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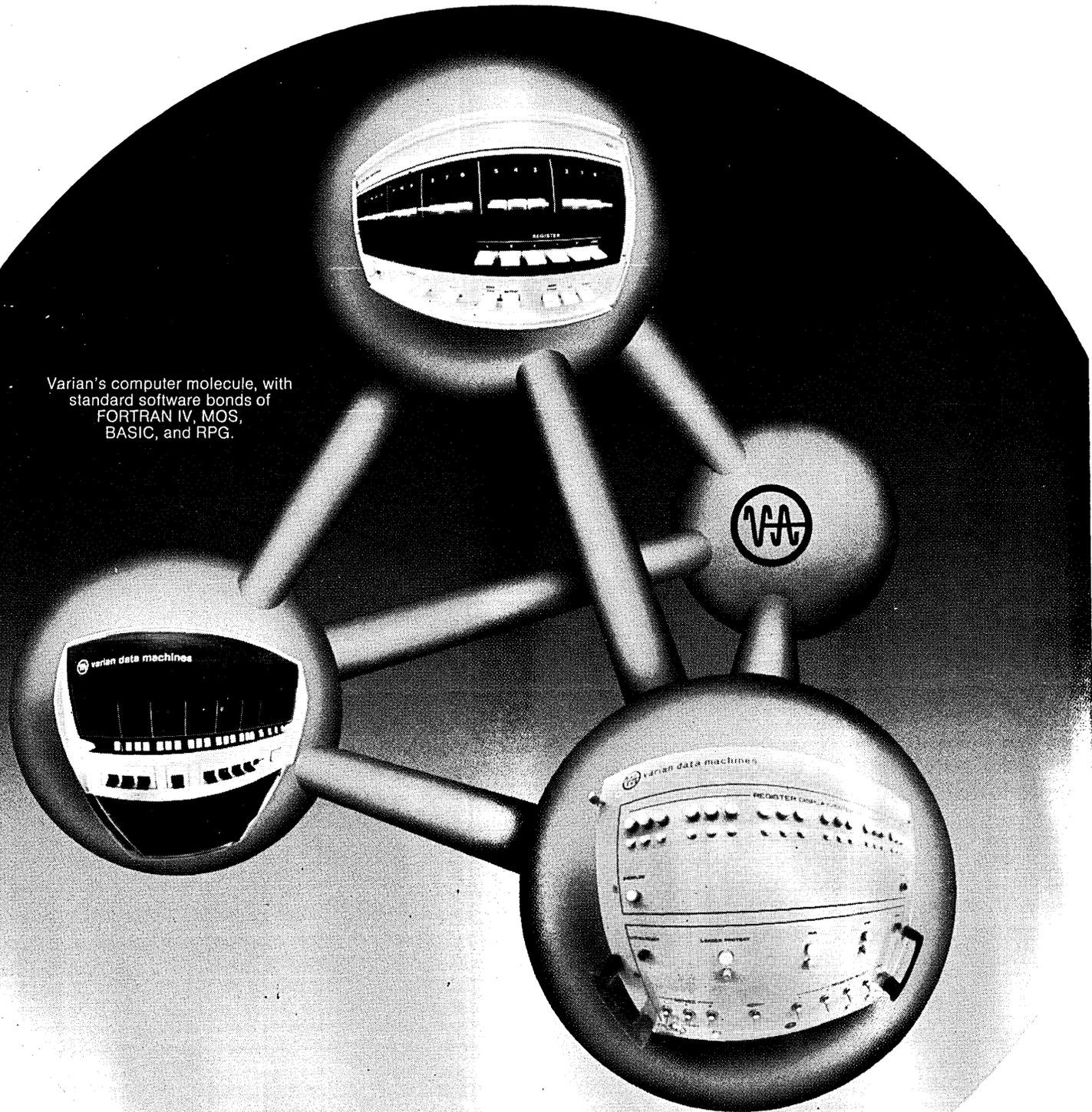
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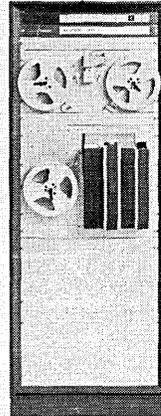
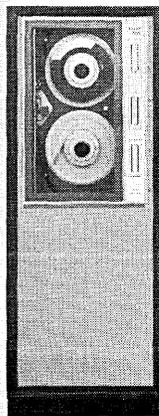
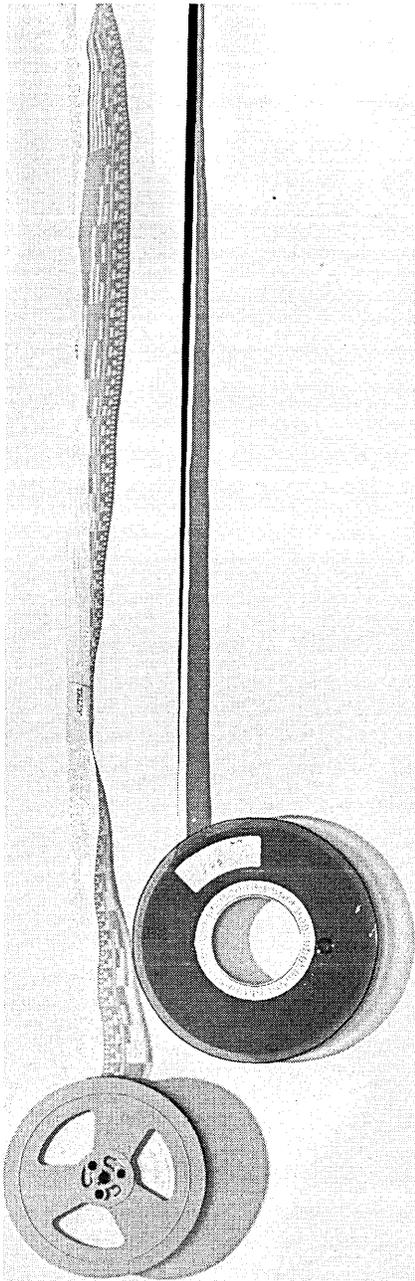
The Big Company in Small Computers

CIRCLE 1 ON READER CARD

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George wanted to build a 3,000 mile wide computer

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(Sure, George, who's going to lay a new transatlantic cable for us?)

"And" he continued, "I only want the customer to have to pay for a local call."

(That had to be a put-on, but he's the boss. Did he have any ideas on how we pull this off?)

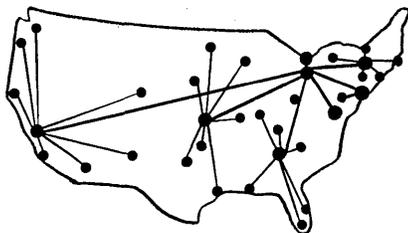
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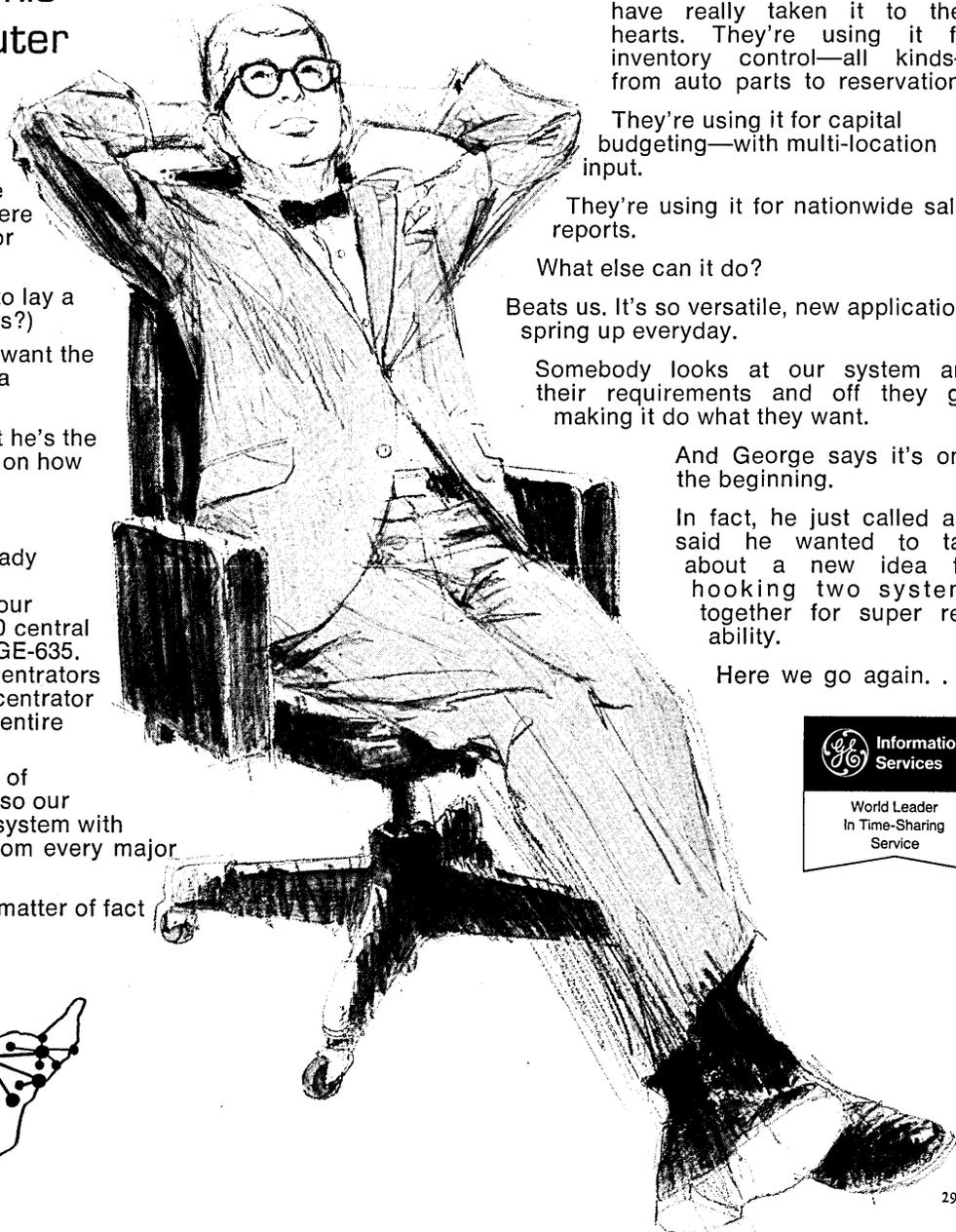
Then, fan out a whole bunch of multiplexers from each one, so our customers can call a single system with a local telephone number from every major metropolitan area."

"You get it?", he said. As a matter of fact we didn't.

So he drew this diagram.



George's drawing



Then he said, "Do it. And use a satellite to get to Europe. It'll be the Time-sharing system that only EDP people can love."

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In fact, he just called and said he wanted to talk about a new idea for hooking two systems together for super reliability.

Here we go again. . . .



291-69

GENERAL  ELECTRIC

DATA MATI⁷⁰ON[®]

DECEMBER 1, 1970

volume 16 number 16

MANAGEMENT

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A survey of the electromechanical and electronic peripherals which are, at long last, changing the conservative ways of the Gutenberg heirs.

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28 Computer Printing Forecast for '70s

Speed isn't the only benefit of computer controlled typography—greater service, better control, and lower cost are also in the offing.

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Not all printing jobs are candidates for computer assistance, but the number is growing. And it might grow even faster if the computer experts better understood the problems of this tradition-bound industry.

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Insufficient space and file overflow are common problems of mass random access storage. Text compaction could be the unique solution.

COMMENTARY

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Users of Digitronics Corp. terminals gathered in Chicago to talk about applications and focused inevitably on the hot line subject of the day, data transmission... Alex d'Agapeyeff, new president of the British Computer Society, talks on the need for growth, standards, and help in solving the mounting problems in business edp.

About the Cover

Virginia Carabillo's design catches the symbols of man's most useful means of communication, the printed word, in the vortex of a new and revolutionizing technology.

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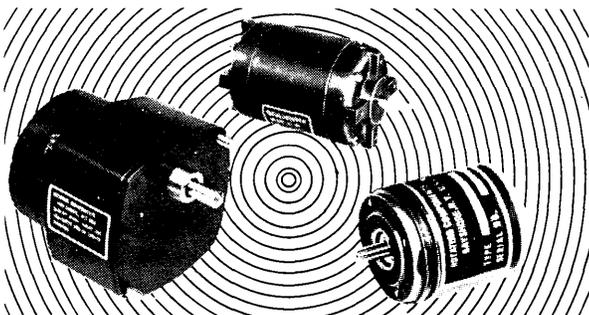
It is of special interest to those who are hamstrung by lack of opportunity. If you'd like to be the "boss" as an independent associate and have a modest amount to invest, there may be a great opportunity for you with this organization should you qualify. It deals with a service that commands the field. Its dominance is unquestioned, undisputed, absolute. A free copy of the booklet will be rushed to you on request.

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CIRCLE 42 ON READER CARD

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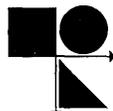
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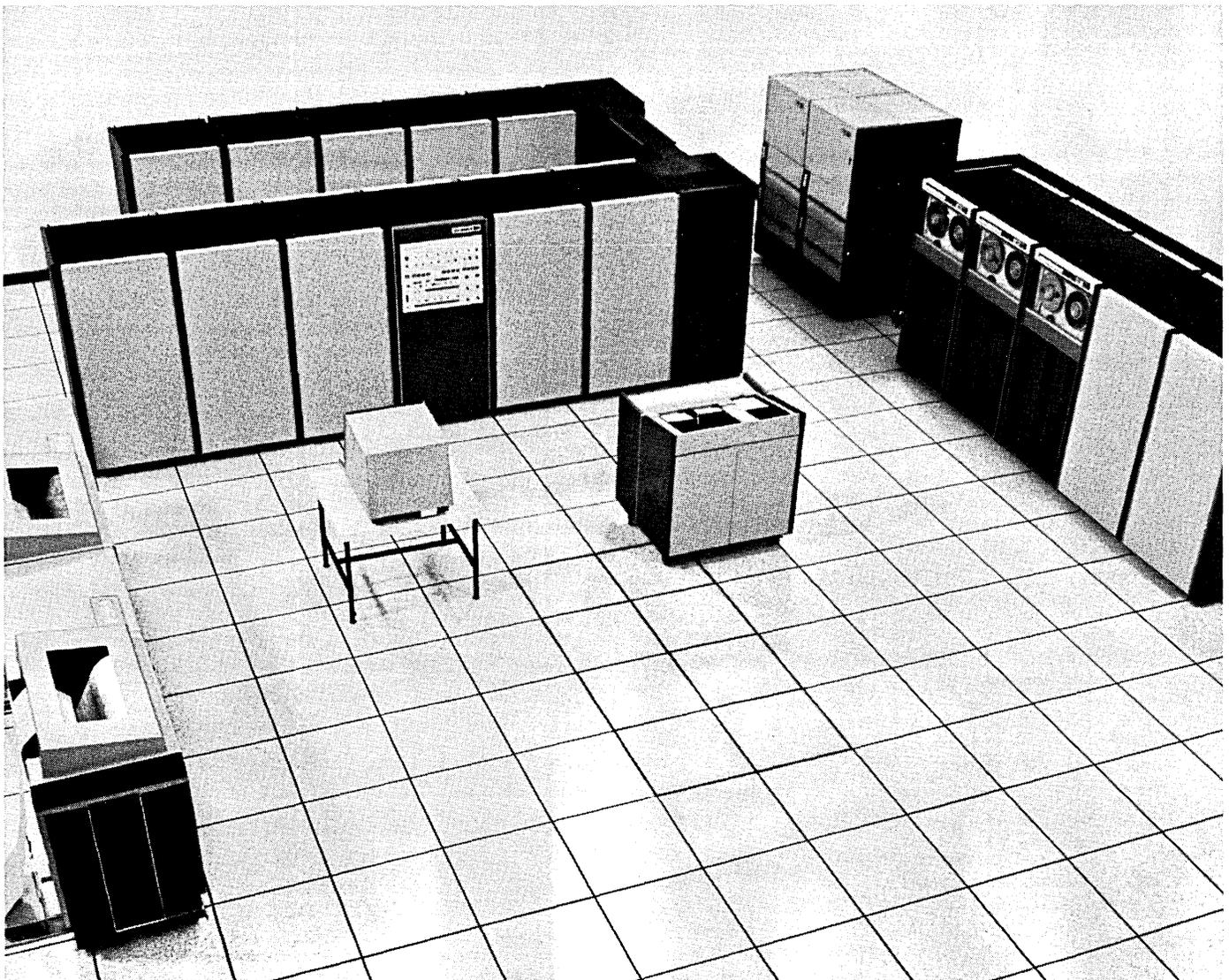
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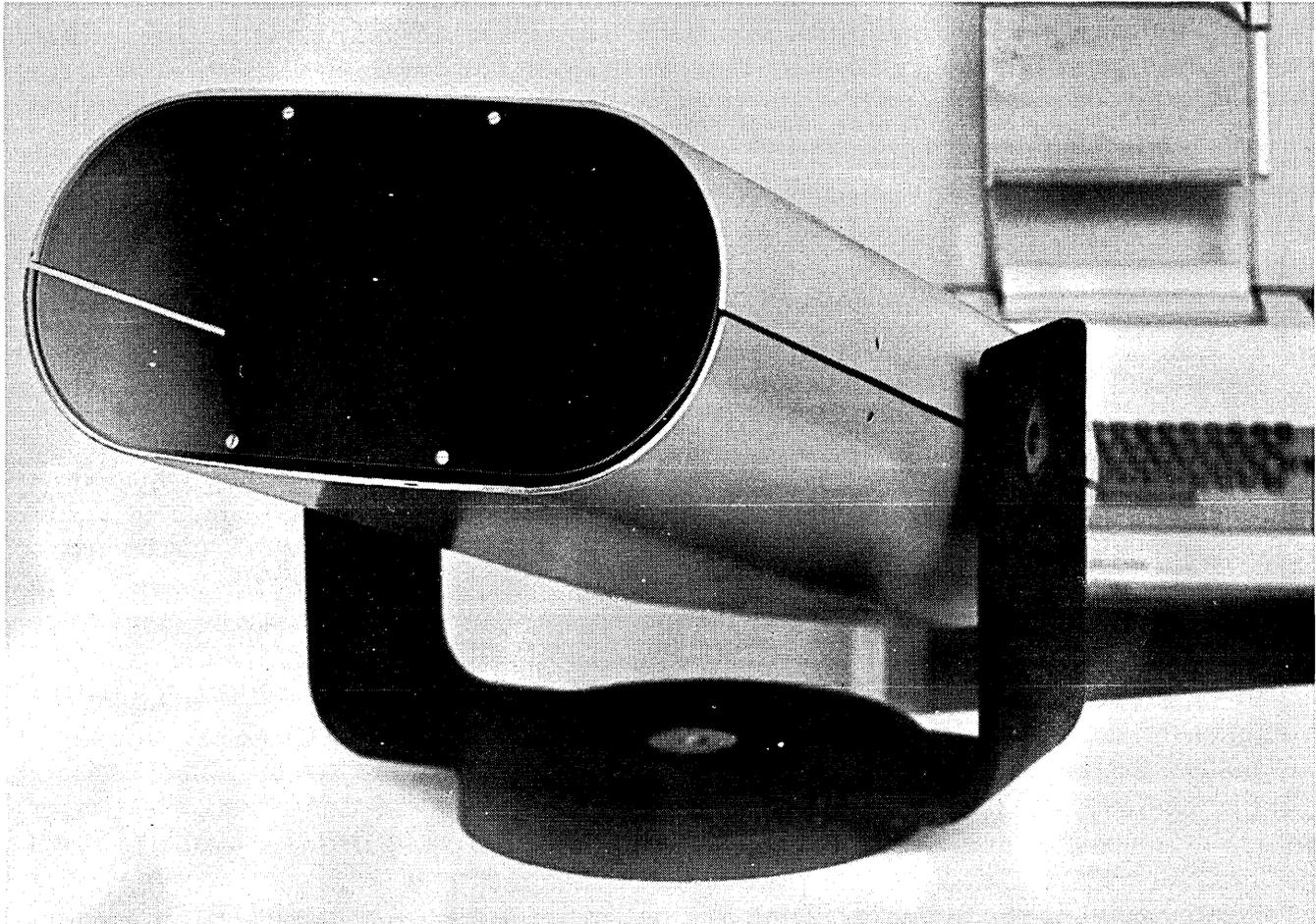
Compatibility and growth. Sigma 9 is upward-compatible with Sigmas 5, 6 and 7. All user software for the smaller Sigmas runs unmodified on Sigma 9, and the peripherals are also compatible. Thus Sigma 5, 6 or 7 users can move up to Sigma 9 without growth pains, and Sigma 9 users can grow too—adding memory, peripherals—and eventually even CPU's, for Sigma 9 is designed for multi-processing.

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LETTERS

Certified mail

Sir:

I'm referring to your News Scene story entitled "Certify Professionals: Who and How" on p. 74 of the Oct. 1 issue.

AFIPS should be commended for its attempt, albeit of limited scope, to certify professionals. But why stop at the categories mentioned in the story?

We also need certified tape handlers, certified tape librarians, certified janitors (to pick up and dispose of the trash we create), certified assistant managers of computer operations, certified manufacturers of computer and peripheral equipment, certified software (hardware) salesmen, etc.

Come to think of it, why don't we broaden the scope of the "undertaking" and consider such categories as certified politicians, certified judges, certified students, certified businessmen, certified mailgirls, certified gas station attendants, certified accounting clerks, etc.

Just let the imagination work; the potential appears to be unlimited.

HENRI DE WILLIGEN
Los Angeles, California

P.S. Please accept my apologies for the sloppy typing. It was performed by an uncertified typist (me).

Libel to get mad

Sir:

Confusion compounded upon confusion! First you print Casper DeFiore's stupid article (Aug. 1, p. 47) and then you print his even stupider reply to my letter and Peter Deutsch's letter (Oct. 1, p. 9).

To say that I "do not understand associative memories" is pretty close to libel, especially since I am coming up for tenure at my university this next year. He illustrates my supposed lack of understanding by saying that the time taken to sort a table of size n is not $n \cdot f(n)$, as I said it was, but $n \cdot f(m)$, where m is the number of bits. If you want to use this notation, then m is itself a function of n , and, therefore, so is $f(m)$. In fact, m is always greater than $\log_2 n$; this follows directly from the obvious fact that n is always smaller than 2^m . Actually, all DeFiore has done is to

change the notation from that which I used in my letter, and which I shall repeat: "there are . . . others which take nk steps, where k is the length of the key." Change k to m and "the length of the key" to "the number of bits," which is the same thing, and you have DeFiore's statement.

I don't need M. H. Lewin's paper to tell me that in an associative memory of size n you can sort in $2n-1$ steps. That seems relatively obvious. DeFiore doesn't say this in his article, though, and it is not at all clear from the article whether his methods are that fast. Most real sorting problems involve gigantic files, much larger than the available core memory—much less the available associative memory—or else they involve files which are small enough that $n \log_2 n$ is reasonably close to $2n$;—that is, reasonably close unless your associative memory becomes competitive in cost with your ordinary main memory.

It is perfectly true, of course, that work on associative memories is exceedingly important as basic research. We cannot assume that the magnetic core will be with us for all time, any more than we can assume this of the internal combustion engine. At the moment, associative software seems to be running ahead of associative hardware; but this must not stop us from steadily increasing our knowledge in both areas. We must never forget that the transistor, which replaced the vacuum tube, grew out of investigations into areas of technology which were themselves supposed to have been made obsolete by the vacuum tube. To be more specific, if LSI prices continue to drop, it is extremely likely that a knowledgeable producer of associative memories will finally be able to compete successfully.

W. D. MAURER
Berkeley, California

True gritty

Sir:

I recently had the privilege and pleasure of reading the article in the Sept. 15 issue on "Project Management Games," by Werner W. Leutert. It is unquestionably one of the finest articles on project/contract management that I have read in my

10-plus years in the purchasing/materials profession. It is quite rare for someone to put in writing a discussion of the real "nitty gritty" things that can happen in contracts management and administration.

J. L. LUSE
EMR Computer
Minneapolis, Minnesota

Stuff shot

Sir:

I would like to bring to your attention an inaccuracy which appeared in the September issue (p. 38), under the byline of your British correspondent Pearce Wright.

The article concerns the IBM System/370 in Europe and states in part that reason for the time lapse between IBM's new business practice announcement in the U.S. and its separate announcements in Europe was to give IBM's European customers "a chance to stuff their lockers with software intended for separate pricing on 370 and System/3."

This is inaccurate. All program products offered by IBM in Europe carry charges similar to those for program products in the U.S. No program products offered in the United States for a charge have been given without charge to European customers. This includes the PL/I compiler, developed by IBM U.K.'s Hursley laboratory.

D. M. BURNHAM
IBM World Trade Corporation
New York, New York

European editor Wright replies: I hadn't realized that there was some sort of formal recognition to the technology gap between the States and Europe that could be measured in terms of the year or so delay between IBM unbundling on the domestic market and later overseas. I had been under the impression from talking to some international users that there would be no difficulty in customers' obtaining some of the products for the interim period in countries where unbundling had not taken place. Hence the statement "it appears as if European users were being given the chance . . ." There was some confusion at this time, to put it mildly.

There is no alternative but to plead guilty, graciously, of having suspected IBM of letting such an advantage be taken by some over others.

(Continued on page 11)

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Where the auction is

Sir:

DATAMATION must be commended for F. Barry Nelson's article, "Used But Useful" (Oct. 1, p. 26), and George Heilborn's article on "Used Computers" (p. 22). These articles show that the used computer business has an economic reason for existence. Mr. Nelson, however, seems unable to reconcile my critique of the recent used computer auction with American Used Computer's sandwich board activity at the SJCC.

With the principal exception of leasing companies, few "middleman" businesses have developed within the computer industry. Trading in "used computers" is a new middle business which like all such that have developed in history . . . whether they be trading in machine tools, money or motor cars . . . face the same obstacles at inception; namely, acquiring stability and attaining the reputation for providing a satisfactory service.

This is an industry-wide problem best faced by engaging only in activities that are likely to produce only positive results. The auction for capital goods has never been a real mechanism for bringing together seller and buyer.

An analysis of the buying (or selling) habits of capital equipment purchasers makes this understandable.

For such equipment, auctions occur principally as a last resort in liquidation. My 14 years' experience taught me that a good liquidation auctioneer makes sure he has enough dealers present to carry the day. Unlike other consumer-based markets, the end-user of capital equipment cannot rapidly bridge the gap between bargain availability and actual need.

In the absence of the requisite characteristics determined from the above, the computer auction at Parke-Bernet Galleries not only failed, but was *doomed to failure* at its inception. And, this is why I objected to it. The computer is not a curio. It is a viable, useful piece of capital goods.

Now, if there were a computer leasing company's portfolio of computers up for liquidation auction, I would say it would be successful! An auction of this type would attract used computer dealers, ready to buy, and stronger leasing companies who can and will buy. No objections

would be raised to "real" auctions of this type.

Sandwich boards, like auctions, create an awareness of business activity. As a successful action, with no portents of failure, such an appearance probably helped the entire used computer industry.

ADOLF F. MONOSSON
American Used Computer Corporation
Boston, Massachusetts

Amortified

Sir:

Regarding the letter from Mr. Anthony Amort in the Oct. 15 issue.

Mr. Amort states, "Ever since the hexadecimal system first appeared (IBM 360) . . ." I hate to tell him, but the IBM 360 was not the first machine using hex notation. The LGP-30 used hex representation of binary, and it came out in 1954. It used alpha representation of 10-15 (F,G,J,F,Q and v).

J. N. LAMBRECHT
Antioch, Tennessee

Shalom

Sir:

The immensely amusing article showing poetry using the hexadecimal core dump (Sept. 15, p. 57) is not quite the first example of its kind. Until the last century, the Hebrew language made use of alphabetic letters both for spelling and for numerical notation. The first letter of the Hebrew alphabet "alef," also served as the numeral 1. The second letter, "bet," served also as 2, and so on. The use of positional notation (i.e., decimal places) was used in Hebrew texts going back a thousand or more years, although the Arabic-speaking algebraists of the late Middle Ages in North Africa deserve the credit for clarifying the use of the symbol for zero and introducing distinctive written symbols for the numerals so that we commonly speak of Arabic numerals today.

Modern Hebrew printing uses precisely the same printed numerals as does English to avoid confusion, since many Hebrew numbers coincidentally form valid words of the language. A widely known example is the number 18, which is written with the letters "chet" and 'yod' (the 8th and 10th letters of the Hebrew alphabet). As it happens, the He-

brew word for "life" is also the same two letters, pronounced "chai" to rhyme with the English word "try."

This coincidental equivalence of certain numbers with natural words was the mainstay of the philosophy of a mystically oriented Jewish sect called the Kaballists, which flourished in the European Middle Ages. They greatly expanded on the numerology of the Hellenic philosophers and claimed to find all manner of mystic relationships between the names of various persons, places, and things in scriptures. A good example of their reasoning can be found in a scene in the recent popular novel *The Chosen* by Potok, in which the numeric equivalents of two names are added together and the numerals (letters) of their sum are rearranged to form another name. In addition to interpreting ancient scriptures, the Kaballists also composed poems and prayers which purposely contained numerological relationships, such as having the first letter (number) of each line appear in alphabetical (numerical) order, or so arranged that they summed to a constant having mystic significance, and so on. Many of these poems are quite similar in intent and form to the clever examples given in the DATAMATION article.

RICHARD C. LEVINE
Plainfield, New Jersey

On his rebuttal

Sir:

Mr. J. A. Hill's remarks (Nov. 15, p. 203) are, in the main, true, though I do not confuse modularity with language dependence, as he suggests. His statements do not, however, form any sort of rebuttal for the indictment of COBOL, which was supported on two counts: 1) poor interroutine linkage, and 2) lack of a common storage facility. Mr. Hill accedes to the first point and ignores the second, which makes coherent reply difficult.

Finally, his notion that imagination and ingenuity can bridge the gap for us is entirely true in a strictly technical sense, but experience has shown repeatedly that the price tag on that ingenuity becomes astronomical when conversion to a new hardware configuration becomes necessary.

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While your computer is remembering Louie's name, our 410 is placing his face.



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While your computer is coming up with a suspect's name, our 410 is coming up with a face, fingerprints and history of arrests and convictions.

A computer can tell you a lot but it can't show you anything graphic quickly or economically. Our 410 can show you anything in its files in a matter of seconds. And

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Best of all, Quantor 1-2-3 is priced far below what you would expect to pay for a microfilm information system.

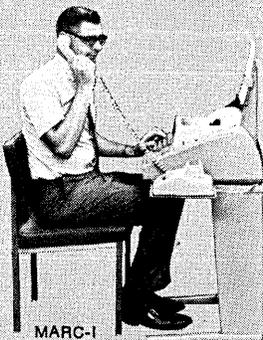
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CIRCLE 29 ON READER CARD

CYBER

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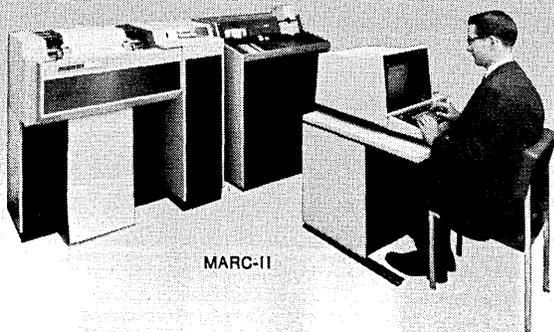
Until now you've had a choice.

Either you got a computer large enough to handle your peak loads (and absorbed the costs for idle time), or you got one for average through-put (and sweated out the peak periods).

Some choice. It gave you the option of upsetting your financial manager or the people with the hot data processing problems.

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Control Data's CYBERNET System is a network of computer centers located in 33 cities across the United States and worldwide. With CDC 6600 and 3300 computer systems, these centers provide a perfect combination of computing power and high capacity data



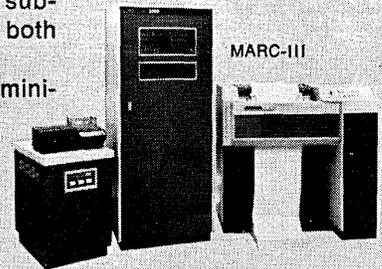
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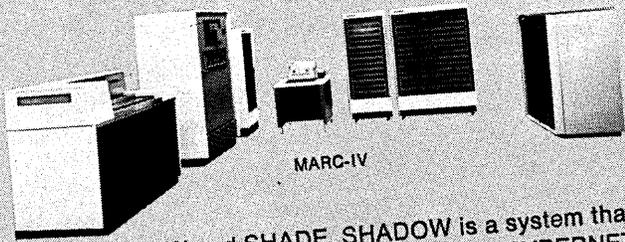
NETTM system

compromise.

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And now we have two new software systems that help you use the full potential of the CYBERNET Sys-

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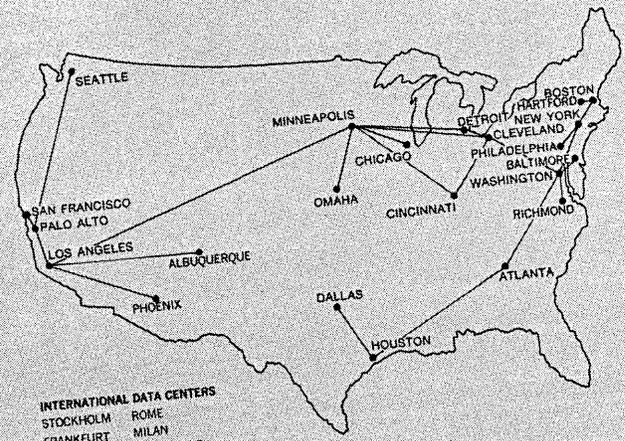


MARC-IV

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MARC-V



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Burroughs announces the 700 SYSTEMS

NEW...for today and through the 1970's!

It's a whole new family of advanced computers starting with systems of intermediate, large and very large scale, each designed to do today's job and grow to handle a heavier, more complex work load in the years ahead.

The first three 700 Systems. The B 7700 (3 models): A very large scale system with up to eight processors. 16-mHz central processors. I/O data rates up to 30 million bytes/second. 6-million-byte main memory, phased and interleaved four ways for 60-nanosecond accessing. Up to 112 billion bytes of high speed disk memory. Over 4,000 data communications lines. "Fail-soft" design for continuous processing reliability. Exceptional power and versatility for heavy data base and data communications applications. Deliveries begin in early 1972.

The B 6700 (5 models): Expandable from a one 5-mHz processor intermediate size system to a three-processor large scale system without reprogramming. Up to 3 input/output processors. Up to 12 data communications processors that can service a 3,000-line network with no central system "overhead." 6-million-byte main memory. Over 80 billion bytes of on-line random storage. "Fail-soft" design. Deliveries start in February, 1971. So, the B 6700's easily the most advanced business data processing system now available for service.

The B 5700 (2 models): A one- or two-processor system for productive, economical time sharing, data communications and batch processing. With many capabilities of larger 700 Systems. Deliveries begin this year.

Burroughs-proved advanced features. The B 6700 and B 7700 and the new facilities incorporated in the B 5700 use the latest version of monolithic integrated circuits.

All three systems come with programmer-independent virtual memory, reentrant code, compiler-language programming, system expansion without reprogramming, plus automatic multiprogramming or multiprocessing, dynamic resource allocation and self-regulation under Master Control Program supervision.

New disk storage. B 6700 and B 7700 systems are offered with Burroughs new disk-pack storage which provides average access times of 30 ms, and a new "Optimized Access Memory Bank" featuring multibillion-byte capacity with effective access times of 2 ms to 6 ms.

The B 5700 offers a unique disk storage system that four separate systems can share.

Ease of systems management and ease of programing, built on powerful systems performance, are the foundation of Burroughs systems design leadership.

The new Burroughs 700 Systems extend that leadership.

Burroughs 

LOOK AHEAD

MORE REACTIONS TO IBM'S SYSTEMS 7 & 3

One source projects that the System/7 will be IBM's communications processor. "Varian's 620/i started out as a process control machine too."

Another claims the 7, with more software, can replace the 1800. Jan. 1, IBM is expected to axe the Digital Acquisition Control Systems organization, which handles the 1800. Its members will be absorbed by the DP Group; some have gone into S/7 marketing.

Some are worried that the volatile semiconductor memory won't be good for real-time applications. But IBM and others say it's no problem since the 7 is designed to run indefinitely on 60% of nominal voltage and has traits like a fail-soft interrupt that permits switching to manual control, motor generator ride-through restart procedures, etc. The System/3, especially with the new BASIC, may give some competition to small-business oriented time-sharing companies like Keydata, XCS, and Digitek. Keydata's John Gilmore says his salesmen have had to compete with the Model 10 and probably will with the 6.

A JOB IS WORSE THAN NO JOB AT ALL

The City of New York ought to look up the laws agin indentured servitude. Some of its computer pros were forced to use up their savings and do without because Fun City didn't pay them for their first several months on the job. They couldn't quit because they weren't on the payroll and could only collect back pay by suing. They couldn't collect unemployment because the state said they were employed, yet couldn't borrow cuz banks said they weren't. The mess, due to political and administrative disagreements, is being straightened out. But this kind of situation and horror stories circulating about how some firms have handled layoffs in this economy could force the computer pro down the unwanted path of unionization.

IBM AND OTHERS REPLACE IBM T-S HARDWARE

A benchmark study by Allen-Babcock Computing on a 370/155 has demonstrated an improvement in throughput over the 360/50 of better than 2:1, chairman Jim Babcock reports. One of the few time-sharing firms said to be operating in the black, the Century City-based firm will take delivery on a 155 in April. It will be installed at its Palo Alto center where A-B has increased the 50's throughput 50% by replacing two IBM 2361 large core storage systems with Ampex ECM units. That's enough, the firm says, to allow it to turn off its Mod 50 in Century City and direct all business to Palo Alto, with Century City becoming a remote data center. The 50 may go back to IBM or to A-B's New Jersey center. Also going back to IBM is a 2703 communications processor (replaced by a Memorex 660) and perhaps some 2314s, also to be replaced by Memorex drives.

RENDER UNTO CAESAR

IBM is discouraging users from diddling with 370 microcode, but they'd still love to know how to get at the 370/145's writeable control store. One source says there is no data path to that control store from anywhere but the "floppy disc" on the control console. And that disc is generated at IBM, so the user would

FOURTH GENERATION SEEN IN '77, '78

RUMORS AND RAW RANDOM DATA

have to make a special request to the firm to get his own microcode on a disc. (Unless, of course, someone comes up with a compatible floppy disc-writing drive.) And no matter what, user diddling isn't supported anymore than non-IBM hardware is.

The 2319 Integrated File Adapter, by the way, is a microprogram in the control store (amended by the hardware control in the 2319 itself); so it shouldn't be hard to imagine IBM using an IFA for future peripherals. But will IBM provide the IFA microcode to interface with someone else's carbon copy of IBM peripherals?

Industry soothsayers who expected word on IBM's fourth generation in 1975 have now set a later date: 1977 or '78. Till then, they say, IBM should be able to hold its own in the market place with enhancements to the 360 line, like the 370s.

Contributing to this delay is the cop out by GE, whose fourth generation was due in the early '70s, forcing IBM into an early announcement and delivery. With GE out, no one else with the resources for a fourth generation is seen. Ironically, then, rather than stiffening competition against IBM by helping create a stronger Honeywell, GE's drop out makes life easier for IBM.

GE was convinced that IBM was coming out with a non-360-compatible ASCII fourth generation system, and that still seems to be a good bet, but it could also be compatible with the 370s. Moreover, IBM could scrap the traditional stored-program approach for a totally new technology in its fourth generation, as B.O. Evans at IBM has hinted.

Mini-mighty DEC will do its thing with mini peripherals. Over the next two months it will announce a line printer, display terminal, IBM-compatible tape drives, and moving-head discs...Burroughs users, according to reports from their recent meeting, are full of optimism since the 28 B6500s shipped are beginning to run with the elegance expected. Users are also impressed by the 6700 and the fact it will cost only a few days to swap the 6500 for it. The data management system due out in the spring is a "well-designed product," says a user...We hear there's a 60% chance that Toshiba will go it alone and develop the Pi computer, a project that started jointly with GE. Management approval to go ahead is being awaited at the Japanese firm...Revised figures on domestic computer shipments for 1970 now show \$4.5-5 billion vs. 1969's \$5.6 billion—down 20%. The six dwarfs are reporting shipments equal to 1969, we're told, but that would mean about all the decline was IBM's. If true, much of it would be attributable to anticipation of the 370. The question is how much of a role unbundling played...IBM announced it will support PARS on the 360/195. That means TWA and United will ultimately move to the biggie from 65s or 75s...Users of a small and unprofitable on-line service in New York were jolted by a message on their crt's: "This will be our last communication. We are going out of business effective immediately."

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Ultronic has over 12,000 on-line terminals in operation throughout the world. And we have the service facilities to back them up. Our trained technical force, based in major cities is available for installation, service, and maintenance.

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**This pen
doesn't write,
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NCR has made it a reality.

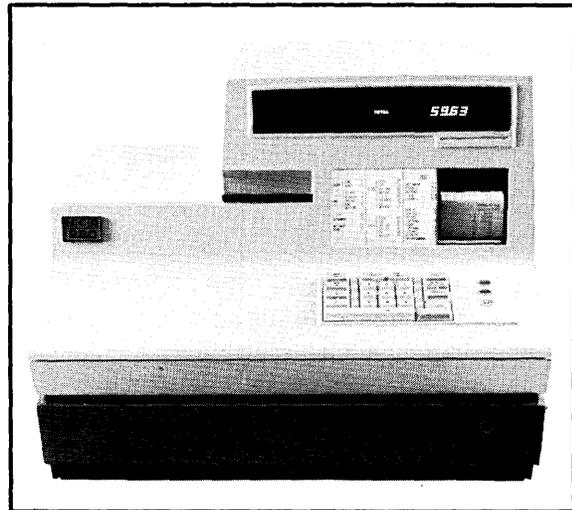
The pen-like wand you see here is actually an optical scanner. Instead of writing, it reads data from binary-coded media, reads it instantly, reads it right with one simple pass. A pen-like wand containing light-sensitive glass fibers makes the instant, accurate capture of data even simpler than writing your own name.

And it's far more than an experiment. NCR coupled the pen that reads instead of writes to a revolutionary new computer terminal that actually teaches as it works. The result? Even untrained operators can capture data for computer processing with a simple wave of the scanner, then follow a series of mandatory, easy-to-follow, programmed steps to complete any transaction.

These two innovations in electronic data processing comprise the heart of the NCR 280 system for mass merchandise retailers. It's a system that will enable mass retailers to process sales faster and capture data for their computers faster and more accurately than ever before. Yet it's so incredibly simple that even inexperienced sales people can turn out error-free input data with less than a few hours of training time.

The pen that reads instead of writes. It's the eye of a revolutionary new NCR computer terminal that actually teaches as it works.

The NCR 280 retail terminal. It's just the first of a whole new generation of terminals from NCR. And you know what that means. Now, more than ever, NCR means computers.



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**Computers
& Terminals**

The staid old printing industry will never be the same again

Phototypesetting -

M During the last six years, a new computer peripheral has evolved which, strangely, is almost unknown in the computer industry. This is true despite the fact that more dollars have been spent by users in this area than would probably be required to buy each and every terminal now on the market. This new peripheral is the phototypesetter, a machine capable of composing typographic images directly on photographic paper or film, as the initial step in the overall printing process.

The reasons for the popularity of phototypesetters are simple and direct. First, much more printing is being done today than ever before, and the higher speeds possible with electronically driven phototypesetters are needed to keep up with the market. Second, more and more printers are converting to offset lithographic printing, rather than letterpress. The lithographic process uses a photographically prepared plate, and thus is more compatible with photographic typesetting than the letterpress process which utilizes the output of type and line casting machines directly. Third, and more to the point, computers have gained a wide acceptance in the printing industry as machines which will hyphenate, justify, format, edit, and merge corrections and alterations.

With letterpress, where each letter or each line is cast on its own block of metal, it is easy to correct, update, or alter typeset material by simply removing letters or lines which are in error and replacing them with corrected letters or lines. This can hardly be done when all characters are on a single sheet of photographic paper. Instead, a computer pass is used to merge corrections into the copy before typesetting.

The fact that error rates of machines which set metal type (called "hot metal" and named for the companies which developed or produced them—Monotype for single letters and Linotype for lines) are on the order of 2-5% and speeds are on the

order of three to five characters per second, did little or nothing to encourage their connection to modern high speed computers. The use of computers in the graphic arts was, therefore, considerably enhanced by the availability of rapid and reliable phototypesetters, and the growing use of phototypesetters was, in turn, abetted by the availability of computers which could perform formatting calculations and merge corrections into copy before type was set—all coupled with the impetus gained by the swing to offset printing.

Why set type?

But why set type at all? The primary reason is that it is easier to read than high speed printer output. The secondary reason is that it saves paper, often as much as 40% over monospace typewriters or high speed printers. The space is saved because the width assigned to each letter is only as much as is required and not the full amount provided, as must be used when only one width is available.

Most phototypesetters today use a letter width system based on one-eighteenths of an "EM" (pronounced "M," and named for the space usually taken by the widest letter, the capital "M"). Each of these eighteenths is called a "unit," so an "i," for example, usually becomes a six unit letter and so on. Table I gives the most common unit width assignments for letters.

These width assignments were originally developed for the Teletypesetter, the first device designed to send coded typeset copy directly by wire, but whose width assignments are now used in many small typesetters. The Teletypesetter, unfortunately, also gave rise to a special six-bit code (called, imaginatively, the Teletypesetter code and now a de facto standard in the printing industry), along with its advanced sprocket $\frac{3}{8}$ " paper tape (called Teletypesetter tape) —a format completely incompatible with any rea-

a Quiet Revolution

by P. L. Andersson

sonable data processing standard.

Nevertheless, more six-level advanced sprocket Teletypesetter tape is probably punched in a single week in the United States than anything which might be considered in second place is punched over the period of a year. For this reason, Teletypesetter tape is the prime input to most phototypesetters. Some forward strides are beginning to be made, with several machines which are programmable to accept any reasonable code and several high speed machines which will accept magnetic tape. For the most part, advances in these areas are slow because printers have been slow to realize that they are really part of the data processing industry and therefore do not see the need for a compatible standard. Today, however, there are over 1,100 computers in use in the graphic arts industry, and even though many of these are special purpose hard-wired machines which cannot really be called computers except by courtesy, there are more than enough 1130s, PDP-8s, 360/40s and 1108s to make a convincing argument for the continuing use of computers in the graphic arts.

Good justification

The initial use of computers in the graphic arts was simply to justify and hyphenate lines, in other words, to make the proportionally spaced letters completely fill a line by calculating and adding word widths, then adjusting the widths of the interword spaces, including if necessary, the breaking of words at their proper syllables to put part of an over-long word on the next line. Computer hyphenation, incidentally, has overcome its initial poor reputation and now appears to be as good as, if not better than, most manual operator hyphenation. There is one disadvantage: an incorrect computer word break may not always have the advantages of "seeming correct" as operators' errors frequently do.

It is now recognized that hyphenation and justification are only a small part of the advantages possible from the use of a typesetting computer. Early phototypesetters were highly dependent upon the use of extremely complex keyboards to generate the commands for the multiplicity of type styles and sizes which could be obtained. Today, almost any keyboard can be utilized because multiple code strings with appropriate delimiting characters can be used to instruct the computer to generate the command structure of the typesetting machine.

Many graphic arts users have finally discovered that a computer is an ideal sorting device, much

<u>Unit</u>	<u>Characters</u>
6	il.,'-
7	jft
8	l
9	rsz()1234567890\$;!*
10	ceo
11	abdg hnpquvxykJS
12	Z
13	CTL
14	ABFOP&QV
15	wDEGRUXYHK N
18	mMW %

Each unit is exactly 1/18th of the width of the capital letter "M"

Table 1. Eighteen unit proportional letter spacing system.

faster than the manual methods used previously; thus, many computers are used to set directories, parts lists, and other items of this nature. Also, when the information to be typeset is already in machine readable language, it has taken no more than five or six years to

or sixths of an inch, that the machine can set.

The comparison chart of phototypesetters is divided into two sections, one labeled "Electromechanical Machines," the other "Electronic Machines."

Electromechanical

Electromechanical machines are usually constructed around a flash or discharge device of some type which can produce a relatively bright flash of

light for a short period of time. The matrices of the type face to be set are then placed on a disc or drum and rotated rapidly between the flash tube and the imaging lens. When the proper character is in front of the flash tube, the tube is triggered and the character is exposed on the photosensitive material, usually silver-type photo material on a paper base. The proper character width is generated by moving either the lens or a prism, depending on the optical path used, the correct amount to correspond to the character set. Stepping motors are frequently utilized for the width and line feeds, and the internal control is almost wholly by solid state devices. It is interesting to note that manufacturers are just now beginning to convert to integrated circuits, perhaps because they were late in using transistors. (The phototypesetters of only five years ago were relay machines.)

The size variations in most electromechanical machines are controlled by the lens used, and a turret is

provided to swing the proper lens into position by tape control. If only one lens is used, then the matrix must be changed for each different type size desired, and the machine is usually limited to setting one size of type at a time. The elimination of multiple lenses does, however, reduce the cost of the machine drastically.

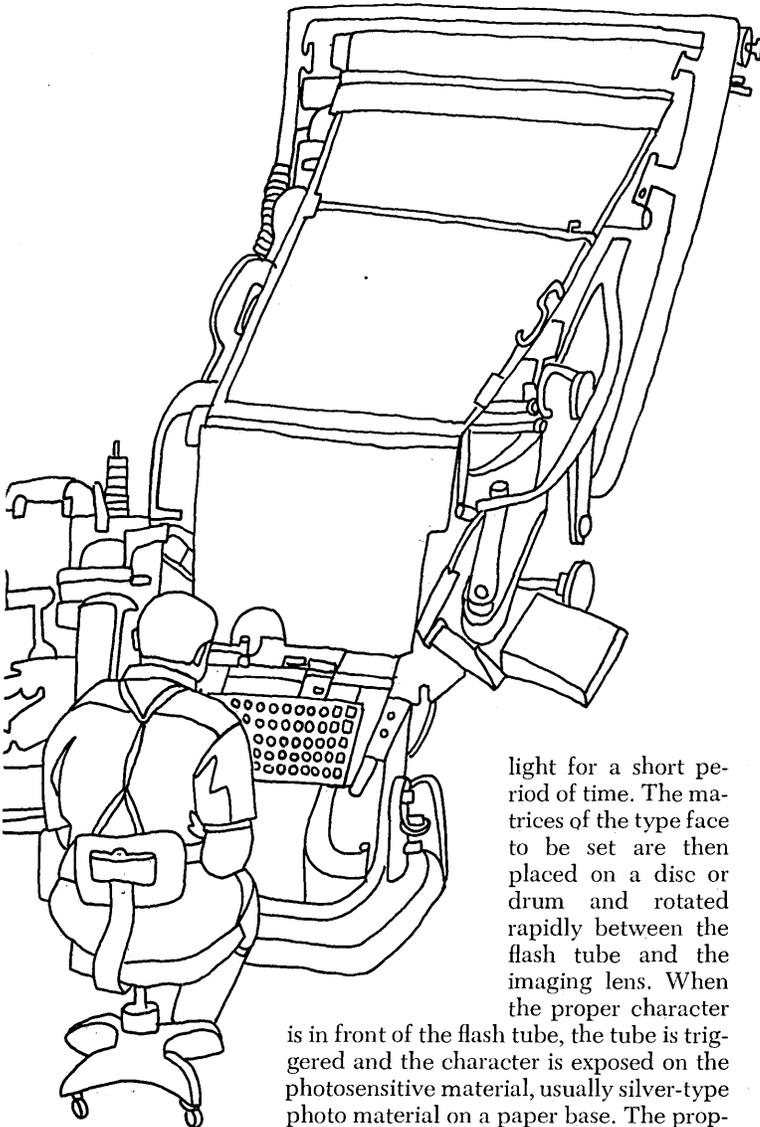
Basic control techniques within the machines vary, ranging from a "computer slave" with almost no internal logic to many new machines which are equipped to accept unjustified tape directly and perform the necessary calculations to justify and sometimes to hyphenate with limited accuracy. As mentioned earlier, a few new machines use an internally programmed controller which permits the code format, control functions, etc., to be changed at will. Some of the controllers are minicomputers in their own right, with 2 to 4K memories and a respectable instruction list.

Electronic

A cathode ray tube font generating scheme characterizes the electronic machines and all of these include a considerable degree of computer logic, frequently being little more than on-line peripherals. The crt machines generate characters from an image of some type which is usually stored in memory, and thus may require incredible memory complements for rather simple functions. Most of these machines are at least an order of magnitude faster than the electromechanical units, largely because there are no large mechanical masses to be moved. Quality of the crt device output is excellent, all things considered, but has not yet quite matched the quality attainable with the better electromechanical units. (Printers worry about quality considerations which the average reader would never notice.) So far, the crt machines have been used largely for setting copy which is already in machine readable form, such as directories, library catalogs, price lists, parts lists, etc. They are only now beginning to be used for higher quality typesetting, such as books.

Although crt machines are fascinating because of their speed, it develops that few of the installations approach anything near 100% utilization. It has been easy for printers to become dazzled by the speed and versatility of these machines without reflecting that a very slow machine might serve their basic typesetting needs. If the entire plant output can be set by one \$5,000 machine which grinds away for three shifts, and even if two are bought so that one will be available for backup, the \$10,000 purchase price is a far cry from the \$300,000 or so for a crt machine, and the quality may even be higher. Many printers, vying to be first on their block with a Videocomp, have forgotten this principle.

Finally, one more item has contributed immensely to the use of the phototypesetters: a darkroom is not needed to use one. Most of the larger machines can be purchased with a built-in optional film processor which will deliver nearly dry, fully developed film or paper several seconds after exposure. For the smaller machines, many stabilization processors are available in the \$500 price range and are operable in full daylight. With this development, phototypesetting has become a normal office procedure, no longer



Electromechanical Typesetters

Manufacturer & Model (Notes 1 & 2)	Remarks	Matrix Construction	Speed ch./sec.	Type Size Range (Pts.) (Note 3)	No. of Sizes (Lenses)	Size Control (Note 5)	Type Style Capacity (Fonts)	Characters Per Font	Line Length in Picas (Note 3)	Input						Cost To Set Up Mach. With Matrices etc.	Base Price (Note 6)	
										Paper		Un- justi- fied	Spe- cial (Note 4)	Mag. Tape	Program- mable			
										TTS	Std.							
Addressograph-Multigraph-AM725 AM707		Disc Disc	10	6-18	9	M	3	112	45	X	X	X	X		X	\$325	\$20,500	
			20	5-18	2	T	2	100	36	X	X	X	X		X	200	11,950	
Alphatype-Standard Mixer	Uses 1/4" Mag. Tape Uses 1/4" Mag. Tape	Matrix Matrix	10	4-18	1	M	2	84	66	X	X					\$65-75	\$ 9,900	
			10	4-18	1	T	10	84	66	X	X					65-75	12,500	
American Type Founders-PC20		Disc	10	5-18	1	M	4	124	33	X	X	X				\$190	\$16,500	
Compugraphic-2961TL 2961HS 2970 2971TL 4961TL 4962 ACM 9000	5 Unit Basis. Justewriter Code Input Justewriter Code Input Computer Slave New Series of Machines	Film Strip/Drum Film Strip/Drum Film Strip/Drum Film Strip/Drum Film Strip/Drum Film Strip/Drum	30	5-24	2	M	2	90	45	X		X					\$ 7,950	
			35	5-12	1	M	2	90	33	X		X					7,950	
			35	5-12	1	M	2	90	33			X					\$ 90	4,500
			25	5-24	2	M	2	90	45			X	X				90	7,500
			25	5-24	2	M	4	90	45	X			X				175	9,950
			25	5-12	1	M	4	90	33	X				2 x 6			110	4,950 Under 20,000
Fairchild		Turret Turret Film Strip	11	5-18	11	M	2	108	30	X	X	X			X	\$219	\$17,950	
			25	5-18	11	M	2	108	30	X	X	X			X	219	22,500	
			60	5-18	12	T	36	96	30	X	X	X			X	595	42,440	
Graphic Systems-C.A.T.	Computer Slave	Segmented Drum	30	5-18	9	T	4	102	47				4 x 6 or 2 x 8			\$16,900		
Intertype-Fototronic TxT Fototronic 1200		2-Disc 5-Disc	80	5-36	12	T	4	120	42	X	X	X		X	X	\$875	\$49,750	
			17	5-72	19	T	10	120	51		X					775	65,000	
Monotype-Monophoto 600	Now Sold by ATF-Lanston	Disc & Slides	35	6-28	16	T	4	100	50	X	X			X		\$350	\$75,000	
Mergenthaler Linotype-Linofilm DCI Quick Super Quick Wide Range Super Quick VIP		Matrix Grid Matrix Grid Matrix Grid Matrix Grid Film Strip	18	6-60	6	T	28	88	42				3 x 6	X		\$350	\$39,500	
			14	6-18	1	M	4	92	45	X	X					200	23,250	
			25	6-18	1	M	8	92	45	X	X					200	33,250	
			25	6-72	1x, 2x, 4x	T	8	92	45	X	X					200	38,250	
			20	6-48 96 on Strip	16	T	3 or 6	96	36	X	X	X				X	120-180	19,500
Photon-532 561 713-5 Taskmaster 713-10 713-100 713-200 7700 7445	Computer Slave	Disc	13	5-72	22	T	32	90	54				3 x 6 2 x 8 2 x 8			\$1,025	\$52,000	
			13	5-72	12	T	16	90	54							1,025	NA	
	Computer Slave	Drum	20	5-18	2	T	4	96	45	X	X	X		X	X	290	22,000	
			20	5-72	8	T	4	96	45	X	X	X		X	X	290	26,250	
			20	5-36	8	T	8	96	45	X	X	X		X	X	525	39,500	
			50	5-36	8	T	4-8	96	45	X	X	X		X	X	525	54,500	
			100	5-36	8	T	4	96	45	X	X	X		X	X	525	62,500	
			300 lpm	NA	2	T	2	90	45					X		NA	NA	
			30	5-18	8	T	2	100	36							NA	NA	
			Singer/Friden-Justotext 70 Photomix 70	6 Unit Basis. Justewriter Code	Drum Drum	20 20	5-12 5-18	1 9	M T	2 4	90 102	33 47		X				\$140 NA
Star Parts-Compstar		Drum	100	5-18	1	M	2	90	30	X		X			\$60	\$11,990		

NOTES:

- Some Older Models of Some Mfr's Have Been Omitted - Write to Author for Information if Needed.
- Specifications Change - Check With Mfr. Before Ordering.
- 12 points - 1 Pica. 6 Picas - 1 Inch.
- 2 x 6 & 3 x 8, etc. Refer to Two Frames of 6 bits each, 3 of eight, etc.
- T = Tape Actuated. M = Manual.
- Frequently Includes Initial Set-Up of Type Faces, etc.

Electronic Typesetters

Manufacturer and Model	How Matrix is Stored	Speed cps	Type Size Range	No. of Sizes From Matrix	Font Capacity	Ch/Font	Line Length (Picas)	Input	Remarks	Base Price
Intertype—Fototron CRT	Mag. Drum or Disc Memory	2,000	4-144	Range	80	100+	100	Mag. Tape	Includes Darkroom	*\$322,500
Mergenthaler—Linotron 505 1010	Photographic Matrix Photographic Matrix	85 1,500	4-96 5-18	18 10	12 12	82 85	64 66	Paper or Mag. Mag. Tape		\$119,000 400,000
RCA—Videocomp 70/820 70/800	Core Memory Core/Disc	600 { 6,000 Proof Mode 1,000	4-24 4-96	Range Range	Virtually Unlimited Font Capacity Through Memory Overlay	80+ 80+	32.5 70	Mag. Tape Mag. Tape	Includes Stabilization Paper Processor	\$236,000 352,000

* Plus \$12.00 for each type character ordered.

requiring the industrial or machine-tool operations traditional to the graphic arts. Apparently, it will take many printers much longer to accept this fact than it has taken to implement the changes.

Phototypesetter Manufacturers

Alphatype Corporation
7500 McCormick Boulevard
Skokie, Ill. 60076

American Type Founders, Inc.
P.O. Box 48
Nashville, Tenn. 37202

Compugraphic Corporation
66 Concord Street
Wilmington, Mass. 01887

Fairchild Graphic Equipment Div.
Fairchild Camera and Instrument Corp.
221 Fairchild Drive
Plainview, L.I., N.Y. 11803

Friden Div., Singer Co.
97 Humboldt Street
Rochester, N.Y. 14602

Graphic Systems, Inc.
217 Jackson Street
Lowell, Mass. 01852

Intertype Company
Div. Harris-Intertype Corp.
360 Furman Street
Brooklyn, N.Y. 11201

Mergenthaler Linotype Co.
Division of Eltra Corp.
One Mergenthaler Drive
Plainview, L.I., N.Y. 11803

Photon, Inc.
355 Middlesex Avenue
Wilmington, Mass. 01887

RCA Graphic Systems Div.
U.S. Highway No. 130
Dayton, N.J. 08810

Star Parts Company
Division of Powers & Eaton
South Hackensack, N.J. 07601

Variety Div.
Addressograph-Multigraph Corp.
11 Mt. Pleasant Road
Hanover, N.J. 07936



Mr. Andersson heads the consulting firm of Andersson Associates, which he founded in 1964 to specialize in advanced computer technology. He was with Univac for seven years, and prior to that with RCA and GE. His BS in mechanical engineering is from the Univ. of Pennsylvania, where he pursued graduate study in electrical engineering, marketing, and business administration.

**Speed, service, control,
and economy
equal a rosy future**

Computer Printing

G Conservatively estimated, there are more than 1,500 computer-driven photocomposition machines operating in the United States today representing approximately 40 different makes and models. They fall into two general categories: line composition devices capable of setting type at speeds ranging from 10 to approximately 150 lines per minute and crt area composition devices which generate thousands of characters per second. The former are generally limited to the production of galleys which require hand makeup to produce formatted pages. The latter can produce galleys but are also capable of outputting fully formatted pages automatically with graphics in place. These machines are driven by some 900 computers ranging from special-purpose hyphenation/justification computers to small and high-powered general-purpose systems.

In terms of total output, the majority of typesetting is still produced by hot metal machines turning out lead slugs which are used to make up galleys and locked into position for page makeup. Some are manually operated. Many are tape-driven either for direct typesetting input or computer processed input. Primary hot metal users are the publishing industries—particularly newspapers.

However, the major trend in printing for the past 20 years has been a conversion from letterpress to offset. With the advent of offset, photocomposition became the most viable typesetting process. Changes in newspaper composition, for example, came about because of the time-consuming process of fitting together pieces of metal type to make up the complex advertisements we see daily. It is much easier to set parts of these advertisements via photocomposition, paste up the complete advertisement, photograph it, and etch a plate.

At the current time, a typical computerized newspaper composition configuration will include one or more photocomposition machines for advertising output and tape-driven hot metal machines for text. As more line photocomposition machines are dedicated to high-speed, quality text setting rather than the flexibility required by advertising copy, photocomposition will replace hot metal.

With photocomposition has come the real marriage of computer and typesetting technologies. Initially,

computers were employed, to calculate the justification of individual lines. Justification requires the adding up of the width of all characters in a line, determining just where the line break will occur by calculating the number of characters which will print on the line, and then distributing the space left over between words (or letters). Distribution must be held within very narrow limits to get acceptable typographic appearance.

The justification process may require hyphenation to eliminate abnormal amounts of white space between words. It was found, in the early 1960s, that computers could perform these calculations and, as well, logically break words at their hyphenable points. A number of special-purpose computers were designed for hyphenation and justification and to prepare paper tape to run hot metal or photocomposition machines. As the performance/cost ratio of new model computers became more favorable, it was decided that this work could be handled by general-purpose computers. These now comprise the bulk of industry installations. Hyphenation and justification programs have been written for a number of systems including Honeywell, IBM, RCA, Univac, General Electric, and DEC.

Performance up, cost down

A number of factors have contributed to the growing number of general-purpose computer installations. First, the cost of computers has been reduced or remained stable while performance has increased. The net effect has been a sharp rise in performance per dollar. Larger core storage devices have been developed which greatly reduce the cost of storing information. Moreover, recent announcements such as the introduction of the IBM 370 series computers—stated to run between two to five times as fast as current machines at about the same cost level—indicate that performance per dollar is again increasing.

We expect this trend to continue for the next 10 years. It is extremely important to the typesetting industry because of the increasingly vast amounts of information which must be processed and stored.

Composition software developments have progressed beyond hyphenation and justification. In the past decade we have seen computer programs de-

veloped for a wide range of typesetting functions including storage and retrieval of classified advertising and wire service copy, text editing, intermixing of type fonts, full-page formatting and now full-page formatting with graphics. Concomitantly, the typographer has either upgraded his original system or replaced it with a more powerful one.

As infant technologies such as interactive display terminals and graphics scanners mature during the 1970s, additional demands will be placed on hardware and software. What will be added is the ability to (1) better specify the area in which you want the composition to occur, (2) be directly interactive with

Harris-Intertype (and the Digiset in Europe). Depending upon how completely the installation is committed to a service bureau philosophy, the total systems configuration will include a crt, computer, and keyboards; crt, computer, but no keyboards; or the crt alone.

Most computer processing in the typesetting industry today is in batch mode, i.e., an entire book may be keyboarded and page formats written. The computer processes the input as a single batch, generates output tapes which are fed into a photocomposing machine to produce the typeset product.

The 1970s will see interactive systems development

Forecast for '70s

by Edwin R. Kolb

files of information to speed the ability to alter and correct text and page formats, and (3) process line drawings and halftones.

Software assistance has, thus far, come from the computer manufacturer, the typesetting hardware manufacturer who wants to most efficiently exploit unique capabilities of his machine, from independent software houses, and staff programmers who develop and/or maintain the typographer's own software. As the 1970s progress this same pattern will continue, but with an increase in assistance from the computer manufacturer who has already begun to realize the size of the typesetting market.

Interestingly, while it was desirable for the typographer to increase his production capabilities, no typesetting machine required computer drive until the 1960s with the introduction of the Photon 901 ZIP. A non-crt, high-speed device, it was built by Photon, Inc., for the MEDLARS program started in Washington at the turn of the decade. MEDLARS is a series of abstracts of all published medical information literature. The project managers determined that the only way to maintain the abstracts was in a computer environment. They built files of abstracts, outputting them on magnetic tape for publication. They needed a composing device to produce the abstracts quickly in page form for printing.

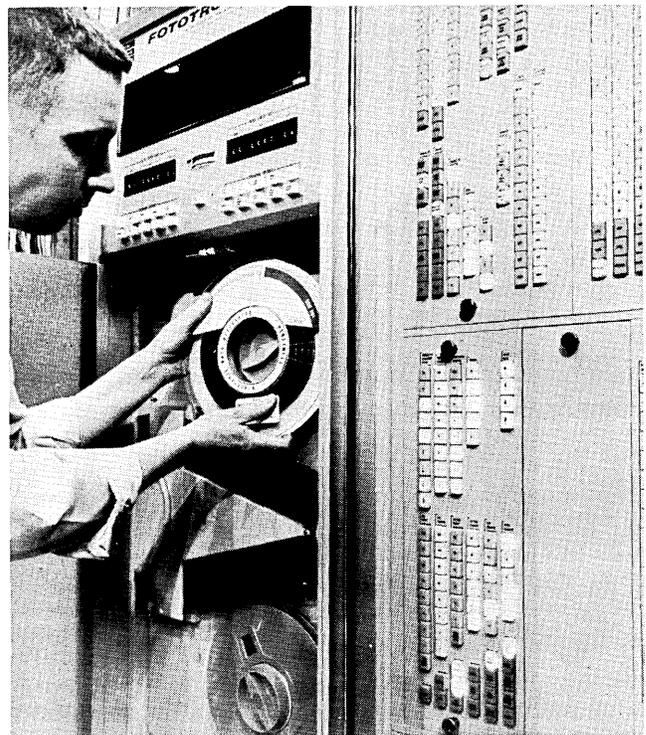
In 1962, the Government Printing Office, with a considerable volume of information to be computer processed and printed, determined that if information output on a line printer could be typeset, space and the attendant printing, binding, and distribution costs could be reduced by 40%. The result was a successful bid, in 1963, by Mergenthaler Linotype Co. in collaboration with CBS Laboratories, which resulted in the development of the Linotron 1010. Concomitant with the development of the 1010, Dr. Hell, in Germany, was developing his Digiset (marketed in this country by RCA as their 800 series crt machines). Also during this period, Harris-Intertype Corporation began development of its Fototronic-CRT.

A whole new generation of typesetting equipment, which generates characters at very high speeds in virtually any type of page format and requires computer processed input, is on the market today.

Currently, commercial installations of the crt area composition machine are dominated by RCA and

which returns all decision-making power to the editor who specifies the original layout. At the current time, the author writes a manuscript, the editor reviews it, returns it to the author with suggestions, decides how the book is to be made up, and then gives the manuscript to a markup man for encoding. The manuscript goes to the typographer as hard copy; the typographer keyboards the job for computer processing and typesetting. The job is then returned to the editor for proofreading and final corrections and sent back to the typographer who produces and processes the final tape.

In the 1970s, the editor will enter the format



One of the new breed of area composition devices, the Intertype Fototronic-CRT is capable of outputting at thousands of characters a second fully formatted pages automatically with graphics in place.

decisions himself. He'll have at least one interactive terminal which will permit him to retrieve and inspect the material on a non-batch basis, see the actual appearance of the page, make whatever text and/or formatting changes are required and control in-house all production and processing functions except typesetting. To accomplish this, the editor will have an editorial satellite system which may include four blind keyboards, two editing terminals, a paper tape reader, line printer, and memory file connected to a small computer. The blind keyboards will be used to input information, the line printer to output hard copy for proofreading. The terminals will be used to call up, correct, and place stories back in memory. These stories would be stored in memory until complete and then released to a larger computer system which would be involved with page makeup and output to a typesetting machine. There is currently a philosophical dispute as to whether proofreading will

be best accomplished via hard copy or an interactive terminal. It can be done effectively both ways.

Prior to batch processing, book production time varied from approximately four months to more than a year. Some feel that today's batch system can reduce the time cycle to three or four weeks. The new system should reduce it further because the interaction will be primarily between publisher and author—and even that greatly reduced. The publisher will ask the author for a correct copy and give him far fewer chances to make corrections because of the shorter time cycle. This should cut down overall costs. The fewer the alterations, the less expensive the process. The publisher will be able to show the author the manuscript in page rather than galley form. This should eliminate another round of correction steps.

The author, himself, may eventually compose his manuscript on an interactive display terminal, eliminating his present "cut and paste" typewriter methods. But other considerations aside, the costs of such a system may be prohibitive for quite some time.

Interactive systems will figure importantly in the magazine and newspaper industries where time is a greater factor than in book publishing. But the problems will be greater. Books typically have a fixed format so that once you program the format, the entire book can be processed. Even complex technical books permit formatting on at least a chapter basis.

Less and less rigid

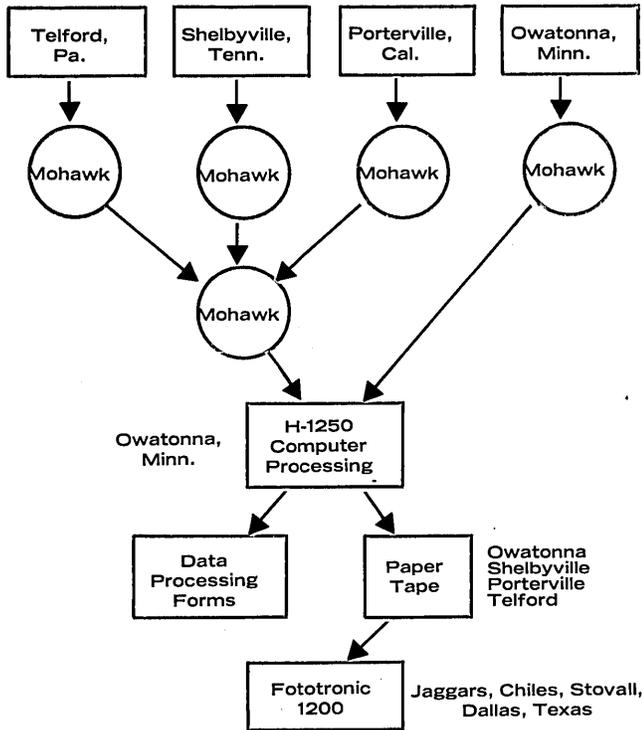
Magazine formats are less rigid than books and newspaper formats less rigid than magazines. Each newspaper page stands on its own because the paper attempts, not always successfully, to reduce runovers by completing stories on the pages on which they start. Almost every page is composed as a free standing entity by first allocating space for advertising and then filling available white space with editorial matter. Magazine formats fall somewhere between books and newspapers in that a number of pages may be sequential as in a book and a number independent as in a newspaper. Magazines also have a fair percentage of advertising to accommodate.

Newspapers are unique in their procedures. The publisher generates most copy in-house and is usually his own typographer and printer. Virtually the entire creative/production cycle is accomplished under one roof. Interactive systems will not, therefore, greatly enhance the publisher's ultimate control of his material. But time and simplification benefits will be there to lower overall costs.

A prominent newspaper group has already taken significant steps toward such a system. One of its papers has installed a general-purpose computer with composition software to handle a number of functions including storing, sorting, and retrieving classified advertisement and wire service copy. The computer also serves a sister paper via Data-Phone link. Each has a similar typesetting production configuration. At present, the editors call up the needed copy and specify typesetting instructions on hard copy for key-boarding. This is a natural environment for an interactive terminal which would permit creating, editing, and formatting copy to produce a fully-encoded tape.

We can expect this same type of interactive systems development throughout the various typesetting

JOSTEN'S / J-C-S WORK FLOW



FILM OUTPUT

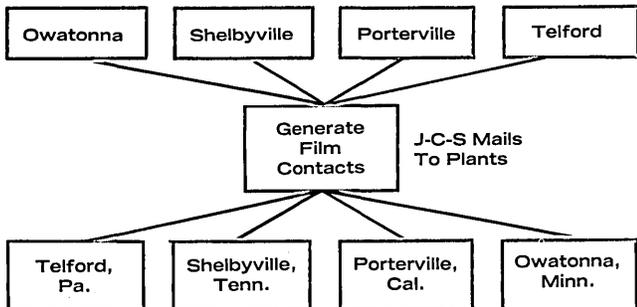


Fig. 1.

industry markets—including commercial advertising. Corporate or advertising agency personnel would visualize the material on an interactive terminal, experimenting with various formats and type styles and sizes until the desired effect is achieved.

There are many implications here. There will be a new breed of customer who can work in this type of environment, using the system as a tool to simplify and speed his work.

Interactive terminals

Interactive terminals will proliferate. There is already wide use of crt display terminals for data processing. Harris-Intertype has just introduced a new terminal, the Harris 1100, which enables an editor to display, edit, and encode data with typesetting instructions. It can function as either a stand-alone unit via paper tape entry or be connected to a computer. During the 1970s, other manufacturers will either modify existing terminals or develop new ones dedicated specifically to this function.

There will be much greater use of computers with vast processing and high storage capabilities. At present, some companies are solving the relatively high cpu costs by transmitting data from remote stations to a central computer. For example, the nation's largest manufacturers of scholastic products, Josten's, has a central computer center in Owatonna, Minn. (Fig. 1). Each division has a Mohawk 1103 data transmission and receiver unit and a battery of Mohawk 1101 automatic data recorders for tape perforating. The tapes are transmitted to Owatonna for both management information and composition processing. The completed tapes, with typesetting instructions encoded, are then mailed to a typographer, Jaggars-Chiles-Stovall, Inc., in Dallas, Tex., for input directly into a Fototronic 1200 line photo-composition machine. J-C-S returns the completed jobs to the divisions as either film positives or negatives. As computer operating costs come down, however, it may become more economical to have decentralized computers rather than transmit data in this fashion.

At present, computer to typesetting time will vary from a 1:2 to a 10:1 ratio, depending upon the speed of the computer system. An average page of straight matter takes 15 minutes to keyboard, two to three seconds of computer time to process and five seconds to compose on an area composition device. As copy and formats become more complex, computer time increases in greater proportion to typesetting time because the computer is doing more work than the typesetter.

Keyboarding time should be speeded up during the next few years via ocr input and on-line keyboards which will bypass the need for hard copy at the input end. Off-line blind keyboards used today continue to convince many that it is not necessary to see hard copy at the entry level.

The greatest problem to be solved is the ability to go in and make corrections far more efficiently than we can today. The next decade will see the speeding up of the I/O workflow and computer output which can match the speeds of the area composition devices. This is a systems and software problem. A considerable amount of effort will be required in these areas to

realize the potential envisioned.

There will be further refinements in the area composition devices themselves. RCA has already announced a machine which can output either full size or microfilm or microform pages. Harris-Intertype is developing similar capabilities. As data dissemination increases, so does the need for data storage. There is some confusion, though, in microfilm technology as to the requirements of a variety of microforms. In addition to microfilm and microfiche, there is a current development called ultrafiche—a reduction in the 150 to 300 range. It is possible to store 2,400 pages on ultrafiche in the same space taken up by 60 pages of microfiche. Area composition devices of the 1970s will output either full size or microfilm and be universal enough to produce a number of microforms.

Harris-Intertype and RCA have developed computer-activated graphics capabilities in their area composition devices which are thus far limited to producing line drawings. Graphics are scanned and stored in digital format. RCA's system uses a microfilm of the graphic and scans it in the area composition device itself. The Harris system uses full-size reflection copy scanned by an off-line laser scanner. The digitized information is stored and processed in a computer for output on an area composition machine. Technological developments in the 1970s will include the ability to scan halftones, both black-and-white and color, and will lean toward those methods which avoid intermediate steps and the interruption of the typesetting production cycle.

The role of the typographer will change. Some will increase their customer services by offering data processing capability in addition to producing typographic output. In other cases, the customer will bring in-house the use of interactive systems and the typographer's role will be limited to output only. His hardware will include a typesetting machine and a paper and/or film processor. The typesetting machine will simply be an output device for a computer which will do all file manipulation and typographic processing at the customer's site.

These two roles are in addition to the traditional role of the typographer. Examples of each can be found in the industry today and they both point to the future—greater service, better control and finally lower cost. ■



Dr. Kolb is presently general manager, Fototronic-CRT Operations, Harris-Intertype Corp., where for the last 15 years he has been involved in r&d of all aspects of computer-assisted printing: electrophotography, optics, printing press dynamics, ultra-high-speed typesetting, computerized photocomposition, etc. He has 11 issued patents in this field. His BS in physics is from Canisus College; his MS and PhD are from Case Institute of Technology.

A major selling job is required to cast the printer in the role of innovator

Goodbye Hot Metal,

G The graphic arts industry, specifically typesetting, has at last caught on to the computer. Computers and data processing techniques are being utilized for justification and hyphenation, pagination or page make-up, not to mention storage, retrieval, and updating of information contained in the final pages. These techniques of data processing along with appropriate hardware can now be found in hundreds of typesetting shops, printers, and publishers across the country.

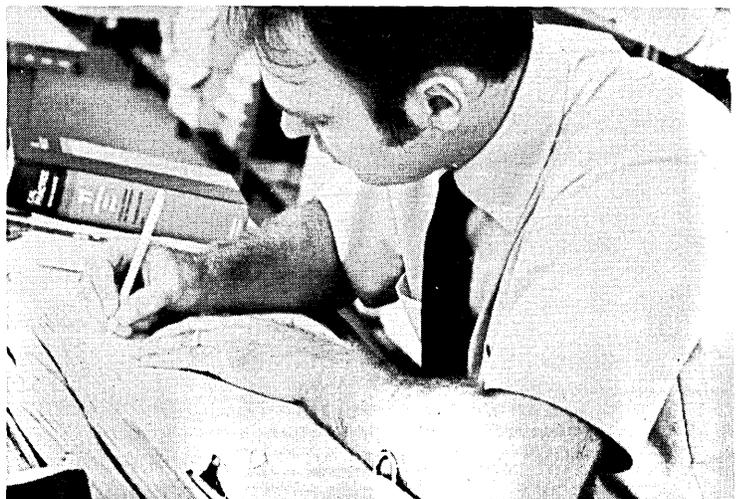
Unfortunately, the data processing industry at large has extremely limited knowledge and experience concerning the applications of computers in typesetting. So for perhaps the first time in data processing history, the application is seeking out the software and hardware, rather than the other way around.

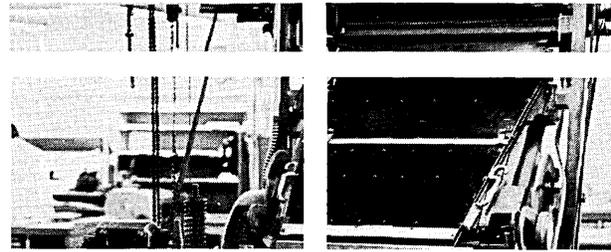
Some time ago a tariff manager in one of the major air freight forwarding companies asked his data processing manager if it was possible to produce graphic arts quality type from the computer. "No," replied the data processing man, "it would have to be typeset at a cost of \$30 a page." Those same tariff pages are currently being photo-typeset on our computer-controlled RCA Videocomp crt typesetter at a cost of \$4 a page. These pages are complete in every respect with all the data in position including rules, column heads, column page heads and page numbers, ready for plate-making and printing.

Limited awareness

Though the technology to accomplish this task has been with us for at least six years, there is a limited awareness on the part of the computer community about the process, its costs, and its advantages. Probably the main reason is that computer people

involved in publishing are not usually closely related to the final product, i.e., the printed page. I am speaking, now, of those published documents which, because of the amount of data involved and its dynamic nature, are appropriate to be produced by computer. In most cases, these products—price and parts lists, abstracts, indexes, bibliographies, library book catalogs, etc.—are printed from the computer line-printer output, all in upper case, photo-reduced prior to printing. The data processing man could care less how the product appears or the cost of printing the publication. He knows the program has worked to create, update, sort, and print the file—after that his responsibility ends. The production controller in the publishing firm who buys printing and binding services has only a remote notion of what the computer did or what it is capable of doing in terms of setting





Hello Cool Tape

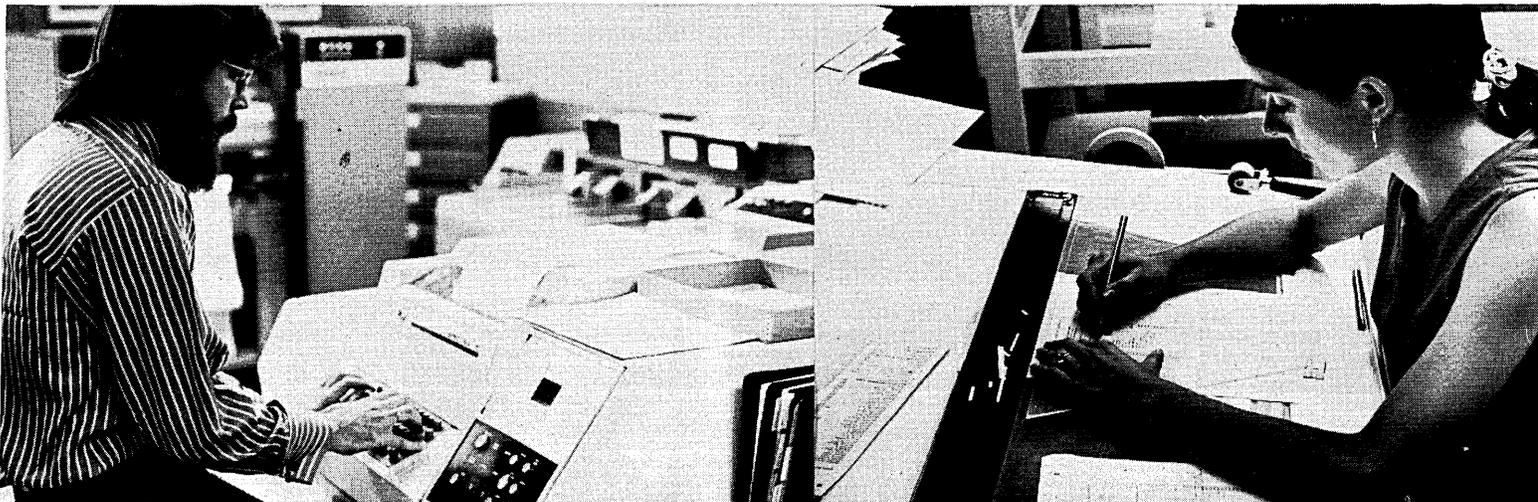
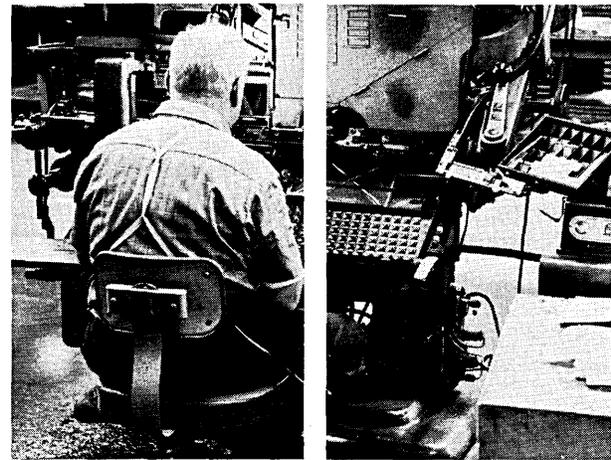
by Henry D. Sedgwick

type, so he is in no position to make any contribution to the graphic quality or legibility of the product.

Enter Videographics, International Computaprint, American Computer Graphics, Publicate, Autocomp, Auto-Graphics, or our own company, Sedgwick Print-out Systems—all service companies specializing in the field of computer-controlled typesetting.

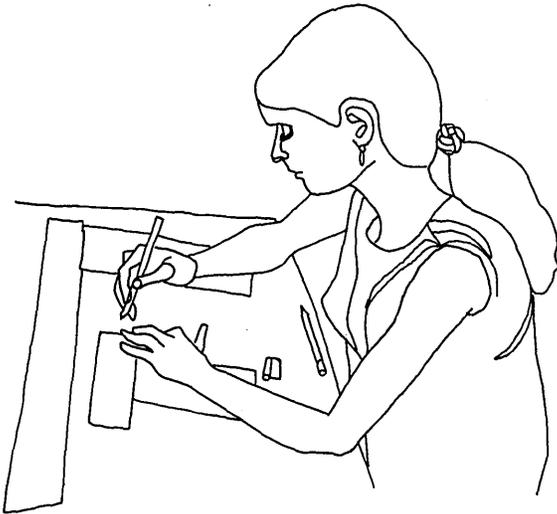
The concepts of the process are relatively simple. Generalized or specific computer programs can be

The mechanical marvel of yesteryear—the clacking Linotype monster with its pot of hot metal—is slowly giving way to the buzz, whir, and cool tape of computer typesetting; sweaty printer's devils to white-collar coders, bearded programmers, and pretty girls stripping and pasting the customer's copy.



everyone do it? (Of the type set in the United States in 1969, only about 3% was produced on the magnetic tape driven high-speed typesetting devices.) How can the old linotype and equivalent traditional operations still survive in competition with the whiz kids of magnetic tape and cathode ray tube? The reasons are essentially two.

First, the printing and publishing industries have never been known as the most progressive technological innovators in the world. Nothing of any great significance has happened in the printing world in



the last hundred years, so the arrival of the computer in the typesetting operation was not greeted with unleavened glee by either printer or publisher. Skepticism and suspicion would most politely describe the reception of the new technology, and for some pretty sound reasons. The computer specialists knew little of the requirements of the application and tended to oversimplify some of the very real problems. One case in point will never leave my memory. The president of a leading publishing firm was discussing the problem of justifying and hyphenating lines of type with a data processing man. This practice of justifying lines of type, so that they all come out to the same length, with the concomitant problem of breaking words at certain recognized and accepted hyphenation points, has long plagued the computer programmer. The solution offered by this particular computer expert was to eliminate the spaces between words. This type of naiveté tended to blunt the enthusiasm of many publishers and printers. In short, the computer people initially failed to understand the application, and that failure hurt the cause of computer typesetting.

The second and, perhaps, main reason for limited use of computer-controlled typesetting is that it just doesn't make economic sense in many areas yet. The computer's ability to create a file, update it, perform whatever sorts are needed, and then finally paginating and composing the information on the Videocomp or equivalent is its most important contribution. In fact, for such publications as price and parts lists, bibliographies, indexes, library book catalogues, telephone books, and membership lists the computer has become a near economic necessity as the central production tool. Publications that do not require this capability—newspapers, magazines, novels, bro-

chures, etc.—are currently marginal candidates for the new technology.

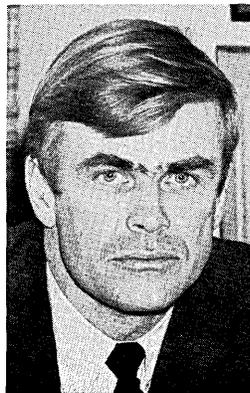
Considering the size of the market for computer services to publishers and printers, there are relatively few suppliers. Three major printers have entered this field and offer an integrated service from source data to the printed and bound finished product. There are ten other companies who offer both computer and typesetting services.

Thorns on the roses

All is not a bed of roses, however, either for those already in the field or those about to enter. There are major problems to overcome. Since the publishers have been traditionally supplied by craft-oriented vendors—typographers and printers—many are not aware of what the computer can do. Data processing groups who want to enter this market are going to have to first learn the application, and then spend some time and money in selling. Learning new applications on their own—as opposed to learning them on the customer's time and money—and selling have never been the strongest suits of the data processing service groups.

The problem of marketing a computer service of this nature is not to be underestimated. This is not just a question of selling computer time, or providing software for an industry familiar with computer usage. To the publisher, the concept of using a computer to manipulate and typeset information is something very new. The marketing effort, then, is one of education and requires patience and perseverance. A sale is never made in a day. Also, it is important for the computer group that aspires to enter this field to learn the nature of the publisher's production process and something about typography. One way to accomplish this might be to link up with a printer who understands the way of this world and sell the service to the publisher through him.

An educated guess of the current market for data processing and computer typesetting services is in the area of from \$50 to \$75 million annually. That market should double for at least the next two or three years. The potential, then, is substantial for progressive data processing service groups willing to learn new applications. ■



Mr. Sedgwick is president of Sedgwick Printout Systems, New York City specialists in information processing and computer-controlled typesetting. His background includes publishing, data processing, and graphic arts. He has been associated with a number of Wall Street firms, including H. N. Whitney Goadby and Abraham & Co., and is currently a member of the board of directors of Equity Research Associates.

A unique way to caulk the seams of your random access file and prevent overflow

The Myriad Virtues

TNo matter how “mass” it is, two common attributes of random access storage seem to be that there is never enough of it and that some files stored in it are forever overflowing. One somewhat unique solution—text compaction—appears applicable for any user having large quantities of fairly homogeneous data. Using the technique described in this article, the Science Information Exchange, Smithsonian Institution, recently compacted the text portion of a 200,000 record on-line file from an average of 851 to 553 characters per record, a significant decrease of 35%.

The Exchange registers summaries of scientific research planned or in progress which embrace all basic and applied fields of the life, social, physical and engineering sciences. It responds to thousands of questions annually, ranging from specific queries of bench-level scientists to broad survey reports for research administrators. The text in its data file, while clearly oriented to science, represents a fairly broad vocabulary spectrum.

As text is added to the master file record via on-line video display terminals (crt's), it is compacted by a simple three-step operation. First, each text character is translated to an alternate hexadecimal code; second, certain pairs of letters are combined so that one hex value represents both; and third, the resulting single character representation replaces the original in the text stream being stored. On extraction from the file the process is reversed.

The concept takes advantage of the fact that most data uses only 88 of 256 possible IBM EBCDIC 8-bit code representations. These include 52 upper and lower case alphabets, 10 numerics and 26 special

symbols such as comma, dollar sign, period, and so forth. (Greek letters, mathematical and chemical formulas, etc., none of which appear frequently in the text, are spelled out in English.) Thus 168 hexadecimal codes (256 minus 88), normally unused, are available for the alternate use of representing pairs of characters.

The compaction process

The first step of the compacting process involves translating each EBCDIC character in the text stream to its equivalent compacted code for single symbols. As illustrated by the second column in Fig. 1, IBM's EBCDIC scatters the alphabets, numerics and frequently used punctuation characters throughout the hexadecimal series. The Exchange's “Compacted Code” groups these all from hex 00 to 57 (column 3) leaving 168 contiguous representations at the end of the scale, 58 through FF (column 4).

The actual compression is then accomplished by testing each translated character in turn to determine if it is one of the “master characters” designated in the left-most column of Fig. 2, Compacted Code (p. 38). The master characters are used as the first of the combined letter-pairs, while those from the second column of Fig. 2, the combining characters, make up the second character of the pair. The remaining two sections of Fig. 2 list the noncombining characters which, as their name implies, are always stored in their single symbol hexadecimal representation, and the “combined pair” codes showing sets of combining characters paired to each of the master characters. Note that the first column master characters are also included

of Text Compaction

by Martin Snyderman and Bernard Hunt

themselves as combining letters and further that in the noncombining characters there are in fact six letters from the basic alphabetic set composing the combining characters. This arrangement has to do with the letter frequency in the English language and is discussed later.

In the input text stream, if a character is a master, the program then determines whether the next following character is one of the combining characters; this is easily ascertained by checking if its value after translation is less than hex 15. Upon detecting a master followed by a combining character, the hex

value that will represent the pair of characters is quickly determined by adding the master character's base value specified in Fig. 2 to the hex value assigned to the combining character. Then the resulting hex configuration is stored in the next available location in the output stream.

If the character immediately following a master is not a combining character (greater than hex 15), then the translated hexadecimal representations for each are moved in turn into the next available locations in the output stream and no combining takes place. The test for a master character then proceeds to the next sequential position in the input stream. If an examined character is not a master character, its translated hex representation is transferred into the next available location in the output stream without further alteration.

This compaction process is graphically illustrated in the top half of Fig. 3. Note how the processing proceeds from left to right one character at a time, and how it is almost impossible to predict in advance exactly what letters will combine and in what fashion. For instance, in one case the "space" after ABOUT has been combined with the preceding letter, T, while after the word PACKING, the space became a master character combining with the following T; also, the E in TEXT, although a master character, was unable to combine with X following it because the X is not among those in the combining character list.

In contrast, however, the actual assembly language coding (Fig. 4) for accomplishing the compression is quite simple taking only 21 instructions, and of this, each master character occurrence is only subjected to a 12 instruction loop which then handles an average

USAGE OF HEXADECIMAL CODE (16 possibilities per high level digit)			
Hexadecimal Code	Used by IBM EBCDIC*	Used by Compacted Code	
		Single Letters	Pairs of Letters
0n	0	16	0
1n	0	16	0
2n	0	16	0
3n	0	16	0
4n	6	16	0
5n	6	8	8
6n	7	0	16
7n	6	0	16
8n	9	0	16
9n	10	0	16
An	8	0	16
Bn	0	0	16
Cn	9	0	16
Dn	9	0	16
En	8	0	16
Fn	10	0	16
TOTAL USED	88	88	168
			256

* Counts only symbols used at SIE

Fig. 1.

Text Compaction . . .

of 2.4 characters of the input stream.

In theory, expansion from the stored compacted text exactly reverses the above cycle; however, the processing varies considerably. The first step for expansion is to examine each stored position for a

combined symbol (over hex 57) and when one is found it is used as the increment value to perform a table look-up. (Since each entry in the table is a two letter pair, this "increment" must be multiplied by two.) The result of the table look-up is, that the

COMPACTED CODE

Master Characters		Combining Characters		Noncombining Characters						Combined Pairs			
Symbol	Base Value	Symbol	Hex Code	Symbol	Hex Code	Symbol	Hex Code	Symbol	Hex Code	Symbol	Hex Code	Symbol	Hex Code
b	58	À	00	J	15	q	2B	<	41	Àb	58	ÀÀ	6D
A	6D	Á	01	K	16	r	2C	(42	BA	59	AA	6E
E	82	Â	02	Q	17	s	2D	+	43	BB	5A	AB	6F
I	97	Ã	03	X	18	t	2E	&	44	BC	5B	AC	70
O	AC	Ä	04	Y	19	u	2F	!	45	BD	5C	AD	71
N	C1	Å	05	Z	1A	v	30	"	46	BE	5D	AE	81
T	D6	Æ	06	a	1B	w	31	#	47	BF	5E	AF	82
U	EB	Ç	07	b	1C	x	32	\$	48	CG	5F	EA	83
		È	08	c	1D	y	33	%	49	CH	60	EB	84
		É	09	d	1E	z	34	^	4A	CI	61	EC	85
		Ê	0A	e	1F	0	35	_	4B	CL	62	ED	86
		Ë	0B	f	20	1	36	`	4C	CM	63	EE	87
		Ì	0C	g	21	2	37	~	4D	CN	64	EF	88
		Í	0D	h	22	3	38	!	4E	CO	65	FA	89
		Î	0E	i	23	4	39	"	4F	CP	66	FB	90
		Ï	0F	j	24	5	3A	#	50	CR	67	FC	91
		Ð	10	k	25	6	3B	\$	51	CS	68	FD	92
		Ñ	11	l	26	7	3C	%	52	CT	69	FE	93
		Ò	12	m	27	8	3D	^	53	CU	6A	FF	94
		Ó	13	n	28	9	3E	_	54	CV	6B		
		Ô	14	o	29	.	3F	~	55	CW	6C		
		Õ		p	2A	.	40	!	56				
		Ö						~	57				

NOTE: The symbol b denotes a space.

Fig. 2.

AN EXAMPLE OF COMPACTION AND EXPANSION

COMPACTION	Sample of text to be compacted (Total positions = 18)	A	B	O	U	T		P	A	C	K	I	N	G		T	E	X	T	:
	EBCDIC Code representation	C1	C2	D6	E4	E3	40	D7	C1	C3	D2	C9	D5	C7	40	E3	C5	E7	E3	7A
	1. Translate into Compaction Code	01	02	0D	12	11	00	0E	01	03	16	09	0C	07	00	11	05	18	11	51
	2. Look for Master Character (b, A, E, etc.)	01																		
	3. Check next character for a Combining Character		02																	
	4. Add base value of Master (hex 6D) to it and store	6F																		
	Repeating steps 2, 3, & 4 with succeeding characters	6F		BE		D6														
	2a. If not a Master Character, store as is							0E												
	Repeating steps 2, 3, 4 & 2a	6F		BE		D6		0E	70	16	A3	07	69							
	3a. If not a Combining pair, store each separately																05	18	11	51
Final Compacted Text (Total positions = 13)	6F		BE		D6		0E	70	16	A3	07	69			05	18	11	51		

EXPANSION	1. Compare for Combination Code (over hex 57)	6F																		
	2. Multiply by 2 and use table look-up to obtain double letter	DE																		
	3. Move letters from table into construction	01	02																	
	Repeating steps 1, 2, & 3	01	02	0D	12	11	00													
	1a. If not a Combination Code (hex 57 or less), move as is	01	02	0D	12	11	00	0E												
	Repeating steps 1, 2, 3, & 1a	01	02	0D	12	11	00	0E	01	03	16	09	0C	07	00	11	05	18	11	51
	4. Translate into EBCDIC	C1	C2	D6	E4	E3	40	D7	C1	C3	D2	C9	D5	C7	40	E3	C5	E7	E3	7A
Final Expanded Text (Total positions = 18)	A	B	O	U	T		P	A	C	K	I	N	G		T	E	X	T	:	

Fig. 3

compacted code for each single character of the pair is placed in the output stream being built up. The next input character is examined for a combined symbol and if found not to be one, is moved directly without alteration into the output stream. Character by character, the input is subjected to the expansion process until the total quantity of characters in the original text stream has been reconstructed. The final process is then to translate the compacted code into EBCDIC representation.

The expansion process is graphically presented in

Actual tests indicate that these figures are not far from the times actually being experienced.

Design considerations

Once the concept of compaction had been conceived, the actual development still proved surprisingly thought provoking because of the many factors involved. Fig. 5, for instance, shows a wide range of possibilities using a varying number of master characters. (The number of masters multiplied by the num-

PROGRAM CODING			
* COMPACTION ROUTINE			
* REGISTER 3 HAS ADDRESS OF FIRST INPUT BYTE			
* REGISTER 7 HAS ADDRESS OF FIRST OUTPUT BYTE			
ENTRY	TR SR	0(L,3),CCTABLE 6,6	TRANSLATE TO COMPACTED CODE
SEEKMC	TRT CLI BL SR LA EX LA B	0(L,3),MCTABLE 1(1),X'15' COMBINE 1,3 1,1(1) 1,MOVE 3,1(1,3) RECYCLE	LOCATE A MASTER CHARACTER IS COMBINING CHARACTER NEXT YES COMPUTE LENGTH OF MOVE BUILD OUTPUT ADJUST INPUT POINTER
MOVE	MVC	0(0,7),0(3)	
COMBINE	IC AR STC SR EX LA	6,1(1) 6,2 6,0(1) 1,3 1,MOVE 3,2(1,3)	GET COMBINING CHARACTER COMBINE BY ADDING BASE VALUE OVERLAY MASTER CHARACTER COMPUTE LENGTH OF MOVE BUILT OUTPUT ADJUST INPUT POINTER
RECYCLE	LA CL BNE S EXIT	7,1(1,7) 3,A(INEND+4) SEEKMC 7,F'4'	ADJUST OUTPUT POINTER TEST* FOR END OF INPUT RE-ADJUST POINTER TO END
MCTABLE	DC DC	X'586D000008200000970000C1AC000000D6EB' XL70'00'	REMAINDER OF TABLE
* PRE-SET THE VALUE X'160116' BEHIND THE INPUT AREA			
* EXPANSION ROUTINE			
* REGISTER 3 HAS ADDRESS OF FIRST INPUT BYTE			
* REGISTER 7 HAS ADDRESS OF FIRST OUTPUT BYTE			
ENTRY	SR LM	4,4 8,9,@A(1,INEND)	CLEAR REGISTER PRE-LOAD FOR BXLE INSTRUCTION
INSPECT	IC CLI BH STC LA B	4,0(3) 0(3),X'57' EXPAND 4,0(7) 7,1(7) RECYCLE	OBTAIN INPUT CHARACTER IS IT COMBINED YES BUILD OUTPUT ADJUST OUTPUT POINTER
EXPAND	SLL LA MVC LA	4,1(0) 6,EXTABLE-176(4) 0(2,7),0(6) 7,2(7)	MULTIPLY BY TWO ADD INCREMENT FOR TABLE LOOK-UP BUILD OUTPUT ADJUST OUTPUT POINTER
RECYCLE	BXLE S EX EXIT	3,8,INSPECT 7,A(OUTFRONT+1) 7,TRANS	ADJUST INPUT POINTER & TEST FOR END OF INPUT COMPUTE LENGTH OF OUTPUT TRANSLATE TO EBCDIC CODE
TRANS EXTABLE	TR DC	OUTFRONT(0),BCDTABLE X'0000000100020003000400050006 ETC.'	

Fig. 4.

the lower half of Fig. 3 and can be seen to be somewhat simpler than the compaction process above. There is only the one test to be made against each input position to determine if it is a combined symbol or not. Note that in Fig. 4, the assembly language coding shows only 16 instructions and that each individual position is subjected to a loop of only 8 instructions.

Using the rated execution speeds for these instructions on an IBM 360/40, compression takes 73 msec for 1,000 characters while expansion requires only 65 msec per 1,000 characters of output text stream.

ber of combining characters must fall within the 168 representations available in the hexadecimal series.) In selecting those master characters which would provide optimal compaction, the letter usage frequency in the English language (Fig. 6, p. 40) is, obviously, important to consider. This turned out to be insufficient by itself, however, since in a text stream, spaces, numerics and special symbols also appear. In a small sample of the Exchange's data, interword spaces consumed approximately one position of every six and therefore occurred 166 times per 1,000 characters, more frequently than E, the most common

Text Compaction . . .

letter. Other frequently used special symbols in text are obviously commas and periods. Their frequency fell far below that of most letters, as did that of the numerics.

Also entering into the consideration for selecting master characters was the letter placement within words. For instance, syllables which are often three to four letters long, must always contain a vowel. Thus while the vowels I and U fall somewhat low in the frequency sequence, their key-position placement is such that they seemed likely to provide more opportunities for combining than several more frequently occurring consonants.

Another complicating factor is that while some of the Exchange's text contains only upper case alphabets, much of it contains both upper and lower case. This required two different compaction codes; the one illustrated here is for upper case. For the mixed text where the lower case letters predominate a table reversing the upper and lower case hexadecimal representations was used. It has a slightly lower compac-

POSSIBLE MASTER/COMBINING CHARACTER ARRANGEMENTS					
(Available for Combination Codes — 168 possibilities)					
4 Masters with 42 Combining — 168 possibilities					
5	"	"	33	"	—165 "
6	"	"	28	"	—168 "
7	"	"	24	"	—168 "
8	"	"	21	"	—168 "
9	"	"	18	"	—162 "
10	"	"	16	"	—160 "
11	"	"	15	"	—165 "
12	"	"	14	"	—168 "

Fig. 5.

LETTER FREQUENCY IN ENGLISH		
Frequency Per 1000 Letters	Frequency Per 1000 Letters	Frequency Per 1000 Letters
E—131	D—38	W—15
T—105	L—34	B—14
A—82	F—29	V—9
O—80	C—28	K—4
N—71	M—25	X—2
R—68	U—25	J—1
I—63	G—20	Q—1
S—61	Y—20	Z—.7
H—53	P—20	

Fig. 6.

tion efficiency however, since capitals which now do not combine exist at the beginning of each sentence and for proper nouns.

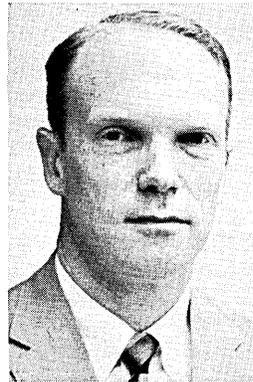
While a mathematical analysis of all these variables would be necessary to determine an optimal selection of master and combining characters (besides being the basis of an excellent thesis) time did not permit that. Instead, a series of trial and error tests were made resulting in a decision to use the 8 master and

21 combining characters shown in Fig. 2. This choice provided a substantial compaction of 30-40% in tests and 35% in actual production processing with 200,000 records.

The economic benefit of compaction for any application will vary with its file size, the portion of the record compacted, and the use frequency of both the file and the routines which pack and unpack its data. For the Science Information Exchange the random access storage requirements for an on-line file in constant daily use were reduced by roughly 60,000,000 characters. This provided expansion capacity and also eliminated the need for additional storage devices which would have required an incremental jump in monthly rental of several thousand dollars.

Further, there was no noticeable increase in the computer's meter time or in terminal-operator's "wait" time. Weekly machine time to copy the file for disaster protection was reduced by that amount necessary to read and then write 60,000,000 characters. The run time for programs which occasionally read the file serially was also reduced. Finally, less tapes (and shelf space for them) were necessary to hold the backup file.

While designed originally to reduce the storage requirements of a particular random access file, the text compaction technique which evolved appears applicable to a wide variety of data bases and useful to any organization with mass storage requirements for alphabetic data on either tapes or discs. ■



Mr. Snyderman is Associate Director of the Science Information Exchange, Smithsonian Institution, and chief of its data processing division. Prior to joining the Exchange in 1962, he was a programmer for the Sandia Corp., Albuquerque, and a systems analyst for the Atomic Energy Commission. He has an MS degree in Industrial Administration from Carnegie-Mellon University and is currently on the faculty of George Washington University.



Mr. Hunt, deputy chief of the Exchange's data processing division since 1967, has been instrumental in the design and implementation of its on-line information system. Prior to joining the Exchange he was associated with the Univac Division of Sperry Rand, RCA, and IBM. He has a BS degree from Drexel Institute of Technology.

PERSPECTIVE

an interpretive review of significant developments

The British Computer Society — A Need to Grow; a Plea for Help

The growing pains of the computer profession were reflected in an inaugural address in London by Alex d'Agapeyeff, president for the next 12 months of the British Computer Society.

D'Agapeyeff virtually "socked it to them" in terms of defining the problems which confront the computer professional. His speech has to be viewed in the context of a president taking to a society in transformation. The work it has done in the past year through introduction of examinations, etc., could have a profound effect on the standards of practice in a field which is subject to understandable criticism at times. It also is a society that has to make a serious attempt to increase by three to four times an existing membership of 15,500 if it is to be the conscience of the computer profession as a whole.

The BCS was established in the fifties by academics, for the obvious reason that the universities more or less formed the computer community at the time. D'Agapeyeff said the principal role of the BCS today is no longer that of a learned society, though "it could retain many of the qualities of such a body." He said it is not yet a recognized professional society but has the potential and desire to become one.

Are policies relevant?

He said the BCS must show that its policies are relevant to the broad spectrum of those who work on and use computers; ensure that its actions on ethics in examinations are effective; and give a lead to the industry, users, and the public on matters of importance as they arise in the industry.

There is no area of computing application to which the BCS has more to offer, d'Agapeyeff said, than business data processing, but efforts cannot be one sided. The business community must do its part.

At present, he said, we have an archaic lack of standards in recruitment and training which is misleading

to students and damaging to employers; a proliferation of dubious employment contracts re confidentiality arising from the belated recognition that computers have made valuable data extremely portable; and an over reliance on small groups of systems designers whose work is neither reviewed nor audited prior to companies becoming dependent upon it.

He called the needs of the public even more serious, noting the silence of the industry "in the face of the

mounting concern about data banks and invasions of privacy expressed in Parliament and by the Trade Unions."

"Do we want the public to regard our work as another form of technical pollution and to regard us as being so irresponsible that we have to be regulated from the outside?"

D'Agapeyeff called upon all sections of the industry, "most especially business data processing," for help in solving current problems.

"I am not asking for charity," he said, "but assistance in business' own interests."

—Pearce Wright

WU to Offer Digital Data Service in 1972, Cox Tells Digitronics Users

In theory, users of a company's equipment form an association to talk about applications. In the case of users of communications terminals made by Digitronics Corp. of Albertson, N.Y., the subject inevitably turns to the hottest communications subject of the day — data transmission.

This was the case again this fall in Chicago when the 5th annual Digitronics Users Association meeting drew a contingent of prominent telecommunications representatives — headed by FCC Commissioner Nick Johnson.

Johnson, in a laugh-packed talk — mostly at the expense of AT&T — contended that decisions of AT&T managers ignore not only the public interest, but also the best interests of its stockholders. The result: the stockholders have been robbed of billions of dollars.

Johnson cited several decisions by AT&T managers to prove this. It included their failure to offer off-peak service at attractive rates, their consistent use of equity instead of debt financing, and their intransigent position on foreign attachments.

Other speakers included spokesmen from Datran, MCI, Western Union, AT&T, BEMA, EIA, the independent telephone companies, and FCC's Common Carrier Bureau.

Possibly the most significant pre-

sentation at the conference was made by John Cox, Western Union's assistant vp for communications systems. He reported that Western Union is planning to carry both digital and analog signals on a single microwave network which should be serving the eastern third of the nation by the end of 1972.

Spending break

"Overbuilding" analog onto digital transmissions facilities, instead of building separate towers, will enable Western Union to cut its long-haul system investment about 50%, he said. Cox admitted that long-haul facilities represent only about 15% of the total cost of the new system, but he indicated that even so, the saving will allow Western Union to compete more effectively with Datran, MCI, and other specialized carriers who must build their systems from the ground up.

Cox insisted that overbuilding isn't aimed primarily at improving WU's competitive position; rather, the purpose is "to provide for future growth of our existing data traffic." However, if the service offered by Datran et al turns out to be as attractive as their advance publicity suggests, Western Union probably will have to become more competitive to retain its present

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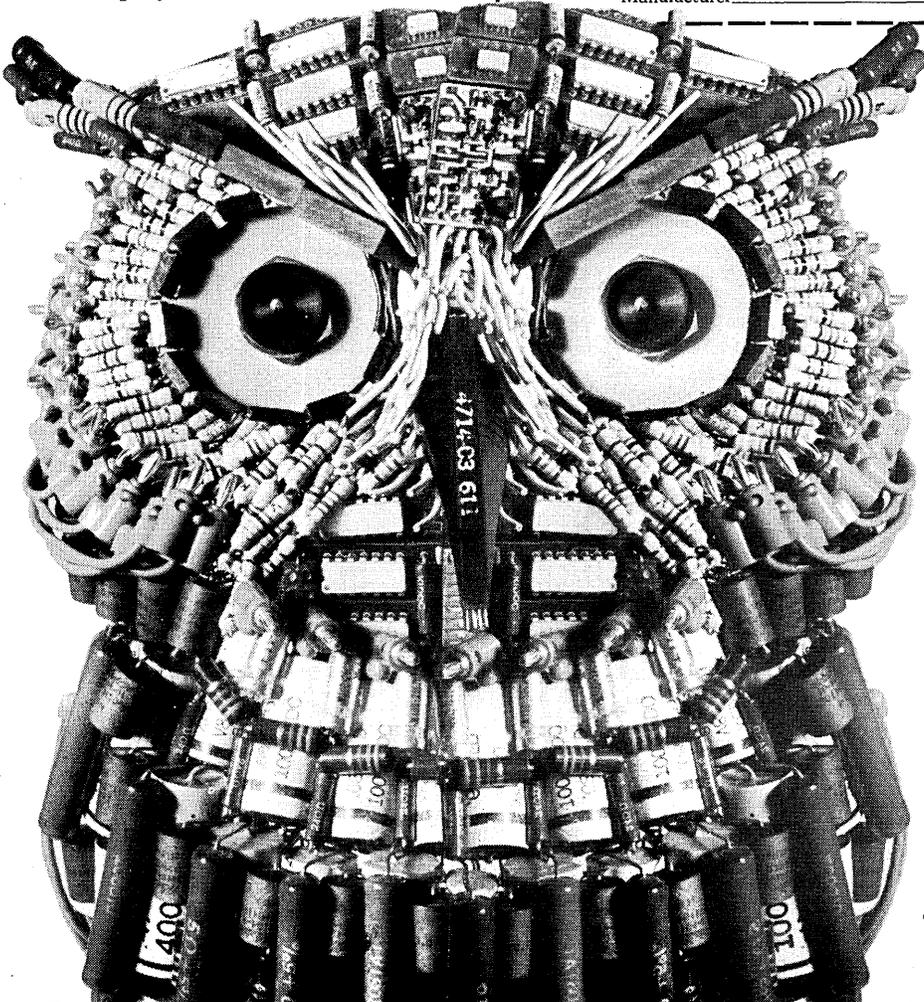
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PERSPECTIVE

data communications customers.

AT&T is planning to use a basically similar transmission system, reported Bill Quirk, Bell's data communications marketing manager.

One question raised but not answered by these plans is how the FCC will keep the established carriers from offering their new data services at subsidized rates. Ed Berg, Datran's executive vp, concisely stated the issue when he said: "If the Bell system comes up with a separate switched (digital) network and they incrementally price it, as we have done, this is proper. If they lump (this new network) into the (existing system) and then come up with some fictitious price to drive competition out of business, we will oppose this." The FCC's job, basically, will be to determine whether the rates offered by Western Union and AT&T are, in fact, "fictitious." Since the new services and the existing ones will be loaded onto essentially the same transmission grid, defining the proper rate base for each won't be easy.

Interspersed throughout the two-day meeting were several comments on foreign attachments. Western Union's Cox, for example, clearly disassociated his company from Ma Bell when he said that WU "wants to make the interface between customer-owned terminals and carrier facilities as nonexistent as possible."

Later, in an interview, Cox explained that by 1975, customers will be able to interconnect their own terminals directly with WU's digital transmission system. A simple interface, protecting the line against high voltages and permitting remote testing of the terminal loop from a central office, will be required, but the cost to the customer will be "negligible." Cox added that keyboard signaling control will eliminate the need for a network control signaling unit.

Asked whether the connecting arrangements currently imposed on TWX users are too elaborate and expensive, Cox said, "this is entirely a Bell system matter." He was alluding to the fact that, although WU now owns TWX, the lines are leased from AT&T, and operating agreements between the two carriers give control over terminal interfaces and network control signaling to Bell.

But Cox indirectly answered the

question about overelaborate interfaces when he added that by 1975, WU expects to be carrying TWX traffic on its own communications network; at that time, TWX customers who prefer to use their own terminals will be able to replace the Bell connecting arrangement with the simplified interface described above.

"Frightening" FCC role

Kelly Griffith, of FCC's Common Carrier Bureau, suggested that AT&T may have difficulty imposing its connecting arrangements on private line customers who prefer to use foreign attachments. Currently, most of these customers can interface directly provided they satisfy certain signal level constraints in the tariff. But next July, AT&T is scheduled to file a tariff amendment that will require them to use data/voice access arrangements. At the DUA meeting, Griffith indicated that unless AT&T can show — from its current operating experience — that this change is needed, the commission won't approve it. But he seemed to take a dim view of suggestions that connecting arrangements be dispensed with on the public telephone system, in favor of certification. He said the Dittberner Report (Oct. 15, p. 39), which made suggestions along this line, "would put the FCC in business to an extent that frightens me."

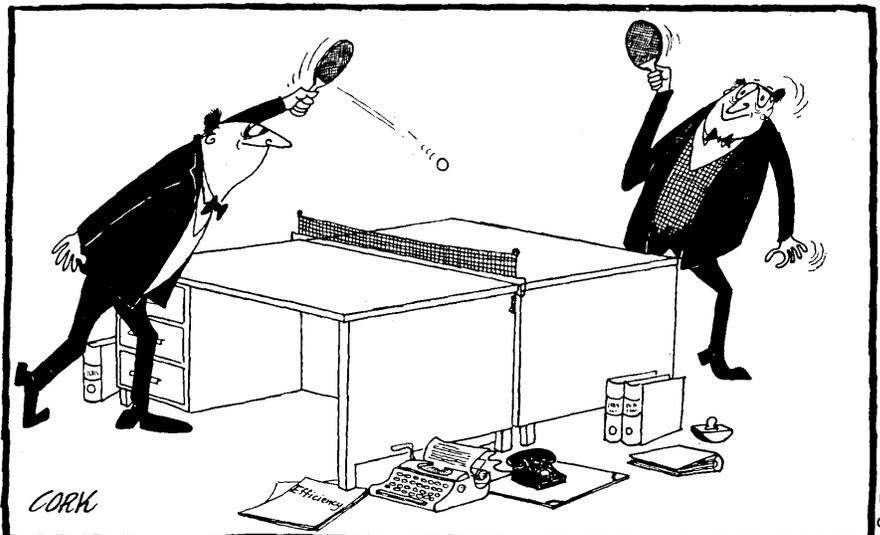
Griffith's doubts about certification were shared by spokesmen for two groups which, in the past, have

worked hard to lift tariff restrictions on the use of foreign attachments.

John Wheeler, of the Electronic Industries Association (EIA) and Vico Henriques, standards chief of the Business Equipment Manufacturers Assn. (BEMA), both endorsed an elaborate certification scheme like the one which the National Academy of Sciences recommended last summer (Aug. 1, p. 77). The Dittberner Report, which was also commissioned by the FCC, proposed a far simpler plan, capable of being implemented immediately. A key difference between these two proposals is that NAS would require independent terminal makers to prove their equipment was nonharmful before it could be used; Dittberner would assume the equipment was safe to use unless the phone company could prove otherwise.

If Henriques and Wheeler were accurately reflecting the views of BEMA and EIA, it seems likely that AT&T will win its battle to retain network control signaling and data voice connecting arrangements, at least for a while. Users and equipment makers who want to do away with these interfaces probably will have to wait for the specialized carriers to be licensed, and for the new Western Union network to get into operation. Since these latter suppliers are willing to use much simpler interfaces, it's possible that competitive pressures will bring about the sort of change that the Dittberner Report advocated.

—Phil Hirsch





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CIRCLE 67 ON READER CARD

NEWS SCENE

IBM Goes Mini Route With S/7 and S/3 Mod 6

IBM permitted Digital Equipment Corp. to celebrate its annual meeting Oct. 27 in relative tranquility. Yet Kenneth H. Olsen, president of the company which is often referred to as "the IBM of the minicomputer industry," appeared uncomfortable anyway, perhaps because of a slight drop in DEC's profits.

The day after DEC's meeting, IBM introduced its own minicomputer, the System/7. The move wasn't totally unexpected (Aug. 15, p. 65). The big company, however, seemed to be avoiding comparisons with existing lines of minis — probably because of the relatively high price tag on IBM's machines. In fact, the computer colossus didn't even call its minicomputer a minicomputer, and, although the 7 is aimed directly at the process control market, tried to define new descriptors for its machine since terms like "process control" and "data acquisition" supposedly do not cover its range of applications.

The specifications: a 16-bit word, the same semiconductor memory as the 370/145, 400 nsec add time, four

interrupt levels, optional telecommunications control for 360, 370, 1800, or 1130 channel attachment, plus analog and digital I/O. The 7 also comes with a required operator station (which costs \$2,240 and is available only on purchase) and a library of host computer macros for making the 7 look like a 2740 terminal. Starting S/7 at \$16,060 with 2K of memory, (plus \$3,675 for each additional 2K), IBM is not only throwing up a pricing umbrella over the minicomputer industry, but raising it even higher than the one it holds for edp processors, thereby probably avoiding any anti-trust charges. As a comparison, Data General's semiconductor memory Supernova SC is priced at \$12K. The SC is slated for deliveries this spring; the 7 won't show till next November.

IBM's other new machine, the System 3/Model 6, is a downward extension of the original System/3, which is now to be called the Model 10. Besides being smaller and cheaper, the 6 introduces several new wrinkles, including: source data entry orientation, a ledger card printer, BASIC and RPG II for software, and a printer that can spell out its first line from left to right and then print the second line on its



System/7: 16-bitter uses same semiconductor memory as 370/145. Price: \$16K.

way back from right to left.

The ledger card capability will mean that the 6 will undoubtedly impact IBM's 6400 ledger card accounting machines and some of the Burroughs and NCR machines. The ledger option provides for control of vertical tabbing, plus customer ID and automatic headings, through a three-level optical code which the machine prints on the margin.

With the exception of the new forward/backward printer and its ledger option, and a 2265 crt, IBM offers the same brace of peripherals as the S/3 — discs, card processors, and communications adaptors to make the machines run like terminals.

Deliveries of the 6 start *this* December, and the models come with price tags "typically" around \$48,250 (\$1,015/month).

CIRCLE 200 ON READER CARD

Japanese Computer Sales Attack Now in High Gear

There was little stir in the computer industry last March when a seven-year-old software house called Automation Sciences Inc. (ASI) announced it would market Fujitsu computers in this country.

When the first two machines arrived, there were yawns at the claim they were the first two "major" Japanese computer systems in this country. But now that promotion has begun in earnest, under the guidance of a



System/3 Model 6: Impacts IBM's 6400 ledger card accounting machine and some Burroughs and NCR equipment.

new ASI subsidiary, Automation Sciences International Corp., New York, one wonders if this could be the start of something big.

As usual, the new computers are impressive. And the salesmen point out many apparent superiorities to IBM hardware — as non-IBM salesmen are wont to do — while at the same time touting substantial System/360 compatibility. But this time consider the source: Fujitsu Ltd. is one of Japan's major corporations. It claims to be the largest computer manufacturer, with more than 2,500 of that country's 7,000 computers bearing its logo; and it produced its first computer in 1954. It's also the only one of Japan's six mainframe-makers that has no cross-licensing agreements with any American computer company; hence, it is the only one free to market here. And the machines being introduced on our shores are not brand new: they were delivered more than a year ago in Japan, and about 250 of the line — called the Facom 230 — are installed there and in other countries.

Cost savings for the first model to be available, the Facom 230-25, a machine comparable to the 360/30, are said to amount to more than 50% on a price/performance basis. Actual rental for systems of similar configuration are about 15% below IBM prices.

The Facom 230 line includes five models, ranging in size from a System/3 competitor to machines matched against the largest System/360 and 370 hardware, at rentals from \$3,600 to \$300,000 per month. The largest model, with beginning rental of \$55K per month, will not be available until 1972, however.

Not only are the prices low, beginning at \$3,600 per month for a basic 230-25, but Automation Sciences intends to provide service even superior to that of IBM. Included in the price are two full-time on-site personnel, one CE and one SE.

The arguments in favor of Facom are dramatic. Stated comparisons of a 230-25 with a 360/30 include: core speed twice as great; compute speeds 5 to 15 times faster; twice as many channels; three times the throughput; hardware registers six times as fast; and it complies COBOL, FORTRAN, and ALGOL programs

two to six times as fast. And multiprogramming is performed in 16K of core.

The electronics include utilization of medium-scale integration (MSI) i.c.'s throughout the cpu's and a broad line of peripherals. Peripheral reliability is enhanced by the use of pulse motors — with only one moving part — rather than clutches or other mechanical assemblies, and photo sensing devices for timing and card reading, instead of wire brushes.

The pitch goes on and on. Now if we can just believe in Japan, Fujitsu, and ASIC, and if a few users will stick their necks out and install some of the equipment. . . .

Australia Takes Stock of Dier Computer Corp.

There are at present seven computer-based companies quoted on the Sydney stock exchange. Information Electronics (manufacturing) has been quoted for a long time. Datacard (supplies) came on the market early this year. These are the only two currently above issue price. The remaining five are all bureaus. Two (Adaps and Square) came on the market late in 1969 and at the beginning of the year were double the issue price. Then Square had difficulties and the three bureau stocks that were launched this year soon dropped below issue price. This stopped any issues that were in the pipeline around April/May. Now Australia is to have its first quoted leasing company — Dier Computer Corporation Ltd., which has big customers like Shell, Massey-Ferguson, Chrysler and Colgate-Palmolive. Nineteen percent of the capital is to be in public hands at 50¢ a share with a premium of \$1 per share. There is asset backing of 18¢ per share.

McGurk Out at XDS; Glavin New President

It has been a year of displacement in the president's office. Latest casualty, announced on a Friday afternoon in late October in El Segundo, Calif., was Dan L. McGurk, president of Xerox Data Systems and a founder of

Scientific Data Systems, the name it had before becoming a Xerox subsidiary last year.

McGurk, 44, is succeeded by William F. Glavin, 38, former head of IBM's Service Bureau Corp. who joined XDS last April as executive vice president. Louis B. Horwitz, 43, former senior vice president, succeeded Glavin.

XDS officials would not elaborate on the short announcement that McGurk has resigned as president and as a group vice president of the parent company.

Observers surmised, however, that the resignation was decided in haste. Only three days before the announcement, McGurk had accepted a position as director of WEMA, a trade association. This post can be held only by persons representing a company and he had been elected because of his position as head of a member company of WEMA.

McGurk later resigned from the WEMA post and said he would devote "at least the next three months to sailing, skiing, and the family." The



William F. Glavin, left, succeeds Dan L. McGurk as XDS president.

McGurks and their seven children live in the secluded Hidden Hills section of the western San Fernando Valley. His first move after resigning was to extend a one-week Christmas skiing outing with the family at Mammoth Mountain, Calif., to a week and a half.

The youthful executive has more than the necessary means to take his time deciding future business plans. He owns 13,590 shares of Xerox stock and another 8,000 shares in unexercised options.

Xerox recently reported that for the first time since 1962, XDS this year was unprofitable. The company said a 1970 decline in orders, shipments and revenues reflected indus-

try trends, particularly a drop in government-related markets which last year accounted for 30% of XDS' total revenues of \$125.4 million.

Florida Computer Scene: Industry in Microcosm

Systems Engineering Laboratories last year projected 40% growth. This year it has a high inventory and low backlog. The people at Modular Computer Systems, now delivering its first system, have taken wage cuts and been given stock options. Two-thirds of the 60 people at Hetra, Inc., have been laid off in hopes this will enable the company to survive until more financing can be found. And Westinghouse Computer Dept. prepares to start production of its first processor. This pretty well describes the computer business in Florida which, along with the rest of the country and the computer industry, is feeling the recession.

Systems, the oldest of the Florida computer companies, had one of its best runs of business ended by stringing out of orders and reduced buying. Since May, 225 people, mainly production force, have been laid off and management has been given a 10% salary cut. President Sheldon Eglash expects revenues and earnings will be down in the current quarter.

Modular, started last February, in October got the first order for its Mod-comp computer, but first it must survive. To this end president Ken Harple has talked his people into taking salary cuts which has brought everyone's paycheck down to under \$9,000 annually, and he has rewarded them with stock options. This, he said, will bring the break-even point closer by one or two quarters. It has also enabled Harple to get between \$1 and \$2 million in additional money.

Money hasn't come so easily to Hetra. The Melbourne company announced its System/3-type system and a terminal system based on the same modules early this year. According to president Keith Milligan, three terminal systems are in the field, another is being shipped, and five are in production. The 20 people who remain with the company are management and technical staff.

The Westinghouse group appears

to have only the pleasant problems of organizing a brand new operation. It has announced its computer, the Westinghouse 2500, essentially a rework of the Protac 2000, and now has some 50 people setting up production in Orlando. A 16-man marketing force has just moved into the field. Marshall Brittain, department general manager, expects to ship 200 units in 1971.

Airlines' Caveat Emptor — Part II

Five years ago, Trans World Airlines chose Burroughs to build a \$30 million-plus passenger reservation and management information system that would be a showcase in the industry — rivaling United's showcase effort with Univac. Under a purchase agreement, TWA built its inventory into a four-cpu B8300 system with over 2,000 crt terminals worth \$3,800 each.

Last month, more than two years after the system was to be operational, TWA called it quits with Burroughs and sued for "misrepresentation and breach of contract" to the tune of \$70 million. Burroughs, obviously prepared for such action, counteracted the same day by filing an \$11.5 million suit for the balance and interest due. Most of that revolved around cost of a fourth processor delivered last July.

TWA, just as United did earlier this year, chose IBM to provide the replacement. Next year IBM 360/65s or 75s are supposed to be up and running under an advanced PARS system.

Very briefly, TWA called the Burroughs system "unreliable, incomplete, and defective with resulting breakdowns and failures . . . totally unfit for TWA's purposes." It also says that at the time of contracting Burroughs falsely claimed, among other things, that the system was "available now." If the airline doesn't win out, it could be stuck with an eight-year leasing contract with C.I.T. Corp. for over \$33 million worth of Burroughs equipment. (TWA negotiated to have C.I.T. buy the equipment for lease-back arrangements that started in 1968 or '69)

Burroughs says that it was only responsible for hardware and basic sys-

tem software, which it claims were operational. TWA was doing applications software. The vendor implication is that the chink was in TWA's efforts. Earlier this year, TWA told *Datamation* that software problems and "increased scope of job" had stymied the project.

While this situation is most similar to United's defection from Univac over nonperformance, United had no payment obligation until the system was running and has not sued. The claims are reminiscent, though not directly parallel, of other user/vendor suits. Data Network (now Mega Systems) sued Xerox Data Systems over system performance while XDS sought back payment. VIP Systems, Inc., countered IBM's payment suit against it with a suit of its own, most recently amended to include antitrust claims. NCR, Honeywell, and again IBM have also been involved in user actions. So many are pending or have been settled out of court that legal precedents for this whopping case are hard to find. One rule that emerges: large system buyer — beware!

TWA filed in the U. S. District Court for the Southern District of New York. Burroughs filed in the Eastern District of Michigan, federal court.



VIP vs. IBM

A \$15-million-plus antitrust suit against IBM and SBC has been filed by VIP Systems. The Washington-based text editing firm claimed IBM/SBC unfairly tried to force it out of business — partly by pricing Data-text below cost, partly by not maintaining VIP's 360/40 adequately. Earlier, IBM sued VIP to collect \$280,000 in allegedly unpaid rental and promissory notes. VIP then counter-sued for \$30 million, largely to cover alleged losses from system crashes. Both of these suits are still pending.

Poor Showing for BEMA Show

Top management has failed the computer, according to BEMA show keynote speaker Dr. Robert Weinberg.

It also appeared that both manage-

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and GDI
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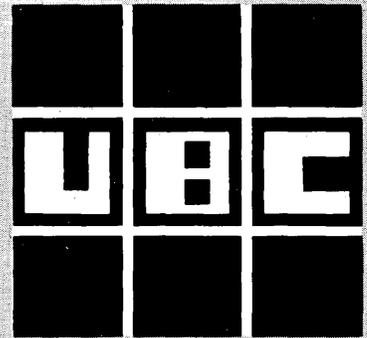
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ment and the computer had failed the show itself. Only 81 exhibitors thinly covered two floors of the New York Coliseum. First day attendance was down 10% from last year. Conference sessions, conducted by the American Management Association at the Americana Hotel, shared the reduced attendance.

Blame for the poor showing was placed on the business downturn despite BEMA chairman C. W. Spangle's prediction that business equipment shipments will total \$14.5 billion in 1970 and will increase 14% in 1971.

Computer sector participation at the show was limited to displays of peripherals by Control Data and CalComp, the Philips P350 series computer, the business systems expertise of Data Processing International and Automated Information Systems, Inc., and the introduction of Wang Laboratories' first business product, a billing and invoicing machine. However, the conference, "Business-Minded Management in a System Environment," was heavily computer oriented, although the substance was often thin.

Dr. Weinberg, vice president of long range planning for Anheuser Busch, established that top management is generally afraid of the computer, wishes it would go away, and thus does not give its data processing operations sufficient support.

Session speakers were more subdued. A report on the impact of remote computing had Robert F. Guise, Jr., president of Com-Share, bundling time-sharing into the data service industry. George M. Brooks of Synergistic Software Systems predicted that unbundling will produce a 50% reduction in edp budgets in the next 10 years.

Packaged Software Can Pay Off

Any survey of the software business this year would read like the computer industry's Book of Job. The hallmarks of the software business this year have been retrenching, bankruptcy, and plunging sales, earnings and stocks.

There have been few bright spots. One of these, however, has come from a software house that is generating substantial profits in what many

would regard as a surprising area — packaged software.

"Our sales are in excess of \$500,000 this year and we are very profitable," says John J. Cullinane, president of the Cullinane Corp. of Boston. "And we've been in business for just two years."

When Cullinane started his firm computer users — even the most sophisticated ones — would buy contract programming services, but they just wouldn't buy software packages, or at least not in enough volume for the package business to be attractive.

"This has changed dramatically in two years," says Cullinane. "When we started out, we recognized that contract programming could be a curse, because few people can deliver on time. We don't have that problem with packages."

The Cullinane Corp., which derives nearly all of its sales from software packages, with 2-3% coming from consulting, has developed a variety of software packages primarily for use by large sophisticated computer users. In addition, the company acts as an exclusive distributor for software developed by some large users.

Cullinane's best-known package is its Culprit system, a report generator system capable of producing all outputs from a larger system. Cullinane claims Culprit, priced at \$10,800 on a three-year lease, can cut system development time by one-third to one-half. Culprit is also useful for one-time report generation.

Another package Cullinane says has been particularly successful is the PLUS program library update system, a software discipline for updating programs daily.

As for the software industry at large, Cullinane believes too many firms have tended to be growth oriented rather than profit oriented. As a result, when the financial crunch came this year, many of these found themselves caught in the squeeze, with some actually being squeezed right out of business (Nov. 15, p. 124).

"Another thing," notes Cullinane, "if you took 100 software companies, I think you would find that 99 of them would be lopsided on the technology side. We've tried to have a balanced company — balanced between the technical side and the marketing side."

Where is software packaging headed?

Cullinane is convinced it is headed up. Other small software houses are beginning to get into the business and there are indications that the larger mainframe companies will be doing more in the area.

Varied Talks, Sessions at Systems Conference

The economic slump was literally illustrated once more when only 400-plus (compared to last year's 741) attendees showed up at the 21st annual conference sponsored by the Western Systems Council of the ASM (Association for Systems Management) held at the International Hotel in Los Angeles in late October. But interest was constant throughout the day-long series of sessions, which ranged from "The Management/Technician Dichotomy" to "Privacy and Shared Data Bases" to "Body Language."

The keynote speaker was Dr. Walter F. Bauer, president of Informatics, Inc., who wryly promised an "unbiased and objective" discourse on the software scene and then proceeded to mention IBM a lot. He predicted that the outcome of the Dept. of Justice antitrust suit against the ubiquitous Armonk business machine manufacturer would be another consent decree similar to the one in 1954 that saw the Service Bureau Corp. spun off as a separate entity. Bauer believes that IBM will do the same with all its software personnel and activities and create a new company that will compete with the independent software firms, thus making the purchase of software "respectable." Bauer forecast a 40% share of the software market for IBM's spinoff in the seventies. Will IBM be satisfied with that?

A much appreciated luncheon speaker at the conference was Anthony Bishop, management consultant, who compared management's preoccupation with trivia to the long-standing theological argument as to whether Adam had a navel, a matter of negligible importance that has concerned otherwise responsible and intelligent people for hundreds of years.

"Perhaps it would have been im-

portant," Bishop conceded, "if Adam had been eating fish and chips in the tub and needed a place to put the salt." However, he concluded that neither fish nor chips nor tub were indigenous to the Garden of Eden, and thus the navel was, indeed, irrelevant.

He cited management's devotion to status environment as an example of the trivial matters that consume many too many hours of decision-making time. "Creative people are herded in bullpens while supervisors are tucked in carpeted offices far from the people they're supposed to supervise."

He exhorted the attendees to push for acceptance from management, stating that there aren't enough systems management people on the decision level. And that's a good level to be on, he added, because that's the level at which waste and incompetence are overlooked.

The well-attended session on Body Language, conducted, logically enough, by Ernest Barefoot, training officer for Security Pacific National Bank, was intended to instruct the audience on the meanings of nonverbal communication represented by various gestures, positions, and looks (perhaps to play one upmanship while systems managing). It was stressed that an individual's gestures seldom vary but gestures vary from person to person. Even so, certain generalizations could be made.

For instance, a person who lays his finger alongside his nose is in doubt (unless his nose itches); a person who sits with his leg over the arm of the chair and drums his fingers on the table is bored (probably only a boss can be bored); hand in pocket jingling coins means the jingler is insecure about money (never mind that he's checking for his car keys); and a person who glances sideways is suspicious (actors get hired who are good at glancing sideways suspiciously).

Barefoot emphasized the need of familiarity with and study of an individual before conclusions as to his emotions and attitudes could be drawn. He kept pulling his pants up while he talked. Self-confidence?

Next year's meeting of the Western Systems Conference will be held aboard the Queen Mary in Long Beach, which is surely a systems management challenge.

NEWS BRIEFS

Russian/U.S. Meet

A high-powered group will gather in Palo Alto for the Conference on Integrated Information Systems under the auspices of the American Institute of Aeronautics and Astronautics, Feb. 17-18. There will be at least two scientists from the Soviet Union, speaking on data reduction systems for deep space vehicles, and control system simulation for Russian spacecraft. There will be J. W. Rabb, director of FAA's National Airspace System Program office, who will be keynote speaker. And there will be Dr. Herbert Grosch of NBS for lunch. Subjects to be covered include space/ground integrated information systems; simulation and analysis; air traffic control, and even ecological/social systems. The gathering also will tour NASA's Ames Research Center and see a film demonstrating Stanford Research Institute's robot project. Man in charge of information is Dr. Robert

Rector of Cognitive Systems in Beverly Hills.

A New Voice for EDP?

WEMA, a 28-year-old trade association of electronic companies in the western U.S., last year was opened to edp firms and since January has seen its ranks swell 14% to 647 companies with half of the newest 80 being edp firms. The association, which may be emerging as a significant voice for the edp industry in government matters, claims much of the credit for persuading a House-Senate conference committee to throw out part of a bill that would have limited government payments for independent research and development done by contractors (Nov. 1, page 121). In keeping with its new image, WEMA's 230-member Los Angeles council recently elected two directors from the edp field — Erwin Tomash, Data Products Corp., Woodland Hills, Calif., and Dan

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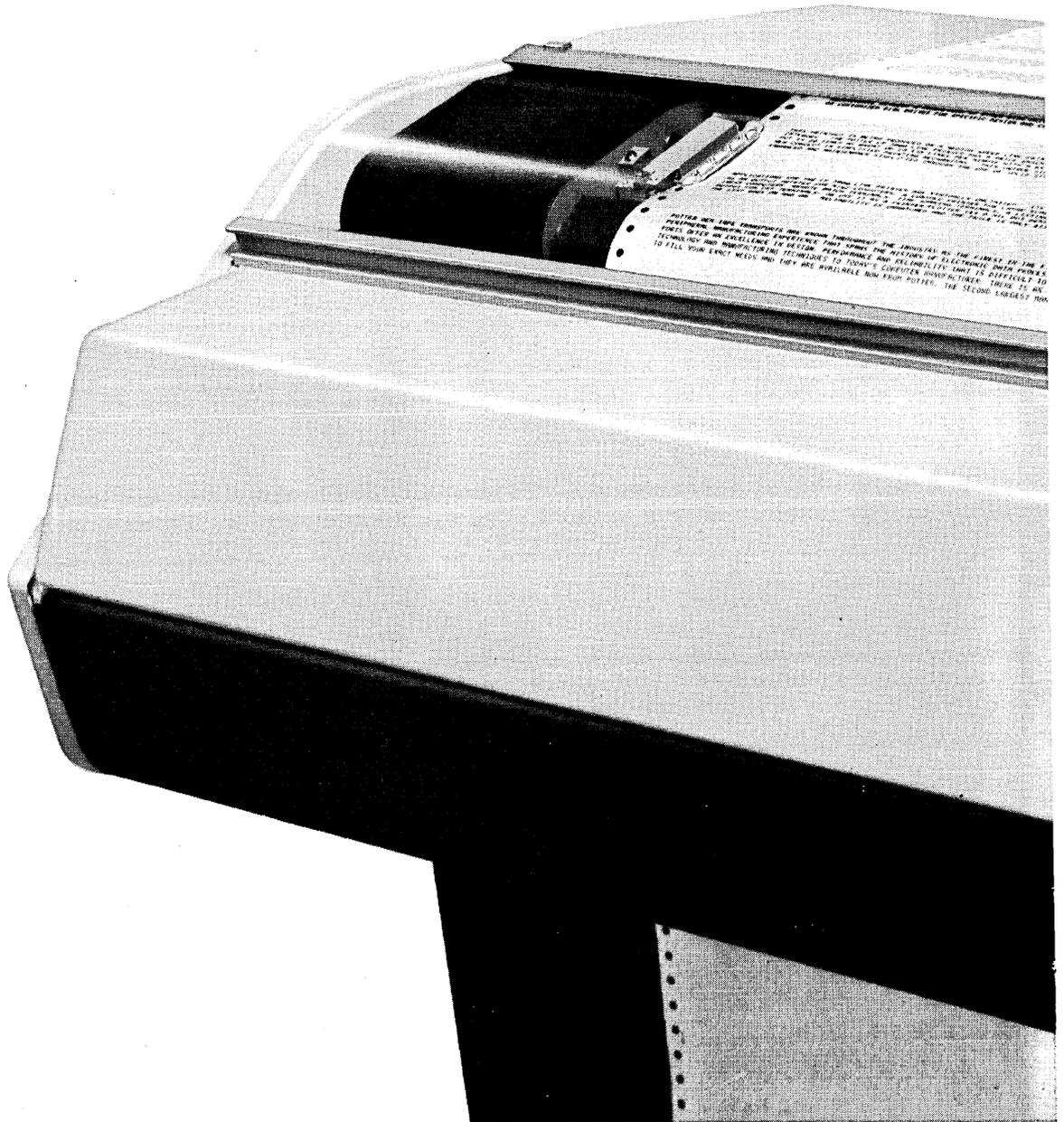
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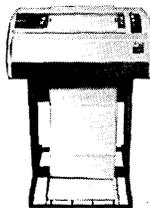
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McGurk, until recently president of Xerox Data Systems (see above).

Another Commission?

After giving "intense consideration" to the question of the computer's jeopardizing individual privacy, ADAPSO has come up with a formal but not very original proposal: establish a Presidential commission to investigate and recommend. ADAPSO's po-

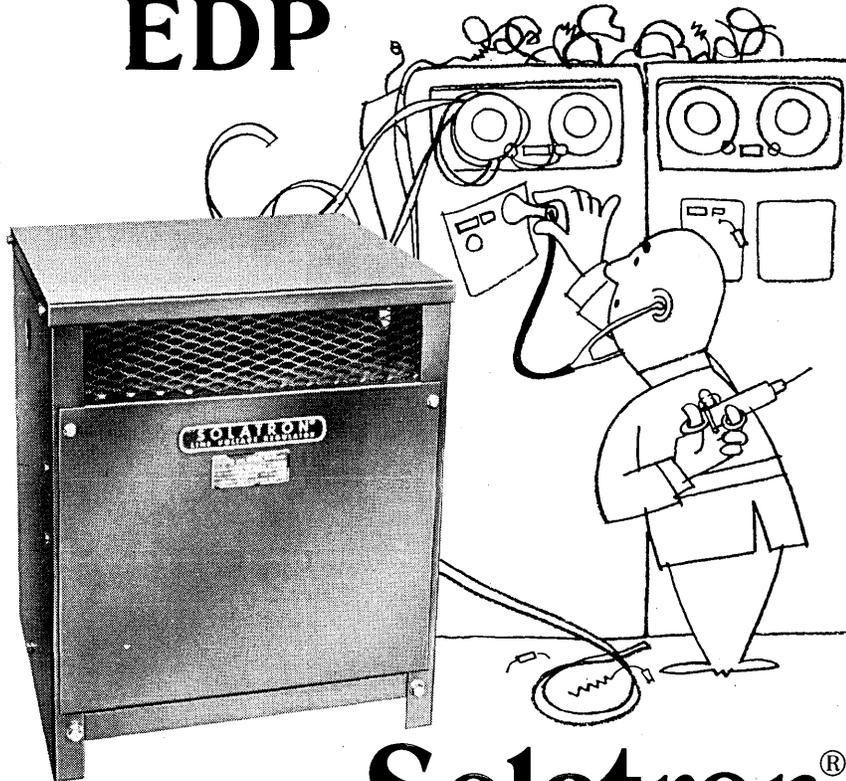
sition is that hastily adopted regulations could create additional problems while regarding possible technological and social benefits, and since some degree of protection is already provided by law, the industry should make all efforts for "meaningful self-regulation" while looking into the matter thoroughly. One industry spokesman, when asked to comment on the position paper, said it reminded him of the mugwump — "a bird that sits on a

fence with its mug on one side and its wump on the other." But in mugwump fashion, he asked that his name not be used.

NEW COMPANIES

It's now official — Britain's International Computers Ltd. has come to the U.S. as an entity, namely **International Computers (USA) Ltd.**, with footholds on Long Island (Garden City) and Madison Avenue. Continuing to promote oem sales, the new subsidiary states diplomatically it will provide "technical liaison with American suppliers," and has no plans to sell ICL computers "at this time." . . . Greater Cleveland's first COM center has been established forthrightly as **Computer-Output-Microfilm Corp.** by two already well-established Cleveland firms, Computer Systems Co., Inc., software, and Computer Information Corp., service bureau. It will use Stromberg DatagraphiX equipment. . . . Another large corporation, Bechtel, has opened a computing subsidiary, **Pacific International Computing Corp.**, in San Francisco, to offer computer time, time-sharing, and such services as text editing, contract writing, accounting, and, as usual, payroll packages. . . . And another large one, Whittaker Corp., is edging further into the management systems field, with newly formed **Sciences Management Corp., L.A.** Whittaker's Dr. William Meng Duke has given up the active presidency of Whittaker (he will still be board chairman) to be president-starter of the new subsidiary, whose formal tag offers "planning and management services for publicly and privately held companies," presumably utilizing Whittaker's instrumentation and control capabilities. Duke's former experience includes ITT. . . . A venture dubbed **Cyber-Dynamics**, operating out of a post office box in Tahoe Paradise, Calif., claims it can offer contract programming for \$10-15 per hour because of a "unique technique" — no overhead? H. Programming & Systems, Ltd. has been formed in North Finchley, Britain, to serve users of Honeywell systems.

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Electrical equipment can cause severe voltage variations. Protect your EDP equipment . . . **BE IMMUNIZED WITH SOLATRON®!**

Designed for computers, Solatron regulators maintain an even line voltage input within $\pm 0.5\%$ for line changes. The fastest response time available, correction begins in the first half cycle with complete regulation taking place within 1/5 second.

If your computer is getting up tight . . . we have just what the doctor ordered: SOLATRON® Call (312) 439-2800 or write: Sola Electric, 1717 Busse Road, Elk Grove Village, Illinois 60007.



MERGERS, ACQUISITIONS

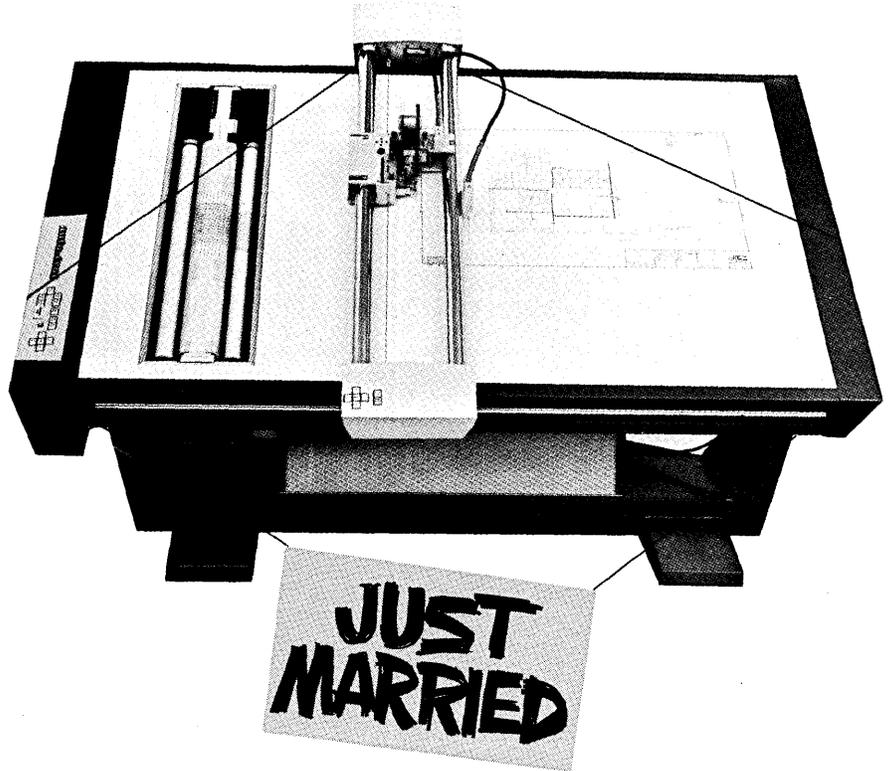
Can a New York dp service company that has been orphaned in the Big City find happiness in Las Vegas? **The Unidat Corp.**, inactive since January because of "current economic conditions" — no business — is reorganizing with the acquisition of **Pioneer Leasing Corp.**, a Las Vegas-based outfit furnishing nationwide financial services, which in turn is dickering to acquire a computer service bureau in its home town. Put them all together, they hopefully will be viable. . . . Two Chicago time-sharing companies who perhaps found time on their hands have linked resources. **Tim, Inc.**, and **Pryor Computer Industries**, which is giving up its t-s division to the effort, say it is necessary to consolidate technical and financial capabilities needed in the mod market. **Pryor-Tim, Inc.**, will be 50-50 owned by each. . . . The Washington, D.C., service bureau of **Tracor Computing Corp.** is being acquired by **Software Systems, Inc.**, which will drop a service bureau in Fairfax, Va. Consolidated operations will come home to roost in SSI's Washington hq. . . . **Computer Micro-Image Systems, Inc.**, San Fernando Valley COM equipper, has hitched its wagon to **Telex Corp.** by accepting that Tulsa company's financial support over a three-year period, at the end of which it may or may not be acquired; details not disclosed.

SHORTLINES

In spite of its domestic slump, Burroughs' overseas operations are proceeding apace. It has contracted for Viennese mag tape transports produced by another expatriate, Potter Instrument, to be used in Europe. . . . Hewlett-Packard expects to employ about 300 Frenchmen at its projected 65K square foot plant in Grenoble near the Swiss and Italian borders, where it will not only manufacture, but conduct research. (One of Grenoble's attractions is a university specializing in scientific training and engineering.) H-P's European sales have more than doubled in the past three years, are now almost \$100 million annually. . . . The Electronic Industries Association

has gotten with it and formed an International Activities Council, made up of one member of the board of governors and one appointee from each EIA division. However, any other member company with an interest in international affairs has been invited to participate. The council will have committees on standards, marketing services, public affairs and export regulations. . . . To centralize its com-

puter systems activities, Varian has transferred its Graphics and Data Systems Div. from Palo Alto to its subsidiary, Varian Data Machines, in Irvine south of L.A., in view of the increasing use of printer/plotters and data systemized instrumentation used as peripherals. ■



perfect union

A drum plotting surface. And a flatbed plotting surface.

They're making it beautifully. In one machine. The Duo-Trol 6030.

The drum is a swinger—featuring straight line drawing at any angle. At a resolution of .0005".

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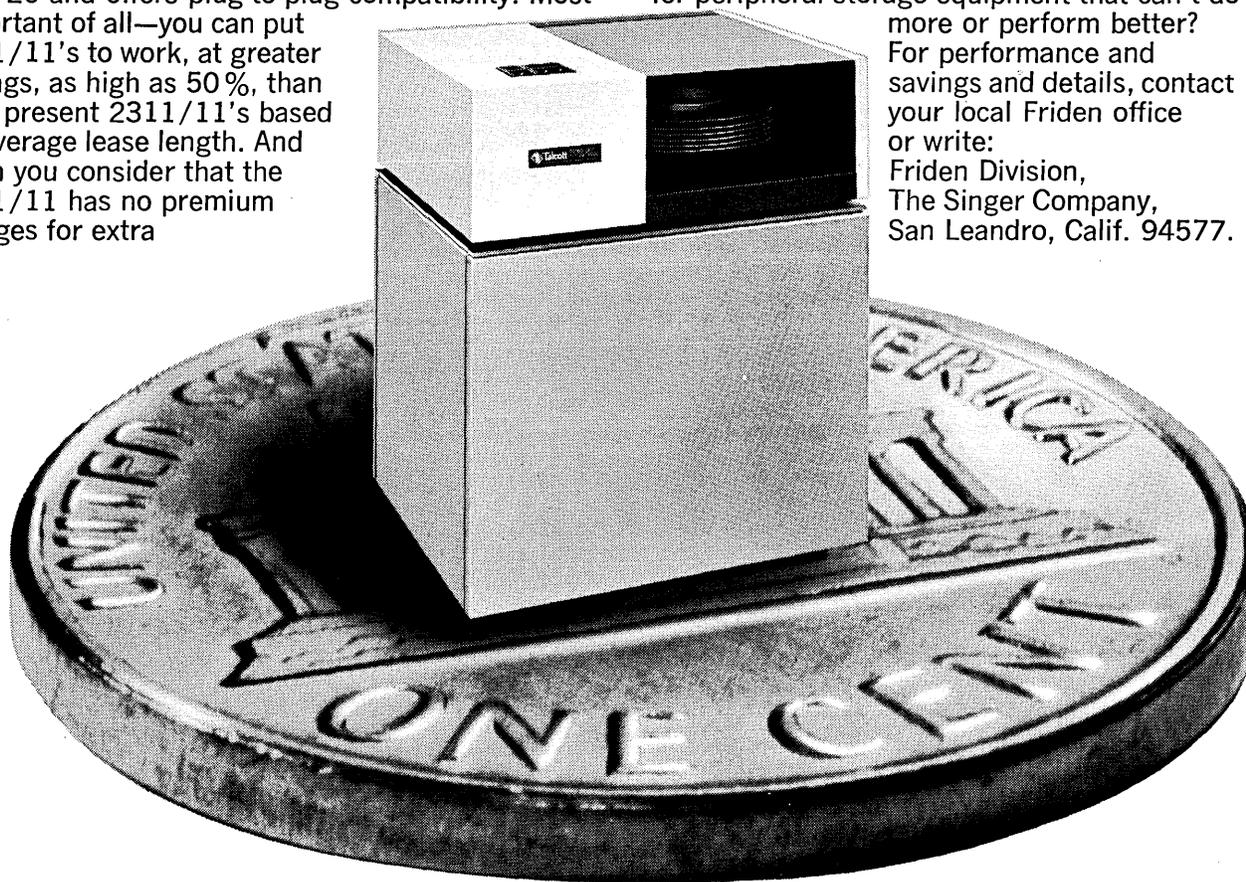
CIRCLE 24 ON READER CARD

FOR THE 360/20 USERS.

THE NEW 9311/11: FURTHER PROOF THAT AT TALCOTT EDP STANDS FOR "EVERY DARN PENNY."

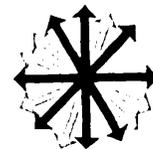
Now—the 360/20 systems users can enjoy the same outstanding performance and savings that the 9311 Disc Drive brings to users of larger systems. The 9311/11 matches the capabilities of the 360/20 and offers plug-to-plug compatibility. Most important of all—you can put 9311/11's to work, at greater savings, as high as 50%, than your present 2311/11's based on average lease length. And when you consider that the 9311/11 has no premium charges for extra

shift work—the actual savings can be even greater. The 9311/11 is made by the Friden Division of Singer—famous for reliable engineering and service, worldwide. So why pay more for peripheral storage equipment that can't do more or perform better? For performance and savings and details, contact your local Friden office or write:
Friden Division,
The Singer Company,
San Leandro, Calif. 94577.



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 **Talcott 9311**



HARDWARE

\$36K Page Reader

A year ago this vendor was a dark horse entry in the ocr race, with a machine called the 370 which read intermixed composition of up to 16 fonts (Nov. '69, p. 421). But it sold for \$900K and none were sold—though the equipment was successfully used in the firm's service bureau operations. Now, at the other end of the spectrum, some of the engineering from the 370 is being used in the new 170 series, with prices starting at only \$36K for this variable size page reader, aimed at the printing and publishing industry.

The 170 is said to be the lowest priced upper and lower case scanner

PRODUCT SPOTLIGHT

ever offered. In its basic form, it recognizes the vendor's Type Scan font, available on a ball element for a standard Selectric typewriter. Type Scan has also been used in services to publishers. The low price is largely attributed to a unique scanning device that utilizes fiber optics to carry an optical image, eliminating conventional lenses and requiring no precision alignment and focus. And the use of recognition logic already employed on the 370 reduced development costs.

Input can be forms varying from 5 x 3 to 11 x 14 inches, and recognition



is 100 cps. Spacing is 3 lines/inch for double space, 4½ for one-and-a-half space, and 6 lines/inch for single spacing (upper case only). Margins should be at least one-half inch on either side. Any character that cannot be recognized is displayed to the operator on an optical display—using no electronics, to further reduce cost—for correction via input from an alphanumeric keyboard.

Output may be magnetic tape, paper tape, or punched cards. The basic 170 has no output peripheral, however. Three more elaborate—and higher priced—models will also be

available: the 171, with an output peripheral; the 172, with the Type Scan edit system, enabling editing by addressing line or page number; and the 173, with a crt display. Prices on these units have not yet been established. Any of the 170 series will read additional fonts, but can only recognize one font at a time. Other fonts available will include OCR A, OCR B, 1401, etc. Deliveries are expected to begin in May or June. COMPUTE-SCAN, INC., Teterboro, N.J. For information:

CIRCLE 360 ON READER CARD

Ledger Computer

The numbers keep getting bigger on the "TC" and "L" series, but it's the same cpu in a new configuration for a different application: now it's the L5000 "magnetic record computer." Translated to archaic terms, it uses stripe ledgers—those old cards with printing on the front and magnetic stripes on the back. The unit has no on-line capability, allowing it to utilize what would have been a buffer area of memory for ordinary memory, and a disc is also used for handling the stripe ledgers. The magnetic records may be randomly accessed for automatic updating or for visual reference. Variable addressing of the 352 digits stored on the records permits selection of categories of data for specific reports. Thus, users can refer to the records visually, use them as input to the computer for updat-

ing accounting records, and process them through an automatic magnetic record reader for many types of reports.

Standard report writing programs



are supplied, and 48 standard application programs, written in COBOL, are available for such lines of business as manufacturing, contracting, hospitals, banks, and government.

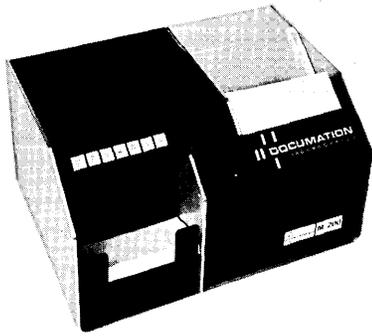
Peripherals available include paper tape, edge punched card, and 80-column card readers and punches.

The L5000 has monolithic integrated circuitry, and is programmed through strings of micro-instructions stored in the computer's disc memory. The micro-instructions are said to provide internal control of computation, print formatting, printer positioning, forms movement, and console and peripheral data input and output.

Prices start at \$19,900 for the basic machine. Add \$4290 for the automatic magnetic record reader. Additional peripherals can bring the price to \$36,610. Delivery is from stock. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 361 ON READER CARD

(Continued on page 58)



THE HEAVY DUTY CARD READER

WITH THE LIGHTWEIGHT PRICE

\$1275.00

OEM Quantities

The compact M200 is the ideal, inexpensive card-input companion for mini-computers and remote data terminals. Its straight-through card track and sophisticated vacuum picker mechanism provides the ultimate answer to handling damaged or warped cards. This delicate treatment gives almost limitless life to your new cards.

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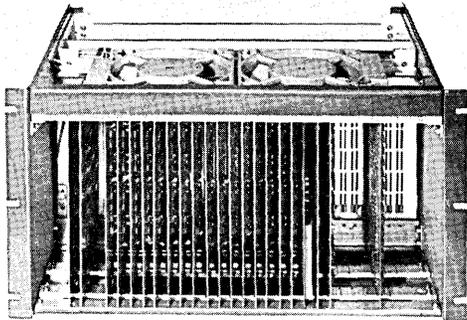
- Low Price
- High Reliability
- 225 cards per minute
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CIRCLE 27 ON READER CARD

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Now rolling off the production line, Toko's HS500R Memory System offers the following key features:

- * Access time of 250ns.
- * Memory capacity of 4K words by 18 bits expandable to 16K words by 18 bits, rearrangeable to multiples of 36 and 72 bits.
- * Compact, space-saving advantages—measuring 10" x 19" x 13-1/3".

Toko's advanced electronic technology also enables it to provide computer components, such as memory stacks. Contact Toko today for details.



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TOKO N.Y., INC. 350 Fifth Avenue, New York, New York 10001 Tel: 212-565-3767

CIRCLE 34 ON READER CARD

HARDWARE...

On-Line COM for S/360

The first product of a new firm is the s/COM-70, a COM unit capable of recording alphanumeric characters, standard symbols, and graphics, together with forms overlay, onto microfilm. It is available in both on- and off-line versions, the former allowing it to perform as a peripheral connected directly to either the selector or multiplexor channels of any System/360 model. It is both hardware and software compatible with IBM 1403 and 1443 line printers, and logically compatible with OS and DOS.

The s/COM-70 can print at the rate of 15,000 132-character lines/minute. Reduction ratio is 25X, and the character set is 64 alphanumerics and symbols. Standard equipment includes a full size, interchangeable forms flash overlay system that is automatically aligned. Input is fully buffered, with transfer rates up to 500,000 cps.

Options include: ASCII or EBCDIC input coding; 7- and 9-track tape transports (200, 556, 800, or 1600 bpi tape input); interfaces to other computer systems; a self-contained, dedicated minicomputer; microfiche camera; graphics package; other reduction ratios; expanded character set (128 characters); and a retrieval code recorder. The s/COM-70 is priced under \$50K, and is available only to oem's, except in the New York metropolitan area, where it may be supplied to end users and serviced by the manufacturer. Deliveries are scheduled for the second quarter. SEQUENTIAL INFORMATION SYSTEMS, INC., Dobbs Ferry, N.Y.

For information:

CIRCLE 362 ON READER CARD

OEM Tape Unit

The model 9 tape transport features fully automatic loading of standard half-inch tape reels through use of a two-reel clasp and air and vacuum tape handling. Tape speed is 112½ to 200 ips, with no start/stop program restrictions. Recording density is 3200 fpi using a single capstan drive mechanism. It is available to oem's only. Single unit price is \$12,025 with discounts in quantity. Deliveries begin in the first quarter. INTERNATIONAL COMPUTERS (U.S.A.) LTD., Garden City, N.Y.

For information:

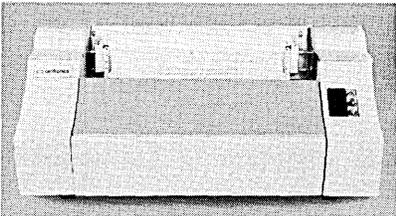
CIRCLE 373 ON READER CARD

... HARDWARE

Low-End Printer and CRT

Specifications and price place the model 101 character printer and the model 301 crt keyboard terminal at the low end of the peripheral list, but indicate a nice break in price/performance. This play of percentage may be due to the units being the first hardware produced by a company that has specialized in developing financial control and monitoring systems for gambling casinos.

The figures for the model 101 are: 63-character ASCII font, 5x7 dot matrix character formation, 165 cps



maximum print rate (60 132-character lines/minute), 3K bps serial or up to 75K cps parallel transmission rate, and a 132-character buffer per line. Voice grade lines are sufficient for serial input.

Paper feed is pin driven. Forms up to 14 inches can be accommodated and four carbons can be produced.

The model 301 crt has the same transfer rate, font size, buffer configuration, and character formation as the printer. Although it can be used off- and on-line with other equipment, it is primarily a companion piece to the printer. Its display capacity is four lines of 33 characters each.

The model 101 printer is priced at \$2400 and the model 301 display is \$995. Initially sales will be to oem's. Delivery is scheduled to begin in late January. CENTRONICS DATA COMPUTER CORP., Hudson, N.H. For information:

CIRCLE 363 ON READER CARD

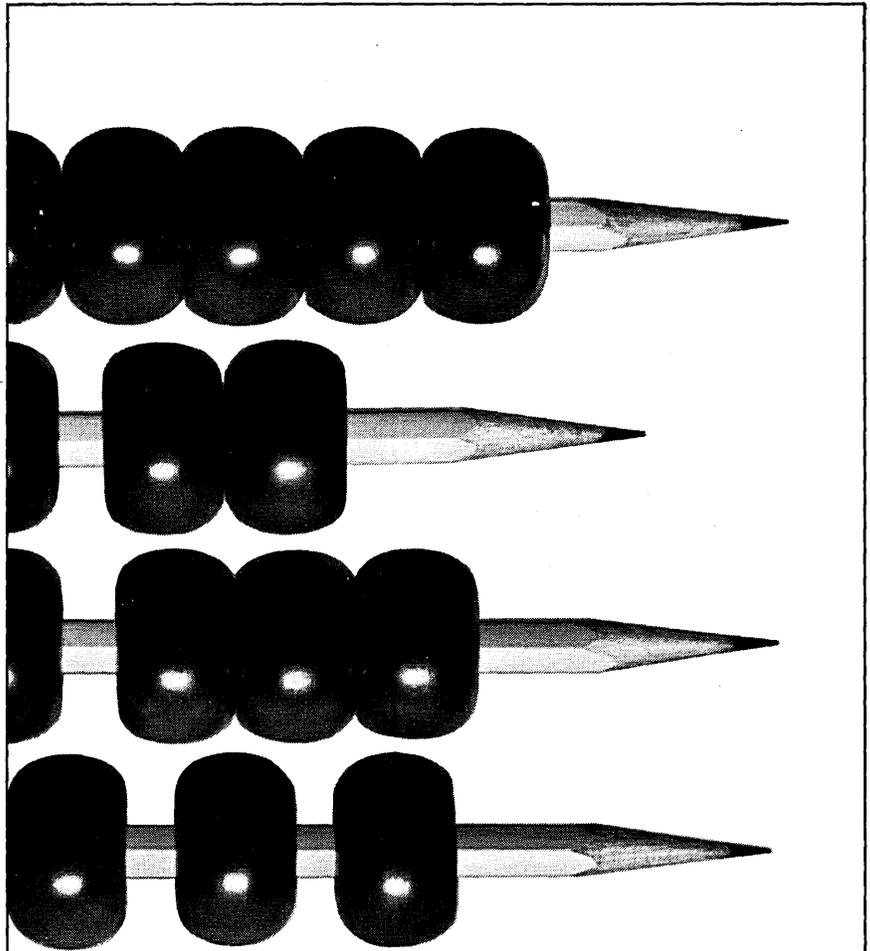
On-line Plotting

Step sizes of .010, .005 inch, 0.2 mm, or 0.1mm are offered on the series 1430 on-line plotter. CalComp compatible, it weighs 45 lbs., and draws at rates up to 300 steps/sec. on 14-inch wide roll paper.

Applications software is included in the price of \$4300. UNIVERSITY COMPUTING CO., Dallas, Texas. For information:

CIRCLE 369 ON READER CARD

(Continued on page 62)



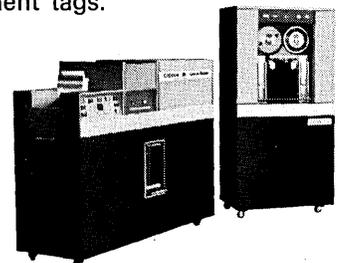
Now count on pencils to feed your computer faster

Make an abacus out of pencils to figure inventories, schedules, profits? Not with an Optical Scanning system handy. ■ With an OpScan® system, you can transfer data from original source documents directly to magnetic tape, ready for computer processing. No keying operations. No large clerical staffs. No modifications to existing facilities. ■ An OpScan system can read as many marks and characters as you'll ever need. From ordinary page-size documents to 1½-inch garment tags.

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data bits from Teletype

knowing
who's
going
where,
when and
now!

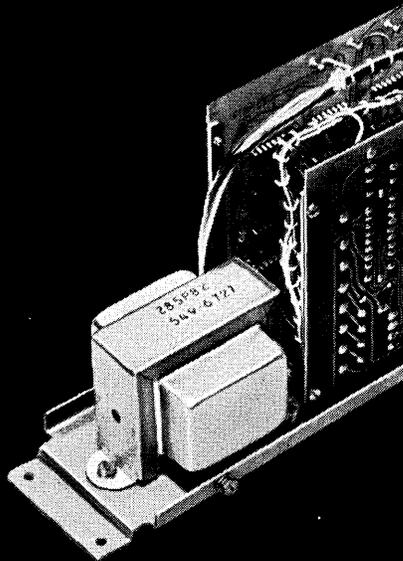


Maintaining a passenger flight manifest is a vital part of airline operations. And highly complex. One carrier, that deals with hundreds of flights and some 25,000 people daily, recently reduced some of the problems involved by integrating high-speed Teletype® equipment into its system.

Computerized manifest data, compiled in the airline's central office, is sent to departing terminals two hours prior to each flight. It's used in a variety of ways: As a boarding checklist. In computing aircraft weights and balances. For meal details. To meet special requests for wheelchairs, etc.

At the time of departure, "no show" passengers are deleted from the manifest, standby names on board are added, and the list resubmitted via Teletype equipment to central office computer for updating. The computer then generates the "official" manifest and sends it to both departure and arrival terminals involved, at 1050 wpm. The send-receive operation usually is complete before the flight gets into the air.

Teletype's Stuntronic™, electronic selective calling station controllers, also helped reduce computer port requirements of this system by 90%.



keeping a multistation network under control

Teletype has a simple solid-state logic device that provides a truly practical and economical way of establishing automatic control over multi-terminal data systems. The Stuntronic™ station controller is what it's called.

This helpful accessory provides station interface, control, and response for all ASCII compatible Teletype data terminals. Can be used with model 33, model 35, model 37, Telespeed™ and Inktronic® equipment. It will recognize all incoming station signals and respond to its own address characters.

More than 100 different control arrangements are possible with the Stuntronic station controller — including detecting vertical parity errors and establishing computer communication and intra-circuit communication among a variety of system terminals.

total on-line time: divide by twelve

If you have a number of low-speed terminals in your time-sharing system that generate heavy loads of on-line time, it may pay dividends to do the above arithmetic. The Teletype Inktronic terminal is about twelve times faster.

This electronic, solid-state terminal will generate 128 ASCII combinations. Print 93 alphanumerics in upper and lower case. It achieves 1200 wpm printing capability. Charged ink droplets are drawn to the page through a series of electrodes that form the character called for. The ink supply and guidance system has only one moving part. So the Inktronic terminal requires little maintenance. And it's really quiet.

It has more than on-line operational economy, too. Uses ordinary teleprinter paper. And inexpensive ink. Like most equipment in the Teletype line, you won't find a more capable terminal on a price/performance basis.



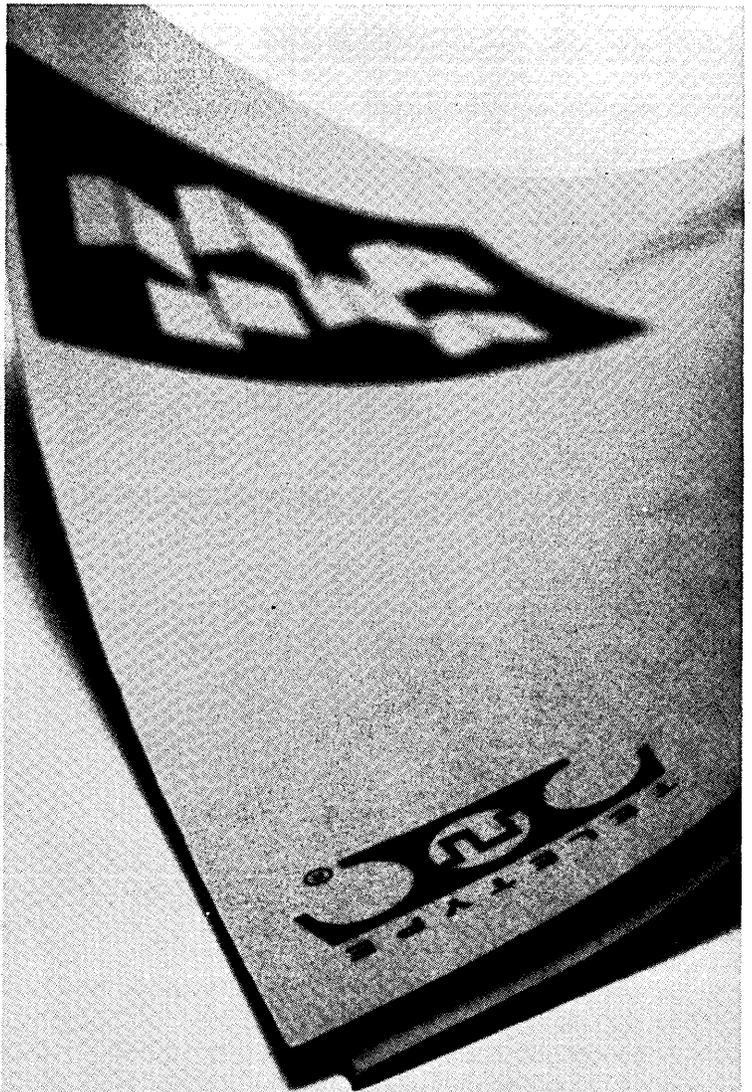
on track with 80,000 cars

Numbers: important in every business. But, no one has to contend with more of them than a railroad. Keeping the digits straight that identify rolling stock alone, staggers the imagination. These numbers represent big money to railroad and customers alike.

One major railroad uses over 500 high and low speed Teletype terminals in its system to provide the type of car utilization that means business and profitable operation. The terminals are linked to a computer by communications channels.

The Teletype equipment has parity error detection capabilities. Important in keeping the identity and location of over 80,000 cars straight. Teletype solid-state terminal logic permits the computer to poll stations and terminals to respond automatically.

Data generated includes immediate car availability, projected car availability in 1 to 3 days, condition of cars, what type of goods each can handle. Locomotive power available. Enabling the railroad to provide shipper customers the equipment they need for loading, when needed. The data system handles over 30 million data bits daily.



recommended reading

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

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



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CIRCLE 76 ON READER CARD

OCR Systems

Documents as small as 3 x 7 inches and pages up to 11 x 14 inches can be read into the models 250 and 350 OCR units. The difference in the model numbers is based on the 250's ability to read OCR A, OCR B, PICA, 1401, handprint, and Selectric typewriter fonts, while the 350 can also read Times Roman, Bell Gothic, Bookman, Univers, and special fonts generated by crt's for microfilming. The vendor claims that any "reasonable" font in both upper and lower case, plus punctuation and special symbols, can be designed into the model 350.

A paper feeding speed up to 12 ips keeps the 800-cps scanner going. Characters are dissected into 1,200 separate elements and analyzed for more than 400 specific features in the recognition process, according to the vendor.

SWAMI (Software-Aided Multifont Input) is a self-teaching software package available on the 250 and 350 models, as well as previously developed ocr products from this vendor. Written in BAL, the program is given an alphabet sample of the target font. The program then develops a reference alphabet by combinations of the various character features.

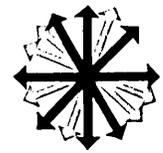
On an extended lease the 250 ocr system including SWAMI is \$3450/month. The 350 is slightly higher. Both systems will be available in the first quarter of 1971. SCAN-DATA CORP., Norristown, Pa. For information:

CIRCLE 364 ON READER CARD

Core Storage

The LCM+ large core memory is now available in standard versions for use with IBM 360/50, 65, 67, and 75 computers. Billed as a cheaper alternative to IBM's 2361 LCS, the LCM+ memories are plug compatible with the 360. They provide all operational functions of the 2361, and a faster memory cycle time of 2.8 usec for the 65 and up, and 3.5 usec for the 360/50. For model 50 main memory replacement applications, the LCM+ sells for about \$234K for 1 megabyte, or \$422K for 2 megabytes. LCM+ units of 4 and 8 megabyte capacity are also available. FABRI-TEK INC., Minneapolis, Minn. For information:

CIRCLE 365 ON READER CARD



Computer Simulation

Ever wonder whether adding more disc or memory capacity to a present configuration would be worth the money? A bad guess in this situation can be disastrous, but here is a program aimed at eliminating the guesswork. Called ECSS (Extendable Computer System Simulator), the 212K-byte package was funded by NASA and is in the public domain—the vendor will turn it over to the customer for a charge of \$100 plus approximately \$4 for the user's manual. (If the customer supplies the

tape, the price drops to \$75.)

The cpu simulator is written in SIMSCRIPT II. Either SIMSCRIPT or ECSS statements are used to control a library of computer simulation building blocks. These blocks are currently being checked out. The ECSS package could even be used to simulate computers that are not yet on the drawing boards by acting on characteristics and performance data building blocks the user would construct. THE RAND CORP., Santa Monica, Calif. For information:

CIRCLE 350 ON READER CARD

Corporate Models

This package is a simplified planning model intended for use by corporate executives. Called PLANDEC, it allows a user to structure his application by specifying as input data whatever relationships are required. Said to be flexible enough to model such diverse situations as real estate development and financial analyses, the 5K FORTRAN IV program is priced at \$3500 including implementation assistance. SIMULATION MODELS, INC., Ridgewood, N.J. For information:

CIRCLE 351 ON READER CARD

Tape Certification

A magnetic tape certification program called NSPEC utilizes special channel programming to ascertain present quality of any number of tapes on a single program run on System/360 under OS or DOS. Thus I/O is at the channel or machine language level, while the rest of the program is written in BAL. It produces a printout giving location and number of errors, as well as total number of usable feet of tape. The price of \$275 includes operating instructions, a chain-loading object deck, and maintenance for the life of the package. CYBERNETICS & SYSTEMS INC., Louisville, Ky. For information:

CIRCLE 352 ON READER CARD

Civil Engineering

Users of Univac 1100 series computers will soon have access to IBM's Integrated Civil Engineering System. Probably the first conversion of ICES for non-IBM hardware, a version for EXEC 8 is scheduled for completion by March 31, and an EXEC 2 version by May 31. The vendor's objective is to provide the entire executive as well as the applications subsystems, many of which can be used for other than civil engineering. ICES will be offered at \$18K, or \$800 per month rental, plus \$1K/year for maintenance. SCI-TEK COMPUTER CENTER INC., Wilmington, Del. For information:

CIRCLE 353 ON READER CARD

Government Purchasing

VISOR is an English language inquiry, search, and retrieval system designed for use by government and large industrial purchasing operations. The package produces a series of reports on all vendor bid and no-bid activity, or on an individual company upon demand.

Two versions of VISOR are available: a batch mode system for 65K System/360 mainframes and an interactive 360 version; an 1108 version will be ready soon. The price is \$15K plus \$2.5K for installation. DATAVENTURE INC., Reston, Va. For information:

CIRCLE 354 ON READER CARD

360 Software Testing

TAPE*JOB is a utility package designed to facilitate the testing of System/360 software. It generates and maintains a magnetic tape of user-provided jobs. This permits the placement of benchmark and other test jobs on tape instead of card decks, resulting in quicker and more efficient testing of software as well as hardware, according to the vendor. TAPE*JOB can list all programs on the tape by job name, list a specific job, and delete or add jobs to the tape. It is written in BAL and operates on any 4K 360 under OS. The price of the TAPE*JOB deck, with documentation, is \$185. Satisfaction guaranteed for 30 days. HYGAIN TECHNOLOGIES, INC., Westport, Conn. For information:

CIRCLE 355 ON READER CARD

Tape Library Accounting

The Automated Tape Library Accounting System is used in a serially oriented magnetic tape environment to record the current status and location of each tape along with historical information. In addition, the system provides a record of every data set name within an installation, plus related retention data. It is written in COBOL F for batch processing on System/360 models 40 or larger using OS (PCP, MFT, or MVT). ATLAST requires an 88K partition or region, four tape drives, and one disc which is used only as a work area. A DOS version is being developed. Price for the first installation is \$9200 including documentation. A second location is \$5700; third, \$4700, etc. GT&E DATA SERVICES, Tampa, Fla. For information:

CIRCLE 356 ON READER CARD

Automatic Cataloging

Auto-Cat is a self-relocating automatic cataloging utility intended to assist in the management of computer installations. According to the vendor, cataloging is reduced "to the simplicity of a sort." Auto-Cat performs the functions of: compilation of a source program in Assembler, COBOL, FORTRAN, PL/I, or RPG; cataloging of the object module into any or all background or foreground partitions without each cataloging requiring a separate run; cataloging of a source program into a source statement library; and creation of a punched-card object deck. Auto-Cat runs on System/360 and requires 4K core. The price is \$950. MNEMOTECH COMPUTER SYSTEMS, INC., New York, N.Y. For information:

CIRCLE 357 ON READER CARD

(Continued on page 71)

**The name
makes a
in disk**



on the label difference packs.

When the name on a disk pack is "Scotch" Brand, it comes from the world's most experienced producer of magnetic computer products.

It's a product of the pioneers who gave the EDP industry its first computer tape.

It's made by the same people who have made virtually every major technological breakthrough in magnetic media.

You can expect "Scotch" Brand Disk Packs today to be unsurpassed in reliability and performance. And when the next advance comes in disk packs, you can expect it to come from 3M.

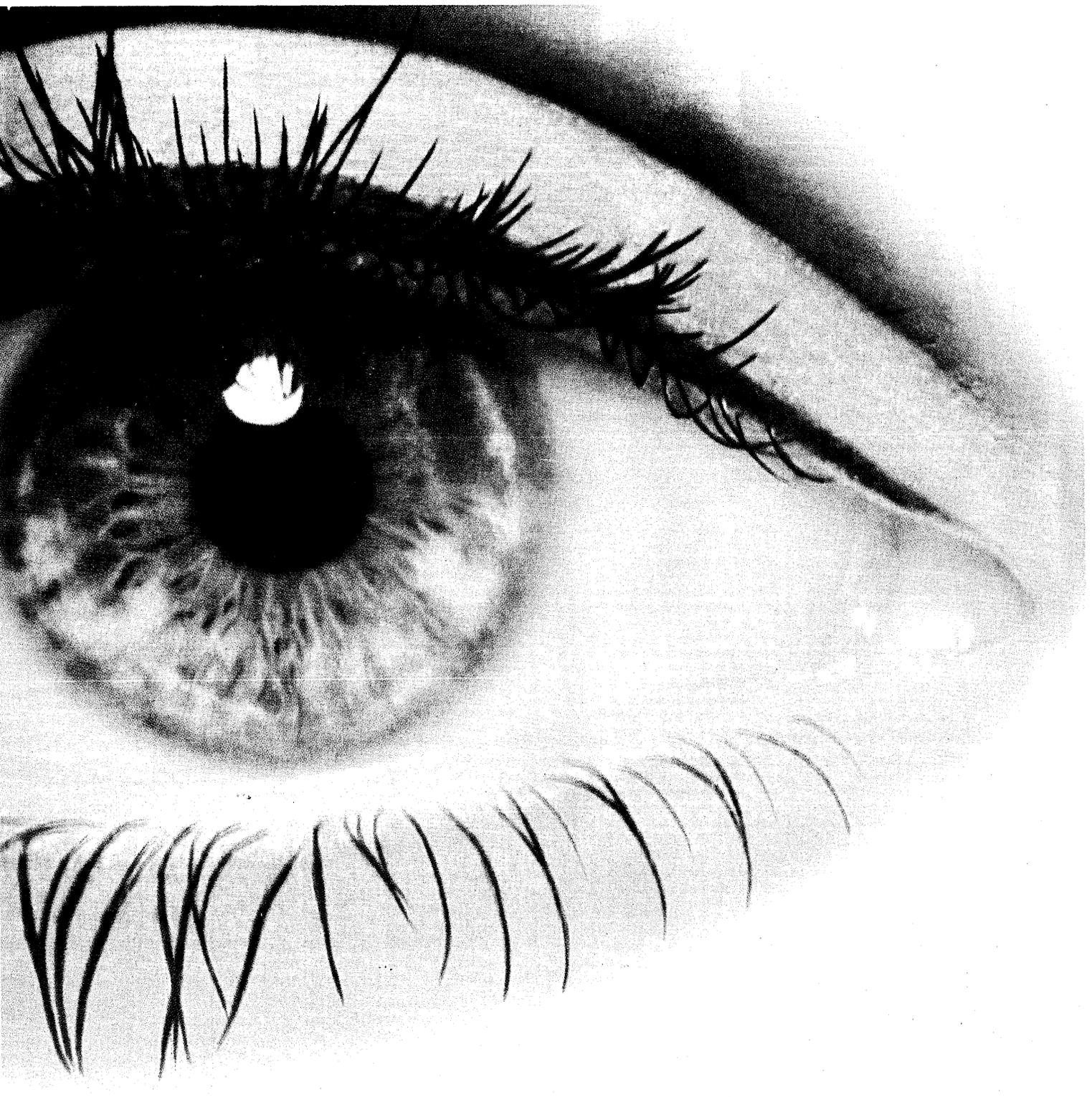
"SCOTCH" IS A REGISTERED TRADEMARK OF 3M COMPANY.



3M
COMPANY

The barrier breakers.

CIRCLE 48 ON READER CARD



Our new data entry system is so simple to operate you can hire the operator on looks alone.

Simplicity is what the ENTREX™ System 480 is all about. We build in a comprehensive visual display because the operator who sees what she is recording, prepares data faster and more accurately. Simplicity is a good idea (foolproof is a nice word for it), and we've made it into a good system. With its own computer and disk, the System 480 controls up to 64 individual DATA/SCOPE™ CRT keystations. You can train a girl to run it in a couple of hours. If she can type, she can enter data on the 480. Verifying on the DATA/SCOPE's 480 character display is about as difficult as watching T.V.

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Questionnaire Analysis

Control cards are used in the MARQUEST survey and questionnaire analysis program to provide statistical calculations for one or two variables. The FORTRAN IV package (cards, job control cards, and an English language user's manual) is set up to run under 360 OS, but can be adapted easily for DOS or TOS usage. IBM 1130 and CDC packages are also available.

The output is headed by a line indicating the field or fields printed. If the data item printed is a function of one variable, the distribution appears in absolute numbers as a percentage of the total number of items including weighting, but excluding missing data. Dual-variable output is headed by a line indicating the fields involved by card number and low-order position. Each matrix includes missing data for both fields and marginal distributions excluding missing data.

Approximately 90K bytes are required for MARQUEST, but the vendor will tailor it down to 32K for an extra amount of money. The basic price is \$1700. MEM ALEF ELECTRONIC COMPUTERS LTD., Rama-Gan, Israel. For information:

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An optimal forecasting program, TIMES enables users to develop mathematical models exhibiting the essential statistical characteristics of their time series data. Such models can be used either to simulate the process being analyzed or to predict its future behavior. Predictions based on the TIMES technique are said to have shown lower forecast error variance by a factor of two than such currently employed methods as exponential smoothing.

TIMES is written in FORTRAN and consists of two programs, one requiring 35K, the other 140K. It's available for System/360 and Univac 1108 computers, and can be converted for other large mainframes at extra charge. The price of \$4750 (plus transportation) includes documentation and one man-day of training. LAMBDA CORP., Arlington, Va. For information:

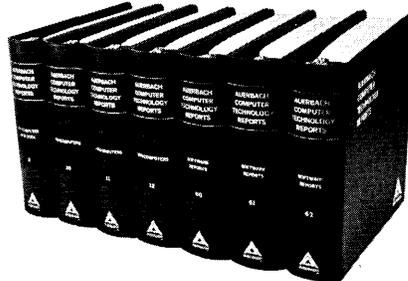
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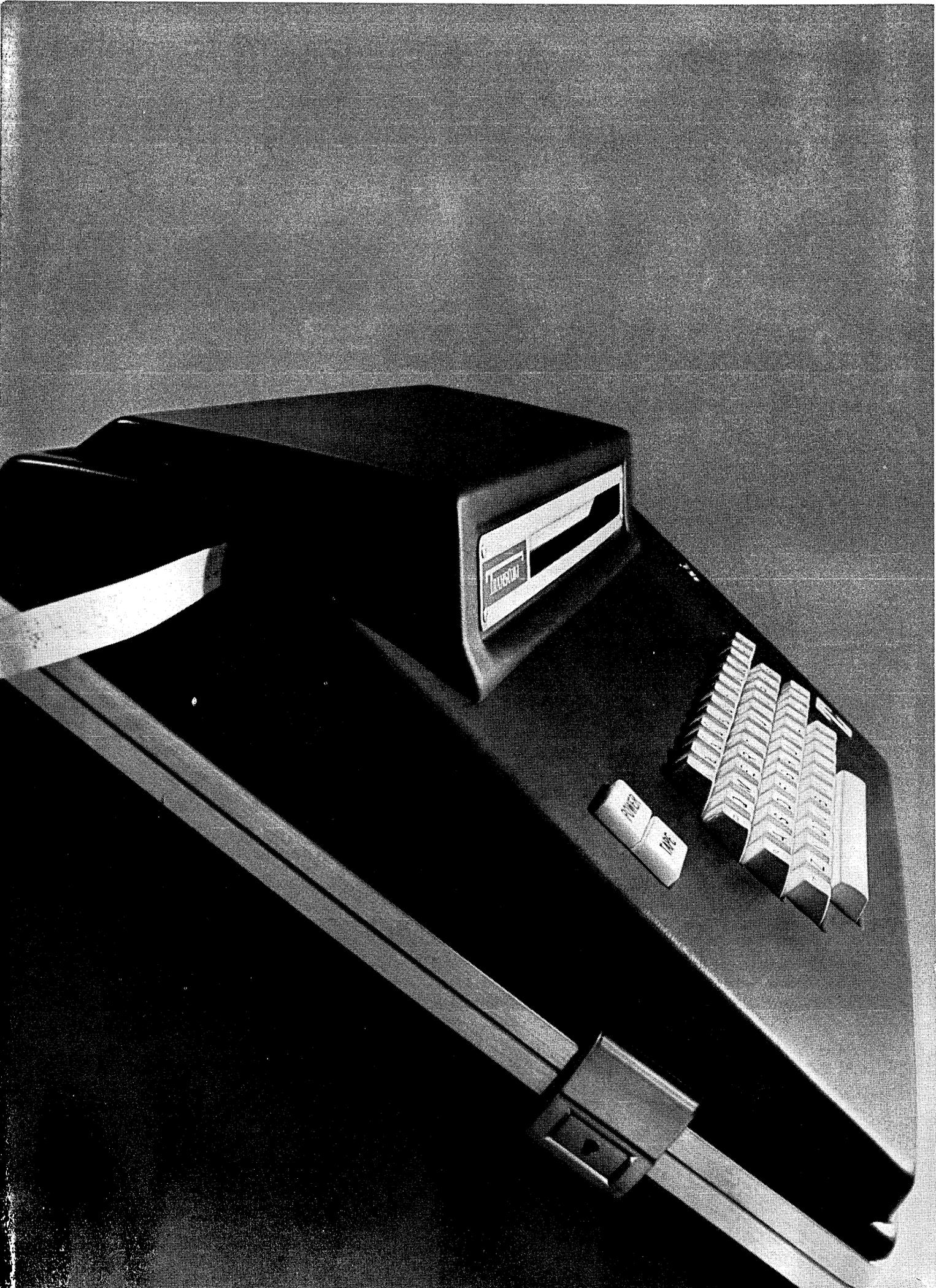


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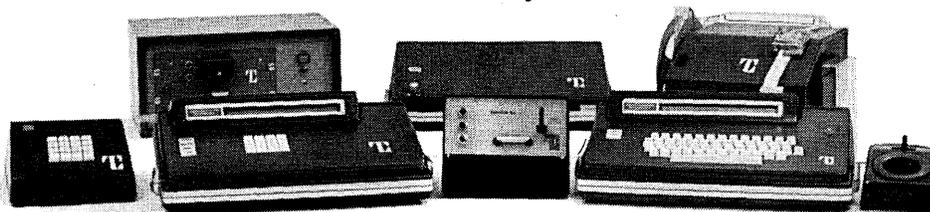
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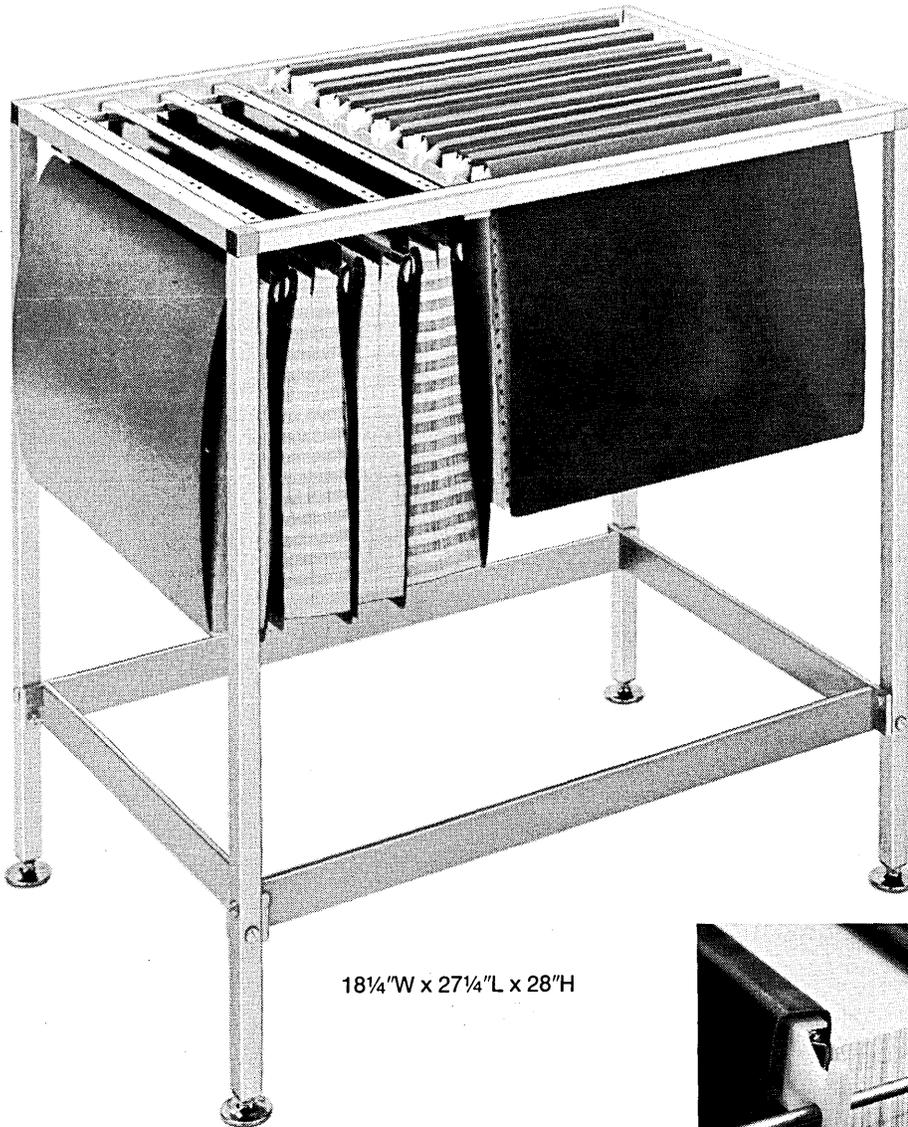
Here's your chance to stock up on the newest, most versatile data binder in the business — and get a handsome new National Control-Rack 907, worth \$59, absolutely free! Just order 100 Natlon Hang-A-Ref's and the Control-Rack 907 is yours... order 200, and get two Control-Rack 907's!

Natlon Hang-A-Ref Data Binders: National's unique new binder with the special plastic sliding hook that holds it in suspension; or retracts into the binder for easy carrying and reference! Tough Natlon covers keep forms clean and neat.

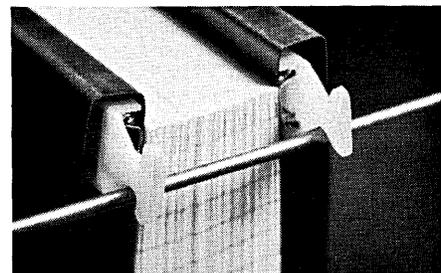
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WORLD ROUNDUP

COMPUTER SUPERMARKET OPENS IN LONDON

Computer Sales and Services Ltd. is hoping for a first-year sales turnover of \$1.27 million from its newly opened "computer supermarket" in London. The used computer center is the first of its kind in Europe and opened with three working computers on show in its salesroom.

Formed as a subsidiary of Electronic Brokers Ltd. (a successful used instrumentation broker), Computer Sales has a 6,000-square-foot sales area where prospective buyers can view the equipment, including peripherals, under realistic conditions and consult the engineers responsible for refurbishing the computers to manufacturers' specs. The company will also act as brokers of large systems.

BRITISH FIRMS PROTEST SIEMENS TRAFFIC CONTRACT

A storm of protest from British companies followed the awarding of a \$1.9 million prestige contract to Siemens of Germany for a Central London computer-controlled traffic system. The U.K. companies charged unfair practice—and now the government has all but admitted it was at fault.

While the absolute value of the contract is unimportant, Siemens has now established a strong foothold in Britain, and the U.K. companies Plessey Ltd. and GEC-Elliott Automation Ltd. claimed that the accepted contract was substandard to the Ministry of Transport's draft specifications. After strong denials at the time the protests emerged, the Ministry of Transport has now effectively admitted responsibility for a breakdown of communications that led to Siemens' winning the contract.

COMPUTER '70 EXHIBIT A SMASH

Orders totalling more than \$13 million were signed during Computer '70, held in October at London's Olympia exhibition complex. Though the event was held for the first time this year, it already seems likely to replace France's Sicob exhibition as the premier European computer show, and ranks favorably with the Fall Joint Computer Conference.

Computer '70 attracted over 40,000 visitors from 81 countries in five days, with strong representation from the Eastern Bloc, and was staged at a cost of about \$5.1 million. Space is now being booked for the next London computer exhibition, in 1972.

FERRANTI CUTS COMPUTER PRICE

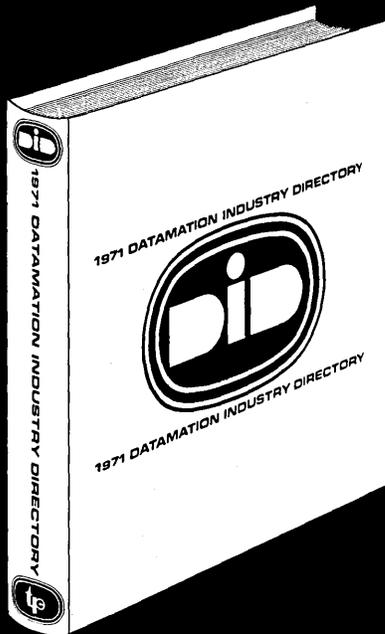
The Automation Systems Div. of Britain's Ferranti Ltd. has cut the price of its Argus 500 computer by one-third as the result of an unbundling procedure.

Formerly priced in the U.K. at \$26,000, the price for new orders will now be \$18,400. The Argus 500—marketed mainly in the process control, information handling, and communications markets—will now be sold as a basic machine, while the more complex software systems will be sold on an optional-at-extra-cost basis. The Argus 500 has a 4-64K core store with cycle times of 500 nsec to 2 usec.

Overall cost of a complex system will remain substantially unchanged, while simple systems are now available more cheaply as a result of unbundling.

Introduced in 1967, the Argus 500 computer has been sold to more than 130 customers, with current deliveries running at one per week. One-third of total production has gone to export markets.

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Turn to one of these categories to find names of supplying companies. Reference to the Master Alphabetical Vendor List will quickly provide company address, and other basic information, including regional sales/service coverage.

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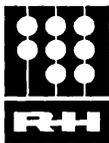
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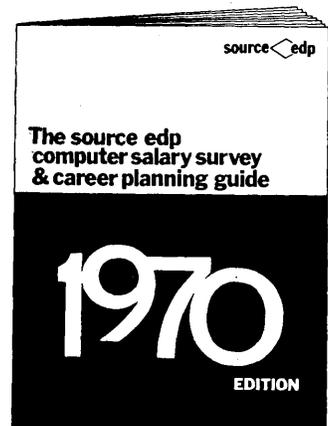
CIRCLE 504 ON READER CARD
December 1, 1970



PEOPLE

The great communications hope of University Computing Co., subsidiary Datran (Data Transmission Co.), has reorganized its executives as part of what it calls "planned evolution," while awaiting the FCC's go ahead on its proposed national network. Sy Joffe has become vice chairman of the board and "executive committee" chairman, succeeded in the presidency by David H. Foster, promoted from administrative vp, the post now taken by Edward A. Berg. Foster is a former Collins Radio exec, where he was vp and general counsel. Datran's board chairman, of course, is Sam Wyly, whose election "formalized (his) identification with Datran's progress." Headquarters, however, are not in Texas, but in Vienna, Va. . . . One of Datran's major subcontractors, Comcet, Inc., which is supposed to furnish computer controlled switching at the network centers, has lost its president, Lee Johnson, who resigned "for reasons of personal health." Board chairman Donald Herman will take over his duties at the Rockville, Md., firm, also in danger of losing its name since it is appealing a court ruling ordering it to change, because of its similarity to Comsat. . . . Philip Fellows resigned as president of Telemax Corp., the travel reservations subsidiary of Wellington Computer Systems, Inc., "because of a difference of management philosophy." Fellows is an old airlines fellow (18 years), and was national sales manager for Univac's airline systems. The person he presumably disagreed with, board chairman William G. Lucas, will take over the management of the Fairfield, N.J., firm until a new appointment is made. He is also president at Wellington. . . . Robert R. Burns, who joined Scan-Data Corp. only a few months earlier this year, was elected president, succeeding Alan I. Frank, who was elected board chairman but who then resigned, leaving Burns to be elected to that post also. . . . Photon, Inc., Wilmington, Mass., manufacturer of phototypesetting systems and computer peripheral equipment, has secured the services of Albert E. Mignone as vp of operations. He was formerly research and engineering vp for Addressograph Multigraph Corp., and a vp at Arthur D. Little.

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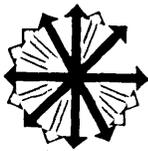


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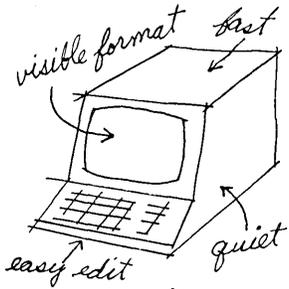
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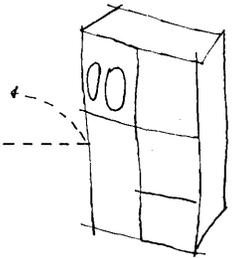
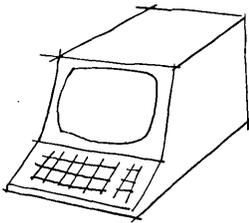
To CRT or not to CRT...

If you've been holding back, the economical new buffers from Wiltek can help you decide.

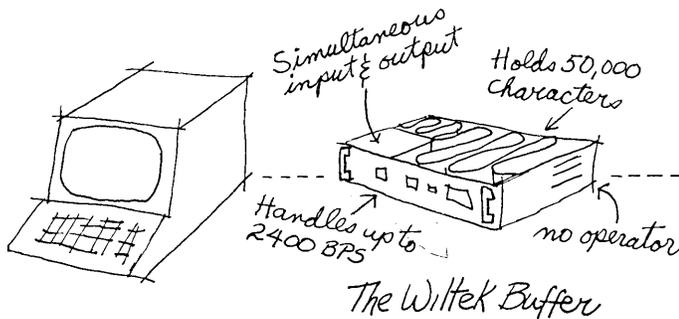
There are plenty of good reasons to replace your key-punch and key-tape devices with CRT sets. But you've probably heard horror stories — about beautiful young CRT operators grown old waiting to transmit to an over-burdened computer . . .



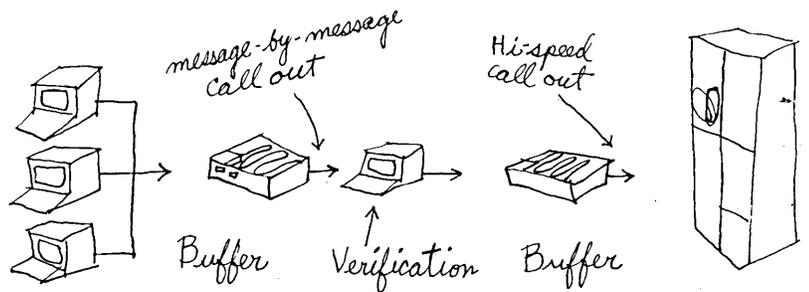
About the need to install a bigger, more expensive computer to handle CRT output. Relax. The Wiltek buffers are here. They can smooth and regulate the flow of data between CRT's and your computer.



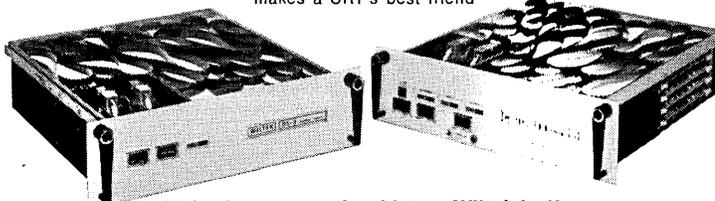
A Wiltek buffer holds data when the computer is busy, forwards data when it's free. CRT operators send at will, yet computer load evens out. Wiltek buffers even let you add off-line CRT's to an existing on-line CRT system without stepping up to a bigger computer.



Here's how several telephone companies use Wiltek buffers for service order entry. CRT operators free-wheel data to the first buffer where it's held for call-out by a CRT verification station. After checking, data moves to a second buffer to await call-out by the computer. Data flows automatically . . . There's no waiting, no hand-carrying of cards or tapes.



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Sycor 340. The one CRT terminal that does it all. Heart of the Sycor System. Trim. Tasteful. Yet figuratively bulging with the newest of proven, mass-produced modular microprocessor technology. All of it operator-oriented. So easy to learn and use that any regular office guy or gal takes to it quickly and can achieve high productivity without knowing a thing about data processing.

Entry by electronic keyboard onto magnetic tape cassettes permits data to be recorded about 30 per cent faster than it would be electromechanically. Sycor 340's unique automatic paging option handles even long or complicated forms by accepting them in small segments, or pages, easily scanned. Then, it automatically displays page after page of labels and field control characters, easy for the operator to follow. And (hallelujah!) no cards, no paper tape to mess with. Just compact cassettes that hold the equivalent of 1400 punch cards. Easy to load and to store. Thriftily re-usable.

You can interface the 340 with the Sycor printer and get all the versatility of high priced line printers. Use multipart, continuous, pre-printed forms for a host of applications.

Like order forms.
Remote invoicing.
Remote payroll checks.
Whatever.

Two 10-digit accumulators—a Sycor first, by the way—generate totals or subtotals detecting keying errors in keying or verifying. Other error detection features include visual proof-reading from the CRT, programmed entry, format field and character checking, and check digit verification. Add and subtract operations give you automatic total and subtotal field computation and entry without re-keying on an adding machine. Result? Clean tape output—at the data source—that cuts delays and confusion, dramatically lowers mainframe processing costs.

But data capture is only a part of what you really want a terminal system to do for you, isn't it?

Sycor's modular system can be configured for batch communication, via the voice-grade public telephone network, for attended or lower-cost unattended operation. Sycor's binary synchronous procedures, with automatic retransmission that provides automatic error detection, and speeds of 1200, 2000 and 2400 baud, are compatible with S/360 hardware and software.

You can set up an off-line system that gives you the advantages, but none of the complexities, of teleprocessing, by using the Sycor 610 Communication Converter Station at your central office to record on, or transmit from, computer compatible magnetic tape.

That's another part, right?
Talk to Sycor.

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SYCOR INC