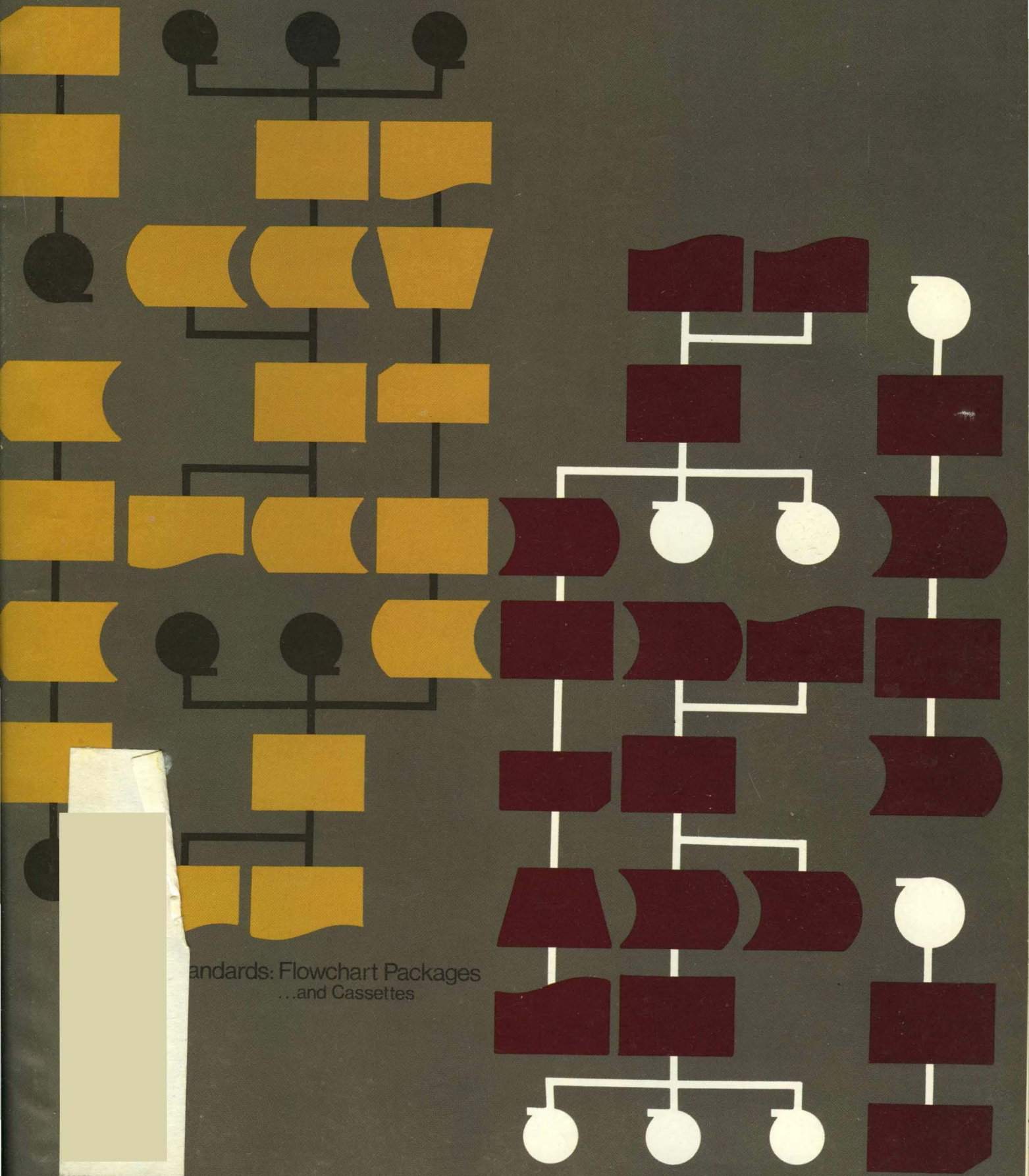
DATAMATION®

'72 September



andards: Flowchart Packages
...and Cassettes

It takes a powerful software library to get the most out of a 330 nsec mini.

Introducing the fully supported VARIAN 73.

What good is a brand-new computer with the hardware capabilities of the VARIAN 73 if you have to wait forever for the software and peripheral systems package?

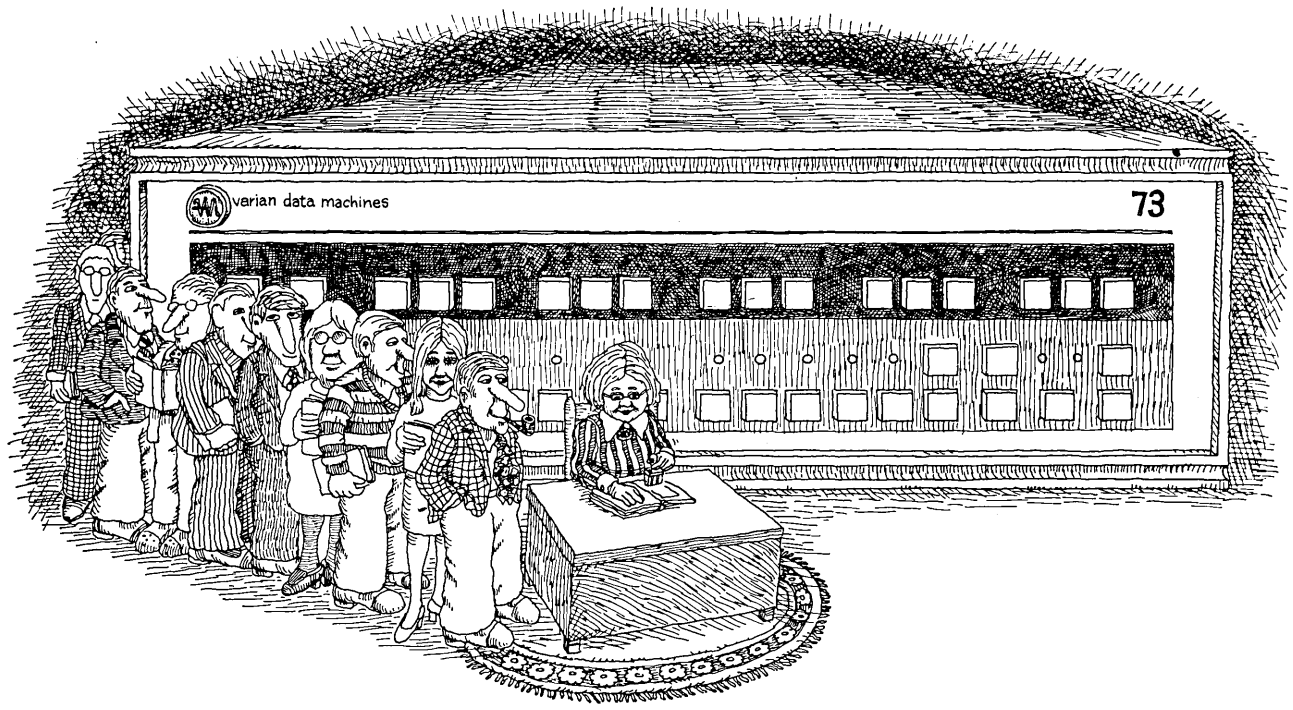
VARIAN 73 is loaded, right from the start. It was designed to take full advantage of the comprehensive software and peripheral package developed for Varian's 620-series computers. Even the power-house operating-system software packages, VORTEX and MOS, are fully rated on VARIAN 73. And the package includes DAS assemblers for programs written in VARIAN 73 symbolic language. Higher-language compilers like FORTRAN IV, BASIC, and RPG IV. Mathematical and data conversion packages. Editing, debugging and diagnostic programs. The works.

And VARIAN 73 is designed for upward software compatibility with peripheral controllers and I/O devices which you can add on as you need them.

Sound expensive? Fully loaded, VARIAN 73 prices out at less than systems of half its capability. And nowhere else can you buy the combination of super speed, accessible microprogramming, 64-bit control words, and dual asynchronous memory busses. Nowhere—not at any price.

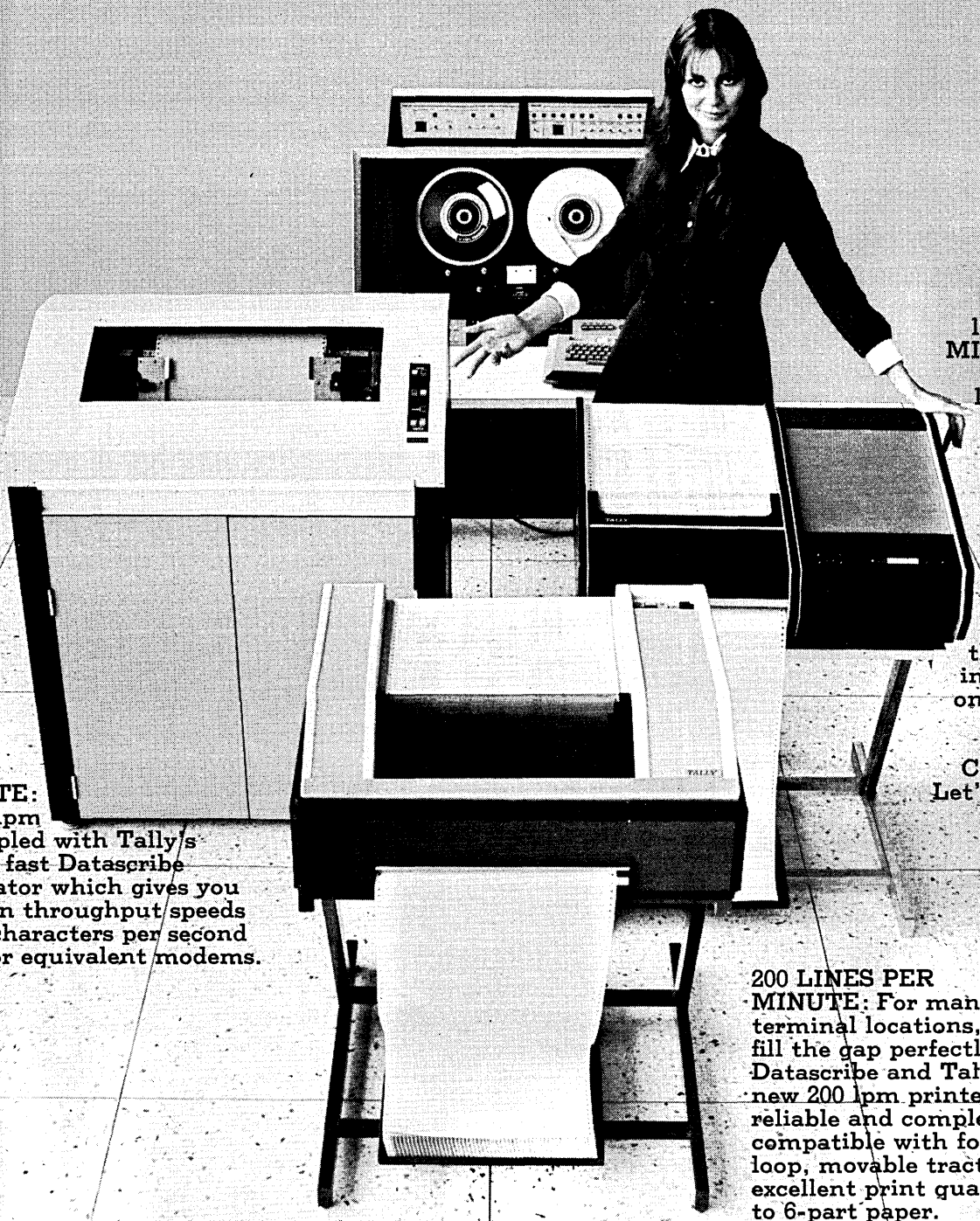
As VARIAN 73's extendable architecture unfolds over the year, you can expect even more from this powerful hardware/software team. And new Varian incremental building blocks will be announced as they are developed. Like integral floating point hardware. But right now VARIAN 73 with Varian software will solve most of your specific real-time applications. Faster and cheaper. Call or write, Varian Data Machines, 2722 Michelson Drive, Irvine, California 92664 (714) 833-2400.

varian data machines



CIRCLE 1 ON READER CARD

LET'S MAKE A DEAL!



100 LINES PER MINUTE: Tally's super reliable 100 lpm impact printer gives you a third alternative in matching printer speeds to the varying requirements of your remote locations. And they're all plug interchangeable on the powerful, flexible Tally Datascribe Communicator. Let's make a deal.

600 LINES PER MINUTE: Tally's 600 lpm printer coupled with Tally's exceedingly fast Datascribe Communicator which gives you transmission throughput speeds up to 1200 characters per second using Bell or equivalent modems.

200 LINES PER MINUTE: For many terminal locations, you can fill the gap perfectly with the Datascribe and Tally's terrific new 200 lpm printer. Completely reliable and completely compatible with forms control loop, movable tractors and excellent print quality on up to 6-part paper.

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Data Terminals • Printers • Disc Memories • Card Reader Terminals • Paper Tape Peripherals

CIRCLE 4 ON READER CARD

Which NOVA* Peripherals Would You Choose?

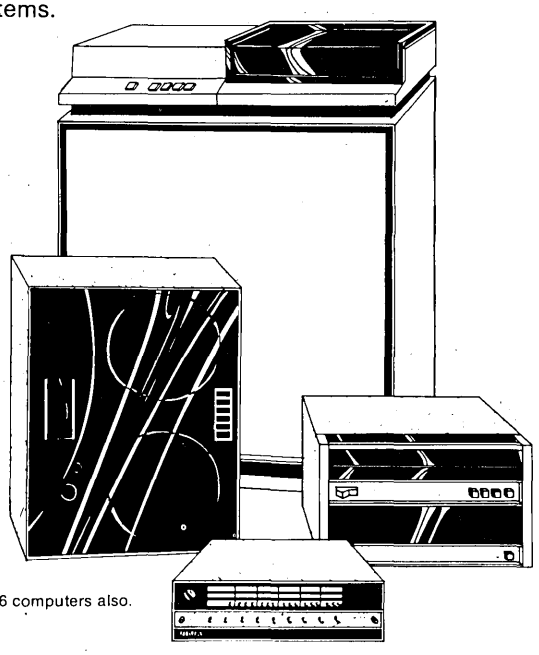
	DATA GENERAL		DECISION	
DISK SYSTEMS				
Diablo Disk	Model 4046, 4047 & 4047A, 1.24M words, DOS requires 12K core minimum.	$_____	Model 3150A, 1.45M words, DOS requires 4K core minimum.	$ 9,500
Century 114 Disk	Model 4046, 4057 & 4054A, 12.3M words, DOS requires 12K core minimum.	$_____	Model 3160A, 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.



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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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WITH OUR NEW 370/STOR, YOU HAVE NO MORE REASONS TO BUY IBM MAIN MEMORY.

370/STOR is the new add-on and replacement main memory for IBM System/370 Model 155. From Cambridge Memories.

We designed it with one goal in mind: to convince even the most cautious buyer that 370/STOR is far superior to any alternative 370/155 main memory. Judge for yourself.

FIRST, IT'S "FAIL-SAFE."

In 370/STOR, if a sector of memory fails, it is reassigned immediately to the highest address level, and the rest of the memory keeps running. That means almost zero downtime due to memory failure. No other memory has such a feature.

FACT #2. IT IS EXTREMELY COMPACT.

One 370/STOR unit has the capacity of four IBM memory cabinets. We store up to two megabytes in the same space that IBM stores 512 kilobytes. That saves floor space, machine room changes, and time during upgrade. No other memory has such a feature.

FACT #3. IT IS FIELD-EXPANDABLE.

After you install a minimum 370/STOR module, we can expand it up to an additional 1.75 megabytes *by simply plugging cards* into your installed unit. As a rule of thumb, figure that we can add about 512K bytes in about two hours. It's as easy as opening two cabinet doors. No other memory has such a feature.

FACT #4. NO COSTLY CENTRAL PROCESSOR MODIFICATIONS.

To add IBM memory to your Model 155 requires processor modifications. These cost from $12,000 to $125,000, depending upon the number of "ports" your memory uses. 370/STOR uses only one port per two megabytes, so there is absolutely no requirement for processor upgrade. That alone can be a huge savings. No one else offers such a feature.

FACT #5. WE'LL GUARANTEE 72-HOUR EXPANSION.

Once you install a 370/STOR memory, we will upgrade it within 72 hours after contract approval if you desire. Our experience as one of the largest suppliers of add-on core for System/360 taught us that when a user wants more memory, he wants it fast. And let's face it, we want to make a point: no one else could possibly offer such a service.

FACT #6. THE PRICE STORY.

We saved the best for last. 370/STOR saves you from 30 to 60 per cent, not including the substantial processor savings that you'll enjoy. To convert that to dollars: two megabytes of memory from IBM costs approximately $1,000,000. From Cambridge, it costs $480,000. You save over a half a million dollars. Our lease terms are just as attractive.

370/STOR is completely hardware and software compatible with any of the seven models of the 370/155, in case you had that concern. And although its unique operator console makes maintenance a breeze, we service 370/STOR from over 150 locations in the U.S. So you can put that issue aside.

That's our story. Since you're probably a cautious buyer, call our local sales office and make us prove our pitch.

If you don't buy what we say, call anyway. We want to know what else you'd like your memory system to be.

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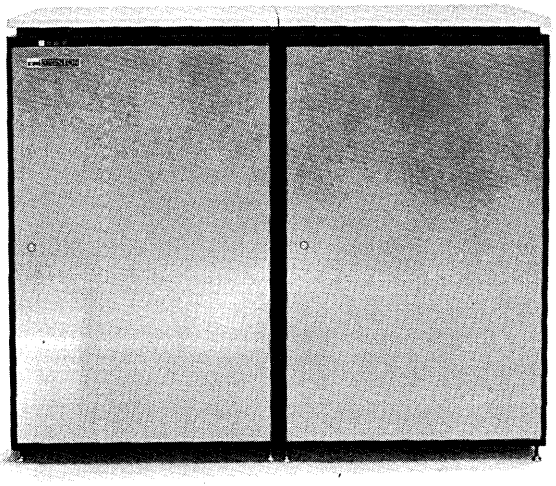
A good place to put your information.



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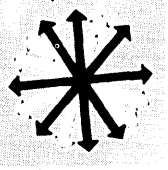


Look Ahead

THE MEMORY LINGERS ON

A couple of weeks after IBM touted its 370/VS announcement as one of the most important in the history of the industry, a few people gathered quietly late last month to honor the 10th birthday of the first machine to offer virtual memory.

Still working away at the old ElectroData plant in Pasadena is a Burroughs B5500 (serial No. 101) that began life in 1962 as a 5000, offering relocatable programs "completely independent of actual storage addresses and the hardware configuration," according to a manual. Burroughs is pleased that IBM has blessed its ancient concept.

VS1--EARLY SATISFACTION AT TEST SITES

San Diego Gas and Electric Co. achieved a 10-15% increase in throughput in field tests of IBM's OS/VS1 on the utility's 370/145 with 256K of main memory. Other reports of "general satisfaction" with the virtual memory extension of MFT in IBM's announcement (see p. 58) began to trickle out of installations where it was tested this spring...although IBM has said the new control might not have been loaded enough for the test sites to give it a thorough evaluation.

The San Diego spokesman, Michael Riley, said he had 140K bytes of real memory to use after the system was loaded and found that optimum performance was achieved when a two-megabyte virtual was run, although four and three megabytes were tried. At a second test site, where VS1 ran on a 370/145 with 160K, the user found that running a virtual memory of more than a million bytes was "a waste of time--just as IBM had told us." Currently, it is running two 128K partitions which will be expanded to 192K soon.

At McDonnell Douglas in St. Louis, tests with its 256K machine on two megabytes of virtual memory shows the system is "very good" at replacing MFT for the same job stream--that is, jobs written for the 256K machine. A spokesman adds, "It's one of the cleanest initial releases of an operating system we've ever seen." He thinks about 80% of the OS code is intact, with most of the changes isolated and localized. But they do not agree completely with IBM's claim that programmers don't have to worry about memory management. "For example," a spokesman explains, "if a job uses virtual memory inefficiently--by jumping around within the program too much--it affects not just the performance of the job being run, but the entire system, because the paging rate goes up."

And Riley said he was experiencing problems running IBM's Customer Information Control System (CICS) under VS1. Every time CICS bombed, it took VS1 with it, he said.

THE 360 MARKET--TWO VIEWS

One effect of IBM's blessing on virtual memory will be a hasty exodus of 360 users to the 370 line. That's the reasoning of California Computer Products, Inc., which was in the midst of auditing its report for the fiscal year ended June 30 when IBM made its announcement. The company said the action reduces the value of its 2311- and 2314-like disc drives out on lease and that this and other accounting changes probably would require it to report a loss of $12 million on revenues of $53 million.

Others see a short-term boom at the high end of the 360 line--especially in the 360/65 market where machines coming off lease can

be secured at rates 60% below the IBM rental price. Users needing expanded capacity may enter a "holding Pattern" during the two years it might take to debug the 158 and 168 systems. Into that holding pattern would enter the 65 and lower priced but higher performance peripherals from independents.

A "BLESSING" OBSOLETED

Just when the 1,024-bit semiconductor memory was blessed by IBM in its 370/158 and 168, Four-Phase Systems has come along with a computer using 2,048-bit chips. A new processor--the model 7002, being announced this month for the company's System IV/70--has eight memory cards, a maximum 98K bytes of storage, and supports 32 1,152-character crt terminals. The earlier 1,024-bit processor, also with eight cards, had a maximum of 24K bytes and supported only eight terminals. First to deliver an LSI computer, a year and a half ago, the Cupertino, Calif., firm is said to have more than 200 System IV/70s installed. Systems with the new processor are being installed at Western Union's subsidiary, Teleprocessing Industries, Inc., which is setting up new telegraph entry centers around the U.S.

DECSYSTEM PRICES SLASHED

Price slashes of 15-37% on Digital Equipment Corp.'s DECsystem-10 line are largely attributable to production economies the company achieved by buying RCA's memory products division. DEC this month will price its KI-10 processor at $240,000, a 37% reduction. It is knocking 27% off the price of the 1040 and 35% off the dual processor 1077. Look for the reduction to spill over into DEC's minicomputer line, because the firm plans to use the same core stack on minis as it does on the DECsystem 10. In a related move, the company said it will give customers allowances on DECsystem-10 equipment that is replaced by more advanced machines.

GROUP TO "ASSESS" ASCII STANDARD

The National Bureau of Standards is expected to announce an "assessment" of the federal ASCII standard--the American Standard Code for Information Interchange. Assessors, composed of suppliers and users, will explore the following matters, among others: How to increase the standard's user appeal; whether facilities should be established to validate ASCII-dependent hardware and software; and whether to change existing implementation procedures to assure greater compliance. The study is supposed to be finished next May.

Meanwhile, ANSI's X3 group has asked its members whether they want to make computer data files more compatible with ASCII code. Basically, this would be done by writing a standard, covering frequently interchanged files, that would ban the use of properties which are unique to a computer's internal code and can't be handled in ASCII--for example, packed numerics.

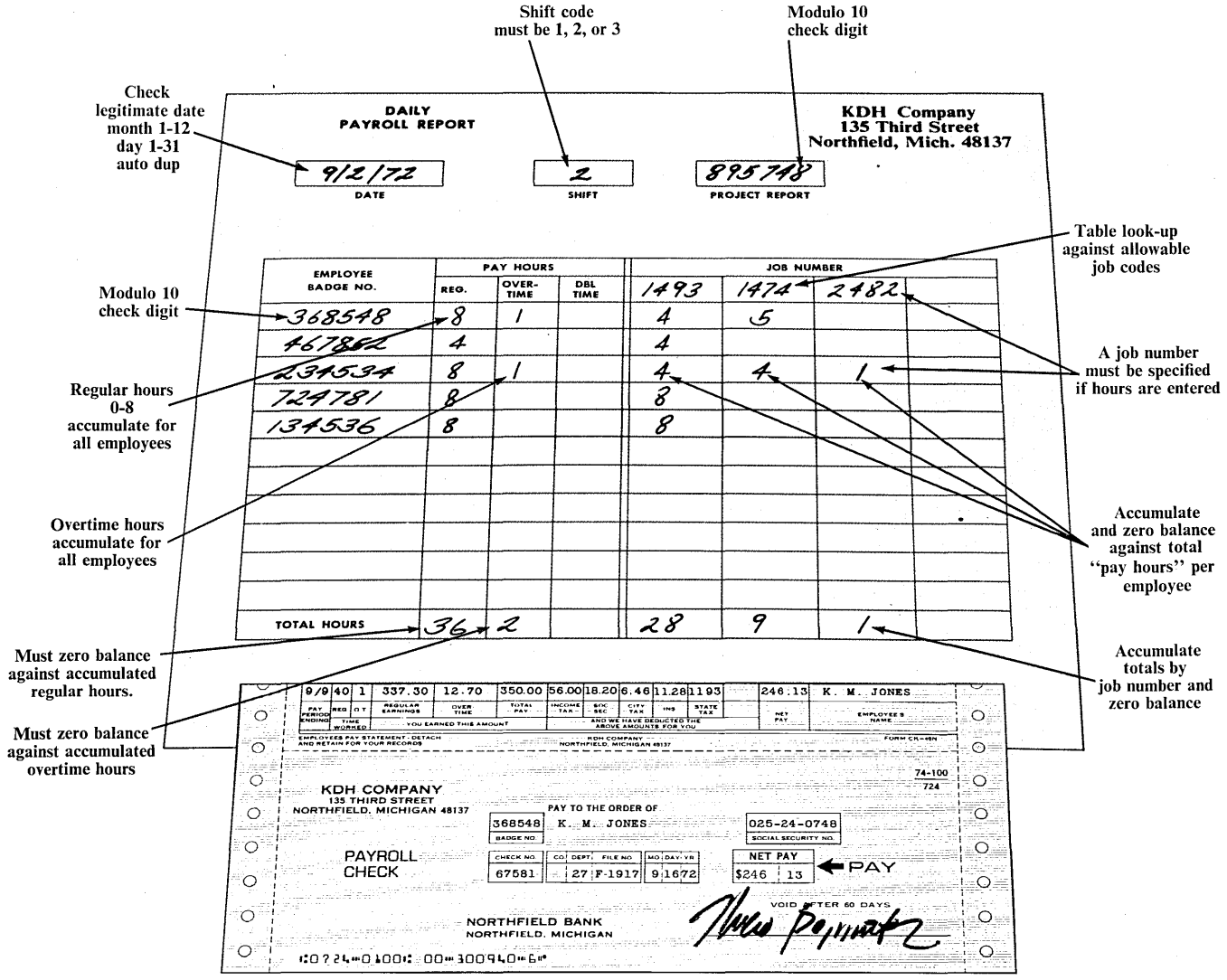
NONIMPACT PRINTERS EMERGE FROM LABS

Two new companies out west have entered the nonimpact printer market. One of them, ElectroPrint, Inc., of Cupertino, next month will announce an 8,000-lpm device that applies a liquid toner to plain paper. Its characters are formed from a 7x10 dot matrix, and a maximum line is 136 columns. Across that width, says ElectroPrint's James Sutherland, the device will print 100 dots per inch and thus can be used for plotting.

In Bellevue, Wash., fledgling Sector Corp., which is still wooing

(Continued on page 175)

REMOTE PAYROLL ENTRY AND CHECK-PRINTING FROM SYCOR.



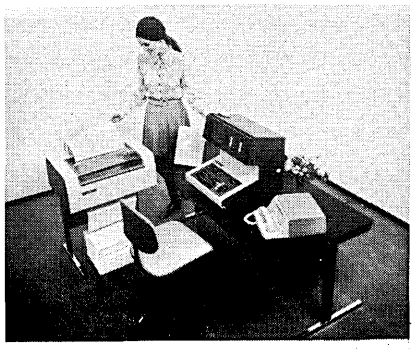
If you're responsible for getting payroll checks to remote locations, you know how important it is that they be delivered on time. Sycor's Model 340 Intelligent Communications Terminal now frees you from the nagging concern that a payroll might be delivered late.

Payroll report data *can be captured at remote locations* on the Sycor 340, where it is automatically checked and edited for accuracy. At the push of a button, the 340 transmits the data at high speeds over the public switched telephone network to a CPU using sophisticated binary synchronous procedures to assure that no data is lost and no erroneous data is received. The processed data then can be sent back, unattended, for printing of payroll checks *at the site* via any of three types of dependable Sycor printers (30 cps, 165 cps and 200 lpm).

As a result, your payroll is prepared quickly, economically and accurately; your employees are paid on time; and you stop worrying.

The Sycor 340 can do this job, and most any other you might have, because Sycor provides users with T.A.L. (Terminal Application Language). With T.A.L. you can write sophisticated programs tailored to your own terminal applications for execution in an optional one microsecond terminal memory.

Want to know more? Call us at (313) 971-0900, or drop us a line. We'll be glad to tell you more about how the Sycor 340 can help to meet your payroll.



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Burroughs

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POWERFUL NEW SMALL-SCALE COMPUTERS FOR THE PROFESSIONAL EDP MANAGER

. . . who wants the advantages of fourth-generation technology—

The B 1700 Systems are the first small computers with these larger-systems benefits:

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Flexibility

- Virtual memory for accommodating programs of any size
- Central site operation concurrent with data communications
- New 96-column card peripherals (including switchable on-line/off-line models) . . . 80-column card equipment . . . new line printers . . . new MICR document reader sorters . . . new magnetic tape drives . . . new high speed disk cartridge drives

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- A Master Control Program for complete self-regulation (like Burroughs larger systems)
- Ready-to-use application programs available now for: Wholesalers . . . Distributors . . . Manufacturers . . . Banks . . . Hospitals . . . Accountants . . . and ready soon for Government . . . General Contracting . . . Credit Unions . . . Savings and Loans . . . Auto Dealers . . . Utilities . . . Schools and Universities . . . with many others to come
- Upward compatibility of systems software and application programs throughout the B 1700 series for economical expansion, long range investment protection

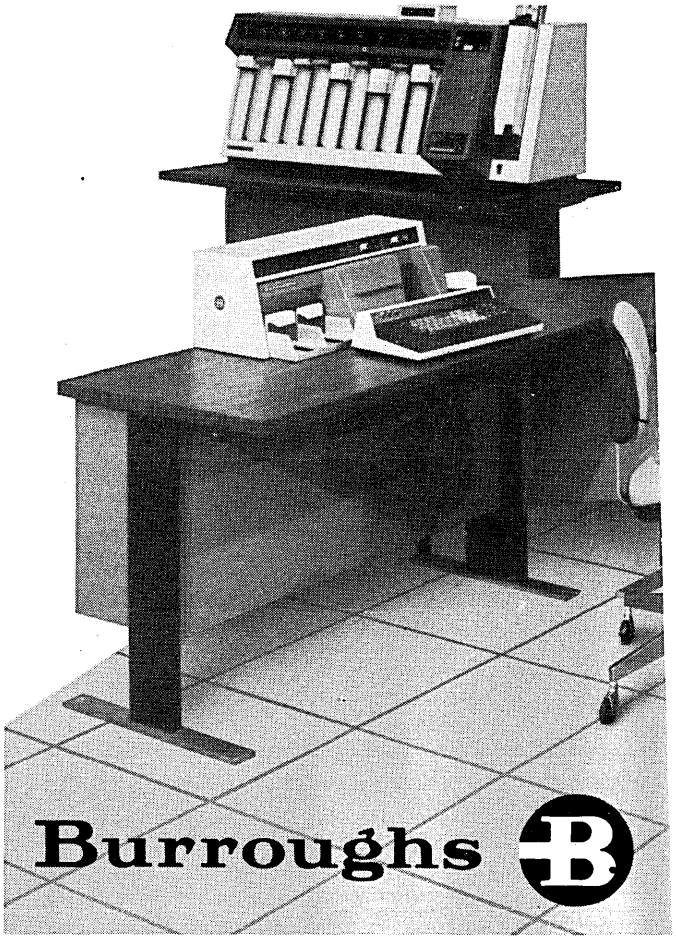
. . . who may be planning a large, distributed processing network—

You can install low-cost B 1700 Systems in plants, warehouses, local offices—wherever data needs to be captured and organized for interaction with a central system, or processed into action information for your field people. In addition to the B 1700's new peripherals and data file subsystems, you can use Burroughs wide range of terminal systems in meeting your exact application needs.

. . . who is concerned with conversion costs and reliability—

B 1700 Systems can accept RPG, COBOL or BASIC programs prepared for other small systems and, in many cases, run them with measurably improved efficiency. Additional micrologic interpreters are being developed to provide efficient processing in a variety of other languages. Burroughs also offers conversion aids to help you move up to higher level languages. B 1700 high reliability design is supported with fast, positive diagnostics, and by field engineers who are trained and equipped to assure you of more hours of uninterrupted system use.

The exciting new B 1700 Systems are being delivered *now*. They demonstrate Burroughs continued success in developing advanced electronic systems that can serve you more effectively and, at the same time, lower the true cost of data processing!



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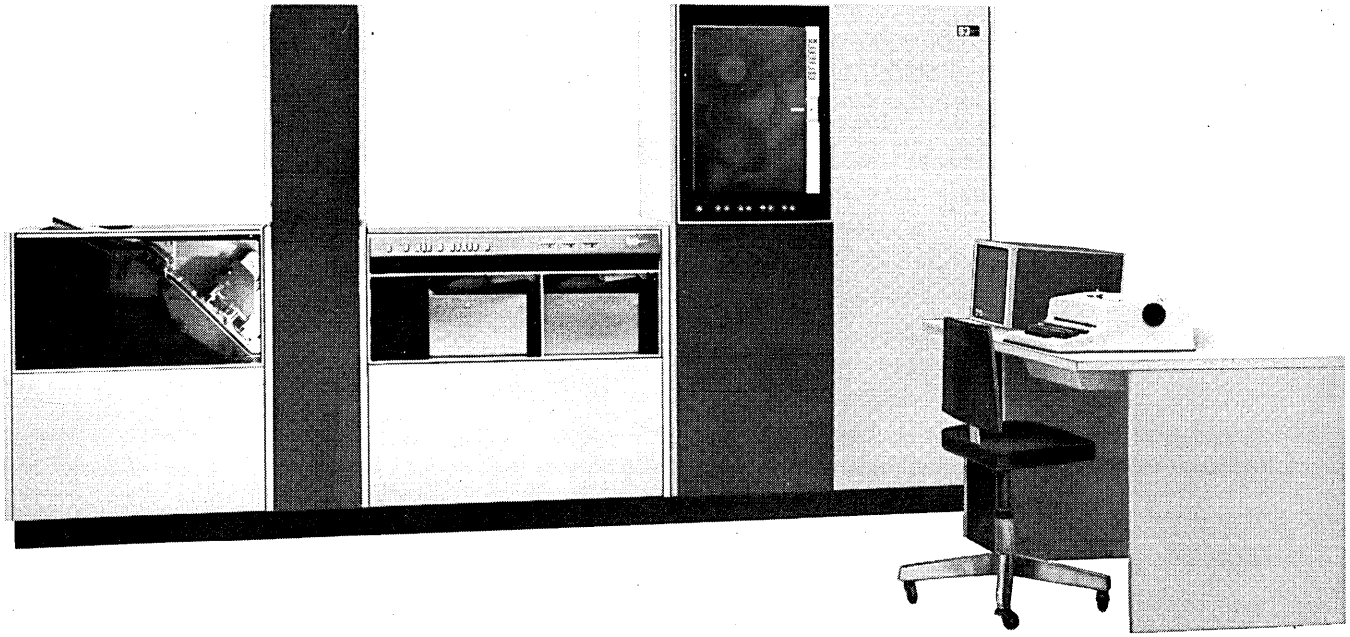
. . . exceptional flexibility in application and responsiveness to change
. . . new levels of cost/effectiveness!



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Problem: At least 30% of your data processing dollar is spent on input. The key to solving your data input problem is not keypunch, or keydisk, or key verifier, or keytape, or key anything else. The real key is the Scan-Optics 20/20™, the versatile, high-thruput, low-cost Page/Document optical character reader.

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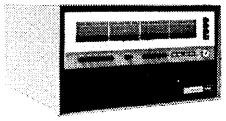
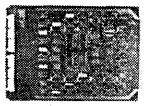
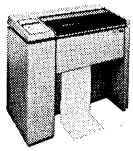
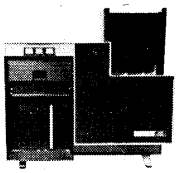
Calendar

EVENT/SPONSOR	DATE	LOCATION	CONTACT	COST
COMPEC '72 Exhibition and Conference	**SEPT. 26-28**	London	Trident Conferences and Exhibitions Ltd. 60 George St. Richmond, Surrey, England	£22 (3 days) £1, exhibits
ASM Northwest Systems Conference	**OCTOBER 5-6**	Calgary	The Univ. of Calgary, ASM 2920 24th Ave., N.W. Calgary, Alberta, Canada	$60
NEC/72	**9-11**	Chicago	National Electronics Conf. 1211 W. 22nd St., #2 Oak Brook, IL 60521	$3, tech. sessions $25/seminar
23rd ASM Western Systems Conference	**10**	Los Angeles	Western Systems Conference P.O. Box 5015 Los Angeles, CA 90055	$40
IEEE Conference on Display Devices	**11-12**	New York City	Thomas Henion, Secretary Palisades Institute 201 Varick St. New York, NY 10014	Advance $12, members $16, others
Institute on Project Management For New Product Development	**16-18**	Madison	William C. Dries Univ. of Wisconsin-Ext. 432 N. Lake St. Madison, WI 53706	$225
SIAM-SIGNUM Fall Meeting	**16-18**	Austin	SIAM 33 S. 17th St. Philadelphia, PA 19103	Adv./at door $10/12, members $12/15, others
IBI-ICC World Conference on Informatics in Government	**16-20**	Florence	IBI-ICC 23 Viale della Civilta del Lavoro 00144 Roma—EUR (Italy)	$80
IEEE/ACM International Conference on Computer Communication	**24-26**	Washington, DC	ICCC-72 P.O. Box 639 Silver Spring, MD 20901	Prereg. $40, members $50, others
13th Annual Symposium on Switching and Automata Theory	**25-27**	College Park	Prof. James H. Pugsley Electrical Engrg. Dept. Univ. of Maryland College Park, MD 20742	Not yet available
ADAPSO 36th Management Conference	**26-27**	San Francisco	ADAPSO 551 Fifth Ave. New York, NY 10017	$80, members $150, others
Computer Monitoring Workshop	**NOVEMBER 12-13**	Provo	Ronald F. Mulberry Special Conferences 242 HRCB Brigham Young Univ. Provo, UT 84601	$135
Data Centre '72	**15-17**	Copenhagen	Danish IAG 58 Bredgade DK 1260 Copenhagen K. Denmark	$225, IAG $250, others

Microdata moves into systems

Microdata, the company that made microprogramming irresistible, has moved into systems. We now offer all the modules, peripherals, software and application firmware you'll need to configure a high-performance system at a low price. Pick the items you need and add up their costs. Then compare the total with anything you get from our competition. You'll see what we mean.

System Computers 	Series 1600 Computers—CPU with power fail/auto restart, ROM control memory, real time clock, teletype controller, power supply, card cage and system control panel. Typically, $4,000	Model 2208 Magnetic Core Memory—8,192 byte, 8-bit module (up to 8 modules per computer). $1,600				
Utility Interfaces 	Model 2510 Byte I/O Controller—provides independent input and output controllers each with 8-bit data transfers. $800	Model 2511 Full Word I/O Interface—provides 32 input lines and 32 output lines with data transfers under program control. $700	Model 2512 Priority Interrupt Board—provides 8 levels of priority interrupt with individual arm/disarm. $550	Model 2513 Selector Channel—operates by way of direct memory access, accommodates up to four I/O devices. $850		
Communications Interfaces 	Model 2601 Synchronous Modem Interface—has auto call/answer unit, accommodates standard rates up to 9600 baud. $1,200	Model 2610 Asynchronous Communications Controller—single channel, full duplex, programmable baud rates to 9600 baud. $500	Model 2612 Asynchronous Communications Controller—provides simultaneous operation of 8 full duplex asynchronous channels. $1,600	Model 2613 Asynchronous Modem Interface—provides simultaneous operation of 8 full duplex 103 and 202 type data sets. $2,000	Model 2620 Modem/Communications Control—provides 16 discrete inputs and 16 discrete outputs. $800	Model 2630 Automatic Call Unit Controller—provides control function for four Bell Model 801 automatic call units. $950
Peripheral Systems    	Model 2710 Paper Tape System—300 cps fanfold 8-channel reader, 75 cps fanfold 8-channel punch. $3,955	Model 2720 Card Reader—300 cpm, 80 column cards. $3,750	Model 2731 Line Printer—80 column, 64 character set, 356 lpm. $9,750	Model 2732 Line Printer—132 column, 64 character set, 245 lpm. $12,500		
	Model 2810 Magnetic Tape System—with one 7", 9 track, 800 bpi, 10,000 bytes/second transport and controller for up to four transports. $4,630	Model 2811 Magnetic Tape System—with one 7", 9 track, 800 bpi, 20,000 bytes/second transport and controller for up to four transports. $4,760	Model 2820 Magnetic Tape Transport—7" reel, 12.5 ips, 9 track, 800 bpi. $2,830	Model 2821 Magnetic Tape Transport—7" reel, 25 ips, 9 track, 800 bpi. $2,960	Model 2822 Magnetic Tape Transport—8½" reel, 12.5 ips, 9 track, 800 bpi. $2,890	
	Model 2823 Magnetic Tape Transport—8½" reel, 25 ips, 9 track, 800 bpi. $3,020	Model 2851 Disc System—includes disc drive with moving head removable cartridge, 2.4 million bytes, 75 ms random access, 200 kb transfer rate. $11,730	Model 2852 Disc System—includes disc drive with moving head (one fixed and one removable), 4.9 million bytes, 95 ms random access, 200 kb transfer rate. $12,750			

TOTAL | **$**

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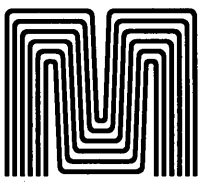

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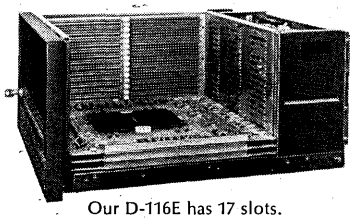
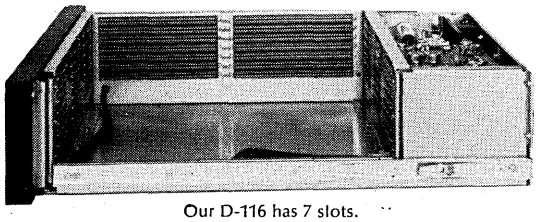
Our slot machines.



Our D-116E has 17 slots.
(Nova's 1220 has 10).



Our D-116 has 7 slots.
(Nova's 1210 has 4).

As you can see, our fully compatible D-116 series of 16 bit minicomputers gives you a lot more slot space than their 1210 and 1220 counterparts.

About 40% more, in fact. The D-116 has a 32K capacity plus one extra slot while the 1210 has only 16K capacity with no extra slots. And that means a whole lot in terms of versatile options and peripheral interfaces that can be ordered with our D-116 series.

How did we do it? By keeping our power supplies modular (and replaceable). The 1210 and 1220 power supplies, on the other hand, are hardwired to the backpanel. It takes a major overhaul just to replace one. (Ours is a snap).

Other features? How about no audible frequency noise from the power supply, reduced conducted RFI from the AC line plug, and cooler air for the logic and memory boards. (Boy, does it get hot with the 1210/1220 power supply under the boards).

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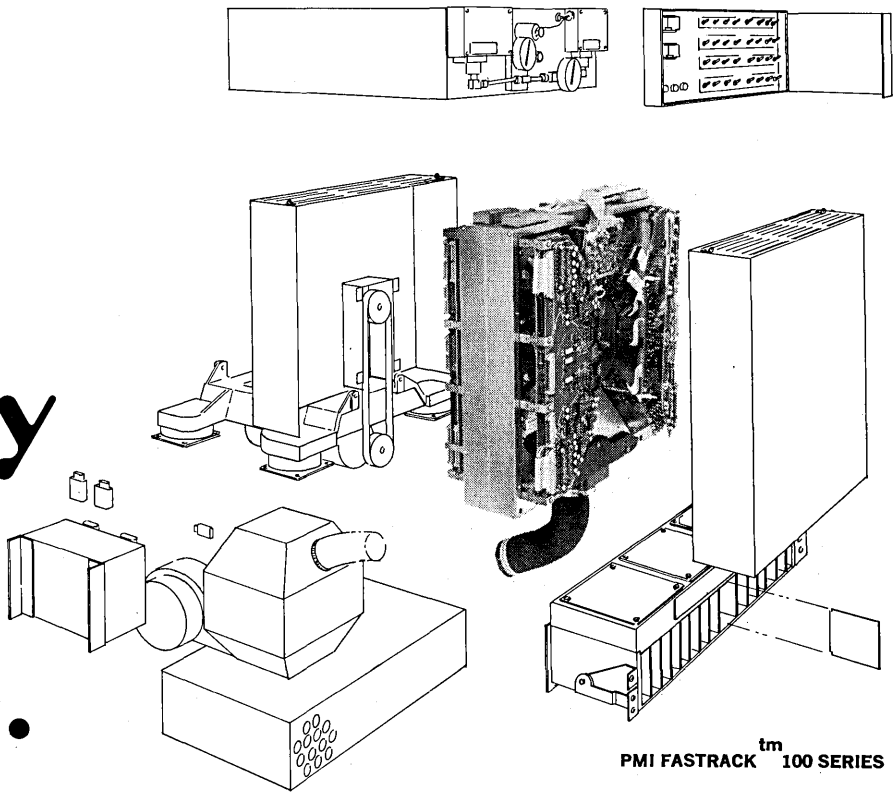

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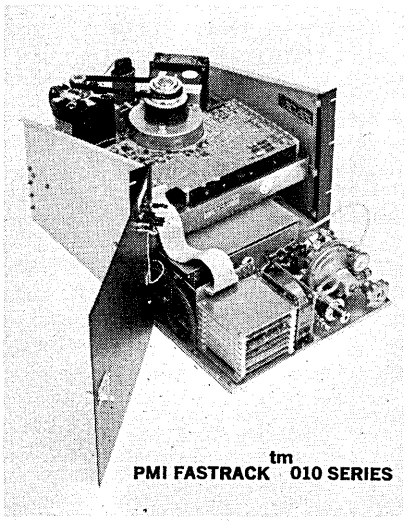

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PMI produces a complete product line of **high-technology** head-per-track disc storage devices featuring high recording densities up to 6,000 bpi, that results in higher data throughput of from 4.5 to 51.2 MHz at a lower cost-per-bit for a given capacity—the 010 Mini Series with access times of either 8.5 ms or 17 ms and capacities from 1.2 Megabits to 19.2 Megabits and transfer rates of 4.5 to 6.4 million bits per second — and the larger capacity 100 Series with access times of either 8.5 ms or 17 ms; capacities of 19.2 Megabits to 153 Megabits and transfer rates of 4.5 to 6.4 million bits per second.

The 100 Series also has the capability of operating up to 8-track parallel, providing transfer rates of up to 51.2 million bits per second.

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The entire product line has interface compatibility with most other head-per-track disc memory systems. Utilize the PMI design versatility for device, system and sub-system compatibility and you can adapt any PMI device to your particular requirement. Some of the standard features incorporated into the PMI product lines are: non-contact, fail-safe heads that fly at 40 micro-inches; automatic head lifters that sense low disc speed, D-C power present, and high head actuation pressure; integral D-C power supplies with A-C line filter; field-expandability; 10,000 hour MTBF and 1 hour MTTR.

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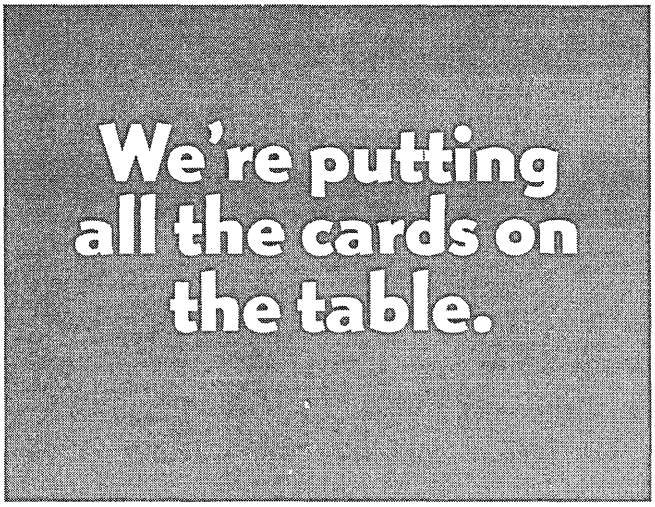

D-112 Advantages	D-112 Computer (Fully compatible with "8" series)	PDP-8E Computer
67 Less components (IC count)	329	396
4 Less boards	6	10
Less power required	3 Amp, 300 Watts	6 Amp, 450 Watts
Less rack mount space. (Save 1¾" front panel height and 1¼" back cabinet stick-out)	8¾" H x 19" W x 22" D	10½" H x 19" W x 23¼" D
No speed compromise	1.2 usec	1.2 to 1.4 usec: 1.2 for fetch and defer cycles without autoindex; 1.4 for all others. 1.5 usec for PDP-8I 1.6 usec for PDP-8L
Accuracy	Crystal controlled timing	Crystal controlled for 8E. Delay line for PDP-8I and 8L.

PLUS . . . For openers we'll save you at least 15% in price on singles and even more on OEM quantities. There are no cards up our sleeve, we're dealing in spades. Over 450 D-112's have been shipped. *Deal Yourself In.*

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IBM introduces Virtual Storage for System/370.

A major part of your data processing investment is in the people who work with your computers. Virtual storage is designed to help them become more productive.

Virtual storage is designed to make System/370 more versatile, flexible and responsive. It can increase the productivity of programmers by freeing them from much time-consuming and routine work.

Yet for all its revolutionary implications, it is an *evolutionary* development, involving no major reprogramming of most applications.

Increasing the computer's efficiency

Virtual storage is simply a way of making more efficient use of a computer's main storage (also called "memory") in most applications.

Instead of holding an entire program in main storage throughout its execution, only those parts actually needed by the computer are brought in at any given time. The rest is kept on disk files, ready for immediate use.

Virtual storage thereby lifts many of the restrictions previously imposed by the physical size of main storage.

It gives an apparent main storage capability that is vastly greater than the computer's real storage—up to 16 million bytes. That is four times greater than the *real* main storage of IBM's largest computer.

More jobs, more functions

Virtual storage can greatly broaden the range of applications feasible for an IBM System/370.

It can permit more jobs to be run concur-

rently. Larger jobs. More on-line, remote terminal jobs. It can thereby potentially expand the capabilities of computer installations. Individual programs, however, may require more time for execution under virtual storage.

It has the potential to reduce the time and work required for developing, testing and maintaining new applications. It opens up exciting new prospects for program design.

It permits many jobs to be interchanged between large and small System/370 machines. To the extent that jobs can be interchanged, a smaller machine can now back up a larger machine.

Compatible growth

Virtual storage capability can be provided by a simple on-site engineering change in System/370 Models 135 and 145. At no charge.

If you own a System/370 Model 155 or 165, virtual storage capability will be available at additional cost. These enhanced computers will be known as the Model 155 II and the Model 165 II.

Four new operating systems support virtual storage on System/370. In addition, a major new access method, called VSAM, facilitates advanced on-line and data base applications.

In many cases, existing System/370 and System/360 programs can be run under virtual storage with little or no change.

Two new models in the System/370 line

IBM also announces two new System/370 models, both equipped with virtual storage capability and advanced all-monolithic technology. They are the Models 158 and 168. They provide the greatest computing power of all IBM's virtual storage models and continue the logical evolution to greater function and higher productivity for data processing installations.

An advance in productivity

As the needs for data processing become more numerous and complex, so do the demands on the computer. And particularly on its main storage capacity.

By more effectively using that capacity, virtual storage makes possible expanded computer use.

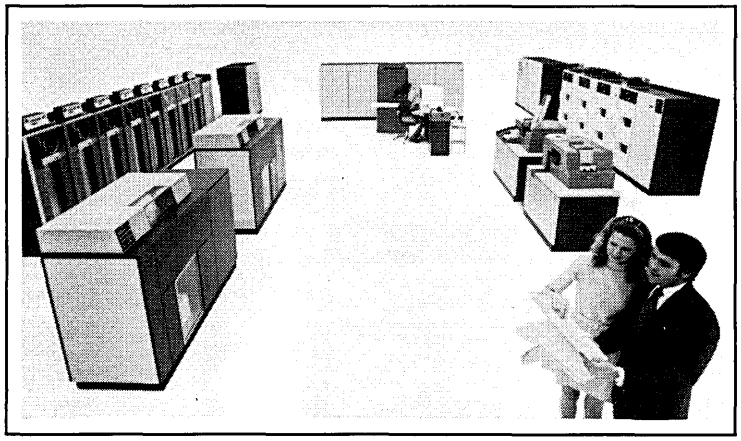
It allows more jobs to run concurrently.

It permits many applications to be developed more easily and rapidly.

Virtual storage. Another way IBM adds to the value of your data processing investment.

IBM®

The new IBM System/370 Model 158 features instructions designed to speed up the central processing unit, as well as an operator's console with a lightpen for systems control.



The new IBM System/370 Model 168 has a real storage capacity of up to four million bytes. It has the ability to handle 12 channels for high-speed devices.

How to reduce Data Input Keystrokes by as much as 62%.

Data input costs can consume as much as one-third to one-half of the EDP budget of high-volume computer sites. Much of this expense is due to the need for keystroke verification. Now, Consolidated Computer introduces its KEY-EDIT® Output Editor, a powerful and sophisticated data manipulation capability that can significantly reduce the need for keystroke verification.

KEY-EDIT's Output Editor is capable of editing, validating and reformatting data resident on the Fixed Head Storage Device of the KEY-EDIT data input system. The result is increased efficiency, decreased turnaround time, faster throughput, and a lower cost of data preparation and entry. For instance, in one typical application involving the processing of sales orders, conventional input methods required 376 keystrokes. The KEY-EDIT® Output Editor reduced the required keystrokes to 126—a savings of 62%.

KEY-EDIT and its Output Editor can achieve data input savings for you. We can make this claim because we can back it up with successful case histories in virtually any field of endeavour. The KEY-EDIT System is working in 13 countries throughout the world, in Manufacturing, Government, Insurance, Finance, Transportation, Education, Medicine. . . you name it, KEY-EDIT applies. And works.

Let us show you how the KEY-EDIT System can work for you. Just phone or send in the coupon below.

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I would like to have detailed information on the KEY-EDIT Data Input System and its Output Editor. We presently use:
☐ Keypunch ☐ Key-To-Tape ☐ Key-To-Disk ☐ OCR.

There are_____number of keypunch or other data entry terminals at our computer installation.

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Letters

Amen

While reading Dick Schubert's article ("Basic Concepts in Data Base Management Systems," July, p. 42), I detected what may very well turn out to be the creation of a new word for the English language. On p. 44, Mr. Schubert says: "The smallest unit of named data in a data base is a *data item.*"

Now, sit back, stare at the ceiling, pretend you are Jean Shepard for a few minutes, and let your imagination take over: You can see it now—in a few years, maybe months, somebody will get lazy and make a contraction; thus, "dat'em." Then, before you know it, we will have "datem," "dat'm," or maybe "datum." Lo! Behold! Just what every programmer has always wanted (and feared)—a singular form for "data"!

ED DEWAN
Urbana, Illinois

Lost in the transcription

In the discussion in Look Ahead in the June issue (p. 8) of the publication of *Government Regulation of the Computer Industry,* coauthored by Bruce Gilchrist, Executive Director of AFIPS, and Milton R. Wessel, you state that "ACM's Executive Committee voted to protest the book and censure Gilchrist." In fact, neither of these claims is true.

The ACM Executive Committee was concerned about the mechanism by which publication of a book on such a controversial subject was approved by the AFIPS Board of Directors. Because of this concern the ACM Secretary was directed to write and did so write a letter to the AFIPS President expressing this concern and pointing out that AFIPS involvement in issues of this nature might raise, as you noted, constitutional questions for ACM. But, as the minutes of the ACM Executive Committee clearly indicate, there was no vote to censure Bruce Gilchrist or to protest the book itself.

ANTHONY RALSTON
President
Association for Computing Machinery
New York, New York

Our reporter replies: DATAMATION accurately reported what I had been told by ACM's outgoing president Walter Carlson, a corporate marketing consultant at IBM. Carlson said ACM's three-man executive committee met to discuss the book. Carlson added that he disqualified himself from the deliberations, in which it was voted to protest the book and censure Gilchrist, although he did sit in on the proceedings. Later, after DATAMATION had gone to press, Carlson called me to say that he had reviewed the notes of the ACM executive committee and found that there had been no vote taken to censure Gilchrist. The whole incident raised another important question about the book, which Mr. Ralston says is about "such a controversial subject." There were attempts at the Spring Joint Computer Conference to suppress the book itself as well as promotional material about it. In at least two instances, IBM officials were involved. We hope that the mere fact that the book or issue is regarded by some as controversial does not mean that the book or the issue will be subject to attempts to suppress it.

Sociogram

In reference to Richard Schubert's article, some important questions and comments should be made.

Although currently not used in a multiprogramming environment, the IBM BOMP (Bill Of Material Processor) file maintenance and access system is the data base management system which most closely resembles the proposed CODASYL DBTG data systems language that I have seen. BOMP's major shortcomings are:

1. As the interconnection between "owner" and "member" records becomes complex, the ability to maintain, update, or extend these files becomes extremely difficult due to the large number of pointer relationships and the large number of accesses required to change them.

2. Any volatile or rapidly changing file, such as raw inventory, open order, or purchase order files, requires such a large overflow, or additional chain area, that direct access speed drops quickly.

3. As files become large, the "chains" constructed between "owner" and "member" records become very long; therefore, long periods of processing time, several minutes or more, may be required to find one piece of information.

The data base management system described in the article addresses none of these problems, and, in fact, seems to allow almost unrestricted chaining between record types, creating greater difficulties in the areas mentioned above.

I must assume that some solution to these problems has been found. If so, I look forward to a subsequent article, or would appreciate a reference where such solutions are addressed.

LANDON MILLER
Seattle, Washington

Mr. Schubert replies: I can't really address myself to the current shortcomings of BOMP. Integrated Database Management System (IDMS) does not restrict the number of set relationships or the complexity of structure which can exist between record types. IDMS automatically maintains all set relationships in the data base and relieves the programmer of this responsibility. In our experience, IDMS does not exhibit the performance problems you mention. The lower portion of the TOPSY data structure shown in Fig. 7 of the article is volatile and performs well. In my opinion, the solutions to the problems you raised have been resolved by the design of IDMS. An article comparing the performance of BOMP and IDMS on a problem with a complex data structure is an attractive possibility and may begin to fill a current gap in literature.

Our gang

The June issue (p. 131) carries a story about me and some other people at Control Data, and I feel that I have to straighten out the record in some minor but perhaps important details.

The article has a sentence that he "remains on the friendliest terms with the Norris gang." I certainly would not use that expression to describe the top management of Control Data, but it is certainly true that I remain on the friendliest terms with Mr. Norris and other people at CDC. Also, there is a sentence which says "As Rabinow puts it: The economics of the OCR business no longer permit much basic research." I can't imagine my saying this because I don't agree with this. It is true that OCR is now entering a mature phase of business, but there is much basic research to be done.

As you correctly stated in the article, I initiated the reorganization of the OCR Div. of Control Data, and it was my recommendation that the research group be combined with the engineering group because I felt and still feel that—in most industrial organizations —research, advanced development, and good engineering have to be done together. This is particularly true in a small division like the OCR Div. of CDC.

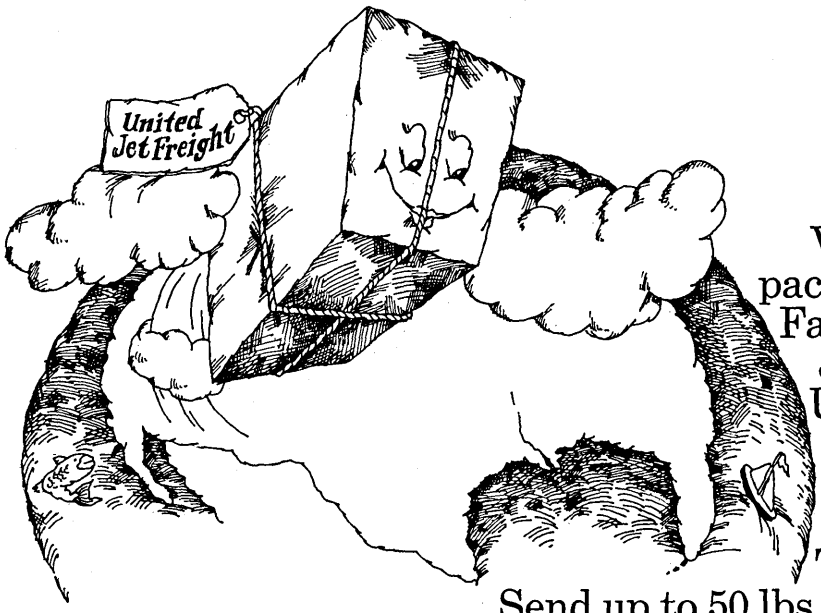
JACOB RABINOW
Acting Chief, Office of
Invention and Innovation
National Bureau of Standards
Washington, D.C.

Time bomb

Your July issue's "News in Perspective" flashes: "Embattled Codasyl Group Now Sees Support for Data Language Report" (p. 82). Angeline Pantages takes a superficial look at the (currently anemic) debate on data base management standards and instructs us: "For the irrationalities and politics behind the data base embroglio, read on," promising us some "knowledge of the play behind the technical scenes."

Since most of your readers who have been in edp for more than three months probably already know that marketing strategies strongly influence the *official,* documented position which any computer manufacturer takes regarding standards proposals, Ms. Pantages' catalogue of the piddling barbs which have been tossed back and forth during the past two years add fuel but not many lumens to the pro-

United's Small Package Dispatch. Same-day delivery to 113 cities.



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letters

verbial fire. In fact, it would all be great fun to read about and watch were it not true that the fire is really a smoldering fuse connected to a camouflaged stick of dynamite which some edp installations might very soon be using as a child uses a popsicle, and the results probably won't be limited to sticky fingers.

For those interested in some of the *technical* issues in the DBTG report, especially as they might pertain to a planned utilization of integrated data base capabilities within the next two years, may I recommend "An Analysis of the April 1971 Data Base Task Group Report," by R. W. Engles, a paper presented at the 1971 ACM SIGFIDET Workshop.

For those interested in some of the *technical* alternatives to the set of implementations strongly implied by the DBTG's proposed Data Manipulation Language, may I suggest "A Relational Model of Data for Large Shared Data Banks," by E. F. Coll (*Comm. of the ACM*, Vol. 13, No. 6, June 1970), and "A Data Base Sublanguage Founded on the Relational Calculus" by the same author (IBM Research Report RJ893, #15716, dated July 26, 1971).

I am currently participating in an application design/implementation project, the "data base management" part for which the latter two monographs provided a strong technical foundation. Though our particular implementation employs procedural rather than interpretive materialization of relations for the sake of application-dependent efficiencies, we have also enjoyed the benefits of:

1. A simple linear view of very complex hierarchical and network structures, with a negligible cost in performance and many unexpected blessings (e.g., faster-moving, more productive design meetings).
2. A GET/PUT type of procedural interface to the data base (something like the interface to an indexed-sequential file).
3. A decrease (not increase) in data base application program debug time; since relations can be represented as arrays, module logic can be checked out prior to the availability of the "data base management" modules.

It seems clear that these benefactions would be very attractive to most users, yet the proposed DBTG standard may preclude them. Thus we can see that there is a lot more under the rug than the little pile of dirt Ms. Pantages managed to discover.

D. WESSLING
Billerica, Massachusetts

Dear Judge Neville,

I have been observing the IBM antitrust suits with much interest. I find it an injustice to allow IBM to continue with their current strategy considering the past history concerning monopolies.

General Motors Corp. is only allowed to consider the dollar volume sales of cars that are sold in measuring its percentage. It is not allowed to include the service stations, body repair shops, dealers' maintenance shops, auto parts stores, or any other business that is an off-shoot of the one product that General Motors makes—"the automobile." I do not see why IBM receives the special privilege of including all the off-shoots of the computer industry, such as service bureaus, software houses, peripheral manufacturers, etc., in measuring its percentage. IBM should be measured the same as General Motors; i.e., what percentage of the dollar volume sales of mainframe computer equipment does IBM have?

Only when IBM does not have a monopoly will the computer industry be able to grow at a rate which is not dictated by IBM. For without competition, we would not have "The American Way of Life"—but, instead, "The IBM Way of Life."

JOHN PREWITT
Director, Computer Center
Southwest Texas State University
San Marcos, Texas

Umbrella time

I am an IBM employee, but I want to take issue—as a person—with your Forum of July on the "IBM Problem."

Gerald Larsen maintains, it appears, that innovation in the U.S. computer industry lags because of IBM dominance and that foreign manufacturers will take over because of this. Contrariwise, he seems to think that emulation and file structure transparency are deadly evils, and that the demise of assembly language programming is to be mourned. He blames the aforementioned on IBM and goes on to criticize U.S. standards, in particular, COBOL. (I agree that COBOL is a somewhat lousy language.)

But then he makes three recommendations for correcting what he takes to be IBM's misdemeanors—and they are sheer feather-bedding: 1) Mount a Congressional investigation; beef up the Justice department staff; fund an industry advisory committee "staffed with a wide variety of computer industry technical, marketing, and management executives." (Is Mr. L. looking for a job?)

Larsen says that "dozens of smaller competitors have gone bankrupt." He fails to note that more than dozens of small businesses go bankrupt every year and that IBM has sheltered more than dozens of smaller competitors under the infamous umbrella. Neither he, nor Richard Sprague, in the companion article, pays any recognition to the fact that IBM has given a free ride to everyone in the business by absorbing the costs and risks of developing software first.

What makes anyone think that a baker's dozen of small companies would supply better service, be more innovative, or compete better with Yamaha than IBM?

SALLY F. DENNIS
Yorktown Heights, New York

Relative Uselessness

I read with interest your article on edp people in the June issue (p. 65). I have no quarrel with the main article's characterization of computerman, although I think it is a bit naive to assume that you can categorize computer people any better than people in any other profession.

I do object, however, to several statements made in the inset article on p. 68 entitled "tomorrow's jobs . . . how will they differ?" I do not know who the "wise men" that you interviewed are; but if Jim Emery and Dan Couger are representative, then I submit that you have a very poor and biased sample. Did you interview any educators from departments of computer science or electrical engineering? If so, I am sure you would not have printed the ridiculous statement about "the relative uselessness of departments of computer science . . . and the people they are turning out."

Is it your belief that the graduates of business schools will design, maintain, and implement operating systems? maintain time-sharing services? develop management information systems? develop models for applications of the computer to complex societal problems? develop discrete and continuous simulation models? If so, you are grossly naive about the capabilities of graduates of business schools. If computer science departments are so useless, why are the graduates from these programs in such demand? Are companies like IBM, CDC, GE, Xerox, Bell Telephone, and TRW Systems hiring these graduates for window dressing? Some of the salaries received by our Purdue graduates this year are embarrassingly high for useless people.

The truth is that industry and business require computer professionals with varied backgrounds. The business school graduate with an edp background is one type; the computer science graduate is a different type. Each has its role to play in helping to make computers a positive contribution to our society. Your article does a disservice to all those dedicated educators in

letters

computer science who have labored for years to provide a product that has in fact been enthusiastically received by industry.

S. D. CONTE
Chairman, Department of Computer Sciences
Purdue University
Lafayette, Indiana

Mr. Forest replies: Our statements about the usefulness of computer science departments were not based on interviews with academicians of any sort, but on interviews with users, high-level technical management, industry observers—and they reflect the judgment being made in the real world of the user. Business school graduates will not mess with operating systems, but they will be designing management information and other complex systems, hopefully with the help of high-level technicians of the sort you are evidently turning out. But most of your graduates will probably work for system manufacturers or users large enough and sophisticated enough to develop or modify and maintain their own systems software and perhaps even their own hardware. The prices being paid your graduates have little or nothing to do with their immediate usefulness to an employer. Remember, too, that the major focal point of our article was the computer user. Believe me when I tell you they have very little regard for the products of the typical computer science curriculum. In any case, none of the remarks applies to any specific group, such as that at Purdue.

Discriminating

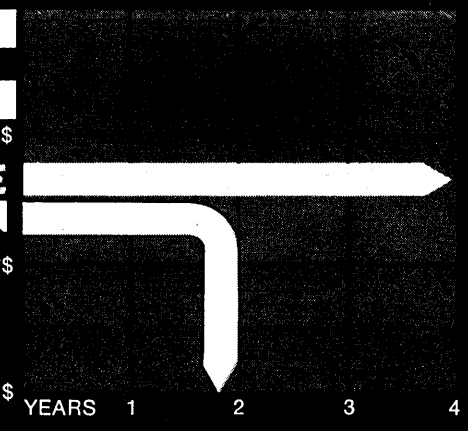
Recognizing my total deafness since birth and my edp involvement since 1966 upon graduation from Gallaudet College in D.C., I have read with great interest your July article on "Sound Waves from the Deaf" (p. 97). Interested readers are referred to the May 1, 1971, issue on the similar subject.

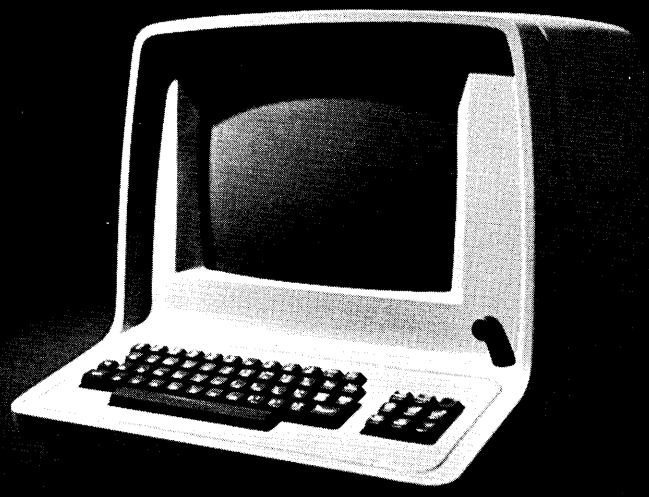
Although this handicap does not affect the work to which the deaf edp persons (far less than 1% of total edp people) are currently assigned (e.g., programming, systems analysis, technical design, et al), it is unfortunate that some firms, large or small, still are letting the deafness distort their reasoning negatively when considering well-qualified deaf edp applicants. Since the deafness is a valuable asset in this field, discriminations against us must die.

PAUL LEVENSON
Rochester, New York □

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.

The buckpassing stops here:





A 16 terminal IBM 2260 CRT system leases for about $2500 a month–from here to eternity.

If this same amount was used to lease/purchase a Wyle 8000 system, the buck passing would stop in less than two years!

How much can you save? This chart will give you an idea.

Number Of Terminals	Approximate Annual Saving After Payoff
16	$ 30,000
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128	$240,000

Regardless of whether you buy or lease your Wyle system, you'll begin saving money from day one.

Wyle's 8000 is plug-to-plug & software compatible with IBM 360/370 systems. With more features for less dollars.

Such as 1920, 960 or 480 character screen capacity, up to 9600 bps data rate, non-destructive cursor, colon-seeking tab, special editing keys, character address, format protect, repeat key. Plus options including; columnar tab, lower case, function keys, numeric pad, hard copy printer and built-in data set.

So far, so good. A better product at a lower price. But what about experience? Financial responsibility? National sales & service?

Fact: Wyle has been building CRT terminals for reservations and ticketing since 1967, including a $2.5 million contract to supply 1150 terminals for New York City's off-track-betting system.

Fact: Our parent company, Wyle Laboratories, has annual sales of over $90 million and assets in excess of $60 million.

Fact: Nationwide sales is provided by GENESIS ONE, one of the country's largest and most experienced computer marketing organizations with offices in 40 major cities. Also nation wide service for full customer support.

So get the whole story of the Wyle 8000. Write for our brochure. Or better yet, phone the GENESIS ONE office nearest you.

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Model 78 Programmed Batch Terminal, plug compatible with 360/20 featuring—

- Simulation of 2780, 1004, DCT 2000, and 200 UT Terminals.
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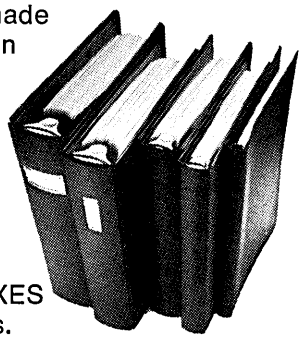

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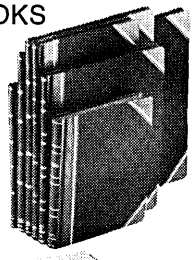

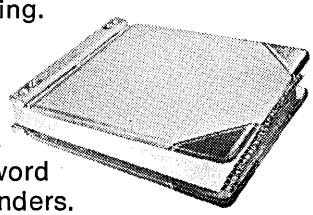

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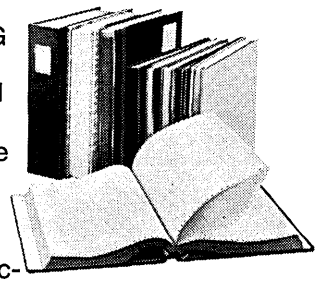

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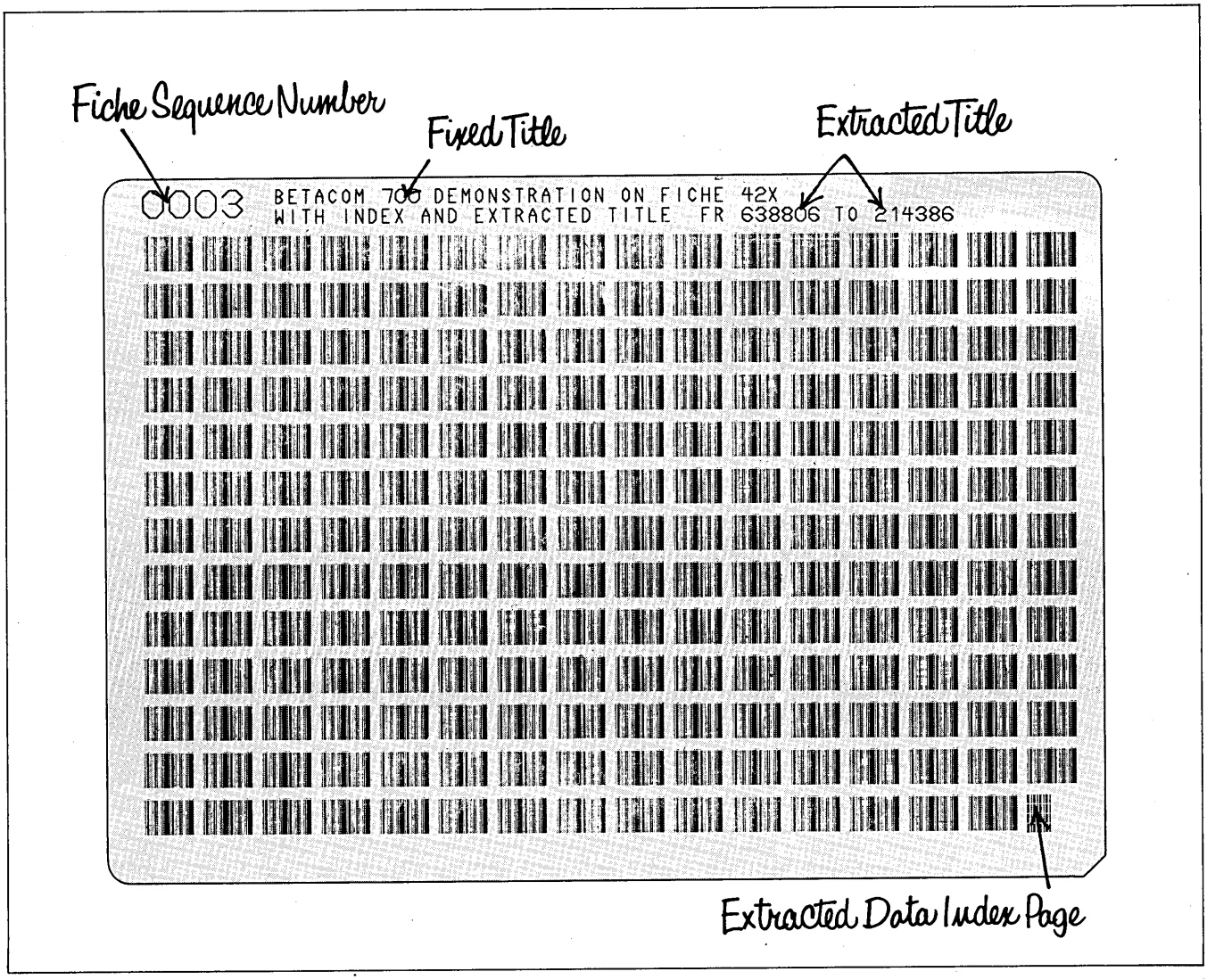

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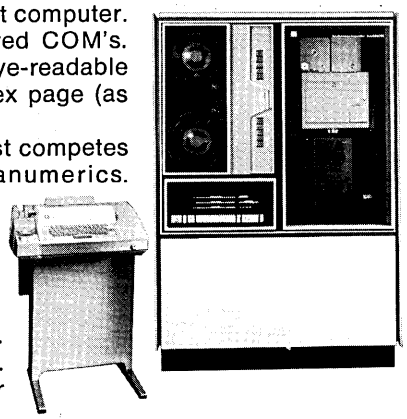

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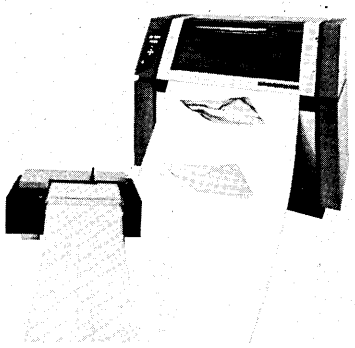

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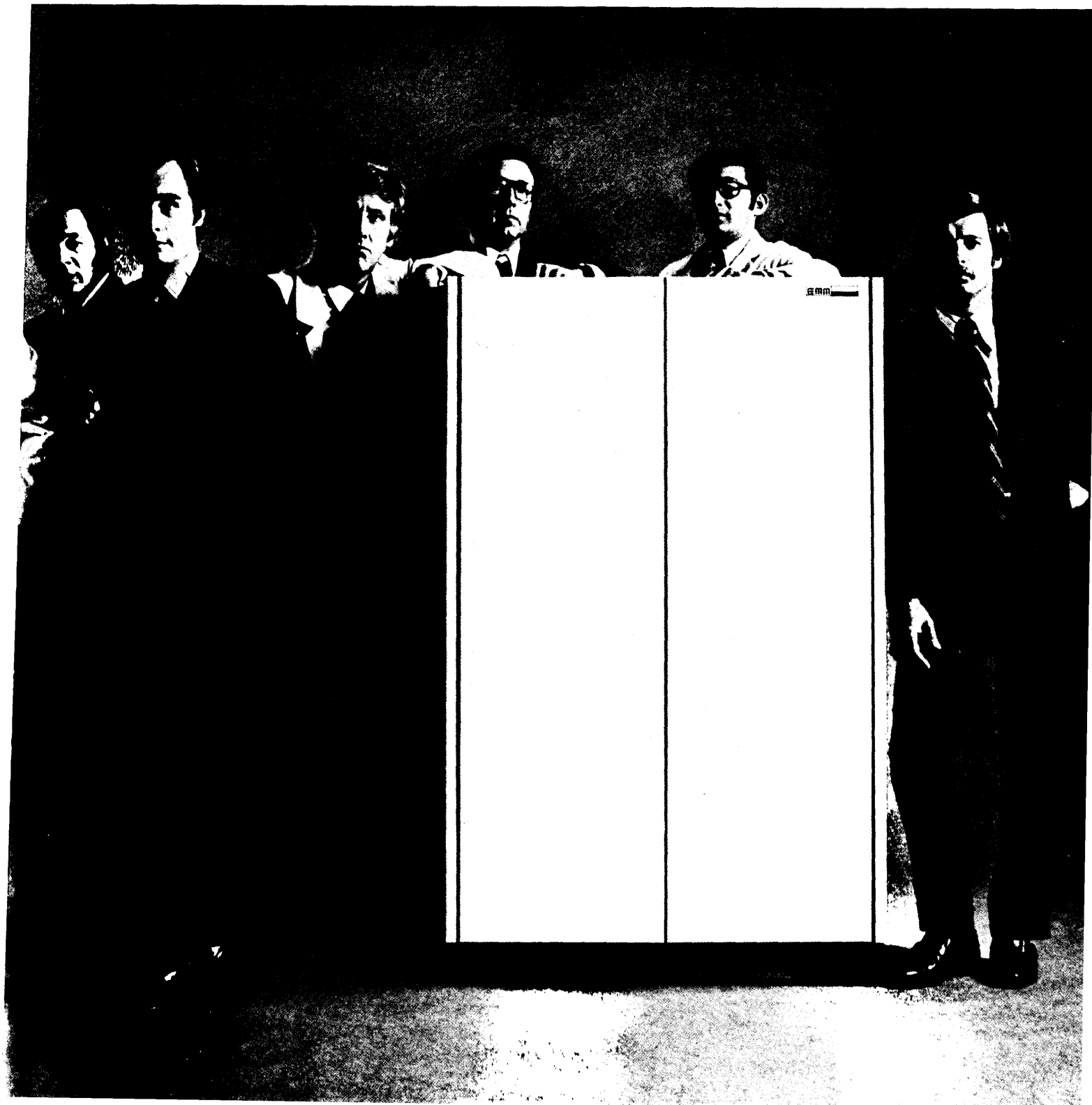

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Storage Element:	18-mil extended temperature range ferrite memory core
Memory System Type:	Coincident current (3 wire, 3D)
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Interleaving:	None (3650/155) 4-way (3650/165)
Operating Temperature Range:	+59°F to +95°F
Operating Humidity Range:	Up to 95% RH excluding condensation
Power Input:	208/230 V ±10%, 47-64 Hz, 3-phase, 4 wire
Heat Dissipation:	4250 BTU per hour (256K bytes) 7750 BTU per hour (512K bytes)
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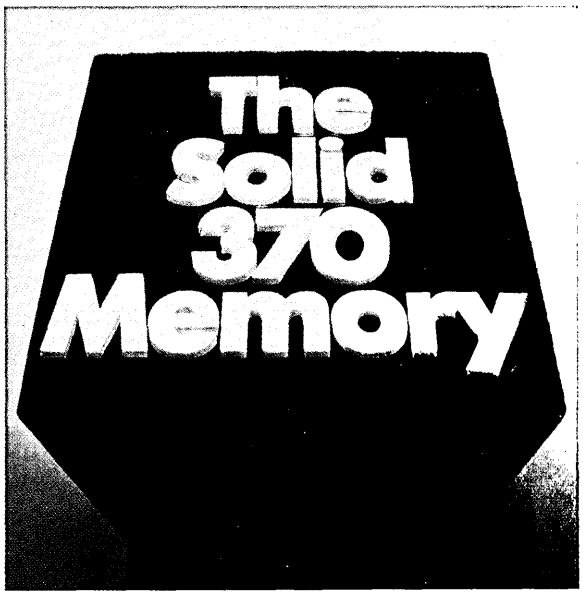
CPU Model 3155 (370/155) Micromemory Models	Capacities
3650/155-1	262,144 bytes
3650/155-2	393,216 bytes
3650/155-3	524,288 bytes

CPU Model 3165 (370/165) Micromemory Models	Capacities
3650/165-4	262,144 bytes
3650/165-5	524,288 bytes



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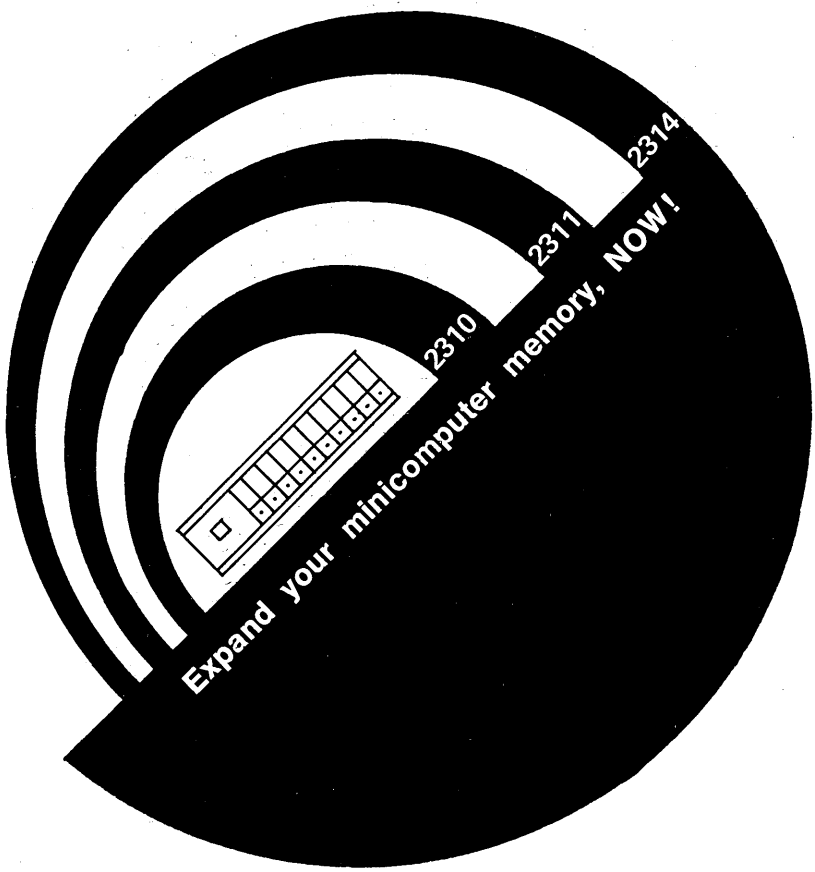

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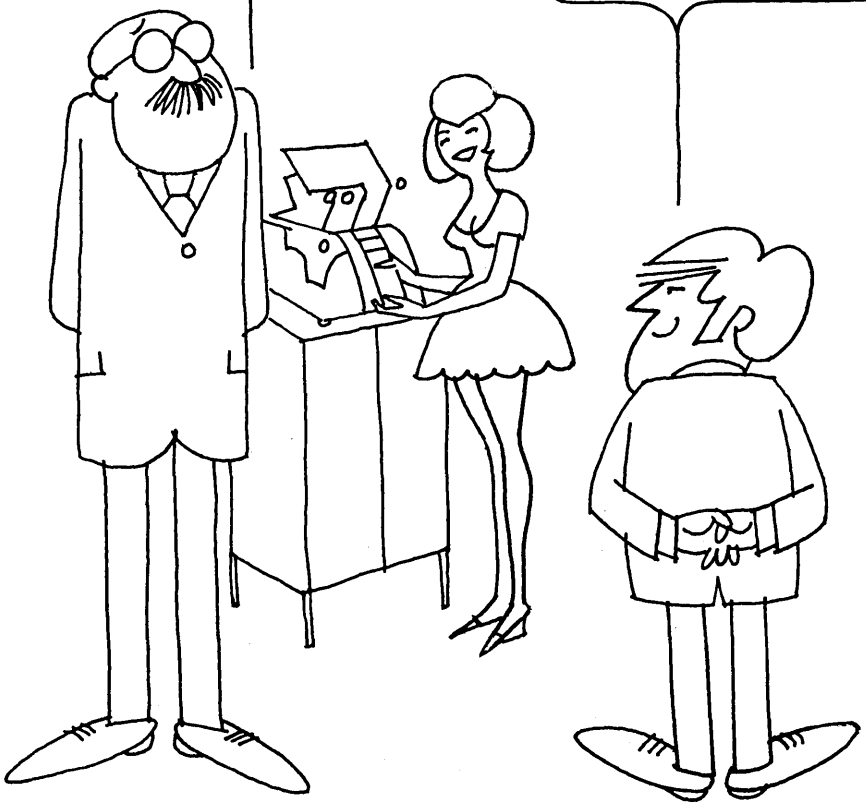

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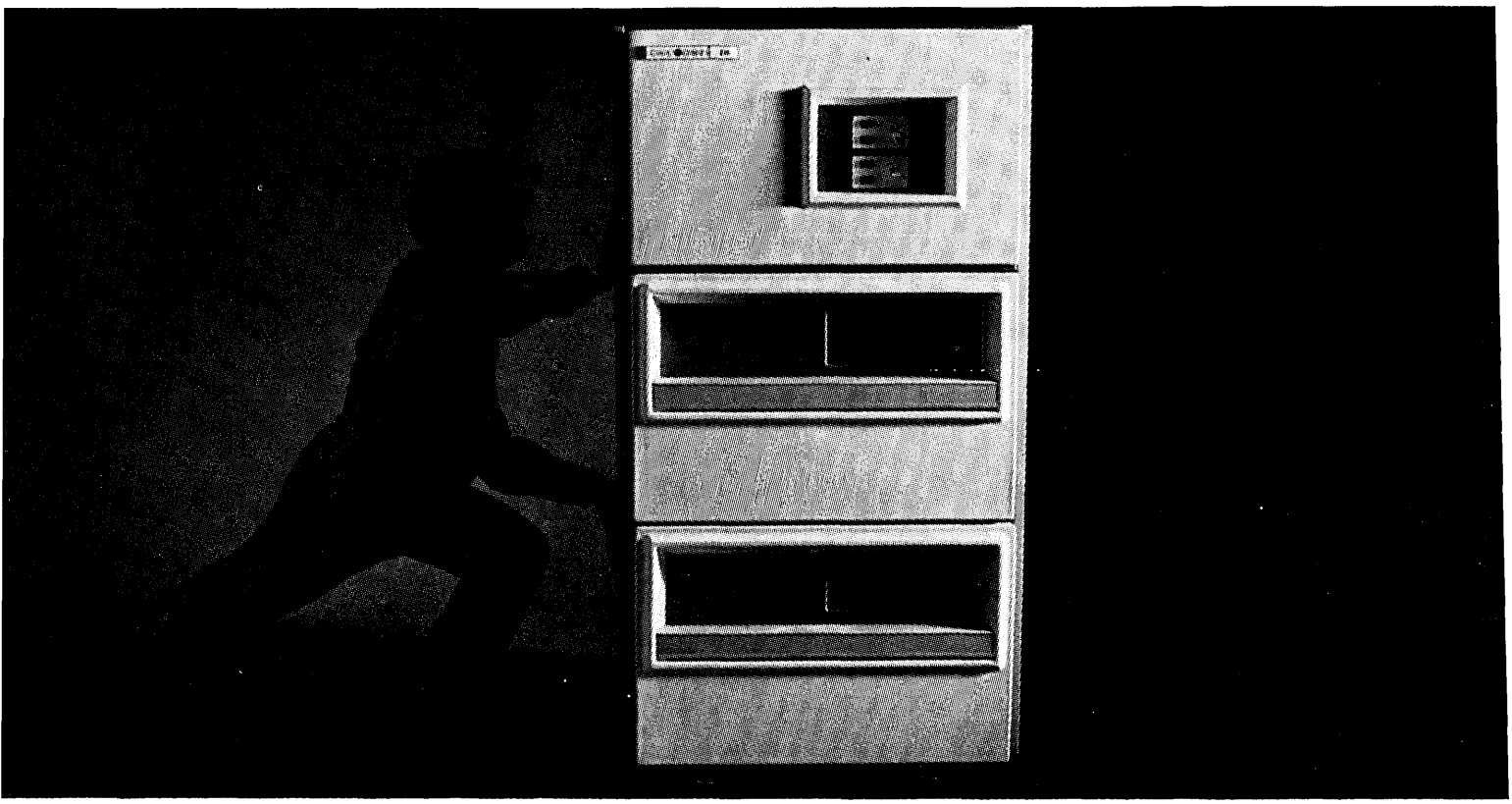

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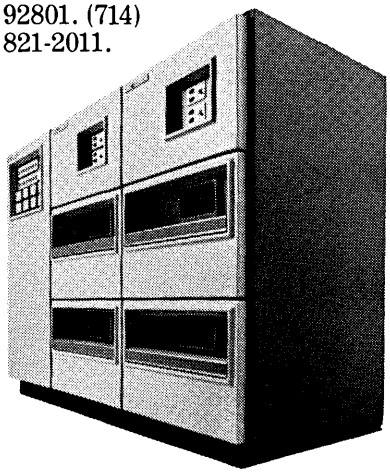

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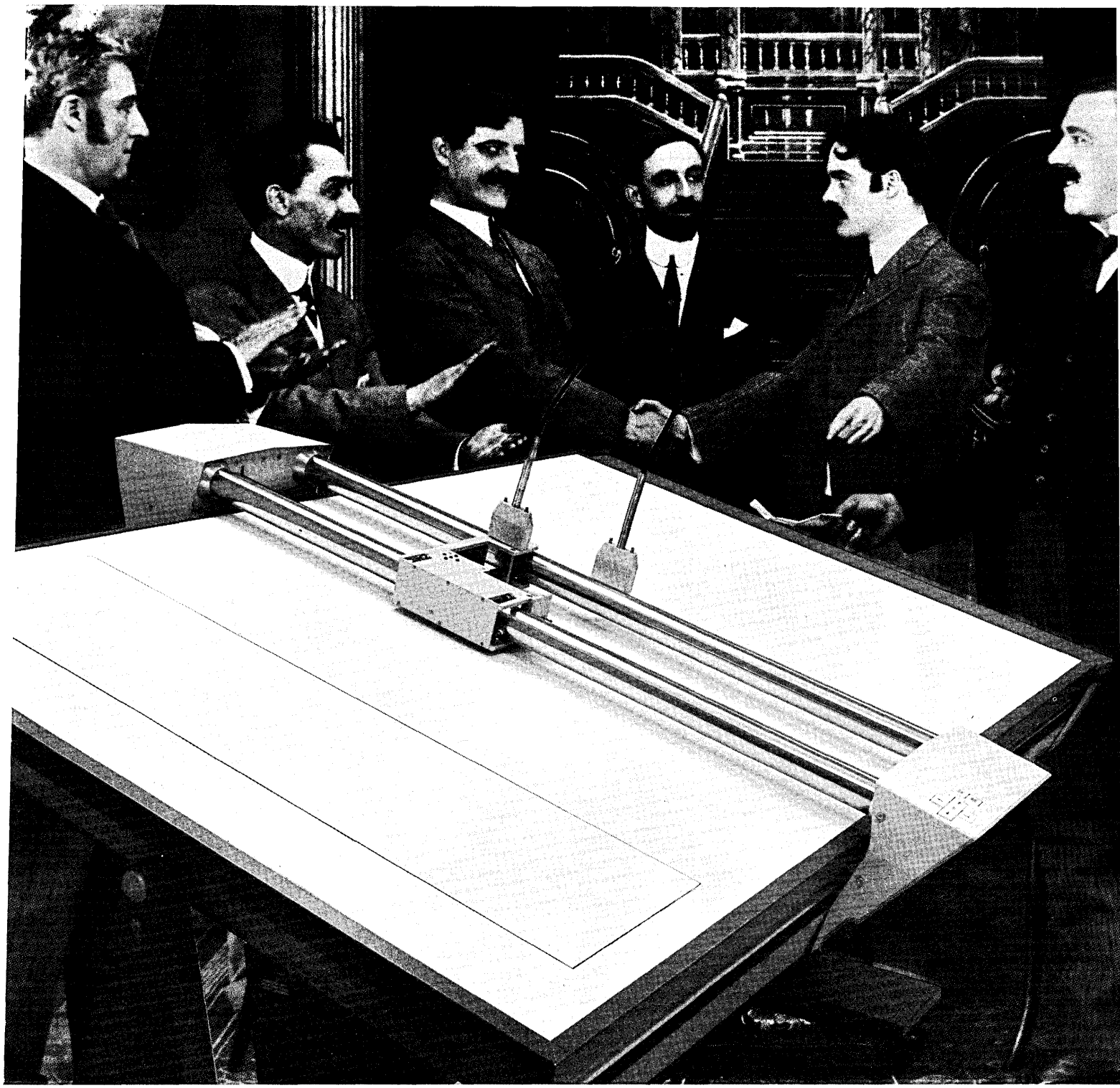

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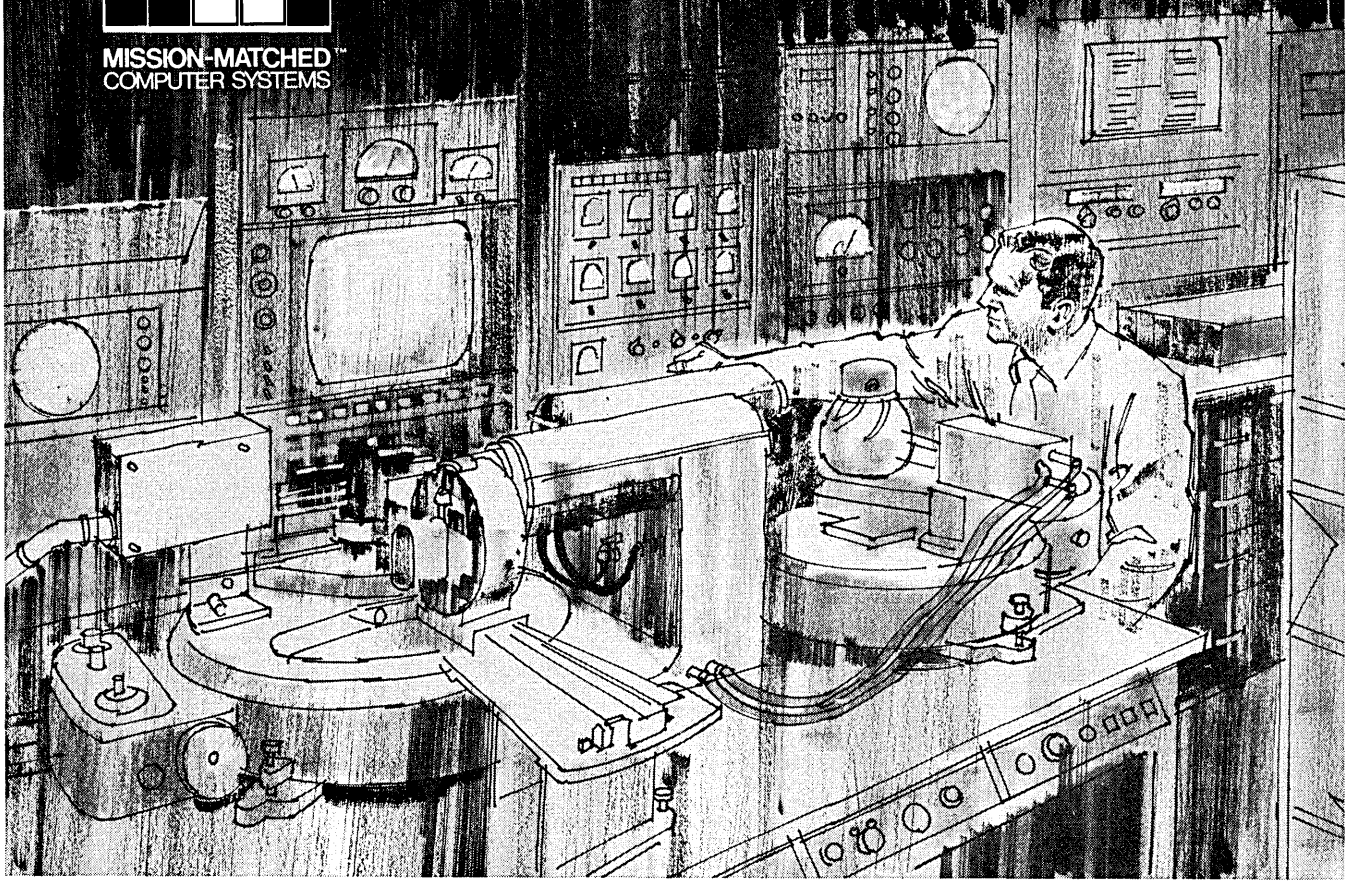

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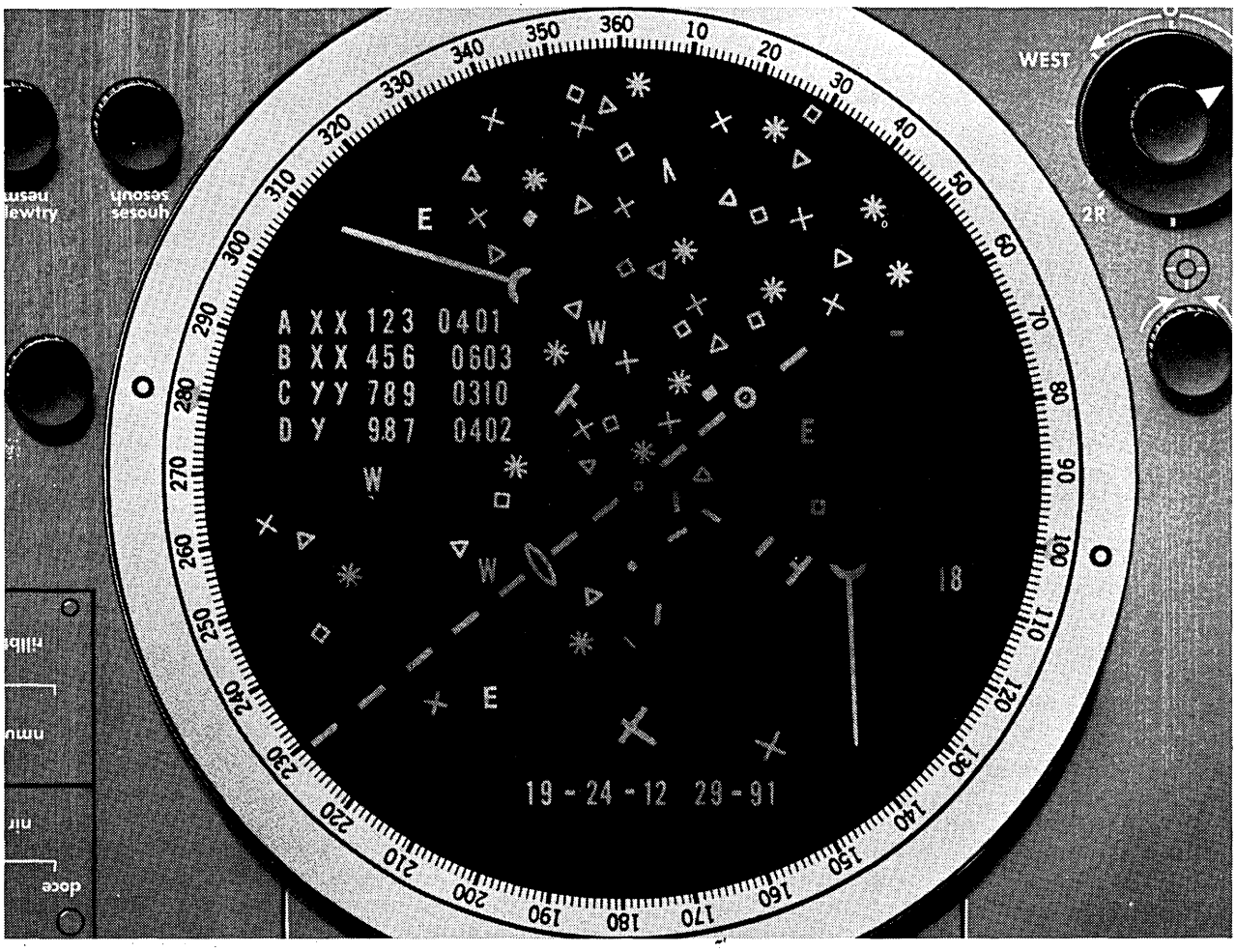

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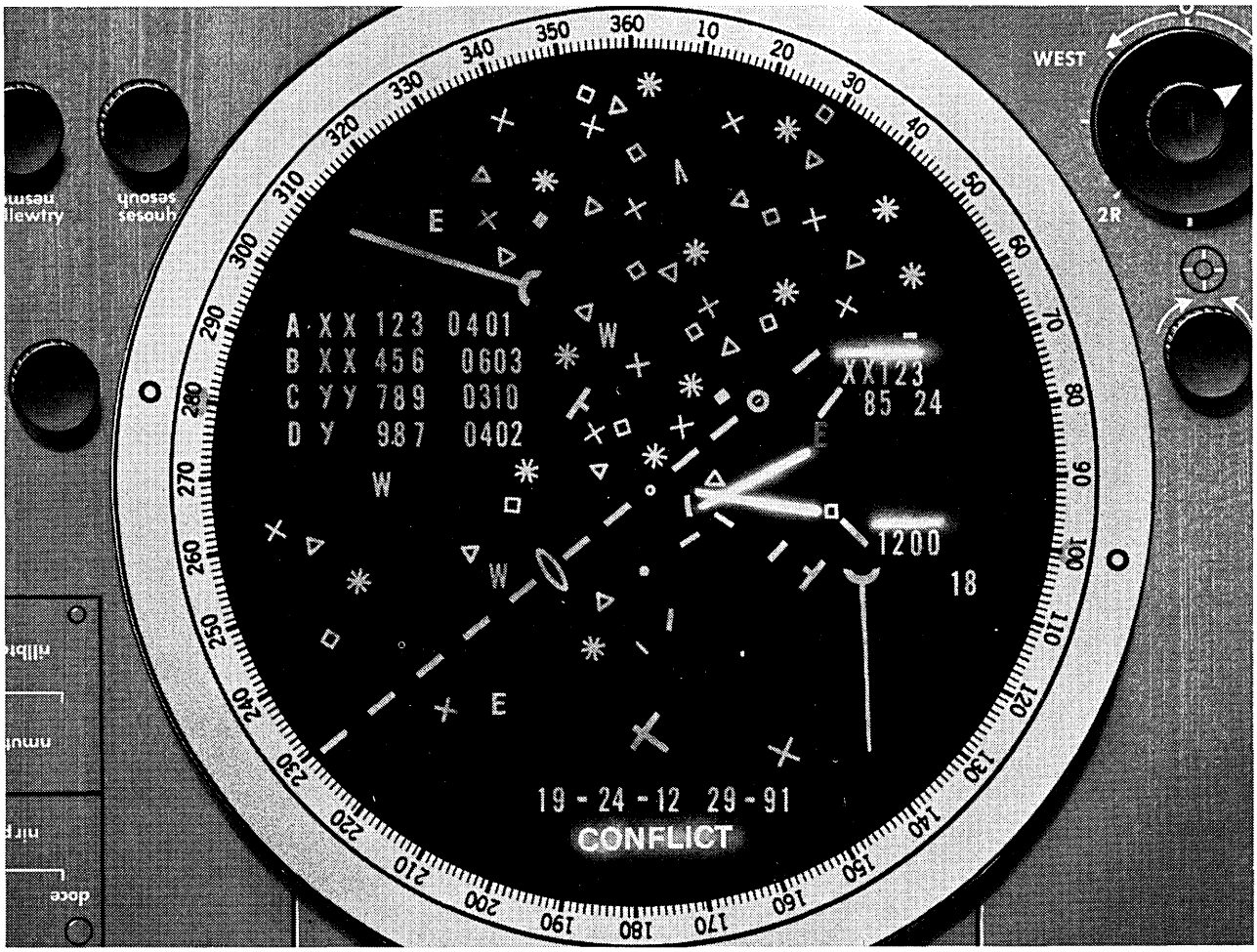

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Even where standards have been long established, nonconformance seems to be the rule

Flowchart Packages and the

Tempers run high and conversations become heated on the topic of flowchart packages and the American National Standards Institute (ANSI) X3.5-1970 Flowchart Standard.[1] The creators and vendors of these software packages generally give the impression of being on the side of motherhood, the flag, and God, and that they are observing the Standard as far as practicable. Or alternatively, they deny that the ANSI Standard has any significance; it is what IBM does that counts, some of their personnel have told me.

On the user side, each installation has its own idiosyncrasies. Anything offered by a vendor that does not match these, the users in my observation decry as "nonstandard." Further, the users generally defend their practices as conforming to the ANSI Standard, or if they do not, claim them as improvements upon it, or as adaptations of it to their unique conditions, or as what their computer vendor recommended, or as common practice.

Clearing the air

In an attempt to reduce contention and to clear the air, I report here on an attempt to measure objectively and quantitatively the extent to which the output produced by a representative selection of flowchart packages conforms to the ANSI X3.5 Standard. Then I offer some reflections in a positive vein on the problems that impede improved conformance.

Background

To make the study reported here, I solicited the assistance of a number of vendors of flowchart packages. My object was to sample widely from among the packages that are the most popular and widely used for flowcharting COBOL programs. Some of the vendors elected not to participate; the participating vendors and packages are cited in Fig. 1. To help distinguish the packages, the vendor name has been prefixed. The name AUTODOC was first used by F. David Lewis. The WCC-FCP package was almost identical in output to the LOGIGRAM package from CTSS.

All of the packages except the Lewis-AUTODOC-V were run against the same five COBOL source programs. One each of these programs was contributed by the participating vendors, except for F. David Lewis. To assure getting a "best foot forward" run, each vendor made the runs at its own installation using its own personnel.

All of the packages can produce more than just flowcharts. Their vendors like to tout them as documentation packages for this reason. Indeed, their output can serve as a significant part of program documentation. But as pointed out elsewhere they do not and cannot at the present provide all the necessary elements needed to comprise program documentation.[2] Further, in this paper, the attention focuses on the flowchart output they produce. For this reason the packages are referred to here as "flowchart packages."

All of the packages produce flowchart output of the flow diagram type, not the systems chart type.[3] That is, the flowcharts these packages produce provide a graphic statement of the algorithm used in the program. They do not show the place of the program in the overall system or the relationship of the program to the rest of the system of which a program may be a part. For this reason, some parts of the ANSI X3.5 Standard are inapplicable to the flowcharts produced by the packages. No comparison therefore was made and no reflection should be inferred on those parts of the Standard not specifically discussed in the comparison that follows.

Shape and ratio

The ANSI X3.5 Standard outlines needed for flow diagrams are summarized in Fig. 2 (pages 50-51), along with the shapes and ratios observed for these outlines in the output from the packages.

The ANSI Standard specifies a shape and a width-to-height ratio for each outline, except the flowline. Shape and ratio specifications have been a part of the Standard since its inception in 1963. They were also retained in the 1970 revision which brought the ANSI Standard into close agreement with the International Standard (ISO).

The shape and width-to-height ratios were measured for each of the outline types for each vendor not once but many times, to see whether or not con-

1. ANSI. *American National Standard X3.5-1970 Flowchart Symbols and Their Usage in Information Processing* (New York: American National Standards Institute, Inc., 1971), 17 pp.

2. See, for example: Ned Chapin, "Program documentation: the valuable burden," *Software Age*, Vol. 2, No. 4 (May 1968), pp. 24-26, 28-30.

3. Background information and directions for producing flowcharts can be found in Ned Chapin, *Flowcharts* (Princeton, N.J.: Auerbach Publishers, Inc., 1971), 179 pp.

ANSI Standard

by Ned Chapin

sistency was present. As can be seen from Fig. 2, the shape was well maintained but the ratios often varied dramatically.

When drawing flowcharts with a computer's line printer, one must live with the restriction of eight lines to the inch vertically and ten characters to the inch horizontally. Because of these restrictions, the shape and ratio requirements cannot be met exactly. But this is no justification for the very wide deviations from the ratio requirement observed, or for some of the shape deviations noted.

As can be inferred from Fig. 2, the common practice is to make the width of the outline a constant, given the type of outline, and then to vary the height to fit the amount of text to be written within the outline. In other words, the vendors have ignored the Standard's permission to use outlines of varying size as long as the ratio be maintained. Two near-trivial exceptions are the DIC-AUTODOC and the NCA-QUICK-DRAW as noted below.

A violation of the ANSI Standard was noted in the input-output outline. Rectangles, as used by the APC-DYNACHART and the NCA-QUICK-DRAW, are specifically not permitted for that purpose by the ANSI Standard since both the input-output outline and the rectangular process outline are among the basic outlines. The use of a trapezoid with the base smaller than the top (a "keystone") was permitted in a previous version of the Standard.

Process outlines also violated the ratio requirement. No shape violations were noted for process outlines or for flowlines. But the later discussion of direction of flow should be noted.

The annotation outline was another story. Not one of the packages presented annotation in a conforming manner. As can be seen from Fig. 2, the violations were major.

The connector outline was often a violation, since the shapes provided often deviated from the circle specified by the ANSI Standard. The terminal outline also was characterized by diversity and nonconformance to the Standard. The terminal and connector outlines have a clearly specified use in the Standard; the packages did use some in those ways. But the packages also used nonconforming shapes. Alternatively, they substituted other outlines for situations where the terminal and connector outlines would have been appropriate, or they did not use them at all.

Among the specialized outlines, the picture was a little brighter. The decision outline was the diamond with one exception: the APC-DYNACHART used a rectangle with rounded corners—a clear violation. In order to accommodate long wordings, the DIC-AUTODOC and NCA-QUICK-DRAW provided three distinct sizes of decision outlines, each of which individually conforms but modestly to the ratio requirement. To accommodate long wording the DIC-AUTODOC drops the bottom out of the diamonds, filling the voids thus made with a column of print—a clear violation of the Standard.

The preparation outline was not part of the earlier versions of the ANSI Standard. This may account for why some

Name of Package Vendor	AUTOFLOW ADR (Applied Data Research)	DYNACHART APC (Applications Programming Co.)	AUTODOC DIC (Data Instrument Co.)	AUTODOC-V F. David Lewis (IBM Library)	QUICK-DRAW NCA (National Computer Analysts)	FCP WCC (World Computer Corp.)
Long-Term Lease	$7370	$4400	$1500	Free	$6300	$2150
COBOL Input	Directly	Directly	Directly	Via SFL	Directly	Directly
Output:						
Flowchart	Yes	Yes	Yes	Yes	Yes	Yes
Cross ref.	Yes	Yes	Yes	Data	Yes	Yes
Source	Yes	Yes	Yes	No	Yes	Yes
Diagnostics	Yes	Yes	Yes	Yes	Yes	Not obs.
Other	Yes	No	Yes	No	No	No

Fig. 1. Flowchart packages included in comparison.

FIGURE 2. SUMMARY OF FLOWCHARTER COMPARISON

OUTLINES	ANSI STANDARD	ADR - AUTOFLOW	APC - DYNACHART
Input-Output			
Shape	Parallelogram	Parallelogram	Rectangle
Size W x H	Any	2.1 x 0.8	2.4 x (0.3 → 2.5)
Ratio W : H	1.0 : 0.67	1.0 : 0.38	1.0 : (0.12 → 1.05)
Graphics	Any Uniform	– /	– /
Source Wording	Any	Some Truncation	Full
Process			
Shape	Rectangle	Rectangle	Rectangle
Size W x H	Any	2.0 x (0.4 → 1.7)	2.4 x (0.4 → 1.5)
Ratio W : H	1.0 : 0.67	1.0 : (0.20 → 0.85)	1.0 : (0.17 → 0.62)
Graphics	Any Uniform	– I * In Corners	– I
Source Wording	Any	Full	Omits "Move" Verb
Flowline			
Forms	Two	One	One
Arrowheads	L, U At Minimum	L, R, D, U	None
Graphics	Any Uniform	– I VA >< +	– I
Annotation			
Shape	R Open Rectangle	Rectangle	No Outline
Size W x H	Any	2.0 x (0.4 → 2.3)	1.9 x (0.1 → 2.4)
Ratio W : H	1.0 : 0.67	1.0 : (0.20 → 1.15)	1.0 : (0.05 → 1.26)
Graphics	Any Uniform	*	None
Source Wording	Any	May Be Successive	Trunc. After 20 Lines
Connector			
Shape	Circle	Circle, IBM, Slash, None	Not Used
Size W x H	Any	0.5 x 0.4, 0.7 x 0.5, 0.7 x 0.3	
Ratio W : H	1.0 : 1.0	Circle OK	
Graphics	Any Uniform	• I / –	
Source Wording	Out Match In	Page.Box, Source	
Terminal			
Shape	Oblong Flattened	Trapezoid, Oblong	Not Used
Size W x H	Any	1.2 x 0.3	
Ratio W : H	1.0 : 0.38	1.0 : 0.25	
Graphics	Any Uniform	– / *	
Source Wording	Identifying	Brief	
Decision			
Shape	Diamond	Diamond	Rounded Rectangle
Size W x H	Any	1.6 x 1.0	2.4 x (0.3 → 2.5)
Ratio W : H	1.0 : 0.67	1.0 : 0.64	1.0 : (0.12 → 1.04)
Graphics	Any Uniform	*	*
Source Wording	Any	Cont. In Annotation	Omits "IF", Uses Positives
Preparation			
Shape	Rectangle With Points	Not Used	Not Used
Size W x H	Any		
Ratio W : H	1.0 : 0.67		
Graphics	Any Uniform		
Source Wording	Any		
Predefined Process			
Shape	V. Stripe Rectangle	V. Stripe Rectangle	Not Used
Size W x H	Any	2.0 x (0.4 → 1.6)	
Ratio W : H	1.0 : 0.67	1.0 : (0.20 → 0.80)	
Graphics	Any Uniform	– I H * In Corners	
Source Wording	Any	Full, Page.Box	
Horizontal Striping	Closed Outlines	Rectangles For Decision	Not Used
Other Outlines	Many	None	Dumbbell

DIC - AUTODOC	LEWIS AUTODOC - V	NCA - QUICK - DRAW	WCC - FCP
Trapazoid or Paral. 2.3 x (0.4 → 1.4) 1.0 : (0.17 → 0.61) * Full	Trapazoid 2.1 x 0.9 1.0 : 0.43 • Specified	Rectangle 3.3 x (0.3 → 2.5) 1.0 : (0.09 → 0.76) – Full	Parallelogram 3.3 x 0.3 1.0 : 0.09 – * Some Truncation
Rectangle 2.1 x (0.3 → 1.1) 1.0 : (0.14 → 0.52) * Full	Rectangle 1.5 x 0.8 1.0 : 0.53 • Specified	Rectangle 3.3 x (0.3 → 2.5) 1.0 : (0.09 → 0.76) – I Full	Rectangle 3.3 x (0.3 → 4.0) 1.0 : (0.09 → 1.21) – I * In Corners Full
One D • V	One L, R, D – I V >< ⌐⌙	One L, R, D, U – I * V	One D – I V
Pair Horizontal Lines 2.7 x (0.4 → 5.0) 1.0 : (0.15 → 1.85) – Full	Not Used	No Outline 2.8 x (0.1 → 2.3) 1.0 : (0.04 → 0.82) None Full	Not Used
Circle, IBM, Oblong 0.5 x 0.6, 0.5 x 0.3, 0.6 x 0.5 Circle OK – / I * Synthetic, Page-Box	Circle, IBM (Also Turned) 0.6 x 0.6, 0.5 x 0.6 Circle OK • Synthetic	Circle, None 0.8 x 0.7 Circle OK * Page.Box, Source	Circle, None 0.6 x 0.5 Circle OK * Page.Box, Source
Oblong, Parentheses 2.1 x (0.3 → 1.1) 1.0 : (0.14 → 0.52) * ( ) Full	Oblong Flattened 1.9 x 0.6 1.0 : 0.32 • Specified	IBM Connect., Paral., Triangle ( ) 3.3 x 0.3, 0.8 x 0.6, 1.2 x 0.9 1.0 : (0.09 → 0.75) – / * ( ) Brief	Paral., Triangle, ( ) 3.3 x 0.3, 0.8 x 0.6 1.0 : (0.09 → 0.75) – * ( ) Brief
Diamond (Drop Bottom) 1.3 x 0.5, 1.8 x 0.8, 2.4 x (1.2→5.0) 1.0 : (0.42 → 2.08) * • Full, Sometimes Rewords	Diamond 2.1 x 1.3 1.0 : 0.62 • Specified	Diamond 1.3 x 1.1, 1.7 x 1.4, 2.1 x 1.8 1.0 : 0.85 * Cont. In Annotation	Diamond 2.1 x 1.3 1.0 : 0.62 / X Omits "IF"
Rectangle With Points 2.3 x (0.4 → 4.6) 1.0 : (0.17 → 2.0) * Full, Page-Box Below	Rectangle With Points 2.0 x 0.8 1.0 : 0.40 • Specified	Not Used	Not Used
V. Stripe Rectangle 2.7 x (0.4 → 4.6) 1.0: (0.15→1.77) * Full, Page-Box Below	Not Used	V. Stripe Rectangle 3.3 x 0.6 1.0 : 0.18 * H Full, Page.Box	Not Used
Not Used	Subroutine Calls	Not Used	Not Used
Rectangle, Right Point	Rectangle, Right Point	None	None

of the packages do not use it. The predefined process outline has been changed in function with the different versions of the Standard. The ADR-AUTOFLOW, DIC-AUTODOC, and the NCA-QUICK-DRAW were capable of producing the vertically striped rectangle form. The use they assigned it in COBOL was for representing the PERFORM statement. Using the more modern versions of the Standard, these should have been presented in a horizontally striped outline, not in the vertically striped rectangle. The Lewis-AUTODOC-V and the ADR-AUTOFLOW provided horizontally striped outlines. The Lewis-AUTODOC-V used them for subroutine calls generally, but did not provide the cross referencing called for in the ANSI Standard. The ADR-AUTOFLOW used horizontally striped outlines for decision functions—a clear violation of the Standard.

Five examples of nonconforming outline shapes were noted. One already cited was for annotation. Another observed only in the APC-DYNACHART was the use of a dumbbell like a pair of connector circles placed astraddle the flowline, for calling attention to the succeeding outline as specifying an ALTER operation, shown in a rectangle (a preparation outline would have been conforming).

The third example was the use of a rectangle with a pointed right end for program modification ("preparation") in the Lewis-AUTODOC-V and the DIC-AUTODOC. This is a usage taken over from IBM's former practice. The fourth was the use of rectangles for GO TO statements in the DIC-AUTODOC. This in effect resulted in successive connectors in the line of flow. Fifth was the use of horizontal striping in the ADR-AUTOFLOW for switch functions. The Standard provides a choice of specific shapes and conventions for this purpose, and assigns horizontal striping a different function.

Cross references

The packages showed much diversity in their use of cross references. Both the ANSI and ISO practices are observed in the examples included.

Sequence numbers assigned to the source code are at the heart of the way all of the packages provide for cross references except the Lewis-AUTODOC-V, which uses a grid arrangement. Also for cross reference, the packages show the COBOL paragraph and section names on the flowchart. But they display no consistency on this matter. The ANSI Standard does not distinguish source code sequence numbers from source code names. Yet both cannot occupy the same space in the flowchart. Using both, as all the packages except the Lewis-AUTODOC-V do, therefore results usually in a violation of the Standard, and a diversity of practices displayed by the packages.

The ANSI Standard for some years has specified that cross referencing by flowchart location is to be done for striped outlines. In practice this convention was not observed by the packages in the manner specified by the Standard.

Striping

Some observations on striping have been reported previously in this paper. The use of horizontal and vertical striping is not new in the ANSI Standard, yet none of the packages produced flowcharts conforming to the Standard on striping. This, like cross referencing, was a major area of nonconformity.

Connector identification

The ANSI Standard specifies the manner of connector identification. Since connectors were used so loosely in terms of conformity with the ANSI Standard, as noted previously, the connector identification also suffered —but not as much as the use of connectors itself.

Multiple exits and parallel operations

The ANSI Standard specifies manners of representing multiple exit flow paths when the number exceeds three, and a way of representing parallel operations. In practice, with present-day computers and COBOL, these situations are rarely encountered. The five test programs did include an instance of the multiple paths. None of the packages handled it in conformance with the Standard. The test programs did not include any instances of parallel operations.

Flowlines

The Standard specifies an open arrowhead for use on flowlines, and this can be approximated on line printers. The Standard requires the use of arrowheads to indicate flow direction if it would be otherwise ambiguous, or if it deviates from the usual top to bottom and left to right. All of the packages deviated from the Standard on arrowheads.

The Standard clearly specifies a means for indicating joining flowlines, for indicating crossing flowlines that do not join, and for avoiding crossing flowlines. Some packages, such as the APC-DYNACHART and the DIC-AUTODOC, never cross flowlines. Others, such as the NCA-QUICK-DRAW, rarely cross flowlines. The ADR-AUTOFLOW and the Lewis-AUTODOC-V both often cross flowlines. But all the packages with crossing flowlines fail to do it in the manner specified by the Standard.

The ADR-AUTOFLOW, and to a lesser extent the NCA-QUICK-DRAW, illustrate another nonconformance with the Standard. When the amount of wording to be placed within an outline exceeds some given amount, rather than use a larger size of outline or truncate the wording the package continues the wording in a subsequent outline or in an annotation outline. Since the Standard specifies a means of changing the outline size, breaking the wording across outlines becomes a violation.

It is my impression from talking with package vendor personnel, from studying the flowcharts produced by the packages, and from talking with the users, that some of the violations of the ANSI Standard arise from inertia or the blind following of prior practice. Some arise from ignorance of the Standard. Some arise from willful deliberate action. And some arise as a matter of vendor convenience. A brief look at each may clarify these comments.

An example of inertia or the blind following of historical practice is the perpetuation of outline shapes used by computer vendors. One example is the off-page connector outline used by IBM. Some of the packages, such as the ADR-AUTOFLOW, have carried this outline over into their output.

Yet the Standard provides a connector outline and provides a means of cross reference to enable the user to distinguish whether or not it is on-page or off-page. It can well be argued therefore that since the Standard has provided something for the function, the IBM off-page outline is a violation of the Standard. In addition, some of the package vendors, such as in the DIC-AUTODOC package, are able to designate by their use of the connector identification whether or not something is on-page or off-page in a manner that conforms with the Standard. (The DIC-AUTODOC's use of the IBM connector itself is redundant.)

A good example of ignorance of the Standard is, surprisingly enough, the ratio and size requirements. The ratios have been a part of the Standard since 1963. The Standard's use of ratios without tolerance ranges follows in the tradition of ratios used in other standards for graphic material as, for example, in some of the standards for electronic graphics. To accommodate different amounts of wording, and different amounts of space available, the Standard permits the use of any size of outline, as long as the ratio, shape, and general orientation of the outline is preserved.

Yet, in talking with some of the creators and maintainers of these packages in their own shops, I have

been frankly surprised at the ignorance of the Standard they show. They generally cannot answer the question "What is the ratio specified for this outline by the ANSI Standard?" nor do they have available a reference source that they can turn to. Many shops had no copy of the ANSI Standard available for use of their package writing or maintenance personnel. Often they could not cite a location in any publication they or their employer had where they could find detail on the Standard.

When the designers of the packages do not know the Standard it is difficult for them to make their packages conform to it. This ignorance of the Standard is perpetuated by the very high cost per page ANSI asks for the copies of the Standard, by the severe restrictions ANSI places upon reprinting the Standard's words or figures in a publication (you notice none in this paper for that reason), and by the failure thus far of professional associations (such as ACM, DPMA, AFIPS) and periodicals (such as DATAMATION) to require all of their authors to use the Standard.

Willful nonconformance to the Standard is not hard to find. The most common source of this comes from the discrepancies between the ANSI Standard and the practices followed by IBM in the past and currently in flowcharting. The package vendors argue that approximately 70% of the computer users (their prime market) have been exposed to and indoctrinated in the IBM way of doing things. They believe, if they wish to sell to this market, they should follow the IBM practices, irrespective of whether or not they conform to the ANSI Standard. Guesses about market acceptance are the criteria, not conformance to the Standard.

IBM's publication in 1969 of a new template (X20-8020-1), which includes as a subset the ANSI Standard outlines, would give less fuel to this argument than existed in the past—if the package vendors would revise their programs to match. However, the new IBM template provides three outlines which are not part of the ANSI Standard: keying, transmittal tape, and off-page connector. The idea of giving the package user a choice has been tried: the DIC-AUTODOC offers the user a choice of IBM practices or not, for example.

The convenience of the vendor is also an important influence affecting conformity with the ANSI Standard. One example is the use of source code sequence numbers in the flowchart. Another example is the common vendor practice of making outlines have a uniform width and variable height, and thus violate the ratio requirement. Using outlines of all one width is convenient for the package creator. Then he simply varies the vertical dimension to accommodate the wording he desires to put in the outline.

Is this really a significant convenience to the vendor or creator of the package? The mathematical knowledge necessary to calculate the length and width of an enclosing outline, given the ratio, is elementary and is widely known. Also, it is easy to calculate the area needed as a minimum to be enclosed within the outline, and the length of the longest line of wording, simply by parsing and counting the characters chosen to be printed within the outline. It then becomes relatively simple to calculate the outline width, center, and height, given the limitations of the printer, to approximate closely the ratio requirement. Further, it is not difficult to center the wording within the outline as is done in the ADR-AUTOFLOW, or to justify it as is done in the APC-DYNACHART.

Where then does the complication come? The complication comes in the allocation of page space. The typical package designer likes to visualize a page ruled off into a fixed number of uniform vertical columns. As long as the outline width stays within the margins of the imaginary column, no problem exists. But when the width of the outline exceeds the space provided in the imaginary column, then the outline begins to infringe upon the space for outlines in the adjoining columns. For columns on the sides of the page, this may be an absolute limit. If they are in one of the center columns, then only smaller outlines can be placed in the adjacent column, or flowlines only will have to be used to pass the bulge in the other column.

But how serious a practical problem is this? The real question arises as to how much wording is to be placed within the outline. In practice, the outlines requiring the largest amount of wording are annotation outlines, process outlines, and decision outlines—in that order. Annotation outlines should always be set to the side of a line of flow anyway, following the practice indicated by the ANSI Standard. Hence, they should be already occupying space in an adjoining column. The impact of these on the allocation of page space is direct and obvious in the common instance—and currently ignored by the vendors.

For process and decision outlines, however, the picture is far less clear, and the problem is at its worst for COBOL. Long decision wording can often be parsed to break the decision into a group of distinct separate decisions. For the process outlines, by contrast, long wording normally arises by combining in one outline more than one operation. Parsing the wording to provide fewer operations within the outline can often have the effect of reducing the amount of wording to be accommodated in any one outline, and thus of reducing the outline size needed. It would be far more difficult to substitute shorter wording for the verbatim COBOL wording.

Conclusion

The flowcharts produced by the packages compared here generally use the shape of outlines appropriate for the operation, as indicated by the ANSI Standard, although even there some exceptions were noted. The packages also conformed well to the Standard on the direction of flow. But on most other points, nonconformance was the rule. Annotation was not in conformance, and ratio, connector, and cross reference practices were commonly not in conformance with the Standard.

Each of the packages lacked conformance with the Standard in different ways. Each of the vendors, in a desire to differentiate their packages and gain a competitive edge, may feel that producing ANSI Standard flowcharts would blur their competitive advantage. Can they best compete by nonconformance with the Standard? But is the welfare of the vendor the main issue? How about the package user? Maybe the real question is "Does the user want packages that produce flowcharts meeting the ANSI Standard?"

Acknowledgments. I am indebted for the fine cooperation provided by the personnel of: Applications Programming Co., Moorestown, N.J.; Applied Data Research, Inc., Los Angeles, Calif.; Data Instrument Co., Sepulveda, Calif.; National Computer Analysts, Inc., Princeton, N.J., and F. David Lewis, Kingston, N.Y. To each I extend thanks. □

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It now appears that
an international standard for cassettes
will be officially adopted

The New Cassette Standard

by William W. Otterson

Despite the paper-rattling by IBM over the last few years regarding a tape pack that—with IBM's muscle behind it—would become a *de facto* standard, the computer industry does have a new draft international standard for cassettes.

The X3B1 Committee of BEMA (Business Equipment Manufacturers Association), the computer industry's input to ANSI (American National Standards Institute), is now voting on adoption of the proposed ECMA (European Computer Manufacturers Association) Standard for Interchange of Data on Cassettes.

The new draft standard (available by writing to the author*), picks up where the old Philips standard—which covered only the outside physical dimensions of the cassette—leaves off. In addition to size, it calls out recording density (800 bpi), cyclical-redundancy-check character (CRCC), recording mode (phase encoded), 2 tracks one at a time (side A and side B), tape length 282 feet minimum, inter-record gap (minimum of 0.7 inches, maximum of 19.7 inches), and format (8 bits per character with preamble and postamble for each record).

For the cassette user—whether he plans to interchange data with someone else or not—the new draft standard offers a number of advantages in system implementation, performance, reliability and cost.

The first advantage to the user is that the new draft standard will make his choice of cassette drives easier. Instead of attempting to determine the relative merits of 550 bpi vs. 800 bpi, or one-track phase encoded recording vs. two-track NRZI recording, the user can evaluate the characteristics that relate directly to his specific application: What is the data transfer rate? Is the transport convenient to operate? How easily will it interface with my system?

With an established standard, product designers can produce cassette peripherals knowing that these will not be made obsolete by a new format.

For example, a product requested by many cassette users is a cassette-to-industry-compatible-tape converter, to permit communication with the computer center. Before the draft standard existed, the design engineer had to tailor the product to a specific manufacturer's format and thereby limit his potential market. With the standard, a general-purpose system can now be designed. With its greater market potential, its price will be lower than the semicustom product.

Other obvious products meeting these same criteria are keyboard-to-cassette encoders for entering programs onto cassette tape, off-line cassette printers for remote printing or used to conserve cpu time, and data loggers utilizing cassettes for the output.

Design engineers will now be able to concentrate on developing products within the standard.

Instead of trying to double the density, the engineer will work to double the tape speed. Instead of trying to reduce the inter-record gap, he will work to reduce start-stop times. Instead of trying to redesign the cassette, he will work on making the transport simpler and more reliable.

The analogy to the history of the industry-compatible ½" tape drive is obvious. By concentrating their efforts on speed, designers of minicomputer tape decks have been able to increase speeds to 75 ips on a $4500 tape drive —unthinkable only a few years ago. Unquestionably, cassette drives will similarly increase their tape speed from a current 24-30 ips to 48 or 64 ips.

Interchangeability

Cassette users have been plagued by a lack of interchangeability of cassettes from drive to drive, in some cases even when the drives were from a single manufacturer. The new standard assures that if its specs are met, there will be no such problems.

The pressures for low-cost cassette drives were so great when they were first used that some of the early drives were simply converted audio decks.

*C/o Cipher Data Products, 7655 Convoy Ct., San Diego, CA 92111.

Poor early reliability almost killed the cassette as a usable magnetic recording device for minicomputers, terminals, etc.

The stringent requirements of the new standard for good speed control, tracking and recording will weed out the lower quality drives on the market.

The standard also does away with the fear of getting locked into a single manufacturer or having your system made obsolete by new, noncompatible equipment.

However, present users of equipment that does not meet the new standard are faced with a dilemma if they need additional units. Should they convert now, or prolong the agony by ordering another noncompatible system? The equipment manufacturer is faced by the same problem: when should he obsolete his present line of equipment?

The shakedown to convert might take a year or so, but steps have already been taken by some manufacturers. If their equipment meets the new standard's specifications for bit-to-bit spacing, phase encoding, track position, inter-record gap, etc., the manufacturers are converting now and providing update kits to retrofit installed tape drives. (Where the equipment does not meet the stringent new requirements, there is a great deal of gnashing of teeth and redesign going on.)

Future of cassettes

Cassette drives should follow pretty much the same pattern that was established by industry-compatible ½" tape drives. There will be a short shakedown period, then the user will have his choice of a greater number of types of equipment from several manufacturers, all of the equipment with better performance, reliability and price than before the standard was adopted. □

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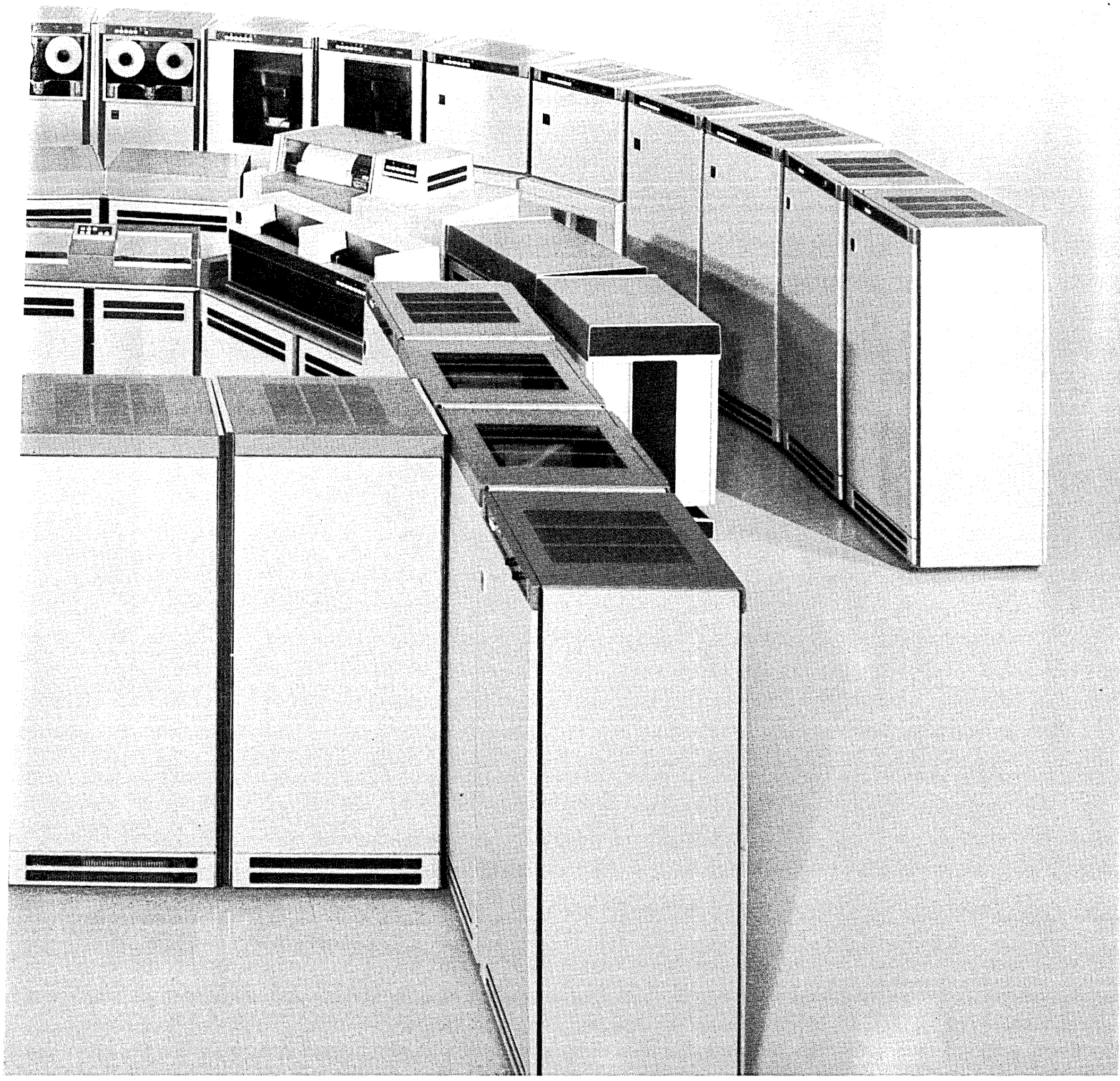

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CIRCLE 37 ON READER CARD

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Announcing faster memory, more expensive processors, cheaper disc systems, and the death of the 370/155 and 165

IBM's Virtual Memory 370s

by R. A. McLaughlin, Associate Editor

On August 2, 1972, IBM propelled itself into a new chapter in its history. With an announcement framed in uncharacteristically bold language, the company simultaneously redirected its product line, increased the capabilities of some of its installed products, showed off a new memory technology, killed the two-year-old 155 and 165, reduced prices, and took a strong swipe at that part of its competition that it considers parasitic.

IBM's announcement confused many. Part of the confusion stemmed from the fact that there were dozens of new products and features hidden under one cover, including: four processors (the 155 II, 165 II, the 158 and 168), a combined disc and controller (the 3333), three integrated disc controller features, and four bundled operating systems (DOS/VS, OS/VS1, OS/VS2, and VM/370).

The common denominator of all the releases was that they were designed to make virtual memory work cost effectively on the 370s.

Virtual memory is not new. It was released at least as early as the Burroughs 5000 processor in 1961, and has been used since by other computer manufacturers, including RCA and IBM itself. Basically, it gives the programmer the ability to use the real memory attached to his processor as if it were much larger than it actually is. The concept relies on a backing store, like disc subsystems, which the virtual memory operating system uses to temporarily hold those parts of a program which are not currently being executed.

The complicated part of any such memory organization is keeping track of what part of the program is in real storage and what part is on disc. IBM does this through a feature called DAT, or Dynamic Address Translation. DAT requires some extra registers and logic. In planning ahead, IBM built most of the DAT requirements into the 370/135 and 370/145, so those machines will get the new feature free. IBM did not build the extra hardware into the 155 and 165, so converting them is quite a job (and a terrific expense on purchased machines). The new machines, the 158 and 168, will come with that hardware too, of course. In other particulars they are much like the 155 and 165 which they replace.

What the user realizes from the change-over is not only the ability to address up to 16MB of memory in a single program, but also of running more jobs at a time, and of dedicating partitions or regions to specific applications without necessarily tying up real memory. He can always keep a partition open for priority runs, although that partition may have zero memory when not being used. Similarly, the user can have a region for systems development, and he can even run a completely different operating system in that region than he is using for production work.

IBM claims that the change-over from an existing operating system to one that is built for virtual memory "will be no more difficult than implementing a new system level." That's good news, as is the fact that no user program conversion is required. Object decks and old JCL will run without alteration in almost all cases.

The first of the compatible operating systems is DOS/VS, a control program that comes as a surprise to those of us who expected IBM to drop DOS except under emulation. To become available in mid-1973, the new DOS runs on anything up to the 158 (except for unconverted 155s).

DOS/VS will divide real memory and back-up store into 2KB "pages" within 64KB "segments" to support the on-demand paging that IBM's virtual storage concept requires. User programs can have as many 2KB pages of real memory as they can keep active, although those pages will not be contiguous. Pages which go idle for a moment may be swapped out until they are addressed again by the user code. The other operating systems, of course, work similarly, relying heavily on hardware for the dynamic address translation and transparent page swapping.

DOS has been enhanced with two more partitions, a relocating loader, and multitasking of 15 tasks instead of 12. It also gets an upgraded version of the POWER Type III spooling program as a standard feature.

Also included is a new disc access method called VSAM, which replaces ISAM. VSAM provides improved record handling functions, especially for overflow records and batch updates. More important, it is said to be "the first truly device-independent access method" and the first one to provide true data portability across operating systems. (Watch for VSAM's data set sharing capability to be used in later data management program products.)

All of the new operating systems use VSAM, but an ISAM compatibility interface is provided so that programs written to access ISAM files can access VSAM

files instead. There will also be a utility for converting ISAM files.

Enhanced OS/MFT and MVT

OS/VS1, available *now* for systems with 148KB and the dynamic address translation, is a replacement for OS/MFT. The new version, in addition to its virtual memory capability, provides a thing called Job Entry Subsystem which is a revision of HASP. It replaces the MFT writers and readers and has a Remote Entry Services function for jobs coming in over binary synchronous lines. As with MFT, VS1 handles up to 15 jobs in fixed partitions. As with DOS/VS, it swaps 2KB pages back and forth between real and back-up memory.

OS/MVT was capable of running up to 15 jobs. OS/VS2, its replacement, can run up to 63. VS2 does not get the Job Entry Subsystem used in VS1; instead it gets HASP, which is an option just as it was with MVT. VS2 also uses 4KB instead of 2KB pages. Available in the fourth quarter of 1972, it runs on 384KB 145s and up.

Two questions must be asked about the new operating systems. First, given

Management Summary

- Although virtual memory allows a programmer to disregard his memory usage, such disregard will still lead to inefficient memory and cpu usage.
- Most programs need no conversion, even in control cards, but restructuring them should improve their performance.
- A single program can now address up to 16 megabytes of memory; but for efficient processing, the amount of real memory must be balanced with the amount of virtual memory.
- Many of the artificial restrictions on the use of partitions or regions have been eliminated; this should facilitate the development of new applications.
- The new virtual memory operating systems are compatible with their older counterparts.
- The new operating systems enable a site to check out one operating system while running production work under another.
- 370/135 and 145 users can have the virtual storage facility immediately, and without charge.
- Sites renting 370/155s and 165s should consider trading them in on 158s and 168s to get the virtual storage facility, a probable increase in performance, and a possibly lower rental.
- Owners of 155s and 165s can upgrade to 155 IIs and 165 IIs, but at a cost of $200,000 and $400,000 respectively; the model IIs will not get the faster semiconductor memory or other performance upgrades.

The model 158, a replacement for the now-retired 155, comes with a light pen console. Oddly, the 165 replacement can't have the toy.

the same mix of jobs, will they run faster or slower than the older systems? Second, do they require more real memory?

The speed question depends heavily on the job mix and on how much tuning a user had done with his old system. It is safe to say that the paging mechanism built into virtual memory management makes for better memory allocation and hence more efficient multiprogramming. Undoubtedly users will have to consider how to modularize their programs to make them run really efficiently, especially so that the operating system doesn't have to thrash around moving the same code back and forth from disc.

As far as main memory requirements are concerned, the virtual memory operating systems are bigger, but not much. As mentioned, virtual memory systems can be run on even the smallest 135. But for comparison, a stripped vs1 system might take 64K, while its MFT predecessor got by on a 40K nucleus. Since the subsystems and utilities are virtually (no pun intended) unchanged, the 24K would represent most of the difference between vs1 and MFT residency.

Beyond that, subsystems, compilers, and utilities can be paged, too, although they may not yet have been optimized for swapping. So fitting one in should be no big problem.

An operating system's operating system

A fourth systems control program was introduced, but it wasn't called an operating system. Instead it is called Virtual Machine Facility/370. It represents a higher level of software than does an operating system. Its function is to allow the multiple operating systems to run concurrently in the same machine, for example setting up a DOS virtual machine for one user and maybe an os/vs2 machine for another. It will probably be most used for checking out a new system level while running production under an old one.

The hardware

It takes more than compatible operating systems to run virtual memory effectively. Fast direct access storage devices are required plus some facility to rapidly move chunks of data or program from memory to those devices. With the 370s there are two kinds of storage to consider, the 2305 disc and the 3330 disc pack subsystems.

On the 135, 145, 158, and 168 there is also fast semiconductor storage for that program swapping. That is not true of the older core-based 155s and 165s. Sites with rented 155s and 165s will be expected to simply trade them in for the faster plug-compatible replacements. A modification is available for customer-owned 155s and 165s to make them capable of handling virtual memory, too. However, the modification consists of the hardware required for DAT and a lot of rewiring, but does *not* include replacement memory.

Most 155 and 165 *owners* will look long and hard at their need for virtual memory before they order the upgrades to make their machines mod IIs. IBM has tagged those modifications with out-of-sight prices. It will cost $200,000 to upgrade a 155 to a 155 II, $400,000 to take a 165 to a 165 II. The work may be extensive, but the pricing seems to be a slap at people who refuse to rent. After all, $200,000 is enough to buy three or four System/3s; and $400,000 will almost get you a 370/135 cpu and memory.

Even after the changes have been made to them, the mod II machines will not be competitive with the 158 and 168. Not only are the newer machines faster, but for large memory configurations they are also cheaper. For all practical purposes, IBM has retired the old numbers.

IBM says the 158 executes instructions at a rate from 20 to 40% faster than a similarly programmed and configured 155. Part of its improved performance can be traced to its new n-channel MOS memory technology, which permits 16-byte accesses in 1,035 nsec—twice as fast as the 155. It features 8K bytes of reloadable control store where the 155 had none. It also sports free emulators and free extended precision arithmetic; the latter should make it more attractive to scientific shops.

The 158 also has five groups of improved instructions, including: multiply, move, shift, pack/unpack, and convert.

A typical small configuration of the 158 was quoted at $49,500/month or $2,300,000 purchase. For that the user gets: 512KB of MOS memory, one 3505 card reader, one 3525 punch, one 3211 printer, one 3333 disc/disc controller, three 3330 dual-spindle disc pack drives, six 3420 tape drives, and the integrated storage controller required to make the 3333/3330 combination work. Deliveries begin in the

Processor and Memory Monthly Rentals

Memory Size	155	158	% of Change
0	$19,980	$30,700*	up 54%
512KB	$26,030	$33,300	up 24%
1MB	$32,570	$35,900	up 10%
2MB	$46,840	$41,100	down 12%

Memory Size	165	168	% of Change
0	$35,640	$48,600*	up 36%
1MB	$47,745	$53,800	up 13%
2MB	$60,500	$59,000	down 2%
3MB	$73,580	$64,400	down 12%
4MB	not available	$69,600	—

*estimated; not actually available

Disc Subsystem Monthly Rental Differences*

CPU	No. Packs	"Savings"
135	2-8	$1383
	10-16	$3446
145	2-8	$ 923
	10-16	$2996
158/168	2-8	(up $127)
	10-16	$1946
	18-24	$4019
	26-32	$6092

*These figures represent the differences in rentals between 3330 disc subsystems using existing 3830 I controllers and similar configurations using the integrated storage controllers, 3333s, and 3330s.

second quarter of '73.

Memory on the 158 can be added in 512K blocks up to 2MB, so a big configuration might include the 2MB memory, two card readers, one punch, two printers, four 3333s, 12 3330s, 16 tapes, and the ISC. Such a set-up would run $85,000/month, or $3,700,000 on purchase.

The pricing

At first glance the pricing seems straightforward. It isn't. First, the cost of the systems to the user has been shifted from the memory and discs into the cpu and its integrated controller. The price is up from $26,030 for the 155 cpu and 512K to $33,300 for the 158 and 512K, an increase of 24%. Given the fact that the memory is now far *less* expensive, at $2600 for 512K compared to $6000 for core and $5260 for the 135/145 bipolar, this means the naked cpu cost has gone up an incredible 54%, as close as we can figure.

And yet, in the big configuration comparison, the 158 cpu and its complement of 2MB of memory costs 12% *less* than the 155 with 2MB.

This kind of pricing can't do very much for IBM revenues, but it may drive independent memory suppliers up the wall (or out of business).

The big machine

The same pricing and performance games are played with the 168. Although this machine does not benefit from an improved instruction set, it reportedly executes instructions 10-30% faster than a similarly programmed and configured 165. A big part of its boost comes from having a dual bus into the memory controller, making for aggregate data rates in the 16MB/second range rather than the 8-9MB/second quoted for the 165. The 168 benefits from an improved buffer algorithm and a memory access of 32 bytes in 800 nsec (compared to the 165's 2,140 nsec).

The 168 ranges in price from a low of $93,000/month for the cpu with 1MB of memory, a selector channel, a multiplexor channel, a block multiplexor channel, a 3333, three 3330s, two card readers, two punches, two printers, and ten tape drives. For that gear, a purchase price would be $4,200,000. Availability is scheduled for the third quarter of next year.

A full-blown 168 would go for $170,000/month or $7,300,000 if it included one selector, two multiplexors, two block multiplexors, four 3333s, twelve 3330s, three readers, two punches, three printers, and 32 tapes.

As with the 158, more of the price of the 168 is in the cpu (it's gone up 36% over the 165 price) and less in the memory. A 3MB 168 is actually 12% less expensive than a 3MB 165. The 168 can go to 4MB, too, as opposed to the 165's top of 3MB. (This in itself is strange, since you should be able to do more with less memory under a virtual storage system, but IBM admits "there is no substitute for real memory.")

The pricing of the memory is only one part of what the independents are stirred up about. Another is that IBM has doubled the minimum storage available with the 158 and 168 compared to that of the 155 and 165. (The numbers have gone to 512KB and 1MB, respectively.) And the minimums are built into the cpu frame. These actions will cut down on the amount of memory that can be sold as add-on.

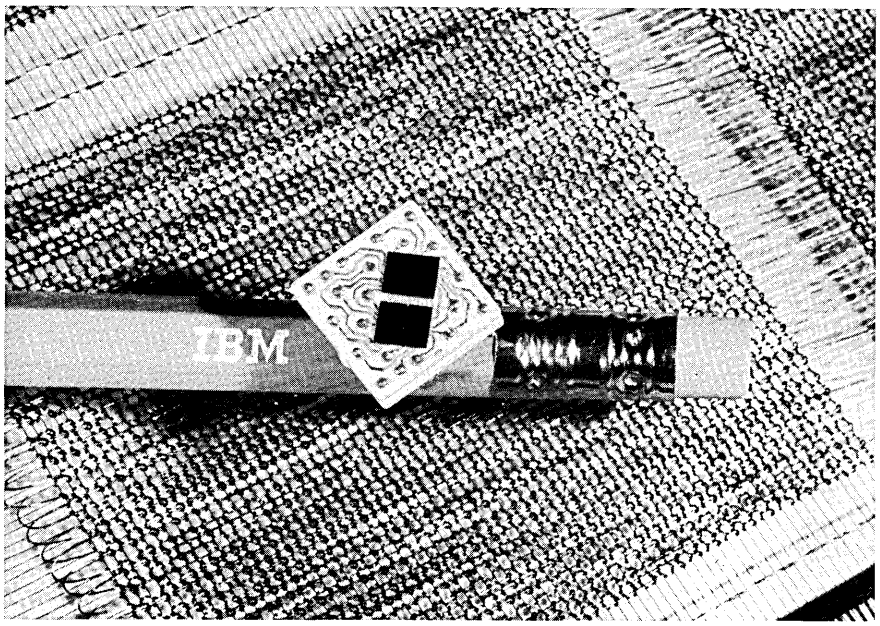
Still another part of the independents' problem comes from the new products and new prices announced in support of the 3330 disc pack subsystems. For starters, 3330s can now be attached to 370s in two new ways, both cheaper than the existing 3830 I. The first way is through a 3830 II controller, which is not only $375 per month cheaper but can handle twice as many 3330 dual-spindle drives as the 3830 I. The 3830 mod II cannot be used alone, however. It requires that the first dual-spindle drive of every four attached to it have some control functions. Hence the introduction of the 3333, which is a dual-spindle drive with some control functions. The 3333 runs slightly more than a stock 3330 ($1627/month vs. $1300/month), but the resulting subsystems can be much less expensive.

With the integrated storage controller (ISC), even the 3830 II can be dropped on the 135, 145, 158 and 168. This feature is variably priced, ranging from $700/month on the 135 (where it is called an integrated file adapter, or IFA, since it performs some channel functions, as well as control functions) to $1150/month on the 145 and $2200/month on the 158 and 168.

Overall, the price of disc support can drop substantially in almost all configurations, but the pricing clearly favors the bigger ones. Theoretically, up to $6092/month could be saved by using the ISC on a 158 or 168 with 32 spindles (instead of the old 3830 I/3330 combination). Even on a 135 with two spindles, the user can realize a $1383/month savings with the IFA.

This kind of reconfiguration and pricing is great for the user, but it hits the independent disc drive supplier in two ways. First, he can no longer expect to sell a full-blown controller, as IBM has pulled some of the functions into the cpu. Second, he must redesign to match the new interface, and that can be costly.

In the final evaluation, IBM will come out of this with a firm platform for launching itself into data base management and teleprocessing applications. The users should come out with more power or more capabilities for the same or less money. The independents, on the other hand, may simply come out with less money. (For initial industry reaction to the announcement, see the News in Perspective section in this issue.) □



Four n-channel MOSFET (Metal-Oxide-Semiconductor Field Effect Transistor) chips the size of the two shown here provide the same 4K bits of storage as the core plane in the background. The chips run at twice the speed for half the price.

Contributors to this article included: DATAMATION staff members Edith D. Myers, Michael Cashman, Dave Gardner, Ed Yasaki; and Lowell Amdahl, DATAMATION's technical adviser.

By judicious use of data compression techniques, this installation has realized clear savings of $10,000 a month

Data Compression for Large Business Files

by Stephen S. Ruth and Paul J. Kreutzer

Data compression is of interest in data processing because it offers cost savings and the potential for increased capacity in mass storage devices, channels, and communications lines. This paper will review compression techniques as they apply to business data files and describe an implementation of data compression on a business type drum file under severe constraints of core space, execution time, and compression requirements.

Definitions

A compressor is a software routine or hardware device which accepts a string of bits or characters of data and transforms it into a shorter string. A decompressor is a routine or device which transforms the compressed string back to its original uncompressed form. Compression ratio or figure of merit (1)* is the measure of degree of compression expressed by the fraction:

$$\frac{\text{Length of Original String}}{\text{Length of Compressed String}}$$

A variety of data design techniques resemble compression; however, they are not included in the above definition since they are applied at the time the data record is designed, and not inside a hardware or software "black box." These data design techniques include header-trailer techniques, packed fields, dual purpose fields, decimal to binary conversion, abbreviating or devising coded values for individual data elements, field differencing, etc. Data compression may take place independently of and in addition to field level data coding and other space-saving data design techniques.

*See corresponding number in reference table at end of article.

1.	CUSTOMER-NAME	JOHNbSMITHbbbbbbbbbbb
2.	ITEM-NUMBER	123456
3.	DESCRIPTION	STRIPEDbSOCKSbbbbbb
4.	QTY-ORDERED	00002
5.	QTY-SHIPPED	00000
6.	AMOUNT-PAID	000200
7.	AMOUNT-DUE	000000
8.	CREDIT-TERMS	bbbbbbb
9.	DANGER-CODE	b
10.	SPECIAL-HANDLING-CODE	0

Fig. 1. Typical customer order record.

Business data files

Since compression routines are designed specifically for the type of data to which they will apply, it is worthwhile to examine some general characteristics of business data files.

Fig. 1 is a fictitious but hardly untypical customer order record. The most conspicuous feature of this record is the large percentage of zeros and blanks. The prevalence of the default or null characters, zero and blank, is not necessarily a result of poor data design. They occur because:

1,3,4,6 Space must be allotted for a maximum sized value, but the value which actually occurred was less than the maximum size.

5,7 Space is allotted for information which is not applicable or not avail-

able at present, though it may be applicable at an earlier or later time.

8 Space is allotted for information which is not applicable to all records.

9,10 Zero or blank is a meaningful code for this field.

A compressor for business type data should attempt to exploit the high proportion of default values which typically occurs.

A second feature of business records illustrated in Fig. 1 is that they consist of an arbitrary alternation of alphabetic and numeric fields of uneven length, usually short, and successive fields are usually not related to each other in any predictable way, either in content or in size. This will preclude the use of compression techniques that rely on wholly numeric data, uniform field sizes, or which attempt to exploit a relationship between the values in successive fields.

The final feature of business records that is of importance in compression is that all characters of all fields are significant, even when data is not present in the fields. Any loss of data in the record of Fig. 1 could possibly result in a serious error in filling or billing the order. Consequently, compression techniques which perform rounding, truncation, which must permit a certain error tolerance after compression and decompression or which achieve compression by permanently discarding portions of the data cannot be used for business files. No loss or change of data can be tolerated. The data must be reconstituted, bit for bit, exactly as it was prior to compression and decompression. It is this characteristic of compression which drastically separates business data and telemetry data (2).

Types of compressors

Null suppression. This class of compressor includes a wide variety of routines which suppress zeros, blanks, or both. These are the simplest of all compression routines. They are widely used in business data processing, often to the exclusion of any other techniques. Null suppression could almost be called the *de facto* standard method for compressing business data files. It takes advantage of one of the most prominent characteristics of business data files, that is, the prevalence of blanks and zeros. It is simple in concept, easy to implement, and usually achieves a reasonable degree of compression at a relatively low cost in cpu time. Null suppression can be easily packaged as a generalized routine which can apply to many different files and is routinely supplied in many vendor implementation packages, especially for data transmission to peripheral devices, such as printers.

On the negative side, null suppression does not usually achieve as high a compression ratio as some other techniques.

Fig. 2 illustrates zero suppression by bit mapping. A bit map is appended to the front of the record. A one in the bit map indicates that data is present in that relative position of the record; a zero indicates no data. Units containing all zeros are dropped from the record during compression and reinserted during decompression.

The fixed size units represented by each bit in the bit map can be of any length. On word machines it is convenient to use words as the unit, since this provides extremely fast compression. Smaller units, halfword, character, hexidecimal or octal, tend to improve the compression ratio slightly on typical data, but at a large cost in cpu time due to the larger number of iterations.

It is also possible to use bit mapping

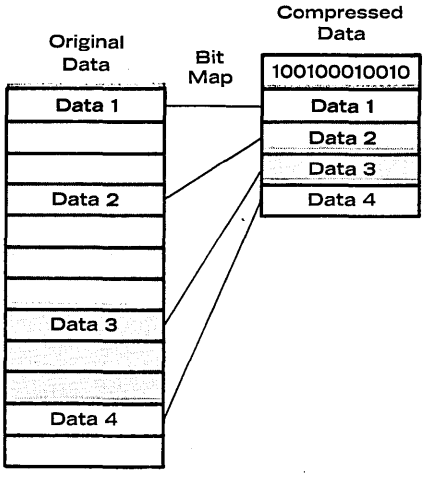


Fig. 2. Zero suppression by bit mapping.

compression where the bits represent data fields, or units of uneven size. When this is done, the compressor must have access to a table which gives the lengths of successive fields within the record (3).

```
Original data:
AE10000X00045600000ON00000

Compressed data:
AE1#2X#1456#4N#3
```

Fig. 3. Run length coding.

Another of the many ways of implementing null suppression is the common run length technique (4) shown in Fig. 3. A punctuation mark is inserted to indicate a run of zeros, plus a number to indicate the length of the run. #n is substituted in the data string where a string of null characters longer than two occurs, n representing the number of zeros or blanks replaced, minus two.

Where the character set includes characters which do not occur in the data, as in EBCDIC, it is convenient to use one of these unused characters as the punctuation mark for a run of zeros. If there are a number of unused characters, a single character can indicate both the fact that zeros have been suppressed and the number.

If the character set contains no unused characters, as in the case on six-bit character machines, the technique may still be used by selecting an infrequently used character as the punctuation character and doubling it when it occurs as part of the data.

Pattern substitution. Business data files often contain stereotyped patterns that occur in record after record. These may include numeric and alphabetic information combined with or in addition to the inevitable strings of zeros and blanks. Fig. 4 illustrates how a table of frequently occurring patterns may be used for compression.

The compressor can be built to scan the data and build its own pattern table or the table can be prepared in advance. The pattern table can be stored or transmitted with the compressed data (5), or it can be built in as a permanent part of both compressor and decompressor. As with null suppression, it is convenient to use unused characters from the character set as substitute values if these are available.

Pattern substitution achieves a greater compression ratio than null suppression, since patterns in addition to strings of zeros and blanks contribute to the compression.

Efficiency is a serious problem in pattern substitution compressors since many comparisons must be made between the data and the pattern table in

```
Original data:
AE10004MFQ00000F320006BCX4
AE20000DBF00000F300000BCX1
AE30002RBA00000F301214BCX7
AE40006MDC00000F373000BCX4

Pattern table:
AE      = #
000     = $
00000F3 = %
BCX     = @

Compressed data:
#1$4MFQ%2$6@4
#2$0DBF%$00@1
#3$2RBA%01214@7
#4$6MDC%73$@4
```

Fig. 4. Pattern substitution.

order to identify a pattern. Patterns are of various lengths, and may be subsets of other patterns. The pattern table may be organized in tree form to reduce the time required to identify a pattern (6).

Statistical encoding. Statistical encoding takes advantage of the statistical probabilities of occurrence of message units (in this case, characters) so

that short representations are used for characters which occur frequently, and longer representations for characters which occur infrequently. Morse code, for example, uses short code groups for the common letters, longer code groups for the rarer ones (4). Bemer's digital shorthand (7) is a version of the same concept where the unit is words rather than characters.

When binary ones and zeros are used to represent a message in variable length codes, there must be a way to tell where one character ends and the next one begins. This can be done if the code has the prefix property, that is, that no short code group is duplicated as the beginning of a longer group. The Shannon-Fano codes are an example of such prefix codes (8), (9).

Huffman codes (10) have the prefix quality and in addition are minimum redundancy codes. They are optimum in the sense that data encoded in these codes could not be expressed in fewer bits. Several applications of this technique have been reported recently (11), (12).

Fig. 5 shows the combinatorial technique used to form Huffman codes. The characters in the character set are listed in descending order of probability of occurrence. The two groups with the smallest probabilities are selected and a zero is assigned to one and a one is assigned to the other. Their probabilities are added together and the combined group is merged into the diminished list on the basis of their new combined probability so that the list is again in order of decreasing probability. The procedure continues until a single group remains.

If fixed length binary codes were assigned to the five characters in the character set of Fig. 5, each would require three bits. Messages written in the Huffman codes given will average 1.7 bits per character.

Character		Probability of Occurrence								Huffman Code
0	E	60%								0)
1	T	20%						0)		10)
2	4	10%		0)			10)			110)
3	B	6%	0)	10)	20%	110)	40%	1110)		1110)
4	A	4%	1) 10%	11)		111)		1111)	100%	1111)

Fig. 5. Formation of Huffman codes.

Huffman codes are usable for business data files. They provide a moderate amount of compression with relatively moderate cpu overhead and use a small amount of core.

On the negative side, Huffman codes lose effectiveness if the statistical properties of the file change over a period of time. They are most appropriate for permanent files with stable content.

Telemetry compressors. Most of the research and technical articles on data compression pertain to telemetry. Papers by C. A. Andrews (3) and P. Elias (14), and C. Kortman (2) contain a survey and summary of telemetry compression techniques. A more recent bibliography developed by Ruth and Villers (15) summarizes a wide variety of compression articles in telemetry and other fields.

In a telemetry application a sensing device records measurements at regular intervals. The measurements are transmitted to a remote station for study and analysis. Compression is applied prior to transmission to reduce the total amount of data to be transmitted (2).

Telemetry compressors assume as data a succession of numeric fields of uniform size and the value of each field is closely related to the value of the immediately preceding field. These conditions do not exist in typical business files and consequently the techniques used in telemetry compressors have not, so far, been successfully adapted to business files.

Practical application

In connection with the discussion on practical considerations in implementing compression, we use as an example the Requisition Status File which is used at Navy Inventory Control Points. This file contains more than a million records and occupies five FASTRAND II drums in all. It is inquired against and updated on the Univac U494 from remote terminals as well as by batch runs in random and sequential order.

Feasibility. The decision on whether to use compression for this application considered the following issues:

1. Compression is suitable primarily for mass storage files and communications. Compression on tape files is seldom practical because the gains in storage cost, reels of tape, is minor and the tradeoff between channel time saved and cpu time spent is marginal and often unfavorable.

2. Compression is especially suitable for large files, where savings in storage costs can be substantial.

3. Compression tends to be more feasible on fast computers or on systems which are I/O bound. Medium speed or slower computers or systems which are primarily compute bound are limited in the amount and type of compression that is feasible.

4. Compression is more suitable for files which are accessed randomly. The cost of compression is minor compared to the cost of a random access to mass storage and increases the run time in random programs by a very small percentage. On sequential runs, however, where I/O is blocked and each record in the file must be decompressed and compressed, the effect of compression on run time can be drastic.

5. Feasibility depends to a great degree on the amount of redundancy in the file being considered. Files with many zeros and blanks are, of course, good candidates.

Our example, the Requisition Status File, qualifies on all the above points except possibly the last. The file is very dense in information content with relatively little stereotyped information and few blanks and spaces. However, there were urgent requirements, new changes, which would require the record to double in size. The choice was either to double the number of FASTRANDS used for the file or use compression. The latter was chosen. Because of the somewhat untypical constraints, we feel that this application is perhaps an "acid test" of compression rather than a standard example.

Choice of algorithm. Tradeoffs of savings in mass storage space against cost in cpu time should be the dominant consideration in the selection of the compression algorithm. In the case of the Requisition Status File, additional constraints were imposed. First of all, it was absolutely necessary to achieve more than a 2/1 compression ratio. Since the records of the file correspond to a sector, the smallest readable unit on the FASTRAND II, if the compression ratio did not consistently exceed 2/1, the file would have to increase in size. This is, of course, not a normal constraint in most systems. Core limitations dictated that the compression and decompression routines together occupy no more than 2K words. Finally, although access is primarily random, there were some sequential runs, and to limit the run times of these, a goal was set of 6 milliseconds for either compression or decompression of a 330-character record.

In addition to mandatory requirements in compression ratio, core space and execution time, two features were considered to be extremely desirable: data independence and transparency to the program. Data independence is de-

sirable in order that the compression logic may be applied without change to other files and to avoid change to the compression logic as the record undergoes frequent minor midifications, such as adding new fields or redefining field lengths and contents. Techniques such as differencing, decimal to binary, and table lookup (12), which amount to recoding values for individual data elements, are not data independent unless they can be table driven. If the routine can be applied to another file or if it can be made to accommodate changes to record format and content by merely altering values in a table, the objective of data independence is achieved. Transparency to the program implies that no application program statements are required to invoke compression or decompression.

Finding an algorithm that would meet these requirements proved difficult. Fig. 6 lists the algorithms tried. Evaluation was by applying the algorithm to a representative portion of the file. Proprietary packages were benchmarked. The algorithm selected was Huffman coding with the character set extended to include patterns. Strings of BCD zeros, binary zeros and blanks were considered to be single characters for the purpose of encoding. The addition of patterns of zeros and blanks takes advantage of the fact that when default values occur, they tend to occur in continuous field sized units. The Huffman code alphabet which was used consisted of 76 characters, the 64 characters in the U494 character set and 12 patterns treated as characters.

Packaging the algorithm. In the random environment it was possible to make the compression function transparent to the program by incorporating it into the file access software. In sequential runs, and runs which process the file dump tape of the Requisition Status File, this was not achieved.

The routines were designed to be table driven so that the compression logic might later be made to apply to other files.

The keys within the record that are used to randomly access the file were left uncompressed, as well as certain fields used for selection in sequential runs. This allows the sequential program to expand only those records which will be processed, thus saving time in runs which do selective processing. The existence of an uncompressed header portion reduces somewhat the compression that can be achieved.

Fixed size records become variable when compressed. It would have saved drum space to reorganize the file to consist of large fixed size blocks which contain the variable sized records abutted end to end without regard to sector boundaries. Due to a number of conditions it was not feasible to modify the file access software to this extent. Records are still stored and retrieved in one-sector units. If the compression routine fails to compress the 330-character record to 165 characters, another whole sector must be used.

Performance. The compression achieved on the Requisition Status File was 2.58/1, which was adequate. The cpu time required was 7.5 milliseconds to compress the 330-character record and 9 milliseconds to decompress. This fell short of the goal of 6 milliseconds each to compress and decompress and is considered barely acceptable. Core requirements were 500 words for the compression and decompression routines plus some additional coding to change the file access software. This was well within the requirements. Run time for random programs shows no noticeable increase. Run time for some sequential programs was increased by as much as half. The analysis of this project required a balancing of the savings in not buying five large drums against the losses in throughput for sequential programs and the obvious risks inherent in forcing an additional level of translation for each access of a volatile file. A marginal analysis indicated that compression was worth the risk in this case. Again, it should be stressed that this application involved files which, we feel, were far more difficult to compress than typical ones; hence, any use of data compression in other applications should be substantially easier.

Algorithm	Compression	Time	Core
Null Suppression			
Run Length I	A	B	B
Run Length II	A	B	B
Bit map-words	A	B	B
Bit map-halfwords	A	B	B
Bit map-character	A	B	B
Bit map-octal	A	A	B
Elias Codes (14)	A	A	B
Pattern Subst. I*	A	A	A
Pattern Subst. II*	2.6/1	A	A
Huffman Codes	A	B	B
Huffman Codes with 2 states	A	B	B
Huffman Codes with >2 states	A	B	B
Huffman Codes with patterns	2.58/1	Marginal	Satisfactory

*Proprietary Packages

A—Unsatisfactory—ruled out
B—Not evaluated because the algorithm was already ruled out

Fig. 6. Algorithms evaluated for application example.

Cost vs. benefits

Development costs of the compression routines were about 1,300 man-hours, valued at approximately $12,000. The cost of computer time and supplies used in development was not recorded.

Cost avoidance savings in rental and maintenance costs for five FASTRAND drums is $20,250 per month, assuming no additional control units or channels.

No cost avoidance savings were calculated for site expansion which would have been necessary to house the five FASTRAND drums.

Cost in cpu time due to compression could not be measured exactly since major additional program processing was implemented simultaneously with compression. However, the total amount of increased cpu utilization due to compression at all ICP activities is estimated to be 82 hours per month. This total is spread over seven cpu's.

In rough terms the development costs were amortized within the first two months of operation and thereafter a clear monthly savings of $10,000 resulted.

Further applications

In view of the results achieved on the Requisition Status File, the technique is being evaluated by the Fleet Material Support Office for other Navy supply files and for other equipments used by the Navy for supply applications, notably the 360/65 with 2314 disc. There appear to be no significant problems in applying the technique to the 360. In fact, improved performance on this machine is expected because of the availability of character level addressing. On the Requisition Status File implementation, speed of compression was the least satisfactory aspect. The bulk of the software time overhead was not in the translation, but in the word-level housekeeping of disassembling the input string and reassembling the output string. This housekeeping would be greatly reduced and simplified on any machine with character level addressing.

Another area of improvement expected on the 360/65 configuration with 2314 disc is added flexibility in selecting the size of read/write units, since these are not inflexibly dictated by the 2314 hardware.

Particular files under examination could yield compression ratios of up to 5 to 1, or more. Of special interest also are files which are currently bit and word oriented but which are planned to be converted to character orientation to support a conversion from assembly language to COBOL and are

therefore expected to balloon in size.

Compression ratios of from 2/1 to 5/1 can be achieved on many business type files. Every large randomly accessed mass storage file should be evaluated for its susceptibility to compression.

Research on compression for business files is continuing, though no dramatic breakthroughs are expected.

Null suppression will probably continue to be the most common compression method for business files.

The importance of compression for mass storage is related to cost of mass storage devices. The per-character cost of mass storage has had a downward trend, but due to increased use, the amount spent for mass storage has gone up. New developments, such as the HDDR devices which enable more data to be stored on current mass storage devices, laser memories or other breakthroughs may further reduce the cost of mass storage and hence the importance of compression; however, it is unlikely that the cost of mass storage will become low enough to eliminate the need for compression altogether.

In communications, compression is likely to increase in importance and find a larger place in remote networks for business activities. □

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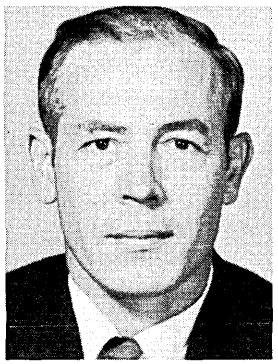

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Buying outside software has its risks but you can reduce the odds against you by ignoring the conventional wisdom and doing your own research

Facts and Old Wives' Tales

by Naomi Seligman

The computer software sector is unique among personal service businesses.

Law firms are selected once in a corporate lifetime, while the average data processing manager may run through as many as six or eight different software services a year. Accounting firms are selected with totally predefined charters of responsibility, while software services contracts are vague and their activities undefined. Advertising agencies are chosen on the basis of a proposed campaign; software firms generally do not provide any real examples of their work before a contract is signed.

It may be the immaturity of the industry, the inexperience of data processing managers, or perhaps just the nature of computers and computer programmers. Software firms are generally selected on the basis of old wives' tales which, often as not, have no basis in fact.

Four of the most prevalent follow:

1. *Old wives' tale:* The best way to handicap software firms is size. At least you can be certain that the company will be around when you need it. Further, a big company generally has the largest staff of the best professionals.

Fact: Of the 20 largest firms at the end of 1969, eight are no longer in business at all, or no longer in the software business, or have been assimilated to such a degree that they do not exist either as a legal or operating entity. At least 50 clients were left midstream by these sinkings. Of course, the vast majority got out before the strains of "Nearer My God To Thee" were over, but at unknown cost to themselves and their projects.

Fact: Size does not appear to guarantee profitability, one logical measure of survival potential. In 1971, firms with revenues of less than $250,000 averaged a 3.4% profit, those with sales of $251,000 to $750,000 generated 1.9% profit, and the largest firms lost an average of 12.2%. Smaller firms are more capable of cutting costs, including officers' salaries, if business starts to slip.

Fact: Less than 20% of the staff of the five largest "software" firms in the industry is actually involved in the design and programming of software. The rest keypunch, operate computers, deliver listings, manage or market.

Fact: The 10 largest "software" firms at the end of 1971 billed clients approximately $397,500,000, but *only 12% of that billing resulted from software purchased by the business sector.* Revenue from other services to corporations such as facilities management, time-sharing, batch processing and machine time sales was 18%. Share received from government agencies was 69%. Upon review, it appears that eight out of the 10 had an "angel," a single large customer who provided between 20% and 80% of revenue and a sometimes tenuous sense of security. To conclude, many "large" software firms are not particularly sizeable when measured in terms of producing software for the business sector. In fact, at least 40 "small" firms received as much revenue from this source as four out of five of the largest in the industry.

2. *Old wives' tale:* The way to pick a software house is to choose the lowest bid. All these companies have the same management capabilities, the same people, and the same overhead rate. Choice of firm doesn't mean much if all you're buying is bodies.

Fact: It is easy to get the most elaborate proposals from companies with no fulfillment staff in the immediate area. Out of the 60 software business addresses listed in the New York Telephone Directory, 26 are sales offices or answering services. Most are among the largest firms in the industry. They are certainly able to truck in their staff but the client always pays in expenses, morale and time away from the project whenever the project manager's baby's teeth need fixing.

Fact: Project management is a sometime thing in even the 10 biggest software firms. The number of professional project managers who have been responsible for a team of more than four programmers at any time in the last two years in the top 10 firms runs from 15 in the best case, down to two. When you pick a firm make sure the local heavy isn't yesterday's salesman or middling level programmer.

Fact: 60% to 70% of the revenue that these 10 firms generate from software development results from body-shop contracts in which the vendor had no management responsibilities whatsoever.

Fact: There is no Fahrenheit gauge relating man-day rates to man-day quality. Well-known software firms pay between $11,000 and $30,500 a year for individuals with the universal description of "senior systems analyst." The same individual can be billed out at hourly rates ranging between $15 and $35 an hour. There are no collar insignia, and the $15-an-hour man in the morning may turn out to be billed for $35 in the afternoon. Of course, the key determinate in man-day rates is overhead and profit, which accounts for 50% of the billing rate in some firms, and up to 75% in others.

3. *Old wives' tale:* The best software packages are those designed originally with multiple users in mind, and the best way to spot this is by counting the number of users on their client list.

Fact: Each of the five major payroll packages was originally developed under contract for a single client and marketed as a package as an afterthought. (One payroll package, with more than 100 customers, in operation for five years, is still paying royalties to the bank for whom it was originally developed.) Even in the more esoteric systems software area, six of the top 10 packages were originally developed for single clients.

Fact: Many of the companies on any long client list of package purchasers have never installed it. They either bought it to cannibalize parts or train their staff, or it never worked the way they anticipated. Last year, 12 references, out of 20 sales, given by the proprietor of one payroll package were in this category. This year, half of the 14 banks that purchased and paid for the top commercial loan package reported a similar result.

4. *Old wives' tale:* Forget outside

computer services. It is always less costly and troublesome to use the in-house staff. They know more about the environment and are more likely to get the system in on time and within budget.

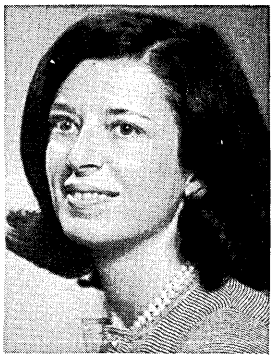
Fact: The average real cost per day of in-house staff in a 100-man organization considering overhead, fringes, and, more importantly, management and support staff, runs between $85 in parts of the Midwest and $100 in New York. One sophisticated New Jersey firm figures a full payout cost at $140 a day, and at a Chicago bank internal staff rates begin at $160 a day. Other internal staffs may be less anxious to frighten the user departments with their rates, but their real costs are probably quite similar. Commercial rates nationally for the broad middle range of programmers are $120 a day —only 15% higher than the corresponding in-house rate. Whether this difference should be justified on the basis of an advantage in skills and experience has to be considered on a case-by-case basis but there certainly seems to be a horse race here.

Fact: 85% of all software house programmers have had at least two years' experience in programming and 70% have worked on some aspects of the same application or techniques in which they are now involved at least once before.

Fact: Nine of the top 10 payroll packages cost less than $30,000 to buy and average no more than $100,000 to install. Initial development costs for these systems, financed by the original customer or swallowed by the software firm, run from $300,000 up. One successful shareholder accounting package now has 67 customers, most of whom have installed it for less than $32,500. The first user had systems development costs of $190,000 and used 500 hours of computer test time. This expenditure is comparable to costs cited by other users who rediscovered the wheel. The point is that even with modification costs, there are some real bargains in outside services for the careful purchaser.

Fact: 50% of all contract software projects are developed on a fixed-price basis; 30% of these have overruns, but the cost of the overrun is always negotiable to the user with a good contract. It doesn't take a survey to tell you that this type of guarantee on overruns does not exist on in-house projects, although some organizations with high-caliber management achieve similar results.

Moral: Whatever the old wives chatter, the only way to buy software services is to read beyond the brochures, talk beyond the marketing representative, and ask the same kinds of questions that you would if you were about to invest your money and, perhaps, your peace of mind. Of course, like all other risk situations in business, the only sure outcome if you avoid the decision is guaranteed mediocrity. □



Mrs. Seligman is executive vice president and a founder of McCaffery, Seligman and von Simson, Inc., a New York management consulting firm. She was previously a vice president of the Diebold Group and was also with IBM. She has a BA from Vassar College and has done graduate work at the London School of Economics.

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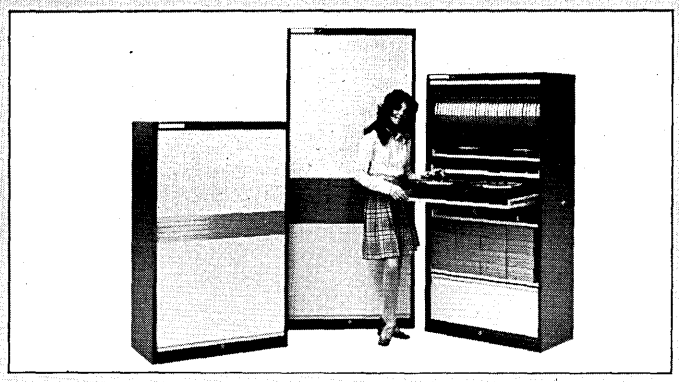

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CIRCLE 8 ON READER CARD

A more basic approach to analyzing installation efficiency should replace the easy but misleading method based on percentage of computer utilization

Evaluating the EDP Function

by Paul Rau

Recently one of the periodicals created a furor in the edp community by claiming that the average computer was utilized only 48% of the time. Most of the edp professionals laughed this off but the article generated a substantial amount of thought and discussion by people both in and outside of edp.

The 48% utilization figure could be used to reinforce arguments for sharing computers or for increasing the size of the systems and programming staff, but, in too many instances, people seized on this statistic as an easy and immediate way to measure the effectiveness of their edp installation.

Nothing presented here is profound or even complicated.

This line of reasoning, followed to its logical conclusion, could place a premium on inefficiency because the more inefficient an installation, the greater its utilization of the computer. This "instantaneous yardstick" approach has only clouded the real issues of (1) "What criteria do you use to evaluate an edp installation?" and (2) "What unit of measure do you use?" The answer is that the only valid criteria must be edp's effect on the profit line of the P & L statement and the only measure of this effectiveness must be in dollars.

The following is an attempt to expand this approach by presenting a basic tool or procedure that may be used to evaluate a system and, by aggregating all systems, an installation. Several simple equations are used to illustrate this concept as applied to a system. All factors are expressed in dollars (excepting R1, R2, and M) and relate to a given period of time.

$$B-(D+P)=E \quad (1) \qquad \text{and} \qquad \frac{B}{D+P}=R_1 \quad (2)$$

Where:

B = the benefits received from using that system. The difference in costs, in the using department, between performing these functions with and without the use of the computer are the benefits.

D = the development cost of the system divided by the life expectancy. This figure includes time spent by personnel in the using department, consultant fees, special equipment, etc., as well as the cost of systems, programming and machine time.

P = the current operational or production costs. This includes systems and programming maintenance, supplies and outside services as well as data preparation, machine and clerical costs.

E = the effect on profit.

R_1 = the ratio of the benefits to the costs of using the system.

Nothing presented here is profound or even complicated. A simple ratio of benefits to costs has been established. If R_1 is greater than 1.0, that system is either saving or making money. If it is less than 1.0, the system is losing money and the function should be performed in some other way.

Summarizing E over all systems indicates whether the installation is running at a profit or a loss. This can be expressed as $\Sigma B - \Sigma (D+P) = \Sigma E$. If E is positive then the total benefits exceed the total costs. The greater E is, the greater the profit.

By expanding equations 1 and 2 potential profits and the ratio of potential benefits to potential costs can be shown.

$$B+\Delta B-(D+\Delta D+P+\Delta P)=E_p \quad (3)$$

$$\frac{B+\Delta B}{D\pm\Delta D+P+\Delta P}=R_2 \quad (4)$$

Where:

$\triangle B$ = the potential unrealized benefits. These may be the elimination of the costs of performing the other related functions which should have been included in the scope of the system, the costs associated with the preparation and maintenance of redundant information or the foregone opportunities to increase profit. This situation could be due to a lack of systems integration, narrow scope, a lack of depth, or just poor systems design.

$\triangle D$ = the estimate of the additional cost, above the original development cost divided by the system life expectancy, required to provide the unrealized benefits of that system.

$\triangle P$ = the potential operational cost savings. These costs may be due to an

abnormal number of reruns, excessive data preparation time, excessive manual balancing or clerical work, bad technical design, etc. They also may be due to excessive maintenance resulting from shortcomings in the original specifications, poor program design, poor language selection or lack of documentation.

E_p = the potential effect on profit.

R_2 = the ratio of the potential benefits of that system to the potential cost.

Equation 4 illustrates a ratio of potential benefits to potential costs. This reflects the benefits and costs of developing and using an optimal system rather than the one currently used. If R_2 is greater than R_1 (it almost certainly will be—no one has developed a perfect system yet) for a system performing the same functions then some improvements could be made in that system.

This leads to one more equation:

$$\frac{R_1}{R_2} = M \qquad (5)$$

Where:

M = a measure of performance.

The measure of performance is the ratio of R_1 to R_2 and expresses how close the system is to its optimal performance. A measure of 1.0 indicates that system is perfect and could not be improved. A measure of .5 indicates that system is operating at half the effectiveness it could.

Again, by summarizing the costs and benefits in equations 2 and 4 over all systems, the overall performance of an installation can be measured. It should be noted that systems or installations can be compared on a relative basis. After some experience an absolute standard for M can be established and any system or installation can be measured against that standard.

Several questions are anticipated.

First: "Where can the information on cost, potential cost savings, benefits and projected benefits be found?" These must be developed by following the same steps that are required for a feasibility study. In fact, the results of the initial feasibility study, done before the system was developed, can be used as a starting point for determining current costs and benefits. Space limitations prevent the enumeration of the complete procedures for performing a system feasibility study but they are available in any number of textbooks.

Second: "Isn't this all very subjective?" The development of the current costs and benefits should be reduced to a mathematical exercise because only the current and past performances of the using departments are measured. There is no projection involved. Calculation of the potential benefits and potential cost reduction is more difficult. However, by using the same standard of rigorous investigation used for feasibility studies, a relatively narrow range of anticipated costs and benefits can be calculated.

Several conclusions can be drawn from the above analysis:

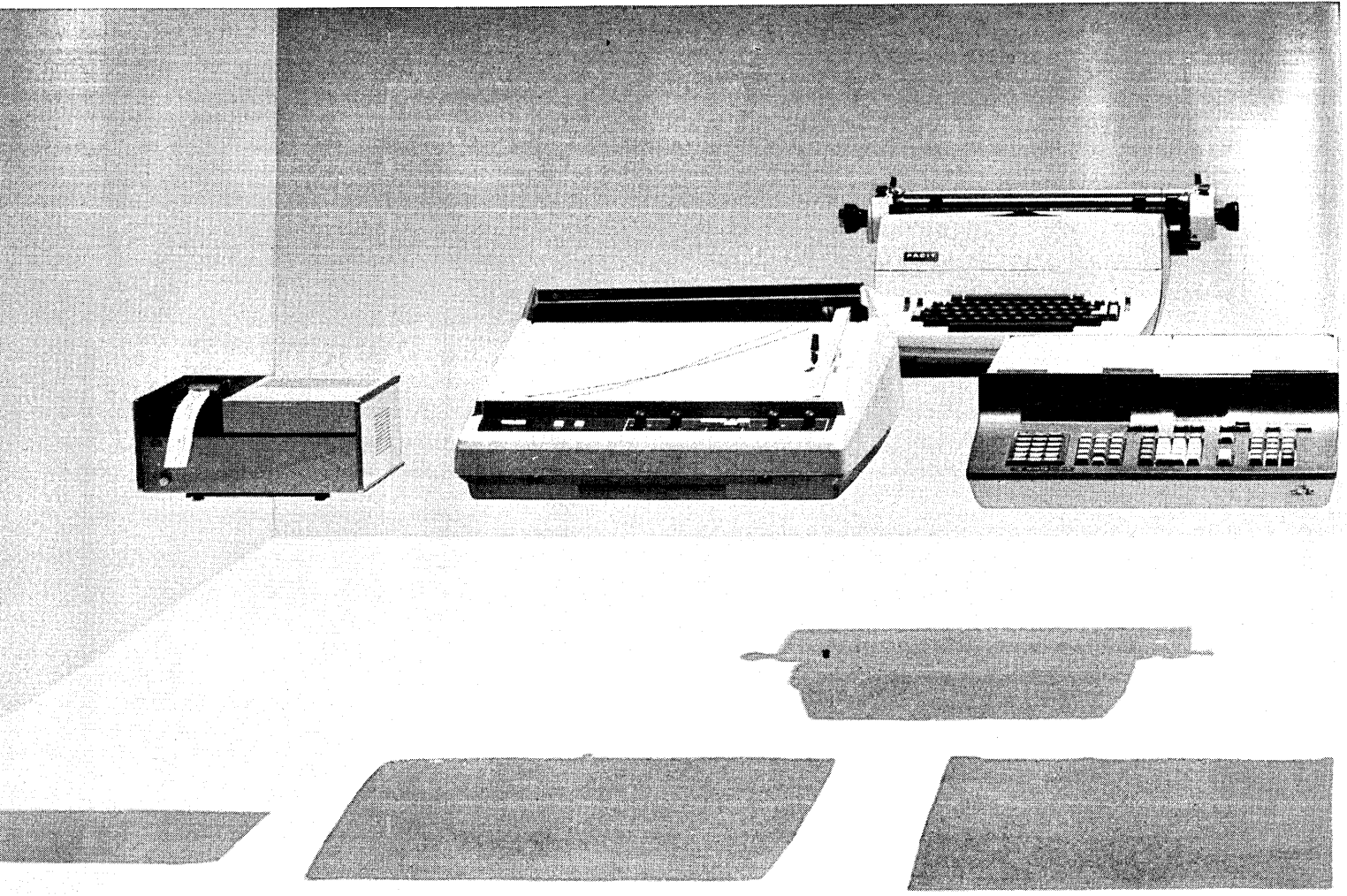
1. Computer utilization is not a valid measure of effectiveness of a data processing installation. The computer, and the extent to which it is utilized, is important only as it affects production costs by allowing faster throughput, providing unused resources, etc. The only way that machine utilization affects the benefit/cost ratio is the potential to increase or decrease one segment of the operational costs.

2. State-of-the-art concepts and technical excellence are important only to the extent that they affect development, production, or maintenance costs. A system or installation is not automatically "good" because of a higher-level language or an "nth" generation computer.

3. In the final analysis, the most important factors in determining the value of systems or installations are the initial selection of the areas to be automated, and the extent to which they are automated. A system could be well conceived, perfectly designed and implemented and still be a losing proposition because sufficient potential for cost saving or profit making never existed in that area.

In conclusion, it has been shown that the value of the systems run on the computer, and not the computer itself, is the most important factor in determining the effectiveness of a data processing installation. This can be readily seen by varying the values of P and B through their reasonable ranges in the above equations. At the same time the framework of an alternate approach to the evaluation of edp systems and installations has been formulated. □

Mr. Rau is now staff edp consultant for AMF, Inc. He was previously data processing manager for Cities Service Co. and before that programming manager for the New York Daily News. He has a BA in economics from San Jose State College and an MBA from the Univ. of Santa Clara.



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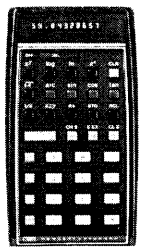

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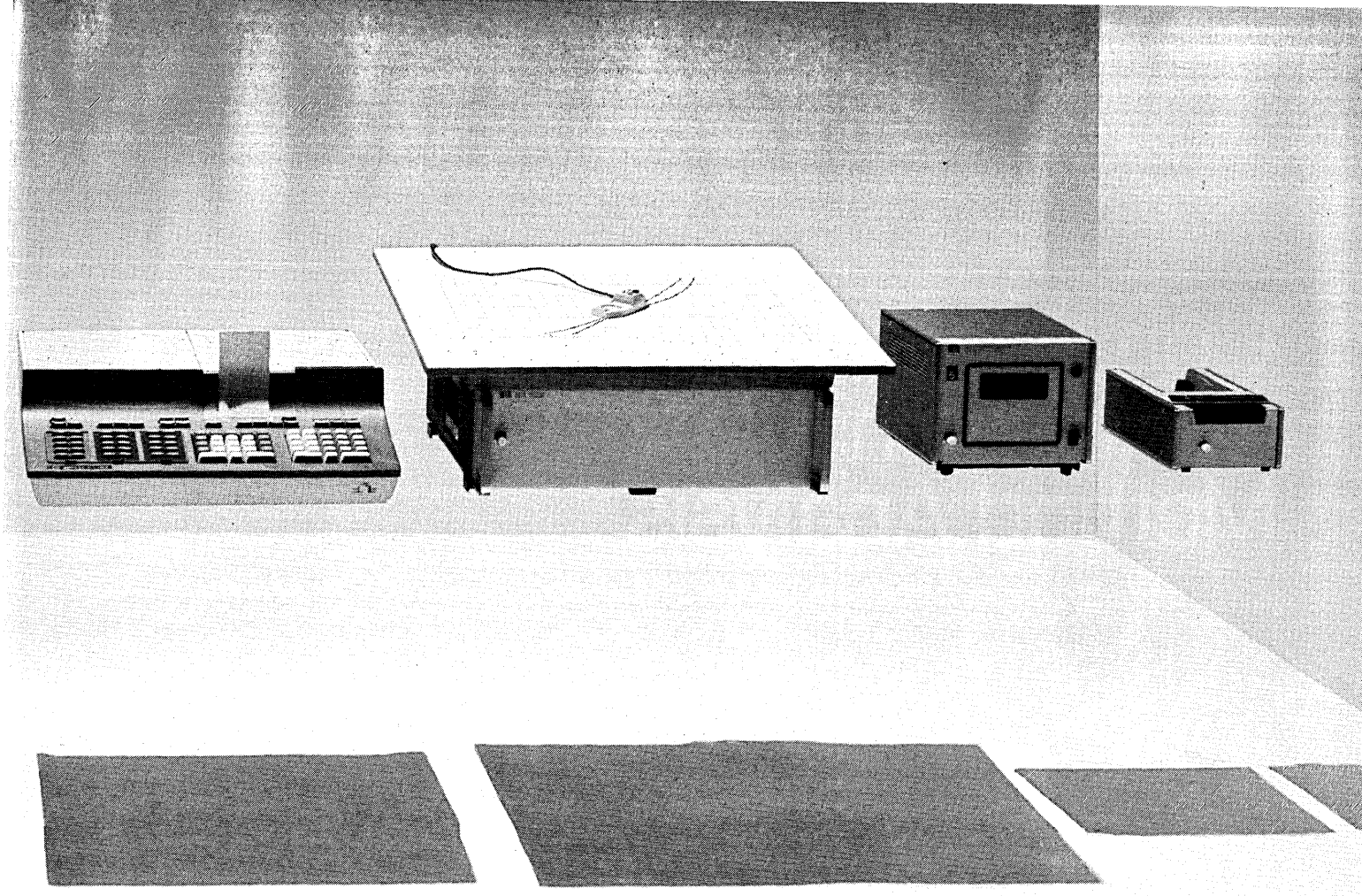

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Although most computer users still rent from the manufacturer, this appears to be the least attractive of the alternatives

Computer Acquisition Method Analysis

by Dick H. Brandon

The computer industry, spearheaded by IBM, started as a rental industry. It was not until January, 1956, by virtue of the now-famous IBM Consent Decree, that IBM was required to sell its equipment. Despite the decree, however, IBM has always encouraged its users to rent their equipment, and today some 66% of all computers are rented from their manufacturers. There are many reasons for the persistence of the rental method, the most prevalent of which is "technical obsolescence." Notwithstanding these arguments, it appears as if outright purchase is the best alternative in most cases, third-party leasing is second-best, and rental is an alternative which is rarely economically viable.

This article explores the three alternatives, and the various methods available for an appropriate analysis.

Factors to be considered

For purposes of this article, it is assumed that a feasibility study has been completed, and that a vendor and a specific configuration have been selected. The decision to be made, therefore, is among three alternative methods of acquisition:

1. Rental from the manufacturer.
2. Leasing from a third party, who has purchased the equipment directly from the manufacturer.
3. Outright purchase, which may be done directly or on some installment purchase plan.

The primary determinant of this decision should be economic, i.e., lowest cost, or lowest cash flow, assuming cash availability. Other factors which have to be considered are:

Leverage. If the equipment is rented from the manufacturer, pressure can be applied for services or other support more readily. If the services are unsatisfactory, withholding payment is one way of gaining attention. An installment purchase, with monthly payments to the manufacturer, has a similar advantage. Notwithstanding this, the manufacturer *should* provide comparable support, regardless of acquisition method. In fact, in the case of IBM, the consent decree inhibits discrimination because of acquisition method.

Obsolescence. The primary argument in favor of rental has been the issue of obsolescence. Presumed flexibility of the rental method allows rapid replacement if technical obsolescence occurs. It should be noted, however, that rapid replacement may be highly undesirable and uneconomic, if a large investment in *systems planning* has not been recovered. The issue of obsolescence comprises three separable components:

Physical obsolescence: Upon wearing out, a machine should be replaced. However, computers are designed with lives far in excess of the time necessary to cover a purchase investment:

Main computer life	12-16 years
Discs and drums	10-14 years
Tapes	8-12 years
Printers, card readers, etc.	8-10 years
Terminals, control units	10-14 years

Thus, physical obsolescence should not be a factor if the breakeven points between all combinations of acquisition methods are less than 8 years.

Technical obsolescence: The 20-year history of the computer field has been beset by change—dramatic technical breakthroughs that increased effectiveness from one generation to the next by several orders of magnitude. Ergo, one argument runs, purchase is too risky. This, of course, is not a true argument. The manufacturers themselves must recover their ever-increasing investments in research, engineering and software development, which requires revenue periods in excess of five years for each new system. Furthermore, the rate of technological change is slowing down noticeably. Speeds are bounded by the nanosecond speed of light, and current developments in MOS and LSI appear to have reached close to the peak for usable capacity. Beyond that, it can be seen that a major change in equipment will not take place; the impact on the installed customer base of *rented* machines would be far too great. It is therefore unlikely that the purchase of a newly announced machine today would result in significant technical obsolescence in the next six to eight years. Finally, of course, technical obsolescence should not affect the user, if the system continues to provide the services required.

Economic obsolescence: The final factor to be considered here is economic obsolescence, that is, the point at which the system can no longer meet the user's requirements effectively. This point is determined more, however, by the user's planning investment than by the equipment cost. In general, a system should be designed and built to allow recovery of the planning costs (design, programming, conversion, parallel operation, testing and the like). Since the planning costs for all applications appear to exceed, in most organizations, the purchase cost of the equipment, the planning amortization period usually exceeds the breakeven period on equipment acquisition.

Economic factors

Aside from cash availability, discussed later, the principal cost elements of the alternate methods are as follows:

1. Rental
   Monthly rental payments
   Overtime payments for use in excess

of a stated amount

Pass-through of the investment tax credit, usually only one-third, or two-thirds, since it is based on the manufacturer's equipment write-off period of five years or so.

2. Leasing

Monthly lease payments (and no overtime)

Maintenance (which may or may not be separately stated)

Full investment tax credit

3. Purchase

Initial purchase cost

Cost of money on purchase price

Maintenance (except for a warranty period)

Insurance

Residual value

Full investment tax credit

Tax advantage of accelerated depreciation

4. Installment Purchase

Same as purchase except for interest cost paid to manufacturer.

All other burdens of ownership, such as property tax, sales tax and the like are generally comparable.

Method 1—breakeven

The breakeven method determines the cumulative cost of computer use, including the money cost of purchase, but without regard to the time value of expense. The cumulative cost of each method is shown in Fig. 1.

By computing the formulas for the three cost curves, the breakeven points N_1 and N_2 can be determined. Thus, the rental cost can be summarized by

$$C_R = \underset{\text{(Rent)}}{NR} + \underset{\text{(10\% Overtime)}}{.1\,NR} - \underset{\text{(Pre-tax Investment Credit)}}{1/3 \times 2 \times .07 \times P}$$

Where N is time in months
R is monthly rental
P is purchase cost

Similarly the lease cost can be determined by

$$C_L = \underset{\text{(Rental)}}{N \times R} - \underset{\text{(Net Discount)}}{D \times N \times R} - \underset{\text{(Full Tax Credit)}}{2 \times .07 \times P}$$

Where D is the net discount percentage, including the maintenance cost after the warranty period.

The purchase cost, without a consideration of possible residual value, is

$$C_P = \underset{\text{(Purchase)}}{P} + \underset{\text{(Maintenance)}}{M \times N} + \underset{\text{(Money)}}{\frac{N \times P \times S}{12}} + \underset{\text{(Insurance)}}{I - 2} \times \underset{\text{(ITC)}}{.07\,P}$$

Where M is monthly maintenance
S is an acceptable simple interest rate
I is insurance cost

In a normal analysis, the costs are known and the variables can be replaced by actual values, except for N. The two breakeven points, N_1 and N_2, can then be found by setting

$C_P = C_R$, and
$C_P = C_L$

For purposes of this analysis, however, it is possible to make certain realistic assumptions, and solve the equations in the general case. The assumptions are as follows, using all figures pre-tax:

P = 48R. In general, the purchase cost is some function of R ranging from 30 to 50 months. For most computer mainframes the ratio is in the order of 48 months of rental.

M = .1R. Monthly maintenance cost is generally about 10% of the rental cost.

S = .08. Any reasonable money rate can be substituted.

I = .01R. The insurance cost is probably close to 1% of the rental.

D = .15. Typical savings in leasing are in the 15% range.

Then, if $C_R = C_P$

$$1.1\,NR - .04667\,P = P + MN + \frac{PSN}{24} + I - .14\,P$$

Applying the assumptions:

$$1.1\,NR - .04667 \times 48R = 48R + .1\,NR + \frac{48R \times .08 \times N}{24} + .01\,R - .14 \times 48R$$

Since R appears in all terms, it can be cancelled:

$$1.1\,N - 2.24 = 48 + .1\,N + .16\,N + .01 - 6.72$$

$$.84\,N = 43.53$$

$$N_1 = 52$$

Thus, after 52 months it is cheaper to purchase than to rent, assuming no residual value.

If, however, a residual value is assumed after the 4½ years to breakeven, the breakeven value is even closer. If for example a 35% residual value is assumed in 4 years (which is undoubtedly conservative considering present market value of four-year-old IBM 360 models) then

$$\text{Residual value} = .35 \times 48R$$

$$\text{Present value (4 years, 8\%)} = .735\,(.35 \times 48) = 12.35$$

Therefore, $.84\,N = 43.53 - 12.35$

$.84\,N = 31.18$

$N_1 = 37.5$, or slightly over three years.

It is unlikely that anyone would wish to rent, if purchase breakeven were to be achieved in 38 months!

Similarly, the lease breakeven calculations can be made by setting $C_L = C_P$:

$$.85\,NR - .14\,P = P + MN + \frac{PSN}{24} + I - .14\,P$$

$$.85\,NR = 48\,R + .1\,NR + .16\,NR + .01\,R$$

$$.59\,N = 48.01$$

$$N_2 = 81 \text{ months}$$

Applying a residual value of 20% in 6 years gives the following

$$\text{Present value} = .6302\,(.2 \times 48) = 6.05$$

Thus $.59\,N = 48.01 - 6.05$

$.59\,N = 41.96$

$N_2 = 71$ months, or almost 6 years.

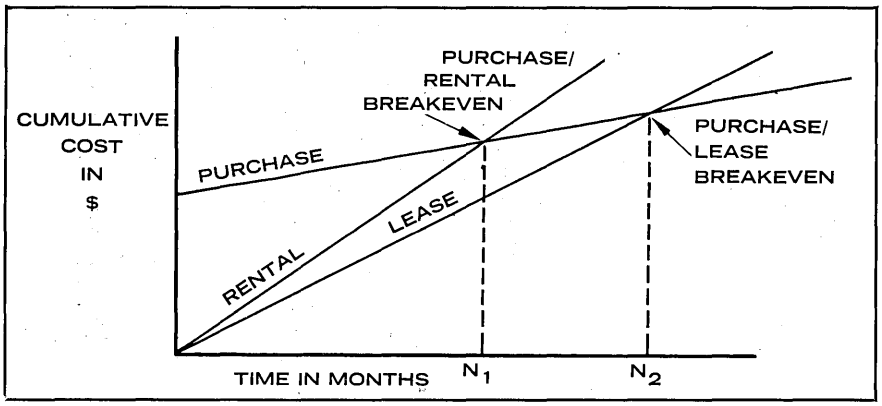

Fig. 1. Cumulative cost

Method 2— discounted cash flow

A second, and more common, method is to determine the actual cash flow of each alternative, discounting it in accordance with a predetermined

interest rate. The net results are comparable, giving a point where purchase becomes more advantageous. Using the assumptions above, Table 1 gives the cumulative discounted cash flow pre-tax for equipment rental.

Table 2 gives the same information for leasing.

The purchase table is slightly more complex, because of the various payments involved. Table 3 shows purchase, pre-tax, with an assumed residual value table, whose impact is also discounted.

Table 4 compares the various methods on a pre-tax basis, using single payment purchase. An installment purchase would require comparable discounting of principal and interest payments.

Year	Rental Payments (No Overtime)	Tax Credit Pass-Through	Discount Factor 8%	Discounted Cash Flow	Cumulative Cash Flow
1	12 R	(.04667 x 48 R)	1.000	9.76 R	9.76 R
2	12 R	---	.9259	11.11 R	20.87 R
3	12 R	---	.8573	10.29 R	31.16 R
4	12 R	---	.7938	9.53 R	40.69 R
5	12 R	---	.7350	8.82 R	49.51 R
6	12 R	---	.6806	8.17 R	57.68 R
7	12 R	---	.6302	7.56 R	65.24 R
8	12 R	---	.5835	7.00 R	72.24 R
9	12 R	---	.5403	6.48 R	78.72 R
10	12 R	---	.5002	6.00 R	84.72 R

Table 1. Cumulative discounted cash flow pre-tax for rental

Year	Lease Payments	Tax Credit	Discounted Cash Flow	Cumulative Cash Flow
1	10.2 R	.14 x 48 R	3.48 R	3.48 R
2	10.2 R	---	9.44 R	12.92 R
3	10.2 R	---	8.74 R	21.66 R
4	10.2 R	---	8.09 R	29.75 R
5	10.2 R	---	7.50 R	37.25 R
6	10.2 R	---	6.94 R	44.19 R
7	10.2 R	---	6.43 R	50.62 R
8	10.2 R	---	5.95 R	56.57 R
9	10.2 R	---	5.51 R	62.08 R
10	10.2 R	---	5.10 R	67.18 R

Table 2. Cumulative discounted cash flow pre-tax for leasing

Year	Purchase Payment	Tax Credit	Maintenance (Warranty in Year 1)	Insurance	Discounted Cash Flow	Cumulative Cash Flow	Assumed Residual Value (%)	Assumed Residual Value	Discounted Cash Flow	Net Cum. Cash Flow
1	48 R	(.14 x 48 R)	.05 R	.01 R	41.34 R	41.34 R	75%	36.0 R	36.00 R	5.34 R
2	---	---	.10 R	.01 R	10 R	41.44 R	70%	33.6 R	31.11 R	10.33 R
3	---	---	.10 R	.01 R	.09 R	41.53 R	65%	31.2 R	26.75 R	14.78 R
4	---	---	.10 R	.01 R	.09 R	41.62 R	55%	26.4 R	20.96 R	20.66 R
5	---	---	.10 R	.01 R	.08 R	41.70 R	50%	24.0 R	17.64 R	24.06 R
6	---	---	.10 R	.01 R	.07 R	41.77 R	35%	16.8 R	11.43 R	30.34 R
7	---	---	.10 R	.01 R	.07 R	41.84 R	25%	12.0 R	7.56 R	34.28 R
8	---	---	.10 R	.01 R	.06 R	41.90 R	20%	9.6 R	5.60 R	36.30 R
9	---	---	.10 R	.01 R	.06 R	41.96 R	10%	4.8 R	2.59 R	39.37 R
10	---	---	.10 R	.01 R	.06 R	42.02 R	10%	4.8 R	2.40 R	39.62 R

Table 3. Purchase, pre-tax, with assumed residual value

Tax implications

The tax implications are relatively straightforward. Assuming a 50% tax rate for simplicity allows halving of the costs of leasing and renting. The miscellaneous payments of purchasing are deductible, but depreciation must be calculated separately. The assumption made in Table 5 is that sum-of-the year's digits is used for depreciation method.

Year	Rental Cost Rx	Lease Cost Rx	Purchase Cost — Rx	
			No Residual	Residual
1	9.76	3.48	41.34	5.34
2	20.87	12.92	41.44	10.33
3	31.16	21.66	41.53	14.78
4	40.69	29.75	41.62	20.66
5	49.51	37.25	41.70	24.06
6	57.68	44.19	41.77	30.34
7	65.24	50.62	41.84	34.28
8	72.24	56.57	41.90	36.30
9	78.72	62.08	41.96	39.37
10	84.72	67.18	42.02	39.62

Table 4. Pre-tax comparison

Year	Cash Flow From Table 3	Deduction of Cash Expense & Tax Credit	Depreciation Deduction (50%)	Net Cash Flow (Taxes)	Discounted Flow (Taxes)	Cumulative Total Flow
1	41.34 R	(3.33 R)	4.32 R	.99 R	.99 R	40.35 R
2	.10 R	.05 R	3.84 R	3.89 R	3.60 R	36.85 R
3	.09 R	.04 R	3.60 R	3.64 R	3.12 R	33.82 R
4	.09 R	.04 R	3.12 R	3.16 R	2.51 R	31.40 R
5	.08 R	.04 R	2.64 R	2.68 R	1.97 R	29.51 R
6	.07 R	.03 R	2.16 R	2.19 R	1.49 R	28.09 R
7	.07 R	.03 R	1.68 R	1.71 R	1.08 R	27.08 R
8	.06 R	.03 R	1.20 R	1.23 R	.72 R	26.42 R
9	.06 R	.03 R	.96 R	.99 R	.54 R	25.94 R
10	.06 R	.03 R	.48 R	.51 R	.26 R	25.74 R
			24.00 R			

Table 5. Tax implications

Table 6 compares the after-tax costs of the three alternatives. There is no comparison for purchase with residual value because the tax implications of a sale at a profit could be difficult to judge. This can be done easily in a specific case.

Even without consideration of residual value, therefore, purchase is cheaper than renting in 5 years, and cheaper

Year	Post Tax — Rx		
	Rental	Leasing	Purchase
1	4.88	1.74	40.35
2	10.44	6.46	36.85
3	15.58	10.83	33.82
4	20.35	14.88	31.40
5	24.76	18.63	29.51
6	28.84	22.10	28.09
7	32.62	25.31	27.08
8	36.12	28.28	26.42
9	39.36	31.04	25.94
10	42.36	33.59	25.74

Table 6. After-tax costs

than leasing in 7½, considering the tax implications.

Summary

Various methods of analysis, supported by *conservative assumptions,* indicate that computer purchase is generally the best alternative, with third-party leasing second among the methods. Installment purchase is equally viable, provided that the interest rate charged by the vendor is less than or equal to the rate used in the discount formulation.

It appears clear that purchase is best also when one considers the effort made by the cash-rich vendors to convince their users to rent!

And yet, there will still be the skeptics, who feel that the ability to change after one or two years is worth the extra cost of renting. Even in those cases purchase is recommended. If, through inadequate planning, expansion is required before the natural breakeven point is reached, examine the market value of the installed system. If the market value of the system is high, and in excess of its book value, sell the purchased system for a profit, and make your replacement.

If, however, the market value is low, and the system can only be sold for a loss, purchase a second one at bargain prices, and double your capacity at lowest cost, without a reprogramming or systems investment.

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Bruce J. Kirchenbaum, "Lease-or-buy decisions without tears: The Present Value Approach," *Financial Executive,* February 1972, pp 30 ff.

Clifford W. Lazar, "Lease/Buy Decisions for Computer Acquisition under Conditions of Uncertain Technological Change," *Proceedings of the ACM—1968,* Brandon/Systems Press, Inc., Princeton, N.J., 1968. □

Mr. Brandon is president of Brandon Applied Systems, Inc., a New York management and technical consulting firm with operations in Europe and affiliates in Australia and New Zealand. He has BS and MS degrees in industrial and management engineering from Columbia Univ. and is an adjunct assistant professor at Columbia's Graduate School of Business.

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The Melcom computer, backed by ample software and services, from a company with $15 billion in annual sales, may prove a formidable competitor

Mitsubishi Moves in Europe

by Gene Gregory

To the outsider, success may seem to come naturally to Japanese companies, but as a Mitsubishi executive put it to us recently: doing business in Europe is like "swimming up a waterfall." For Mitsubishi, success on this difficult, distant, highly competitive market has been complicated by its choice of waterfalls. In the past, Japanese trading companies have made their reputation as buyers and sellers of bulk products, heavy machinery or industrial plant. It was largely their slowness to adopt intensive marketing techniques and to offer the necessary services required by sophisticated high-technology products that led many Japanese manufacturers of electronic products to by-pass traditional trading company channels and set up their own international sales and service organizations. Now the giant Mitsubishi Corp. has taken the plunge in Europe's fast-moving minicomputer and photocopy market, where success can be taken as a signal of further Japanese entries.

When Mitsubishi Shoji Kaisha Ltd. switched its patronym to the Mitsubishi Corp. last year, it changed much more than its name. The recent emergence of Japan's largest trading company on the European computer and photocopy market was the first indication of radical revisions in its basic corporate strategies. These changes have far-reaching implications in markets for high-technology products where financial prowess and global marketing structures are key factors of competitive power.

It is precisely because the field is dominated by multinational giants, as much as because of the rapid growth potential, that the Mitsubishi Corp. decided to assault the European market frontally from beachheads in the U.K. and West Germany.

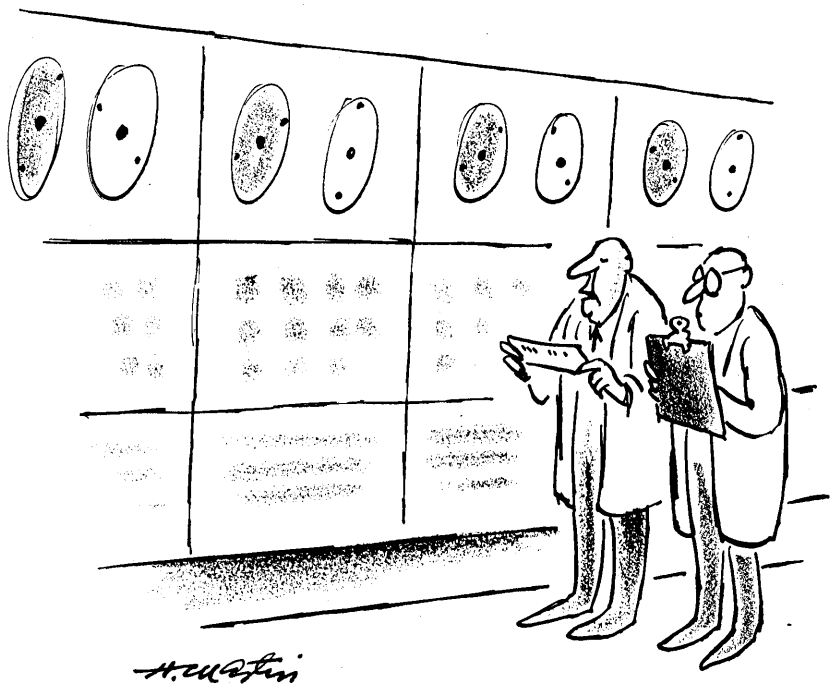
Previously, Mitsubishi's 12 offices in Europe have bought and sold a vast array of bulk commodities, metal and mineral products, chemicals, foodstuffs and heavy plant and machinery. Some Mitsubishi home electronics products, maintly TV receivers, were sold throughout Europe by Teleton, a German-based firm selling under its own brand name. But Teleton suffered the same fate as many marginal Japanese electronic manufacturers who were totally reliant on price competition; after revaluation they were caught with large volume sales and disappearing margins, forcing Mitsubishi to a rescue-takeover action to preserve its channels of distribution.

Other members of the Mitsubishi group, such as the quality-conscious makers of Nikon cameras, had opted out of the Mitsubishi stable and decided at the outset to go it alone on the European market with their own intensive marketing strategies supported by extensive service facilities. The mammoth Mitsubishi trading firm, like others of its genre, was slow to realize that with the changing structure of Japanese industry, its future growth depends largely on its ability to market high-technology products requiring heavy added-service value.

The emergence of Mitsubishi Electric as one of the leading Japanese manufacturers of modular, compact "user-oriented" computers provided the necessary catalyst for the big switch. At the same time, another camera company in which Mitsubishi Corp. has a small interest, Konishiroku Photo Industry (KPI), had developed a new dry photocopy machine with attractive price and quality advantages over the competition. The Mitsubishi management decided to provide the necessary added capital to develop the new line of copiers and produce them for world markets, taking a majority interest in KPI.

Ready for direct marketing

With the two lines of equipment, Mitsubishi Corp. decided it was broad based enough to enter the European market directly. It was only a matter of choosing the time and place, both of which were decided when the U.S. parent of its U.K. distributor, Farrington Data Processing, went bankrupt last year. Mitsubishi Corp. moved quickly to take over its agent's sales, software and engineering organization, with more than 130 trained personnel and offices in major industrial centers



"You're born, you're processed and you die. That's life."

Mitsubishi

of England and Scotland.

Mitsubishi's Melcom computer is medium-sized, designed for use by smaller- and medium-sized companies in sales control, inventory control and invoicing. "We see a tremendous future in Europe," a top Mitsubishi executive told me. "The compact computer will gradually replace the billing machine and become a critical competitive factor for smaller firms. Independent surveys indicate that the market will grow from 20-25% annually until 1975, and we believe that this will continue for some time."

The strategy Mitsubishi is counting on to obtain a solid share of that market is defined by Mitsubishi's European regional manager as a long-term development action. The European market is a big one and "it must be developed with patience." The key elements of that action are:

The will and the means to succeed. The European market is a difficult one, and Mitsubishi is fully aware that some very big multinational firms have failed in their efforts to break into the market dominated by Xerox. "But," Shino says, "Mitsubishi is too big to enter any new field lightly. We have made our decision and we intend to succeed. After all, a company the size of Mitsubishi makes most of the giants in the field look pretty small."

With an annual turnover of about $15 billion, including about 9% of Japan's total exports, and some pretty powerful banking connections, there is no question of Mitsubishi's financial staying power, which the company believes will inspire user confidence.

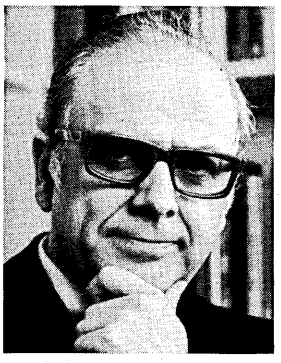
Selective national staffing. The switch to direct marketing of highly sophisticated Mitsubishi products has been accompanied by another equally revolutionary change to primary reliance on carefully selected national staff. In the U.K. and German operations there are only three or four Japanese managers and technicians; the rest are recruited and trained locally. Operational management, systems engineering, sales and service are all delegated to nationals, with only top management and some staff functions filled by Japanese.

Upstaging software. Mitsubishi places emphasis on software and service. An extensive library of its own brand of software—System Mosaics (Melcom Optional Software Applications for Integrated Commercial Systems)—is supplemented by custom-designed installations. Mitsubishi likes to boast that it is essentially a software and service organization that seeks to provide a system that will make more money for its customer, and it spares no effort to assure prompt and adequate service to keep Melcom computers on the job.

Flexibility. Mitsubishi will either sell or lease photocopy machinery, depending on the customer's preference. This offers some advantages over other makers with a standard leasing policy.

Reasonable prices. Both Melcom computers and U-Bix photocopiers are offered at highly competitive prices. Melcom systems are designed for maximum flexibility—to use rather lower priced 1,000-word memory discs which can be expanded by an add-on system to well above the million mark. These, in turn, are supplemented by a range of high speed auxiliary tape readers, punches and complementary printers. U-Bix copiers sell for less than $4,000, a price which has assured market acceptance in Europe as in the U.S.

Mitsubishi is not as much concerned with the present American and European competition in either the computer or photocopy field, as with the emergent Japanese competition in world markets. Canon, Inc., has recently introduced a dry copier, and it is expected that Minolta Camera will soon be in the European market with a range of dry duplicators. Also in the near future, the aggressive Ricoh Company, Ltd., and Mita Industrial Co., Ltd., top Japanese makers of wet Diazo copy machines, are expected to move into European markets, with prospects that competition among Japanese manufacturers for the copy machine sales may rival the fierceness which has driven down prices of desk-top electronic calculators in recent years. □



Mr. Gregory is now a business consultant and writer in Geneva. He is the author of articles appearing in many publications in Europe and Asia and has been a publisher, editor, and professor, as well as serving with agencies of the U.S. government. He has a BS in foreign service from Georgetown Univ., an MA in international relations from Johns Hopkins Univ., and was a Ford Foundation Fellow in Southeast Asia.

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The proposal to CODASYL's Programming Language Committee that Report Writer be removed from COBOL has prompted a vigorous defense

Using the COBOL Report Writer

by Harry T. Hicks, Jr.

The Report Writer feature has been a part of COBOL since 1962. Since that time it has been COBOL's "forgotten man." Few COBOL users spent the time to learn how to use it and those who did evidently didn't have much to say about the experience. Recently, something happened to bring increased attention to Report Writer: CODASYL's Programming Language Committee received a proposal that recommends removal of the feature from COBOL on the grounds that it is "redundant with current features in the language and too complicated for the general report writing needs of the user community." This event is sure to provoke many responses, both pro and con. This article is one such response—a definite con. Although the primary purpose of the article is to refute the charges against Report Writer, it is also designed to subtly persuade the reader to try Report Writer for himself and, having once tried it, to continue using it thereafter.

The proposal to remove Report Writer makes two contentions. The main one, that it is overly complicated, will be addressed by the remainder of this article. The other, that of redundancy, is based on how one defines a report-producing facility. Certainly, COBOL has the general facilities for writing report-producing programs, just as it has facilities (other than the SORT statement) for writing programs that can sort files. It even has some facilities specially designed to produce listings: the LINAGE clause and the ADVANCING option of WRITE. However,

PAYABLES PG. 1

NAME	DUE	AMOUNT
XYZ CO	6/21	248.16
ACME	6/21	1,117.28
*	6/21	1,365.44
ACME	6/28	98.26
*	6/28	98.26
**		1,463.70

Fig. 1

most business reports are more than just simple listings and, thus, require fairly extensive and often complex code to produce them. Report-producing routines can be generalized just like sorting routines, and in the interest of programmer efficiency they ought to be. Thus, the definition of a worthwhile report-producing facility requires the degree of automation found in Report Writer but nowhere else in COBOL, and we must conclude that the facility is not redundant with other language features (it may indeed be redundant with facilities outside of COBOL such as RPG programs, but that is not the issue here).

Let's investigate how complicated Report Writer is (or isn't) by using it to code a report-producing COBOL program. The report is shown in Fig. 1.

This looks pretty simple: two heading lines, one with a page number; a detail line; and two total lines, one produced every time the due-date changes and one final total.

Before we apply our complicated Report Writer to this simple report, let's think about how we would write a program in plain, easy COBOL to produce it. The code we would need just to produce the report (not to read the input records, edit them, etc.) is listed below:

1. A file description (FD entry) for the file on which to write the report. This definition would probably include a record description entry for the detail line that contains elementary item descriptions for the name, date and amount fields.

2. Working-Storage descriptions of the two heading lines and two total lines, a couple of counters for the total

lines, a page counter, a line counter, and a field to store the date field for control purposes.

3. Procedure Division code to:
   Format and write the heading lines, total lines and detail line.
   Maintain the page, line and both amount counters include "rolling" and zeroing of the latter.
   Check for a control break (change in the due date) and a page break (line counter overflow) and take the required action in each case.

Maybe this report isn't so simple after all! Let's see if Report Writer helps out.

Using Report Writer we still have to define the output file, but we can omit the record description entry by writing REPORT IS PAYABLES instead of the usual DATA RECORD clause. When this clause appears in an FD entry, no record description entry is needed.

Next, we need to define the report in terms of its layout (what kinds of lines there are and what appears in each of them) and sources (where does the data that appears in the report come from). Shown in Fig. 2 is the complete Report Description (RD) needed to produce the report. Before we discuss it in detail, look it over and see if some of it looks familiar.

It really isn't much different from what the Working-Storage description of the report lines would be—just a few new clauses. There is one *major* difference though. With this Report Description, all you need to write in the Procedure Division to produce the report are the following statements.

```
PROCEDURE DIVISION.
HOUSEKEEPING.
    OPEN INPUT INFILE OUTPUT OUT-
        FILE.
    INITIATE PAYABLES.
DO-REPORT.
    READ INFILE AT END GO TO ALL-
        DONE.
    GENERATE RPT-LINE.
    GO TO DO-REPORT.
ALL-DONE.
    TERMINATE PAYABLES.
    CLOSE INFILE.
    STOP RUN.
```

Let's look at the Report Description piece by piece and see what each does. Report Descriptions appear in their own Data Division section—the Report Section. Each report is described by an RD entry which specifies the broad details of the report, followed by a series of record description entries, one for each group of report lines.

The RD entry names this report PAYABLES; the name is needed for the INITIATE and TERMINATE statements. The clause CONTROLS ARE FINAL, DUE-DATE names the data fields which control the appearance of total lines. FINAL is a COBOL word that indicates that a final total is desired. DUE-DATE is a field in each input record; when it changes, a total line will be produced before the detail line with the new value is produced. Control fields are listed in decreasing order of importance.

```
REPORT SECTION.
RD  PAYABLES
    CONTROLS ARE FINAL, DUE-DATE
    PAGE LIMIT 50 LINES, FIRST DE-
    TAIL 4.
01  TYPE PH.
    03  LINE 1.
        05  COLUMN 8 PIC X(13)
            VALUE "PAYABLES PG.".
        05  COLUMN 21 PIC 99
            SOURCE PAGE-COUNTER.
    03  LINE PLUS 1.
        05  COLUMN 1 PIC X(22)
            VALUE ".NAME . . . DUE
            . . . . AMOUNT.".
01  RPT-LINE; TYPE DE; LINE PLUS 1.
    03  COLUMN 1 PIC X(6) SOURCE
        PAYEE.
    03  COLUMN 8 PIC ZZ/ZZ SOURCE
        DUE-DATE.
    03  COLUMN 15 PIC Z,ZZZ.ZZ
        SOURCE PAY-THIS.
01  TYPE OF DUE-DATE; LINE PLUS 2.
    03  COLUMN 6 PIC X VALUE "*".
    03  COLUMN 8 PIC ZZ/ZZ SOURCE
        DUE-DATE.
    03  AMT-TOTAL COLUMN 14
        PIC ZZ,ZZZ.ZZ SUM PAY-THIS.
01  TYPE OF FINAL; LINE PLUS 2.
    03  COLUMN 5 PIC XX VALUE
        "**".
    03  COLUMN 14 PIC ZZ,ZZZ.ZZ
        SUM AMT-TOTAL.
```

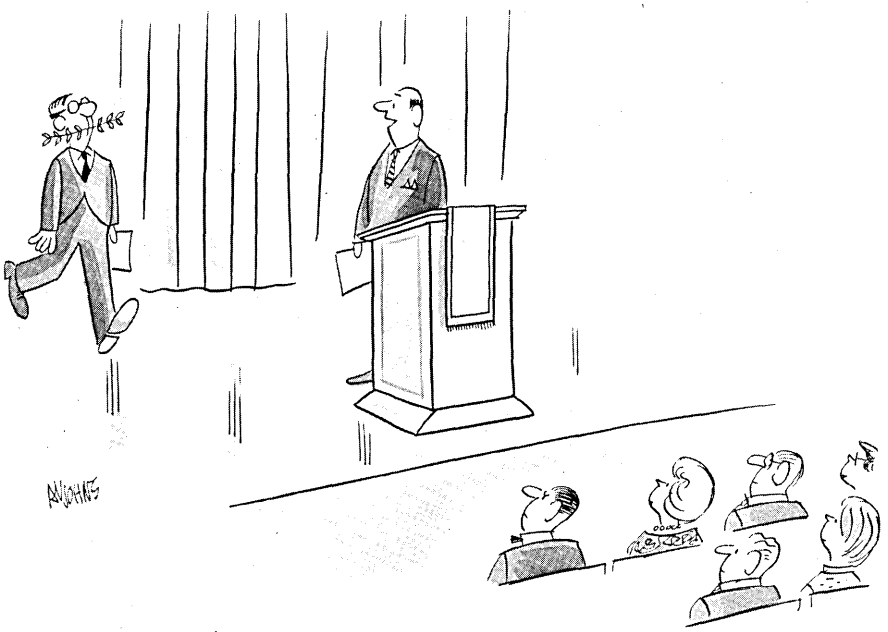
Fig. 2. Complete Report Description.

The clause PAGE LIMIT 50 LINES, FIRST DETAIL 4 tells the Report Writer to: (1) begin a new page whenever the next group of lines to be printed will exceed the 50th line on the current page, and (2) to put the first detail line of each page on physical line 4; this puts a blank line between it and the two heading lines. If this phrase were omitted, the first detail line would appear immediately under the second heading.

Both page heading lines are described by the Record Description entry beginning 01 TYPE PH.

Most Report Writer data definitions don't require a data name, so none of the page heading entries has one. The TYPE clause specifies the type of lines in the group, in this case Page Headings. The two lines themselves are described by the two level 03 entries and their subordinates. Each line description must include a LINE clause to tell the Report Writer what spacing between this line and the previous line is desired. LINE 1 means "put this line on the first physical line"; LINE PLUS 1 means "single space."

The level 05 entries describe the fields on each line. The description of every elementary item must have a COLUMN clause to tell Report Writer the column in which the first character of the item appears. Also required are a PICTURE clause (just as in other Data Division sections) and one of three clauses to indicate where the data comes from. Two of these clauses are: (1) VALUE—the data comes from the literal written in the clause and (2)



"The political views of our next speaker are well known."

SOURCE—the data comes from the field whose name appears in the clause (Report Writer automatically moves the data into the report line at the proper time). The name PAGE-COUNTER that appears in the first SOURCE clause is a special register in which Report Writer keeps the current page number for you.

The definition of the detail line begins 01 RPT-LINE; TYPE DE; LINE PLUS 1.

The detail line is given a name so that the GENERATE statement can refer to it. This line is the only type that is explicitly produced by the program; all of the other lines are produced automatically at the appropriate time. The elementary items in the detail line are defined using the .COLUMN, PICTURE and SOURCE clauses just covered. (Notice the editing PICTURE, ZZ/ZZ; the "/" character in a numeric-edited item is a fairly new addition to COBOL.)

The last two level 01 entries define the total lines, or "Control Footings" as Report Writer calls them. Each control footing line is associated with one of the fields named in the CONTROLS clause of the RD entry. The definition of the first control footing line begins with 01 TYPE CF DUE-DATE; LINE PLUS 2.

The TYPE clause not only names the type of line but repeats the name of the control field DUE-DATE. Report Writer generates all the code needed to test DUE-DATE against its previous value each time a GENERATE statement is executed and to produce the control footing line when a change occurs.

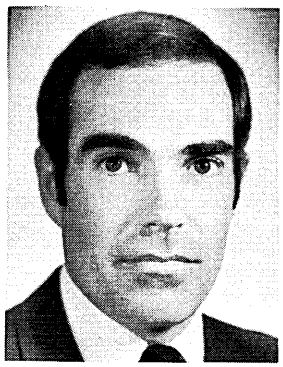
The elementary item definitions are the same as those we've been looking at except for the SUM clause. The SUM clause is used instead of VALUE or SOURCE to indicate that the data that fills that portion of the line represents a total. Report Writer generates code to accumulate the data item named in the SUM clause in a counter and to move the value of that counter to the control line just before it is written. Rolling the counter up to the next level (FINAL in this instance) and resetting it to zero are also automatic. The definition containing the SUM clause has the data name AMT-TOTAL. Report Writer associates this name with the counter so that the name can be used elsewhere in the program to access the content of the counter. Notice that the SUM clause in the last line of the FINAL control footing definition names AMT-TOTAL rather than PAY-THIS. This causes Report Writer to roll the counter from the first control footing to the second when a control break occurs on DUE-DATE rather than adding PAY-THIS to both counters at each GENERATE statement execution.

The last level 01 defines the FINAL control footing. This line is produced once—when the TERMINATE statement is executed.

Using this Report Definition, the Report Writer portion of the COBOL compiler generates all the code needed to produce the report. As noted earlier, all the Procedure Division needs to contain is an INITIATE statement to ready the report writing code, a GENERATE statement to produce each detail line, and a final TERMINATE statement to produce the final control footing line.

You're probably thinking "it can't be that easy" and in most cases, you're right. The Report Writer feature offers much more power than this brief run-through has shown. But, having read this far, you've learned the basics; everything else—the other types of lines, totaling and line control options and such—fit into the framework you now have. And each new feature brings with it enough power to more than compensate for the small incremental learning effort involved.

Is Report Writer redundant and overly complicated? You can answer that question for yourself. Take one of your operational report-producing programs written in COBOL and recode it using your implementor's Report Writer (if he doesn't have this feature in his compiler, his phone number or address is probably in the back of his COBOL manual) and compare the results. Or, try recording the sample program we just discussed in plain, easy COBOL, and compare the results. You'll find that the Report Writer version takes far fewer lines of code, is easier to understand, and is much more readily changed. And you learned all about it in less than one hour.



Mr. Hicks is director of consulting services for Information Management Inc. and has been a member of both the ANS Working Group for COBOL standardization and the CODASYL Programming Language Committee. Before joining IMI, he was with Computer Usage Co. and Boeing. He has BS and MBA degrees from the Univ. of California at Berkeley.

Computers go from the latest thing to objects of historical interest in a surprisingly short time. Lest we forget..

The Last

Only during the last two years has everybody seemed to be talking about the virtues of making do with what you have, rather than jumping to order the latest machine, but some few people began following this principle far earlier. One of them is Gene Usdin, head of Southwestern Computing Service in Tulsa, Okla.

We went to see him in response to his letter reporting that Southwestern's ALWAC III, serial number 5, "had a sinking spell a couple of months ago and is probably not long for this world." As far as Gene knew and we were able to find out, his was the last ALWAC in regular operation.

Southwestern has been in business since 1953, starting out with an IBM 604. (Since then, many other service bureaus have come and gone in Tulsa, including one across the street.) In 1956, Gene decided to get a real computer and chose the ALWAC. The big competition then was the IBM 650, and price was a factor in the choice. Logistics Research Inc. of Redondo Beach, Calif., the manufacturer, offered a price of $700 a month for a basic system, including a Flexowriter, but without maintenance. The unusual reliability of the machine made this arrangement feasible. As Gene recalls, the first trouble appeared some three months after installation. He called another installation on the phone, described the trouble, got a diagnosis, replaced one tube, and was back in operation. Gene's attitude toward preventive maintenance differed from that recommended in the ALWAC manual: he didn't do any. His motto, he says, was "to let sleeping dogs lie and never touch the diodes—the machine had great recuperative powers."

ALWAC

by William J. Rolph, Senior Associate Editor

The new machine arrived in July 1956, accompanied by a three-man installation team. "None of us had ever seen the machine before or knew anything about programming it. Alan Beek (then head of programming for Logistics Research and now at UC Irvine) gave us a one-day course and then we felt we were ready to be on our own . . . " Gene and his colleagues also had a one-day logic and maintenance course, "so that we would be able to handle our own field service," backed up by a genuine field engineer who was to be resident at a later installation in Enid, Okla.

"During the two weeks that the installation team was with us," Gene says, "much of their time was spent glued to the scope looking for noise and substandard pulses. This process

BELOW: An instruction list for the ALWAC. In the olden time, programmers were expected to be familiar with a quaint notation called machine language. RIGHT: This chart and an explanatory memo were distributed in 1957 to ALWAC installations to show the possibilities and limitations of program exchange. The few solid arrows indicate installations able to run received programs without modification. Dashed arrows show that the sending installation has some feature or equipment not present at the receiving installation. Dotted arrows show incompatibility that may require modification or recoding. Dot-dashed arrows indicate both incompatibilities and extra features. The memo concluded by saying that these are only coding differences; engineering differences are not shown.

ALWAC III OPERATION CODES

ARITHMETIC

60	Add
62	Minus add
64	Minus subtract
66	Subtract
bc	Long add
be	Long subtract
e0	Add multiply by D
e2	Add multiply
e4	Multiply by D
e6	Multiply
e8	Long divide by D
ea	Long divide
ec	Divide by D
ee	Divide
22*	Round off
28*	Clear A
2c*	Positive A
2e*	Reverse A sign
3e*	Complement A

SHIFT

a0	Double shift right
a2	Double shift left
a4	Shift right
a6	Shift left
a8	Scale
aa	Float

INPUT-OUTPUT

f0	Codes in
f2	Letters in
f4	Codes out
f6	Letters out
d8	Sign out
dc	Number out
9a	Type
9c	Punch
9e	Both
98	Neither

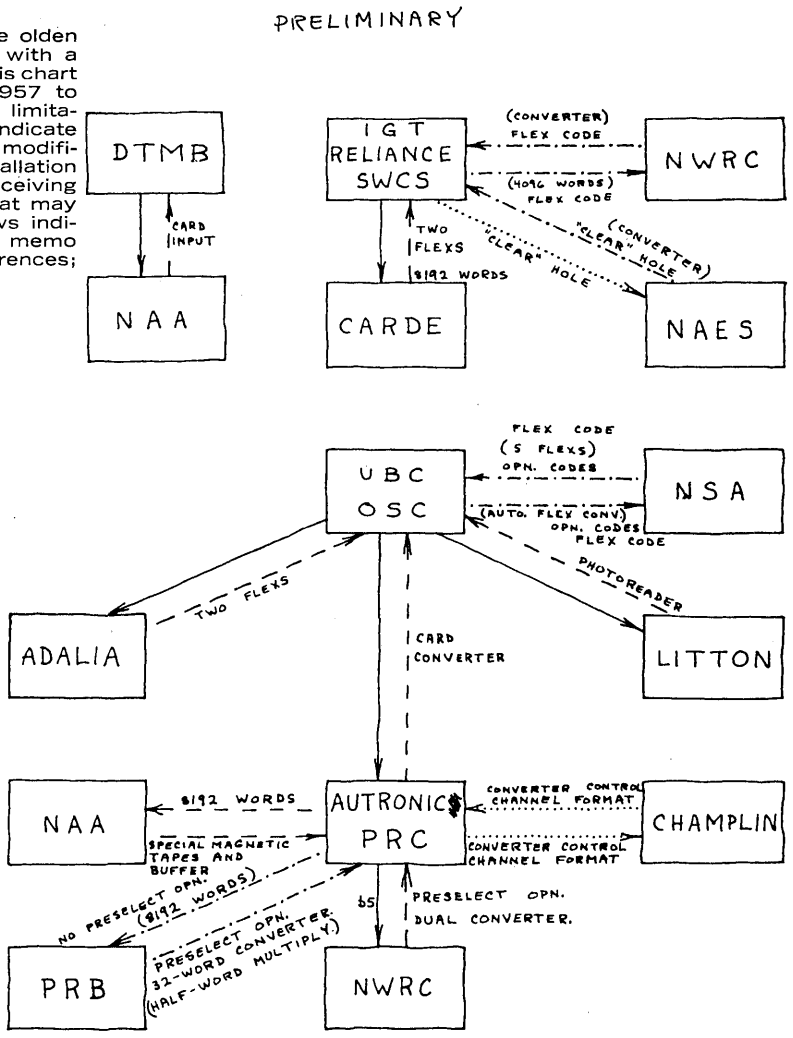
JUMP

10	Jump
12	Control jump 1
14	Control jump 2
16	Count down
18	Non-zero jump
1c	Less-than-zero jump
1e	Overflow jump
50	Overflow if A smaller
02*	Reverse overflow

EXCHANGE, COPY

68	Exchange W and A
30*	Exchange B and A
36*	Exchange E and A
3a*	Exchange D and A
48	Copy A to W
78	Copy W to A
56	Copy W to E
40	Copy W to B
5a	Copy W to D
0a*	Copy E to D
08*	Copy E to B
34*	Copy E to A
38*	Copy D to A
32*	Copy B to A
b4	Copy M to A
80	Copy to I
82	Copy to II
84	Copy to III
86	Copy to IV
88	Copy from I
8a	Copy from II
8c	Copy from III
8e	Copy from IV
4c	Copy address to W
4e	Copy half to W
6c	Copy address to A
6e	Copy half to A
70	Controlled copy
74	Extract

*Needs no address. Add 1 to double-up operations.



The Last ALWAC

generated about 100 field changes to our machine, and it was that kind of attention that made the machine work so well for so long."

After their programming course, the group wrote some routines for the open house demonstration, then went directly to programming engineering applications for the bureau's customers, starting with those that had proved a little awkward for the 604 to handle.

The ALWAC was a binary machine with a 32-bit, plus sign, word. The commands were eight bits, "so naturally the programming was done in hex. We all programmed in hex, talked in hex, did mental arithmetic in hex, and

(Continued on page 91)

Wenner-Gren: From Light Bulb Salesman to Merchant Prince

LOGISTICS RESEARCH INC. (the name was changed to ALWAC Corp. about 1957) was founded by Axel Wenner-Gren in 1952 and initially staffed by a computer group who left Northrop, some going instead to start Bendix Computer.

Wenner-Gren's original purpose, according to some who were there at the time, was to develop a computer suitable for planning a worldwide network of monorails, because he owned a large part of a German company that built them.

He owned some other things too. Born in Sweden in 1881, Wenner-Gren went to school in Germany, worked there briefly, then in 1907 appeared in New Jersey, where he had come to seek his fortune—a venture that proved successful. He worked in a New Jersey factory for 15 cents an hour, then found a job as salesman for a light bulb company with headquarters in Sweden. He may have been the greatest light bulb salesman ever known, because he sold the U.S. government on floodlighting the Panama Canal for its grand opening in 1914.

By 1917 he owned the majority of his company's stock. In 1921 he formed the Electrolux Co., making vacuum cleaners, then acquired plans from two inventors for a refrigerator, leading to formation of Servel. With returns coming in from Scandinavia, Germany, France, Britain, and the U.S. for these products, he bought

mines, power plants, and control of Sweden's biggest wood pulp producer, thus getting five million acres of timber lands. In 1935 he headed a group buying a one-third interest in Bofors Munitions Works from Krupp of Germany, makers of the antiaircraft guns soon to be produced in many countries under license. Then he arranged with Northrop to build military aircraft in Sweden—a complementary industry for the Bofors operation.

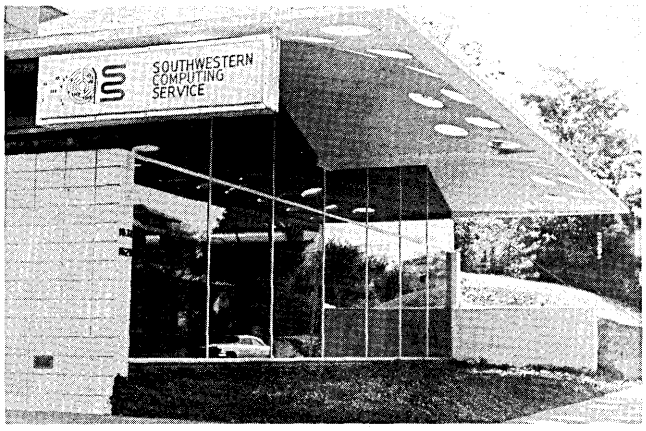
Meanwhile, he had become acquainted with Hermann Goering and made trips between Germany and England in an announced attempt to further the cause of peace. Knowing Goering, however, later led to Wenner-Gren being blacklisted by the U.S. But well before then he had acquired Hog Island in the Bahamas, which he visited on his yacht, the Southern Cross (formerly owned by Howard Hughes), which had a crew of 315.

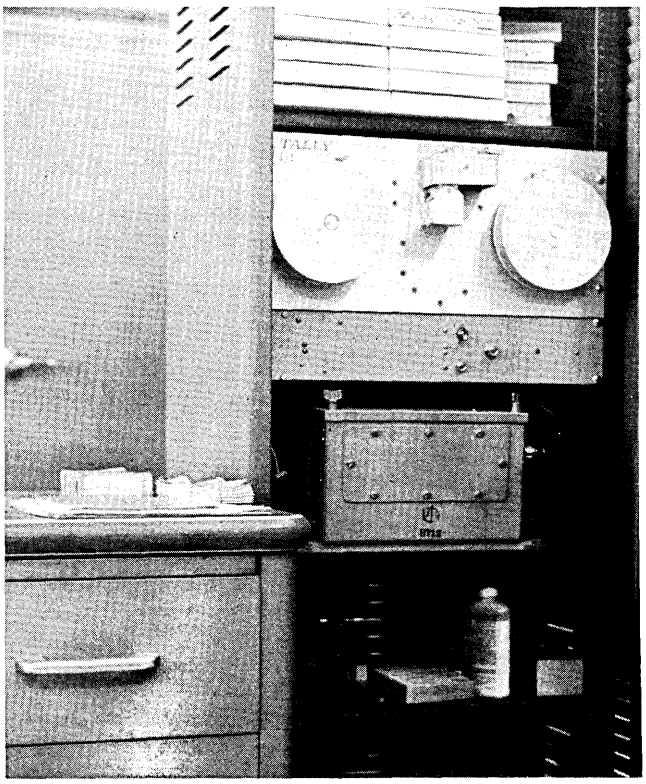
Wenner-Gren had many other diplomatic ventures, but before starting Logistics Research he also financed the archeological expedition to Peru that discovered the lost cities of the Incas, gave Peru a million-acre park, and arranged the merger of the two competing telephone companies in Mexico, gaining control of the resulting company. At the age of 76, four years before he died in 1961, he undertook the development of 40,000 square miles of wilderness in British Columbia, where he planned to build 15 or 20 new towns, supporting timber and mineral exploitation, and connected by a 400-mile monorail.

Owning the telephone company in Mexico was a factor in the operations of Logistics Research, because the U.S. blacklisting made it difficult to bring money into the country and, according to one of the early employees at the computer company, it was done through the Mexican phone company. The money fostered the development of the ALWAC I, II, III, and III E. But, according to one user, the sales prices were not adequate to cover the costs and leave a profit.

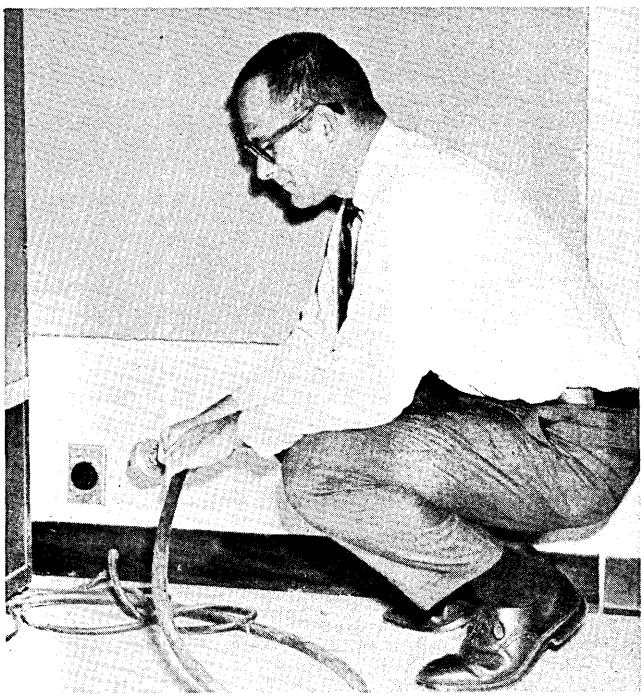
About a year and a half before the acquisition of the company by El-Tronics in 1958, the ALWAC 800 was under way, an all-new computer promised to the first customer, the Federal Reserve System, in 15 months. "But," says a logic designer who worked there, "we couldn't have designed the circuits in that time." Soon, Wenner-Gren's accountants descended from Sweden and Canada, cutbacks occurred, and the computer wasn't delivered.

DATAMATION noted a final conclusion to the ALWAC story in January 1965: ". . . a federal judge awarded over $200K to the Federal Reserve Board as the result of the nondelivery of an ALWAC 800 . . ." □





OPPOSITE PAGE: Southwestern's ALWAC, with mainframe in the two-door cabinet and memory cabinet on the left. Paper tape reader is in open cabinet by the window. Flexowriter, scope, and control console are on the desk. The battered card decks on the corner of the desk were wrapped in rubber bands and used to hit the plug-in tube packages, insuring that they were firmly seated. This procedure was the only regular preventive maintenance at this installation. LEFT ABOVE: Inside this modern building in Tulsa, Okla., the last ALWAC III served for 15 years. LEFT BELOW: Tally high-speed paper tape reader. Auxiliary power supply just below it has small anchor insignia, showing it was Navy property. This unit was acquired as war surplus. BELOW: After 15 years of steady production, Gene Usdin pulls the plug on his ALWAC III. Most of the machine will be scrapped, but he intends to keep the memory cabinet as a bookcase.



What do these beauties have in common?

Both of these WANGCO tape drives can read and write 800 cpi NRZI and 1600 cpi phase encoded tapes. You can select either industry standard format with the flick of a switch, or let the computer do it for you. And the same flexibility, at low cost, is available with all other WANGCO tape drive models.

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CIRCLE 70 ON READER CARD

The Last ALWAC

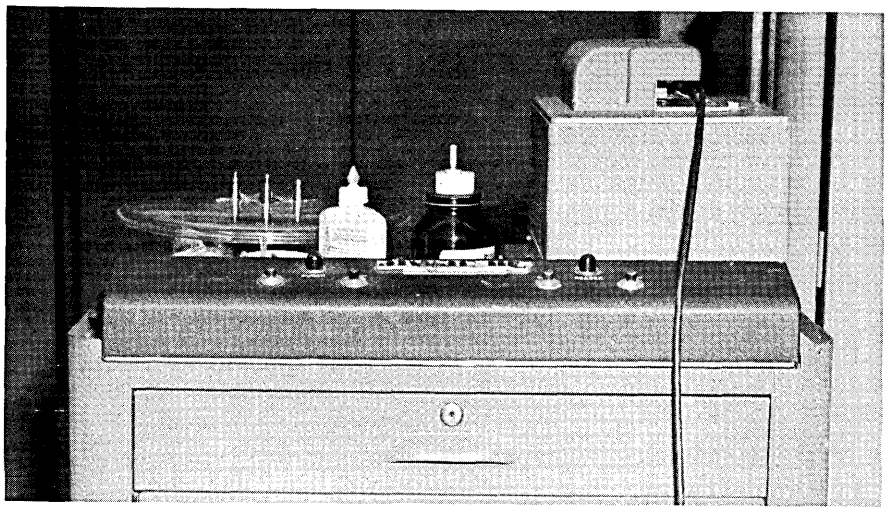
didn't know it was a big deal."

Memory was a 4,096-word drum (8,192 words, optional), with 128 words of "fast-access" storage, provided by having two heads per track, and another 32 words of fast storage for constants. "We never needed a symbolic assembler," Gene says, "but we had a 32-word operating system."

And the package included paint, a paintbrush, and paint remover.

Gene made some special arrangements for input too.

"Since the paper tape code of the ALWAC was very unusual, we decided to prepare our tape by converting cards on an IBM 063. In order to do this, we had to modify the 063 internally in a very substantial way. This was pre consent decree, the 063 at that time was rented, and so we had to conceal the fact from IBM that we had



One component lives on. The high-speed paper tape reader has been modified to read into the 704 replacement for the ALWAC.

Add and subtract time, as given in the sales brochure, was 1 to 9 milliseconds; multiply or divide, 17 to 25 msec. Flexowriter output was at 9 characters/second. Input was cards, paper tape, or keyboard. And there were 78 standard operations.

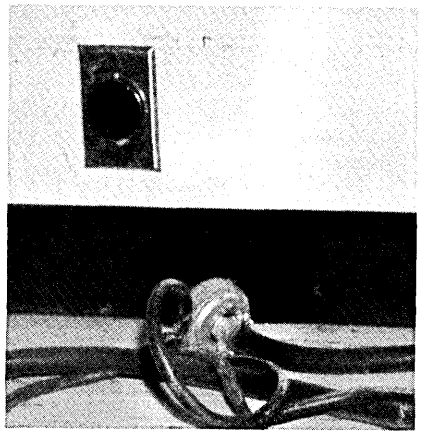
But Logistics Research was always accommodating about modifications: "they couldn't say no." Gene added five new commands, with the manufacturer's permission. Many other installations made major changes too. This led, Gene says, to "total incompatibility, because of their reasonable attitude. It must have generated terrific paperwork problems for them, trying to keep a current set of drawings for each machine installed. We wanted to add high-speed paper tape to our machine, and I wrote many letters . . . They felt our power supply was too weak to support any additional peripherals, but since they couldn't say no they just didn't answer the mail at all." But Southwestern got their paper tape reader, a Tally unit, with additional power from a war surplus Navy 24-volt unit.

The cooperative attitude of the manufacturer extended to spare parts. With a new machine, the customer got at least 10% additional pieces. To back up 50 flip-flops, he was given five spares. But, since there was only one clock read amplifier, he got one extra.

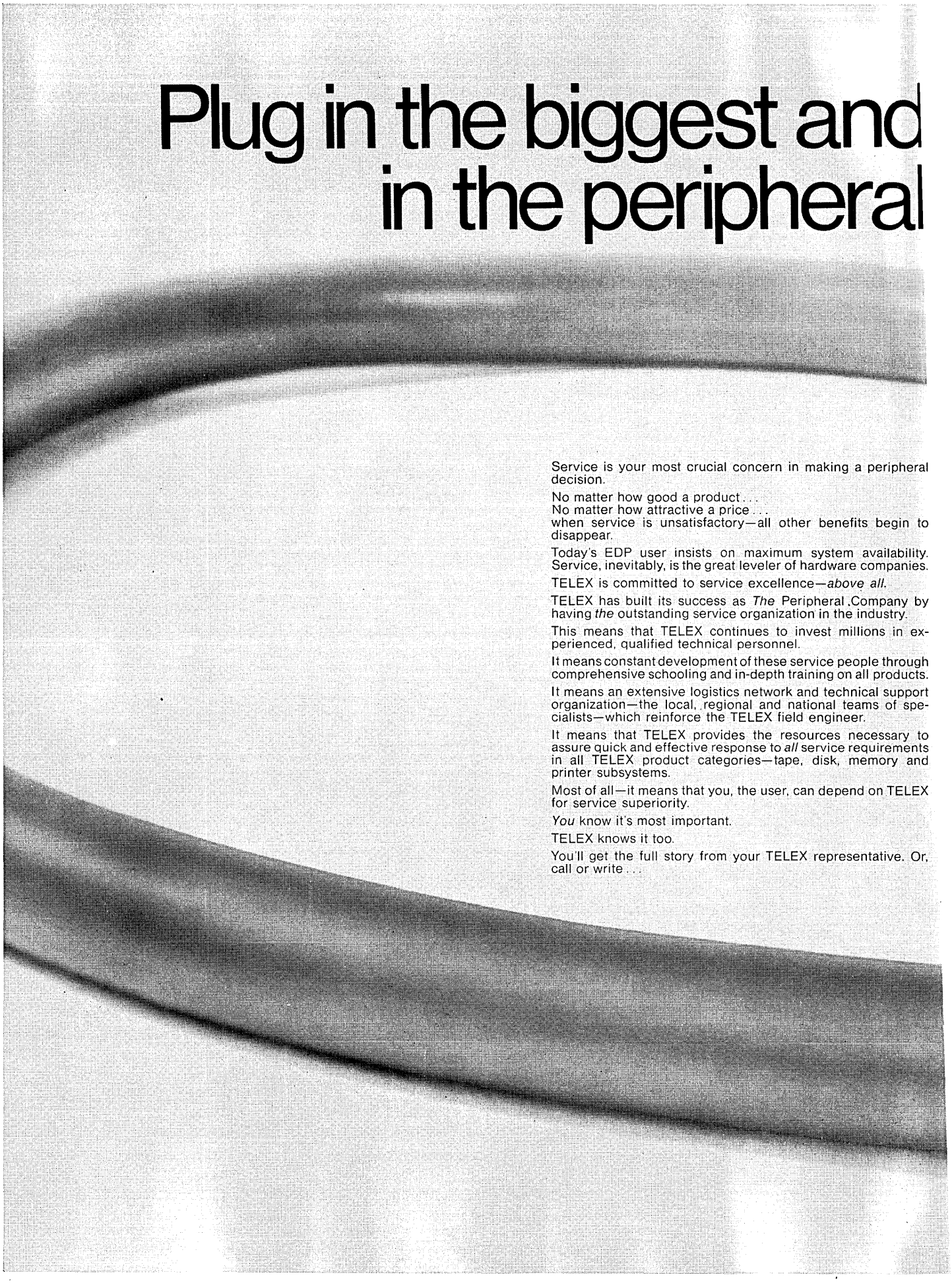
changed their machine. For a couple of years we did our own maintenance on the 063 because we were afraid that if we called a serviceman they would find out what we had done to their machine and scold us."

During the past 15 years, the ALWAC handled all of Southwestern's engineering applications. (Newer Burroughs equipment is used for business applications.) But the sinking spell convinced Gene that it was time to move up to later, more advanced equipment. And, at about the same time, he heard of a good machine for sale. So, by the end of last year, conversion was under way to his new scientific machine, an IBM 704.

Gene expects it to be cost-effective. He got it for $1. □



Plug in the biggest and in the peripheral



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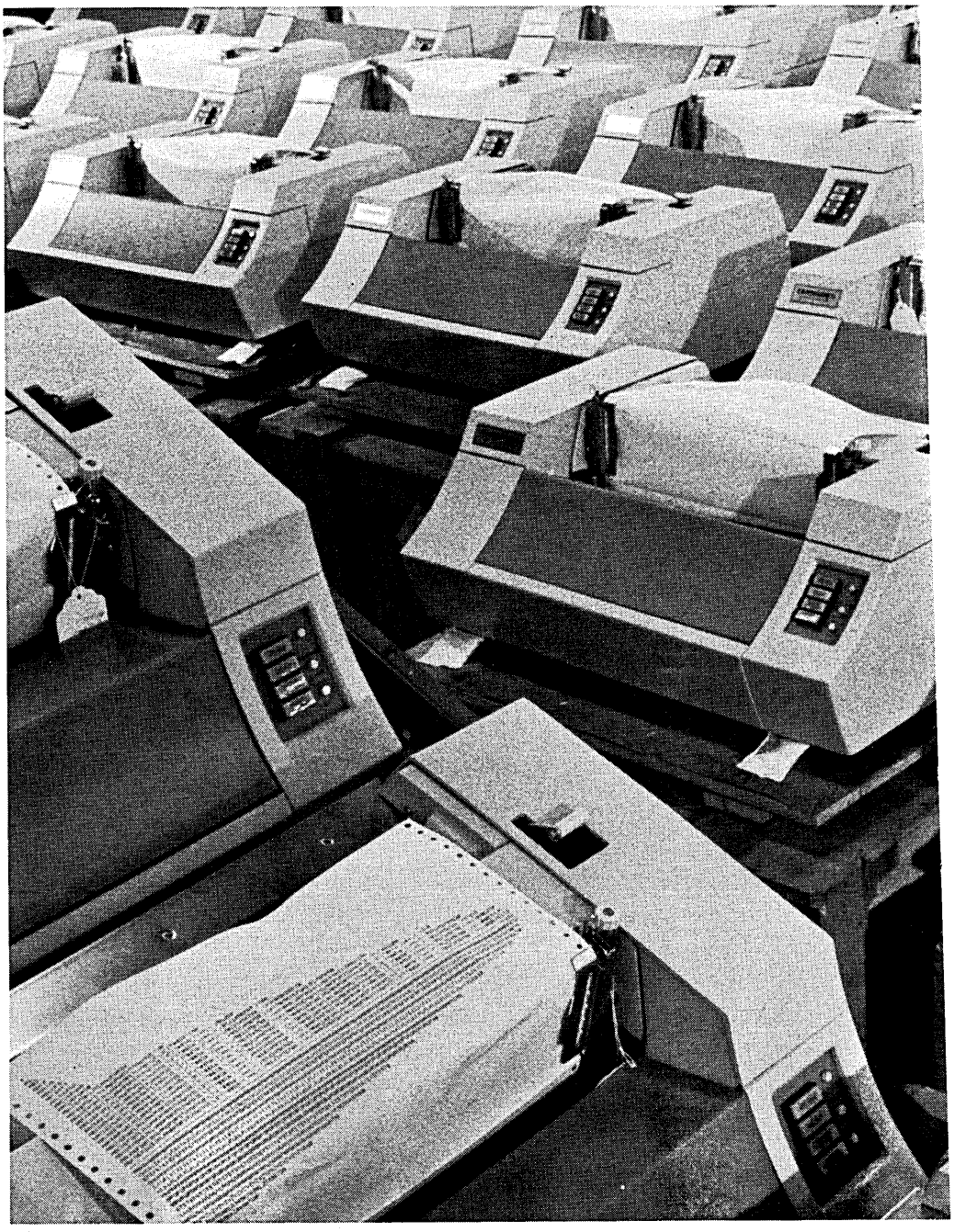

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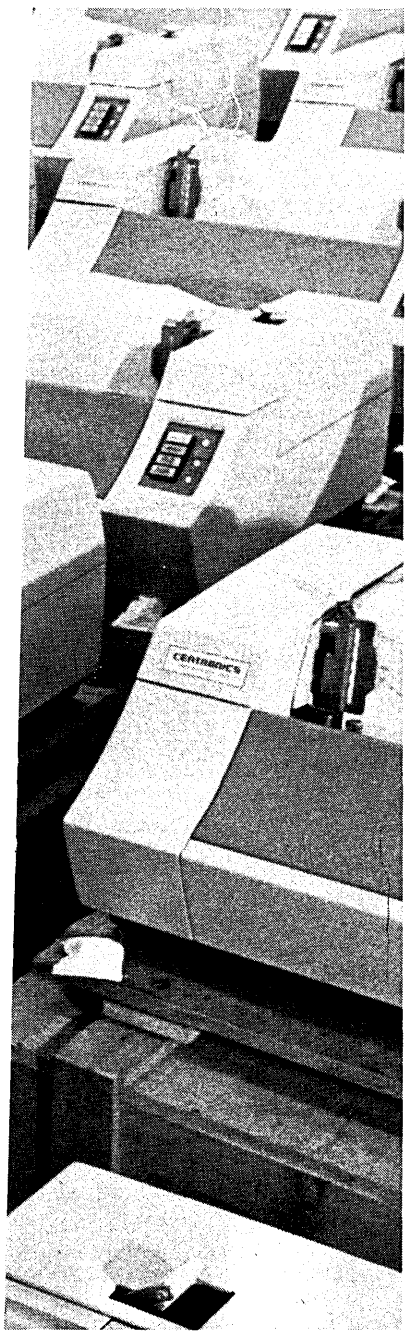

The conference showed the technical excellence of Canadians, but at the show U.S. subsidiaries dominated the exhibits

Canadian Computer Show and Conference

by W. David Gardner, New England Editor

Canada did its annual computer thing in the form of the Canadian Computer Show and the Canadian Computer Conference in Montreal recently and a brief walk between the two events told much about the dilemma that is facing —haunting, some might say—the Canadian computer industry.

At the Place Bonaventure where some 60 exhibitors had set up booths, there was one overwhelming impression about the Canadian computer industry: It's American. Most of the manufacturers exhibiting were subsidiaries of U.S. firms. Nearby, at the Queen Elizabeth Hotel where the Canadian Computer Conference was conducted, the first-rate technical program proved that Canadians don't have to take a back seat to anyone.

The contrast between the two events raised an obvious question: Why haven't the Canadians been more of a computer manufacturing force both within Canada and as an exporter?

Apparently a unique combination of relatively small population, entrepreneurial conservatism, some bad luck and a dash here and there of mismanagement have been largely responsible for the Canadian industry's difficulties. Add to this the universal boogeyman that everyone in the industry must face sooner or later—an exceptionally powerful indigenous IBM—and you have what would appear to be a bleak future for Canada nurturing its own sizable hardware or mainframe computer industry.

The keynote speaker at the Canadian Computer Conference, R. C. Scrivener, president of Bell Canada, said it is unlikely that there will be "a significant native mainframe industry in Canada." Scrivener, however, went on to propose some new and bold directions for the Canadian industry.

Pushing software

"It is in the software end of the business that the greatest opportunities and risks lie," said Scrivener. "If Canada is to develop its own software competence that can not only succeed against foreign competition but be capable enough to export its product into other markets, certain steps seem to be necessary.

"First, software skills should have professional status just as do engineering, accounting, legal and medical skills. Around the professionals and the academic base of their training would develop all the paraprofessional skills allied to software just as has been the case with the older established professions . . . If Canada took the lead in the world and created the process to develop an accredited software profession it would certainly gain a great advantage internationally and would attract to Canada outstanding people from other countries."

The speaker noted that Canada has the human resources, the educational system and the financial resources at hand, but he indicated that the financial resources should be diverted from hardware R & D into the software area.

In discussing another subject, Scrivener touched upon the proposed formation of a Canadian network of computer communications services. The speaker said it was his "guess" that a low cost network—with the chief computer installation based in Ontario —would be the route taken in the future. Such a network, he added, would provide "the greatest likelihood of developing east-west communications to offset the natural pull of connecting our terminals to computers south of the border."

Another speaker, Allan E. Gotlieb, Canada's deputy minister of communications, observed that a communications cable that will link Ottawa and Montreal initially and Toronto later, is currently being installed by the Bell Telephone Co. By 1980, London, Ontario, and Quebec City will be included in the loop.

The idea that Canadians can compete best in the software and services side of the computer industry was also voiced by George Fierheller, past president of the Canadian Information Processing Society who is also president of Systems Dimensions Ltd. (SDL) of Ottawa. SDL is involved in computer services and he had that field in mind when he said: "We can domestically compete on the manpower side rather than manufacturing. We're quite convinced that it's a continent market and not a country market. We

don't see that border."

SDL, which has some $12 million worth of hardware including a Model 85, stresses turnaround and reliability. A company executive noted that more than 50% of the firm's jobs are turned around in less than 17 minutes. The company performs some 2,500 jobs a day, adding up to a current annual rate of $6 million. SDL's services are marketed in the U.S. in Boston and New York City by EDP Resources and the company has plans to expand its services in the U.S.

One Canadian who has been practicing for eight years what many others were preaching in Montreal in June is Ian P. Sharp, president of I.P. Sharp Associates, an Ottawa-based software house. The firm, which employs some 70 people in North America, does nearly one-third of its business in the U.S. During the first quarter this year, Sharp Associates chalked up revenues of $520,000 and a $40,000 profit.

"I don't detect any vast differences between doing business in the States and in Canada," said Sharp in an interview. "I don't think the border should make any difference. It's largely in the minds of people. But it's the governmental bureaucracies on both sides of the border that can make life difficult."

In addition to his business in the U.S., Sharp has some 20 professionals working in Europe. When Ian Sharp founded his firm in 1964, he could raise only $4,000 in venture capital, a fact that illustrates Canada's entrepreneurial conservatism. Profits and success spawned more success and five years later, in 1969, Sharp Associates raised $1 million in private placement to finance its further growth.

Other Canadian companies have not been so fortunate.

Many had been looking to International Computers of Canada Ltd. (ICCL) to carry the mainframe banner in Canada and while the firm dominated the last Canadian Computer Show in Montreal in September, 1970, ICCL didn't even exhibit this year and, for all practical purposes, the company is in limbo. Its former president, James E. Bieser, is no longer with the company and independent observers of the Canadian computer scene have been able to pinpoint no more than 10 installed ICCL systems. ICCL appears to be waiting for a new Canadian charter from England's ICL—with which it has an affiliation. ICL has a new management team and many in Canada believe the U.K. managers must get settled before they will be able to turn much attention to the Canadian affiliate.

ICL has already come to the rescue of another Canadian computer company, Ontario-based Consolidated Computer Inc., a data entry firm. ICL has agreed to purchase $7 million worth of Consolidated's systems this year for sale in Europe and this arrangement was largely responsible for the Canadian company being able to announce its first profits at the Montreal show—$177,121 on sales of $2,073,874 during the first quarter of 1972.

"We're still on an austerity program," says William G. Hutchison, Consolidated's president. "But I think it's working. We've cut back our employment from 510 to 230. We still expect to do about $10 million in business this year."

Consolidated was forced into receivership several months ago and in the process lost its president, Mers Kutt. Its chief market had been in the U.S., but the company has had to trim its sales force there down to five men. Besides ICL, the company was propped up by the Canadian and Ontario governments, which now own 54% of Consolidated.

"We're concentrating in more vertical markets now," says John M. Dennehy, Consolidated's director of marketing. "We're aiming at insurance companies and at state and regional governments. We've become very knowledgeable on state income taxes and have developed software and systems expertise in these areas."

Bad luck with minis

Another company that has lost its president is Datagen of Canada Ltd., the Canadian offspring of minicomputer manufacturer Data General. Juan A. Monaco has left as president and the company's original plans to design and manufacture a wide variety of products for export have been largely abandoned. But Datagen's arch rival in the minicomputer business, Digital Equipment of Canada Ltd., shipped its 1,000th computer from its Canadian plant during the Montreal show.

Meanwhile, the Canadian government continues to subsidize large U.S. mainframe companies in a move to encourage them to step up production and R & D in Canada. Control Data is the leading light here, followed closely by NCR and IBM. While these ventures appear to be successful, some Canadians have complained that the government subsidies have strengthened U.S. subsidiaries while too many of the Canadian firms that have received assistance have foundered.

One new Canadian firm that attracted considerable attention at the show was Comterm Ltd. of Montreal. The company markets a family of programmable remote batch terminals—called the Series 2000—that can access a host of mainframe computers. Each system is configured around a PDP-11 and uses a variety of card readers and printers for the different models. The model capability ranges from 300 to 1200 cards and 300 to 1500 lines per minute with prices from $40,000 to $75,000.

"We've been marketing in Eastern Canada to establish a solid base," said Richard Shirley, marketing manager. "We plan to move into New England soon and then spread out across Canada."

As for the show itself, some 9,000 persons attended. Derek Tidd, show manager, said that while attendance was down from past years, the quality of attendees was high. "The trend is toward serious buyers of computer equipment and services," said Tidd. "The people were more interested in buying computers than those who attended the shows in the past."

The technical sessions at the Queen Elizabeth Hotel covered a broad range of subjects, from operating system design and pattern recognition to the status of the four-day work week and top management involvement with computers.

Two academicians, Andrew Grindley and Gordon Cummer of Western Ontario Univ., surveyed 65 senior executives at 42 corporations and found that none of the firms had a management information system in use. "With the exception of budget preparation, little use is being made of the computer for strategic planning purposes," they reported.

As for the four-day work week, David Alderman of P.S. Ross and Partners of Toronto estimated that some 50 Canadian firms have adopted the measure and he added that proponents claim that the four-day week has tended to bring about "higher output per man-hour." He said that the small number of firms that had reverted back to the traditional five-day work week after experimenting with the four-day week—about 10% of the firms, he indicated—did so largely because of poor and inadequate planning and scheduling.

Alderman responded to some criticism of the four-day week by stating: "Certain prominent behavioral psychologists have suggested that increased leisure time will in itself create problems—they believe that work is a basic need. My comment on this is that I am sure similar fears were expressed when it was suggested in mid-19th century Britain that society might generally be improved by reducing working hours of children in mines, or in fact taking them out of mines altogether." □

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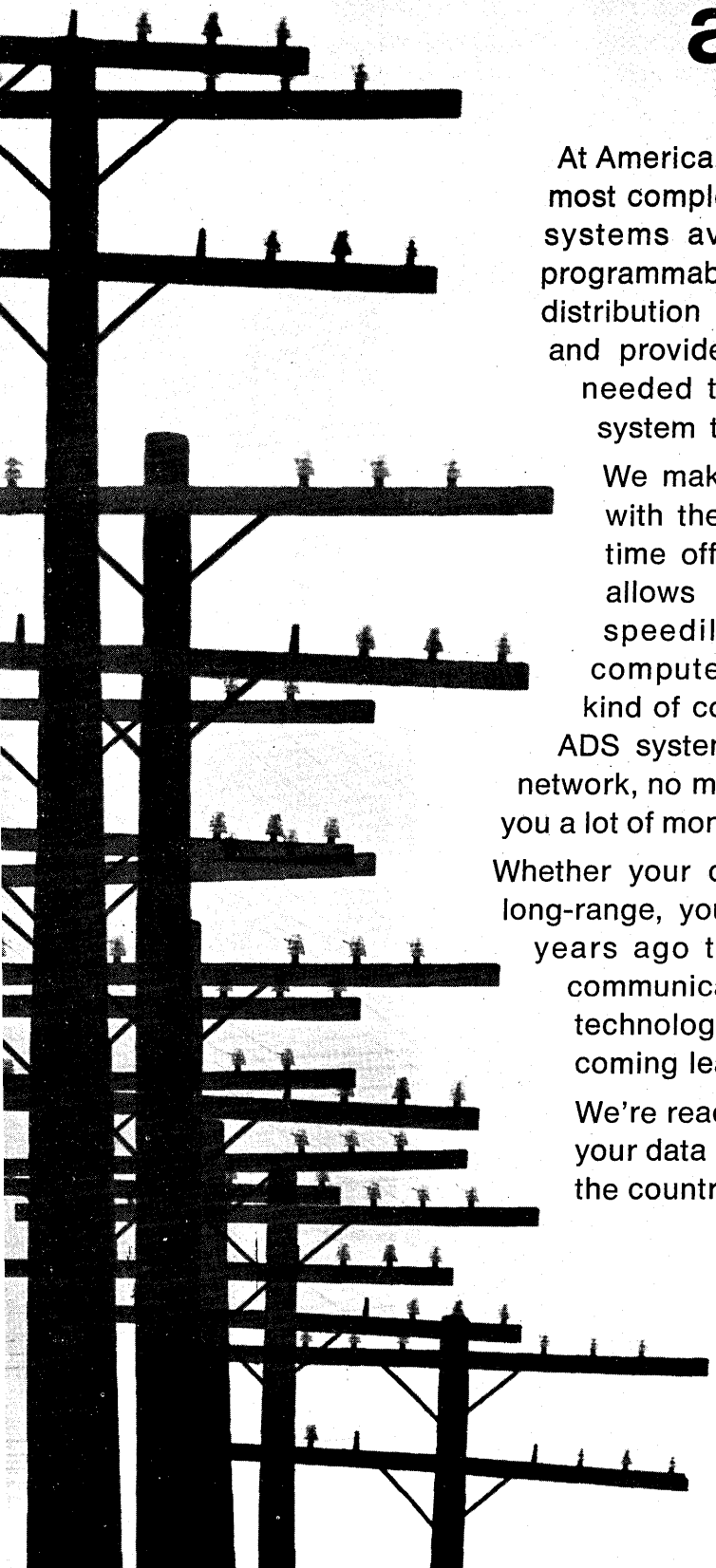

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CIRCLE 10 ON READER CARD

News in Perspective

In its Aug. 2 announcement, IBM offered machines and methods that allow users to use big hunks of auxiliary memory as if it were main memory. But it also chops off big hunks of a market that independent peripheral makers hoped to share with Big Brother. The independents' strategy for survival, page 109, is beginning to unfold . . .

Programming costs are lower in Europe than in the U.S. Thus there is mixed reaction there to the concept of virtual storage and its encouragement of big programs and less attention to program efficiency. But, on page 112, Europeans see the day when that trend may be reversed . . .

Transcripts from the Justice Dept.'s case against IBM make for interesting reading, page 112. One excerpt is about the cancellation of a proposed trip by IBM, the Justice Dept., and the Federal District Court judge to view computer installations at Cape Kennedy during a moon shot . . .

The cities of Pasadena and Charlotte are setting up on-line interactive municipal information systems, page 116. They seem to use different approaches, but their goals are similar . . .

Look for a lengthy debate in Congress next year on privacy and computer-based data banks, page 123.

On-Line Systems

CSC and New York's Off-Track Betting: Pioneers Get Arrows

It all started April 1970 when New York State legalized off-track betting and New York City planned that its fiscal '71 budget would include a $50 million profit from the new Off-Track Betting Corp. That's profits, not revenues — profits that had to be made by June 1971 from a company and a system that had not yet been designed or staffed.

As its appointed president, Howard Samuels, one-time Democratic nominee for New York governor and ex-executive of a plastics company, had to prove a great deal in this "unconscionably short time": that a city-owned corporation could seriously combat organized crime by competing with it, fill the public coffers, and satisfy man's sporting blood. It was a heady, but realistic goal. Estimates are that nationally racing, numbers, and sports could rake in $10 billion yearly. New York City realized only a $12 million profit last year, but it is now grossing at a $300 million rate and with numbers and sports could reach $2 billion annually, says Samuels.

Despite this apparent success, as he sees it, Samuels and company have been jumped on by political opponents like Gov. Rockefeller who don't want to see a Democrat make OTB a success, by the tracks that didn't want to cut OTB in on the action, and by the nation's "hypocritical moralists." He has been thwarted by labor, the telephone company, Con Edison, and last, but not least, the propensity of the computer industry for being late.

If you've been reading the New York papers, Samuels and the vendor that won the computer contract, Computer Sciences Corp., did not form a lifetime friendship. In fact, "emotionally speaking," Samuels would like to "open the window and drop the software industry on its head."

Going back to that summer of '70, Computer Sciences was really the only reasonable bidder that committed to the Oct. 15 deadline for an initial operational system. (That was the only way to get the contract, says a CSC source.) It had the terminals left over from the defunct Computicket, some software (a DOS modification), and a very strong desire to become king of computer services for the future betting market — services that could go as high as $500 million annually. But it did not meet its equally strong and continual promises to be up Oct. 15, Nov. 15,

The nation's first experiment in legalized off-track betting gave widespread exposure to the inadequacies of automation. But the basic problem was overwhelming.

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Jan. 4, and almost every week thereafter until cutover finally came June 15, 1971. And what went up, came down.

What's wrong?

Two years later, CSC executives admit to OTB that the system will not handle 1,100 terminals as promised. Inadequate restart procedures require up to eight hours to reconstruct the system (although the second cpu can begin handling transactions with an hour). Input errors can't be corrected once entry and verification are made, meaning that if a horse gets scratched by mistake, no correction can be made unless the system is taken down. System redundancy is inadequate. The latest software release, number 4, is eight months late. The system is able to handle more than half of the 500,000 transactions and $1.5 million in daily bets, but the response is slow — 8-10 transactions a minute. Thus, Ticketron has been brought in to handle about half the 800 terminals installed. AmTote is doing the telephone betting (in which a bettor keeps a cash account) and was able to fill a CSC lack — immediate update of an account after a win or loss. The two additional vendors are costing an extra $250,000 a month. To boot, the city has lost millions because it is not able to open offices quickly; 84 offices are open vs. over 100 planned.

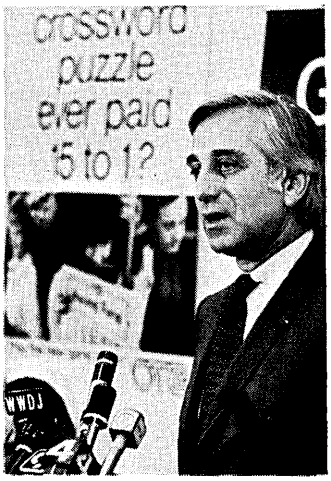
CSC, which has managed to gross $5 million for these services, seems now to be in a scrap for its OTB life — perhaps its life in the betting industry in general.

Computer Sciences' well-publicized inadequacies have been a big cause for the sniping criticisms of this nation's first experiment in legalized off-track betting. In all fairness, it has also been a victim of the same haste and pressure that beset OTB itself. The basic problem was overwhelming: How can one simultaneously design, test, and implement a high-volume, ever-changing, ever-growing, real-time system? And if you do what CSC did — use 360/50s, modify OS with BTAM (seldom used for such high-volume applications), and front-end the whole process with mini's (30 to date), the experts say you've really got troubles.

Not that late

Ed Brenman, director of the municipal data systems for the Bureau of the Budget (which had initial responsibility for OTB), counters that 10 months between selection and delivery is not bad, compared to, say, the 30 months it took Control Data to get an off-track betting system up in Australia. CDC, he adds, bid the OTB contract, but couldn't offer the terminal built for the Australian contract and wouldn't let Ticketron bid the system either.

If it was working on a pioneering system under impossible conditions, why then is CSC so criticized? Long overdue, OTB is finally this year under a new strong, dp management, led by executive vice president Jerry Paul, an ex-IBM marketeer with much PARS and SABRE experience. Paul, who has a hardnosed attitude about the industry, emphasizes that his experience with CSC at IBM had been very good, so he came to OTB with a "positive attitude."



HOWARD SAMUELS; Drop the software industry on its head.

But what he found, he said bluntly, was the "typical industry case of alligator mouth and hummingbird ass." And he wonders about his seven letters to CSC president William Hoover that have not been answered.

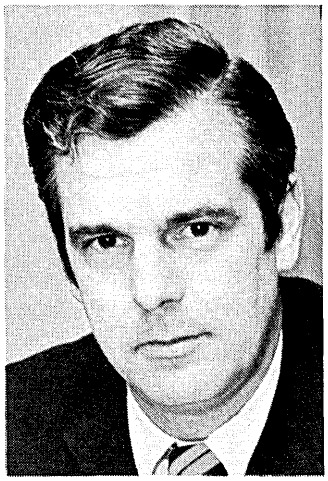
Although no contracts have ever been signed, original agreements gave CSC the rights to the software, a cost-plus arrangement, and no penalty clauses. The payment has since been changed to a per-transaction one, eliminating the escalation software charges, and CSC has agreed to penalties for downtime. We asked Samuels why OTB gave up the software rights to CSC. He readily admitted that OTB was naive in the beginning. One source calls it a blessing. "Who wants software that smells like a 12-pound garlic soaked in diesel fuel?"

Thus the major criticisms against CSC seem to be broken promises and a not-too-cooperative attitude by its management, plus a faulty design approach. The system was generated under pressure, but still, two years later, is uncorrected to satisfaction.

We tried to piece together an objective story. But under orders from Mr. Hoover, CSC, which strongly feels that it has been treated shabbily and with bias by the press, would not give *Datamation* its perspective technically or otherwise. So, we talked to OTB, ex-CSC personnel on the project, Brenman, and other vendors.

From the beginning

Though the Bureau of the Budget had been studying off-track betting for a dozen years before the law was passed, all that was really ready when the request for proposal went out were the specifications themselves. That August, Charles Chriss, a computer



JERRY PAUL: His "positive attitude" soon changed.

professional with a programming background and two stints as an entrepreneur, joined OTB to handle operations in an organization that now totals 2,000 people and 84 branch offices. He was shocked to find that though the computer vendor, CSC, had been selected, nothing had been done on operations. His tasks ranged from defining betting and track interface procedures, protecting against fraud and theft, establishing a financial system, and hiring — to selecting durable furniture and wallpaper that would stand up in heavy traffic.

Chriss says the first big snafu that affected the whole operation came that fall. OTB had planned to list only 12 horses per race and to open up for betting at 7:30 or 8:00 a.m. It discovered that the daily scratches weren't made by the tracks until later in the morning, and at 7:30 there might be as many as

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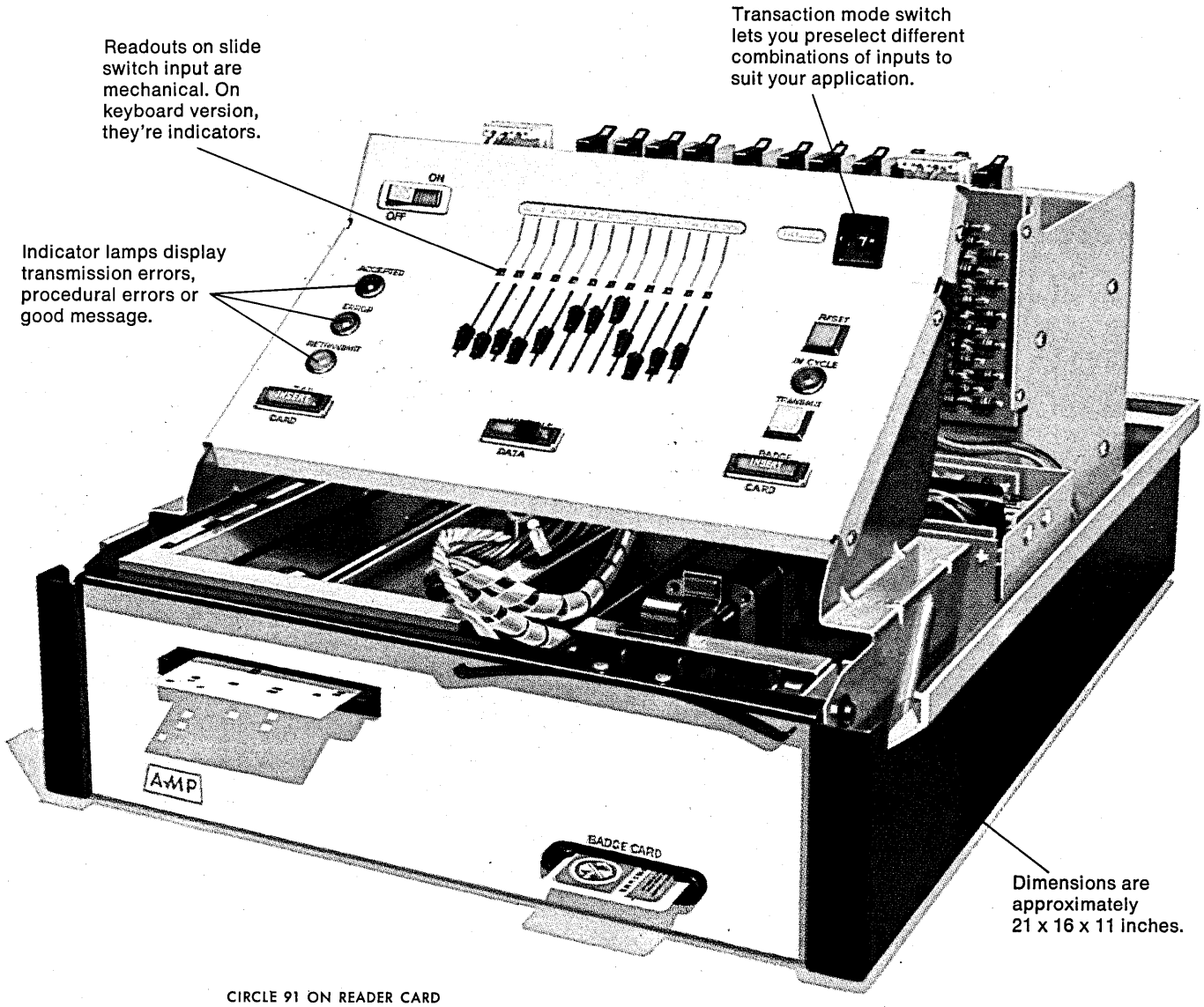

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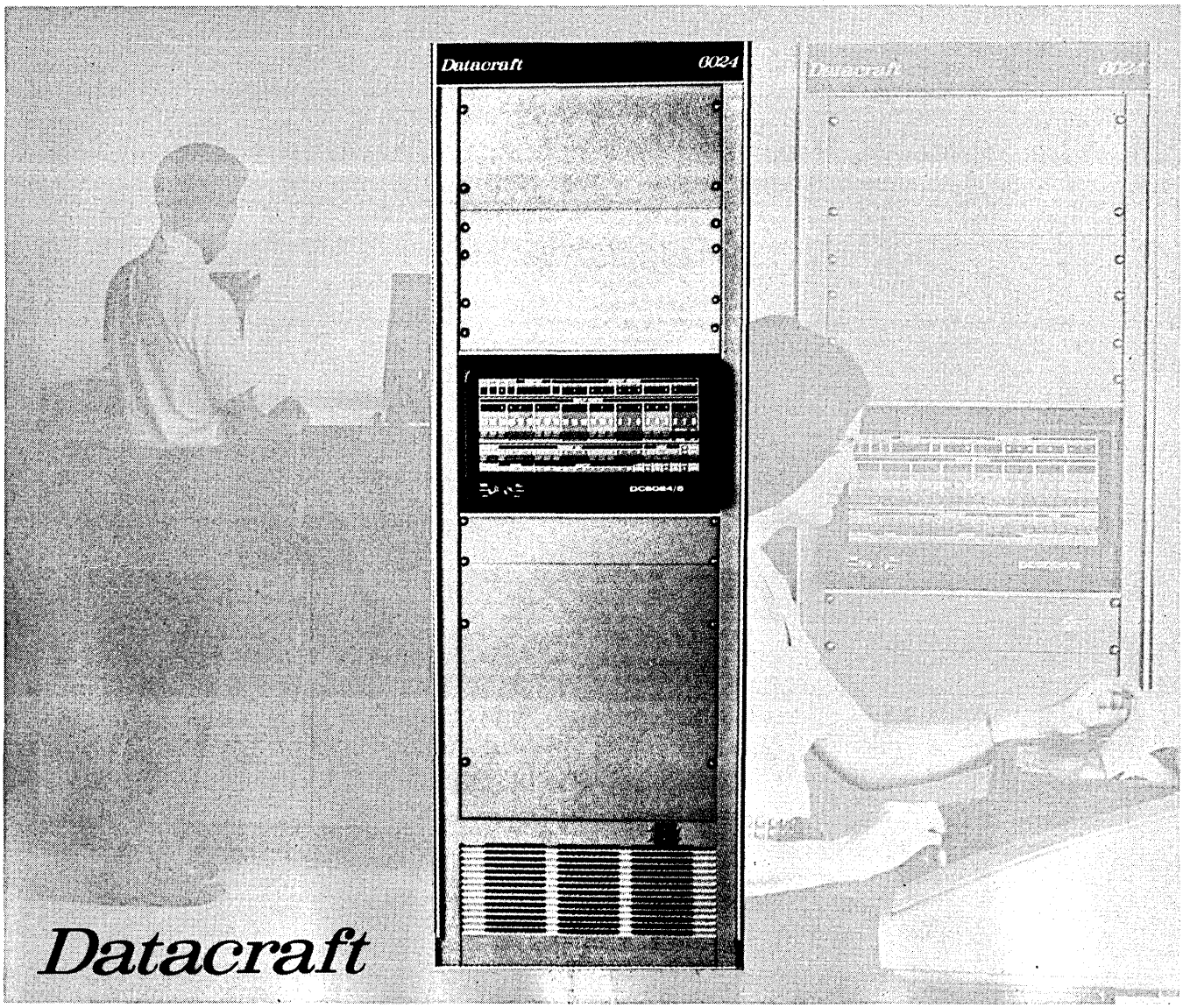

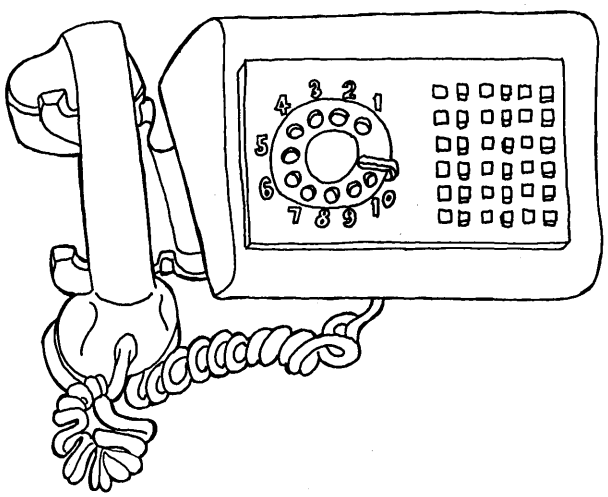

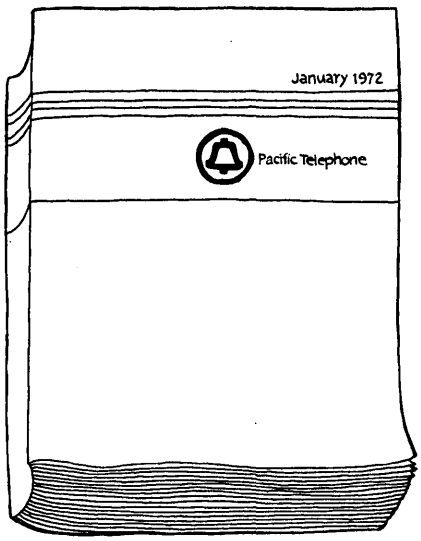

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news in perspective

24 entries still listed. The system therefore had to handle not 12 but 24 horses, or critical early morning rush-hour revenue would be lost. That decision affected the files, the programming, and the terminals, which were then being manufactured with 12 keys for horse entry.

CSC might have had its first inkling of how volatile the new effort would be, but it insisted, we're told, that it could be up by Nov. 15 (a month delay was actually caused by track and legal problems). In the meantime, CSC and the city's technical committee dickered over the features that would be in the initial system, and according to an ex-CSCer on the project, what they agreed upon "doubled the amount of software that would have to be developed." Nov. 15 slipped to Jan. 4. This source says that the technical staff never committed to any of those early dates, although Jan. 4 might have been made if those additional features weren't required.

This ex-CSCer also said that modifying OS with BTAM was planned as an interim step. "We had to work with something available to get up in time." The CSC staff was developing its own scheduling and job control programs, using OS only for I/O handling. The plan was to gradually replace the whole system with custom-tailored software, much the same as the industry has seen IBM do with reservation systems like PARS.

He "chickened out"

By December, Chuck Chriss was getting skittish because some branch management staff had been hired for the Jan. 4 cutover (just a few offices were to be opened), and there was no system to be tested. CSC kept saying "everything's under control"; but the month wore on, and when CSC's marketeer on the project appeared before the Board of Directors to speak the truth, our source says "he chickened out, optimistic until the end."

CSC didn't make it and promised from week to week that the system was coming. Because of this, OTB procrastinated on whether to go to a manual system. With multiple vendors involved — IBM, the phone company, Wiley (terminal manufacturer), and CSC — it became a cry of "bug, bug, whose fault is the bug." Our ex-CSC source says that the real problem in January and February was a change in technical management. As previously agreed, Dr. Wayne Swift left for another project and his replacement's talents "cost the project three months." Management "didn't admit soon enough it had made the wrong decision."

Generally, this source sums up the problem as two-headed monsters on both sides: On CSC's side, the technical management reported to the Systems Div., and the marketing management fell under the new Custom Systems Division; on the city's side, the Budget Bureau was still partially in control, but OTB management was taking hold. So, he says, there were orders and opinions from four sides.

Everyone agrees on one thing — that the CSC technical crew worked their hearts out, sleeping on floors and cots and spending New Year's Eve at Nathan's hot dog stand. With each passing week of delays, all were painted with the same brush, maligned by the press, and blamed by all. Off-Track Betting Corp. personnel, out of sheer frustration, began visiting the CSC quarters with great frequency, demanding, blaming. Computer Sciences executives in California began to hit the panic button, calling the marketing manager on the project, who in turn called the technical staff — many times daily. Morale crumbled. And the constant turnover in staff may have led to the kludge that resulted.

Time fled, and by spring, OTB had decided to go to a manual system. CSC made one final effort in early April to stave that off, but its demonstration before the board failed — "castastrophically, as only a computer can make you fail."

The bettors couldn't have cared less whether a computer was involved; in fact, manual ticketing is faster. But OTB needed the computer to store and consolidate the betting for the tracks, protect against fraud (through personnel and other checks), track and corroborate the winning tickets, and develop reports on revenues for all who would get a cut — the tracks, the state, the city.

The system did go up June 15, though without being duplexed and lacking many features originally agreed to (no contracts have been signed). But it was better than nothing. Through a pitiable catastrophe, CSC's shaky reputation was jolted again within a few weeks, when the system went out for eight days in July. In testing, a programmer had wiped out their whole produc-

tion system; and because they didn't have a backup, they had to construct it from earlier versions and the memory of the staff.

In the meantime, Ticketron had watched the troubles and quietly developed a modified system that they offered and brought up within 45 days — making CSC appear a bigger goat than perhaps it was. The system, which is currently handling as many terminals (about 400), though not the same volume as CSC, is — in marked contrast — based on the smaller CDC 1700s. It doesn't have as much power as the 50s but it is duplexed, has a quicker restart, and initially provided markedly higher reliability than the CSC system.

Why not minis?

All those who felt that the OTB system could have been done on minis with big storage space began to point knowingly at the Ticketron, and subsequently the AmTote system, which is based on dual Varian 620/i's. AmTote handles only 60 terminals, but one system developer opined that it could handle the whole OTB system on dual 620s front-ended by two more such minis and supported by more storage. We did ask CSC why they hadn't at least tried minicomputers as an interim system; but, as noted, they wouldn't discuss it. One ex-CSCer commented that he thought New York was anxious to use IBM 360s because of its giant cache of 360s that could be used for backup; and "going from 50s to minis would have looked bad."

In any case, the CSC system is still suffering reliability problems and has a software approach that a technical manager says has become a kludge and should probably be restarted from scratch. He adds pityingly that some problems weren't CSC's fault: "Last December, everything on the system, which had been worked 24 hours a day, decided to go haywire." At writing, he said that Ticketron, which had amassed a good reliability record, was suffering the same and, according to Brenman, had stopped adding terminals to its system. "The bettors only know what terminal is working, and while they used to line up at Ticketron terminals (which are used in many of the same offices with CSC's), they've been going to CSC's lately."

So today, the three vendors are scrapping for what may become a one-vendor shop. If Ticketron or AmTote are winners, they should be in a good position to capture future systems around the country. About 14 states are studying or have legislation on off-track betting. New York itself, which won't allow most of its counties to link into OTB in the city ("for sheer political reasons," say Samuels) should have some kind of regional plan to cover the state by next year. Samuels thinks that legislation legalizing sports and numbers betting may be passed before 1975. In the meantime, he continues to fight off the tracks and the state, both of which want a bigger cut of the OTB revenues and are battling televising races. He's battling the nation's "hypocrisy" in opposing more legalized betting while leaving the riches to organized crime. And he's trying to get Off-Track Betting Corp. into shape to be the model of a fully automated, highly profitable corporation "to show that the government can run something successfully."

Several of OTB's offices are run by ex-addicts and the handicapped — just 1½-2% of the staff, but "just think if all corporations did that," Samuels muses, his mind moving rather quickly from computer problems to betting to the social problems he expects to tackle when he leaves OTB for some appointed or elected office in the next year or two.

And CSC is left wincing over the adage: "Pioneers get little but arrows in the derriere."

—Angeline Pantages

Peripherals

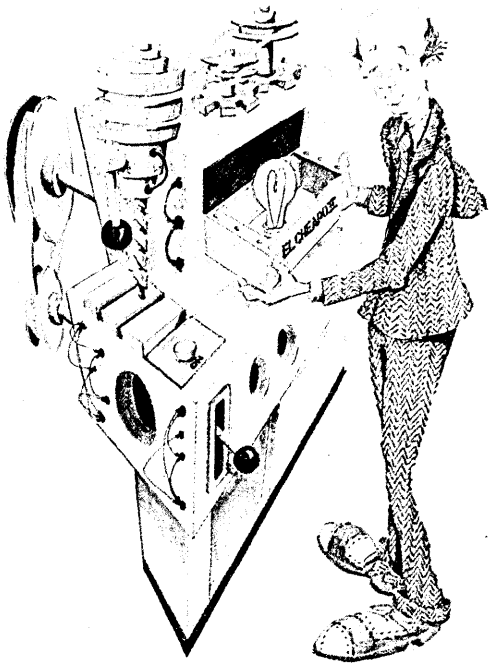
Will Independents Survive IBM Move?

Physics students studying lenses and mirrors learn that a "virtual image" is an image of something that is not there. In many ways, IBM's August announcement was not all that it appeared to be.

With its virtual storage architecture and operating systems, IBM was announcing "an advanced technique that can significantly speed and simplify the development of many computer applications." What it didn't announce — and what competitors claim is very much part of the Aug. 2 releases — was a return in some ways to bundled pricing.

In its court action seeking to constrain IBM from making its announcement, Telex Corp. claimed the announcement would damage its ability to compete with IBM in supplying add-on memory and 3330-like disc drives. Telex refused to comment after the announcement, noting that the merits of its case were to

What the industry taught us about cheap OEM minicomputers.



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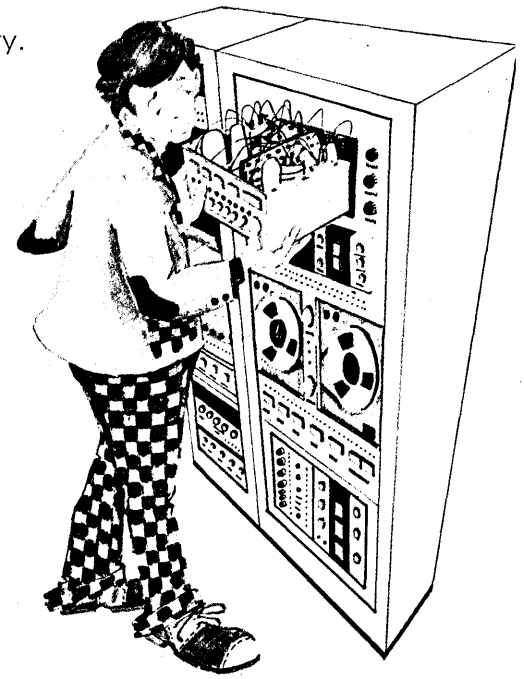

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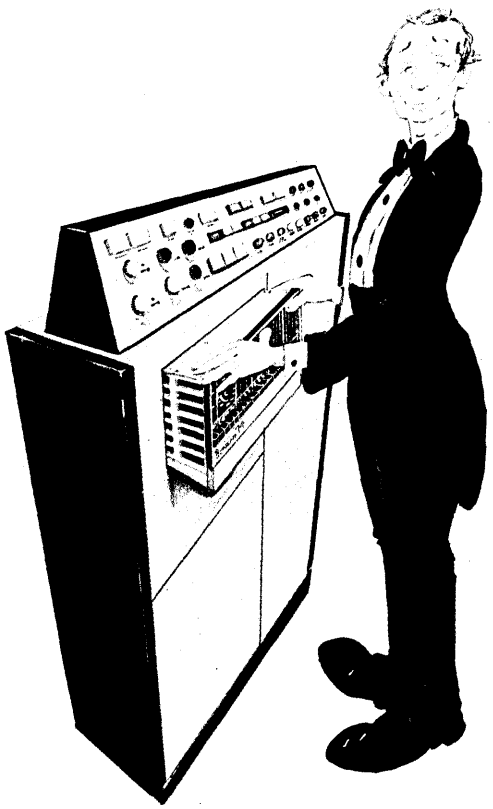

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be heard in Federal Court in St. Paul Sept. 11. Coincidentally, one of Telex' former directors, James L. Quick, sold all of his 12,700 shares right after the announcement.

Some memory suppliers claim that in reducing the price of the memory offered on the new machines and compensating for this by raising the prices of its new central processors IBM may be cutting memory prices artificially. "If that is not restraint of trade, I have never seen anything that was," said the vice president of a large-volume core memory firm who asked not to be identified. He said core makers would be hard put to justify the heavy expenditures of going into the semiconductor memory business if IBM's price umbrella were lowered below profitability levels.

Robert Lloyd, president of Advanced Memory Systems, the Sunnyvale, Calif., firm which sells semiconductor memory add-ons through Itel Corp., figures that IBM's new MOS semiconductor memory should have been offered at a price 20% lower than core. Instead, it is 50% lower.

Also hurting independent suppliers is that fact that the minimum memory IBM offers on the new machines is double that offered on 155s and 165s. Lloyd said this has the effect of slicing off from 25-30% of the independents' potential main-memory replacement market.

Stuart Lotwin, president of Data Recall Corp., which has some 300 installations of main-memory replacements and add-ons across IBM's 360 and 370 lines, doesn't think his firm will be seriously affected. There is lots of business left in the 360/65 and 370/145 market, Lotwin said, adding that his company had planned soon to begin offering semiconductor memories for the 135 and 145 lines anyway, and also was considering entering the 158 and 168 add-on market.

In integrating more electronics into the central processor, IBM has reduced the number and complexity of devices open to competitive selling. "Integrating," in this context, is very close to "bundling" because it cuts the market for independently manufactured disc and printer controllers. IBM continued the practice with its development of the integrated storage controller for the 3330 disc drive.

James Pyle, spokesman for California Computer Products, thinks there still is a healthy market for his company's 3330-like equipment. He said the IBM move "doesn't kill the market, but it does cut the size of it down drastically. We'll be able to stay in the market, but I think some of the smaller people may not." Pyle says the estimated 3,000 IBM 3330s already installed represent a pretty good replacement market in itself. "Even with the current price cut, we can stay at least 10% under their price and still make a good profit." Neither Pyle or any other suppliers will admit they're certain this is IBM's final price reduction.

Meanwhile, Itel Corp. said the pricing differences will put it out of the operating lease business on 370 memories, unless they are part of "package" deals the firm has been offering. Says Gary B. Friedman, president of Itel's data processing group: "A 512K memory used to rent for approximately $6K a month. Now it's $2600. On a $6K deal, we could save the user about $1000 a month. New we can't rent it to him for, say, $1500 and make a profit on an operating lease basis. We think we can, however, on a package lease basis."

Twelve days after the IBM announcement, Telex began advertising savings to users through package deals offered by its newly formed leasing operation in Phoenix. It said that by leasing IBM 155s and 165s and using Telex memory, discs, printers, and controllers, a customer could use the benefits of virtual storage immediately and still save 30% on a 158-like configuration and 26% on a 168.

Itel's Friedman says IBM's strategy is "to get themselves into a position where no one can impact their rental base." In the long run, Friedman adds, the user is the loser. "We can save the user money over any IBM plan, but now we can't save him as much as before."

Edward Farris, vp of the Electronic Memories Group at EM&M, said "any time a user becomes a captive of IBM, he is put into an undesirable position. The 158 and 168 announcement does seem to be intended to produce a captive state for the 360 and 370 customer."

As for customer reaction, it might have been best put by William Payne, assistant director of administration and computer servies at Lockheed in Burbank. Payne did not expect an immediate impact as a user, but one that would be felt 15 years from now. "If all those

small companies go out of business, there will be no reason for IBM to make announcements like this," Payne said.

International

Virtual Storage an Interim Step

Large European users in general are pleased with what large-scale virtual memory will afford them.

But in interviews a week after IBM's announcement of the new 370 systems, they complained that the requirements of the VS2 operating system for three megabytes of virtual storage are "overwhelming," and "in the unfortunate tradition of IBM software." Most concur that virtual storage is just an interim step until IBM can bring semiconductor storage costs down to replace it with real memory. In the meantime, virtual storage encourages big programs and less attention to efficiency.

Because of the low costs of programmers relative to hardware, Europeans have always emphasized efficiency more than their U.S. counterparts. Thus, they are not too pleased with the IBM encouragement of "bigness" in programming. They do, however, feel that as programming salaries go up — a trend in many countries — and hard ware costs come down, they too may be swept along by the IBM approach.

Multinational users see another side to the announcement. Always plagued in the past by the need to maintain two operating systems — DOS in their smaller centers and OS with big 360s and 370s — they are particularly pleased by the program transferability offered by the new operating systems.

Other factors enter in, too. For instance, although leasing has become increasingly popular in major user-nations (Leasco Europa has recently placed $24 million worth of machines), sources estimate there are several hundred purchased 155s and 165s. The value of these systems has, of course, been depreciated. Switzerland, with a tradition of buying 80% of its equipment, should be the hardest hit.

Opinion varies on what will happen to the independent memory and peripheral makers or marketeers. Although mixing installations is not common in research and university environments in Europe, it had gathered speed among commercial users. Now, except for the likes of BASF, Europe is not expected to spawn any indigenous manufacturers of plug-compatibles.

Even mainframe manufacturers are worried. In fact, some panic has been created in firms like ICL, which had already seen its stock plummet to a value equivalent to about one-third of its gross annual sales. The company's valuation on share price is about $140 million, and its real estate holdings alone are said to be worth several times that amount. European users had already been eyeing IBM because of its PL/1 package, which has a much wider appeal there than in the U.S. Virtual storage just might add enough to that appeal to get some customers to switch from machines like the ICL 1900 (for which IBM has emulators) and the byte-oriented ICL System 4 and Siemens 4004.

Many European users are amused by the IBM introduction of paging "almost as if it was the first time," chuckling that the Atlas computer had that capability in 1960, "by chance a European invention." Then, as everyone does, they mused about the Burroughs 5000.

Antitrust

Trip to the Cape Didn't Come Off

The transcript of the Justice Dept.'s antitrust case against IBM contains a statement that an attorney representing IBM threatened to go to President Richard Nixon to "obtain clearance" for representatives of the court, IBM, and the Justice Dept. to visit NASA computer installations at Cape Kennedy and Houston during a moon shot.

The trip had been proposed by attorney Thomas D. Barr, who, according to the statement in the transcript, became "truculent" when the trip was canceled by the government. Barr represents IBM in the case.

The statement was made by Judge David N. Edelstein, who is presiding over pretrial proceedings in U.S. District Court in New York. In his statement, Judge Edelstein referred also to Justice Dept. attorney Raymond M. Carlson. The judge said: "Mr. Carlson related that Mr. Barr's attitude after his last conversation was truculent. Mr. Barr indicated that he would (go) to the President if necessary to obtain clearance."

Both Mr. Barr and Mr. Carlson were in court when the judge made his statement about the planned moon-shot trip, and neither made any comment on the statement about the President. There is no evidence to suggest that Mr. Barr ever attempted to contact the President.

Both IBM and the Justice Dept. were contacted by *Datamation* and each refused comment, citing a court order that forbids them from discussing the antitrust case with the press. The unusual court order was proposed by IBM, prepared jointly by IBM and Justice Dept. attorneys and signed by Judge Edelstein. Reporters covering the case are thus restricted to working from what selections of the proceedings are available in the federal courthouse in New York.

"Excellent" suggestion

In February, Mr. Barr proposed that the court visit the Cape Kennedy computer installation, and his associate, attorney F.A.O. Schwarz, observed that there would be a space shot there in April. The idea seemed to appeal to Judge Edelstein immediately. "I think your suggestion to view this scene is an excellent one," he said.

However, Mr. Carlson, the Justice Dept. attorney, appeared at first to express some hesitation at the IBM suggestion. He said: "I would love to go, but I wouldn't want Your Honor to take this as any indication that I think the (sic) Cape Kennedy has anything to do with this case or the tracking of missiles has anything to do with the case."

Mr. Barr's reason for suggesting the trip was, he said, that he was having difficulty in explaining what was involved in electronic data processing and that a trip to a sophisticated computer installation like the one at Cape Kennedy would be valuable. Later, he added that the NASA equipment, in many instances, is standard commercial equipment.

Mr. Carlson said that the NASA facilities were "a highly specialized group of data processing installations," but that he felt the antitrust case could be advanced by the trip. He also suggested that consideration be given to visiting a "more commercially oriented installation, perhaps in the New York area." There are several large, sophisticated commercially oriented computer instal-

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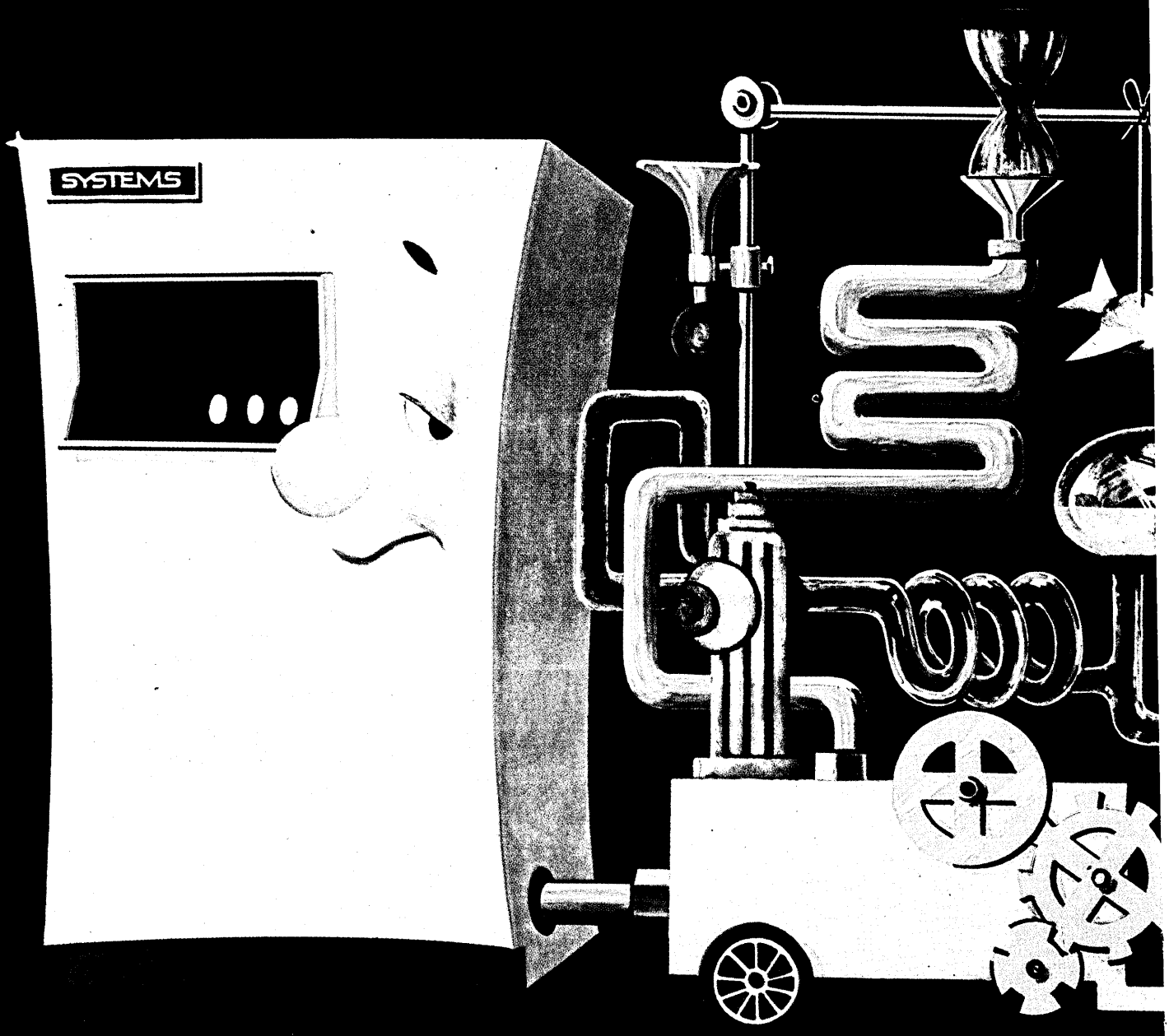

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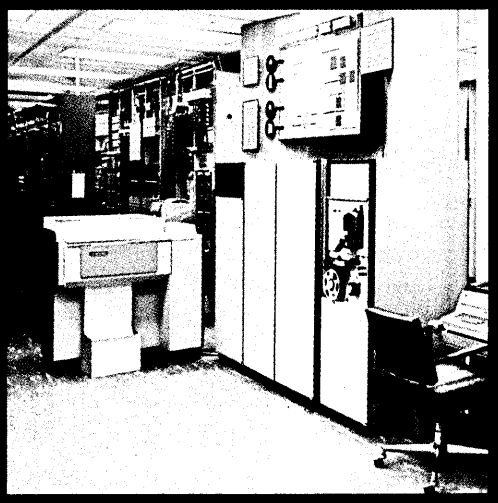

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lations within walking distance of the courthouse in Manhattan.

It is not precisely clear from the transcript why the trip was canceled. NASA refused clearance, noting that IBM had not given NASA ample notice, with the result that there was concern the NASA installations would be too crowded. In addition, NASA, being a part of the government and, as such, a part of the government case against IBM, did not approve of a party that would consist of the judge, the Justice Dept., and IBM.

Of ITT and planes

Moreover, the celebrated ITT antitrust controversy, triggered by the so-called Dita Beard incident, was in the news at the time, and government officials were sensitive to it. In discussing the government's refusal to grant clearance for the trip, Mr. Barr said: "I think I would be less than candid if I did not say to the court that in the day or so preceding this abrupt about-face, we began to hear from the government mention of the ITT affair; we began to hear from the government mention of the use of a plane from another corporation by a former head of the antitrust division; and all of a sudden, those matters seemed to have some relevance to what we were doing."

Judge Edelstein was sensitive that the trip not be construed as a junket or a party, and at one point he said: "I don't know why you insist upon referring to this as a party. I can't understand that characterization whatsoever ... I considerd it a scheduled hearing."

Judge Edelstein, maintaining that he thought the then acting attorney general Richard Kleindienst should have been advised of the importance of the trip, ordered Mr. Carlson to present the entire record of the trip and its cancellation before Mr. Kleindienst.

Kleindienst replied to the judge that "government counsel had serious reservations concerning the propriety of the use of an IBM aircraft for the purpose of transportation," but did not attempt to obstruct the trip. He noted that Justice Dept. officials attempted unsuccessfully to obtain a government aircraft for the trip.

Although Kleindienst alludes to an "IBM aircraft," it is not clear from the transcript whether or not the firm planned to use one of its aircraft for the trip. In the transcript, Judge Edelstein had stated that he had indicated "from the very outset ... that I would not travel in an IBM plane."

Meanwhile, the court order prohibiting participants in the case from talking with the press has been strongly protested by the Assn. of Data Processing Service Organizations (ADAPSO), which has petitioned the court to withdraw the order. ADAPSO refers to it as an "order of secrecy" in its petition.

It adds: "This is not a jury trial, and the only reasons which come to mind for the suppression of public information are those of military security, trade secrets, and the like. If these are the reasons for privacy, certainly, at least, the public should be told so. Unexplained secrecy inevitably generates suspicion that there is something to hide."

Assistant Attorney General Thomas E. Kauper, chief of the Justice Dept.'s antitrust division, wrote to ADAPSO saying the order was "never intended to be 'an order of secrecy,' as you call it." He added, in replying to a letter asking him to persuade the court to withdraw the order, that the order was "designed to assure that the public and the news media would have access to all proceedings before the court and to all papers on file with the court in this case."

ADAPSO maintains that many documents and other papers crucial to the case are often not filed on the case docket or are filed so late as to make them useless to many who could otherwise make use of them.

The ADAPSO petition also makes another important charge regarding the case: "IBM's role is that of prosecutor, not defendant." Its argument is that the Justice Dept. has limited resources when stacked up against IBM's legal resources. It says the major part of the case's recent proceedings has been initiated by IBM and that the undermanned and underfinanced Justice Dept. staff on the case is unable "both to meet IBM litigation demands and still at the same time move forward with the government's own active preparation."

IBM and the Justice Dept. won't comment, citing the restrictive court order on the press. ADAPSO, however, said that the hearing on its petition would be conducted in New York on Sept. 12. It said also that additional papers were to be filed by IBM, the Justice Dept., and ADAPSO before the hearing.

—W. David Gardner

Governments

Municipal Systems: Two Ways to Go

Pasadena, Calif., population 114,000 home of the Tournament of Roses, soon will have an on-line, interactive municipal information system which it claims will be the first operational municipal data processing system of its kind in the country.

The city last month publicly demonstrated three operational modules of its system and explained two others which currently are being tested and are scheduled to become operational before the end of the year.

Charlotte, N.C., population 242,000, also is working on a municipal information system and expects to have a good chunk of it up and running by the first quarter of 1973.

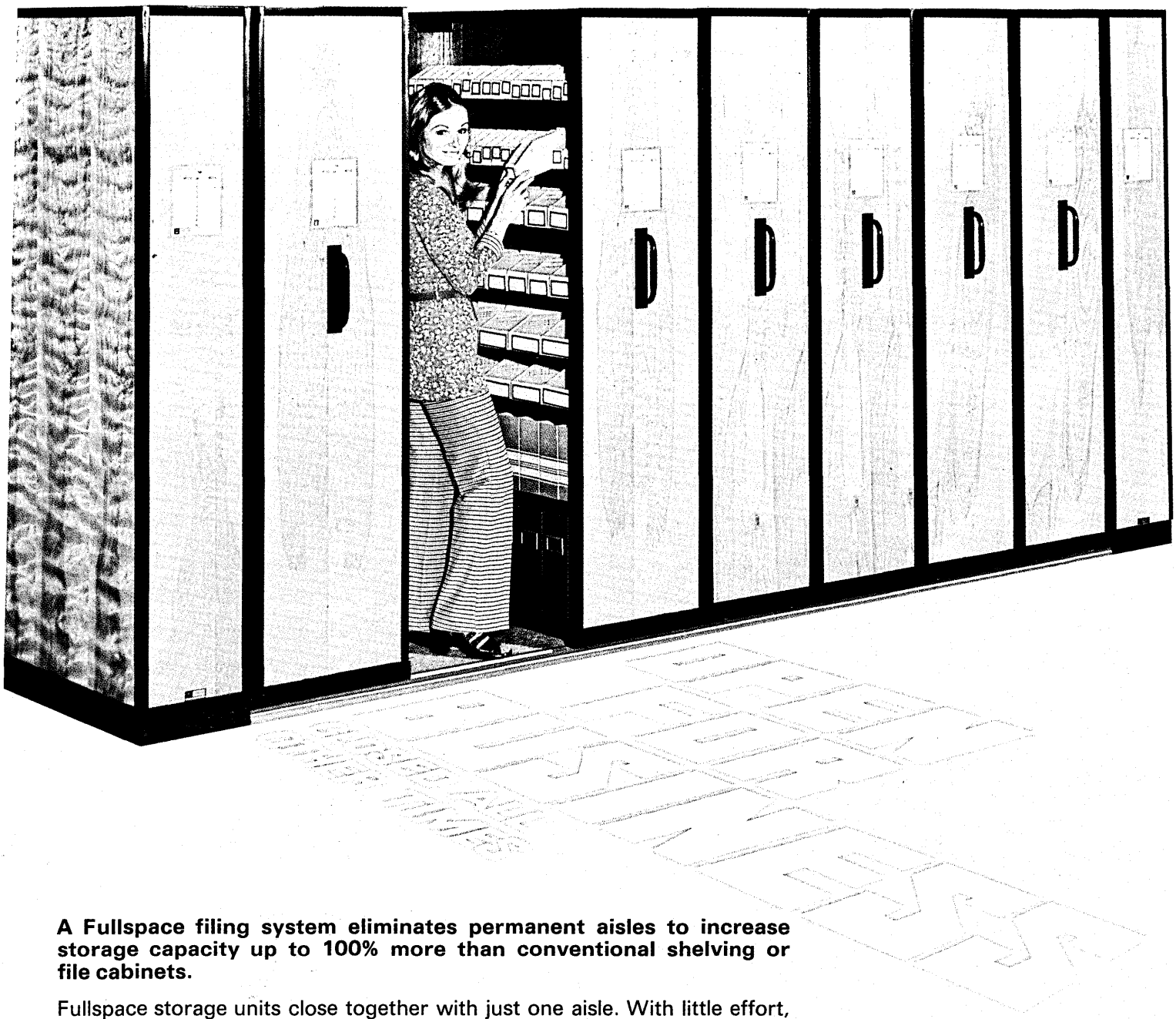
At first glance the two cities' approaches to systems development appear completely dissimilar. Pasadena doesn't own a computer. Charlotte owns two. Pasadena has funded its system development on its own. Charlotte has a grant from the Urban Information Systems Inter-agency Committee (USAC) of the Dept. of Housing and Urban Development (HUD) and hopes to get one for a portion of its system from the Law Enforcement Assistance Administration (LEAA).

But the two systems are aimed at similar problems, and a closer look shows similarities in the two approaches. Both started by putting together teams which blended functional and data processing experience. Both are using a modular approach. Both are working with outside vendors whose on-site employees are so integrated with city employees assigned to development staffs, an outsider couldn't tell one from the other.

Pasadena city manager John Phillips decided in 1967 that the city needed some kind of management information system. A consulting firm was brought in to conduct a two-year joint study with city personnel and to recommend a plan for an MIS. This plan was approved by the city council in April 1969.

"We made, at the outset, a number of decisions," said Pasadena's mayor, Donald F. Yokaitis. "We knew we wanted a user-oriented, real-time system;

(Continued on page 121)



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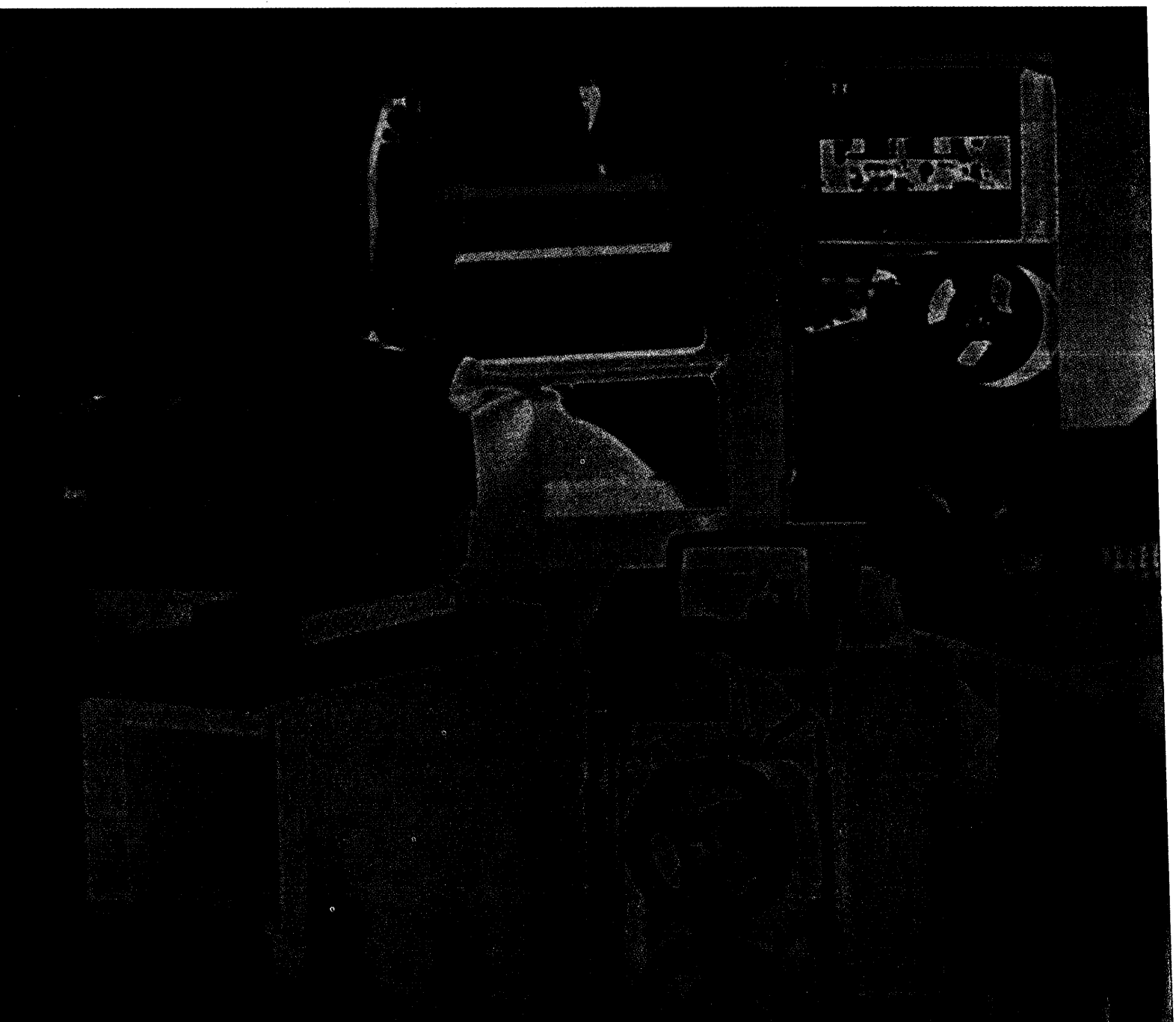

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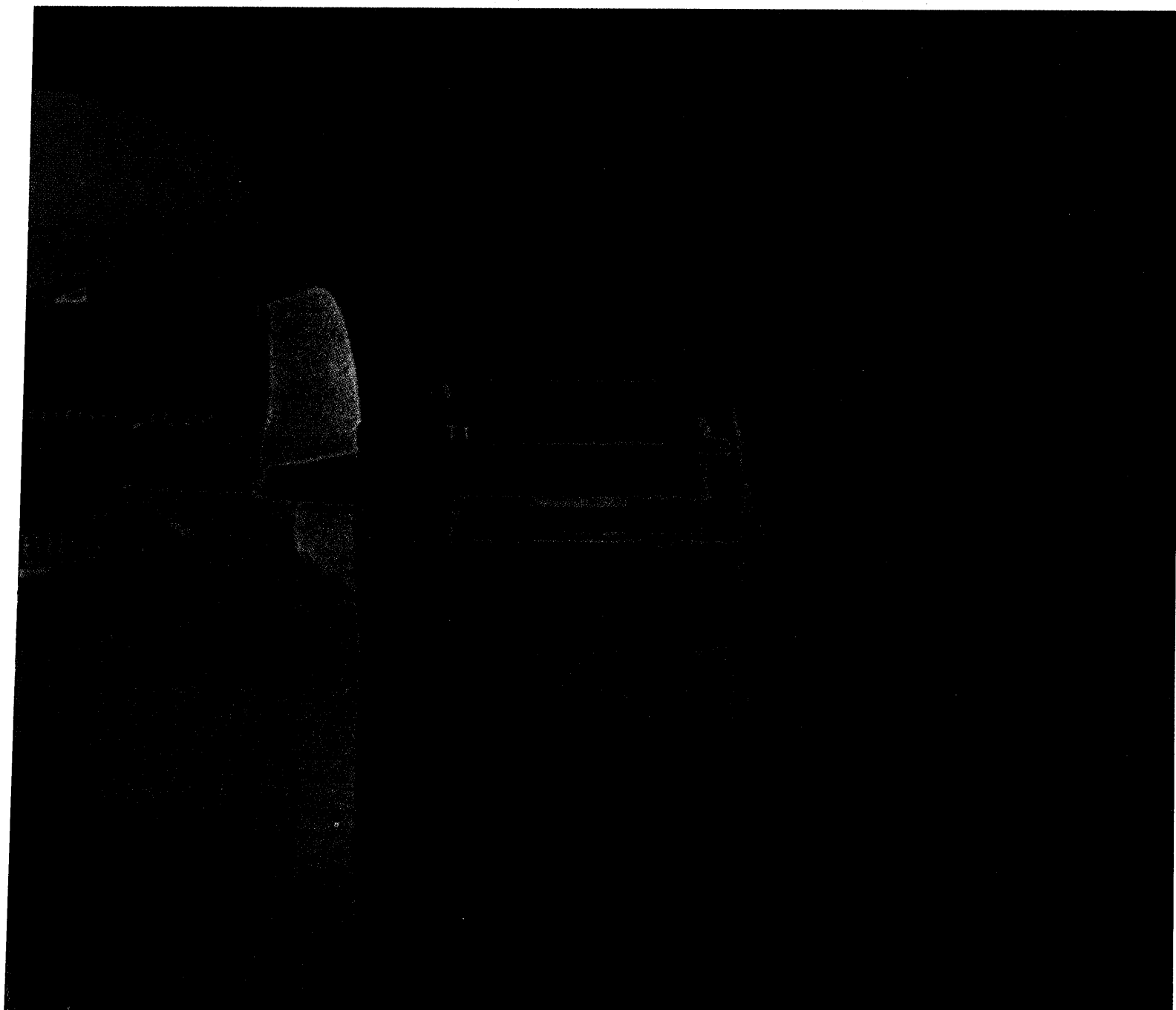
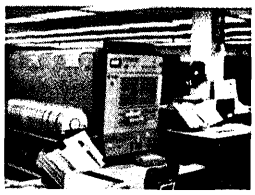


Extend a little, replace a lot,



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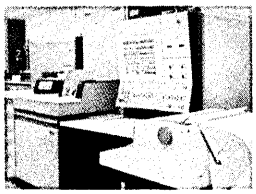

Model 22 – extended from 24K to 64K.
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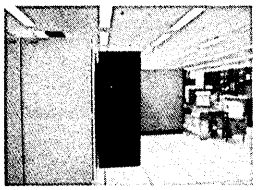

Model 50 – extended from 512K to 768K.
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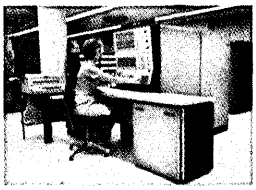

Model 30 – extended from 32K to 64K.
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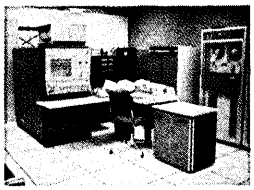

Model 22 – extended from 32K to 64K.
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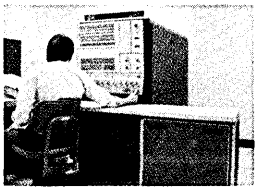

Model 30 – extended from 32K to 64K.
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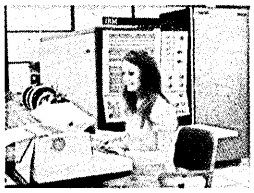

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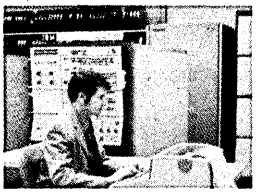

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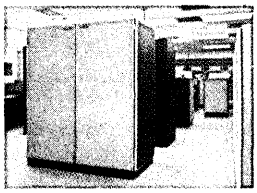

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one which would place terminals at easy access to those who would need them; a system which would provide immediate response with up-to-the-minute information. We knew we needed a system which, like the city itself, would be composed of various subsystems, each receiving and generating its own functional information, but also contributing to other subsystems and to the whole — information for general management decision making."

Mixed backgrounds

In July 1969, Pasadena began putting together a systems division "whose job would be not to run computers or do programming, but to manage and quide the development of the Pasadena Management Information System (PMIS) and to serve as an interface between the system and city government at all levels. Today this division has 11 people with mixed backgrounds: two data processing, one psychologist, one insurance, one accounting, and so on, to encompass all the major functions with which PMIS will have to deal.

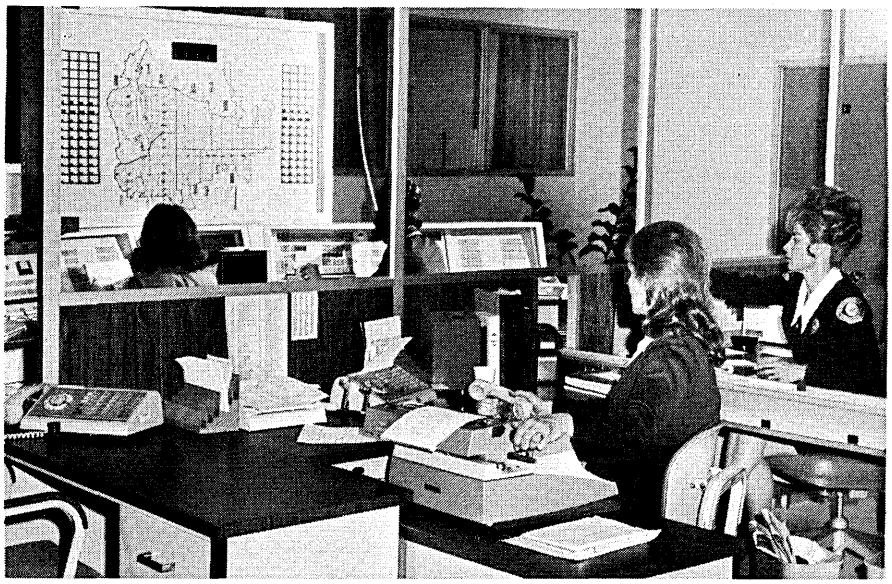
In January 1970, the city of Pasadena entered into a joint venture relationship with Xerox Computer Services, and full-scale development of PMIS was under way. XCS has two on-site employees who work with the city's Systems Div. full time and numerous others who are "in and out from time to time." When a module has been designed and specified by the Systems Div. and approved by city user departments, it is turned over to an XCS systems programming group in nearby Marina del Rey, Calif., where the Xerox Sigma 7 computer, on which the system is running, is housed. When this group has completed development of a module, it is returned to the city for testing and training. Then comes debugging and implementation.

For XCS, which is absorbing most of the development costs (projected at just under $400,000 for the coming year), the arrangement affords saleable products. James Campbell, president, said XCS already has 14 cities in the Los Angeles basin using products the firm developed with the city of Pasadena.

"Training City"

There's also the experience gained in developing and implementing a total municipal information system which XCS hopes it can use with other cities both larger and smaller. In fact, it says, a lot of cities have been watching closely the developments in Pasadena, and representatives of at least one, San Bernardino, Calif., were on hand for Pasadena's public demonstration. "Pasadena has been ideal as a training city," said Bill Cavanaugh, project director for XCS, "because it has all the exceptions. Any other city would have to be easier."

The annual Tournament of Roses parade is one of these exceptions. For a short time each year demands on a number of city departments like sanitation, traffic, and fire change drastically. "We have to completely redistrict the



POLICE Information Reporting System is one of first modules of Pasadena's on-line interactive municipal information system.

fire department," says Frank Lagatutta, a city employee on the systems staff, "to assure that no truck would have to cross the parade route to get to a fire." The system takes care of this as it does a special budget problem created by the annual extravaganza. "Most of the extra expenses incurred by various departments involved with the parade, its preparations, and its aftermath, don't come from department budgets, but from a special budget which is provided for in the integrated financial system module of the MIS."

In addition to the integrated financial module, modules currently operative in Pasadena are the Municipal Services Billing System and the Police Information Reporting System. Coming soon are the Community Manpower Planning System and the Health Services System. The system is costing the city $16-17,000 a month as it is now operating. By 1978 Pasadena expects to have achieved all goals set when it started planning the system. "And by 1991," says Mayor Yokaitis, we will have recovered everything we put into it, assuming we stand still, but we won't."

The Charlotte system is somewhat more expensive. Design and development in fiscal year 1973 (begun July 1) are projected at $1,630,000; but $1,130,000 is reimbursable under the city's USAC contract. Additional equipment costs in the year will run $312,-000; however, $200,000 of this will be offset by LEAA funds.

Even a policeman

System development started in Charlotte in Feb. 1970. Completion is scheduled for fiscal year 1975. The vendor working on this system is System Development Corp. The city had had some data processing before the project got under way; and when it did, an existing data processing department was transferred into a new MIS department of which it became half. The other half is devoted to the project and is staffed by about 40 people, 21 from SDC and the rest from the city. Assignment to specific tasks within the project "is made on the basis of talent and know-how" said Don Luria, SDC project manager, and without regard to employer. All have data processing experience and some also have functional experience, "including a guy who used to walk a beat as a policeman."

Charlotte currently has three modules of its MIS operational. These are a utilities module, a police wants-and-warrants module, and a landfill control module which is concerned with soid waste disposal. The last is a batch operation, while the others are on-line and interactive.

In design and development stages and due to be operational in the first quarter of 1973 or shortly thereafter are inventory/purchasing; information complaints and requests for service (for responding to citizens on everything from complaints about potholes to reports of signs knocked down); a geographic data index which will not be of direct service to citizens but rather will support other modules; fire operations, which will allow dispatchers with terminals and radios to obtain information on characteristics of the neighborhood, the affected buildings, and the people in them and relay it to firemen in trucks on their way to fires; equipment management, serving all departments with mobile equipment; redevelopment/relocation, assisting people who must relocate as a result of city projects; building

permits and code enforcement, concerned with automating the permit application process and the code enforcement process; personnel operations and personnel management; cost accounting; and vital statistics.

The system runs on a 128K Univac 70/45 and a 512K Univac 2. "The fact that we had RCA equipment back in September of 1971 did create some problems," said Luria. "We had decided upon IPS 70, a transaction process and data management system which pleased us because it meets almost the exact functional requirements of a system which has to meet the needs of heterogeneous users with overlapping data requirements. We believe we were the first or second customer to decide on it."

"There was a hiatus for six months after RCA went out of the computer business," said Dr. Launor Carter, vice president and general manager of SDC's Public Systems Div. Resources were diverted from modules which were almost operational back to design of others. "Two months ago," he said, "Univac assured support for IPS 70, and now we can go ahead and make some more programs operational." Luria said IPS is up and running seven days a week, 24 hours a day, and support has been satisfactory. "But the delay had its psychological effect."

Work in stages

Charlotte's project staff, like the XCS-Pasadena team, works in stages. As resources for a given module become available, Luria explained, it is turned over to a design leader who is assigned two or three people to design it and specify it, working closely with user departments. There usually are from four to seven modules in design at any given time. When the design team is finished, and again as resources become available, the module is turned over to a development leader and a team of three or four; and they write programs, develop the module, and test it against parameters set up by the design team. Next, in the same way, the module is handled by implementation and training teams which work closely together.

Luria said the completed municipal information system will be transferable to other cities larger and smaller and with different kinds of city government. "That's the aim of the USAC program."

To facilitate transferability, he said, the project staff is producing detailed documentation as it goes along, including technical documents which describe parts of the system and management modules "which are almost instructional on how we do everything we do" and which will include one on how to manage a project of this size and scope.

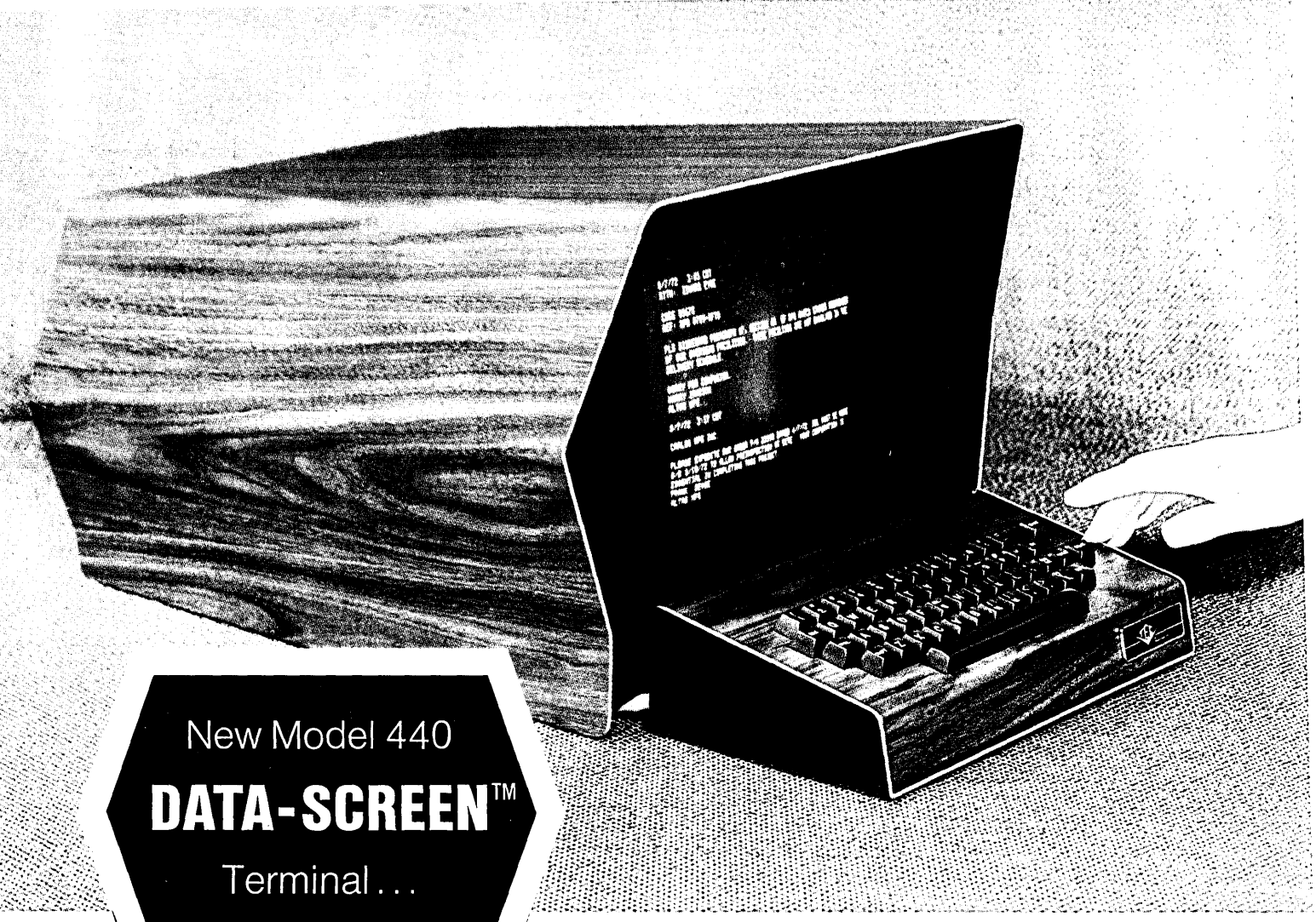
—Edith Myers

Privacy

Who Will Control the Data Banks?

Comprehensive regulation of government-supported data banks to prevent invasion of individuals' privacy is the ultimate goal of a bill Senator Sam Ervin (N.C.) plans to introduce shortly. Ervin, generally considered the most knowledgeable constitutional lawyer in Congress, recently became chairman of the Senate Government Operations Committee; the bill will be referred to this group, so there is little doubt that it will be reported to the Floor.

The Ervin bill will join a number of others addressing the computer-gener-



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ated privacy problem which already have been introduced. Because of all this legislation, there probably will be a lengthy debate on the whole subject in Congress next year. The other bills are concerned with banning military surveillance; protecting the privacy of arrest, employment, and bank records, as well as passport information. A hot battle was raging in the Senate at press time regarding the dissemination of arrest records on individuals who are subsequently not convicted. A rider attached to the Justice Dept.'s FY'73 appropriation bill would prevent dissemination of such data to banks or state/local government officials. Among the pending bills is one backed by the Administration that would allow the Attorney General to disseminate the data to these sources if he thought it was desirable.

Introduction of Ervin's bill will follow the recent release of an analysis by the staff of the Senate Subcommittee on Constitutional Rights of lengthy hearings it conducted last year into Army surveillance of civilian political activity. In the preface to this analysis, Sen. Ervin—who is chairman of the subcommittee—comments that the files collected on protesters and protest groups "posed a clear and present danger to the privacy and freedom of thousands of Americans—citizens whose only 'offense' was to . . . exercise rights they thought the Constitution guaranteed to them. These files confirm . . . that Army intelligence, in the name of preparedness and security, had developed a massive system for monitoring virtually all political protest in the United States."

By its own admission, the Army didn't gain any useful information from this massive data collection effort. The report includes the following quote from the Army's general counsel: "They (the surveillance records) were the most worthless damn things I had ever seen in my life. It was a waste of paper."

Destroyed or "classified"?

Many of the files were destroyed, according to the Dept. of Defense, but the subcommittee staff suggests in its analysis that many dossiers are still being preserved in various military intelligence agencies. Some were "classified" shortly after the investigation began. And "lack of time and resources prevented us from making the same inquiries of the Navy and Air Force (that were made of) the Army."

Stamping a top security classification on documents requested by the subcommittee was one of several gambits the Army used to frustrate the investigation, says the report. The Defense Dept. declined to let certain intelligence officers testify. Some agents "were threatened with prosecution if they talked." As a result, "military intelligence has become more of a closed society than at any time in its history." In some cases, according to the analysis, the subcommittee "appears to have been lied to; in other instances it appears to have been victim of the art of 'plausible denial' . . . by which intelligence agencies (and others) admit just enough of the truth to mask an essential falsehood."

One instance of "plausible denial" cited in the report involves the Army's assistant chief of staff for intelligence; his office denied that computerized files on nonviolent political protesters and protest groups were being kept at specified locations. Later, after the existence of these files was disclosed in the press, Army officials "discovered" the files. Still later, according to the subcommittee report, it was found that

printouts from the files were being transmitted to the assistant chief of staff for intelligence as early as 1968, long before his office "discovered" that the information existed. The final example of hypocrisy was that the original denials, and the subsequent discoveries, were made by personnel who worked in a room which housed one of the files.

The subcommittee staff estimated, on the basis of admittedly fragmentary data, that Army intelligence had "reasonably current files on the political activities of at least 100,000 individuals unaffiliated with the armed forces." In addition, Army intelligence agencies had, and have, access to outside files of the FBI and other military agencies, including the Defense Central Index of Investigations. Reportedly, the latter data contains 25 million index cards relating to individuals and 760,000 cards relating to organizations and incidents.

Immunized from review

The beginnings of the Army's civilian surveillance program go back at least to the end of World War II, the subcommittee reported. Lack of both military and civilian control enabled each major data bank to develop independently, "in a milieu which showed little concern for ... privacy, freedom, efficiency, or economy." Meanwhile, "the traditional secrecy we have granted our intelligence agencies immunized each echelon from review by its superiors."

Ervin's new bill was still in rough form at press time, so details may change, but essentially it addresses the privacy threat posed by all information collection, processing, and distribution activities supported by federal military and civilian agencies. A commission is authorized by the legislation—consisting of three Senators, three Representatives, and three other members selected by the President from outside the Executive Branch. It would recommend "legislation ... and other action" aimed at:

Restricting the information collection effort made "by or for government agencies" to items "relevant and necessary to the statutory responsibilities of these agencies";

Standardizing the handling of this information, from collection to dissemination and use, so that constitutional rights of citizens and states are not jeopardized;

Limiting authorized access to individual-sensitive government information. One set of committee recommendations would be designed to make such information available only to those "who have a valid interest, as defined by statutes." Another set of recommendations would aim at preventing unauthorized access.

The commission is also given extremely broad authority to evaluate ex-

Companies

Informatics, Data Products: 10 Years

Few things are nicer than a birthday party. Unless it's two birthday parties for two jointly launched edp companies who successfully weathered the stormy decade just passed.

In 1962, Erwin Tomash, then vice president and general manager of Ampex Corp.'s Computer Products Div., and Dr. Walter Bauer, head of Ramo-Woolridge's computer installation, de-

isting privacy safeguards affecting not only federal, state, and local government information systems, but related private systems as well. In addition, if the bill is enacted, the commission will be able to subpoena witnesses and records. If the latter are withheld, the commission will be able to seek court orders directly. Among the materials that will be obtainable by court order are computer program documentation and system analyses pertaining to the data banks covered by other provisions of the bill.

—Phil Hirsch

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cided separately to launch, respectively, a hardware company and a software firm. "It was a bad time," said Dr. Bauer. "The market was soft, and venture capital was hard to come by." So the two men got together. Tomash's company, Data Products Corp., managed to secure $1 million in venture capital from three different sources, and it and Bauer's Informatics were launched jointly, with Informatics starting life as a wholly owned subsidiary of Data Products.

According to plan, Data Products, which is in the peripherals and data communications business, divested itself of its ownership of Informatics in three pieces in 1965, '66, and '69. And last month the two separately observed their tenth anniversaries with healthy statements of operations and optomistic outlooks for the future.

For Data Products it was a turnaround situation, with the company reporting income of $703,000 for fiscal 1972 after a loss of $10,573,000 in '71. Theirs was the more cautious optimism and the quieter of the two tenth-anniversary observations. Said chairman Tomash and company president Graham Tyson: "The near-term outlook for Data Products for the next fiscal year is promising. While weakness is still being exhibited in many sectors of the electronic data processing business, the across-the-board slowdown of the past two years seems to have disappeared. The steady profit improvement begun last year should continue into the current year."

In answer to a shareholder question, Tomash admitted that Data Products foresees inroads being made into its core memory products market by semiconductors but added: "We've reduced the costs of core and improved performance. We feel we've extended the life of core for many years, but we intend to limit our investment in this area and not to grow in it up to the last year."

Hit the exports

Tomash said an immediate aim of Data Products is "to hit the export market hard." The company is increasing its marketing staff in Eastern Europe and "has received at least one multimillion dollar printer contract which is awaiting approval from the U.S. government." Data Products has shipped evaluation printers into Poland, Romania, Bulgaria, and Hungary. "Interest in our core memory products is also high in Eastern Europe," said Tomash.

Informatics' anniversary shareholders' meeting was a bit more positively optimistic and definitely more festive, perhaps because it included champagne and birthday cake and predictions by executive vice-president Frank Wagner, who likes to make predictions.

Dr. Bauer summed up the future like this: "In view of the improving market for the company's services and the excellent position of the company in the software field, we expect continued growth in revenues and profits and further strengthening of the company's

(Continued on page 133)

Rest easy, we're not talking needless extinction, but our company grew out of a simple idea.

Eliminate the pokey old punchcard. Go directly to magnetic media. You'll increase throughput 15% or more, and the bundle you save will be in both people and equipment costs.

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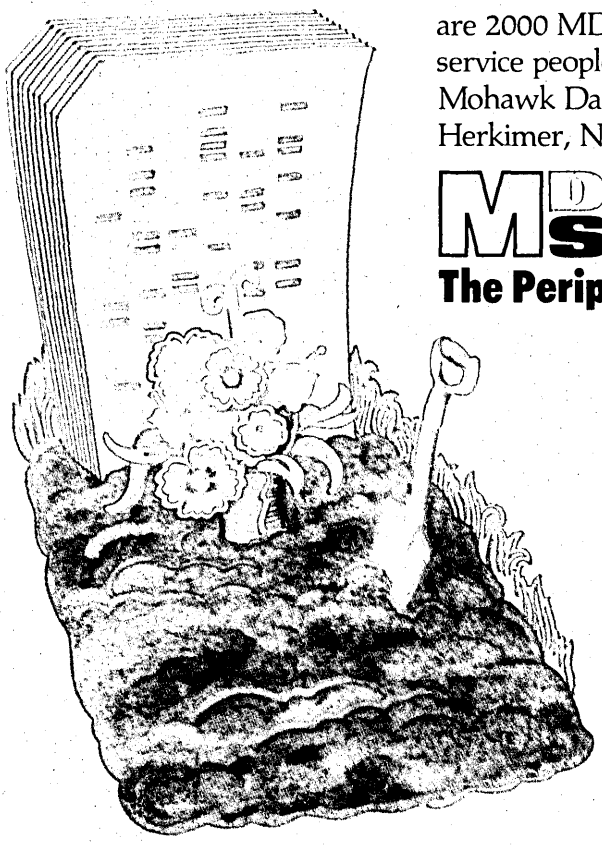

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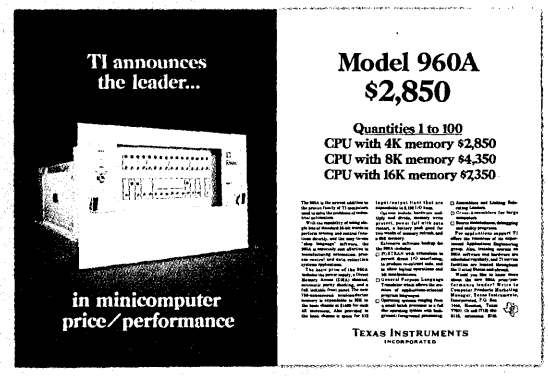

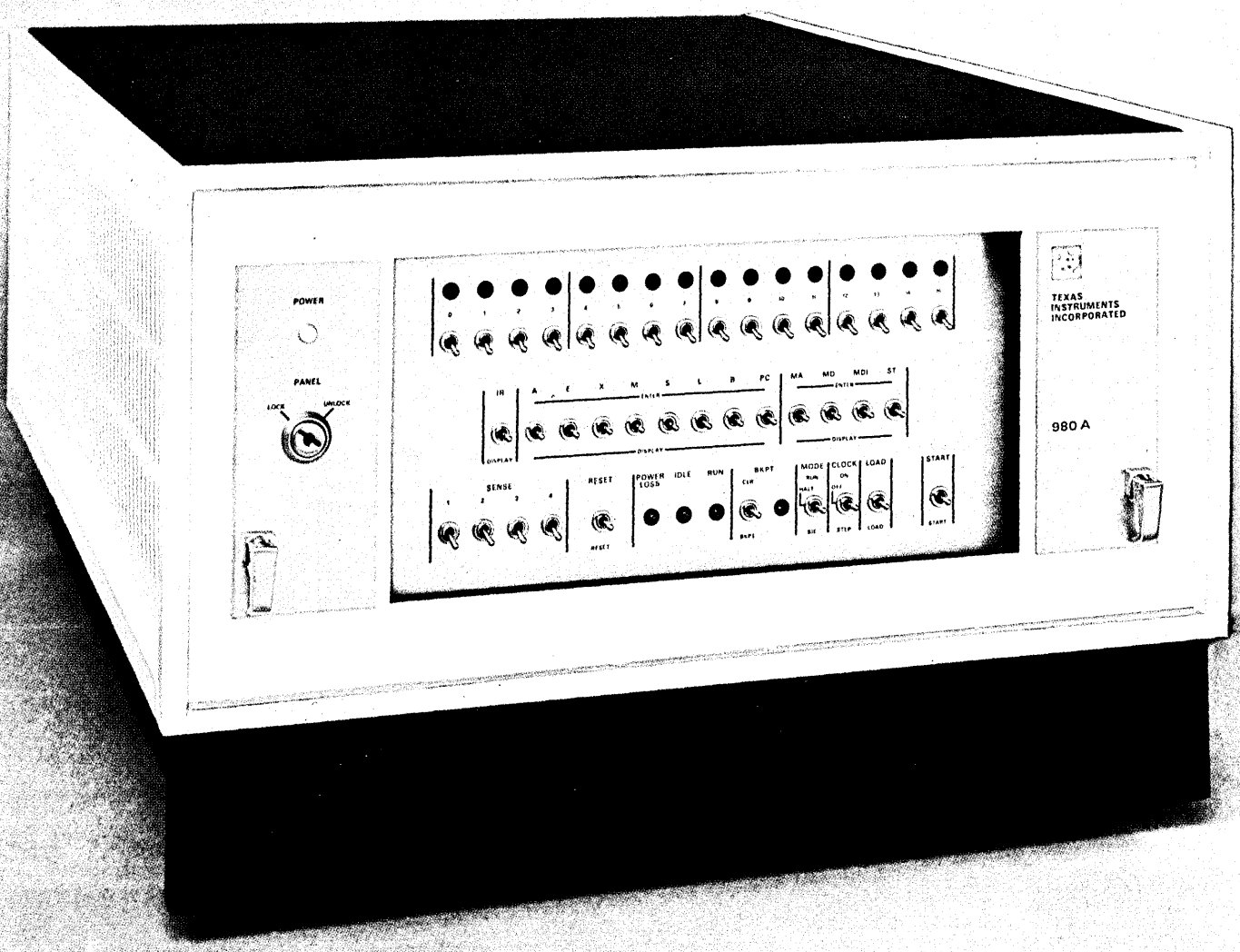

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Model 980A
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CPU with 4K memory	**$ 3,475**
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- ☐ Main chassis semiconductor memory expandable to 32K. (Up to 65K with memory expansion unit: Two weeks memory protect with optional battery)
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For applications support, TI offers the resources of its experienced Applications Engineering group. Also, training courses on 980A software and hardware are scheduled regularly, and TI service facilities are located throughout the United States and abroad.

Would you like to know more about the new 980A price/performance leader? Write to Computer Products Marketing Manager, Texas Instruments Incorporated, P.O. Box 1444, Houston, Texas 77001. Or call (713) 494-2168 or any of the sales offices listed below.

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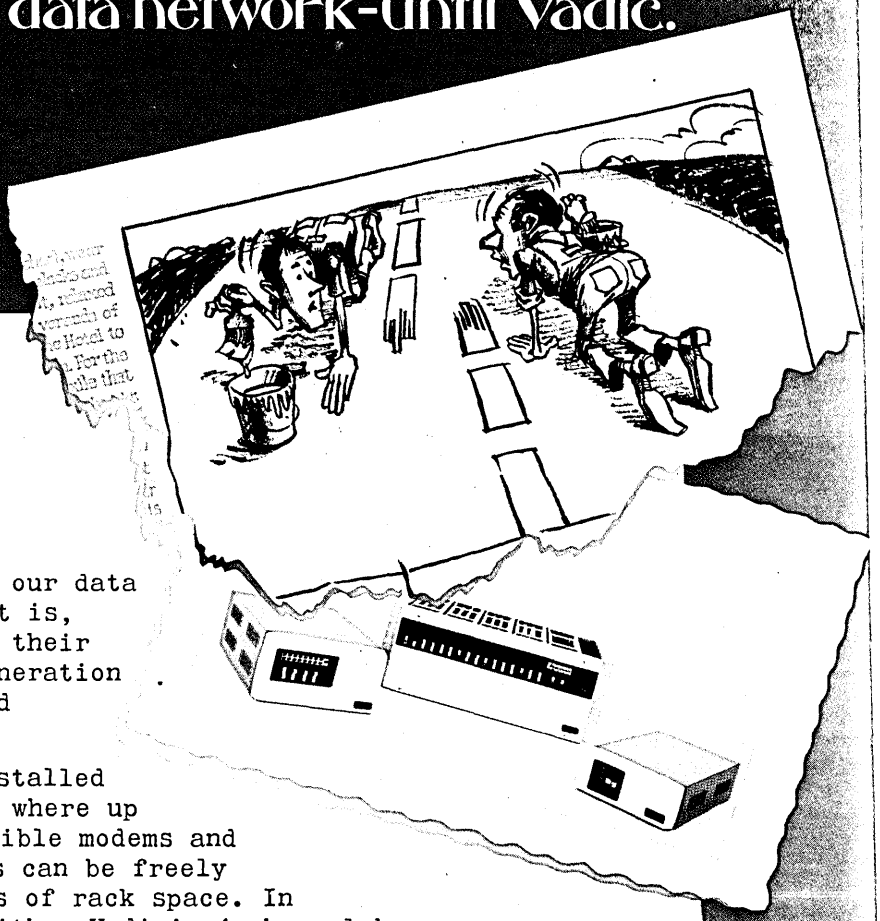

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Dear Ma:

This cartoon reminded me of our data communications network. That is, until Vadic came along with their planned family of second generation 300 and 1200 baud modems and automatic dialers.

At our computer site, we installed Vadic's MDS system (center) where up to 16 Bell 103 & 202 compatible modems and 801 type auto calling units can be freely intermixed in just 7-inches of rack space. In remote locations, we use either Vadic's 4-channel box (left) which houses up to 4 modems (or a modem & a dialer), or Vadic's 1 & 2 channel stand-alone units (right).

Sure, the modems work great. But it's Vadic's systems understanding, their applications backup, and the built-in displays and diagnostics, that make it so simple to monitor & troubleshoot both ends of our data network.

Our operators can loopback data to check out the terminal, the modem, & the phone line, and can watch computer and terminal activity through display of all EIA leads – at both ends! Vadic's powerful diagnostics, plus built-in 300/1200 baud test signals, make it easy to completely test any channel. No wonder our system uptime is so much greater these days!

Better send for Vadic's new brochure, Ma. It's "must" reading for data comm people. See you soon.

P.S. Who's Vadic? They've delivered over 15,000 modems in the past 3 years.

Your son, the independent thinking communications manager

Alexander Graham Jr.

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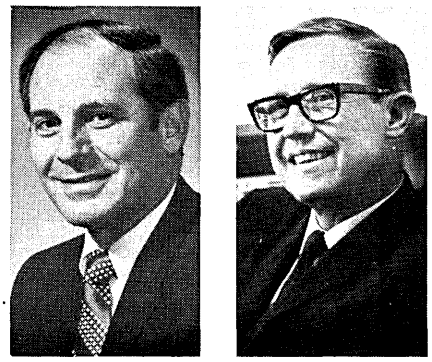
position." He said he believes Informatics has "the best balance sheet relative to size." A big thing for the future will be acquisition and mergers.

There are some 500 installations around the world now of the company's Mark IV file management system, Dr. Bauer said, and some 10,000 people



HAPPY BIRTHDAY: Erwin Tomash, left, and Walter Bauer.

are qualified to use Mark IV, of whom Informatics trained 7,000. Informatics, which, except for its first six months, has regularly shown a profit, reported earnings of $424,000 for fiscal 1972, up from $268,000.

Wagner, who said Informatics currently has 0.2% of the software market, predicted it will have 0.6% in 1975. Most of his predictions were predicated on IBM's becoming a government-regulated company, much like AT&T. This, he predicted, will occur in 1977 or 1978.

For the hardware sector of the industry, he said, survival will depend upon U.S. regulation of IBM. He sees hardware companies surviving until regulation and growing slowly afterwards. He feels independent peripheral manufacturers and leasing companies will have a difficult time before regulation but have a bright future after.

Wagner's evaluation of the future for the software industry was — not much affected by IBM, slow growth for custom software, and rapid growth for software products. For data processing services he predicted: decline of the service bureau; slow growth for time-sharing, rapid growth of computer utilities; and a bright future for data base services.

Among his major conclusions were that the trend toward mainstream-type edp operations will be up and that edp eventually will become the largest U.S. industry.

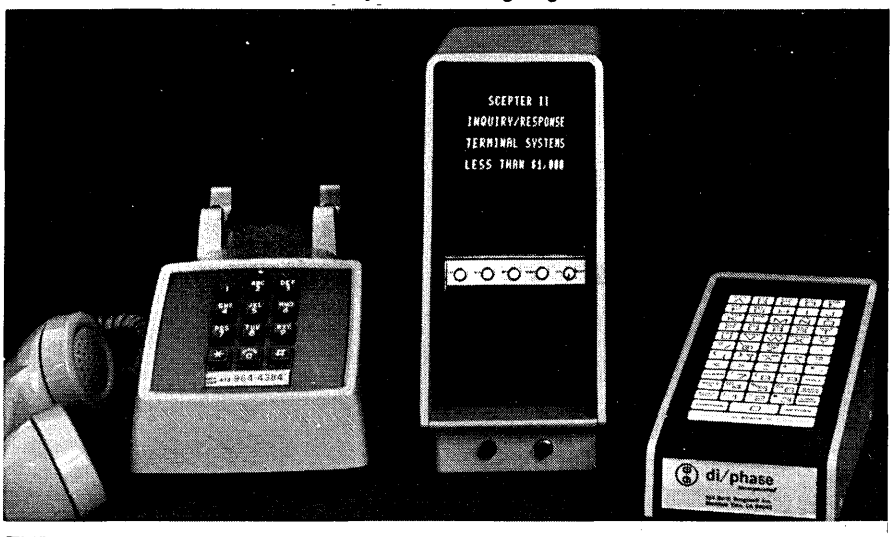
And it looks as if both Data Products and Informatics will be a permanent part of it. **—E. M.**

Terminals

A Tiny Terminal for Quick Peeks

Some applications really need to be on-line. People at numerous remote locations may need to access a data base, perhaps updating a file or taking a quick peek. And the length of the message, whether going into or coming out of a file, is short. For such usage, a new crt/keyboard system has been developed by one-year-old Di/Phase Inc., Mountain View, Calif.

It uses a 3-inch crt capable of displaying four 16-character lines, or 64 alphanumeric characters. There's also a newly developed 128-character keyboard with a full Mod 37 Teletype keyboard. Instead of mechanical keys, it uses a pliable elastomeric membrane imprinted with the key designation. The free-standing system, which operates in a half-duplex mode, is designed to sell in small quantities for $1000 and rent for about $30 a month.



THREE-INCH CRT can display four 16-character lines and uses a 64-character keyboard.

"A small, interactive terminal is especially useful in customer service applications," says Leo E. Feltz, president of Di/Phase. "In banks, there's a need to know a depositor's account balance. Retailers must look up a customer's credit record. In many businesses, one wishes to update or get the status of information on manufacturing, distribution, inventory, or purchasing."

Feltz, who formerly was director of product management and planning at Singer Business Machines, notes a hierarchy of computers (ranging from minis to large-scale), of calculators (handheld to programmable), and now of terminals ("There's a place for large crt systems, as well as small"). It's an unbuffered terminal, explains Peter R. Pettler, Di/Phase vp. When you press a key and an image appears on the tube, that character has gone to the computer and come back — at speeds up to 300 baud. So, what you see is what the computer got. They call it echoplexing.

Several units of the terminal are undergoing field test at a customer site, according to Feltz, who says the plan there is to add new applications with the passage of time. Two other test sites, in different lines of business, are to take delivery before the end of the year. There's no longer any doubt that the under-$1000 crt terminal is upon us.

CIRCLE 197 ON READER CARD

Conferences

WESCON Shedding Technical Image

The West's biggest electronics conference and trade show, the Western Electronic Show and Convention (WESCON), is trying hard this year to deemphasize its strong technical image and to increase its identification with information processing industries.

No longer does WESCON have a technical program. This year it's a "professional program," one which includes 11 (out of 28) sessions and 47 papers and/or panel discussions on

topics relating to data processing and data communications. An increased number of edp industry names show up this year on the roster of session organizers and on the professional program committee, which is co-chairmanned by Eldred Nelson of TRW Systems Group and includes Guy Dobbs of Xerox Computer Services and Clark Weissman of System Development Corp.

With its technical image this year, WESCON has shed its traditional third-week-in-August scheduling and will be held instead Sept. 19-22 in Los Angeles' new Convention Center. It will be the first time in many years that the big show will be under one roof in its biennial Los Angeles appearance.

WESCON registration, which was partly automated last year in San Francisco, will be fully computerized for the 1972 show. The system, designed and developed by Jacquard Systems of Santa Monica, Calif., includes five on-site registration modules consisting of two crt's and one high-speed inquiry badge embosser each. As it generates the badges, it will store pertinent visitor information on magnetic tape for later use in attendance auditing, post show billing, and generation of research information. The system also will include two remote registration stations, one in Orange County and one at Los Angeles International Airport, which will transmit all information to the Convention Center so that badges will be ready for bus commuters when they arrive.

Benchmarks

The Last Fall Joint: From next year forward, the American Federation of Information Processing Societies (AFIPS) will sponsor only one major conference and exposition annually. It will be called the National Computer Conference. After independent research and upon the advice of an Industry Advisory Panel chaired by *Datamation* editor Bob Forest, the Joint Computer Conference Board made its announcement. The first NCC will be held the week of June 4, 1973, in New York City. The last JCC will be Dec. 5-7 in Anaheim, Calif.

Guns and Butter: In order to increase its investment in Data Transmission Co., a proposed nationwide all-digital microwave common carrier system (no revenues expected until '74), University Computing Co. has sold UCC Communication Systems, Inc., a terminal and communications subsystems manufacturer, to Harris-Intertype Corp. for approximately $20 million in cash. A net capital loss of about $15 million will be recorded in UCC's third quarter. Construction of Datran's first increment —linking Houston and Dallas—is scheduled to get under way before the end of the year. Earlier this year UCC had tried to sell its Gulf Insurance Co. subsidiary to Northwest Industries Inc. of Chicago for approximately $60 million, but the deal was called off as not "in the best interest of University Computing."

SCC Traded for Dormitory: Richard Kelly tried awfully hard to get into the computer business. It took him six months to acquire controlling interest in Scientific Control Corp., Dallas, from Penn Central affiliate, Great Southwest Corp. (April 1, 1971, p. 52). But now he has traded the company's computer operations for a dormitory complex near Southern Illinois Univ. In the year and a half that he has headed Scientific Control, Kelly has moved the firm into non-computer-related fields through acquisition. His decision to move it out of the comuter business was made, he said, "because there's too much competition." The trade of Scientific Control's 4700 computer and 660 batch terminal products, patents, and operating divisions, with a book value of $2.5 million, was to Consultronics, Inc., a Dallas-based electronics firm. And soon, Scientific Control will be no more. Its attorneys are researching potential nontechnical new names for the company to be presented for shareholder approval this month.

Reserving the Rails: Easterners will be the first to use the $7 million Amtrak on-line reservation system for intercity rail passengers, and the nationwide system should be fully operational by late 1974. Control Data Corp. will supply the computers and peripherals; CDC's Ticketron subsidiary, the ticket issuing equipment; Cytrol, Inc., of Minneapolis will program the system; and communications from four regional reservations centers to dual CDC 3500s will be handled by the Bell System. Passengers will reserve seats and services by calling a single 24-hour toll-free phone number. The system is said to be more complicated than airlines reservations systems because trains make many more stops per trip than do planes.

System Success Story: The Migrant Student Record Transfer System (see Sept. 1, 1970, p. 64), which keeps school records on some 300,000 migrant students in the U.S., was used successfully this summer to find a 10-year-old girl whose school examination showed that she had tuberculosis. By the time the diagnosis was made, the girl and her family had moved from California. It took just a little over four hours to telegraph the CDC 3300 central computer in Arkansas and find that the girl was at a labor camp near Salt Lake City. "The system has always had the capability for emergencies," said program coordinator Patrick Hogan, "but this is the first time we've used it."

Fax First: In what is said to be the largest commercial facsimile transmission order ever signed in the U.S., Graphic Sciences, Inc., Danbury, Conn., will sell 1,000 of its dex I transceivers to Medfax Communications Inc., of Harrison, N.Y., which is setting up a facsimile communications system to service the health-related industry. The agreement includes an understanding for a follow-up order of another 1,000 units. The dex I, which transmits 8½ x 11-inch documents over voice-grade lines in 6 minutes, sells for $2900 in single quantities.

European Sales Consortium: International Technology Sales Corp., a new London-based firm, has been started by Infotech founder Roy Goodman to help U.S. computer and related companies sell their products in Europe. ITS claims to represent over 150 companies in 23 countries who account for some 40% of Europe's sales. □

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Data General Corporation is the world's number two minicomputer company. We make the Nova line of computers, peripherals, software, and systems. We're looking for people with heavy software and/or hardware experience and the aggressive attitude it takes to succeed in a fast-moving, competitive business. Lack of sales experience won't disqualify anybody with the right credentials. We'll give you a car allowance, good benefits, good base salary, and the chance to get rich. Data General Corporation is an equal opportunity employer.

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Gentlemen:

( ) Yes, I'm interested in attending the '72 FJCC.
Please send full information.

( ) My company is interested in exhibiting at the '72 FJCC.
Please send details.

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The computer professional. He knows how perishable knowledge is, and the need to keep abreast of rapidly changing technology. ☐ The computer user. He knows the value of seeing what's new, and finding answers to his specific problems. ☐ The marketing manager. He knows the Fall Joint is this year's major national conference, and the prime environment for meeting his customers and prospects. The EDP press. Largest gathering in the field. They know how to get a peek at next year's news before it happens. ☐ The '72 FJCC has a lot going for the people who know everything, and want to keep it that way. If you're one of them, chances are you know where you're going in this business. Then you also know that your business will be going to Anaheim in December. ☐ To the '72 FJCC. Big, bold and different. Sixty-one information packed sessions and seminars, half of which are user oriented. ☐ This year's largest display of computer hardware, software and services. And all right in the heart of the growing West Coast EDP market. ☐ The men who know everything will be at the '72 FJCC. Give yourself a gift and be there too. ☐ Treat yourself and your associates to the most precious gift of all. The gift of knowledge. Send the Gift Certificate for complete registration, hotel and conference information.

The '72 FJCC. Big, bold and different.

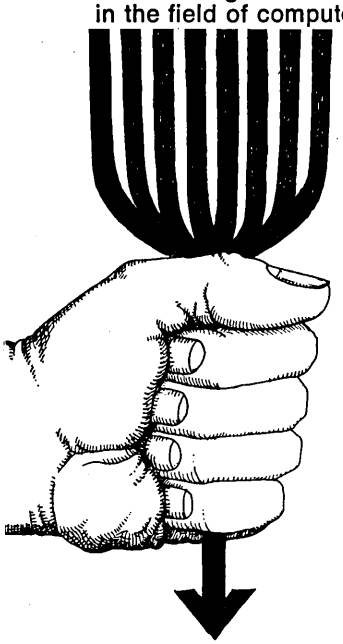
ANAHEIM—DECEMBER 5-7

If you use leased lines, we'll help you use the least lines.

What we'll do is design, furnish, and install for you a Time or a Frequency Division Multiplex System. At multiple locations. Anywhere in the world. The whole works.

All of which, by reducing the number of lines you lease, drastically reduces your costs.

The Singer Tele-Signal Operation, a leader in the field of computer-based communications systems, has done this kind of work for years for military, civilian, and international customers.

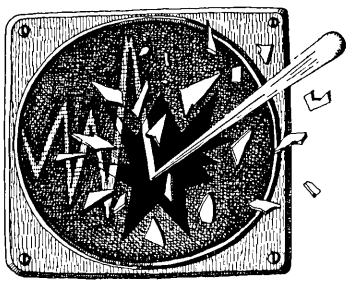


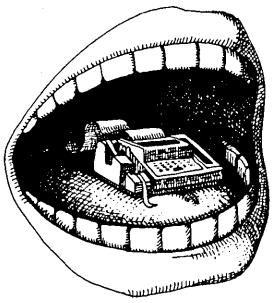
For Time Division multiplexing, we provide plug-in integrated circuit-card assemblies. They're engineered to give you the maximum in bandwidth utilization.

For Frequency Division multiplexing, we offer plug-in assemblies to accomodate a variety of rates to serve almost any teleprinter and/or data modem terminal hub equipment.

Our multiplexing systems reduce your need for leased lines, and will concentrate a maximum number of channels into one.

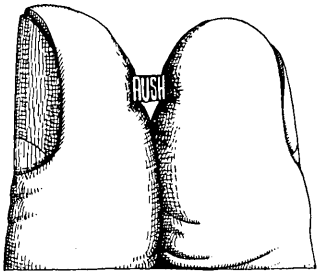
With the multiplexing, you'll need a Data Network Management Center. We'll supply it. A complete monitoring and control facility. One that insures the integrity of the system by rapidly isolating network faults, and thereby increasing traffic throughput.





Some companies require simultaneous speech and data communications (Speech Plus). We'll supply it. Up to eight data channels operating with speech. Or we can quickly tailor a system to suit your requirements.

We also improve the quality of a voice channel over a radio path using our linked compressor and expander (LINCOMPEX). And we have the answer to most of your telephone signaling problems with our universal inband signaling units.



Not the least important part of the system are the modems; these allow your digital devices to talk to each other over telephone lines (leased or DDD). We'll supply them. Many with features not found in their Bell counterparts.

We'll also supply voice privacy equipment, test equipment, and everything else you require to complete your communications system. And we'll provide service and personnel training throughout the world.

We've done all this for such prestigious telecommunications users as RCA Global, American Airlines, Western Union Data Services, FAA, NASA, and the U.S. military services.

So if you're in the market for highly-reliable, complex communications systems and components, check out the Singer line for fast, easy answers.

For information, write: The Singer Company, Kearfott Division, Tele-Signal Operation, 250 Crossways Park Drive, Woodbury, N.Y. 11797
Or phone (516) 921-9400.

SINGER

AEROSPACE & MARINE SYSTEMS

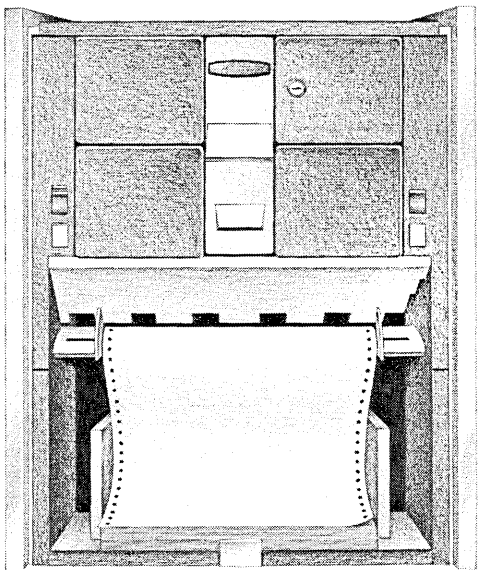
COM FOR PEOPLE WHO NEED A LITTLE LESS THAN COM.

Bell & Howell Inter/COM.

Sophisticated cathode-ray COM systems are sensational. They are also whoppingly expensive to own.

So Bell & Howell set out to provide computer output on microfilm capabilities without high-cost cathode-ray tubes.

Inter/COM prints microfilm directly from data print-out sheets at 11,000 characters per second. No cathode-ray tubes required.



And while it may not have the blinding speed of cathode-ray COM systems, Inter/COM can give you all the benefits of microfilm, right now.

You can store your computer output data in less space. And distribute it with greater speed and efficiency. All at realistic cost.

Ask your Bell & Howell representative for full information. Or write: Bell & Howell, Business Equipment Group, 6800 McCormick Road, Chicago, Illinois 60645.

At Bell & Howell we draw on our leadership in electronics, training and education and photography to find better ways to make business equipment better.

Before you buy anything, ask to see Bell & Howell.

BUSINESS EQUIPMENT GROUP

BELL & HOWELL

Know how you feel when someone keeps calling you "George" . . . and your name's "John"?

Well, you've got to help us.

Most people know we make an economical, non-impact computer printer.

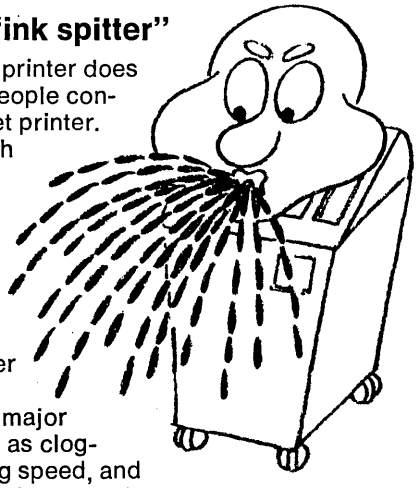
But if one more person calls our Matrix printer an "ink spitter" or a thermal machine, or anything else that it's not, we're going to yell at the kids. Or do something equally drastic.

After all, our Matrix printers and plotters are no strangers to computer users. We're operating with hundreds of mini- and midi-computers around the world.

So it's about time someone presented the facts . . . simply and clearly.

Especially when they can save you a cool fortune.

We're NOT an "ink spitter"

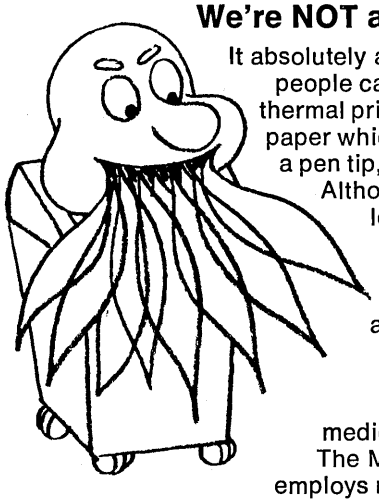


Although our Matrix printer does utilize toner, some people confuse us with an ink jet printer. We're not even fourth cousins.

An "ink spitter" employs jets of colored liquid similar to a fountain pen. The advantages of such a system are: writing on plain paper and low noise.

But there are also major disadvantages, such as clogging jets, low printing speed, and poor graphics capability . . . problems an electrostatic printer never has to deal with.

We're NOT a "thermal printer"



It absolutely astounds us whenever people call us that. Basically, a thermal printer uses a multi-coated paper which, when heated through a pen tip, reveals a black line.

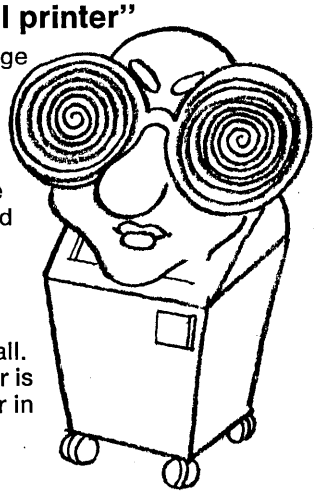
Although it too eliminates problems associated with ink, it has other drawbacks we wouldn't like to live with. Such as an odor and actual debris caused by the burning process, high cost of paper, slow writing, and mediocre output quality.

The Matrix printer employs no heat at all.

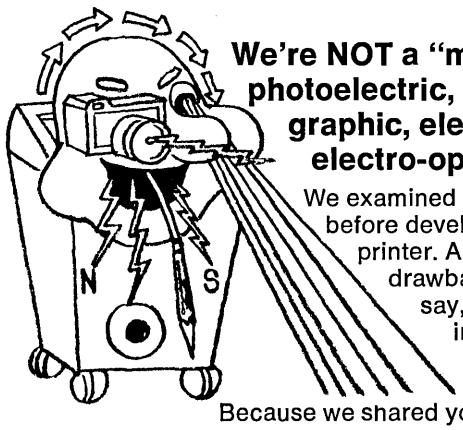
We're NOT an "optical printer"

There are two kinds. The image is recorded either on paper containing silver, or electrostatically, as in Xerography. In the first case, paper costs are prohibitive and the image is of low quality. In the second case, there are many moving parts and the machines are very expensive.

By contrast, the Matrix printer employs no optics at all. The output from the computer is translated directly onto paper in the form of dot matrices.



We're NOT a "magnetic, arcing, photoelectric, electrophotographic, electrolytic, or electro-optical printer."



We examined all these techniques before developing the Matrix printer. And each had its drawbacks. So, when you say, "Oh, yeah, I looked into one of those and didn't like it," we understand.

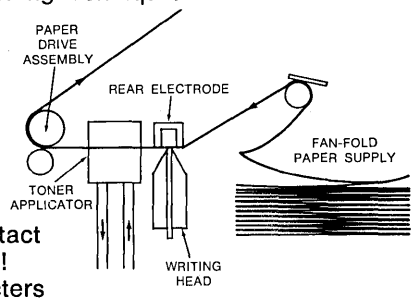
Because we shared your same experience.

Now do you understand why we get so frustrated every time you equate Versatec's Matrix printer with any of these other devices?

Versatec's Matrix printer explained

We told you what we're *not.* Now we'll tell you what we *are.*

The Matrix Electrostatic Writing Technique (MEWT™) is a *true* electrostatic writing technique. The data travels directly from the computer to a linear array of stationary nibs in a writing head which place a small charge on the dielectric coating of the paper. Immediately, the paper comes in contact with the toner and voila! Clear dot matrix characters . . . up to 600 lines per minute.



There are no moving parts, jets, hammers, belts, heated elements, traveling electrodes, magnetic dust, odors, blinking lights, noise and other contrivances in the writing method. The only moving part is the paper drive mechanism.

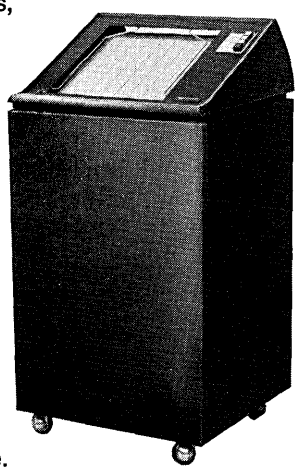
The paper is easy for you to write on (pencil, pen, or felt-tip marker). It has excellent archival qualities. And it can be reproduced easily and clearly on any office copier.

Reliability is infinitely better than with any other device. The average monthly maintenance cost for an impact printer is about *three times* that of a Matrix printer. And, our MTBF is over 3,000 hours. Proof enough?

True electrostatic writing is the first major advance in writing in 20 years.

600 line-per-minute printers for only $3,900.

Because of the plummeting costs of electronic components, a product that's 75% electronics, such as the Matrix printer, has a beneficial effect on your pocketbook, and it's getting less expensive all the time. By contrast, the thousands of mechanical parts keep high speed impact printers high in price.



Today, the first breakthrough has already occurred. You can buy the Matrix LP-860 — our 600 lpm, 80 col. wide printer — for only $3,900. Quantity of one.

Our LP-1150 printer — 500 lpm, 132 col. wide printer — costs just $4,300. Quantity of one.

In addition, we offer economical controllers for 23 different mini's and midi's.

And these low prices, friends, are yet another major difference between our Matrix printers and most other devices on the market today.

For more information write or call Versatec 10100 Bubb Road, Cupertino, California 95014. (408) 257-9900. TWX: 910-338-0243.

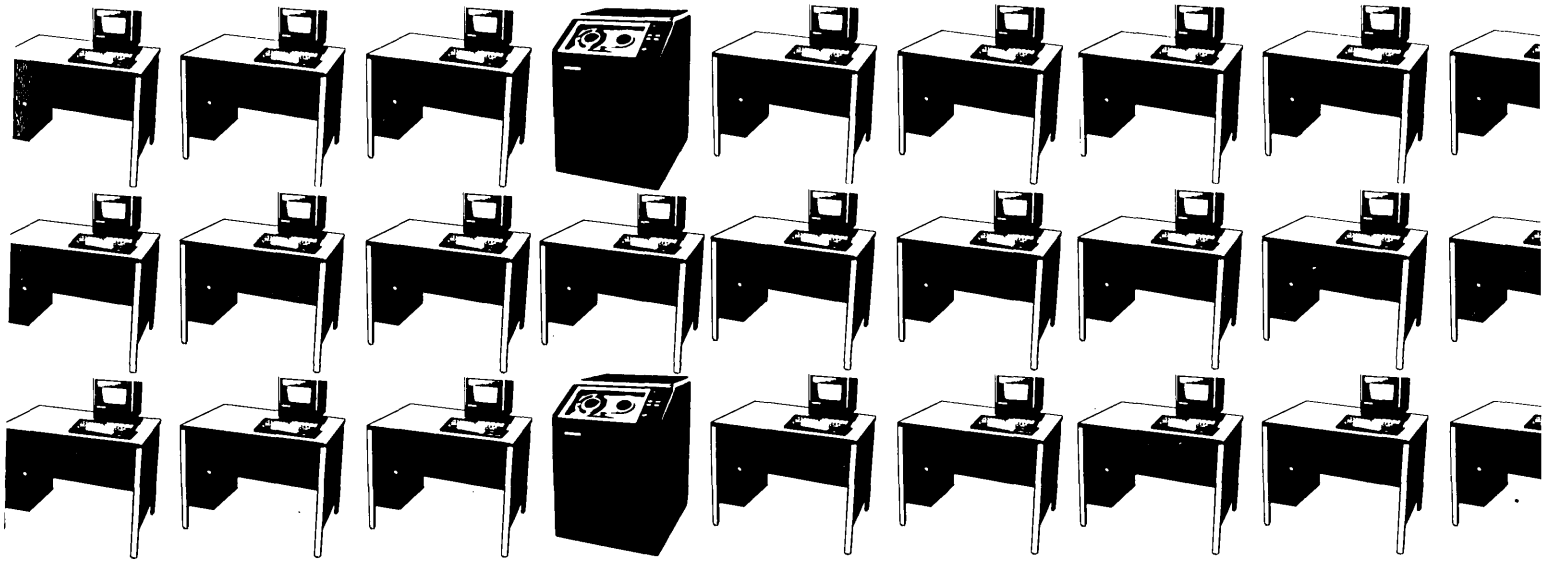
The Matrix printer uses a true electrostatic writing technique (MEWT™). Don't confuse it with anything else.

VERSATEC

CIRCLE 68 ON READER CARD

Think of The Computer Maker.

What's he really done to improve your data entry?



Think of Inforex.

What we've done makes us Number One in key-to-disc systems.

Data entry for computer manufacturers is strictly a sideline.

Not at Inforex.

It's our specialty. Our full-time specialty. Which helps explain why our key-to-disc systems provide the most advanced key entry of all.

Consider. You get CRT display at every keystation, an Inforex first. Makes data entry virtually goof-proof. Discs store up to 128 four-level program formats. And over 2 million data characters. You get concurrent data entry and verification. Balance totalling. Check digit comparison and calculation. Automatic pooling on 7- or 9-track compatible tape.

You get data management like you never had before.

All of which sounds expensive. But isn't. Basic system rentals start as low as $101 a month per keystation. You can also add system-expanding options, like On- and Off-Line Communications, Line Printing, Reformatting, to name a few.

Our customers include many of the country's largest companies. Companies that take a long, hard look at price. And performance. And supplier stability. And service. What they find has made Inforex key-to-disc systems the most widely used in the world.

When you think of data preparation, think Inforex. The leading specialist in the new and different world of data entry. Contact your Inforex representative. We have offices in major cities throughout the United States, Canada, and Europe. Inforex, Inc., 21 North Avenue, Burlington, Massachusetts 01803.

INFOREX

Hardware

Hardware Notes . . .

We've discovered two more firms whose products qualified for our June small business computer survey (p. 51).

One is the Berg-Haus Corp., of Holliston, Mass., which offers a totally bundled turnkey system based on the Digital Equipment PDP-11. A complete line of peripherals is offered, and there are approximately 50 applications programs available. A 6K model with a 165-cps serial printer, 4-megabyte disc, and 200-lpm printer rents for $1200/month on a five-year purchase contract. The systems are generally available 90 days ARO.

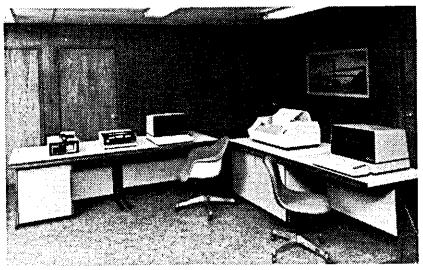
The Model A system from Linolex Systems, Inc., North Billerica, Mass., also satisfied our criteria. The cpu is a proprietary design that features 2K of 240-nsec 12-bit control storage for instruction implementation, and up to 16K bytes of read/write memory. A full complement of peripherals is offered, and there is a large number of application programs available. These are generally separately priced, with charges typically about $250. A basic Model A includes 4K of user memory, three cassette drives, crt/keyboard, and a 75-lpm printer, selling for $14,400. A one-year lease is $475/month, and Linolex has approximately 20 Model A systems in the field.

Minicomputer prices continue to plummet. Digital Equipment now offers its PDP-8E with 8K of memory for $5650, down from $7740. To remain competitive, Digital Computer Controls reduced the price of its D-112 PDP-8 replacement cpu with 8K to $4750, down from $5590. The 16-bit mini builders have been active, too. GRI Computer Corp.'s model 99 (in this section) comes with 8K for $3K each in orders of 25. But the topper of them all is likely Interdata's fifth member of its New Series, the 74. With 8K of memory, 16 g-p registers, and hardware multiply/divide, it's priced at only $3600, dropping to $2268 each in an order of any 45 Interdata cpu's.

How safe are data safes? We know of a company that found the source of 56 head crashes and 73 destroyed packs on its Century 100 computer to be a storage safe built with round-headed screws in the drawer mechanism. Each time the drawer was pulled out, filings would drop on the packs and subsequently wind up inside the disc drive. It took one and a half years to discover the source of the problems.

Business System

There's nothing quite like running an equipment survey to find out how many others out there have, or are working on, systems that qualify. That's the case with the Manufacturers Management Control System (MMCS for short) that our June small business issue uncovered (see p. 51). The MMCS is based on a Hewlett-Packard model 2100 cpu, with 12-32K of 980-nsec memory available to support such



applications as payroll, accounts payable and receivable, inventory (complete with bill of material processing and material requirements planning), billing, sales analysis, and many other programs.

A complete line of peripherals is offered to support applications, excluding 96-column card equipment. The operating system requires 16K, but supports eight terminals. Software includes a macroassembler, a time-shared BASIC, and COMFORT (Commercial FORTRAN). A full turnkey system, consisting of 16K memory, crt work station, 100-lpm printer, modem interface, 5-megabyte disc, and customized software for performing inventory management rents for $1250/month on a five-year lease. There is no charge for installation, training, education courses, documentation, systems analysis, or programming service. Systems are generally available in 90 days. MICROLINE CORP., Santa Ana, Calif. For information:

CIRCLE 222 ON READER CARD

Display Terminal

The ASCISCOPE crt terminal combines a crt, 110/300-baud modem, 64-character ASCII set, 960-character buffer, and acoustic coupler and rents for only $63/month. As such, it is bound to be considered as a replacement for model 33 and 35 tty's by users who don't absolutely require hard copy. Or maybe it will wind up being added to those models, as there is a low-cost connection that allows the two to work in tandem. The operator has a choice of page, roll, or block display modes, operator or remote controlled screen erase, etc. An RS-232C interface is also available for 1200- and 2400-baud operations, and the ASCISCOPE transmits in half-duplex mode. INTERNATIONAL TELEPHONE AND TELEGRAPH CORP., New York, N.Y. For information:

CIRCLE 223 ON READER CARD

360/65 3330 Channel

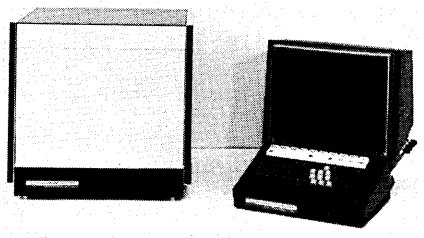
There are numerous purchased 360 model 65s, 67s, and 75s in the world that users might consider keeping if they could realize all the advantages of the 3330-type storage device, with its rotational position sensing, and lower-cost-per-byte storage. The last year has seen announcements of interfaces for the 3330 to these computers, but one key element has often been missing: the block multiplexor channel (IBM 2860) that can accommodate the 3330's high transfer rate of 806 KB/second.

This manufacturer has the channel. It is based on the I/O processor from the Standard Computer Corp. IC 7000, and it's set up to be compatible with OS/360 software releases 20.1 through 21. The Selectoplex channel can also be attached to the 370/165. The purchase price is $100K, or $3K/month on a two-year lease. The manufacturer can also supply the 3330s. ALLIED COMPUTER TECHNOLOGY, INC., Santa Monica, Calif. For information:

CIRCLE 224 ON READER CARD

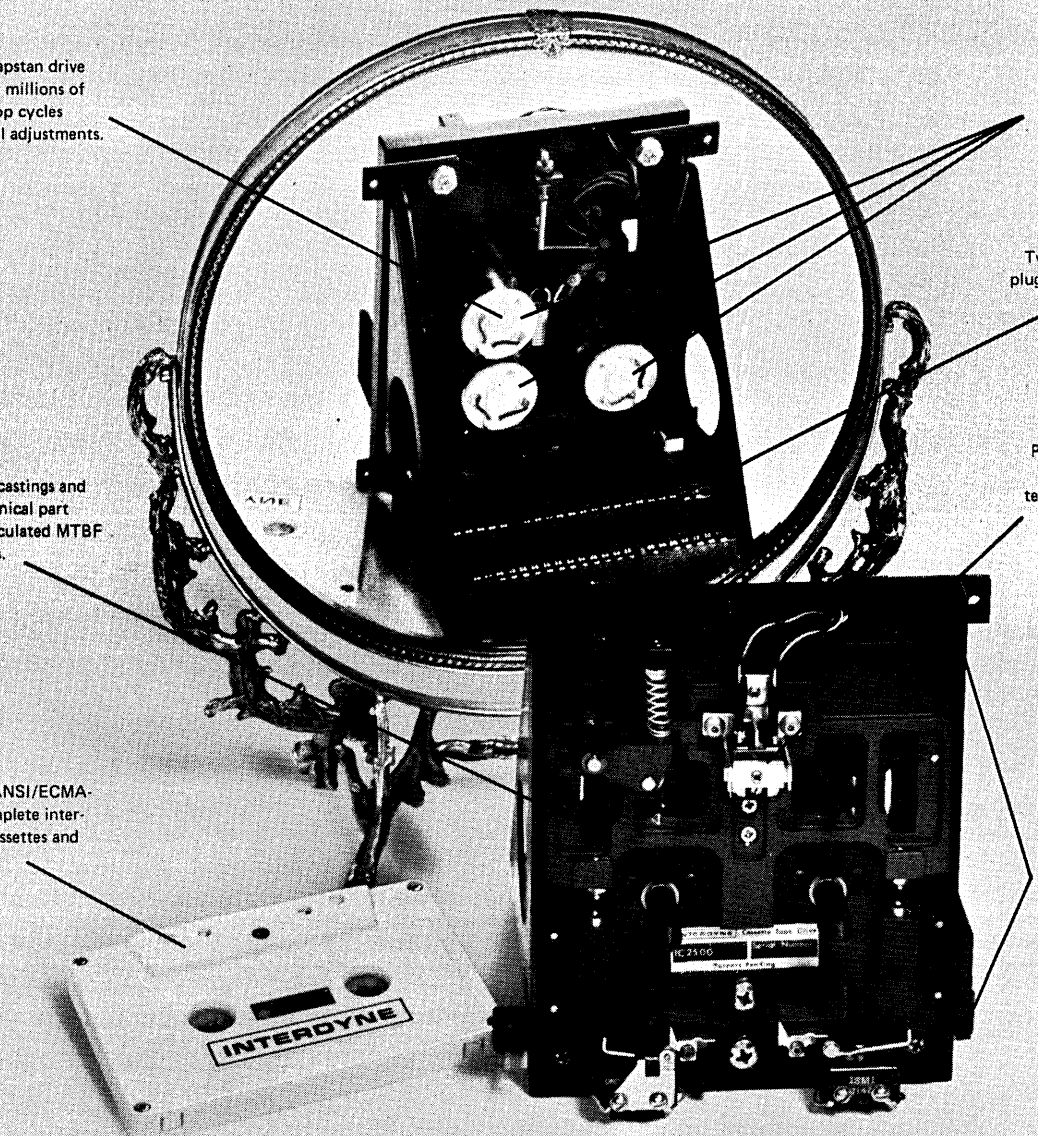
Crt Display

The Videomaster 7100 is a stand-alone remote display terminal said to be plug-to-plug and logically compatible with the IBM 2265. It's based on a 12-inch diagonal crt that displays up to 24 lines of up to 80 5x7 dot-matrix characters



(maximum of 1,920 characters), with the display being refreshed at 60 Hz. A format mode permits fixed- and variable-length fields to be constructed through the terminal. The software also generates a "fill-in-the-blanks" format to ease data entry, and there is data insertion/deletion of characters, aided by a cursor. Options include a

From any angle, it's easy to see why Key OEMs are choosing Interdyne's digital cassette drive.



Servo-controlled capstan drive means hundreds of millions of repeatable start/stop cycles with no mechanical adjustments.

Three precision, direct drive motors - no belts or clutches anywhere. That spells reliability and low maintenance.

Two compact circuit cards can plug into transport or be located up to 6 feet away.

Rigid, heavy duty castings and one moving mechanical part contribute to a calculated MTBF of over 7500 hours.

Pressure pad by-pass*, precise guiding and repeatable tape tension yield error rates of less than 1 in 10^8 bits.

Meets or exceeds ANSI/ECMA-34 standards. Complete interchangeability of cassettes and drives.

The little gem weights 2 lbs. 6 ozs., uses 16 watts and is 4 1/4" x 5 1/4" x 5".

OEMs can't afford a mistake when choosing a digital tape cassette drive. They know that the rent stops on their system when even the smallest peripheral is down.

INTERDYNE's drive, along with scores of others, has been evaluated by the largest makers of point-of-sale recorders, remote terminals and digital systems. And time after time the IC 2500 has been rated tops for performance and reliability.

Frankly, we're not surprised. The IC 2500 is a classic in simplicity. You won't find the usual, complex assortment of mechanical levers, banging solenoids and belts. Just a DC capstan motor and a pair of reel motors to precisely control tape velocity and tension.

A velocity controlled servo capstan drive system achieves gentle, precise tape handling, just like the big reel-to-reel machines. We've even gone them one better by replacing the digital tachometer with an ingenious back-EMF sensing servo circuit.*

The IC 2500 handles data synchronously up to 9600 bits per second, or incrementally to 30 char./sec. And try this spec on the other guys: Bi-directional Write/Read at either of 2 remotely programmed speeds between 2 ips and 12 ips with optional 40 ips search.

The word is spreading fast. From any angle the IC 2500 reflects simplicity and performance. Find out more today.

INTERDYNE

14761 Califa St., Van Nuys, Calif. 91401 (213) 787-6800

* Patents pending

CIRCLE 38 ON READER CARD


ON
RS
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dataphone 4800

Introducing the 4800, first in a new family of data sets from the Bell System.

The Bell System's new 4800 data set is designed for transmission at 4800 b.p.s.—and it's economical.

This set cuts transmission costs three ways. First, the charge for the set itself is low.

Second, it makes it possible to transmit at 4800 b.p.s. over basic private line facilities—an automatic equalization feature corrects for variations introduced in the transmission channel.

Third, it uses your computer time economically. In addition to its high bit rate, it also features rapid startup and turn-around. The time from "request to send" to "clear to send" is less than 50 milliseconds in switched carrier operation. That makes the 4800 particularly well suited for multipoint polling applications.

In addition to speed and economy, this new data set also offers convenience. Local and remote loop-back testing is accomplished by operating a three-position test switch. Seven lamps on the front panel indicate the status of the set at all times.

And solid-state technology from Bell Laboratories fits all these features into a compact housing 16 by 11 by 4½ inches.

For details on the new "dataphone 4800" data set, including its low price, call your local Bell System Data Communications Consultant.

AT&T and your local Bell Company.

row of program attention keys that can request the application programs' 10 most-used functions, and two optional buffered printers (impact, nonimpact, or both that can be hooked up to a single terminal). The character set is ASCII, 64 characters. Including installation and maintenance, the 7100 rents for $125/month, with initial deliveries under way. GTE INFORMATION SYSTEMS, White Plains, N.Y. For information:
CIRCLE 225 ON READER CARD

OCR Line Printer

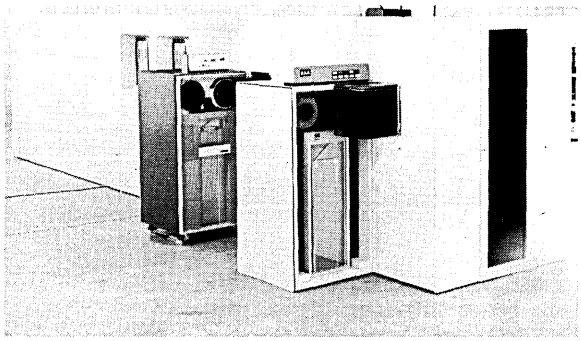
The creation of utility bills, insurance statements, and other documents that take advantage of machine-readable ocr characters should be eased by using a combination alphanumeric and ocr line printer available for this manufacturer's Century 200 computer. The printer is available in line widths of 132 or 160 characters and prints its 41 regular characters and 23 ocr characters at up to 1,500 lines/minute. A two-position switch on the printer selects which character set is used. Since the printer cannot print ocr and standard font in the same pass, two passes must be made to put both types of print on documents. Rental on the 132-column unit is $1300/month; the 160-column version is $100/month more. Maintenance on both models is $120/month. NCR, Dayton, Ohio. For information:
CIRCLE 226 ON READER CARD

PDP-11 Disc Storage

The rapidly growing list of Digital Equipment Corp. PDP-11 owners is offered a variety of disc storage combinations that appear to offer dramatic cost savings. Fixed-disc, removable-disc, fixed and removable discs in the same drive, and combinations of separate fixed and removable drives (with common controller) are offered, providing storage sizes ranging from 64K 16-bit words to over 6 million words of storage. Average access times are either 8.35 or 16.7 msec for fixed-disc units and 60 msec for the removable-cartridge (IBM 5444-type) unit. Transfer rates are roughly 240,000 words/second for fixed-disc units; 100,000 words/second for the removable-cartridge versions.

A typical configuration, including a 2.5-megaword cartridge drive in combination with a 256K-word fixed-disc platter beneath it, would run about $14,950 with controller and compete favorably with the $30,500 RK0 package. In the combination configuration, both the fixed- and cartridge-drive units can be transferring data at the same time, and both look like RK0 components to the PDP-11. INTERNATIONAL MEMORY SYSTEMS, Scottsdale, Ariz. For information:
CIRCLE 227 ON READER CARD

product spotlight



Automatic Tape Library

The concepts of reducing installation support personnel and cutting down the time it takes to get tape files mounted on computers continues to spur automatic tape library development. But perhaps the consideration that will really create a market for these devices is the one of security. With the tapes stored in a vault-like structure, there's less chance of malicious mischief, and that's a thought on most dp managers' minds these days.

The ATL-1 is the latest automatic tape library management system to come to our attention. At the heart of it is a Digital Equipment Corp. PDP-11, receiving commands from the host 360 or 370 selector or block multiplexor channel (respectively) to locate and automatically mount tapes on IBM 3420 self-loading drives—or equivalent. The PDP-11 keeps track of tape generations and cooperates with the JCL at the computer to make sure the correct file gets mounted. Tapes are automatically scratched by generation or expiration date, and when the system calls for a scratch tape, the PDP-11 knows which one is the least recently used. And tapes are always transported to the nearest available drive. For tapes that are not cataloged, there is a pick-up port for these tapes to be entered when the JCL asks for the mount. In all, it seems to be a fairly well thought out product, requiring no changes to the host computer operating system.

The basic two-drive system is priced at $85K, or $1840/month on a three-year contract. A system that serves eight drives is approximately $170K and rents for $3590. Models for serving up to 32 tape drives can be supplied. The first unit is scheduled to be shipped next month, with quantity shipments slated for next June. XYTEX CORP., Boulder, Colo. For information:
CIRCLE 221 ON READER CARD

3330 Storage for 360s

This is the second 3330-type storage system we know of that includes the block multiplexor channel allowing 360s above the model 65 to get all the performance out of the 3330. Additionally, this one is offered to the 360 model 30, 40, and 50 user, with software patches supplied by the vendor to "blind" the cpu and the 3330 from looking for multiplexor channel. (The 65 model requires no software patches.) If the user subsequently upgrades the installation to a 370, the same 3330 can be retained by the customer, but the disc controller adapters must be changed. Prices for the disc storage system are the same for all units: $6015/month on a three-year lease for a full 800-megabyte eight-drive configuration. The 360/65 version can be delivered next month, with November slated for the smaller models. COMPUTER INVESTORS GROUP, Stamford, Conn. For information:
CIRCLE 228 ON READER CARD

Minicomputer

Texas Instruments has made a bid for a larger share of the general-purpose minicomputer market with the announcement of the 980A. It's said to be just the thing for systems designers to use in building data communications, communications preprocessing, scientific, and small business dp products—though the machine does not have decimal arithmetic. The basic 980A has 4K 16-bit words of semiconductor memory (expandable to 64K), hardware multiply/divide with double-precision instructions, dynamic memory management, power failure automatic restart, a 333K word I/O transfer bus with four ports (expandable to 13 in the basic chassis), a one-megaword DMA channel expandable to eight ports, four hardware-vectored priority interrupts (expandable to 64), bit/byte/word/string addressing, 89 operation codes, eight general purpose registers, etc. All for $3475. The software

library includes FORTRAN IV; assembler languages; link and source editors; an executive that manages disc storage; IBM 360/370. cross-assemblers; and TILT, a proprietary TI high-level macro language. Initial deliveries of the 980A have been made. TEXAS INSTRUMENTS INC., Dallas, Texas. For information:
CIRCLE 229 ON READER CARD

POS Terminals*

Singer, the acknowledged leader in number of point-of-sale terminals with approximately 9,000 units in 500 store locations, has announced two additions to the basic MDTS (Modular Data Transaction System) that has been in the field more than four years.

The new models, the 902 and 925, can be programmed for positive and negative credit assessments, make multiple copies of sales checks or cash

receipts, and provide an original audit tape of each transaction. The 925 differs in that it has a side insertion printing capability with a full alphanumeric printer with two print heads that independently produce an audit tape and a receipt of the transaction. Both models also feature selective itemization, tax table look-up, check for a minimum and maximum number of entry digits, and keep track of transaction counts.

Current MDTS units can be upgraded to model 902 specs in the field for $300 per terminal. The 902 may be purchased for $3200; the model 925 sells for $3500. The 902 and 925 will be available in the first and second quarters of next year, respectively. THE SINGER CO., New York, N.Y. For information:
CIRCLE 230 ON READER CARD

Modem*

The model 412/424/436 is a modem cabinet that can be equipped with a number of field-installable pc cards for 1200-baud asynchronous shift key, or 2400 and 3600 phase-shift keyed operation. As such it is compatible with the Bell 202 and 201B modems, as well as standard EIA and CCITT interface specifications. The manufacturer claims the model is the first one with digital integration of both the transmitter and receiver, accomplished with a unique digital wave form synthesis technique, resulting in the elimination of maintenance. The basic model 412 is $580; the pc card for 2400-baud is an additional $370; and the 3600-baud card is an additional $650. There are options for secondary data channels, remote loopback control, automatic equalization (standard on the 436 card) dial-up back-up, and auto answer. AMERICAN DATA SYSTEMS, Canoga Park, Calif. For information:
CIRCLE 232 ON READER CARD

1130 Tape Subsystem

The 1130 market continues to attract the attention of peripheral manufacturers, and here is a new one that can supply a controller and up to four NRZI (800 bpi), phase-encoding technique (1600 bpi), or dual-density drives. The standard speed of the units is 37.5 ips. The supporting software includes a basic utility package and a tape utility program patterned after the disc utility programs. A minimum configuration,

*European distributor has information on this product.

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consisting of the controller/formatter, 800-bpi drive, and software, is priced at $10,430. Delivery requires four months. PERIPHERAL SYSTEMS RESEARCH, INC., Murray, Ky. For information:
CIRCLE 231 ON READER CARD

Commo Processor

The Tempo II is a communications processor that will be pitched to 360/370 installations with 2701/2/3 gear. It is the little brother of the Tempo I introduced several years ago, which is a direct competitor with the recently announced IBM 3705. The model II is based on a 750-nsec mini expandable from 4-64K. It also features 16 multipurpose registers, eight standard priority interrupts, a DMA channel, a ROM that enables users to initiate program operations from a variety of sources, an I/O processor, and a choice of an operator control panel or a security panel for industrial applications. The mod II can handle up to 16 50-kilobaud synchronous lines running in a full-duplex mode, or up to 48 asynchronous 2400-baud lines. A typical 270X replacement rents for $1590/month, plus $20/month for each pair of asynchronous lines and $50/month for each synchronous pair. Delivery is 60-150 days. GTE INFORMATION SYSTEMS, White Plains, N.Y. For information:
CIRCLE 233 ON READER CARD

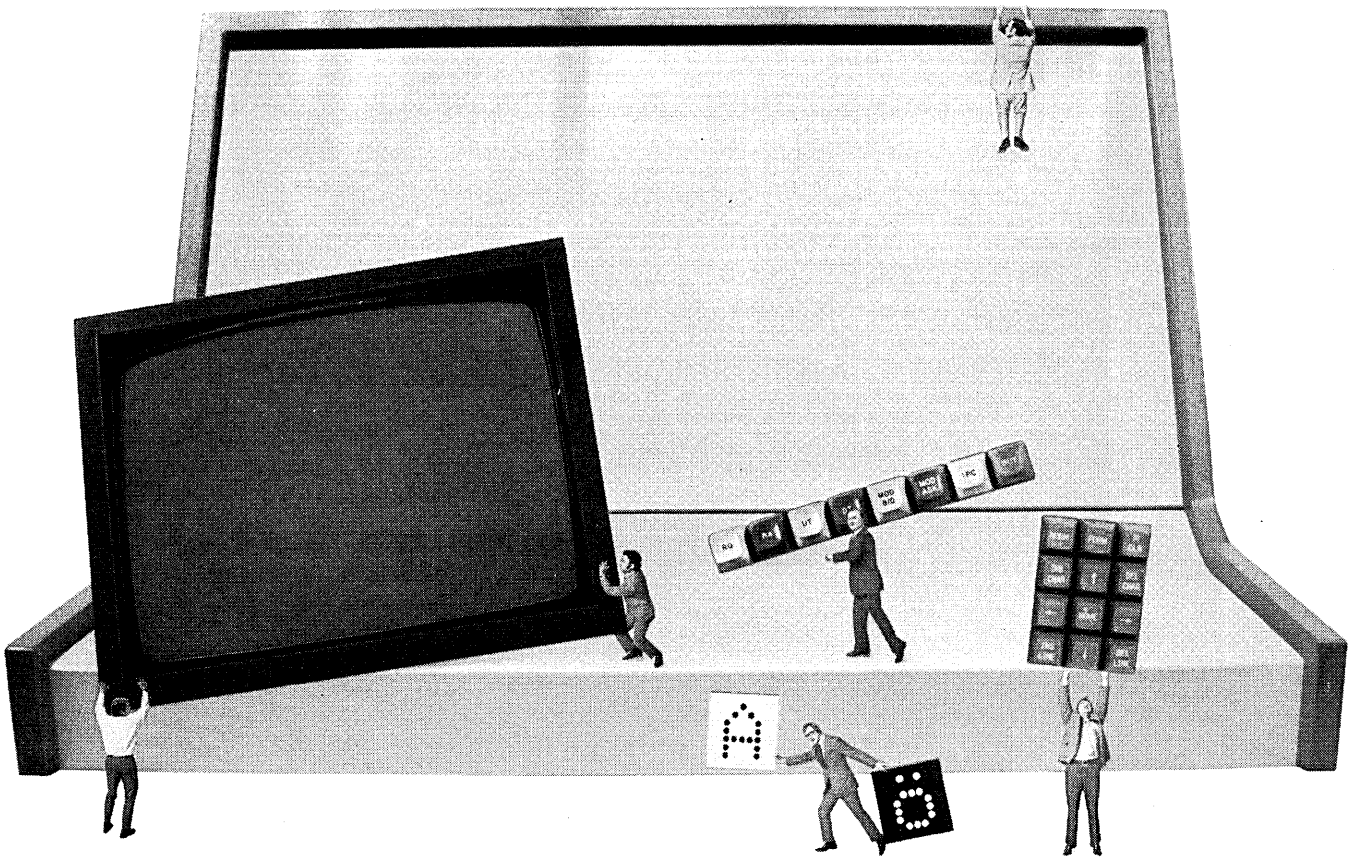
Universal Disc Storage

The recent development of a ROM-based controller is allowing this manufacturer to offer 2314-type disc storage systems for duty on any cpu. The model 844 controller handles from one to eight model 741 drives having average access times of 29 msec and transfer rates of 312 KB/second. There are built-in features for indicating such conditions as write error, head and/or cylinder error and its location, and drive not ready. A full 2314-equivalent (eight drives plus one spare, 233-megabyte capacity) rents for $3524 on a one-year lease, including maintenance and unlimited usage. Delivery is 30-90 days. PERIPHERALS GENERAL, INC., Cherry Hill, N.J. For information:
CIRCLE 234 ON READER CARD

Audio Response Unit

The latest audio response product from this manufacturer is called the Mini-Speechmaker. It is primarily offered to the oem market, but the firm has had reasonable success selling similar units to what it calls quasi-oem's—users willing to undertake the hardware and software interface necessary to make it a finished product.

The Speechmaker in its basic form is supplied with a 31-word vocabulary (limit of one-half second per word) field expandable to 378 such words, or 126 1.5-second phrases. Multiplexing electronics can keep track of up to 256 output voice lines. Storage registers and a couple of voice lines are also included in the basic unit, priced at $10K. A general-purpose interface is said to ease the problem of attaching the Speechmaker to 16-bit minicom-



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puters. COGNITRONICS CORP., Stamford, Conn. For information:
CIRCLE 235 ON READER CARD

Reader for TTY's

It seems as if independent manufacturers are developing equipment for the venerable Teletype products to lengthen their useful lives in much the same way as was done for the 360 product line. As an example, here is an 80-column card reader that plugs into the RS-232 connection on the back of the tty ASR models 33 and 35, which would allow card decks that didn't require any changes made during input to be fed directly into the computer. The device comes in two models: a model 4010 for transmission at 10 cps, and the model 4030 for 30-cps operation. The price for either version is $3800 and includes all necessary cables. PIVAN DATA SYSTEMS, INC., Lincolnwood, Ill. For information:
CIRCLE 236 ON READER CARD

Modem Sharing

The LSD-6 allows collocated terminals —running at rates up to 9600 baud in a communications network where the cpu is polling the terminals—to share a single modem. The unit is inserted between the RS-232B/C interface of the terminals and the modem. Additional LSD-6 units can be hooked up behind the first one to support 11, 16, or more terminals. The code-transparent device is priced at $785, or $30/month on a one-year lease. RIXON ELECTRONICS, INC., Silver Spring, Md. For information:
CIRCLE 237 ON READER CARD

Oem Cpu's

Lockheed Electronics continues to edge toward entry into the business systems manufacturing market. In support of that plan, a decimal and a scientific-oriented cpu have been developed, supplied in pc card form for other system designers. These cpu's are additions to the basic SUE (System User Engineered) components announced last year, which consisted of a 16-bit mini with 4-32K of 900-nsec memory with instruction sets for accommodating assembly, FORTRAN, BASIC, and RPG languages.

The model 1111 cpu knows 109 instructions, excluding addressing permutations, with decimal commands for doing addition, subtraction, multiplication, and division of 4-digit packed words. A maximum field of 29 digits can be handled for these operations. Also in the decimal set are clear/add decimal, right and left decimal shifts, and pack/unpack word, compare decimal, left/right character string shift, and string compare. These are all very common business processing instructions, so the 1111 should at least be considered by companies interested in entering the business processing sector. For information:
CIRCLE 238 ON READER CARD

The scientific pc board—the model 1112—has 126 instructions, including arithmetic, eight for double-length shift that operate on 32-bit words, eight normalize and count instructions, and seven for bit manipulation and logic. Both the scientific and the decimal cpu's are priced at $1495 and will be available in November. LOCKHEED ELECTRONICS CO., INC., Los Angeles, Calif. For information:
CIRCLE 239 ON READER CARD

Batch Terminal

The model 74 batch terminal is the first such unit from this manufacturer that has incorporated a minicomputer; the predecessors were hard-wired units that could only handle a single communication line discipline. And although the user of the 74 can't get at the programs the mini stores, the computer does allow the terminal to act as a 2780; a 360/20, 22, or 30 under

HASP; a CDC User 200 terminal; or as a Univac 1004 (to cpu's running Exec 2 or Exec 8). The 74 can be equipped with line printers that go up to 400-lpm rates, a 300-cpm 80-column reader, and 4800-baud communication equipment. Including maintenance, rental prices for a model 74 equipped with a 300-cpm reader, 300-lpm printer, and 2780 software start at $985/month on a one-year lease. Deliveries are under way. DATA 100 CORP., Minneapolis, Minn. For information:

CIRCLE 240 ON READER CARD

8K, $3K Minicomputer

It wasn't long ago when 3K minicomputers (had there been such things) would have sold for $8K, but the tables have turned. The GRI-99 comes with 8K of 1.76-usec 16-bit core memory (expandable to 32K) for $3K each in quantities as low as 25—which is certainly a reasonable oem order. The 99 is said to be best at large-scale data transfer, with five groups of instructions for data testing, format testing, register-to-register operations, format generate, and register-to-memory transfers. The aggregate I/O rate is 568,000 words/second. From 512 to a full 32K words of ROM or various combinations of read/write and read-only memory can be plugged into the standard memory slots. Software includes a relocatable assembler that runs in less than 4K, a loader, generalized real-time executive, floating-point interpretive package, and a list of library routines developed for the 99's predecessor, the 909. Initial units are currently going into the field. GRI COMPUTER CORP., Newton, Mass. For information:

CIRCLE 241 ON READER CARD

Disc & Drum Replacement

Earlier this year Ampex announced a replacement for the Univac Fastrand II and III drum storage systems used on the 1100 and 400 series large-scale processors. Shortly after it was announced, the Ampex engineers decided that they could design the controller for the system so that it could not only replace the Fastrand II and IIIs, but the Univac 8414, 8440, and 8460 disc storage systems, too. This combination system is called the DS-8430, comprising one radial array controller and up to 32 disc drives, each of which can store 9 million 36-bit words. The average access time for the drives is 29 msec, and the transfer rate is on the order of 140,000 words/second. A typical DS-8430 system with four tape drives rents for under $3700/month on a one-year contract, including prime-shift maintenance, and is available 60 days aro. AMPEX CORP., Marina del Rey, Calif. For information:

CIRCLE 242 ON READER CARD

Cassette

The CP-5000 is this new firm's first product, designed by a collection of ex-Ampex and CalComp personnel. It's an asynchronous unit available in tape speeds from 6-20 ips and read/write, or read-after-write electronics. The 5000 records on one or two tracks at 800 bpi and is supplied in deck form or with control electronics. The vendor is thinking big, preferring to quote large quantity oem orders: a thousand decks, less electronics, would be priced at $250/each. Availability is 45 days. CERTIFIED PERIPHERALS, INC., El Segundo, Calif. For information:

CIRCLE 243 ON READER CARD

Minicomputer

The first product from this firm is a 16-bit minicomputer that seemingly has a head start in life, as it runs much of the software developed for Honeywell's line of 16-bit minis. It has 750-nsec MOS memory, a DMA channel, and a host of peripherals. The software includes a macroassembler, real-time ex-

ecutive, linking loader, debug package, text editor, a library of run-time packages, and the extended ANSI FORTRAN IV compiler. Systems range in price from a 4K unit, including tty, for $10K, to a more typical configuration containing 16K memory, disc operating system, a fixed- or moving-head disc, tty, and high-speed paper tape reader/punch for $30-35K. Delivery is scheduled for October. PRIME COMPUTER, INC., Natick, Mass. For information:
CIRCLE 244 ON READER CARD

Audio Response Modem

The DMC/403 is a Bell 403D5, DLL, E3, or E-6 type data set on a single pc card. It accepts Touch-Tone or other "2 of 8" codes, and is intended for incorporation by oem's into audio response systems. The 403 can decode up to 10 digits per second. It's claimed that 24 of these modems require less space than one conventional 403 data set. The price per unit is $710. PERIPHONICS CORP., Bohemia, N.Y.
CIRCLE 252 ON READER CARD

Cassette Storage*

A 1-megabyte dual-transport cassette subsystem is now available to users of the Interdata New Series processors, including the model 50, 55, 70, 74, and 80. There is hardware read-after-write check, signal drop out detection, and other error checks. The transfer rate is up to 1,000 bytes/second from the twin Philips-type cassettes operating at 10 ips. The recording density is 800 bpi. The price is $4200. INTERDATA, Oceanport, N.J.
CIRCLE 251 ON READER CARD

Data Error Correction

Users of 4-wire, full-duplex, synchronous data transmission networks that run at speeds up to 9600 baud might be interested in the Validata 9100, which is inserted between a terminal and a modem on the network. The code-transparent unit then adds a bit combination to the data to help ease line noise, line drop out, and loss of modem synchronization. A decoding unit on the other end of the line detects and corrects such errors. For orders of six units or more, the Validata 9100 rents for $1/day on a five-year contract. INTERNATIONAL DATA SCIENCES, INC., Providence, R.I.
CIRCLE 245 ON READER CARD

Source Data Collection*

The Source 1000 is a battery-powered portable data collection terminal, related to one of this firm's earlier products. But the 1000 stores numeric characters only in its 2K or 4K semiconductor memory, entered through a 16-key keyboard. A third component of the 1000 is a combination battery charger, acoustic coupler, and transmitter unit. The information stored in the portable memory is read into the transmitter unit, where it is converted from 4-bit representation into 8-level ASCII. The price for one set (keyboard, 2K memory, battery, and transmitter combination unit) is $800. An additional 2K of memory adds $240 to that price. MSI DATA CORP., Costa Mesa, Calif.
CIRCLE 246 ON READER CARD

Commo Processor Option

A high-speed option offered for this manufacturer's CT/90 communications processor is said to increase that unit's throughput by a factor of five and should help the 90 qualify for large-scale applications it couldn't tackle before. The option is actually a second processor for the 90, a 16-bit microprogrammable mini that can add two 16-bit numbers in two's-complement fashion in 160 nsec. The estimated throughput for the 90 with this option is 20 KC, or roughly 200,000 bps. This rate may be distributed among up to 256 lines varying in transmission rates between 40 and 50 kilobaud. The high-speed option is priced at $17K, and can also be leased along with the CT/90. Delivery is 90 days. COMTEC DATA SYSTEMS, INC., Hawthorne, Calif.
CIRCLE 247 ON READER CARD

TTY Replacement

Users of the model 1401 tty magnetic tape terminal are offered an IBM Selectric typewriter set up to work with the tape unit on that configuration. The Selectric is called the model 37T KSR, and it rents for $93/month. The user continues to pay Teletype Corp. the $112 monthly rental on the tape unit. For an additional $40/month, customers can obtain the Bell

202C data set that permits 1200-baud transmission. TYCOM SYSTEMS CORP., Pompton Lakes, N.J.
CIRCLE 248 ON READER CARD

Card Reader
The addition of a card reader to the catalog describing this vendor's model 800 and 1600 minicomputers should just about complete it, for numerous other peripherals have been announced for it lately. The reader, based on a Bridge Data Products mechanism, is rated at up to 300 binary and Hollerith cards/minute. The price of $4100 includes the reader, controller, and necessary cables. The reader is available in both table and desk-top versions. MICRODATA CORP., Santa Ana, Calif.
CIRCLE 249 ON READER CARD

Modem*
The model 403 modem is billed as being programmable, which, in this case, refers to the ability to field-strap the unit to any asynchronous line rate up to 300 baud. The interface is RS-232-C and CCITT for European use, and the unit is compatible to the Bell 103, for answer or originate on two-wire operations. The unit can also be field-strapped to look like a 103A, 103E, or 103F. In pc card form, it sells for $400; add $150 for the complete unit, including enclosure. Delivery is 25 days. AMERICAN DATA SYSTEMS, Canoga Park, Calif.
CIRCLE 250 ON READER CARD

Modem
The model 920 is an originate-only acoustic coupler compatible with 0-300 baud Bell 103A-type modems. It contains its own power supply and wood cabinet and can be used with any terminal having the standard RS-232 plug and using half- or full-duplex communication modes. A carrier detect light is standard on all units, and each comes with a direct access arrangement. The 920 is priced at $99.50 in any quantity. TYCOM SYSTEMS, CORP., Pompton Lakes, N.J.
CIRCLE 253 ON READER CARD

Cassette
The model 143 cassette is a serial unit that incrementally records at up to 3 ips on Philips-type cassettes. It incorporates a positive reel take-up clutch, capstan drive mechanism, and positive traction reel drive hubs. All I/O interfacing is TTL logic, and there is a baud buffer that can be set to accept and generate data in RS-232C format at 110, 300, or 600 baud rates, in 10- or 11-bit format. The single unit price is $875. MEMODYNE CORP., Newton Upper Falls, Mass.
CIRCLE 263 ON READER CARD

S/3 Disc Cartridge*
The model 5440 disc cartridge operates on IBM 5444 type drives. The recording surface is a proprietary aluminum alloy substrate and coating that is then heat treated and polished. The manufacturer claims this process allows the 5440 to perform reliably through 6,000 head loadings with a minimum of maintenance. Priced at approximately $145 in small quantities, the cartridges are warrantied for three years. Delivery is immediate. CFI MEMORIES, INC., Anaheim, Calif.
CIRCLE 257 ON READER CARD

***European distributor has information on this product.**

MAC Bootstrap
A solid-state diode-matrix bootstrap memory is available for the popular MAC 16 and MAC Jr. 16-bit minicomputers. It can hold up to 64 16-bit words and is programmed by inserting a diode to represent each "one" in a word. The cycle time is 1 usec for each word. The unit can be used to load programs from tty's, paper tape readers, tape units, and communications equipment. A circuit board with 500 diodes is priced at $550. LOCKHEED ELECTRONICS CO., Los Angeles, Calif.
CIRCLE 261 ON READER CARD

MAC Read-only Memory
The model MP69632 alterable ROM offers users of the Lockheed MAC 16 from 4K of 160-nsec access (500-nsec cycle time) memory, complete with all interface and control electronics, which is installed by removing the back panel of the 16-bit mini and inserting it into one of the interface slots that holds the regular read/write memory. Pricing across the entire capacity range is approximately 1¢/bit, and availability is four weeks. DATAPAC INC., Costa Mesa, Calif.
CIRCLE 262 ON READER CARD □

Software & Services

Software Notes . . .

Many companies are using 360s and 370s for running up to 80% of their jobs in 1401 emulation mode, says International Resource Development, Inc., Ramsey, N.J. IRD has just reached an agreement with Com-Stute, Yokohama, Japan, whereby IRD will send 1401 Autocoder and SPS (Symbolic Programming System, wasn't it?) programs to Japan for line-by-line conversion to 360 BAL by Com-Stute's 40 programmer staff. The charge is $11 per statement, not including any file organization changes. While the charge seems high, it's claimed that machine performance at installations doing a great deal of 1401 emulation will improve enough perhaps to stave off the need for a larger, or more powerful system. IRD points out that installations seldom get around to doing conversion because it is the most tedious programming job. Perhaps they're right, as IRD claims three customers for the new service already.

Southern hospitality includes giving computer programs away —or at least some folks in Georgia think so. One is Governor Jimmy Carter, who offers a set of computer programs to other state and local governments to simulate cash flow and automatically determine which investments for collected monies will yield the highest amount of interest. The Governor states that the programs recovered their $105,000 development costs in their first month of operation.

Digital Communications Associates, Inc., also in Atlanta, is offering the FOCAL language to PDP-8, 10, and 11 users; and a set of diagnostics called DSP-8 for only the cost of duplicating a DECtape—typically $10-20. DSP-8 contains I/O routines, scope loop commands, data comparison routines, etc. DCA has just recently set up shop to do small custom computer applications involving both hardware and software.

Robert P. Henderson, vice president and associate general manager of Honeywell Information Systems' North American Computer Operations, sees the annual revenue from network data processing services in North America tripling to more than $1.5 billion in 1975, compared to about $420 million in 1970. "The general business segment of network services will grow the fastest, to about $600 million, or 40% of the 1975 figure, compared to 1970's $55 million, or 13% of the revenue."

Report Generator

The DYL-260 report writer/composer is a difficult product to classify generically. It's more powerful than a simple report writer and appears to be an embryonic form of a true file management system. It can't be used to construct a ring-type data file relationship, but it can be used to build variable- or fixed-length ISAM files and sequential files on tape or disc. It can also perform such utility functions as batch balancing, file reformatting, data packing, and a good bit of reporting.

The developer's target in developing DYL-260 was the "quick-and-dirty" COBOL and RPG program that is written perhaps once to obtain a very specific report and then probably tossed into the circular file. To do this it was necessary to equip 260 with approximately 50 modules that take their cues from a special report generation parameter sheet. (This sheet also serves to document the run.) DYL modules then scan one or two selected files, edit the data, calculate formulas that can be entered on the parameter sheet, and then produce the report (one report per pass for now). An interesting point about the equation processing is that DYL-260 scans the equation from left to right and performs the operations in the sequence they are indicated—no parenthesis to try to balance.

Perhaps the best way to illustrate DYL-260's capability is with a typical example: produce an employee-by-cost-center report with three levels of control totals and 17 report fields. The DYL package required 32 cards, compared with a 349 statement COBOL program. The COBOL program compiled in 35 seconds, link loaded and executed in 1.9 seconds on a 360/50. The complete DYL-260 run required only 1.2 seconds on the 50.

There are DOS and OS versions supplied in object deck form on tape, and the package will run on any 64K 360 above the model 25. The program rents for $2.60/day ($80.60/month) or can be purchased for $8K. DYL-260 is scheduled for delivery next month. DYLAKOR COMPUTER SYSTEMS, INC., Van Nuys, Calif. For information:

CIRCLE 275 ON READER CARD

Forecasting

A forecasting package for use with periodic data is available in BASIC or in FORTRAN, and comes adapted for the user's particular time-sharing service. EXPSMOOTH interactively accepts 24 data points or more which describe the past data values, smooths the data about 10 times using polynomial and trig functions, then projects up to five years of future data. The program operates in less than 8K bytes and is priced at $500. It is expected to be used primarily for short-term forecasts, especially in manufacturing and marketing. STEVE BACHMANN & ASSOC., Costa Mesa, Calif. For information:

CIRCLE 276 ON READER CARD

Data Base Management

More and more foreign software packages seem to be emigrating to the U.S. The latest arrival is a data base management system from Australia, developed by a group dissatisfied with the IBM BOMP and DBOMP (Bill of Materials Processors). The ISOGEN package is said to have virtually no limitations on the range of logical relationships that can be established between data segments; linkage may be maintained in any direction. There is a range of file structures available, accessible by PL/1 or COBOL application programs. The developers claim it has much the same facilities as the IBM-supplied IMS but requires less memory both because the nucleus is smaller and because ISOGEN requires only the portion of the data base actually being processed to occupy memory.

The DOS version of ISOGEN occupies 28K, and the COBOL programs it generates typically require 2-3K bytes per file being processed within the data base. The OS version requires 70K bytes, and generates programs typically requiring 3-4K bytes of memory. ISOGEN can be purchased for $17K, and can also be leased. It's currently being evaluated by several firms in the U.S. NATIONAL COMPUTER ANALYSIS, INC., Princeton, N.J. For information:

CIRCLE 277 ON READER CARD

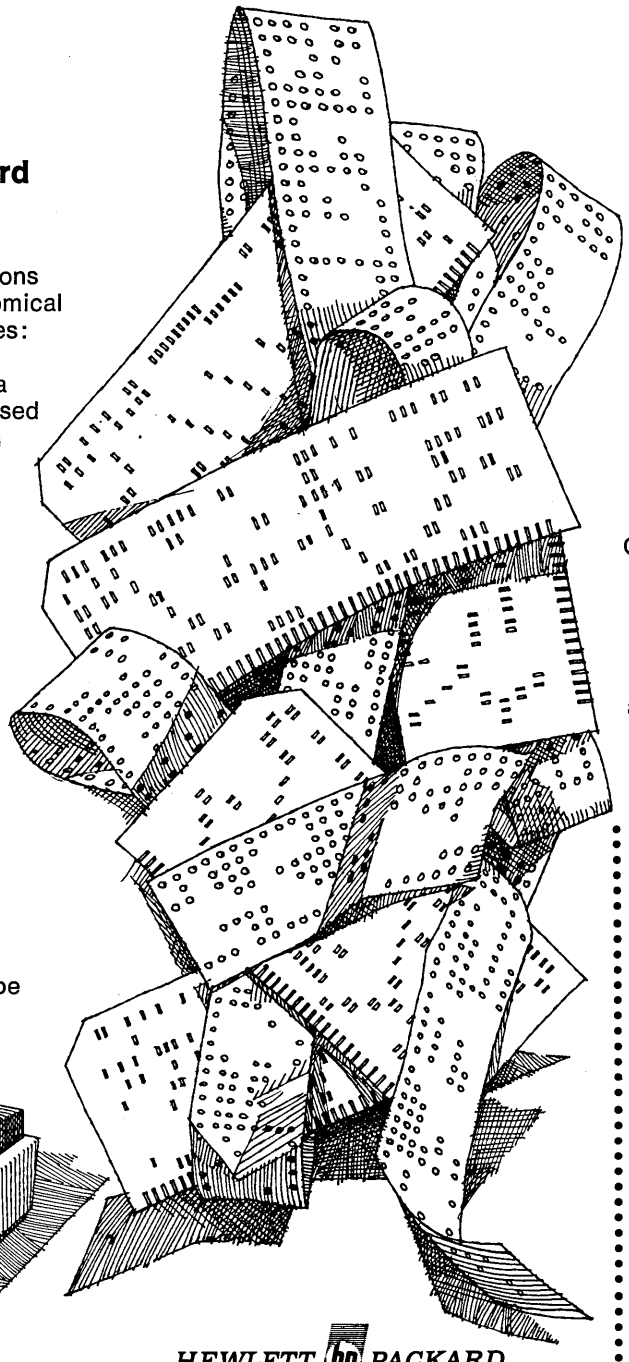
ISAM Replacement

IBM 370 users will have a choice of access methods to replace ISAM—IBM's own VSAM or this vendor's TAM (The Access Method). TAM has the added advantage that it can be used on 360s also. Reorganizing disc files with TAM will reportedly make for faster updating and packing 20%-40% more data in the same disc space.

TAM provides indexed sequential access to 2311, 2314, or 3330 fixed- or variable-length records. It works under unmodified DOS or OS, eliminates most overflow linkage, handles duplicate keys automatically, keeps access statistics, and can retrieve records by the next higher key than the one specified

There's a hole in your data entry/input system.

Or didn't you know?

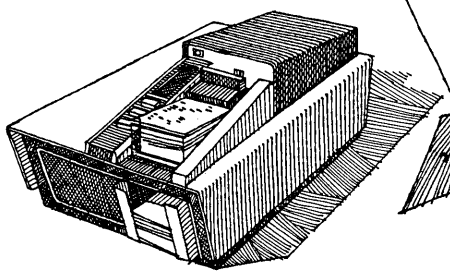


Get your data out of the hole... use one card to do the work of two.

Now you can bypass time consuming keypunch operations with the simplest, most economical of all data entry/input devices: pencil and paper. Start by sketching us your ideas for a tab-sized card that can be used as a data entry form. Keep in mind that once the form is marked in pencil it's going to be used as a data input card, too. That's because the marked card will be read by Hewlett-Packard's Optical Mark Reader, and the data fed continuously, or on demand, into your computer. Quickly and quietly. Local or remote.

A custom card design will leave some punch in your system

We'll study your sketch, then help you get it converted into finished cards. If you like, repetitive data or codes can be pre-punched. The Reader senses holes as well as soft-lead pencil marks.



She's better looking and tries hard, but...

she can't match our desk-top Optical Mark Reader for accuracy, reliability and economy. And if it's not just right for your specific application, we'll customize it. To get a data sheet use the coupon. You may even want to attach an entry-input card sketch.

Hewlett-Packard, Palo Alto, California 94304; Europe: Box 85, CH-1217 Meyrin 2, Geneva, Switzerland; Japan: YHP, 1-59-1, Yoyogi, Shibuya-Ku, Tokyo, 151.

112-04

Send the hole story

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COMPANY

ADDRESS

CITY

STATE ZIP

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Palo Alto, California 94304

☐ My card sketch is attached.

HEWLETT hp PACKARD

Everyone can use an H-P Optical Mark Reader

software & services

(as in alpha ordering). Installed in 15 minutes, the program product can be leased for $300/month or $7500 for three years. INTERNATIONAL MANAGEMENT SERVICES, Hacienda Heights, Calif. For information:
CIRCLE 278 ON READER CARD

Disc Dump/Restore

This utility offers users a way to free up some disc spindles or to keep more up-to-date backup copies of disc files. Called Fast Dump Restore, it reportedly dumps 2314- or 2319-compatible disc packs to tape in 15% to 30% of the time required by the IBM OS utility. Its vendor claims that a "typical" pack is dumped in from 2½ to 4½ minutes, that full packs take between 3½ and 7 minutes, and that restore times are always less than dump times. Further, the program requires 40% less mag tape (meaning that full packs can usually be dumped onto a single reel). A 30-day free trial is offered, after which $990 is payable for the first copy and $500 for each successive copy. INNOVATION DATA PROCESSING, Flanders, N.J. For information:
CIRCLE 279 ON READER CARD

DOS Courses

For those expecting to stick with DOS in spite of attempts to lure them away, this vendor offers a 12-lesson videotape course in DOS' architecture and operation. JCL is covered, along with service functions like Linkage editor, data management facilities, and advanced features such as multiprogramming and multitasking.

Offered for purchase for under $1500 after a 30-day preview, the course is also available on a subscription basis which allows the user to trade it in, when finished, for one of 50 other courses. EDUTRONICS SYSTEMS INTERNATIONAL, INC., Los Angeles, Calif. For information:
CIRCLE 280 ON READER CARD

Pert/Cpm Service

IMPACT (Integrated Management Planning and Control Technique) is billed as being a more powerful and flexible version of the popular PERT/TIME and CPM programs. It includes features such as controlled cost crashing to ascertain the best way to expedite a project for a specified cost, and resource leveling to smooth the peaks and valleys in resource usage by automatically shuffling nonessential jobs. The service is run from a Honeywell 435 computer, and the FORTRAN IV program generates a 72-character-wide report suitable for Teletypes. The charge is 6¢ per cpu unit, or, typically, a 100-activity network run costs about $12. No plots are generated at present. RAPIDATA, INC., Fairfield, N.J. For information:
CIRCLE 281 ON READER CARD

Financial Statements

This unnamed package is for planning, budgeting, and cost control. It produces monthly financial statements and year-to-date figures for income, taxes, cash flow, balance sheet, financial ratios, debt coverage, and earnings/share. It compares previous, actual, and budgeted figures, then projects figures for the remaining months in a year and for year-end results. It operates on three levels of statements, including company or division, groups of companies or divisions, and corporate. Written in FORTRAN, the program requires 120K unless it is overlaid. It leases for $150/month or can be purchased for $9000. STEVENSON & KELLOGG, LTD., Vancouver, B.C. For information:
CIRCLE 282 ON READER CARD

Cobol Tracing*

For those computers not equipped with adequate COBOL tracing routines —which this vendor claims include some CDC, NCR, and ICL machines —RSTRACE is offered. Object decks RSTRACE produces allow programmers to enter, at run time or at compilation, a list of paragraphs or groups of paragraphs to be traced. The program inserts TRACE statements and routines into the COBOL source, causing the paragraph names to be printed as the code is executed. When being used, RSTRACE turns off any tracing called for in the source code. It also can list and resequence decks and optionally provides for printing the last N paragraphs executed before an abnormal termination.

RSTRACE requires 40K-60K words if all features are implemented, and sells for $1000 to $2500 ($40/month to $80/month on lease) depending on installation size. ROBERT SHERRY & ASSOC. LTD., Lancs., Eng. For information:
CIRCLE 283 ON READER CARD

DP Auditing

Eleven kinds of audits can be made of a dp facility through this specialized service, including ones for software design, new applications, existing applications, technical procedures, documentation, operations, personnel, dp

*European distributor has information on this product.

objectives, dp equipment, software procurement, and product specifications (for hardware and software manufacturers). These audits are all available on a fixed-price, fixed-time basis where the only variable expense is the per diem.

As an example, a review of an existing application would include a technical and economic analysis of its expected life, its effective cost to modify, its cost to replace, and its potential enhancements. Recommendations are made for changes in the system and its operation and controls; and the costs of those changes are estimated.

The price for the service depends on the application size. A 360/30 general accounting system review might run as much as $15,000. Also, for objectivity, the company is willing to sign an agreement limiting its further work on a system if it is asked to perform an audit. UNICORN SYSTEMS CO., Los Angeles, Calif. For information:

CIRCLE 284 ON READER CARD

software spotlight

Cobol Shorthand Utility

COBOL-EZE is an inexpensive way to stretch your programming dollar. It allows its users, for $100 plus a $2 handling charge, to define their own shorthand expressions for words and phrases in their COBOL programs. Instead of the statement "APPLY PAGE-END TO FORM-OVERFLOW ON PRINT," the user might write "APP FOP" The real names are substituted for the abbreviations at object time, and a new sequenced and labeled source deck with the expansions can be requested.

A source deck, sample substitution cards, DOS JCL, and operating instructions are included in the price. The only other investment required is 13K bytes of memory. GENERAL SYSTEMS CORP., Seattle, Wash. For information:

CIRCLE 274 ON READER CARD

Text Editing

The TEXT text processor operates under Xerox' UTS time-sharing operating system on Sigma 6s, 7s, and 9s to provide a function equivalent to IBM's ATS. In fact, TEXT provides some functions, like automatic table generation and automatic indexing, which are not available in ATS.

Typists and technical writers can work interactively on teleprinter terminals or Selectric terminals to input any kind of document, then to alter those documents by addressing line numbers for changes. Global changes are accommodated, as are floating spaces for graphics.

TEXT requires 9K words for itself, plus and additional 2K for each user. It is available free to Sigma users. XEROX CORP., El Segundo. Calif. For information:

CIRCLE 286 ON READER CARD

PDP-8 Sort

A sorting package is offered to PDP-8 users having at least 4K of memory, three DECtapes, and a tty. A disc version of SORT3 is also offered. To use it, the user enters parameters via the tty, detailing which fields will be sorted, file names, etc. An employee file with 400 records (each 128 decimal words long, unblocked in complete reverse order) is said to require 5½ minutes to sort. The price for the package is $1500 per installation. ILLINOIS SYSTEMS CO., Maywood, Ill. For information:

CIRCLE 273 ON READER CARD

Edp Career Development

This vendor claims that edp has not yet matured as a profession, and that this is evidenced by undefined career paths, inadequate job descriptions, and inadequate professional training. The solution is claimed to be a service that provides documented job descriptions, paths, and training programs for departments and for individuals.

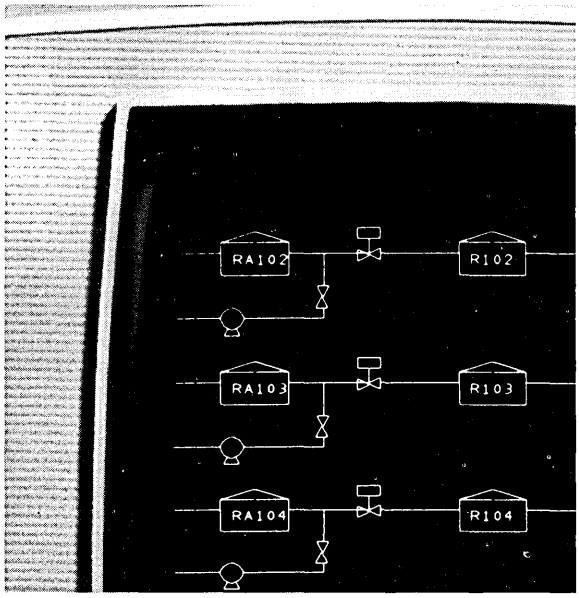
Part of the value of the service comes from the structure of the forms and of the interviews employed. A do-it-yourself kit that includes the physical pieces and a description of the methodology can be obtained for $14,000. The value of the consulting portion runs the price to $25,000 to $50,000. Q.E.D. INFORMATION SCIENCES, INC., Wellesley Hills, Mass. For information:

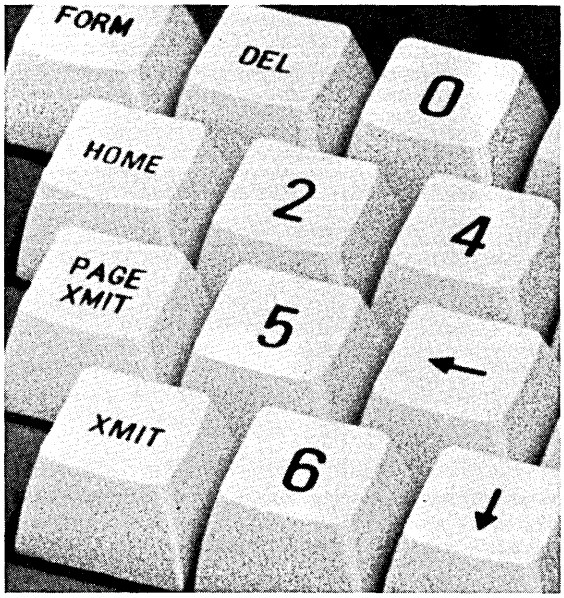
CIRCLE 285 ON READER CARD

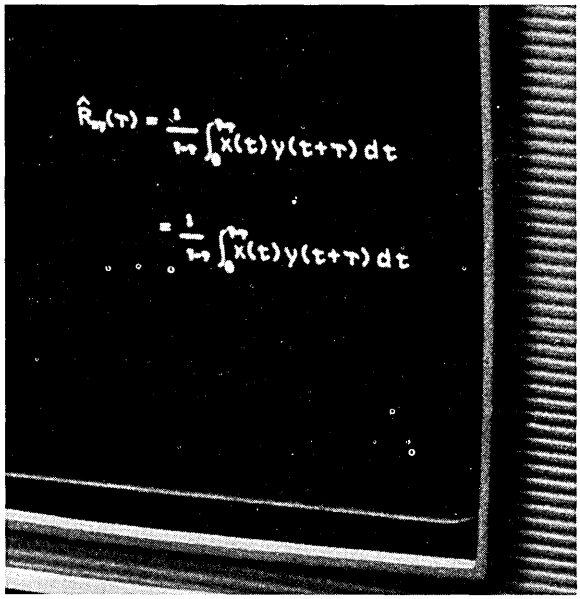
Commercial Subroutines

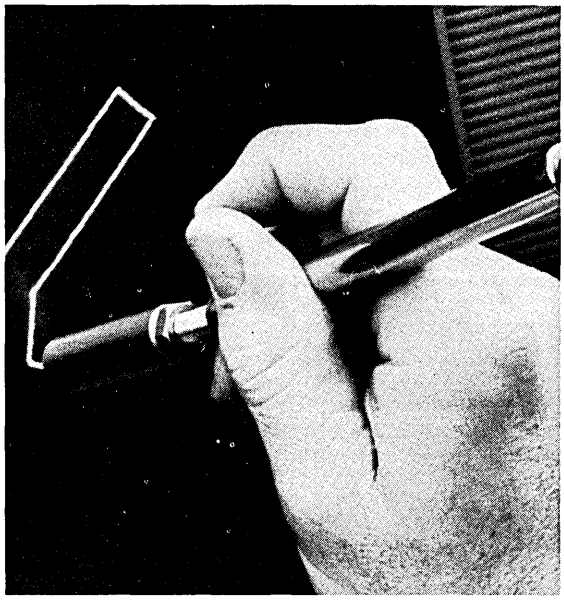
The commercial subroutine package is a collection of 30 FORTRAN modules for easing the problem of performing business data processing applications on 16-bit minicomputers. Included in the package are routines to perform variable length decimal arithmetic; editing for preparation of outputs in commercial formats; conversion to and from alphanumeric, decimal, or floating-point formats; and various utility functions. The price for the package is $800. PANATEC INC., Santa Ana, Calif. For information: □

CIRCLE 272 ON READER CARD









The Refreshed, Interactive Graphics Display Computer PDS-1D ($10,000)

- **Refreshed CRT Monitor and Keyboard**
- **16-Bit, 4096 Word General Purpose Mini-Computer**
- **Stored Program Display Processor**
- **Serial-Asynchronous Communications Interface**
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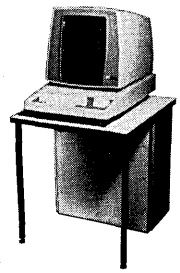
and—its memory is expandable to 32K □ it functions Stand-Alone or on-line with minimum burden on the host CPU □ optional peripherals include: Disk, Magnetic Tape, Cassette, Paper Tape □ it can be supplied with Light Pen, Mouse, Tablet or Joystick. A lot for a little. And, without obligation, IMLAC will perform an Applications Analysis to test the effectiveness of PDS-1D in your application. Call (617) 449-4600 or write IMLAC Corporation, 150 A Street, New England Industrial Center, Needham, Massachusetts 02194.



IMLAC

INTERACTIVE INTELLIGENCE

Is your payroll input obsolete?

The conventional time card payroll system remains useful, but now there is a new computer compatible payroll processing system. The Model 75 Badge Recorder from Cincinnati is the payroll input of tomorrow.

The Model 75 saves real time and real money — there are no time cards to buy — no time spent delivering and picking up time cards — no sorting or auditing of time cards — no posting to payroll sheets. Team the Model 75 Attendance Time Data Collection System with your computer to cut clerical time and costs to a minimum.

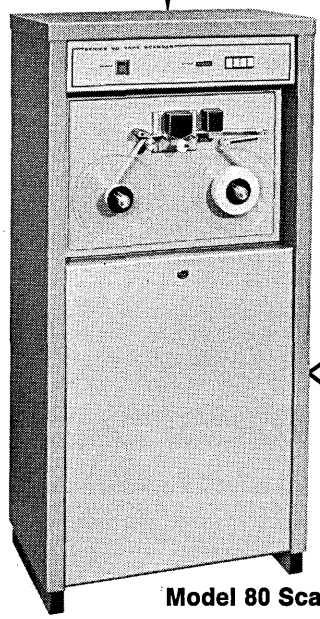
Each employee is provided with a credit card size plastic badge embossed with a modified bar code employee number. The badge is inserted in the recorder registering the time, date and identification number on carbon backed dual paper tape. The registration is man-sensible and can be visually checked by the employee through a window on the unit. It is also machine-sensible and can be converted to magnetic tape or punch cards at up to 120 registrations per minute via the Cincinnati Model 80 Scanner.

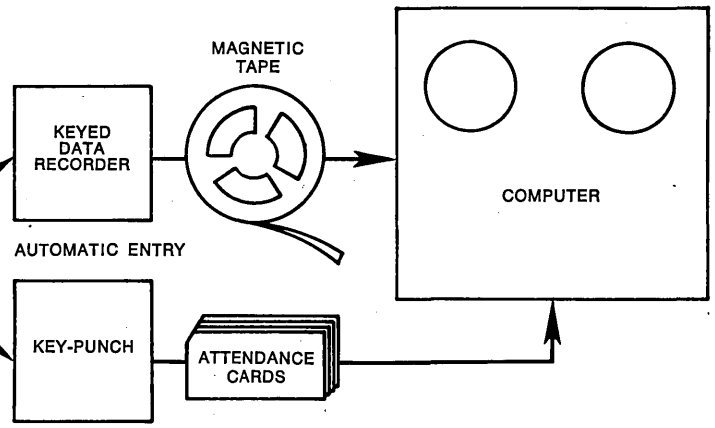
Take up reels hold tape for 2400 registrations per pay period. This means 100 employees per recorder can clock as many as four times each day for a normal work week with space for 400 registrations left over for overtime or extra employees. The master tape supply reel holds 10,000 registrations or about a one month supply.

When the time card system came in to being almost a century ago, it was a great innovation. The Model 75 is one-hundred years better. If it's time to cut costs, call the Cincinnati Sales Engineer listed under "TIME RECORDERS" in the Yellow Pages, or write for free literature on the Model 75 — our 75th anniversary — just in time.

cincinnati®
TIME RECORDER CO.

1828 Central Avenue, Cincinnati, Ohio 45214
A Unit of General Signal Corporation





Literature

Infrared Data Links

Brochure on a device called Optran, an infrared data set for line-of-sight data transmission without wires, lists economic and performance benefits to be derived from using infrared data links for short-distance transmission. COMPUTER TRANSMISSION CORP., Los Angeles, Calif. For copy:

CIRCLE 200 ON READER CARD

B 1700 Report

Ten-page report which describes and analyzes the new Burroughs B 1700 computer series is specifically designed to aid data processing executives in understanding the systems' features and evaluating their suitability for specific applications. DATAPRO RESEARCH CORP., Moorestown, N.J. For copy:

CIRCLE 201 ON READER CARD

Programmer Exam Guide

An announcement and study guide for its next Registered Business Programmer examination to be held April 28, 1973, have been published by the Data Processing Management Assn. The guide gives information on the purpose, history, administration and scope of the examination and lists by topics and subtopics the areas to be covered. DPMA, Park Ridge, Ill. For copy:

CIRCLE 202 ON READER CARD

Learn to Program

In five minutes and four pages, this brochure reportedly can teach a nonprogrammer to write a program using the vendor's Mark IV Information Request form. The narrative follows the steps necessary in filling out the form to solve the problem, but deliberately avoids technical terminology and information beyond the scope of the problem. INFORMATICS, INC., SOFTWARE PRODUCTS CO., Canoga Park, Calif. For copy:

CIRCLE 203 ON READER CARD

Expanded Glossary

A revised version of a microprogramming handbook includes an expanded glossary of data processing terms in which more than 200 commonly used data processing definitions are listed. The handbook also contains descriptions of the vendor's latest peripheral systems and communications interfaces. MICRODATA CORP., Santa Ana, Calif. For copy.

CIRCLE 204 ON READER CARD

Robot Proceedings

Proceedings of the Second International Symposium Industrial Robots, sponsored by IIT Research Institute May 16-18, are available at $17.50 per copy. The symposium reviewed and forecast industrial robot developments and applications throughout the world. IIT RESEARCH INSTITUTE, P.O. Box 4963, Chicago, Ill. 60680.

Data Transmission System

Eight-page pamphlet briefly describes vendor's type 26D 4800-bps data transmission system which operates over a typical series 3002 line with C2 conditioning. The pamphlet includes typical applications diagrams, error rate performance charts, interface specifications, and interchange circuit assignments according to EIA RS-232-C and CCITT V.24 rquirements. GTE LENKURT INC., San Carlos, Calif. For copy:

CIRCLE 205 ON READER CARD

Used Computer Prices

Summer issue of the "Computer Price Guide," also known as the "Blue Book of Used Computer Prices," has 26 pages listing most major manufacturers and current asking prices of computers available on the used market. IBM 360/30s are quoted at about half their price when new. TIME BROKERS, INC., Elmsford, N.Y. For copy:

CIRCLE 206 ON READER CARD

Minicomputer Solutions

Broadening applications for minicomputers are covered in a 24-page book, "If Minicomputers Are the Answer, What Was the Question?" It also covers the evolution of the present-day minicomputer and the manner in which the changing needs of minicomputer users have had an impact on the conventional computer marketplace. GRI COMPUTER CORP., Newton, Mass. For copy:

CIRCLE 207 ON READER CARD

Teleprocessing Services

"Data on Demand" is a 16-page brochure explaining the capabilities of an information services organization which include the design and installation of computer communications systems that gather data over any distance, process it, and deliver it in the form required, as fast as necessary. TELEPROCESSING INDUSTRIES, INC., Mahwah, N.J. For copy:

CIRCLE 209 ON READER CARD

Courses, Seminars

More than 55 seminars and symposia, designed for management and data processing professionals, ranging from Design of Data Communications Systems, EDP Project Management, and Methods of Market Segmentation, to Affirmative Action Programs, Management by Objectives, Public Lotteries and Off Track Wagering, and What You Always Wanted to Know About Computers—And Were Afraid to Ask, are described in a 53-page catalog. THE INSTITUTE FOR ADVANCED TECHNOLOGY, Washington, D.C. For copy:

CIRCLE 210 ON READER CARD

For Associations

Six-page brochure, "Computer Services for Associations," describes ways in which associations can use computers most effectively. APC ANALYSIS AND PROGRAMMING CORP., Greenwich, Conn. For copy:

CIRCLE 211 ON READER CARD

Tape Drive

Brochure describes operations and lists specifications for vendor's Model TNY 7-inch tape drive for minicomputers, data terminals, key-tape equipment, and process control systems. AMPEX CORP., Marina del Rey, Calif. For copy:

CIRCLE 212 ON READER CARD

ROM Simulation

Six-page brochure describes equipment which simulates large read-only-memory subsystems and enables engineers to determine instantly and accurately how a new read-only memory will perform in a system. S.M.S., Sunnyvale, Calif. For copy: □

CIRCLE 213 ON READER CARD

We hired this man to baby-sit for computers.

Ever think what would happen to your business if fire destroyed your irreplaceable tapes and records? It could shut you down for weeks, if not forever.

At Fenwal we've got engineers with all sorts of talents. Like electronics experts studying causes of fires in computer centers; chemical engineers continually seeking more effective use of extinguishants such as Halon 1301; camera bugs photographing roaring infernos from the inside out. Of course, it's taken more than this to make us No. 1. We're years ahead of everyone in developing fast fire suppression systems, with more and better test and research facilities. The only one capable of producing an Explosion Suppression System that works so fast it stops explosions after they start! Got the idea? When you're looking for a high speed fire suppression system,* start at the top. Call us. And ask for a showing of our color film, "The Fireaters," featuring our fire suppression systems in action. For a free copy of the Harvard Business Review report on Safeguarding Computers, write Fenwal Incorporated, Ashland, Mass. 01721. Phone (617) 881-2000. A Division of Walter Kidde & Co., Inc.

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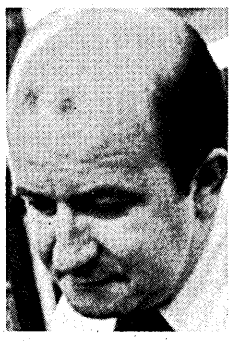
FENWAL

In fire and explosion suppression systems, Fenwal has more experience than any other company in the world.

People

It is difficult for anyone in the surging minicomputer business not to be an optimist. And the new king of the mini business—Digital Equipment Corp.'s ANDREW C. KNOWLES—is the king of the optimists, too. "I think the mini boom is just beginning," says DEC's new vice president in charge of minicomputers. "There are more than 20,000 minis out there now, and I can foresee two or three times that many—easy. And soon."



Andrew C. Knowles

In Knowles' eyes one obvious spur to the minicomputer phenomenon has been rapidly decreasing prices. He observes that when DEC introduced the PDP-8 in 1965, it was priced at $18,000—a price that now will buy a complete mini system including a PDP-8, a disc, a printer, and a display.

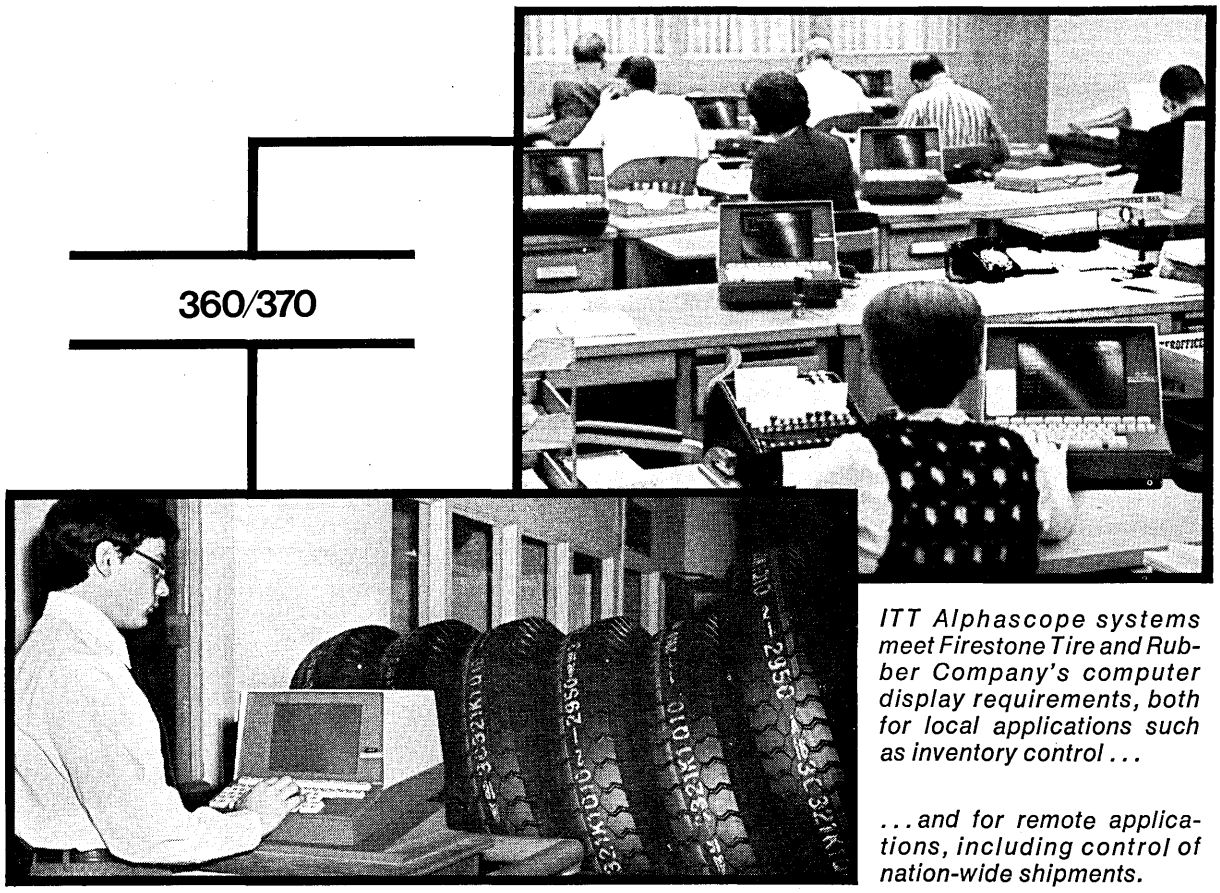
And how does Knowles propose to halt DEC's loss in minicomputer market share? He concedes that a phalanx of mini firms has been "sniping away" at DEC's base, but he feels the company is now not only in a position to maintain its market share, but will be able to increase it. "We have a complete line," observes Knowles. "On the low end, the PDP-6 dedicated controller costs $1900; and, on the high end, the PDP-45 costs $250,000. More than that, now that the PDP-8 and PDP-11 lines are mature, we're rough." DEC is the undisputed pacesetter in the mini business, having shipped well over 15,000 units. The firm's mini business runs at a rate of more than $75 million a year.

Knowles' background at RCA's Semiconductor Div. in the early 1960s and later at RCA's Memory Products operation was useful when the minicomputer company purchased most of RCA's equipment at its Memory Products Div. in Needham Heights, Mass. Knowles joined DEC in late 1969 and became product line manager for the PDP-11 16-bit machine line. A former baseball star at the Univ. of Massachusetts where he earned a B.S. degree in electrical engineering, Knowles also did graduate work at Babson Institute. He succeeds Nick Mazzarese, who is on a leave of absence.

Another new and optimistic exec is VIRGINIA GODDARD, recently appointed vp, technical services, at Intercon Systems, a three-year-old international consulting and services corporation for which she sees a bright and blooming future providing technical support to government and industry. The company, with offices in Los Angeles, New York, and Tokyo, has a rapidly expanding task force, including optics designers, laser system specialists, design engineers, system analysts, CPA auditors, programmers, and configuration management specialists—and provides management and professional consulting services which range from the development of software for airborne computers to system auditing for a large corporation in Anchorage, Alaska.

Virginia H. Goddard

A totally charming, soft-spoken lady, Miss Goddard foresees a task-oriented trend in dp consulting where the specialist will enter the project on contract at the point of origin, in the design and concept stages, and hopefully stay on for the life of the project—rather than just getting it launched or



ITT Alphascope systems meet Firestone Tire and Rubber Company's computer display requirements, both for local applications such as inventory control . . .

. . . and for remote applications, including control of nation-wide shipments.

Your 360/370 is only as good as your display systems. That's your best reason for ITT Alphascopes.™

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coming in when disaster strikes.

In addition to a distinguished and diversified background in computer science, including management and technical stints with the U.S. government, IBM, United California Bank, the L.A. Times, Standard Oil of Calif., and most recently as vp, technical services, at Dart Industries, Miss Goddard has been active in ACM, ASM and DPMA.

While she strongly supports these societies, she believes there is an urgent need for the formation of one strong organization, similar to the American Medical Assn. and the Bar Assn., to speak for the industry with a united voice at a decision-making level. Legislation concerning the certification and/or licensing of dp personnel appears inevitable—and it is important that industry specialists assist in determining the requirements and qualifications, she believes.

You can't accuse PAUL ARMER of going to pots. Actually he has left POTS and moved to POSTS. Directionally, it's east to west. Armer, a DATAMATION contributing editor, recently took over as coordinator of the Program on Science, Technology and Society (POSTS) at the Center for Advanced Study in the Behavioral Sciences in Stanford, Calif. It's a program supported financially by the National Science Foundation at the nonprofit center, which is not affiliated with the university, although located on Stanford property. Armer will spend half his time as coordinator of the program, the other half as a Fellow of the center, trying to finish the book he had been working on at Harvard Univ. as part of the Program on Technology & Society (POTS) that had existed there.

Paul Armer

The 18-year-old center, situated on a quiet, wooded hilltop overlooking the university campus, provides a setting and facilities for study and contemplation for some 50 multidisciplinary scholars invited each year. Many arrive to complete one or more books they've been working on; others read or renew themselves in a variety of ways.

There, Paul Armer and the new program will "try to shed some light on the interaction among science, technology, and society," as he phrases it. Meanwhile, there's still his book on the Paul Principle and the problem of the obsolescence of a person's skills and knowledge resulting from rapid technological change. It's a phenomenon he used to call technological obsolescence; but, since discovering the social variety, he just refers to it as "obsolescence."

KARL E. WENK JR. is new to the computer business, with the typical new entrant's enthusiasm but an atypical newcomer's job. He's the new president of Intercomputer Corp., Phoenix manufacturer of a minicomputer and a front-end controller. Wenk is a long-time veteran of the finance business and was finding it static ("our product—dollars—might change in value, but never in character") when he became interested in data communications. As president of Ritter Finance, he was a prime mover in a consortium of finance companies which were attempting to develop a credit-checking network. "I sensed a growing interest in the whole field of data communications," he said, explaining his big switch. One of his first accomplishments at Intercomputer was completion of negotiations with UCC subsidiary, Communications Systems Inc., on an oem contract under which Intercomputer will produce, and CSI will market and service, a line of IBM-compatible front-end controllers. □

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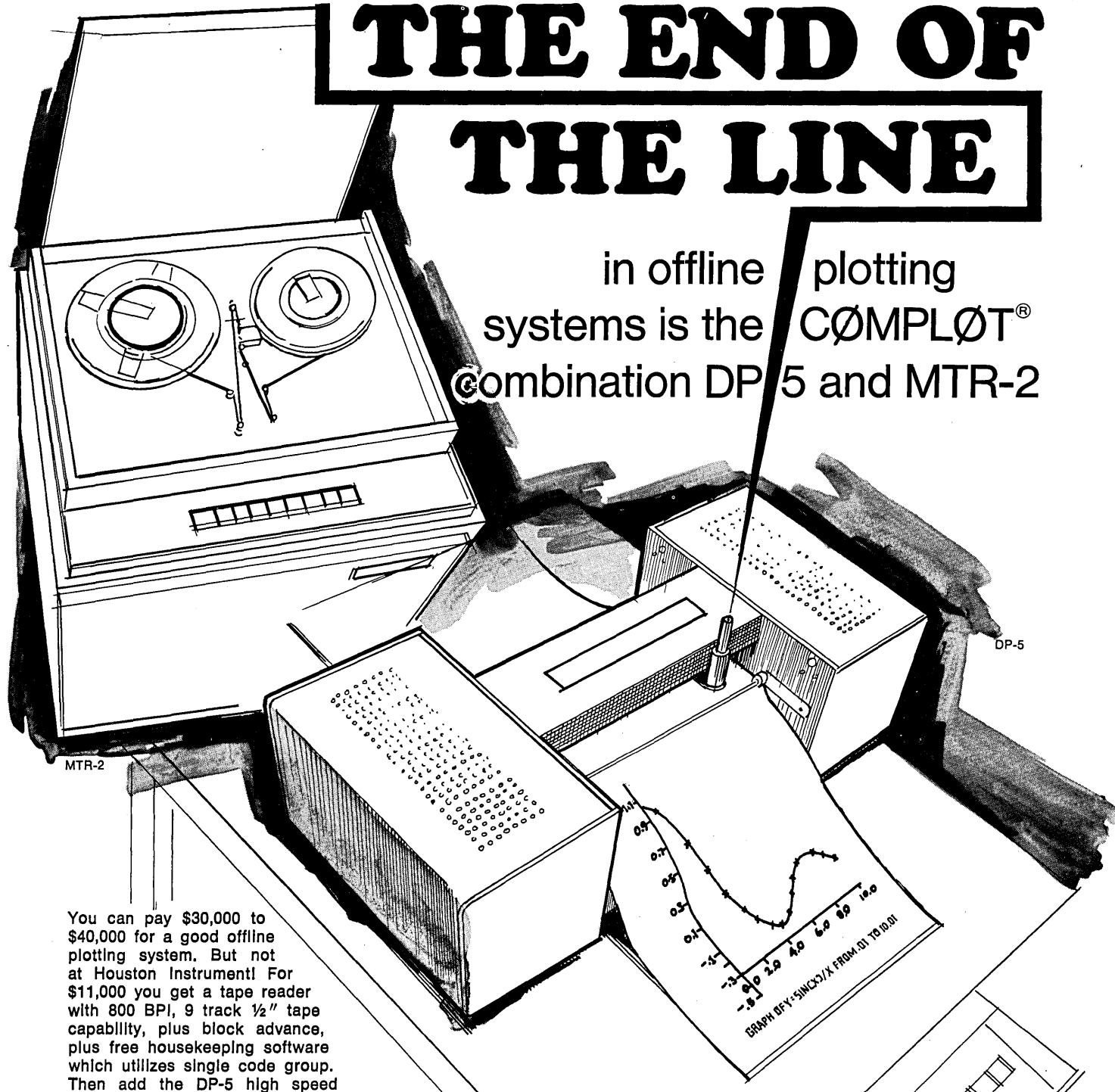

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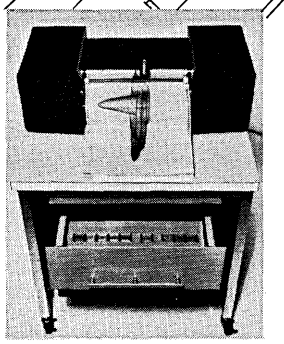

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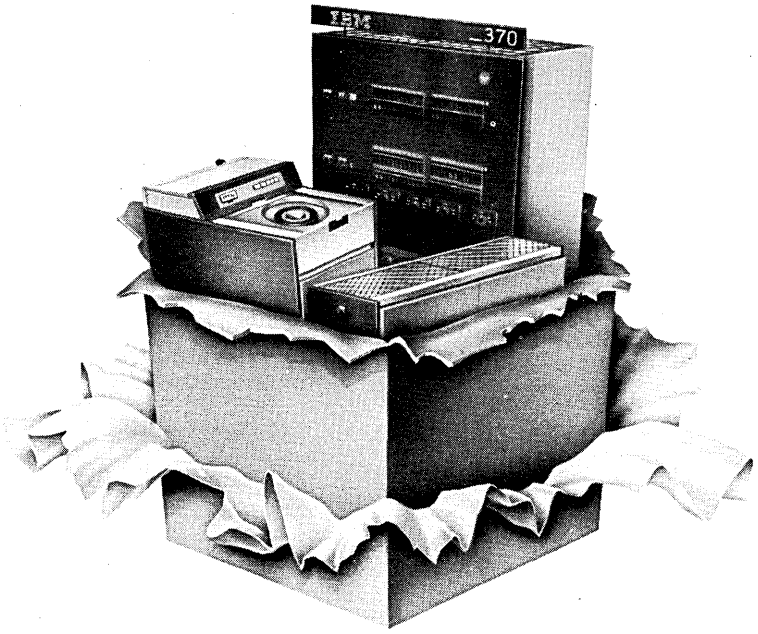

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Books

Computers and Political Campaigning
by Robert L. Chartrand
Spartan Books, 1972
220 pages. $5.00 (paperback)

Mr. Chartrand is the specialist in information sciences for the U.S. Congressional Research Service and has served in political environments for about a quarter century. However, in spite of bipartisan testimonials to the contrary, this reviewer does not feel that the quality of his book is commensurate with that of his credentials. The foreword and other areas of the book quite explicitly state that its audience is to be the nontechnician. However, in his introduction, Mr. Chartrand states his agreement with a quotation to the contrary that there is a shift of " 'political power from party leaders, political brokers, and special interest group leaders to those who are information and communication experts.' " His first chapter, "Information Technology," is geared to the information scientist, not to the politician.

Succeeding chapters shift between the level of comprehension of the data processor and that of the politician. Perhaps the most appropriate audience would be the technical administrators of the more sophisticated political campaigns—not the politicians who employ them nor the data processors hired by these administrators.

If the audience is to be these technical administrators, then it appears that the content of the book is unfortunately stratified. The preface promises that:

"Campaign files and their computerization are discussed thoroughly, including such essential data as those used by campaign workers, correspondence and financial records, and analytical commentary based on political research.

"Beyond the mundane organization and manipulation of these basic files are the more exotic uses of the computer, such as simulating through the use of a computer model how groups of voter types may act (or react) politically."

Although the author largely fulfills the promised discussion of file organization and processing, only ten pages in the text are devoted to math-science applications (seven of which address a 1960 application). Furthermore, he continually confuses supervision and management by shifting his scale of exposition from such details as the need for and the structure of back-up files to theoretical questions of the role of data processing in campaigns.

Generally the text divides into a discussion of information for using edp in politics, a chapter on file creation—which would normally be followed by his rather thorough discussions of campaign files but is interrupted by a chapter on the historic approaches of the Republican and Democratic National Committees to edp in political campaigning—the extremely anemic chapter on simulation and modelling, a chapter on election night prediction by national media, and finally some recommendations for development of issues-oriented files for future use. Three appendices: (A) a case study; (B) a table of data processing costs; and (C) a registry of political consultants, along with a bibliography and glossary, follow.

Mr. Chartrand does identify some interesting applications of edp to political campaigning in his chapter "Campaign Files." In the section on Constituent/Voter Files, besides addressing censuses of party registrants, he points out that at least one direct mail advertising firm is prepared to merge data generated from credit bureaus, governmental agencies, etc. with the preceding censuses in order to create and update a "Political Data Bank System." It is rather a chilling thought that he suggests that the parties might recoup the costs of the system by selling the data in the commercial market. On a more socially positive note, less ambitious data base efforts enabled the deployment of mobile registration vans in Nassau County, N.Y., which increased the effectiveness of voter registration efforts by reducing average registration time per registrant from one person every ten minutes to one every 90 seconds.

The section on Financial Files, besides addressing the more pedestrian issues of housekeeping, discusses the use of historical files of contributions by individuals and their application to selective fund raising solicitations. The opportunity that this technique renders for exerting pressure on noncontributants raises the specter of political extortion.

The section on Campaign Worker Files discusses the opportunity to rationalize campaigning through critical path networking. Mr. Chartrand points out that little use has been made of this tool at least through the 1968 campaigns. Other aspects of the discussion of computerized campaign worker files include clerical replacement and the development of precinct walking lists. Unfortunately, the author viewed them purely as tab runs and did not offer approaches to assigning the work through the use of service area programs such as REDIST.

The sections on Political Research and Issues Files and Biographical Files both lack discussions of cost-effectiveness. However, his analysis of the ca-

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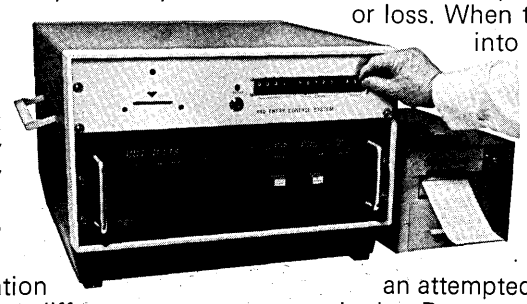

Or you can change the authorization of any individual from one entrance to different entrances, without changing the locks, or his card. Total control.

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veats and benefits of Survey/Polls Files is particularly lucid and thorough. He succinctly discusses the questions of validity, obsolescence, completeness, relative importance, quantitative predictability, and relevance. He also knowledgeably handles the usefulness of "Vote History Files" by demonstrating how they can identify "swing" and "soft" precincts as "target" areas in which maximum campaign efforts should be expended.

The only contribution of Mr. Chartrand's chapter on Simulation and Modelling is the statement that time series voting statistics by precinct are available and the precautionary statement of vital differences in modelling local and national campaigns. "Those who have worked with local computer models point out that there are important differences between these and a computerized simulation on a national scale. Essentially it is necessary to predict individual rather than group opinions, and these are less reliable than bloc reactions."

Mr. Chartrand's ignoring such advances in political modelling as media impact simulations is topically unfortunate in light of George McGovern's weak victory (less than expected) in the California Democratic Presidential Primary. Political analysts have attributed the 15% difference between Sen. McGovern's anticipated and actual vote to the impact of Southern California's media. This phenomenon could have been projected by political models developed since the late 1960's and they should certainly have been included in *Computers and Political Campaigning.*

In summary, in spite of some well written sections, the book is inconsistent in its direction. In its dealing with the role of edp in campaigning, it shifts its scale from the details of the data control desk to general structures and procedures. It displays a lack of awareness of the capabilities of third and fourth generation systems. In so doing, it raises questions that would be more relevant if the title were "EAM and Political Campaigning."

—Alan Weiner

Book Briefs

Manager's Guide to Management Information Systems

by Robert V. Head
Prentice-Hall, Inc., Englewood Cliffs, N.J., 1972
176 pp. $12

This is a useful book for nontechnical top management people who expect to interact, as users, with an information system for problem-solving purposes and who are responsible for directing (and challenging) system development projects in their companies.

It discusses the role, structuring, and maintenance of data bases from technical and managerial viewpoints; the way in which managers interact with a management information system, with emphasis on on-line hardware and software; the problems involved in justifying an MIS; and the system development process, its alternatives and organization. Also included are a glossary of MIS terms and a bibliography (with abstracts) of books for the nonspecialist on subjects covering the various disciplines that contribute to MIS.

The book is well organized, easy to read, and should give managers sufficient background to intelligently consider and discuss management information systems within their own organizations. It also serves as an overview for business school students and gives analysts, programmers, and other specialists a broader picture of the information systems to which they are contributing in their specialized ways. □

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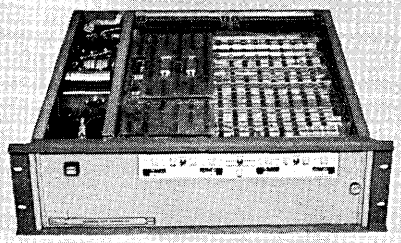
DATUM's I/O systems let you add up to four magnetic tape units to any of 20 makes of minicomputer. Seven- and nine-track mix, NRZ and phase-encoded formats, different densities, several speeds and compatible software.



Key conversation piece in the mini-to-tape dialogue is DATUM's Series 5091 Formatter. This lets you generate and read IBM-compatible NRZ **and**/or phase-encoded formats. One formatter will handle up to four 7- or 9-track, multiple density (200, 556, 800 bpi), multiple-speed (6.25 to 112.5 ips) magnetic tape units. Plug in a computer adapter and you have a complete controller system. Daisy-chain two formatters and control up to four 7- and 9-track NRZ **plus** one to four 1600 bpi tape units.

Almost 600 DATUM magnetic tape systems are operating reliably here and abroad. They're field-proven.
We like to provide you with a total system — tape units, formatter/controller, software, installation and all the expertise derived from decades of systems experience. But we also furnish formatters with blank PC boards for the knowledgeable systems man who wants to build his own computer adapter. These boards have 196 IC sockets already mounted. DTL/TTL integrated circuit logic is used throughout the formatter design to ensure compatibility.

Total systems prices start about $8000. Delivery off-the-shelf much of the time, 30 days to be on the safe side.

Circle 72 on reader card

performance...

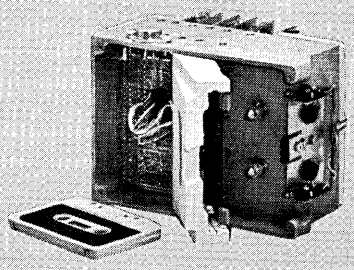
Digital cassette systems

DATUM's cassette systems create new standards of performance. Using the Peripheral Dynamics Model 4200 Digital Cassette Transport — the cassette with reel performance — these systems offer:

storage capacities of over 20 million bits, two- or four-track recording at speeds from 10 ips to 75 ips, NRZ or phase-encoded formats, read/write or read-after-write heads.

And no more tape-chewing. A reel-driven servo system, without capstans or pinch rollers, keeps tape velocity constant. A torque feedback tension servo maintains tape tension. A reference-edge tape guidance system provides precise tracking (±0.001 inch) and cuts skew to less than 2 microseconds at 37.5 ips. So tape will last.

Standard speed is 37.5 ips, though you can have up to 75 ips or down to 10 ips. Search and rewind speed is 120 ips. Operates bidirectionally at high or low speeds, under local or remote control.



Reliability? It's the simplest cassette drive on the market. Two moving parts in the drive mechanism. No springs, capstans, pinch rollers or solenoids to get out of whack. It is as reliable as it is simple.

OEM versions or systems, with the same formatters, controllers and software as with conventional reel-to-reel tape drive systems.

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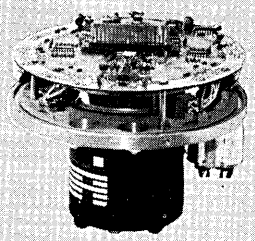
reliability...

Mass memory systems

DATUM's mass memory systems — drums or disks — offer low cost expansion to core-limited minicomputers, or solutions to other storage problems requiring a highly reliable, rapid-access, economical data base.



At the lower end of the storage scale, DATUM's Series 55 rotating drum memories provide 2K 16-bit word capacity with 18,000 bits per track on 2 tracks and an average access time of 8.3 milliseconds, for about $650. Common capacities of 32K and 65K words run from $1550 to $1750 with self-clocked, read-write electronics.

Series 88 drums, rugged and reliable, provide up to 1.2 million words of storage. Designed for tough environmental conditions, high vibration and shock-prone applications.

All drums have head-per-track, fail-safe, flying heads. And low cost per reliable bit.

DATUM's new Series 44 dual disk drives are designed primarily to provide both sizeable on-line random access storage and unlimited off-line storage. Small system compactness and price, with big system features like top-loading removable disks, air filtration systems and optical head positioning. Storage capacities to about 3 million words.

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Look Ahead

(Continued from page 8)

investors, has a portable time-sharing terminal with graphics capability and nonimpact printing speeds up to 120 cps. Its 40-pound Teletype replacement has an acoustic coupler and prints alphanumerics and graphics on electrosensitive paper. It produces characters with a 5x7 dot matrix.

Meanwhile, we hear Honeywell is developing a 15,000-lpm nonimpact printer that uses treated paper.

GSA LIABILITY HASSLE SETTLED--MAYBE

The hassle between GSA and cpu makers, chiefly IBM, regarding "consequential damage" (May, p. 122) is near settlement--at least for a while. The agency is willing to accept liability for such damage. But a key source says there still may be a need to increase suppliers' liability beyond the limits specified in current liquidated damage, nonperformance, and related contract clauses. GSA wants to establish a government-industry study group to define "consequential damages" and explore possible contract changes. It would be given "no more than two years" to produce recommendations.

Also at GSA, Control Data Corp. signed its FY'73 federal supply schedule contract, and three other mainframe suppliers, unnamed, are reported on the verge of doing likewise. IBM remains a holdout. CDC and at least one other mainframer have agreed to let the feds attach independently supplied peripherals to their leased cpu's. A government source expects similar concessions from the others.

IS THERE LIFE AFTER DEATH?

When GE's computer division perished, there was a warehouse full of assorted computer equipment left over. Now an enterprising Los Angeles company, Media Images, whose main business is supplying computer services and processing, has bought the whole works for "pennies on the dollar." Estimated orginal purchase value is $45 million, and the inventory includes a 225, 235, 425, two 645s, lots of peripherals, 11,000 circuit boards, and the complete TRADAR system. It's all been moved to Media Images' warehouse in Santa Ana, Calif., and the company has already made its first sale--a 625 cpu to Honeywell Information Systems.

RUMORS AND RAW RANDOM DATA

Datamation, with the cooperation of the U.S. Dept. of Commerce, will sponsor a "Grand Tour, Europe '73." The combination conference and exhibit will hit five European cities starting in November of next year...Watch for Burroughs to announce semiconductor memory later this year for the 6700 line...Transcript of the government's antitrust case against IBM includes a statement from an IBM attorney who says General Electric and RCA are both in the computer business, "and I believe I can prove (it)." Some consolation to those who lost their jobs or were left holding an RCA or GE computer when those firms went out of the mainframe computer business...General Computer Systems, the Texas-based key-to-disc firm, sold three systems to companies that were using equipment made by the defunct Redcor Corp. Not surprising--marketing vp Dallas Talley and the GCS New England and Central U.S. managers are ex-Redcor marketeers. Computer Machinery Corp. earlier this year took over the Redcor customer base... According to IBM insiders, "Smash"--supposed code name for IBM's virtual memory announcement--has nothing to do with "smashing" the competition. They say it came about when a market strategist, trying to decide when and what new products to announce, exclaimed: "Let's announce the whole smash." The term caught on.

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This forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

The Forum

Cassettes – Latest Growth Market?

The rapid growth of minicomputers and key-to-tape systems during the late 1960s provided a significant market for the low-cost reel-to-reel tape unit. But during the 1970s the digital tape cassette recorder will take center stage as vast markets open up for key-to-cassette systems, point-of-sale recording systems, paper tape replacements and remote data terminals requiring bulk memory.

History evolves rather than repeats and this is particularly true of the digital tape recorder. Originally, the only units available were very large, very fast and carried a very big price tag (in excess of $20,000). In the early '60s, companies like Datamec, Ampex and Potter brought out smaller, slower-speed tape recorders in the $10,000 price range to satisfy the needs of systems people. In 1967, Peripheral Equipment Corp. (now PERTEC) came along with a $3,000 tape unit and a number of other manufacturers followed suit. The next major evolution is the digital cassette recorder which will carry a price tag of $300 or less in large OEM quantities.

Actually, the computer industry has only taken the digital cassette seriously for the past three years and, after evaluating some of the early kludges, many industry experts seriously doubted if enough performance and reliability could be built into a digital cassette drive to make it suitable for recording and playback of computer data.

However, during the past year, the digital cassette recorder has come of age. Tape specifications have been standardized. There have been some major technical breakthroughs in cassette drive design which make it possible to achieve performance and reliability on a par with the smaller IBM compatible reel-to-reel machines. Today, a few mature cassette drive manufacturers have emerged from the pack, ready to slug it out for the big pot of gold on the horizon.

Most industry experts agree that the potential market for digital cassette recorders is enormous. However, even veteran researchers like Quantum Science and A. D. Little are having a difficult time projecting the absolute size of the market on a year-to-year basis because of the uncertainty of how fast new markets will develop. The growth rates in the various surveys are similar, but these curves can shift forward or

backward for a year or so. By taking a consensus of the available studies, it appears that the digital cassette market will be between $60 and $90 million annually five years from now, with exact timing dependent on the introduction of new cassette-oriented products by the large point-of-sale suppliers. Some of the most important markets for digital cassette recorders include:

Key-to-cassette systems. Key-to-reel-to-reel tape systems have already given the old punched card quite a battering. Key-to-cassette systems, with a much lower price tag, may well deal a knockout blow to the punched card and make edp available to even the smallest businesses.

Point-of-sale-recording systems. Here is an even bigger potential market for cassettes with such industry giants as NCR, Friden, General Instrument, TRW Data Systems, Pitney Bowes, and Olivetti taking dead aim at every department store, discount house, franchise chain, supermart, drug store, motel and gas station in the free world. There is no doubt that digital cassette recorders will show up by the hundreds of thousands in point-of-sale and accounting equipment.

Remote data terminals. This is another big potential market since manufacturers of hard copy teleprinters and crt terminals are finding that the digital cassette is an appropriate mate for their products where bulk storage is needed.

Replacement for punched paper tape. Like the punched card, the punched paper tape has as many lives as the proverbial cat. Eventually, however, the digital cassette will make strong inroads into this broad price-competitive market.

Right now, the biggest competitor to the digital cassette in low-cost storage is the 7-inch reel-to-reel machine. The going price for a 7-inch tape unit is $1400 to $1600 in quantity. These prices may drop to $1200 eventually, but won't get below $1000 because of the necessity to accelerate and control this large mass of tape.

The ¼-inch cartridge machine is another worthy contender. IBM, along with others, is seriously considering this approach. It is logical that the ¼" concept will find a niche in systems where additional data capacity justifies a much higher price than a cassette drive. If a ¼" machine can be produced without tension arms, the price could run close to $700 in very large quantities. However, this will still be more expensive than the ⅛" cassette drive. There appears to be room for both quarter and eighth-inch devices. They will compete head-on in some areas, overlap in others, but in most cases they will find distinct markets. The cassette, because of its lower price, should reap the lion's share of the business because its capacity is more than sufficient to take care of a day's typing, a day's cash register receipts or replace thousands of punched cards.

Another possible challenger to the digital cassette is the flexible "floppy" disc, which has the advantage of fast random access and high transfer rates. However, since manufacturers of these discs are quoting prices of $2000 and up, it appears that the flexible disc and the digital cassette drive will be more complementary than competitive, just as disc files and reel-to-reel tapes both have a place in large computer systems.

It appears that the manufacturers who will be most successful in the digital cassette drive sales race will be those who stick to simple design, rather than attempting radical approaches involving belts, pulleys, clutches and other mechanical nightmares. Some cassette drive builders like Bell & Howell and Dicom believe that the tape must be pulled out of the cassette, using mechanical or vacuum methods. This technique is unique, but it appears to be an unnecessarily expensive solution to tape control. Other manufacturers have taken the same design approach as for reel-to-reel tape recorders. An example is the Interdyne cassette drive which uses a DC capstan motor and a pair of DC reel motors to control tape velocity and tension and a simple back EMF servo circuit in place of the feedback tachometer. The overall result is a digital cassette drive that uses very few components yet rivals the reel-to-reel tape recorders for performance and reliability.

The big explosion should take place soon. The major suppliers of point-of-sale equipment are ready to make major plunges into mass markets. There are scores of exciting new products in the pipeline which will use digital cassette drives. It appears that four or five cassette recorder manufacturers, at the most, will share the business. These are the ones who have solved the problems which broke the back of some 24 suppliers during the past 24 months. The successful survivors will offer equipment which:

1. Has high performance and reliability.
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4. Is priced below $300 in large OEM quantities.

—Nyal McMullin

Mr. McMullin was one of the founders of Peripheral Equipment Corp. and is now a consultant.

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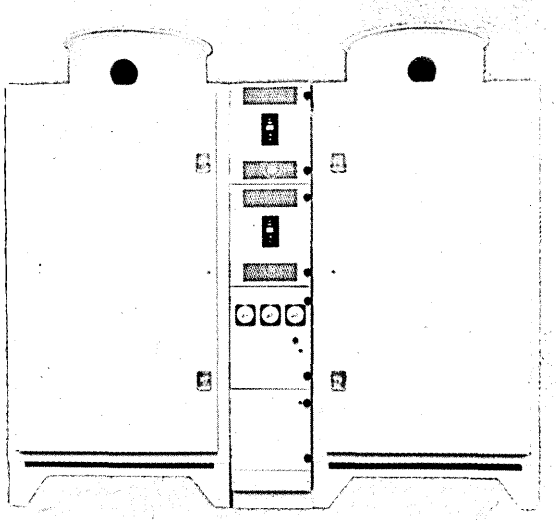

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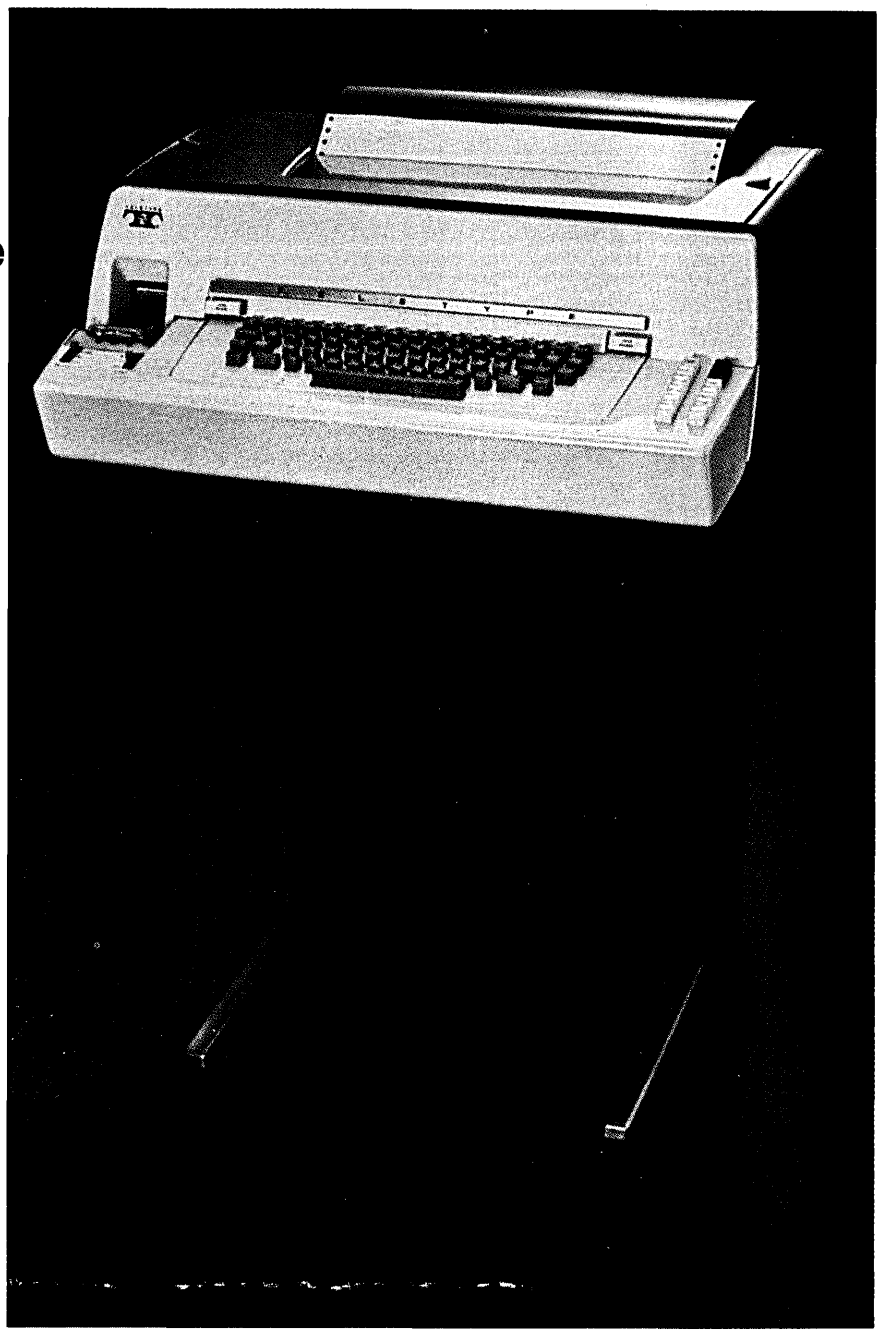

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