9200s for remote processing. Univac soon will adapt for the 1106 a manufacturing system called UNIS (Univac Information Management System for Manufacturing) now available with the company's 9000 series.

Univac is looking with caution at the small business computer market, although a model in its 9200 series qualifies as one (June, p. 55). Asked if it had a major development plan, Kroger replied in an interview at San Diego's Rancho Bernardo Inn, "I've got one up in my room." But the company still ponders to what extent it should allocate its resources to a market whose profitability is still a big question mark. If it enters, Univac will probably do so through an acquisition.

Besides losing only 5% of the RCA customer base — against 20% anticipated at the outset — Univac has shipped some $27 million in RCA (now Series 70) equipment to users since Jan. 1. It has been on target with its promised enhancements to TDOS, DOS, and VMOS operating systems, and further releases are to be made in the fall.

J. J. KROGER and JOHN C. BUTLER: Buy of the century?

To bridge the gap between RCA and Univac equipment, it has formed a software and hardware development group consisting of developers of the 1100 and 9000 series and the RCA line. The group, headed by Tony Fazio and appropriately named the "bridge products group," will develop simulators, emulators, and data conversion packages that would take Series 70 customers into the Univac machine fold. Soon to be announced is "SMOOTH," a conversion package for Series 70 users going to the 9700.

Key to its apparent success is the great leverage Univac gained in acquiring for $70 million a customer base that was producing rental revenue of up to $96 million a year. Customers whose rental agreements were ending have been offered discounts of up to 25% to stay — and most are, according to industry sources. A discount of 15% is being offered users who sign for three years, and 25% for five-year contracts. And there is no penalty for upgrading. If a user does upgrade and Univac fails to deliver what is promised, the contract can be cancelled without penalty.

Olin Brass of St. Louis, whose Spectra 45 is on a five-year contract, will upgrade next year to a 9700 because it needs more communications capability to do remote data entry. The company made a thorough study of Burroughs and IBM equipment and found Univac offered the "best incentive to stay." For the same reasons, others are advancing to 1106s and sometime around the mid-'70s, RCA's own NBC will install an 1110.

What six months ago was called a "gamble to broaden its computer market," may by the mid-'70s indeed turn out to be "the buy of the century."

—Tom McCusker

Point Is Made in California

Univac wasn't happy with a consolidation plan which would have seen its share of the state of California's computer installations drop from 50% to about 17% (June, p. 8). Its main objection was to a proposed procurement of three IBM 370/165s without competitive bidding. Univac made its point.

The state's budget bill, passed in mid-June, identified funds for the planned consolidation but included a clause requiring that the big data processing buys involved go out for competitive bid, and state officials concede the clause was the result of Univac pressure. "They were all over the place," said one.

There was one exception written into the budget bill. The state's Dept. of Public Works will be allowed to purchase a computer without the competitive bidding, and, although the bill doesn't state this, it will be a 370/165. But Public Works was IBM anyway, so Univac doesn't lose there. Its main concern was a massive consolidation of departments into a Business & Service data center which would have gotten the other two 165s and returned several Spectras.

People

New Number 2 Man at NCR

Two of William S. Anderson's three daughters cried when they learned they'd have to leave their high school friends in Tokyo and go to Dayton

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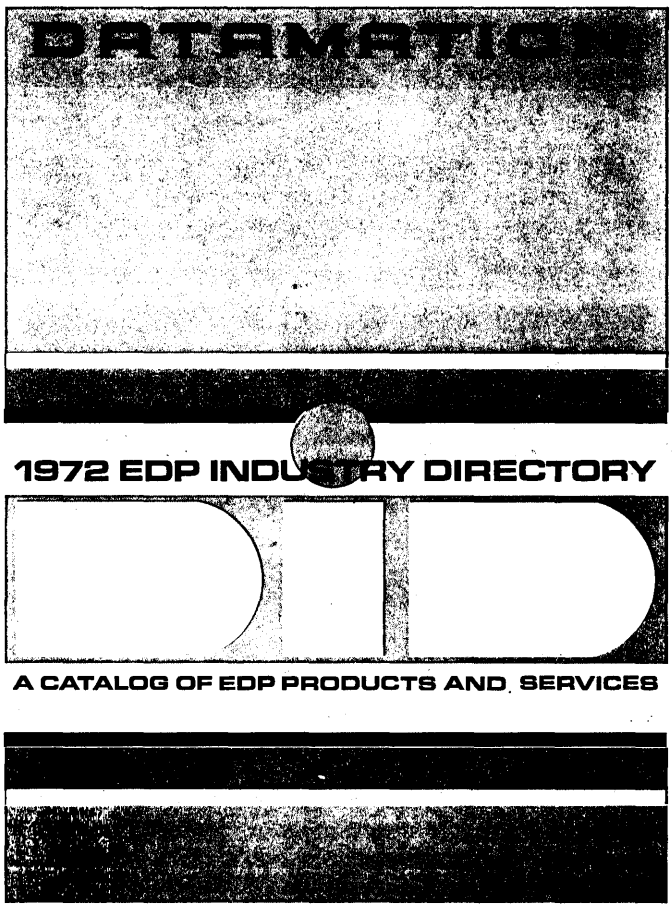

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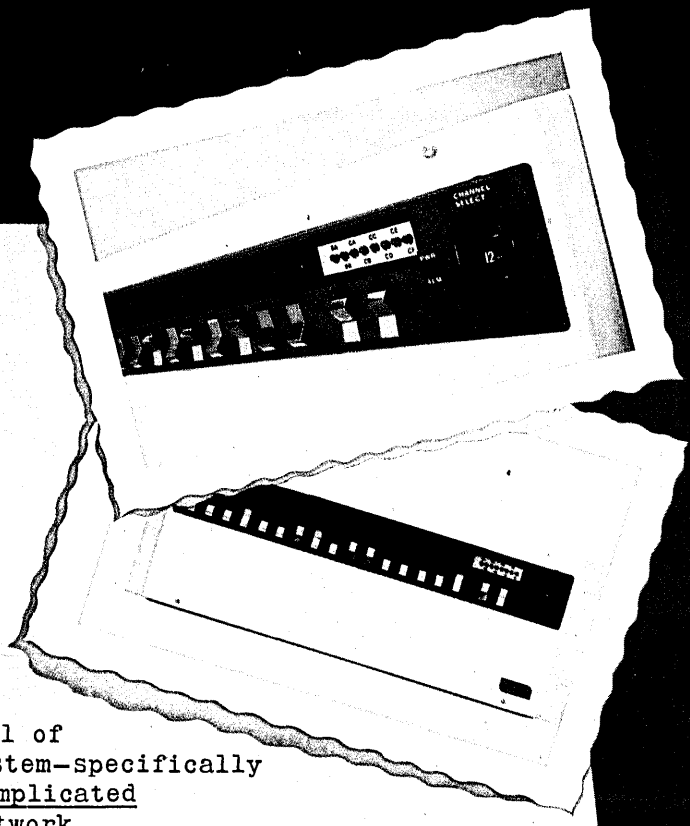

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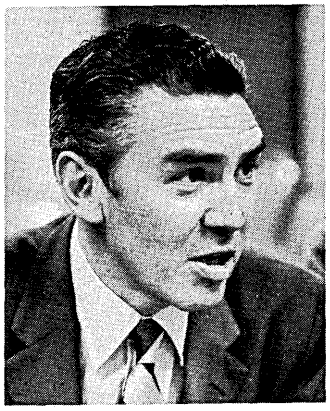
where their father moved in mid-June to direct the operations of the National Cash Register Co. "But they are adjusting to it," said the 53-year-old one-time auditor who was the surprise choice of the directors to head the big business machines company after R. Stanley Laing resigned suddenly in May.

Anderson arrived June 12 in his ninth-floor, green-carpeted and walnut-paneled office to face some adjustments of his own. In his 10 years as chairman



WILLIAM S. ANDERSON: Some adjustments at Dayton.

of NCR Japan, he's headed an operation whose profits have increased 10 times. In Dayton, he'll be running a company that has experienced two money-losing quarters in a row and whose quest for profitability in the computer business forced it and Control Data Corp. into a joint venture (March, p. 83). A Wall Street computer specialist commented: "Too bad he can't bring his Japanese labor force with him."

In addition, he may face the delicate task of soothing some of NCR's 30 top staff men who were passed over when he was selected to fill the No. 2 spot in Dayton. Robert Oelman, 63, is the NCR chairman.

Anderson's longest time friend at NCR, George Haynes, who is vp and group executive of international operations, has no doubt that Anderson is the man for the job. "He's a very thorough planner and a first-class financier who's done an incredible job in Japan," says Haynes. And he knows how to get things done. Haynes, who met Anderson when both were interned in a Japanese prison camp from 1941 to 1945, says Anderson believes in motivating people. "He doesn't tell peo-

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ple what to do. He says to them: 'This is what I want I want you to achieve; you come up with the plan.' " Haynes also observes that Anderson is intolerant of those not doing a good job.

Haynes was the NCR sales manager in Hong Kong on Christmas Day, 1941, when he and Anderson, then a 22-year-old auditor working for a Hong Kong hotel, were rounded up. After their release, Haynes took Anderson to London where he was trained and then returned to Hong Kong as an accounting machine salesman. He became chairman of NCR Japan in 1960.

Software

Software and Taxes: A Basic Question

The state of California is setting a precedent by legislating on the subject-ability of computer software to personal property tax, but the legislation hardly provides clear guidelines other states might wish to follow.

Some of the confusion may be cleared up in public hearings to be held by the state Board of Equalization beginning Aug. 2 to define language of a bill which was expected to have been signed into law by Governor Reagan late last month. The bill, which would limit for two years the assessability of most software to the value of the raw materials, the cards or tapes, has been reworded many times since its introduction last February. It was pulled back from the governor's desk by its author, Assemblyman Joseph Gonsalves, for its final revision.

The word "software" doesn't appear in the bill in its final version, which helps. That's one less term that has to be defined. A term which badly needs definition is "basic operational programs," for the bill says that "except (for) basic operational programs," storage media shall be taxed as if there were no program on it.

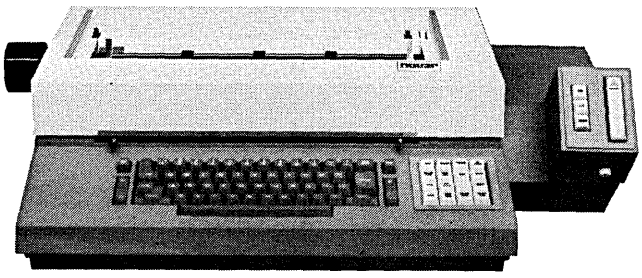
And the Board of Equalization, while holding hearings to clarify the meaning of the bill, AB 438, still has "under consideration" a tax rule, Rule 32, which would define all software as tangible and taxable.

The Board's Neilon Jennings said the rule is dormant now but it isn't dead, and there certainly will be more activity concerning it before the two-year life of AB 438 runs out. This rule was vigorously opposed by vendors, users, and professional societies in hearings early this year. These same groups had supported AB 438 when it was first introduced, but even then there was concern about its language. Many groups asked for and got changes as the bill passed through the state's Assembly and Senate. Most were satisfied with the bill as it was when it first went to the governor's desk.

Los Angeles County wasn't. County representatives feared the bill as it was then would erode its existing tax base, and they convinced Assemblyman Gonsalves of this, which is why the pullback, the exception of basic operational programs, and inclusion of the statement "it is the intent of the Legislature that only those basic operational programs presently being assessed and taxed continue to be assessed and taxed."

What's being taxed?

Dan Wendin, an attorney representing Boole and Babbage, Inc., a northern



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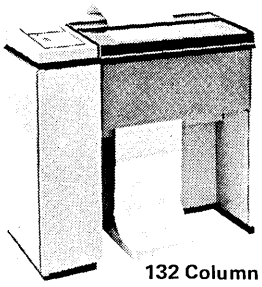

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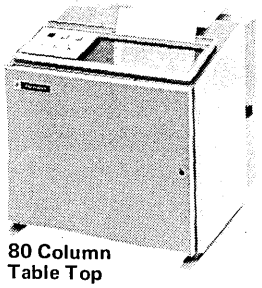

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California supplier of computer performance measurement products and services, doesn't like this language. "It isn't clear whether they're talking about specific programs or types of programs. If they mean types, then what about independently vended utility packages which are of the same type as programs previously taxed?"

Wendin also is worried about the term basic operational programs. "What about compilers? If you conclude operating systems are basic operational programs, then aren't compilers and report generative programs? And what about major operational programs like Southern Pacific's TOPS, which controls rolling stock and oil companies' refinery optimization programs?"

Hopefully the August hearings will answer these questions.

Eben Tisdale of WEMA also is worried about the bill as its now worded. WEMA was vocal in its opposition to Rule 32 and was an early supporter of AB 438. He and others say the only thing to which all parties agree is that the intent of the legislation is to create a two-year moratorium that won't disturb the existing tax base and will allow time for a careful study of the whole question of software and property taxes by the legislature and the Board of Equalization. "We'll support anything that accomplishes this intent." But he fears present wording could mean 75% of the software not now taxed could be taxed "through gerrymandering of the sections." WEMA will take part in the August hearings.

So will ADAPSO, the service bureau organization. Paul Rosenthal, who has been the group's spokesman and representative in all proceedings in the state tax controversy, kind of likes the bill as it now stands and isn't too worried about the term basic operational programs. He feels it was based on wording in IBM price structures where the term applies to those programs still bundled. "Our big concern is to see software itself bypassed." He feels the elimination of the word software from the bill was a positive move. But ADAPSO "will have a continuing concern until something permanent is established and good guidelines are adopted."

He'll try again

Another voice which will be heard in August is that of Orange County tax assessor Andy Hinshaw. Orange County is the one California county which has been assessing software for several years and collecting. Hinshaw will try to collect again this year. In mid-June he said, "bills are going out now and they haven't been changed as a result of the bill." Orange County currently is facing a court battle with California Computer Products over taxes collected on software in 1969-1971 on programs Hinshaw concedes are more customized than not and clearly not basic operational programs. "But then I don't know what anybody means by basic operational programs." However, AB 438 can't affect this case because it refers to tax lien dates 1972 and '73.

Hinshaw called AB 438 "a silly kind of bill." He feels the Legislature would have been better advised to simply exempt in-house generated software or to just plain declare a moratorium for a two-year study. "Historically, once something is exempt you can't get it back on the books." He sees the bill as leading to a lot of litigation. He says Orange County, as a result of the bill, will ask for minute details on software development costs that they haven't gone into in the past. "The manufacturers won't want to give it, so we'll make an arbitrary assessment which the taxpayer won't like, and we'll end up in

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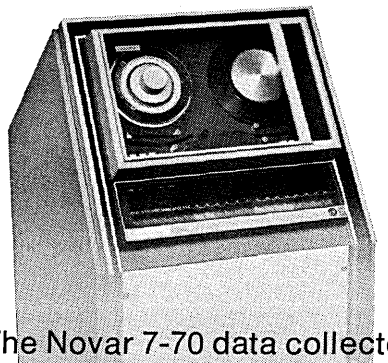

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court."

Los Angeles County, which assessed software for the first time this year, was a little happier with the bill, maybe because it had something to do with its final wording. Marvin Blatt of the L.A. County assessor's office called it "workable." In mid-June L.A. County was holding up 3,300 tax bills which would be affected by the bill, awaiting the governor's signature. They anticipated a signing and were expecting to have to revise the bills downward. Blatt couldn't estimate the dollar value of the downward revision, but the state's legislative analyst, A. Alan Post, has estimated potential revenue which would be killed by the bill at $45 million a year. L.A. County will be represented at the August hearings, and Blatt says "we already have drawn up something we think should be included."

It's all in the wording; and the final words, at least for the next two years, should come next month.

—Edith Myers

International

China Has Some Computer Building

The People's Republic of China sent its first delegation of computer specialists to North America recently, and the members of the three-man team said they were favorably impressed with what they saw at the Canadian Computer Show and the Canadian Computer Conference in Montreal.

The Chinese delegation touring Canada is from the Institute of Computing Technology at the Academy of Science in Peking. The group spent a few days attending technical sessions at the conference and observing the exhibits at the show before going on to visit other business and university computer installations throughout Canada. One firm they visited was Systems Dimensions Ltd. of Ottawa, a computer service company with a 360/85.

Members of the delegation were Te-Chin Huang, an expert in computer memories; Hsiu Chang, a logic designer; and Kung-Shih Hsu, a software specialist.

Dr. S. Hyder, the Univ. of Montreal professor of computer sciences who invited the Chinese to send the delegation, said that although China is advanced in its computer expertise, it must work with old computers. The Chinese said that computers are designed and built in China, but that the total number was "not very many." Although there are no U.S. computers in China, Hsu said the People's Republic has purchased both French and English computers.

As for the Institute of Computing Technology, the Chinese delegation said some 1,000 persons — scientists, engineers, technicians, students, and workers — are affiliated with the institution. In all, there are 10 divisions of endeavor at the institute, covering such fields as logic design, circuit design, memory development, peripherals development, numerical development, and software.

CHINESE delegation at Canadian Computer Show: Hsiu Chang, K. S. Hsu, and Te-Chin Huang.

They also indicated there was a factory located at the institute. The Chinese added that they have built a computer that is similar to the middle range of IBM's 360 line. The machine uses a solid-state technology and averages 200,000 operations a second. "Our computer industry is just beginning," said one of the Chinese visitors. "We are mainly involved in scientific research."

Mr. Hsu said that there would be "more mutual visits between the Chinese and American scientists which will help in promoting friendship and mutual understanding."

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Meanwhile, from U.S. sources, it has been reported that six U.S. computer specialists are preparing to visit China. The U.S. delegation is headed by Severo M. Ornstein of Bolt Beranek and Newman, Inc., of Cambridge. Other members of the delegation include Prof. Thomas Cheatham of Harvard, Prof. Wesley A. Clark of Washington Univ., Dr. Anatol Holt of Applied Data Research, Prof. Alan Perlis of Yale, and Dr. Herbert A. Simon of Carnegie Mellon Univ.

Law Enforcement

Crime Fighters: A Year's Reprieve?

In an election year, with people worried about law and order, it's dangerous for any Congressman to vote against money to fight crime. And so, that great provider of crime-fighting funds, the Law Enforcement Assistance Administration (LEAA), has been faring well. It's received more than $1.5 billion in the past four years, and for Fiscal '73 another $850 million will be voted — about $150 million more than Congress provided last year.

Next year, a nonelection year, LEAA's enabling legislation comes up for renewal, and the story may be considerably different from this year when legislators tended to look the other way after irregularities in LEAA's administration were disclosed.

A recent report by a House Government Operations subcommittee, headed by John Monagan of Connecticut, charged the investment in LEAA has had "no visible impact on the incidence of crime."

Among reasons cited by the subcommitte was that recipients of LEAA grants hired outside consultants who were grossly overcompensated and who engaged in a variety of shady practices. The subcommittee was disturbed that an Alabama consultant, Criminal Justice Systems, Inc., won a $91,570 contract only one day after it was incorporated by a newspaper editor, a television announcer, and the announcer's father. It complained, too, that Ernst & Ernst, a long-established nationally known consulting firm, charged the state of Indiana up to $75 per man-hour for its services — a figure that would amount to more than $3000 for a 40-hour week, "more than twice the salary of the director of the FBI and almost three times the salary of (Jerris Leonard) the administrator of the LEAA." On this and other charges made by the committee, a spokesman for Ernst & Ernst told *Datamation* it would prefer not to comment.

But although Monagan's subcommittee labeled the program "a giant subsidy program for outside consultants," Monagan not only voted for the FY'73 appropriation — on the same day the report was released — but stood up on the floor of the House and urged his colleagues to do likewise. Only four Congressmen voted to deny the agency any money in the coming year.

$54 million for dp

The data processing industry's stake in the program is suggested by a recent estimate of the General Accounting Office that in 1970 and '71, a total of about $54 million in LEAA funds were spent on criminal justice information systems. "Substantial funding of information systems can be expected in the future," the agency added. Other sources estimate that federal and state expenditures for such systems come to more than $100 million a year. An industry source estimates that by 1975, law enforcement agencies will be putting $500 million annually into electronic gear.

LEAA administrator Leonard is already preparing for next year's confrontation. He has taken steps to recover at least some of the more improvident investments criticized by the Monagan subcommittee, while trying to blunt criticism from other quarters.

Among the criticis:

General Accounting Office: It says the agency has failed to promote a way to share technical information about criminal justice information systems — that too much money is being spent reinventing the wheel. Leonard promised to set up a "computerized clearing house" for this purpose, but this project is reported to have fallen way behind schedule. And the means the agency will take to update it are vague.

Civil libertarians: Nub in this dispute is the National Criminal History System, outgrowth of Project Search (June 15, '71). It is managed by the FBI and essentially is a massive file of individual criminal histories. Some 20 million of these records will be on file by 1975. Nearly half will be stored in machine-readable form at the FBI's National Crime Information Center, the rest with state law enforcement agencies. The criminal history system will allow a local

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112-07

police agency to find out whether a suspect has a history of either an arrest or a conviction in any state of the nation. But the rules to protect the sanctity of this data are to be the same as those drawn up to guard the FBI's system. Civil libertarians claim they provide no real enforcement machinery and contain gaping loopholes.

Lawyers Committee on Civil Rights: This group says the FBI system's guidelines "are inadequate not only because they fail to provide safeguards against improper distribution of criminal offender data, but also because they depend exclusively on the FBI — the agency with the primary interest of keeping the system operational — for enforcement."

Rep. Don Herbert, California: He's opposed to the history file and says that 75% of the employment agencies in New York City refuse to recommend an individual for a job if he has an arrest record, regardless of whether the arrest was followed by a conviction. He's introduced a bill (HR 13315) that would prohibit federal and federally funded law enforcement agencies from disseminating arrest-only records to anyone other than law enforcement officials. (LEAA and nine other federal agencies are jointly funding a demonstration project aimed at showing it's feasible to put the bulk of a city's records — including police records — into a single data base. The records then could be accessed by banks, utilities, health and welfare groups, and similar community action organizations.)

Powerful allies

Herbert and his fellow believers don't have enough political clout, by themselves, to alter the Administration's privacy philosophy. (The Justice Dept. has drafted a statute empowering the Attorney General to write the privacy rules after consulting with state and local law enforcement agencies.) They have potentially powerful allies, though: Congressional efficiency experts worried about the revelations of the Monagan subcommittee, legislators from big cities who feel their constituents have not received a fair share of the LEAA money, Democrats seeking partisan advantage from a program that has been clearly identified with the Nixon Administration, and politicians of both parties who see a chance to make the FBI subservient to Congress now that J. Edgar Hoover is gone.

In addition, managers of state government computer systems are chafing under an FBI rule that requires them to interface with NCIC through separate, dedicated computers and communications channels. The extra expense is almost certain to persuade at least some governors to write their Congressmen.

If these forces coalesce, they could significantly change the amount of money spent on criminal justice information systems. New controls over computerized criminal history records are likely, and that could lead to similar controls of individual records maintained by non-law enforcement agencies, including business firms.

—Phil Hirsch

Training

Sound Waves From the Deaf

The deaf in the computing profession have a message for the industry, and they're making themselves heard.

The message concerns the accomplishments of the deaf who already have found a place in the computer professions, and its intent is to open that first door to others.

ROBERT BATES: "Deafness is an asset."

Bob Bates, deaf since the age of 7, and a programmer with NAVOSSACT (the large Navy computer system development agency supporting the Chief of Naval Operations) thinks deafness is an asset in the computer profession since "programming calls for intense concentration. This ability, this compensating factor, is an important one that should influence industry and government to seriously consider the greater utilization of handicapped, but qualified people in edp."

Bates is trying to do something about fostering such serious consideration. He is vice-chairman in deafness for a Special Interest Committee on Computers and the Physically Handicapped (SICCAPH) authorized early this year by the Association for Computing Machinery (ACM) and is founder and chairman of the Special Interest Group for the Deaf (SIGDEAF) found in 1970 as part of the Washington, D.C., chapter of the ACM.

A graduate of Gallaudet College, an accredited liberal arts college for the deaf in D.C., Bates has been in the edp field since 1955. He said Gallaudet is the only college in the U.S. today with a full computer science program designed only for persons with hearing handicaps. The National Technical Institute for the Deaf, affiliated with Rochester Institute of Technology, is setting up a computer science curriculum it hopes to make available next fall. San Fernando Valley State College, Northridge, Calif., has a program to aid deaf students who attend classes, including computer science classes, with hearing students (see May 1, 1971, p. 36).

Jack R. Gannon, director of alumni and public relations for Gallaudet, estimated there are some 300 deaf or hearing-handicapped persons at work in the computer field, between 100 and 150 of whom are Gallaudet graduates. "Aside from communication," he said, "our graduates have not encountered problems in the field."

Instructors are deaf

But there is no communication problem for computer science students while at Gallaudet. All the instructors in computer science courses are deaf. All courses are taught by the simultaneous method employing sign, fingerspelling, and speech. They have not developed special signs for computer terms. They simply fingerspell them.

Jerald Jordan, head of the Gallaudet computer center, said the college's computer courses stress hands-on experience so that students spend a great deal of time interacting with the computer itself.

"No communication or hearing is required to communicate between man and computer," says Bates, "almost all

projects are put down on paper. After all, computers are deaf."

Bates believes the following are the hearing and speech requirements of each task performed by a computer programmer: computer system design, some; program flowchart preparation, none; input data collection and preparation, none; program coding, none; program debugging, none; program testing, none; accuracy checking of output, none; documentation, none; and system turnover, some.

"Communication between the deaf and the hearing that is required can be successfully accomplished in various ways depending on the deaf individual's preference. The means include lip reading and oral response, handwriting, and sign language."

Bates' SIGDEAF is the first professional organization for the deaf in the computer world. Its purpose "is not only to provide the deaf with a medium for exchanging professional interests and keeping abreast of technological developments, but also to make it possible for the deaf to integrate into the computer society and to make their capabilities as programmers known."

Most deaf computer professionals agree that getting that first job is their biggest obstacle and that chances of their being hired are better if the prospective employer has had experience with deaf programmers. Robert J. Herbold, a deaf systems analyst at Gallaudet, suggests by-passing personnel people and obtaining interviews with section chiefs with whom a deaf programmer can talk about his interests and abilities.

Herbold does not totally agree wit Bates' contention that deafness is an asset to a programmer. "I do not think deafness has anything to do with a programmer's ability on concentration. Environments and desires of the programmers usually determine whether they will concentrate well or not."

But Donald Bradford, a deaf systems programmer with the Univ. of California Los Alamos Scientific Laboratory, does. He rates hearing loss as "probably a slight disadvantage in group discussions although much junk is automatically sorted out with the important stuff coming to my attention. Hearing deficiency is probably an asset in the area of concentration."

Kendall Doane, 26, a 1967 graduate of Gallaudet currently working toward his PhD at the UCLA, calls his hearing handicap (he has been deaf since birth) an inconvenience, not a handicap. "In our technological society, such personal traits as laziness and defeatism are more handicaps than deafness."

Doane went to work for IBM as a trainee after graduation from Gallaudet, where he majored in mathematics and took some computer science courses. He said his Gallaudet training introduced him to programming principles, taught him how machine language works, gave him an understanding of the fundamental concept of software, and prepared him for entry-level employment at IBM where he worked for two years. He is now on educational leave and plans to return to IBM.

Doane's doctoral work probably will have wide implications for the deaf. His subject is "An Approach to Computer Speech Recognition: Gaussian Cosine Modulation Wave Function Analysis System." He feels it will have benefits in three directions: speech therapy, dictation devices, and interpreter substitutes. The latter could be of particular

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RCA

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benefit to deaf students attending hearing institutions. Doane uses an interpreter for all of his classes at UCLA and pays him $7.50 an hour plus parking.

The deaf themselves are quick to face up to the disadvantages of their handicap in some computer work. Norman E. Long, Jr., a deaf senior associate programmer with IBM, feels "the deaf programmer who considers programming to be a job and looks forward to writing programs all his life would probably find his deafness an asset as far as his superior visual and concentration powers are concerned.

"On the other hand," he says, "the deaf programmer who considers programming a profession and looks forward to contributing to its advancement would find his deafness a partial disadvantage with respect to seminars, classroom education, symposia, and other large gatherings if interpreter facilities are inadequate in his geographical location."

A hearing university counselor who has worked closely with a deaf graduate student said the student's deafness was a "serious handicap" and neccessitated many extra hours of work than otherwise would have been required. The problem, of course, was communication. He conceded the student is an excellent programmer "and on that level his deafness probably is no handicap."

And programming is where Gallaudet is putting its emphasis. It currently has 50 students involved in some phase of its computer program. The college is purchasing, through direct federal appropriations, a PDP-10 which it expects to fully own by 1977. The school also has a small lab computer, a PDP-12 which is used for speech analysis research.

The Gallaudet computer center is used for more than training. The Registrar's Office uses it for student records. The bookstore uses it to keep track of accounts. Student body government uses it to collate findings in its program of teacher evaluation. The sociology, psychology, and economics departments use it to evaluate statistical surveys and studies. The director of admissions uses it to analyze entrance examinations, and the Business Office soon will be running an accounting system.

Center director Jordan likes to talk about all of his students, but he particularly enjoys discussing Pat Leon, who was in one of his first classes and is now on the center's staff. Following graduation and before joining the staff, she worked as a programmer for the Chesapeake and Potomac Telephone Co. for three years.

"How does taht grab you as an occupation for a deaf person," says Jordan. "The telephone company, yet!"

—E.M.

Benchmarks

AM Awakening: The stirring giant, Addressograph Multigraph, has bought Documentor Sciences Corp., Santa Ana, Calif., for cash "exceeding $1 million." Documentor, which manufactures minicomputer-based point-of-sale terminals, will continue under present management as part of AM's Data Products Group. At a lower end of the POS line, AM still markets and services the TRW-built "Menu-Riter." McDonald's fast-food chain has been evaluating both systems (March, p. 143).

Fisticuffs: While most computer firms are avoiding physical contact with IBM, two minicomputer companies have been having increasing success in knocking out IBM mainframes. California-based General Automation has replaced as many as 50 1130s with its 18-bit 18/30 machine, which has a disc monitor system (DMS). Moreover, many are looking for the Anaheim company to step up the assault with its new mini DMS, a few of which already have replaced 1130s. GA has also picked off some IBM 1800s with its TSS package, which also operates on the 18/30. Another California firm, Digital Scientific Corp., San Diego, is aiming the major marketing thrust for its Meta-4 computer, available with emulators for 1130s and 1800s, at present IBM customers and already has installed some 100. It also is considering going after customers for IBM machines still in production (the 1800 and 1130 are not) with development of emulators for the System/3 and 360/50 (a two-machine configuration).

No Foundation: The $71 million suit against Computer Sciences Corp. brought by eight minority shareholders of Computicket Corp. — who claimed that CSC had closed down the subsidiary in April 1970 to remove it from competition with the parent for a contract to develop an off-track betting system for New York City — has been dismissed. When the suit was filed in Sept. 1970, CSC president William R. Hoover described it as "nothing more than a nuisance action."

From the Brink: Following the pattern of so many computer companies born in the mid-'60s, Management Science America, Atlanta, went from modest success to fantastic growth to overspending to more growth to tremendous losses, and, in March 1971, into Chapter X. But unlike many others, the company has been resurrected and today is relatively debt free. President John Imlay sold the assets of the highly unprofitable consulting and computer centers divisions and concentrated on the development and sale of seven financially oriented software packages — a radical plan involving a staff cut from 318 to 75 in one week — and filed for protection under the federal Bankruptcy Act. This spring, the firm's two major creditors — First National Bank of Atlanta and Gulf Life Holding Co. of Jacksonville — agreed in reorganization to take equity, leaving MSA free to struggle forward.

And in New York, Brandon Applied Systems and all its subsidiaries have received confirmation of their Chapter XI plan. It calls for a 50% cash payment to creditors of under $100 and 14% to those with notes over $100. Creditors holding convertible debentures received shares of Brandon stock.

Up Wimmix: The first Honeywell computer delivered under terms of the $51.3 million World Wide Military Command and Control System (Wimmix) contract has been accepted by the command at Offutt and March AFB, Calif. The 6000 replaces three IBM systems dedicated to a classified function. A second Honeywell system has been delivered to the Joint Technical Support, an arm of the Defense Communications Agency in D.C.; and a third was scheduled for installation late last month at the Air Defense Command in Colorado Springs. Nine Honeywell systems are to be delivered this year.

Society News: AFIPS has a new constituent society — its 13th — the Association for Educational Data Systems, Washington, D.C.

DPMA announced that 1,202 of the 2,603 candidates passed the Certificate in Data Processing exam held last February, bringing the number of total CDP holders to 13,142. The next CDP test will be held Feb. 17. Application deadline is Nov. 1.

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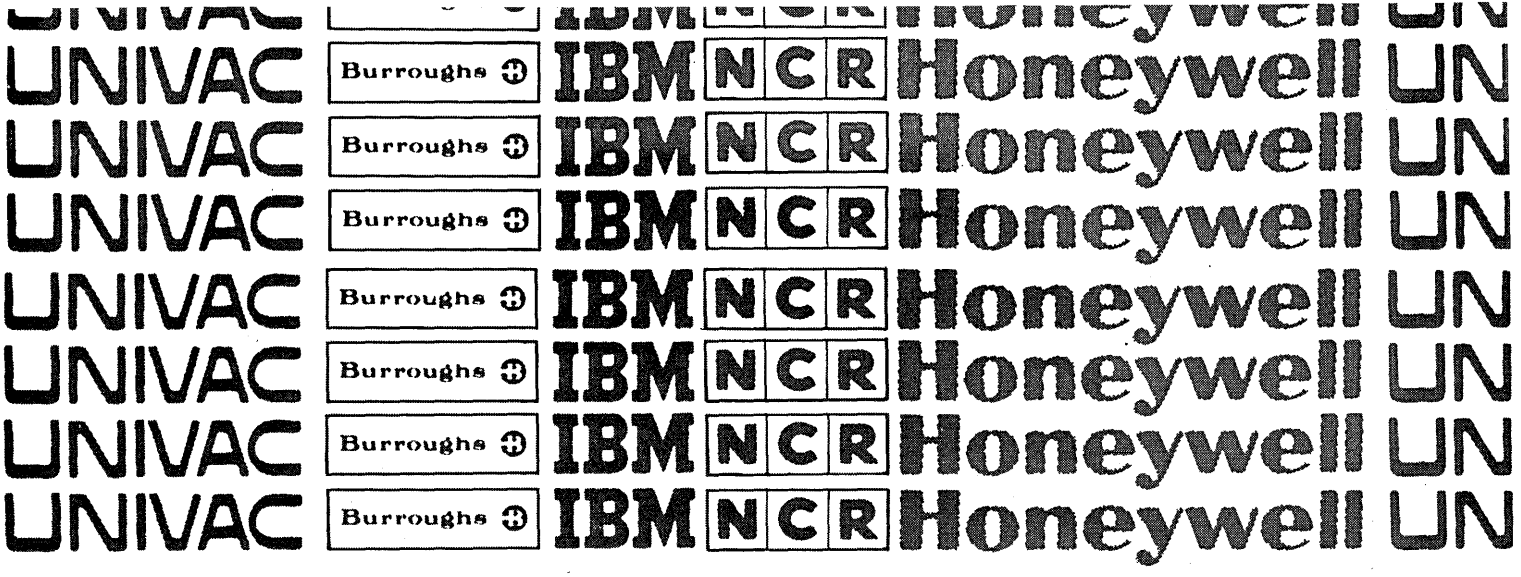

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INFOREX

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Hardware

Hardware Notes . . .

Threshold Technology Inc., Cinnaminson, N.J., is demonstrating a supermarket checkout system called VACS (Voice Activated Checkout System). In operation, the grocery checker reads the item's price and department into a microphone. Each checkout station is "tuned" to recognize a specific cashier's voice characteristics. VACS then displays the information for both the operator and the customer. There are also a number of control words in the system, such as cash, tax, check, etc. At the end of the procedure, the system presents an itemized list of purchases, just like a cash register. The advantages claimed for such a system are that it frees the clerk's hands to bag the groceries at the same time the price is called out; the customer gets to hear the price both called off and displayed, perhaps reducing the number of checking errors; and VACS doesn't require any change in marking procedures. VACS is scheduled to be available later this year.

Wang Computer Products, Inc., a Santa Monica, Calif., manufacturer of tape drives, has changed its name to Wangco. The change is intended to end the confusion between the company and Wang Laboratories, a Tewksbury, Mass., calculator maker.

When the 370 model 135 was announced (see May 1, 1971, p. 75), we speculated that its performance looked good enough that it could be considered an upgrade for 360/40 users, despite the fact that the machine was clearly intended to be the next step for model 25 and 30 users. It would appear we were right: The first customer, Bertea Corp., a manufacturer of hydraulic flight controls for military and commercial aircraft located in Irvine, Calif., took delivery of the first 370/135 in the U.S. It replaced a 360/40, and the firm has been "very impressed" by the increased performance. At this writing, no other 135s had been installed.

Univac continues to woo the former RCA customers—now called the Series 70 users. The latest hardware announced in support of Series 70/60 and 70/61 (Spectra 60s and 61s) and 70/6 and 70/7 processors (RCA-6 and -7 models) is the 8440 disc subsystem (Univac's largest) and the UNISERVO 16 and 20 magnetic tape systems.

Remote Batch Terminal

The 3780 data communications terminal will be a big brother to IBM's 2780, rather than its replacement. It can print 120- or 144-column lines much faster than the 2780 (at 425 lpm compared to 240 lpm using a 39-character set) and read cards at 600 cpm vs. the 2780's top of 400 cpm, but it is not offered with a punch. Still, its price of $25,450 or $815/month compares favorably with the $29,875 and about $900/month for the earlier machine.

The 3780 talks in EBCDIC or ASCII using the familiar binary synchronous communications method over phone lines at up to 7200 bps. First shipments will be scheduled this month. IBM, White Plains, N.Y. For information:
CIRCLE 283 ON READER CARD

More 700 Series Cpu's

Burroughs continues to announce stepping-stone machines for its 500 series users. The B 2700 and 3700 computers are completely software compatible with the machines they aim to replace—the B 2500 and 3500 models that went into the field in 1967.

The B 3700 is offered as a single- or dual-processor machine, with each processor about 70% more powerful than the B 3500. It operates at 3 million cycles per second on a memory ranging in size from 100-300,000 bytes. Single-cpu models can have from 8 to 20 high- and low-speed I/O channels that have an aggregate data rate of 3 megabytes/second—a 50% increase over the 3500. The largest dual-processor model can have 600 KB of memory and 40 I/O channels. Monthly rentals range from $14-42K for the 3700, and deliveries are scheduled for the fourth quarter.

There are six models of 2700 series machines—five single processors and a dual-cpu configuration. The baby of the series has 30-60K of storage and six I/O channels, and the larger versions go up to 300 KB of memory. The cpu operates at 670,000 cycles per second, and the I/O subsystem rate is 2 megabytes/second. Monthly rentals start at $5500 and go up to $15K. The 2700 will be available in the third quarter.

Also announced was the fifth version of MCP (Master Control Program), said to improve throughput 10-20% on all systems it runs on (B 2500, 2700, 3500, 3700, 4500, 4700) and increase the channel speeds of five of the B 4700 models 100%. BURROUGHS CORP., Detroit, Mich. For information:
CIRCLE 284 ON READER CARD

Faster Teleprinter

The TermiNet line of teleprinters has a big brother in the Model 1200. Available in three configurations—receive only, keyboard send-receive, and automatic send-receive—the 1200 prints either 80-column or (optionally) 120-column lines of ASCII characters at switch-selectable speeds to 120 cps. Upper and lower case alpha are included in its 94-character set, and a 202C-compatible data set is built in. Prices start at about $5000. GE COMMUNICATION SYSTEMS, Lynchburg, Va. For information:
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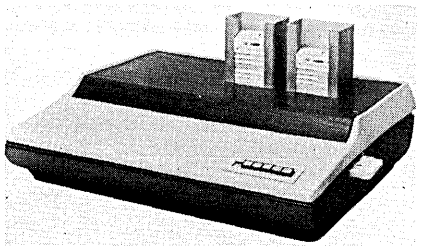
Cassette Copier

We've never seen a product quite like this before. It's a Philips-type cassette copier that can signal if the blank cassette is too short for the master and be



operated in two modes for blanks that are longer than the master to permit erasure of blanks to end of tape. It has sensors for detecting defective cassettes, end of tape, hopper empty, or improper loading. Copies require approximately two minutes. The first versions will be for analog (audio) tapes, but a digital version is on the way. The price is $2950, and delivery is 60-90 days. DATA INSTRUMENTS CO., Sepulveda, Calif. For information:
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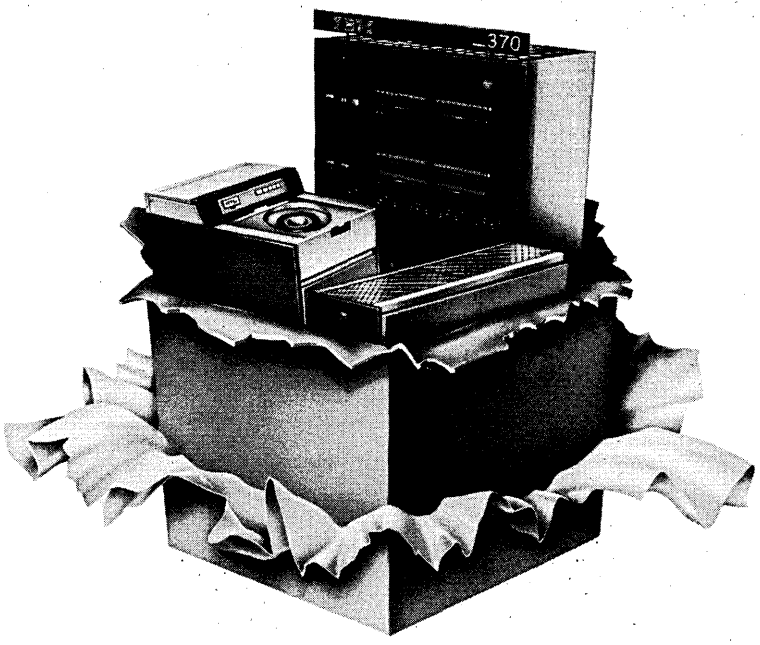
Integrated Modems

In a continuing effort to incorporate controllers and other electronics boxes into the mainframe cabinetry, IBM offers integrated modems for the 3705

BREAKTHROUGH!



ITEL's unique new Packaged Lease Program may be the most significant announcement since the introduction of the 370.

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Present system _____

communications controller, the 3735 programmable buffered terminal, and the good old 2701 data adapter unit. The modem feature is for synchronous transmissions to 1200 bps, and, when used with the 3705 and 2701, can be rigged to handle outgoing calls automatically. Leases start at $15 for private and leased lines, $20 for switched lines. Purchases are from $525 to $700. Deliveries for the 3735 and 2701 start this month; 3705 customers must wait till March. IBM CORP., White Plains, N.Y. For information:
CIRCLE 281 ON READER CARD

Accounting Machine

The ABS/1281 magnetic ledger business machine has a 4K memory (40-bit words), a 35-cps ledger printer, mag tape, punched tape, and edge-punched card peripherals. Although called a "minicomputer" by its maker, the memory is a five *milli*second cycle drum and the 1281 doesn't understand any common programming languages. Still, the machine comes with programs for payroll, accounts receivable and payable, invoicing, and other common business applications, and makes it possible to automate—if not computerize—these functions for $22,960—about half the price of an IBM System/3 Model 6. LITTON AUTOMATED BUSINESS SYSTEMS, Carlstadt, N.J. For information:
CIRCLE 282 ON READER CARD

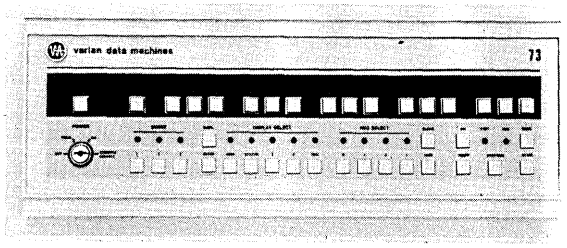
Store and Forward

The MDRS-9, built to be compatible with Teletype terminals, can go beyond the 110-1200 baud transmission rates of those terminals up to 10KC. Its basic configuration includes a 9-track tape drive (full-size reel), a Teletype interface, 200-character buffer, parity and read-after-write error checking. To be used in either transmitting to terminals over 103, 202, or 402 data sets, or in receiving from terminals, the system produces IBM-formatted tape, optionally converting between EBCDIC, ASCII, and BCD as required. Its base price of $12,400 does not include a communications interface (which will run at least $500). MITRON SYSTEMS CORP., Beltsville, Md. For information:
CIRCLE 295 ON READER CARD

Optical Mark Reader

This vendor aims for the low end of the optical character reading market, claiming that in 1971 less than 65 ocr systems with price tags under $70K were shipped and that 30 of those were its own. The Orbit 2 is a mark-sense unit, rather than a character reader, and runs at 124 cps reading handfed documents from stub size to 8½ x 14 inches. Base priced at $1495 (with a paper transport available for $750 more), it is intended to drive optical data entry prices even lower. The reader interfaces to either a data set or display. ORBITAL SYSTEMS INC., Moorestown, N.J. For information:
CIRCLE 286 ON READER CARD

product spotlight



Multiple-cpu Minis

Minicomputers have paralleled the evolution of full-scale machines, and they may now have pulled ahead. Here is one that is offered in multiprocessor, multimemory, multi-I/O bus configurations. Called the 73, it allows use of fast control store, semiconductor and core memory, cpu's, and I/O buses as building blocks.

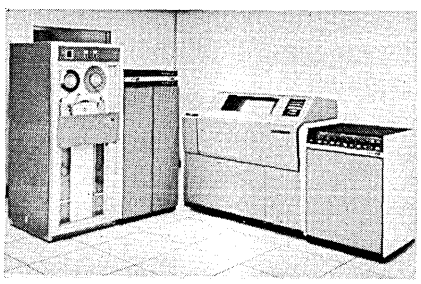
The cpu's are 16-bit asynchronous processors with cycle times of 165 nsec for a 64-bit microinstruction. They have 16 registers, use two's-complement arithmetic, have built-in multiply and divide, and will offer floating-point a little later. They come standard with 512 (64-bit) words of 165-nsec read-only control store, and will have write-able control store (which is expected to be nearly as fast). The read-only store is presently being programmed to emulate the Varian 620/f to retain compatibility with that machine's software library, but it could presumably be coded to emulate anything, even a 370. Like the 370, its operating system also belongs to the earlier generation.

Memory modules have two ports each, and are available in 1K increments of 330-nsec semiconductor and 4K increments of "slower" 660-nsec core. Three kinds of channels are provided, ranging from programmed I/O at 500K words/second (direct to memory) to a priority channel at 3 million words/second.

To prove it's a mini at heart, the whole processor is contained on a single board, and prices for the 73 begin at less than $15,000 with "many" options and 4K of either MOS or core. VARIAN DATA MACHINES, Irvine, Calif. For information:
CIRCLE 280 ON READER CARD

Off-Line Printers

If you are doing enough printing from tape that one drive is generally tied up for that purpose, you might consider this off-line train printer system. In its single-printer, single-tape configura-



tion, it runs $1588/month, or $66,270 on purchase, complete with a control unit. That's very likely less than you are paying for a printer and drive now, especially if you're using IBM gear. The printer is the 5403, a 1200-lpm unit with a 288-character train. The drive is available for 7- or 9-track, 200 to 1600 bpi tape.

The standard controller is hard-coded for IBM tape formats, but presently can be coded for use with any vendor's cpu, and eventually will have its own software for more extensive editing or for user-defined compatibility with other systems. You might even double your savings in dollars and in cpu cycles by opting for the dual-printer, dual-tape version for $117,540 or $2921/month. TELEX COMPUTER PRODUCTS, Tulsa, Okla. For information:
CIRCLE 285 ON READER CARD

HIS Computer Series

Some of the configurations of the minicomputer-based System 700 will directly compete with IBM's System/7 sensor-based data monitoring and control computers, but the series goes on from there into communications processors, batch terminals, and peripheral controller models.

Any IBM overlap will involve the Model 716 cpu, an 8K to 32K (by 16 bits) 775-nsec processor with a 78-instruction repertoire. Configured as a process controller, it will typically run about $1280/month or $45,200 purchase. (The price quoted is for 12K,

teleprinter, real-time clock, 32 analog inputs, 92 digital inputs, and 32 relay inputs.)

As a remote message concentrator, the 700 accepts data from up to 128 full-duplex 300-bps lines (or up to 64 half-duplex at 2400 bps) and outputs on up to four medium-speed lines. The system will talk to any computer that uses binary synchronous communications, including the IBM 360 and 370, and will cost about $1080/month or $35K for a 16-line version.

Other versions are available, including a terminal-support model to handle up to 16 terminals on a medium-speed line controller, plus up to eight local teleprinters for data entry and reporting. A "multipurpose system" and a "batch processing system," both based on the older 316 processor, are also offered.

Software to support the single-address, two's-complement 716 includes the operating system (which takes advantage of the factory-programmed 2K ROM), a macro assembler, a BASIC interpreter, link editor, FORTRAN IV, and a FORTRAN-coded Host Resident Software program for preparing programs on larger machines for loading into the 700. HONEYWELL INFORMATION SYSTEMS, Waltham, Mass. For information:

CIRCLE 287 ON READER CARD

Crt Terminal

A bit of honesty is always refreshing, and this manufacturer admits it has never built the 440 DATA-SCREEN terminal announced last summer (Aug. 1, p. 53). However, it *will* build the redesigned version of it announced here. It's a tty replacement that features 10 discrete, crystal-controlled transmission speeds ranging from 110 to 9600 bps, independently selectable for receiver and transmitter. The 12-inch crt displays 1,728 and 1,920 5x7 dot-matrix characters in 24 lines of 72 or 80 characters, switch selectable. The unit is priced from $1985, including tty-equivalent keyboard. TEC, INC., Tucson, Ariz. For information:

CIRCLE 290 ON READER CARD

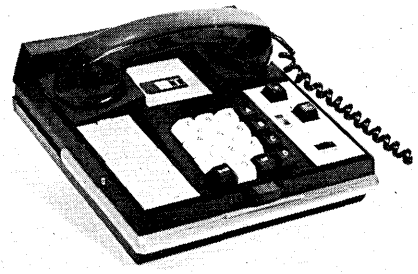
Inexpensive Display Terminal

Though it has only a 16-button keyboard and therefore would be difficult to use for normal data processing department functions, the RT02 alphanumeric display terminal should find a home in industrial, retail, and inquiry/response applications, especially since it is priced at only $1300. The 14-pound unit displays up to 32 (bright red) characters at a time from its modified 64-character ASCII set and connects to a cpu through either a Teletype or modem interface. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 288 ON READER CARD

Audio Terminal

A patented code cell built into the model 102 portable remote terminal assigns your terminal a unique hardware ID number, allowing you to talk confidentially to your computer. Compatible with IBM 7770 audio response



units or their equivalents, the 102 has a mostly numeric keyboard with a few special buttons for things like end-of-transmission messages. It weighs three pounds, has a speaker built into its cover, comes with a charger for its NiCad batteries, and is available on a three-year lease/purchase plan at $25/month. CHANCELLOR INDUSTRIES, INC., Dallas, Texas. For information:

CIRCLE 298 ON READER CARD

CASSETTE or CARTRIDGE ?

...a simple choice

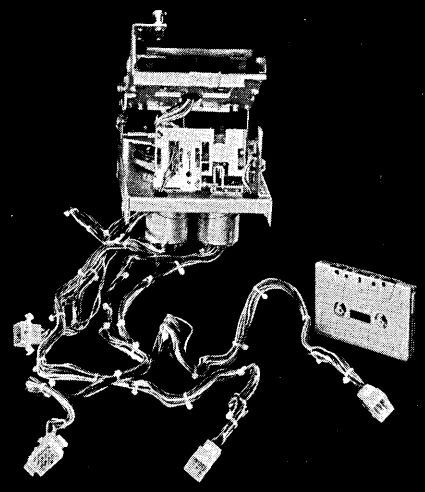
Their cassette or our cartridge?. . .which will you choose as the deck for your key-to-tape unit, communications terminal, or mini-computer.*

If you're willing to do **without** retracting idler arms, head guide forks, solenoids, complex mechanical linkages, pressure pads, up to three motors, tension arms, and other sophisticated engineering schemes needed to make a cassette work reliably, our Mini-Cartridge Transport is the simple choice.

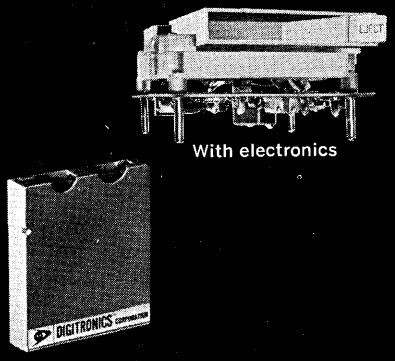
Digitronics unique mini-cartridge with built-in pressure roller and spring-tensioned, flanged reels:

- keeps tape taut in or out of the deck
- minimizes torque losses
- loads like dropping bread in a toaster

Tape automatically wraps around the "working end" of the head with the proper tension. There is no need for dirt-collecting pressure pads to keep the tape in contact with the head.



Without electronics



With electronics

*Now plug-to-plug

Write or call for complete data.

DIGITRONICS CORPORATION

Route 9, Southboro, Massachusetts 01772, (617) 481-2500

CIRCLE 26 ON READER CARD

hardware

370 Memories

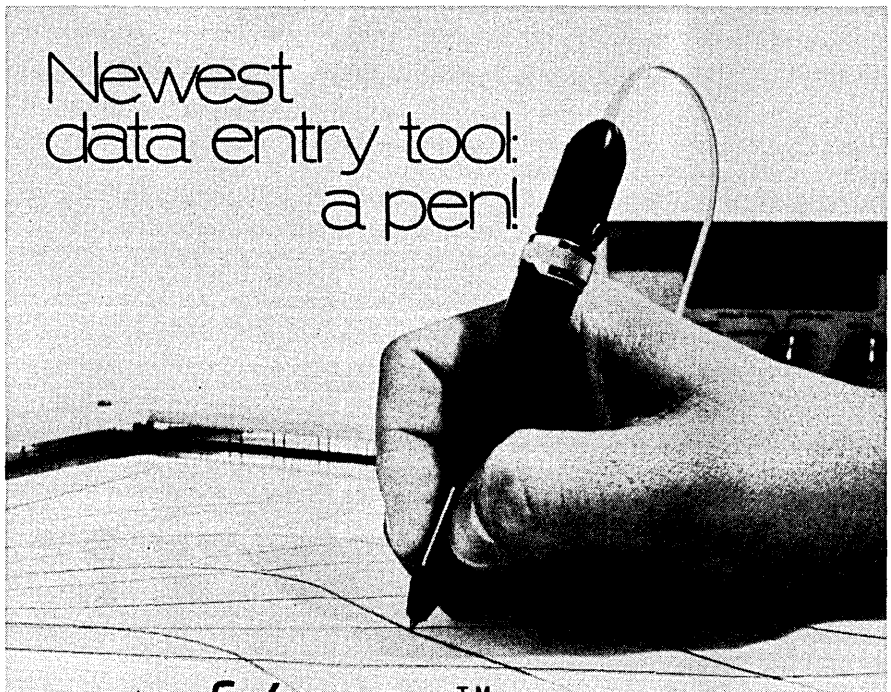
Semiconductor memories for the IBM 370 models 145, 155, and 165 represent an entirely new product line for Telex. The 145 user can choose either a 128K or 256K module to add to the IBM-supplied system minimum of 256K. On a one-year lease, 256K rents for $4995/month, including maintenance, and will be available early next year. The 155 and 165 user can build up to the system maximums of 2 and 3 megabytes, respectively, with 256, 384, and 512K modules. A 512K-byte storage system for both 155s and 165s rents for $5700 on a one-year lease, including maintenance. These memories will be available in the last quarter of this year. TELEX COMPUTER CORP., Tulsa, Okla.

CIRCLE 316 ON READER CARD

Forms Detachers

Claimed to be the fastest detachers available, the 486 and 488 can run at speeds to 500 feet of continuous forms per minute while slitting pages, slicing off margins, and stacking single-copy or multiple-part forms in consecutive page order. The models, which both handle forms from 4 x 2½ to 19 x 17 inches, differ in that the 488 has a printer for adding fixed information to each page. The 486 is priced at $3500; the 488 at $4195. MOORE BUSINESS FORMS, INC., Niagara Falls, N.Y.

CIRCLE 312 ON READER CARD



graf/pen T.M. sonic digitizer

The graf/pen solves data entry problems for any computer in any field. It enters graphic data from two-dimensional curves or three-dimensional objects, speeds entry of alphanumerics for printed or projected formats. Or you can use it for map making and analysis, printed page make-up, remote A-V presentations or data reductions.

The graf/pen is a special ball point which creates both a visual record and an electrical spark when contacted to a graf/pen tablet, visual display, CRT screen, film viewer or any selected surface. The spark's hypersonic sound is detected by sensors at the edges of the display. X and Y (Z for 3-D graf/pen) coordinates are digitized in binary or BCD codes for storage, simultaneous display, computer entry or remote transmission.

There are no costly interfacing or start up problems, and the graf/pen costs just $2800 complete. Write us for complete information.

SAC SCIENCE ACCESSORIES CORPORATION
A division of Amperex A North American Philips Company
65 Station Street, Southport, Connecticut 06490
Telephone: (203) 255-1526

CIRCLE 19 ON READER CARD

Keyboard Terminal

The Model 120 electrostatic printer has been augmented with keyboard capable of generating 102 parallel ASCII codes and operating up to 10 feet from the 120-cps printer. The keyboard has an optional 128-character buffer to allow it to run at speeds to 300 baud. The printer is priced at $1500; the keyboard, at $350. REPCO INC., Orlando, Fla.

CIRCLE 314 ON READER CARD

Microfiche System

The model 926 is a large-scale information storage and retrieval system designed for use with standard National Microfilm Assn. 4 x 6-inch microfiche. Up to four storage banks, each containing 200,000 fiche, can be configured—the equivalent of 76 million page images. Fiche edges contain unique codes which are searched by a scanner at 1,000 fiche per second. The correct fiche is then transported to a tv camera for display. The average access time is between 8 and 14 seconds. Prices start in the $100K range for an open-loop version (no tv—the fiche is delivered to the operator). The 926 will be available next year. VARIAN ADCO, Palo Alto, Calif.

CIRCLE 315 ON READER CARD

Terminal Disc

As minicomputing has become cheaper, terminals have become smart enough to look like g-p computers. The addition of a 2.5-megabyte cartridge disc (about 80 msec access, 156KB transfer) to the Datapoint 2200 means that all the ex-crt terminal lacks is its own terminals. The single disc option sells for $9800 or leases for $211 monthly. More discs can be added. COMPUTER TERMINAL CORP., San Antonio, Texas.

CIRCLE 310 ON READER CARD

Discs

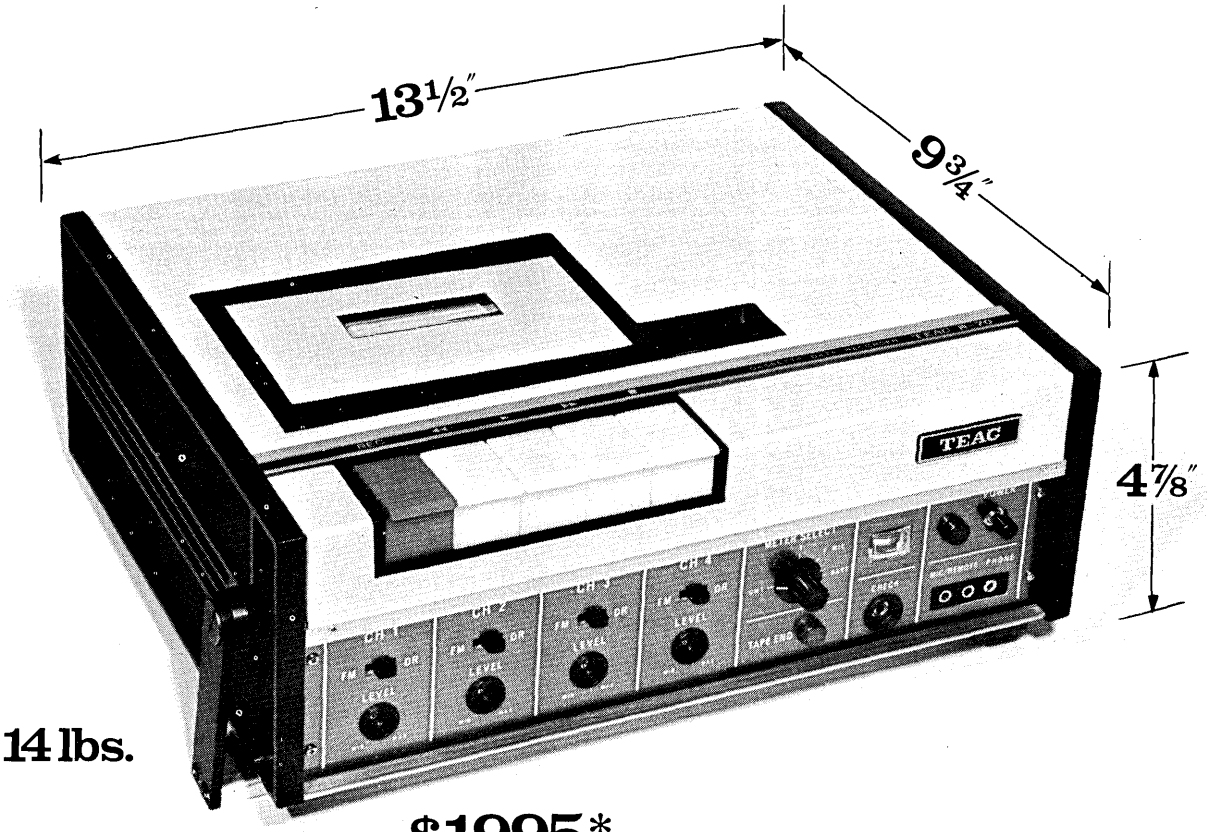
Available as front-loaders or top-loaders (like washing machines?), the D-3000 series of moving head discs offer up to 10-megabit capacities using IBM 2315 or 5440 compatible cartridges in single- or dual-spindle versions. Average access times are 35 msec, and up to four discs can be handled by one controller. Oem prices for 100 units start at $2900. PERTEC CORP., Los Angeles, Calif.

CIRCLE 320 ON READER CARD

Synchronous Tape Drives

"We looked at the features everybody else in the industry was offering and decided to combine the best ones in our next series, "says a Kennedy spokesman about the 9000 series tape drives. The synchronous read-after-write units come in a variety of combinations of speeds (12½ to 37½ ips), densities, (556 and 800 bpi), and tracks (7 and 9). Other features include crystal-controlled timing throughout, three automatic clipping level changes, marginal skew check, overwrite capability, selectable addressing, and light-emitting-diode indicators. In orders of 100 the 9000 series drives are approximately $2500 each. Delivery is 30 days. KENNEDY CO., Altadena, Calif.

CIRCLE 321 ON READER CARD □



14 lbs.

$1995.*

This is a lot for your money?

If you judge superiority by size and worth by weight, the looks of our R-70 cassette data recorder may be deceiving.

But for what it's worth, it's not just another pretty face with a slim figure and expensive taste.

It's a handful of fine features that no other data recorder its size can measure up to.

We make it that way because the R-70 has the family name to uphold.

Its housing is a strong case against dust, vibration and manhandling. And it's made to do the job lying down or standing up.

Since both FM and direct record electronics are built in, you can choose either with a mere flip of a switch on any of its four channels. And even add voiced comments.

Each channel can be individually monitored, too, via a meter or a built-in output to a scope or VTVM to insure proper input level.

And a built-in tape counter tells you the exact spot of any recorded data.

For those who tend to be forgetful, we've even included a warning light that tells you when you're at the end of your tape.

Frequency response in the FM mode is DC to 625 Hz while the direct mode is 100 to 8,000 Hz.

The unit uses commercially available instrumentation grade Philips-type cassettes.

Made to travel in fast company, the R-70 can operate on its own self-contained batteries, or draw upon outside AC or DC power sources.

For more of the fine points on this or other data recorders in our line, write or call Ken Williamson, Director of Marketing, Technical Products, TEAC Corporation of America, 7733 Telegraph Rd., Montebello, CA 90640. Telephone (213) 726-0303.

He'll tell you why it pays to

go TEAC®

*Price includes these accessories: TEAC CT-60 tape cassette; memo announcement microphone; monitoring earphone; input-output cords; fuses and lamps; AC power cord; DC power cord; check terminal cord; cleaning kit; vinyl cover; adjustment screwdriver; operating manual.

For our card readers, the name of the game is economy.

Our card readers wrote the rules for EDP economy. For 12 years, they've been saving EDP budgets with reliable, low-maintenance operation.

Now comes our Model 8330. The latest in our line, and the lowest in cost. The perfect reader for minicomputers and remote terminals. Easy loading and quiet running. It reads up to 318 cards a minute fed from a contoured bed that accommodates a variety of straight or bowed cards. No card can escape our bifurcated picker blade. Twelve light-emitting diodes make up the read head. They make every little bit count.

The 8330's optional mark sense station reads the new 40-column mark format. Soon, you can try 1000 card-capacity and 600 cards-per-minute models. Our basic electronics and card transport will drive them all. The ante is right, too. The card transport alone is $900 in OEM quantities.

You can bet that our card readers will keep EDP costs in line. And you'd win. Call us on it.

DATA PRODUCTS

OEM National Marketing: Boston (617) 237-1950; Dallas (214) 231-2240; Detroit (313) 354-5858; Los Angeles (213) 474-1596; Minneapolis (612) 927-8747; Philadelphia (609) 667-7555; San Francisco (415) 941-5485; Washington, D.C. (301) 652-8120. **U.S. Representatives:** Chicago, *L-TEC, Inc.* (312) 286-1500; Orlando, Fla., *Gentry Assoc., Inc.* (305) 894-4401; San Francisco, *W. J. Purdy Co.* (415) 347-7701. **OEM International Marketing:** Amsterdam 020-452-457; London 01-579-291; Munich 08-106-5766; Tokyo 493-6451; Vienna 84 53 61, 34 44 16. **International Representative:** Tokyo, *Marubeni* 501-7421. **Home Office:** 6219 De Soto Avenue, Woodland Hills, California 91364 (213) 887-8000.

We introduced carbonless NCR Paper in 1954. Now, what have we done for you lately?

Quite a bit.

In 1970, we spent an unprecedented $55 million to improve our base stock, our coating capability and our delivery. We now own two paper mills which gives us absolute control over base paper weight, caliper, consistency and color. By consolidating more than 90% of our coating operations in Appleton, we offer the most sophisticated techniques, equipment and craftsmen in the industry. Better control of production simplifies and speeds delivery. We've also added three new warehouses with back-up stock. Meanwhile our research labs have been busy. We're in our 9th generation with hundreds of improvements behind us. With Appleton's paper making and coating skills plus NCR's traditional strength in business systems, we've put it all together.

First, we were firstest. Now we're also the mostest. This is the year

NCR Paper means business

NCR Paper. Appleton Papers Inc., P.O. Box 348, Appleton, Wisconsin 54911, Subsidiary of NCR.

APPLETON

Software & Services

Software Notes . . .

The Logos I language translator developed by Logos Development Corp. in Middletown, N.Y., has had an interesting history. The federal government has used it for nearly two years for translating English technical manuals into Vietnamese. Next the government asked whether it could be used to translate computer languages. Less than two weeks later FORTRAN IV programs were being converted into PL/1, with several other language pairs subsequently developed. The programs effect translation between languages by operating on language-dependent data containing rules of syntax, vocabulary, etc.

Univac announced a number of operating system enhancements to its Series 70 computer users association at its May 22 meeting in Houston. DOS release 14.1, just now available, provides a resource management extension called DOS/RMS, including scheduling, automatic volume recognition, spooling, and other changes. Approximately 75% of the Series 70 users run the TDOS operating system, and the 400 programmers at Univac's Cinnaminson, N.J., facility unveiled something for them, too. It's TDOS release 22, scheduled to be available next January. I/O spooling, job scheduling by priority, disc-oriented compiling, and the capability of running up to 14 jobs are among its features. November was announced as the release date for DOS-15. It will include major language enhancements to RPG, COBOL, and FORTRAN; 70/590 direct access storage system support enhancements; ISAM support enhancements; and a SPECTRA to ANSI COBOL translation package called UCOLT.

The first 25 users of Software Design Inc.'s partition balancing features in its GRASP/II DOS spooling package report that some of them are saving as much as eight partition hours per day, according to the El Segundo, Calif., firm. Considering that the partition balancing option rents for only $20/month, it might be one of the better bargains around these days.

It's hard to imagine an intelligent terminal getting any smarter than having its own programming language. But one is now available for the model 340 terminal marketed by Sycor, Inc., Ann Arbor, Mich. TAL lets users create checking, editing, and arithmetic routines for the terminal.

Software Performance Monitor

Software monitoring has come of age as third-generation operating systems have made it more difficult to see what a machine is really doing. STROBE is built to operate on a 360 or 370 to identify the processing time consumed by a program plus the interaction of I/O and cpu usage. Unlike other monitors, it is able to measure these in terms of program module names rather than by core locations, and measures in terms of percentage of total run time rather than in absolutes like milliseconds.

Written in BAL and COBOL, STROBE sells for $9400 in versions for OS MVT and MFT; a DOS version is in preparation. The portion of the program that does the interrupting and data saving requires 4K and is said to add less than 5% to the run time of a 10-minute job on a model 50. PROGRAMART CORP., Cambridge, Mass. For information:
CIRCLE 251 ON READER CARD

DOS Enhancements

The DOS user who feels he is being pressured by IBM to move up to OS may want to consider extending his operating system with EDOS rather than replacing it. Made to operate with IBM's DOS release 26, EDOS provides the user with some features that are only available in OS, like block fetching, automatic volume sensing, procedure library support (for cataloging sets of JCL statements), and a relocatable loader. Also included are a disc dump/restore program, a text editor, and a link editor said to be two to four times as fast as IBM's.

At least one of the features is not available even in OS. That is the ability to use a 360 or 370 as if it were twin machines with three partitions each.

The argument against operating system enhancements has been incompatibility, but DOS is not expected to change much, and maintenance is included in the $225/month price. (The dual-machine option runs another $75/month.) THE COMPUTER CO., Richmond, Va. For information:
CIRCLE 252 ON READER CARD

Faster Cobol

Would you spend $4500 to have your COBOL programs compile up to 20 times more quickly, then execute in half the time or less than they now do? This vendor is offering what it claims is an ANSI-compatible COBOL which will do just that. The developer explains that this is due to the use of more modern techniques of language recognition, evolved from automata theory, and offers free trials on prospects' programs to demonstrate the program's capabilities.

In addition to speed, the program offers run-time diagnostics, can check array dimensions for variables, is reentrant and self-relocating, gives non-standard COBOL extensions for those who wish to use them, and then *flags* each usage of those extensions. The $4500, or $150/month, is for its standard form; a load-and-go version (probably the one used in speed tests) runs $5000 or $160/month. COMPUTER LANGUAGES, INC., New York, N.Y. For information:
CIRCLE 253 ON READER CARD

Interactive Debugging

These two packages will allow a programmer at a terminal supported by the OS Time Sharing Option to test and debug programs compiled with IBM's most recent COBOL and FORTRAN program products. Both will be available at the end of the third quarter.

The COBOL Interactive Debug is used with programs compiled with the OS Full ANSI COBOL Compiler and Library, Version 4, announced three months ago. Among its features are advanced symbolic debugging that produces a formatted dump using COBOL source data-names when abnormal termination occurs, a syntax checking compilation request capability, dynamic subprogram linkage that gives the user object-time control of main storage, a library management facility that allows installations running with multiple COBOL regions or partitions to share some or all of the COBOL library subroutine modules and save main storage, an object code optimizer, and string manipulation. The program rents for $220/month.

The FORTRAN debugger can suspend execution at any time to obtain testing information, display and change variable values, perform program tracing, display part or all of the source program, correct invalid statements, perform conditional execution of specific sequences of debugging commands automatically, and maintain an execution frequency count for reach FORTRAN statement. This program will rent for $150/month. IBM CORP., White Plains, N.Y. For information:
CIRCLE 254 ON READER CARD

Data Base Manager

The description of the model 204 data base management system includes most of the good phrases required—

The digital cassette loader that can splice tape and punch EOT/BOT holes all by itself.

Contact Paul McGonigle
King Instrument Corporation
Kane Industrial Dr., Hudson, Mass. 01749
Tel. 617-568-8771

World leader in tape tailoring systems.

KING

software & services

multikey access to data, shared files, variable-length and variable-format records, on-line file maintenance, time-shared operation, and multilevel file security. Asked to place his system among the other data base management products, the vendor said that it is not competing with Informatics' Mark IV, but taking its customers primarily from IBM's IMS.

Model 204 has its own simple language, comprising commands like "FIND ALL RECORDS FOR WHICH SEX = MALE, AGE IS UNDER 30 . . . " Among its 22 modules are some for sorting, Boolean arithmetic processing, automatic range retrieval, audit trails, and security (including passwords and account ID numbers for retrieval only, data entry only, or access to certain files only).

Priced at $300 per month after the first two months (which are included in the $1K installation fee), model 204 requires a minimum of 77K on a 360 or 370. One of its big selling points is that it does not have to do sequential retrieval; it uses its own access method. COMPUTER CORP. OF AMERICA, Cambridge, Mass. For information:
CIRCLE 255 ON READER CARD

S/3 Accounting

Look at this: 16 programs exclusive of sort routines; approximately 200 pages of documentation; 11 weekly, 4 monthly, and 3 as-requested reports in an accounts payable system for System/3 users—all for $245. The package operates on a 12K model 10 card system or a 16K disc version. Major files include vendor master, document number, and account number master. Extensive editing and file protection features are claimed for the package, as are check and batch control capability.

Or, for the same price, how about a general ledger system (17 programs, 150 pages of documentation, 10 reports . . .) for 16K model 10 disc systems. The package contains three major card files and four major disc files for doing single- and multilocation organizational accounting.

Finally, a $385 payroll system is offered. It contains 28 subprograms and 300 pages of documentation. Twenty-two weekly, one monthly, three quarterly, and a number of yearly and demand reports are generated. It runs on 16K disc version model 10s. Deliveries for the programs are said to be 48 hours. ENGINEERING COMPUTER SYSTEMS, INC., Lexington, Mass. For information:
CIRCLE 258 ON READER CARD

software spotlight

Project Management System

If the TOPS integrated management system does as well as its vendor claims, it might make PERT and critical path method scheduling programs look like arithmetic subroutines. In addition to determining the total costs or total time requirements of a project as PERT and CPM do, TOPS has modules which optimize the scheduling, the cost, or the performance of the finished product. For instance, if there are contract incentives for speed or for product performance, they are taken into consideration.

Similarly, if the output of a project is a product, say an aircraft, it may be much cheaper to produce a plane with a range of 4800 miles rather than 5000. If so, TOPS will determine that and schedule the project for a 4800-mile craft. (A large aerospace firm reportedly increased its profits on a very large space program from $13 million to $70 million because TOPS found better ways to optimize.)

Written in FORTRAN, the three-module system (Cost, Schedule, and Performance) requires as little as 20K bytes to operate, but reasonably should have 100K. It's claimed that TOPS takes only 50% more time than PERT on the same network. The purchase price will range from about $50K to a typical $70K, so TOPS isn't for everyone . . . but not everyone is looking at profits of $13 million, either. HOLLANDER ASSOCIATES, Fullerton, Calif. For information:
CIRCLE 250 ON READER CARD

Cobol Optimization

A COBOL optimization service is offered that guarantees a minimum 20% reduction in cpu time or no fee is payable. To use the service, customers send a COBOL compilation to this firm for examination. A list of specific source coding changes is returned to the user. The charge for the service is $100 for each program up to 2,000 source lines in length and $3 for each 100 additional lines. GEOFFREY FRIDD ASSOC., Guelph, Ont. For information:
CIRCLE 259 ON READER CARD

Crt Terminal Manager

IBM reportedly has offered no access method for using crt terminals on machines at the very bottom of its 360 line, the 22, 25, and 30. Owners of

"I almost bought the wrong Job Accounting System..."

Value Computing recently announced the availability of Comput-A-Charge, an automatic system for billing IBM DOS/OS computer users which solves the multi-programming billing problem.

The response has been extremely enthusiastic. From one of the first customers:

"I almost bought the wrong job accounting system. In my attempt to save my company time and money, I was about to choose an over-priced inadequate system. Comput-A-Charge stopped me from going down a blind alley. With Comput-A-Charge, I can go into other systems, like scheduling and tape control."

COMPUT-A-CHARGE

An automatic system for billing computer users which solves the multi-programming billing problem.

Daily: Summary on Jobs . . . Idle Time . . . Multi-Programming Graph . . . Class Utilization . . . Device Utilization . . . Shift Analysis

Periodic: Device Utilization Graph . . . Device Utilization . . . Job Utilization . . . Application Utilization . . . Major Application Graph . . . Total System Summary

Billing: By Core Used, Core Requested, CPU, I/O's, Card Read, Lines Printed.

value computing inc.

383 Kings Highway North
Cherry Hill, New Jersey 08034
Phone (609) 667-8770

CIRCLE 91 ON READER CARD

How to keep a thousand terminals talking over leased lines at least cost.

You need a data communications system from GTE Information Systems. At its heart will be a Tempo communications processor.

With the cost of dedicated lines today, one of these programmable beauties can save you a bundle.

It can poll your terminals, and listen for the dial-ins. Accept teleprinter and video data at any number of speeds and codes, all at once. And handle all these inputs and outputs, and send the data over high-speed trunks or local central processor channels.

With complete error control.

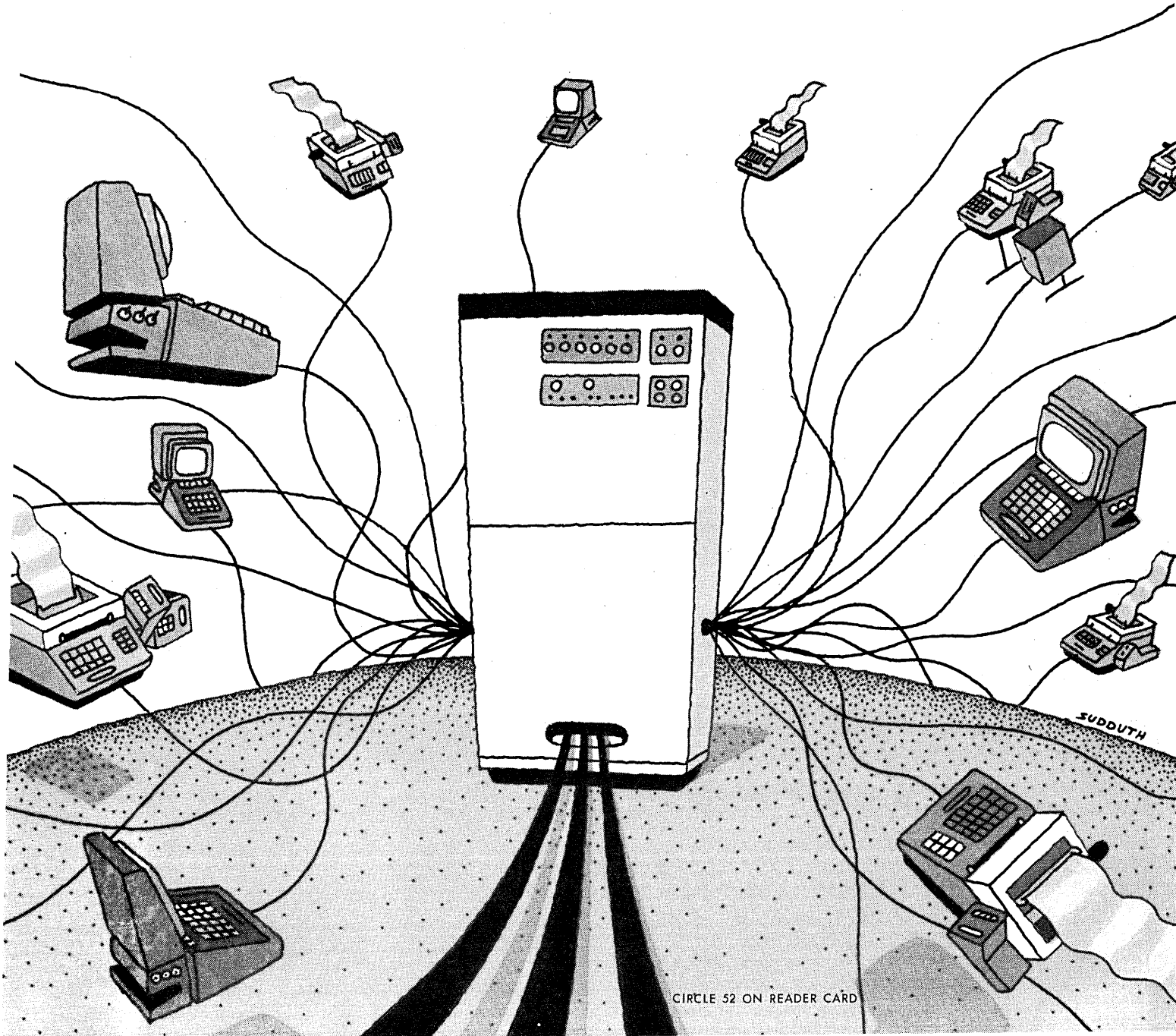
But there are several other possible custom configurations our very adaptable products can take. You ought to see our intelligent terminals and front end processors, for instance.

From terminal to central processor, GTE Information Systems' Tempo knows how to control your data communications.

And we've got the hardware, the software and the support services to give you exactly what you need.

To start with, call Gary Cadwallader at 714-523-9440. Or write GTE Information Systems, 4005 West Artesia Avenue, Fullerton, California 92633.

GTE INFORMATION SYSTEMS



CIRCLE 52 ON READER CARD

What are the odds on a power failure as they round the clubhouse turn?

And how much pandemonium would result? None at this track—because the data processing system operates from a Topaz Uninterruptible Power System. So no matter what happens back at the generating plant—or anywhere along the line—the data remains intact, the payoffs are made, and the rest of the races will run on schedule. Besides preventing a shutdown, the Topaz UPS also eliminates spikes and line transients that could turn a 30-to-1 longshot into the consensus favorite.

If you're in no position to gamble on a power failure, we're in an ideal position to help you—with a Topaz Uninterruptible Power System.

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Ph. (714) 279-0111 TWX: (910) 335-1526

INVERTERS/CONVERTERS/ULTRA-ISOLATION TRANSFORMERS

CIRCLE 23 ON READER CARD

these cpu's and the mod 40 can turn to Minicomm, which uses a core-sharing technique to handle up to 99 crt application programs under DOS. It operates in as little as 24K by taking priority from shared batch processing. Minicomm can be addressed in BAL, COBOL, or PL/I application programs; there is also an interface for RPG.

The system sells for $8000 in its standard form and $10,000 in its multiprogramming version, which operates in a 3K partition. PROGRAMMING METHODS, INC., White Plains, N.Y. For information:

CIRCLE 261 ON READER CARD

Business Game Simulation

Although it is described as a game, and allows for participation of up to four "teams," the use of this licensed program could have an important influence on a firm's future business plans. Written in APL for time-shared use on a 360, the program accepts the input of parameters such as number of marketing regions, number of shifts worked in each plant, number of products produced, and kind of competition to be expected (ranging from pure price monopoly to no price interaction). Outputs include profit and loss statement, balance sheet, cash flow statement, competitive performance reports, etc. The program requires at least 200K, and operates at a rate of one 3-month simulation per minute on an IBM 360/67. Its rental price of $435 per month is waived after 12 payments. IBM, White Plains, N.Y. For information:

CIRCLE 256 ON READER CARD

Fortran Documentation

FORDOC is a set of six programs that perform documentation tasks on FORTRAN source programs. FORDOC renumbers statements in ascending order; indents statements in DO loops; closes up unneeded blanks; aligns all statements and comments on a left-hand margin; moves all format statements to the end of the deck; inserts special comment cards to improve the appearance of the program; and generates comment cards that list all variables in alphabetic order with cross-references of which cards contain the variable and lists all statement numbers in numerical order, showing where each statement is cited. The programs sell for $400 each, or all for $1800. J. TOELLNER & ASSOC., Los Angeles, Calif. For information:

CIRCLE 260 ON READER CARD □

If you're seriously talking about graphics, let's talk about ours...

seriously
call (213) 346-3410

Without any of the ours-is-best sales pitch.

Just plain talk about interactive graphics hardware and software. About what we do best and what others do best. We'll talk price/performance trade-offs and relate them to your needs and applications.

If you're an OEM, ask about our Series 2 and Series 3 peripheral graphics terminals unit-priced from $19,800. We'll talk about discounts, specifications, building-block hardware and software, interfacing, deliveries, training, and whatever else you need to make an intelligent evaluation.

If you're an end user, great. Ask about our new family of stand-alone systems: Vectorgraphics 11. (The picture above shows an expanded version with DOS.) For $35,900 we have a complete interactive graphics system with a display terminal, a PDP-11/05 with 4K memory, an ASR33 and a utility software package. We'll talk about what these systems can do, how they expand, the software you get, our users association, and exactly what it would take to get you started on your application.

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What do we expect from all this talk?

An opportunity to talk seriously with you about interactive graphics in general. And about our systems in particular. Because we feel that after you discover what you can get for your money, many of you will talk about our systems . . . seriously.

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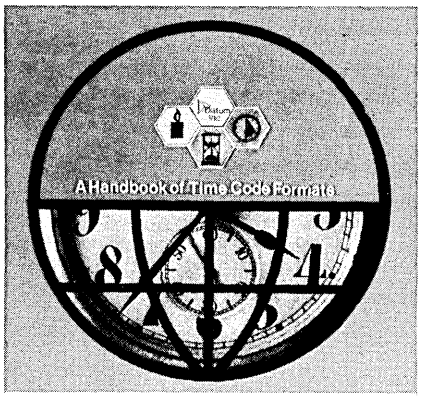
Canoga Park, California 91304
Phone: (213) 346-3410 / TWX 910-494-2764

CIRCLE 100 ON READER CARD

Literature

Time Code Reference
A reference book of time code formats contains drawings and characteristics of some two dozen of the most com-



monly used codes and includes a glossary of terms and abbreviations which defines the jargon used in typical applications where masses of data are correlated to a precision time standard. DATUM, INC., Anaheim, Calif. For copy:
CIRCLE 215 ON READER CARD

Scheduling Programmers
Catalog of magnetic scheduling aids describes a new line of magnetic boards for scheduling workloads of programmers and systems people as well as magnetic systems for computer time scheduling, project control, installation control, flowcharting, and Pert programming. EDWARD OCHMAN SYSTEMS, Fairfield, Conn. For copy:
CIRCLE 200 ON READER CARD

IEEE Papers
Synopses of three papers presented at the 1972 IEEE International Convention are contained in an eight-page brochure called "Technological Leadership." The papers are "Static and Dynamic Control Memory in Micro-Programmable Computers," by Richard M. Genke; "The Dedicated Minicomputer in Industrial Applications," by James Folts; and "Micro-Programming: Real Applications in Minicomputers," by Dominic E. W. Archdale. INTERDATA, Oceanport, N.J. For copy:
CIRCLE 201 ON READER CARD

Terminal Maintenance
Eight-page booklet covers a terminal maintenance program for time-share users. Called "Centralized Maintenance Keeps Terminals Running," it describes a range of terminal problems time-sharers encounter and how the maintenance program helps solve them. WESTERN UNION DATA SERVICES CO., Mahwah, N.J. For copy:
CIRCLE 204 ON READER CARD

The Cost of Tape
"Do You Know What It Is Costing To Keep Me?" is a brochure on a method of analyzing magnetic tape efficiency losses in computer installations. Included are examples for calculating the cost of present computer tape inefficiencies and a variety of applications program information for establishing a tape maintenance system. COMPUTER-LINK CORP., Burlington, Mass. For copy:
CIRCLE 202 ON READER CARD

Time Sales Rulebook
Sixteen-page booklet describes what a company must do to sell computer time in today's market and lists rules buyers should know before they sign a contract for purchase of computer time. The various facets of time sales are defined and the subject of pricing is covered from both the buyer's and seller's points of view. TIME BROKERS, INC., Elmsford, N.Y. For copy:
CIRCLE 203 ON READER CARD

Crt Terminals
Ten crt terminal models offering parallel, serial, serial polling, and tty replacement interfaces are described in an eight-page brochure which lists prices, specifications, options, and details of modular design. TEC, INC., Tucson, Ariz. For copy:
CIRCLE 205 ON READER CARD

Telephone Center MIS
A telephone center management information system called STAR (System for Telephone Administrative Response), for monitoring, analyzing, and forecasting telephone work-force requirements, is described in a 36-page manual which covers some of its latest enhancements and is directed toward management concerned with control of telephone communications. APPLIED DATA RESEARCH, INC., Princeton, N.J. For copy:
CIRCLE 206 ON READER CARD

Microprogrammable Systems
Ten-page booklet entitled "Design of Microprogrammable Systems" is designed to provide practical ideas on how to go about implementing a microprogrammable system. It includes a discussion of the concept of microprogramming, provides advice on building a simple microprogrammed system, and describes practical microprogrammed implementations. S.M.S., INC., Sunnyvale, Calif. For copy:
CIRCLE 207 ON READER CARD

Video Instruments
Twenty-seven video instruments, including data display devices, video analyzers, video disc recorders, special effects, image enhancers, test and sync generators, and tv-to-computer interface equipment, are listed in a 1972 short-form catalog. COLORADO VIDEO, INC., Boulder, Colo. For copy:
CIRCLE 208 ON READER CARD

Cobol Programmer's Kit
Ten-page booklet describes vendor's COBOL programmer's "Tool Kit," a package of six programming aids. It contains a section for each of the aids —a shorthand translator, a decision table translator, flowchart generator, cross-reference processor, a library facility, and a source language debug facility. WESTINGHOUSE ELECTRIC CORP., Pittsburgh, Pa. For copy:
CIRCLE 209 ON READER CARD

Dp Management Training
Folder describes a new management course for data processing executives. Called "Managing Data Processing," it is a 15-hour program for individuals or groups, designed for the new or seasoned dp manager, systems manager, operations manager, or programming manager. The program includes a workbook and five audio cassettes. SYSTEMATION, INC., Colorado Springs, Colo. For copy:
CIRCLE 210 ON READER CARD

Printer Technology
Nine-page article explains the operation of computer output impact printers and compares full-character and dot matrix types. It also introduces a new concept for increasing printer speed and reliability. PRINTER TECHNOLOGY, INC., Woburn, Mass. For copy:
CIRCLE 211 ON READER CARD

Data Set
Four-page brochure covers vendor's DigiNet 2201 synchronous 2400-bps data set which is designed for use primarily over private voice-grade lines and can be used on the switched network through a data access arrangement. GENERAL ELECTRIC COMMUNICATION SYSTEMS DIV., Lynchburg, Va. For copy:
CIRCLE 212 ON READER CARD

Troubleshooters
A test pattern generator (PG-303) and a data analyzer (DMS-303), both featuring 16 switch-selectable data rates up to 9600 baud, are covered in a four-page brochure which describes both units and lists technical specifications. DATA PRODUCTS, Stamford, Conn. For copy:
CIRCLE 213 ON READER CARD □

The three things our new display terminal does best are cut costs,

cut costs and cut costs.

This is the Bendix 4390 message-oriented, teletypewriter-compatible display terminal. It's built to cut your communication costs three ways. Here's how.

First, the 4390 gives you editing capability at the terminal instead of the computer. This means lower computer overhead for sure.

Secondly, the 4390 can cut your communications costs. For instance, as a replacement for the Teletype terminal, the 4390 means instantaneous information retrieval, with message displayed in large, easy-to-read CRT display. It's highly flexible, too. You get line and character editing. Protected fields. Tabbing. Block transmission of data.

Thirdly, the 4390 is yours to buy or rent. This allows you to pay for the terminal only as long as you need it. You can cancel on 90-day notice. Lease. Or take advantage of a lease/purchase plan.

Options? Upper and lower case, printer interface, light pen, polling module.

Finally, the 4390 is backed by a computer systems capability able to meet all your CRT terminal needs. All your real-time computer system needs as well. And just who are we to offer you all this? The Interactive Terminals Corporation, a Subsidiary of The Bendix Corporation. Write or call us about the 4390 soon. Bendix Center, Southfield, Michigan 48076. (313) 352-6035.

Bendix

CIRCLE 35 ON READER CARD

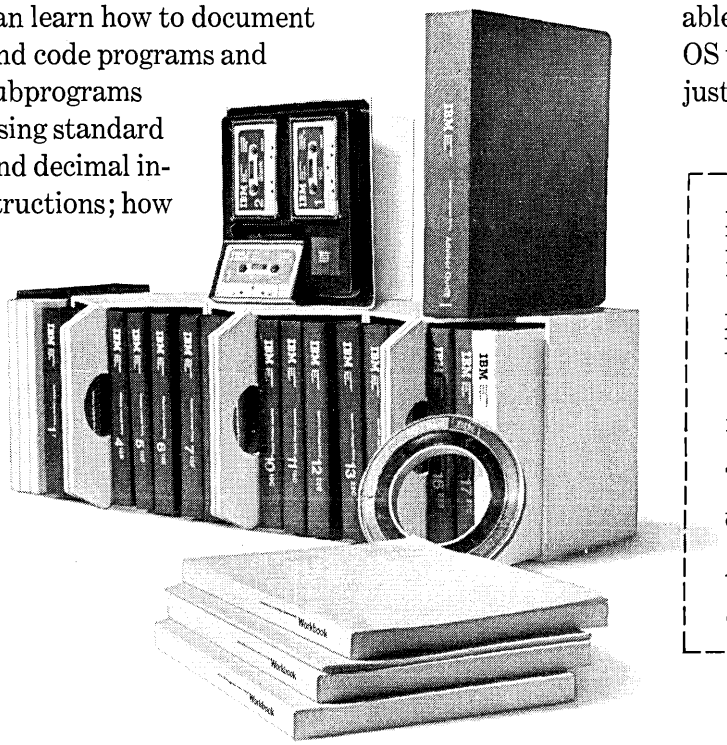
With IBM's new independent study courses, your programmers can learn at their own pace.

Now your programmers can be taught Assembler Language or ANS COBOL coding with IBM's independent study courses. They can learn and progress at their own pace right where they work.

The courses include video tapes, self-study texts, workbooks and practical computer exercises that run on an IBM System/370 or System/360. And with the Assembler Language course, your programmers also get audio tape lectures which they follow along with annotated machine listings and illustrations.

The lessons themselves provide an expert level of instruction. And with the Advisor Guide included with the course materials, anyone experienced in Assembler Language or ANS COBOL can administer the program.

With the Assembler Language course, students can learn how to document and code programs and subprograms using standard and decimal instructions; how to use the program listing and storage dump as debugging aids; and how to write programs and subprograms to be combined with other modules, using standard conventions for linkage and passing data.



With the ANS COBOL course, they can learn the coding of ANS COBOL programs using data manipulation, arithmetic logic and table handling features of the language. They can also learn how to code programs to create and access sequential and indexed sequential files; how to code statements to accomplish subprogram linkage and debug ANS COBOL source program listings; and how to provide the job control information necessary to compile and execute an ANS COBOL program.

Each course contains material to train 10 programmers, with texts for additional students available. You may order the courses in either DOS or OS versions. For more information, just fill in the coupon below.

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IBM Data Processing Division
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Please send me information on your Independent Study Program courses.

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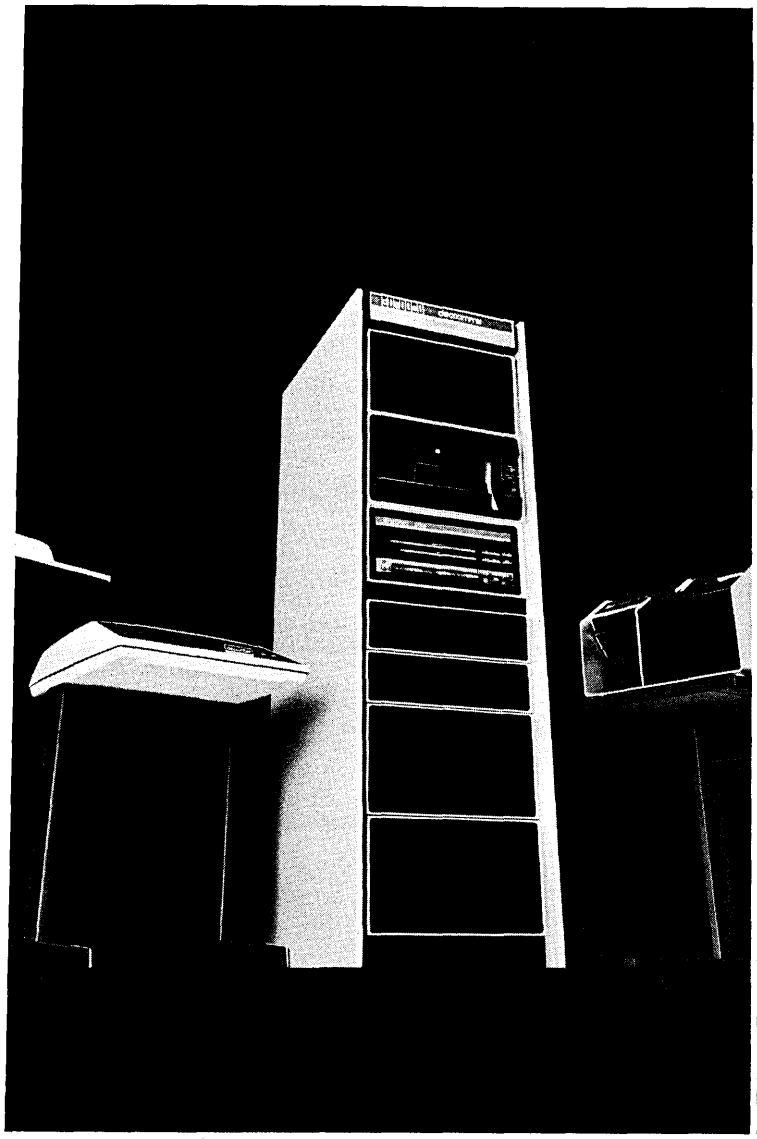
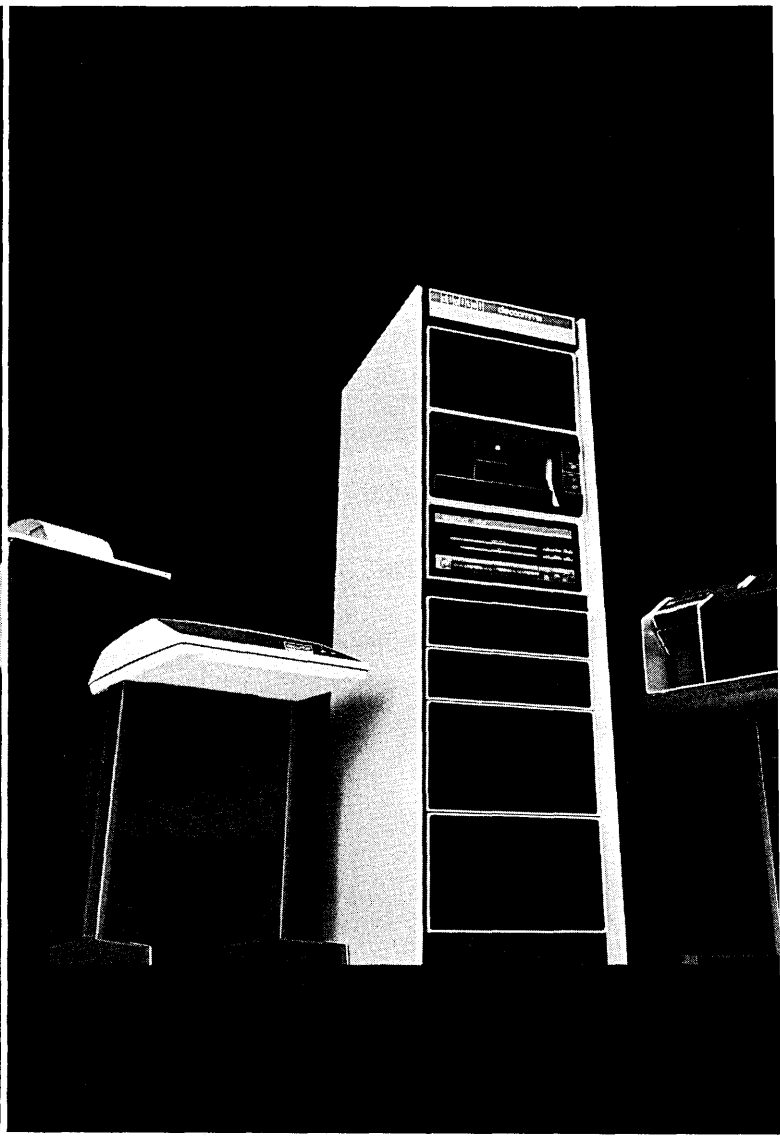
Company _____

Address _____

City _____ State _____ Zip _____





Digital introduces the remote batch terminal that's a computer.

Digital introduces the computer that's a remote batch terminal.

Our new DECcomm-11D26. It's really two systems in one.

Think of it as a remote batch terminal if you will. It has IBM 2780 capability.

Data rates up to 4800 Baud. Features like Multiple Record and Horizontal Printer Format. All standard. And at a better price. Like $35K installed and running.

Or, if you prefer, think of it as a remote system for local processing. Because at the heart of the DECcomm-11D26 is the world's most popular 16-bit minicomputer, the PDP-11, the computer with the exclusive UNIBUS ™ architecture.

And actually, you can think of the DECcomm-11D26 as both. A remote batch terminal that let's you sneak in a little computation on the side. And vice versa.

But do think of it. Because DECcomm-11D26 will do whatever you want done. Now and in the future.

Get the literature. Write the DECcomm Group, Digital Equipment Corporation, Maynard, Mass. 01754. (617) 897-5111. European headquarters: 81, route de l'Aire, 1211 Geneva 26. Tel.: 42 79 50.

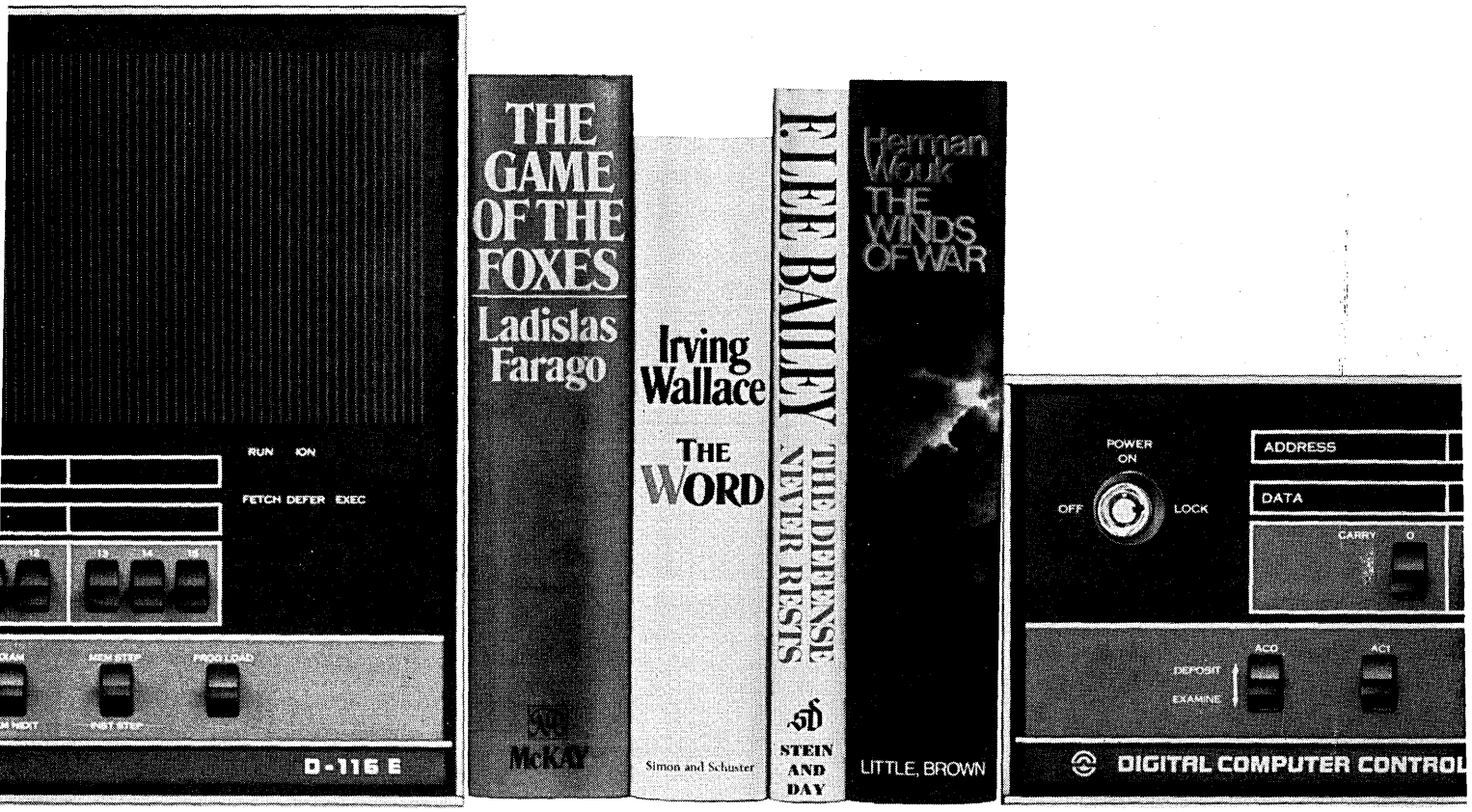
digital

CIRCLE 46 ON READER CARD

PDP IS A REGISTERED TRADEMARK OF DIGITAL EQUIPMENT CORPORATION.

Building great, inexpensive minicomputers is our business.

How they're used is yours.



Buy any minicomputer from us and you get an inexpensive, reliable, compatible piece of equipment.

Our D-116, for example. You get a 16-bit LSI/MSI minicomputer that's completely compatible with 1200 series machines. You get a 1.2 microsecond cycle time. You get either a 5¼" or 10½" chassis. And you get total interchangeability.

What you *don't* get is a lot of grief about licensing or proprietary agreements. We don't require them. We don't even want them. We just want to deliver hardware.

Digital Computer Controls, Inc.,12 Industrial Road, Fairfield, New Jersey 07006. Phone (201) 227-4861.

DIGITAL COMPUTER CONTROLS INC
Coming up fast.

People

In past years the Data Processing Management Assn.'s man-of-the-year awards have gone to a programming languages pioneer (Cmdr. Grace Hopper) and a major system developer (Dr. Frederick Brooks). This year it belongs to one of the unsung, a foot-soldier and victim of the computer wars of the last decade—a user. ROBERT C. CHEEK, president of Westinghouse Tele-Computer Systems Corp., Pittsburgh, is cited for "his plannings, construction, and subsequent management of the Tele-Computer Center, which was the first facility to use successfully the computer to control the large Teletype network."

The network was not only a computer/communications first, but also pioneered in changing regulatory attitudes on interconnection. Cheek says that in 1961 before the project could begin, "we had to convince AT&T to permit us to do message switching with gear not made by them," a Univac 490. Then the group built facilities, rewrote the operating system, and linked 250 locations to the 490,—which had to handle up to 14,000 transactions daily—all within about 18 months. The network has doubled since, and Cheek, who holds about 10 electronics and communications patents, notes that "when the door to domestic satellite communications opens, we'll be one of the first through it."

Cheek, whose career spans 31 years at Westinghouse, fought and won against a proposal to centralize all company computing on a supercomputer. The ill-fated Burroughs 8500 was in the running. And under Cheek's tutelage, the company is moving slowly toward semi-centralization; that is, computing centers for groups of similar operations.

A can of paint and some home-made bumper stickers comprised the entire election campaign expense inventory of JUDITH MOSS in her third try last April in the Mountain View, Calif., race for city council. And apparently that's all the information systems consultant needed this time to win by a landslide.

Brave as well as bright, the first woman to win a seat on the council says she was surprised herself at her decision to run a third time, but her conviction that "we need meaningfully balanced communities, responsive to all the needs of the community, rather than to special interest groups," was strong enough to carry her through. "I believe 100% that people in the field of computerism should be actively involved in government and the community in general. Local government was the most comfortable and logical place for me to start since a large part of my background is in urban information systems."

Judith Moss

Miss Moss was a supervisor of computer-based economic analysis in urban and transportation planning with the Port of New York Authority before taking her first commercial data processing job with Revlon in 1956. She has since worked with the city of Philadelphia's dp division and the computer department of General Electric, where she managed state and local government sales. She joined Lockheed Missiles and Space Co. in 1966 and last year earned her MS in computer science at Stanford, studying under a National Science Foundation fellowship. Currently, she intends to open a municipal information systems consulting firm.

As for politics, Judy was the Santa Clara County campaign chairman for Sen. Hubert Humphrey's California primary campaign and is a caucus delegate to the Democratic National Convention. Political aspirations beyond the local level: "If an opportunity arose, I would react in any way that was appropriate."

JOE CUNNINGHAM, the key architect of federal adp policy for the past six years, retired last month. He was chief of the adp management branch of the Office of Management and Budget and before that was associate director of data automation for the Air Force.

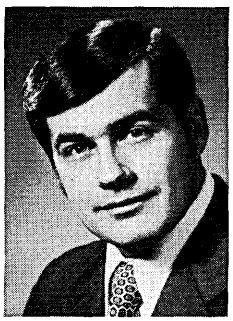
Joe Cunningham

"We have established a climate where greater interaction among federal dp users and policy makers is possible," Cunningham said when asked what his major accomplishments had been at OMB. He also played a leading role in implementing the Brooks bill; one of its many results is a management information system for controlling the acquisition, use, and disposal of federal dp equipment which has saved the taxpayers several million dollars.

Cunningham intends to continue working. A systems management job in private industry involving interaction with diverse groups of people would have the most appeal, he indicated.

"Within the next couple of years" he expects the feds to be using system performance measurement techniques much more. But simulators, the measurement tool most commonly used today, "aren't precise enough." Cunningham also believes that independent peripheral makers won't be able to enlarge their existing markets significantly, even if cpu manufacturers are persuaded to disclose their interface specs. Reason: processor's internal logic can be altered if "foreign attachments" become too much of a threat. Likewise, the mainframers' control of operating systems will enable them to keep independent software suppliers at bay.

At 30, RICHARD T. GRIFFITH is believed to be one of the youngest full vice presidents of a western bank. This isn't too surprising, since he heads a relatively young part of banking —its data processing. As vice president and manager of data processing and systems administration of San Francisco-based Crocker Bank, the nation's 12th largest, Griffith manages an operation with a 370/155, a 360/30, and a B 4700 in Los Angeles and another 155 and a B 4700 and two 65s in San Francisco. The Burroughs gear is used for check processing.



Richard T. Griffith

"I'm very much a proponent of the philosophy that check processing should be a stand-alone operation," he says. "The only interface it has with your mainline processing is the passing of tapes for updating. And that's the way we run it."

His philosophy seems to please management. Earlier this year he was given an extra title: assistant to the president. □

Which NOVA* Peripherals Would You Choose?

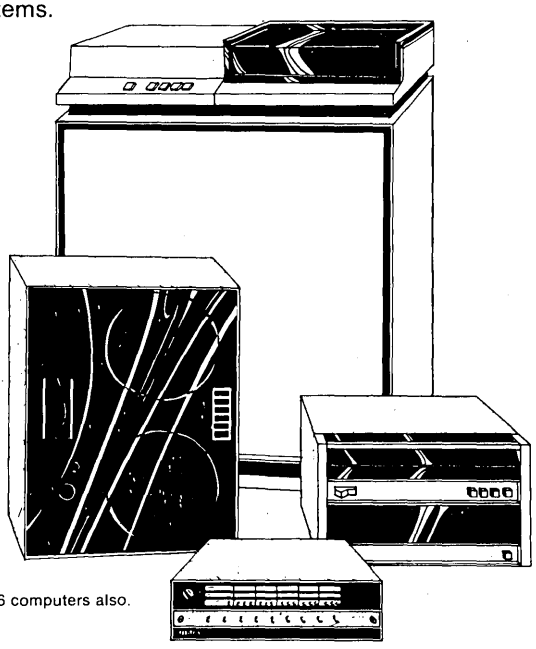
	DATA GENERAL		DECISION	
DISK SYSTEMS				
Diablo Disk	Model 4046, 4047 & 4047A, 1.24M words, DOS requires 12K core minimum.	$_____	Model 3150A, 1.45M words, DOS requires 4K core minimum.	$ 9,500
Century 114 Disk	Model 4046, 4057 & 4054A, 12.3M words, DOS requires 12K core minimum.	$_____	Model 3160A, 14.5M words, DOS requires 4K minimum.	$18,500
DISK CONTROLLERS				
Diablo Disk	Model 4047 & 4046 adapted for two drives.	$_____	Model 3150 for four drives, overlap seeking, multiple sector transfer.	$ 3,850
Century Disks	Model 4057 & 4046 adapted for four Century 114, 2314-style drives.	$_____	Model 3160 for any eight Century 114, 214, 215, 2314-style drives, UL approved.	$ 8,000
TAPE SYSTEM				
Wang	Model 4030J and 4030, 45 ips only.	$_____	Model 3120A, 12.5 to 45 ips, 7/9 track intermix.	$ 7,200 to 8,400
TAPE CONTROLLER				
Wang	Model 4030 and 4035 adapted for one Wang 1045 drive.	$_____	Model 3120 for four Wang drives, 12.5 to 45 ips, 2/3 character per word option, PEC Compatible.	$ 3,900

Use the current Data General price list to fill in the blanks. You'll see that DECISION's peripherals are a better deal. DECISION makes only the peripherals for the Nova and SuperNova. We don't build mainframes, CPUs or memories...just peripherals.

Not only do we make the best peripherals, but we also have better software that takes up less core space. All at a lower price. Because our design and production efforts are dedicated to building efficient Nova peripherals.

The best high-performance drive assemblies are used in DECISION peripherals. We use disks from Diablo and Century, and tape transports from Wang...companies with thousands of field proven drive assemblies in use today.

For End Users, we supply complete Nova peripheral systems including drives, controllers and software. OEM's can buy the complete peripheral system or just our controller, with or without software, for integrating into Nova systems.



*DCC 116 computers also.

Either way—we deliver in less than 45 days.

DECISION also assumes full system responsibility. Our Disk Operating Systems, Remote Batch Terminals, and Interactive Data Entry Systems are a lot less expensive and more powerful than anything else on the market.

DECISION's Timesharing BASIC for 60 users has full disk file capability and extended BASIC language.

DECISION's Disk Operating System software requires only 700 words of core, is device independent and is fully compatible with all DECISION peripherals. DDOS supports standard Data General software such as FORTRAN, BASIC, and ALGOL.

If you are expanding an existing Nova system, or designing new ones, compare DECISION's price, performance and delivery. For more information, call: 415-654-8626 (San Francisco); 213-348-8522 (Los Angeles); 203-743-7447 (New York); or mail the coupon to: DECISION, INC., 5601 College Avenue, Oakland, California 94618.

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City _____ *State* _____ *Zip* _____

Look Ahead

(Continued from page 8)

25,000-square-foot pad for a reported $1 million, is a winner in business, if not in racing. Despite the OTB problems, CSC--as a pioneer in such betting systems--has the inside track on a potential national market of $500 million; its struggling Infonet division recently snapped up a lucrative government teleprocessing contract; and CSC has apparently won support in the financial community for its daring act last winter in writing down all of Infonet's $60 million development costs.

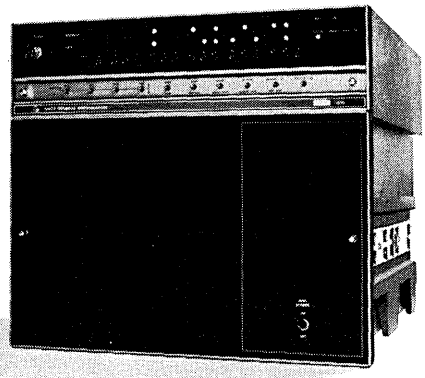
U.K. TO BUY CONTROVERSIAL AIR TRAFFIC SYSTEM

Britain's Civil Aviation Authority is buying a 9020D computer system from the Federal Aviation Administration (FAA) for flight plan processing--despite a report which says the 9020 (customized twin 65s) is obsolete and utilizes inadequate software. But the British, who won't admit officially that they've read the report, intend to invest $40 million to redesign the software over a two-year period. (Next month, Datamation will publish an article which quotes from the report; the article describes the new system and concludes that it is still in deep trouble.)

RUMORS AND RAW RANDOM DATA

Univac this month will announce a front-end processor which will enable its computers to communicate directly with IBM 360s...And a novel approach has been suggested at Univac to the idea of distributed computing in a network of computers: One computer in the network would have the sole function of monitoring the others. It would be called Unifink...American Airlines, a pioneer in airline computer systems, is trying to determine the usefullness of a stand-alone system in airports for seat selection. It has installed test systems in Dallas, New York, and San Francisco... Data Recall soon will offer Univac 1100 main memory add-ons in 32K increments because that's all that is needed in a conversion from Exec 2 to Exec 8 operating systems. Smallest increment now available is 64K...Western Tele-Communications, Inc., of Denver, which operates 13,000 route miles of microwave to carry tv, radio, and CATV broadcasting, has applied to the FCC to carry data traffic too...Fabri-Tek soon will announce the addition of 370 add-on memories to its 360 memory line. One reason for the announcement: Current 360 customers want assurance the company is in the market to stay...Although Rod Frederickson, one of four Rand computer scientists who left to form USC's Information Sciences Institute (June, p. 79), has returned to Rand, the institute opened on schedule this month. Director Keith Uncapher said by January it will have a staff of 25 professionals, double the "11 or 12" expected to come aboard this month...Pitney Bowes says it's actively marketing its point-of-sale system in France, despite a report in this column last month that France had refused it a license. P-B says the license trouble involves postage meters...The co-chairman of the History of Computing session at the USA-Japan conference in Tokyo is finding disagreement among his reviewers. Says Lou Fein: "Some of the authors who say they were there when significant ideas were born are debating over who really deserves credit for them"... Chuck Welch, a Univac branch manager in Los Angeles, once left Univac to join RCA Computer Systems in Sacramento. Then RCA gave up the ghost and Welch was back with Univac--but not before he had ordered his current license plate: RCA EDP.

DATA GENERAL ENTERS THE MINIPERIPHERAL WAR.



A NEW DISC WITH GUTS.

Data General, the world's number 2 minicomputer company, has just introduced a new line of compact, fixed-head discs – the Novadiscs.

They're the ruggedest, most reliable mini discs on the market.

When we designed the Novadiscs, we recognized that a critical consideration was reliability: most minicomputer discs simply can't stand up to the kind of hard use that minicomputer mainframes take.

So we made sure the Novadiscs have the guts to go anywhere our computers go – including the tough on-line industrial applications in which modern minicomputers work.

Instead of trying to fly the read-write heads on a fragile 30- or 40-gram air bearing, we designed an air bearing that can stand up to 4 pounds of force. So the heads aren't disturbed by the bumps and jolts that make other discs crash.

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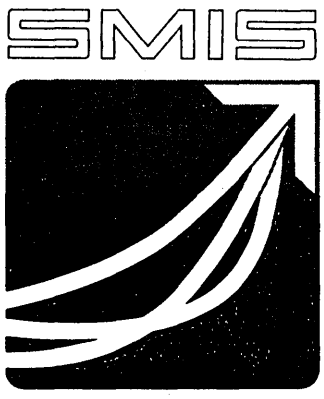

MONTREAL, CANADA
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CONFERENCE THEME

Information Systems and Organization Structures for

- **Operational Planning and Control**
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- **Long Range Planning and Control**

Problems of applying information systems to improving the effectiveness of organizations cut across the traditional classifications of private and public sectors, established classification of industries, and know no international boundaries. From the teething problems of exploiting the computer and its soft-ware as a management tool in the sixties, we are moving to the more complex and substantive problems of directing and integrating the whole systems function into existing organizations to improve management and operational effectiveness in the seventies.

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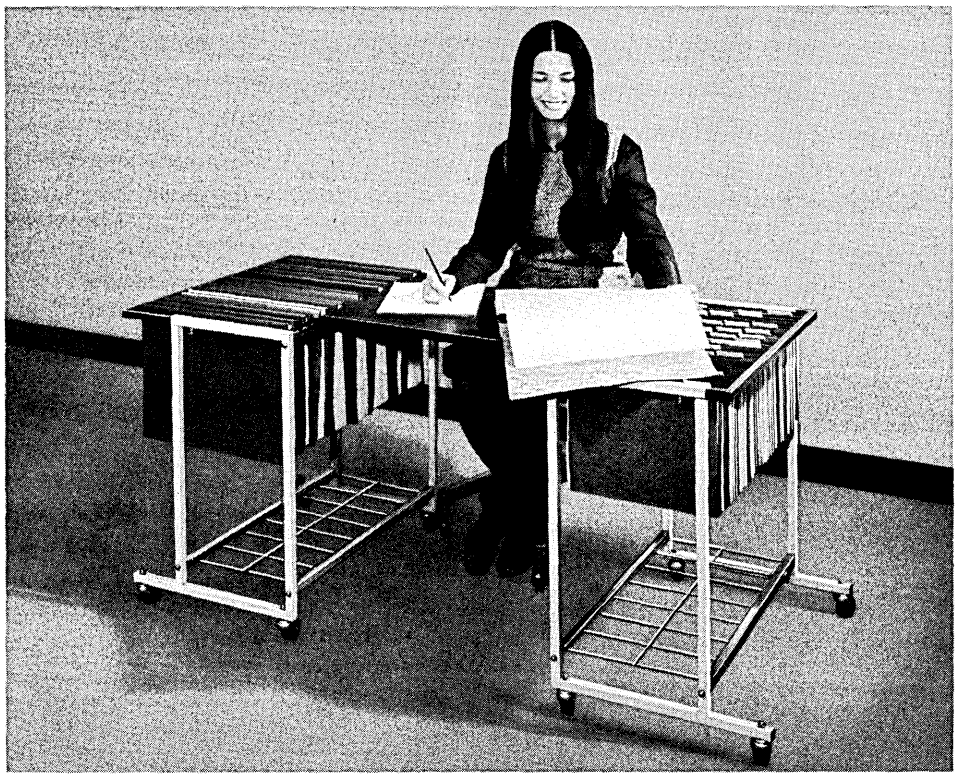

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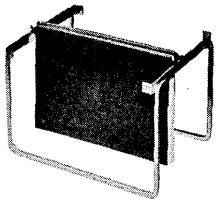

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Books

The Executive's New Computer
by Oliver Wight
Reston Publishing Co.,
Reston, Va., 1972
182 pp. $9

This book says such things as:

". . . isn't it fun to develop a formula that can massage an error and an approximation and an estimate to get precise results!"

"When business historians look back at the twenty-year period following World War II they are likely to label it The Age of Naive Sophistication."

"Very few systems have failed because they weren't sophisticated enough."

"The responsibility for systems success must be assigned to the user."

"Every hero who prides himself on firefighting is usually among the greatest causes of the problems he gets so much glory for 'solving.' "

". . . there is little hope of disciplining people to use something that does not make sense to them."

A book like this can't be all bad! In fact, this book is almost all good. It is a brief, sprightly, palatable combination of debunking and good advice for general executives of business computer system users. It is one of the best tools yet for dealing with that elusive problem of "getting management more involved." A hitherto glassy-eyed executive, after spending an evening (one will do) with this book, just might come in next morning bristling with questions for his data processing manager and user department heads. And you want him to, don't you?

The book's major faults stem from the same brisk style that makes it attractive. The author is given to generalizations that many would question, and that at worst might do active harm. Some examples are:

"Since there are very, very few successful (profitable) Operations Research applications in business, something must be wrong."

"Never approve a systems proposal where the justification was provided by systems people, outside consultants, or representatives of the hardware manufacturers."

"Why do anything on a computer that you can do manually?"

"A great many thinking people today acknowledge that the colleges and universities have made a botch of business education."

Maybe you agree with these, but to this reviewer they seem unfairly overstated.

Another problem is that the book is entirely oriented toward manufacturing situations. The author recognizes this and tries to generalize, but the book will clearly be more meaningful to executives of manufacturing companies than to others.

The book is also a little inconsistent in its degree of iconoclasm. It advises executives to suppress false images of uniqueness and use application packages wherever possible, and it advocates gaining computer time by expunging low-value applications rather than buying a larger computer—arrant heresies. But it also advocates the use of crt and microfilm combinations as substitutes for paper reports without providing due warnings about resulting increases in systems complexity and cost.

Finally, a pedantic reviewer-type gripe is in order about the number of typographic, spelling, and grammatical errors—more than should be expected in a book this short at this price. And there is no bibliography; if the executive does begin to become interested because of this book, it would be nice if he had a road map to further information.

Notwithstanding these faults, the book is highly recommended for your noninvolved boss. But you'd better read it first and maybe prepare a defense or two.

—Frederic G. Withington

Book Briefs

Data Display Systems
by W. Gray Horton
Brandon/Systems Press Inc.,
1101 State Rd.,
Princeton, N.J., 1970
135 pp. $8.25

This is a discussion of murographics —the depicting of logical thought on walls—and covers the various formats, techniques, and chart media used to produce visual planning aids for management in the computer age. The book is extensively illustrated with 65 diagrams and 19 photographs.

Computer-Oriented Approaches to Pattern Recognition
by William S. Meisel
Academic Press Inc., 111 Fifth Ave.,
New York, N.Y., 1972
250 pp. $15

Problems involving recognition patterns in image, speech, or data arise in many different fields, including engineering, biology, medicine, computer science, operations research, and analysis and control of large systems. This book discusses mathematical concepts and techniques of wide applicability. It emphasizes methods which can be used in the solution of practical problems but which are independent of specific applications. The book is oriented toward the development of algorithms for the design of pattern recognition systems on a general-purpose digital computer and requires no prior knowledge of the field by the reader. □

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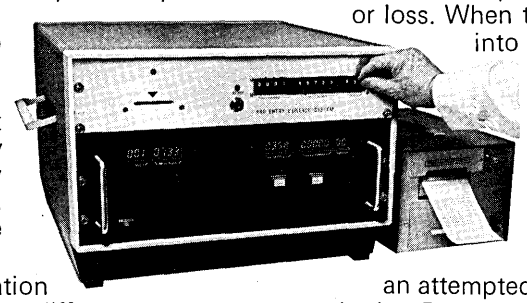

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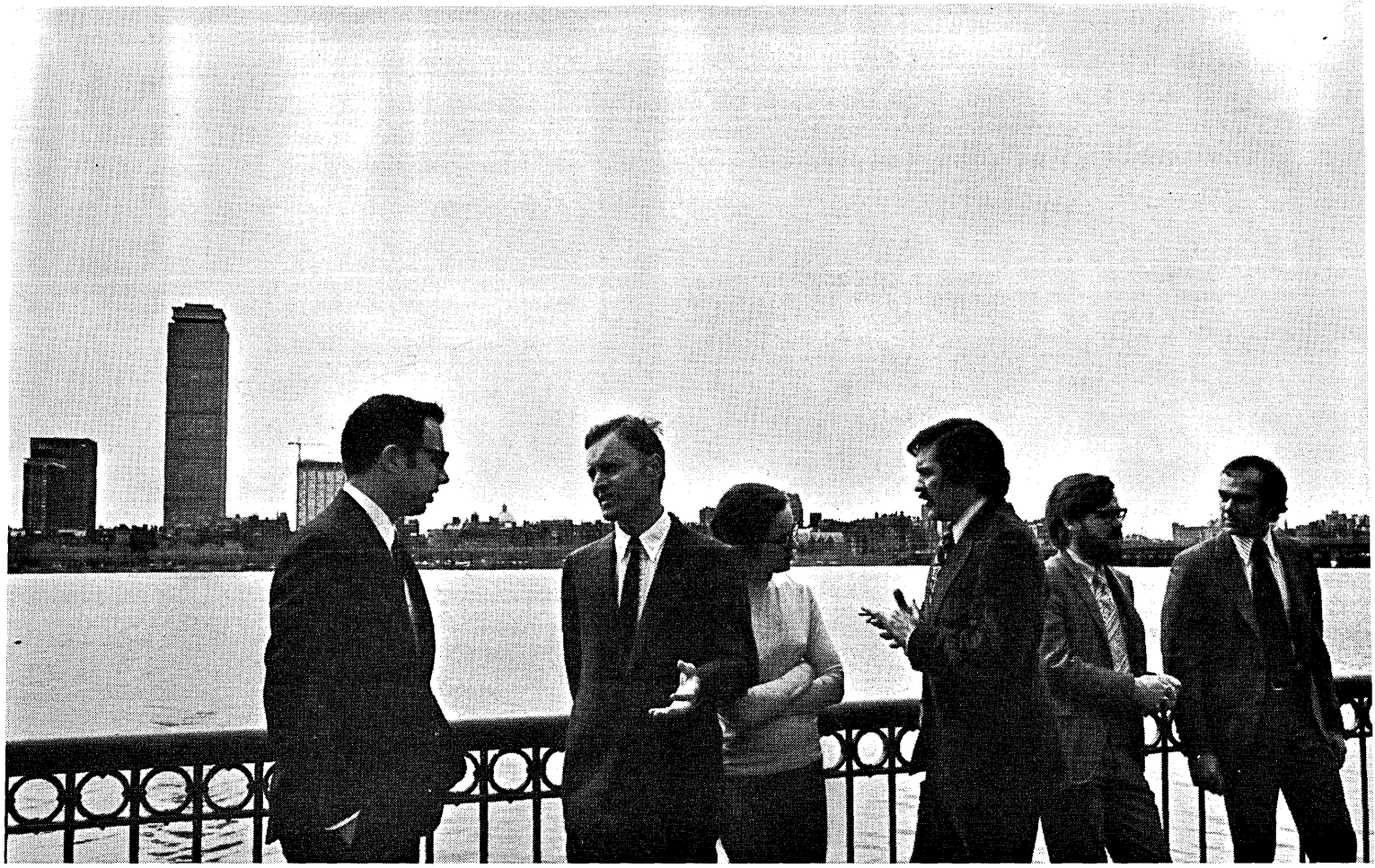

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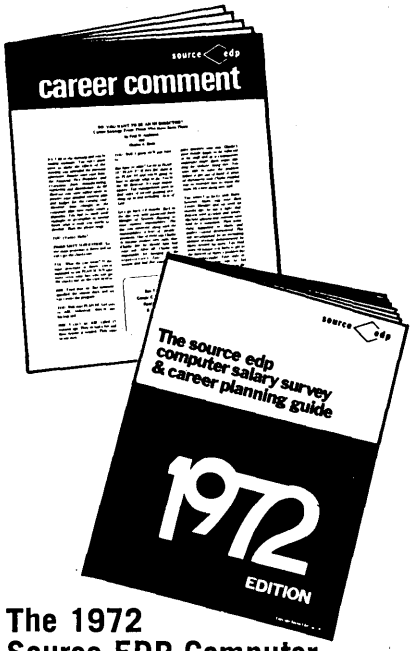

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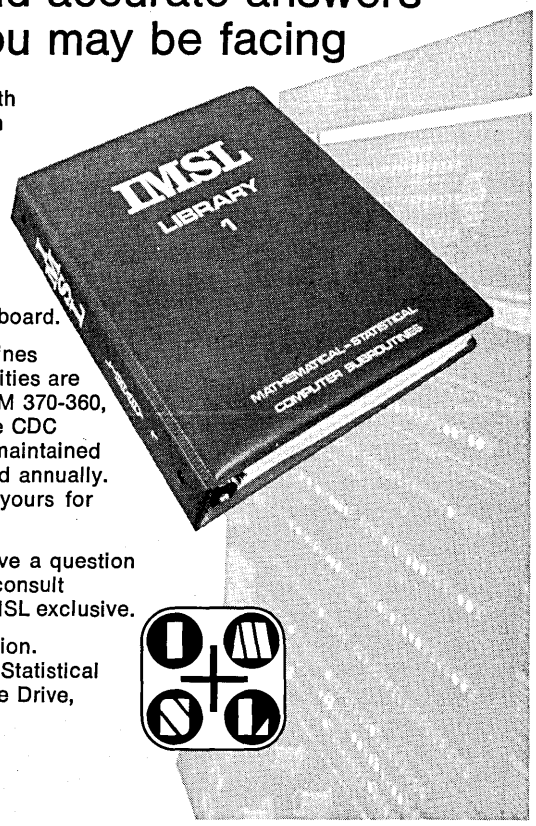

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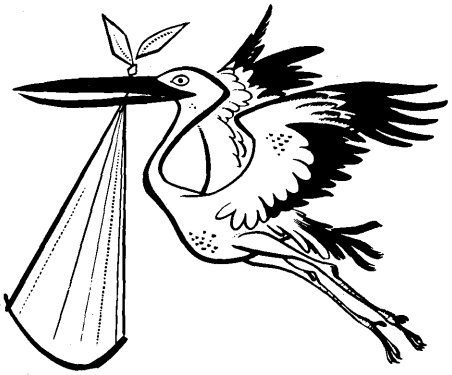

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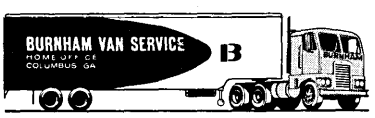

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The Forum

The IBM Problem: Two Viewpoints

The Results of Domination

It is the thesis of this paper that the computer industry is in extreme danger due to the present monopolistic practices of the industry. IBM's domination of our industry threatens not only those of us directly connected with computers, it also threatens our nation. The arguments which support this thesis are a mixed bag of technology, economics and sociology. They are also somewhat based upon future extensions of related past experience. Before proceeding to discuss the issues behind the monopoly in the computer industry, we must first clear away some basic debris.

Many people equate arguments which uncover monopoly as a direct attack on IBM. This is understandable since, if there is a monopoly in our industry and if a monopoly is bad, then there ought to be a bad guy around somewhere. Unfortunately, nothing could be further from the truth. IBM stands out as a living testament to the power of free enterprise and the achievement possible in a democracy. Their ability to plan is awesome and they are unquestionably one of the best managed organizations of any kind in the world. It is, in fact, IBM's sheer capability for greatness that is in large part responsible for the monopolistic situation as it now exists. And if it took great leadership to get us to this point, it's going to take even greater leadership to get us away from it.

We can now clear away a second piece of debris. This concerns the argument that even if there is a monopoly in the computer industry, what's so terrible about that?

Several things. First, there is the problem of foreign erosion of a major domestic industry. The U. S. is currently the world leader in computing. Our ability to remain a leader is directly proportional to our ability to remain technologically innovative. As technological growth stagnates, which has already begun in our industry, it opens the doors to nations unwilling to make our investment in technology but more than willing to take advantage of lower labor costs. The Japanese, for example, invented neither the radio nor television nor even the color TV tube, and look what's happened to the consumer electronics industry in the U. S. When was the last time Volkswagen was innovative? To underscore that one and examine what happens when a foreign manufacturer decides to innovate, consider Mercedes-Benz. With each innovation, they become non-competitive with U.S. manufacturers. Foreign erosion in the consumer electronics and the automotive industry has cost the U. S. hundreds of thousands of jobs and added considerably to our balance of payments deficit. Or consider—for years, the number one motorcycle company in the world was Harley Davidson. They built the best and ate everybody's lunch in the process. Soon, everybody else quit, and that left Harley Davidson. Take a look at who's eating Harley Davidson's lunch these days.

If that problem alone isn't sufficiently alarming, look for a moment at national security. Almost without exception, every major defense system which guards the U. S. has been designed around our leadership in computer technology. It may be tough being the strongest nation in the world, but it's a lot tougher being the second, third or fourth strongest. Our progress and survival require technological innovation. Remaining innovative means remaining competitive from within, driven by the profit motive fundamental to the free enterprise system. The last government-forced innovative project was called the F-111. We can now return to the present economic and technical considerations which make our industry a monopoly.

When RCA decided to leave the computer industry, the last door closed violently on competitiveness. RCA demonstrated quite clearly that identical products available at lower prices cannot be profitably manufactured and marketed in the computer industry. As long as RCA stayed alive, an argument could be put forth along the lines that IBM had built a better mousetrap. When RCA failed to sell their identical but cheaper mousetrap, it became clear that IBM did not have a better mousetrap—what IBM had was industry control. How did IBM get that control? By being good. Damn good. By being tough. Damn tough. And probably, from time to time, by being some of the things that their antagonists accuse them of. But trying to claim that IBM doesn't have control is about as optimistic as General Custer telling his sergeant, as the Indians make their second pass, not to take any live prisoners.

The computer industry has still not fully recovered from the conversion trauma associated with the transition from second to third generation computing. The evidence of the massive conversion difficulty is seen, for example, by the number of IBM System/360 users who continue to operate in emulation mode. The problem is still so severe that IBM was compelled to include emulation in their System/370. While many good things can be said for emulation, it has a notorious feature of encouraging users to stagnate and forcing comparative conversion costs significantly in favor of the manufacturer who can emulate his previous product regardless of its quality. It is interesting to note that this trauma has been so ingrained in the user marketplace that during the last four years the only segment of the industry which has shown any reasonable growth whatsoever has been the plug-in compatible equipment group.

Where do we go from here? Third generation computing equipment brought with it many blessings. One of these was the ability to free the computer user from internal information file manipulation mechanisms. These mechanisms are now part of the hardware-manufacturer-supplied operating system.

Initially, these mechanisms did relatively little since their major task was to map pure sequential file structures. During the last four years, however, the use of nonsequential file techniques has expanded a thousandfold. In most cases, the data structures and information behind these techniques has been made transparent to the user. At the same time, assembly language programming has almost vanished in contrast to source level language programming. This subtle shift in function now places the entire industry on the horns of an unbelievable dilemma. Eight years ago we were traumatized by program conversion. Now, we are slowly being locked in to machine-dependent data structures whose conversion may well be extremely expensive, extremely difficult, and in some cases, next to impossible. The

dilemma we face is that despite this new form of bondage, we are actually accomplishing many more valuable computing tasks than ever before. We took our uppers and we are still too high to see anything but the clouds.

Second generation computer users continue to emulate outmoded equipment because it is less expensive than to convert, and (as we've said) he who had the emulator got the customer. The present shift of information processing toward data orientation means that, for the next go around, he who has the data gets the customer. The last time, we emulated programs in computers. This time, we will emulate data mechanisms. This means that the very blessing that permits us to perform vastly complex direct access storage operations will lock us into the hardware supplier and his conveniently transparent software.

For years, many members of our industry felt that standards were a solution to the problems of manufacturer dominance, conversion, and competition. The facts are that standards, even when they work, are an ineffective and stagnating tool. COBOL, for example, became standardized not because it was a good language, but because of the sledge hammer wielded by one customer: the U. S. government. And while the American National Standards Institute flits about with communications control standards, few manufacturers follow them in the construction of remote terminals and their central processing communication interfaces. The computer industry needs standards to be sure. Many standards. But it needs standards which ensure innovation and competitiveness, not those which guarantee industry stagnation and foreign erosion of our industry.

U. S. technology today is on the brink of developments which have the potential for revolutionizing our approach to computing mechanisms. But we can never get there in a one-manufacturer-dominated industry, regardless of why the industry is so dominated. If there were a simple solution to the problems of our industry, we wouldn't be on our present treadmill. It is our responsibility, as members of the industry, to take appropriate action and help restore free enterprise and competition to the computing industry in the U: S. I am proposing a three-point program whose objective is to do just that:

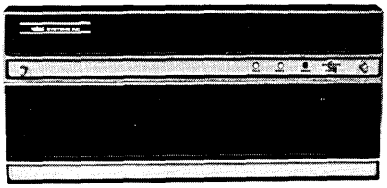
1. Take whatever action is necessary to begin an immediate Congressional investigation concerning monopolistic practices in the computer industry and the Justice Dept.'s failure to mount sufficient effort to solve this problem.

2. Take whatever steps are necessary to ensure that the Justice Dept.'s funding for prosecuting their present suit against IBM is of an order of magnitude sufficient to withstand IBM's lawyers and delaying tactics.

3. Initiate funding for the formation of an industry advisory committee which could report both to Congress and to the Justice Dept. and which would be chartered with the task of technically developing a plan to restore competition to our industry. This committee should be staffed with a wide variety of computer industry technical, marketing, and management executives. This committee, in concert with the Justice Dept., can formulate a plan for the future of the computer industry.

In the three years since the Justice Dept. filed their suit against IBM, two major competitors (GE and RCA) have left the industry. Dozens of smaller competitors have gone bankrupt. IBM's budget for their legal defense of this suit and the Control Data lawsuit is over $7 million a year, involves over 50 million pages of materials, and occupies the time of over 200 people.

We thought it was impossible to put together a large capacity data file system for under $6,000



Then we did it. We put together the Xebec "MEGA-STOR" System combining a moving head disk drive and formatter that's so small it fits into a standard 19" EIA rack, is only 8.75" high; has average random access of 75 milliseconds; a storage capacity in excess of 1.2 mega-words and costs far less than any other system on the market.

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The Justice Dept.'s staff is approximately seven people. I'd say that's pretty good odds in IBM's favor and something has to change. If you agree, you can help by contacting your elected representatives and requesting them to act immediately on this program.

If you have a better idea, tell your elected officials about that.

—Gerald H. Larsen
President
Unicorn Systems Company

The 2,700—An Open Letter

Judge Philip Neville
U. S. District Court
316 North Robert St.
St. Paul, Minnesota
55101

Dear Judge Neville:

This is in response to your order of Dec. 13, 1971, to provide information from Personal Data Services Corp. to assist the court and IBM in defining the edp market for products and services.

In my 26 years of experience in the computer field, I have never been so surprised, amazed, and startled to a point of disbelief, as I was when I received your court order. . .

The documents forwarded to me by IBM's attorneys, John French and Norman Carpenter, tell an incredible story about what has been happening to our courts, our system of justice, and to the computer field itself.

As one of the pioneers in the field, and a long time consultant to nearly all of the large suppliers of computers as well as to many users, I believe it is desirable for me to enlighten the court on several issues raised by the entire case. These issues are fundamental and go directly to the core of many problems in business, government, society and the computer field. The prime reason for my calling these to your attention is that I do not believe you can achieve your objective of market definition using your present approach. In addition, the definition of the market on the traditional basis will not help detect the most fundamental problem of all: namely, the extreme dominance by one company of a field of interest and endeavor second in importance to very few in this country.

The issues are as follows:

IBM dominance

The dominance of IBM in the computer field is well known to nearly everyone. The measurement of that dominance is tricky and complex. Most opinions are based on measuring the percentage of dollar volume sales of main frame computer equipment. IBM's percent has always been in the range of 70 to 75, with the second competitor in the 3 to 7% range.

This method is probably not too far off, if one is seeking a quantitative figure. Admittedly, IBM's percentage of the grand total of dollars spent for information systems and services (a category much broader than main frames) is much lower. However, IBM's true dominance can not be measured by percentages of things bought or sold.

There is only one word to describe the real dangers inherent in IBM's dominance, and that is "influence." The influence extends throughout all of the decision making and business processes in government, education, industry, science, etc., most of which are based upon information. Thus, the dominance should be measured in terms of the number of decisions, or reports, or other information factors permeating the American way of life in the 1970s.

For example, walk into any corporate office of a large or small company today, and ask what supplier furnishes the **business system** upon which they depend. The odds are greater than three to one (**more** than 75%) that the answer will be, IBM. **That** is real, **and dangerous,** domination. No other industry of any major importance (except the telephone industry) is so dominated by one company.

Effects of dominance

The permeating effects of IBM's dominance can be felt in practically every walk of life, from business, to government, to education, to science, to labor, to politics, to the professions, and to the public. Some of these effects have been good, measured on the scale of the greatest good for the greatest number of people and organizations. However, most of the effects have been bad, measured on the same scale. The list of bad effects covers several pages. Briefly, six of them are:

1. Disappearance of competitors and impossibility of survival.
2. Excessively higher systems costs, especially software.
3. Slow progress in types of systems needed by customers, example: on-line real-time systems.
4. Misleading of users, especially smaller users.
5. No competitive bidding—consultants frozen out or handed IBM as only selection.
6. Ingrown IBM attitudes, insiders from IBM, user fear of going against IBM.

Perhaps the specific policies of IBM have brought about these bad effects. However, it is much more likely that the dominance **itself** is what has caused the problems. **Any** competitor dominating an industry as all pervading as the information industry, to the extent that IBM has dominated it (more than 75% of the market, based on influence) would probably cause the same bad effects or even worse ones.

The interesting thing about this is that IBM management is well aware of the bad effects, due to the consent decree of several years ago. The lawyers at IBM as well as the management continually question whether their dominance is really good for the country.

Plight of competitors

The issue of how or whether competitors can stay in the information systems and services business is raised by the case. I served as one of several consultants to the management of GE when they were evaluating the question of what to do about the Information Systems Division in 1969-1970. As you know, they decided to sell most of the division to Honeywell in the spring of 1970.

The evaluations made by the consultants as well as GE management at that time were quite comprehensive and complex. It was felt that to continue in the business, the division would have to increase its share of the market (measured on the basis of main frame sales) to a level above some survival threshold. It was felt that this would be impossible to accomplish, as long as IBM dominated the field, without an extremely large new investment on the part of GE.

Another approach might have been to attempt to compete in a broader market (the information systems and services market) and to change the entire marketing approach, organization structure, and management policies. This would have involved an even greater investment and some fundamental changes within GE.

The only sensible decision available to management was the one they made. Basically, they decided to get out of the business except for a minority (18%) interest in the new Honeywell company.

While I am not completely familiar with the RCA case, I am sure that a similar situation existed. In fact, the same set of dominance problems faces, or will face, **any** of the major main frame suppliers. You can look for more of them to fold, or merge in the near future, unless something is done to change the IBM dominance.

The dominance also prevents newcomers from entering the field in any substantial way. The latest large entrant, Xerox, is having great difficulties.

Who loses?

If the industry continues to be dominated as it has to date, the question is, who will lose? Who will suffer from the dominance problem? The answer is: **everyone**! Everyone, including IBM, will suffer in the long run, from an unhealthy industry. Any consulting firm active in the information systems field can tell you this. Even those doing marketing consulting for IBM will, if they are pressed hard, make the same statements about the ill effects of IBM dominance.

How dominant is IBM?

One issue raised by your survey of 2,700 companies is: Will you find out what IBM's dominance is or what the market is that IBM dominates by means of the questionnaire prepared for you by IBM?

The answer is that you **will not** find out. You will not find out, first, because the 2,700 companies are not going to answer the questions. Either they will not answer at all, or else they will send you sales literature and published price lists. Secondly, even if they did answer properly, the chances are you would be completely misled by the data. For example, the information systems and services field, from a business system point of view, does not and never will include many, or even most, of the products and companies on the IBM list of examples.

IBM's strategy is obvious. If they can convince you that the "total" market includes all of those products and services furnished by the 2,700 companies surveyed, they will look pretty good. Their percentage may even be as low as 50% measured on a dollar volume basis. If the court's only measuring stick is dollar volume, then dominance will have been disproved.

As indicated earlier, IBM's true and real dominance is of a different nature, and amounts to a much higher percentage than the 75% dominance of the main frame market. The court should, or some independent group of professionals should, set the proper ground rules for measuring dominance and set about collecting the proper, meaningful data. There are a number of professional groups and consultants sufficiently unbiased and knowledgeable to do this.

Security of data

I get a very queasy feeling about how private and secure any data I might send you will be. One reason is the publicity in **Business Week** recently concerning the court clerk's error in allowing the **Business Week** reporter to see the 30 odd file drawers containing the responses of 1,500 companies. A second reason is that the court order was mailed to me with a cover letter, **not** from you, but from the IBM's lawyers. Now, this may be standard legal procedure, but if it is, I object to it strenuously.

If I object, then I assume that the companies having the most to lose by exposing all of their secrets to IBM would also object. The questions asked in your (or

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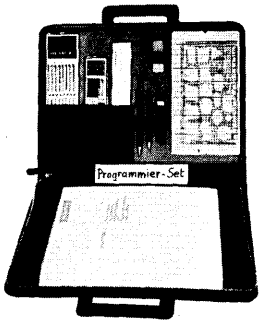

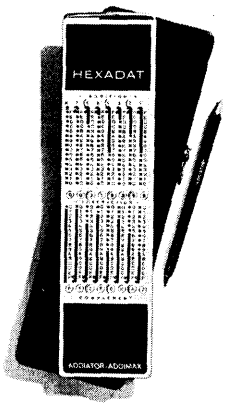

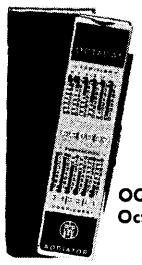

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rather IBM's) questionnaire cover the most sensitive competitive data I can imagine.

There is no indication in the court order, or in the material sent with it, as to who at IBM will be allowed to see the data or to use it. You will not be able to legislate the number of people or the particular people within IBM who will see and use the data. Compared to the main issue, IBM's dominance, this is perhaps a minor issue. Nevertheless, it is quite bothersome.

Costs of data collection

Your decision to force 2,700 companies to bear their own costs (rather than having IBM pay) in supplying data, so that IBM can prepare a defense in the main suit, is really an unbelievable decision. Surely, the U.S. government has the resources to collect data to define a market in an antitrust case. Assuming that the Justice Dept. truly does want to do something about the information systems industry and its unhealthy state, why can't they pay the costs? Compared to the total amount of money the federal government loses every year because of IBM's dominance (in software overhead alone), the costs of gathering data pertaining to the problem would be small.

The reason the documents I received seem so incredible and unbelievable is the surface appearance of the case. It would seem that IBM is controlling the entire situation, dominating the courts, just the way they dominate the industry.

1. The court has apparently accepted IBM's attempt to define the market in a way favorable to them.
2. The court has followed IBM's suggestion and forced 2,700 companies to provide information.
3. The court has decided that the 2,700 companies will pay the costs of collecting information and not IBM.
4. The court plans to turn data on a falsely defined market over to IBM for use in their own defense.
5. The court is forcing highly sensitive data to be supplied by competitors and made available to IBM.
6. The court has allowed IBM's lawyers to send the court order along with other material to the 2,700 companies.
7. The court appears headed for a decision in which IBM's true dominance will be completely hidden.

The overall issue

The overall major issue with which the court, the Justice Dept., and everyone else should be concerned is the health of the information field. The Control Data position is important in that overall context, primarily because if CDC falls, then the industry will really be on the way to a total monopoly.

GE and RCA, together with Sperry Rand, Xerox, Honeywell, and to some extent even Burroughs and NCR, have had other products and markets to keep them going. CDC has had to rely on Commercial Credit to keep going in recent years. But CDC was the only one of the big eight main frame manufacturers whose prime business always was computers.

Greyhound's interests are also important from the leasing and service point of view. But, if the court decides in favor of IBM, based on the data it will receive using the current approach, the entire major issue will have been missed and total disaster will occur. All of the basic principles of our democracy will have been violated.

—Richard E. Sprague
President
Personal Data Services Corp.

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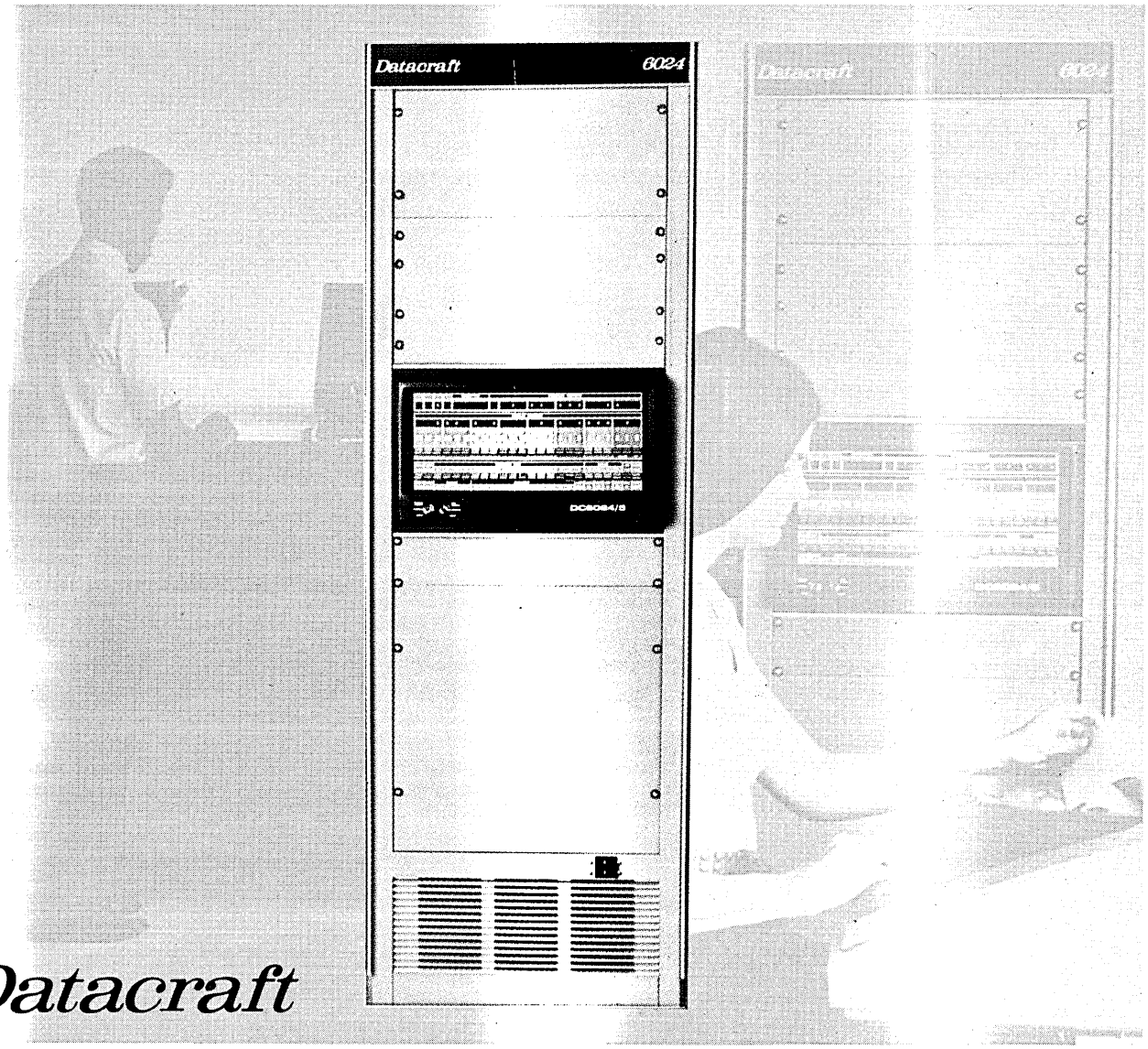

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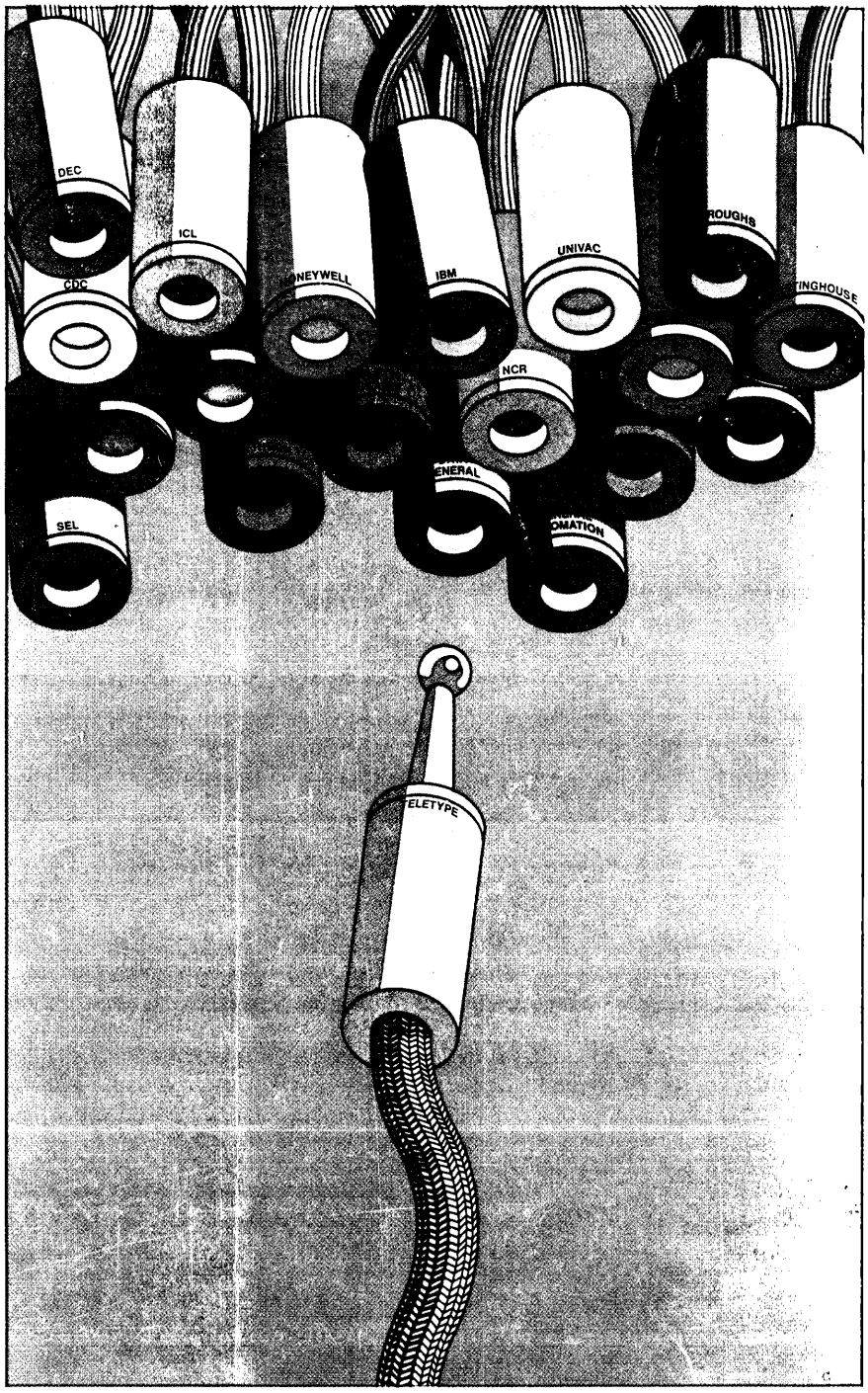

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