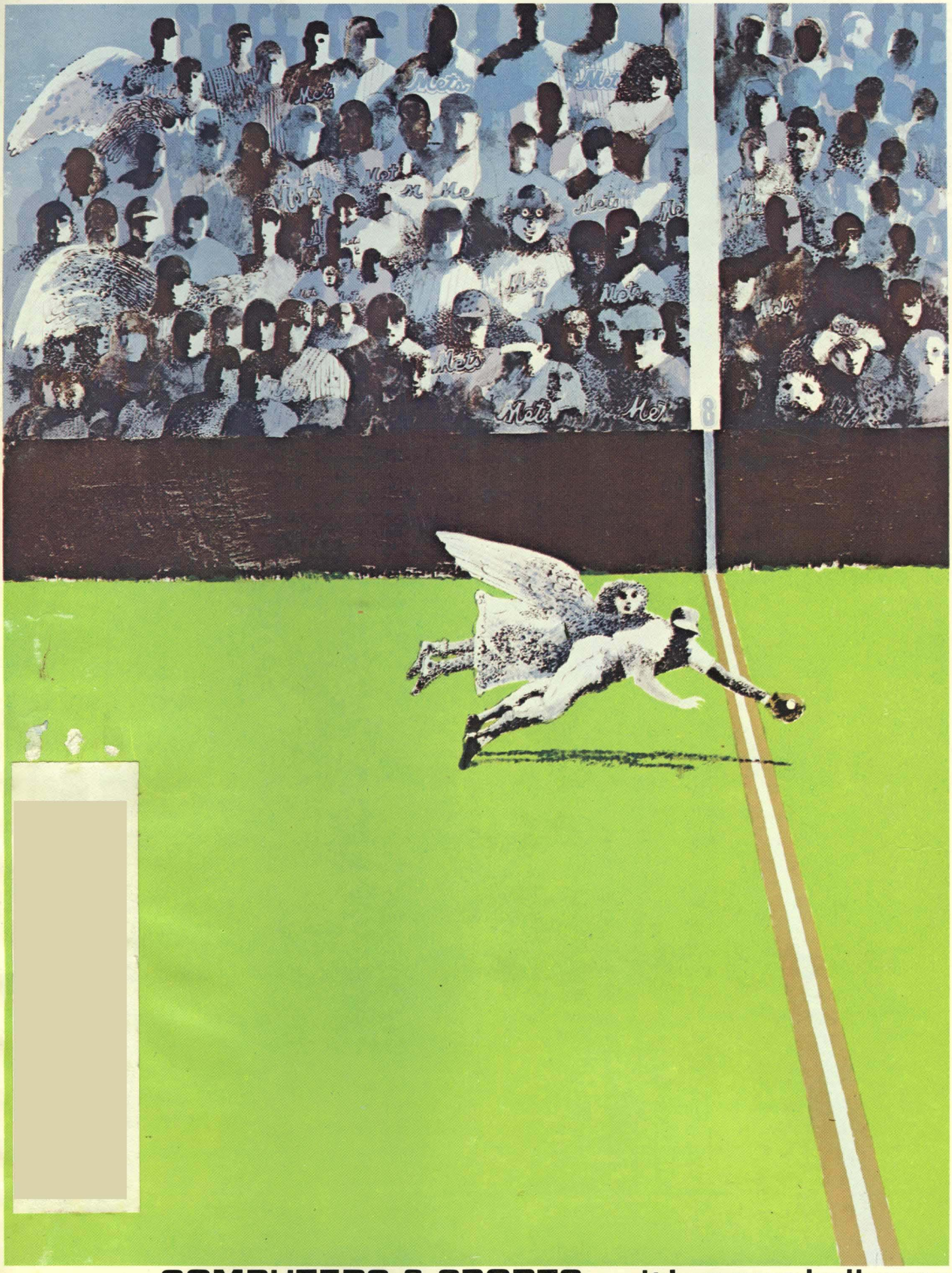
DATAMATION 71®

June 1



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We've made a great computer a lot better.

Varian's new 620/L has a dramatic price/performance ratio that gives more computer in less space at lower cost. The 620/L is an advanced design of the reliable, field-proven (over 1300 installed worldwide), systems-oriented 620/i computer.

Priced at only $7700, the 620/L has an 8K, 16-bit, high-performance memory that can be expanded to 32K inexpensively. Each 4K memory increment is $2300. What's more, if you don't need 8K, you'll find the basic 4K, 16-bit 620/L very attractive at $5400!

The 620/L is small, so small that when fully expanded—a 32,768-word system with all main frame options and up to eight peripheral controllers—fits into just 21 inches of rack height.

The 620/L is 100% I/O-and software-compatible with the 620/i, and new peripherals and software have been, added. All peripherals, software, and application packages (developed for earlier 620 models), as well as the 620/L itself, are off-the-shelf.

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varian data machines

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U.S. Sales Offices: Downey (213-927-1371), San Diego (714-298-9292), San Francisco (415-968-9996), Calif./Washington (301-773-6770), D.C./Chicago (312-692-7184), Ill./Waltham (617-899-8055), Mass./Detroit (313-645-9950), Mich./Minneapolis (612-926-6571), Minn./Albuquerque (505-298-5570), N. Mex./New Rochelle (914-636-8118), Rochester (716-586-3273), N.Y./Fort Washington (215-643-2355), Pa./Dallas (214-231-5145), Houston (713-781-0105), Tex./Canada: Malton, Ontario (416-677-9303). Other offices worldwide/Varian Data Machines, a Varian subsidiary, 2722 Michelson Drive, Irvine, California 92664. Telephone 714/833-2400.

CIRCLE 1 ON READER CARD

Tally Corporation
8301 South 180th Street
Kent, Washington 98031
(phone 206-251-5500)

Tell me more about saving my company money by moving more data for less.

Name _____ Title _____

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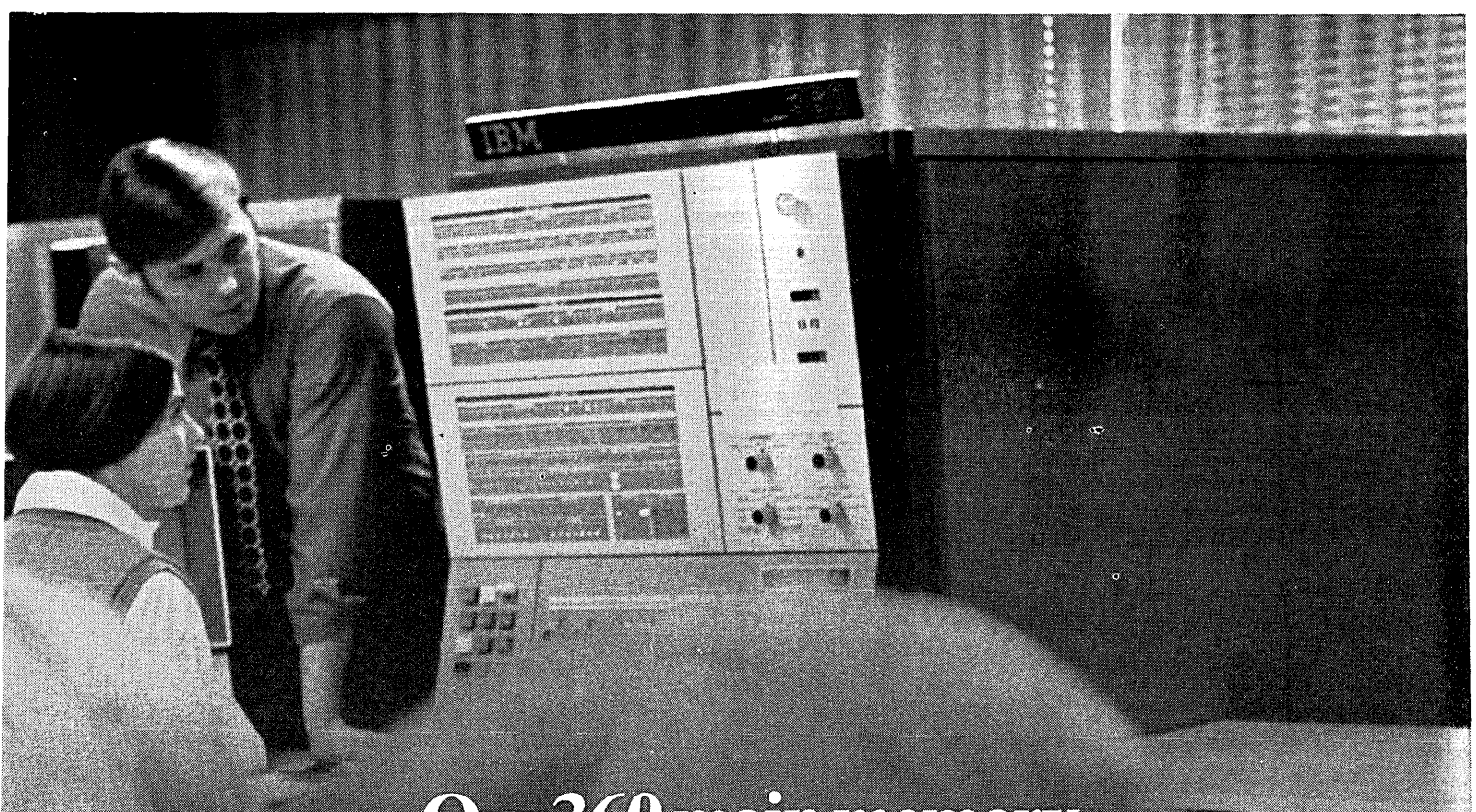
Tally rings "the Bell"



Our 360 main memory has been running a lot longer than yours.

We've logged over 100,000 operating hours on the memory technology used in our new 360/CORE add-on main memory for System/360 models 30, 40 and 50.

For two years, in applications ranging from message-switching to main computer core, we proved the performance and reliability of 360/CORE technology.

Now it is available to 360 users as the most attractive main memory alternative ever offered.

360/CORE is simple to install on a direct plug-to-plug basis. It operates exactly like your present memory, even though its design specifications exceed those of the memory you now have. It is far more compact, occupying about half as much space. Its modularity makes it easier to expand and faster to repair. And you can add capacity in more flexible increments, from 8k bytes up to 524K bytes.

In addition, 360/CORE has its own built-in power supply and diagnostics. A single lowboy cabinet houses up to 131K bytes and adds valuable counter-top workspace near your console. It was built to look like it belongs in your installation.

360/CORE costs an average of 30 per cent less than the main memory you have now, or are planning to add. But after two years and 100,000 hours of experience, we like to think of 360/CORE as the add-on main memory with the features that outshine the price.

If you want to add to or replace your 360 core, find out more about 360/CORE from Cambridge Memories.

cmi

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CIRCLE 21 ON READER CARD

360/CORE

DATAMATION®

JUNE 1, 1971
volume 17 number 11

GENERAL

COMMENTARY

About the Cover

Seymour Leichman's *Fate Takes a Hand* captures the old mystique of supernatural intervention in America's favorite pastimes. But fate may be about to take a bleacher seat as computers and probability wizards combine to broaden the field of operations for coaches and players alike. The lithograph is reproduced here courtesy of Kennedy Galleries, Inc., New York.

departments

DATAMATION®

JUNE 1, 1971

volume 17 number 11

This issue 110,632 copies

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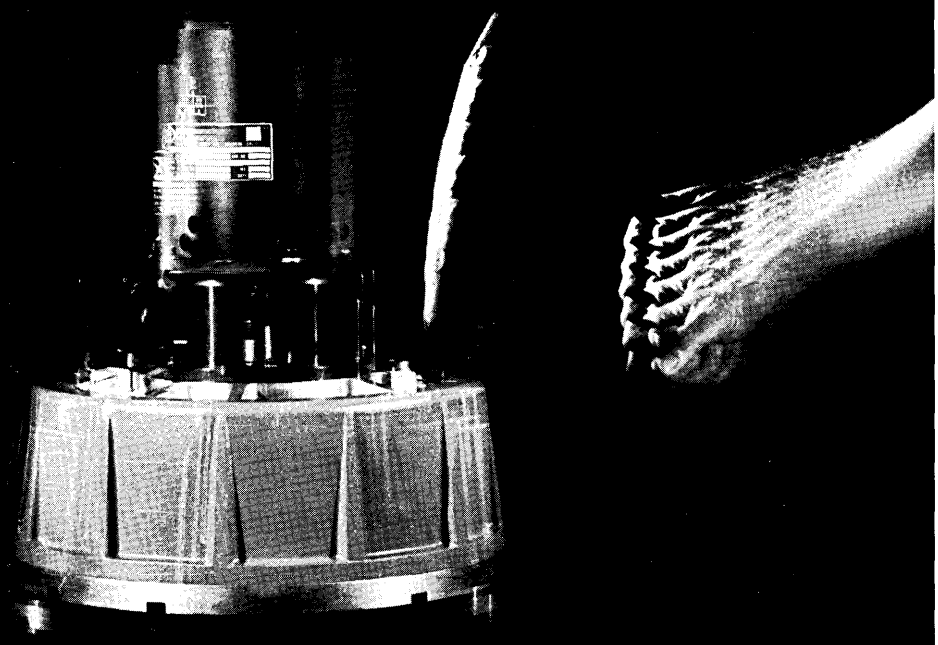


We beat the hell out of our drums

That's one reason why DATUM drum memories beat hell out of the competition. A memory device is only as good as it is reliable—which is why we rate reliability as the prime parameter in making rotating drum minimemories. And why our designers gave them such a beating* to ensure rugged, reliable performance. Test, modify; test, improve; test, refine.

To satisfy our penchant for performance we designed head-per-track, flying heads; unique military-type read/write heads restricted to one degree of mechanical freedom. We nickel-cobalt plated all drum recording surfaces.

Some of the other performance specs take some beating, too:

Storage capacities from 132,000 bits to 6,400,000 bits. Transfer rates from 1 MHz to over 2 MHz. Average access time from 8.3 ms. Prices from $895.

Our electronics package features self-clocked, peak-detecting circuits within the RETMA standard rack-mountable cast-aluminum housing.

Power supplies include voltage sensing, sequencing and all necessary memory-protect features to ensure data integrity during possible power loss.

System clocking, including master, index and track sectoring is standard.

We call these high-performance devices the DATUM Series 88 Rotating Drum Memories.

When you need reliable, low-cost core expansion to mini-/midi-computers, or other storage applications requiring rapid-access economical data bases, call us for the drums to beat.

*We'd be happy to show you an engineering report by an independent laboratory which conducted temperature, shock and vibration tests. Excerpts: *"The memory was subjected to shock forces as high as 15 G's—without incurring bit errors."*

"The memory was operational without error throughout the frequency spectrum—"

DATUM CALIFORNIA PERIPHERALS DIVISION

170 E. Liberty Avenue, Anaheim, California 92801. Telephone (714) 879-3070. TWX 910-592-1289.

CALENDAR

DATE	EVENT/SPONSOR	LOCATION	CONTACT	COST
June 11	Fifth Conference on Advances in Computing	Stony Brook, NY	Computing Center SUNY at Stony Brook Stony Brook, NY 11790	$15
June 22-25	DPMA Conference & Exposition	Houston	DPMA 505 Busse Highway Park Ridge, IL 60068	$90, members $115, others
June 24-25	ADAPSO 32nd Management Conference	Montreal	ADAPSO 551 Fifth Ave. New York, NY 10017	$80, members $100, others
July 19-21	1971 Summer Computer Simulation Conference	Boston	Donald H. Niesse McDonnell Automation Co. Dept. K676, Box 516 St. Louis, MO 63166	$50, members $55, others $25, students
Aug. 3-5	ACM'71 National Conf.	Chicago	Al Hawkes Computer Horizons 53 W. Jackson Blvd. Chicago, IL 60604	$35, members $60, others $10, students
Aug. 23-28	IFIP Congress 71	Ljubljana, Yugoslavia	IFIP Congress 71 Box 4197 New York, NY 10017	$60 $20, students
Aug. 24-27	Western Electronic Show and Convention	San Francisco	WESCON 3600 Wilshire Blvd. Los Angeles, CA 90010	$5

...try a Teletype® 37
...and look
into mag tape!

We don't have a crystal ball. And rarely resort to mystic means in recommending what terminal should be used for a particular data communications application.

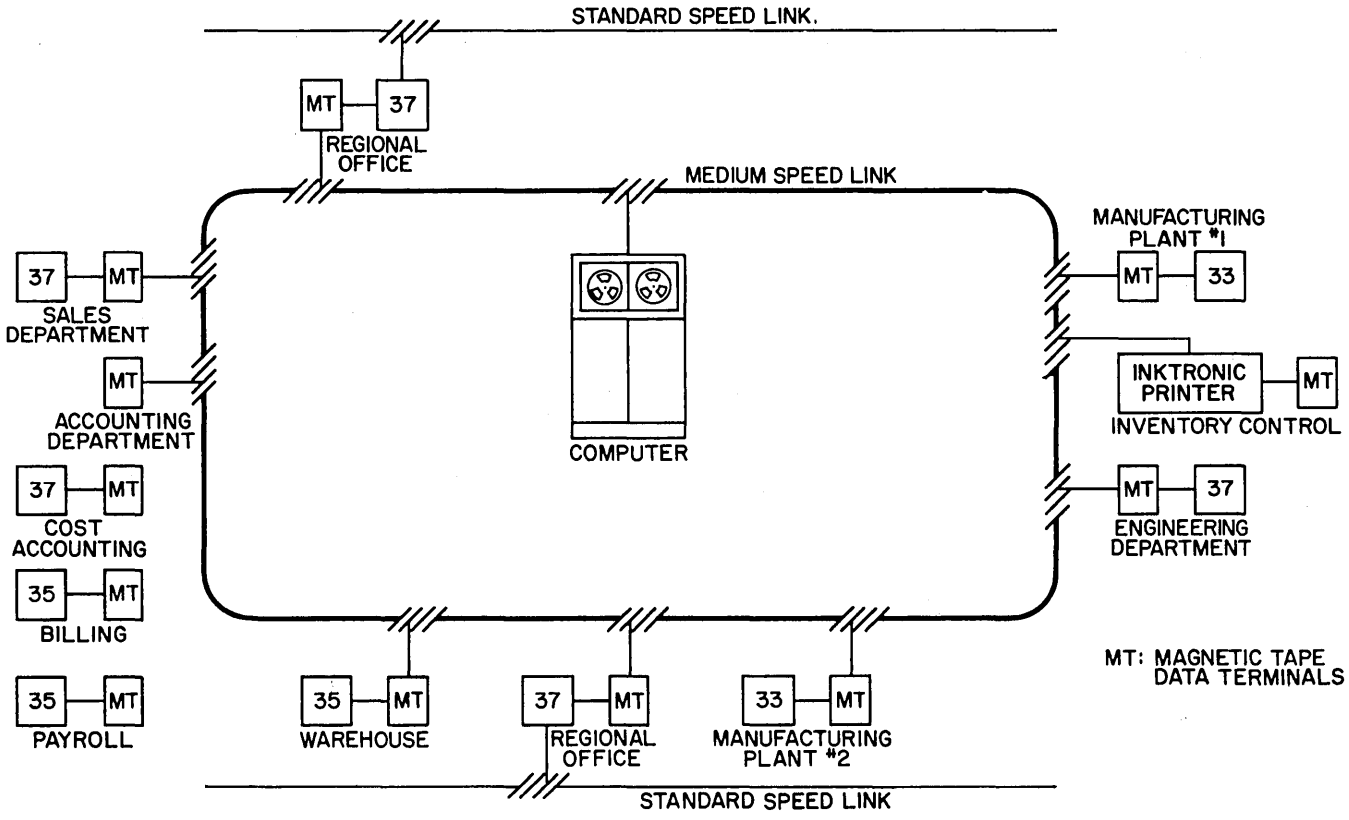
Some of the things, we at Teletype look at, that make the job a little easier are these:

Distribution	Volume
Urgency of message	Language
Frequency of use	Accuracy

The diagram below demonstrates how you can fit a number of Teletype terminals into a system based on function and usage requirements. Magnetic tape makes the speed and language of various terminals compatible. In this hypothetical case we use one computer program, one major line control procedure, one computer port, one type of data set per link. And deliver greater data through-put per on-line dollar. Using terminals that offer the best capabilities within each station's communication situation.

Using Teletype magnetic tape data terminals, combined with various Teletype keyboard send-receive sets, you obtain some unique system flexibility. And the on-line time saving aspects of operation are really dramatic. Magnetic tape data terminals can keep data flowing on-line at up to 2400 wpm.

In the example shown, the manufacturer has linked sales, engineering, accounting and inventory control departments to a central office computer. As well as manufacturing plants, warehouse and regional offices. He's covered all critical data points with a common medium speed link, using a variety of terminals. Magnetic tape data terminals make it possible.



DATA COMMUNICATIONS

equipment for on-line, real-time processing

Routine aspects of the system are maintained in standard speed links. Branch offices are tied into the regional office terminals on standard speed networks. Regional offices batch routine branch office data on one magnetic tape. Transmit the data to the central office processor at one time. Saving a number of additional computer port requirements.

Since data generated at manufacturing plants is urgently needed, but volume is low, low-cost model 33 terminals are used here. The warehouse data volume is higher, but not complex, so a heavy-duty model 35 is working here.

Volume requirements are heaviest in the accounting department. Cost accounting, payroll, billing and invoice payment functions generate data all day long. Here magnetic tape is prepared off-line at various terminals. And an on-line stand-alone magnetic tape terminal is used to transmit data to and receive data from the central processor.

Sales and engineering departments are equipped with Teletype 37 terminals. But for different reasons.

This terminal offers engineering people some unique format flexibility. Half-line and full-line forward and reverse line feed can be used to communicate complex equations and engineering formulae to the processor. It is possible to add special graphic engineering symbols to the normal compliment of letters, numbers and punctuation marks found in the typebox (up to 32).

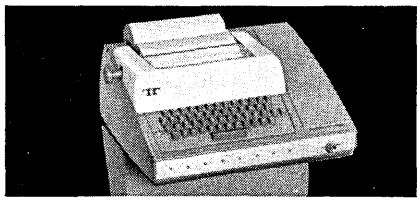
The sales department uses the model 37 for order processing. It has on-line vertical and horizontal tab set control, and form feed platen (optional) which makes data transmission and reception on multiple copy business forms easy and economical.

At the inventory control point, this manufacturer has an urgent need to obtain printed page copy of large volumes of inventory items. Magnetic tape is used to feed data to the processor and a Teletype Inktronic® KSR set receives data and prints page copy on-line up to 1200 words per minute.

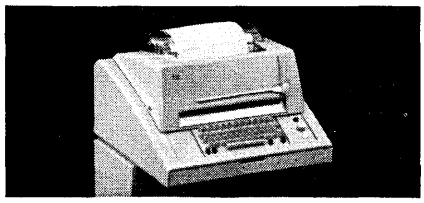
As you can see, Teletype's modular terminal design allows you to use various units as building blocks to meet the most demanding system needs. Teletype also has the station and error control accessories necessary for more efficient and economical data communications operations. Since cost is a very important part of the mix, Teletype offers greater terminal capabilities on a price/performance basis than any other manufacturer.

If you're involved in designing a teleprocessing, time-sharing, remote batch or computer switched system; looking into a multi-point private line, point-to-point private line or switched data communications network; talk to Teletype about terminals. For ideas, equipment and understanding, you'll find no better source. Anywhere.

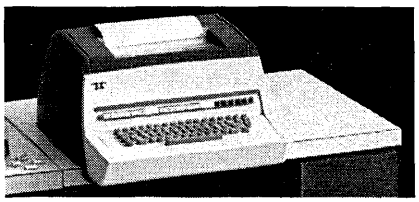
Teletype data communications equipment is available in send-receive capabilities of up to 2400 words per minute. If you would like specific information about any of the equipment described here, write: Teletype Corporation, Dept. 81-16, 5555 Touhy Ave., Skokie, Ill. 60076.



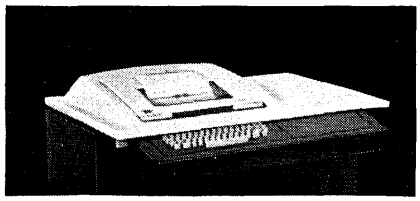
model 33 series: *An extremely low-cost 100 wpm terminal line. Uses ASCII. The most widely used terminal in time-sharing systems today.*



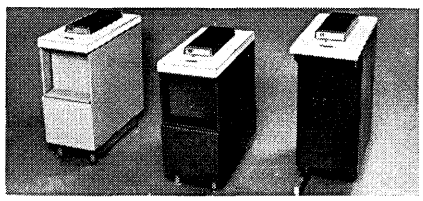
model 35 series: *A rugged, heavy-duty line of 100 wpm terminals. Uses ASCII.*



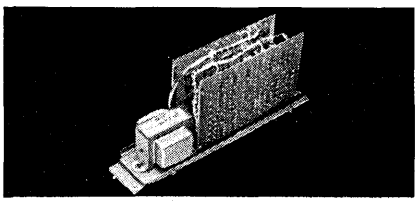
model 37 series: *One of the most versatile heavy-duty terminal lines going. Generates all 128 characters of ASCII. Operates at 150 wpm. Prints in upper and lower case.*



Inktronic® data terminals: *A unique electronic, solid state terminal. Prints up to 1200 wpm. Forms characters through electrostatic deflection (no typebox). ASCII compatible.*



magnetic tape data terminals: *Use compact reusable tape cartridges. Operate on-line at up to 2400 wpm, and connect "locally" to lower speed Teletype terminals using ASCII.*



Stuntronic™ accessories: *Electronic solid state terminal logic devices offering many control options. Such as, automatic station control, error detection and correction capabilities.*

machines that make data move

TELETYPE®

CIRCLE 11 ON READER CARD

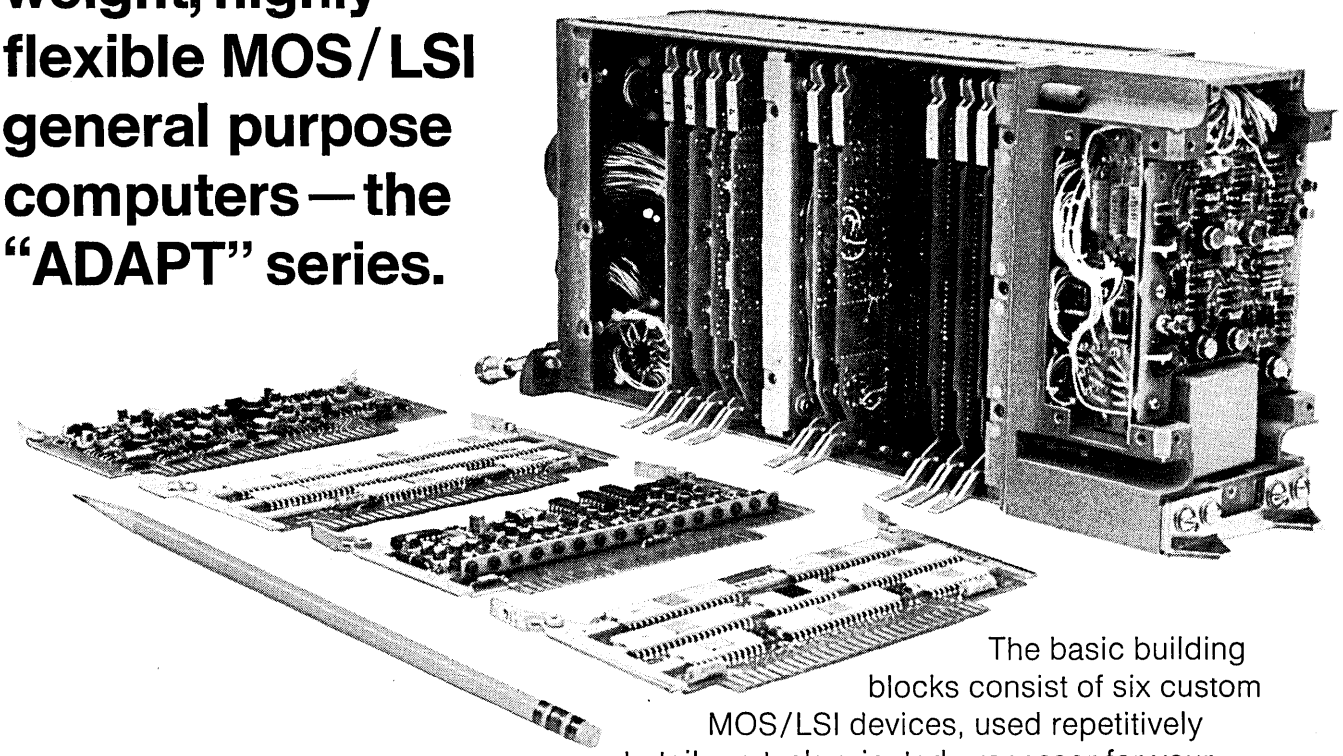
Garrett has a new family of minimum weight, highly flexible MOS/LSI general purpose computers—the "ADAPT" series.

The first application of the "ADAPT" G. P. Computer concept has been the air inlet control system for the Navy's F-14. It meets all the requirements of MIL-E-5400, Class 2 and is in quantity production.

Some of its obvious advantages are the direct result of MOS/LSI technology. Models in the "ADAPT" series weigh as little as 8 pounds, measure 4¼" x 7" x 8", and run on 20 watts of MIL-STD-704 power. At low cost. With high reliability. No cooling is required.

Even more remarkable is the flexibility of the "ADAPT" series, achieved through

- microprogramming
- bus orientation
- the "bit-slice" building block concept.



The basic building blocks consist of six custom MOS/LSI devices, used repetitively to tailor a task-oriented processor for your application with a minimum of non-recurring cost.

Garrett has a family of MOS/LSI general purpose computers; and you can learn more about them with a phone call or letter.

Contact: Sales Manager, Garrett AiResearch Electronic Systems, 2525 West 190th Street, Torrance, California 90509

GARRETT

AiResearch Manufacturing Co.
one of The Signal Companies

LETTERS

Source panned

Sir:
I read with interest your comment in the April 1 "Look Ahead" section:

> "One source says IBM has 100 people doing nothing but protecting the 3330."

It is appropriate that "yellow journalism" be printed on yellow paper.

Printing irresponsible and untrue drivel like that and attributing it to a "source" is most unfair.

I have observed that it's traditional in the industry to take a "cheap shot" at IBM whenever one can. At DATAMATION, it's become almost a compulsion!

L. M. GOTTLIEB
Greenwich, Connecticut

We print only responsible and true drivel.

Make believe

Sir:
In reference to the item "McCracken on Tour with Anti-ABM Ploy" (April 1, p. 46), I support the ABM and believe it will work!

WILLIAM A. BOCCHINO
Fairleigh Dickinson University
Englewood Cliffs, New Jersey

SHARE takes stock

Sir:
In reference to "At Last: Standards for Keyboards" by C. P. Ancona, S. M. Garland, and J. J. Tropsa (March 1, pp. 32-36), I wish to point out that in March of 1968 SHARE Inc. (then known as SHARE) issued a position paper entitled "Functional Specifications for Typewriter-Like Time-Sharing Terminals." That paper included a keyboard layout which differs significantly from, and is, in our opinion, superior to the layouts being proposed for standardization by ANSI.

Further, I would like to observe that the aforementioned paper was forwarded to BEMA as the sponsor of both X3 and X4, the ANSI committees concerned in the matter of keyboard standardization. It is our understanding that the X3 System Advisory Committee directed the attention of the Keyboard Subcommittee to this paper with a strong recommendation that it be considered. To our knowledge this request was ignored; certainly we never saw a critical evaluation of the paper.

This SHARE position paper has been published in its entirety in *Computing Surveys,* March 1970, pp. 5-31.

E. D. CALLENDER
President, Share Inc.
New York, New York

Dolotta good

Sir:
I read with interest the article entitled "At Last: Standards for Keyboards" by Ancona, Garland, and Tropsa in your March 1 issue (pp. 32-36).

The two keyboard layouts described in that article may indeed become ANSI standards some day, but *good* standards they will never be.

This article points up quite clearly what is wrong with ANSI: It is, by its

very nature, an organization of *manufacturers* (as opposed to *users*) of various systems, devices, and sundry gadgets. (Note, in passing, the affiliations of the three authors of this article.) Thus, ANSI's vested interest is in standardizing the status quo, and its motto might well be "Tradition is better (whenever it is cheaper) than improvement."

The article is a good example of that attitude: Note, for instance, that the *first* criterion it gives for a good keyboard arrangement is that it should "facilitate simplicity of *design*" (my emphasis). "Ease of *operation*" (ditto) comes second. "Simplicity of design," I assume, stands for "simplicity of design of the device driven by the keyboard," since any keyboard layout, *per se*, is as simple to design as any other. This ordering of priorities directly leads to a proposed standard which sanctifies that abortion known as "logical bit pairing." "Logical bit pairing" should be read as "that electrical or electronic indication of upper/lower case shift which is cheaper to implement, even if it makes the keyboard harder to use and less compatible with accepted usage." This concept is in fact so bad that, as a palliative, we see the authors proposing a *second* (slightly less undesirable) *standard layout* side by side with the first one.

This raises the interesting question as to whether two (or more?) equivalently acceptable but different standards for the same thing are better than one. By following this line of reasoning, we could standardize, say, 127 different ASCII codes (calling one of them EBCDIC, for good measure), and coincidentally give everyone their very own preferred logical bit pairing. In passing, note that one of the two proposed layouts has 47 printing keys, and the other 48. How this fits in with the 44-key Selectric mechanism which is fast becoming a *de facto* standard I do not know, nor wish to speculate upon.

The proposed standards exhibit a fair dose of chauvinism: no provision appears for the so-called "National Usage" keys (there are many alphabets which contain 27, 28, or 29 letters, or which have various accents, such as the cedilla).

There are a few additional problems with the proposed layouts. For instance, placing both the left and right square brackets (or both the left and right braces) on the same key is an invitation to typographical disasters, since it forces the typist to map a relationship which is naturally left-right into an up-down relationship. Locating the minus sign in lower case and the plus sign in upper case makes poor sense from a programmer's point of view. In the same vein, an enormous amount of case shifting will be required in any programming application with either

The Victor 2-Step.

Now you can side-step five of the seven steps it takes to prepare compatible computer input under conventional data collection systems. It's your shortest route to compatible computer input.

No more batching, coding, keypunching, verifying, editing and merging, and retrieving error listings. With our Victor Series 800 all you do is prepare your source document on our console. It handles all the intermediate steps for you—automatically. Right up to actual data processing.

What's more, our Series 800 gives you built-in flexibility. It's a stand-alone computer creating hard copy documents needed for your accounting and billing operations (payroll checks, invoices, accounts payable) while at the same time it transmits data to a pooled magnetic tape unit.

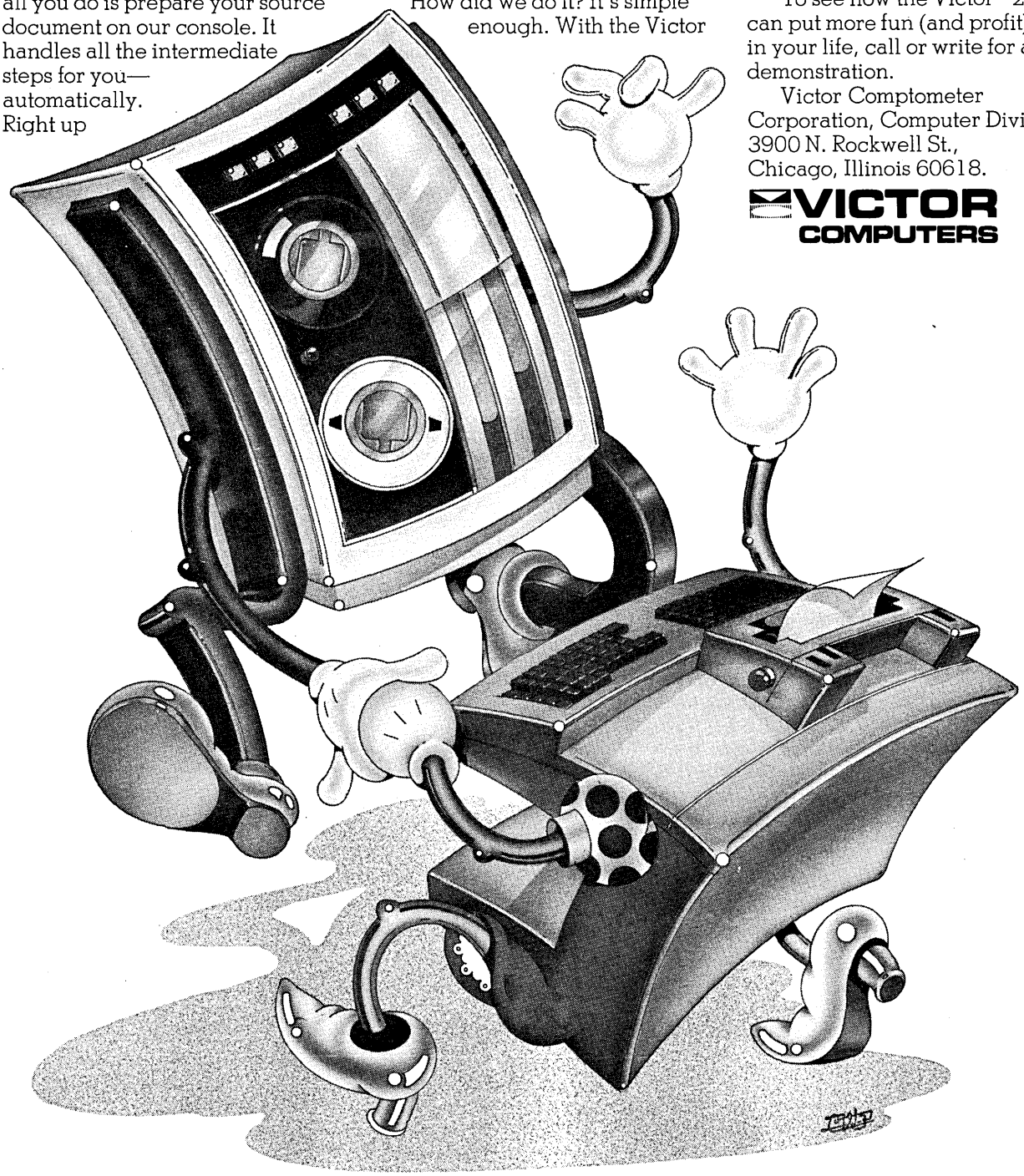
How did we do it? It's simple enough. With the Victor Series 800, we simplified. Each console* has a true internal programable memory.

It pre-edits, formats, field checks and error checks all data entered and then transmitted to the pooled magnetic tape unit. In order to save you space, time and, last but not least, money. Right now and in the long run.

To see how the Victor "2-step" can put more fun (and profit) in your life, call or write for a demonstration.

Victor Comptometer Corporation, Computer Division, 3900 N. Rockwell St., Chicago, Illinois 60618.

VICTOR COMPUTERS



*Up to 16 consoles can be feeding data into one pooled magnetic tape unit at one time.

layout.

To summarize, then, the proposed standards are unacceptable because:

1. They disregard user needs when these needs conflict with manufacturers' vested interests.
2. There is one too many of them.
3. They are incomplete.
4. They are unnatural and cumbersome.

Finally, let me propose a motto for ANSI and other standardization bodies:

"When matching men and machines, be sure to match machines to men, rather than vice versa."

DR. T. A. DOLOTTA
Princeton, New Jersey

Mustn't point

Sir:

Unqualified statements to the effect that documentation, *per se*, is good serve us no better than statements to the effect that a "quick little program" will set everything right. Some managers operate on the principle that a certain amount of inefficiency is a good thing, while an uncertain amount is bad—even though the uncertain amount of inefficiency is substantially less than the certain amount. Such managers are liable to use documentation as a club rather than a tool, wrapping their people in red tape and pointing to the elegance of everything surrounding what is actually a trivial, obsolete, or nonfunctioning program. There are a variety of subenvironments in a programming shop, and what is appropriate for one problem is not appropriate for another. We need more judgment, not more rules.

R. A. BAKER
Houston, Texas

ICL to pay

Sir:

In the edition dated 1st April 1971, your World Roundup notes refer to the computer procurement policy of the U.K. Government and to its effect on ICL. Though we would not wish to attach too much significance to the date of your notes, there would appear to be some misinterpretation of the actual situation, particularly as reflected by your comments on price performance.

A year ago, in evidence to the House of Commons Select Committee, Mr. E. R. Nixon, Managing Director of IBM (UK) Ltd., speculated as follows, "For IBM to achieve an order or for any other non-British company to achieve an order we have to be either 25% better or we have to be unique in some way and provide a facility which ICL cannot provide, and in some cases that is the case."

The policy actually applied by the previous Government was stated in evidence by the Civil Service Department on 11th May 1970. Where tenders were invited the policy was "to evaluate the tenders objectively; and to award the contract on the merits of the evaluation, allowing preference in favour of any British machine provided that there is no undue price differential as compared with overseas supplies, that the British machine is technically suitable and that no undue delay is involved."

There was no mention of a 25% preference and the only occasion that such a figure was referred to was in the context of the IBM evidence.

This year, the present Government has reviewed its policy towards computers and in a statement to the Select Committee, Sir John Eden said, "We feel it is unnecessary to continue for computers made in Britain a price preference which in fact has played no part in practice in enabling British firms to win Government contracts. Because the prices of British made machines have proved to be fully competitive we see no point in continuing that."

I trust that these comments will help to clarify at least this element of the present U.K. position.

P. V. ELLIS
Assistant Managing Director, ICL
London, England

Penney Candy

Sir:

Two of the letters (that of Walter Penney and that of Candy Wilmot and Tom Allen) in the April 1 issue contained surprising comments about the cartoon on p. 50 of the Feb. 1 issue.

Moreover, the editorial comment on these letters indicates that the cartoon achieved its impact through a typographical error.

Personally, as a long time reader of both DATAMATION and *MAD* magazines, and also, by default, as a WASP (with very little sting, hopefully), I thought the cartoon achieved a rather high point in satiric humor by pointing its barb at the semi-literate, though probably college-trained, executive.

(Yes, I am a college graduate, myself.) Yours for more satire,

VICTOR E. WHITTIER
DeWitt, Michigan

Hold your tongue

Sir:

The April 1 issue of DATAMATION was the first issue that I've enjoyed in a long time.

Some imagination and thought went into these tongue in cheek or not so tongue in cheek stories. It would be delightful if more thought, imagination and fewer words went into more of the articles written for DATAMATION.

DONALD C. TUCKER
Denver, Colorado

Borderline case

Sir:

Re the letter from Denis Hill in the April 1 issue (p. 12), sabotage from our 51st state is upon us!

Why "introduce random errors" when the cornerstone, yea, the genesis of data processing is accuracy (ask any ex-IBM'er about "speed, accuracy and flexibility").

Back to your FLQ and other more visible forms of sabotage, Mr. Hill, lest we petition Mr. Trudeau to invoke the War Measures Act against insertion of random errors in census data!

BERNARD A. MCILHANY
Atlanta, Georgia

Put 'em up

Sir:

I would like to add my name to what I hope is a growing list of names responding to your April 1 issue challenge for supporters of ABM. As a 15-year veteran of computing and aerospace, I believe in ABM—as a valid tactical risk, and as a useful strategic defensive weapon. When so much of our defensive posture is built around the threat of using offensive weapons, it is reassuring and hopeful that the strictly defensive ABM can also play a role.

ROBERT GLASS
Kent, Washington ■


DATA ENTRY GAME
GO
WITH YOUR SOURCE DATA
LOSE A TURN
key again
key
TAKE A CHANCE
VERIFY
VALIDATE
Hire extra people
GO BACK 3 SPACES
EDIT
PAY!
Re-key
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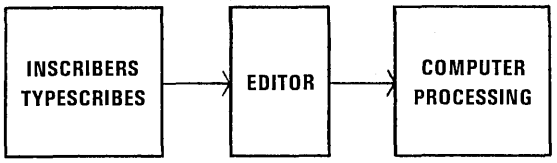

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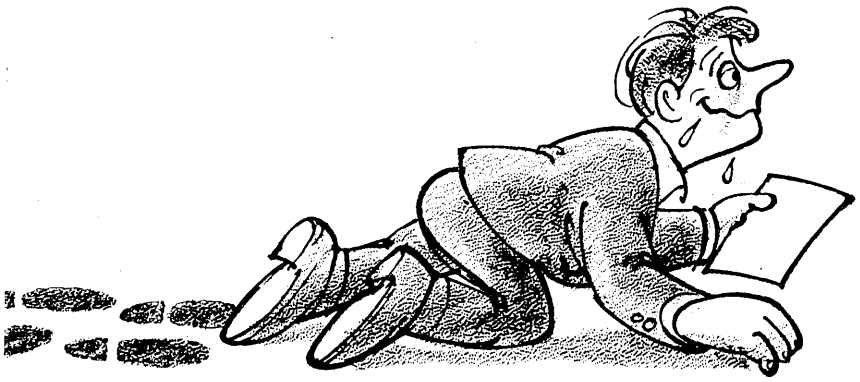

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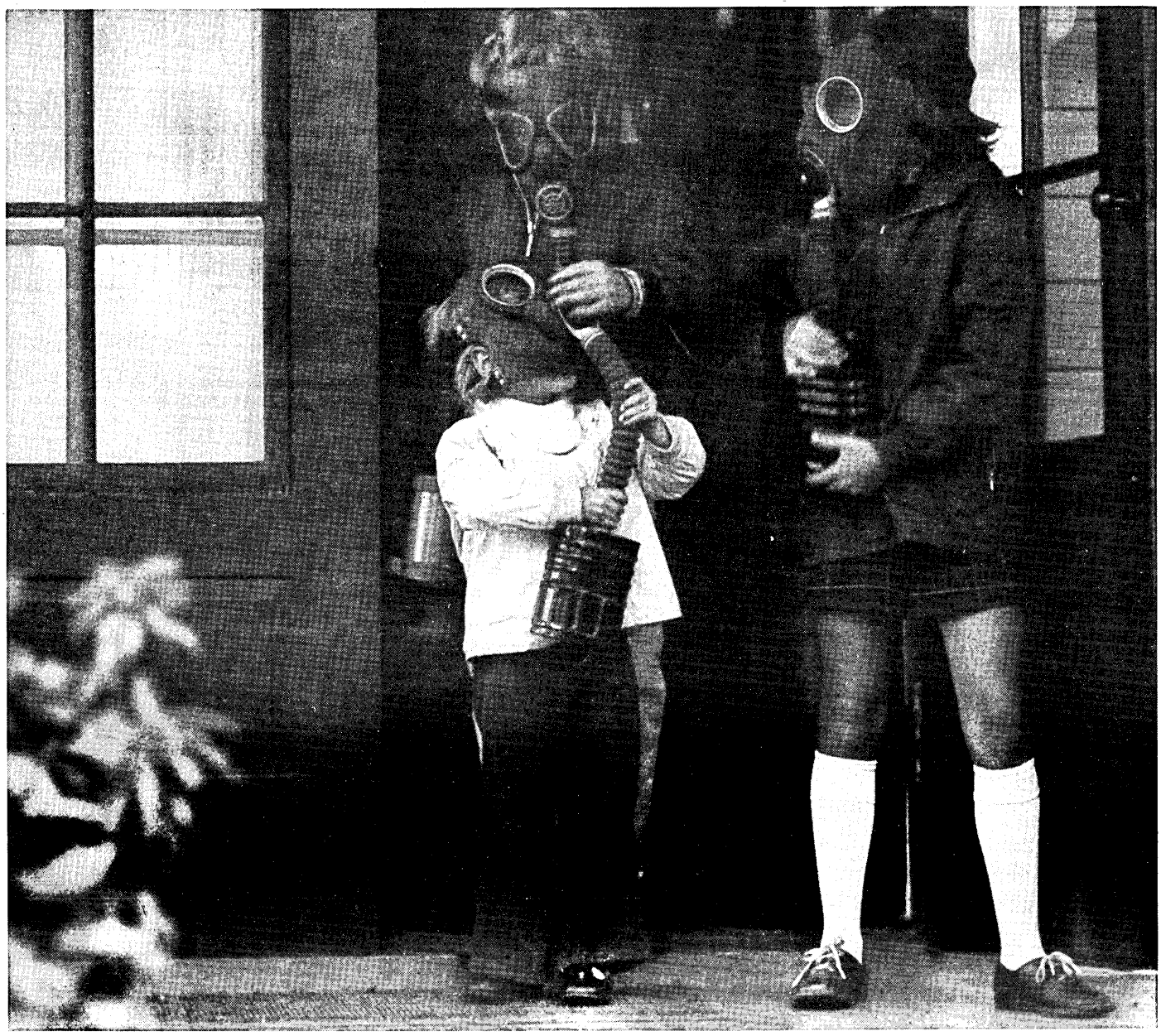

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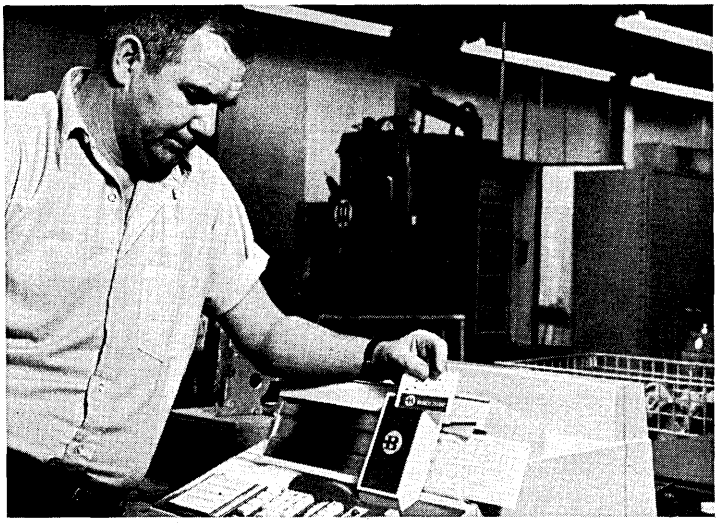

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COMPUTER, COMPUTER? WHAT COMPUTER?

The Phoenix chapter takes seriously the Assn. for Computing Machinery's national drive to curb the "blame the computer" syndrome. When the Allen Piano and Organ Co. ran a radio spot claiming they were overinventoried because of a computer error and were having a sale, the chapter wrote a letter offering to correct the problem free--on condition that if the error turned out to have been made by a human the company would mention this in future advertising. Allen Piano and Organ says it will think twice before blaming a computer in future advertising, but they won't take up the offer in the letter written by ACM's Bob Bemer. They don't use a computer.

PRIVATE LINE USERS OFFERED BULK RATES

AT&T is informally proposing a new bulk rate which would enable virtually all private telephone line users to pool their requirements and thereby cut telephone costs by as much as 80%. The proposal follows the FCC 1970 Telpak decision, allowing other than federally regulated users to share line requirements at lower bulk rates under the Telpak package. Telpak users are fighting that decision in court. They probably will object to the new offer. A spokesman for one large Telpak customer said a settlement is possible if AT&T will give a slightly better price break and a shorter channel lease period to customers using more than 30 voice-grade channels (four years is the minimum currently proposed for this group).

SOME USERS DO WELL WITH PACKAGE SALES

Sales of proprietary software packages, a difficult business to date, is increasingly becoming good business for computer users themselves. It's estimated some 80 of Fortune's top 500 actively market packages. At the recent American Bankers Assn. conference, First Wisconsin Bank of Milwaukee said it has had 45 sales recently of seven banking products; 31 were for a $35K trust package that cost $350K to develop. Lincoln National Bank, Syracuse, has sold 10 of its $25K programs for one-statement banking. It cost $100K to develop.

HOW TO SURVIVE EXTINCTION

No one answers the phone at Telefile Computer Corp. in Newton, Mass., these days for good reason. As a result of a business fielding play that makes Tinkers-to-Evers-to-Chance look like bush league stuff, Telefile, as originally established, doesn't exist any more. But it is alive, in Santa Ana, Calif. If that sounds complicated, it's because it is. Telefile was formed by ex-Honeywellers in 1968 to offer an on-line business computer system and a time-sharing service. It never got wheeling. It foundered. Then last December it acquired interactive Data Systems of Santa Ana which markets communications processors and file controllers, and IDS was renamed Telefile. Then everyone concerned took a hard look at the new company and IDS looked like the best part, so Telefile folded its Newton tent, closed out its original product line,

kept IDS', and the whole shebang is now in Santa Ana. IDS, in effect, acquired a company that acquired it, and all that's left of Telefile is its name. Officers of the new Telefile and most directors are former IDS people.

BRYANT DISC COATING IS CRASH RESISTANT

The oxide coating Bryant Computer Products applies to its large discs soon will contain a chemical agent that makes the discs resistant to head crashes. The firm says discs tested withstood periodic touchdowns of around 12 msec at a time without losing data. Touchdowns of up to 10 minutes' duration wiped out data, but there was no damage to either the discs or heads and lost data merely was written back in. Bryant calls the oxide "Marc 5" for magnetic abrasion resistant coating. The "5" is for a five-year guarantee for discs so coated. It will license Marc 5 to makers of both large discs and the smaller disc packs.

SO THERE!

In the previous issue, Computer Machinery Corp. was referred to as "runner-up" to Inforex among makers of keyboard data entry systems. Although the latter has shipped more systems to date, CMC points out that the value of its shipments to date far exceeds those of Inforex. Right on. As of March 31, the total value of CMC's shipments was more than $23.6 million.

SIGNS OF THE TIMES

More than 10% of computer installations in Southern California have closed down in the last year, says KLH Assoc., San Francisco publishers of installation censuses. Of 850 sites listed in last year's count, excluding the federal government, 88 have been withdrawn from 1971's. Consolidations, out-migration, and bankruptcies are blamed for this. And a year ago, 60% said they had spare time available on their machines, but this year it's closer to 80-90%. Still, a significant number of new listings in '71 are service bureaus.

RUMORS AND RAW RANDOM DATA

Although interest is high among computer exhibitors, organizers of the Western Electronic Show and Convention this August in San Francisco have pulled out of the Cow Palace to the more modest confines of Brooks Hall where exhibit space is limited to 750 booths. Wescon has accommodated more than 1,000 booths since 1960...Allen-Babcock Computing, the Los Angeles time-sharing company, is delaying until October taking delivery on a 370/155 which was to have been installed in Palo Alto last April (see Dec. 1, 1970, p. 17). "Contractual obligations" are blamed for the delay...At press time in May, word was that UCC has "official" FCC approval of its Datran digital network. Public word may be out before mid-June, but delays may stem from the "enormous writing job" involved...A Midwest memory manufacturer who asked employees for suggestions to help the planning committee anticipate tomorrow's technological needs received this interesting piece of advice: "subscribe to all the science fiction magazines."

SYSTEM 2400, Data-Satellite Configuration.

SYSTEM 2400 edits input, edits output, sorts and merges, reformats and prints, transmits and receives.

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Truly, peripherals have come of age. Mohawk Data SYSTEM 2400.

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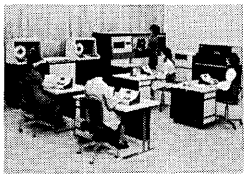
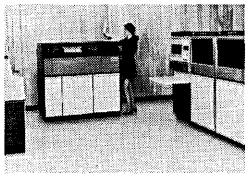
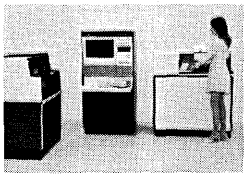


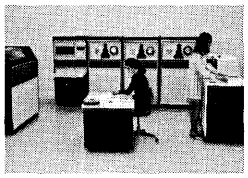
Data-Printer Configuration



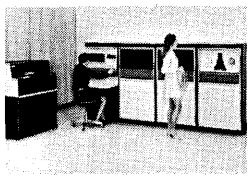
Data-Communicator Configuration



Data-Converter Configuration



Data-Sorter/Collator Configuration



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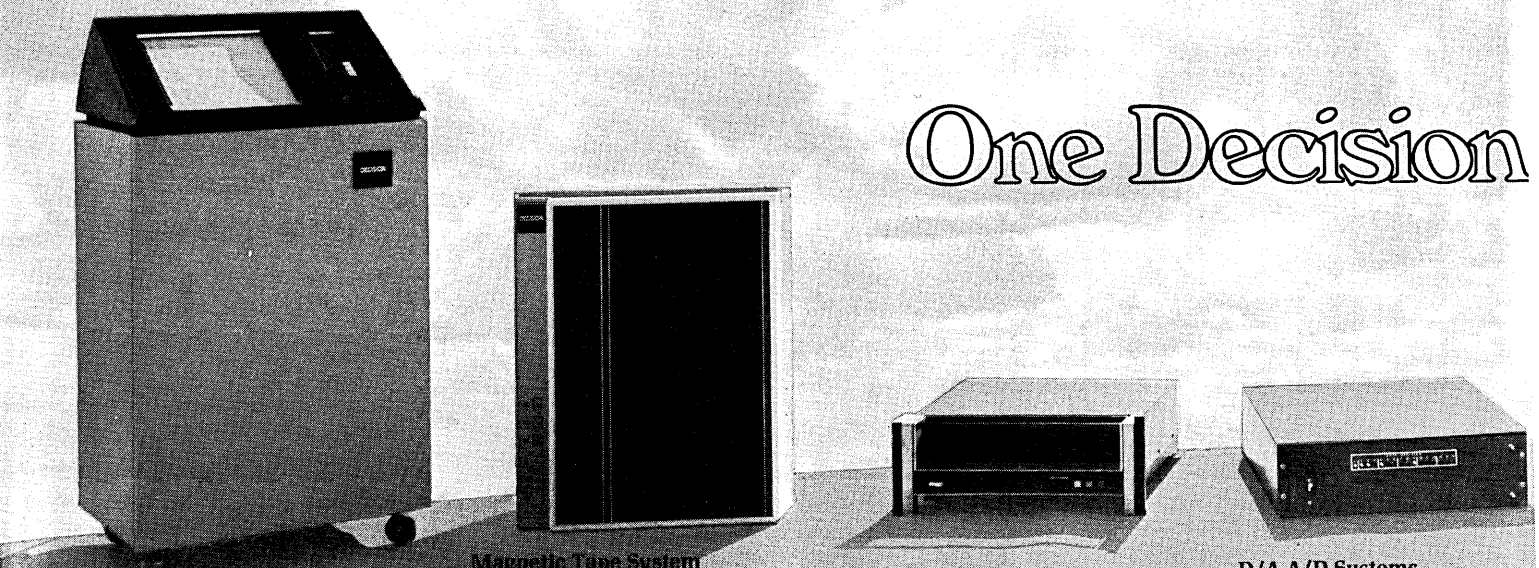

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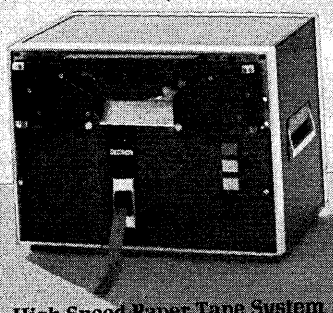

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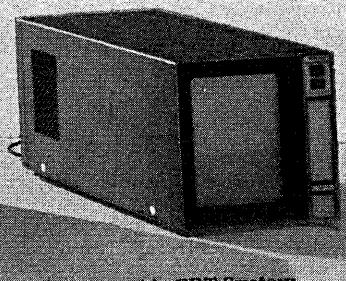

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CIRCLE 18 ON READER CARD

Scheduling, simulating, scouting, scorekeeping — the computer may soon be doing it all — except setting the records

Sports and EDP...

Is it possible that some future Super Bowl will have a computer picking the winning play? Today the rules[1] actually forbid the use of computers during the game, but many football teams—both college and professional—are using computers to analyze the play tendencies in the previous games of themselves and their opponents.

The application of computers to athletics is developing quite rapidly. Almost every sport has seen some application of computers besides having the front office running off a mailing list for ticket requests. These applications have been for the sport itself, either to gather and analyze data about opponents or to analyze and model one's own sport.

But, you may ask, "Why computers in athletics anyway? What effect can they have on human performance?" Besides the economic benefits, there are three good reasons why computers and computer people are getting involved in athletics:

1. *Entertainment.* Athletics are fun; people enjoy both participating in and watching sports, which means computer people can easily enjoy applications in this area.

2. *More information.* Computers can make the sport more interesting since it provides more information to everyone involved (assuming GIGO isn't involved).

3. *Improved performance.* Computers can improve the athletic performance and quality by providing more information in less time than with other methods.

It should be made quite clear at the start that computers or their output are not going to take the place of people in any sport. Rather, computers simply provide a way to organize and analyze the available information so that it can be put to the best possible advantage of the athlete.

There are many different types of systems which have been developed for athletics. Functionally, they may be grouped into the following five categories:

1. *Statistical tabulations.* This is perhaps the simplest type of system, since programs are written to read various inputs and generate tables of summary information. Most of the football play analysis programs fall under this category. Another example is the generation of baseball statistics. Many of the reports to be made in the 1972 Olympic Games will be simple reports listing results, usually for the press.

2. *Statistical analysis.* This type of system is similar to the one above except that more mathematical analysis is performed. A program which evaluates data about athletics and tries to rank them according to some order is an example. Many of the professional football teams have rankings of eligible college players made each year for the draft which make heavy use of statistical analysis.

3. *Information retrieval systems.* In this type of system, a data base is created which contains information about the sport and/or athlete. The program works like other retrieval systems in that it allows the user to ask various questions and receive answers. There has been a system developed for rowing by JAMCO, Inc. that can retrieve information about any oarsman that is contained in the data base; e.g., what international championships he has rowed in and what success he has had.

4. *Real-time systems.* This type of system employs a computer in real-time during an athletic event, to either monitor the competition itself and/or give information concerning its progress. A good example here is the system currently being employed at the Ontario Motor Speedway, where an IBM 1130 actually monitors each car on every lap and posts the current order on displays for the spectators.

5. *Modeling.* This type of system incorporates perhaps the most complicated mathematical and computer science aspects of the five, just as modeling in other fields can be and usually is quite complicated. The system which the author has been working on to

1. Rule 1, Sec. 2, Article 9 of the NCAA Official Rules states: "Television replay or monitor equipment are prohibited at the side lines, press box, or other locations adjacent to the playing field for coaching purposes during the game." Section (E) of Article X (Prohibited Conduct) of the NFL Rules states: "No club, nor any coach, representative or employee thereof, shall use or employ any mechanical or other equipment or device in connection with the staging or playing of any game . . ." A check with both the NFL and the NCAA confirms that these rules include not being able to use computers in any form during the progress of a game.

It's a New Ballgame

by J. Gerry Purdy

model track running training is an example. A program which might try to optimize the sequence of plays to be used in a football game would be another.

With the functional areas now defined, the remainder of the article is devoted to describing the actual systems which have been developed.

FOOTBALL

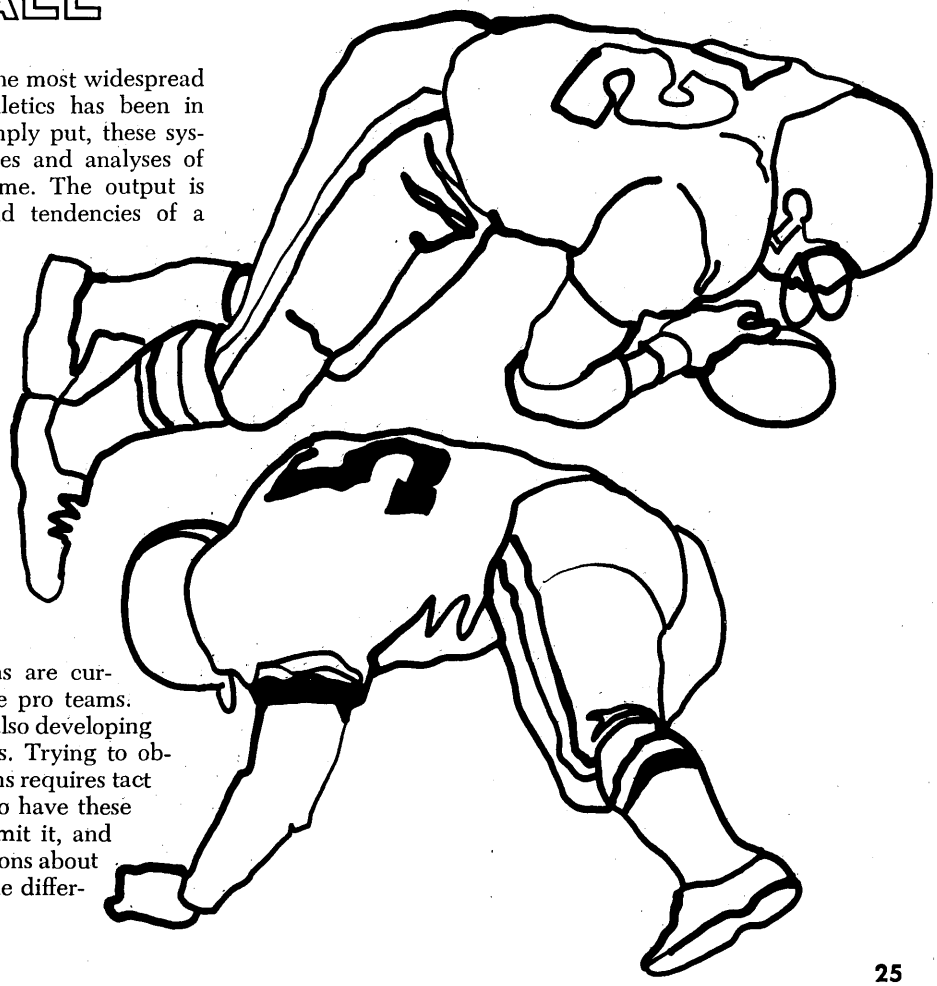
Football play analysis. One of the most widespread applications of computers to athletics has been in football play analysis systems. Simply put, these systems generate statistical summaries and analyses of the plays of a given football game. The output is examined by the coaches to find tendencies of a team.

Coaches may look at summaries of another team's offense and/or defense, or they may look at the same kind of summaries of their own team. If a consistent tendency is found by a program, then presumably whoever examines the output will recognize that tendency; i.e., Team A's coaches may examine their own team from the previous week(s), just as the next opponent (Team B) may also recognize those same tendencies upon examination of Team A's play data.

Football play analysis programs are currently being used by many of the pro teams. College teams, to some extent, are also developing or have developed similar systems. Trying to obtain information about these systems requires tact and persistence. The teams that do have these programs usually don't like to admit it, and when they do, they guard descriptions about the program as if they made all the difference between winning and losing.

Some of the universities that have developed or are developing play analysis programs are Kent State, Univ. of Pennsylvania, Univ. of Tennessee, Dartmouth, USC, UCLA, Washington, and Stanford. Undoubtedly, many other college teams have or are in the process of developing play analysis programs.

Most typical play analysis systems simply read in the play information which has been filled out by the coach on a keypunch form. The program then sorts by



field position, formation, and down and distance. Various reports are then generated summarizing the running and passing play tendencies. (An example output of the Stanford system is given in Fig. 1.) One of the most important aspects of a football play analysis program is organization of the output information. Too many systems generate literally hundreds of pages of output, making the analysis a difficult task for the coach.

One of the first organizations that developed play analysis programs for profit was the recently disbanded Computer Applications, Inc., in Maryland. William Witzel did most of the programming for a system employed by the Washington Redskins in 1966. His contact with Washington was Coach Ed Hughes, now head coach for the Houston Oilers. Washington no longer uses Witzel's system, but the Oilers do. Witzel has been involved with other systems that are currently being used by the Chicago Bears, Dallas Cowboys, San Francisco 49ers, and the Atlanta Falcons. A published cost estimate says the system by Witzel runs $7,200 initially and about $150 per week to actually run it at a local service bureau. An article by Witzel[2] describes his system for play analysis and scouting of prospective college players for the pro draft (discussed below).

More recently, two new systems have been developed. The first of these is Sam Huff's Computerized Scouting System, developed and marketed by Jack Frease of Penn. Scout Corp. Frease uses an IBM Porta-Punch Card (also used in the IBM-developed Voto-matic system for election voting). Frease's system accepts up to 40 columns of information in a fixed format. This simplicity allows him to offer the system to a wide range of potential customers for a small cost—$20 to $65 per game depending on the number of reports generated. Each coach has to transform his terminology into that of the input form (sometimes a real difficulty), but the cost factor makes it attractive even down to the high school level. Their output looks similar to other typical play analysis programs, but is of a more general nature. The coach who desires to have specialized output for his staff alone can't be helped here.

The other new approach has been made by Dr. Frank Ryan, great quarterback for the Cleveland Browns in the '60s and now with the Washington Redskins. Ryan's concept was to develop a generalized report generating system, where the user composes commands to generate desired reports from the existing data base. His system, called PROBE, was jointly developed between Chi Corp. of Cleveland and Ryan Computer Services. The unusual feature of this system is that it is easily adapted to applications other than football. In fact, their first paying customer was a brokerage firm in Cleveland, which composes commands to generate analyses of stocks.

The programming of Ryan's system involved 10 to 12 people during 1970, was coded in ALGOL 60, and is running on a Univac 1108. To use PROBE one defines a data base with a syntax called DENOTES. Data is then keypunched and read into the data base according to the DENOTES definitions. Commands to generate the desired reports are then accepted. The commands key off terms such as COORDINATE (generate an x-y plot), DISPLAY (histograms), LIST (straight lists with sorted fields), and FIELD (boxed off areas with occurrences in respective areas).

The application of the PROBE system to football play analysis (called PRO-PROBE) is currently being employed by the Washington Redskins. Vince Lombardi believed in the usefulness of computer analysis and managed to have Ryan traded to Washington to work on his play analysis system. Lombardi also served as a vice-president of Ryan Computer Services.

Another football play analysis system that has been accepted by a number of teams is the Computer Stat program of Apex Data Services and headed by Joe Guardino in Los Angeles. They handle the play

STANFORD UNIVERSITY FOOTBALL PLAY ANALYSIS PROGRAM
DOWN AND DISTANCE SUMMARY REPORT REPORT 03
****

		ALL PLAYS				RUNNING PLAYS					PASSING PLAYS						
DOWN	DISTANCE (YARDS TO GO)	NO. PLAYS	% OF ALL PLAYS	TOTAL YARDS GAIN	AVG. YARDS PER PLAY	NO. RUNS	% RUN PLAYS THIS D & D	% OF ALL PLAYS RUNS	YARDS GAIN	AVG. YARDS PER RUN	NO. PASSES	% PASS PLAYS THIS D & D	% OF ALL PLAYS PASSES	NO. COMPL	% COMPL	YARDS GAIN	AVG. YARDS PER ATTMP	AVG. YARDS PER COMPL
1	SHORT (1-9)	3	4.0%	-2	-0.7	3	100.0%	4.0%	-2	-0.7	0	0.0%	0.0%	0	0.0%	0	0.0	0.0
1	NORMAL (10)	30	40.0%	134	4.5	19	63.3%	25.3%	33	1.7	11	36.7%	14.7%	6	54.5%	101	9.2	16.8
1	LONG (11+)	1	1.3%	13	13.0	1	100.0%	1.3%	13	13.0	0	0.0%	0.0%	0	0.0%	0	0.0	0.0
2	SHORT (1-4)	6	8.0%	26	4.3	4	66.7%	5.3%	13	3.3	2	33.3%	2.7%	2	100.0%	13	6.5	6.5
2	NORMAL (5-7)	7	9.3%	38	5.4	1	14.3%	1.3%	3	3.0	6	85.7%	8.0%	4	66.7%	35	5.8	8.8
2	LONG (8+)	11	14.7%	38	3.5	3	27.3%	4.0%	-2	-0.7	8	72.7%	10.7%	6	75.0%	40	5.0	6.7
3	SHORT (1-3)	4	5.3%	1	0.3	4	100.0%	5.3%	1	0.3	0	0.0%	0.0%	0	0.0%	0	0.0	0.0
3	NORMAL (4-6)	0	0.0%	0	0.0	0	0.0%	0.0%	0	0.0	0	0.0%	0.0%	0	0.0%	0	0.0	0.0
3	LONG (7+)	10	13.3%	127	12.7	0	0.0%	0.0%	0	0.0	10	100.0%	13.3%	8	80.0%	127	12.7	15.9
4	SHORT (1-)	1	1.3%	0	0.0	0	0.0%	0.0%	0	0.0	1	100.0%	1.3%	0	0.0%	0	0.0	0.0
4	NORMAL (2-5)	1	1.3%	17	17.0	0	0.0%	0.0%	0	0.0	1	100.0%	1.3%	1	100.0%	17	17.0	17.0
4	LONG (6+)	1	1.3%	10	10.0	0	0.0%	0.0%	0	0.0	1	100.0%	1.3%	1	100.0%	10	10.0	10.0

Fig. 1. Stanford football play analysis program output.

2. Witzel, William L., "Computer Programs in Professional Football," Modern Data, February 1968.

analysis for the Rams, UCLA, USC, Fullerton, and Long Beach State. Their program was coded in BAL for the 360/30, and involves over 75 different routines. The output is mostly pictorial in the form of field diagrams and graphs. A nice feature of this system is that teams can purchase as many of the reports as they can afford, with prices ranging from $25 to over $300 per week.

Football personnel scouting. A second large application area for computers in football has been the scouting of college players for the pro draft each year. There are three organizations that perform scouting of the college players: TROIKA, BLESTO-VIII, and CEPO.

The first of these—TROIKA—stands for the combine of three teams: 49ers, Rams, and Cowboys. BLESTO-VIII stands for a combine of eight teams: *B*ears, *L*ions, *E*agles, *S*teelers, *T*alent *O*rganization, *V*ikings, and *III* for Colts, Bills, and Dolphins. The acronym, CEPO, stands for *C*entral *E*astern *P*ersonnel *O*rganization.

The purpose of these organizations is to scout college football players. It is argued that one organization serving many teams is more cost-effective than each team doing the whole job by itself. According to Jack Butler of BLESTO, "One team could never afford to scout the whole country. We scout every school and perform detail analysis—more than any one team could by itself and cheaper per team since we do this for eight teams." But some teams that want their own, private information go it alone.

Both CEPO and BLESTO employ scouts who travel around the country visiting the schools assigned to their district. They fill out standard scouting reports which are sent to the home office for processing. One of these organizations may gather 30-40,000 reports during one year, which makes hand processing difficult, if not impossible. Enter the computer.

The scouting reports are keypunched (or converted to cards if mark sensing scanner sheets are used) and placed into a data base. Computer programs have been developed for these organizations which rank the players both according to position and independent of position. The obvious problem with this process is how to correctly weigh the respective characteristics and remove the biases of the scouts. The reported cost of providing these services ranges from $70,000 to $200,000 per year, which includes the scouting and computer processing.

The TROIKA organization is operated by Optimum Systems Inc., of Palo Alto. The company was founded by Salam Qureishi, who formed OSI after leaving IBM—where the original work was performed. Qureishi began his scouting system back in 1962, when Tex Schramm, president of the Dallas Cowboys, wanted to bring computer analysis into football in hope of eliminating the wide variances and biases which existed in the scouting reports. OSI is owned, in part, by the Cowboys, Rams, and 49ers.

The OSI scouting process begins with the filling out of the scanner scouting forms. The total scouting information is compiled by team scouts from either the field (practice sessions and games) or films. As a result, each team will end up with different rankings since the input scouting reports are different.

The scanner sheets are compiled by OSI and are converted into punched cards with an IBM 1232 Optical Mark Page Reader–534 Keypunch system. The cards are then fed into OSI's 360/65 for analysis. Their program is probably the most sophisticated of the three scouting combines, since it weighs not only the characteristics scouted, but also the scout who filled out the form.

The reports generated by the program rank the personnel according to position and in overall ranking, independent of position. Each team of the organization receives copies of reports for the college draft each January.

The purpose of the CEPO scouting combine is similar to OSI, but the detail process is somewhat different. They have scouting forms which are color coded for each of the years in college that the football player is rated. The program is run by a service bureau and it is not as sophisticated as the OSI system (they do not weigh the particular scout making out the report—this is done by the CEPO personnel in their combined staff meetings).

Each player is ranked by the scout on a 1-0 to 5-0 basis, with the five level denoting a reject and a one level denoting a sure regular. Each of the players is scouted according to the position that he may play in the NFL, not according to his current position in college, e.g., a collegiate offensive halfback might look like a good pro defensive safety, so he is scouted as a safety.

Each spring the CEPO personnel get together for their dry run meeting in which they examine all the draft picks from the previous fall. Before and after this meeting and before the draft in January, they produce a master listing (called the Bible), which contains the complete ranking information.

The BLESTO-VIII group operates quite similarly to the CEPO combine. All of the members get the same report. Their data is run at the Univac bureau in Pittsburgh, which also provides programming service. A Univac DCT-500 terminal prints the scouting summaries.

How good are these scouting personnel ranking systems? Generally, they have been successful in making a fair appraisal of the total available resources. They include the players from the smaller schools with the more well known players and give fairer rankings. For example, in the 1968 draft, an "unknown" named Calvin Hill of Yale was the first round draft choice of the Dallas Cowboys thanks to the computer rankings. In 1969, Hill was Rookie of the Year!

Each of the organizations analyzes its picks from previous years to see how successful they have been and modifications are incorporated. There are some ratings that the organizations don't like to talk about; for example, giving a high rank to a player who turns out to be an early cut, or ranking a player quite low who turns out to be a star. These flubs are rare, however, and only demonstrate that the human element still exists.

The scouting systems can be used for purposes other than the ranking of college football players. OSI has begun marketing a hybrid of their player ranking system which will rate personnel in industry so that management may have an unbiased look at their personnel (perhaps for no reason other than salary advancement).

Dr. Atam Lalchandani of OSI says: "We have taken

the tools of operations research to develop a specific system to rank football player personnel. We are now generalizing this into a ranking system which can be employed by corporations to rate more fairly their employees. Hopefully, some of the unfair practices related to personnel evaluation can be eliminated."

Other football systems. This past fall many radio stations throughout the country aired a program called "The NFL Computer Game of the Week." An organization called Javelin Sports Corp. obtained a franchise from the NFL for the rights and access to the weekly statistics. They then arranged with Hi-Score Enterprises of Encino, California to write the necessary programs to analyze the statistics and simulate the game. According to Ed Mintz, programmer of the system, the program uses the NFL supplied statistics as a prediction of the tendencies for the current game. The program simply calculates an occurrence based on a random number normalized over the range of possibilities. If a particular team runs 67% of their plays a given way in a situation, then the program will have the play go that same way 67% of the time. The program was in Autocoder and ran on a 360/30 with a 1401 emulator.

Hi-Score has also produced Compu-Sport college team ratings which have appeared along with the AP and UPI ratings in many papers. They have also promoted some sports oriented computer contests in the L. A. area.

Simulation of the football game is also being done by Woroner Productions—the people who put together the simulated Muhammad Ali-Rocky Marciano fight. They are employing the services of Henry Meyer and SPS, Inc. of Miami (a division of United Data Centers). They intend to come up with the all-time great college football team by simulating games as a playoff series. Films of the old teams have been studied to gain tendencies of the past teams. Programming is in SIMSCRIPT and it runs on a CDC 3600 with 64K, using all of core. (The application of Parkinson's Law to computer programs never fails.) The program has 148 different tables which contain the various team statistics. Admittedly, they have had a few problems such as taking into account such differences as single and double platoons and the weights of the lines (they were much smaller back in the early days). The future status of the series is in doubt, since the project is curtailed at present (money problems presumably).

Before leaving the area of football it would be a disservice not to mention the work of Bud Goode, a statistics expert associated with John Guedel-Art Linkletter Productions in Beverly Hills, California. He has compiled total game information from almost all the major college football games and all the pro games since 1965. He performs various statistical analyses of the data, such as factor analysis (to determine the relevant dimensions in a sport) and multiple regression analysis (to predict the major criterion measures: percent won/lost, offense, and defense). Univac provides the computer time.

Goode claims that his analysis has determined the relevant variables in most sports which account for almost 100% of the "explanatory" variance. He does not claim to account for the "predictive" or "winning" variance, but still he claims to have 80% success in picking the college and pro games. (Las Vegas had better watch out!) Goode has broadened his statistical coverage from football to basketball (both college and pro), and the Indianapolis 500, pro baseball, PGA golf, soccer, and the National Hockey League.

TRACK

Track and field is one of the oldest sport categories in existence, with competitions dating back to the early Olympics in Athens (776 B.C.). Help from the computer had to wait a few years—until the mid to late 1960s, when James B. Gardner and the author developed a system for performance measurement and running training using a computer.

Track application, unlike football, is not motivated by economics, since there is virtually no professional track in existence. Our motive in developing a computer application in track and field was personal involvement and interest. What started as a casual interest in examining track statistics turned out to be almost a full time effort to systematize both performance measuring and training.

Performance measuring involves assigning some abstract value to one's performance in track so that these performances may be compared from one event to another. The value typically assigned to the different marks is a numeric score called *points:* the better the performance, the more points are awarded. Almost everyone is familiar with the decathlon in the Olympics and the fact that it is won by the athlete who accumulates the largest point total—the sum of the points awarded for each event.

In 1967, James B. Gardner began examining the existing performance measuring systems (commonly called *scoring tables*). In a desire to develop a system that was more mathematically consistent, he joined with the author to generate a consistent set of scoring tables for the running events in track. By the end of 1969 with three completely different rewrites of the computer program finished, we completed a scoring system that represents a substantial improvement over the other tables currently available.

A technical article[3] which describes the system in detail shows that the points awarded for a given performance can be expressed by:

$$P = A(T_s/T_p - B)$$

where P is the point score for the performance time T_p, A and B are constants and T_s is the standard time for a particular event. The ratio T_s/T_p expresses the point score proportionality and establishes the actual point scale. The standard time is established from an analysis of performance for all the distances. The standard time in this system takes into account the delay due to reaction time of the starting signal, the delay due to the acceleration to running speed, and the delay to running around the curves of a track.

With this model, a computer program was written, first in FORTRAN and later in PL/I. The computer runs were made on Stanford's 360/67 (see Fig. 1). (An interesting question often asked is, "How does Jim Ryun's world mile record (3:51.1) compare with his

3. Gardner, James B. and J. Gerry Purdy, "Computer Generated Track Scoring Tables," Medicine and Science in Sports, Vol. 2, No. 3, pp. 152-161, Fall, 1970.

world record for the 1500 meters (3:33.1)?" In our scoring system, these performances differ by only one point.)

An extension to the scoring tables described above is the generation of pacing tables, which are referenced for training. Much general publicity has been made concerning the benefits of jogging, but little has been done to quantitize the amount of training one does in relation to level of ability. The competitive athlete constantly hears about the types of workouts that the world record holders are doing, but has no guidelines to tell him how he should do those types of workouts for *his* level of ability. And how about the high school track coach who has 75 boys out for track? How can he give each one the workout that is just the right amount for his capability?

Questions of this sort are easily answered with the pacing tables. First, one establishes level of ability relative to all the other people from the scoring tables. Then, one simply refers to the pacing table assigned for that point level.

The pacing tables are derived from the scoring table in a straightforward manner. Given one level of ability, say the 500-point level, the pacing table times are computed by taking percentages (dividing by the fraction) of the times for the distances. One can easily obtain the times for the various distances that should be run for the given percentage speeds. The number of repetitions and the amount of suggested rest are also listed. Since the athlete is running less than 100% speed, in his training sessions he is expected to be able to repeat the run more than one time.

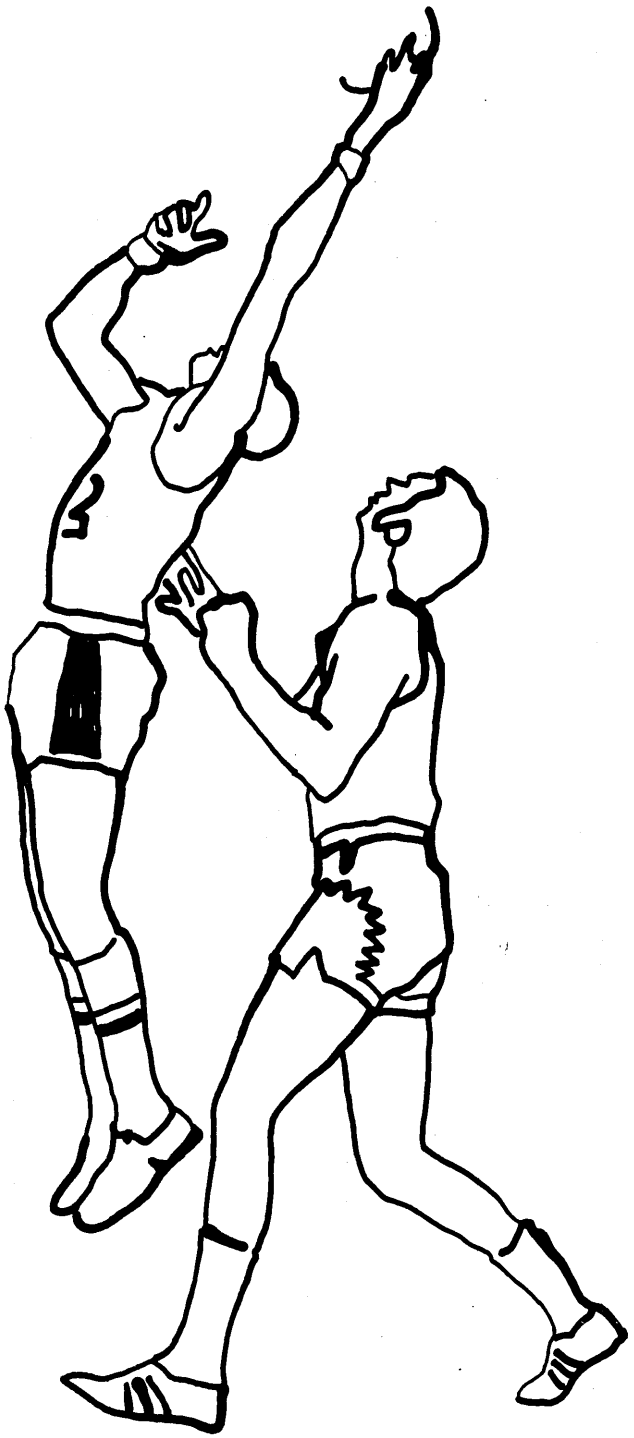
There is one pacing table for every 20 points in the scoring table. This gives recommended training schedules for levels of ability ranging from an 8:43 miler to a 3:30 miler (better than the current world record). Given the proper point level, each runner or jogger can easily determine the appropriate level of training which is correct for him.

The recently published book, *Computerized Running Training Programs*[4], contains both the scoring and pacing tables along with an explanatory text. (The author is currently working on his PhD thesis which involves extensions to these concepts.) Scoring tables for the hurdles and field events will be developed with the hope that the complete tables will become the international standard, replacing the current systems, which are not as mathematically consistent. Work is also under way to determine the true relationship between the number of repetitions performed and the amount of rest taken, so that if one performs more (or less) repetitions or more (or less) rest, the resulting effect can be predicted.

In each of the more recent Olympic Games, there has been an increasing implementation of electronic aids, computer systems, and other automatic devices. Many of the results of the Games in Mexico City in 1968 were tabluated using a computer, and there were scoreboards that contained digital logic for the displays. In Munich, Germany—site of the Olympics in 1972—there will be a total games computing system to centralize information gathering and dissemination.

The Siemens Co. of Germany completed a specification report that details the needs of each event, the press, and the visitors for information. The interesting feature of the report is that they proposed a general information retrieval system to satisfy almost all the needs for file creation, maintenance, query, and update. For example, the data base is to contain a variety of files, and the users generate the desired changes in the files with a command language based on keywords.

The system can be used to reserve a room, query the data bases about Olympic information, and generate results of the events after they occur. The system will have data base files containing, for exam-



4. Gardner, James B. and J. Gerry Purdy. **Computerized Running Training Programs,** Track and Field News, Los Altos, Calif., 1970.

ple, all the medal winners since 1896, all the personnel in the games, their past achievements, results of previous Olympiads, terminology, current Olympic records, rules of the sports, decathlon tables, visitor space allocation, etc.

As an example of the system, the report shows a request for the time in the decathlon which will receive 628 points for the 1500 meters:

LEICHTALETIK /\ ZEHNKAMPF /\ 1500 MTR
/\TABELLE /\ 628 PKT

The system then is supposed to answer with 4:24, 5 MIN (remember, Europeans switch the comma and decimal).

In addition to the central computer itself and its software, there are proposed many electronic aids for measuring the performances in each of the sports. In the track and field throwing events, they propose to have an optical scanning device which is aimed at the point of contact of the implement (shot, discus, javelin) with the ground. Using a simple program and trigonometry, the distance for the throw is computed.

The track running events will be timed with an electronic system which uses an array of photoelectric cells in each lane to signal the end of performance. A majority of the cells have to be turned off in each lane before the time is stopped. The rules specify that the time for a competitor is determined when the plane of his shoulders passes the finish line; thus, a head or hand passing through the array of photoelectric cells will not stop the timer—a majority logic cutoff.

Although the 1972 Olympics will certainly be the most computerized one to date, rest assured that the 1976 Games in Montreal will be even more so.

There is one final system in track and field that should be mentioned. It is a handicapping system developed by John Brennard of Santa Barbara, Calif. Brennard is a vice-president of the Road Runners Club of America and is a good distance runner. He wrote a FORTRAN program for the CDC 6400 that determines the handicap, in seconds per mile, for all distance (road) runners of the SPAAAU in Southern California. The algorithm is quite simple in design since it merely averages the best five times out of a runner's last ten races and computes the time lag (from the leaders) in seconds per mile. There are a lot of defects in the system (not considered are rate of improvement, distance run, etc.), but it does demonstrate a normalizing process in a quantitative fashion. The interesting point here is that if professional track ever develops, a system such as this could be used to compute handicaps. Then, races would be even more exciting since all the competitors would be near one another at the finish.

BASEBALL

The game of baseball can be simulated just like any other two-team sport: the statistics of frequencies of occurrence are compiled, and random variables are chosen to pick game actions from the statistical distributions. This is exactly what was done by an outfit called Computer Research in Sports of Princeton, New Jersey. Through Dick Auerbach of NBC Sports, they arranged to have an all-time World Series, resulting in the simulated best team of the century. Two brothers, Eldon and Harlon Mills, chose eight teams to play in the computer World Series:

1927 New York Yankees
1929 Philadelphia Athletics

1942 St. Louis Cardinals
1951 New York Giants
1955 Brooklyn Dodgers
1961 New York Yankees
1963 Los Angeles Dodgers
1969 New York Mets

On seven Saturday mornings preceding the NBC Game of the Week during 1970, results of one of the games were read by Curt Gowdy. The finals were held on September 19, 1970 with the 1927 New York Yankees going against the 1961 New York Yankees. The winner of the game was the 1927 New York Yankees. Of course, the simulation does not mean that the 1927 Yankees are always the best team: it would have been interesting to see how consistent the results would have been running multiple simulations with each team having to win the best four out of seven.

The Mills brothers have written a book[5] concerning computer analysis of baseball statistics. They develop a statistic called the Player Win Average which they contend is the best available measure of the player's ability to help the team win. The computer program written by Computer Research in Sports was in FORTRAN and was run on a local computer.

There have probably been more statistics accumulated for baseball than any other professional sport. You name the category and there is a mountain of statistics about it.

The ultimate in statistical reporting of player data has come about for the Atlanta Braves. Lee Walburn and Bob Hope of the Braves engaged the services of Honeywell in Atlanta to develop a real-time, on-line baseball statistical information system. The program was written in FORTRAN IV for the Honeywell 1648 time-sharing computer with a core of 68K words. Developed by two Honeywell personnel, Gary Williams and Susan Gerald, the program is described by Ms Gerald:

"Information is input to the machine as events occur during the game; game situations have been coded for ease of input—BB signifying base on balls, 1B a single, etc.—and files are instantly updated according to player number. At any point in the game the operator may interrupt the data input to request short statistical print-outs that can include an up-to-the-minute line-up stat sheet or an up-to-date sheet on any player, any combination of players, or the entire team. In addition, the system maintains and will print upon request files of special situations for pitchers and selected batters. Also, the system includes a short routine that will respond to any question in a conversational mode.

"The use of this system has already pointed out several interesting facts about individual players as well as the team as a whole. For example, through comparison of the statistics concerning Braves batting against left-handed pitchers versus batting against right-handed pitchers, we found that our Latin American players as a rule hit better against the right-handed pitchers."

Atlanta feels that the system is both efficient and useful, and Honeywell plans to market it to other teams in pro baseball.

The 1970 All-Star game was composed of players selected by computer processing of punch card ballots by Marden Kane, Inc. Fans filled out the cards, which were tabulated. The National and American Leagues are also looking into the possibilities of preparing their schedules each year by computer, since there is so much trouble with rescheduling due to weather.

The Houston Astros employ a computer to analyze the scouting information on prospective players. The reports are keypunched and processed by their 360 system. (The program was written by a programmer in their accounting department!)

Computerized scoreboards are being developed to present statistics and other information to the fans attending the sports. The Conrac Corporation (hardware) and Information Concepts, Inc. (software) built the scoreboard in the Oakland Coliseum. There are 23,214 individual light bulbs in the board and it takes 1,000,000 watts to operate it for one game. The board is 24 ft. high and 126 ft. long (over 3,000 sq. ft.). An IBM 1130 actually generates the display information sequences, which can be preprogrammed to show lettering and/or animations. The computer also has been programmed to keep track of statistics so that, for example, it can display how many balls and strikes have been thrown by each pitcher at any time during the game.

BOXING

One of the most publicized sporting events during 1970 was the computer simulation of the Rocky Marciano-Muhammad Ali fight. Murry Woroner of Computer Sports, Inc., Miami, developer of the production, utilized the services of Systems Programming Services, Inc., also of Miami. The program itself was written in FORTRAN IV to run on an NCR 315 with 160K of core. Each fight simulation took three minutes of computer time for the 15 rounds (unless there was a knockout).

The data base was generated in the usual manner: statistics were compiled of at least ten fights for each fighter—the number of blows, type of blow (such as right hook, jab, etc.), what part of the body was hit, location and severity of any cuts, number of clinches, and knockdowns.

A scouting-rating analysis was also conducted, since a large number of fighters were originally in the fight-off competition. According to Henry Meyer of SPS, "We had boxing experts such as Nat Fleisher, the Dundees and members of the World Boxing Historian's Assoc. throughout the world evaluate some 55 characteristics of each fighter on a scale of from 1 to 10. These characteristics included such things as speed and hardness of various types of blows, ability to deliver and avoid punches, stamina, courage, etc. The ratings were then statistically reduced to a weight for each factor for each fighter. Of interest, courage was the most important of all."

In trying to test the system they sometimes had a fighter compete against himself—with rather interesting results. Again, Mr. Meyer tells what happened: "Many times they really out-classed themselves offensively vs. defensively: often their weakest defense was

5. Mills, Eldon and Harlon Mills, **Player Win Averages**, A. S. Barnes and Co., 1970.

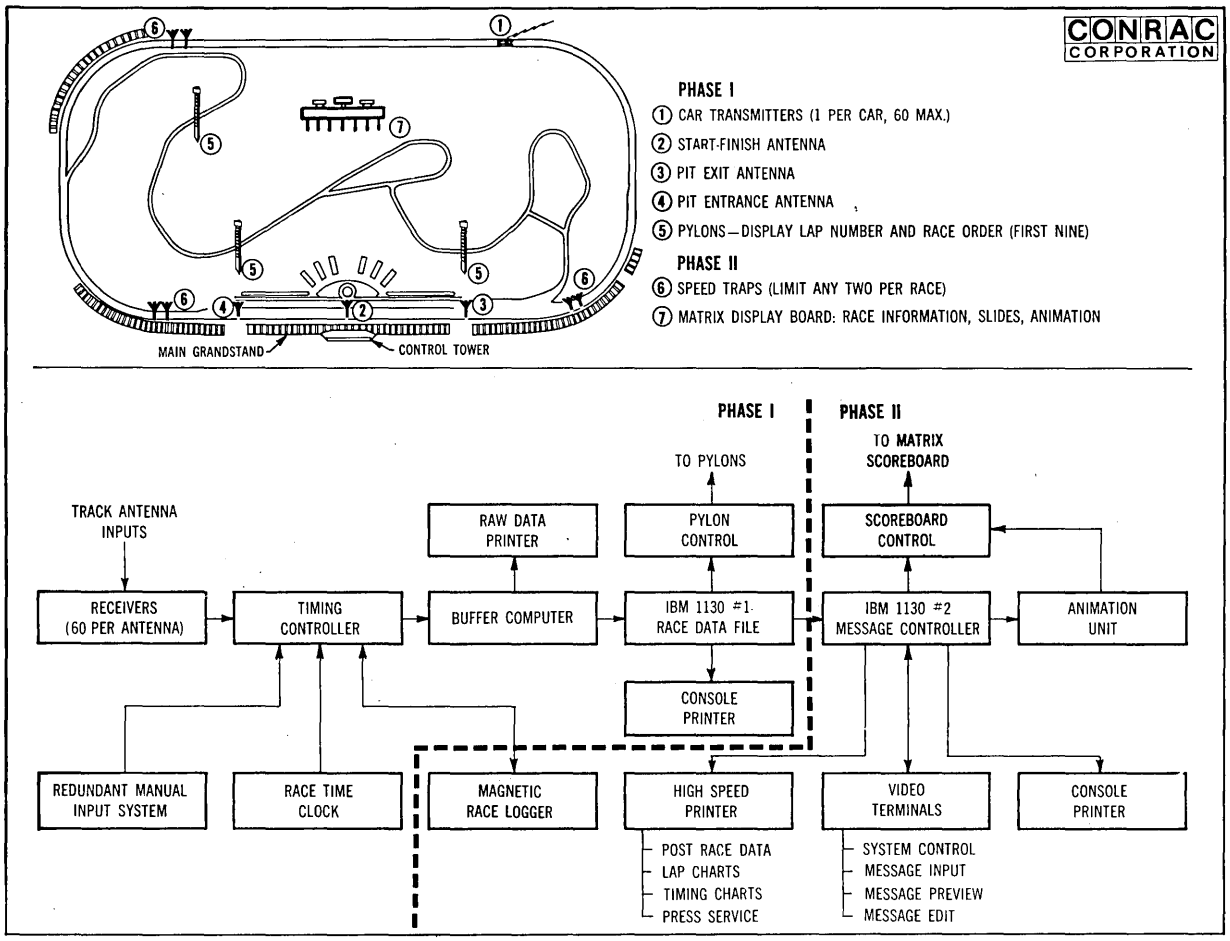


Fig. 2. Computer system overview, Ontario Motor Speedway (courtesy of Conrac Corp.).

against their best blow!"

As most everyone knows, the climax was the Marciano-Ali bout in January 1970 which Marciano won (of course Ali disagrees). Over 70 rounds were filmed of Marciano and Ali actually boxing, with all possibilities included. The computer program was then run and the rounds which most closely matched the computer simulation were included. After each round, a computer output was flashed on the screen summarizing the score and adding commentary.

BASKETBALL

Basketball has not seen as many applications of computers as most of the other professional sports, but the areas of team scheduling, player scouting and play analysis are all possibilities. According to the league offices of both the American and National Basketball Associations, they have looked into the possibility of scheduling their games by computer but have not done so as yet.

The largest penetration of computer applications in basketball has been made by the SCOUTMATIC scouting system developed by Jim McMonagle of COMSERV, a Philadelphia-based organization. The Philadelphia 76ers currently employ their services to rank the prospective college players according to the scouting forms filled out by the various 76ers' scouts. The computer process is quite straightforward: the forms are keypunched, fed to their XDS Sigma 7 computer, and reports are generated for the 76ers' staff. The program was written in FORTRAN, and costs approximately $3K per year for a team. McMonagle and COMSERV plan to market the system for both professional baseball and hockey.

To the author's knowledge, no one has yet attempted to perform computer play analysis, although Joe Guardino of Apex Data Services has looked into it and thinks it has good potential, i.e., some initial study has shown that some very strong tendencies do exist in basketball teams from the standpoint of their play sequence.

ROWING

Rowing is a sport that one might think would not have any computer applications. However, due to the efforts of Kent Mitchell, software systems have been developed to report the results of rowing races in a rowing-oriented format, to report data about rowing histories of the oarsmen in the competition, and to generate a graphic display of the boats as seen from above the course.

Mitchell, a Palo Alto, Calif., attorney who was a

coxswain on the 1964 Olympic team, recently formed a company called JAMCO to distribute and market the rowing systems. Reports were provided by JAMCO for each of the 66 races at the Third World Rowing Championships in September, 1970, in St. Catharines, Ontario. These bulletins were run every evening after the races on an IBM 360/30 located in St. Catharines; over 6,000 of these reports were distributed to competitors, coaches and officials from more than 30 nations. The associated programs were all written in FORTRAN.

The organizing committee of the 1972 Olympics met with JAMCO this past April to have software developed for a Conrac display board which the committee purchased for use at the Olympic regatta. Conrac was also recently awarded a contract for the main Olympic stadium display board.

AUTO RACING

A very interesting application of computers to sports has been in the area of auto racing. The recently built Ontario Motor Speedway contacted the Conrac Corp. (hardware) and Information Concepts, Inc. (software) to construct a display board (similar to the Oakland Athletics') and a real-time measuring system for the track, to the tune of $3.6 million. An overview of the complete system is shown in Fig. 2. Antennas are placed in the roadbed of the track, and transmitters—each operating at different frequencies—are attached to each car. Every time the car passes over the antenna, the signal causes an interrupt in the IBM 1130 computer, which stores the clock time (good to 1/1000 of a second) and other information about the car. The system is designed to handle up to eight cars running abreast over the finish line at 200 mph. The 1130 computes elapsed time, velocities, and places. The places are output on three pylons for spectator information. This much of the system was successfully used in the USAC 500 race held in September 1970. The second phase of the system, which includes the 246-ft. long display board, is now under development. Most of the programming was done in FORTRAN, but some assembly language routines were used for character generation on the pylons.

How did the system work in the USAC 500? According to Ray Smartis, vice-president and general manager of the track, "The system performed as designed, and the results were excellent. It is definitely the scoring system of the future."

OTHER SPORTS

New digital timing systems by Data Time, Inc. of Oregon and Deka Products of Palo Alto were recently introduced as portable timing systems for many sports. The Data Time system has already been used in swimming. Pressure pads on the end of the pool and on the take-off boards interrupt the digital clock; a crystal controlled clock is employed which allows the time to be kept to 1/10,000 of a second accuracy. The output of the timer is in the form of digital readouts, and—for more advanced systems—a large display board can be attached. This was the system which performed the official timing at the Santa Clara Invitational Swimming Meet on July 10-12, 1970.

Most of the track applications mentioned above can also be adapted to swimming. This author intends to develop scoring and pacing tables for swimming in the future. Many swimmers do interval training, i.e., swimming distances at sub-maximum speeds repetitively. The pacing tables will prescribe exactly how the intervals are to be run for each level of ability.

A number of small software packages have been developed to compute handicaps for golf. These programs use PGA rules for the computation of the handicap. There are differences for women, and even the difficulty of the course can be taken into account.

International Computer Programs[6] also lists a number of bowling statistical packages. They produce individual and team statistics, as well as league performances and yearly best averages. These systems have been programmed in either RPG or FORTRAN.

Summary

We have shown in this article some examples of computer applications that demonstrate positive utilization of computers—most sports computer systems provide information that is useful to the team or to the individual athlete. In the future, we can expect more sophisticated software systems to be developed, and the computer science aspects to be more challenging.

Acknowledgments

The author wishes to acknowledge the help of Sports Expert, San Jose, for names and addresses of people to contact in the various sports. Also, information provided by the league office of the NFL, Optimum Systems Inc., JAMCO, and Honeywell is appreciated. The author would like to hear from those involved in other applications in sports that were not mentioned. ■

Mr. Purdy is working on his PhD thesis in computer science at Stanford Univ., where for the past two years he has been on a TRW fellowship. He is also currently employed by TRW, Sunnyvale, as a programmer on such projects as spacecraft tracking, trajectory, and command and control systems. He has a BS from the Univ. of Tennessee and an MS in computer science from UCLA.

6. International Computer Programs, Inc., ICP Quarterly, July 1970, pg. 117.

One insider's view of what REALLY happened when Penney and GE went pffft

TRADAR: Death of

In May 1969, the J. C. Penney Co. and the General Electric Co. signed a $10 million contract to install a full TRADAR system in 50 Penney retail stores throughout the Los Angeles area. A joint GE-Penney press release described TRADAR as: "The Retailer's Dream Come True."

October 1969, at the Century Plaza Hotel, Penney's point-of-sale manager, Mr. Bill Martin, stood where our space astronauts were cheered, and described Penney's Glendale, Calif. store experience with TRADAR, and Penney's plans and rationale for making a TRADAR system commitment. In 20 years of attending edp conferences, I had never felt a more enthusiastic response to a technical, factual report. Bill Martin received a standing ovation. His message about TRADAR's tested and measured performance so excited a worldwide assemblage of retail data processing folks, all later conference talk seemed anticlimactic.

December 1969, after GE distributed its 1970 in-house calendars featuring TRADAR as one of GE's significant products, the J. C. Penney Co. canceled its TRADAR contract. A joint GE-Penney press release announced "system bugs" were the reason for the contract cancelation. What really happened to TRADAR? Before we try to answer that question, we'll sketch TRADAR's developmental background, and then take a quick look at a full TRADAR system.

The seeds that grew into the TRADAR project were planted in Schenectady in the early '60s. There the GE lab people obtained a government contract to study and implement some form of identification badge reading technology. Having done this government sponsored work, they looked about for other applications of their newly developed "circular magnetic read" technology. GE's close ties with the retail industry, and the need for better point-of-sale data capturing techniques, led to a corporate funded development identified as ISIS (Integrated Store Information System). The ISIS development objectives appealed to Mr. Ralph Lazarus, a retail industry executive who is also a member of GE's Board of Directors, and a pilot ISIS project was established at the family run Lazarus Department Store in Columbus, Ohio. The plan was to build a prototype integrated department store information system, install it and test it there in Columbus. After much soul searching, GE chose its 400-line processor as the hub of the system, and Computer Usage Corporation was engaged to build the system's required software. Lazarus was using NCR 304 equipment for data processing, and installation of GE-400 gear would require extensive reprogramming. Nevertheless, the project continued with GE funding. Prototype hardware was built (not all by GE), software was designed and tested, and costs began to mount. The project began to attract attention from the retail industry and from GE image watchdogs, who noted that ISIS was a goddess of fertility, and also a brassiere brand name. The project identification then changed to TRADAR (TRAnsaction DAta Recording).

GE made rather loose contracts with Dennison Co. for the manufacture of TRADAR merchandise ticket making devices, and for supplying TRADAR ticket stock. Friden Co. was engaged (also loosely) to build the prototype TRADAR terminal. Projected total system costs continued to mount, and before the system was installed for live testing, Lazarus lost interest. Very shortly thereafter, the J. C. Penney Co. agreed to try out the nearly completed TRADAR prototype system in California, and GE then transferred the project to Phoenix. I was assigned to the GE TRADAR project as a software system adviser just prior to the drafting of the Penney contract. In contemplating the possibilities of the system I was "turned on," so I can't deny some personal bias in what follows.

GE image watchdogs noted that ISIS was a goddess of fertility...

In a nutshell, a full TRADAR system was 1,500 specially made cash registers sending and receiving point-of-sale information over leased telephone lines to a brace of middle-aged GE-400 line processors standing back to back at a data processing center. Auxiliary components of the system, in addition to a duplicated set of standard processor peripheral equipment, included a device for making magnetically encoded credit cards, devices for making magnetically readable merchandise tickets, a device to read and capture information from large batches of TRADAR merchandise tickets, and Teletype terminals

a Retailer's Dream

by Richard M. Petersen

connected to the TRADAR's communication lines.

TRADAR cash register terminals were designed by GE, prototype built by Friden Co., and manufactured by the non-GE acquired part of the Olivetti Co. But we'll bypass that story because it's too complicated to explain at this point.

The fact that a second generation processor, the GE-400, could be made to talk "simultaneously" to 1,500 on-line terminals is something that merits a closer look. A GE-400 processor has 64K words (256K six bit chars) maximum core size, and a 5.8 usec access time per word. TRADAR's fast talk secret was contained in a device called a multiline controller (MLC) that interfaced 64 telephone lines directly into GE-400 core. Of the MLC's outgoing lines, 63 were distributed into 32 terminal lines by specially designed scanners, making a total of 2,016 possible terminal connection points. One MLC line was connected to a back-up twin GE-400 processor through a duplicate MLC box. Through this line the back-up processor was able to monitor the activity of the on-line processor, and activate immediate 63 line switchover in the event the on-line processor stopped doing its tasks. The MLC was a communication system "programmer's dream come true." It sanitized each incoming message, expanding it into a fixed length 4 word record (16 chars), right justified each data field within the record, stuffed in a source terminal identification code, marked each new record as "not yet processed," stored each record in the next empty position of a circular queue in processor core, checked to see that the input record queue was not about to get overloaded, and did all this good work without interrupting the GE-400 programs that processed these input messages. MLC also serviced 64 output queues automatically, queues filled in core by GE-400 message processing programs. So it was MLC hardware, not GE-400 software, that handled the critical job of moving messages in and out of processor core fast enough to avoid any noticeable delays at any one of the 1,500 TRADAR terminals being serviced simultaneously. In a typical cash sale transaction as many as 27 short messages were exchanged between terminal and processor before the transaction was completed. If input messages came at a rate faster than earlier messages were being processed, the MLC recognized this condition and told each scanner to stop scanning until told to go again. In a second or so, time not noticeable at any on-line terminal, the input message scanning process would be resumed automatically.

TRADAR's ability to keep 1,500 on-line terminals clacking should be of interest to computer programmers, but what actually took place at the cash registers may be of more interest to retailers. Under ideal conditions a customer approached a TRADAR checkout terminal, carrying an armful of TRADAR ticketed merchandise and a magnetically encoded credit card. To consummate this charge sale transaction, a salesperson at the terminal pushed a credit sale key, removed each merchandise ticket, inserted it in the terminal's magnetic reader, and after all tickets were read one at a time, inserted the customer's credit card in the magnetic reader, returned the card to the customer along with a TRADAR printed receipt, asked the customer to sign a TRADAR printed store receipt, wrapped the customer's purchases, and said: "Thank you."

From the start of the transaction recording procedure a sequence of screen-displayed and printed messages were given at the TRADAR terminal to remind the salesperson of the proper procedure. These ever-present reminders made even complicated or infrequent kinds of transactions easy for a new salesperson to learn. And the system was programmed to process many different kinds of transactions: cash sale, charge sale, lay-a-way, payment on charge account, merchandise return, special credit authorization, employee time clocking, etc. TRADAR terminal keyboard entries could be used in place of magnetically encoded tickets and/or credit cards, although less convenient and subject to human error. When TRADAR merchandise tickets were used, the additional cost of magnetically encoding the tickets was more than offset by not having to process the tickets beyond the point of sale.

All instructions for guiding a point-of-sale transaction and capturing all the data generated by the transaction were stored in the data center's twin processors. All charge sales, not just those over $25, were automatically credit checked by the on-line processor. For sale of a large ticket item, such as a pink, left-hand-door refrigerator not out on the sales floor, an immediate inventory check and update could be made automatically, providing dependable delivery information to a satisfied customer. (Large ticket item processing was not tested by Penney, but was one of TRADAR's multiple capabilities.)

(Continued on page 36)

Lots of action took place at Penney's Glendale store as a result of TRADAR's full time, but unnoticeable, credit checking talents. For example, one woman managed to charge over $2,500 to her Penney account by shopping in many different Penney stores and making many small (non-credit-checked) purchases. Penney's credit manager became quite concerned with this busy woman's behavior. He wanted her to pay for her purchases and he wanted her credit card back. One day she made the mistake of charging a small purchase in the Glendale store. When her credit card was fed to the TRADAR System, the salesperson read a TRADAR printed message: "Hold card, go to credit office." The woman got the message, too, and ran as fast as she could go for the nearest exit. Penney's credit manager was happy to have her credit card returned, even though it was difficult for him to discuss account payment plans with her that day. During the time TRADAR was being tested in Glendale, it's been estimated that more bad credit cards were picked up in that one store than in all of the other Penney L.A. region stores put together. TRADAR was not a good system for dishonest customers.

All the detailed data from each point-of-sale transaction was immediately captured at the data center and recorded on duplicated magnetic tapes called "journal tapes." During the test Penney chose not to exploit the wealth of information on its journal tapes, because to do so would have required the design and implementation of a completely new data processing system. Instead of going all the way during the TRADAR test that started in November 1967, Penney simply extracted data from the journal tapes and merged it into the existing batch processing system. Full exploitation of TRADAR's "real-time" on-line data gathering capacity was a big task yet to be accomplished in December 1969. All the necessary data was being gathered from one Penney store, but no computer programs were written to digest this data for use as a management information tool, except for the programs required to feed journal tape data to Penney's current edp system. Penney did, however, implement a very satisfactory test of descriptive billing, using journal tape data as direct input to a new system for customer billing. Few if any customer complaints were registered during the time Penney tested descriptive billing from TRADAR captured data.

By more than a year of live testing, Penney proved to its own satisfaction that TRADAR was a reliable enough system for point-of-sale data gathering to go all the way. Nonetheless, lingering doubts were sometimes expressed, such as: "If we tie all our stores' operations to TRADAR, how can we sell merchandise if both processors go down at the same time, or if our leased telephone lines stop carrying messages, or if electrical power is lost?" In this writer's opinion, a temporary loss of electrical power is not a fearful thing. In fact, an occasional power outage offers a refreshing possibility: Recall the New York City blackout not long ago when "people machines" became friendly human beings, and for a few hours laughed and talked with each other? Not altogether a negative happening, indeed.

I realize the "weak" argument above might appeal to a Huck Finn, but not to an efficiency-minded retail executive. And since Huck Finns don't buy large scale integrated edp systems, we must recognize that the only TRADAR system catastrophic failure fall-back procedure to keep merchandise moving was the use of old fashioned pencil and paper at the point of sale. And of course all manually recorded sales documents would have to be keypunched or key-to-taped later and fed to the system after the failure condition was corrected. No such catastrophic failures were experienced by Penney in more than a year of live system testing. Nevertheless, the fear of fall-back to pencil and paper, in the event TRADAR was not alive to assist each salesperson in recording a sale, was an ever present concern in the minds of retail executives. Most men who drive Cadillacs hate to think of walking if their Cadillacs break down on the road.

Several months after the Penney contract was signed, GE flew in a new top level manager schooled in warfare (West Point grad, military commander, GE military armaments department head) to handle the TRADAR project. The manager who successfully negotiated the signing of the $10 million dollar contract, and who happened to know something about the retail business (it was his family's "bag"), was sent back to the East on a different assignment. He was asked to take what he thought would be a promotion: responsibility for GE world-wide advanced project control, coordination, and monitoring. In September 1969, Penney's top TRADAR project executive resigned. He was enticed away from Penney by another retailer who had new point-of-sale system plans. So near the end of 1969 we find new bulls on both sides of the TRADAR bull pen. And when these bulls locked horns, dogs barked, chickens ran, ducks quacked—the whole barnyard became unglued, and neither side won. A contract for one of the world's most carefully

Most men who drive Cadillacs hate to think of walking . . .

and extensively tested large scale, on-line edp systems was canceled, even though test results indicated: "All systems are GO."

GE had set a pattern of sending its top managers to Phoenix without prior edp exposure. There were exceptions, of course, such as the late John Haanstra who was lifted from IBM, but who suffered a fatal accident in mid '69, and the lively Herb Grosch, who was transfered to Phoenix at the start of GE's edp equipment manufacturing effort. Nevertheless, when GE finally admitted its large stable of professional managers sans edp credentials couldn't cope with the edp industry, and sold out to Honeywell, Penney executives' doubts about GE in the edp equipment business may have been substantiated. Although Honeywell's leaders have shown they know how the edp game is played, how could J. C. Penney Co.'s decision makers forsee GE's smart move a year before it happened? Penney had to make a critical decision on whether or not to push a $10 million risk, with GE's known track record a factor in the decision (not all TRADAR subsystem committments were met on schedule), and with a Penney cash shortage position in late '69 pressing the decision. After all, there are lots of good ways a retailer can spend $10 million to en-

hance his business.

Other Penney contract decision bearing factors that were in the picture in late '69 included:

The National Cash Register Co., not wanting to lose its lions' share of the cash register market, quietly suggested to retailers that it had something better than TRADAR being perfected in its advanced development lab. Retail executives were flown to Dayton, Ohio, in NCR's private jet to peek at NCR's answer to the TRADAR threat, unpublicized yet mind-boggling peeks into NCR's plans. Since Penney is loaded with NCR cash registers, it's a good bet Penney executives were invited to peek.

Friden Co., the people who built the TRADAR prototype terminal, announced to the world its own internally programmed "intelligent" cash register device: one that could operate in a free-standing mode and, at a user's option, could become a TRADAR-like terminal.

NCR quietly suggested to retailers that it had something better than TRADAR...

Olivetti, the company that manufactured production model TRADAR terminals but was not tied by GE to an exclusive production contract, offered U.S. retailers a lower cost, non-GE, TRADAR-like system controlled by a minicomputer. Olivetti claimed its smaller scale point-of-sale TRADAR-like system did not require total retail business commitment in order to be cost justified.

With these new TRADAR-like offerings beginning to appear, I imagine Penney executives wrestled with the fear: "If we continue our $10 million GE TRADAR contract implementation, three or four years from now we may not have the 'best' system available"—another mind-boggling dilemma.

What too many would-be edp commanders fail to appreciate, and I suspect both Penney and GE executives of this inexperienced view, is that total system performance, particularly the way people relate with the system, not just higher speed, lower cost, nth generation hardware glamour, is the key to successful edp. And a large scale, on-line, tested and reliable edp system is never proven by laboratory models and press releases. Those who believe the next generation of hardware will make their edp dreams come true may not be aware of the fact that some Univac I systems were alive and productive for almost 20 years.

Undoubtedly there were other factors of which I'm unaware, that contributed to the decision which caught GE and the retail industry by surprise in December 1969. All that I can do is express my own limited, not privy to corporate level point of view in the hope it will help clear up an edp mystery. However, to the J. C. Penney Glendale, Calif. store manager who was dismayed to learn his TRADAR cash registers were scheduled to be shop lifted by his own bosses during the 1969 Christmas rush; to all the retailers who gave Bill Martin a standing ovation at the Century Plaza for his TRADAR experience presentation; to the J. C. Penney executives who had that tough decision to make in December 1969; to the young salespeople who enjoyed TRADAR assistance in their sales recording chores; and to all Penney's honest customers who moved quickly through TRADAR terminal check-out lines, never irritated by delayed telephone call credit checks, I say: "Keep the faith, baby." TRADAR-like systems are coming back. Bullock's department store people are installing one now in downtown Los Angeles. Bullock's will have more than 45 terminals in operation by the time you read this. Also, a new law that limits a credit card owner's liability in the event his card is lost or stolen will accelerate the TRADAR concept comeback.

Additional comeback acceleration stems from a bank in California that has latched on to the TRADAR concept, and will exploit it in small pieces. Through a shared service plan, a Union Bank affiliate, Unionamerica Computer Corp., will offer TRADAR-like services to retailers who need as few as ten terminals. For more than ten terminals in Unionamerica's plan, cost per terminal decreases. The new cash register terminals and the electronic components in the Unionamerica offering, and in Bullock's newly installed TRADAR-like system, are being provided by American Regitel Corp., headquartered in San Carlos, Calif. Regitel is staffed by people who were at one time involved with GE's TRADAR system. And the secret hardware retail executives peeked at in Dayton more than a year ago, was recently announced to the world. NCR's "280" system, after its on-line credit checking feature is made available, will have the functional capability of the TRADAR system in spades.

Although GE's TRADAR had some features needing further development, and was too expensive for a small retailer to operate by himself, it was one of the most "people oriented" and large retail business oriented edp systems it's been my pleasure to know. The GE people who created and carried the TRADAR concept as far as they did, deserve to be applauded by the edp and retail industries. Others may now reap financial rewards from the efforts of those who were paid by GE and permitted by GE to do their own thing. My hat's off to GE, the Johnny Appleseed of the on-line point-of-sale edp business. ■

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Stop begging for understanding of dp problems and start earning managerial respect and confidence

Commitment ... the

Given the choice between conflict and commitment, you would almost certainly opt for the latter. Yet, I suspect that for many practicing dp professionals, commitment is a distant hope and conflict an oppressive reality—conflict that manifests itself as misunderstood objectives, fuzzy project specifications, development cost and schedule overruns, unworkable systems, and disrupted business operations.

In my view, conflict abounds. Although each of us may point with considerable pride to brilliant—even inspired—use of the computer to solve significant industry problems, I believe the very reason we are so proud of these singular accomplishments is that they stand as a palm tree in an oasis and lead us to cry: "Who said there's no water in the desert?"

Commitment, on the other hand, is that rare and cherished state of affairs arising out of mutual respect, of partnership, of common interest in common goals, and of common approaches to reaching them. Utopian? Perhaps, but certainly worth striving for, even in the face of human frailty and the inevitable obstacles—both human and material—that beset man in whatever profession he pursues.

If you read the trade and professional literature, you have been deluged with articles giving you advice and urging you to gain top management involvement in your efforts. The hypothesis underlying most of this advice is that involvement leads to commitment and that commitment, in turn, leads to satisfactory results. But few authors are very convincing in telling their readers how to get it. The majority of them assume that management must do this, and management must do that, and management must learn such and such. To me, this kind of advice seems depressingly far from the mark.

Why? Because managers don't like being told what they "must" do, particularly if they're already overloaded by many (usually conflicting) demands on their time and energies.

Maybe I should be encouraged that the need for involvement is now more widely recognized—but recognizing a need is not the same thing as *meeting* that need.

Let's begin by enumerating the need in some detail.

Is management's involvement really justified? And is management's commitment needed? Yes, in all but trivial cases. Why? For two reasons: First, the computer can (and often does) significantly affect company profits; and second, that effect on profits can be negative unless management does something to ensure that worthwhile applications are selected and then implemented in a businesslike way.

Elaboration is hardly necessary—there are plenty of examples of misdirected (or nondirected) computer applications that have bitten deeply into company profits. To look for further justification for management's involvement would be more painful than illuminating.

But it is not enough that we in the dp trade are convinced. What arguments can be used to convince management? I don't like some of those I hear.

But in an absolute sense, data processing costs are not that large ...

Managers are told that data processing is terribly important. Indeed it is; but so are production, sales management, purchasing, and distribution. And all of these functions, too, are crying for management attention—and all of them deserve it. Yet all are frustrated by their inability to get as much attention as they'd like.

Providing we are not embarrassed by the amount of money we are spending on data processing, we often use the sheer size of data processing expenditures as justification for management's attention. Indeed these expenditures may be large, and in most

Based on a speech given at the Eleventh European GUIDE Conference, June 3, 1970, Interlaken, Switzerland.

industries, are growing rapidly. But in an absolute sense, data processing costs are not that large—compare the cost of computer equipment to other items in the asset accounts. Or compare the cost of data processing staff salaries—definitely a more troublesome cost because it seems to increase inexorably—to other operating costs. Chances are that neither one is the primary concern of the president or his immediate subordinates when they come to work in the morning.

Other reasons, more subjective, also are offered to management: Data processing is new; it is challenging; it is exciting; it is fun. We may firmly believe that all these are true, but I suspect that most senior executives smile within themselves and think: "Well, I'm glad *you* enjoy it, but I have other things on my mind."

And so, these and similar arguments fall on deaf ears; and data processing does not get as much attention from management as some think it should. But neither did the 10-year-old boy who, after taking violin lessons for a few years, wanted to demonstrate how well he played Mendelssohn—he drew a relatively small audience made up primarily of grandparents and doting aunts.

I'd like to suggest a different tack (though I don't guarantee that it will help the budding violinist). Begin by looking at the business your employers are in and think about how profits are generated in that business—and how you might contribute to increasing those profits through data processing. Do you understand the economic foundation on which the business stands? Can you lower production or distribution costs, for example? Have you the tool at your disposal that would allow faster and more accurate shipments to customers? Is it possible for you to improve the yields of a costly process plant? Can you reduce the asset base on which your company earns its profits through inventory control systems? Can you *really* improve the quality of decisions (a difficult, even dangerous area where many opportunities lie unfathomed)?

If you can indeed help your management achieve these objectives, you will soon find that the problem of management involvement will swiftly solve itself. If you can't all the arguments you can muster will go unheard.

I don't much like the expression "management involvement"—it is far too vague. Who is management? And what is involvement? There is a ring of self-pity in the frequently heard cry that "management is not involved." To me, it sounds too much like the lament "Nobody loves me." Perhaps it would be worthwhile to examine oneself to see if one is indeed lovable. In all other areas of human behavior, one must earn respect, confidence, and commitment; these are not gained by begging for them, no matter how plaintively.

Let's examine the question: Who is management? If management is translated to mean those who are at the highest levels in the organization structure, then I believe it is completely unrealistic to expect that any substantial proportion of managers at this level will become involved in data processing on a continuing and active basis. I suggest we take a more pragmatic approach and focus on individual *users* of data processing as the managers who must be involved. My reasons are as follows: First, the user is easier to identify as a person (or as a relatively well-defined group of persons). Second, the user has a direct and personal interest in our success, since presumably his operations will depend heavily on the system being designed for him; in many cases, his interests will be sharpened by the effect we have on his profit and loss statement. Finally, if we concentrate on satisfying the user, even if he is not now at the highest level in the organization, we contribute to his success and ultimately to his move up the organizational ladder to higher management positions. And what better friend in court could you have? I realize that this is a long-term process, but it takes time and patience to build confidence and gain commitment.

Unreachable Star?

by George Glaser

Now let's examine the question: What is involvement? Or, if you accept the substitution of user for management, the question should be rephrased: "How can the user help?"

Basically, he can do two things:

1. He can ensure that development projects undertaken on his behalf are sound—economically, technically, and operationally.[1]

2. He can contribute immensely to the effectiveness with which these projects are carried out.

He accomplishes the first of these two tasks by ensuring that projects are undertaken only if they will contribute to the achievement of businesslike objectives for the company—that is, that each project will contribute directly to improving profits or will yield some other concrete results that will have the same effect indirectly.

The user also plays a critical role in evaluating the feasibility of proposed projects. He is obviously poorly equipped to evaluate technical aspects of the design and the related costs of development and operations. But he is in an ideal position to evaluate the benefits that are expected; in this, he is a major contributor to the evaluation of the economic feasibility. Finally, he is the only one qualified to judge the operational feasibility of the project wherein questions of acceptance and motivation must be answered. He also is the only one who can make the necessary commitment to achieving the benefits that the system is designed to provide. Data processing's commitment, on the other hand, is to deliver the system on time and on cost. But data processing typically is not in a position to direct the achievement of benefits; only the user can do this.

In accomplishing the second task—contributing to the effectiveness with which projects are carred out—the user begins by establishing realistic performance

[1]George Glaser, "Are You Working on the Right Problem," Datamation (June 1967).

targets for the system; and he makes informed judgments on the tradeoffs between performance and cost that inevitably arise during development. The user also contributes by assigning good people from his organization to the development effort—good people, assigned full time, are excellent evidence of his level of commitment. The wise user also gives adequate attention to the operational problems that will undoubtedly arise at the time of—and after—implementation; he ensures that his people have been trained and are properly motivated to use the system wisely. And he carefully monitors the progress of development efforts so that at all times he is well informed, and consciously and continuously endorses the design objectives.

Some users are simply scared—even terrified—of data processing.

Each of these steps seems logical enough. Why is it that users/managers are not more involved today? I believe there are a number of reasons. Some of these result from the fact that users, being people, don't behave as we'd like them to; others must, I'm afraid, be laid at the door of the data processing department.

First, consider the users/managers as people. Users may have a variety of unfavorable attitudes toward data processing and data processing personnel. These are not always rational; but they are, nonetheless, quite real. And they do serious damage. Let's examine a few user attitudes that are frequently encountered:

1. *Scared.* Some users are simply scared—even terrified—of data processing. Data processing is new; it is different; it is moving too fast. They just don't understand it well enough to be comfortable with it.

2. *Frustrated.* Some users would like very much to become more involved in data processing, but they don't know how. It is unlikely that short courses in FORTRAN will overcome this.

3. *Overworked.* Some users are too busy; they have so much to do that they cannot take the time to understand and actively support data processing as they should.

4. *Skeptical.* Some users say: "You've got to show me." They expect data processing to prove the value of their services before accepting them. This leads to a chicken-and-egg standoff.

5. *Disillusioned.* Some users are disillusioned by poor results from their prior experience with data processing. When in this frame of mind, they are unlikely to take a more active role until shown that their past experience will not be repeated.

6. *Antagonistic.* Some users oppose data processing for no apparent reason at all; they seem just plain ornery.

Users also can be expected to have quite different value systems from those of data processing personnel. Their educational backgrounds may reflect little or no technical training; they may be both older in years and less imaginative in outlook; by definition, their assigned responsibilities are different.

But users have no monopoly on human frailty. The behavior of data processing personnel has been very annoying to them as well. The data processing professional is, as a rule, young; he is enthusiastic, idealistic, and optimistic about the worth of his labors. His world is centered on a fascinating technology, often to the complete exclusion of the most basic principles of economics and psychology. He is dedicated to change because he honestly believes that his skills can be used to improve the way things are done. At the same time, he is naive, with little or no business experience that would equip him to approach business problems realistically. He may even burst out in self-righteous indignation when he discovers that a system he designed and which he believes is "right" will not be used.

Is the typical data processing manager much different from his people? I think not. I believe that as a group, data processing managers have no political capital; their credibility is very low. They display an obvious lack of management skills as shown by schedule and cost overruns, and high personnel turnover. And they show an appalling lack of sensitivity to the realities of corporate economics, to the intractability of operating managers' problems, and to the frailties of the humans who are trying to cope with them. For these reasons, data processing managers all too often have failed to earn the respect and confidence of other managers in the business, and I believe that management is unlikely to "get involved" to any significant degree until they do.

That the situation is not hopeless is attested to by the number of successful installations and the number of data processing managers who have won the respect and support of management. But how does the less fortunate data processing manager go about building his political capital? Must he grovel and fawn? Must he be devious and patronizing? Hopefully not, for these tactics will gain him favor only with others who rely on similar degrading approaches. Such favor would do more harm than good.

He must stop thinking of users as obstacles . . .

I'll tell you what I think he must do. He must stop thinking of users as obstacles and must acknowledge them as the *raison d'être* for his job.

First, he must communicate with them and in a language they understand. He must try to appreciate their problems and view their problems as his problems. His role is to serve, and serve he must. He must be realistic. He must ask and ask again: How can data processing help? What is the solution worth? How likely is it to work? And he must answer these questions in terms of dollars or in some other visible manifestation of success. He must routinely keep his users informed—in a frank and constructive way—of progress he has made and difficulties he has encountered; he must seek their aid in overcoming them.

Second, he must deliver results. Beginning with realistic performance, time and cost targets, he must produce systems that are usable. He must look beyond the problems of file structures and language subsets to

the problems of human behavior and consider not only *how* a system will be designed but, more importantly, *why* a user would be motivated to make it work.

Third, he must plan for the future. I am dismayed at some of the so-called data processing plans I have seen. Often, the only numbers that appear are machine numbers; and the descriptions of applications for future development are fuzzy in concept, shaky in justification, and in the worst cases, grossly misleading. Few plans consider the resources required—the people, the equipment, the communications, and the data; the decisions to be made and who must make them; the obstacles that are foreseen and how they will be overcome; and the assumptions about the environment in which each system will be used. Good plans are specific and detailed, so that they can be criticized, improved upon, and approved; and ultimately, so that individuals can be measured for what they have accomplished.

Finally—by far the most neglected and yet most fruitful opportunity—the data processing manager must develop his staff. The data processing profession has done an outstanding job of technical training. But training in the nature of our employer's business, its competitive environment, and its economics are sadly lacking. And, although most data processing managers fight hard to negotiate adequate salaries for their staffs, little attention is paid to career opportunities. And here is where I think we have done a miserable job.

Long-term career opportunities *within* data processing for systems analysts or programmers look dim indeed to me. Promotion possibilities within data processing will be few because the number of significant managerial positions is small. Fortunately, while a large number of new computers are being installed each year, there will be enough new jobs to provide the best people with managerial positions in other companies—a small comfort to their former employers. But the number of new installations and new software companies cannot continue to increase at the current (or recent) rate indefinitely. For most established companies, the day will soon come when all managerial positions in data processing have been filled by youthful incumbents and the bright young graduate will say "No thank you" to offers of a data processing career.

And yet, we expect to attract and keep men of high intelligence and high motivation to design our systems and to make them work. Unless these men are given opportunities to broaden their skills and interests and to move up in the organization by moving out of data processing, we will lose them—if indeed we attract them in the first place. The good data processing manager must encourage individuals to transfer from data processing to other organizations in the company even though he does so at some sacrifice and with understandable reluctance to release his best people. Yet, these individuals will be his most enthusiastic and best informed disciples. And unless he takes these steps, data processing in the long term will lose its attraction for high-quality people—and if that happens on a broad scale, all of us will suffer from our association with mediocrity.

I believe there is considerable evidence that data processing has disappointed industry thus far. In spite of widely heralded promises, real successes are still too hard to find. Unless the attitude of data processing people and data processing managers changes, we can only look forward to further frustrations. No doubt there will be more powerful machines and no end of exciting technological developments; but the wise data processing professional might well reflect

. . . there is considerable evidence that data processing has disappointed industry thus far.

on what the future holds for him and his colleagues if the current success rate continues at its rather undistinguished level.

There is no doubt that a gap now separates many in the data processing fraternity from top-level executives. Data processing personnel are disappointed at management's seeming inability to appreciate their problems. Could it be that management is *equally* disappointed at data processing's inability to grasp *its* problems? If so, the wise data processing manager will take the first steps.

He will begin by delivering results, not methods; benefits, not elegance; economics, not technical features. He will serve his customer, not his own sense of achievement at having solved difficult and challenging technical problems. He will think big, but deliberately start small; plan long range, but produce results quickly. He will be ambitious when setting goals, but realistic when making promises.

Finally, the wise data processing man will not only agree, but insist that his work be measured. Realistic plans, executed on time and within budgeted costs, are almost certain to win him and his ideas a welcome in the councils of management. If he demonstrates that he can solve his *own* problems as a good manager should, he will quickly earn the respect of his managerial peers. And the commitment needed so desperately by both will follow. ■

Mr. Glaser is a principal in the San Francisco office of McKinsey & Co., Inc., an international management consultant firm he has been with since 1961. He formerly was associated with Ampex Corp. and Sandia Corp. He holds a BS degree in electrical engineering from the Univ. of Notre Dame, and has done graduate work in business administration at the Univ. of New Mexico. He is currently serving as treasurer of the ACM, and is a member of the Institute of Management Sciences.


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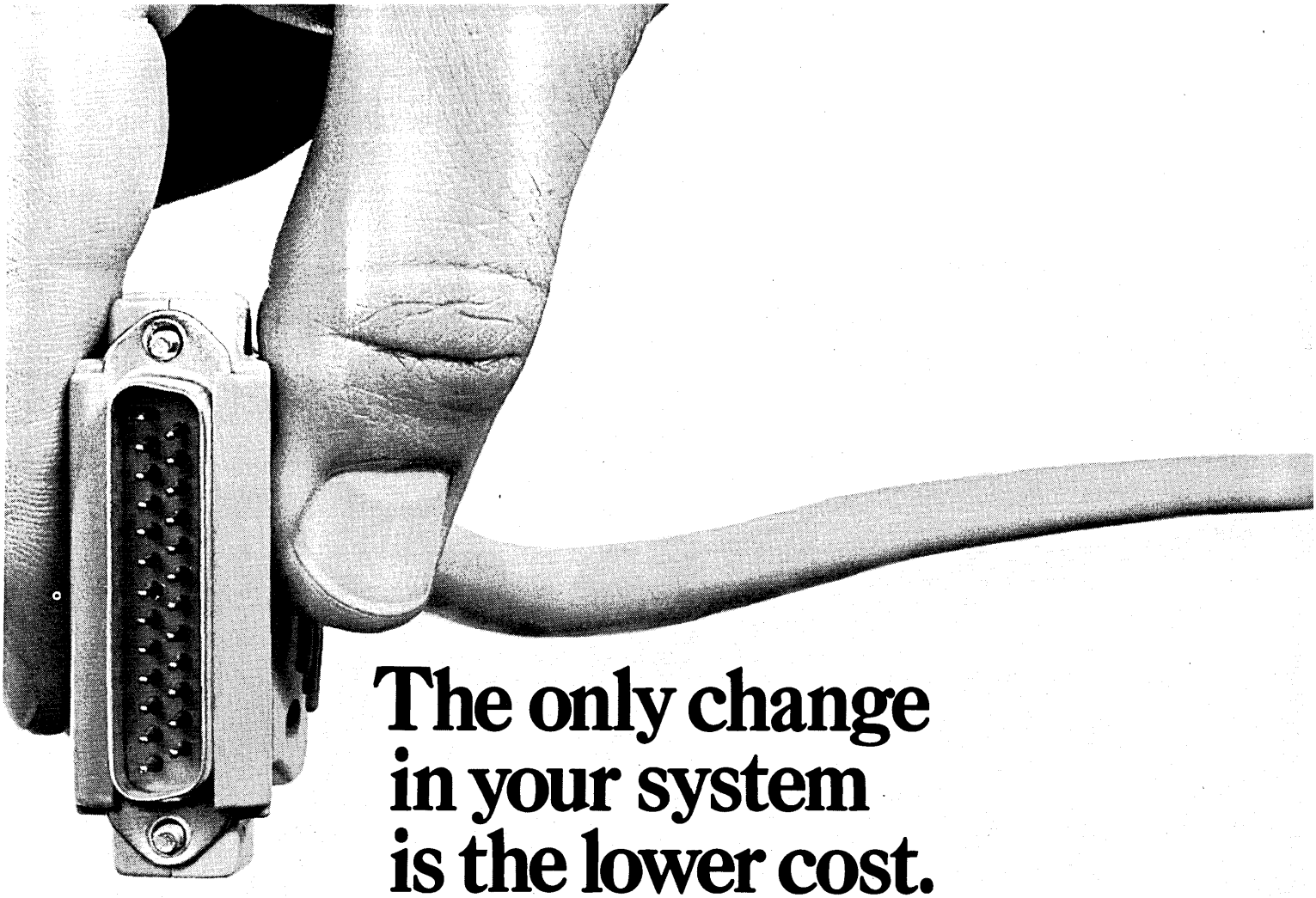

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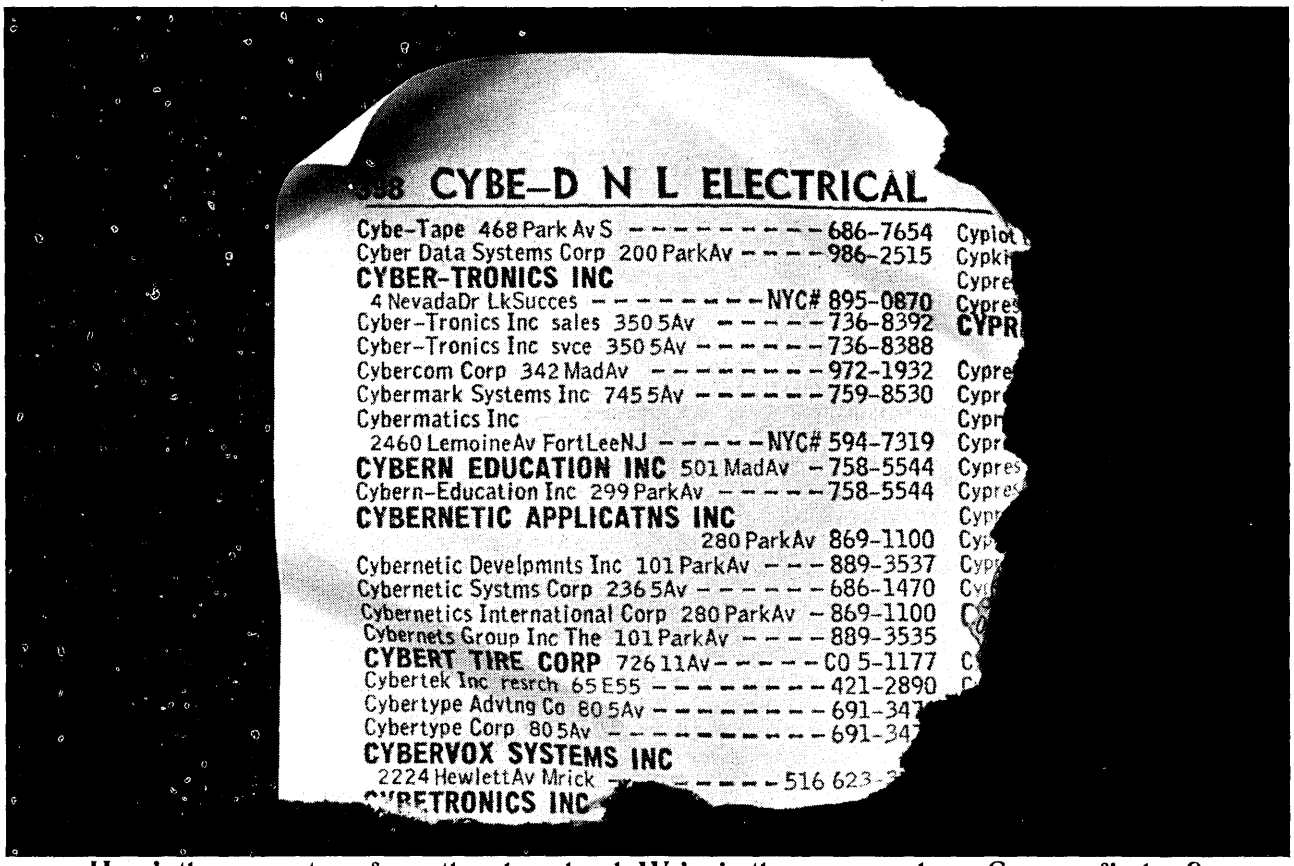

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But when you do, please pronounce it very, very carefully.

IIA and Proprietary Rights

by Phil Hirsch, Washington Editor

Members of the Information Industry Association (IIA) vigorously opposed "unfair" government competition at their recent annual meeting, despite some uncertainty that a threat really exists. They also passed three resolutions aimed at giving software developers and other "information product" producers greater protection against infringement.

How to exploit census data and commercial mailing lists was another major topic. In this part of the meeting, however, no one seemed to be concerned about the proprietary rights of the individuals whose characteristics actually make up the information product.

The launching pad for the discussion of unfair government competition was a recent announcement by the Public Printer, A. M. Spence, that his agency, the Government Printing Office (GPO), plans to distribute microform copies of federal publications. Soon after the announcement, IIA's president, Jeffrey Norton, sent a letter to the Joint Congressional Committee on Printing —GPO's board of directors—objecting to "the government taking over business from private industry," as an IIA release put it.

Spence, in a dinner speech at the IIA meeting, indicated that it will be a while before the plan is implemented. First, he must get authorization from the joint committee. "We realize this (microform publishing) is a massive undertaking, with major implications . . . and are anxious to have outside views," he added. Spence promised to appoint an advisory committee which will "assist me in enumerating problems (and) evaluating views" of interested parties. He also said a meeting would be convened shortly at which industry spokesmen could state their case.

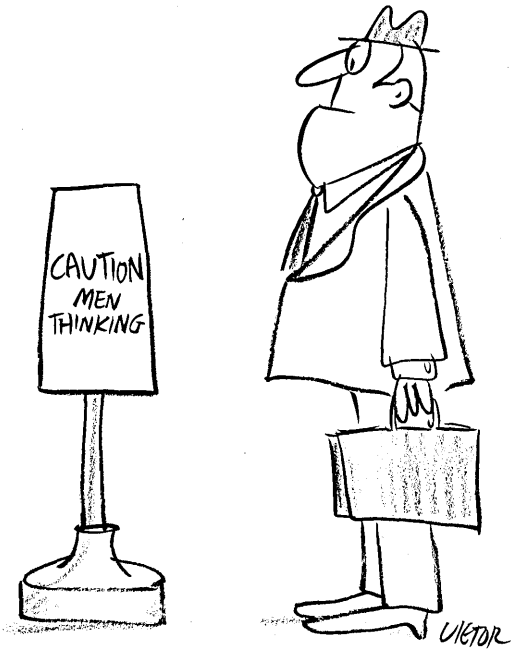
Coffee-break conversations with several IIA members suggest they are uncertain whether GPO's projected foray into micropublishing really represents a threat. The basic question seems to be whether commercial information suppliers are selling the information itself, or easier access to the information. In his speech, Public Printer Spence indicated that he will confine himself to putting on microform media the documents he is now distributing in printed form. If that's actually the case, it's hard to see how the commercial supplier who rearranges, abstracts, indexes, or otherwise massages the same material will be hurt.

Another possible source of government competition is the National Technical Information Service (NTIS), established several months ago within the Department of Commerce to distribute data generated by federal agencies. But NTIS Director Bill Knox said IIA has little to worry about from his agency. "We want to use our charter to promote the productivity and profitability of the information industry," he explained.

Knox, who came to NTIS from McGraw-Hill, is the founding father and first president of IIA. At this year's conclave, he was presented with the association's 1971 "Leadership Award."

Good marketeers

NTIS is planning to establish a marketing department, and will need help from "some good commercial marketeers," Knox said. His agency is currently distributing computer tapes generated by the Internal Revenue Service and Federal Communications Commission, and is negotiating with the Census Bureau to provide a similar service. Creation of a centralized data base, containing "substantive" inputs obtained mainly from the Census Bureau, is "under way." This centralized facility will correlate census statistics with similar data from other federal agencies, and offer the composite to government and private users. Interviewed after his speech, Knox added that the new service might offer some competition to private firms but he doesn't believe



there will be a serious problem, partly because NTIS will devote most of its attention to government users, partly because "the job is too big to be done by any one mechanism."

NTIS is also seeking to market data generated by 100-200 federally funded information centers around the nation, Knox told IIA. The agency is concerned about the relatively low prices charged for federal documents because this policy doesn't seem to

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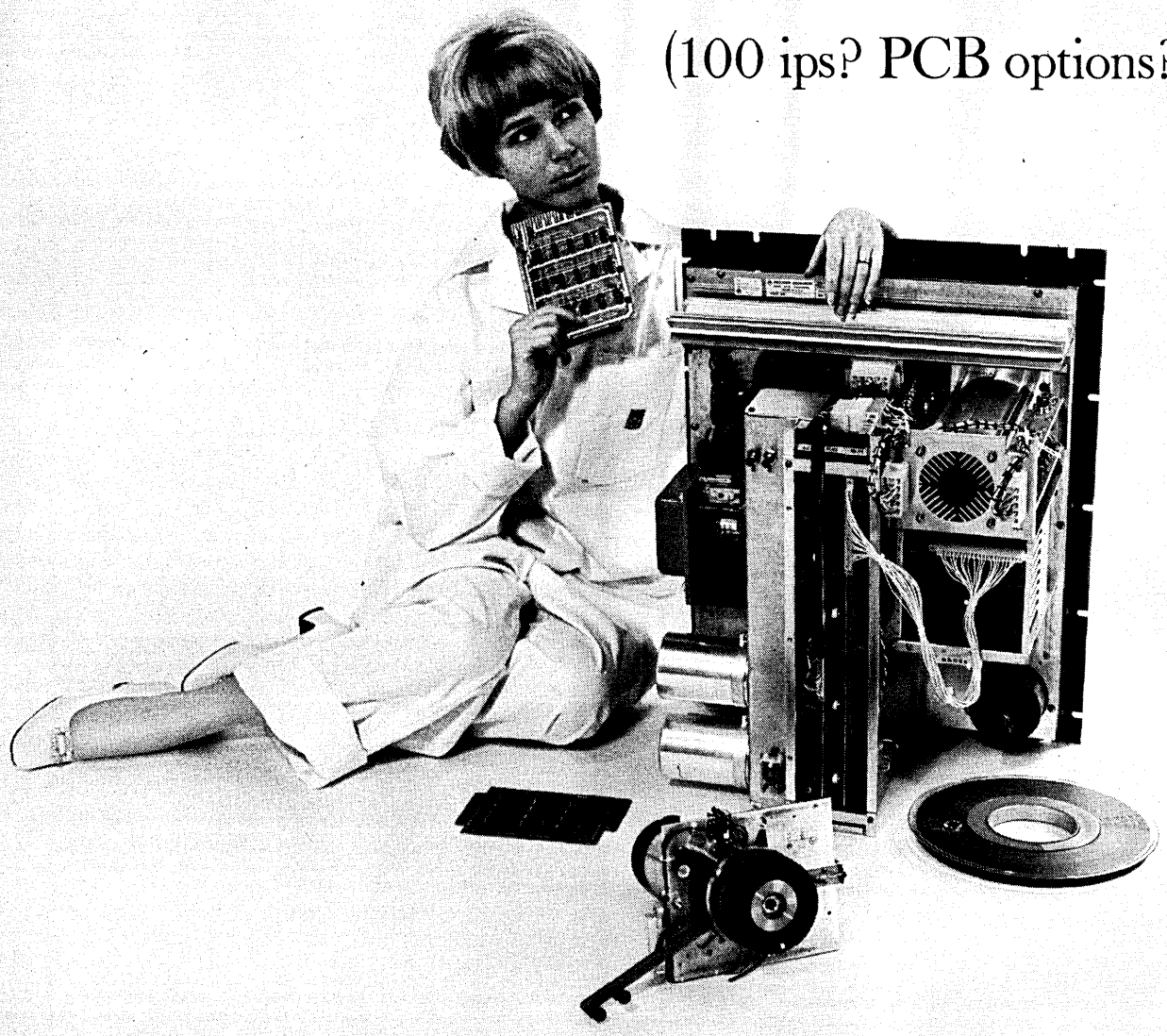

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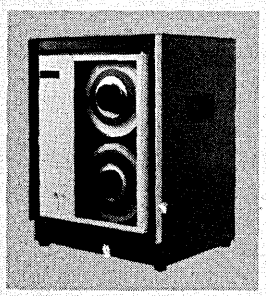

". . . Let's see now . . . PCB? . . . ('PCB'—I know what *that* means—'perfectly charming boards')."

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CIRCLE 30 ON READER CARD

leave enough money after expenses for an effective marketing program. The result is that federal publications aren't reaching everyone who could use them, Knox explained. He asked IIA to sponsor a meeting at which the pricing problem could be discussed.

Another speaker who attracted attention was Ed Burnett, head of a mailing list consulting firm of the same name. He reported that about 10,000 computerized mailing systems are now in operation, and estimated that the number is doubling every year. One reason for the growth, undoubtedly, is the increasing usefulness of census data. Burnett pointed out that the bureau's demographic statistics are now aggregated down to sub-blocks, which, typically, contain 250 families. In earlier censuses, the smallest aggregation unit was much larger.

Census data is vital to many direct mailers, since it pinpoints those areas having the desired demographic characteristics. The more precise the data, the more accurately the target area can be defined. Then, by obtaining a commercial mailing list, the marketeer can get his message to those living within the target area. Burnett reported that census data can be made even more precise by merging it with private data bases—automobile registration lists, for example. Another technique is to locate an individual with desired characteristics—high income, for example—and then address literature to everyone in the surrounding area on the assumption that they have similar characteristics and interests.

Mail lovers

Later, in answer to a question from the audience, Burnett said the average person "loves to receive mail" and doesn't feel his privacy is being invaded by direct mailers who zero in with the help of census data.

He indicated that the growing use of computers for direct mail, combined with improved census statistics, has created new opportunities for the information industry. For example, many companies in other lines of business have customer mailing lists; these lists could be purchased, and then marketed profitably, by information merchants.

About 120 members and guests attended the IIA meeting, which was held at a resort near Lancaster, Pa. Before they went home, members passed resolutions which, respectively: endorse S647, a pending Senate bill designed to strengthen trade secret agreements; ask the Commissioner of Patents to seek a Supreme Court ruling on the patentability of computer software; and urge quick approval of international agreements to protect the rights of software developers. IIA also elected three new board members: Pat McGovern, International Data Corp.; Norman Cohn, National Business Services, and E. S. Safford, Cahners Publishing. Jim Adler, of Congressional Information Service, Bethesda, won an award for the best new information product, the CIS/Index, covering Congressional hearings, legislation, and publications. And Dr. Eugene Garfield, president of the Institute for Scientific Information, Philadelphia, Pa., received the IIA Hall of Fame award for Current Contents, a series of pocket-size publications reproducing contents pages from world scientific and technical journals. ■

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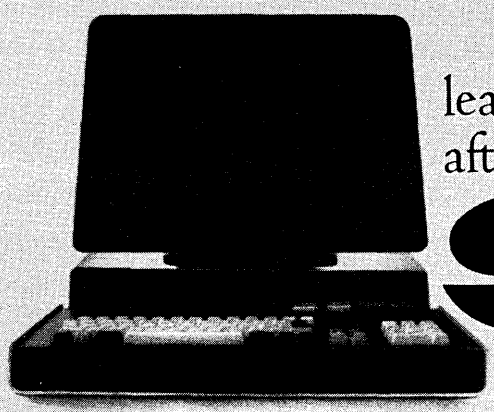

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PERSPECTIVE

an interpretive review of significant developments

Computing in Los Angeles: It's in the Plan / Plans

Local government computing costs the taxpayers of the city and county of Los Angeles some $20 million a year, and it looks as if they're getting their money's worth.

Oh, there have been problems, the usual types that crop up with implementation of something new. Most notable was the county's problem with its vote counting system (July 15, '70, p. 123; Nov. 1, '70, p. 48). But, in an area of 4,000 square miles and 7 million people where boundaries between city and county are confusing to say the least, with islands of county territory popping up here and there within city boundaries, there is little jurisdictional conflict where computing is concerned, and, more surprisingly, little duplication of effort.

The Los Angeles city and county data processing departments work well together. Each has a plan, and the plans mesh.

The oldest plan belongs to the city. Los Angeles probably is the only city in the country where it has been decreed by law that data processing activities be centralized under a service bureau responsible to a specially appointed Board of Administration. Ordinance 126, 244 was adopted by the Los Angeles City Council in 1963.

To implement what it interprets to be the intent of this law, the Data Processing Service Bureau adopted a seven-year master plan aimed at development of a Los Angeles Municipal Information System (LAMIS). This plan is currently in its third phase, implementation of specific computer applications. Full realization of LAMIS, on schedule, would make Los Angeles the first large metropolitan city to have a true municipal information system, although prototype municipal information systems currently are being implemented in two medium-sized cities by the federal Dept. of Housing and Urban Development (June 1970, p. 200).

Probably the man most singly responsible for the effective centralization of the city's data processing functions is the service bureau's general manager, Tug Tamaru, who began working toward the goals embodied in the seven-year master plan as early as 1957 when he was with the city administrator's office.

When the centralization ordinance was passed, Tamaru left this office to establish the dp bureau. At that time the city had some data processing functions in 10 separate areas. The largest operation was the data processing division of the controller's office, and it was decided this should be the nucleus of the new bureau. Tamaru credits then-controller Charles Navarro with "great foresight and interest in data processing and the way he cooperated in the transfer of this division out from under his jurisdiction" with success of the first steps in creation of the bureau.

Navarro's spirit of cooperation was not universal, however, and there were the usual problems associated with centralization in that first year . . . reluctance on the part of some department heads to part with what they felt was a degree of authority. But the problems were minimal compared to those that might be faced by people trying to do the same thing today, says Tamaru. "Time and size were on our side."

The city Data Processing Service Bureau had 36 people when it was started and has 337 now, including since last year a deputy general manager in the person of Bill Porter, formerly manager of Aerojet General's Sacramento computer sciences department. Its budget has increased by 40% each year to reach a present $6 million annually. Tamaru says the bureau saved the city $4 million in its first year. The bureau currently is working up figures to demonstrate current savings which he estimates will be "at least four to five times our budget."

The bureau operates around the clock seven days a week providing some 104 different services for city departments. It services all city activity centers except the Dept. of Water and Power and city schools, which have their own dp centers. The bureau provides some interface with the latter's center, particularly for the city's new Community Analysis Bureau which plots demographic charts and maps of the Los Angeles area using data from, among other sources, the census figures and the city schools (dropout rate, turnover rate, etc.). The dp bureau runs the city school files for the Analysis Bureau, which couldn't effectively function without computers.

But the bureau's biggest efforts are not in creating new functions for new departments but in streamlining existing city functions. Largest users of its services currently are the library (Feb. 15, p. 52) and the police department. Tamaru sees the traffic and airport departments as running these a close race in the near future. He feels the bureau could provide a significant cost-cutting service for the airport department by developing an automated operation system for their parking lots, which he says are big revenue losers.

Integration of departmental systems is a big aim of the bureau. Completion of LAMIS will see vertical subsystems by department interfacing with horizontal subsystems by function, such as fiscal, personnel, and planning.

Integrated use of fire department, traffic department, and building department files, for example, would enable a fireman answering an alarm to determine the best route to the fire and to have an idea what he might find when he got there. Or the fire might have been prevented if the building inspector's report had been accessible before the fact.

The data processing bureau is developing a Coordinated Inventory System (COINS) which already is implemented for the Bureau of Street Maintenance, the Bureau of Transportation, and two areas of the police department and is being implemented for the purchasing and the fire departments.

Law enforcement is one of the functions where the city and county work together. Another is vote tallying. The city is using the county-pur-

(Continued on page 52)

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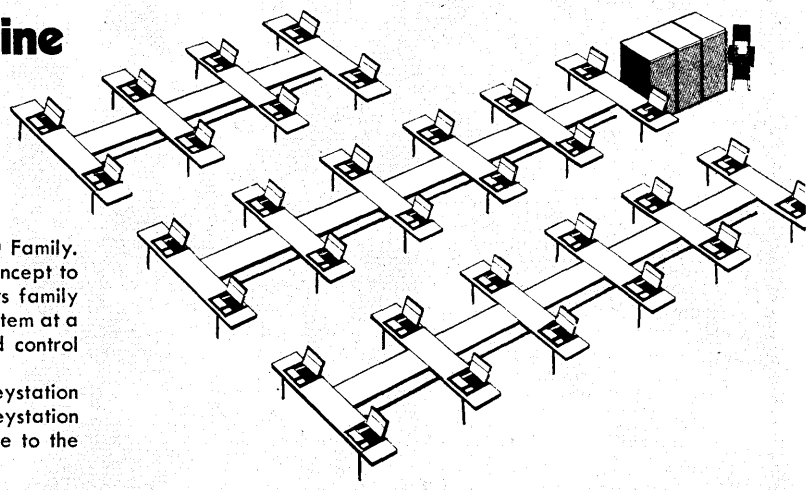

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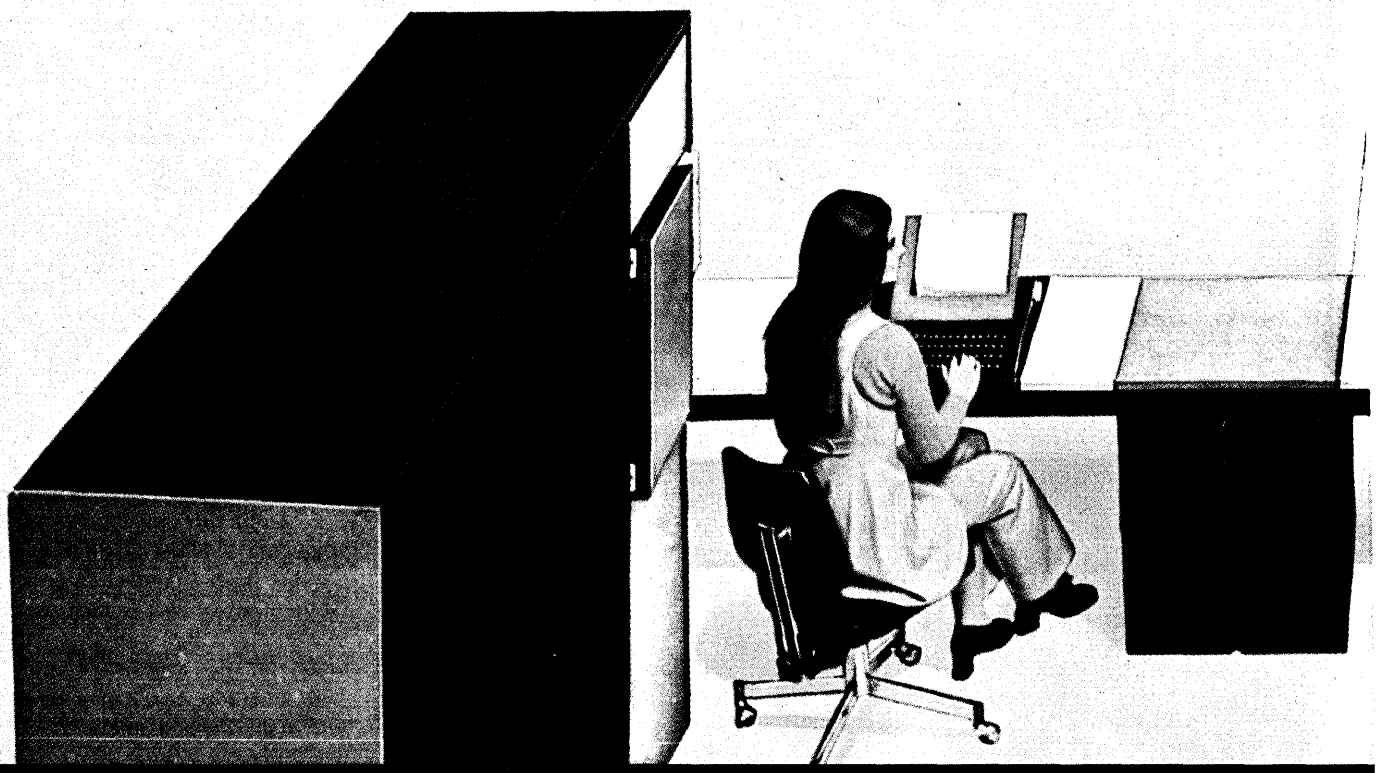

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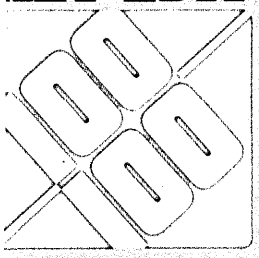

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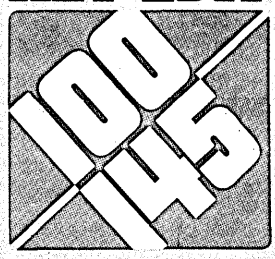

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chased IBM Votomatic system in city elections and so far has experienced no problems.

In law enforcement, the city has expended some $1½ million on a system which soon will be taken over operationally by the county. It's the Automated Want/Warrant System which has attracted national and even international attention in the law enforcement field. It's a regional system used by some 67 cities and the county on a cost-sharing basis. Development of such a system normally would have been a county function, but since the county didn't have the capability to develop it when it was deemed necessary back in 1968, the city was asked to do it. Current plans call for the county to take over its operation this year or next, and financial details are being worked out. There are some 620 active wants/warrants on file in the system, which receives about 500,000 inquiries per month.

When the county takes over its operation, AWWS will be incorporated into its Justice Data Center. Ultimately AWWS will become part of a Regional Justice Information System (RJIS) currently in the study stage with System Development Corp., prime contractor, and the county, contracting agency. The study is aimed at development of a totally integrated regional information system to serve justice agencies, which includes courts and prisons as well as law enforcement groups of the city and county of L.A. and surrounding cities and counties.

The Los Angeles County Dept. of Data Processing is a little younger than the city's Data Processing Service Bureau. It became two years old last April 1. Its director, Gordon Milliman, came to Los Angeles two and one-half years ago from Alameda County specifically to get the department started. At that time 11 different departments of county government had their own separate data processing operations, and it was Milliman's job to consolidate them.

Like Tamaru, Milliman's goal is an all-encompassing information system, but the county's won't be quite as centralized as the city's. Currently the county is consolidating all data processing functions into seven on-line functional centers called Justice, Administrative, Property, Records, Health Care, Welfare, and Engineering. Health Care and Property are the largest now, but Milliman says Justice is catching up fast.

The county's long-range plan calls for consolidation by 1976 into either three or four centers. These probably will include one for general government, covering administration, property, and records; one for social service, covering health care and welfare; one for public protection, covering fire and justice; and a separate center (maybe) for engineering and public works.

The county department's budget was $10 million in its first year and $14 million in its second. Staff went from 300 (all pulled in from departmental dp operations) to 900. A county budget freeze will keep the department's budget to $14 million this year. Milliman believes this isn't enough. He feels an effective dp budget should represent 2% of a total budget, and in L.A. County's case total budget exceeds $2 billion.

The county has a mix of equipment, both second and third generation, including Burroughs, IBM, CDC, RCA, and Honeywell cpu's. They currently are trying to upgrade to all third-generation gear and hope to accomplish this by the end of the year. The long-range plan calls for a single-vendor network by 1976, and an rfp for this will go out in 1974.

Why three or four centers in '76 and not just one? Milliman gives two reasons: practicality and security. "One big center serving our multitude of needs for 7 million people," he said, "would be too cumbersome."

"And with several installations, if one or even two went down, the others could take over." The county has some reason to worry about security, particularly where its Welfare data center is concerned. This center in March was the first to move into newly acquired county buildings in Downey, Calif., which also will house the Justice and Engineering centers by summer. Before its move, the Welfare center at its downtown Los Angeles headquarters was receiving regular bomb threats, sometimes as many as three a day, and each one required evacuation of the center.

The Downey computer complex, Milliman said, will be highly secure with only one entrance, constantly guarded. An inner second level of security will assure that only people with security clearance and a reason to be there will have access to computer rooms. An uninterruptible power source will be provided for the on-line services and will be backed up by a diesel or turbine emergency generating plant.

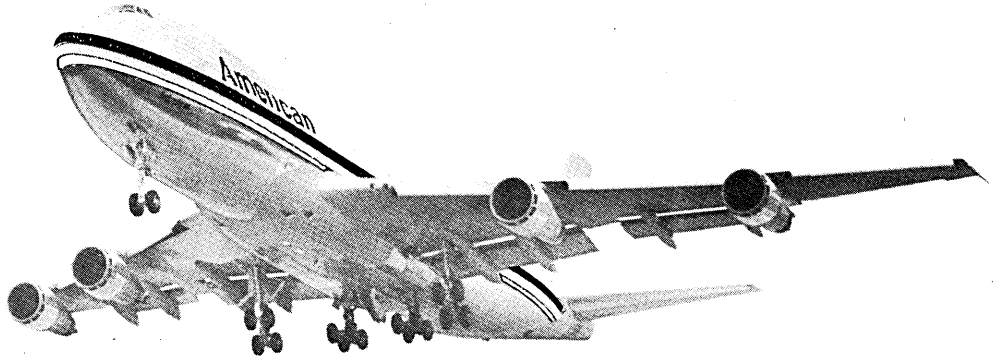
The city's service bureau is highly security conscious too. Recognizing the vulnerability of a totally centralized system makes it doubly so. When it moves its computers in September or October into now-under-construction subterranean quarters near city hall, it will install the tightest of security measures with emphasis on regulating access. The city's computers, all IBM, currently are scattered around city hall behind unmarked doors.

Like the county, the city wants to upgrade and must do so, according to Porter, by the time of the move this fall for the very practical reason of not moving gear they don't want to keep. Also, they have to increase capacity to keep up with an increasing workload, and they have to do it within the existing budget.

Porter thinks they can. The city currently spends some $2 million in rental a year on dp equipment. To upgrade without increasing this expense they will consider third-party leasing, lease/purchase agreements, and non-IBM peripherals. As for the cpu's, they'll probably stick to IBM. Recruitment and training have a lot to do with this. Under civil service procedure they have to fill every position with one of the top placers from a civil service exam, and the likelihood of any of these having non-IBM experience is, says Tamaru, very small. And with the cost of training a big factor since unbundling, he said, this is an important consideration.

And, after all, it's cost, not profit, that makes the difference in government. Both L.A. city and county dp operations appear to be making the most of their dollars, no mean task when you're dealing with a diversity of operations that would pale most private business and industry. How many commercial operations have to run the gamut in systems from straight payroll to a zoo animal inventory system? L.A. city does. So what's gnu? **—Edith Myers**

a change is coming in communications-based computer systems



It's already starting at American...where Collins C-System means long life for SABRE II

American Airlines already is implementing the important change Collins C-System makes possible in total system design. This communications-based computer system permits increases in capacity and capability on an orderly, modular basis... without change in basic system design. It's not necessary to start over with newer and/or bigger communication networks and computers – plus new software. The basic C-System accommodates growth as required – thereby eliminating one of industry's costliest data problems: periodic design and implementation of a new system around new hardware and software.

The C-System is an integral part of SABRE II, American's new data system for passenger reservations. The C-System will connect approximately 2,000 agent terminals across the nation to American's new Tulsa, Oklahoma data facility as well as to the existing SABRE I Center in Briarcliff Manor, N.Y. And it will assure SABRE II of a reliable, cost-effective operation over a long life span. American can increase capacity and capability on a modular basis as data traffic loads require.

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CIRCLE 26 ON READER CARD

NEWS SCENE

Outcome of New Accord: Standardize, or Else!

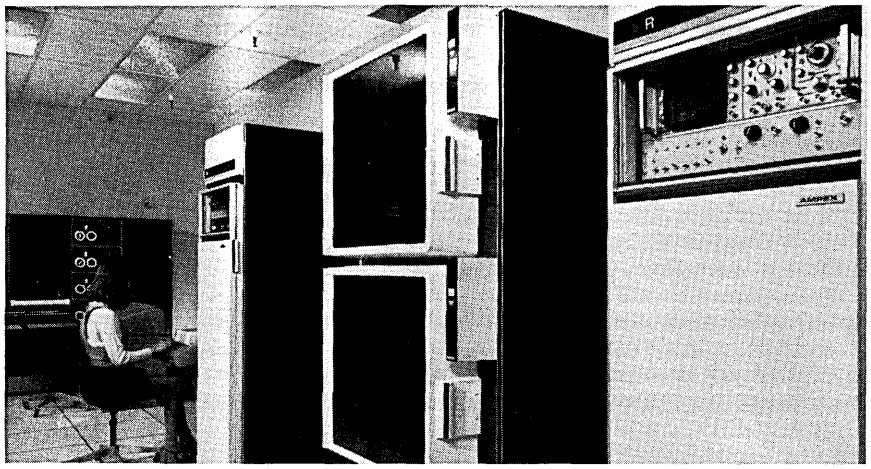
A bill aimed at promoting greater U.S. participation in international standards work was sent to Congress recently by the Nixon administration. It was inspired largely by the Multipartite Accord, an agreement among 13 western European nations ostensibly designed to improve the quality of manufactured products sold within their borders. Some sources in Washington believe the real purpose of the Multipartite Accord is to exclude U.S. products.

Basically, the accord requires products marketed within the member countries to carry a "mark of conformity" showing that they comply with specified standards and have passed specified quality assurance tests. Electronic components will be the first product group affected. U.S. officials expect that by next October, components bearing the mark of conformity will begin appearing on the market. Soon afterwards, they add, governments of the member countries probably will begin restricting their procurement of electronic end products — including data processing equipment — to those containing approved components.

The impact of such a move on U.S. data processing equipment manufacturers is suggested by one estimate that in 1970 our shipments of computer mainframes abroad increased 25%; domestic shipments dropped 8-10% during the same period, producing a net overall gain of 4%.

Officially, the United States can't join the Multipartite Accord because we don't have an "authorized institution" capable of representing all affected interests, government and private.

The legislation allows the secretary of commerce to identify international standardization activities affecting U.S. interest; to subsidize our participation in these activities through private or governmental organizations; to accredit testing and other private agencies that may be needed to implement international standard agreements we sign; and to encourage use of international standards within the U.S.



The basic 11 billion byte TBM configuration is shown here.

End of Off-line Storage on the Way?

Numerous installations already have trillion-bit memories — it's just that they take the form of tape libraries with 10,000 or more individual tapes. Consider the advantages of putting that much information onto several reels of video tape and placing it all on-line. Tape libraries could be drastically reduced, if not eliminated entirely; the floor space of the library could be put to other uses; most of the tape drives could be returned to the lessors; and the personnel supporting the library and computer operator functions could perhaps be significantly reduced, or assigned to other responsibilities. And the savings realized from these possibilities could help offset the cost of such a memory system.

Ampex's TBM (Terabit Memory) is being billed as such a system. It consists of from 1-3 data channel modules, from 1-6 tape transport drivers, and from 1-32 transport modules, each storing 11 billion bytes on its two tape transports. Tapes are searched at 1000 ips, which at the TBM packing density is equivalent to searching six conventional computer tapes each second. The best application for the TBM would seem to be for transferring entire files, such as payroll, onto 2314s, 3330s, or similar devices prior to processing. The TBM has an impressive transfer rate of 750KB per data channel — which comes very close to the 806KB rate of the IBM 3330.

There are other memories that can hold nearly as much information as the TBM, such as Precision Instruments' Unicon laser memory (July 15, '70, p. 117). Access times are about the same, but the TBM has the advantages of being a read/write memory, and a considerable price break. The TBM sells for about $1 million per trillion bits of capacity, while Unicon's price has climbed to $1.6 million from the originally announced price of $740K. The "starter" version of the TBM, good for 11 billion bytes, is about $500K. The maximum configuration stores nearly 3 trillion bits.

The TBM system software support or standard access method is provided by Ampex. Special application programming must either be done by the buyer, or by signing a separate contract with Ampex. First deliveries of the TBM will be late next year.

IBM to Rent (Yet) a 145 to Yugoslav Railway

Yugoslavia's railroad company, Yugoslav Railways, soon will take delivery on an IBM 370/145 computer, probably the most advanced of the computer company's third-and-a-half gener-

ation. The machine, which is to be rented from IBM World Trade, will be installed in the second half of this year at the railroad company's head office in Zdravka Celara St., Belgrade.

The order signals two "firsts." It's the first machine from IBM's System/370 series to be ordered by an East European user and the first of any model to be rented. There are other surprises.

With its fully monolithic circuitry and unique paging system, the model 145 certainly represents an advance in computer technology — more so than the larger capacity 155 and 165 series. Observers note that although Yugoslavia in many ways is virtually part of Western Europe, exports still are subject to the strategic embargoes enforced by NATO's Cocom committee. Therefore, they consider that IBM has scored a minor triumph in achieving clearance for a machine as advanced as this.

In New York, IBM World Trade spokesmen refused to confirm receiving the Yugoslav order and referred questions to Yugoslav Railways. This is IBM's practice on all inquiries about customer orders. The Commerce Dept.'s Yugoslavia desk confirmed that Yugoslav Railways had recently received new monies for capital expenditures, but was unable immediately to confirm that IBM was authorized to sell the 145 to the railroad. Word of the order was received on this magazine's deadline day.

Up to now, the largest computer in Yugoslavia — and the largest IBM machine in Eastern Europe — has been a 256K 360/50 at the Federal Institute for Statistics in Belgrade. This itself was a unique case, as the general limit for systems which could be exported to the eastern bloc stopped short at the 128K 360/40. There are now more than 25 of these installed — mostly in Yugoslavia and East Germany. There are a few in Rumania, Bulgaria, Hungary, Poland, and Czechoslovakia.

For some years, Yugoslavia has been used by western manufacturers as a bellwether of the political climate. Any developments or enhancements which got past the Cocom embargoes for Yugoslavia have been found to filter through gradually to the countries of the Cocom bloc. There are a few exceptions to this, but they do not alter the general picture. On this basis, a relaxation in embargo limits can be expected across the board within a year or two.

Significantly, IBM last November selected Yugoslavia as the only Eastern European country in which to "announce" the model 145.

The fact that a machine is to be rented by a Yugoslav user is encouraging to observers. Until now they could only be purchased. This created considerable difficulties in selling to the countries of the eastern bloc whose hardware requirements are enormous but whose hard currency budgets are severely limited. Informed sources in Yugoslavia suggested this breakthrough will lead to a pronounced swing towards renting in the future.

Yugoslav Railways has relied exclusively on Univac equipment up to now, with a 1050 in Belgrade and several 1004 card processors and 1005s strewn around the country at provincial processing centers. When the 145 is delivered, the 1050 will be moved from Belgrade, probably to one of a number of dp centers being set up by the railway, according to its computer manager, Radoslav Jovanovic.

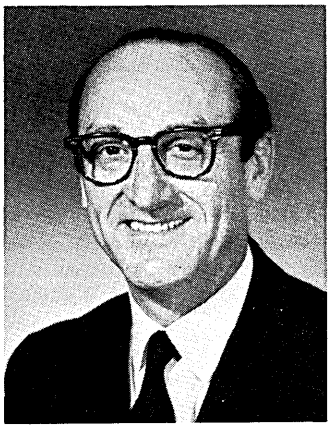
The 145 will receive payroll and other accounting data over an on-line network. But its primary task will be the real-time control of rolling stock and passenger reservations. Mr. Jovanovic said he expects the system to be fully operational by early 1973. The railway, it's learned, might also link its rolling stock control and passenger reservations systems with similar systems in Western Europe. Talks are under way with the West German rail company, Deutsche Bundesbahn, which uses Siemens equipment.

The proposed link would put Yugoslavia on a par with the Austrian, Danish, Belgian, Swiss, and Swedish railways, which have already decided to link up with the German firm for passenger reservations. The French and Dutch rail companies are likely to follow suit. There are further plans to follow the German railway company in the real-time control of rolling stock throughout Europe.

In the rest of Eastern Europe there has been no such attempt at integration, and the various rail companies display a typically heterogeneous collection of equipment. Hungary has a Honeywell 2200, East Germany an ICL System 4-50, Rumania a Siemens 4004/45, the Russians a Minsk-32, and Bulgaria is installing a Fujitsu machine. The Poles and Czechs are still operating second generation computers. **— Ivan Berenyi**

SDC Appoints New Chief Exec

After months of indecision and delay, System Development Corp., Santa Monica, Calif., has finally chosen someone to lead them to the promised land of commercial profitability. He is Dr. George E. Mueller (pronounced Miller), who has been elected to the posts of chairman of the

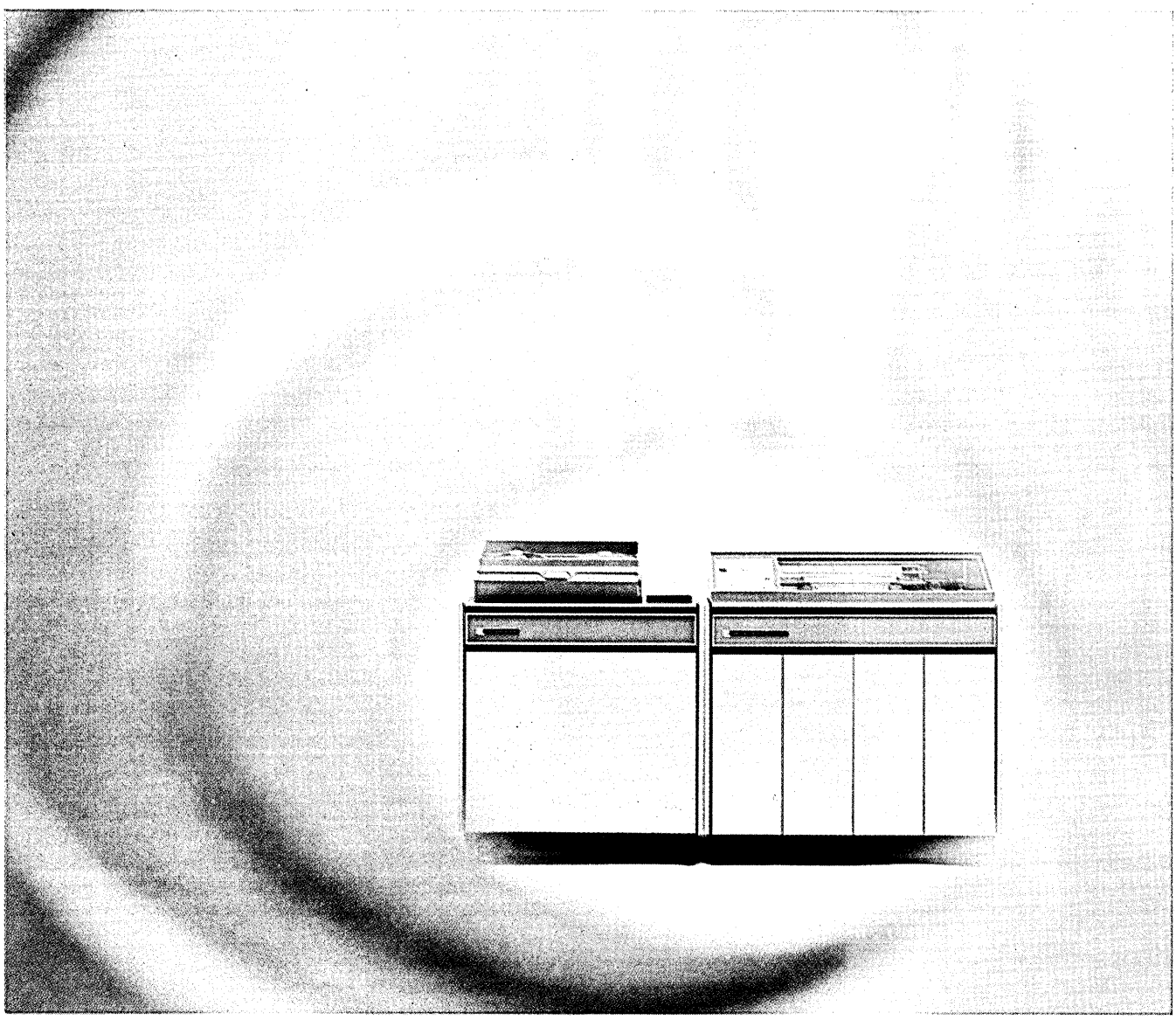


DR. GEORGE E. MUELLER: New head man at SDC.

board, president and chief executive officer. He replaced William E. Zisch, the former chairman, and Wesley S. Melahn the former president. Zisch said he left to pursue outside interests, although continuing as a director. Melahn first announced he would stay with the company as president and chief operations officer, but later resigned.

Mueller, who assumed his new duties early in May, came to SDC from General Dynamics Corp., where he was senior vice president responsible for the Convair Aerospace, Electro Dynamic, Electric Boat, and Quincy Shipbuilding divisions. Prior to that position, which he took over in 1970, Mueller was NASA's associate administrator for manned space flight from 1963 to 1969, heading the Gemini and Apollo projects and the advanced manned missions offices.

Mueller's previous experience in-



Keep your eye on the Data Products off-line printer. It cuts print-processing costs right out of the picture.

No matter what anyone tells you, on-line printing in any form costs you money in main-frame time. And spooling is on-line. You can allocate as many partitions as you want for memory. When the time comes to process printing, though, you still have to drive the printer with main frame. Even then, you have to wait for a process cycle. Main-frame time is too expensive to waste this way. By contrast, a Data Products Satellite Printer's time is a real bargain. You know that your computer generates tapes up to 15 times faster than it prints. What you should know is that the Satellite Printer is the perfect "yes man." It will interpret your main-frame's print format instructions, and process those 7- or 9-track tapes ... off-line. All this happens while your computer is doing other, more important work. You get faster printing, without interruptions. You get the flexibility of up to 16 selectable print programs. Alter existing ones, or add new ones; it's up to you. You get the straightest line in the industry with our exclusive one-piece print hammer. What's more important, though, is that you can manage your computer resources to their full potential. You can schedule main-frame more efficiently. That includes memory. Our Satellite Printer won't drive your computer into overtime, or your EDP budget into the red. Take our word for it. And those of the 300 major installations that have Data Products Satellite Printers going for them.

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cludes 6 years as a researcher at Bell Labs and 10 years with the electrical engineering faculty of Ohio State Univ. He "holds seven patents in electrical engineering and is the author of more than 30 technical papers."

Countdown at SDC.

A Final Decision Subject to Change

The carriers complained that FCC went too far while Bunker-Ramo argued it didn't go far enough last March in deciding that carrier subsidiaries which offer commercial dp services shouldn't also do data processing for their parents.

At press time, the commissioners were mulling their next step. Sideline observers thought the commission would impose a 10-day stay of its March decision. This would allow district courts in New York City and St. Louis to act on petitions for relief which they have received from several carriers.

Most of the carriers filing objections to the March decision complained about specific parts of it. But Continental Telephone Co. objected to the whole decision on the grounds it exceeds the commission's jurisdiction.

The commissioners in the decision said, essentially, that FCC can regulate the noncommunication activities of any organization that helps provide interstate communications service whenever such regulation is necessary to "deal with clear-cut, reasonably forseeable dangers which would be patently detrimental to the public interest." But this contention breaks new regulatory ground, as suggested by the commission's 4-3 vote. FCC chairman Dean Burch was among the dissenters, which may reduce the majority even more than the vote suggests. It is possible that either a court or the commission itself will decide the decision goes too far.

Western Union said the dp services ban is unfair to carriers because it "would not preclude major industrial corporations from purchasing data processing from one of their affiliates." WU's point was that if these noncarriers offered commercial dp services, the carrier subsidiaries competing with them would be put at a disadvantage.

United Telephone Co., which already has established a commercial dp subsidary called United Computing Systems, said the ruling on dp services would increase the parent's costs and deprive the child of revenue, causing "irreparable injury" to both.

The carriers' other objections related primarily to the ban imposed by the decision on use of the parent's name and/or other identification by a commercial dp services subsidiary and on the commission's treatment of hybrid communication services. Under the new rules, a carrier must give the FCC a complete description and justification of such a service before filing a tariff and offering the service to the public. Western Union argued this would expose proprietary information to competition. The company said independent service bureaus planning hybrid services should be forced to make the same disclosure, or the decision should be amended to assure that the carriers' disclosures be kept confidential.

The ban on use of common identification, said WU, was imposed because the commission wanted to discourage cross-subsidization, but "the prohibition against name or symbol similarity does not relate to potential abuses such as cross-subsidization ... and hence ... lacks justification."

Bunker-Ramo made the point that the commission spent too much time considering *how* to let carriers into the commercial dp business and shortshrifted the more basic question of *whether* they should be let in. B-R thought the answer should have been an unequivocal "no."

Without violating the decision, B-R said, the carriers can hit independent service firms below the belt. For example, a carrier could give its affiliate quicker and/or better service. The company cited its protracted and still unresolved hassle with Western Union. Bunker-Ramo offers on-line stock quotation services using Western Union communications lines. WU offers a competing service called SICOM. B-R contends its customers have to wait much longer for installation, maintenance, repair, and restoration of service than SICOM customers.

Although the commissioners prob-

ably won't go along with B-R and bar carriers' dp subsidiaries from offering commercial services, they may agree with the firm that there is a need to "evaluate and prescribe, now, the nature of proof which will be required to enable data processing companies to enjoy the fruits of the March decision."

Canadian "FCC" Would Foster Nationalism

Canada is expected to set up a national communications agency, similar to the FCC, following publication of a major study on telecommunications in the country. The government's plans on future regulatory activities, requirements on interconnection, rules for data banks, and measures to foster Canadian ownership and control in the broad area of telecommunications are expected to be introduced in Parliament late this year by communications minister Eric Kierans.

The telecommunications study, entitled Instant World, reflects growing Canadian nationalism and concern about U.S. ownership in important sectors of the economy. Special concern about U.S.-based data banks is voiced: "Although Canada has an efficient and sophisticated east-west telecommunications system, the United States' lead in the development of large computer utilities could result in a north-south flow of business that would hinder, or even prevent, the establishment of an indigenous computer utility industry — industry that may, some experts believe, eventually become one of the largest and most vital in Canada." There already are examples of Canadian industrial and commercial information being stored in data banks, including vital information about natural resources, the report says, maintaining the real danger exists that much of this information will be used to the exclusive benefit of nonresident commercial interests.

It also warns that a concentration of information about Canadian individuals, transactions, and insititutions in U.S. data banks might render ineffective Canadian laws dealing with corporations or personal privacy and that the use of U.S. data banks, although cheaper in the short-run, may jeopardize the economic viability of future computer-communications systems in Canada. The report also is concerned about the high degree — some 80% — of foreign ownership in Canada's computer and computer service industry.

At the end of 1969, the cumulative depreciated investment in computer systems was about $600 million, and the revenue derived from those systems in 1969 was about $250 million. It is possible that the annual growth rate has leveled off to about 20%, the report states, but even this rate would lead to a total investment of about $5 billion by 1980.

The report suggests a greater direct effort by the government to foster growth of Canadian-owned companies, perhaps by allowing a greater role for the common carriers. If greater interconnection takes place with the common carrier networks, a preference should be shown for Canadian products, it goes on to say, but adds that the long-term viability of Canadian manufacturers will depend on their ability to export, since the size of the Canadian market is so small.

The report sees Canada's main manufacturing efforts in computer terminals, switching systems, and data transmission. Computer manufacturing itself is basically a U.S.-dominated industry in Canada, and the report suggests that the government should continue in its efforts to persuade the major international manufacturers to give their Canadian subsidaries the responsibility for design, development, and international marketing of complete product lines. IBM Canada and Control Data (Canada) are in fact already operating or planning to operate along these lines.

Scantlin IR System Has Own Computer

Scantlin Electronics, Inc., has staked a claim to some of the communication and information retrieval market and expanded its services to the financial community with the introduction of Quotron 800, a quotation reporting service which monitors specific securities and has many display and function options.

But it is the hardware that may be more significant in the long run. This consists of a 16-bit, 750-nsec computer with up to 64K words of storage and a programmable 9-inch display with keyboard.

The units have been developed and are being built by Scantlin in Culver City, Calif. The company is not giving any other specifications at this time, except to say that the computer is general purpose and the system is multipurpose. A system has been in use by the Los Angeles Police Dept. handling warrant data for some time.

There is no price on the equipment, either, and Scantlin chairman John R. Scantlin claims there will be no equipment sales for the time being. The emphasis is on Quotron 800, a $600/month system (per office), accessed through the display terminal ($60/month). The terminal ties into an online financial data base and a national computer-controlled communication network to provide quotations of trades on the exchanges and NASDAQ, as well as communication between brokerage offices. Service options include display of news, statistics, the Dow Jones Industrial graph, and interoffice messages. System options include order entry and matching, research reports, display of customer accounts, message switching, and hard copy printout. Scantlin has been field testing the Quotron system over the past year and reported preannouncement orders for the service from 10 brokerage offices. First installations of the system are scheduled for this summer.

NEWS BRIEFS

IBM Meets in Canada

The annual shareholder's meeting of IBM was held in Toronto, Canada, this year and the performances were similar to U.S. meetings, with dissident stockholders (the same all the time, it seems — those who buy one or a few shares and then show up to take the spotlight — this time one of them turned up in hot pants) on hand to bait the chairman. However, T. J. Watson, Jr., was in fine fettle for the meeting, handled the dissidents with dispatch (one of them had to be evicted for continued disputation), and appears to have completely recovered from the heart attack he suffered last November. IBM, by the way, is also in fine shape.

More Ties with "Home"

A new transatlantic cable to link Canada and Britain, to be known as CANTAT-2, will be in place by 1974. The project, which will add more than 1,840 telephone circuits between Canada and Europe, is a joint effort of Canadian Overseas Telecommunication Corp., a government-owned agency, and the British Post Office. The 2,840-mile cable will run from Halifax, N.S., to Cornwall, in Britain. Over the next 15 years there will be a 20% annual increase in demand for transatlantic circuit use, according to communications minister Eric Kierans. Direct-dial telephone calls will be one factor, but the Canadian government expects strong growth in Telex traffic, leased circuits, and data transmission.

Heart Cut from Cogar 4

Cogar Corp., after an abrupt reversal of sales, laid off almost half of its work force. The move wiped out all but a few of the close to 50 field sales and support staff, two-thirds of the 140-man production crew recently established to manufacture the Cogar 4, along with R.R. Klein, director of the Information Systems Div., and around 150 of the 400 employees at its Technology Div.

President George Cogar said the cuts reflect a reassessment of the Cogar 4 market. Initial forecasts are being modified and production has been "practically suspended." Sales and service has been revamped for oem emphasis. He said oem MOS memory system sales now account for 90% of company revenues.

Leasco Broadens Leasing

Leasco has arranged for $32 million of term credit which will be used to broaden the company's leasing operation. A company spokesman said the money would be used for full-payout leases on such equipment as System/3-type computers, basic office machines, laboratory equipment, and antipollution devices. Asked if there were a possibility the company would begin buying and leasing 370 systems, he said it may do so in the U.K. but doubted that it would in the U.S. The $32 million in credit was extended by a group of 14 domestic banks. Terms of the credit provide for an 18-month revolving credit to be followed by a five-year loan with interest at ½% over the prime rate.

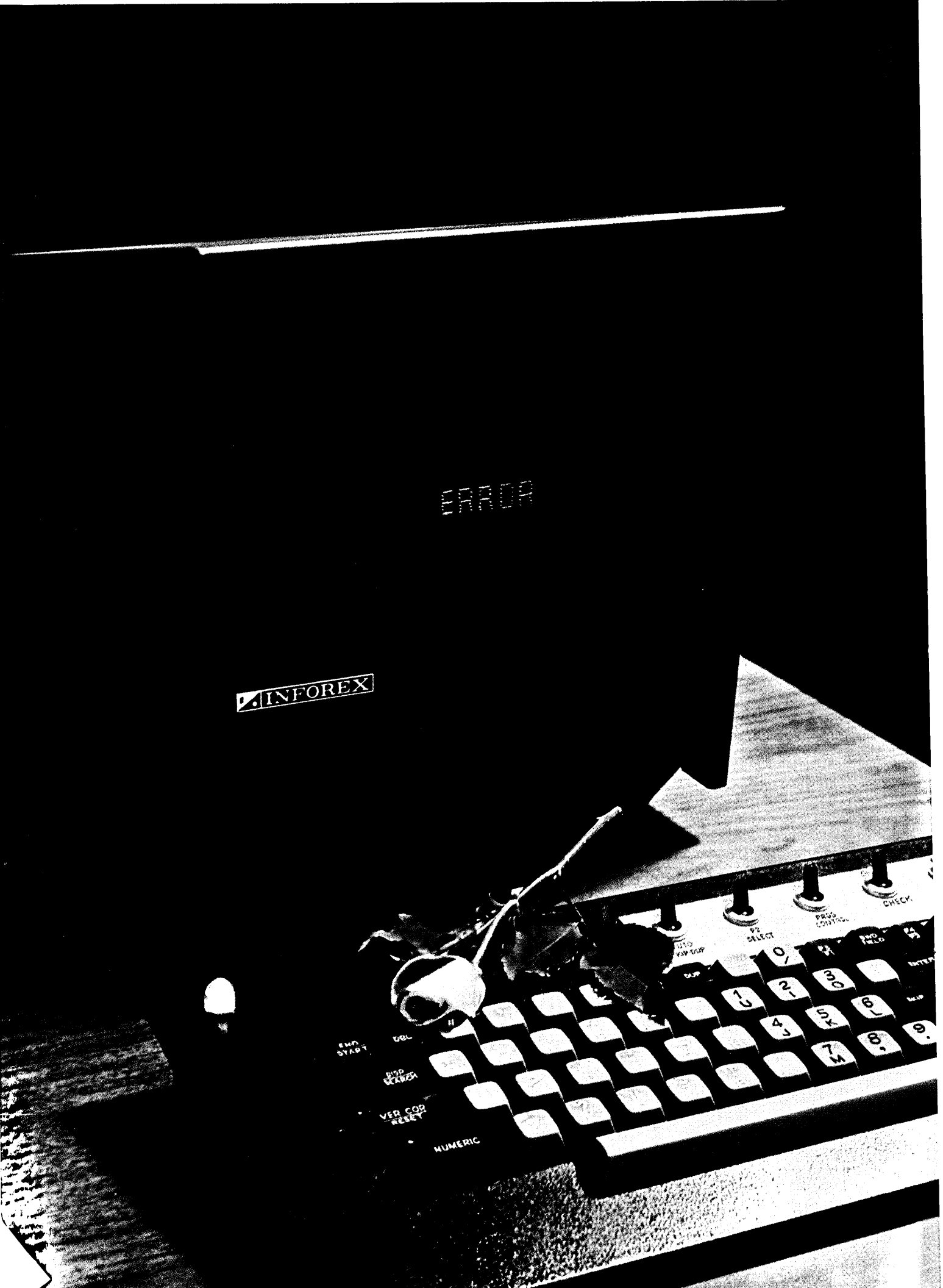
No Alphas or Numerics?

All you seem to be getting is a line-feed signal as blank paper spews from a silent printer at 150 lpm in a research lab at A. B. Dick Co., Chicago. Actually, the paper is full of writing, but the ink is invisible, readable only after a chemical is rubbed onto it.

The printer is the model 960 Videojet, which uses a stream of controlled ink droplets to print at 250 cps. Some 200 have been sold since it was introduced two years ago, but none with invisible ink, although vice president Robert Stone thinks there may be some security applications for it. For now, the firm is thinking of visible ink uses, one of which is in high-speed nonimpact cancelling of postage stamps. A system being evaluated by the Postal Service cancels stamps on letters passing the ink nozzle at 150 ips. The company also is working with another in making a desk-top calculator with Videojet printing.

SHORTLINES

An anticipated Internal Revenue Service ruling on tax treatment of software costs has drawn opposition from the Data Processing Management Assn. DPMA contends the new ruling, which would treat systems engineering and programming services not as business expenses but as intangible costs to be deducted over a five-year period, would "invoke a severe hardship on thousands of service bureaus, software houses, and others, as well as computer manufacturers who supply such services." ... A new Auerbach Technology Evaluation Service study sets the potential domestic market for minicomputers at "well in excess of 500,000 units" but warns that price declines of 18% per year, fierce competition, and changing technology will place demanding requirements on those competing for a share ... Ampex Corp. has purchased a semiconductor fabrication facility from Varadyne, Inc., Santa Monica, and will begin producing semiconductor devices there for use in its memories and for sale as components by the end of the year ... National Sharedata Corp., Dallas-based facilities management firm specializing in banking, has signed up its seventh bank, The Citizens National Bank of Lubbock, Texas ... Fairchild Hiller Corp. told the Federal Communications Commission a $211 million domestic communications satellite system it is proposing could cut long distance telephone rates to one tenth what they are today and could be in service in 33 months ... Asiadata Ltd., the Hong Kong computing service formed by International Computers Ltd., Jardine, Matheson and Co. Ltd., and Barclays Bank, has acquired a new major shareholder, Cable and Wireless Ltd., and soon will acquire a new ICL 1904A and additional terminals which will make it the largest computing services operation in Southeast Asia ... CBS Television has automated its selling and billing with installation of an IBM 360/65-based Broadcast Management Information System (BMIS) in its five network-owned tv stations in New York, Los Angeles, Chicago, Philadelphia, and St. Louis ... Kalvar Corp., New Orleans, and Anderson Laboratories, Inc., Bloomfield, Conn., formed a joint venture company called COM IV to develop a fourth-generation computer-output-microfilm system ... The Dept. of Commerce reported $1.1 billion in exports in 1970 of computers, peripherals, and parts. Of this computers accounted for $428 million, parts for $281 million, and input/output devices for $224 million. Major customers were West Germany, the United Kingdom, France, Canada, and Japan ... Commerce also reported $2.5 million in sales for the October 1970 Tokyo computer solo exhibition and said the show generated $54 million in projected first-year sales ... Digital Information Devices, Inc., Lionville, Pa., entered the Japanese market through an agreement signed with Nippon Office Automation Co. Ltd. of Tokyo which will buy DID's key-to-tape machines for resale in Japan under a joint NOA/DID label ... A two-week summer course, Management of R&D, is scheduled for Aug. 16-27 at the MIT Sloan School of Management. Tuition is $800 ... Simulation Councils Inc. is arranging a group tour to and of Japan for those attending the Tokyo/AICA/SCi Symposium in Tokyo, Sept. 3-7. SCi membership is not required. Contact Suzette McLeod, P. O. Box 2228, La Jolla, Calif. 92037. ■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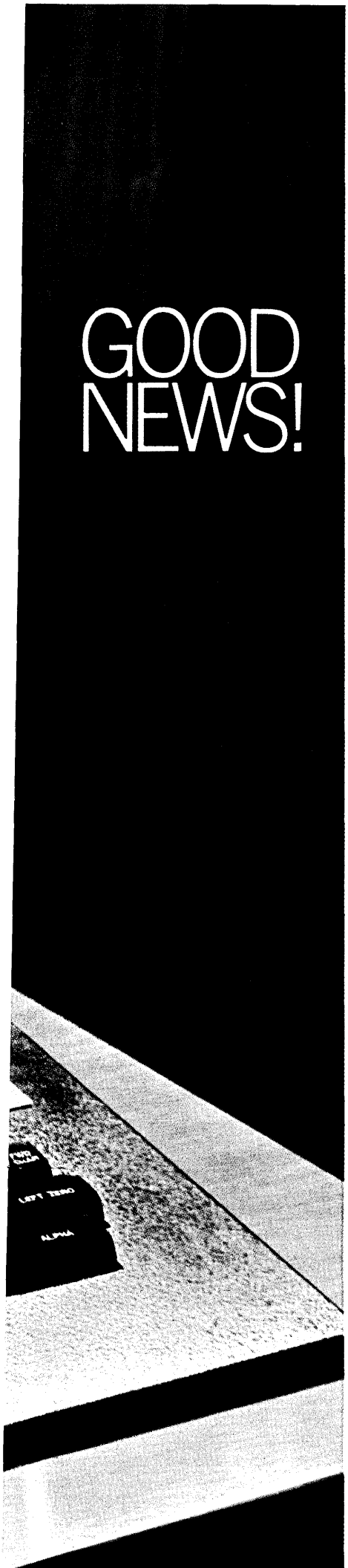


GOOD NEWS!

The INFOREX Intelligent Key Entry™ System just caught another error before it became costly.

Every element of this System including the CRT display and flashing red indicator light is designed for faster input with fewer mistakes. The CRT display not only tells the operator when she makes an error, it displays the full record as she enters it. Helps avoid duplicated or omitted data.

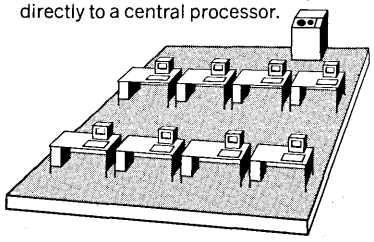
Correction is easy. Just backspace and rekey the proper character. Smooth and simple. Any keystation can sight and key verify the work of any other keystation—with the same ease of correction. Result: Even greater efficiency in error detection and correction.

Write for full data to help evaluate the price/performance leadership of the Intelligent Key Entry System in your operation. We would also be pleased to have you check with present users on System performance and service.

Write Inforex, Inc., 21 North Avenue, Burlington, Mass. 01803 or Inforex AG, Dornacherstrasse 210, Basel, Switzerland.

EIGHT KEYSTATION SYSTEM FOR $120 A MONTH PER STATION

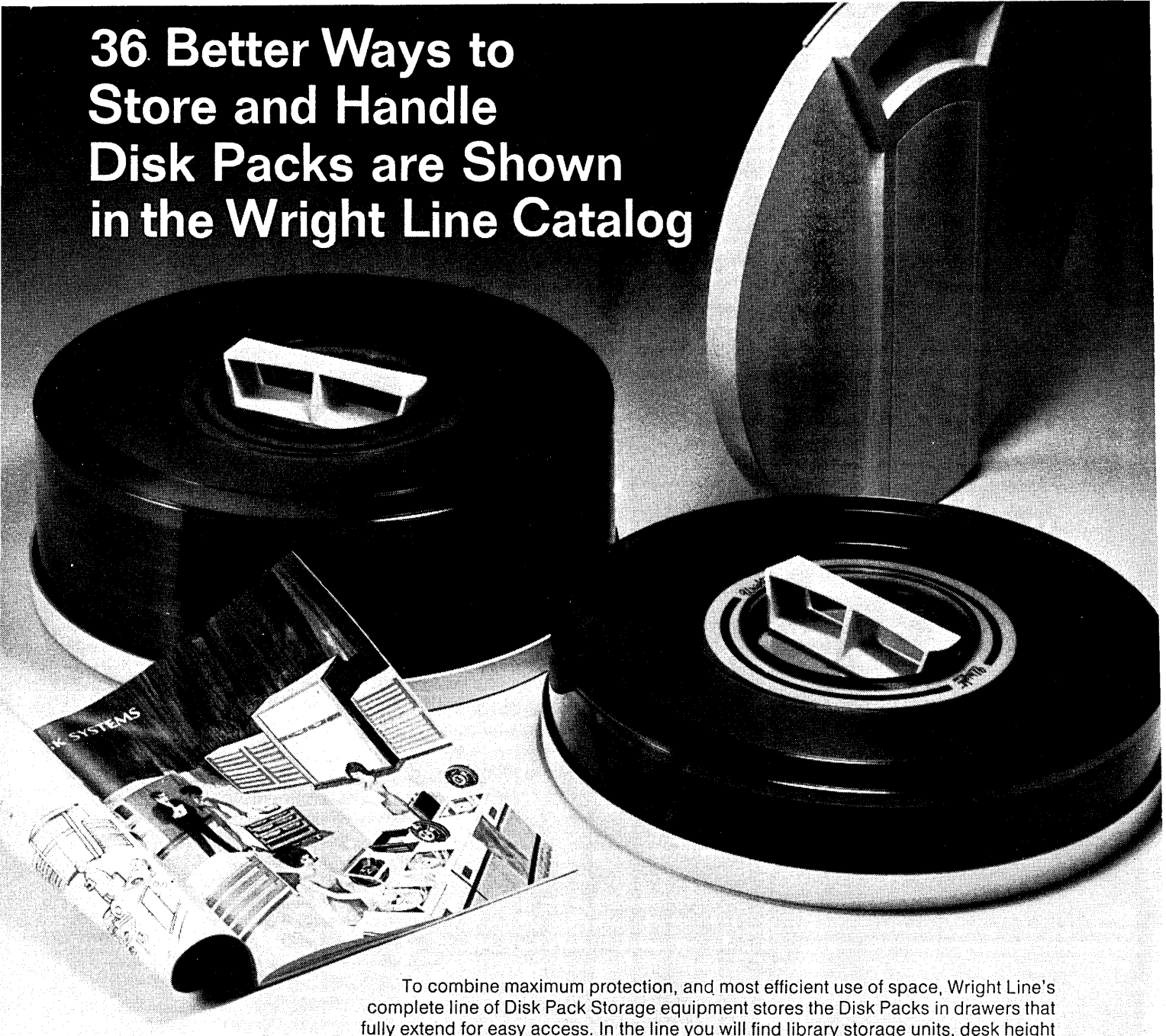
Up to eight keystations input to a memory and logic control unit capable of storing 128 program controls. Any keystation can check the work of any other by full record CRT display or key verification. Completed jobs are transferred to 7- or 9-track computer compatible tape or, with on-line option, directly to a central processor.



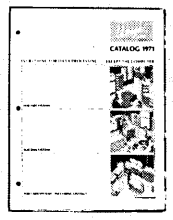
INFOREX

CIRCLE 31 ON READER CARD

36 Better Ways to Store and Handle Disk Packs are Shown in the Wright Line Catalog



To combine maximum protection, and most efficient use of space, Wright Line's complete line of Disk Pack Storage equipment stores the Disk Packs in drawers that fully extend for easy access. In the line you will find library storage units, desk height cabinets, trucks and fire resistant Data-Bank Safes along with a complete line of Disk Packs. They are all shown in your Wright Line Catalog, your one best source for information on Disk Pack Storage and accessories for use in tape, eighty column, and the new ninety-six column card systems.



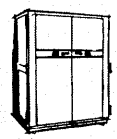
It's so easy to solve your data processing accessory needs with the Wright Line Catalog

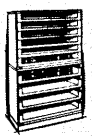
1. Select from the catalog and mail or phone your orders directly to your local Wright Line branch office or main plant in Worcester. Wright Line's more than 60 offices are listed in the yellow pages.

2. If additional information is needed when ordering or planning installations, call your local branch office and ask to have one of Wright Line's more than 125 field specialists call on you.

If you don't have a Wright Line Catalog, we'll be glad to send you one. Write or phone any of our offices or circle the readers' service number below.

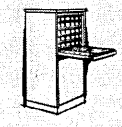
Everything for data-processing . . . except the computer


DATA-BANK SAFES


DISK STORAGE


CARD FILES


TAPE STORAGE

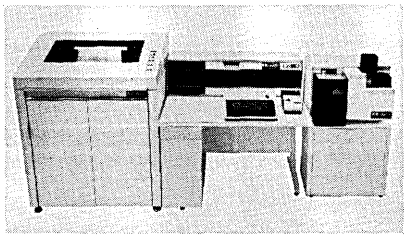

SYSTEM/3 ACCESSORIES

Wright LINE
DATA PROCESSING ACCESSORIES

WRIGHT LINE • A DIVISION OF BARRY WRIGHT CORPORATION, 160 GOLD STAR BLVD., WORCESTER, MASS. 01606
CIRCLE 17 ON READER CARD

Batch Terminal

System 3700 is an IBM 2780 emulation, batch, and conversational terminal. It combines a 600 lpm, 132 character font printer, magnetic card read/write, 80- or 96-column card input, with a data transcriber. The transcriber includes a programmable 200 character buffer store and system controller, IBM compatible magnetic tape I/O, CRT display, keypunch or typewriter keyboard and the 2780



communication control. Synchronous transmission rate is 4800 baud and asynchronous is 600, 1200, and 1800 baud. The unit can handle off-line key to tape, card to tape, tape to print, and card to print conversion. On-line capabilities include card to tape, or print and tape to tape or print, and conversational keyboard communication. Price for the System 3700, now offered to the end user for the first time, is $42,000. Monthly rental starts at $950. Delivery is 120 days ARO. DIGITAL INFORMATION DEVICES, INC., Lionville, Pa. For information:

CIRCLE 511 ON READER CARD

Bank Commo Computers

Three communications computers, called Remote Item Processing Systems, provide the link between MICR equipment and card readers for such bank situations as branches and smaller banks that cannot justify their own large-scale computers. Use of the new machines eliminates the need for physical shipment of items to a central processing location. The RIP systems are designed for use with Burroughs 300, 500, and 700 series mainframes, and use ASCII code. One model, the 344, however, outputs standard 200 or 556 bpi 7-track tape which can be used by other vendors' hardware.

The 343 provides input to the central computer through direct transmission of information captured from MICR or card readers. Information may be transmitted back to the 343 for output on a remote line printer. The 344 outputs tape, as noted above, for physical shipment or transmission through devices such as the Burroughs Series N7000 magnetic tape encoder. The 345 accepts input from MICR and card readers or from magnetic tapes of such data for transmission to the central computer. Information may be transmitted back to the 345 for printing directly on a remote line printer or for capture on a back up tape for subsequent off-line printing.

Rental of the basic B343 and 344 systems is $1705-1940/month, with purchase prices starting at $93,120. The B345 is $2120-2410/month, or $115,680 on purchase. Deliveries have already begun. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 512 ON READER CARD

Computer System

Many manufacturers have recently begun to yank bits and pieces off of their products, not only to lower the price, but to perhaps more closely approach what the buyer really needs as well. Though details (and photos) of the 360/22 are limited, it appears to be a cut-down model 30 at a dramatic reduction in price. Two storage sizes, 24 and 32K of 1.5 usec core are offered, with the latter size being half the amount available to /30 users. Another reduction in capability is in the channel rates, with the single selector channel on the /22 rated at 170KB, also half the rate of the /30. That channel speed will not support 2314 storage, while the /30 could. Slower speed disc equipment goes on the /22 selector channel. One multiplexor channel is also standard for controlling up to 96 slow-speed devices such as card and tape equipment. As in most 360s there are 16 general-purpose registers, and the /22 has standard decimal arithmetic with floating point capability an option. Software includes COBOL, FORTRAN, and RPG II, all running under DOS.

The pricing is the most interesting thing about the latest 360. A 360/30 cpu with 32K memory rented for $2670/month and sold for $120,250. The 360/22 cpu with 32K memory rents for $1150 and can be purchased for $44K. Interestingly enough, the maintenance on the /22 cpu/memory unit is higher at $145/month than the /30 rate of $115. The 360/22 seems to be a lot of machine for the money—and was doubtless intended to be. But pricing schedules like these are going to give competitive equipment builders and leasing companies fits. IBM CORP., White Plains, N.Y. For information:

CIRCLE 515 ON READER CARD

Core Storage

Additional or replacement core storage is offered for the Digital PDP-11 16-bit mini in 4-24K modules with the CORPAC 11. The 1.2-usec memory is said to be both electronically and logically compatible with the PDP-11 and its peripherals. Prices are typically $6400 for 8K and $18,500 for 24K, including power supplies. Delivery is stock to 30 days ARO starting May 1. INFORMATION CONTROL CORP., Los Angeles, Calif. For information:

CIRCLE 519 ON READER CARD

Disc Storage

DISC-CELL is a head-per-track storage unit with capacities of 1.6, 3.2, or 6.4 megabaud contained in a sealed cabinet. The power supply, drive motor, and necessary electronics are contained in the other component of the system called the TWIN-CARRIER. Thus, the storage discs, rotating at 2400 RPM and providing 12.5 msec average access time to the contents, can be added to the system as system requirements increase, as they are tied to the TWIN-CARRIER motor with a belt. The transfer rate is 2 megabaud. Only test evaluation and preproduction units will be available during the remainder of this year, with production models of the DISC-CELL component tentatively priced at $953 and TWIN-CARRIER driver/controllers likewise scheduled next year at $1233. DATAFLUX CORP., San Jose, Calif. For information:

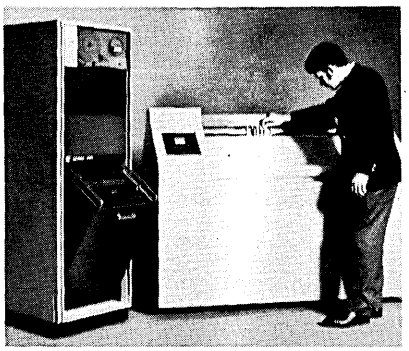
CIRCLE 510 ON READER CARD

(Continued on page 70)

Drum Plotter

A significant departure from this firm's product line, which in the past consisted of flatbed drafting systems, is the model 462 drum plotting system. It consists of an H-P 2100 minicomputer with 4K of 16-bit, 980 nsec memory, an 800 bpi, 9-track, IBM-compatible tape unit, and the plotter.

And the plotter is fast. It accelerates from a standing start to 1600 inches/minute in less than 30 msec thanks in part to the two-year development of a new servo drive. The standard drawing head is a three-pen assembly utilizing regular ink, ball point, or felt tip pens. The two outside pens can travel 36 inches in the Y



axis.

The drawing surface is on the 44-inch wide drum, with the maximum length of plots permitted being 125 continuous feet. Paper tension is maintained by servo operated feed and take-up rolls with vacuum column buffers. Low vacuum and end-of-roll sensing systems are provided.

The software package includes speed optimization control, linear interpolation routines, dash line generation, and automatic rereading for correction of lateral and/or longitudinal parity errors. The complete model 462 drum plotting system has a base purchase price of $35K, with delivery 120 days ARO. THE GERBER SCIENTIFIC INSTRUMENT CO., South Windsor, Conn. For information:

CIRCLE 514 ON READER CARD

Line Printer

The model 761 line printer attaches this manufacturer's KeyProcessing system, enabling system reports, batch listings, and tape listings to be generated in multiple copies at speeds up to 1000 lpm. It has a 64-character EBCDIC set, and prints 80-character lines. Printouts of batch data, which is stored on the KeyProcessing system disc, can be obtained either after the data has been edited or in a character-for-character format. Selective printing of out-of-balance batches is also possible.

For tape listings, the 761 generates a character-for-character printout directly from the magnetic tape, bypassing the system disc. The records are automatically unblocked and one record per line is printed. The 761 printer leases for $450/month, which includes the requisite controller. COMPUTER MACHINERY CORP., Los Angeles, Calif. For information:

CIRCLE 527 ON READER CARD

Cassette Transports

The 4200 series of cassette transports is available in speeds of 10-75 ips (37½ ips standard), and 800 bpi NRZI or 1600 bpi phase-encoded recording modes. The units are reel driven and record on two-track Philips-type cassettes. The rewind or high speed search rate is 120 ips. Optional are character or byte electronics, rotational position, and multiple transport interfaces. Production is scheduled for July for the 4200 series, with prices starting at approximately $1000 for an order of 100 units. PERIPHERAL DYNAMICS CORP., Orange, Calif. For information:

CIRCLE 516 ON READER CARD

Automatic Drafting

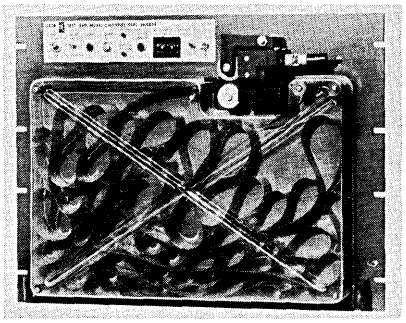
There must be many firms that would like to get an automatic drafting system, the only thing holding them back being the large amount of money usually involved. Even this vendor introduced a system within the last 18 months priced very close to $100K. But the model 1100 automatic drafting system is about as modular as a Chinese menu—in fact, the order and pricing form resemble one. For as little as $23,650, a 25 x 42" drafting table and necessary interfacing for an IBM 1130 can be purchased. Above that starting price, one can add equipment for off-line plotting (a MAC-16 is used), hardware slope generators, several different pen kits, vacuum holddown for the Sawyer drive plotter (see Jan. '70 p. 201), two larger table sizes (42 x 57" and 57 x 89"), etc.

The unique thing about the 1100 is that the pen assembly is suspended from the bottom of a slab over the actual drawing surface to allow thicker materials to be inserted, if desired. Plotting is done at 40 ips with ± .001-inch repeatability. Systems are available 90 days ARO and are warrantied for 90 days. Prices include installation and checkout of the basic modules, with later additions subject to installation charges. XYNETICS INC., Canoga Park, Calif. For information:

CIRCLE 509 ON READER CARD

Paper Tape Reader

The model 560 multichannel closed-loop paper tape reader suggests that paper tape equipment manufacturers may yet stave off penetration of their markets by cassette and magnetic tape manufacturers. Up to 100 programs (or 12K characters—whichever comes first) is stored on the loop with the program number selected either by using the thumbwheels on



the control panel, or by a remotely located computer. Models for 320, 640, or 1,000 cps transfer rates are available, as is a single-channel model suitable for applications requiring only single program storage. The model 560 is priced at $1900 and the single program model 555 lists for $1500. DATA TEST CORP., Concord, Calif. For information:

CIRCLE 513 ON READER CARD

Auto Test & Control

Any application requiring that a computer control a large number of dissimilar devices would seem a candidate for the model 6936A Multiprogrammer and 6937A Extender. When attached to any of this firm's 16-bit computers, the 6936A changes the output channel effectively into 15 separate, individually addressable, 12-bit output channels. If one has more than 15 devices, the 6937A Extender ups the number to 30; as many as 15 Extenders can be attached for control of up to 240 12-bit channels. Plug-in output cards in each of the channels provide outputs in the form of resistances, dc voltages, contact closures, or logic levels. Each unit also accepts any combination of these programmable output cards: resistance output card, low-speed D/A card, relay register card, and TTL output card.

Delivery for the equipment is five weeks ARO. The model 6936A Multiprogrammer priced at $1200, and typical output cards are $350. If extenders are required, they are priced at $750. HEWLETT-PACKARD CO., Palo Alto, Calif. For information:

CIRCLE 520 ON READER CARD

Patient Monitoring

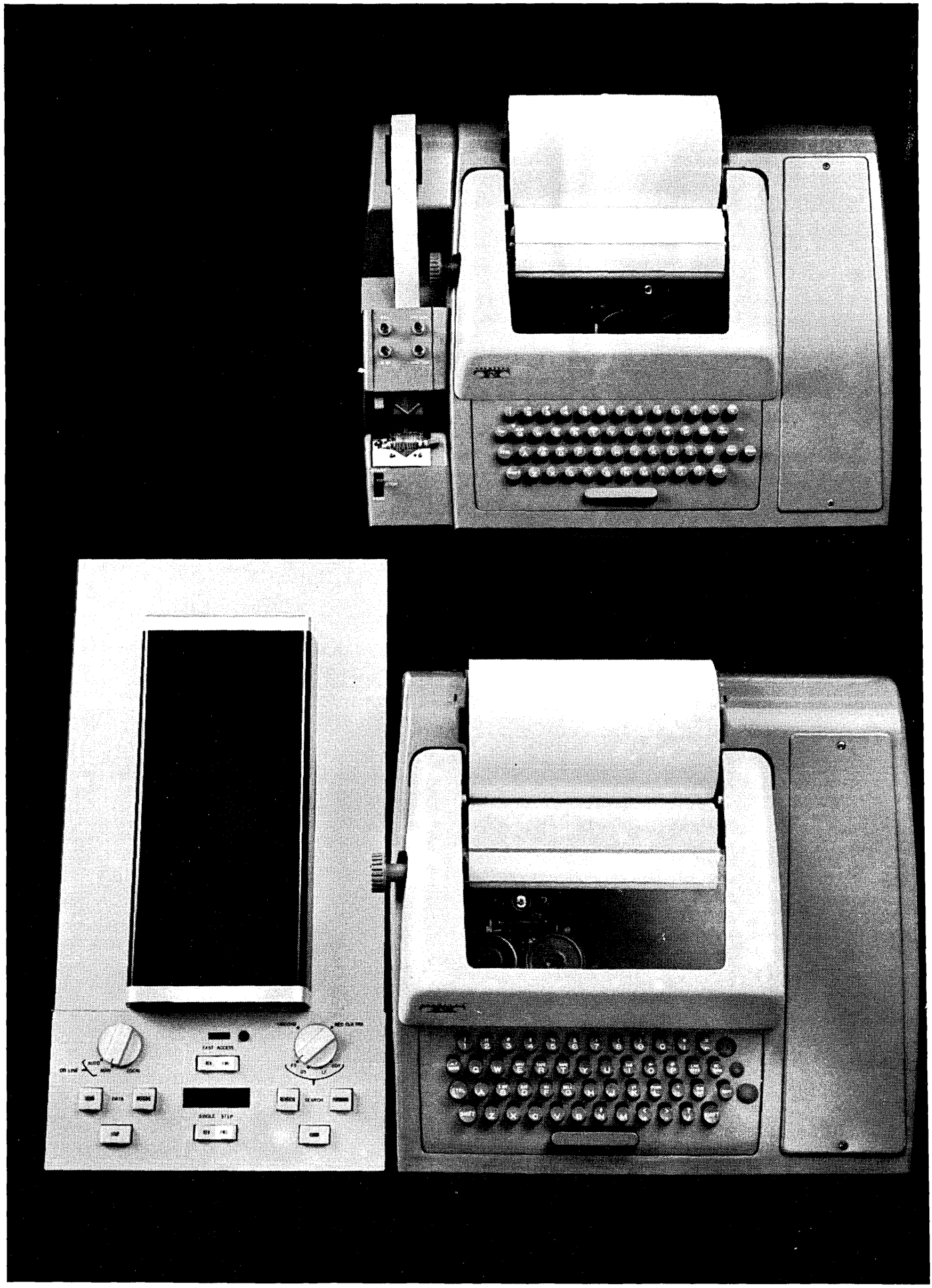
The Autochart is intended for monitoring of the life signs of patients in intensive care units and coronary care units of hospitals. It includes a PDP-8 minicomputer for continuous monitoring of up to 16 patients simultaneously. A Hazeltine crt terminal with 27 lines of characters and x-y access capability displays graphic and tabular presentations of the one-hour values for parameters monitored. The data samples are used for computations of statistics, and values recorded during the past 24 hours can be drawn from memory. A Teletype provides hard copy. A minimum system, for monitoring just one patient, is $20,000, with an upward range to about $50,000. Delivery requires 90 days ARO. BIO-MEDICAL ELECTRONICS, INC., Rockville, Md. For information:

CIRCLE 518 ON READER CARD

Keyboard

This 48-key (tty model 33-compatible) communications keyboard with 7-bit ASCII positive logic encoding is offered to oem's in both stepped and sloped key configurations. Other design information includes DTL/TTL-compatible outputs, a key operating force of 3 oz., and a stroke of .187 inches. Also included is a two-key rollover, double-shot molded keys, electronic or mechanical shift lock, and fully buffered outputs. Key colors can also be ordered. Interface to existing equipment is accomplished through a single standard card edge termination. These latest members of the DC series are priced at $150/each with an order of 100. Delivery requires six weeks. DATANETICS CORP., Redondo Beach, Calif. For information:

CIRCLE 521 ON READER CARD ■



DOS Sort

The following impressive claim is made for PI SORT 2: Without changing anything in a user's procedure, at least 20% and as much as 80% of the time currently required to sort files on DOS 360 machines can be pared. It is written in BAL and requires 20K of memory when working with 2311 disc storage, or 30K for 2314 units. PI SORT 2 is also said to be "plug-compatible" with IBM's SORT since it uses the same control cards. A 30-day free trial under no obligation is offered, and after that $100/month keeps PI SORT 2 on the machine. The program and necessary JCL are furnished the purchaser. PROGRAMMATICS INC., Los Angeles, Calif. For information:

CIRCLE 506 ON READER CARD

File Maintenance

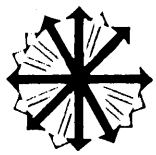
A file dump and restore program for UNIVAC 1108 users provides a tape copy of all user FASTRAND files in modified Rolout format. All files or only those files that have been updated during the day may be dumped. The package includes modifications to EXEC 8 level 26 to recover all FASTRAND files after field engineers have written on the FH 432 drums. The dump can run on levels 23, 25, 26 without modification, as the program internally converts all files to 25 format. The package is a multi-activity EXEC 8 worker program so other programs can run alongside the dump/restore package. It is written in FORTRAN and requires about 18K words of core. The price is $2K. AXICOM SYSTEMS INC., Paramus, N.J. For information:

CIRCLE 508 ON READER CARD

Program Relocation

The addition of one card to the JCL before linkage editor execution is all that is required to invoke this relocator utility program. It is written in BAL and requires approximately 160 bytes plus 3 bytes for every address constant in the user's program. No alterations to the operating system is required, and the program is priced at $3K. WEBSTER COMPUTER CORP., Danbury, Conn. For information:

CIRCLE 503 ON READER CARD



SOFTWARE

File Maintenance

CARIS (Copy And Reorganize Indexed Sequential) is a 24K byte program allowing DOS users on 360/25 models and up to reorganize index sequential files on 2311 or 2314 discs. From one to three control cards using free-form keyword operands instruct CARIS to copy selected files onto a work area and either restore them to the original disc area, or to a different area, or to a different volume. The newly loaded file will have all of the characteristics of the original file except all of its records will be located in the prime data area. Upon control card specification, records tagged for deletion in the original file are excluded from the new file. CARIS dynamically allocates storage used for I/O. The price is $495. SOFTWARE TECHNIQUES, Scarsdale, New York. For information:

CIRCLE 501 ON READER CARD

Printing Program

A parameter-driven printing routine called STENCIL is available for DOS 360 users (with other versions due to follow). Its features include card, tape, or disc input and printed or spooled output. The output formats include multiple-up printing, letter writing, labels, precollation of output, conventional columnar directory, etc. It handles packed and unpacked data and provides for upper and lower case printing.

STENCIL parameters are modeled on sort control statements, so most jobs should be able to be specified by operators or clerks. The program is self-relocating and can run in as small a partition as 10K bytes. The first three-year lease is $2400, including installation, training, manuals, and guarantee. DATA SYSTEMS AUDITORS, INC., Philadelphia, Pa. For information:

CIRCLE 504 ON READER CARD

EDP Auditor

EDP Auditor is intended for use by auditors in testing the integrity of information filed in computer systems, and was developed using criteria established by leading auditing firms, according to the vendor. It is said to be simple enough to be used by any auditor regardless of edp experience, and can handle any type of file, applying "unlimited" test and selection criteria to produce varied reports in one pass of a file. It's written in assembler and runs on 53K System 360 models 30 and up under DOS or OS, and on Spectra 70 models 35 and up under TDOS or OS. Purchase is $20,000, lease is $15,000 inclusive for three years, and rental is $500 per month for three years. Installation, training, documentation, warranty, and maintenance are provided. CULLINANE CORP., Boston, Mass. For information:

CIRCLE 502 ON READER CARD

Financial Planning

The AdSim financial planning and risk analysis package, which formerly ran on an XDS 940 for studies of individual product and acquisition situations, has now been greatly expanded to handle large corporate planning models, including multiproduct, multidivision, etc., problems. It's an interactive system written in FORTRAN, and requires at least a 360/65 with 512K core; modification for other large time-sharing systems is available at extra cost. At present, the system is available as a service through both Com-Share and National CSS time-sharing, with a selling price for in-house use of $8000. Users of other time-sharing services may request that their services have AdSim installed. The vendor is also prepared to develop specialized planning models for users. APPLIED DECISION SYSTEMS, INC., Wellesley Hills, Mass. For information.

CIRCLE 505 ON READER CARD

Basic Compiler

This extended BASIC compiler/interpreter is offered to oem's that are developing small- to medium-scale time-sharing systems, enabling them to offer end users software capabilities. It is a generalized model that can be adapted to particular machine designs. Among the features of the program are line-at-a-time entry for saving and/or execution; syntax checking; error recovery procedures; multiple statements per line; string and numeric values, arithmetic, relational, logical, and string catenate operators; dynamic storage for strings and arrays, including multidimensional arrays; string manipulation; and matrix operations. The price for the BASIC processor, supporting a reasonably rich language, is in the neighborhood of $30K, and development requires four to six months. POLYMORPHIC CORP., Palo Alto, Calif. For information:

CIRCLE 507 ON READER CARD

PDP-15 Batch System

Take a PDP-15/35 and add this operating system and you can process punched cards in a variety of scientific and engineering applications. The purveyor of the system claims it was designed for the small research-oriented college, commercial, or government data processing center. It permits programs to be written in FORTRAN IV, ALGOL, and MACRO, a PDP machine language. There are also subroutines that allow construction of FORTRAN programs for payroll and accounts payable. Basic configuration for the system is a PDP-15 with 16K words of core, magnetic tape and disc storage, Teletype, paper tape reader/punch, card reader, and a line printer. It is available free to present PDP-15 users. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 517 ON READER CARD

Decision Table Processor

The Decible III decision table processor is written in COBOL, but it can convert decision tables directly into PL/I and FORTRAN as well as COBOL. It also features a library system that permits source language programs to be stored on tape or disc. According to the vendor, the system uses a unique algorithm to optimize the coding that is produced yet still run at I/O speed. Decible III uses only three free format statement types, making it easy enough to be learned in less than two hours, so the two-day training course mostly concentrates on the uses of decision tables. Hardware requirements are that the system must be able to handle a COBOL compiler. Present versions operate on System/360, Spectra 70, Univac 1108, and Burroughs 3500 and 5500 cpu's. The price of $9000 includes installation, training, service, and warranty. INDEPENDENCE COMPUTING & SOFTWARE CORP., Collingswood, N.J. For information:

CIRCLE 522 ON READER CARD ■

PEOPLE

Frank T. Cary is filling an IBM post that had been vacant for 10 years, that of corporate executive vice president. It was last held by Albert L. Williams who became IBM president and now is a director and member of the corporation's executive committee. Cary joined IBM as a salesman in 1948. He was named president of the DP Div. in 1964, corporate vp and group executive in 1966, and senior vice president in 1967. In 1968 he was elected a director and in 1969 became a member of the corporate office and management review committee. He continues as a director and member of the two groups.

University Computing Co. has pulled **Douglass Parnell, Jr.**, into the corporate operation. The former president of Computer Technology, Inc., and administrator of that facilities management firm's combination with UCC (May 1970, p. 185), is now CT chairman and a UCC vice president supervising CT and UCC's Data Link Div. operations. He succeeds UCC executive vp and director, **E. W. McCain, Jr.**, in the chairman's spot. **Michael F. Sivinski**, CT vice president, operations, was named president of CT and, at Data Link, **John F. Watters** was named general manager. Watters, former eastern operations vp of UCC's Computer Network Div., succeeds **Karl Young** who resigned for personal reasons.


F. Cary


W. Gorog

Robert N. King is the new president of Varifab, Inc., a manufacturer off-line data collection equipment and a subsidiary of Condec Corp., Old Greenwich, Conn. . . . One of Levin-Townsend Computer Corp.'s cofounders, **Howard S. Levin**, left the company with the parting statement, "I consider my job at Levin-Townsend done." Levin resigned as

People . . .

L-T director and chairman of the finance committee to concentrate on his other business activities which include a position as chairman of the executive committee of Computer Resources, Inc., Cleveland . . . **William F. Gorog,** president and chairman of the board of Data Corp., Dayton, Ohio, was elected a vice president of its parent, Mead Corp. . . . **William F. Bauer** resigned as eastern regional marketing manager for Honeywell's Information Systems Div. to become president of Combyte Corp., Farmingdale, Long Island, N.Y. . . . **Louis B. Lundborg,** recently retired Bank of America board chairman, joined the board of General Automation, Inc., Anaheim . . . **Richard E. Brindley** left a post as data services director of Control Data Corp.'s Houston-headquartered southern region to become president of Central Information Processing Corp., Baltimore, a subsidiary of Commercial Credit Co. . . . **Ronald J. R. Kallman** was named to a new Transamerica Computer Co. position, assistant to the chairman of the board. He had been western division vp of Auerbach Corp. . . . **D. Ray Whitson** who left Texas Instruments in late '69 to help found Datotek, Inc., Dallas manufacturer of data security devices, has been named Datotek's vice president for operations . . . **Donald E. Oglesby,** former president of Data Computing, Phoenix, became vp of marketing for Wabash Computer Corp.'s Equipment Div. . . . **Howard I. Morrison** was appointed division vice president of Auerbach Corp.'s Automated Systems Corp. He had been president of the Information Sciences Div. of Computer Applications, Inc. . . . **Norman I. Wheatcroft** was named vp, marketing and sales, for Astrosystems, Inc., New Hyde Park, N.Y. He is a former account manager for Ferroxcube Corp. . . . **David A. Huemer,** a former dp manager with Borg-Warner's Byron Jackson Pump Div., joined California Computer Products' subsidiary, Century Data Systems, as director of management information systems . . . **B. R. Babaniss,** a former IBM systems engineer, is the new director of systems support for the Computer Leasing Div. of Itel Corp., San Francisco . . . **Samual L. Sander** left a post as regional manager for Computer Machinery Corp. to become western regional manager for Data Instruments Co., Sepulveda, Calif., source data entry producers. ■

sea sample

good advice when you're considering a new product

before you buy

And the 1971 Datamation Industry Directory is a new product in a sense... the first issue of a wholly new kind of edp directory, designed to make life easier for the installation manager and OEM buyer by providing a means to check out competing products and vendors.

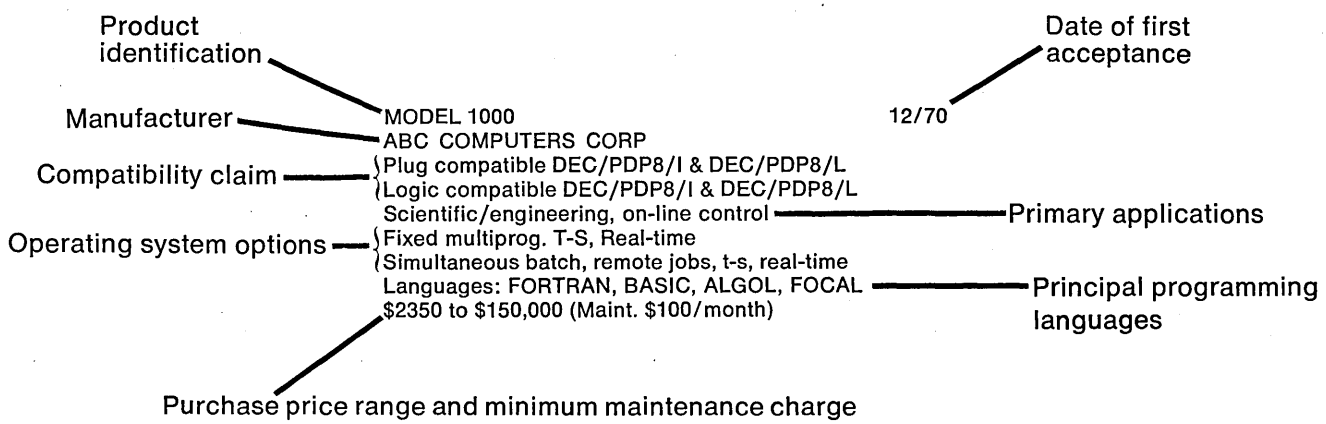
To give you a glimpse of how the information is organized, we're reproducing here the first part of the introduction to Chapter I, Computers, plus some sample listings of the very small and the very large computers. From these, we think you can get an idea of what's in between... the hundreds of machines that have been analyzed and correlated to simplify your screening before selection.

Chapter I...

Introduction

The computers included in Chapter I range from relatively simple-minded controllers through specialized missile or fire control devices to super-scale scientific and commercial data processing configurations. The computers, generally speaking, are arranged in order from smallest to largest on the basis of their low-end prices. The minimum prices quoted are generally for mainframes with a minimal number of controllers and the smallest main memory; the prices quoted as the high ends of the ranges may include a very broad range and large number of peripherals.

Following is a sample composite listing for this chapter that shows most of the information given for every type of computer. The variable information that is not self-explanatory will be described later in this introduction under the appropriate section headings.



Using the labeled composite entry as a key to the compressed information in the listings, take a look now at some actual samples.....

DIGITAL COMPUTERS

Under $5000

MODEL Home-Ec VII --
APPLIED SYSTEMS, INC
Home and personal use
$400 to $1200 (Maint $NG/month)

MODEL CP-8 04/70
UNICOM INC
Scientific/engineering, on-line control
Languages: Assembly
$970 to $7000 (Maint $NG/month)

from the very small (p 115)

MODEL M400 Micro 400 12/70
MICRODATA CORP
Commo/message switching, on-line control
Languages: Assembly
$3250 to $3750 (Maint $NG/month)

MODEL SPC-12 12/67
GENERAL AUTOMATION, INC
On-line control
Real-time
Simultaneous real-time
Languages: Assembly
$3600 to $18,000 (Maint $40/month)

Omnus-1 --
OMNICOMP COMPUTER CORP
Scientific/engineering, Commo/message switching
T-S, Real-time
Simultaneous batch, t-s, real-time
Languages: Assembly
$3800 to $35,000 (Maint $NG/month)

MODEL 20 GRI-909 03/70
GRI COMPUTER CORP

MODEL 100 Elbit 09/66
ELECTRONIC PRODUCTS INTL CORP (EPIC)
Commercial data processing, Scientific/engineering
T-S, Real-time
Simultaneous t-s, real-time
Languages: Assembly, Industrial control
$4800 to $6000 (Maint $NG/month)

$5000

MODEL 18 --
COMPUTER LOGIC SYSTEMS, INC
Scientific/engineering, T-S
Variable multiprog, T-S, Real-time
Simultaneous batch, remote jobs, t-s, real-time
Languages: Assembly
$5000 to $30,000 (Maint $600/month)

MODEL SAL-100 Satellite 06/70
DATASERV
Commercial data processing, on-line control
T-S, Real-time
Simultaneous batch, remote jobs, real-time
Languages: Assembly, FORTRAN
$5000 to $70,000 (Maint $NG/month)

to the very large (p 23)

$500,000

MODEL 3500 09/67
BURROUGHS CORP
Commercial data processing, Scientific/engineering
Variable multiprog, T-S
Simultaneous batch, remote jobs, t-s
Languages: COBOL, FORTRAN, BASIC
$500,000 to $1,500,000 (Maint $140/month)

MODEL 5700 --/70
BURROUGHS CORP
Commercial data processing, T-S
Variable multiprog, T-S
Simultaneous batch, t-s
Languages: COBOL, FORTRAN
$500,000 to $2,000,000 (Maint $700/month)

MODEL 8561A-1/2 C-System 06/67
COLLINS RADIO CO
Commo/message switching
Fixed multiprog
Simultaneous batch, remote jobs
Languages: FORTRAN
$500,000 to $2,000,000 (Maint $1100/month)

MODEL 4200 --
HONEYWELL INFORMATION SYSTEMS INC
Commercial data processing
Variable multiprog, T-S, Real-time
Simultaneous batch, remote jobs, t-s, real-time
Languages: COBOL, FORTRAN, BASIC
$567,005 to $1,203,410 (Maint $632/month)

MODEL 6200 11/70
CONTROL DATA CORP
Commercial data processing, Scientific/engineering
Variable multiprog, T-S, Real-time
Simultaneous batch, remote jobs, real-time
Languages: COBOL, FORTRAN, ALGOL
$589,580 to $1,301,900 (Maint $2478/month)

MODEL DPE-411 --
TELEFILE COMPUTER CORP
T-S, on-line control
T-S, Real-time
Simultaneous batch, remote jobs, real-time
Languages: COBOL
$600,000 to $1,300,000 (Maint $1128/month)

MODEL 615-300 Century 300 --
NATIONAL CASH REGISTER CO
Commercial data processing, on-line control
Fixed multiprog, Variable multiprog, Real-time
Simultaneous batch, remote jobs, t-s, real-time
Languages: COBOL, FORTRAN, NEAT/3
$605,900 to $2,566,800 (Maint $1035/month)

MODEL 3155 System 370/155 --
INTERNATIONAL BUSINESS MACHINES CORP
Commercial data processing, Scientific/engineering
Fixed multiprog, Variable multiprog
Simultaneous batch, remote jobs
Languages: COBOL, FORTRAN, PL/1
$888,000 to $1,015,200 (Maint $2160/month)

MODEL 8610 Sigma 9 --
XEROX DATA SYSTEMS
Commercial data processing, T-S
Variable multiprog, T-S, Real-time
Simultaneous batch, remote jobs, t-s, real-time
Languages: COBOL, FORTRAN, BASIC
$927,000 to $2,000,000 (Maint $3160/month)

$1,000,000

MODEL 4500 --
BURROUGHS CORP
Commercial data processing, T-S
Variable multiprog, T-S
Simultaneous batch, remote jobs, t-s
Languages: COBOL, FORTRAN, BPL - BASIC
$1,000,000 to $2,500,000 (Maint $245/month)

MODEL 6700 --
BURROUGHS CORP
Commercial data processing, Scientific/engineering
Variable multiprog, T-S, Real-time
Simultaneous batch, remote jobs, t-s, real-time
Languages: COBOL, FORTRAN, PL/1, ALGOL, ESPOL
$1,000,000 to $9,000,000 (Maint $1,264/month)

now... when you've found some of the products that **could** warrant further evaluation, turn to Chapter IX... for a complete listing of vendors for each product... including information on the size and nature of the manufacturer, location of his service outlets, and the other key facts to help you select **before** you request detailed product specifications.

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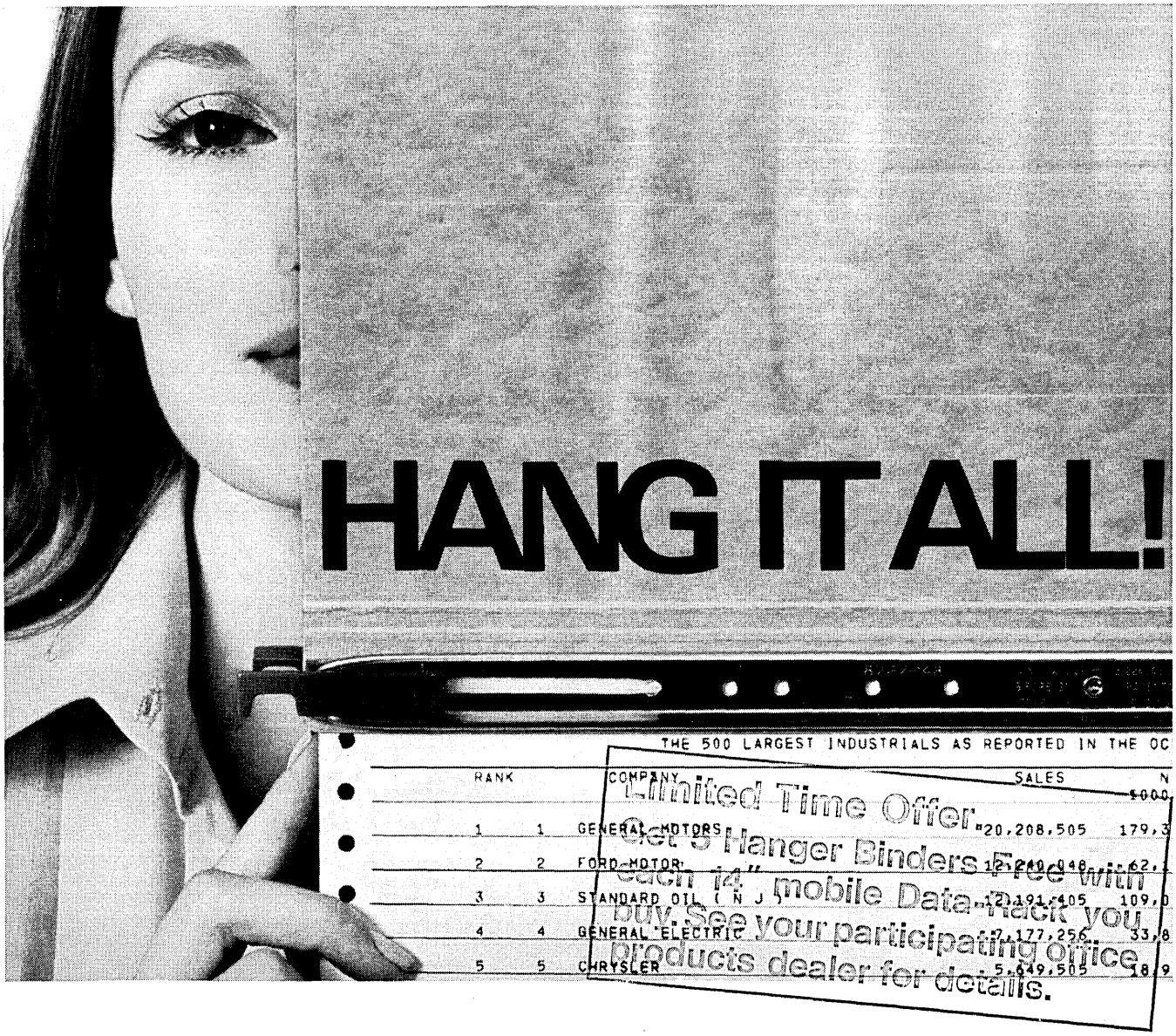

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Now! The fastest, most convenient method of binding EDP printouts for suspension filing systems: Wilson Jones Nylon Post *Hanger* Binders.

EASY TO LOAD—Bind "tab" sheets exactly the same way as in all other WJ Nylon Post Binders.

EASY TO USE—Just extend the slide hangers for suspension; push them in, out of the way, during reference on desk or counter tops.

AND THERE'S NOTHING TO ADD... NO EXTRA HANGERS NEEDED ...NOTHING MORE TO BUY!

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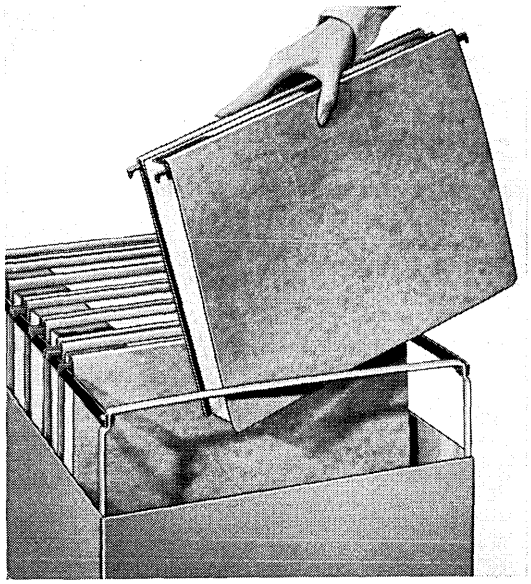
GET THE HANG OF IT TODAY... Immediate delivery from your Office Products or Data Processing Supplies Dealer. Or write for full information.



WILSON JONES
Inventor of the Nylon Post Binder

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WORLD ROUNDUP

SOMETHING'S GOTTEN TO DENMARK

It looks now as if the battling indigenous computer industry of Denmark has to bow out in preference to the heavyweights from the States. That traditional enemy of all who take the plunge into the mainframe business--adverse cash flow--has struck a probable mortal wound at the Danish Regnecentralen (RC). The company was among the early manufacturers in Europe when it was formed in 1956 as a research unit to the Danish Academy of Sciences. The guiding light behind the decision to manufacture in-house hardware was Niels Ivar Bech. It was almost inevitable that some of the in-house designs should appeal to outsiders and lead to a manufacturing business.

In a sense the company was the first to demonstrate the market for the smallish machine, which was kept deliberately from the harsh competition of the general business machines field. Through the '60s, when so many much larger corporations went to the wall or sold off their computer division, RC pegged away with a steady trade in Scandinavia and Northern Europe. It was the only computer company in the world to be able to claim no favoured government treatment, key orders from government expenditure, or direct subsidies.

Its computer line started with a generation one called Dask. Then came the Gier series, and most recently the RC 4000, which looked tailor-made for t-s, at about a quarter to half-a-million bucks for academic and scientific users. RC's price-performance margin has not kept ahead of the developments of the johnny-come-latelies with their free-standing processors that can be tailored into a system or the new goodies on offer from the resident crowd. Revenue over the past two years has been Kr.70 million and Kr.90 million, respectively. This is off-target by a factor of about 10, even for the modest RC goals. At the beginning of April, Bech lost his seat on the board, and the possibility of splitting the company into smaller units to form a software house and a peripheral manufacturer is highly likely. Regnecentralen has shown a consistent profit on the electro-mechanical peripherals it has developed, and this has been helped by a steady trade with some Eastern European customers. Some of the processors have also been installed in Eastern Europe.

UP THE REDS

Just as the Chinese were causing the ping-pong balls to gyrate, the Russians were demonstrating a more tangible attitude toward the West with a $4 million order to International Computers Limited for machines to handle the production control for automobiles at the Moskvich factories outside Moscow. The Soviets have ordered two System 4 model 62s. (System 4s are the series produced from the Spectra 70 licence from RCA to ICL.) The new orders brings ICL's total with the Russians to more than $60 million. The 4S processor incorporates a high-speed semiconductor memory from the Cogar Corp.

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ADVERTISERS' INDEX

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

THE FORUM

Computer Ecology

Recent trends indicate that a major issue in the coming decade will be the quality of our environment. It is appropriate, therefore, that the computer industry examine its position and identify its problems in this area. Casual reflection on the nature of our business produces little cause for concern. The industry is not a flagrant polluter of the environment; no serious depletion of natural resources is entailed by the manufacture or usage of computer equipment. Yet experience in computer operations touches on many instances of wasteful procedures which collectively constitute a serious ecological problem.

The computer, by nature, is capable of ingesting and producing large quantities of information. When the computer is exchanging information with man, the medium of transaction is commonly paper—either in the form of tab cards or printer listings. The generation of hard copy computer output is the most chronic source of disposable waste material in the data processing cycle. A single 1,000 lpm printer, for example, is capable of consuming 300 pounds of printer form paper a day. Based on a five day week, this accumulates to a yearly total of more than 35 tons of paper. An average American, by comparison, produces some 1,400 pounds of disposable waste material each year. In terms of waste production, therefore, one line printer is equivalent to 50 people. But these people are Americans who in turn consume resources and produce waste products at a rate 50 times the per capita average of less developed countries. Thus, from a world standpoint, the printer produces an accumulation of waste material equivalent to a city of 2,500 people. Techniques exist for reducing this profusion of waste.

Source data automation is the process of acquiring data at its point of origin. The optical reader, key-to-tape recorder, on-line keyboard terminal, and magnetic reader are all devices which have been specifically designed to bypass the intermediate storage medium (tab cards) as well as reduce the labor involved in source data handling. The continued popularity of the tab card, however, suggests the relative inadequacies of these devices. The optical reader lacks a comparable degree of reliability. The key-to-tape recorder lacks convenience of use. The keyboard terminal lacks a capacity for volume of information. And the magnetic reader probably lacks a little of each. Yet within their

limits of applicability, each of these devices offers a relative ease in handling which is superior to the tab card. The ecological aspect is clear: elimination of the tab card as an intermediate storage medium entails an increased efficiency in resource utilization and a reduction in waste production.

The waste problem created by the high-speed printer is at once the most serious and the most promising of solution. Each advancing computer generation has been accompanied by an increase in printer capabilities as though the increased computational power dictated a corresponding need for more printer output. A realization of the ultimate futility of this race has been manifested in at least these two third generation innovations: the time-sharing and microfilm systems.

The concept of a time-sharing system is perhaps the most aesthetically pleasing from a conservationist standpoint. In these systems, considerable effort has been expended in developing man/machine interfaces which minimize the exchange of superfluous information. The motivation for this development was, of course, the limited capacity of terminal devices. The results indicate the system potential which can be realized when operating under stringent I/O limitations. It is apparent, however, that a variety of needs cannot be served by the item exchange capability of a time-share system. Moreover, the cost and very finite dimensions of system mass storage require a more economical, yet convenient, storage medium. The development of COM (Computer Output Microfilm) systems is a most attractive alternative to paper. Unfortunately, the current cost of microfilm readers has reduced the accessibility and thereby retarded the acceptance of this expedient at the level of working programmers. A very substantial market awaits the developer of a $20 desk-top reader.

Clearly, though, solution to the problem of computer waste involves more than new gadgetry. None of these devices or techniques will supplant the tab card or printer form in the foreseeable future. The problem itself does not stem from a lack of alternatives but rather from a lack of motivation. It is simply the convenience and economy of paper which account for its popularity. The situa-

tion requires management commitments which, in effect, would make paper a less attractive medium. The following procedures recommend themselves for both conservationist and economic considerations:

1. Computer centers should be administered on a device accounting basis which equitably charges the user only for the service he uses. The job printer page output should be taxed under this system to reduce its economic appeal.
2. Data processing facilities should be equipped with recoverable waste paper disposal containers. Discarded printer listings and cards are salvagable and constitute a salable commodity, not garbage.
3. Management should require that programmers account for their tab card usage. Many individuals cling to antiquated card decks in an avoidance reaction to the discomfort of learning new techniques. Tape reliability is not the factor that it was ten years ago although many operating procedures are geared to this anachronistic belief.
4. The computer industry must maintain a continuing technology of alternatives to paper bound I/O. These alternatives take the form of hardware and software development aimed at facilitating the exchange of required information between the computer and its user. Superfluous information should remain at its source.
5. An educational process is called for which impresses computer users with the ecological need for waste reduction. Programmers should run each job with a concern for, and prior awareness of, the total page output to be generated.

Innovations in data processing are usually justified in terms of convenience and the economics of reduced labor or processing time. If the computer industry is indeed responsive to the public interest, it must add the significant weight of ecological responsibility. The continued neglect of this obligation will inevitably result in governmental action or overreaction.

—T. M. Ames

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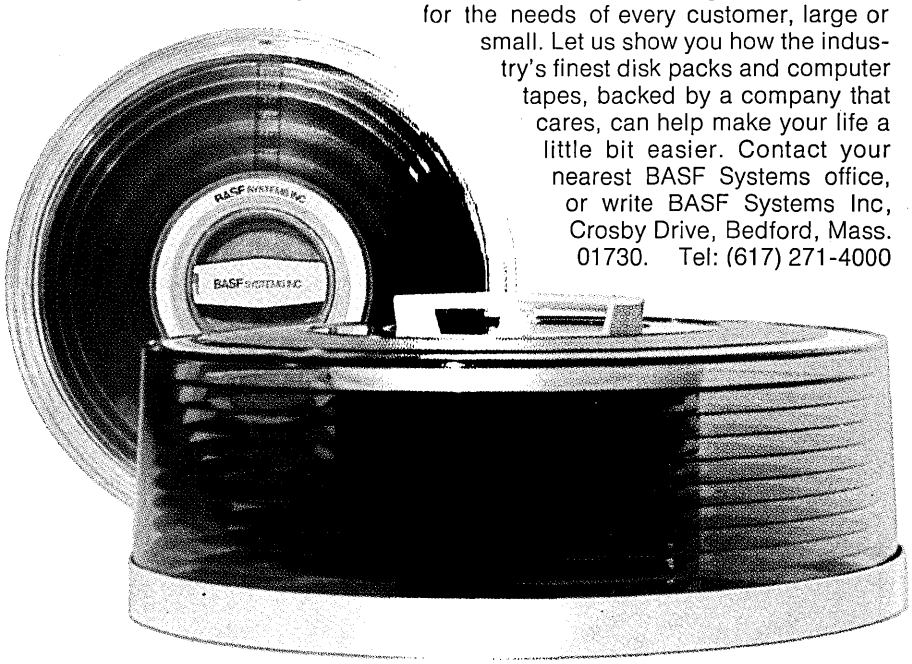

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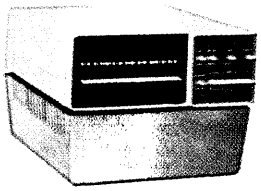
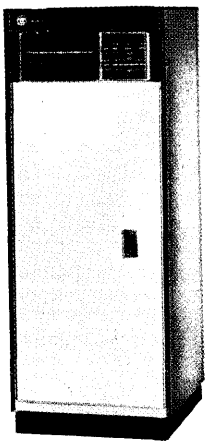
CIRCLE 2 ON READER CARD

The growing family of Westinghouse Computers

Westinghouse Computer Department, dedicated to the principle that response to customer needs must be paramount, introduces the newest member of its expanding computer family, the Westinghouse 2550 Satellite Processor. It joins the recently-announced Westinghouse 2500 table model and rack-mounted model 16-bit digital computer line. The Westinghouse 2550, one of the industry's first user-oriented modular systems for remote and off line data processing, is available **today** for **today's** user requirements. The basic Westinghouse 2550 configuration incorporates the versatile 2500 computer with 4096 words of memory, control console, data set adapter, card reader, line printer, and supporting software (executive communication system, I/O handlers, data set adapter handler, communication formatter with data compression, and emulators compatible with IBM, UNIVAC, CDC and other terminal manufacturers).



Westinghouse 2500 Table Model



Westinghouse 2500 Rack-Mounted Model

The Westinghouse 2500 computer line features a 750 nanosecond memory cycle time, 4096 words expandable to 65,536, hardware multiply/divide, a full line of peripherals, and many options that give meaning to systems modularity. Established software features monitors, FORTRAN IV compilers, BASIC compilers, assemblers, linking loaders, cross assembler/simulator and numerous other packages.

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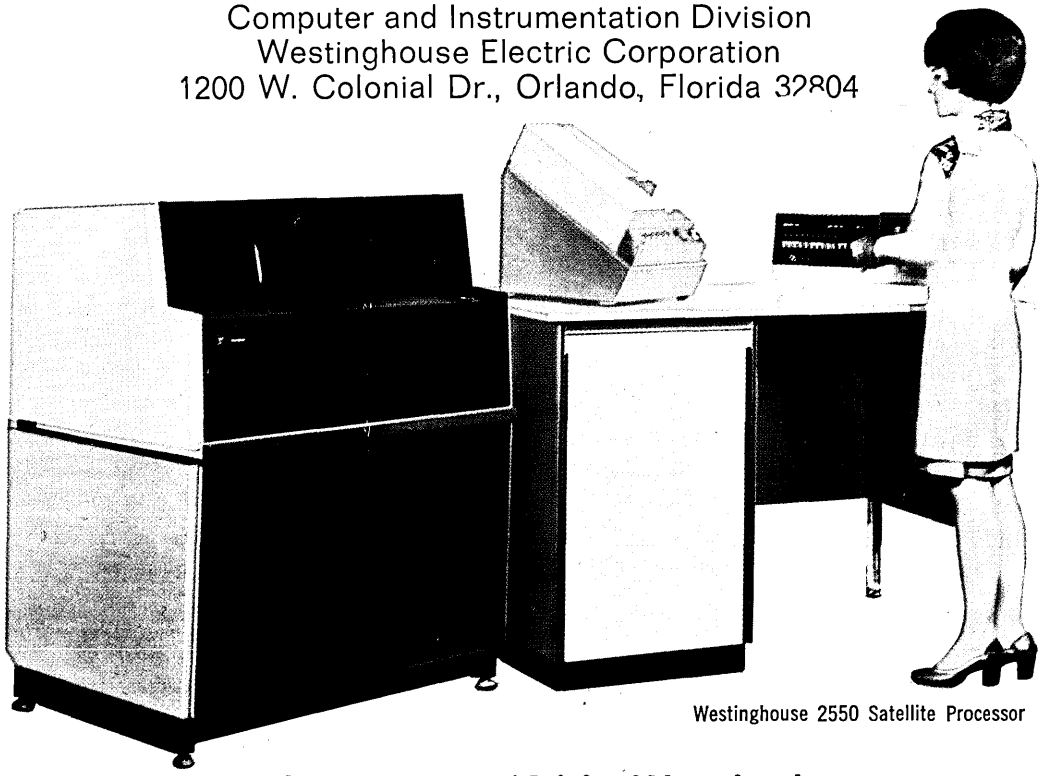

Westinghouse 2550 Satellite Processor

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CIRCLE 3 ON READER CARD