DATAMATION 70®

August 1

NEW
semi monthly
LOOK

PEOPLE:
management
and motivation

Underpriced Overachiever: Varian's 520/i, the computer plus.

It's one economical computer that's more than a computer. It will, for instance, run dual programs because it has two complete sets of hardware registers, including index registers. And handle arithmetic functions in 8-, 16-, 24-, or 32-bit lengths within the same program, with precision changeable at any time.

Hardware? Two 32-bit accumulators, two 16-bit index registers, two program counters, two overflow registers, 11 interrupt lines. And a 1.5-μsec memory, expandable from 4K to 32K.

The price is $6,000. True, that isn't peanuts. But it isn't very much, either—especially when you consider the cost/performance ratio you get with the 520/i.

CIRCLE 1 ON READER CARD

U. S. Sales Offices: Downey, San Diego, San Francisco, Calif.; Washington, D. C.; Atlanta, Ga.; Chicago, Ill.; Waltham, Mass.; Ann Arbor, Mich.; Albuquerque, N. Mex.; New Rochelle, Syracuse, N.Y.; Fort Washington, Pa.; Dallas, Houston, Tex.
Other offices worldwide.

Varian Data Machines, a Varian subsidiary,
2722 Michelson Dr., Irvine, Calif. 92664.
Telephone 714/833-2400.

varian data machines

The Big Company in Small Computers

Even in Hungry Horse, Montana, down time doesn't last long with the Tally STC* as near as your phone.

Tally's Seattle Test Center* (STC for short) can diagnose over the phone in 2 minutes or less about 80 per cent of the ills that might occasionally befall your Tally data communications system.

Generally STC can tell your technician or operator exactly how to cure the ailment in just a few moments. STC determines quickly which office in your network is experiencing a malfunction, i.e., transmitting errors or receiving errors.

There is no charge for this unique service to Tally customers. It's as near as your phone and available on a worldwide basis. Additionally, in the realm of preventative maintenance, field service is available at pre-scheduled times. Tally has one of the largest field service forces of any company of its size in the computer industry.

Naturally, the Tally Seattle Test Center uses the very latest test equipment and the best trained personnel to put a quick fix on your problem. If it's the unusual problem that can't be solved over the phone—men, equipment, and parts can be dispatched at once. No matter where you are, in most cases, you'll find a knowledgeable Tally service technician based less than an hour away.

For all the details on the Tally Seattle Test Center, talk to your nearby Tally sales representative. Write or call Tally Corporation, 8301 S. 180th Street, Kent, Washington 98031. Phone (206) 251-5500.

Regional offices:

Atlanta: 3785 Northeast Expressway, Atlanta, Georgia 30340. (404) 457-1624.

Chicago: 33 North Addison Road, Addison, Ill. 60101. (312) 279-9200.

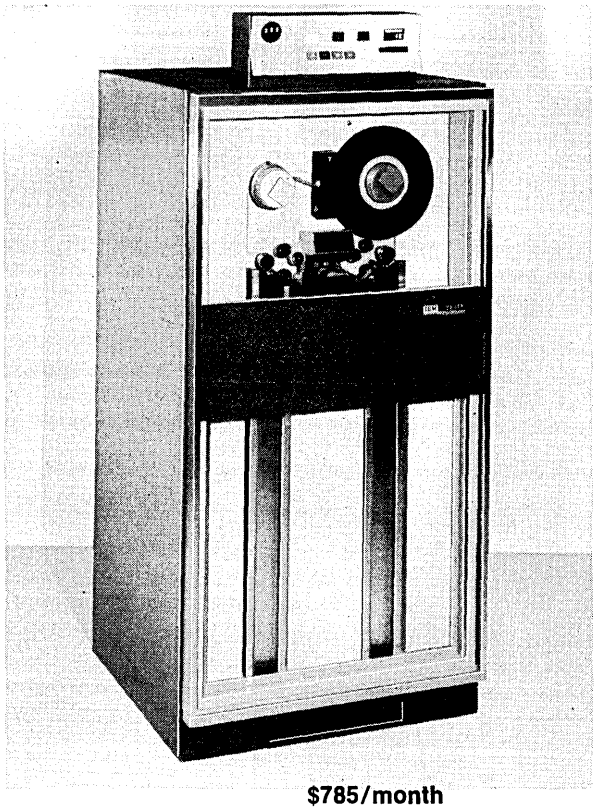
Los Angeles: 501 N. Golden Circle Drive, Santa Ana, Calif. 92705. (714) 542-1196.

New York: 45 North Village Avenue, Rockville Centre, Long Island, N. Y. 11570. (516) 678-4220.

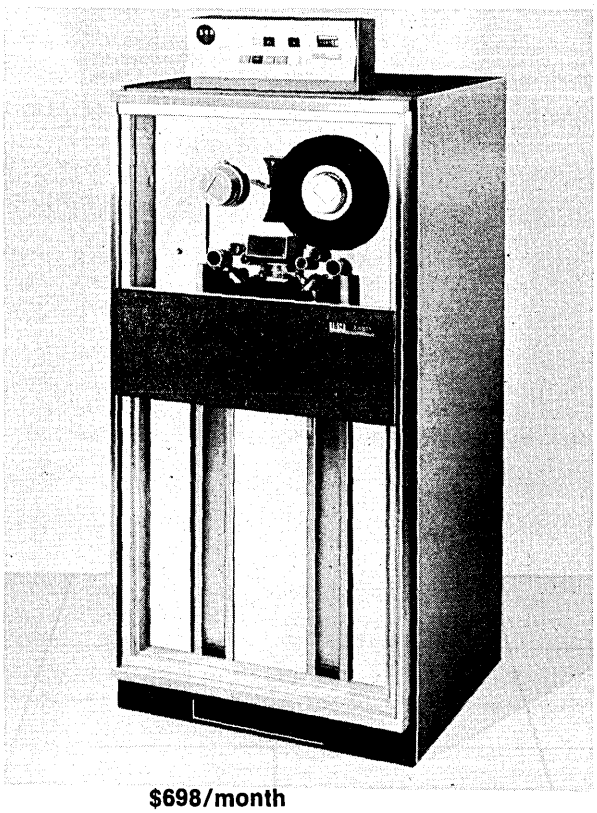
San Francisco: 420 Market St., 94111. (415) 989-5375.

England: Tally, Ltd., Tally House, 7 Cremyll Rd., Reading RG 1, 8 NQ, Berkshire. Reading 580-142.

TALLY®



$785/month



$698/month

Which twin is the phony?

Neither. They are identical-in-every-way IBM tape units. Yet, one costs 11% per month *less* than the other.

Why should one tape unit cost 11% less than its identical twin?

. . . Because the $698 per month unit is available from Computer Leasing Company.

This CLC unit is coming off lease to its original user. Its cost has been partially amortized. The new user will benefit because Computer Leasing Company has spread the cost over its full useful life. In fact, 11% is the savings on a 1-year lease; longer terms yield greater economies . . . a 5-year lease saves you 28%.

This tape drive will look and perform like new. Special features may be added. The "package" will be the same as that offered by the manufacturer to the first user, i.e.: We will pay maintenance, insurance and taxes. The only difference is that your rent will be lower.

To summarize:

If you are renting a tape unit from IBM

- We can supply a twin to take its place
- The rent will be lower than IBM's
- The term can be as short as you wish (though obviously, the longer the term, the lower your rental)

The unit shown is a 2401-3. We also have 2401-1s, 2401-2s, 2401-5s, 2401-6s and their respective control units. Some are available for immediate delivery. Others will be available within 30 to 90 days.

Computer Leasing Company has more than $150 million in computer equipment on lease . . . including UNIVAC 1108s, HONEYWELL 200s, CDC 6000s, and IBM 360s. For details on upcoming computer availabilities, contact any of the offices listed below:

Computer Leasing Company
2001 Jefferson Davis Highway
Arlington, Virginia 22202
(703) 521-2900
Ask for Hayden Williams

Regional Offices:

Joseph Walkes
One Cherry Hill
Cherry Hill, N.J. 08034
(609) 667-8585

Robert Frank
4068 Wells Fargo Bldg.
San Francisco, Calif. 94104
(415) 391-2898

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DATAMATION®

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volume 16 number 8

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MANAGEMENT

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30 A Different Breed
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GENERAL

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About The Cover
Good data processing people evolve from the right education and training. The image is clear, the picture bright. Management and motivation add the necessary depth. Our design is by Barbara Benson.

DATAMATION®

AUGUST 1, 1970

volume 16 number 8

This issue 105,773 copies

Circulation audited by Business Publications Audit BPA

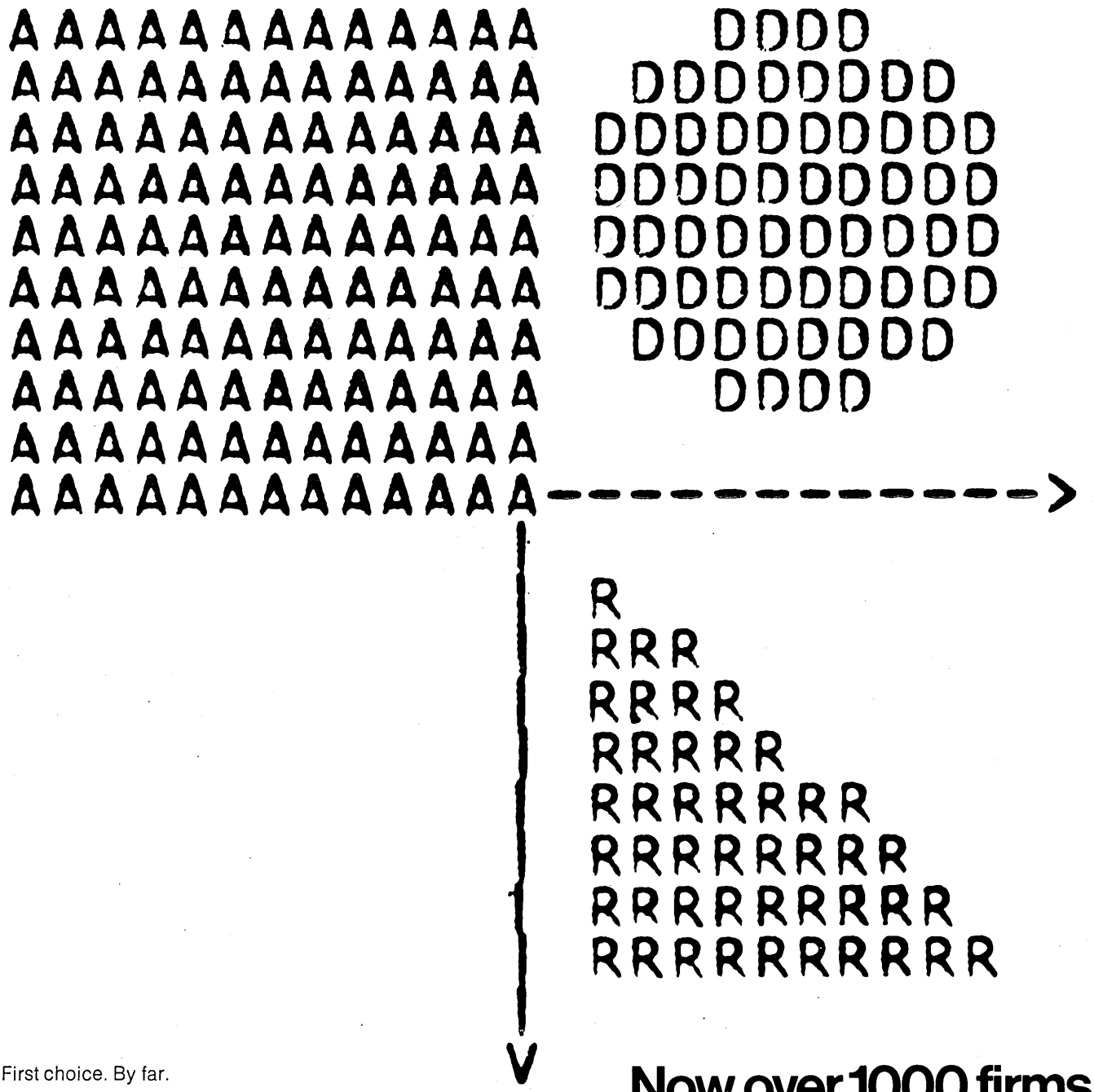
ABP Member, American Business Press, Inc.

DATAMATION is published twice monthly on or about the first and fifteenth day of every month by Thompson Division, Technical Publishing Company, 1301 South Grove Ave., Barrington, Illinois 60010; Arthur L. Rice Jr., President; Gardner F. Landon, Executive Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, Conn. 06830 (203) 661-5400. Editorial offices, 94 So. Los Robles Avenue, Pasadena, California 91101. Published at Chicago, Ill.

DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $25 annually in the U.S. and Canada. Reduced rate for qualified students. Foreign subscriptions are on a paid basis only at a rate of $38 annually. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, O. and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000, Greenwich, Conn. 06830.

Microfilm copies of DATAMATION may be obtained from University Microfilms, Inc., 313 No. First St., Ann Arbor, Michigan.

Printed by Beslow Associates, Inc.



First choice. By far.

ADR's Autoflow system is now at work on a day-to-day basis in over 1000 installations around the world.

This means more computer systems in more diverse applications than any other comparable software system.

For one simple reason.

Autoflow is readily recognized as the most versatile, most productive system available for flowcharting, documentation and debugging.

Autoflow saves time, cuts non-productive chores. Delivers the flexibility and capabilities to give you greater efficiency and productivity from your equipment and people.

Autoflow accepts programs in COBOL, FORTRAN, PL/1 or Assembly languages. Available for IBM 360, H200, Spectra 70, IBM 1400 and 7090 systems.

Right now there are 1000 good reasons for you to write or call for information or a demonstration.

Now over 1000 firms see the logic of Autoflow®

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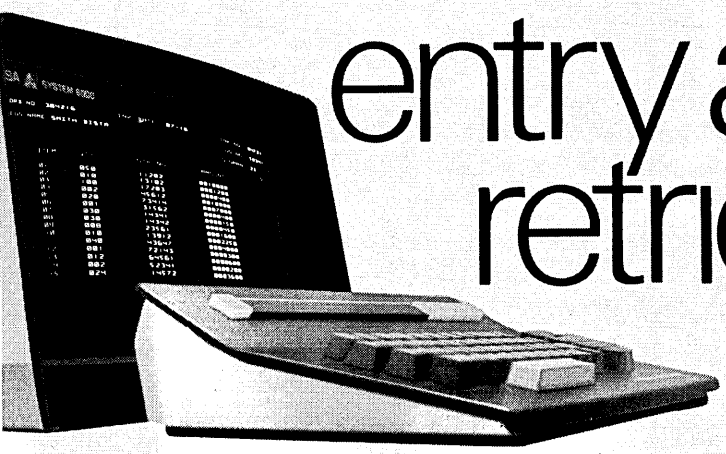
Who makes data display systems for off-line and on-line, stand-alone and multi-terminal, entry and retrieval, key to mag tape

Sanders 620
Stand-Alone
Data Display System

Sanders 720
Data Display System



Sanders System 6000 Display Data Recorder

CIRCLE 26 ON READER CARD

Sanders, Sanders, San

Sanders makes data display systems for application after application. And there's actually something special about every Sanders system.

Multi-terminal? The 720* Data Display System answers that need. And more. With its unique edit capabilities you can easily add or delete data at any point in the displayed text.

Remote? The 620* Stand-Alone Display System is completely self-contained. Place it where you need it. And link it to a computer through a data set.

Off-line entry? The System 6000* Display Data Recorder permits visual verification of data before it is entered on magnetic tape. Output from as many as twelve stations is automatically merged on a single computer-compatible tape reel. No tape pooling is necessary.

Display capacity? These systems have the exclusive Memory Save. In most formats, you can display up to 50% more data.

For more information, write or call Mr. Raymond A. Zack, Vice President and General Manager, Sanders Data Systems, Inc., Daniel Webster Highway South, Nashua, New Hampshire 03060. Tel. (603) 885-4050. Join the growing list of users: auto manufacturers, telephone companies, b

Sanders Data Systems, Inc., is a subsidiary of Sanders Associates, Inc., Nashua, New Hampshire.

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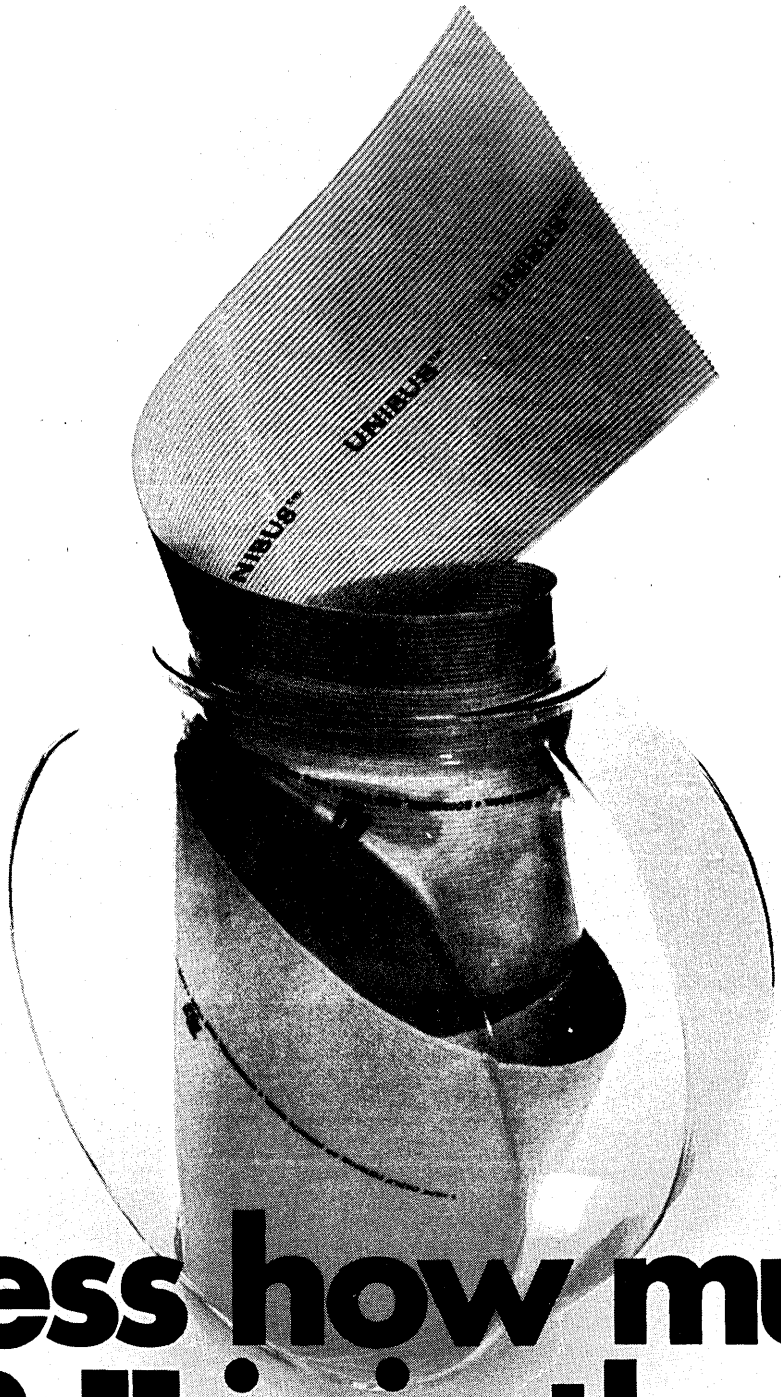

Guess how much PDP-11 is in the jar.

A dedicated computer with 1K of read-only memory and an ASR-33. A multi-terminal, multi-user, 32K, general purpose system. A data acquisition system with disk file.

Actually it's only a ribbon of 56 conductors called UNIBUS.™ But into it you can plug any of the above systems—or anything else that will solve your computing or control problem, now or then.

Plug in. That's all. PDP-11 is an asynchronous system. All devices, all memory, and indeed the central processor are independent of each other. Devices can transmit direct to devices, disk to display. Device to memory. Meanwhile the central processor is largely free to compute—which is an understatement when you realize that 400 instructions are in the order code.

Small system or large system, PDP-11 is the world's most powerful mini-computer architecture. Listen: Variable word length (bit to multiword); 8 general registers, hardware stacking; automatic nesting of interrupts; reentrant and relocatable code; multi-channel DMA.

Now guess the basic price: to include the processor, 1K read-only memory, 256 words of read-write, an ASR-33, and six inches of UNIBUS. (Hint: make it under $10,000.)

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COMPUTERS · MODULES

Digital Equipment Corporation
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CIRCLE 21 ON READER CARD

LETTERS

Foil Rapper

Sir:
The general algorithm of Hoffman and Miller in the May issue for compiling a dossier from a "statistical" data bank can be easily foiled. Just have the data bank provide its output in the following number system: zero, few, 10, 11, 12, . . .

Hoffman and Miller deserve our thanks, though, for reminding us of the need for some such safeguard.
CHRISTOPHER J. SHAW
Los Angeles, California

Rio con Brio

Sir:
I enjoyed Mr. Iannuzzo's informative and interesting article about Data Processing in Brazil (May, p. 112).

I had spent two years in Rio at the headquarters of Univac do Brasil, among other duties, helping to install a Univac 418 in Belo Horizonte. It was my opinion also that the Brazilians were intelligent, hardworking people, who could be fine programmers, if given the proper training, guidance and continuing exposure to current technique.

In many ways, it is really amazing what has been done down there. If one could investigate the marketing research applications, hybrid computer utilization or "bootlegged" local projects, he would agree that a great many computer systems are superior to counterpart systems being marketed in the United States.

What was not stated in either article about edp in South America (Brazil being a dominant force) was the size of computer configurations. They are usually quite small, which hinders effective computer utilization. Still, in their fashion, the Brazilians get the job done; however, it normally requires a little "Jeito."
PHILIP RAVITCH
Norristown, Pennsylvania

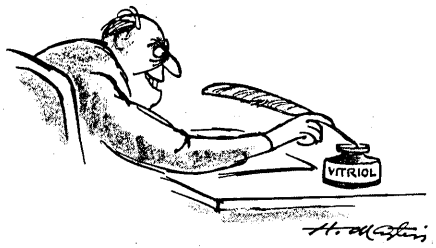
Placement Kick

Sir:
The long-standing stigma the placement agency business finds itself burdened with today is a way off from having it lifted by use of the computer (May News Scene, "Head Hunting by Computer," p. 169).

Any upgrading of the industry will first be brought about by management instilling sound selling techniques and ethical business practices at the counselor level rather than providing them an education in automated skills retrieval.

Specializing in the search for and placement of individuals in marketing positions within the data processing field, I, as a potential employer, would hesitate to base even an initial interview on a printout, considering the intangible (and often uncodeable) qualities a salesman should possess, or the "sight unseen" recommendation of a counselor, the latter too frequently having little company, product or position knowledge.

With a foot in two burgeoning industries, I anticipate and welcome the effective integration of the computer into professional placement



activities. Used as an instrument to refine the many aspects of headhunting rather than a means of injecting more paper into the system, it has unlimited potential. So did the dirigible until they found hot air exploded.
JAMES F. BOLLINI
Bollini Associates, Inc.
Arlington, Virginia

S.O.P.

Sir:
Recently (April, '70) your Forum column published a letter which described the large number of inaccurate numerical computing routines, and suggested certain steps which could be taken to solve this problem.

The Department of Commerce's FY-71 Budget submission includes a request for funds ". . . to develop, test, document and disseminate reliable computer algorithms for the evaluation of mathematical functions and to study methods for evaluating the uncertainty of nonlinear estimates."

If the Congress is favorably disposed to our request, we plan to conduct this work at the National Bureau of Standards as the start of a program to resolve the problems mentioned in your column. It is anticipated that NBS will provide the necessary leadership in a cooperative program among industry, Government and users, and I welcome everyone's participation in determining the areas of emphasis for NBS's efforts. Your ideas and comments should be sent to Dr. Hans Oser, National Bureau of Standards, Washington, D.C. 20234.
MYRON TRIBUS
Department of Commerce
Washington, D. C.

Santa Claus Printer

Sir:
Thank you for including a description of DYLAFLO's new off-line Peripheral Controller in the May issue (p. 218).

I would like to point out, however, one minor discrepancy; namely, your editorial reference to the product as "shades of second generation." To be accurate, this should have read "shades of first generation."

The systems' concept of the DYLAFLO Peripheral Controller has a long, white beard going back to early 1950's and the UNIVAC I. The concept of off-line processing lay dormant for many years but recently has made a strong resurgence. Would you believe that many people today are actually trading out System 360's and other third generation computers to take advantage of the cost savings available from off-line processing units?

In particular, users with extensive high-speed printer requirements have benefited from off-line print stations. To print on a typical computer configuration costs $50 per hour vs $10 per hour on an off-line print station.

Yes, Virginia, there really is a first generation idea very much alive today!
RICHARD I. GROVE
Dylaflo Business Machines Corp.
El Segundo, California

CartriFile is a one-in-a-billion kind of tape system

For EDP applications with highest data-reliability requirements, you need a minicomputer magnetic tape system that equals the performance of the big, "IBM-compatible" equipment. Depending on housekeeping and other variables, that means bit error rates between one part in 10^7 and one part in 10^9.

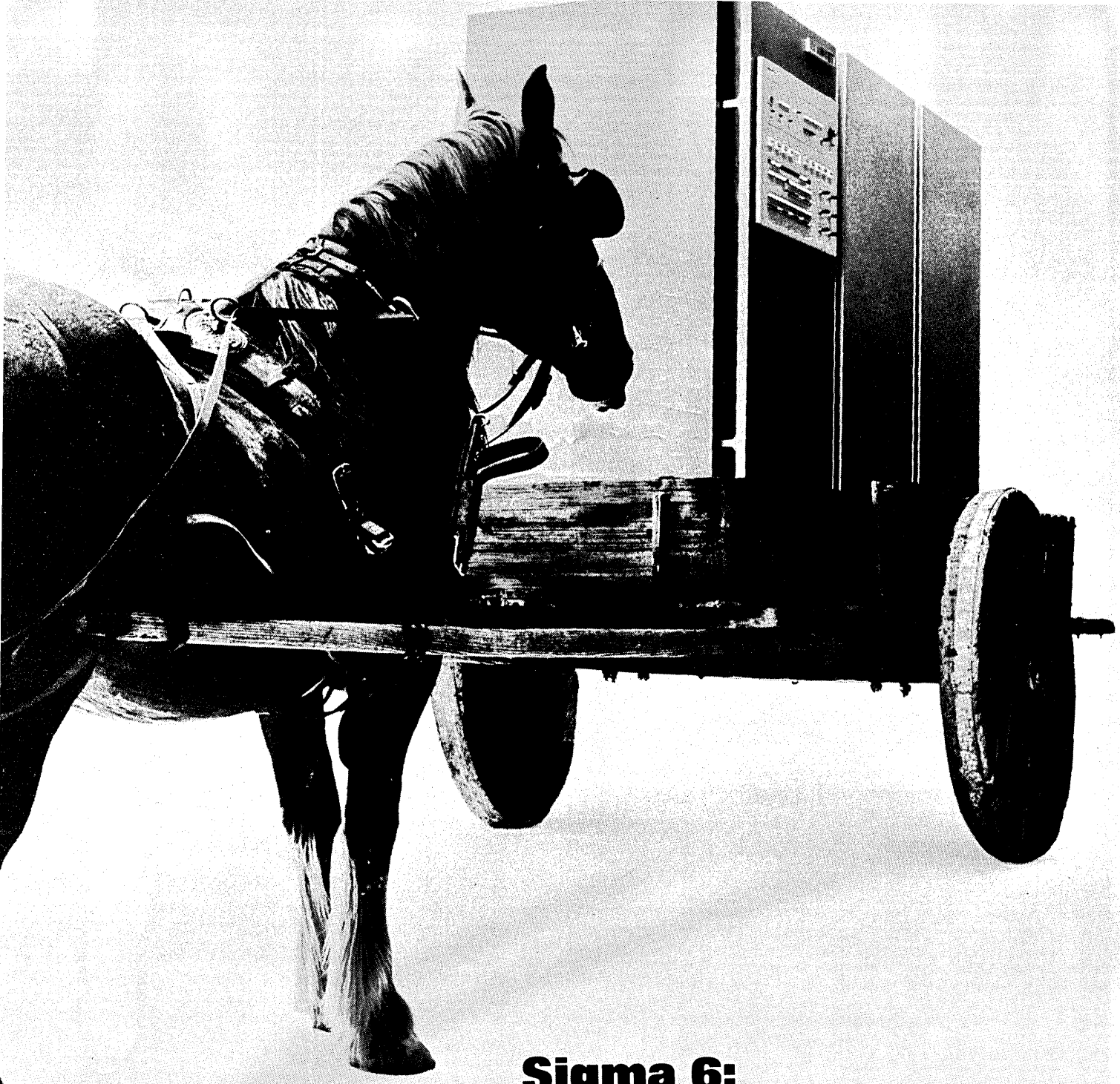
In our CartriFile, data reliability toward the high end of this range —1 in 10^9—is built in. It stems from such features as full-thickness, quarter-inch, computer-grade tape, integral electronic error correction, redundant data recording — and a quick-change, file-protected tape cartridge specifically developed for digital data-processing applications.

CartriFiles are made for minicomputer users who need high data retention and want the flexibility of four separate, independently controlled tape transports in one unit, along with 4, 6, 8, and 12-bit words, variable record length, and interfaces for all widely used minicomputers.

If you can use those qualities in your magnetic tape system, get in touch with Tri-Data. On your command, we'll send full details on CartriFile, the high-performance magnetic tape unit for minicomputers.

TRI-DATA 800 Maude Avenue, Mountain View, Ca 94040 (415) 969-3700

CIRCLE 61 ON READER CARD



Sigma 6: first the software, then the computer.

Crazy.

Develop a lot of expensive software packages, put them out in the field, prove them in demanding user environments, then build a computer to run them on.

Who does that?

Us.

Sigma 6 is our business computer. Designed for high-throughput commercial batch work, together with remote job entry, and interactive time sharing.

Sigma 6 uses all the software developed for Sigma 5 and 7. Including operating systems for batch only or concurrent batch and time sharing; powerful Cobol and Fortran compilers; several systems for structuring and manipulating files and large data bases. Plus mathematical and simulation packages.

To run these systems efficiently we gave Sigma 6 byte-string decimal arithmetic (as well as floating point), memory mapping, dual-access memory, an independent input/output processor, and many other high-performance hardware features.

We also gave it an astonishingly low price.

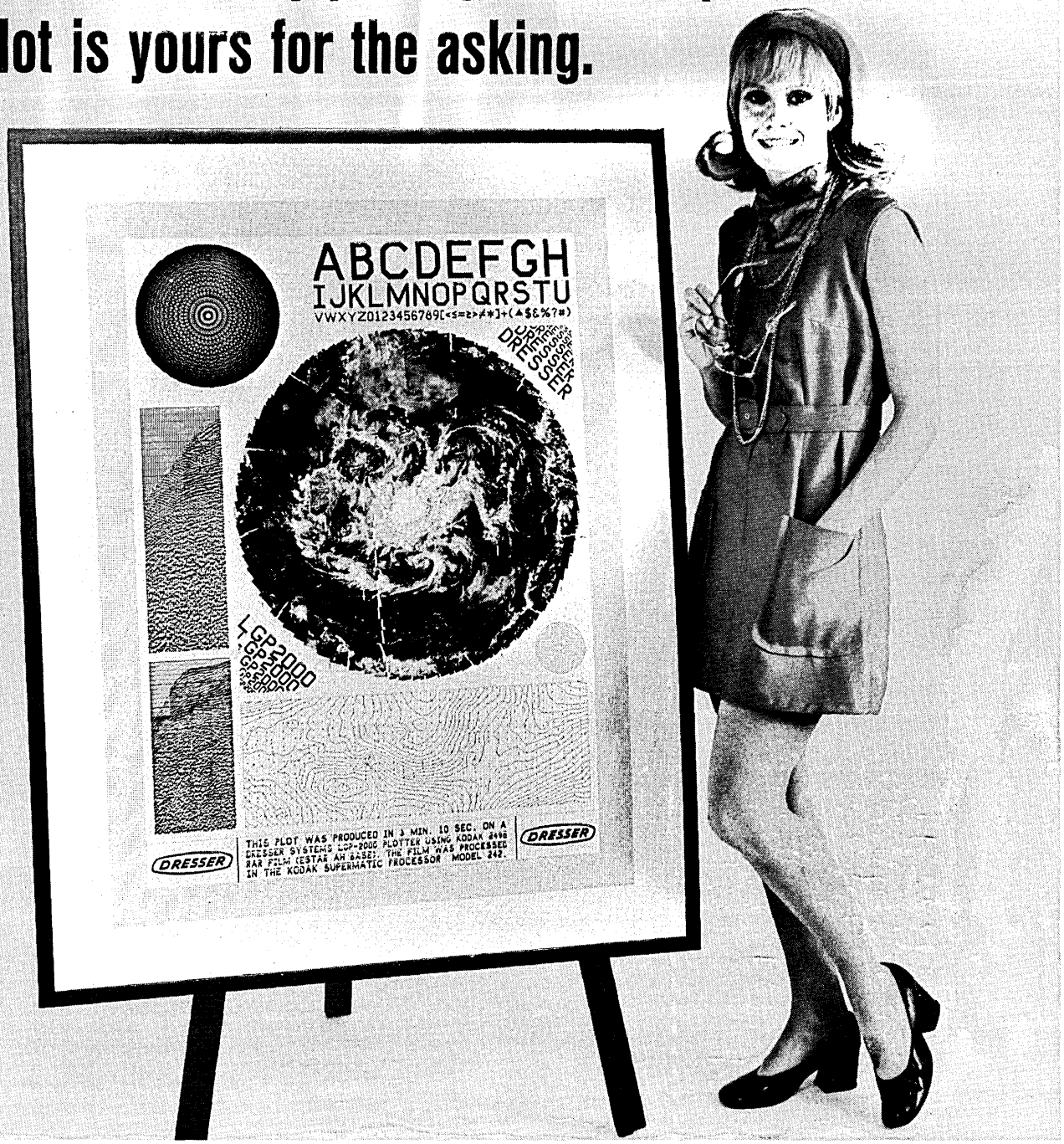
We went into business backwards and came out ahead.

XDS

Xerox Data Systems
El Segundo, California

CIRCLE 45 ON READER CARD

This beautifully-put-together sample plot is yours for the asking.



It's a composite plot produced by Dresser's new Lasergraphic Plotter—the LGP-2000. On one 30-inch by 40-inch plot you'll get a glimpse of the LGP-2000's unique plotting capabilities. There's a photo of the earth composed of 1,600,000 points that's done in 16 shades of gray. There's a piece of a contour map that was originally produced with 3,000 inches of line and 2,000 characters of annotation. And there are other things like grid squares, alphabets, seismic records and concentric circles that will prove to you that the LGP-2000 is really a new dimension in computer graphics.

There are two things that you can't see on the composite plot: the LGP-2000's speed and its plotting size capability. It will plot up to 40 inches wide by 100 feet long. And it will do it as fast as your computer can feed it data. The LGP-2000 drew the entire 30-inch by 40-inch composite plot in only 3 minutes and 10 seconds. No other plotter can offer you speed like that.

Get your personal copy of this beautifully-put-together composite plot today. Write Dresser Systems, Inc., P. O. Box 2928, Houston, Texas 77001. Or call us at (713) 781-5900.

DRESSER

Dresser Systems, Inc.

ONE OF THE DRESSER INDUSTRIES

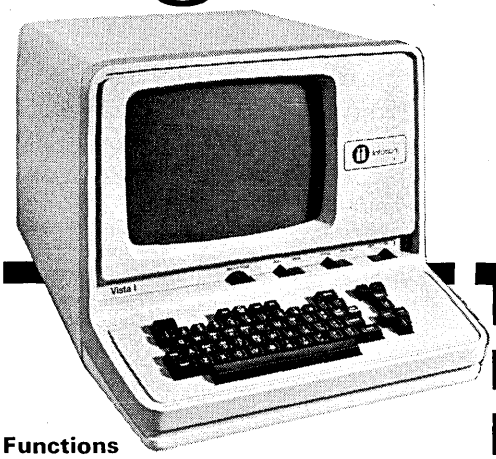
The average reading time for this ad is 30 seconds. In this time Dresser Systems' LGP-2000 could have plotted 30,399,690 bits of information.

If we make you wait... we'll pay the freight.*

Buy or lease our VISTA I alphanumeric display terminal in any model. If we don't ship it to you within 30 days ARO, we'll air freight it—FREE!

So, if you need a CRT terminal that's fast, silent, easy to read . . . that replaces a model 33 or 35 teletype with far more efficiency . . . that's compatible with *any* mini-computer . . . that's a completely self-contained, stand alone unit with keyboard, video presentation, control and refresh electronics—*plus a Data Phone interface and power supply . . . AND, if you want it NOW . . .* JUST MAIL THIS AD.

*** THIS OFFER EXPIRES AUGUST 31, 1970**



Specifications

Model	A	B	C	D
Characters/line	32	32	64	64
Number of lines	10	20	10	20
Character size (nominal)	.15" high, .10" wide			
Line spacing	.45 character height			
Character spacing	.40 character width			
Character format	5 x 7 dot matrix			
Character set	64 character ASCII			
Cursor	Non-destructive Blinking underscore			
Refresh rate	50/60 Hz			
Memory	MOS shift registers			
I/O rate	110-2400 BPS standard; High speed serial or parallel optional			
Communication interface	RS 232C or current loop			
Parallel interface	TTL logic, bit parallel, demand-response control			
Power	125 watts, 110-220 volts, 50/60 Hz			
Size	15" high, 17" wide, 27" long			
Weight	65 pounds			

PRICES	PURCHASE	MONTHLY LEASE*
VISTA 1A	$1,495.00	$ 78.75
VISTA 1B	$1,995.00	$ 97.50
VISTA 1C	$1,995.00	$ 97.50
VISTA 1D	$2,495.00	$116.25

***Includes maintenance for 3 year lease plan.**

Command Functions

- Cursor control — up, down, right, left, home
- Start blink, stop blink
- Erase screen

Interfaces

The standard interfaces allow connection to modems up to 2400 baud. Available as options are serial or parallel data interfaces up to 800 characters/second synchronous, or up to 1500 characters/second in a demand-response mode.

Operating Modes

I/O — Full duplex or ½ duplex
Format — Roll or page

Options

- Hard copy output
- Magnetic tape input and output
- Card or badge reader input
- High speed data transmission up to 1500 character/sec.

SALES TERMS

Terms of sale for the company's products are net 30. Shipment will be made FOB Burlington, Mass., prepaid, best way unless otherwise specified by the customer.

WARRANTY

Ninety days warranty on parts and service. Twelve months on parts manufactured by Infoton. Manufacturer's warranty on all other parts (no less than ninety days or more than twelve months).

YES! **I want to ☐ lease ☐ purchase the following VISTA I CRT terminals within 30 days ARO. I understand that if I have to wait . . . *you'll* pay the freight, air freight.**

MODEL	QUANTITY	UNIT PRICE	TOTAL PRICE
☐ VISTA 1A			
☐ VISTA 1B			
☐ VISTA 1C			
☐ VISTA 1D			

Total Price $_____

Please check one: ☐ 110 Baud ☐ 300 Baud ☐ Current Loop

Name _____

Title _____

Company _____

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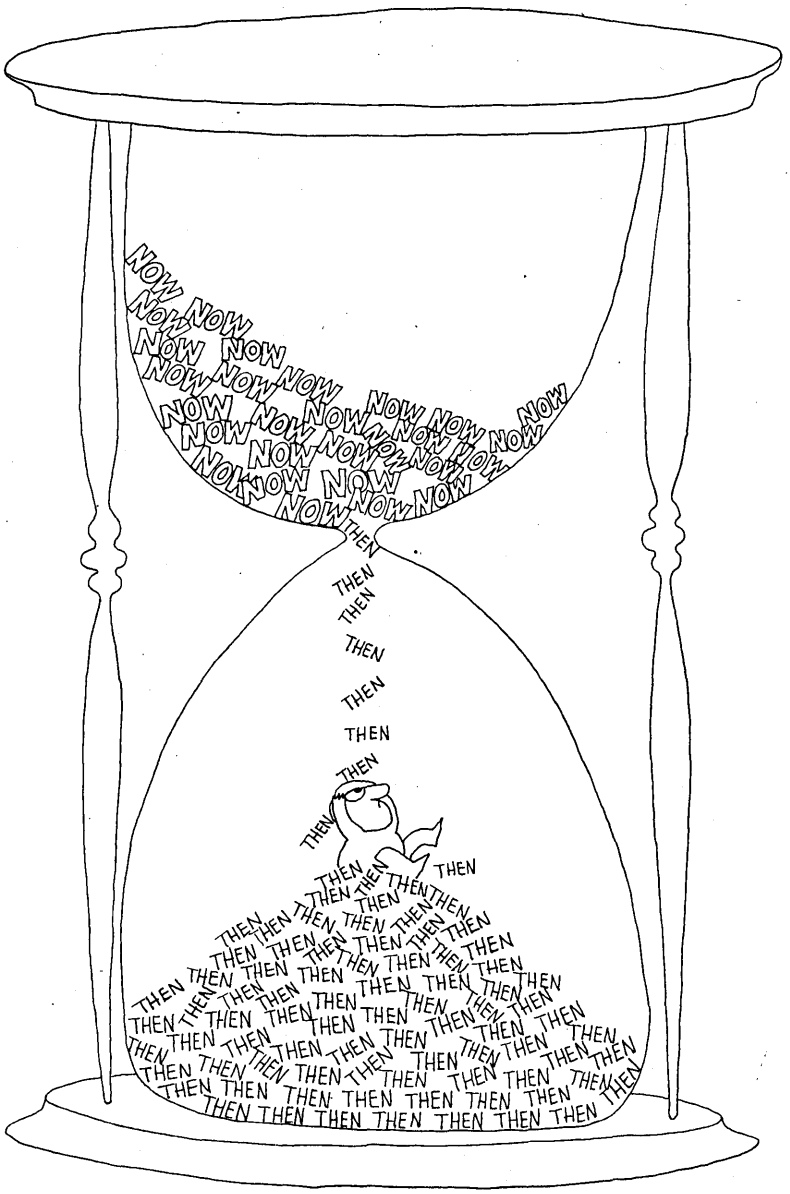

Now never waits.

What happens to unused nows?

They turn into unusable thens.

A day-old report is a then. A weekly wrap-up. A monthly sum-up. A quarterly round-up. They're all thens. They're all anything but now.

Yet now is when modern business has to operate. When you need essential information for essential decisions.

And now is when you get that information with a UNIVAC® 418-III System.

The UNIVAC 418-III is a medium-scale, general purpose, real-time system with hardware characteristics that provide for fast and efficient communications-oriented applications such as data collection and message switching. These applications can be processed concurrently with background batch applications. This hardware design also provides for up to three-way, simultaneous access to core memory.

The 418-III comes with a comprehensive software package which includes an efficient multi-programming Executive System, job-controlled language, application-oriented Language Processors, and a highly effective communications control system. All available at no cost to the UNIVAC 418-III System user. An extensive array of remote terminals can be utilized.

Your Univac representative can tell you more about the 418-III and how it can help you operate in the now.

Just call him. And why wait? Now won't.

UNIVAC SPERRY RAND
FIRST IN REAL-TIME INFORMATION SYSTEMS

Burroughs closes a communications gap.

Our new Series N Magnetic Tape Encoder brings a number of distinct advantages to the process of recording data for computer input.

First of all, it closes the operator/machine gap by communicating in "plain English". When the operator keys an "A", she can display the "A". On a large, easy-to-read ALPHA-NUMERIC display. This simplifies error identification and spot corrections. The display also reminds her where she is in a program and what she should do next. And even tells her when she has made an operating mistake.

With all this built-in help, she can concentrate on speed and accuracy to prepare more data, faster. And the ability to verify on the same encoder just as fast reduces machine investment and eliminates scheduling problems.

Secondly, Burroughs Encoders can communicate over phone lines, providing economical, high-speed data communications. Other optional capabilities include variable record length, pooling, paper tape and card input and line printer. All this means increased data handling flexibility.

In addition, the Series N improves communications with your computer. Magnetic tape data can be recorded up to 30% faster than punched cards. And your computer accepts it, 50 times faster. The faster you talk to your computer, the more efficient its use, and the sooner it responds with timelier records and reports.

For a brochure call our local office or write us at Detroit, Michigan 48232.

The New Burroughs Magnetic Tape Encoder

Burroughs

CIRCLE 9 ON READER CARD

LOOK AHEAD

RCA DOESN'T DUPLICATE ONLY EMULATE

RCA has in the works a line of five new mainframes but at writing it was pondering whether and which to announce in July — and how to overshadow IBM's news. Sources were fascinated to learn RCA would break with the tradition of Spectra 70 and System 360 explicit compatability, but not leave these markets behind: the new stack oriented computers (a la B 6500 architecture) are said to have a high facility for emulation, using either software or preferably read only memory. They would be designed to take full advantage of the accumulator stack, high coding density, "need to know" protection hierarchy, assumed addressing, paging and segmentation, and multiprogramming and multiprocessing.

370 ANNOUNCEMENT: THE AGONY & THE ECSTASY

More industry reaction to the 370 announcement: The 3330 disc drive's incompatability with the 2314 throws a curve at independent disc and drive makers. They still have the below-200 megabyte market to shoot at for now, since that's where the 2314 stops and the 3330 begins (IBM protecting its backlogs again). The smart independents have been working on a 3330 version for some time: for one thing, they hired the "dirty dozen" and others who defected from IBM's San Jose Labs. For example, Memorex says it'll have its version ready when IBM does. The rest could be damaged because R&D money is hard to come by now. In either case, the tough thing will be price, since for example the 200 megabyte 3330 costs $3700/mo. vs. the same 2314 at $4790/mo.

Communications front end makers breathed easy for a moment since IBM didn't announce a 2703 replacement — expected this fall. Something called a 2969 (separate unit) was on the boards, but there's been a design argument within IBM which reportedly leans toward an integrated unit with multispeed handling. Whatever, time-sharing and remote batch firms are supposed to fall in love with the 370...

Users are waiting for a 3330-to-S360 interface — from a mini maker? Says one, "it'll take a big fast mini to handle the 800 KB rate of the 3330"...

The /165, at face value, is taking a direct swat at IBM's own /85, CDC's 6600 and the Univac 1108 (which we hear has been sold many times at a 30-40% discount).

One user noted that if the /155 benchmark performance is extended to the /165 the /165 may run twice as fast as the 6600 for 25% less dollars. But he wants to run his own tests on both the /155 and /165. The /145, cheaper and better than the /50, wasn't announced in June so that IBM could try to persuade /40 and /50 users to go to the /155 — better for business. The resistant ones, happy with /50's, would later be enticed by economies to the /145...

Heaven help the leasing companies that don't have their huge inventories of /50's and /65's on very long-term contracts. Many were placed at 10-20% off IBM rental and won't draw near that on second go-around. A used computer firm says that now /65's are selling

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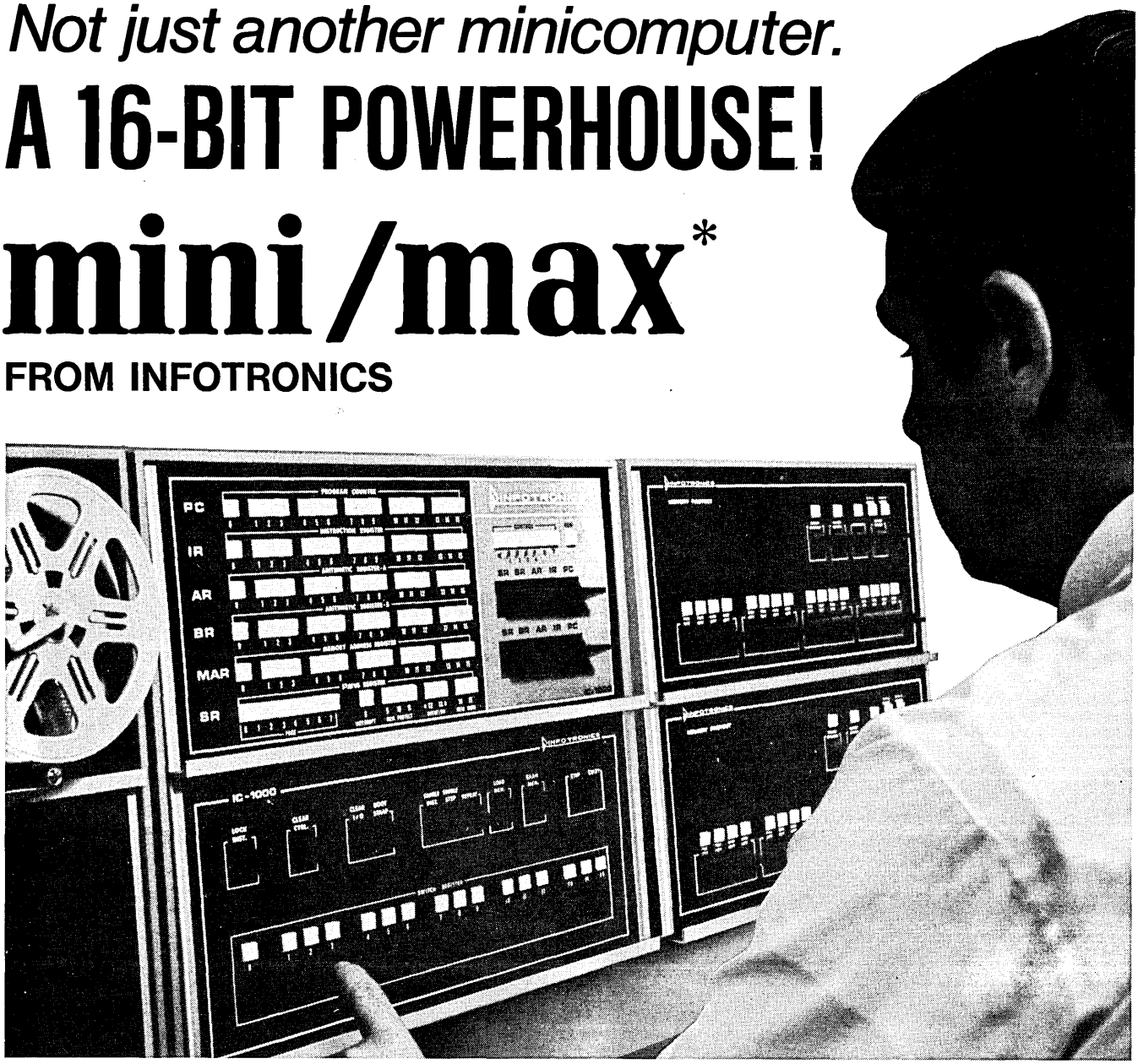
A 16-BIT POWERHOUSE!

mini/max*

FROM INFOTRONICS



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A 16-bit computer with remarkable power, instruction capability and flexibility of application . . . the **mini/max** computer system is uniquely suited to implement realtime systems, data acquisition, process control, batch processors, data concentrators, communication links, and other demanding applications. Modular design of total hardware and packaging allows full expansion capability—forever . . . assuring the customer of optimum capability without over-investment. A systems manufacturer can purchase a computer configuration to fit precisely his specific need.

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Off the shelf peripherals include teletypes, high speed paper tape reader, high speed paper tape punch, 300 LPM printer, a 300 CPM card reader and a disc controller for disc storage up to 2,048,000 words. Available software developed by Infotronics includes assemblers, diagnostics, arithmetic packages, utility packages and others.

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at 22% discount, /40's at 30% off — and should drop dramatically below that by 370 delivery time...

The few budding firms planning to attack IBM's main memory market better look again. A 256K byte memory on the /65 costs over $9K/mo. On the /155 and /165 it costs only $3K...

Educational institutions who have IBM systems under the old educational discount will be loathe to move to 370s under the new unattractive discount...

Software firms are ecstatic that programs are 360 compatible — no reset to zero for costly packages like Informatics' Mark IV.

And there are 360 users who aren't reacting one way or another. A spokesman for the dp department at the Pacific Coast Stock Exchange thinks his /50 is just great and as for more capacity, "Hell, with the market the way it is, I don't need ANY."

ADPAC RECOGNIZES ENEMY COBOL

Down but not out, Pete Harris has trimmed Adpac, San Fran software house, to about a dozen people: "They're hustling, they're ugly, they know everything." Earlier in the year he had turned his sales offices over to independent distributors, but had to close down the L.A. office.

Harris, famous for his claim that he would bury Cobol, has joined forces with the enemy: he'll start marketing Polypac, a package that translates Adpac into subject languages. The first one will produce ANSI Cobol. Other versions will be aimed at minicomputers, enabling users to program in Adpac, check it out on the 360, then run through Polypac to produce mini assembly language, thus avoiding core-gobbling compilers on the small machines.

Polypac will sell for $5K (with an annual renewal $2K fee), represents an answer Harris never had before to the question: What do we do when you guys go out of business? Admits a chastened Harris: "You're not going to sell a language unless it's got a bail-out."

RUMORS AND RAW RANDOM DATA

Interesting that Honeywell, which told us it has "far in excess" of $33 million in 316's on order has beneficiently cut prices on a 4K 316 from $9700 to $8400. Surely this kindness will put them "far in excess" of their new, or is it old, goal of 1,000 sales this year...GE's communications group in Lynchburg, Va. — which Honeywell doesn't get — is rumored developing a 16-bit minicomputer version of the DataNet 500... The Univac 1110 announcement, we hear, has slipped to the end of the year because of executive system troubles...IBM has set up a laboratory in Japan to work on cheap terminal devices — a counterpart to the Raleigh, N.C. lab....In line with its new systems-building image, Varian this fall brings out a minicomputer-based text editing system called Varitext — a line printer, Selectric with cassette tapes, and 620 for justification and pagination...Coming from Mohawk Data Sciences: 96-column data entry gear; its own tape decks to replace Ampex's; a dot Matrix teleprinter; and the addition of Atron minis to its remote tape handlers, keyboard systems.

data bits from Teletype

8 million pounds of food moved daily!

When you handle 14,000 food-filled freight cars annually, deal with more than 160 truck carriers to service the daily needs of over 500 retail chain and independent outlets, the need to know takes on staggering proportions.

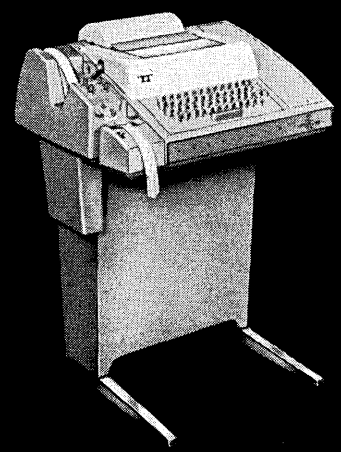
The warehouse that copes with this logistical problem has linked its customers with a computer using Teletype® terminals. Shipping data from processors and food packers is fed into the computer on a daily basis. Retail buyers use Teletype equipment to obtain up-to-the-minute inventory status reports, to place orders and receive concise shipping data. This enables the warehouse to keep track of, and move some 8 million pounds of food every day. Fast, accurate data communications has also helped cut processor billing time down from over a week to twenty-four hours.

time-sharing money saver

There are probably more Teletype 33 sets being used in time-sharing applications than any other data terminal. Because, on a price/performance basis, it is one of the most reliable and economical terminals available.

The model 33 has everything required for preparing programs, getting them into the computer and retrieving information. It communicates in ASCII and operates at 100 words per minute. Its design simplicity makes computer dialog easier for the operator. But, what's really nice, is the price: It's amazingly low for all of its capabilities.

The model 33 line includes options and accessories needed for a variety of time-sharing needs. If you would like to know more about this low-priced terminal line, write for the model 33 brochure.



nine year old squeezes a year into 38 days

A young boy became so fascinated with a Teletype 33 terminal that he completed a whole year's arithmetic program in 38 days. His school is involved in a computer assisted educational program using a remote university computer. The simplicity of the terminal enables the youngest of students to master its operation in a short period of time.

Some subjects included in the program are reading, science and arithmetic. Students receive individual drill and instruction geared to their own level of comprehension. The slower student gets much needed practice at a level which he can achieve. The average student reinforces his grasp of the subject with drill and practice at the terminal. The bright are offered programs that challenge and are limited only by their own abilities. Computer assisted education also enables teachers to find more time for individual student needs.

erasing errors on-line

Teletype has an interesting solid-state device called the Stuntronic™ parity error detector which helps locate and eliminate parity errors. It can be used with Teletype 33, 35, 37, Telespeed™ and Inktronic® terminals.

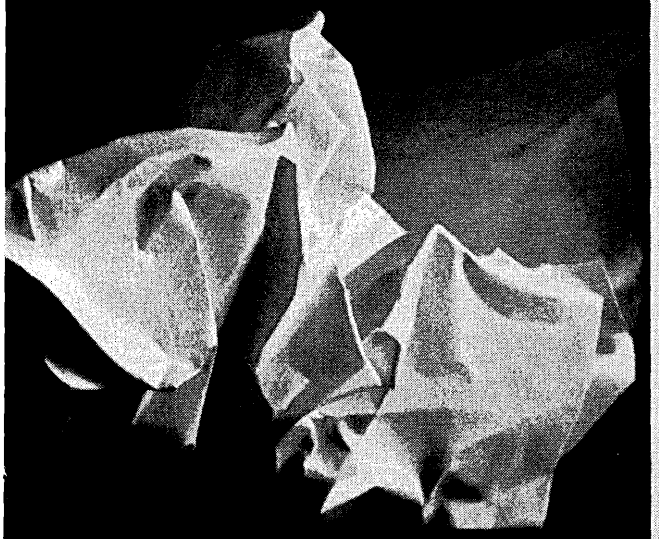
This accessory will accept a signal with up to 45% distortion and regenerate the signal with less than 5% distortion before passing it on to the terminal. Minimizing erroneous print-outs due to distorted signals.

It will also locate individual vertical parity errors and alert the station operator so that corrective action can be taken.

```
HERE IS AN EASY WAY TO SPOT AND      432*
CORREC* ERRORS RECEIVED IN TEXT      5678
OR NUMBER TRANSMI*SION.              90*2
```

With the Stuntronic detector, a preprogrammed substitute character can be used to graphically indicate exactly where an error is on the terminal print-out.

Stuntronic accessories can also count errors, light a signal lamp and generate a line break, notifying the sender of any errors.



recommended reading

Teletype has a number of bulletins on equipment, applications, and case history data. A short description of what is available is contained in: *"How to get answers to your questions about Teletype equipment." Write for your copy.*

Teletype data communication equipment is available in send-receive capabilities of up to 2400 words per minute. Included are hard-copy, magnetic-tape and paper-tape terminals, error control devices, options and accessory equipment to fit most data communication system requirements. For information, write:

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The seemingly irrational effects of introducing a computer must be recognized and dealt with in preparing the organization for automation

Getting Ready

by Davis B. McCarn

Careful planning and tactful action to ready the organization are critical to the success of automation. In spite of the obviousness of this platitude, many egregious system failures have resulted from unrecognized organizational resistance. The assault of the systems analysts and programmers is often either naive or Machiavellian; naive when it assumes that computer technology is the wave of the future and no rational employee could object to the new system; Machiavellian when technology is used as a pretext to wrest control of the organization's information network and, thus, control of the organization itself. To facilitate effective automation, management must recognize these potentials for conflict; act to resolve those which develop; develop and maintain a climate hospitable to change; involve personnel throughout the organization in system design and development; recognize and act to reduce unrealistic uncertainties and fears; control the enthusiasms of the technologists; and insure that employees are trained to accept new ways and new roles.

The preparation of this paper on the systematic installation of new systems has been a humbling experience. A hurried review of 15 years of computer systems development and administration revealed a singular gap with regard to organized thought on preparing the organization for computer systems. Upon further reflection it seemed clear that the problem was far from trivial and, in fact, the majority of known system failures had probably resulted from man rather than machine problems. The development of systems had often been a day-to-day exercise in the tactics of systems installation, but insightful analysis of alternative strategies was lacking. I had been certain that the textbooks and professional literature would provide the framework and strategy I had missed in my previous reading. I went through my two feet of old DATAMATION magazines; I found no articles at all! Somewhat shaken I turned to the *Computing Reviews* and searched all the indexes from 1960 to 1967 and found nothing. While I am not a good searcher and there may be articles I missed, the conclusion still seemed inescapable that the information technology professions in their professional literature were unconcerned about actually getting organizations to adopt their systems.

No problem

The next hypothesis which suggested itself was that there were no problems; organizations took to automation easily as the wave of the future; they shouted "surf's up" and hung ten. There seemed to be some support for this view; Galbraith has stated in *The New Industrial State* that "technological sophistication" is one of three major goals of large corporations. A moment's reflection on recent experiences, however, destroyed the illusion that this goal made implementation easy. Now there were two problems instead of one: How does one prepare the organization? Why doesn't the profession worry about this problem? As a digression, but to illustrate the size of the problem, a recent development may be worth describing.

I had occasion not long ago, in a previous job, to observe the floundering of a new system development effort. This effort involved the development of a large-scale, integrated, on-line information handling system for an organization which already had a successful batch-processing system. The batch-processing system, itself, was in trouble because the organization had had it built completely by contract effort and had allowed the knowledge of this system to be concen-

trated into the hands of one or two individuals. These individuals had subsequently left the organization leaving an undocumented operating system behind. Thus, the organization was trying to simultaneously build a new system and survive the crises of the old.

The relationship between the chief of the computer center and the chief of the division which the new system was supposed to serve was star-crossed from the beginning because the computer center had originally been controlled by the division chief for whom the new system was being built, but had recently been moved into a higher organizational position.

The system to be built was not well defined. Its goal was to automate, for the sake of automation, the input process to the old system. No analysis indicated that such automation was desirable, nor that it would produce a more efficient or a more economic operation. A major software house had the audacity to accept a contract to build the new on-line computer system and was soon trapped in the crossfire between the principals and their staffs.

The first problem was to define clearly the requirements for the system in terms of the functions and operations that it was to perform. The using division, already sufficiently threatened by the newly independent computer center, felt doubly threatened by the insistence that it define its requirements with precision. The specter that haunted the operating division was of having a set of requirements finally accepted; having the computer people go off and build the system to meet those requirements; and then having them come back with a system that met every single one of the precisely stated requirements but failed to accomplish the functions of the operating manager.

This threat, of course, was not illusory. Such systems have been built, and such results have occurred. These results are almost inevitable when one adopts a deterministic approach of systems development. In this particular case, a cycle of definition and redefinition, using more and more abusive language and involving more and more abrasive encounters, developed between the two staffs, with the contractor as the shuttlecock.

As the situation worsened, the operating division manager finally forbade his people to talk to the contractor or the representatives of the computer division, and the head of the computer division refused to meet with the head of the operating division. This impasse had to be resolved by higher authority. The story did have a happy middle—the internal factions were momentarily resolved; the organization joined forces against the contractor; and a stiff penalty was imposed on him for failing to deliver the system in time. The system still remains to be completed—only the first round is over.

Other examples

The National Library of Medicine has had similar problems. It began seriously considering automation in 1949 and moved into a punch-card/Listomatic system in 1959. The Listomatic system was born in a time of scarcity. The library had had no increases in authorized personnel for 10 years in spite of having graduated out of the Army and having become a national resource. A singularly honest account by Ed Miller in the *Bulletin of the Medical Library Association* reads in part: "January 1960. A catastrophe was discovered on January 5. For an unknown length of time the camera had been operating with no exposure light flashing. The entire subject and author sections had to be rerun. Page stripping was performed on a crash basis by four operators. The January issue was

delivered from the printer on January 18. The February issue of 9,985 items went to the printer on the 12th. The cutoff date for the March issue was January 21 with 8,317 items. The indexing assistant backlog rose to 6,300; the input typing backlog rose to 4,200; the proofreading backlog rose to 3,455; the keypunching backlog dropped almost 3,000 to 584; the output imprinting backlog rose to 3,208. Input typewriters suffered from minor problems such as blown fuses. Keypunching improved. Output Justowriters were proving to be prone to breakdown; there were eight days of down-time here. Adequate film processing in Washington was still unavailable, and film was transported via Trailways Bus delivery service to be processed in New York."

Were these experiences isolated ones? A review of literature from other sources would indicate that it was not an isolated phenomenon. McKinsey & Co. ran a survey (*Getting the Most Out Of Your Computer*) in 1963 of some 27 companies and identified three factors as being crucial to successful computer systems: executive leadership, management control, and the involvement of operating management.

The same company repeated the survey in 1968 ("Unlocking the Computer's Profit Potential," *Computers and Automation*, April, 1969) and concluded that from a profit standpoint, our findings indicate, computer efforts in all but a few exceptional companies are in real if often unacknowledged, trouble." The major problem identified by the survey was the gap between the computer staff and the operating management. To bridge the gap, McKinsey Co. proposed (1) improved teamwork in the corporation between the top management, operating managers, and the computer professional; (2) more extensive reliance on evolutionary development of computer systems rather than turnkey operations; (3) careful consideration and use of communications with computers and on-line remote access systems; and (4) most important of all, improved leadership from the top executives in the company.

". . . and remember, son, before you leave the office I want to see your desk neat and your cubicle tidy."

Another recent survey done independently by Arnold Putman in *Business Automation*, Nov., 1968, reviewed the success of computer systems in some 20 firms and found the major sources of resistance to integrated information systems in the large corporations to be: lazy senior management; insecure operating managers who are threatened by automation; organizations which are themselves already sick and are more concerned with affixing blame for efforts than credit for effective action; executives who are egocentric and sufficiently powerful to override the valid objectives of the organization; and politics within the company. The most difficult problem with regard to installing unwelcome systems was politics, because the manager who is acting from political interest can be completely rational and most effective in his action to defeat the new system. Such activity is at its worst in organizations which have internal empires ruled by their own feudal lords. The advice of Putnam with regard to these difficulties and dangers is (1) involvement of the senior company executive, (2) obtaining outside, objective evaluation judgment (from a management consultant, naturally), and (3) a constant alertness to the human problems involved in the systems implementation. It would certainly seem from this brief review of available surveys that the human problem in the organization deserves careful consideration in planning the installation of a new system.

There has been substantial work on innovation in industrial organizations. The business administration world has been studying it in business administration schools for many years. There are good texts on organizational behavior. The Institute for Research on Human Behavior at the University of Michigan has charted some of the behavioral science aspects of the problem, and Enid Mumford has summarized much of this work in relation to edp in a very perceptive article in *The Computer Bulletin*, Jan., 1969. She pointed out that the stability of the organization, the user perception of the change, the strategy for change, and the role perception of the computer group are the important parameters in determining the success or failure of a system.

My own experience leads me to believe that the installation of new systems begins in a paradox, also implied by Mrs. Mumford: A stable organization satisfied with its own performance and providing personal satisfaction to its employees cannot be automated; but automation as a cure in an unstable organization is fated to be born in confusion and conflict. Many attempts to introduce edp into stable, well-functioning organizations have met with open resistance or apathy. As D. N. Michael (*Science*, July 11, 1969) observed, "The risks of individual, interpersonal, and organizational failure involved in deliberately accepting the uncertainty that must accompany organizational and individual changes are usually too great for men to take willingly when things are going well and when men and institutions have been successful . . . The evidence indicates that basic organizational changes can occur

through disasters or by deliberate organizational change programs. The latter must be directly and continuously supported from the top of the organization over many years of unremitting and highly organized effort. Such deliberate efforts have been rare. . . ." Thus, one could conclude that the efforts which have been undertaken must have largely been spurred by the threat of disaster.

Now, the disaster which threatens information centers is overload of input and insatiable demand for services. As such overloads develop, compensating actions are taken by the organization. These are described in a study of a university library by R. L. Meier (University of Michigan). As loads increase, processing efficiency eventually drops, much as the throughput of a highway drops with heavy traffic. Stress and anxiety increase with backlogs and complaints until collapse threatens. (Systems do collapse, they don't just fade away. The Chicago mail system collapsed several years ago.)

As the specter of collapse begins to materialize, the organization may turn to thoughts of edp in hopes of staving off disaster. In reality the installation of edp systems requires investment of scarce resources in design and in parallel operation; this further degrades the performance of the information center. The critical point is that the edp development offers hope of relief. If that hope is kept within reasonable levels and if the system progresses so as to maintain hope, a success may result. If expectations become excessive as the system development stumbles, the organization will lose faith and the system will fail. As Hoffer observed in *The Ordeal of Change,* "When a population undergoing drastic change is without abundant opportunities for individual action and self-advancement, it develops a hunger for faith, pride, and unity. It becomes receptive to all manner of proselytizing, and is eager to throw itself into collective undertakings which aim at 'showing the world.' In other words, drastic change, under certain conditions, creates a proclivity for fanatical attitudes, united action, and spectacular manifestations of flouting and defiance; it creates an atmosphere of revolution." If these energies can be channeled toward the development of a new system, great progress is possible; if they oppose it, failure is sure.

Directing change

Thus, the first problem of the system developer is the harnessing of irrational forces to provide the extraordinary effort required. At the same time, however, he must move to increase the rationality of the organization. This rationality can be improved in a variety of ways. The first is to reduce the uncertainties and fears associated with the new system and move to avoid excessive expectations. These obejctives can both be achieved through preparation of an implementation plan and the presentation of that plan to affected members of the organization.

Such a plan should justify the new system and identify how it will resolve the crises or inadequacies of the present system. It should provide an overview of the new system and of how it will perform the function it is to support. The plan should specify the probable impact on organizational elements, managers, and individuals and provide individuals throughout the organization with information on job changes, training, and replacement programs. It should provide a schedule for the effort and specify the costs. The schedule should be clear on the period of parallel operation. Finally, it should specify who or what organizational element is expected to participate and what the responsibility of each is. The press of time and the rate of change of some aspects of the above may make it difficult to produce a formal plan, but such information should exist and be available to the concerned staff.

Not to provide such information raises the concern of personnel that they are confronted with a Machiavellian manipulation. Cooperation must be fostered through clear specification of goals and the road to these goals.

Cooperation, however, will not be enough. Systems developers must continuously strive to support their development through legitimate power. As every survey found, top management must support the system. Maintaining this support when the center is faced with day-to-day operational problems is not easy, but without such support the human investment of the "great leap forward" will not be found in time, momentum will flag, and the movement will fail. It is particularly important that the reward and punishment system reflect this top management support. Those who contribute to the new system should be rewarded and promoted, rather than dropped from the mainstream of advancement as is sometimes the case. Similarly, effective deterrents to resistance need to be developed.

To provide a vital incentive to the development, it should be a little daring. Doing what many others have done before because it *looks* safe may not *be* safe. A trite system may look easy but it will not mobilize effort the way an imaginative one can. Pride in technological sophistication can be an important stimulus at all levels of effective systems development.

Involving the organization

Harnessing irrationality and creating the climate for change must be paralleled by efforts to involve all levels in the development. Managers must be involved in establishing goals, directing and assisting in functional analyses, and explaining the system to their staff and users and outside groups. This new system should not become the property of the edp staff, but all management must assume a stake in the success of the effort.

Of almost equal importance to the managers are the opinion leaders. These must be converted to "change agents." They should be involved in the preparation of requests for proposals, evaluation of proposals, selection of hardware and software contractors, functional analyses, etc. It is particularly important that these people see equipment and comparable systems. Those who will have major roles in the new system may be detailed to work with the developers.

Other staff to be affected need education in the concept of the new system, information on the plans for its development, and encouragement to help carry the extra load the development entails. They also need to be realistically apprised of the "unforgiving" nature of computers with regard to sloppy inputs,

new quality control expectations, and new procedures. Some detail planning should be done at the work group level.

The new system will probably involve high levels of conflict—with large segments of the organization, with informal work groups, or with individuals. An attempt to "paper over" these conflicts, attempts to solve or resolve them by edict, or other efforts that do not contain the element of negotiation are likely to result in major problems in the systems development. The signs of conflict and resistance are usually relatively clear if we are willing to see them. Persistent failures to agree, delays in acting on important paperwork in the systems development, refusal to provide inputs, the maintenance of parallel systems generally with better information, and refusal to use a new system are all obvious resistances. Less obvious perhaps are those kinds of resistance that are passive and attempt to kill a system with kindness. The insistence that it move promptly from research and development into operation is only too common, as is the insistence on rapid changes even before operation of the system. Such conflicts must be faced and resolved if the system is to succeed.

Thus, foreseeing resistance and adopting programs which will circumvent foreseeable problems is essential in systems development. Equally essential is a sensitivity to the on-going state of the system and developing resistances, and taking prompt action to overcome these resistances. As C. P. Snow (*Science and Government,* 1961) noted with regard to Tizard's installation of radar, "To get anything done by any highly articulated organization, you have got to carry people at all sorts of levels. It is their decisions, their acquiescence or enthusiasm (above all, the absence of their passive resistance), which are going to decide whether a strategy goes through in time."

Why no literature?

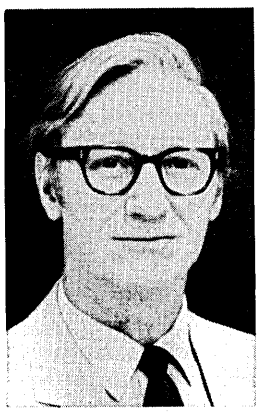
The final problem still remains on why there has been so little literature in the professional computing journals on this subject. One can hypothesize that this is again an illustration of the two-cultures phenomenon. The people who have been and are experts in the use of computers in general see well-bounded problems with great precision and can solve such problems on computing systems. There is another kind of individual who sees broad patterns and total pictures better. The first have a tendency to be highly rational and mechanistic in their thinking, while the second group tends to be more humanistic and sensitive. It would appear that people of high rationality tend to deny the existence of human, nonrational reactions to systems and, therefore, they do not acknowledge the requirement for system installation planning of the kind we have discussed. This same intellectual difficulty has been revealed in the computer industry through programs of exceptional *hubris,* like machine translation, where it was ultimately learned that human communication is much more complex, and its context more extensive, than was initially conceived by the computer programming staffs.

Computer professionals have been short on peripheral vision even though they have had exceptionally acute focal vision. This may already be changing as people from outside mathematics and the hard sciences enter the profession and as those in it face the kind of experiences described above. Planning the reaction to resistance and selling the system also smack of manipulation, which of course it is. While such manipulation is not foreign to most of us, it is often unacknowledged; to make it a conscious, acknowledged part of required planning would certainly be a step forward.

Conclusion

This paper will have served its purpose if it has outlined even a trifle more sharply the dark shadows on the periphery: the emotional context of the system and the nonrational and conflict potentialities that surround any new systems development.

In any event, the way of the reformer is not easy, and systems builders and change agents are certainly reformers. As Machiavelli observed half a millennium ago, "It must be considered that there is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things. For the reformer has enemies in all those who profit by the old order, and only lukewarm defenders in all those who would profit by the new order, this lukewarmness arising partly from fear of their adversaries, who have the laws in their favour; and partly from the incredulity of mankind, who do not truly believe in anything new until they have had actual experience of it. Thus, it arises that on every opportunity for attacking the reformer, his opponents do so with the zeal of partisans, the others only defend him half-heartedly, so that between them he runs great danger. It is necessary, however, in order to investigate thoroughly this question, to examine whether these innovators are independent, or whether they depend upon others, that is to say, whether in order to carry out their designs they have to entreat or are able to compel. In the first case they invariably succeed ill, and accomplish nothing; but when they can depend on their own strength and are able to use force, they rarely fail. Thus, it comes about that all armed prophets have conquered and unarmed ones failed; for besides what has been already said, the character of people varies, and it is easy to persuade them of a thing, but difficult to keep them in that persuasion." ■



Mr. McCarn is the deputy director of the Lister Hill National Center for Biomedical Communications, part of the National Library of Medicine, Bethesda, Md., which is developing computer and communication systems for health care, medical education, and biomedical research. He previously worked for the Dept. of Defense on computer systems for intelligence and managed the worldwide Intelligence Data Handling Systems. He holds a BA in mathematics from Haverford College.

Reasons and solutions for the continual job-changing of dp professionals

Curing Discontent

by Myron R. Parr

"I've been with my company for more than a year." This was the answer the 30-year-old systems analyst sitting in my office gave me as to why he was unhappy. This answer was not unusual and it embodies a good part of the reason that computer men have often been described as "the most job-hopping professionals in history."

In the course of interviewing thousands of discontented computer professionals each year, we have come to the conclusion that there are nine basic reasons for discontent within the computer profession. These reasons probably aren't all different from other professions, but some factors do play a unique role:

1. Computer professionals as individuals are young —as is the profession. Along with youthfulness comes an exaggerated sense of self worth and fewer restrictions on mobility.

2. Demand for qualified computer professionals is generally far greater than the supply, hence the external pressure to "greener grass." It could be said, therefore, that we as computer professionals can "afford" to be discontented more than many other professionals.

The following material is intended to be a guide to those employers who wish to recruit and retain qualified computer professionals. The reader who doesn't have hiring responsibility may still be interested in some management viewpoints.

Problem: "Limited Exposure." Every day we talk with someone who has been caught in the trap of getting one year of experience four times rather than four years of increasingly responsible and broadening experience. Designing, redesigning, and maintaining the same application system year after year may create the world's foremost expert in controlling inventories of paper clips or whatever, but this isn't of much benefit or stimulation to the individual. The larger the company, the greater this danger of limited exposure or "overspecialization."

Solution: Introduce a program of specific rotation of assignments. While this will have some short-term penalties on efficiency, the end result of this "cross-training" will be reduced turnover (due to greater interest in assignments), less panic when an "expert" does resign, and, in the long run, lower costs.

Problem: "Promotion Pass-over." Whenever a person is promoted, someone has made a judgment. If an employee feels he should have received the promotion and was passed over in favor of someone else, he will be unhappy. And it is easier for management to make the same judgment the next time a promotion becomes available than to reverse it. A smiliar situation may develop when there is a top echelon change within the computing group. In some cases, a new man from the outside may fill the position that would logically be a next step for a current employee.

Solution: Tact is certainly required to keep an "injured" employee. In the case of a "new team" from the outside you must point out the reasons for "importing." This is often due to extreme company growth that has created a job too big for your current employee. A promotion pass-over is equally hard. If there is honest doubt about the ability of an individual to handle a more responsible position, he should be told—and reminded that this could be as true in another company as in this one. The key is to review progress of each employee regularly and to initiate specific programs to improve individual capabilities so that chances for promotion are maximized.

Problem: "Professional Obsolescence." The computer industry is in a constant state of technological change, and from one year to the next, some computer hardware becomes obsolete. Periodically, a computer professional examines his present company closely in relationship to what others are doing. Does the company have a third-generation computer installed? Is it being up-

graded? Are there plans for data communications and on-line applications? Will he be using an advanced operating system? What applications are planned? Will they include manufacturing, engineering, marketing, etc.—or will they be solely financial in nature? Is the top corporate executive sold on a management information system? Has the company made plans for applications that represent "industry firsts" (or even seconds)?

Company ranking

He will continually evaluate your company in relationship to your industry as a whole. If your company does not show a healthy growth rate, if its profits are marginal or less than others', if its product line is not keeping pace with its competitors, he will probably look to the outside. He knows that where several or all of these conditions exist, there is a tendency for management to look for places to cut costs by eliminating any plan that does not yield an immediate return. In such situations, planned longer range data processing applications are likely to suffer.

One yardstick by which computer professionals will measure your management's outlook and acceptance of the computer is to determine where the information systems function reports. If it reports to the president, executive vice president, or some other general executive, it is probable that top management recognizes the potential impact and importance of the computer as a planning and control tool. If it reports to the controller or chief financial officer, top management may look upon the computer as nothing more than a giant accounting machine. The more progressive companies usually don't experience much trouble from this problem, regardless of company size. It is in the less dynamic environment of the stable middle-sized or smaller firm that the problem is most common.

Solution: While it certainly helps to have the latest in hardware and the most sophisticated applications scheduled for development, much of the problem of professional obsolescence can be overcome with an honest and demonstrated management interest in getting the most out of the computer dollars spent. Improving (and even upgrading) equipment today may well result in spending less rather than more for installed hardware. Also, there is no reason that the smaller firms cannot profit substantially from the extended use of computing power in "other than accounting" applications, and any computer professional worth his salt will feel much more professionally useful if asked to participate in a program to more fully utilize his equipment, however small it may be. There will be instances, of course, where you won't be able to hold a high powered man in a small installation unless you "buy" him and even this won't last for long. You are better off to let him move on in his career. In the case of the top computer man, a broadening of his responsibilities beyond computing may serve to keep his *company* interest and overcome the lack of professional growth in computing.

Problem: "Limited Headroom." Professionals need room to grow. Whenever you are fortunate enough to have two outstanding employees of similar capabilities and interests in your organization, they will continuously compete for promotion, and one will ultimately end up subordinate to the other. Even if there is no friction caused by working for a virtual peer, there is, likewise, usually no hope of advancement in the immediate future since the superior position is held by a man of equal talent and often equal age. Another aspect of this problem is intensified by the relative youth of computermen. In most other professions there is generally a span of 25 years or more between the time a man enters the profession and the time he reaches his realistic upper objective within that profession. In computing, this is often accomplished within a span of 10 years or less. A professional in his early thirties isn't ready to relax and enjoy the fruits of his labor as will his noncomputing management counterpart who reaches this objective in his late forties.

Solution: Limited headroom is probably the most difficult problem facing a company that hopes to prevent professional discontent. In the case of the dual "stars," from a company standpoint it is nice to have "instant backup" for your management slots. However, the chances of holding these reserve players is slim if they have management interests. If they are willing to be senior man without the management title and responsibility they may be held by "management pay." In the case of the 30-year-old information systems director who is still full of drive, the usual solution is to bless him on his way to a larger company with larger problems to solve. This man may be saved, however, by getting him involved with other aspects of company operations in addition to computing. The personal characteristics which caused him to rise rapidly within computing (and technical competence isn't enough) should serve him well in other areas of management.

Problem: "Industry Change." Although satisfied with his present position and company, a computer professional may feel a legitimate desire to move into another industry. It may be that the application areas in another industry are more interesting to him or that his academic background will be more useful. He may want to pioneer or to gain more stability, or may simply need to broaden his experience base for a future consulting or management position.

Solution: This problem, if severely felt by an employee, may be insoluble, as it represents an honest desire that your firm cannot satisfy. The best approach is to continuously review and communicate future plans with your professional employees. To the extent that your industry is changing in exciting ways, you may hold a key employee by these discussions.

Problem:"Overcommitted Situation." If your manager (or computer salesman or consultant) has inadvertently overcommitted your company with regard to what the computer can and will do, your professional staff may begin to look for other employment. Once your company has begun a substantial program based on an unattainable objective, it is only a matter of time before the project is scrapped. Those closely associated with such a program realize that they will suffer damage to their reputations, both within the company and within the computing profession.

Solution: This situation is more frequent than most of us want to believe. "Paper tigers" are not as common in the hardware realm as was true a few years ago, but doubtful *applications*, like "total MIS" where unrealistic, still abound. The solution here is to be permissive with your key employees. If they feel that

the planned computer projects are not realistically achievable, they should feel free to say so—to go on record—and to be heard. In many cases where there is an honest difference of opinion as to success possibilities, an employee can be challenged to "wait and see what you and I can do" by making him aware of explicit plans and schedules. If he still doesn't agree, he isn't "on the team" and his leaving will probably be mutually beneficial.

Problem: "Mergers and Acquisitions." With the ever-increasing trend in business toward merger and acquisition, the sharp computer professional will maintain a constant awareness of his company's plans and intentions in that regard. Obviously, when two organizations merge, or one is acquired by another, a duplication may result in the computing and systems functions. In many cases, it is difficult to predict which company's computing activity will dominate. This being the case, the prudent computer professional will frequently want to protect himself by evaluating opportunities prior to the actual merger or acquisition, so as not to subject himself to timing problems should his department or position not survive. Once this search starts, chances are that you will lose your man.

Solution: It is important to start your staff planning in *parallel* with the financial considerations of such a merger or acquisition. The security surrounding these discussions is generally nowhere near as tightly controlled as the principles think, with the result that often the problem of duplication is "solved" by the best man bailing out in advance, because he wasn't brought into confidence. The staff planning function performed early and communicated on a need-to-know basis will head off this problem. Wherever possible, a general statement to the effect that all employees will either be protected (if true) or given at least two months' notice of position elimination will greatly reduce professional concerns.

Little hope

Problem: "Geography." On occasion, due to family or personal reasons, it may become necessary or desirable for one of your professional staff to relocate to another part of the country.

Solution: Unless you have branch operations or subsidiaries located elsewhere, there is really no solution to this problem.

Problem: "Compensation." Although not as important a reason for professional discontent as usually assumed, compensation is nonetheless used as a measure of value for services. Computer professionals generally stop to consider their salary when:

1. The wife complains.
2. He is involved in a payroll project where access is available to the pay of others.
3. He hears what others make or are being offered.

Computer professionals are generally aware that supply and demand imbalance has created a historically bullish employment market where good professionals can often sell their services at a premium. And even some who are not so good have done so. The company that equates computer professional salaries with those of accountants and others in nontechnical classifications will often have a real problem in salary administration. This condition is typical in companies with a nontechnical product.

Solution: The best solution to this problem, of course, is to pay competitive salaries. Computing salaries are often competitive with respect to a company's internal salary structure, but not the open marketplace. It is generally true that the longer a man stays with one employer, the further he gets behind the marketplace. A 10% annual increase has been the norm in the computer professional marketplace while most companies' merit increases are on the order of 5% to 7%.

To correct this situation it is necessary to review salaries more often than once a year. This review should include not only the value of each professional to the *company*, but also to the *marketplace* in general.

A danger exists, however, in that being competitive within the marketplace may cause serious salary administration problems within the company. While not at all common, some companies have formed computing subsidiaries expressly to solve this problem. The better approach, which is becoming more common, is to classify the bulk of the computermen as "members of the professional staff" where the salary plan is very broad. This has historically been used in R & D activities whose "members of the technical staff" salaries may range from $10,000 to more than $40,000 per year with the same title.

In summary, our 30-year-old systems analyst and almost any other computer professional can be made more content by observing company policies of "open doors," regular progress reviews, and effective communication of future plans. This last point is not only of the greatest positive value, but will also serve as a defense against what other firms will usually be selling to your employees . . . future plans.

In the final analysis, I am reminded of the bright young professional who was sufficiently discontent to tell the company chief executive that he was going to leave unless he was given a raise from his current $25,000 to $100,000 per year. The employee was in a key position with respect to company plans and would be almost impossible to replace. After trying all the classic methods and those mentioned here, the desperate chief executive called his personnel vice president for advice. After a few minutes of thought the personnel man said, "Have you considered threatening physical violence?" ■

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The manager of a systems group should realize that he is dealing with a mass movement, rather than a typical company department

A Different Breed

by Robert C. Maegerlein

An army is composed largely of unthinking men, dependent on and obedient to their leaders, individually lacking initiative. The army accomplishes its goals in an attack by the sheer mass of numbers, carried forward by its own inertia. In defense, from an entrenched position, again by inertia, unquestioning obedience to the demands of the situation characterizes it. It consists of individuals inefficient and unproductive in the gross, but highly trained for one particular job, the firing of a rifle or the sending of a radio message. Collectively efficient only as the sum of the individual strengths, the army is effective through interdependence and mutual reinforcement. Heroism is not demanded, but is evident on occasion.

The Green Berets (henceforth indicated by "GB") are highly trained in many facets of warfare, self-motivated, courageous, seasoned veterans. They have great *esprit de corps*, are self-reliant and proud.

At least these are the popular opinions, and the way that both groups are cast in movies and novels. Lest I offend the reader who holds opinions at variance with the above, for the purposes of this article, let us assume that "army" and "GB" are as I have described them.

A systems group—by which I mean the group composed of systems analysts, their supervisors, and programmers collected or already existing—having the assigned task of designing, programming, and implementing an application for computer, is either an army or a GB outfit.

It is my opinion that, in the long run, the GB systems group will design, program, and implement a better system, at less over-all cost, in less time than

the army type. And a second point: systems management must decide which kind of group it wants. Otherwise it will get the army type and not even a very good one at that.

I realize that I have not defined what I mean by "better," "less cost," or "faster." Nor even if I had is there a convenient way to prove such an opinion, because proof would demand a controlled test, involving the duplicate implementation of a good-sized project, and having the results of each of the two groups judged by impartial observers. Such a course is impractical and probably impossible (but an interesting idea).

Therefore, I will explain my points by presenting some observations on the job of systems development itself and on the nature of systems people who do this job. In a way, the designing and implementing of a large system is a *mass movement,* something like Christianity or Communism. It is a revolutionary, even a religious undertaking. The system is new, and will do a much better job—faster and at less cost. It is religious in the sense that there is a reward or final goal. There is group action, a *community* of analysts. And there is ceremony, unity of purpose, a common jargon, and dogma. There are even heroes and martyrs.

If this is so, an insight can be gained into how to manage such a group by observation and analysis of the characteristics of mass movements.

The cause comes first

Successful mass movements generate in their members a readiness to sacrifice and die for the cause. The mass movement breeds fanaticism, enthusiasm, hatred, and intolerance. In the early stages, the frustrated predominate and they join of their own accord. They are looking for something at which they can be successful.

Such excitement and revolutionary spirit is necessary. There must be an atmosphere of crusade, reform, revolution, and change. The group overpowers opposition not by force of logical argument but by offering hope and making promises. The group expands by the momentum of its own enthusiasm.

I have been associated with two data processing projects from their beginnings. One grew from no staff to eight people, the second from none to forty-three. Those who joined in the beginning came to be part of an enterprising, fascinating, and revolutionary mass movement.

In retrospect, these two projects seem rather mundane. But they were challenging at the time. Not many companies had systems like them at the time when we began, and the methods by which the system would be designed and implemented were not known. There was considerable challenge to the staff to understand the complications and to solve the problems of doing these jobs—especially since the goals were not even defined, much less the techniques, hardware, software, or even the forms or communications networks.

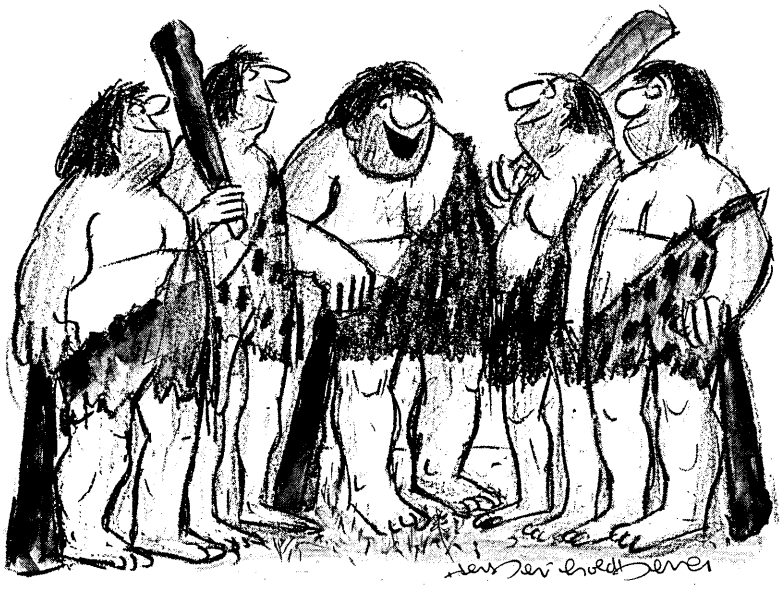
The first project was the implementing of an order processing, inventory control, and sales forecasting system using WATS and paper-tape terminals. The second was a real-time system for processing loans and payments and related transactions for a medium-sized finance company. Both concepts seemed revolutionary, challenging, and exciting. So the frustrated came and each systems group became a mass movement. These are only two examples. But I am convinced that all groups start in the same way.

It is not the purpose of this article to provide specific, day-by-day management plans for running a systems group. Nor is this intended as a list of do's and don't's for management. Intentionally I want to stay away from specific applications. But, from time to time, I will become more specific and at least try to direct the reader in his thinking about how these concepts apply in his own situation.

Assuming that the best systems group *is* a GB outfit, and that systems work *is* best characterized as a mass movement and that it attracts revolutionaries, what specific thinking could we do?

First, consider the wisdom of trying to integrate such a group into the company. I maintain that such a course is as unnatural as trying to raise a lion cub as a domestic pet. It just does not work. Observers of mass movements have pointed out that such people as the Jews have prospered because they have not been integrated in any significant degree into any society. And that the early Christians prospered because they were persecuted. To the extent that these two religions became accepted and their adherents absorbed into a larger society, they lost their potency and vitality.

To absorb a systems group into the company is to destroy its unique identity and its identification with its end: systems analysis, development, and implementation. In an established company, as in society, it is true that there exist people doing great things. But they are more allegiant to their group, or to themselves as individuals, than to the company. Historically, the great poets, writers, musicians, and philosophers have been largely ones who lived, either by their own choice or because of contingencies beyond



"Now that we've learned to talk, let's have a conference."

their control, apart from and not integrated into the larger society.

Some examples of people who exist in but are not part of a company are automobile stylists, advertising people, and researchers. Those who *are* actually absorbed into the corporate structure and clerks, production workers, and bookkeepers. These identify with the company. The creative ones do not.

It is, therefore, a mistake and contrary to the nature of the systems group to try to integrate them into corporate thought structures and identity. Clerks need a home, a sound and secure environment. The kind of systems group of which we speak does not.

We should not want such people to stay with the group out of identification with the company. Rather we want those who are continually challenged, intellectually and professionally, and emotionally satisfied. We should want finely tuned people who are within a moment of leaving if they are no longer challenged.

Control without absorption

I am not advocating chaos. Only rebellion. It is true that the goals of the company must be served; this group must be subordinated to these goals—and it must implement systems that will best serve the company's needs. So the group does need control, but it doesn't need to be emasculated and broken.

Don't integrate, then. Let the rebellion run free. Isn't it true that the closer an individual identifies with the established group, the less he will criticize? If the youth today, on college campuses and in the ghettos of New York and Watts, were part of the establishment, would they be in such rebellion? The closer the individual identifies with a corporation, which by its nature must be dedicated essentially to the status quo, the less he will criticize. Because that criticism, as he becomes more and more identified with the company, becomes *self*-criticism. And people do not do too much of that.

But when we hire systems people, we are asking for criticism. The critical attitude of the systems group is precisely what is needed if new and better systems are to be developed. Do we hire systems people and tell them not to change anything? So we should not be upset when these people tell us how to run our company. That's why they were hired: to criticize and improve. Insiders don't do that, at least to the significant degree demanded in a rapidly changing business environment.

At this point I might say that systems people are not to be feared. But managers should recognize the nature of the breed that they are supervising. We need only general direction, not dictatorship; we need a free environment in which to create. The systems manager himself need not be so rebellious, only to understand the urgency and enthusiasm of his people.

I am convinced that systems people are a very different breed, not so much because they work with hardware which is not understood by outsiders, or because they have their own jargon and work strange hours. The work itself, the work of building and dreaming systems, seems to attract a certain kind of person. We have asked the question: "Are systems people nuts?" I have concluded that most of us are. And I ask a further question, yet unanswered to my satisfaction: "Were we this way when we started, or did the work do it to us?" But I strongly lean toward the answer that the job attracts the person.

However, let us assume that we are not different—that there are other groups just as creative and important, and making essential contributions to the company. The point is that we *think* that we are different. It is only good management to treat people the way that they want to be treated, based on an understanding of how they view themselves.

As a second application of the analysis of the systems group as a mass movement, let us consider another stage in the development of a system. Once the project is well under way and schedules get tighter and deadlines draw near, the hiring of new employees is done with less than perfect adherence to the original high standards. We need systems analysts and are not as concerned as before whether they are the ones to whom the project is just a job or is a real challenge. And herein is the seed of destruction of the revolutionary force—an end to the Messianic nature of the original embryonic systems group. These new ones are attracted no longer by the exciting nature of a beginning mass movement but by the less significant features: security, better pay, a chance to identify with a successful group.

Thus, once the system nears completion, especially if there have been important intermediate goals and deadlines along the way, these people become hangers-on and more and more sap the spirit of urgency and vitality, and the whole staff slips into a coagulated mass, essentially aimless and unmotivated.

Danger signs

This is a critical point. It is true that the project will carry on to final implementation by the inertia generated from all the work done to that point. But the revolutionary ones, those restless ones who got the project off the ground, are no longer challenged. True enough, they are *busy* putting out fires and keeping things going on a day-to-day basis. But this was probably the point they had reached when they left their last jobs. The hangers-on will stay, but the vital cadre will not. And this is the end of the group's vitality.

This is a critical time and management must be aware of when it is likely to hit and be prepared to make decisions. What kind of systems group do they want from now on? Is this the end of the company's growth in data processing? Or is this just the beginning?

If the new system is just the beginning, then we must isolate the creative and revolutionary group as they were when the project started. Turn them loose on goals that are just as revolutionary as those which attracted them when they first came.

This, of course, demands planning, and that is something that is hard to do during the hectic days of implementation. And management objects that those leaders are needed to supervise the implementation. But are they really? If efforts have been made to train their replacements, the enthusiasm and challenge of more responsibility by new leaders, plus the inertia of which I spoke earlier, will insure that the new system will be installed.

Even so, there is no reason why effort should not be

made to capture the minds of the current leaders. Isolate them conceptually. Get them planning and dreaming again while they are closing out their work. Don't wait too long to get them out of day-to-day details.

The new system will need changes. It needs to be maintained. And this indicates what to do with the hangers-on. System maintenance is often a dull job. But some are suited for it. What we need, now that the system is almost on, is to separate out the GB's and let the army take over.

For the GB's, we must create again the faith that things can be better. We must nurture the extravagant concepts of the potentials for new things, even if this means ignoring the difficulties, to capitalize once again on the group's inexperience in these new projects. Management should create an atmosphere of impatience. That's the atmosphere that attracted these people and we must create those same conditions again if we are going on to better things.

The third application of concepts of mass movements to systems management touches two ideas already partially developed here and brings them together. There is a tendency on the part of company management, when they hear criticism from the systems group (assuming that the criticism does not merely blast but offers reasonable alternatives), to answer by defending and justifying the old way. The attitude is sometimes: "If you don't like it here, why don't you go somewhere else?" But isn't it true that management should encourage such people? Precisely because they *don't* like it there? Either a company grows or it stagnates, and it cannot grow if everybody "likes it there."

I maintain that it is only in the soil of criticism that growth takes place. From the examination of mass movements, we see that this is true. It is only when people are unhappy (and they think that they can do something about it) that they change things.

Of course, the basic position that I am taking could be made extreme. But I am not advocating anarchy or chaos—only revolution and growth. This growth demands planning, a subject upon which we have only briefly touched. The topic requires some elaboration, this time from the point of view of responsibility for planning.

Who sets the goals?

We are expecting too much, I believe, when we look to the company management to define our next set of goals. Consider that they have spent months, perhaps years, getting themselves to the point of admitting that they needed the system that the group is implementing. And the steps required to build the systems group, to procure the hardware, to gamble on unknown new people and mysterious processes, took courage and foresight, agonizing decisions and a lot of faith. Is it reasonable to expect that management is again ready immediately to start all over again on new applications or even extensions of the new system? Too, management often does not comprehend the potentials for better systems. They don't realize how a streamlined reporting system, for example, would make their decision-making more efficient and accurate. Whose responsibility is it, then, to make plans of which we spoke?

Once the system is in, there is a tendency for systems managers to relax. But this is a mistake. The creative thrive on action. Some rest is necessary but if there is too much they will look for more intriguing activity elsewhere.

If the manager of systems says that we will do the rest of our things at a more leisurely pace, he is, intentionally or not, encouraging the army approach to systems. If plans are not made for a new system or extensions to the one just installed, and if we cannot reasonably expect company management to make them, whose responsibility is it?

Consider those active revolutionaries who have come to a success (assuming that the system gets installed successfully). They have been with the company long enough now, if the system has taken any time at all to install or is sufficiently rooted in company operation, to see new and greater things available to do. This system is no longer the promised land. The improvements, the extensions of the system deeper into the fabric of the company—these are the new inviting possibilities. Depending on the company, these people see the basis of an exception reporting system, or that the data base that they just created is the key to an analysis of advertising effectiveness. Or they see some other brand new application for their newly acquired skills. And, as companies with successful computer installations can attest, it is really these extensions of the new system that make the computer pay off.

Nothing is more rewarding to the creative systems analyst than seeing his efforts bear fruit. To put an end to outlets for this creativity is to frustrate him. Clearly, the systems managers, when they are hiring, recognize the need for creative people. We see advertisements: "Don't judge the entire systems world by where you work." Most of the advertisements in the

"Take me to your central processor."

journals try to appeal to the restless, the creative, the thinkers. Paradoxically, however, after we obtain such people, we forget that.

So I ask not only, "Whose responsibility is it to make plans?" but another question: "Who is really best able to see future applications for the computer and the systems group?" And still another: "Whose job is really on the line if he does not keep the best of his systems group?"

Now, these plans will tend to be optimistic and blue sky but they will get other people thinking if they are not already. Or thinking on higher levels if, perchance, they are.

Another type

We can now return to further examination of mass movements for additional insights into systems. Mass movements attract not only the creative, the restless, and revolutionary by nature. They also attract another interesting group: the "failures" and malcontents. There seems to be a great number of people living empty lives. Among these I have worked with who have offered the largest contributions to a systems effort are an ex-brick layer, an ex-tab shop supervisor, an ex-computer operator, an ex-housewife, and an ex-warehouse hand. They all had, of course, demonstrated before they were hired an intense desire to do a job in systems and programming. Two had quit their jobs and had attended a computer school full time. Others were already started in the field. Others got part-time systems and programming training. But they all had some things in common: the desire to prove themselves, to get ahead, to find a more fulfilling job, and a talent for systems. What they lacked in creativity and experience they made up for in drive.

So it seems that they are not too different from the creative and sensitive ones who are attracted to mass movements. And, practically, they can be included as one for this next discussion.

Studies in psychology tell us that the creative and the, shall we say, "temporary failures" are those who are not satisfied with themselves. They want to produce more and more. By sacrificing themselves, they find meaning in their lives. By becoming identified with a group, they are able to forget their frustrations and take on the identity of a successful group.

Historically, mass movements have recognized this group and the leaders offer greater and greater challenges to them. They try to integrate them into the mass movement. They ask them to perform difficult and dangerous tasks. Can systems managers afford to ignore the example of successful leaders?

At this point, if I were forced into making some sort of conclusion from all of the above, it would be this: A systems group cannot be quietly effective—not for maximum output. It is not most effective when broken down into small, quiet subgroups. Great systems are created in an intensely active and dynamic unified group. There is conflict, not harmony. And a synergistic reaction begins to take place; ideas are open to criticism by anyone who cares to evaluate them. If someone is sensitive to having his ideas, methods, and thoroughness questioned by his peers, or even by his subordinates, he had better find another environment where there is less competition.

In such a stimulating atmosphere, even the inexperienced are challenged by others in the group to do better work. And this has always been the way in the world of ideas, such as systems essentially is. The philosopher submits his ideas and defends them. So too the theologian, the scientist, the historian. By this process, truth is tested and emerges. Specious arguments are destroyed. Can we ask less of a critical atmosphere to prevail in this dynamic systems group?

Consider now the spirit that is developed in the CB or in the Marine Corps. From the time that the new recruit enters one of these outfits all that he hears is how good the group is. Pride in the outfits is instilled. Like the old Notre Dame football teams or the New York Yankees, part of their success was that they believed that they were better.

I am not, of course, advocating that we station cheer leaders in the halls outside our offices, or that we start off the day with close order drill. But there are ways to create loyalty and cooperation and group identification. The systems manager should make it clear that all rely on every individual and make sure that all are aware of the history of the project, of the future plans, and where everyone fits in. Difficult deadlines should be set. Finally, the staff should not be enlarged quite to the point where anyone has the time to loaf. Each, as a key member of the systems group, can then face his world, a member of a group with a successful past, an exciting, challenging present, and a bright, promising future.

Demands from the group

We know that great stress and demands upon an individual are met when these demands are on him and his abilities, and are from the group to which he belongs. If the very nature of the job is exciting, such group spirit and pressure is easy to engender and to maintain. If the work is not exciting, the job is, of course, more difficult. But the simple fact seems to be that most systems managers who do more than pass out work and keep track of progress are interested only in those things that affect the group spirit negatively and take positive action only to remove a negative influence. They make little or no effort to develop and build *esprit de corps.*

How to develop this spirit is a question that analysis of successful mass movements can answer. For example, all have what can be termed "group symbols." The Nazis had the swastika; Communists, the hammer and sickle; Christians, the cross, the chi-rho, and the fish; present-day hippies, long hair, flowers, especially the common stylized daisy, and the "ban the bomb" or "peace" symbol.

They have their ceremonies: the Nazis, their heel-clicking salute, their goose-stepping manner of parading; Christians, a bible meeting or other Sunday service with definite rubrics; such groups as the Knights of Columbus, the Masons, the Shriners, which are, or at least started as, organizations with an essentially missionary or mass movement flavor, all have their secret ceremonies and signs.

Perhaps the systems manager can steal a page from their books in patterning his group. We can have ceremonies in the form of meetings during which not only group planning takes place, but also meetings for dissemination of information, for bestowing rewards,

and for social contact.

It is easier, and far more efficient, to publish information in memos, to notify the group of a promotion of one of its members by interoffice directive, and to leave socializing to whatever the people in the group are moved to do. But if we are trying to build a group, why not get them physically together for information meetings? If all depend on the group to get the job done, when someone does an outstanding job the group should participate in the bestowing of recognition. And if eating together, sharing a meal, has had such significance in mass movements (Christians and their celebration of the Lord's Supper; the Jews and their Passover; Little League and their sports banquets) why not have bimonthly or quarterly dinners as a group? And it is an easy thing to give the group a symbol: their own logo or letterhead. All of these techniques have been applied successfully in sales-oriented groups; why not in systems?

I would be truly naive to think that all systems managers who read this article will swallow all that is said here, that they will run out and start managing their groups in a positive way according to the principles of mass movements. But if there is any truth to what I say, at least we would hope that they will become more sensitive to whatever group ceremony, group identification, and symbolism has developed of its own accord and not destroy it by blundering. One of the worst things that a manager can do when he hears a member of his group bragging about himself or about the group is to tell him that there are better people and better groups in the company. Each man has to think that he is the best systems man in the world and that his is the best group.

If criticism of the current system and of the current state of data processing in the company, discussed briefly above, is not forthcoming, it should be encouraged. The past and the present must be presented by systems management as horrible—a gigantic blunder. The future will be better. It is the job of the systems group to make it so. They know all the answers and they have the faith to make it so. ■

Mr. Maegerlein is a staff systems analyst for IBM, now working at Beneficial Finance Co. His previous computer experience was with American Motors and Dial Finance Co. and he also taught high school mathematics and physics for five years. He has a BS in mathematics and chemistry from the University of Detroit

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One of the most vital, but most subtle, of the management arts is listening to a reference for a potential employee

Reference Checks

by Sylmar Van Nuys

Along with the art of resume-reading, lightly treated in these pages, the management art of reference-listening has received far less formal attention than its importance warrants. If anything, hearing a reference in the proper way is even more critical than resume-reading. Doing the latter poorly can only waste time. Doing the former poorly can result in hiring a dud, or passing up an able man.

Let's set up a typical reference situation. The department head has interviewed Pierpont J. Bitwhacker. The project manager has interviewed him. They like the cut of his jib. The project manager likes the facts that Pierpont just finished a similar job and that he comes with a complete set of flowcharts. The time has come to make the reference calls. Bitwhacker's application lists his supervisor among his references. The department manager picks up the phone.

"Megadyne Industries. Good morning."

"Good morning. Mr. Troy Menage, please."

"Thank you." Pause.

"Mr. Menage's office."

"Mr. Menage, please."

"May I say who is calling?"

"Mortimer Boss, Mammoth Data Processing."

"Thank you." Pause.

"Menage here."

"Good morning. Mort Boss, Mammoth DP, Troy. I'm calling about one of your chaps we are giving serious consideration to hiring."

Silence.

"Troy?"

"Yes. Uh, who might that be?"

"Oh, I thought you'd know. It's P. J. Bitwhacker. I think he worked for you?" Silence.

"Troy?"

"Yes. I, uh, I was under the impression that he *still* works for me. Come to think of it, he's been sick a lot lately."

"My God, Troy, I had no idea. I thought he'd given notice."

"Not unless he talked to his section head this morning. Well, no matter. He doesn't have to bother now. What do you want to know?"

"Oh, the usual. How is he technically?"

"O.K."

Silence.

"Troy? Just O.K.?"

"Yeah."

"What kinds of things did he work on?"

"General programming."

"Well, was he involved in any special projects? Payroll? Receivables? Utilities?"

"Yeah, general."

"How would you rate him in relation to your other programmers?"

"Average."

"Just average? Is that in all respects or was he better or worse in some areas?"

"He was pretty much average all over."

"Well, how about nontechnical areas. How was his sense of responsibility?"

"O.K."

"Just O.K.?"

"What's wrong with O.K.?"

"Well, nothing, but I just thought—you know, usually you like something a little more specific."

"All right, I'll be specific. The S.O.B. punched his clock on time, usually wore clothes, didn't pick his nose in public and rarely cursed in front of secretaries. Aside from that he occupied valuable desk

space and breathed air that costs us a penny per cubic yard to condition. I canned him just three minutes ago and he's all yours." Loud click.

Now, this situation illustrates a few principles of reference-listening. First, it's a good idea to get some firm handle on where your prospect stands in relation to his present employment. Chances are, if Boss had told Bitwhacker he was going to call Menage, Bitwhacker would have been reduced to driveling idiocy. That would have given some sort of clue about Bitwhacker. At the best, Bitwhacker would have pleaded for delay to give him time for the amenities.

That Bitwhacker hadn't got his timing quite right was significant. Obviously, the rest of the conversation was not highly revealing. If anything, it tells Boss that Menage has a low boiling point and probably does not hold his company's record for tolerance. In itself that might say something about why Bitwhacker wants to leave Megadyne. Chalk this call up as mostly unrevealing.

For contrast, regard the situation in which it has been determined that Bitwhacker has indeed given notice and has not only cleared the prospective employer to check references, but has urged him to call his boss and revered mentor, Hamilton Sort.

"Mr. Sort's office. Good morning."

"Good morning. May I speak to him, please?"

"May I say who is calling?"

"Mort Boss, Mammoth Data Processing."

(Incidental note: when checking references it is best not to play The Telephone Game. In that game, it will be recalled, the winner is the player whose secretary asks the other party to wait while her boss comes on the line. If you win you antagonize the other player; if you lose, you are irate at yourself. The most rapport is established when you place the call yourself.)

"Hello. Ham Sort."

"Ham, I'm Mort Boss, Mammoth DP. I'm calling about one of your people . . ."

"Ponty Bitwhacker, right? Great lad."

"That's right. I guess Bitwhacker . . . "

"Called me twenty minutes ago. Great lad, Ponty. Told me all about your great company. Sounds like you really have something rolling over there at Mammoth."

"We're doing all right. Now, about Bitwhacker . . ."

"Great lad. Worked for me three years or more. Can't say too many good things about him. Say, you folks just knocked off that AFMTC contract, didn't you?"

"Yeah. Signed it last week."

"About five million over four years, wasn't it?"

"Well, more like four million. Changes of scope might run it up to five. Now, about Bitwhacker . . ."

"Yeah. Great lad. Worked for me for three years. Rotten shame we had to lay him off . . . "

"I thought he resigned."

"That's right, he did. Well, the situation over here is a little confused. Actually, the department is being phased out, you see, and you know what happens, all the good people start looking. By the way, if you are interested in Bitwhacker you must be manning up for that AFMTC job, right?"

"Well, yes. But . . . "

"Look, I have an idea. I'd like to talk to you some more about AFMTC. I've got ten years in systems analysis and I worked on our proposal for that job. Why don't we get together for lunch? I'm free today or tomorrow. We could finish up this Bitwhacker thing at the same time. What do you say? How about Shady Sadie's, noon?"

"Well, O.K."

"Swell. See you there. Bye."

"Bye."

What has happened is pretty obvious. Boss has been conned, but the result might be useful to Boss's company if indeed they need to staff up to a large contract. Sort is a manager, experienced, and if he is any good he can identify and recruit the best people from his present company. So serendipity may have sprouted.

Still no word

The call was an obvious failure with respect to Bitwhacker. Aside from a generally favorable attitude, the conversation elicited zero information about Bitwhacker's capabilities, performance, reliability, level of seniority, etc. Maybe the lunch will be more successful, but we are left with the definite impression that Boss will wind up hiring Ham Sort, while Pierpont J. Bitwhacker may or may not get the job at Mammoth.

In both examples so far there is one paramount factor. The ego involvement of the callee in his own problems beclouds the issues and prevents the transfer of information useful to the caller. In these examples the ego involvement is obvious. Sometimes it is not so clear.

So far we have dealt with pathological cases. Now let us examine a more nearly representative interview. As before, Mort Boss has tentatively decided to hire P. J. Bitwhacker. He places a call to Bitwhacker's former section head at Megadyne, Walter Puckey.

"Walter, this is Mort Boss, Mammoth DP. I'd like to talk with you about one of your former employees, P. J. Bitwhacker."

"Oh, yes. Let me get his file . . . Here we are. Let's see. He joined us June 12, 1967 . . . now, that's peculiar."

"What's peculiar?"

"Well, probably nothing to it, but June 12 that year was a Tuesday. New people usually start here on a Monday. Oh, here's the answer. June 11 that year was Guelph day."

"Guelph day?"

"Yes, it's a local holiday. The second Monday of each June. There's a pageant celebrating the victory of the Guelphs over the Ghibellines. That was in Florence in 1266. There are costumes and everything. It's because there are so many local people of Italian descent."

"O.K., well, let's go on. So Bitwhacker joined Megadyne three years ago. Did he work for you at that time?"

"No, he was assigned to work for Ham Sort over in Systems. Say, Ham just went to work for you people, didn't he?"

"As it happens, he did. When did Bitwhacker start to work for you?"

"About eighteen months ago."

"Did you supervise him personally?"

"For a while, yes. Then I was promoted and he

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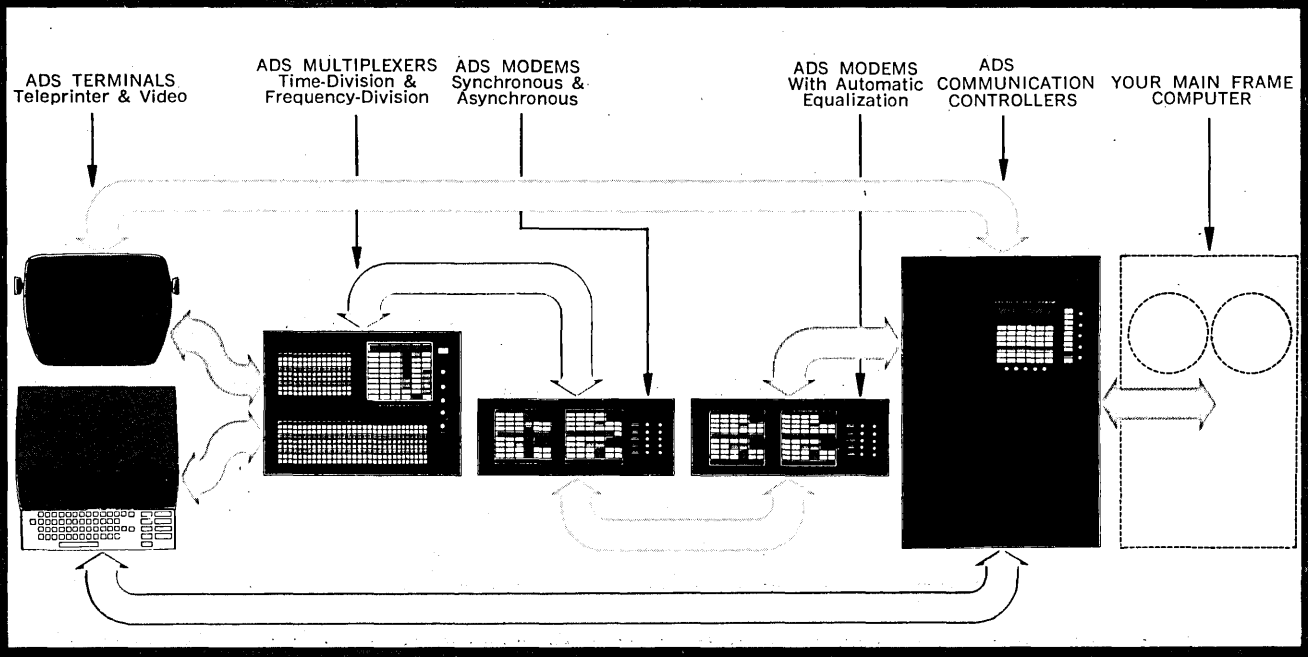

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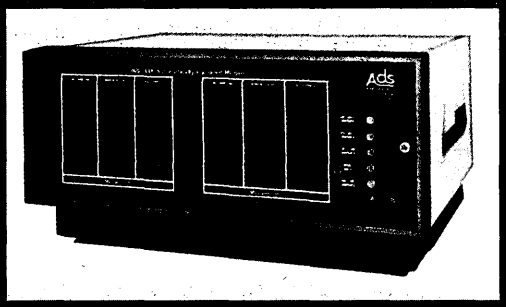

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reported to another project manager."

"While he was working for you directly what were his assignments?"

"We were working on the software for the NMMNS."

"Did you say 'nummies'?"

"That's just the way we pronounced it. N-M-M-N-S Bitwhacker did the loader and the dump utility."

"Well, did he do a good job?"

"Oh, yes. It was an acceptable job."

"Did he do the design?"

"He did the whole job, design, coding, checkout, documentation."

"How was his documentation?"

"Not bad."

"In your judgment, is Bitwhacker a good technical man? How would you rate him as compared with the other technical people on your staff?"

"Probably better than average."

"Probably?"

"Well, definitely."

"O.K. Now, how about his personal characteristics. Was he dependable?"

"Yes. He was usually in on time, was conscientious about his work, that sort of thing."

"How about personal habits?"

"Well, lots of people wear long hair and sandals these days. He was always clean, though. I don't recall any objectionable habits."

"Now, he states he was laid off. Is that correct?"

"Yes. Nummies closed out and we missed on AFMTC, but you know that."

"Yes. Is there anything else you can tell me?"

"No, I don't think of anything."

"Would you rehire him?"

"Oh, yes, if we had the work."

"Well, thanks, then, Walt. I appreciate the information. Bye."

"Goodbye. Oh, by the way, are you people still hiring?"

"Not in my department. Maybe you could try Applications."

"O.K., thanks. Goodbye."

Getting closer

Again, the information content of this interview is low, but significantly higher than the previous cases. Low, that is, unless you are turned on by local arcana such as Guelph Day. The general impression one gets is that Bitwhacker is a conscientious, reasonably willing programmer, young, without any really significant experience. If that impression squares with his own, and if there is an appropriate position open, Boss will probably hire Bitwhacker. Walter Puckey, of course, stands revealed as an unimaginative, probably incompetent bore.

Suppose there had been a problem with Bitwhacker, though. Part of the conversation might have gone like this:

"What was he working on in the nummies project?"

"The loader and dump utility."

"Did he do the whole job?"

"Well, he was assigned the full responsibility."

"Did he finish the job?"

"Well, in a way."

"What do you mean by that?"

"He, uh, he had some help later in the project."

"What kind of help?"

"Well, we had to assign additional personnel. The job turned out to be larger than we thought."

"A loader and a dump? You ought to be able to estimate that within about five man-hours."

"Yes. Well, it turned out Bitwhacker had never done that sort of thing, so he got into a little trouble."

"How little?"

"Someone else finally did the job."

"And what did Bitwhacker do?"

"He worked on the documentation."

"Now, Walt, what *really* happened on that project?"

"It's hard to say. I think what happened was Bitwhacker got the idea he could improve on the original specifications, so he went ahead without telling anybody. By the time we found out, he had written a dump routine that blew core, but since he wrote the dump before he wrote the loader he had no way of checking it out."

"That's pretty dumb. How did he do a thing like that?"

"Well, I wouldn't state this as an outright fact, now, but some of the guys who saw him socially said they thought he was blowing a little too much pot. He did look kind of funny sometimes, but I don't think he ever actually got stoned on the job."

That's about enough. Boss was persistent enough to develop some really meaningful information. He can act on the warning signs alone and dump Bitwhacker right now, or he can, if he has reason to doubt Puckey's story, confront Bitwhacker or pursue other reference sources. An unwary interviewer would not have been so fortunate. Puckey is obviously reluctant to say anything that might be construed as disparaging, even though the evidence seems to warrant frankness. For that reason, Puckey seems to be more representative than not of people who give references. Lurking in the back of his mind is the thought that even though in his observation Bitwhacker was incompetent and probably irresponsible, it is possible he could be wrong. To pass on possibly damaging information is hard enough, but to do so knowing there is the possibility it is erroneous is intolerable. Moreover, the Puckey's of this world have been wrong sufficiently often that they live with a constant gnawing doubt of the validity of their own conclusions.

In the last analysis, then, it is up to the listener to *interpret* what he hears. The skilled reference collector senses the psychology of the interviewer and adds this information to the words that are being said. Most of us do this by instinct, but sometimes people are clever in concealing themselves. Further, the decision-maker sometimes does not make all the calls himself, so he is reading through a filter, which is the person calling. Forms reporting reference calls ought to provide for interpreting the attitude of the interviewee towards the subject of the call.

The potential for further analysis is endless, but these pages are not. Let us close, then, in the comforting knowledge that, as we close the curtain, Mort Boss, Ham Sort and P. J. Bitwhacker are happily employed at Mammoth, while Walter Puckey is still scanning the want ads. There is some justice in the world after all. ■

In the future, hardware will be recording more details of usage

Operational Data

by Howard C. Montgomery

Functions that are put into a system represent a compromise between what is needed and the cost of satisfying these needs. The *form* in which functions are provided is determined largely by the state of development of hardware and programming technology. For a given function, the preferred technology is that which involves the lower cost.

Much of what we require of humans in our systems is determined by functions that either cannot be done at all by programs or hardware, or, as is more frequently the case, cannot be done automatically at an acceptable cost. In general, we should expect technological improvements to relieve users of those operations for which humans are too slow or prone to error.

The general function of interest here is recording—during normal operation—details of usage experience. First, I shall mention some of the uses of this information and suggest why the needs for recording are increasing. Next, I shall point out some changing trends in application environments and technology. And finally, I shall speculate on how this changing balance between need and technological capability is likely to affect the systems that we shall be using in the next few years.

What is recorded and how it is used

Two classes of recording will be identified here—recording of resources usage and recording of problem symptoms.

Included in resources usage are both hardware and software resources. Examples of hardware resources are cpu time and space in main and secondary storage. Software resources usage can be such things as the number of accesses to certain data files, the number of times the OPEN macro-instruction is issued, or the number of times the COBOL processor is invoked.

Information of this kind can be put to a variety of uses. Hardware resources usage, for example, is a common basis for charging users, and is often employed as a (perhaps misguided) measure of installation efficiency. Another application is the comparison of actual resources usage, such as storage, with what has been requested and reserved, to identify users who are tying up much more of these resources than they need.

As a justification for existing or new equipment, usage is combined with information about other service parameters such as turnaround time. Combined records of hardware/software usage are used to tune options and configuration selections to optimize whatever value criteria (response time, throughput, number of terminals supported, etc.) a given installation considers important. Finally, information about component usage and options selection is used to help decide what products to market and which options to include.

Problem symptoms related to hardware failures, program errors, and human mistakes are needed for several reasons:

1. Automatic recovery facilities must know the details of the problem in order to effect recovery. For example, before trying to re-execute an instruction that was terminated by a cpu failure, it is necessary to determine if the original operands are available and if they must be restored to the locations from which they were fetched during execution of the instruction.
2. For recovery from many failures and errors, transaction journals provide the information necessary to reconstruct past event sequences for situations in which more immediate, local recovery is either not possible or desirable.
3. A user, who is trying to decide whether to call maintenance personnel, needs symptom data just to determine whether the problem is being caused by hardware, system programs, or his own application.
4. Maintenance personnel need symptom informa-

tion to know where in the system to start looking for the problem, and ultimately to locate and repair it.

5. In order to apply corrective actions intelligently, system designers need data about problems to learn where the system is making unrealistic demands on users and operators and where additional recovery facilities are needed.

Environmental influences

In the environment that is becoming more common for dp systems, several things point up the necessity of increasing our ability to capture operational data automatically. Multiprogramming and remotely connected users make it infeasible for the operator at the central console to record billing information manually. Furthermore, the complexity of multiprogramming interactive systems can mask significant inefficiencies from the view of a human observer. It is not easy to visually detect the refetching of programs that are already in main storage. Imbalances in channel utilization pose a similar problem. And even if they are detected, in many cases more information is needed to determine the appropriate correction.

Another factor is that, as the user community broadens, average levels of user familiarity with the internal structure and operation of the hardware and system programs will decrease. There will be increasing numbers of users whose contact with dp systems will be a frequent but not dominating aspect of their work. Sales people who record purchases and law enforcement personnel who make inquiries to a base of motor vehicle data are examples.

From a systems standpoint, an on-line system is less tolerant of failures of components (hardware and software) that provide vital functions. A failing control unit that prevents further use of its attached discs, or an error in a language processor, are examples. Still less acceptable are situations in which the entire system must be taken out of service to get the symptom data needed to troubleshoot a failing cpu or main memory.

Even if the entire system has to be dedicated to troubleshooting, symptoms of many data-dependent failures will be difficult to reproduce because it will be virtually impossible to duplicate the environment in which they first occurred. Determining which terminal users were logged on, what each of them was doing, which background jobs were being processed, what parts of main memory they occupied, and which I/O devices they were using at some arbitrary prior moment is exceedingly difficult. But even if these and other details were known, getting the system into exactly the same state would require a degree of operational control that probably doesn't exist. Further, elaborate preparations would be necessary to capture the symptom data before they again disappeared.

The class of hardware failures that are usually called intermittents would in many cases elude the careful preparations of the preceding item. A faulty electrical connection or contact, or dirt on a tape read head, may well not require or even respond to an exact duplication of the external environment in which it originally occurred. Of course, this type of problem is not unique or even necessarily worse in newer systems. It is listed here because of its relevance to the need for automatic recording of elusive symptoms.

Technological influences

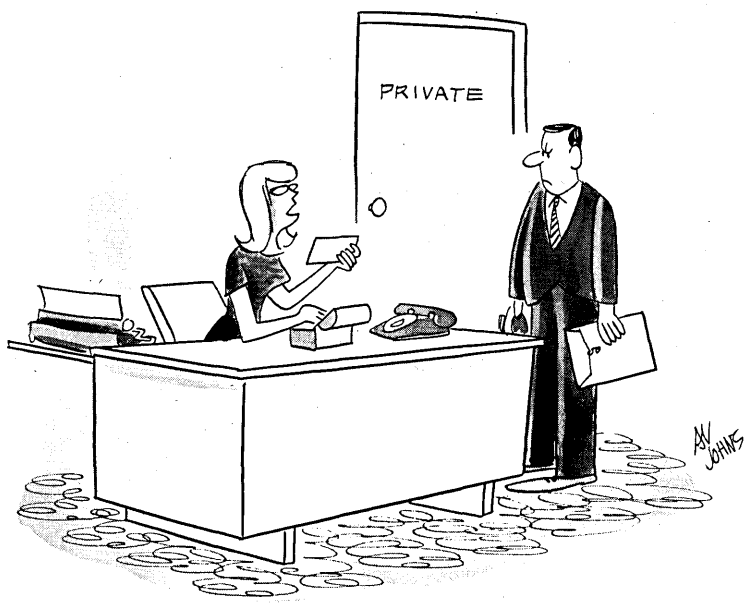
Two related trends in hardware development are worth noting:

1. Cpu power has been increasing faster than the speed and capacity of I/O equipment.
2. As the amount of function in peripheral equipment increases and the cost of read-only storage is reduced, using ROS to provide the added function becomes more attractive.

An important consequence of the lack of balance between cpu power and the speed and capacity of I/O equipment is the exploration of moving more I/O control functions from cpu's to channels, control units, and devices as a means of improving system balance. Frequently mentioned examples are error recovery procedures and interruption handling.

Using ROS to provide added function is more attractive than using conventional controls, because the cost of conventional controls increases almost linearly with added function. The cost of ROS, on the other hand, is more nearly a step function. Once a box of ROS is bought, the investment remains almost constant, whether a few of its locations are used or nearly all of them are used. Consequently, any unused locations in an ROS unit are likely candidates for use to give added function.

The combination of these two trends may produce the situation in which functionally enriched control units and devices present the opportunity of incorporating additional support (recording and recovery)



"Oh, yes . . . here you are. He's out."

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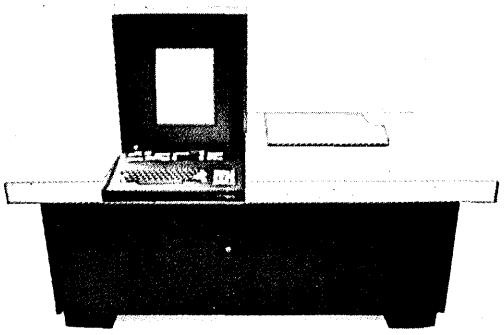

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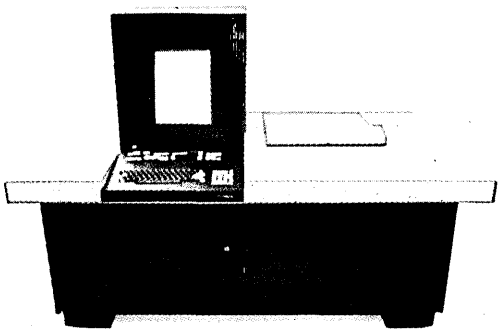

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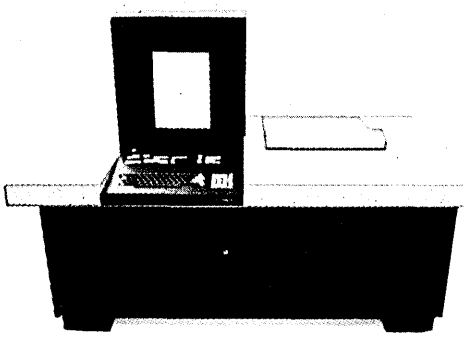

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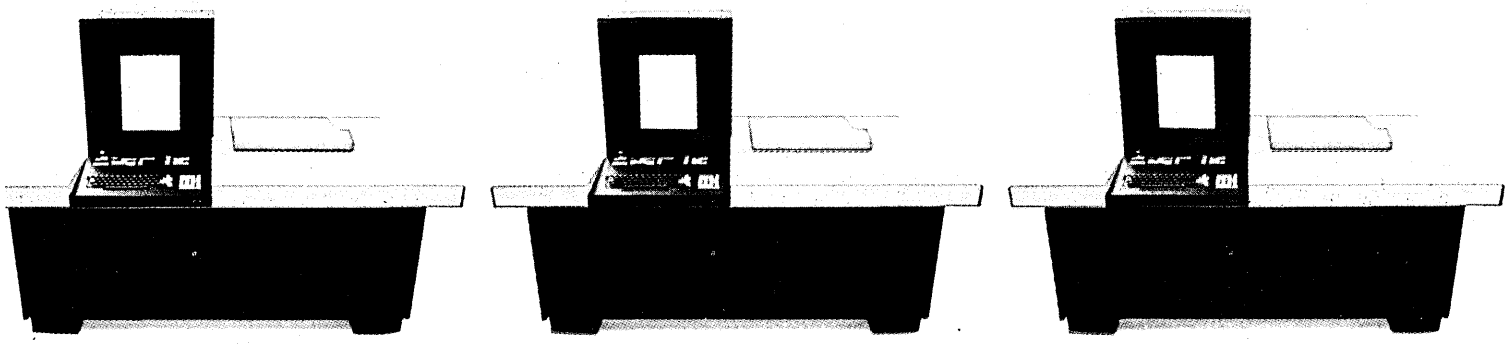

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function at a very small added cost.

On-line systems will require larger amounts of this kind of recorded data than do conventional batch systems. Transaction journals alone account for a quantum jump in this regard. And the on-line character itself proscribes the familiar process of having repair personnel use the entire system in an attempt to recreate the environment of a vaguely defined problem. Because much more will be recorded, one should expect to see these data written on dedicated devices or volumes instead of sharing a device or volume with other system libraries, as is common today.

This increase in the amount of information available and the improved consistency one gets from regular, automatic recording will justify the preparation of analysis programs. These programs will allow those who are not experts on system internals to make productive use of the additional information.

Problem-detection mechanisms will be distributed more widely throughout hardware and software. In hardware, the extensions will come primarily in I/O control units and devices, mainly because detection facilities already cover cpu's, main memory, and channels reasonably well. Such extensions will also become easier to justify as the needs increase and technology advances like ROS control make added function relatively inexpensive.

Improved distribution of detection mechanisms in system programs will be observed more as a concession to need than as a result of lower costs through better programming technology. An important result of this will be an improvement in distinguishing errors in user programs from errors in system programs. These distinctions will be accompanied by more helpful error messages that explain not only *what* is incorrect, but *how* it is incorrect.

Capturing of symptom information in many present cpu's is largely done by the hardware. Extensive status information about failures is written into special locations in main memory before interruptions related to these events are taken. Similar facilities for I/O devices are anticipated as the result of several of the developments mentioned above:

1. A growing awareness that good symptom data enhances troubleshooting efficiency.
2. The trend toward capturing this information as the related events occur during normal operation.
3. Advances in hardware technology that reduce the cost of adding function.

It is likely that the writing of captured information on secondary storage will continue to be done by programs. One reason for this is the control that is needed to supervise the writing on one device of data that come from many sources asynchronously, and hence possibly simultaneously. Another reason is the flexibility that programs offer in the choices of device, data formats, and data compression.

When and if

The preceding comments have addressed the direction, and not the rate, of change. In addition to one's interest in "when" these differences are likely to appear, it is also reasonable to ask "if" this will, indeed, happen at all. Neither of these questions can be answered with certainty, but the things that determine the answers are easily identified:

1. Support functions such as these have costs just as real as application functions. Hence support function is competing with application function for the user's dollar and the system designer's attention. Of course the values of the functions in the two categories are derived differently. For application function, the value question is "How much is it worth to do this?" For support function, the question is "What is the penalty if I am delayed or prevented from doing the application?"
2. The rate of growth of perceived need varies widely among users. Not all users will have the stringent requirements outlined above; even users with similar application environments do not place the same premium on uninterrupted operation – and consequently the facilities needed to approach it. A clear result of this is a strong bias toward making such extra-cost items optional.
3. The rate and direction of hardware technology development affect both the "if" question and the "how soon" question. The "if" question is very sensitive to the step-function property of ROS costs, because adding support function to already existing application function can be done at essentially zero additional cost. If a technology different from ROS emerges that is economically superior to ROS for the application function, then moving support function out to control units and devices becomes much harder to justify.

The long-term answer to the "if" question seems to me to be a confident "yes," at least for complex, interactive systems. Whether this will apply to small or simpler systems depends to a large extent on whether a dual line of I/O devices will be available—one family for the larger systems and a lower cost, reduced-function family for small systems.

The near-term answer to the "how soon" question also depends very strongly on hardware technology developments for I/O control. If the technology moves to ROS control, then increased problem detection and data capturing at the control unit and device level seem very likely. ■

Mr. Montgomery is a manager in the OS system requirements group in IBM's Poughkeepsie, New York, development laboratory. He has a BS in mathematics from Juniata College and an MS in applied mathematics from Carnegie-Mellon Univ.

The combination of a CDC 1604 and a special associative memory has turned in the fastest sorting times yet

Fast Sorting

by Casper R. DeFiore

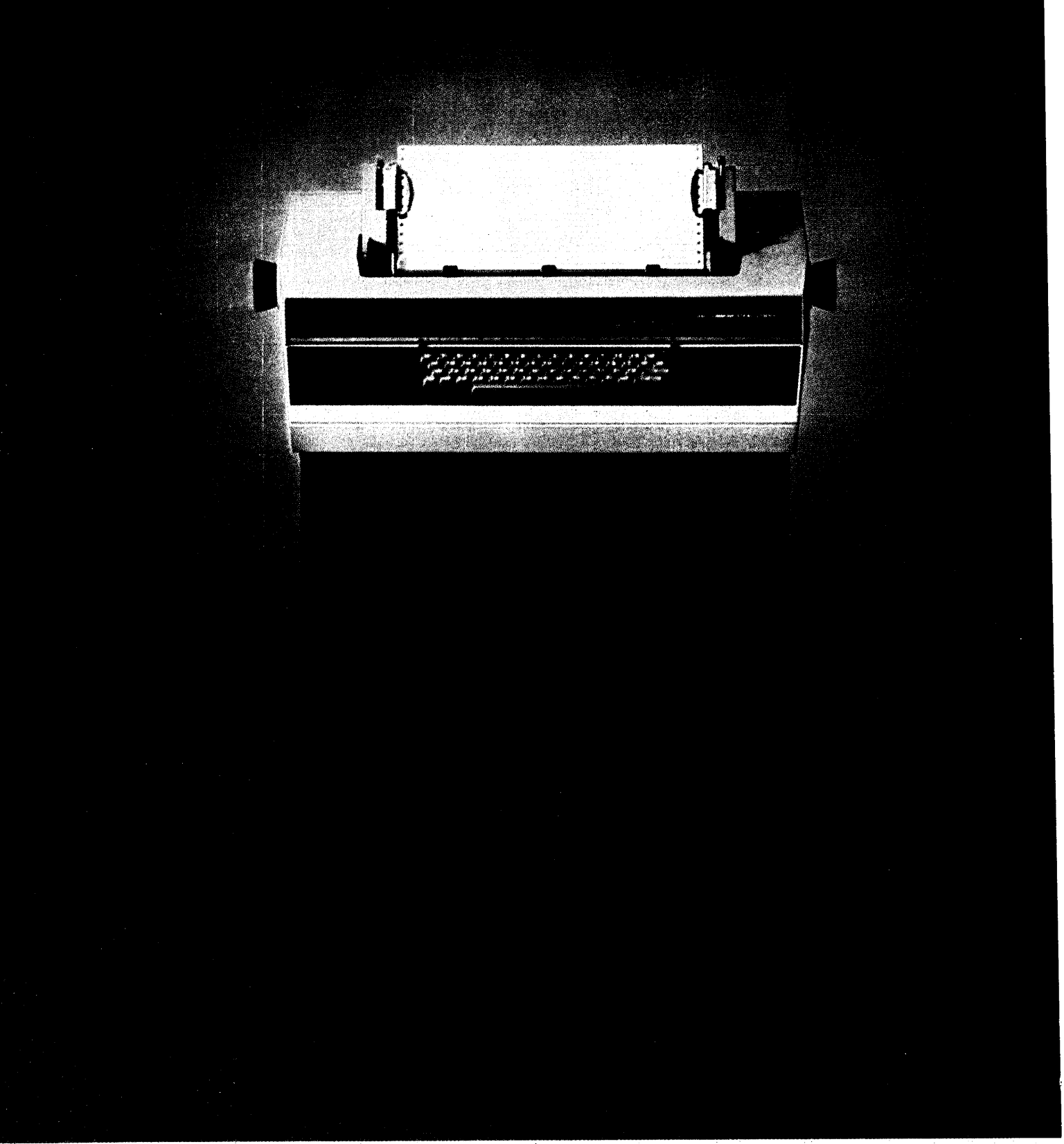
The work described here was done in order to investigate and develop methods for improving the performance of data processing functions using the Goodyear Associative Memory in conjunction with the CDC 1604 computer at Rome Air Development Center (RADC). The improvement consists of a unique sorting technique written in JOVIAL for the CDC 1604, taking advantage of the associative memory. It is shown that the technique is far superior to any existing sorting technique. The program implementation was written as a generalized JOVIAL procedure, thereby increasing its utility. This is the first in a series of efforts to utilize associative processing techniques so that they may be applied to such areas as data management, computer graphics, pattern recognition, and the like. Before describing the technique, the CDC 1604-Goodyear Associative Memory configuration together with the salient features of the associative memory are briefly discussed.

The Goodyear Associative Memory was developed by Goodyear Aerospace for RADC. The system, which has been operational for about a year, consists of a CDC 1604B computer and the Goodyear Associative Memory (AM), with a hardware interface which permits access to the 1604B core memory. The AM has its own control logic and registers and uses 1604B core memory.

The AM

The associative memory is a content-addressable or parallel search memory with 2,048 words, each with 48 data bits. The search capability provides for single instruction execution of a variety of types of searches.

The AM is interfaced with the 1604B via a special channel, called the direct memory access channel (DMA), which provides for more rapid access than



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would be possible with the normal channel. The AM directs the operation of this channel, including specification of the 1604B core address from which the information is to be taken.

AM hardware

The AM contains hardware which allows reasonably independent operation. There is a program counter, instruction register, three index registers, and various other registers. Instructions, comparands, and masks are obtained from the 1604B core memory via the direct memory access channel. The AM in its present 1604B interface is dependent on the 1604B core memory for storage of all instructions, comparands, and masks. All loading of data into the AM or unloading from the AM is via the direct memory access channel from the 1604B core.

Operation of the AM is initiated by the 1604B. Once started, the AM can operate autonomously until it completes its task or it requires some assistance from the 1604B. The 1604B can sense the status of the AM in terms of whether it is operating or not. An interrupt capability is also available, which, if enabled, results in an interrupt of the 1604B whenever the AM halts.

The hardware of the AM consists of the content-addressable (or parallel search) memory, the registers and circuitry needed for execution of the instructions, and the AM side of the interface with the 1604B.

The memory contains 2,048 cells with 50 bits each. Each cell contains 48 data bits, a busy bit, and a parity bit. The memory is directly addressable for some load and unload instructions. It is content addressable in search instructions and for other instructions, using the results of previous searches. Instruction execution is word parallel, bit serial for search instructions, and word serial for reading and writing.

The AM contains an AM address register, three index registers, instruction register, mask register, comparand register, shift count register, word count register, and a program counter. In addition, there are registers within the array hardware which are used to preserve the search results.

The AM address register is used to contain a starting address in the AM.

The mask register is used in loading and search operations to contain a mask word.

The shift count register contains a count of the number of places the comparand register is to be shifted.

The word count register is used in some load, unload, and erase or activate instructions to contain a count of the number of words to be transferred.

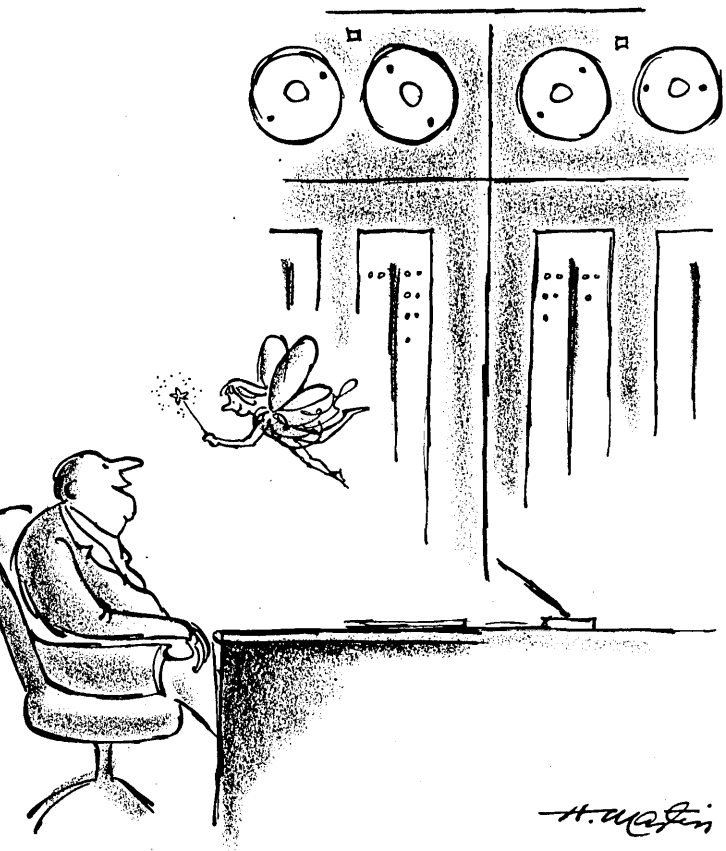
The comparand register is used in search operations and load and unload operations. In search operations, the value that the AM contents are to be compared with is placed in the comparand register. The shift specified in the shift register is performed on the contents of the comparand register prior to performing the search. In load and unload operations, the words being written into or read from the AM are placed in the comparand register, shifted, masked (if writing), and then written into the AM or the 1604B core memory as appropriate. Loading and unloading the AM is a serial operation.

Search results can be ORed or ANDed or complemented with previous searches, and there are also some instructions which allow indirect addressing.

Searches and search time

The AM can perform 11 different types of searches. In addition to these, there is a complex search instruction which provides for combining the search of several fields in a single instruction. Searches are performed in word parallel, bit serial. That is, the first bit in all words is searched in parallel, then the second bits, and so forth. The search types are: (1) exact match, (2) mismatch, (3) maximum value in memory, (4) minimum value in memory, (5) greater than comparand, (6) less than comparand, (7) greater than or equal to comparand, (8) less than or equal to comparand, (9) between limits of two comparands, (10) next lower than comparand, and (11) next higher than comparand.

Search times vary with the complexity of the search procedures—the number of bits that must be examined, whether both memory halves must be searched, and whether a mask must be obtained. However, all of the searches are fast. For example, the entire memory can be searched for an exact match in 70 μsec, including the time for obtaining the comparand, instruction, and a mask. A minimum or maximum value search requires less than 160 μsec if it is



"Well, since you asked, I wish I had a general-purpose, disc-oriented edp system with monolithic integrated circuits, thin-film memory, and upward software compatibility."

not necessary to obtain a mask. It is the AM's very fast search capability for a variety of searching procedures that provide its tremendous power for certain tasks.

It is possible to extend searching over two or more consecutive words by performing two or more searches and shifting the response vector on the second or later search.

The complex search capability allows for the execution of up to eight connected searches on distinct, contiguous, nonoverlapping fields of a word. Any of the search types can be used. The complex search capability reduces the number of instructions required to perform the equivalent search functions and execution time since there are fewer words to be transferred over the DMA channel. Equivalent searches can be performed using sequences of searches.

The sorting technique

The associative sorting technique is a method by which up to 2,000 words and up to 48 bits per word can be sorted into increasing or decreasing order. Suppose one has a set $X = (X_1, X_2, \ldots X_n)$ to be sorted into increasing order. The associative sorting algorithm for doing this can be described as follows:

1. Choose the smallest item or items in the list and place them into another list. Note that the nature of the associative memory essentially allows all the items to be examined in the time it takes to examine one (i.e., in parallel), whereas it would have to be done sequentially and therefore much slower on a conventional computer.
2. Remove the item(s) found in #1 from the original list. This is also done very fast on the AM since it involves only an erase responder instruction.
3. If the original list becomes empty then halt, otherwise go to #1. Again this can be done very quickly; i.e., when there are no responders, the list must be empty.

The algorithm was implemented in JOVIAL on the CDC 1604-associative memory configuration, and compared with the bubble sort normally available on the CDC 1604.

Using a set of data consisting of 2,000 48-bit words, it was found that the associative sorting algorithm ran 375 times faster than the bubble sort. The speedup of over two orders of magnitude is evidence of the superiority of the associative memory organization for many nonnumeric data processing functions.

In addition to the enormous time savings, a further advantage of the AM sort is that the existence of the associative memory is transparent to the user. That is, anyone using the CDC 1604 can use this sort routine by merely setting up the proper parameters and making a call to this JOVIAL procedure.

It should be pointed out that while the AM sort technique can sort on any portion of each word, the bubble sort cannot (i.e., masking is not allowed in the bubble sort and is allowed in the AM sort); thus the AM sort is more useful.

The JOVIAL procedure for performing the sort has the following format:

ASORT (A, B, C, D, E, F) where ASORT is the library name of the sort routine.

A = Name of input area

B = Name of output area

Note: It isn't required that $A \wedge B = \phi$

C = Integer I ∋ $0 < I \leq 2000$

Specifying the number of words to sort:

D = v (INC) if increasing order sort:

D = v (DEC) if decreasing order sort

E = Integer I ∋ $0 \leq I \leq 47$ specifying the starting bit in each word on which the sort will take place. (In order to be consistent with the JOVIAL language, bits are numbered left to right and left-most bit is bit zero.)

F = Integer I ∋ $0 \leq I \leq 48$ specifying the number of bits of each word on which the sort will take place. $(E + F \leq 48)$

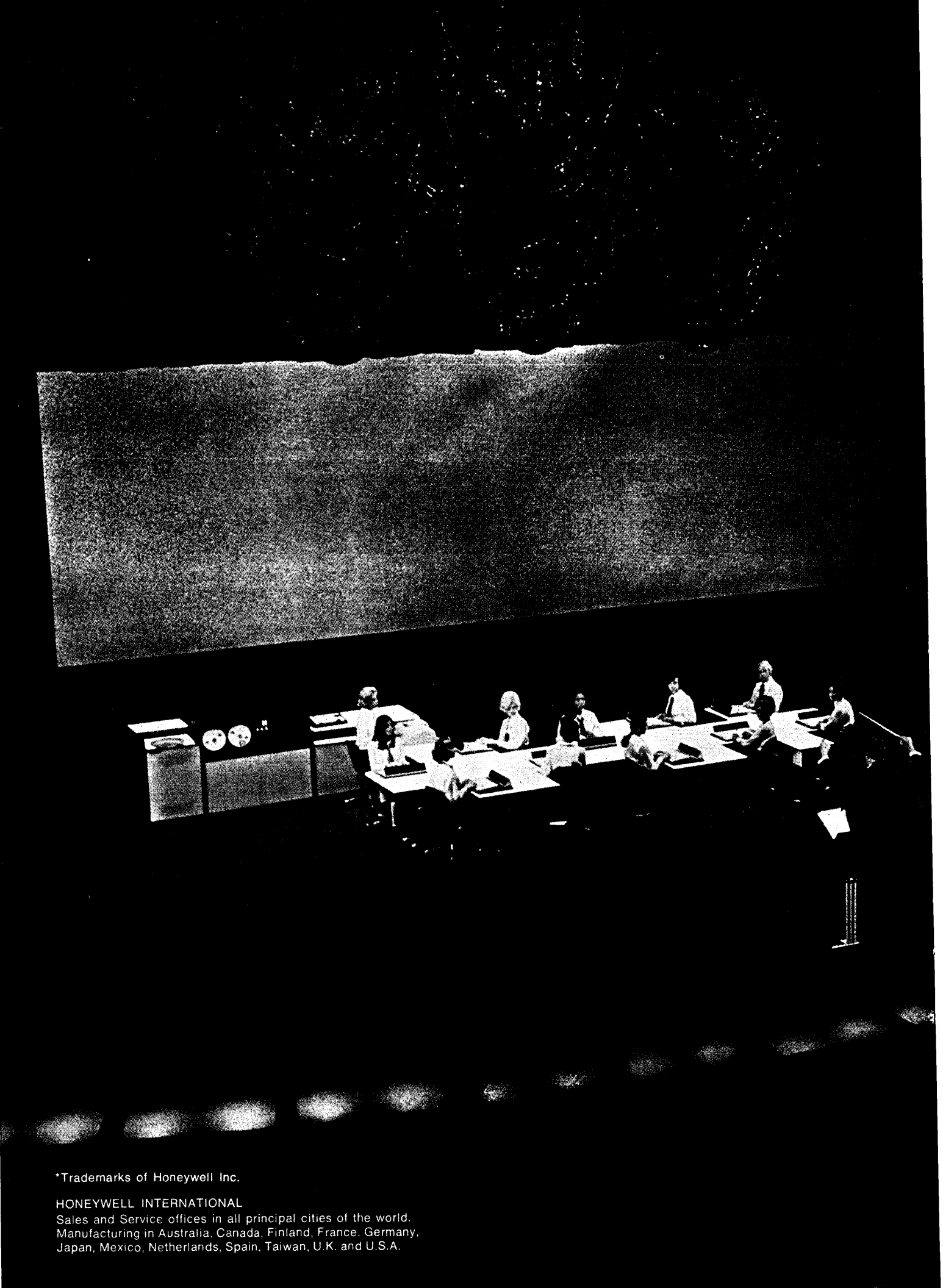
Conclusion

Sorting is among the basic algorithmic functions of almost any computer installation. It has application in commercial and scientific problems, data management, operating system, program assembly and compiling, and in list processing. It is estimated that sorting comprises from 25% to 50% of the over-all computer workload for business-oriented systems. When one realizes that in terms of present-day technology the production-cost ratio of associative memories to conventional memories is about 4 to 1, and that with the advent of large-scale integration (LSI) the cost ratio will be about 2 to 1, then it becomes clear that associative memories have a tremendous potential for certain functions.[1] The key factor about an associative memory is that it allows data to be located, processed, and/or retrieved, though their physical addresses are unknown and without recourse to sequential search. Thus it can show a substantial improvement in operations that are performed on populations of data.

Further work in the design, development, and implementation of generalized JOVIAL associative memory programming techniques is continuing at RADC. This initial effort has shown the feasibility of such techniques in the enhancement of data processing activities. Such applications as data management, computer graphics, computer aided design, etc. surely would be greatly enhanced through the use of associative processing techniques. ■

Mr. DeFiore is a scientist in the Systems Information Sciences Section, Rome Air Development Center, where he is involved in developing techniques for increased dp systems capabilities. He has a BS and MS from Syracuse University.

[1]Barsamian, Harut, **Firmware Sort Processor With LSI Components,** AFIPS Conference Proceedings, Spring 1970.



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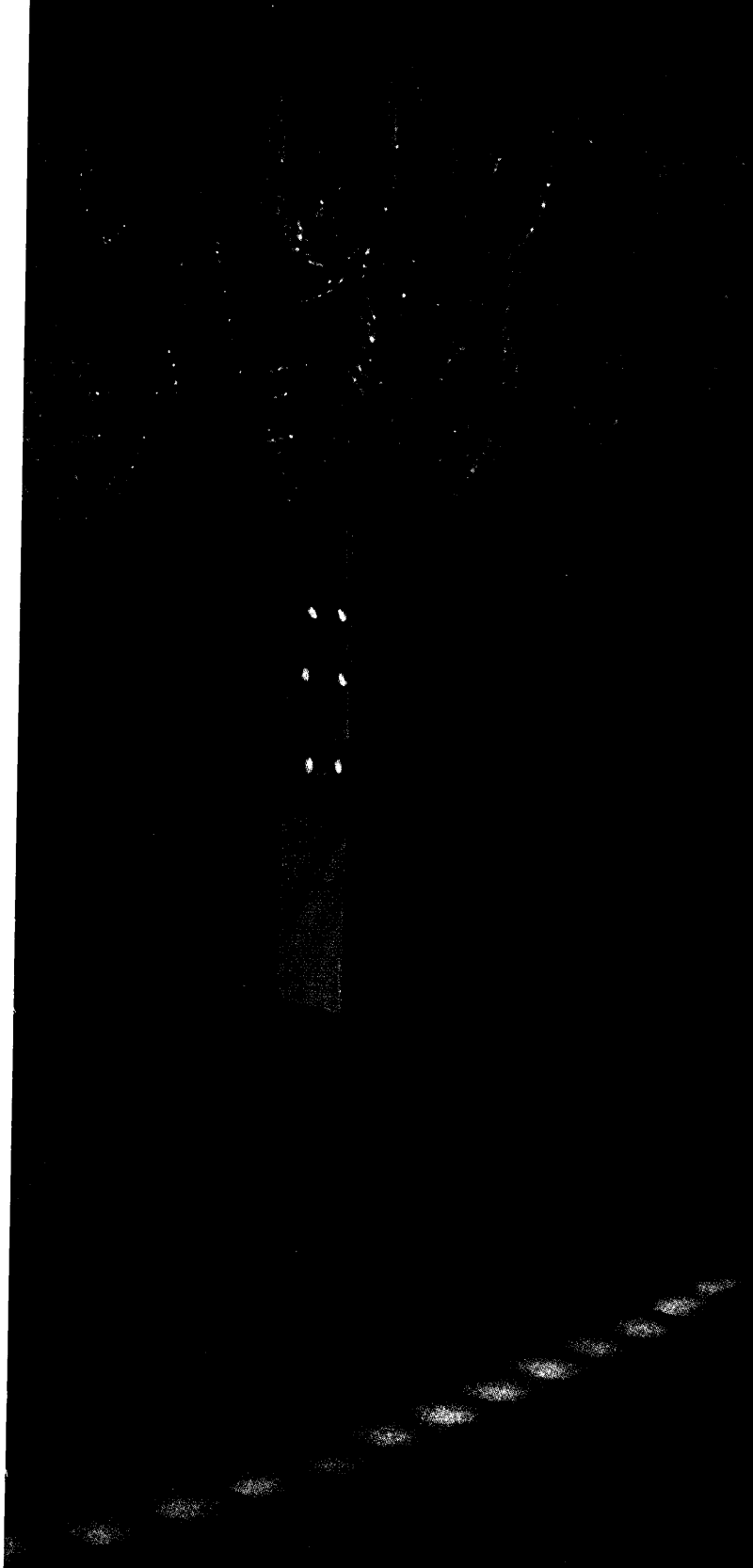

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On-line, multiterminal medical systems got most of the attention at this conference and exhibit.

Biomedical Symposium

The annual San Diego Biomedical Symposium (formerly San Diego Symposium for Biomedical Engineering) entered the 1970's with the theme "Computers On-Line." Dr. Homer R. Warner delivered the keynote address on Monday, April 6, and described the system which he and his co-workers have developed in Salt Lake City, Utah. Dr. Warner stressed the importance of increased orientation toward user acceptance and the development of products which are useful to and usable by the physician.

Dr. Donald A. B. Lindberg, of the University of Missouri, chaired the Monday afternoon session which was devoted to "Information Transfer Requirements in the Practice of Medicine." Several comprehensive information management systems were described. Included were: ACME (Stanford University) which is a centralized time-shared signal-processing system; ANSUR (Houston, Texas) which is oriented to the processing of anesthesia and surgery data; and a system developed at the University of Chicago for obstetrical intensive care information. The University of Missouri group described the work which they are doing in evaluation of computer terminals.

Dr. Max Harry Weil, of the University of Southern California and Hollywood Presbyterian Hospital, opened the Tuesday morning session on the subject "Bridging the Gap Between the Computer and the Patient." Instrumentation and interfacing appropriate for electrocardiography, pulmonary function studies, and a host of other applications were discussed.

Large systems

On Tuesday afternoon, C. Frank Starmer, of Duke University School of Medicine, chaired the session on the theme "System and User Software for Multi-Terminal Computers." Several systems for monitoring of cardiac intensive care patients were discussed. The emphasis was on the use of large, time-shared systems which were not devoted exclusively to the patient-monitoring function, and supported a number of simultaneous activities. Experience at Alabama, Loma Linda, Pacific Medical Center, and Duke University were discussed.

And small

In contrast to the large multipurpose system emphasized in the preceding session, "The Small, Dedicated Computing System in Patient Monitoring and Intensive Care" was the topic of the Wednesday morning session chaired by Dr. Richard M. Peters of the University of California, San Diego. Cardiac arrhythmias and preprocessing of electrocardiograms received considerable attention. Techniques for monitoring respiratory mechanics and pulmonary function were discussed, and appear to offer significant benefit in the management of the critically ill patient.

The commercial exhibits followed the theme of the symposium. Communications and display devices and systems, patient-monitoring instrumentation, and laboratory automation received the most attention. Exhibitors included Control Data, Delta Data Systems, Arthur H. Thomas Co., Computer Communications, Typograph Corp., Ivac Corp., Electronic Associates, and Civil Systems.

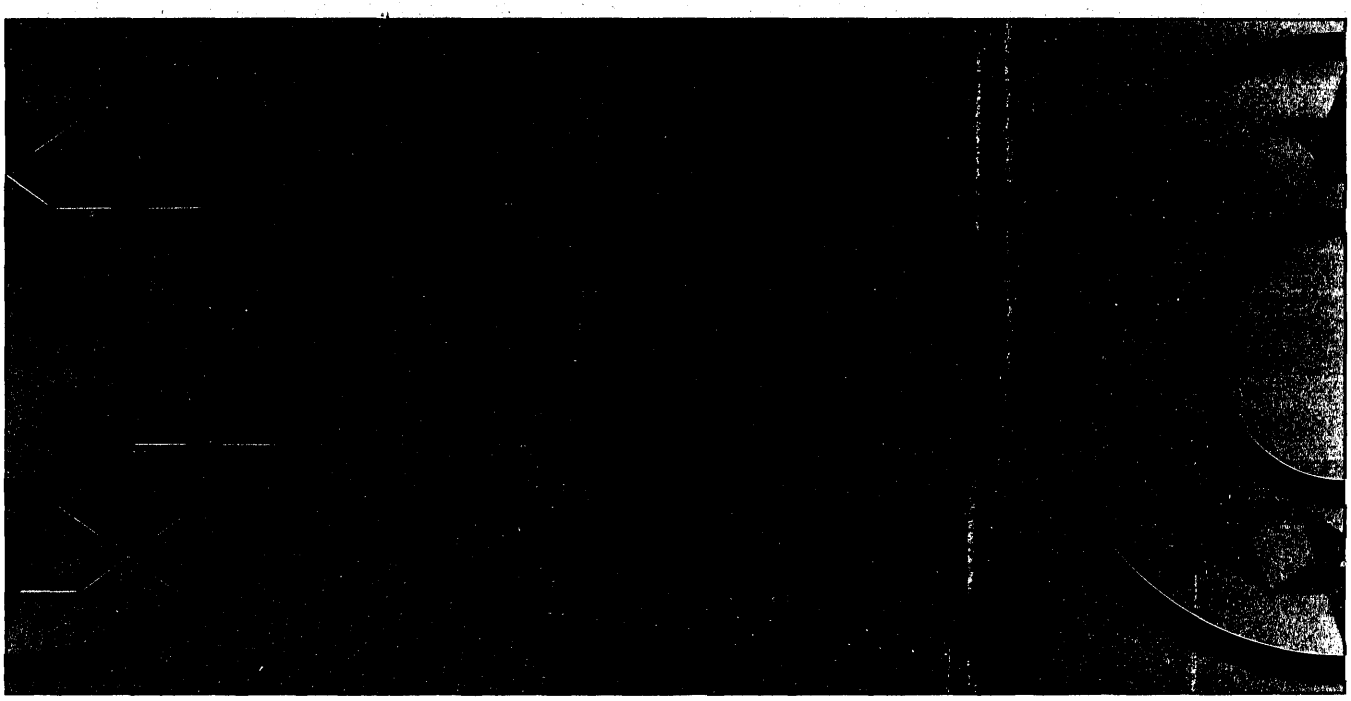
Value is real

If a single conclusion could be reached after listening to the many excellent presentations, it would have to be that computing is finally beginning to be of real value to the physician in the care of the critically ill patient. This is true whether the computers are dedicated or shared, and whether "on-line" means the use of typewriter and crt devices or instrumentation for signal processing. The advantages of being on-line are accessibility to computing in the first case, and adequate response time in both cases. These capabilities are now enhanced by a growing repertoire of things which we can do with computers which are useful to the physician.

Officers of the San Diego Biomedical Symposium this year include: W. A. Shafer, president; Sherman Klein, treasurer; and Paul Sherertz, secretary. Program co-chairmen were James W. Covell and Richard D. Yoder. Printed proceedings were available at the door and may be purchased for $15.00. Inquiries should be addressed to the San Diego Biomedical Symposium, P.O. Box 965, San Diego, California 92112.

—Richard D. Yoder, M.D.

There's a computer system that makes time-sharing profitable. You must be star gazing.



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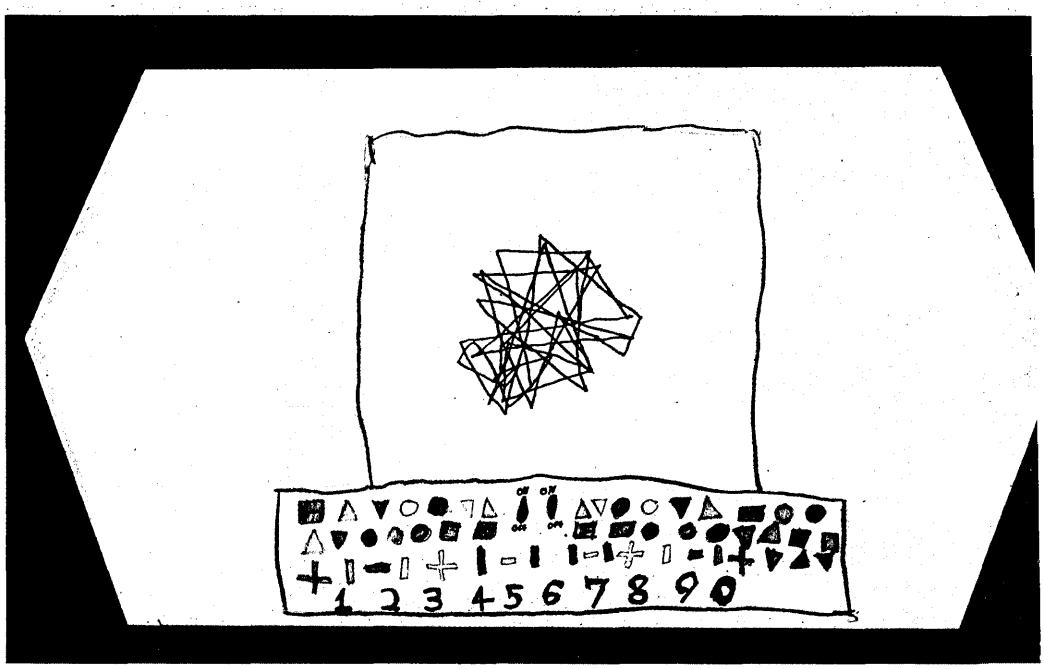
Pictures and opinions from some of the children who entered Data General's computer art contest

Amy's grand prize entry " . . . started out to be a star. Mrs. Green and I were the only ones in class who knew what a computer was."

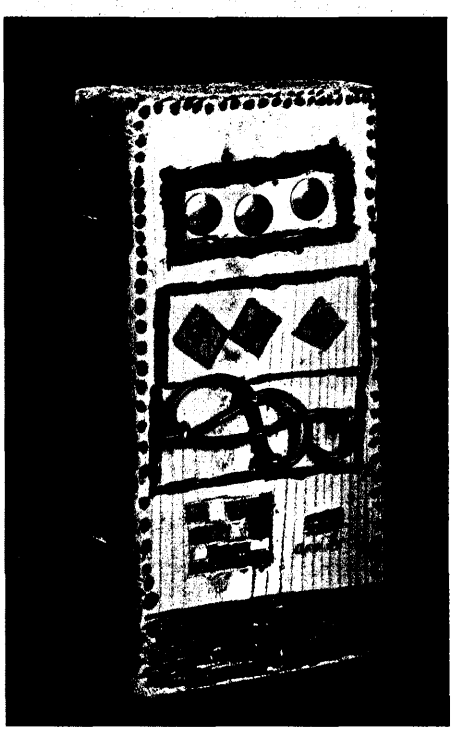


Amy Smith, 10, was grand prize winner out of 600 entrants. She lives in Seattle.

KIDS AND

by Angeline Pantages, Special Features Editor

Maya Ohl, 10, of Sudbury, Mass. Her entry at right was second best of show.



"I played tic-tac-toe with a Nova once, but I lost. Computers take jobs away but people don't want to work that much."

So the electronic data processing industry is the third largest in the world, and a computer is used in almost every major field of endeavor. Who cares? Carla Saltzman wants to be a princess.

To this delightful five-year-old and to many other children entering Data General's "Kids and Computers" art contest this spring, a computer is just something you draw, scribble, carve, or paste together. You make it like a batmobile, a robot, an "Outomatic Criminal Finder" (you know, a truck with a load of names and addresses like Joker, Salbury Ave., Riddler, New Ave., Ruby Stealer, St. Sue St.), a box "with tape recorders," animals—all kinds, the "Star-Trek" computer, or "something like this with triangles, circles, buttons, and an Easter egg for decoration because it was near Easter time." If you're a budding young scientist, as many of the 600 entrants were, a computer is, well, almost like the real thing,

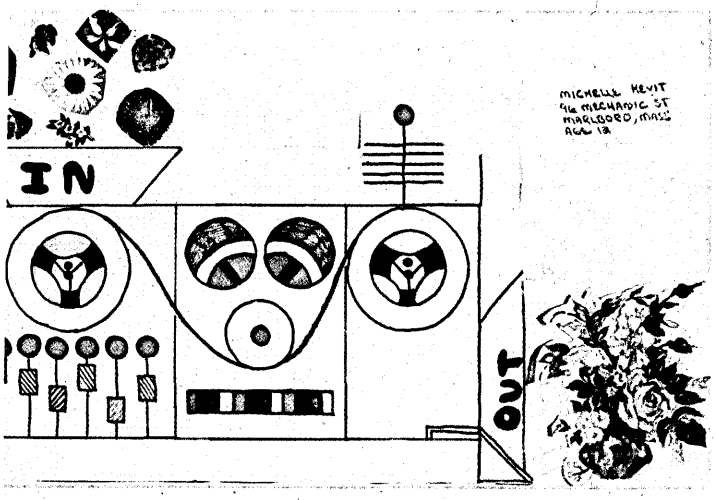
Michelle Kevit is 12, and lives in Marlboro, Mass. Her entry was first in the 10-12 group.

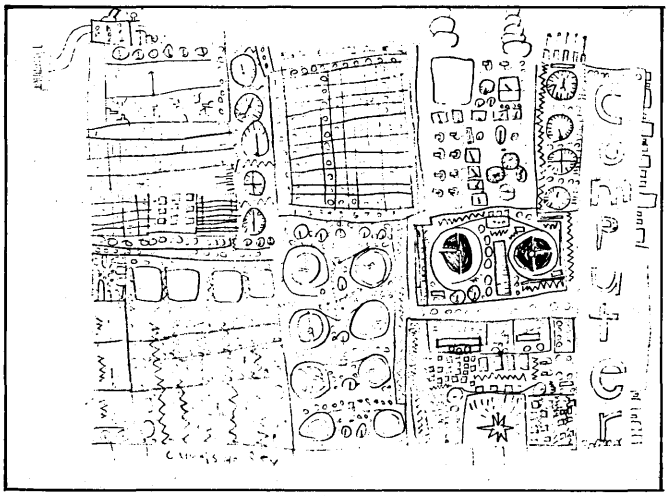
Curtis Helsey of Bridgewater, Va. is 7 and placed second in his age group.

Holly Anderson from Acton, Mass. entered the happy computer at lower right.

"Computers are okay for people because it helps them with their arithmetic."

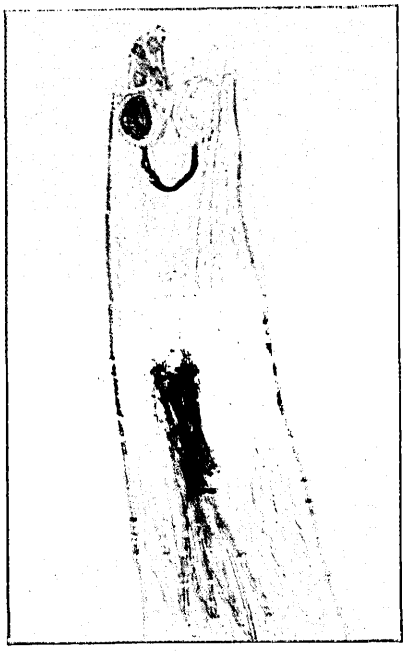
"There's no mystery. So many flowers go in and a bouquet comes out."





COMPUTERS

What do you think a computer is, Holly? . . . Holly? "What?"



with switches and dials and wires.

For Data General, what started out as a local contest to obtain children's art for next year's calendar practically turned into an international event. A single ad in Science and a press release picked up by newspapers around the country netted 600 entries from 31 states and other countries, including Hungary, Canada, Germany, and Australia.

The Wakefield School, Wakefield, Mass., sent a van over to Data General with 20 three-dimensional entries from its students, including a four-foot-high robot; 25 entries came from Lake Havasu City Elementary School in Arizona; and 30 were submitted by children at the Fairbank School in Sudbury, Mass. Twenty-four entries came from a brother and sister in Detroit; and William A. Kindru's four girls from Delmar, N.Y., submitted eight drawings with explanatory text (the robot computer "wears a big hat, and when he cooks buns, his master says good boy and he gets paid a dollar. For a good pizza his master pays him 10 dollars").

Five judges—from Fortune magazine, Harvard University Center for the Visual Arts, the Boston Museum of Science, Boston's Children's Museum, and the Boston Museum of Fine Arts—traipsed around the exhibits in the Data General plant to select 10 winners. That's two from each age category: preschool, 5-7, 8-9, and 10-12, and first and second place over-all.

DATAMATION presents the entries of some of these winners and of others on these pages. In completely on-the-record interviews with the children, we found out what they thought of computers (see captions).

None were sparked by their brief brush with computers to aspire to become a computer something-or-other "though computers might be fun as a hobby"—and mostly, if they were interested at all, they wanted to know what a computer did, rather than what it was made of.

PERSPECTIVE

an interpretive review of significant developments

IBM's System/370 Surfaces But is That all There is?

The international brotherhood of magicians pulled the first rabbit out of the System 370 hat the last day of June — two computers, a big new disc system, high-speed printer, and new 360-compatible program products.

The world's data processing community had long awaited the New Systems from the industry's most powerful computer company, buzzing all the while with catch-phrases like "fourth generation" and "variable micrologic." Although Thomas J. Watson, Jr., had described the announcement as the "second most important" that IBM had ever made, those who had been anticipating the dropping of a second shoe, a departure from the existing order of a magnitude like that represented by the 360 series, were left disappointed.

The two new computers, the 370/155 and 165, were no great surprise to many. They do hit the upper end of the line, the 155 being a "grow to" system to 360/40 and 50 users which impacts the 65 and 75; and the 165 being the next step for 65 and 75 users, and maybe even strong enough to destroy the sales potential of the 85. Users were surprised that IBM did not announce additional equipment known to be in development for the higher volume, more lucrative lower end — Mod 30, 40, and 50 replacements. Other manufacturers are expected to attack that market with new systems: RCA was waiting in the wings with three new computers at writing; Honeywell has three 200 series systems and new terminals in the offing, although it's not clear how the GE deal will effect this; and NCR has the Century 50 and 300 and remote terminals ready.

Absent were mentions of variable firmware, of virtual memory, of the incorporation of peripheral controllers into the cpu. After the press releases were digested and the chaff discarded, the image of an evolutionary machine not that much brighter nor bigger than its predecessors emerged. Perhaps that should not have been surprising, for it is unlikely that any company — least likely IBM — will ever shake the foundations of its user audience as profoundly as IBM did with the introduction of the incompatible 360 series. Compatibility is the new key word now. With the exception of some new instructions added to the set, and software features to handle the new peripherals, the 360 OS and DOS user can move to the 370 without more than the usual software problem.

Technically, the numerical designation of the 370 series accurately reflects the fact that the new is only a step away from the old, not a quantum jump. The fact is reflected in the circuitry, built on a technology called Monolithic Systems Technology (MST) in which the circuits are up to eight times more densely packed than the 360's.

The most exciting of the hardware features is the memory architecture. Both machines enjoy an advantage

over all but the largest existing machines in the world in that they have an associative buffer memory which makes their larger, slow bulk core look just as fast as the cpu. One of the biggest lessons of the '60s, this kind of memory architecture keeps the central processor busy and still can be implemented at acceptable cost.

Just to show that the step taken was not uncomfortably big, the first page of every packet of information about the 370 contained a statement to the effect that the vast majority of 360 programs would run on the new series of machines without reprogramming, through the agency of emulation, and that those programs could be run in a multiprogramming environment alongside 370 series jobs, and even that 360 DOS programs could be run alongside 360 OS (either MST or MFT) programs on one of the machines.

In the 370, IBM has recognized and met several of the requirements for machines of the '70s, including the need for large data bases, for massive I/O rates and remote computing, and even to some extent for error recovery and debugging aids. But the company has not gone so far as to reinvent its great grey wheel, for it seems to have neglected — largely by ignoring them — the need for remote terminals and their administration systems, the desire for redundancy in processors for reliability, and the wish for programmer access to the microcode.

Giving credit where it is due, some of the 360's problems are solved in the 370 through the design of its peripherals. For instance, it seems that Burroughs and GE have long known that effective time-sharing and multiprogramming require the presence of bulk, relatively fast disc memory; and IBM has agreed to give this to its customers in the form of the 2305, a fixed-head-per-track unit previously announced for use with the 360/75 and larger machines. IBM has not seen fit to yet give its customers the base address register to go with the disc ... maybe on the 380 series.

Along with the 2305 is a higher density, faster 2314 disc subsystem replacement called the 3330 which will put on-line 800 million bytes of memory accessible in 30 msec. Users were glad to see it, but some expressed disappointment in that it could have been built three years ago and still did not fill the really big storage needs of many who will have to look for trillion-bit systems from other vendors.

The 370/155 is billed as being four times as fast — internally — as the 360/50. The 165 is touted as up to five times faster internally than the 360/65. These speeds do not necessarily translate into throughput timings since it can be expected that a pro-

	360/50	370/155	360/65	370/165
CPU				
cycle time	2 usec	115 nsec	750 nsec	80 nsec
word size	32 bits	32/64 bits	64 bits	64 bits
arithmetic	fixed (32-bit), decimal floating (32- or 64-bit)	fixed (64-bit), decimal floating (32-, 64-, or 128-bit)	fixed (32-bit), decimal floating (32- or 64-bit)	fixed (32-bit), decimal floating (32-, 64,- or 128-bit)
registers	16 general purpose	16 general purpose	16 general purpose	16 general purpose
MEMORY				
buffer cycle time	N/A	115 nsec	N/A	80 nsec
buffer size	N/A	8000 bytes	N/A	8000 or 16,000 bytes
core cycle time	2 usec (for 4 bytes)	2.1 usec (for 8 bytes)	750 nsec (for 8 bytes)	2 usec (for up to 32 bytes)
core size	up to 524 KB	up to 2 MB	up to 1048 KB	up to 3 MB
I/O				
number of channels	3	3 - 6	4	up to 12
aggregate data rate	1 MHz	5.8 MHz	4.5 MHz	8 MHz

gram would have to be rewritten to take advantage of new features, and rewriting programs is not acceptable as a rule of the game.

Channel capacities have been expanded to take advantage of the faster cpu's and peripherals. The 155 will come standard with three channels, including two block multiplexor channels and one byte multiplexor channel. Three more block multiplexing channels can be added. The 165 can have up to 12 channels, for an aggregate data rate of 8 million bytes/second compared to the 155's 5.8 million tops. The block multiplexing channels, which will be used to drive most of the big peripherals, are rated at 3 megabytes and 1.5 megabytes for the 165 and 155, respectively.

The price half of the price/performance story reads this way: The 155 runs $47,985/month for a typical configuration where "typical" includes four channels, emulators for the 1400 and 7010 (which is actually the same emulator), an 85 cps printer/keyboard console, an eight-drive 3330, 768K bytes of core, a card reader/punch, eight tape drives, 2703 communications control unit, a 3211 printer (2000 1pm, faster with a smaller character set), and the necessary controllers. Such a configuration would sell for $2,248,550 and maintenance would run $6,050/month.

Prices for the 165 are almost double the 155's. For instance, $98,715/month rents a one million byte system with three channels, three 2305 discs, two 3330 disc pack systems, a printer, card reader/punch, and 12 tape drives. Purchase on that mix would be $4,674,160 and maintenance would be $12,452/month.

The price figures lead to a purchase to lease ratio in the order of 50 to 1, and indicate, as closely as we can figure, about 50% increases over the cost of comparable 360/50 and 360/65 systems.

But hear this! For what appears to be the first time, IBM gives the 370 purchaser a full year's warranty ... just like you get on a vacuum cleaner, and probably better than the unenforceable version that comes with your new car. By eliminating one year's worth of maintenance charges, the warranty will also make the purchase/lease ratio look less forbidding.

The 165 can emulate too, but it emulates the 7070, 7080, and 7090 series machines. Never be called incompatible again, IBM has made it possible, if we read the tracks right, to run a 709 emulation program written for a 7090 on a 360/70 which is emulating the 90 under 360/OS.

The 165 also comes with a crt operator's console and a microfiche file to be used for diagnostic purposes. Are they trying to warn us? Although double the price of a 155, the 165 also brings a faster cpu and buffer (80 nsec compared to 115 nsec), a data path that is eight bytes wide everywhere — while the 155's is only four bytes between the buffer and cpu — a more sophisticated buffer organization needed by the faster cpu, and four-way core interleaving.

Some say that the 370/165 is a minor reworking of the 85 to make that super-scale machine more price competitive. The new decimal rounding instruction, for example, is thought to be there to make the 165 upward compatible. In the same vein, extended precision (128-bit numbers) floating-point hardware is available for the 370/155 as an option, and comes standard on the 165. Similarly, an optional high-speed multiply stunt box, like that of the 360/85, allows for 64-bit floating multiplies in 610 nsec, fixed multiplies in as little as 420 nsec.

Of course even the fourth generation cannot run without software. IBM proved that it really believes in unbundling by not introducing a 370/OS at this time. In fact, all of the products that were announced can be used on the 360 too, including: a PL/I optimizing compiler, additional ANSI Cobol features, extensions to Fortran H and the Fortran library, improvements in Assembler H, a fast sort/merge for OS that will support both the 3330 disc and ASCII files (which seems awfully low priced at $60/ month), a new Information Management System, and enhancements to GPSS.

Overall, the user feels he's seen only the top of the iceberg. He awaits that communications ability, vital cpu features like relocation, and more new peripherals. He is also, somewhat fearfully, waiting for the new OS and to see what the piecemeal announcements and enhancements will cost in systems engineering time, education, and program products.

IBM is apparently already doing a masterful job of selling top management on the 370, and the dp managers are wondering if they can stave off the pressure from the top until more rabbits are out of the hat.

— Angeline Pantages and R. A. McLaughlin

NEWS SCENE

Twenty-Three Cent CAI System Aimed by Mitre

Critics complain that computer-assisted instruction (CAI) systems are too expensive, narrow in scope, difficult to apply and most have been one-shot experimental ventures.

Mitre Corp. this month talked of a new system they think will escape the criticism. Called TICCET (Time-shared Interactive Computer-Controlled Educational Television), it's still a prototype — but they're confident it will be installed in 1,000 schools in 1974 and can be operated at an astonishingly low cost of 23 cents per terminal hour. Prototypes are to be installed in two schools in 1972, allowing two years of intense use before it goes on the market. That cost of 23 cents, Mitre researchers say, can be achieved with a turnkey system of 128 terminals in a school with 500 students.

Mitre, a nonprofit r&d organization founded by MIT, so far has funded the project internally. But it is seeking outside money and thinks its nonprofit status will enhance the possibility of aid. The National Science Foundation is considering a proposal prepared jointly by Mitre and Research for Better Schools, Inc., an organization largely responsible for the TICCET instructional strategy and content. Help also is sought in software development.

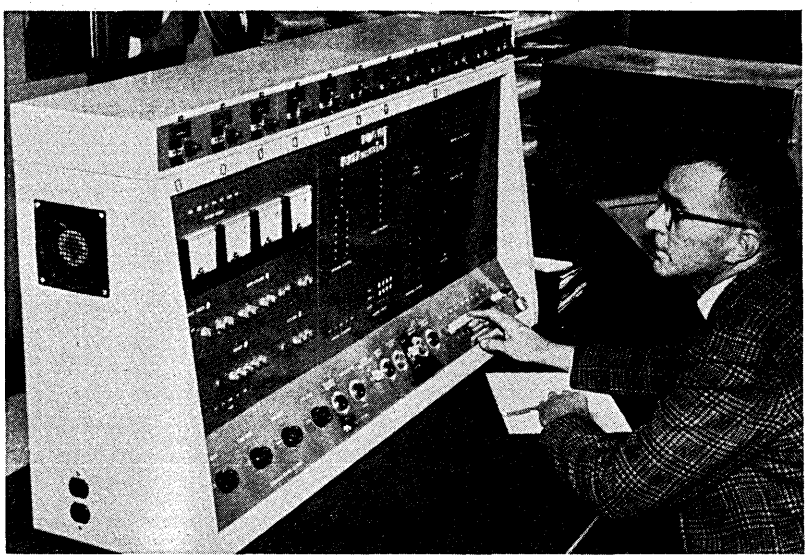
TICCET uses standard hardware and special-purpose software to reduce costs. A small computer — a DDP-516 in the prototype — will be used in each school, in contrast to the concept of a large central computer serving many schools advanced in other CAI systems, such as the Plato IV planned at the University of Illinois. Mitre researchers say small computers are getting cheaper and are more reliable.

Projected costs for 1974 indicate the hardware may be purchased for $155K per 500-pupil school. Estimating the 23¢ cost per terminal hour for one hour of use per child per day, this corresponds to an approximate 5% increase in today's education costs — an increase that could be offset by adding only one student to an average class. Assuming education costs continue to rise, while computer costs fall, a still lower cost percentage increment would prevail in four years. Present CAI systems, with similar capabilities, typically cost $3-10 per terminal hour, so that even in 1974, Mitre feels 23¢ should be low.

It calculates its costs this way: construction of a large quantity of systems slashes costs in half, and projected decreases in costs for 1974 result in another 50% reduction. Additional savings are attributable to the design of the system, which would also reduce the schools' expenses, not by replacing teachers, but by replacing "teachers' aids," those clerical employees who are primarily concerned with keeping track of test results and classroom teaching aids.

The TICCET terminals consist of an ordinary tv set with headphones and a standard alphanumeric keyboard. The cpu retrieves alphanumeric, picture, and voice outputs on an individualized basis, utilizing disc storage. With a 65K-word memory, the data base is large enough to accommodate a complete reading and arithmetic curriculum for an elementary school. Four disc drives are used. Rapid retrieval of data is achieved with an overlapped seek scheme in which the average disc access time is reduced to rotational latency values.

Direct memory access is used to link the cpu to the tv display system. A minicomputer is used as a keyboard multiplexer, and a low-speed magnetic tape drive is used to record student performance for later analysis, while a printer provides hardcopy summary information for teachers and administrators. The tv display system consists of a pair of magnetic video storage discs, each with 64 tracks. The recording on these tracks is dense enough so that each track



Gone But Not All Gone

The last of Honeywell's giant first generation D-1000s and one of the last of the big vacuum tube machines in active service, this system at the Baltimore & Ohio/Chesapeake & Ohio Railroad office in Baltimore was retired with all the honors which would have been accorded a revered old steam locomotive.

Today the console of the $1.5 million, 40-ton system and one of its tape units with its 26 lb., three inch wide reels, occupies a place of honor in the B&O railroad museum in Baltimore. A second tape unit is in the Smithsonian Institution. The giant system saw 10 years and 8 months of active service. In all, seven D-1000s were installed. The last of the others was retired about two years ago.

can store all the information for a two-level gray-scale tv picture in a single field.

The audio system largely utilizes the same hardware already required for generating pictures. Each spoken word is processed by the cpu and written on the tv disc as if it were a pictorial frame. Some tv disc tracks are connected to tv displays, while other tracks feed D/A converters driving headphones.

The prototype does not actually serve 128 terminals, but uses six actual terminals, with the remainder software-simulated. Maximum use is made of available core by storing infrequently used algorithms as frames on discs, plus the use of the video disc to buffer voice data. On-line efficiency of accessing is maximized by performing as much data base maintenance off-line as possible. A computer at an "authoring" site — a 360/50 in the prototype — will be used to generate curriculum disc packs for distribution to user schools. Pictorial data is entered into the data base by digitizing the output of a vidicon camera, a method once proposed by little known Technomics in Santa Monica.

Significantly, the outside preparation of curriculum discs prevents teachers from modifying the material, just as they cannot alter textbooks.

The principal challenge faced in the design of the software has been the need to provide for a huge throughput and at the same time to accommodate many independent service requests that must be answered with fractional-second responses. Special purpose software should keep execution time for each request short. A custom-tailored monitor is ordered around functional queues, where highest priority is given to those functions that contribute toward keeping the I/O channels busy. These two factors in the design keep the queues short and service fast. Although the data base is frame-oriented, algorithmic frames allow great flexibility.

Mitre is developing TICCET at a time when most firms are retrenching their CAI efforts in disillusionment after overoptimistic predictions of past years, and illusory profits. How the TICCET system could eventually be marketed is as yet unclear. Mitre itself is prohibited by its charter from being in the hardware business, so somehow it must develop a plan, perhaps with government aid, for sources to be developed to sell the systems. The systems preferably would be available for leasing to schools, and multiple sources should be provided for authoring of curriculum disc packs.

There are 126,000 potential user schools out there. If Mitre's calculations are correct all that's needed is a thousand. **— F. Barry Nelson**

GSA Unveils FY'71 Procurement Goals

Tight controls over separately priced software are being sought by the General Services Administration from vendors who want to be listed on the FY'71 Federal Supply Schedule.

GSA also is demanding: additional discounts and credits from suppliers of system maintenance and rented data processing equipment; documented proof that a newly installed dp system has performed successfully, on-site; and similarly convincing proof from suppliers of "accessorial equipment."

The extent to which these new terms appear in the final FY'71 FSS contracts depends on how persuasive and/or stubborn the government and vendor negotiating terms are. So far, RCA is the only major system supplier to sign with GSA for FY'71. A GSA spokesman said RCA has agreed to "virtually all the new provisions."

The section covering separately priced software (which RCA doesn't offer) requires the supplier to fulfill any written claim he makes concerning the "physical, design, or functional characteristics of a product and of an installation date" with liability for liquidated or other damages the penalty for failure. If a program doesn't work and a contractor can't fix it within 30 days, the contract is cancelled.

Rental charges begin on the next working day after delivery and rental may be discontinued on 30 days written notice. Discounts are asked for on rentals exceeding a year and for contracts for more than one type of program. A contractor would have to correct program errors within five days of notification or risk rental loss.

GSA said it wants the proof of successful on-site performance because "it will help us determine whether we're entitled to a credit if and when the system malfunctions."

GSA's proposed standard of performance for accessorial equipment requires operation at an "average effectiveness level of 90% for 30 consecutive days" (or a different mutually agreed upon period). The acceptable level would be determined by dividing total productive time by the sum of productive time and downtime. If it isn't achieved in 30 days, performance tests would continue and rental charges would start with the first day of successful performance. On purchased gear the government would not be obligated to pay until completion of a successful test period.

GSA also is asking for reduced rentals on all dp hardware in use for more than a year, reduced maintenance rates on leased and government owned dp equipment where installations are clustered, and extra credits from suppliers of rented dpe when their hardware disables equipment owned by the government or rented from other vendors. The extra credit provision would go into operation whenever rented equipment was out of operation for 12 or more hours during any 24-hour period.

If government owned equipment was disabled, the vendor responsible would have to pay .5% of its monthly maintenance charge and if another vendor's equipment was harmed the penalty for each hour of downtime would amount to 1/200th of the monthly rental and maintenance charges.

Other new terms proposed by GSA include: rental systems with downtime rates exceeding 10% of total operational use over three months would be subject to replacement; a system vendor would be obligated to pay conversion credits even if he didn't provide the predecessor system; on overseas installations, liquidated damages would be collectable if a contractor failed to install a system within 30 days after delivery; if dp equipment doesn't work and has to be replaced, the government would be entitled to a new guarantee; and a contractor would be required to modify equipment to operate on a 50 or 60 cycle current at no additional charge. *(Continued on page 62)*

Regroup at ACM With New President, Director

The newly elected top representative of 27,000 computer professionals is Walter M. Carlson, president of the Association for Computing Machinery. Carlson is an IBM corporate marketing consultant at Armonk. His priorities are in the humanities sector of computing — individual professional growth and recognition, "effective" technological education, and increased awareness of social implications. He will be assisted by Dr. Anthony Ralston, vice president, and Charles L. Bradshaw, secretary. Ralston is chairman of the computer science department, N. Y. State University at Buffalo, and Bradshaw is board chairman of General Computer Services, Inc., Huntsville, Ala.

In another development, Gordon Smith, former head of international marketing for Univac and more recently with the Diebold Group as vp and head of the research program, has been named interim executive director for ACM replacing Don Madden who has joined Compata, Inc., in the Palo Alto office.

Smith is expected to head the newly in-the-black organization for from two to four months, the time new ACM president Walter Carlson predicts it will take to select a permanent director.

Bill Would Extend Use of Computers by Congress

A legislative reorganization bill authorizing establishment of two computer systems for Congress has been okayed by the House Rules Committee and sent to the floor. Some opposition to the measure (HR 17654) has developed, but knowledgeable observers believe it will be passed by the House, and possibly by the Senate, before the end of the current congressional session.

The bill also would give more scope and staff to the Legislative Reference Service of the Library of Congress and change its title to "Congressional Research Service." The Service would provide any Senate or House committee with research, analytical and evaluative assistance it required. It would have authority to employ outside experts — individuals or organizations — in specialized fields of knowledge.

One of the new computer systems would provide a budgetary-fiscal information service to both houses of Congress. The other would provide each house with a data bank capable of satisfying legislators' information needs.

A 12-member House and Senate joint committee would run the show with the help of a staff headed by a $40K a year director and a deputy paid $36K. The needed hardware would be acquired by purchase, lease, "or otherwise," including use of service bureau facilities.

The joint committed also would watch over costs and utilization of adp within the legislative branch, hire outside experts and set up and pay advisory groups.

70's Computer Use Shift May be a Glass Slipper

The king will be dethroned in the 70's and Cinderella will become queen, Joan Van Horn said in effect at ADAPSO's recent management conference in Washington, D.C. Miss Van Horn, president of VIP Systems, thought the king would be displaced by a shift in computer usage — from in-house systems to an "information processing utility."

Large-scale computers will be the predominant kind of purchase by utility operators, she explained, and "IBM has never had predominance" in this market. Commercial service bureaus will get "well over 50%" of every dollar spent by dp users during the 70's versus 5% today, Miss Van Horn said, because the service bureaus will operate the utilities. She also predicted that service bureaus will provide customer support now supplied by hardware makers and some communications services now supplied by common carriers.

Another speaker, Dr. Herbert W. Robinson, vp of CDC, said "the provision of complete supercomputer and communications networks by the computer manufacturer will vastly reduce the capital needed to enter the service bureau business."

It may be significant that none of the conference speakers regarded communications common carriers as possible operators of information processing utilities.

The conference thinking was "the seventies: decade of the computer services industry," and virtually all of the speakers look forward to the future in typical chamber of commerce fashion. But ADAPSO's general counsel, Milton Wessel, suggested service bureaus would face additional problems as well as additional opportunities.

"Expanding social concepts are making the courts more critical of companies which market defective products or services," he said. One result is that in the 70's, service bureaus will run greater risk of being penalized for computer errors, for violating individual privacy, and for performing professional services without a proper license.

State laws banning unfair competition represent another threat, "with the result that the (dp services) industry will . . . experience increased liability to competitors for conduct such as alleged theft of trade secrets or interference with advantageous commercial relations."

Wessel believes "that the 1970's will see the establishment of a new statutory form of software protection and that during the '70's, organized labor will enter the industry."

Hazeltine Offers In-House Training Service

As if purveyors of seminars and packaged training courses weren't in enough trouble already because of the recession, a new department of the 3,000-man Hazeltine Corp. is now trying to lure user firms away from seminars with an in-house training service. What Hazeltine Data System Services does is organize and, if necessary, administrate training programs according to the specific needs and planning goals of a user firm, considering the skills of their personnel today, and what will be needed in the future. The eight-man Hazeltine group, headquartered in Little Neck, N.Y., relies on independent consultants and college professors to supplement its staff, and claims capabilities for instructing anything from com-

puter operating to systems analysis and design. They'll even teach executives how to deal with their computer centers under the aegis of "user training."

Price for the service is $300 per man-day expenses for each Hazeltine consultant. They'll go anywhere in the U.S. or Canada.

Blessings on Autoflow as Patent Flows In

A landmark first-in-software patent is being granted to Applied Data Research, Inc., for Autoflow, a two-dimensional flowchart system that was first marketed in 1966, and was the first software product to be put on the GSA schedule. ADR applied for the patent in 1965, has been a staunch fighter for software protection ever since, and received government grace with the notification that there would be 45 separate features cited in the patent to be assigned to ADR in the name of vice president Martin Goetz.

Autoflow has been installed in more than 1200 dp facilities, and has piled up a total revenue of $6 million for its originator company. Sales have been particularly strong in Europe for the past several months.

NEW COMPANIES

Companies are putting forth more than one catch-name to catch the business. **Computeria, Inc.,** is a catch-all for almost anything a person could ask for, like representation, conversion, installation and proprietary programs support (under its **Compugram** service); turnkey design, procurement, installation and startup of computer sites, systems and software, with remote access terminals (under its **Compusite** service); and systems engineering and consultation for design and application of process control, with time-sharing, supervisory, direct digital, and instrument configurations (**Polycomp** service). All this is located in Braintree, Mass.... **Aydin Data System,** Fort Washington, Pa., consists of **Monitor Systems,** at home, and **Stellarmetrics,** Santa Barbara, Calif., the latter specializing in aerospace.... **Iotron International, Inc.,** has been founded by Peter Dietz in Sunnyvale, Calif., featuring its CADET program for automating engineering and manufacturing processes, and COMET, display retrieval system .

Philadelphia firm, Management Concepts, Inc., has created a Chicago subsidiary, **Malt Keyboard Dynamics, Inc.,** to show trainees how to operate any keyboard equipment now used in dp, printing and publishing. The reason for its name is Mrs. Lillian G. Malt, an international expert in behavioral science, who has furnished the guidelines for the courses.

MERGERS, ACQUISITIONS

Something new in tentative plans was propounded when **Clary Corp.** announced it had agreed in principle to merge with **Addmaster Corp.,** but neither one of the San Gabriel, Calif.-based companies had decided who would be the survivor, mainly because they were waiting for the other shoe to drop on the merger rule changes advocated by the Accounting Principles Board... But **Automatic Data Processing, Inc.,** Clifton, N.J.-based computer service center operator, went ahead with its plans to add **Delta Data Processing, Inc.,** San Jose, Calif., to its national network, on a pooling-of-interests basis, which is one of the practices under question.... **Academy Computing Corp.,** the time-sharing network based in Oklahoma City, is continuing to spread its web with acquisitions, the latest being an agreement to absorb **Compute America Corp.** (COMERICA), a batch processing service and hardware marketer, based in the same city, but with centers and offices in the middle west and eastern seaboard cities.

NEWS BRIEFS

More Burroughs

While other companies cut back, Burroughs Corp. has announced a spinoff of its operations to create a new Systems Manufacturing and Engineering Group, once part of the Business Machines Group. The new group will be responsible for development and manufacture of dp systems, while the old group will remain in charge of marketing them. In charge of the new organization (nine plants, 13,000 employees) will be DuRay E. Stromback, vice president/group executive; Richard Baily continues as vp/ge of the older group. Both have been with Burroughs for more than 20 years.

A Million for a Hundred

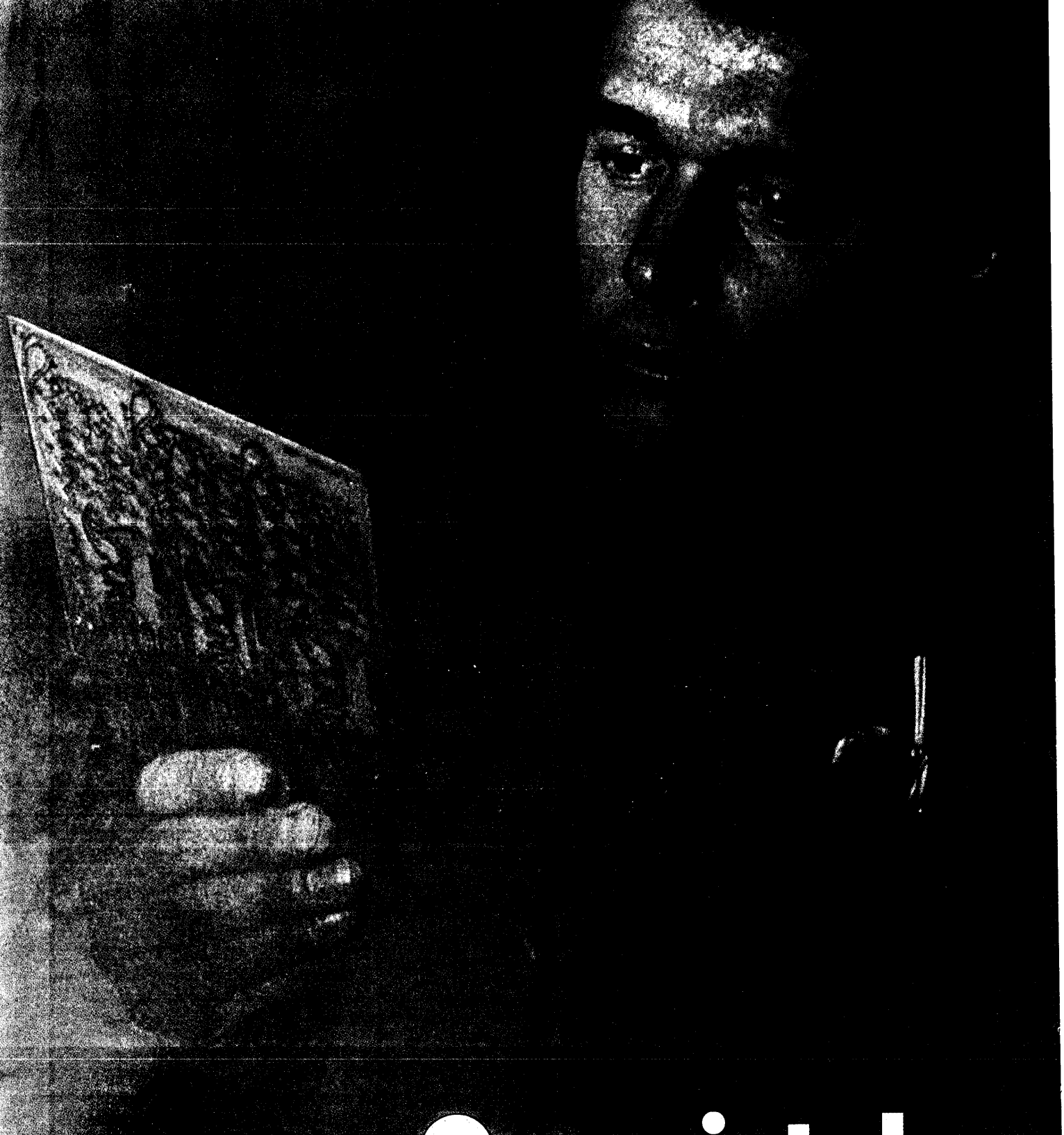
A million-dollar order for 100 minicomputers was received by Computer Automation, Inc., from a Sepulveda, Calif., company, Data Instrument, Inc., to use in their DATAPLEX systems. DATAPLEX processes business data at point of origin for computer entry, eliminates batching, coding, keypunching, verifying and pooling, thereby claims it gets down cost-per-unit record to .2¢ as compared to 5½¢ for regular keypunch. CAI's models 808 and 208 will interface with the system's automatic cassette handling unit, I/O writer, mag tape drives, and a variety of options.

Testing, One to Three

Less than one third of the applicants taking the DPMA data processing examination passed this year, it was announced. Certificates have been issued to the successful 718, who were tested on equipment, programming and software, management principles, quantitative methods, and systems analysis and design. Total CDP recipients since the exam was first given in 1962 now amount to 11,069.

All About Environment

A bill establishing an environmental data bank, "central national depository of all information, knowledge and data relating to the environment," is being studied by a subcommittee headed by Congressman John Dingell of Michigan, the man who introduced it, and appears due for some Congressional action this session despite reported Administration opposition. If established, the proposed data bank would be operated by a National Environmental Data Bank Board whose services, along with the bank itself, would be available to Federal, state and local governments.



Our print shop

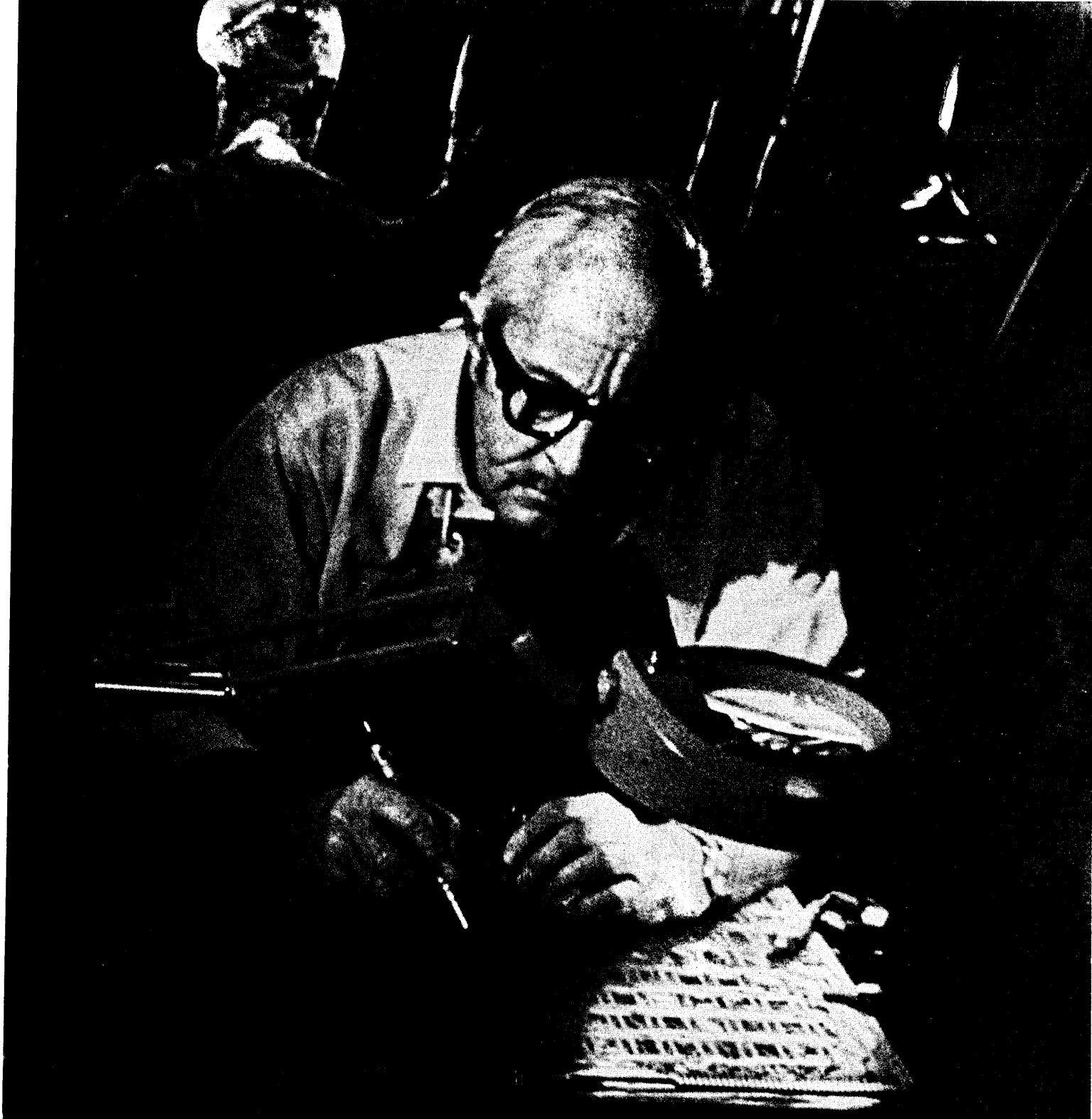
We're pretty sure that we're the largest manufacturer of complex printed circuitry in the world.

Over the past nine years we've shown our printed circuit competitors no mercy. We've manufactured more double-sided and multilayer plated-through-hole boards than anyone else.

Last year we introduced flexible circuits.

What next? Multilayer circuit boards with electrical characteristics controllable to such a fine degree that designers can use the boards themselves as electronic components, that's what.

But printed circuits are only part of the story. We can immodestly state that we've shipped more bits of high speed — one microsecond or faster — core memory than



turns out best sellers.

all other independent manufacturers combined. Plated wire memories with 150 nanosecond read cycle time speeds are the hot new item in our memory department right now.

As long as we have printed circuits and memories going for us, we might as well manufacture our own computer. And we do. The MAC 16 control computer. We make the entire mainframe, all the parts, ourselves. There's not another manufacturer of mini computers that can say the same.

We could go on and brag about all the big names on our customer list. But enough is enough.

Lockheed Electronics
Data Products Division
A Division of Lockheed Aircraft Corporation
6201 E. Randolph St., Los Angeles, California 90022

DO ELEPHANTS RESENT BEING FED TOBACCO?

Remember what elephants never do?

And you've probably heard that an elephant will hold a grudge for years. Especially against the fool who would feed him tobacco.

But the truth is that elephants are quite fond of chewing tobacco (so long as it's not burning at the time). And only elephant doctors have very strong feelings about it at all.

We ask this irrelevant elephant question to jog your memory. Of course we'd rather replace it. Because we're the memory company. The company that makes a whole line of drum and disk memories and a brand new controller.

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DRUM AND DISK MEMORIES – CONTROLLERS

EXPAND YOUR MEMORY

CIRCLE 124 ON READER CARD

Laser Memory

The Model 6314 laser-based memory system won't be ready for deliveries until August or September of 1971, but it is far from a paper machine. The memory is operating in prototype form now, and is actually a scaled down version of the previously announced Model 690-212 trillion bit laser memory system.

The storage medium for the memory is a magnetic tape strip, roughly 31x5 inches, in which small holes are burned by the laser beam. The holes are not refillable, so the memory lacks the ability to erase or rewrite. Nevertheless, with the ability to access data in an average of 160 msec and transfer at up to 500KC, the 6314 should find homes in many applications—in insurance firms, utility companies, and title insurance records keeping outfits, for instance—where records are fixed or can be updated in ledger form. (The user can leave blanks anywhere in his records and later add information.)

Two versions are offered. Both use four magnetic strips which are wrapped around a single drum and pass under the same read/write head. Both store 10 billion bits of data and, with the help of a Hewlett-Packard 2116B minicomputer front-end, look just like an IBM 2314 disc subsystem to a 360 series computer (but with six times the storage). The two models differ in that one is detuned to transfer data at 2314 speed (312KC) rather than at 500KC. Prices start at $360,000 compared to $248K plus for a single nine-spindle 2314. Rentals, including 24-hour maintenance, will be in the $15,000 range. PRECISION INSTRUMENT CO., Palo Alto, Calif. For information:

CIRCLE 302 ON READER CARD

$1486 CRT Terminal

Display terminal manufacturers seem to be playing "can you top this?" by offering more and more features and/or a lower price. Latest entrant is the Series 400 DATA-SCREEN Terminal. The price figure above is for the basic 12-inch screen (512-character display) model without keyboard; but adding another 512 characters (you can have up to 1,536), a keyboard (choice of three), and edit capability, the price jumps to only $2256.

Other options available include a special data panel containing color messages of your choice on the screen; I/O adapters for asynchronous, synchronous, parallel and tty operation; a memory; selective blinking; multistation operation; format protection; and hard copy printing.

The vital statistics read: 68 5x7 dot matrix ASCII characters (up to 64 characters per line), four additional special symbols, a refresh rate of 60 Hz, and a data transmission rate

ranging from 300 to 9600 baud. Interfaces for most systems will be available along with the unit in September. TEC, INC. Eden Prairie, Minn. For information:

CIRCLE 303 ON READER CARD

Microfilm Recorders

Joining the still select group of under $50,000 computer output microfilmers is the CMS-5000, a machine which can be purchased in on-line or off-line versions and which offers many more controls than its immediate competitors. The 5000 receives input format descriptions and tab instructions through a built-in single-card reader, which enables it to print ASCII or IBM-compatible tapes in line printer formats.

An unusual feature the device offers is on-line film processing, said to slow only slightly the maximum 60KC character printing rate (which is equivalent to about 20,000 lpm).

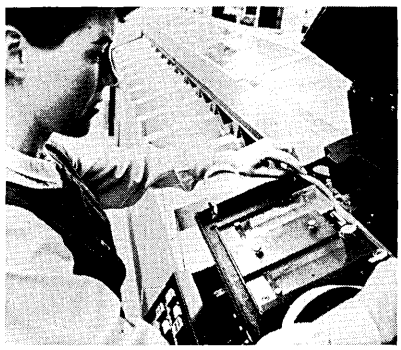
Available with cameras for 16mm or 105mm film or both, the 5000 uses a 64-character set and lays its images in either cine or comic format.

The on-line 16mm-only version sells for just under $50K. To go off-line with its own tape unit or to add on-line film processing runs about $10K more. Deliveries are slated for the fourth quarter of this year. COMPUTER MIRCO-IMAGE SYSTEMS INC., Chatsworth, Calif. For information:

CIRCLE 304 ON READER CARD

Input Microfilmer

Making a microfilm copy of input materials can be helpful or necessary for oil companies and other firms which process card invoices or in other applications where it is unreasonable to save the source data in its original form. Most of these applications, however, require high speed filming. The Input Image microfilm recorder works at high speed—to 2400 documents per minute—and also has the neat facility of working on-line with an ocr reader or sorter. In fact, the box is attached to a sorter or recorder and becomes a part of it; the path for each document is only extended a bit. There are no additional



input steps for the operator to take.

Input Image uses film cassettes and allows for photographing either or both sides of input documents, and those documents can vary from 2¾x3¼ to 4¾x8¾ inches, depending on the device to which the imager is attached. Reduction ratios to 40:1 allow for filming images in pairs across the 16mm film.

The idea was Terminal Data Corp.'s. REI customers can obtain it for use with their ocr systems for about $1,950/month or $73,825 on purchase. RECOGNITION EQUIPMENT INC., Dallas, Texas. For information:

CIRCLE 306 ON READER CARD

(Continued on p. 72)

HARDWARE CONTINUED

Batch Terminal

If a "systems architect" is one who assembles hardware and software of various manufacturers to form a tailored complex, then this vendor should at least be called a "systems constructor" for doing the same thing on a smaller scale with a batch terminal, the GH 500. Assembled from a General Automation SPC-12 minicomputer, a 300 lpm printer, 400 cpm card reader, and a Teletype for an I/O console, the 500 is offered with line communications interfaces for 2000 or 9600 baud lines and performs its code conversions—from Hollerith to either EBCDIC, XS-3, or ASCII—within the software.

The standard configuration is delivered with 4K bytes of 2.16 μsec core, but this can be expanded to 16K in 4K increments. Priced at $39,625 in the batch terminal version, the system can also be ordered in versions for off-line tape to printer applications or for communications work.

Software includes a card assembler, conversational assembler, card and tape IOCS, a basic utility system, subroutine library, and a communications controller routine. Deliveries take 90 days. GH COMPUTERS, INC., Los Angeles, Calif. For information:

CIRCLE 307 ON READER CARD

300 cps Printer

This printer, the LP 3000, fills the void between the character-at-a-time and high-speed line printers, according to the manufacturer. Its speed is 300 5x7 dot matrix characters per second, or 135 lines a minute, using 64 characters and 132 columns. The print mechanism is a horizontal scanning, rotating stylus with 12 impact actuators. It is said to produce clear, clean multiple copies.

Directed toward the OEM market, the LP 3000 features a $4,400 single unit price, the result of LSI and the simplicity of the print mechanism. At

present only an upper case character font with some symbols are provided with the ASCII-compatible printer.

Delivery of the LP 3000 will begin in November and production quantities will be available in the first quarter of 1971. POTTER INSTRUMENT CO., INC., Plainview, N.Y. For information:

CIRCLE 305 ON READER CARD

Compact Computer

Datamate 70 is a 16-bit digital computer for on-line data acquisition, control and monitoring, time-sharing, automatic testing and instrumentation, as well as educational applications. Micro-circuitry enables 1K of ROM and 256 words of scratch pad memory, a 1-usec add time cpu, and space for I/O controllers to be housed in a cabinet measuring only 1¾x19x 20 inches.

Additional memory up to 32K, as well as faster memories, are optional. Features include 11 hardware registers—four of which are arithmetic accumulators—an index register for input/output at up to 1 megawords/-sec., six addressing modes, built-in add/substract (with hardware multiply and divide also available), 144 machine instructions, and up to 64 priority interrupts. Peripherals for which interfaces exist are paper tape and card equipment, magnetic tape, disc, terminals, and communications equipment.

Software supplied consists of an assembler, a symbolic editor, relocating loader, I/O drivers, diagnostics, and a debug package. The mini costs $5900 plus interfaces, cannot be leased, and will be available in September. DATAMATE COMPUTER SYSTEMS, INC., Big Spring, Texas. For information:

CIRCLE 308 ON READER CARD

CRT Terminal

This Teletype replacement, the DD-70 alphanumeric crt display terminal, is available in 1024- or 256-character configurations (with like amounts of storage), has a built-in modem for teleprocessing and a 50K baud serial I/O interface for in-house data communications, plus Teletype and RS-232B interfaces.

Designed primarily for use with the manufacturer's own turnkey data entry and communication systems, each terminal has its own address, which permits operation in a polling scheme. It also has capability for local or remote definition of characters; i.e., fixed, variable, duplicate or highlight. This allows complete formatting and table selection.

The display can be configured in 8, 16 or 32 lines of 32 characters. An optional feature is the addition of a delay line that permits retention of more than one page of data. Keyboard configurations include Teletype, keypunch, separate numeric pad, and cursor control.

The price of the DD-70 starts at $3500 for a single unit. Quantity discounts and third-party lease contracts are available. The first units are being delivered this month. Delivery is 60 days ARO. MARK COMPUTER SYSTEMS, INC., Plainview, N.Y. For information:

CIRCLE 309 ON READER CARD

360 Commo Processor

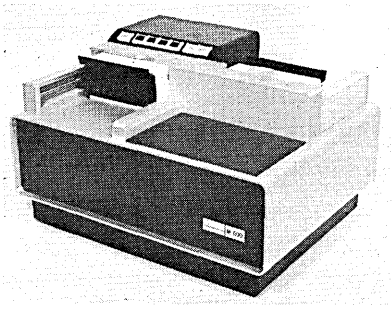
CIP (Communications Interface Processor) is a turnkey system that enables multiplexing of low speed terminals directly into 360 computers without software modification. Consisting of processor, ROM for multiplexing/demultiplexing and OS compatibility, 360 interface hardware, and line adapters, CIP takes care of code conversion, network maintenance and monitoring. The system supports up to 12 multiplexors over full duplex, voice grade lines (1200, 2400 or 4800 baud) and up to 176 low speed (600 baud) lines. The ceiling on the low speed lines is determined by the number of channels addressable by the 360 systems.

Software for CIP includes automatic polling as a standard feature, code conversion, diagnostics and executive programs. Basic price for the CIP is $65,000 and a number of lease plans are available. Service and installation are priced separately. Delivery is four months ARO. ULTRONIC SYSTEMS, Mt. Laurel, N.J. For information:

CIRCLE 354 ON READER CARD

Remote Card Readers

The admonition to not fold, spindle or mutilate will continue to appear on punched cards even though this family of card readers has a "high tolerance" to those that are damaged or abused. The units—300, 600 and



1000 cpm models—are described as heavy duty and are constructed around two large castings.

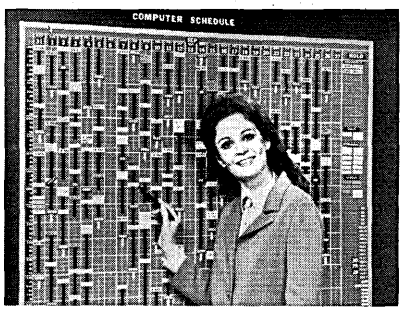
A 1000-card input hopper has air riffling, and there is a short (3½-inch) straight-through card track to prevent jamming.

The card readers are designed for remote use by people with little or no computer experience. They are being marketed to oem's. Unit prices range from $2395 to $3395. Deliveries are scheduled to begin this month on a 60-day ARO basis. DOCUMATION, INC., Melbourne, Fla. For information:

CIRCLE 310 ON READER CARD

Scheduling Board

A four-week computer scheduling board handles one or more edp systems using magnetic "Action-Indicators" with pre-printed activities such as Open, Search, Delay, Test Re-Run, Sort. Also included are self-adhesive letter and number sets, magnetic data, month, and time heading sets, chart tape, markets, and mag-



netic arrows. The 36x48-inch model sells for $199. MAGNATAG PRODUCTS, Rochester, N.Y. For information:

CIRCLE 311 ON READER CARD

(Continued on p. 74)

Computer Family

This family of minicomputers ranges from an 8-bit word read-only memory controller to a 16-bit 56K word multiprocessor system. The Modcomp I is the ROM controller. The II and III are 16-bit units with 4K to 32K words of 800 nsec core. Modcomp II has 256 to 512 (40-bit) words of 200 nsec ROM, and Modcomp III has 256 to 1K words.

Other features include up to 15 general registers and up to six other hardware registers, buffered I/O bus, simultaneous direct access to main memory for up to 16 peripherals, up to 32 separate interrupt levels with multiple signals per level, up to 141 instructions, plus hardware multiply/divide and floating-point.

Modcomp software begins with four executives and includes four language processors (ASCII standard FORTRAN IV, a two-pass macro assembler, a basic assembler that is a subset of the first, and a FORTRAN-coded BASIC assembler that will operate under 360 DOS and enable program compilation on System 360).

Prices for the basic system with ROM will range from $5000 to $10,000. MODULAR COMPUTER SYSTEMS, Fort Lauderdale, Fla. For information:

CIRCLE 313 ON READER CARD

Remote Batch Terminal

ComFile 88-33 is a tape-oriented batch terminal with sufficient computer power to do small business applications and control up to four input devices.

The basic system consists of the processor with 4K of 16-bit one usec core, control software, 64K characters of tape cartridge storage, and an input station. It can be expanded to four input stations, either ASR 33 or 35 tty's or the ComFile 88-03; four tape pack units with a total of 288K characters of storage; and 16K of core. Other additions are a 132 column, 200 lpm line printer; a 300 cpm card reader; and one or two computer-compatible magnetic tape drives.

The manufacturer is supplying a series of application programs such as forms generation, payroll, accounts receivable and payable, plus operator control software for information entry.

The purchase price is $17,200, and monthly rental on a one-year contract is $500, including maintenance. COMPAT CORP., Westbury, N.Y. For information:

CIRCLE 314 ON READER CARD

Mini Tape Drive

The Model 3112 Synchronous Digital Magnetic Tape Recorder features read-after-write electronics, 10 to 25 ips tape speed, and a rewind speed of 150 ips.

The drive recording formats are 9-channel, 800 bpi, or 7-channel with 200/556, 200/800, or 800/556 bpi recording densities, and are IBM compatible. In quantities of 100 the Model 3112 price is $2500; single units cost $3125. KENNEDY COMPANY, Altadena, Calif. For information:

CIRCLE 312 ON READER CARD

Data Editor

EDITIT is designed to detect explicit errors in the data that is input to an edp system, "purify" data through left or right justification and zero insertion, and segregate the purified/valid data from the errors. The user directs EDITIT in how to distinguish errors and what purification to perform through command cards. In response, EDITIT sets up tables to perform these functions.

EDITIT output may be either to tape or mass storage devices, and can be blocked if desired. The package is written in COBOL; currently available versions run on System/360 under DOS, TOS, and OS; Honeywell 200 series; and Univac 1100 series. IBM core requirement is a 24K partition. EDITIT comes with documentation, full job control for cataloging in the user system library, and a 99-year lease for $500. D. N. JAMES CORP., New York, N.Y. For information:

CIRCLE 317 ON READER CARD

Mini-cpu to S/360

This software package enables minicomputers to communicate with a System/360 by causing the minicomputer to simulate IBM communications hardware, enabling the 360 programmer to use the BTAM conventions governing 360-to-360 transmission. Thus, the minicomputer acts as a remote batch terminal with the System/360 as the central computer.

The software controls the entire transmission sequence, including "handshaking" necessary to establish line discipline, data transmission, data reception, and transmit and receive in the same call. Data is transmitted in EBCDIC, but the program can be adapted to ASCII if desired. The package also contains the routines necessary to service I/O to an auxiliary storage medium. Hardware requirements are a minicomputer with a modem interface and an auxiliary storage device; and a System/360 with a data set, the 2701 Data Adapter Unity with an SDA II adapter, and the minimum storage to support BTAM. Price is under $10K. DIGISCAN SERVICES INC., Melville, N.Y. For information:

CIRCLE 319 ON READER CARD

$199.95 COBOL Documentor

The COBOL-MAP documentation system provides two listings: the first furnishes a standard alphabetical reference directory, indicating by line number all references to every data and procedure name; the second listing—claimed to be unique—is a substitute for the COBOL compiler's listing. As well as the standard information, COBOL-MAP charts bi-directionally the label references to and from each statement of the program. This listing is set up as follows: at the origin of each symbolic label, the system provides a table of all line numbers that make reference to that label; also, at each statement that refers to symbolic labels, COBOL-MAP lists the line number of the label origins in the order of their appearance in the statement. The complete system comprises three programs—two IBM DOS sorts, and compiler interface—and costs $199.95, including documentation and one year of maintenance. PIONEER DATA SCIENCES, Wilbraham, Mass. For information:

CIRCLE 316 ON READER CARD

Microfiche Formatting

In an attempt to recoup program developmental costs, this jumbo-jet builder is offering its own computer output microfilm system called MICS (Microfiche Interface Controller/Processor System), an interactive preprocessor designed to reformat ordinary print tapes for input to the Stromberg DatagraphiX 4440 unit and, at the same time, index and title the frames.

Basic requirements for running MICS are a 32K 360/30 or larger and 43 disc tracks. The price of $12,000 includes on-site installation, instruction, and maintenance. BOEING CO., Wichita, Kan. For information:

CIRCLE 315 ON READER CARD

H-200 Inventory

The Profit II inventory management system runs on Honeywell Series 200 computers with either tape or disc, or both. Features of the system include forecasting techniques reflecting both life-cycle and seasonal trends, ordering techniques for independent or joint item replenishment, and warehouse-delivery schedules. The idea is that by means of the system's automatic analysis of current data, a distributor can immediately recognize market fluctuations in item demand and vendor activity and then adjust his inventory to meet these changing conditions. HONEYWELL, Wellesley Hills, Mass. For information:

CIRCLE 318 ON READER CARD

Program Protection

It'll be pretty hard for someone to steal a disc pack copy of your programs if you're using Auto-Source. The package centralizes all source program decks onto a disc, where cryptographic techniques scramble them. Passwords are used to prevent unauthorized access and modifications to a program. The package automatically compiles any program through a control card. Auto-Source also has the ability to compare the operational program to the protected program and note any discrepancies. It runs on System/360 Models 25 and up. Price is $3100. RAPID RESPONSE SYSTEMS, INC., New York, N.Y. For information:

CIRCLE 320 ON READER CARD

Payroll

This payroll package was designed for the NCR Century 100 and 200 computers, but the producers will implement it on other machine makes at extra cost. Straight forwardly designated the General Payroll System, it consists of about 20 COBOL programs that handle the range of payroll calculations, deductions and reporting. It also does file maintenance and provides an audit trail. The programs require 32K of core and some can be modified for 16K machines.

The system is priced at $3000. Systems and program documentation, installation, assistance, on-site orientation, and instruction, and a guarantee against program and system errors are included. DCS, INC., Montoursville, Pa. For information:

CIRCLE 322 ON READER CARD

PEOPLE

A former director of management systems for IBM, **James T. Lawson,** has gone over to Ultronic Systems Corp. as president, succeeding **Robert S. Sinn,** company founder, who becomes board chairman. Ultronics, a Sylvania company based in Mt. Laurel, N.J., makes peripherals and data communications equipment, specializes in brokerage-financial systems. . . . One of the six Univac breakaways who founded Mohawk Data Sciences Corp. six years ago, **Richard P. Rifenburgh,** has been named president of that company on the recommendation of another founder, **V. E. Johnson,** who passed on the post, but remains chairman of the board, "establishing directions, markets and products for the company." . . . Resignations came from two big-time, topline, longtime execs: **Jack DeVries,** chairman and president of Computer Applications, Inc., since 1961, was replaced by **Joseph A. Delario,** president of E.B.S. Data Processing, CAI's comparatively successful service bureau operation; and **Harvey Goodman,** founder, chief executive officer and chairman of DPF&G, said he wished to devote more time to his family and personal interests—and DPF&G has had a bad year. . . . After looking for a long time since the departure of **Ed Hecht** last fall, Sterling Computer Systems, Inc., Houston, has found a new president, **Thomas E. Holdsworth,** a recruit from IBM's Service Bureau Corp. with 13 years' experience. Meanwhile, the parent company, Sterling Electronics, has pledged a 77% interest in SCSI to secure an extension of its $9.5 million bank debt for two more years. . . . Victor Comptometer Corp. has brought in new blood with the election of **George W. May** as president and chief operating officer. May was president of Litton's Kimball Systems Div. He succeeds **Alvin F. Bakewell,** 69, who first came to Victor in 1927 in export sales, and will now be vice chairman of the board in charge of international operations and electronics and research activities. . . . General Dynamics has brought over **Dause L. Bibby** to be president of Stromberg DatagraphiX, Inc., San Diego, in addition to his duties as president of another GD subsidiary, Stromberg Carlson. Former president **Carl V. Shannon** will be on special assignment with GD president Roger Lewis. ■

WASHINGTON REPORT

NAS REPORT EXPANDS TERMINAL MARKET

Interfaces between terminals and the public telephone system don't have to be supplied exclusively by the carriers; a standardization-certification program can be established to qualify independently-made terminals with built-in interfaces.

This was one of the key conclusions recently reached by a National Academy of Sciences Panel in a long-awaited analysis of the foreign attachment problem. By endorsing interface standards, the panel has laid the basis for much wider use of foreign attachments, which ultimately could produce new markets for independent terminal makers, and better service for telecommunications users.

The adoption process is certain to take quite awhile, though, if only because the panel recommends a "step-by-step development" and "carefully" phased-in implementation of the interface standards and related component and equipment certification procedures. But even before FCC can begin thinking about development and implementation, it will have to give the disputants time to argue about the adequacy of the NAS report, the effectiveness of the standards-certification approach, and the kind of organization needed to carry out the program.

One question sure to be discussed at length in these comments is whether the carriers should continue supplying some terminal interfaces on an exclusive basis, outside whatever standardization-certification program is established. The NAS panel dodged this issue by concluding that either approach, "alone or in parallel, in such proportions as non-technical factors might determine, can supply the requisite degree of network protection."

In any event, there is no doubt about Ma Bell's opinion. Shortly after the report was released an AT&T press release announced that "The...recommendations on enforced standardization and certification... provide an added and complementary method of safeguarding service quality...We look forward to working with all interested parties in considering the possible implementation of the standardization and certification program recommended by the panel." (Emphasis added.)

DOD PUTS THE HEAT ON SOFTWARE SUPPLIERS

New Pentagon regulations require a supplier of separately priced software to guarantee that his program will perform stipulated functions on designated equipment; run times, core requirements, terminal response times, and other performance characteristics must also be stated in the contract. A benchmark test is required before acceptance of a program, and DOD demands unlimited rights to all programs, data bases, and documentation that results from development-type software contracts.

CAPITOL ARRIVAL

VIP Systems' newest software product is a highly interactive audio response system named Lawrence Andrew Frazier. Lawrence, born June 4th, was developed jointly by Mr. and Mrs. Louis Frazier. He is VIP's marketing manager; she, more widely known as Joan Van Horn, is president of the company.

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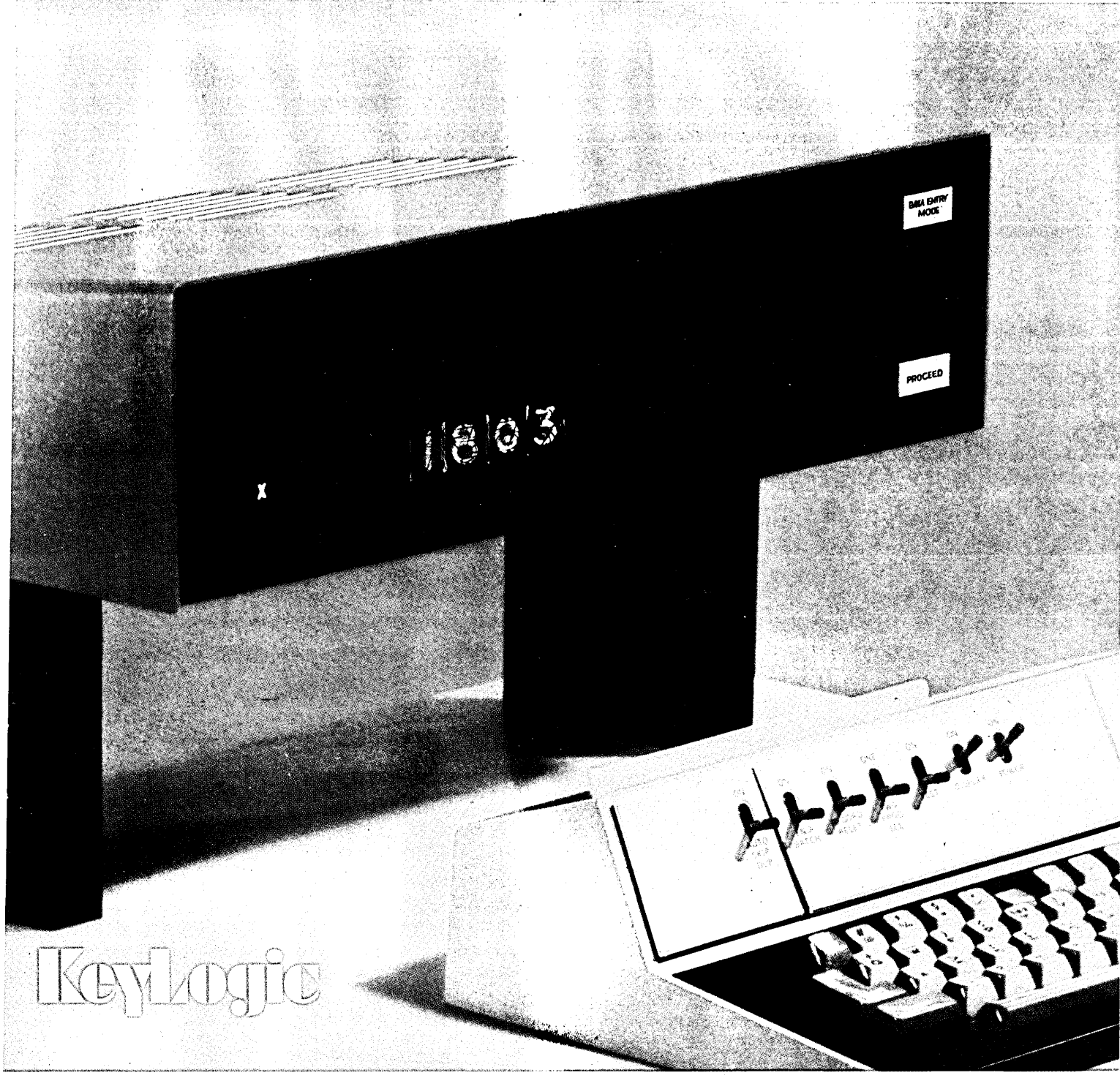

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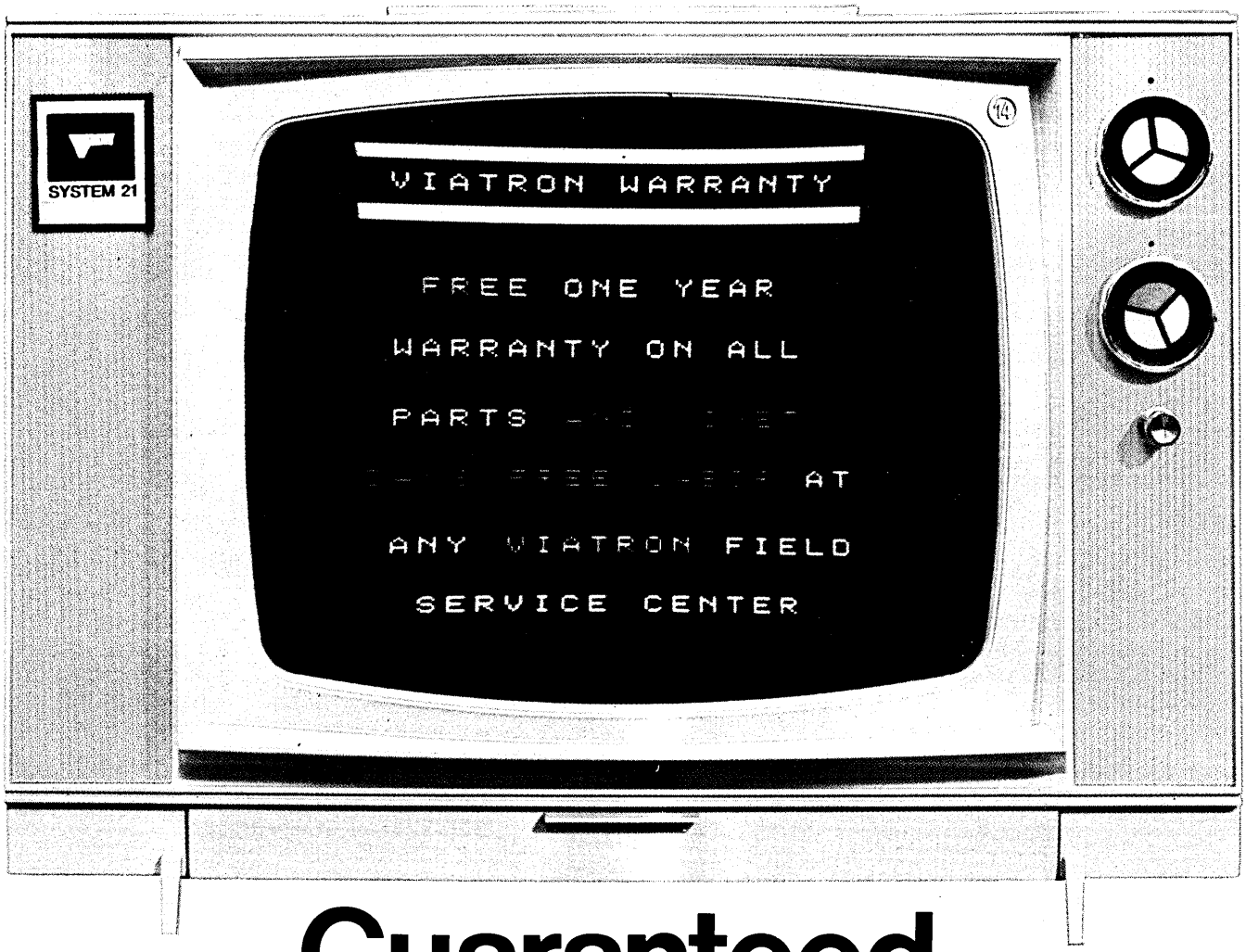

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