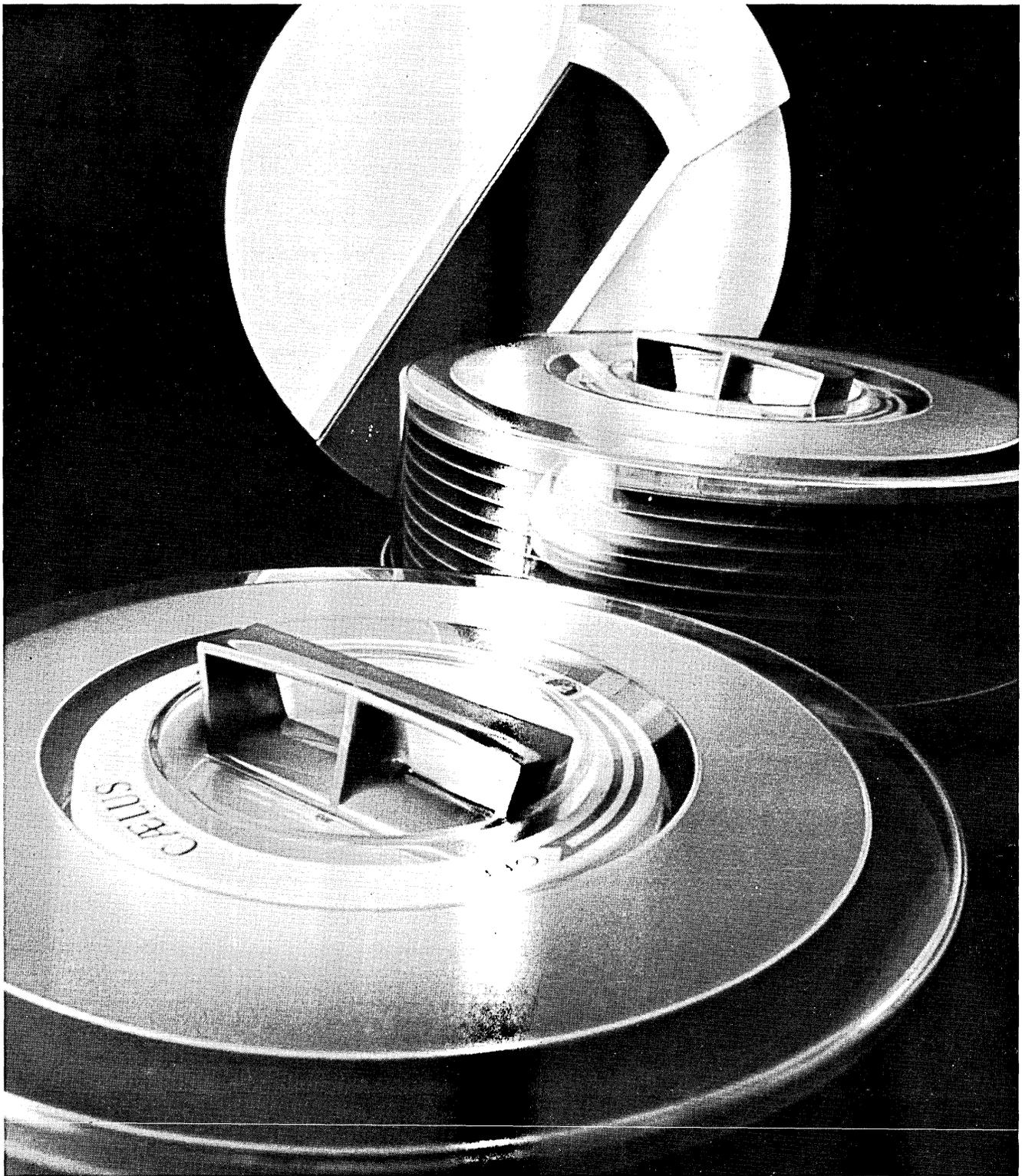


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July 15

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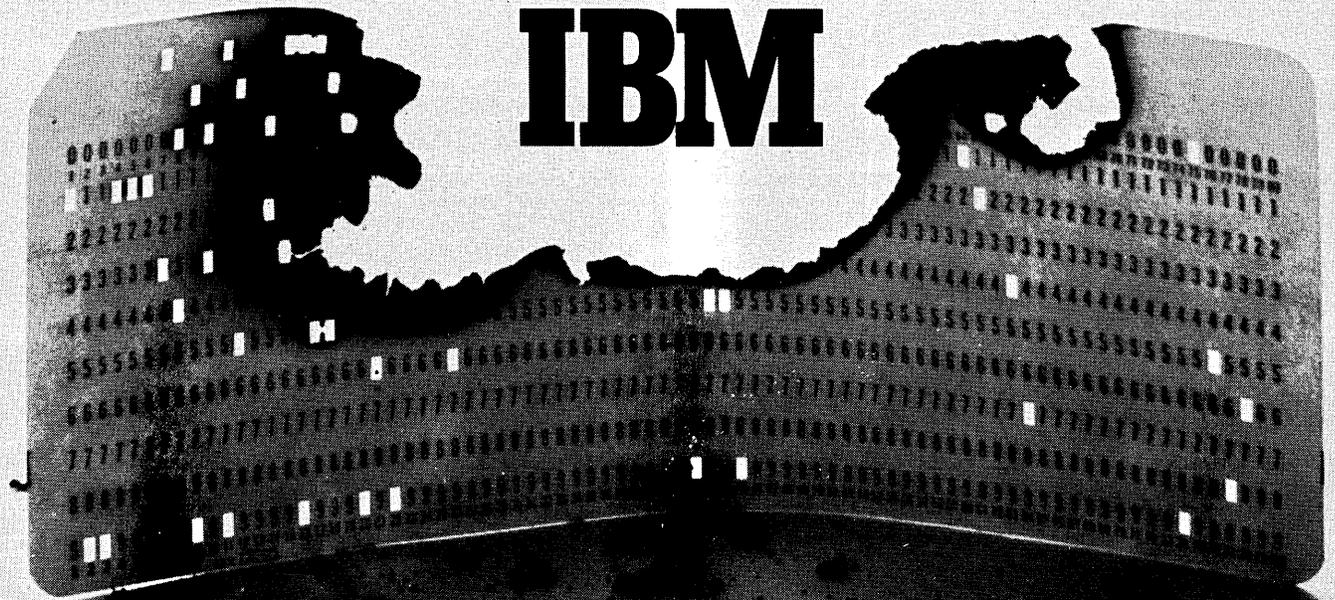
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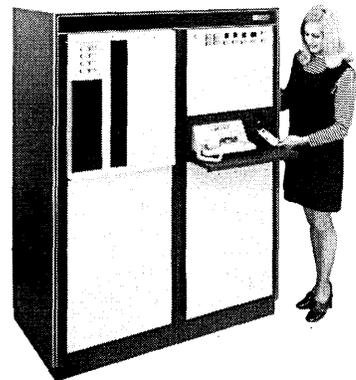


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*Remote off-line terminals capture data error-free and speed it to the central computer.*

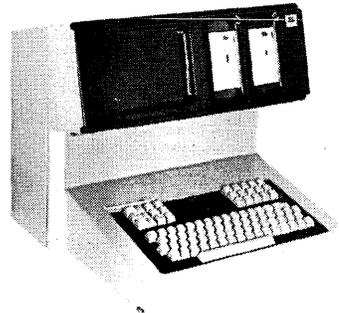
Fast, efficient processing of the thousands of reservations that pour in for American Express tours begins at the travel division's five Regional Reservation Centers in New York, Chicago, Toronto, Atlanta and Los Angeles. These tour bookings, phoned in by some 8,000 travel agents and the company's own nationwide network of offices, receive immediate verbal confirmation from available inventory.

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it is received and converted to computer compatible tape by Sycor 610 data communications stations.

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# DATA MATI<sup>71</sup>ON<sup>®</sup>

**JULY 15, 1971**

volume 17    number 14

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F. BARRY NELSON. Exhibitors down, attendance down, but booth inhabitants reported brisk business on the floor and plenty of influential prospects.

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IBM's second major price cut in six months has been met with price adjustments by the competing independents; but many of these will suffer in the money market. IBM's action lowers the already-shrinking profit margins of the competition. Users, however, find big savings as extra shift charges on peripherals come to an end. Look for some big bargains in data transmission rates, if MCI, Datran, Western Union and Ma Bell carry forward their plans to build huge data transmission networks.

### 72 The Forum: COMmentary

CHARLES ASKANAS. Doubts have been expressed in edp trade publications as to the state of health of the COM subindustry. A manufacturer of COM (surprise!) disagrees.

### About the Cover

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CIRCLE 38 ON READER CARD

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**JULY 15, 1971**

volume 17 number 14

This issue 110,424 copies

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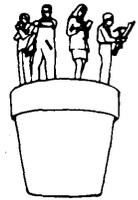
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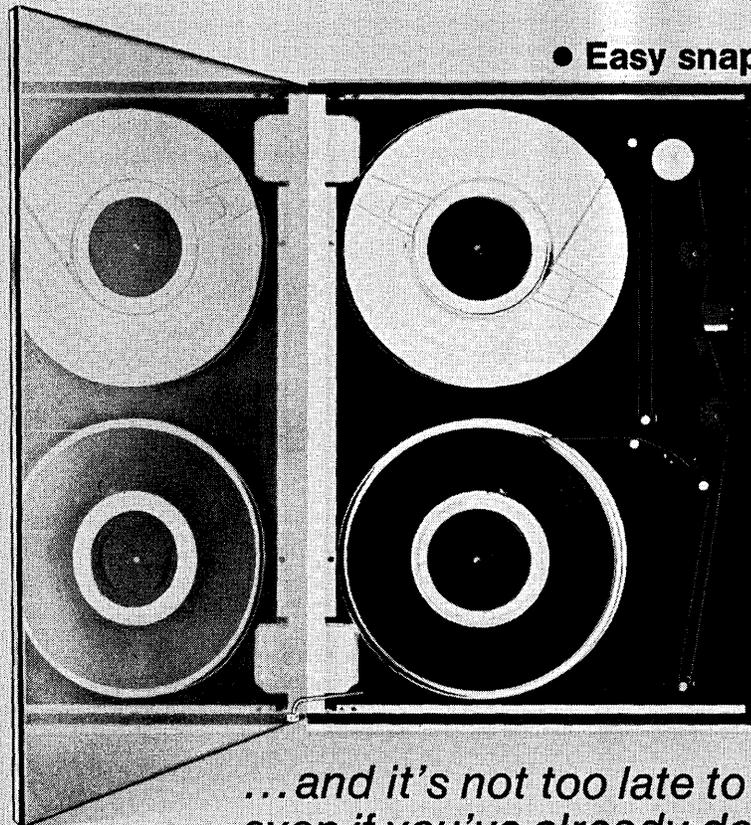
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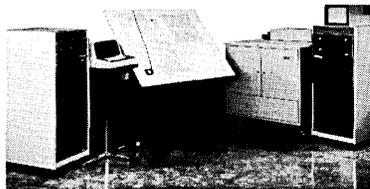


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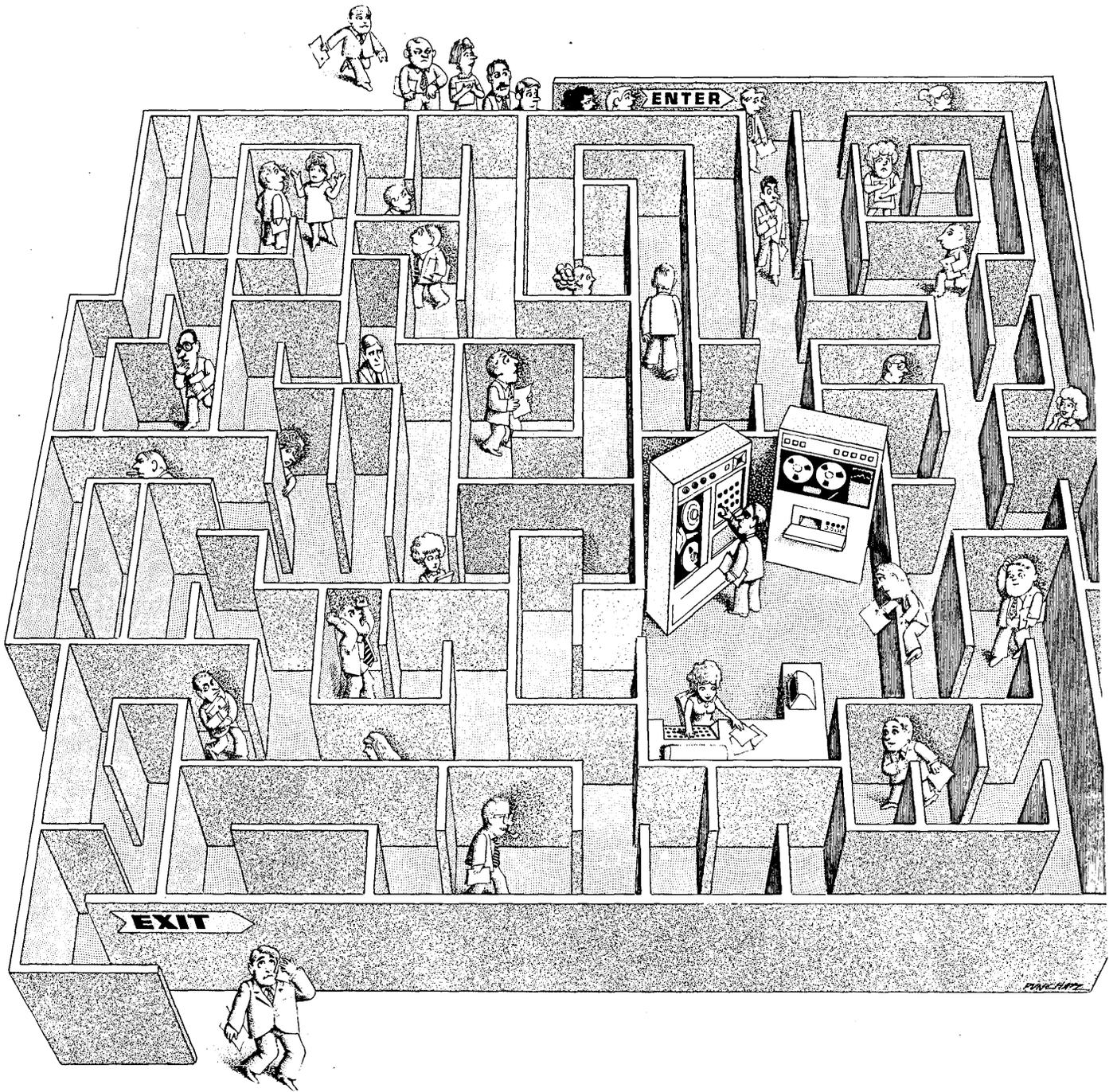
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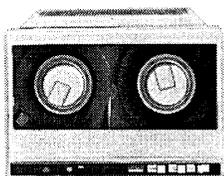
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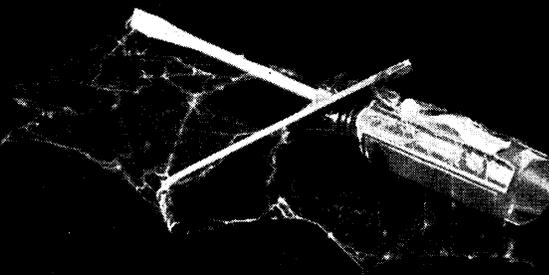
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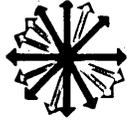
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**Bright? Right.**



# LETTERS

## Grounds gripping

Sir:

Please let me add a clarification of our challenge. We in Computer Professionals Against ABM assert that no computer professional has ever publicly disputed our technical argument against the ABM software. Nobody has ever said, "Well, I am a computer professional, too, and I say it *will* work."

This is not at all the same thing as saying, "Of course it won't work, but I think we ought to build it anyway," or, "I don't know whether it will work or not, but I think we ought to build it anyway." Both of these are perhaps rational positions to take (although we disagree), but they do not come to grips with our technical argument.

On the basis of a long series of correspondence and a recent phone call, I believe that my old friend, Bob Head, has been misrepresented in the April 1 News Scene story about us (p. 46). He has not "provided technical assurance that it will work." He does indeed think it should be built on other grounds, but he takes no position whether it will work or not.  
DANIEL D. MCCrackEN  
Ossining, New York

## Bad timing

Sir:

Fifteen years ago it was a popular sport to display the absurdities one could find when a FORTRAN compiler would read 5.0 from a data card and treat it as 4.99999. Today most of the manufacturers have improved their software so that simple numbers look the same when read in and printed out. But what about functions such as INTEGER(N) which is supposed to give the integer part of a real number? What does a manufacturer mean when he says his system handles real numbers to a precision of six or eight decimal digits? Does he mean we can expect to add 0.4 and 0.6 and take the integer part of it correctly? Try these examples on your time-sharing computer.

- A)  $\text{INT}(0.4 + 0.6) =$
- B)  $\text{INT}(0.1 + 1.9) =$
- C)  $\text{INT}(0.2 + 1.8) =$
- D)  $\text{INT}(0.3 + 1.7) =$

$$\text{E) } \text{INT}(0.4 + 1.6) =$$

$$\text{F) } \text{INT}(0.5 + 1.5) =$$

All three of the different systems these examples were tried on gave the sum of the two numbers correctly. But General Electric's Mark II service gave the answers to examples C and E as 1. IBM's CALL/OS system also got two wrong, but a different two, examples B and C. A third service, Tymshare, Inc., gave wrong answers for the first five cases! How far have we really come since the days of the first compilers?

THEODORE SHAPIN  
Orange, California

## Revisited revised

Sir:

We wish to thank you for including the MAC 16 and MAC Jr. in the survey, "The Minicomputers Revisited" (May 15, p. 24).

Enclosed is an updated MAC computer specification for your future reference. We would especially like to bring to your attention two of our software packages—a real-time executive (RTEX) and a disc operating system (MBEX)—both of which have been available since January of 1971.  
GARY P. BOOTH  
Lockheed Electronics Co., Inc.  
Los Angeles, California

## Sight/performance

Sir:

Some of your recently published letters have shown an interest in the legibility, for human use, of symbol fonts designed for optical character recognition. About three years ago Mrs. Glennis Bell did two experiments on the relative legibilities of USASOCR X 3.17 (which I believe is OCR-A), Farrington 12L2/12F2 (which I believe is like OCR-B), and IBM Manifold 72 (which is a conventional typewriter font). Since the studies have not been published, a brief report here may be of interest to your readers.

One experiment compared the errors made by five subjects who were shown the symbols one at a time, in random order, with the viewing time shortened to 15, 10, and 8 msec. The results showed significantly few-

er errors with X 3.17 than with the other two.

The other experiment compared the speed and errors made by 12 skilled typist-secretaries who copied both English text and random materials in all three fonts. Speed and accuracy were significantly best for Manifold 72, next best for 12L2/12F2, and least for X 3.17; but the differences were small. There was some evidence that more practice might have reduced, or possibly eliminated, the differences she found.

While her experimental results are not decisive, we believe that they raise serious doubts about the validity of predicting or judging human performance from visual inspections of a font's appearance, from opinions about a font's legibility in the absence of data on performance, or from subjective ideas about "distraction," "familiarity," and the like. Since the main concern of everyone seems to be with the performance of users, then why not collect data on the performance itself?

We have done many other experiments on the performance of people in reading and symbol-identification tasks during the past few years, and we would be happy to answer inquiries.

GLENN C. KINNEY  
The Mitre Corporation  
Bedford, Massachusetts

## Scratching back

Sir:

In response to Samuel Gordon's inquiry (Letters, May 15), we have found the following uses for used continuous-form printer and plotter paper:

1. Scratch paper (many of us never use "new" paper for first drafts);
2. Packing material in shipping department;
3. Paper for posters made by student and other nonprofit groups;
4. The local ecology group picks up our used printout and finds uses for the paper;

5. We have given stacks of used paper to nursery schools—children like big pieces of paper to draw on;

6. Unfortunately, a few times we found it necessary to use the "other" side of plotter paper, as we had run out.

MARY FOWLER  
Physics International  
San Leandro, California

## Xeroxing in

Sir:

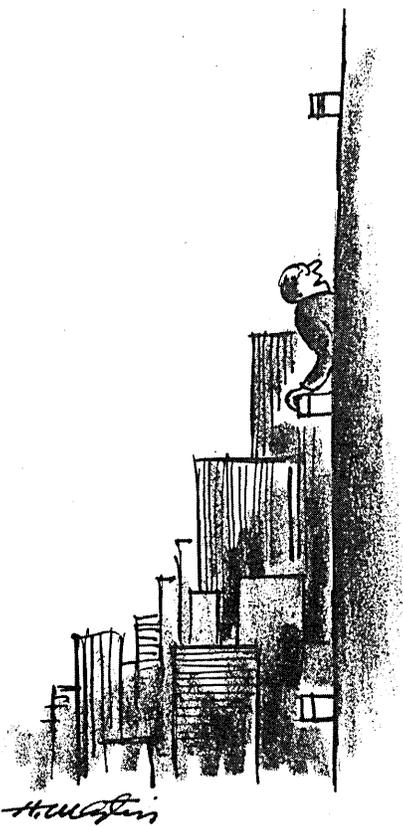
Please advise Messrs. Theis and Hobbs ("The Minicomputers Revisited") and your staff that Xerox is not spelled with a "Z"! See top column of p. 32 of the May 15, 1971, issue.

RAYMOND S. PERRY  
Xerox Corporation  
Rochester, New York

## The XZ affair

Sir:

I have enjoyed the enclosed cartoon for several months. However, p. 32 of



"Miss Caulkins, come quick!  
There's a xebra going into the  
Xerox building."

© DATAMATION ®

your May 15 issue is much more  
amusing.

MICHAEL WOODARD  
Sacramento, California

## Feed need

Sir:

In reference to the March 1 article titled "At Last: Standards for Keyboards" (p. 32), I would like to make the following comment. A

standard which doesn't meet the needs of the community will not be accepted. There is a need for a standard for the New Line (NL) function. The European standards include this control by eliminating the control for Form Feed (FF) and assigning the code which was used for FF to the control for Line Feed (LF) and assigns to the new control New Line the code which was previously used for Line Feed. The rationale for this suggestion is:

1. The New Line control is needed and is used much more than the control Form Feed.

2. The Form Feed function can be accomplished by repeated use of the Line Feed control function, and hence the assignments of LF to the previous code for FF.

3. Many systems currently use the code LF to perform the function of NL.

I would support a standard which recognizes the existence of the New Line function and hope that it isn't too late for agreement.

J. M. WINETT  
Lexington, Massachusetts

## Deafusion

Sir:

This is in reference to the May 1 article, "Computing Signs Help Train the Deaf," by Fred Gruenberger and Robert Teague (p. 36).

Being deaf myself, gainfully employed as an associate programmer with IBM Corp., I can't see how the authors measure the success of the program when such authors fail to have a degree in the education of the deaf. As far as interpreters are concerned, how can a deaf person, in a normal classroom, learn more, if any, of the concepts of a subject when such person is torn into *three* concurrently receptive worlds? How can one learn when he has, at the same time: to look at the blackboard (reception 1); to look at the interpreter who takes up most of the deaf student's attention (reception 2); and fails to accept a learning stimulus by not writing down learned and extraordinary notes (reception 3)? Note takers, depending on their style, will take notes for themselves, which could be very irrelevant to the learning desires of a deaf person.

I do applaud the authors for taking a part in creating new signs. Such signs will be helpful in a deaf environment, only to the extent the

teacher is using it! This method is the best method and widely accepted among the deaf today. "Total communication," as it is called, is being used in more learning institutions for the deaf than before.

My formal education was obtained at Gallaudet College, Washington, D.C. This college, being the only liberal college for the deaf in the world, gave me a good foothold in my learning process. There were no interpreters in classes, because the instructors, be they deaf or normal, have to use the sign language. This process was a big boost in my learning desires.

Concluding, I fail to see what results were obtained by the authors' project and would very much appreciate knowing the job placements, if any, of such students in the programming field.

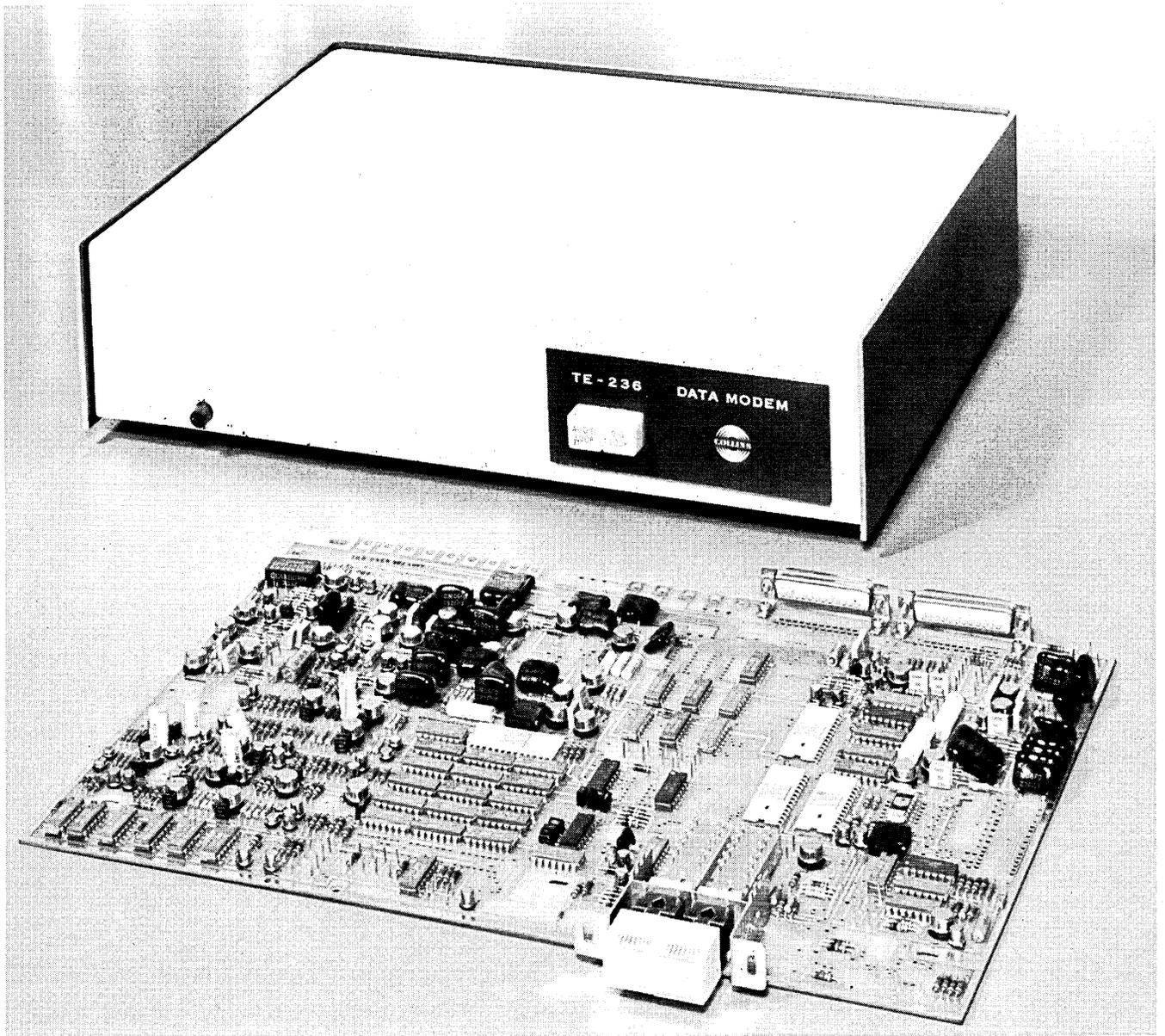
KENNETH S. ROTHSCHILD  
Poughkeepsie, New York

## Intensive care

Sir:

In the article in the May 1 issue, "Computing Signs Help Train the Deaf," the authors state: "Ideally, a subject like computing should be taught by someone who knows the language of signs himself (and who knows computing too) and to a class consisting entirely of deaf students." These ideal conditions actually exist right now at the National Technical Institute for the Deaf on the Rochester Institute of Technology campus. Four full-time data processing professionals are training 20 deaf students via sign language in such courses as basic computer concepts, flowcharting, operating concepts, RPG, BAL, COBOL, FORTRAN IV, PL/I, advanced programming, and systems design. Within three years, when the NTID is fully operational with 750 students, the number of students in this program is projected to grow to 50. We share the philosophy of the authors that the greatest hurdle for deaf programmers is getting intensive training—an area in which we have been quite successful to date. While for us the use of specialized signs is not so critical—our instructional approach and pace is geared to a deaf-only group—these new signs will indeed be a most welcome addition to the sign language vocabulary of our instructors.

E. MARSHALL WICK  
Rochester, New York



## the test features alone make this new modem the best you can buy

Collins new TE-236 2400-bps data modem is making the competition lower its price. It's the only modem on the market with the test capability of isolating in seconds a malfunction in the telephone line circuit, the terminal equipment, or the modem — thereby permitting immediate remedial action. And with a reliability of 20,000 hours (MTBF), odds are excellent the problem will not be with the TE-236.

Collins new modem is priced considerably lower than competitive units approaching its quality and features. Among these features are fast acquisition time, low system bit error rate,

and advanced MOS/LSI circuitry. End user or OEM versions available now. Call or write your Collins rep or Collins Radio Company, Dept. 600, Newport Beach, California 92663. Phone: (714) 833-0600.



COMMUNICATION / COMPUTATION / CONTROL



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

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

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

- |                    |          |
|--------------------|----------|
| Distribution       | Volume   |
| Urgency of message | Language |
| Frequency of use   | Accuracy |

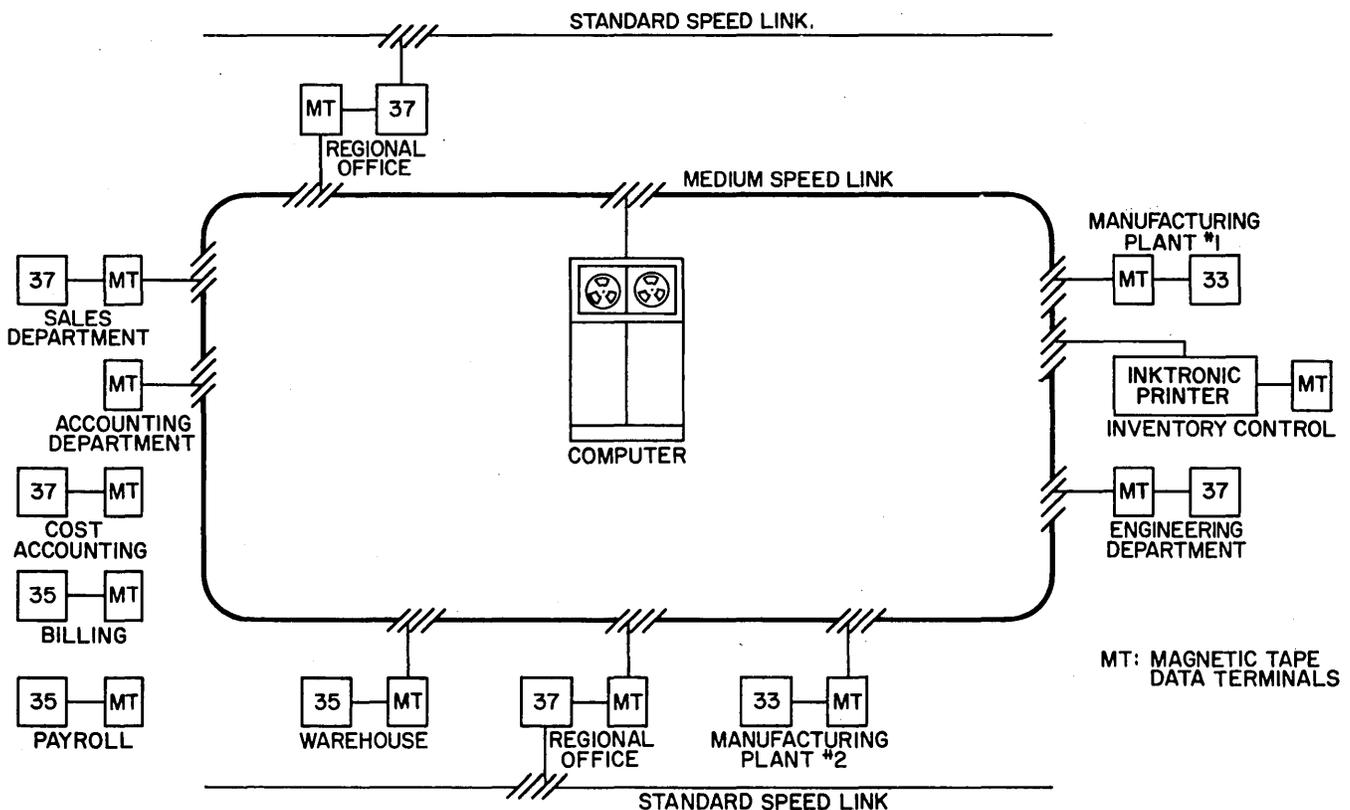
The diagram below demonstrates how you can fit a number of Teletype terminals

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

Using Teletype magnetic tape data terminals, combined with various Teletype keyboard send-receive sets, you obtain

some unique system flexibility. And the on-line time saving aspects of operation are really dramatic. Magnetic tape data terminals can keep data flowing on-line at up to 2400 wpm.

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



# DATA COMMUNICATIONS

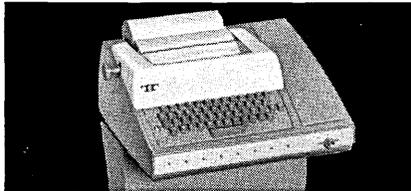
equipment for on-line, real-time processing

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

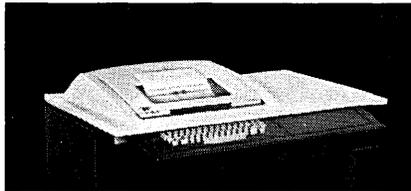
Since data generated at manufacturing plants is urgently needed, but volume is low, low-cost model 33 terminals are used here. The warehouse data volume is higher, but not complex, so a heavy-duty model 35 is working here.

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

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



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



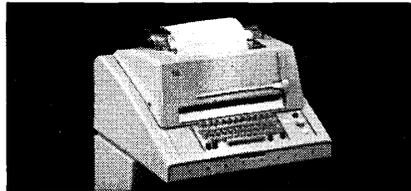
*Inktronic® data terminals: A unique electronic, solid state terminal. Prints up to 1200 wpm. Forms characters through electrostatic deflection (no typebox). ASCII compatible.*

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

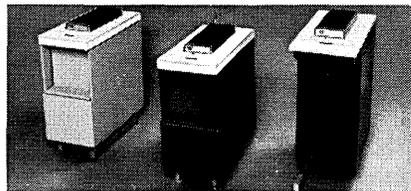
The sales department uses the model 37 for order processing. It has on-line vertical and horizontal tab set control, and form feed platen (optional) which makes data transmission and reception on multiple copy business forms easy and economical.

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

As you can see, Teletype's modular terminal design allows you to use vari-



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

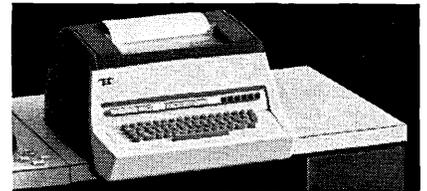


*magnetic tape data terminals: Use compact reusable tape cartridges. Operate on-line at up to 2400 wpm, and connect "locally" to lower speed Teletype terminals using ASCII.*

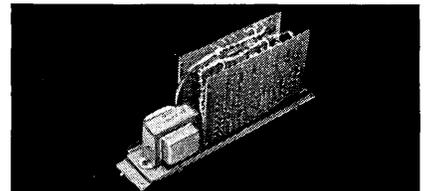
ous units as building blocks to meet the most demanding system needs. Teletype also has the station and error control accessories necessary for more efficient and economical data communications operations. Since cost is a very important part of the mix, Teletype offers greater terminal capabilities on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

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

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



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



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

Teletype is a trademark registered in the U.S. Pat. Office

machines that make data move



CIRCLE 16 ON READER CARD

# edp directory

good advice when  
you're considering a  
new product

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

To give you a glimpse of how the information is organized, we're reproducing here the first part of the introduction to Chapter I, Computers, plus some sample listings of the very small and the very large computers. From these, we think you can get an idea of what's

# before you buy

in between... the hundreds of machines that have been analyzed and correlated to simplify your screening before selection.

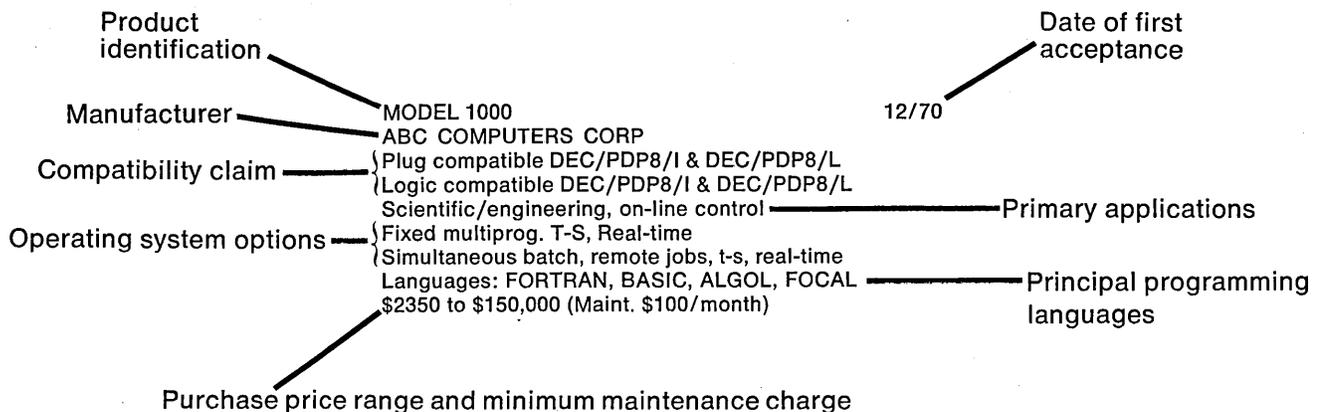
## Chapter I . . .

## Introduction

The computers included in Chapter I range from relatively simple-minded controllers through specialized missile or fire control devices to super-scale scientific and commercial data processing configurations. The computers, generally speaking, are arranged in order from smallest to largest on the basis of their low-end prices. The minimum prices quoted are generally for mainframes with a minimal number of con-

trollers and the smallest main memory; the prices quoted as the high ends of the ranges may include a very broad range and large number of peripherals.

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



Using the labeled composite entry as a key to the compressed information in the listings,

take a look now at some actual samples . . . . .

# DIGITAL COMPUTERS

## DIGITAL COMPUTERS

### Under \$5000

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

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

from the   
very small

to the very   
large

### \$500,000

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

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

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

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

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

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

MODEL 20 GRI-909  
GRI COMPUTER CORP  
03/70

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

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

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

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

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

### \$5000

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

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

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

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

### \$1,000,000

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

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

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

We think the **datamation industry directory** will save you time, trouble, and money if you use it this way. For your own copy, clip and mail the coupon today, with check or company purchase order enclosed.

## DATAMATION® INDUSTRY DIRECTORY

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Send me \_\_\_\_\_ copies of the 1971 Datamation Industry Directory at \$25\* a copy. \_\_\_\_\_ Check enclosed \_\_\_\_\_ Co. purchase order enclosed. (\*in U.S.A. and Canada; \$35 elsewhere)

Name \_\_\_\_\_ Title \_\_\_\_\_  
Department \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

# Introducing the newest scientific computer from IBM.



PI FORT turns any System 3 with 12K into a scientific computer. All that engineering you're now doing at a service bureau can now be done in-house at tremendous savings. Programmatic's ANSI FORTRAN is full-fledged, fast, does not require a disk and, most important, is available right now. (The poop says that IBM's FORTRAN for the System 3 will not be ready until late '72.) All this for only \$100 a month. Try it out for 30 days free. You'll see.

#### Programmatic, Inc.

11661 San Vicente Blvd., Los Angeles, Calif. 90049

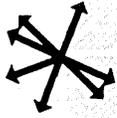
- I would like to take advantage of the 30 day free trial offer for PI FORT (System 3). Please send all necessary paperwork.
- I would like further information including complete system description and manual before taking advantage of the free trial offer.

Name \_\_\_\_\_  
Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_



**PROGRAMMATIC**

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11661 San Vicente Blvd., Los Angeles, California 90049 (213) 826-6503



PURCHASERS HANDED  
ANOTHER IBM BONUS

IBM, handing another bonus to purchasers of its equipment, made a series of changes to its maintenance agreements last month. Particularly significant is a reduction on charges for "optional weekday periods." In other words, those who need maintenance beyond the basic nine-hour period (unchanged) are getting a break that could save them thousands a year. The greatest cuts, which vary, are on the 20- and 24-hour agreements and would most seem to benefit users of teleprocessing systems.

The obvious negative impact (besides on IBM's computer competitors) is on third-party maintenance firms, although it's not clear at writing how serious that is. Comma Corp., for example, is still 10% cheaper on the basic nine hours but says IBM comes "closer" to it on the optional periods. Whether and how Comma will change its fees was unknown at press time.

370 PRICE BOOST  
IS NOT IMMINENT

Scratch those rumors that IBM might raise its prices on 370 mainframes. We hear there's no such action planned -- at least for now. Too much slick pricing maneuvering on the part of IBM just could arouse the Justice Dept., which has maintained a deafening silence in the wake of IBM's recent actions (price cuts, etc.) that have sent shock waves throughout the industry.

LOSING FACE IN JAPAN

Digital Equipment Corp. has been trying to save face in Japan ever since its arch rival and spin-off, Data General Corp., signed a franchising agreement with Nippon Mini-Computer Co. for the manufacture of Data General's minis in Japan (see July 1, p.55). Digital remains inscrutable on its activities -- at this writing saying only that it has been negotiating to improve its Japanese business and will continue to do so. If Digital is to save its face in the booming Japanese market, there are many who feel that the firm must pull off a franchising agreement just as juicy as Data General's.

UP WIMMIX?

An option to acquire 40 or 45 more systems for the World Wide Military Command and Control System (Wimmix) is being "discussed" by DDR&E with other Pentagon offices. DOD controller Bob Moot is said to oppose the option that would boost the maximum order to 75 or 80 systems from the present 35. If an add-on is OK'd, the feds may have to accept additional bids. At least one rebid is probable -- from Burroughs, which was declared nonresponsive the first time around because its discs weren't ready. If the option is added, the winning Wimmix bidder won't be known for six months.

GROSCH WOULD LIKE END  
TO NAS COMPUTER GROUP

A bitter attack on the prestigious Computer Science and Engineering Board (CSEB), a part of the National Academy of Sciences, has been unleashed by Herb

MEMORY EXTENSION FIRM  
OPENS HONG KONG PLANT

Grosch, the industry's well-known gadfly. He accused the board of interfering with the computer activities of the National Bureau of Standards; of lending its prestige to academic members trying to wangle federal money for pet projects; and of acting as a foil for Pentagon efforts to restrict computer exports. The charges were detailed in a letter Grosch addressed primarily to 12 recently appointed members of the 24-member CSEB. He recommended that they disband the group.

Anticipating stiff competition in the main memory extension market, front-runner Data Recall Corp. of El Segundo is setting up facilities in Hong Kong. President Stuart Lotwin says the firm will make nearly all of the components it's been buying elsewhere and save 40%. The firm is one of seven making core memory extensions to the IBM 360/30/40, and 50. It has installed 115 systems since February of 1970. Lotwin said competition will come not only from independents, but from IBM, who may react through maintenance maneuvering instead of price cuts.

MARSHALL SURFACES, BUT  
DIRKS STAYS IN HIDING

Its first key/disc data preparation system will be delivered in November by Marshall Industries, latest entry into the crowded data entry market. Up to 64 keyboards, renting at \$65 a month each, can be used on the shared-processor system (\$1150/mo. with controller), whose first public showing is the Las Vegas FJCC. Meanwhile, mysterious four-year-old Dirks Electronics of Sunnyvale has decided not to announce its first product, which also happens to be a key/disc system (the model 001 64-station system), that had been scheduled for introduction next month. President G.F. Pilcher won't say why. Nor will he discuss published reports of Dirks' proposed \$40,000 Datastreamer computer and a 9 x 4-inch crt terminal priced at from \$3000 to \$6000. Says Pilcher, who joined Dirks this spring from Memorex where he was vp-finance: "We're going into hiding for three months."

RUMORS AND  
RAW RANDOM DATA

Key/disc data preparation system manufacturers are confident IBM won't enter their market for at least another 18 months. Their reasoning: IBM wants to protect its estimated 400,000 keypunch systems. IBM's threshold of pain is 30,000 keyboards, and that shouldn't be reached by the key/disc makers for another 18 months. But there are others who say IBM will never enter because it can't afford to dent its keypunch revenues, estimated at \$50 million a month . . . That fretting about layoffs at RCA Computer Systems' headquarters in Marlboro, Mass., may be unnecessary: The personnel department there has been told to gear up to prepare to double employment at the plant over the next 18 months . . . IBM, we hear, has taken its systems engineering force off quota, easing the strain of a couple of poor years for making quotas. It's also changed its sales commissions policies so that some, if not all, will get a percentage of commission on their quota even if they don't make it.

# Data base: before you invest, investigate.

The most exciting concept in computer usage today is the data base information system.

The most *talked-about* data base management system is IMS-2.

But the most widely and successfully *used* DBMS is Cincom Systems' TOTAL.

With all of its power, TOTAL is applicable on 64K systems and up, and in any environment.

That says a lot for TOTAL. And it tells you something of great importance if you're thinking data base.

Because the most critical decision for the ultimate success of information system implementation is your *choice* of data base management systems.

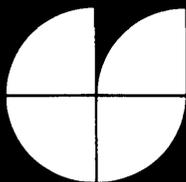
It will serve you well to investigate TOTAL. (More

than 80 blue-chip customers are achieving their information system goals using TOTAL.)

Even if you've already started to implement, TOTAL's design approach will allow you to accelerate your current progress and enhance the effectiveness of your investments in time and energy for future success.

In fact, it will pay you to consider TOTAL no matter what your status: if you're thinking data base; are in the decision-making stage; implementing; or just curious.

Write today for full information about TOTAL, the most powerful system in existence. Currently available for use with IBM DOS or OS, Honeywell and RCA. Cincom Systems, Inc./2181 Victory Parkway/Cincinnati, Ohio 45206.



**Cincom Systems, Inc: We create efficiency.**

Cincom offices also located in Palo Alto, California and Toronto, Ontario, Canada.

## **Some ground rules to help you begin to find your way around this volatile, dynamic market**

# **Retail Terminals... a**

■ "The retail industry is on the threshold of a conversion to electronic point-of-sale terminals from mechanical cash registers." That statement may or may not go unchallenged, depending on who hears it. First, the term "retailer" is often used loosely to include food chains, discounters, department stores, drug chains, specialty stores, etc., whereas most of these present different problems from a terminal point of view. Then there are the big retailers as opposed to the small ones. The

---

**NCR, with the lion's share of the conventional cash register market (which won't disappear overnight), has to be a factor . . .**

---

former are considered prospects for in-house systems where the latter probably will depend on services, leased terminals, etc.—which may be a long time coming and being accepted.

A second consideration is the definition of "threshold." Some say that retailers have been poised at the threshold for a number of years. Others argue that they will remain poised there for many years to come. Regardless of what point of view you take, you will have to agree that there is a lot of action in the retail terminal field at present—principally in the point of sale and credit authorization areas.

What is the reason for this situation? And why is it occurring just now?

The answer to number one is that retailing is a "transaction-oriented" industry (like banking, for example) and a natural for a terminal system that provides large-scale data collection capabilities and some on-line characteristics. The answer to number two is simply that the technology is just becoming available at prices that can be afforded by the industry. Retailers in general have been accused of being

nonprogressive (or even "cheap") in their attitude toward advanced electronic systems. This sort of judgment is probably harsh when you consider the volatile marketplace they live in and the narrow margins they must deal with.

The move to electronic terminal systems in retailing was predictable a number of years ago. In 1963, when the National Retail Merchants Association asked Touche Ross & Co. to consider the long-range implications of edp in retailing from the chief executive's point of view, a two-day seminar was developed called the Retail President's Conference which took as lofty and long range a view of the problem as was considered warranted under the circumstances. Probably the most interesting part of that seminar was a session called "The Store of 1970" in which a terminal-oriented department store system was postulated together with a cost structure that seemed reasonable for the industry. It is interesting to note that the terminal systems for department stores that are being offered today by most manufacturers can be described quite accurately by "The Store of 1970" system. It is not so much that Touche Ross was clairvoyant in its predictions. Rather, the nature of the problem tends to lead to a particular solution.

The department store group is a good basis for discussion in this article because it represents what is probably the most complex systems situation in retailing and also because it is the area in which the most work on terminals is being done at the present time. This type of retailing represents, according to its name "department" store, a diverse collection of merchandise items brought together under one roof. "One roof" has to be a figure of speech because one of the characteristics of the industry has been its enormous expansion in numbers of locations (stores) in recent years.

When a store sells hundreds of thousands of items in 15 or 20 locations (branches), at literally thousands of points of sale, it generates a substantial data collection problem. The term "item" requires some precise definition because a blue tea kettle is different from a red one, and a size 8 dress is different from a size 10.

# POS Survey

by William D. Power

Retailers have coined the term Stockkeeping Unit (or sku, as it is called in the trade) to indicate this level of description which defines an article uniquely for purposes of ordering, inventory control, etc.

Creating a system which will keep track of the large number of sku's in an orderly fashion is only one part of the problem. There is also the element of time to be considered as a system constraint. Because of the emphasis on fashion elements in a wide variety of products, the selling life of an article can vary substantially. Reordering (or marking down, which is the opposite alternative for the retail buyer) can present a problem with big financial consequences. It is necessary, therefore, to identify the trend in sales (or, say, the on-hand position) very rapidly. This is one of the pressures for faster reporting which, in the extreme cases, can run all the way to on-line systems.

Sales recording is not the only part of the transaction that requires handling at the time of and at the point of sale. The whole credit situation, which has been the subject of so much attention in the press recently, can be a nightmare to the retailer who does a large credit business (and most of them do). Because of stolen or forged cards and other fraudulent practices, retailers have experienced increases in loss of merchandise and in bad debts. Credit authorization has gotten increased attention in the last two or three years, and more money is being spent on it now than would ever have been dreamed of a few years ago. This defensive move on the part of retailers represents a cost that they have little control of if they are to act to minimize their exposure and loss.

Once again, the systems requirements are fairly rigid here because a conscientious retailer will try to maximize the service aspects of the situation and handle a customer in a minimum amount of time. A fast and accurate identification must be made of the customer, and an inquiry must be made into a very large file (of all customers) if an up-to-the-minute, positive status of credit standing is to be determined. But, because of limitations on file capacity and inquiry capability, the common method today is to refer to a "negative list" (bad accounts only, rather than

the whole file). This method is less than perfect, but it is the most practical solution from a current point of view of cost and capability.

If the user of a "hot" card is out to take a store, he will make a number of purchases in rapid succession in a very short period of time. With present methods



it is difficult, if not impossible, to detect this type of "load up" (as it is called in the trade). Actually, what is needed in this situation (and is now being offered by several manufacturers) is an on-line system that at least records the fact that a card has been used "X" times during a day, or an hour, or what-have-you.

Presently, the most common methods in use at the point of sale are manual and batch oriented. The basic machine is the mechanical cash register. That is not to say that there have not been improvements made in mechanical registers over the last 5 or 10 years. The addition of punched paper tape outputs and optically scannable journal tapes have made it possible to collect at least a part of the data available at the point of sale in machine readable form as a by-product of the cash register operation. However, the department store industry is still heavily dependent on the use of registers which produce "hard totals" that are read at the end of the day's business to indicate sales activity in various categories.

There is one notable exception to all this, and that is the Uni-Tote terminal (around since 1965) now op-

**Sweda has an excellent opportunity to improve its position in a new ballgame.**

erating at some 3,000 points of sale. The Uni-Tote machine is actually a combination of electromechanical and electronic components which operates in a system that has substantial data collection capability as well as certain on-line capabilities. The Uni-Tote register, while capable of operating as a free-standing unit much like a mechanical cash register, is connected by wire to a controller system which enables it to record the output of a number of registers at a central location, inquire into random access storage devices (such as for credit authorization), and transmit certain signals back to the point-of-sale location. More details on this and other systems are given below.

As far as credit authorization is concerned, the most common method in use at the present time is the telephone call (some stores may, in addition, keep a "hot list" of stolen credit cards at each register). A call is placed from the point of sale to a central location in the store where reference is made to a variety of media—negative lists, computer printed trial balances produced as a result of billing, ledger cards (where manual systems are used), and, in a few cases, cathode ray tubes which display the status of an account as of a given date.

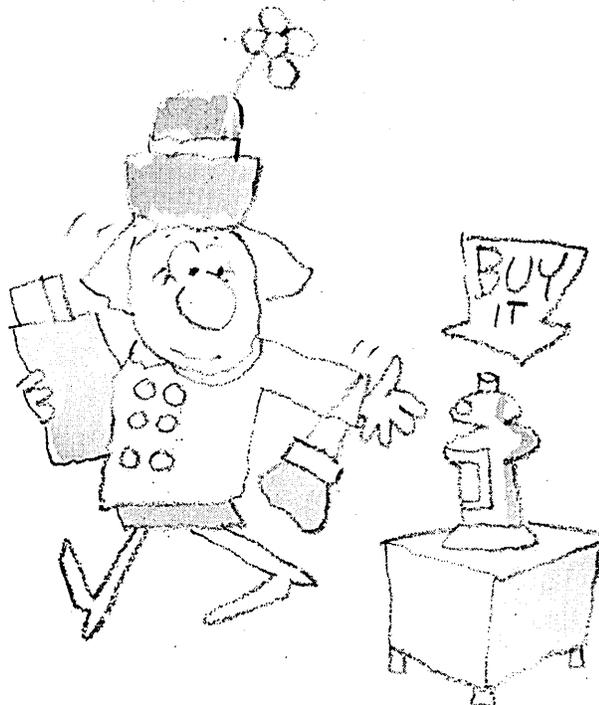
In the last couple of years there has been a flurry of activity in the area of electronic credit authorization systems which provide for key entry of an account number through a small terminal at the point of sale and on-line random access into a file containing either negative or positive authorization data. The most common method is the negative list. A significant number of these systems, produced by three major manufacturers in the market (Credit Systems, Inc.—Credit-Chek; Digital Data Systems—Creditmaster; TRW—Credifier), are installed and operating at the present time. To repeat, the increase in the use of this type of system has been brought about to a great extent by the increase in fraudulent use of credit cards and by the mounting bad debt experience of the credit retailers.

The recording of the financial aspects of the sale transaction and credit authorization are not the only considerations at the point of sale. In retailing there is

also the necessity to record by some means the description of the goods that are sold (or returned). The methods employed at the present time vary all the way from handwritten sales checks which contain a noun description and perhaps a department number, classification, vendor stock number, etc., to a throw-out slip or listed sales check prepared by a mechanical cash register which shows perhaps department and classification. Such registers may be equipped with punched paper tape output or optically scannable journal tape output from which this merchandise information (and an SKU number in some cases) can be read for further processing.

The most common mechanized method of collecting detailed merchandise identification data is the so-called print-punch detailed ticket. These tickets, which are used as the price-marking medium, contain perforated machine-readable coding which can carry about 29 digits of descriptive information on an item. The most common method in use for collection of this data is to remove the ticket physically from the goods, collect it at the point of sale, and process it at the close of business in batch mode. Currently there are some limited installations of special-purpose readers located at the point of sale which can read these tickets and record the information on tape as the transaction occurs.

Most of the general point-of-sale devices which will be discussed below claim the capability of furnishing a device which can read this type of ticket at the time of the transaction. A more recent innovation is the use of the so-called "wand" method of reading optically or magnetically encoded merchandise identification



tickets. This is done through a stroking action at the time of sale and may be accomplished without removing the ticket from the goods.

It can be appreciated that there are a number of other points in retail operations in addition to the point of sale where merchandise needs to be handled and/or accounted for. Some of these include order-

ing, warehousing, marking, transfer among stores, payment of vendors, returns by customers, and others. The thinking on retail systems at the present time includes terminals which will handle activities at these various points. However, the industry has not yet converted to and digested the electronic point-of-sale system, let alone some of these other areas. In due course, terminals will be used by buyers to order merchandise or to control the receipt and marking of merchandise as it comes into the store.

An ideal system (by today's standards) might be one in which a buyer could have access to a CRT display which would indicate merchandise alternatives available to him. Either a typewriter keyboard or some type of "light pen" method could be used to enter his choices or decisions into the system, thereby creating a machine record of the goods ordered and placing them in an "on order" condition in memory. The order could then be transmitted to the vendor in machineable form if he could accommodate it. When the goods arrive at the store or warehouse, another terminal would be capable of accepting keyed information indicating the order being received, or of reading a "ticket" or some other medium that was encoded by the manufacturer and attached to or made a part of the goods.

This process would, in turn, trigger the appropriate number of "tickets" to be affixed at the store and would also shift the transaction from an "on order" condition into a "received" condition and make it available for processing for payment. The goods would then be moved on to the selling floor and passed through the point-of-sale recording system as they were sold. Returns could be handled in a way similar to sales through special-purpose readers or terminals located at customer service points.

The whole system would be supported by a central computing facility which would service a number of locations connected by wire communications or other similar means. The system would have such on-line capabilities as were considered required under the circumstances—credit authorization, merchandise reservation or availability inquiry, price look-up, and other applications where on-line requirements were sufficient to justify the cost (which would tend to diminish as the system became more complete in terms of terminals and communications facilities). This kind of system is easy enough to visualize and is technologically feasible at the present time. However, it appears to be several years away from reality because of costs, lack of preparedness from a systems point of view, and lack of organizational capability in retailing to use its output effectively.

A first step has already been taken toward the goal with the installation of a number of dedicated terminal-oriented credit authorization systems. These are relatively simple from a hardware and systems point of view, consisting of a terminal with a keyboard and some type of yes or no indicator, connected by wire to a small computer or controller which supervises the activities of the terminals and effects inquiry into the authorization list (usually a drum or disc). These systems have been assimilated relatively smoothly in a variety of stores, large and small.

The next major hurdle for the industry is the installation of electronic point-of-sale devices in large numbers—not with the coded merchandise ticketing sys-

tems or the wand reading methods, which are separate (and more difficult) problems. Progress is already being made in this direction. Uni-Tote, with some 3,000 of its Model 101s installed, has announced a new fully electronic terminal. Alpex has been actively testing and installing for the last couple of years. Friden, NCR, and Sweda have run pilots and are now installing in significant numbers. IMC and Regitel have operating installations. Olivetti, Ricca, and Transaction Systems are all moving along. But anything like an industry "conversion" is still to come.

Who are the players in the suppliers game? And what do they offer?

Table 1 (pp. 26 & 27) gives a general rundown on the principal participants and the unique characteristics of their machines. Table 2 (pp. 28 & 29) gives a detailed description of the general characteristics of these terminals. How they will shake down in the marketplace remains to be seen. NCR, with the lion's share of the conventional cash register market (which won't disappear overnight), has to be a factor in spite of the fact that they were late getting started. Sweda, next in conventional registers (if "next" is appropriate considering the spread), has an excellent opportunity



to improve its position in a new ballgame. It also has the advantage of being a sister company (in Litton) to Kimball, the dominant supplier of print-punch merchandise tickets to the industry. Alpex gets the award for "most improved"—coming from obscurity to national prominence in a couple of years. Its tie-up now with Pitney-Bowes certainly makes the combination a strong challenger. (Pitney-Bowes also has ticket-making capabilities in its Monarch Div.) Friden, an old-timer in business machines, but a relative newcomer to point of sale, seems to have a guaranteed start with the Singer retail stores as its first customers. Friden gained experience through its association with GE in the TRADAR effort. Uni-Tote has to be counted again because it has announced a new terminal which is fully electronic and can compete on a one-for-one basis with the other principal terminals.

There is another group of terminal suppliers that represents the second wave, so to speak. Their companies are smaller, but no less ingenious in injecting

Table 1. SPECIAL CHARACTERISTICS OF POS TERMINALS

	American Regital Corp.	Friden Division, The Singer Co.	Information Machines Corp.	National Cash Register Co.	Olivetti Underwood Corp.
	Regitel	MDTS (Modular Data Transaction System)	Registron	NCR 280	TC 600 Retail Terminal
10-key Keyboard	Yes	Yes	Full bank - 24 rows maximum.	Yes	Yes
Sequence Control	Yes	Yes	Parallel Sys. Can require specific key depression. Sequence not significant.	Yes	Yes
Reader	Circular magnetic, Hollerith, print punch.	No. Interface capability.	Print punch (in terminal, hand-held).	Optical wand (3 color bar code).	Circular magnetic in terminal or hand-held.
Calculation (add, subtract, multiply, etc.)	At central.	At terminal.	No multiply. Control at terminal.	At terminal. Also tax table look-up at terminal.	At central.
Display	Operator & customer optional. Customer may be remote.	Yes	Yes	Yes, plus optional remote unit.	Optional.
Printer	Yes	Yes	Yes. Salescheck validation optional.	3 printers, 3 print stations. Inserted salescheck in separate, open throat.	Yes
Hard Totals	2 in Sys III, none in Sys IV.	4	1-4 (optional)	2, plus charge media counter.	None
1/8" Cassette at Terminal	No	No. Own module with 1/4" tape loop.	Yes	No	No
1/2" Tape at Central	Yes	Yes	Yes	Yes	Yes
Manager Readout	Yes	At central console only.	No	Single terminal only.	No
Network Control					
System I (Independent)	No	Yes	Yes	No	No
System II (Terminal Polling)	No	Yes	No	No	No
System III (Store & Forward)	Yes	Yes	Yes	Yes	Yes
System IV (On-line)	Yes	Yes	No	No	Yes
Dual Components	User's option.	No, but interlaced partitions in Sys. Ten processor.	Cassette in terminal (System I & III).	No, but interlaced controllers in multiple controller systems.	Controller (optional).
Communications Failure	Sys III terminal operates with opt. device. Sys IV terminal inop.	Terminal operates.	Terminal operates.	Terminal operates.	Terminal operates.
Wiring	2 wires (not twisted or shielded).	1 twisted pair.	17 wiring cable.	2 twisted pairs.	2 twisted pairs.
Clock	Yes	Yes	No	Yes	Yes
Terminals per Controller	120	180	16	48	128
Terminal Programming	None. Central Control.	Through keyboard.	None	Through keyboard.	None. Central control.
Central Totals	Indefinite. Programmable.	Indefinite. Programmable.	None	None	Indefinite. Programmable.
Random Look-up	Yes	No	No	No	Yes
Credit Authorization	Yes	Yes	No	Yes	Yes
Applications Software	No	No	Yes	Yes	No
Peripherals	—	—	—	Optical bar code price ticket maker & credit card printer.	Circular magnetic ticket maker.

1. For "emergency" use. Normal entry of data and instructions through magnetic wand.

2. No salescheck insert. Customer signature recorded on journal tape as well as tear-off salescheck.

Pitney Bowes— Alpex	Ricca Data Systems, Inc.	Sweda International Div. of Litton Industries	Transaction Systems, Inc.	Uni-Tote, A General Instrument Co.	Uni-Tote, A General Instrument Co.
SPICE (Sales Point Information Computing Equipment)	RDS Retail System	Series 700	Transaction Register System	Model 101 (Electromechanical)	Model 102 (Full Electronic)
Variable format. Typical: 10 keys in 2 vertical rows.	Yes	Yes	Yes ①	Full bank — 11 rows.	Yes
Yes	Partial	Yes	Yes	Yes	Yes
Optical wand (2 color bar code). Print punch.	Print punch (in terminal & hand- held).	Magnetic wand	Magnetic wand.	No	No. Interface capability.
At central except in System I.	At central.	At terminal except in System IV.	Add, subtract, multiply at terminal. Check digit & other at central.	Part terminal, part central. No multiply.	At terminal.
Yes, plus optional remote unit.	Yes	Yes, plus optional remote unit.	No	No, but key depressions visible.	Yes, plus rear (customer) option.
Yes	Yes	Yes	Prints alpha descrip. of merchandise on tear-off salescheck ②	Journal tape & fanfold salescheck.	Yes
None	None	4 to 16. Additional available in modules of 16.	10	None	2
Yes	No. ½" cartridge with read after write capability.	Yes in Sys I.	No	No	No
Yes, or dual 1/8" cassettes.	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	No	Single terminal only.
Yes	No	Yes	Yes	No	No
Yes	No	No	No	No	No
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Certain applications and data collection.	Yes
Controller, tapes.	As required. User's option.	CPU & tapes in Sys IV.	Tapes recommended.	Controller, tapes, power supply.	Controller, tapes, power supply.
Terminal inoperative.	Terminal operation varies with system design.	Terminal operates except in Sys IV.	Terminal operates.	Terminal operates.	Terminal operates.
2 twisted pairs.	1 twisted pair.	2 twisted pairs.	1 twisted pair per 10-15 terminals.	38 wire cable.	2 twisted pairs.
Optional.	Yes	Yes	Yes	Yes	Yes
32	100	16	75	120	120
Keyboard, or panel at terminal.	None. Central Control.	Through keyboard.	Through magnetic wand.	None	Plugboard. Hard wired.
160 to 1,000	Indefinite. Programmable.	Indefinite. Programmable.	50	None	160 (optional)
Yes	Yes	Yes	No	No	No
Yes	Yes	Yes	No. Interface capability.	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Optical bar code price ticket maker.	—	Magnetic price ticket maker.	Magnetic price ticket maker miniregister ③	—	—

3. Miniregister--portable, battery operated recording unit with magnetic wand. Transfers data to main

terminal electronically by push button.

For additional detail on all yes items, see Table 2, pp. 28 and 29.

**Table 2. GENERAL CHARACTERISTICS OF POS TERMINALS**

This table describes general characteristics which are common to most point-of-sale terminals. These are considered as a departure point from which exceptions are noted that apply to specific terminals mentioned in Table 1.

**INPUT**

**Keyboard**

Ten-key numeric keyboards are the most common. Additional "function" keys condition the terminal to recognize various steps in the transaction such as type of sale, tax, account number, etc.

**Sequencing**

"Teaching machine" concept is applied. Panel lights or lighted keys guide the operator through a fixed sequence once a "function" has been identified.

**Readers**

Machine-encoded data (punched holes, optical bar codes, magnetic stripes, circular magnetic tracks) are read by inserting documents (merchandise tags, credit cards, salespersons' badges) in a reading slot or stroking with a "wand." (Because of wide variations, each terminal in Table 1 is identified with its own capabilities.)

**CALCULATION**

**Arithmetic**

Addition, subtraction, and multiplication are the functions most commonly provided to complete the sales transaction. In addition, most systems offer check digit verification and other error checking. In general, terminals have enough internal arithmetic capability to complete the sales transaction in case of communications failure (see below under System Backup). CDV and other error checking may be done at the controller or processor.

**OUTPUT**

**Printer**

Most units produce a journal tape (locked in machine), a cash sale "throw-out" or tear-off slip, and a charge sale ticket which is signed by the customer. The latter may be an inserted slip or a version of the throw-out.

**Display**

Visual indication of money amounts and other information concerning the transaction or "readout" of accumulated totals (departmental sales, for example). Some terminals have separate (and remote) display units for the customer.

**Hard Totals**

Totals accumulated in the terminal for balancing, control, or operational reporting. These vary from none to 16 or more depending upon the degree of independent operation intended for the terminal.

**Magnetic Tapes**

1/8" tape cassette can be located at the terminal and can also be used as central data collection medium for multiple terminals. 1/4" tape cartridge can also be used at each terminal. 1/2" computer tape is the most common method of collecting data in multiterminal systems.

**Manager Readout**

Various displays or printed totals are available to management personnel making an authorized inquiry at any terminal with a key or through a special terminal (management monitor).

**NETWORK CONTROL**

(The following configurations are arbitrary designations for this article.)

**System I (Independent Terminal)**

A terminal designed to operate without communications — such as one with a self-contained tape cassette or one with sufficient internal totals to satisfy normal system requirements. (This should not be confused with the so-called "stand alone" capability of a terminal in case of communications failure explained below under System Backup.)

**System II (Terminal Polling)**

This refers to the capability of polling an individual terminal for transmission of accumulated data (from a tape cartridge, for example) periodically, or at the end of the day. It does not refer to the capability of polling controllers or other central collecting points for data from a number of terminals — nor does it refer to the normal polling or scanning function performed by a controller in operating a multiterminal system.

**System III (Store and Forward)**

This mode includes those terminals with self-contained cassettes which are removed for transmission or physical transportation as well as those systems which collect data from a number of terminals at a central point on magnetic tape (which is then transmitted or physically transported).

**System IV (On-Line)**

Those systems where the terminal is connected directly to a central processor for control or for performance of certain applications. (This should not be confused with store-and-forward systems in which certain functions, such as credit authorization, are performed on-line at the controller level.)

**SYSTEM BACKUP**

**Dual Components**

Certain systems provide dual compo-

nents (such as processor, tape drives, etc.) to insure reliability of operation.

#### Communications Failure

This is the situation commonly referred to as "stand alone" operation. It refers to the capability of the terminal to continue to function sufficiently to complete a transaction if communications with the controller fails (or if the controller itself fails). In general it means that such operations as printing, calculation, sequencing, etc., continue to function at the terminal level. This does not include a situation where power supply is interrupted.

#### WIRING

##### Number of Wires

Most systems operate with either a single or double twisted pair of wires connecting terminals to the controller.

#### CLOCK

##### Timing

The ability to record the time of day at intervals on tape or other medium for the purpose of analyzing workload, etc.

#### TERMINALS PER CONTROLLER

##### Number

The maximum number of terminals that can be handled by a controller without degradation of response time.

#### TERMINAL PROGRAMMING

##### Changes

The method by which changes in terminal functions (tax or discount rate, for example) can be entered — such as through the keyboard, a wand, a change in circuit card, etc.

#### CENTRAL TOTALS

##### Number

The number of totals available at a central point to accumulate data — such as for departmental sales. Normally these totals can be read out at any time or are at least available at the end of the day's business.

#### PERIPHERALS

##### Devices

Additional equipment offered for use with the POS system. Price ticket makers, special readers, etc., are examples.

#### RANDOM LOOK-UP

##### Functions

This refers to the capability of having on-line access to a random file. An example would be a price look-up triggered by the entry of an SKU (item) number. A positive credit authorization system or a big ticket (furniture, appliances, etc.) inquiry and reservation system would also fall in this category.

#### CREDIT AUTHORIZATION

##### System

Most terminals have the capability of interfacing with a credit authorization system — entering an account number and receiving a signal based on the credit condition of that account. The common methods are negative — a list of bad or exception accounts; negative with update, where a memo record is maintained of the number of authorization inquiries for each account in a given day (to catch load-ups); positive, where the entire file of accounts is available for reference upon inquiry (may also incorporate the update feature). In Table 1 only those manufacturers who offer full systems (not merely the interface capability) are listed as having credit authorization systems.

#### SOFTWARE

##### Applications

Some manufacturers offer application software such as sales audit, certain sales analysis, credit authorization, some inventory control, etc. (This is not to be confused with the operational software which is required to control the system.)

#### SYSTEM DESIGN

##### Computers

Terms like controller, line concentrator, communications controller, processor, minicomputers, cpu, etc., are used to describe the device that "supervises" the activities of the terminals and, in some cases, the interaction with other files (such as credit authorization, price look-up, etc.). These terms are not interchangeable in all cases even though they are often used as if they were. Systems designs range from the extremes of a "dumb" terminal, which is heavily dependent on a "supervisor" for intelligence, to the opposite — a "smart" terminal with a high degree of independent capability in terms of memory, logic, control, etc. Some systems fall in between. Each design has its own advantages in terms of cost, performance, reliability, flexibility, and other characteristics. The choice of system is dependent upon the requirements of the user.

#### COST OF SYSTEM

##### Price

Prices of individual terminals or system components are not listed because this information given separately is misleading. The overall system cost is dependent upon the number of terminals, controllers, and other devices; communications; applications; discounts; bargaining; and other factors. In general, the terminals themselves fall in a fairly consistent price range. Psychologically there is a tendency to compare terminal costs to the cost of mechanical cash registers, but the terminal is only one aspect of the overall system cost.

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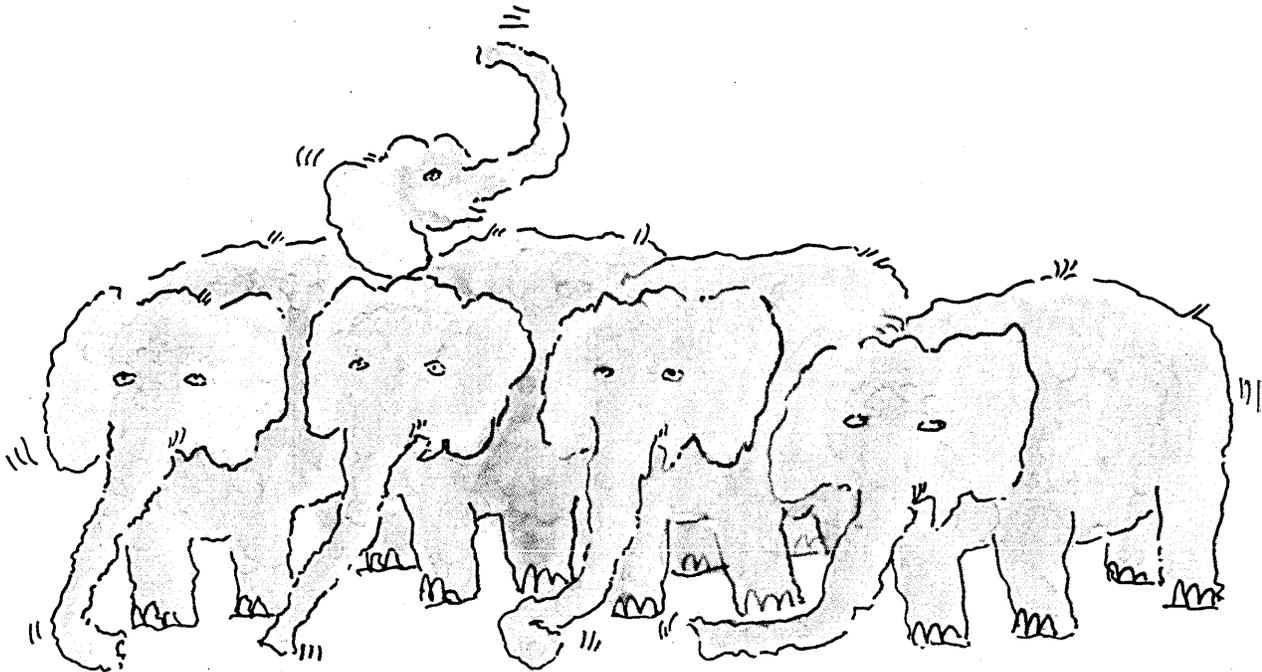
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innovative ideas into their products. Information Machines Corp., Regitel, Ricca, and Transaction Systems fall in this category. Olivetti would fit in here as well except for its size. However, it would have to be considered a breakthrough if any one of these companies assumed a major or dominant role in the industry.

What about some of the major computer companies—IBM, RCA, Honeywell, Burroughs? None of them is actively in this market at the present time. IBM and RCA have done some recent testing with food chain terminals, but neither of them has made any specific announcement of products or intentions. Burroughs, Honeywell, and others have worked in other areas with terminal systems and undoubtedly have some capabilities (particularly Honeywell since its tie-in with GE) that could be used advantageously in retailing. However, they are not in active competition in this market at present.

Describing the terminals and systems can be at once simple and complicated. POS terminals are "all alike" in one respect—a keyboard, a printer, some logic and arithmetic capability, communications—al-

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### Friden gained experience through its association with GE in the TRADAR effort.

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though their manufacturers would not like to hear it put that way. And there are three basic systems—"stand alone," "store and forward," and "on-line" in the jargon of the trade. Both of these statements are oversimplifications, but they serve to orient the reader.

POS terminals, while very similar in regard to basics, vary in their capability to perform certain functions that are key to the sales transaction from the retailer's point of view. For example, the ability to accept an inserted charge sales check (very much like the ones currently in use) scores high marks for a terminal with many department store retailers (discounters care less about this). A terminal that cannot "read out" departmental totals immediately at the end of the day gets a low grade. Alpha description of the item purchased printed on the sales check is a big plus (only Transaction Systems offers it now); no stand-alone capability is a big minus, etc. If terminal systems are compared in detail, a wide variety of differences can be observed.

The same is true of the three basic systems—stand alone, store and forward, and on-line.

What does "stand alone" mean, anyway? A simple way to define it is to ask what happens to the terminal when you cut the communication wires (not when you pull the plug out). In true on-line systems (like TRADAR) the terminal is out of business. In other systems you can continue to operate at the terminal location (print, compute, etc.), but you can't communicate or record in machineable form—you have to punch manually from the journal later on. There are variations between these two.

That is not the end of the confusion. Some "electronic registers" are intended to operate as separate units from the outset (the Sweda 726 with 16 or more

"hard" totals and local cassette recording is an example) and are neither terminals nor stand-alone units in one sense. They are not terminals since they are not part of a communications network. And they do not "stand alone" if we define that as a terminal with its communications cut. They really belong in the "store-and-forward" group or to a group that is called "independent" later on.

Definitions get troublesome because "store and forward" is used to describe both the local recording method (usually a 1/2" tape cassette) and the system in which a number of terminals record on a common tape (usually 1/2" computer tape).

"On-line" is just as confusing a term because it is not clear whether it applies to the control technique used for the entire system or a capability for a specific function—such as credit authorization or big-ticket reservation.

In Table 1 (pp. 26 & 27) and Table 2 (pp. 28 & 29) we have dealt with each of these cases specifically. Stand alone capability is treated both under Network Control and System Backup, the former meaning the separate, independent "electronic register" and the latter dealing with functions which can be performed at the terminal when the communication wires are cut. Store-and-forward capabilities are identified as being local (at the register) or central (at some collecting point). On-line means that terminals are controlled directly by the computer (not the "controller" but the CPU). It means that at least a part of the arithmetic and logic capabilities are located centrally and that a failure in communications or central control puts the terminal out of action.

The simplest way to present all this information seems to be to describe the general characteristics of most terminals (or systems) in one table (Table 2) and to note the significant differences that apply to the individual suppliers in matrix form (Table 1). It is not possible in this presentation to recognize all of the relative advantages of each system, of course.

It would be unrealistic to attempt to determine the cost of even a "typical" system in this article because of the wide variability in factors which affect cost. It is misleading (perhaps naive) to compare systems based on the list price of a single terminal. Interested parties are advised, therefore, to consult their terminal suppliers on this subject. ■



Mr. Power is a partner in the international accounting and consulting firm of Touche Ross & Co., where he is director of services to commercial industries. Previously he was with Univac and served for 14 years as an officer in the U.S. Air Force. He is a member of the Electronics Committee of NRMA, a charter member of the Retail Research Society, and an editor of its bimonthly publication. His BBA in economics is from the Univ. of Oklahoma Business School.

**Electronic gear capable of causing radical change in your company's merchandising system is here, but is it cost effective?**

# EDP Technology and

**M** The level of electronic technology necessary to dramatically change the retail industry and affect major competition areas has been reached. Dozens of small companies are battling for a piece of the retail data capturing business, but are headed for financial trouble not so much through their hardware performance in specific areas, but due to a failure to understand the status and scope of the total retail system environment and the corresponding ramifications of timing. Even the largest point-of-sale and point-of-order/receipt (computer-oriented) vendors will finally agree that price justification for the immense dollar outlay for point-of-sale and point-of-receipt hardware must lie in increased merchandising performance.

(Unlike the terminal-based system technology of the airline/hotel industry, the transaction does not hinge upon instant knowledge of the product availability; for the customer has already, at time of sale, selected the merchandise. Computer file inquiry as a service for customers may become a subsequent eventuality in certain classes of merchandise. The sale can depend, however, on customer credit authorization. Many stand-alone credit systems have been introduced exclusive of their point-of-sale systems.)

Retailers, with a degree of point-of-sale control, cannot claim functional savings by the replacement of present-day cash registers with new terminals on a one-for-one basis. Sophisticated retailers' acceptance of the new computer/terminal hardware will in most cases be based on a great deal of basic systems planning. In some cases, the whole decision may be turned over to the staff by a top management too busy to realize the major dollar implications, or subsequent costs, if the wrong system is selected.

Many major retailers have set about the long and complex task of systems requirement analysis and conversion planning which must precede the selection of point-of-sale/receipt hardware. A dilemma exists because of the rapidly changing terminal hardware technology and the long implementation period, which could become disastrous if the point-of-sale/

receipt approach has any false starts.

The degree of retail planning necessary to ensure the payoff and performance of the new systems may be too steep for many retailers to undertake. The result of the lack of systems planning will be the premature installation of point-of-sale/receipt terminals up to what the budget will bear, and a hodgepodge of mismatched systems. Retailers have been traditionally too busy with day-to-day merchandising to treat the new technology with that priority ac-

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**The degree of retail planning necessary to ensure the payoff and performance of the new systems may be too steep . . .**

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corded the systems effort of other computer-revolutionized industries. Some terminal vendors will insist on selling on a "purchase only" basis in an attempt to lock the retailer into their system. The only alternative for the retailer is extensive total systems test prior to final volume orders.

Today the point-of-sale system for data capture of many retailers consists of a variety of punch tickets, punch cards, punch paper tape, and optical cash register journal tapes with some keyboard data entry on conventional cash register keyboards. Point-of-receipt or order processing/marking systems are generally not computer based, but rather are in a manual mode. Because of the variance in data capture methodology, many of the retailers' management information systems are often:

1. Inaccurate due to input errors, timing and control problems inherent under the present technology.
2. Undeveloped due to available programs not fully in use (across all departments) or understood by merchandising personnel.
3. Inadequate due to content of reporting, speed,

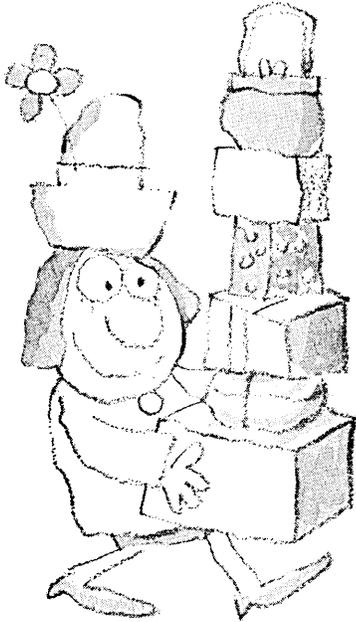
# Retail Planning

by Jack A. French

array of information, and lack of measurement (performance) criteria.

4. Limited and inflexible with respect to information needs. Present information programs are basically historical; future programs must be predictive in nature.

Long-range development will encompass a revision of most of the present retailers' computer reporting systems. The facility provided by the new technology for both point-of-sale and point-of-order/receipt must ultimately be reflected in the merchandise informa-



tion and reporting system. Some point-of-sale vendors have failed to recognize the important linkage between point-of-sale and point-of-receipt for the retailer. By an increased marking of a larger percentage of merchandise ticket information at the time of sale, increased control and reporting can be obtained. The systematic use and analysis of new report and com-

puter-correlated data should provide the facility for increased merchandise turnover and a more profitable performance.

Point-of-sale terminals that can improve many functions of current cash registers will be available in substantial quantities in 1972 from a variety of manufacturers. In addition, terminals can be connected electrically to computers and allow for the direct reading of merchandise ticket numbers, credit card numbers, or allow for keyboard indexing of these numbers by sales personnel. The point-of-sale devices are expected to:

1. Decrease present sales audit and salesperson staff payroll.
2. Decrease present merchandise ticket control staff.
3. Decrease credit authorization staff; provide direct credit authorization facility to reduce bad debts and frauds.
4. Increase customer service by faster transaction recording by providing automatic discount calculation, providing automatic tax calculation, providing automatic price-quantity extensions, and physically producing sales checks.
5. Provide faster (more accurate) reporting capability measured within hours of actual sales.
6. Allow better personnel scheduling for salespersons and receiving work forces.

While these benefits are excellent features, the cost of the total program strictly to replace present cash register control technique and accomplish the above will not necessarily be in itself economical or feasible.

Point-of-receipt terminals connected directly to a computer are proposed for the receiving/checking of merchandise and the production of merchandise tickets at the point of receipt. Immediate access of merchandise checkers and buyers to a visual display of purchase orders can allow the direct entry to the computer of received units of merchandise.

The maintenance of continuous computer file status of purchase orders is forecast to provide an accounts payable staff reduction. The speed and facility

## Retail Planning . . .

of purchase order file access should provide faster and more economical handling of merchandise receipts to the selling floor and reduce buyer time in purchase order change and follow-up activity. The economic benefits of new efficiency are difficult to project.

Although there are some personnel cost savings which can be estimated through new receiving and marking utilization of on-line computer technology, the added equipment rentals are projected to more than offset these savings. The benefits from the faster movement of merchandise and better space utiliza-



tion should be realized. Again, increased merchandise performance must provide the economic payoff. The availability and testing of ticket-making hardware and other technical/personnel interface complexities of the order processing system will require implementation of long duration.

The retailing industry has only superficially tapped the full operating and reporting power of the computer. The priority of emphasis must begin with the requirements of reporting financial data, customer and merchandise behavior. Retailers have only limited resources and personnel talent to allocate to the new merchandise system development. Astute retailers will realize that the priority of action is definitely with the merchandise computer program because of the high return and cash-flow economics which can then be used to subsidize the continual dollar outlays for additional new point-of-sale and receipt technology.

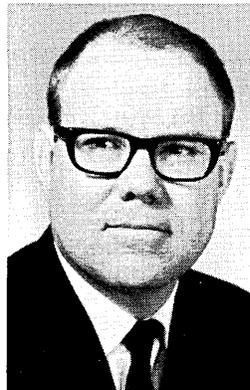
New merchandise programs will be required to report and control various types of merchandise differently and to include corresponding control-level summaries for appraisals by merchandise management of individual performance against plan. It is apparent that any single merchandise reporting system introduced to a range of departments covering various merchandise classes of differing behavior can be disastrous for information users. Forward-thinking retailers will place their monies on "brainware" rather than initially in new electronic hardware. More dollars and personnel talent will be invested in decision

rules and model making for merchandising strategy, profit planning, and line allocation analysis. Predictive reporting will become more important than present historical reporting. Data control enforcement and measurement will be the crux of success. New problems will replace those presently encountered.

While such emphasis is not entirely confined to larger retailers, it is safe to assume that smaller retailers simply will not be in a position to afford the gearing up to the new technology and will do business as usual until that day evolves where the larger merchants are pricing and turning so effectively that they (the small retailers) are forced to cut margins significantly. Large retailers with a versatile computer data base will be able to penetrate small competitive markets easily with new stores and strategies. The salvation may be some type of computer time-sharing service which will give the smaller retailer the same turnaround analysis as the larger retailer. Once the new technology is merged with the larger retailers' war room mathematical planning, buying, and reporting strategy, it is doubtful that the undeveloped retailer will be able to sustain even his present-day performance. It will be a consultants' field day.

The new electronic technology and its vendors have once again preceded the ability of an industry to react. Those vendors who recognize and select aggressive retailers who are prepared to fully utilize their products will be in a better position to stay solvent. Recognition by the vendor of the priority of implementation and the requirements of the retailer is paramount. Neither point-of-sale nor point-of-order/receipt hardware installation funds should take precedence over the systems development activity in merchandise/customer/financial reporting and analysis.

Justification for the new technology can only be found if retail management is prepared to fully organize for and utilize the information which the new methodology makes possible. This utilization and related new implementation will require a long period of time. Pioneers will see new technology rapidly obsolete their original decisions. Conservative retailers will require a planned implementation on a pay-as-you-go (measurement) basis. Vendors will find some initial fast reaction, but eventually must plan on a long and vigorous campaign for the retailers' dollar. ■



Mr. French is currently systems planning and development manager for Dayton's, Minneapolis, where he is directing implementation of a merchandise and financial information data base system, incorporating on-line point-of-sale and point-of-receipt capabilities. Previous to this he worked for the Dept. of Revenue, State of Illinois; Touche Ross; and NCR. His BS in industrial management is from the Univ. of Illinois, his MBA in finance from Northwestern Univ.

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## The Boardwalk hasn't collapsed

# SJCC Report

by F. Barry Nelson, Eastern Editor

**G** Although fewer persons and fewer exhibits were at the SJCC, the mood remained optimistic and exhibitors were generally pleased with the exhibit hall and with those people who did attend. Despite a boost from some 2,500 attendees who paid a special \$10 exhibits-only admission fee—a new category this year—attendance was only 21,360, a drop of about 700 from the RJCC, but some 7,000 fewer than were at Atlantic City last year. Booths were down to 599 from last year's 960, which made for much less crowding, especially now that the convention hall has been expanded, placing the entire show on one floor.

The recent trend toward fewer mainframes being exhibited neared its ultimate end, as only one mainframe was displayed by the single mainframe manufacturer present, RCA. IBM not only did not exhibit, but it mandated that no IBM personnel who didn't have a "need" to attend should be there. This left only speakers, committee members, and competitive analysis teams from the white shirt corps, and probably cost hundreds in attendance.

Despite AFIPS rules instituted last year in an effort to bring more dignity to the JCC's, many exhibits featured buttons, gimmicks, and girls, though no beauty contest was held this year. The attendees themselves seemed more conservative of attire, with few tieless. The Computer People for Peace, many of whom affect a hippie style, looked even more out of place than usual. And the military were more evident, probably because their fortunes are less affected by a recession.

The CPP itself seemed more subdued and attracted less interest than usual. In line with the SJCC's theme of "responsibility," AFIPS management had acceded to virtually all of CPP's demands for space and sessions, and this may have been the radical group's undoing. For now that CPP presented its own sessions, the group found itself largely talking to its own members and supporters rather than a reasonable cross-section of attendees.

Even the favorite "war contractor," Honeywell, was not present to be sniped at. And an attempt by CPPers to make a "citizen's arrest" of an FBI agent at a regular session was foiled when the agent failed to appear. A "mass rally" on the boardwalk attracted a lot of police and little more than a hundred spectators, most of whom paid little attention to the words of the speakers charging AFIPS with such diseases as racism and "sexism."

While attendees seemed quite interested in the many exhibits of peripherals and System/360 memory extensions, their attention was momentarily distracted at the opening of the exhibits by an avant garde art exhibit which had been commissioned by AFIPS to fill some of the excess space. The "art" consisted of a tv monitor showing a naked girl, and a contest which offered two hours with either of two other girls as the prize. Complaints from nearby computer exhibitors put a quick end to this entertainment, however.

Unusual exhibitors included the Iron Mountain Security Storage Corp., Hudson, N.Y., which offered storage of magnetic tapes beneath a mountain where they might be safe from atomic attack as well as insurrection. And for the job-hunters in attendance, a booth promoted the weekly newspaper *Job Market*, with a special computer edition; the periodical reprints help wanted ads from newspapers.

The giant Japanese firm of Fujitsu Ltd. returned, and was joined by the Matsushita Electric division called Panasonic. The latter wasn't pushing transistor

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### Japanese competitive analysis teams appeared to be even more aggressive than IBM's...

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radios, but two minicomputers that have been sold in Japan for a few years. One model, the Mc 7/F, uses a plated wire memory and has a 600-nsec cycle, while the 4-usec Mc 7/S uses core. Both are 16-biters and will be marketed initially only to oem's in this country.

But while some Americans trembled at the prospect of Japanese inroads in the U.S. market, Data General was completing a licensing agreement for Japanese firms to build and market the Nova line.

Japanese personnel were extremely visible this year and, for the first time in recent memory, Japanese competitive analysis teams appeared to be even more aggressive than IBM's fact-gathering groups, although there was still a heavy sprinkling of IBM personnel examining exhibits.

At one point, two Japanese were particularly intrigued by an Ampex memory. One man was holding a magnifying glass while open-mouthed Ampex employees looked on.

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CIRCLE 27 ON READER CARD

A session called "An International View" was disappointing in that the speakers from Japan and Russia had time only to whet the audience's appetite with information on their computing uses and developments, leaving unanswered the question of how they viewed their futures as world marketing powers in this industry.

Sumio Ishizak of the Fuji bank, Tokyo, sees the '70s as the years when "Japan must mold its own future" and the role of computers will continue to become more important. In the 12 months preceding September 1970, Japanese computer installations increased by 44% to 8,000, and they expect to keep up this rate. Domestic hardware accounts for 55%. About two-thirds of the applications are traditional and simple; i.e., accounting, inventory control, etc. But 55% of their applications software development for this decade will be in planning and forecasting.

Japan is developing information syndicates made up of several firms cooperating on the development of hardware, software, network, and standard interfaces—a development similar to the kind of cooperation Sir John Wall proposed among companies of various nations and the kind of "study company" formed by ICL, CDC, and CII (see the summary of Wall's address below).

Russia's computer emphasis was reiterated by S. I. Samoylenko of the Council of Cybernetics, Moscow Academy of Sciences: it is on research in the theory and applications of cybernetics, natural language development, and implementation of various programming languages. While admitting to the well-known lag behind the U.S. in computing and software, he did note that the USSR is paying more attention to devel-

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### **. . . trying to keep the rest of the world technologically subservient.**

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opment of software protection techniques than the U.S.

Dr. Phillippe Dreyfus, head of the Anglo-French Computer Analysis and Programming software house (CAP), said that Western Europe and the U.S. are "not doing things dramatically different from each other," although Western Europe has half the computers the U.S. does for the same population.

Despite having the most systems—6,000—Germany is the least sophisticated user and has just begun real development of its own computer production, according to Dreyfus. Its operations are decentralized and most systems are in the small- to medium-scale range—a situation partly caused by the nonmilitary development of computing in Germany. The more centralized France and England, with 4,000 computers each, are far ahead of Germany in the use and development of large-scale computers and networks.

Hence, noted Dreyfus, both countries have a software sophistication equal to that in the U.S. and are strong competition for American firms. Scandinavian countries also are strong in software capability. He said CAP is working on a real-time air freight system for airports in England and France that will entail up

to 1,000 terminals and require almost 100% reliability.

Finally, social implications pierced the international session when Harold Head, a former editor of an anti-Apartheid newspaper in the Union of South Africa, spoke up. His invitation to be a formal member had been withdrawn because he lacks computer credentials. Head pleaded for the "technology leaders" to be more responsible in marketing their systems to the developing nations. "If technology is not good for the people, what good is it?" His personal case was South Africa, which he asserted had "computerized" him out of the country seven years ago. Head noted that the government is using computers to keep detailed dossiers on its citizens. "This information perhaps reads like all data, unless one can understand the horrors perpetrated in Nazi Germany and Viet Nam."

Perhaps the highlight of the SJCC was the keynote address, which also emphasized an international theme. According to keynoter Sir John Wall, board chairman of ICL, U.S. dp systems manufacturers are ignoring the threat to individual privacy created by the computer; they also are trying to keep the rest of the world technologically subservient. His talk ended on a possibly prophetic note when he said the U.S. dp industry has the "capability" to correct both alleged shortcomings; the only question is "do you have the will?"

Wall argued that an industry-wide "professional ethic" must be developed and must be accepted by the public before computer professionals can deal effectively with the privacy problem. Then, like doctors and lawyers, they will be able to refuse socially harmful jobs without worrying about retribution. The ethic can't be achieved, though, until the industry develops a consensus regarding the nature of the threat to privacy. This involves working out generally acceptable answers to some difficult questions—for example, what details of a person's life should legitimately be stored in a data base. Also, the industry will have to improve its public image—by making systems more comprehensible to laymen and more reliable for users.

Wall's complaint about U.S. technological dominance boiled down largely to two charges: we are imposing arbitrary and ineffective restraints on dpe exports to the Soviet bloc, and we aren't allowing the natives sufficient opportunity to invest in overseas U.S. subsidiaries. These practices, he contended, put the U.S. in danger of repeating the mistake which Britain made a century ago. "Instead of letting [foreign markets] develop independently, instead of competing with other nations for their customers in an open market, we used our dominance to make them take our products. . . . It was just great while it lasted—we did not have to compete, we did not have to sell, we just had to produce. And gradually we became arrogant, uncompetitive, and more dependent on them than they were on us. Some of our older industries have not recovered yet."

ICL has built up a "substantial" business in the USSR and Eastern Europe, Wall added, "and the further extension of this important business is now being inhibited by your government . . . the present system [of trade restrictions imposed on Great Britain and other NATO countries at U.S. insistence] . . . makes us

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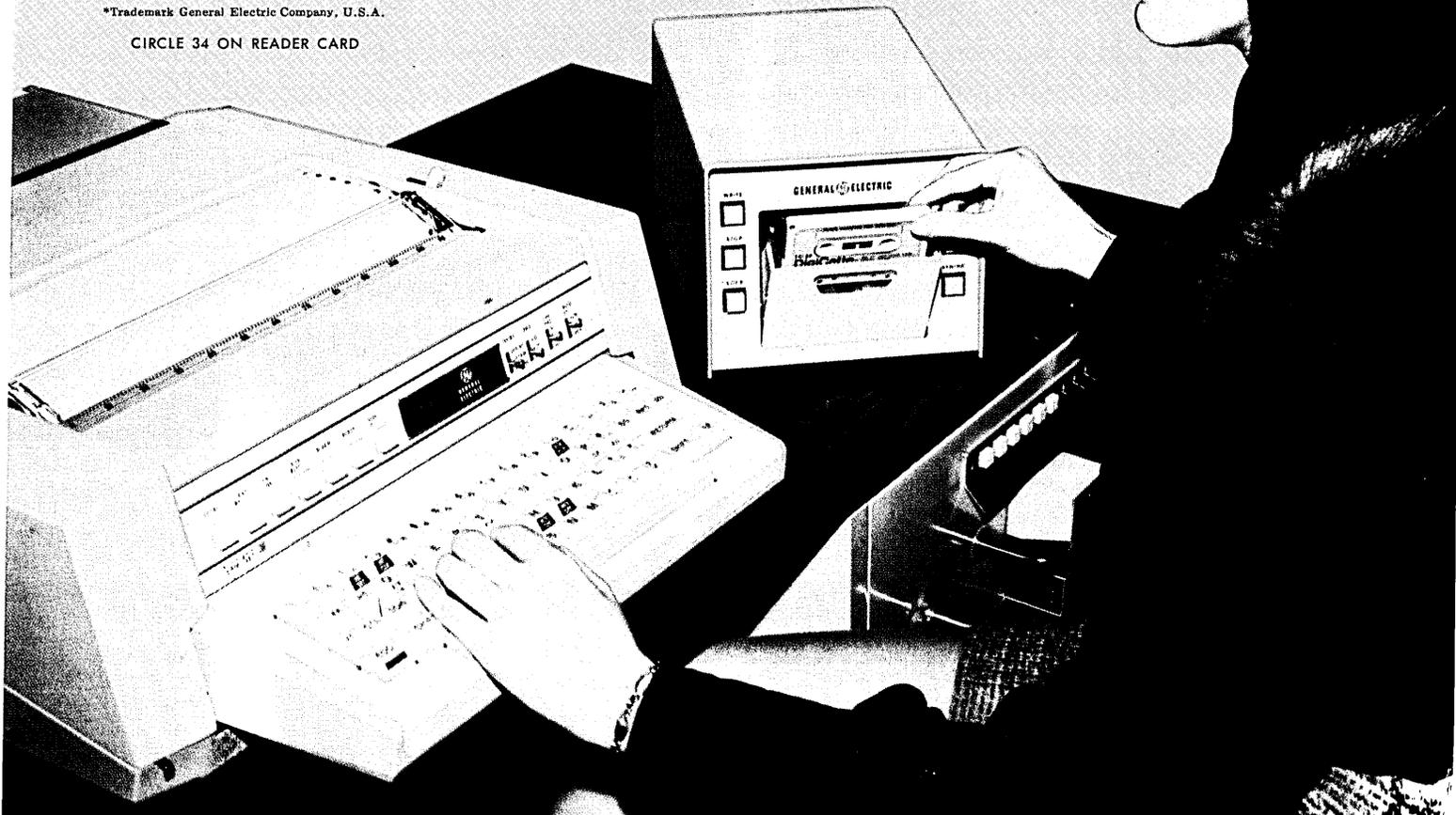
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CIRCLE 34 ON READER CARD



all look stupid in the eyes of . . . Russia and Eastern Europe. . . . They know they have great technical skills and are rapidly acquiring greater skills." Eastern Europe dp users, he added, have developed "all the necessary end use undertakings. . . . What do we achieve by depriving them of new products and systems?"

Wall also called for world standards which look ahead, and are not the de facto standards imposed by "the dominant supplier." He thought the move in this country toward greater use of plug-compatible peripherals is a step in the right direction but said it represents "just the beginning." The goal, as Wall sees it, is development of standard interface arrangements for peripheral controllers, front-end processors, "and indeed complete systems." Unbundling has made the search for standards "more necessary and easier," he added, and the rapid development of common software languages together with common carrier communications standards has brought compatibility much nearer.

"All these developments give a remarkable, perhaps a unique, opportunity to use standard interfaces to develop formal or informal standards among computer suppliers—not just in America but overseas. And this will sharpen international competition, especially from non-American firms. . . . We in Europe also hope very much that we will see more associations along the lines developed between Control Data in the U.S., ICL in the U.K., and CII in France."

Immediately after the keynote address, a panel led

by Dr. Herb Grosch of the National Bureau of Standards discussed whether the computer is a messiah or menace, and along the way picked up some of the thoughts discussed in the keynote address. Grosch contended that no computer professional can really call himself a professional unless he frequently questions both the ends and means of what he's doing. "You must ask yourself not only whether you *can* do a particular job, but whether you *should* do it," Grosch said. Panelist Peggy Talbot of the Univ. of Pennsylvania wondered whether Wall's proposal for an industry-wide professional ethic is really prac-

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**" . . . secrecy in government  
has been overworked . . . "**

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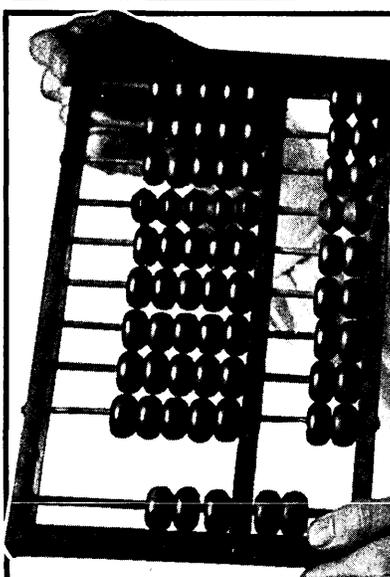
tical given the divergent political and social attitudes of computer professionals. Basically, she argued, that rather than getting the computer professional involved, the real problem is to persuade policy makers and the public as a whole to take the professional's advice.

At the session on "Image of the Industry" a panel of two newsmen from *ABC* and *Time* plus Herbert Klein, White House Communications Director, found conversation straying to data banks. Klein admitted "secrecy in government has been overworked" and that attempts are being made to classify less data and allow more public scrutiny. He said some secrecy has been to "hide scandals" within the government. Another problem, though, is how much information can be made available to civilians without negating the law enforcement efforts of the FBI, for example.

The panelists from the general press were less inspiring, although Marshall Loeb, senior editor of *Time*, did suggest that the computer industry is being "too sensitive" to humor items about computers being "fired" for their mistakes.

At the sjcc luncheon, Senator Sam J. Ervin of North Carolina, whose judiciary subcommittee recently completed a lengthy hearing on federal data banks, said "there is an immediate need for an effective disclosure law on computers. . . . If [government data banks] are not lawful and relevant for some purpose, they should be exposed for what they are in effect: attempts to intimidate citizens into silence and conformity." He predicted that "government will make increasing use of computer technology in pursuit of its current claim to an inherent power to investigate lawful activities and to label people on the basis of their thoughts. Some of you will help develop such systems proposals for municipal, state, and federal agencies. It falls on your shoulders to make known the restrictions and the limitations of the machines as well as the alternatives for what is proposed."

Three hours later it was all over. Although attendance was down, exhibitors reported they had done a brisk business on the floor with plenty of influential prospects. The theme "responsibility" had been carried out with high interest. And even the CPP could hardly complain it hadn't been granted everything it had demanded. Yet the enlarged convention hall would look better with a few more people in it next year. ■



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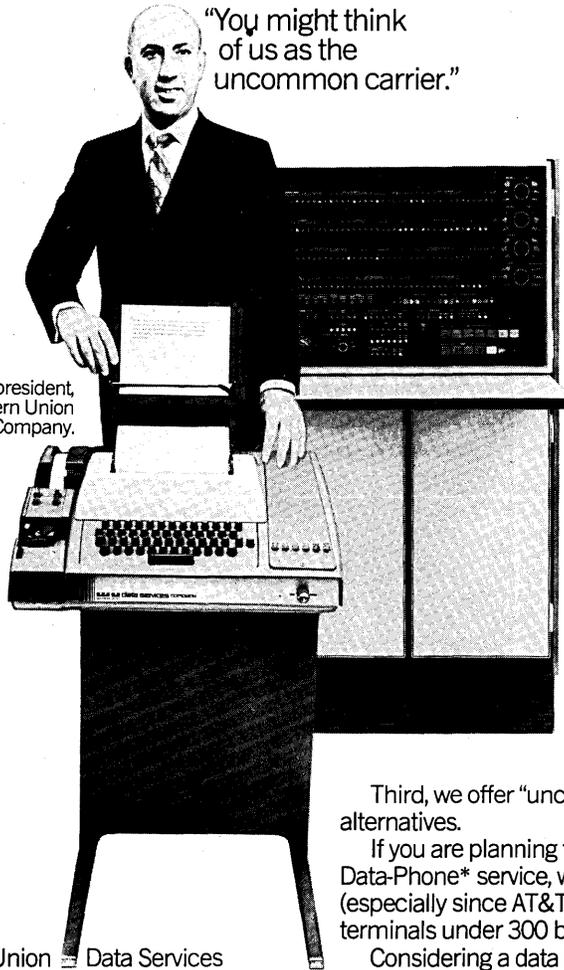


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## Semiconductors are becoming complementary, if not competitive, to core technology

# An Impartial Look at

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**T**In the past four years semiconductor memories have dominated new technology forecasts for commercial memory applications. Trade journals and professional journals abound with articles and discussions relating to semiconductors, integrated circuits, LSI (large scale integration) and their effect on semiconductor memories. New memory organizations, new memory cells and new processes are frequently introduced—though many innovations are either trivial or impossible to implement.

The MOSFET (metal-oxide semiconductor field effect transistor) has become more popular than bipolar devices for memory applications due to ease of fabrication. In the past year or two, many new companies have entered the integrated circuit field. Most of these companies have announced their intention to make products related to digital computer memories. These announced products range from replacements for existing core memories to ultrahigh performance memories not obtainable with existing core. Some even claim to be replacements for magnetic tape, drum, and disc memories. Semiconductor memories have been, at one time or another, hailed as covering the entire spectrum of storage for digital computers. In addition to the new firms entering the IC field, existing semiconductor manufacturers also have shown a renewed interest in memory applications, and several of them are concentrating heavily in this field.

The enthusiasm among semiconductor manufacturers at this time may be compared to a similar enthusiasm several years ago in the logic field. At that time, the question was not whether logic would be capable of reduction to large scale integration, but only where this would occur first—in peripherals or in mainframe. LSI has not yet been employed on

significant scales in either of these applications, although “next-generation” hardware does look promising for LSI. The interest in LSI for logic application encouraged a number of semiconductor manufacturers to enter the systems field. These ventures were almost all unsuccessful. The limited application to date of LSI for logic is due in part to the lack of standard configurations. One reason is that digital computer manufacturers differ widely in the configuration, organization, and design of their systems. Logic circuit assemblies are therefore primarily custom devices and require a different type of specialization than had been thought by many semiconductor firms.

It would be worthwhile at this point to discuss a few of the other technologies competitive to core and review their history as well as their potential.

Plated wire still has a number of exponents and is finding limited acceptance in the computer memory field, particularly for military applications. The emphasis of plated wire has shifted from high performance bulk storage to smaller, more specialized applications. Plated wire technology, while being touted as a successor to core for many years, has not found significant applications. The initial objective of high performance gave way to an objective of cost/performance. (This is a classic pattern for relative failure of a technology: Progressive technical targets, starting with “high performance” and proceeding through “cost/performance,” then “bulk storage,” then “special applications,” and finally extinction.) Process problems constantly arose so that optimistic yield objectives were seldom obtained and anticipated costs were never realized. Process repeatability for plated wire also has been a problem, resulting in unpredictable evaluations ranging from very promising to virtually impossible.

From the history of plated wire there are a number of lessons to be learned which apply equally to semiconductors. This new memory technology is susceptible to the same shift of technical objective, with the result that no solid objective will be obtained. Like

plated wire, semiconductors are also significantly process-dependent and rely on yields in order to obtain their cost objectives. Process repeatability and consistency are essential.

Prior to plated wire, thin planar magnetic films were thought to be the logical successor to core. Several of the major manufacturers in the computer field devoted many years of effort to this technology, and there has also been much university research. The result has been discouraging. There are virtually no thin film memories being used by industry.

Fig. 1 shows a universal curve for memory technologies. It is interesting to note that this curve has

mils inner diameter) are being successfully wired. There is little doubt that still smaller cores could be wired should this requirement arise. Consequently this does not appear to justify the statement that cores will soon reach the limit of their capability.

There are several other considerations, however, which do indicate this. First, it is clear that memory capacities of larger and larger sizes are required. As core size decreases, the size of the wire through these cores also decreases with a commensurate increase in the resistance of this wire. Further increases in wire resistance would present significant drive and sense problems in a core memory of significant size.

# Semiconductors

by H. Frederick Koehler

applied regardless of the year, or technology, or the total bit requirement of the industry. In the late 1950s it was thought that cryogenics would supplant core. In the early 1960s magnetic thin film, in the later 1960s plated wire, and now—semiconductors. Nevertheless, 15 years later, ferrite cores still dominate memory technology and new technologies are being continually investigated. All this while the total number of bits per year required is constantly increasing.

Why, then, should we seriously consider semiconductor memories as the next evolution of memory technology? There are several reasons: speed, density,

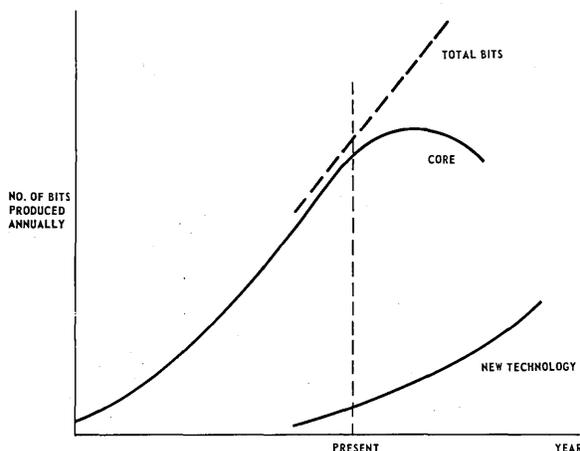


Fig. 1. Universal memory technology curve.

cost, and technology. Several times in the past it has been thought that cores had reached their ultimate limit in speed. This has proved to be false. Advances in ferrite technology have produced faster materials, and reduced core size has made possible faster switching, shorter line length, and increased density. In the past, it had been thought that cores had reached the limit of their capability because smaller cores could not be physically wired. At the present, cores as small as 12 or 13 mils in outer diameter (approximately 7

Further, 10 mil or 8 mil cores—which are a logical evolution of the 12 mil and 13 mil cores presently being considered—are extremely fragile. The fracture strength of 13 mil cores is less than 50 grams. It is estimated that the fracture strength of these smaller cores would be on the order of 25 grams. Such cores would not be sufficiently rigid to withstand normal mechanical requirements without external reinforcing. This would defeat the purpose of reducing the size of the core. So perhaps the technological limit of ferrite cores has finally been reached, not because of an inability to string smaller cores, but because of electrical problems associated with resistance of the small wire required to string them, and mechanical problems associated with the strength of the core.

By comparison, semiconductor memories offer speeds ranging from those of core memories to 10 nanoseconds or less. While magnetic film technologies, including plated wire, optimistically offer potential speed improvements of a factor of 2 or 3 (considering NDRO operation), semiconductors offer potential speed improvements of a factor of 10 or more compared to core memories. Bit density improvement in core memories is clearly related to the size of the core:

Typical Core Memory	250 bits/cu. in.
Semiconductor (256 bits/chip)	375 " "
8K sense line	
(Ampex 1890 core memory)	750 " "
16K sense line	
(Ampex 3690 core memory)	1000 " "

Film memories offer potential improvement in density over cores due to the inherent nature of the processes involved. Core memory size limitations are dictated by rather simple mechanical constraints where film memory density limitations are subject to constraints more associated with etching and plating technology. Semiconductor density is also related to processes, and these processes again offer significantly greater densities than core or even thin film technology, in that they are associated with diffusion and evaporation technology.

There is little doubt that the costs of core technol-

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ogy are significantly lower than those of any comparable technology. Technological exponents of any successor to core have hoped that core costs associated with process and assembly steps—which are distinctly discrete—would be attacked by a technology-utilizing process amiable to batch fabrication. Batch fabrication has been the dream of memory technologists ranging from cores to semiconductors. To date it has found little success in ferrite or thin film technology. It was attempted in ferrites on IBM's "Flute Memory" and RCA's "Laminated Ferrite Memory." Thin film and plated wire technology have been touted as amenable to batch fabrication, but this has never been successfully translated on a universal basis to a major production line. The very fact that film and plated wire are batch technologies contributes to some of the difficulties in repeatability, uniformity, and yield. The semiconductor process is inherently a batch process, and, contingent upon yield improvements, may become the first truly successful implementation of a batch fabrication process for memory technology.

It has become clear that speed improvements in the core memory are difficult to achieve without increases in cost. Such improvements demand a new technology. Although previous technologies have offered some improvements in these areas, semiconductors appear to offer a significant advance. In the area of cost, however, core memories continue to have a competitive position which can be overcome only by successful utilization at reasonable yields of the inherent batch fabrication advantage of semiconductors.

Even in certain high performance areas core technology is holding its ground by utilizing somewhat more costly organizations such as 2D and two-core-per-bit. In the future, core memories will continue to improve in cost, in size, and in density. These are areas where attention will be devoted—attention which had previously been given principally to increasing speed. It is in the area of large, low cost storage that cores will remain a tough competitor. Moreover, for the present, cores are also competitive in both the high performance and smaller capacity areas.

Some of the other problems associated with semiconductor memories are yields, power, volatility, and standardization. The relationship of yield to cost is certainly clear and has been discussed previously. Many people mistakenly believe that power consumption in semiconductor memories is less than that of cores. Actually, present semiconductor memory devices are somewhat higher in power consumption than cores, and high performance devices actually use more power than comparable core memories. A typical small core memory utilizes approximately 1 milliwatt per bit. This is comparable to approximately 1-4 milliwatts per bit in typical semiconductor memories.

Semiconductor memory	2.0 milliwatts/bit
3D3W-8K core memory	.85 "
3D3W-16K core memory	.75 "
3D4W-16K core memory	.50 "
3D3W-32K core memory	.50 "
3D4W-32K core memory	.25 "

Volatility of a semiconductor memory—the fact that it loses information if power fails or if there is a loss of DC voltage to the cell—can be a severe restriction. A degree of protection against such a failure can be

obtained by using a storage cell or through a data transfer during the DC shutdown procedure. Nevertheless, the volatility of semiconductor memories renders them distinctly different from cores, which retain information in the complete absence of power. Modern large scale data processing requirements dictate the retention of data under all circumstances. All valuable information stored in the semiconductor memory must be retained elsewhere in magnetic form, either in a core memory or on magnetic tape, disc, or drum. For smaller systems, minicomputers and the like, this may not be true.

The evolution of integrated circuits has been a very rapid one. However, the technology has not yet acquired the degree of thoroughness or discipline ultimately required. In the memory area objectives are constantly shifting. They range from relatively low speed, low cost, serial application to ultrahigh performance, random access memory to read only memories, etc. Process technologies range from various MOS technologies to various bipolar technologies and even to a variety of somewhat more exotic technologies. MOS technologies include P channel or N channel devices; further, gate metallization may be silicon or aluminum.

Devices have varied threshold voltages. Some memory chips utilize dynamic logic and storage cells requiring refresh, others utilize static logic and/or storage cells. Devices are packaged as single chips or as multiple chips in a carrier. Carriers range from multilayered ceramic substrates to rather standard dual-in-line (DIP) ceramic or plastic packages. Devices are stacked vertically or packaged horizontally. Vendor specifications are never alike. In short, this rapidly growing technology is diverse and badly in need of standardization. Lack of standardization can harm such a technology, particularly since users require it. The embryonic integrated circuit industry as a whole is not yet profitable and requires universal acceptance to become so.

Probably the biggest single factor affecting the future of semiconductor memories is not directly connected with the technology itself. The fact remains that computer technology is largely influenced by IBM which controls more than 70% of it. Although IBM has apparently minimized development engineering work on core memory systems, it has obviously devoted extensive amounts of research and development engineering resources to semiconductor memory in the past several years. It is apparent that IBM intends that future memory developments will utilize semiconductor technology. Nevertheless, it is not likely that IBM will eliminate core memory systems in the next few years; on the contrary, core products are an integral part of both the highly successful System 360 and the new System 370. The introduction of a "cache" memory on the Model 360/85 was only the initial introduction of semiconductors on IBM systems. New semiconductor memory products will be gradually introduced and accepted and coupled with core memories, as has been done with the System 370.

The System 370 Model 145 has a maximum storage capacity of almost 5 million bits of semiconductor memory and no core memory whatsoever. Similarly, the System 370 Model 135 has maximum capacity of more than 2 million bits of exclusively semiconductor memory. On the other hand there are over 18 million

bits and 27 million bits of core memory in the System 370 Models 155 and 165, respectively. The core memory in both the Model 155 and 165 has a cycle time of approximately 2 usec which is relatively slow and obviously oriented toward minimum cost. If we considered the 370/145 and 370/135 at quantities comparable to the 360/30 and 360/40 combined, and the 370/155 and 370/165 together at quantities comparable to 360/50, 360/65 and 360/75 combined, one can estimate that there will be approximately  $35 \times 10^9$  bits of semiconductor memory and  $225 \times 10^9$  bits of core memory introduced as a result of IBM System 370. IBM has extensive semiconductor

### Very few are willing to pay a premium for higher performance.

fabrication facilities to effectively execute a major shift to semiconductor memory.

Semiconductors offer a logical vehicle for extension of the total bit production capability of the industry. Without semiconductors, it is doubtful that the total projected bit requirements 10 years from now could be satisfied by core.

A reasonable estimate is that the total number of random access memory bits required in 1975 is  $150 \times 10^9$ . If we assumed that 30% or  $45 \times 10^9$  bits are available to the noncaptive market and  $\frac{1}{2}$  of these bits will be core while  $\frac{1}{2}$  or  $15 \times 10^9$  will be semiconductor, then a cost of  $\frac{1}{3}$ ¢ per bit will generate a sales volume of \$50 million. At the present time there are over 40 known competitors for the semiconductor market. If we assume that this number is reduced to 10 by 1975 there will be an average sales volume of \$5 million per company. This does not appear to justify the huge investment currently being made in this industry. There may be several factors in error in the preceding analysis:

1. The forecast total bit requirement may be low.
2. The percent of the total number of bits that are semiconductor may be high or low.
3. There is no telling what the cost per bit will actually be.

The cost per bit for semiconductor memories will ultimately be determined on an economic basis that justifies the investment and development associated with this technology. Semiconductors will only be competitive with cores where rationally determined price/performance offers advantages to the customer.

Fig. 2 compares the growth of the total computer market for hardware with the growth of the available memory systems market. The individual growth curves of the core memory and semiconductor markets, within the memory systems market, are broken out. Here the continued annual growth of more than 100% in the semiconductor memory market is shown in contrast to the 4% annual rise of the core memory market. It also is seen clearly that the total available memory systems market will grow at a faster rate than the total computer market for hardware.

There appears to be a dichotomy in requirement

for small semiconductor memories as it is identified by peripheral manufacturers and as it is identified by IBM. IBM has employed semiconductor buffer memories of extremely high speed and relatively small capacity in cache-like applications. It may be anticipated that these memories, which are bipolar, will be coupled at some time in the future with larger capacity MOS memories having somewhat slower speeds.

Outside of IBM the small memory market is different in that buffers are not typically used in IBM's cache-type application but in various terminal and other peripheral equipment. Buffer memories for OEMs (original equipment manufacturers) do not require the high speeds found in IBM semiconductor memories. On the other hand, main memories utilizing other than core technology must offer performance (and/or price) advantages over core. Consequently, neglecting IBM, the market for small memories appears to be in the relatively slow speed categories where MOS technology is acceptable. For larger memories, speeds greater than those obtainable by core and perhaps even MOS are desired.

The question of cost per bit is somewhat of a confusing factor at this point. Very few are willing to pay a premium for higher performance. If performance improvement is essential, interleaving is most often used. Transparent memory hierarchies similar to cache are only being considered at this time by most OEMs. Thus, semiconductor main memories must gen-

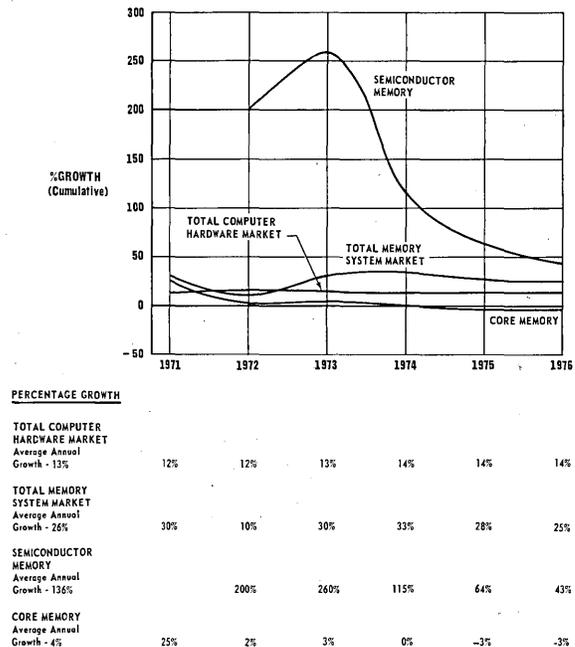


Fig. 2. Market growth comparison (in percentages).

erally not only provide better performance than core, but may also have to be sold at comparable prices. A major advantage of semiconductor memory is that costs are relatively independent of size or organization.

Many semiconductor firms are now becoming involved in integrated circuit memories, both bipolar and MOS. The number of firms indicates that while there will be some successes in this field, there will also be some failures. The semiconductor memory market

is handicapped in two ways. First, the market has been exaggerated and the products underpriced. Second, many firms have not thoroughly developed the technology.

The systems engineering task is not the trivial problem that some IC manufacturers believe it to be. Some manufacturers refer to a single chip or device as a system. Such devices are a far cry from the requirements of a complete memory system. They lack such fundamental items as power supplies, cooling, interface circuits, packaging and a service organization to guarantee field performance.

Before a significant semiconductor memory market is established for IC manufacturers, standardization is needed and compatibility between manufacturers is essential so that customers may second source a product. By analogy, many major ferrite core memory stack customers generally insist not only that similar memory stacks be available from several sources, but also that all sources use the same or equivalent cores.

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### It is evident that magnetic storage must yield at least partially to another means of data retention.

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It would appear that the initial market for semiconductor memories is in the buffer area. This is not the same IC memory used by IBM in its cache system. It is, rather, in small, relatively low performance systems where the cost of the circuitry is significantly higher than the cost of the core stack. Standardizing and second sourcing such buffers remains a key problem to both the manufacturer and his customer. Further competition from core cannot be dismissed. Fortunately for semiconductor firms, the rapid advance of digital computer technology requires that manufacturers continually seek changes in their systems and are continually exploring future technologies. Manufacturers today must consider the implementation of semiconductor memories on their future systems. Nevertheless, most manufacturers are not limiting their plans exclusively to semiconductors, and future computer technology is almost certain to offer a hierarchy of memory systems composed of core, semiconductors and perhaps even other technologies.

Companies such as Ampex, which are committed to magnetic technologies such as core and magnetic tape for digital computer systems, must seek to maintain the leadership position they presently enjoy in computer storage technology. It is evident that magnetic storage must yield at least partially to another means of data retention. Indications of the growth and success of semiconductor memories are too positive to ignore. In order to maintain their leadership firms such as Ampex must become involved in integrated circuits and their memory applications, or lose their established position in the memory field. If initiative is lost by current manufacturers, other firms both from within and without the IC industry will fulfill these requirements. However, the IC manufacturer should note the history of previous technologies competitive to core and attempt to focus the technical

and marketing objectives of its products. At the present time, in an industry more concerned with price cutting than profitable performance, several manufacturers are finding it difficult to sell integrated circuit memory devices even though they are offering them at a loss.

At Ampex, core memories and semiconductors are approached as complementary technologies. Large core memory systems are available at moderate speeds and low cost for extensive, nonvolatile, random access data storage. Smaller integrated circuit memories may be used in buffer applications of two kinds. The first application of IC buffer memories is as small, low cost replacements for core buffer memories where cost of circuits is higher than cost of the core stack. The second application is for IBM-like cache systems, where large, low cost core memories are used as backing stores for high performance and higher priced semiconductor memories. Here the semiconductor buffer speed, by use of either a hardware or software algorithm, effects an apparent speed for the hierarchy significantly faster than that of the core memory alone. The matter of transfer algorithms, both in software and hardware, is an area which requires further study. Read-only memories may be employed to incorporate a hardware transfer algorithm into a system. A typical application of such a memory hierarchy system would be in conjunction with an IBM LCS (2361) memory or the Ampex extended core memory (ECM). Another would be with an IBM 2365 or its Ampex ARM-2365 equivalent. The design of such a system can allow the addition of a semiconductor memory to improve overall throughput.

Although a number of promising technologies have emerged as potential replacements for core memory, none has had a significant impact on the dominant position cores presently hold. Nevertheless, semiconductors now appear to be slowly emerging as complementary if not competitive to core technology. Semiconductors offer the batch fabrication of integrated circuits and significant performance and potential cost improvement. Semiconductors also are susceptible to many of the difficulties that have plagued competitive technologies in the past. Undoubtedly recent announcements by IBM will favorably affect their potential success. ■



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# PERSPECTIVE

an interpretive review of significant developments

## Independents, Analysts, Lessors Wonder: Will IBM Strike Again?

IBM cut disc drive prices by up to 19% last Dec. 14 and then watched in horror as sales of its plug-compatible competitors continued to soar. Six months later, on May 27, IBM struck again, offering one- and two-year leases at reductions of 8 and 16%, plus a cut of 15% on purchase prices for disc drives and for tape drives and printers as well.

The new deal, affecting an estimated 80% of IBM's installed peripherals on rent, was aimed squarely at independent manufacturers of plug-to-plug compatible peripherals which System/360 users have been installing at big savings in both price and performance. The independents, for instance, had penetrated 10-12% of the lucrative disc drive market, and at the rate they were moving threatened to capture 30% by the end of the year. IBM marketing men put the pressure on Armonk. A financial analyst said he learned 1,000 salesmen threatened to resign unless IBM became price competitive with the independents.

But within a few weeks of the announcement, most major independents — CalComp, Memorex, Telex, and Ampex — had announced price adjustments of their own which in many cases put them back into the competitive position they held before May 27. The question arose: Will IBM be forced to strike again before the year is out?

Yes, says Richard Caveney, head of the 100-member Computer Peripheral Manufacturers Association. He added the only recourse independents have, short of merging, is to put pressure on government agencies at all levels for support of competition.

Said an observer of antitrust laws, "If the Justice Dept. lets this one pass, there's trouble in the industry."

### Unbundling Revisited?

The spokesman for a small manufacturer of tape drives, caught by the announcement in the midst of its first public stock offering, asked, "Once the competition has been killed off, what's to stop IBM from raising prices

again, as it did with unbundling?"

The more immediate concern of users wasn't competition, but dollars. A user who was putting half of his IBM tape drives on lease at an estimated saving of 7% was asked what he would do with the savings. "I'm going to use it to reduce the credibility gap with my management," he said, indicating it was nice for a change to promise savings and mean it. The user, who asked not to be named, had been considering buying independently made peripherals, and now had decided to stick with IBM.

To large users the price cut is a windfall because extra-shift charges on equipment have been eliminated on all leases. Some big installations operate at from 400-600 hours a month and usually had to pay extra-shift usage fees for equipment used more than 176 hours a month.

IBM offered customers four choices: stay on month-to-month rent; take a one-year lease with a reduction in monthly rental of 8%; get 16% off on a two-year lease; or buy at 15% off. Extra-shift charges are eliminated only if you go on lease.

The company also increased to 24 months from 12 months the amount of time in which a user can apply accruals toward purchase of equipment, provided the user goes on lease. The 24-month period may include up to 12 months in which the user was on rental.

### OK, Lock In

For years, users have been exhorted by IBM salesmen to stay on a monthly rental basis. Do not be locked into a product in such a swiftly changing technology, they were told. Some users, with this exhortation vividly in mind, said they were concerned about penalties they would have to pay just to upgrade. IBM assesses 2½ months' rental (or the remaining time, whichever is less) if a lease is terminated before the end of the first year. If a two-year lease is broken during the first 12 months, the penalty is five months; after 12 months, the

2½-month penalty applies. This is what you pay if you must break a lease to upgrade — unless the upgrade is field-installable. Users moving from 2314 to a 3330 would pay the termination penalty because IBM would have to bring in a new unit. Addition of a new feature to the 3330, however, probably would escape the penalty since it could be added at the site.

At this writing in mid-June, large users still were studying the new offering, although there were some selected conversions to lease prices on 360 peripherals. Many users expected to order 370 peripherals, such as the 3330, on two-year leases. Those with equipment from independents generally intended to keep it, anticipating the independents would fall into line, as they did.

In Chula Vista, Calif., Rohr Corp. still was planning to install Ampex tape drives and probably replace leased 2314 systems with Ampex equipment. Although its one-year lease with Telex for tape drives had expired and it was now paying on a month-to-month basis, Crocker Citizens bank in San Francisco had no intention of changing suppliers on the basis of price alone. Dp manager Don Long said the bank, which also leases peripherals from Greyhound, would certainly require a much bigger incentive if it were to go through the problems of moving in and moving out in a switch to IBM.

But while the independents might not be having trouble with customers and some prospects, the IBM strategy was being felt in the money market. "IBM not only lowered prices," said an analyst with a large investment banking firm, "it also lowered the ability of its competitors to get cash to finance a negative cash flow by lowering their profitability." Other analysts said IBM easily could continue to cut prices. Its economics of scale and excellence in manufacturing techniques, born of its dominance throughout its history, would allow this.

### 60% Profit Margin

IBM is said to have a 60% pretax profit margin on disc drives. It would

be as high as 75% if the company didn't average various overhead costs across the entire product line. The independents, on the other hand, have at best a 25% margin, and those who cut prices to remain under IBM's umbrella will reduce this to less than 20%. A consultant thinks this is dangerously low, considering the overhead they incur in an end-user market.

Spokesmen for independents counter by saying a profit margin of 10%, which many earn, is quite respectable. "The money market may cool off for a few months," says one independent, "but after the quarterly reports are out and show our profits to still be healthy, it will warm up."

This, says an analyst, may be true for larger companies such as Telex, Memorex, Ampex, and a few others. "About 100-150 of the smaller independent peripheral companies, however, would appear to be in serious trouble."

IBM's price cuts will cost it from \$100-200 million during the first year in lost rental revenue. Perhaps half could be recovered from purchases of peripherals under the more attractive 15% reduction. The new deal also brings IBM's complete systems down an average of 6%, which is about equal to what unbundling has cost. This makes it more competitive with other mainframe manufacturers, whose price edge has been about 10%.

IBM also was chipping away at the 20% price edge third-party leasing companies hold in the systems market. The 11-member Computer Lessors Association purchased newspaper ads entitled "Think" to tell customers that 8% or 16% was not enough. "Independent lessors offer savings of 15-45%," said the association, which is trying to extend the life of the \$2.6 billion in 360 equipment now on lease. The association president, Ryal Poppa, said the new price schedule may severely restrict the R&D funds of independents.

### Justice Is Silent

There has been no public announcement by the Justice Dept., whose antitrust suit against IBM, filed in January of 1969, won't go to trial until late 1972. If Justice stays silent, it will appear it has decided that IBM

has first and foremost benefited the consumer and left the competitor enough of a profit margin to compete. Financial analysts think this will work in IBM's favor. An antitrust expert disagrees. He thinks the move will lead the Justice Dept. to investigate carefully the European notion of "dominant concern."

European countries are clear about what a "dominant" firm — not necessarily a monopoly — cannot do. For example, regardless of intent, a dominant firm cannot cut prices if the effect is to hurt nondominant companies. In the U.S., intent to destroy competition must be proven. In West Germany, for instance, a dominant firm can't refuse to license its patents, whereas competitors must wait years in the U.S. for monopoly charges to be proven.

Whatever the intent of the Justice Dept., it isn't saying. A spokesman said "there is quite a bit of work to be done" on the IBM suit. Discovery proceedings are still under way. The next step — taking of depositions — is likely to be taken this fall. Some 75 depositions will be taken from IBM em-

ployees and executives and from competitors and some users. It won't say how many lawyers are working on the case, nor give the cost of the investigation or the extent of the discovery proceedings.

The independents' spokesman, Richard Caveney, says most manufacturers can't afford to wait much longer. IBM will keep the pressure on, he says, and core memory extensions are next on the list of price cuts. He said users are affected as well.

Caveney and other observers wonder what happens to the consumer's power if enough competition is destroyed to make the price he pays the whim of a benevolent giant or the edict of a government regulatory agency? The more observers examined the plight of competitors, the more it became clear the industry and its customers needed some assurances from the Justice Dept. that they are technically capable of judging what's going to happen as a result of the May 27 cuts. They are the only ones that have or can get enough data to figure it out.

—Tom McCusker

## FCC Decision Opens Door to Bargain Basement Rates

Big savings are almost certain to be generated by the FCC's May 25 decision allowing new companies to offer data communication services.

Western Union, for example, plans to expand its Datacom service. This offering is the telegraph company's answer to the competitive threat posed by MCI, one of the new data communication suppliers challenging the established carriers. Datacom, introduced last fall, is a private-line package which costs the user as much as 80% less than what he'd pay for the same lines if leased separately.

Initially, Datacom users could obtain a mix of 75-150 baud subchannels. Last month, the company was authorized by the Federal Communications Commission to add 300-, 600-, and 1200-baud service. This month, says a company source, WU

will ask the FCC to approve 2400- and 4800-baud services; and early next year, Datacom will be further expanded to encompass 9600-baud service.

Under the present Datacom tariff, 24 channels, each rated at 75 baud, can be leased between New York City and Chicago for \$1757/month, or \$73.21/channel. As the number of channels decreases, the price of each goes up rapidly. For 12 channels, the total bill is \$1631, or approximately \$136/channel/month. MCI, by comparison, plans to charge approximately \$90 for each 75-baud channel between New York City and Chicago, regardless of quantity. Thus, MCI offers the low-volume user a price advantage while WU does likewise for the large-volume user.

But there are other considerations which could enable each company to get a substantial foothold on the oth-

er's turf. The Datacom network links 45 cities, right now. MCI won't have a nationwide system operating until mid-1972 at the earliest. On the other hand, MCI is planning to offer a number of extra inducements that could reduce or eliminate WU's time and price advantages; for example, it will charge lower rates for part-time use and one-way transmission, provide alternate voice/data service at no extra cost, and help round up partners for a customer who wants to share a circuit.

### Squelch Through Sharing

AT&T, so far, has tried to squelch MCI mainly by allowing users of low-speed transmission facilities to share individual voice-grade lines (Series 3000 channels) and Series 11000 broadband channels.

The latter is an experimental offering limited to seven Eastern states. It's available in two bandwidths — 48kc and 240kc (kHz). Each communication pipe can be subdivided into varying numbers of lesser bandwidths, including 4kc voice-grade channels, and each of *these* can be assigned to different joint users. Voice and/or data can be transmitted, and users of voice-grade channels can further subdivide them (with their own multiplexing equipment) into slower speed transmission facilities.

Ma Bell also has been looking for a competitive answer to MCI's bulk communication offerings. A 240kc Telpak channel, leased from Bell, currently costs \$30/mile/month. MCI is willing to lease the same capacity for \$20.40. MCI also allows unlimited sharing, while AT&T restricts Telpak sharers to airlines, pipelines, railroads, and other industries regulated by the federal government.

FCC has ordered the telephone company to lift this sharing restriction, but Ma Bell has taken the commission to court in an attempt to overturn the order. At the moment, and until the court rules on Bell's appeal, the Telpak sharing restrictions remain in effect. Bell officials have said that if they are forced to allow unlimited sharing, Telpak rates will go up. But customers are complaining, via another court suit, that Telpak rates are already too high. So, if she loses in court, Mother Bell will have to kill three birds with

one stone — develop a new offering that meets MCI's competition, satisfies the FCC sharing order, and mollifies Telpak users who are unhappy about present rates.

Series 11000 may be the answer. At a meeting of the International Communications Association last May in Atlanta, Fox Stoddard, AT&T's private-line marketing manager, said his company is looking at the possibility of converting Series 11000 into a regular, nationwide offering, a process that would take "6 to 12 months" after FCC gave its blessing. Wider sharing would also be allowed, he indicated. Stoddard added that besides offering Series 11000 on a bulk basis, AT&T may "unbundle" part of the available capacity into individual voice-grade circuits which could be leased separately. Users would be able to subdivide these channels into slower speed subchannels and obtain a service analogous to Western Union's Datacom offering.

### Price Chopper

Substituting Series 11000 for Telpak would chop AT&T's price for a 240kc channel from \$30/mile/month to \$18. Significantly, this is about \$2 below MCI's charge. The present rate for the 48kc version of Series 11000 is \$15 for the first 250 miles, \$10.50 for the next 250, and \$7.50/mile after that. MCI charges \$10.80/mile, regardless of distance.

Since Datacom and Series 11000 are both point-to-point private-line offerings, they don't affect Datran, the other major challenger to the established carriers. The market Datran is aiming for consists partly of telecommunication users who now rely on the dial-up (public telephone) system, but even more on potential data communication users who find present tariffs uneconomic. Typical applications for both groups are on-line credit checking services, and computerized order-entry/inventory control systems linked to remote terminals.

Datran's proposed rates are considerably lower than Bell's. For example, the phone company charges \$30 to transmit one hour's worth of data from Boston to San Francisco. The maximum speed available is 2000 baud. Datran will reduce this rate to \$11.80 and increase the speed to

4800 baud. Like MCI, Datran will be offering a number of extras not available from the phone company. Most users won't need modems, for example; connections will be completed in a maximum of 3 seconds (vs. the phone company's 18-20 seconds); and the minimum toll-charge period will be 6 seconds instead of one minute. Datran will also transmit data at a lower bit-error rate and guarantee fewer busy signals.

So far, AT&T hasn't done much about the Datran threat — possibly because it will be 1974 at the earliest before Datran's system is fully operational. Bell retains a number of options, though, in the wake of FCC's May 25 decision.

That decision, essentially, made both Datran and MCI a credible threat. Until the commission stated officially that new entrants would be allowed to challenge the established carriers, it remained possible, or likely, depending on your bias, that AT&T, Western Union, and the other charter members of the common carrier club would continue to be the only ones.

### Rate Debate

But if the May decision made the challengers credible, it gave the defenders additional maneuvering room. Specifically, the commission said the established carriers could abandon the present rate-making system to meet competition. This system averages the costs of serving high- and low-density areas. In effect, the carrier charges more than he has to in the former areas, so that he can charge less in the latter areas. Since Datran, MCI, and the other challengers intend to service the high-density areas primarily, the established carriers could be under a handicap if they had to continue basing their rates on averaged costs.

The commission also discussed, but did not decide, how costs should be assigned to specialized data services. This is a hot question. Historically, the established carriers have used "incremental costs" to arrive at rates for new services. Datran and other critics charge that this approach excludes much of the applicable overhead expense, forcing users of the carrier's existing services to pay more than they should and, in effect, subsidi-

dize the new service.

The commission, in its May decision, walked around this issue: "There is no reason to deny the public the benefits that may derive from active and vigorous participation by the Bell System and Western Union in this market, so long as their participation is not a burden upon . . . their other services. Thus, it is our intention to permit the existing carriers to price their competitive services in a fashion that will realistically and reasonably reflect economic advantages, if any, that are inherent in the plant and operations of those carriers. Moreover . . . there should not be any 'protective umbrella' for the new entrants . . ."

Datran reportedly will suggest to the commission in the near future that the carriers be required to offer specialized services through subsidiary corporations. Allegedly, this would simplify the job of identifying overhead and operating costs of a new service. Almost certainly, AT&T will argue that this would cause duplication of facilities and unnecessary extra costs.

It will be quite a while before the FCC resolves the argument over incremental costs and decides how far the established carriers can lower their rates in competitive markets. Until those answers are in, data communication users won't know the real value of the May 25 decision.

### Changing Charges

In the meantime, the charter members of the club and the pledges will offer services based on rates that are subject to change. Some of these rates — for example, those covering Datacom, Telpak, and Series 11000 — have already gone through the FCC mill, but as the services are altered, and as regulatory policies become better defined, new rate proposals will be submitted to the commission. Both Datran and MCI have tentatively announced their charges, but the formal filings, which are due shortly before regular service starts, could be different. And once a tariff is proposed, it is subject to challenges which could lead to subsequent adjustment. Even after the FCC lets a rate become effective, it may investigate further, and later on order the carrier to charge more or less.

While the lawyers argue about rate

economics, the engineers will be laying microwave networks across the face of the nation. MCI, which has already obtained authorization for the first link in its network, between Chicago and St. Louis, will start offering commercial service next September. The initial load consists of "about 280" channels, says president Jack Goeken. MCI's present authorization consists of a total of 1,800 channels between Chicago and St. Louis. "Early next year," adds Goeken, FCC will be asked to grant 1,800 more channels along this route.

Interdata Communications, Inc., an MCI affiliate which intends to service the East Coast between New York City and Washington, seems likely to get the next construction authorization. It could happen this month. Applications for about 45 other systems have been filed. If all of them are processed before the end of the

year, which is probable, microwave data networks could be criss-crossing the entire country by the end of 1972.

By then, Western Union should have its hybrid digital-analog microwave system built between Cincinnati and Atlanta, New York and Washington, Washington and Atlanta, and possibly New York-Chicago. MCI, as well as WU, is using hybrid technology. The big benefit of this technique to the user is that no modem is required if he uses a digital local loop. Even with an analog local loop, there's a big saving because a far simpler modem will do the job. John Cox, WU's engineering manager, estimates that for a 2400-baud terminal the modem cost is reduced from \$2000 to \$700. This saving, of course, is in addition to the reduced rates charged for the communication channel.

—Phil Hirsch



"It's a wedding invitation. You remember that nice young couple at the Bennett's cocktail party who met by computer?"

## Safeguard: Competition, Criticism, and Progress

While the Safeguard antiballistic missile program was running into both competition and criticism last month, the ABM computer concept, PEPE (Parallel Element Processing Ensemble), appeared to have enhanced prospects with the scheduling by the Army of a secret briefing for prospective PEPE hardware builders.

Currently, security surrounding PEPE is so tight even prospective hardware builders don't seem to know much about it, but the concept is quite fully described in an unclassified document published in Sept. 1969 by Bell Labs, which developed it. The document, Ballistic Missile Defense Advanced Development Program — Advanced Data Processing, Vol. 1, is complete with samples of simulation.

Safeguard's competition was coming from Hard Site, the second-generation ABM concept which appeared to be gaining ground as evidenced by the transfer of Julian Davidson, Hard Site project manager, to Safeguard headquarters.

The strongest criticism was continuing to come from the Computer Professionals Against ABM, headed by Dan McCracken, who June 23 wound up a nationwide tour in which he addressed ACM chapters and university groups. Through the life of the tour, McCracken attempted to turn his talks into debates, but at this writing it looked as if he wasn't going to make it. He still hadn't been able to get anyone to oppose him in his final talk June 23 to the ACM chapter in Omaha.

In March McCracken attempted to enlist the aid of Senator Hubert Humphrey in his efforts to get someone to debate him on the adequacy of the Safeguard software. A letter from McCracken to Humphrey asking for help was answered by Julian R. Levine, special assistant, public affairs, assistant secretary of defense, who advised "it is not our policy to have members of the Dept. of Defense enter into public debates as advocates of proposed weapons, particularly while action on those weapons is pending in Congress."

Levine cited tests on Meck Island

in the Pacific as evidence of the workability of the data processing subsystem. He said 13 systems integration tests had been conducted with "only one failure and only one test in which limited objectives were accomplished as compared to 11 successful tests."

McCracken countered in an answering letter that he had relayed the Meck Island example to "a couple of dozen audiences of computer people, and the response is always incredulous laughter. Do the people managing the ABM *really believe* that a one-



DAN McCRACKEN: "It's still a bunch of nonsense."

target test says anything about a system that is specified to be able to track a *thousand* targets simultaneously?"

McCracken called Levine's "decision to evade debates that you could not possibly win . . . a wise one, from your standpoint, but either way you have lost the public opinion battle within the computer industry." He noted votes taken on his position at meetings in Madison, Wis., and Kansas City where the votes in his favor were 44 to 0 and 100 to 3, respectively.

And how do the Computer Professionals Against ABM feel about Hard Site, something of a scaled-down version of Safeguard that would protect only missiles, not cities, and would involve three sites instead of 13? Says McCracken: "It answers some of our objections, but it's still a bunch of nonsense."

## Legislation Would Curb Data Gathering

The introduction of legislation restricting the kinds of information the government can collect and guaranteeing access to individuals who are the subjects of dossier-type files is planned by Sen. Sam J. Ervin, Jr.

Speaking at a press conference following his SJCC luncheon address, the North Carolina Democrat said he is "not thoroughly convinced" that data banks of information gathered surreptitiously by the Army on students, civil-rights demonstrators, and other protestors have been destroyed, because much data had previously been exchanged with other government agencies.

Sen. Ervin expects the Nixon administration to oppose controls on data banks because of a fear that they would hamstring federal surveillance activities. Ervin cited recent testimony before his subcommittee in which assistant attorney general William H. Rehnquist said his agency will "vigorously oppose" any attempt to "handicap in any way [their] ability to put Americans under surveillance." Ervin added, however, that he has mixed feelings about imposing controls on the FBI.

## Emulation Patent — Is It Meaningful?

What do you do when your broadly worded patent application covering a fundamental concept in computer design is approved? That's what Standard Computer Corp. of Santa Ana, Calif., has been wondering since the U.S. Patent Office issued patent 3,544,969 entitled "Language Independent Computer" to them last December. The patent is for utilization of microprogramming technology to emulate other data processors. Standard said it appears to be generalized enough to cover the way other firms, including IBM, do emulation, and raises the question of whether these other firms shouldn't be licensed by Standard.

"It's when we get into details that

we may have trouble with the wording of the patent," says vice president Ernest J. Porcelli who, along with Laszlo Rakoczi, David Keefer, and Gary Goss, authored the application originally filed in 1967. Dr. Robert Rosin of the computer sciences department at SUNY at Buffalo, a frequent lecturer in microprogramming, played the whole thing down. "The Patent Office sure couldn't know much about computing. A couple of years ago they were willing to let some guy patent the Fibonacci numbers, and numbers are concepts. I'm sure it says somewhere in their charter that concepts cannot be patented; yet lately they seem willing to patent them. If von Neumann didn't do it, some other designer early on used the emulation technique, and all IBM would have to do would be to prove they built emulation into their machines before the patent was granted and they would be safe." Porcelli doesn't feel that Standard will contest IBM's right to emulators, which is in line with Dr. Rosin's opinion that a smaller firm obtains a patent only to keep from being "locked out" of using a concept should a larger firm decide to make an issue of it. But this might not be the last word on patent 3,544,969. Says Porcelli: "We know we want to do *something* with it, but we don't know what."

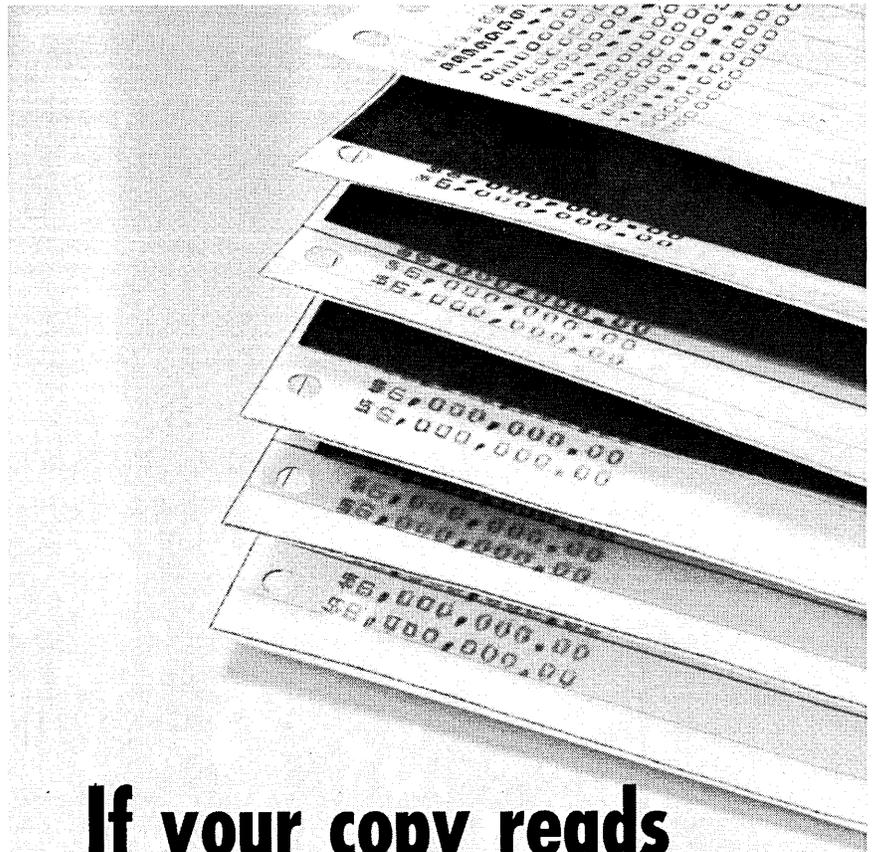
### Hoffman Electronics in Computer Field

Hoffman Electronics Corp., Los Angeles-based electronics firm, has taken a side door into the computer field with acquisition of control of UniComp, Inc., a Northridge, Calif., minicomputer company it helped start in May of 1969.

UniComp, whose sales currently are running at \$800,000 annually, was organized to attack the vertical end-user market for minis and, says Wayne M. Aamoth, vice-president, marketing, is applications oriented. The company builds special-purpose systems around its Comp-16 and Comp-18 minicomputers for applications which have ranged from correlating sonar accuracy on submarines to analyzing investment portfolio performance for a mutual fund.

From the beginning, though, the

July 15, 1971.



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emphasis has been on systems which could perform in rugged environments yet be produced without the expense usually involved in meeting Mil-Specs. Even the mutual fund analysis application turned out to be a rugged environment use, although the original intention was not there; the user is carrying his system around the country in a van.

While UniComp's business currently is 60% military, it expects to be 80% commercial within three years, Hoffman, now strongly military oriented, feels UniComp can lead its parent into new commercial markets.

### NR Comes to Collins' Aid ... \$65 Million Worth

Merger-shy Collins Radio Co., which this time last year was looking to computer sales to pull it out of the financial doldrums, now is pinning its hopes on an investment by North American Rockwell Corp., an investment which would give NR a controlling vote on an expanded Collins board.

Spokesmen for both firms were careful to call the agreement, approved by directors in mid-June, an investment and "not a merger." The agreement calls for NR to purchase \$35 million of a new issue of Collins convertible preferred stock and obtain warrants to purchase \$30 million of Collins common stock. Collins would increase its board to 11 members, and North American Rockwell would be permitted to elect six.

Collins executive vice-president W. W. Roodhouse declined to discuss the state of his company's business "on advice of counsel" as a proxy statement was being prepared for a shareholders' vote on the agreement which was expected early this month. In March of 1970, Collins executives were predicting that 25% of their sales would be in computer and data systems by the end of 1974, when they were anticipating a volume of \$750 million.

Their big hope was for their C-System, a computer-controlled communication system based on their C-8500 computer and said to be largely the result of the personal work of the Dallas-based firm's inventor-chairman, Arthur Collins. In spring of 1970 they had some 60 systems installed, half

for their own use. How much this has changed will be revealed in their proxy statement. Collins has been producing computers since the early 1960s.

It's generally assumed Collins will use the funds from the NR investment to reduce a substantial amount of short-term indebtedness on which the interest has been called staggering.

I. Gordon Odell, staff vice president, corporate development, for NR, called his company's interest in Collins evidence "of our desire to strengthen our image in commercial electronics." He said NR has no long-range plans regarding Collins but noted there is "a great community of interest and we have a number of very complementary activities." He said it is conceivable that the services of NR's North American Rockwell Information Systems Co. (NARISCO), a service company which designs and implements computer-based information systems, could be used to help push the C-System.

Whatever happens, should shareholders approve the agreement, Collins, which has been going it alone since 1931 when it was founded to build amateur radio equipment, will not be alone any more.

### ACM 71 Commemorates Industry's 25th Birthday

A retrospective and prospective "Quarter Century View" of the computer industry, to commemorate its 25th anniversary, will highlight ACM's annual conference next month in

Chicago. The three-day meeting, Aug. 3-5 at the Conrad Hilton Hotel, includes presentation of 57 papers plus eight panel sessions and two tutorials. A two-day ACM-sponsored management seminar, "Computing Today: The Profit Crisis," will follow the conference.

The program encompasses mathematical programming, information retrieval, programming languages, and data communications; it also includes several sessions on the political, legal, and social impact of computers.

Conference registration fees are: \$35 for ACM members, \$60 for non-members, and \$10 for student members. Charges for a single day's sessions are, respectively, \$25, \$35, and \$5. Temporarily unemployed ACM members will be admitted free of charge to all technical sessions. "Sigmeet" get-togethers are an optional extra. They'll be held the evenings of Aug. 3, 4, and 5. The cost is \$4 for one Sigmeet session, or \$11 for three. The fee covers snacks and two drinks per evening.

The "Quarter Century View" will feature presentations by four management consulting organizations, summarizing the computer's impact during the past 25 years and its likely impact during the next 25. "Never before and perhaps never again will the inventors and pioneers of the computer profession be together at such an event," said ACM president Walter Carlson. The management consulting firms and their topics are: A. D. Little, technology and the computer industry; McKinsey & Co., the

Univac will host a formal dinner during the ACM convention to honor computer pioneers Dr. John Mauchly, Dr. J. Presper Eckert, and Comdr. Grace Hopper of the U.S. Navy. Mauchly and Eckert are coinventors of Eniac, the first computer. Comdr. Hopper programmed Mark I and Univac I.



lessons of management; Auerbach Information Services, hardware and software; Booz, Allen, Hamilton, people resources; and Stanford Research Institute, market structure.

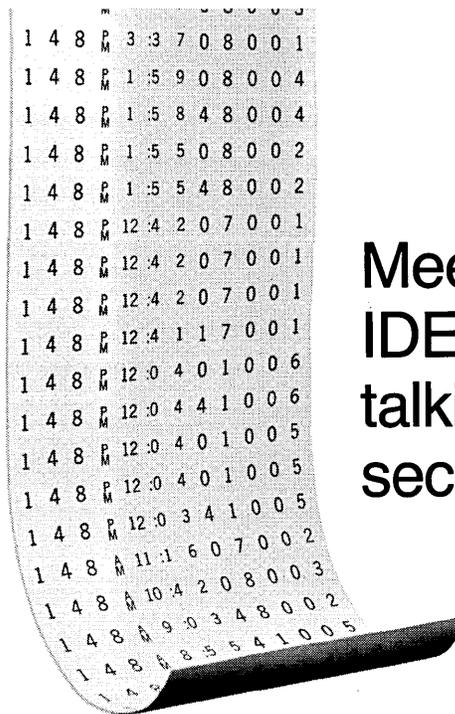
The "look back" portion of this session will be presented on Tuesday, Aug. 3 at 1:15 p.m., while the "look ahead" portion is scheduled for the following morning. Tuesday evening, Univac will host a formal commemorative dinner. Among the honored guests will be J. Presper Eckert and John W. Mauchly, coinventors of Eniac, and Commander Grace Hopper, who programmed both the Mark I and Univac I.

The A. M. Turing Award lecture will be presented by Prof. John McCarthy of Stanford. His topic is the present state of research on artificial intelligence.

Two sessions on telecommunications are included in the ACM 71 program. One is a tutorial on digital communications technology, chaired by Edward Fuchs of Bell Telephone Labs. The panelists are Ed Berg, of Datran; John E. Cox, Western Union; and H. S. McDonald, Bell Telephone Labs. This session is scheduled for Wednesday at 1:15 p.m. Immediately afterward, at 3:30, Robert E. LaBlanc, of Solomon Brothers, will lead a panel discussion entitled "Economic and Regulatory Policy for Advances in Data Communication." His panel will include Paul Davidson, Rutgers Univ.; David Foster, Datran; A. M. Froggart, AT&T; and Newton H. Minow, former FCC chairman who is now a practicing attorney

The two-day management seminar that follows the conference will consist of lectures and workshops, beginning with a session on data communications. Other topics include recent developments in operating system design, system performance measurement, programming language standards, personnel evaluation and training, input economics, data security, and software buying. The seminar fee is \$140 for ACM members and \$175 for non-ACMers. For one day, the charges are, respectively, \$75 and \$100.

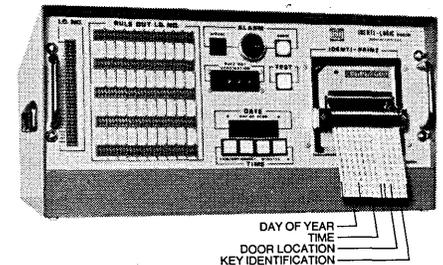
Preprints of most sessions will be available at the conference. Those who attend for three days get the preprints of two sessions free of extra charge.



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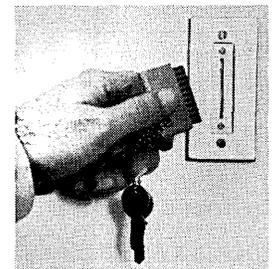


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CIRCLE 14 ON READER CARD

**Corning's Solution Lacked a Problem**

When Corning Glass announced the 904, an interactive graphics display terminal with hardcopy output at only \$820 per month (May '70, p. 179), it generated great interest; the *Datamation* news item drew 435 reader card responses.

But just a year after introduction, Corning Glass Works withdrew the terminal from the market and dissolved Corning Data Systems, which manufactured and marketed the unit. The company blamed misjudgment of the market. Indeed, despite optimistic predictions last year, only thirteen 904s were acquired by users.

An observer said the unit was "an elegant solution searching for a problem." It worked well, but didn't have a niche. The low price was achieved by using photochromic glass for display, eliminating the need for refresh electronics. But that also eliminated selective erase capability, and eight seconds were required to erase the entire screen. Thus, the terminal

couldn't be used for many graphics applications, while, at the same time, it was much too expensive to be used as a Teletype replacement.

The final Corning announcement said the market for the 904 "was considerably smaller and growing more slowly" than had been anticipated. Further, "profitable operation could not be expected in the foreseeable future." It marked the end of Corning's only venture into the end-user computer market.

**Simple Arithmetic Isn't Always Simple**

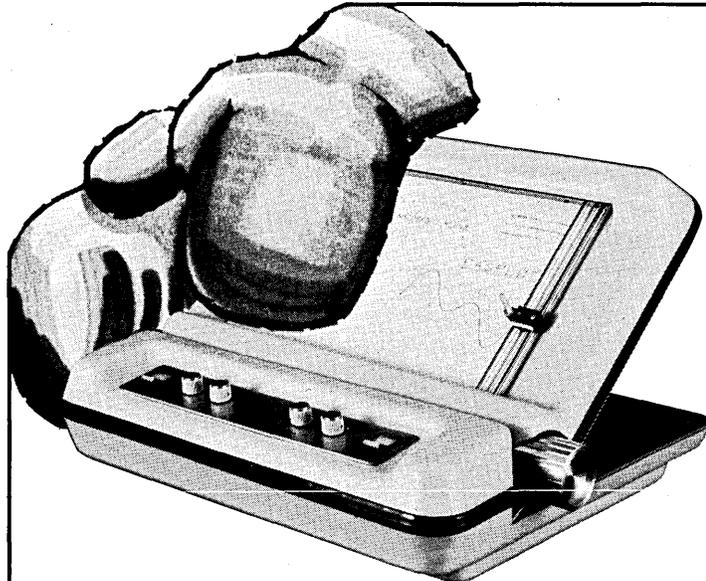
Two plus two added up to a payment hassle for Logicon, Inc., Los Angeles, which in March announced cancellation of a program to develop a time-sharing system by that name.

Logicon had designed the system around Meta 4 equipment produced by Digital Scientific Corp., San Diego, and gave as its reason for the cancellation the fact that Digital Scientific had temporarily suspended opera-

tions because of financial difficulties. Now Digital Scientific has filed a breach of contract arbitration claim against Logicon charging failure to pay for computers delivered, and Logicon has filed a counterclaim with the American Arbitration Assn. for "damages suffered as a result of DSC's breach of contract in failing to deliver computer hardware as agreed."

"I would have filed on them to begin with," said J.R. Woodhull, Logicon president, "but I didn't think there was any money there to get." Woodhull said Logicon's agreement with Digital Scientific, negotiated in the spring of 1970, called for DSC to deliver a prototype system and then additional systems on an oem basis. "We weren't contractually obligated to take any more than the prototype." He said DSC delivered "pieces" of a prototype in mid-July, two months later than the mid-May delivery called for in the contract, and "it never worked to specifications."

Logicon, he said, canceled the contract when it canceled its 2 + 2



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program and asked DSC to take back the equipment, which they finally did in May of this year, relieving a garnishment served on Logicon at about the time of the contract cancellation.

## IBM Tightens Up Internal Security

There has been a leak in IBM's new drive to tighten up its internal security program — details of the stringent new security steps have leaked out.

In an internal news bulletin distributed at IBM's Harrison, N.Y., plant, the details of the tough new program are outlined in an article headlined "Serious Security Breaches Lead to Strong New Program." The article states that the stringent measures were instituted in part because of "the offer of confidential data for sale to IBM competitors." The particular case in point was not mentioned in the article, and an IBM spokesman would say only that the incident referred to occurred "some months ago." He declined to go into further detail.

The new security measures at IBM include the removal of self-service copiers at certain data processing group units and their replacement by copying machines that will be manned. In addition, all Polaroid cameras have been recalled. The IBM unit is also tightening up on the physical security at exits and entrances, closing off some doors to some people and installing on other doors buzzers that are activated when unauthorized persons use the doors.

The IBM spokesman, who was reluctant to discuss the matter, said simply that IBM has always had security measures and the firm recently instituted the new steps.

## The Decade of the Laser?

Indications are popping up that the 1980s could be the decade of the laser in the computer industry.

Dr. William Webster, vice president, RCA Laboratories, which is working on an experimental memory system for NASA in which 1 million bits of data can be written, stored, or erased by laser light, believes such memories in the 80s "could replace

the entire hierarchy of magnetic tapes, discs, drums, and cores now used in modern computer memory systems and would lead to simplification in computer architecture and operation." He said the experimental memory, when completed next spring, will be the first full-cycle, all-optical memory ever built and "could set the stage for the development of a whole new species of mass memories that are equal in storage to but 1,000 times faster than the biggest disc systems achieved so far."

On another front, Zenith Radio Corp. has introduced a laser deflector (D-70R) it says may lead to new techniques in data processing, "including the printing of computer readout on microfilm at rates exceeding 1,000 pages per minute." The deflector, in combination with an acousto-optic modulator, converts the laser beam into a fan of light which sweeps across a strip of microfilm.

And then there's Frank Marchuk (July 1, p. 52).

## NEWS BRIEFS

### Korean Data Entry Center

Going a step beyond sporadic efforts to provide keypunching service from the Orient, Keyboard Training, Inc., New York, has launched a joint venture with Korea Keyboard Co., Ltd., Seoul, to provide conversion of data to magnetic tape using key-to-tape equipment manned by Korean personnel who are fluent in English and boast high school or college education. KTI had previously confined its activities to training operators of keyboard equipment. Prices are "highly competitive," and the Korean workers are said to be highly efficient.

### ComFor Folds

The latest computer trade show casualty is the first annual International Computer Forum and Exposition (ComFor) originally scheduled for early last month, then postponed to run concurrently with the National Electronics Conference (its sponsor) in October, and finally canceled al-

together, as was NEC/71. The reason for the cancellation, says NEC, was "poor response." Earlier this year the highly touted Compso regional shows canceled out, presumably forever, and IEEE canceled the exhibits portion of its annual Computer Society conference. The first annual ComFor is not dead for sure, though, as NEC has plans, not officially announced, to try to run the show in October 1972, again along with the National Electronics Conference.

### ADL Software Subsidiary

The formation of ADL Systems, Inc., a wholly owned subsidiary of Arthur D. Little, Inc., was announced at the SJCC. The new firm will be located at ADL headquarters in Cambridge, Mass. It begins life with more than \$600,000 of the parent firm's software development work and a goal of reaching revenues of about \$10 million a year in five years. This objective would make ADL Systems one of the top 15 software houses. President of the new company is Dr. Bernard W. Romberg, who was responsible for many of ADL's largest systems implementation projects and most recently served as head of the information technology group in ADL's management sciences division.

### ADR Hospital Contract

The Control Systems Div. of Applied Data Research has been awarded a \$1.5 million contract by the Cleveland Clinic Foundation for a computer-based communications system to handle services and supplies ordering within the hospital, maintain patient-bed and patient-doctor assignment records, control pharmaceutical and central stores inventory and ordering, schedule operating-room facilities, and route clinic patients. ADR will supply all computer hardware and accept total responsibility for the system, which is based upon hospital methods designed by the Cleveland Clinic. Digital Equipment Corp. will supply the three PDP-11 computers and their peripherals; terminal equipment will be supplied by other subcontractors. Work on the system will be done at ADR's Princeton headquarters. ■

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September 9 and 10, 1971*

## **AN INTEGRATED APPROACH TO MIS**

A new approach is being taken to this year's annual conference. In the first two conferences, topics and speakers were selected on the basis of a broad range of interests and subjects relating to MIS. This year, the conference will consist primarily of in-depth case histories of the computer information systems programs of two well-known major corporations:

- *The Weyerhaeuser Company*
- *Westinghouse Electric Corporation*

Comprehensive visual presentations are being prepared covering the philosophies these two companies pursued in applying computers to information systems for management functions; the approach to design selected; major applications — how they were developed, how they are used; applications of management science; the perspective of key executive users — before, during the development process, and after completion of major systems. The presentations will be handled by key executives and computer and systems planners of both companies.

### **Special conference features**

- *Manager/Computer Interaction*

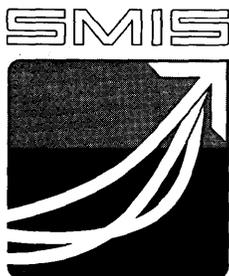
Executives of Westinghouse and Litton Industries will discuss key applications of their systems made available to managers for direct interactive use.

- *Identification of MIS Principles: Industry Applications*

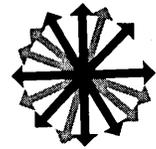
A prime objective will be identification of principles applying universally to MIS design programs. During the last conference session on the second day, attendees will separate into industry groups — banking, insurance, manufacturing, government, retailing, etc. Discussion will be directed toward how universal principles can best be applied in each individual industry.

- *Dr. Paul Nadler, dinner speaker*

Dr. Paul Nadler, Professor of Finance, Rutgers University, is widely known for his ability to present a serious subject in a highly entertaining manner. As guest dinner speaker September 9, he will discuss the role of Financial Information Systems. Don't miss this conference highlight!

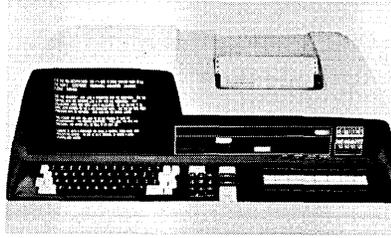


If you wish to receive a Registration Packet for this Third Annual Conference, please write to: Gerald M. Hoffman, Secretary, The Society for Management Information Systems, One First National Plaza, Chicago, Illinois 60670



## Work Station

The DECdatacenter is a PDP-11 linked not with a Teletype, but with a terminal including a crt, typewriter keyboard, and function keys with indicator lights. The indicators can be programmed and labeled to guide the operator through specific jobs. A



basic system, including a 4K PDP-11, is \$21,395; but typical configurations are expected to be \$40-50K. Additional terminals only are \$7995 each. Deliveries are to begin late this year. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 535 ON READER CARD

## Extended Core Storage

Apparently there are just 16 addressing wires in a 360/30, and this has limited its maximum storage to 64K all these years. IBM is currently accepting RPOs for doing the work necessary to get the extra wire in the cpu/memory to install 96K memories. Of course, once that wire is

there, 128K will be possible, and that's what is being offered by this company. Rental for a full 128K will run \$3415/month on a three-year lease, including maintenance.

There is something in this for model 40 users, too; namely, expansion to 448K from the previous high of 256K—almost double. A three-year lease for the full 448K runs \$8575/

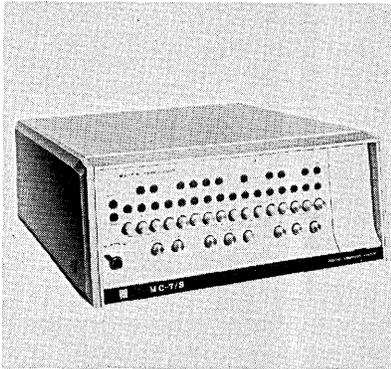
month, including maintenance.

Model 50 users can be upgraded to a full megabyte of memory, starting at the 128K increment, for \$18,570/month with maintenance. There are no extra-use charges. COMPUTER INVESTORS GROUP, INC., New York, N.Y. For information:

CIRCLE 551 ON READER CARD

## Foreign Hardware

This large manufacturer is offering oem's in this country a raft of equipment, including a 600-nsec, 4-16K plated-wire 16-bit computer called the Mc-7F (\$8K for 4K memory, single quantity) and a less capable model called the Mc-7S with the same general memory specs except for its 4-usec cycle time and minimum 1K of memory (\$5200 for 4K memory, single quantity). The rest of the list includes the model JD-201



stand-alone billing machine, the JK-204 mark sense reader, the JK-206 paper tape reader, several models of keyboards, the model KP-361-S-A MACC SCOPE crt terminal, the JK-801 mini disc memory, delay lines, etc. Lots of software is available on the minicomputer models, including three separate FORTRAN compilers. MATSUSHITA ELECTRIC CORP. OF AMERICA (PANASONIC), New York, N.Y. For information:

CIRCLE 549 ON READER CARD

## S/3 Tab Equipment

Versatility best describes the 9660 sorting data recorder. Both oem and end users can obtain a machine that will sort 96-column cards at 300 cpm, reproduce, interfile, gang

punch, interpret, and post information from a master file to other 96-column cards, in addition to performing keypunch and verifier (printing or nonprinting) functions. An oem interface is offered as a special feature, permitting the 9660 to be used

as a 300-cpm reader, a 60- to 120-cpm punch, and a 60-120 cpm reader/punch. All this for \$8400, and deliveries begin in August. DECISION DATA CORP., Warminster, Pa. For information:

CIRCLE 527 ON READER CARD

## Crt Hard Copy

The hard-copy unit incorporated in this manufacturer's crt terminal line is now being offered end users for attachment to any "standard" crt. Information is presented on a 4½ x 5-inch sheet of bond-like paper supplied in 500-foot rolls. Five seconds is required for the first duplication, and two seconds for each additional copy. The model 01 can be shared by up to eight 60 Hz displays and has a resolution of 10 line pairs per millimeter. Delivery is 60 days ARO, and single units are priced at \$3500. PHOTO-PHYSICS, INC., Mountain View, Calif. For information:

CIRCLE 545 ON READER CARD

## Data Terminal

Several different configurations of this 2780-compatible terminal are possible, starting with the RBT 6786. It consists of this manufacturer's KDR key-to-tape unit which enters data onto a 9-channel, 800-bpi tape ready for processing, and an LP 3000 line printer for local or remote 132-column printout at 135 lpm using 64-character ASCII or EBCDIC sets. The 6786 rents for \$590/month, including maintenance, and will be available during the fourth quarter. POTTER INSTRUMENT CO., INC., Melville, N.Y. For information:

CIRCLE 541 ON READER CARD

## Newest Model 360

Of the six submodels of the 360/20, the model 6 is the second most powerful offered so far. Users can choose from 8K, 12K, or 16K memory configurations, and this version is rated at 3.6 usec per two bytes. Two 2311 disc storage units may be attached to provide up to 10.8 megabytes of storage. Monthly rental for a typical system with 12K of memory is about \$3375/month, with a purchase price of about \$139,480. Deliveries are scheduled for the last quarter of the year. IBM CORP., White Plains, N.Y. For information:

CIRCLE 547 ON READER CARD

## Chain Printers

The LP 3500 chain printer operates at 1240-1500 lpm using 48 characters and 132 columns. An adaptive control allows the next line to be printed as soon as the buffer is empty. Fonts may be changed from 48-96 characters, or from 64-128 characters, by switching chains. Single units are priced at about \$19K for oem's, and the end-user version (designated the LP 3403), plug and logically compatible with 360s, rents for \$1250/month on a one-year lease. Deliveries begin the first quarter of next year. POTTER INSTRUMENT CO., INC., Melville, N.Y. For information:

CIRCLE 537 ON READER CARD

## Non-Philips Cartridge

A magnetic tape cartridge transport featuring coaxial reels that are held under constant torque and a pinch roller contained within the cartridge case to maintain constant tension has been announced as available to oem's by a subsidiary of North American Philips. The new design should be superior to Philips-type cassettes because the tape, being under tension, cannot inadvertently be placed on the wrong side of the capstan during mounting. The price is \$290 in single quantities, with discounts to oem's. Delivery is 30 days ARO. DIGITRONICS CORP., Albertson, N.Y. For information:

CIRCLE 538 ON READER CARD

## Oem Cassette Recorder

The model 125 digital cassette recorder uses a Philips-type cassette for storage of up to 224K characters in 100-character blocks. The bidirectional unit reads and writes at 12.5 ips, providing a data rate of 10 kilobaud at the 800 bpi packing density. Start/stop times are 20-25 msec, and the rewind time is 30 seconds for a 282-foot cassette. Low skewing permits two-track, parallel-redundant recording at 800 bpi NRZI, and tape tension is said to be within ECMA limits at all times. Prices are under \$500 each in quantities of 1,000. SYCOR, INC., Ann Arbor, Mich. For information:

CIRCLE 530 ON READER CARD

## Microfilm Plotters

The Beta Plot microfilm plotters are available in two models: the 100, designed to be interfaced to a computer, coupled directly to a display controller, or slaved to a graphics display; and the model 110, a programmable system using a PDP-8 controller, with unbundled software and peripherals options. Prices are about \$40K and \$58K, respectively. Substantial oem discounts are available. Delivery requires about 60 days ARO. BETA INSTRUMENT CORP., Newton Upper Falls, Mass. For information:

CIRCLE 532 ON READER CARD

## Tape Drive

An IBM-compatible 75-ips tape drive is now listed among this firm's products. The MOD 1075 can be specified with 200-, 556-, or 800-bpi densities for 7-track NRZI recording, or with 1600-bpi electronics for 9-track formats. Variable write deskewing for NRZI recording is featured, as is a tri-level read threshold, with one level programmable, for recovery of marginal tape data. Pricing for an order of 100 units is something under \$5K. WANG COMPUTER PRODUCTS, INC., Los Angeles, Calif. For information:

CIRCLE 545 ON READER CARD

## Core Storage

The 360/CORE line includes extension and replacement storage for 360 models 30, 40, and 50. The systems are plug-compatible with the original modules and expandable in small segments of 8K bytes upwards. Maximum expansion of model 30s is to 64K; model 40s can go to 256K, and model 50s up to 512K bytes. Pricing is geared to about 20% under IBM prices, which, at press time, amounted to about \$960/month for 32K. Delivery requires 60 days ARO. CAMBRIDGE MEMORIES, INC., Newton, Mass. For information:

CIRCLE 531 ON READER CARD

## Multi-Image Display

This firm produces high resolution display units for applications requiring fine detail, and its latest model, the model 36, can display up to four separate images for simultaneous viewing and comparison. A 10-inch diagonal storage tube is utilized, requiring no refreshing of the display. The maximum resolution is 2,048 points per axis, with each point assigned one of 64 intensity levels, with a contrast ratio of 3:1. Image generation times range between two and four minutes, with the maximum erasure time given as 20 seconds. Position repeatability is given as  $\pm .005$  inch for successive images after warmup. Available 60 to 90 days ARO, the model 36 image display is priced at \$25,400. DICOMED CORP., Minneapolis, Minn. For information:

CIRCLE 517 ON READER CARD

## Disc Storage

Disc storage is offered for the H-P 2114A 16-bit minicomputer in capacities ranging from 512,000 to 3 megabits. Attaching to the i/o bus of the 2114A, the 501H disc unit has an average access time of 8.5 msec. Transfer rates are performed at 30 kHz under program control. The 501H has specifications that might qualify it for severe environment usage, including operation between 0-55° Centigrade and the ability to withstand 10G shock during operation. The 501H is supplied with software that includes an i/o driver subroutine compatible with BCS, a disc operating system, sio driver, absolute bootstrap loader, and disc diagnostic routines. Prices start at \$5800 for the 501H, and delivery requires 30 days. DYNACOUSTICS, INC., Hayward, Calif. For information:

CIRCLE 521 ON READER CARD

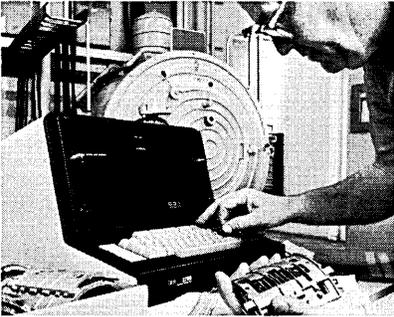
## Keyboards

The latest entry to the keyboard market incorporates complete TTL/DTL interfacing, newly designed sealed reed switches, capability to output any 16-bit or less code, and a wide range of options. These can include electronic interlock or two-key roll-over, odd or even parity, level or pulse output strobe, and even key shape and operation force. The reed switches are said to offer high operational reliability. The keyboards are expected to sell at around \$90 each in quantities of 1,000 based on an encoded 50-key keyboard. Prototype units can be made available within four to six weeks, and production units are expected to have six- to eight-week availability. AMPHENOL SWITCH DIV., THE BUNKER-RAMO CORP., Broadview, Ill. For information:

CIRCLE 520 ON READER CARD

**Industrial Terminal**

The 2790 data communication system has gained a specialized, interactive industrial terminal called the



model 2798 guidance display unit. Information is entered through a 56-key keyboard where it is displayed in

a 16-character field for verification. Replies from the system light up selected messages printed on a film overlay on the face of the terminal. The overlay can contain up to 48 application-oriented messages. The terminal hooks up to System 360s or 370s through the 2715 transmission control unit. A typical installation, consisting of a controller, twelve 2798 terminals, and thirty other devices, including data entry units and printers, will rent for about \$4500/month, with a purchase price of about \$216K. Monthly rental on the 2798 alone will be \$90, or it can be purchased for \$4320. Shipments are scheduled for this time next year. IBM CORP., White Plains, N.Y. For information:

CIRCLE 543 ON READER CARD

**Tape Transport**

The 1600 series magnetic tape transports handle IBM-compatible 9-channel tape at 800 or 1600 bpi and operate at speeds from 12.5 to 37.5 ips. The units are bidirectional with 10.5-inch reels. Features include a dual-gap tape head, single-capstan direct-reel drive, self-contained formatter, and a special leader clamp system to simplify loading. A tape hub locking lever is said to permit removal of reels with one hand. Prices start at under \$4500, and delivery requires 60 days ARO. DIGITRONICS CORP., Albertson, N.Y. For information:

CIRCLE 539 ON READER CARD

**Memory Expansion**

IBM recently announced an RPQ for expanding the memory size of 360 model 30s up to 96K bytes from the previous limit of 64K. But this vendor is offering 32K more than IBM's RPQ, doubling the capacity of the 30 by providing up to 128K. Moreover, rental of the MOD 30+ 128K size memory is \$1750/month on a two-year lease vs. IBM's announced rate of \$1865/month (including extra-shift charges) for their 96K modification. The MOD 30+ 128K memory will go to initial installations in September. FABRI-TEK, INC., Minneapolis, Minn. For information:

CIRCLE 525 ON READER CARD

**Mini Memory**

The co-500 direct access mass memory system may look like an ordinary tape drive, but it isn't. It can only



store about 100K 16-bit words on its tape, but it can load 4K of them into

a minicomputer in less than one second due to its 60-ips tape speed. The co-500 is bidirectional, records at 400 bpi, and does not use capstans, pinch rollers, or mechanical brakes. Several common interfaces are available optionally, or oem customers can design their own. The basic co-500 will be available in October for approximately \$3500. COMPUTER OPERATIONS, INC., Beltsville, Md. For information:

CIRCLE 548 ON READER CARD

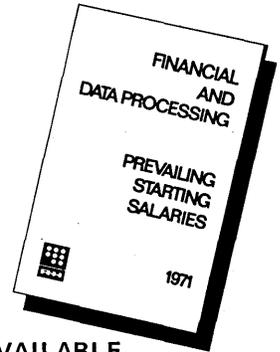
**Financial Terminal**

The TC 1700 financial supervisor terminal is programmable and features up to three cassette tapes, a 256-character display panel, and on-line interaction with TC 700 teller terminals and a central computer. A typi-

cal unit with two cassettes sells for \$15,990 and rents for \$432 per month. Deliveries begin in the third quarter of 1972. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 534 ON READER CARD

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CIRCLE 304 ON READER CARD

**16-bit Minicomputer**

The *real* MODCOMP I minicomputer has stood up, and it isn't at all like we wrote last August (Aug. 1, '70, p. 74). It's a 16-bit, 800-nsec machine that can be equipped with 16K of ROM, random access memory, or core. It is designed specifically as a dedicated controller for real-time mea-

surement, control, and communications applications. Undoubtedly the nicest feature of the MODCOMP I is its total compatibility with the MODCOMP II and III models, allowing a user to graduate up to multiprocessor systems powerful enough to be priced in the \$300K bracket without rewriting the software. Numerous peripherals are offered, but a mini-

um MODCOMP I sells for something under \$4K. More typical configurations (4K memory) are priced at approximately \$5K. Units are available to oem's and end users starting in the fourth quarter on a 60 day ARO basis. MODULAR COMPUTER SYSTEMS, Fort Lauderdale, Fla. For information:

CIRCLE 544 ON READER CARD

**Core Storage**

Here's another manufacturer of exclusively oem memory products that is just now entering the end-user market with a line of replacement core storage for the 360 models 30, 40, and 50. Deliveries begin in the

fourth quarter for up to 64K of core for the model 30, up to 256K for 40 users, and 512K bytes for model 50s. Price reductions may go up to 40% over comparable IBM charges, but not less than 20%, according to the firm. Since IBM's rate for 32K on the model 30 is currently \$1180/month,

a figure around \$940/month must be in the ballpark. A 128K model 30 memory is scheduled for the near future. STANDARD MEMORIES, INC., Santa Ana, Calif. For information:

CIRCLE 540 ON READER CARD

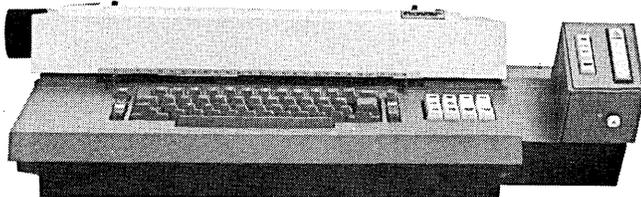
**Commo Equipment**

The 1240 communications terminal announced last year (April '70, p. 203) has now been joined by five other versions of the unit. The 1241 is a multipoint version of the 1240 that will rent for \$160/month; the 1242 is a 1241 with a line buffer

(256-512 bytes) and rents for \$195/month. The models 1250, 1251, and 1252 are keyboardless versions of the 1240, 1241, and 1242 models and rent for \$115, \$130, and \$170/month, respectively. Also announced was the 1271 terminal control unit which competes directly with the

IBM 2701 for support of a range of communications devices. Additionally, code conversion capability has been added to the existing terminal control units allowing BCD to ASCII conversion. MEMOREX CORP., Santa Clara, Calif. For information:

CIRCLE 550 ON READER CARD



Since the NOVAR 5-50 can be *polled and addressed*, many terminals can share a single voice-grade phone line, and can be individually called by the computer using a unique code for each. Will detect transmission errors too, and retransmit until correct.

**NOVAR**

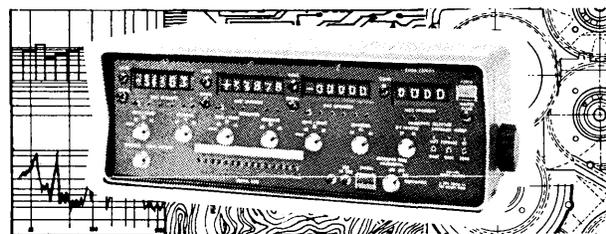
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CIRCLE 29 ON READER CARD

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Completely solid-state at 10Mhz and capable of handling up to three axes, the RSS-400 Graphic Quantizer accepts pulse signals from optical shaft encoders and converts them instantly into digital X, Y and Z values for display and recording.

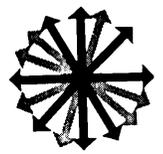
Available as a basic system or with a wide variety of ancillary electronics and position determining units, the RSS-400 provides resolution and repeatability of  $\pm 0.001"$  and a built-in program board for simple formatting. Individual axis display is 5-6 digits plus sign, and manual inputs can be front-panel inserted.

The RSS-400 will normally interface with standard card punch units, Flexwriters, calculators, typewriters and magnetic tape recorders. Custom interfaces are available for on-line computers.

For complete information, write or call:

**H. DELL FOSTER CO.**  
Petroleum Center Building, Suite C-118  
900 NE Loop 410, San Antonio, Texas 78209  
(512) 694-3476

CIRCLE 31 ON READER CARD



**S/3 Ansi Fortran**

It appears IBM has been scooped. They have announced an ANSI FORTRAN compiler for their thousands of S/3 users which won't be available until August of next year. PI FORT is currently available to those same users for \$100/month, including a 30-day free trial. Significant also is that PI FORT does not require any disc storage capacity for operation, which contrasts with the IBM product. PI FORT fits into 12K and is claimed to be exceptionally fast even under heavy computational loads. PROGRAMMATICS, INC., Los Angeles, Calif. For information:

CIRCLE 522 ON READER CARD

**General Ledger**

The Consolidated General Ledger system is a time-shared program oriented toward minicomputer systems with their accompanying terminals. Up to 50 divisions or subsidiaries can be processed on a fully consolidated basis with the parent company, it is said. The FORTRAN IV or BASIC program versions require typically 8K 16-bit words and can be supplied for any minicomputer having FORTRAN capability. The price to end users is \$1250; service bureaus pay that plus 15% of the revenue generated. WESTERN DATA SCIENCES, INC., Phoenix, Ariz. For information:

CIRCLE 516 ON READER CARD

**DOS Job Accounting**

A DOS job accounting report program features production control and management reports and includes a generalized capability whereby the user can tailor other reports to specific needs. It uses job step accounting data collected by the recently released IBM DOS version 2.5. Reports provide information to measure utilization by device, operator, job, programmer, department, etc. The price of \$550 includes documentation, user guide, object deck, and demonstration data. Approximately 14K bytes of storage are required for the program. COMPUNETICS CORP., Arlington, Va. For information:

CIRCLE 513 ON READER CARD

**Circuit Board Testing**

The Digital Fault Analysis (DFA) software package of six modules, written in FORTRAN and COMPASS for encoding data describing the logic contained for a unit under test, creates a logic model, develops the stim-

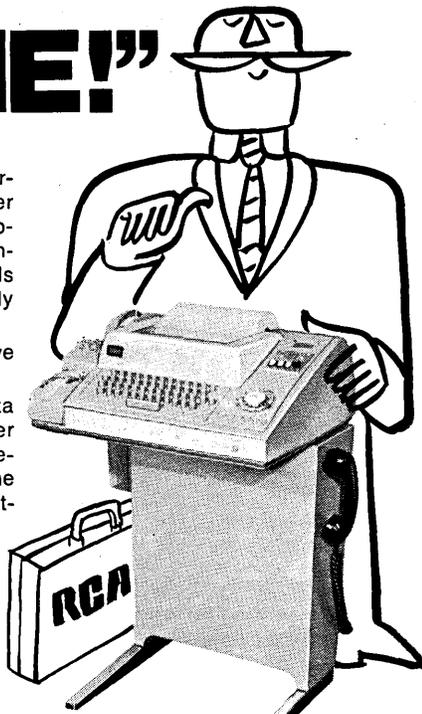
ulus patterns and expected responses, uses fault isolation dictionaries meeting MIL specs, and delivers a verified program tape formatted in test language or binary form. The program can run on CDC 6000 series computers and requires 35K words of memory. Including installation and out-

put tailored to customer requirements, DFA rents for \$9400/month on a one-year lease, or is offered on a service basis. AUTOMATION ANALYSIS, INC., Marina del Rey, Calif. For information:

CIRCLE 524 ON READER CARD

**What's so great about Teletype equipment leased from RCA?**

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CIRCLE 22 ON READER CARD

**Report Generator**

'mx03016' is an RPG-type program written in BAL for OS and DOS 360s, and requires 20K core. Through control cards a user specifies the input/output format, and other cards permit the skipping of duplicate records, the skipping or processing of selected input records, etc. The control cards were made as independent of each other as possible, and most of them are optional so that reports can be created with minimal coding, it is said. The price of \$500 includes source coding, user documentation, and a one-year warranty.

Also available to the same users is a package called 'mx0501' for the selection of card, tape or disc file records to be directed to a printer or other output file. The user can also obtain a number of various types of control totals for all or specified records. 'mx0501' operates on character, packed decimal, fixed-point and binary data fields, and might be a handy tool for one time reports, or inspecting any record on any file. It is also priced at \$500, including source deck, documentation, and warranty. MACRODYN INC., Hillsboro, Ore. For information:

CIRCLE 514 ON READER CARD

**Payroll**

No program changes are said to be required for changing taxation schedules, methods of compensation, deductions, or any other variable in the PAS-1 payroll program. The 360 COBOL program generates 19 standard reports, has multiple firm/division capability, provides for all federal, state, city, and county tax deductions, and can handle nonresident situations. PAS-1 can also be obtained with personnel and labor distribution subsystems. The program requires 64K bytes on a 360/30 (or equivalent), and the price of \$10K includes installation and documentation. BRADY-TOWER INC., Encino, Calif. For information:

CIRCLE 515 ON READER CARD

**Cobol Optimization**

STAGE II is a COBOL program that checks source COBOL coding for efficiency. It produces a card image correction file for reinsertion into the original source program or library, as well as an efficiency log indicating additional modifications required to effect total optimization. STAGE II is now available for 360 OS users; a 50K version for DOS systems will be along shortly, and the program can also be modified for non-IBM users. The price of \$2150 includes documentation, first-year maintenance, and enrollment of two participants in a seminar for training. OPTIMIZATION SCIENCES INC., Silver Spring, Md. For information:

CIRCLE 518 ON READER CARD

**Bank Accounting**

A package for demand deposit accounting in commercial banks which have up to 80,000 checking accounts and use NCR Century series computers above the model 100 is available in the NEAT/3 language. The program requires 32K of memory. Banks now using NCR 315 equipment may convert to the new program on the Century computers without emulation. The package includes account reconciliation processing and a list/post program to combine check transactions for selected high-volume accounts along with stop payment and ARP. NCR, Dayton, Ohio. For information:

CIRCLE 512 ON READER CARD

**Cobol Program Testing**

COBOL De-Tester is composed of a COBOL utility package called TDG-II, a COBOL debugging manual, and a four-day course on debugging tools and

techniques. The TDG-II component operates on either ANSI or COBOL F programs, creating test files using the source code. It requires typically 82K bytes on OS or DOS 360s. The complete COBOL De-Tester package is

priced at \$7500, or the TDG-II portion may be purchased separately for \$4K. INFORMATION MANAGEMENT INC., San Francisco, Calif. For information:

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H. Levin, MBA, Personnel Management, Member of ACM and DPMA



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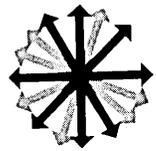
Position exists in Eastern Pennsylvania, centrally located to large metropolitan areas, and summer and winter vacation spots.

Interested applicants should send a complete resume including salary requirements and work experience to Mr. Tom Roe, Employment Manager:

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CIRCLE 302 ON READER CARD



### Industry Directory

The first directory of computer products, services, and suppliers produced by computer techniques covers more than 15,000 products and services from some 2,200 vendors. The 437-page DATAMATION Industry Directory covers every type of product and service regularly used at computer installations including: 413 terminals, 1,607 software packages, and 545 communications products. A separate section on vendors, each cross-referenced to products offered,

gives brief company profiles, including size, date founded, last year's gross sales, and geographical areas covered by sales and service offices. Price is \$25 in the U.S. and Canada and \$35 in other countries. TECHNICAL PUBLISHING CO., 1301 S. Grove Ave., Barrington, Ill. 60010.

### Directory Described

Four-page flyer describing a new "Computer Programs Directory" published by the Association for

Computing Machinery (ACM) and the Joint User Group (JUG) states: "The directory will help reduce costly duplication of programming efforts which often occur simply because users are not aware that a program already exists that will either solve a problem similar to their own, or, at least provide a clue to its solution." It describes the volume, which sells for \$25, as a compilation of over 1,200 programs in all areas of computing applications. CCM INFORMATION CORP., New York, N.Y. For copy: CIRCLE 506 ON READER CARD

### Management and MIS

"Management and MIS," an 11-page reprint of a speech, "Preparing Management for MIS," delivered by Arnold Barnett at the GUIDE-32 meeting in May, suggests ways of getting management involved in the development of their own MIS and means of using this involvement to produce an on-time, workable, and user-accepted system. BARNETT DATA SYSTEMS, Rockville, Md. For copy: CIRCLE 507 ON READER CARD

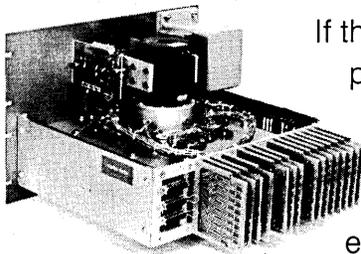
### Equipment Analysis

A proposal, "Automation Equipment Analysis," outlines a research program being initiated to "provide industries with reliable, unbiased evaluations of automation systems." Subjects for analysis will be selected by an advisory committee. Membership in the program will cost \$6,000 annually. IIT RESEARCH INSTITUTE, Chicago, Ill. For copy: CIRCLE 505 ON READER CARD

### Work Measurement

"Guidelines for Organizing a Work Measurement Program" is a 52-page soft-cover book in three sections. The first covers current work measurement practices discovered through research; the second considers problems uncovered by the research; and the third presents a "work measurement checklist." List price is \$1.50. ASSOCIATION FOR SYSTEMS MANAGEMENT, 24587 Bagley Rd., Cleveland, Ohio 44138.

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### Security System

Four-page bulletin describes a security system which, when installed in entrance ways to computer centers, can detect the presence of magnets which could garble or erase tapes. THE DICKSON CO., Evanston, Ill. For copy: CIRCLE 503 ON READER CARD

### Patent Information System

A computerized service that logs and organizes patent information from submission of a disclosure to the expiration of a patent is described in a six-page brochure which outlines and illustrates some of the reports generated by the system, including periodic reports showing the backlog on each attorney and each patent committee, letters of instruction to foreign agents and licensees, reports showing action required to meet deadlines, comprehensive reports for reference purposes, and summary reports that permit managerial control. WESTINGHOUSE TELE-COMPUTER SYSTEMS CORP., Pittsburgh, Pa. For copy: CIRCLE 501 ON READER CARD

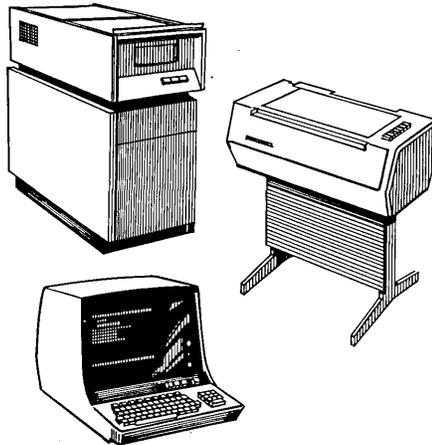
# Control Data adds 3 new terminals to low-cost OEM line

Announcement of two new Cathode Ray Tube (CRT) display terminals, and a compact Keyboard/Printer unit now gives OEM's an even broader choice of peripheral equipment from Control Data's low-cost peripheral line. The three low-cost terminals provide economical remote access to computer systems via telephone lines.

## New emphasis on small systems market

These new product additions now make CDC a complete source for serving minicomputer and small systems OEM needs.

In addition to a broad selection of terminals, CDC offers a Cartridge



Disk Drive which provides 25 million bits of random-access storage, or a Micro Drum with 4.3 million bits of storage capacity. Along with CDC's 200-line-per-minute Line Printer and 300-card-per-minute Card Reader, they represent just a few of the many low-cost peripherals CDC has in store for OEM's.

## Catalog covers low cost peripherals

Interested manufacturers can obtain further information or arrange for a demonstration of peripheral devices through any Control Data sales office. For a copy of CDC's 1971 full-line catalog of peripheral products, write Dept. D7-15, Box 1980, Twin Cities Airport Station, MN 55111. Or call our HOT LINE collect:

612/853-3535

**CONTROL DATA**  
CORPORATION

## Training Brochure

Twelve-page brochure, "Technical Training Courses," describes the vendor's complete line of process automation hardware and software courses for customers and company personnel. It covers facilities, philosophy, subjects, tuition fees, and student prerequisites. GENERAL ELECTRIC CO., Schenectady, N.Y. For copy:

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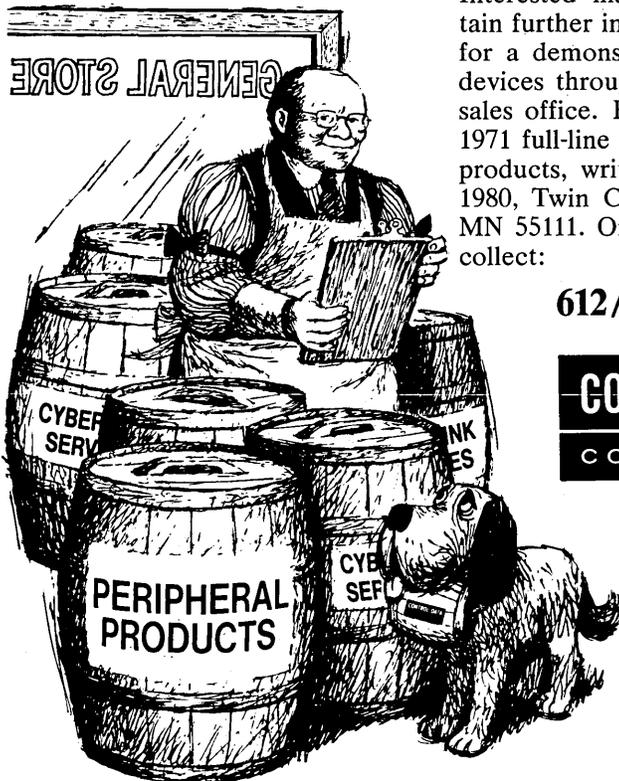
## Acronym Dictionary

ALERT COPS CASE PRIME PLACE; PLAN FAST; SAVE GIRLS. Make sense? Maybe yes, maybe no. If you interpret it with "mAny Computer teRms fOR defINing Your teRMs eaSily," second edition, it comes up: "Automatic Logging Electronic Reporting and Telemetry—Customer Order Processing System—Computer Aided System Evaluation—Programmed Instruction for Management Education—Programming Language for Automatic Checkout Equipment; Problem Language Analyzer—Facility for Automatic Sorting and Testing; System for Automatic Value Exchange—Generalized Information Retrieval and Listing System. The publication, intended not to make a simple sentence unintelligible but rather to make edp acronyms more intelligible both to laymen and professionals, lists and defines 1,070 acronyms and is available for \$2 in the U.S. and Canada and for \$2.50 in other countries. JOHN P. TUTUNJIAN, P.O. Box 93, Jericho, N.Y. 11753.

## Fault Tree Simulation

Pamphlets describing the vendor's Fault Tree Simulation service and Automated Fault Tree Drawing service, define the Fault Tree as "a logic modeling technique used to relate component failures in a complex system to system failures which lead to specific undesired events." The combination of a Fault Tree logic model and computer simulation, says one pamphlet, "provides the system safety/reliability engineer and the system manager a cost effective and powerful analytical tool for risk assessment and safety/reliability design trade-offs." LOGIC SIMULATION CO., Kent, Wash. For copy:

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...from your General Store of computer products and services

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## ... LITERATURE

### Accounting Procedures

"Uniform Accounting System for the Data Processing Services Industry," a 33-page handbook, has been released by the Assn. of Data Processing Service Organizations (ADAPSO). Sections cover Industry Characteristics that Affect the Accounting System, Principles and Objectives of the Accounting System, Functional Organization of a Data Service Company, Classification of the Chart of Accounts, and Reports to Management—Financial and Operating Reports. The price is \$20. ADAPSO, 551 Fifth Ave., New York, N.Y. 10017.

### APL Time-Sharing

Pocket-sized reference card summarizes the primitive (built-in) functions of the vendor's "APL Plus" time-sharing service and is described as "useful for the most experienced as well as the beginning user of APL." SCIENTIFIC TIME SHARING CORP., Washington, D.C. For copy:

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### Telephone Tariff Rates

A 12-page, four-color reprint of the Karl I. Nordling article, "Analysis of Common Carrier Tariff Rates" (DATAMATION, April 15), contains a summary of the tariffs on file as of the end of 1970 for three types of voice-grade service: (1) private line, (2) the dial-up network, and (3) WATS (Wide Area Telephone Service). Further, it presents some techniques for making rapid rough cost comparisons of the different types of service. Payment with order: \$1 each for 1-49 copies; \$.50 each for orders of 50 or more, postpaid. DATAMATION, 94 S. Los Robles Ave., Pasadena, Calif. 91101.

### Electrostatic Writing

"New Techniques in Electrostatic Printing and Plotting," a paper presented at the sjcc by Renn Zaphiropoulos, explains and discusses true electrostatic writing and compares it to conventional impact printers and pen-plotting systems. VERSATEC, INC., Cupertino, Calif. For copy:

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**APPLICATIONS SOFTWARE DESIGNERS . . .** Responsible for the development of call processing software for a computer controlled electronic switching system. BS/MSEE or Computer Science with 2 or more years software design (programming) experience in telecommunications or data systems.

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**SYSTEM EVALUATION ENGINEERS . . .** Responsible for the evaluation, testing utility program generation of a computer controlled, electronic switching system prototype. Field testing and evaluation of first several field models. Minimal travel. BSEE or Computer Science with one or more years experience in program or hardware debugging or field engineering for telephone or computer manufacture.

**MAINTENANCE SOFTWARE DESIGNERS . . .** Responsible for specification and design of maintenance plan and maintenance software for computer controlled electronic switching systems. Will help lead the design and implementation of fault recovery and diagnostic programs in addition to interfacing with hardware designers and other programming groups. BS/MSEE or Computer Science with 3 or more years experience in software design of real time control systems and diagnostic program design.

. . . Responsible for design of fault recovery and diagnostic programs for computer controlled hardware of switching systems. BS/MSEE or Computer Science with several years experience in the design of electronic digital hardware using I.C.'s with experience in assembly level programming.

**FIELD SUPPORT ENGINEERS . . .** Responsible for field testing and evaluation of computer controlled electronic switching systems. BSEE with strong knowledge of telephony and several years experience in evaluation and testing of electronic switching systems. Assembly level language programming helpful.

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# WASHINGTON REPORT

## FED RULES LET BANKS OFFER DP SERVICES

New Federal Reserve Board regulations permit one-bank holding companies to offer dp services to clients but limit operations to processing of banking, financial or related economic data -- such as payroll, accounts payable/receivable, or billing. They can service any of their own and subsidiaries' dp needs. Incidental activities also permitted include making excess computer time available and furnishing any dp service upon request if not otherwise "reasonably available" in a market area. ADAPSO threw up its arms in desperation and withdrew its lawsuit against the Comptroller of the Currency and American National Bank of St. Paul. It claimed the FED gave the banks a loophole to circumvent the law and destroyed ADAPSO's case in the suit.

## GAO FINDS WASTE IN EXCESS DP EQUIPMENT

The General Accounting Office says unnecessary rental costs of \$920K could have been avoided by the federal government by using excess data processing equipment instead of renting additional systems. The GAO report (B-115369) said government agencies were found returning equipment with purchase credits of \$760K, while other agencies were entering into rentals of similar equipment. Redistributing excess systems would have saved credits for possible future purchase. The agency recommended that the General Services Administration's excess equipment bulletins indicate purchase credits on dp systems available for redistribution.

## U.S. PERMITS SALES TO RED CHINA

The White House has authorized U.S. firms to export general and special-purpose minicomputers and electronic calculators to Red China without special government license. Maximum memory size is 2K bits. Special licenses are required for all other types, as well as for peripherals and software. How many are to be approved won't be known until applications are made. The administration indicates it will approve U.S. trade missions to Peking, but the Chinese reaction was unknown.

## FEDS RESTRICT SOLE-SOURCING

Federal policy makers are serious about breaking the ties that bind users to particular system suppliers. A new policy statement encourages federal agencies to pay extra for software conversion when systems are to be upgraded/replaced, if this promotes competition. The policy also lists several alternatives to sole-sourcing and requires documented reasons if the alternatives are rejected.

## THE DOLLARS AND CENSUS

The Nixon administration, which originally favored a mid-decade census, is now nixing it because of the cost. Rep. Charles Wilson, chairman of the House Census & Statistics Subcommittee, is trying to enlist major census users in a campaign to reclaim White House backing. The Senate Post Office Committee has indicated its support for 1971...

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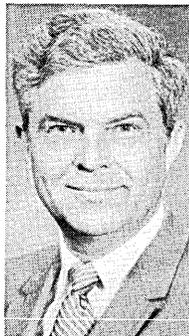


## PEOPLE

Dr. George E. Mueller, recently appointed president and chairman of the board of System Development Corp., has been awarded the National Medal of Science by President Nixon . . . In a somewhat unexpected move, Robert W. Sarnoff gave up the presidency of RCA to Anthony L. Conrad, a 25-year RCA veteran who had been serving as executive vp, services. Sarnoff will remain chairman and chief executive officer. Conrad will be responsible for all major operating units except for principal corporate staff functions and NBC . . . Keith W. Uncapher of The Rand Corp. has been elected president of the American Federation of Information Processing Societies (AFIPS), and Walter L. Anderson, president of General Kinetics, was elected vice president. In addition, Dr. Donald E. Walker of MITRE was elected secretary and Dr. Robert W. Rector, Cognitive Systems, was reelected as treasurer . . . At the Spring Joint, AFIPS presented Dr. Edwin L. Harder, recently retired as a senior consultant for Westinghouse, which he joined in 1926, with the Distinguished Service Award . . . Prof. Joseph F. Traub, supervisor of numerical mathematics research at Bell Labs and professor of computer science at the



K. Uncapher



W. Anderson

Univ. of Washington, has accepted the position of professor and head of the computer science department at Carnegie-Mellon Univ. He succeeds Prof. Alan J. Perlis, now at Yale . . . Wright Line, the dp accessories division of Barry Wright Corp., has two new top executives. E. William Housh, who had been with IBM for 15 years, is now president and general manager; and Herbert S. Holzman, most recently controller of Honeywell's Computer Control Div., has been appointed vp, administration . . . Gene E. Washing-

ton, a management consultant, is now senior vp of Boothe Computer Corp. and will be responsible for all of the company's leasing operations, including over \$220 million worth of computing equipment. He replaces Thomas Nebel, on leave of absence . . .

Dr. Mario I. Montana has been named president of Computer Sciences' newly established International Div., headquartered in Los Angeles. He had been president of csc's European subsidiary, Computer Sciences International, Brussels. The new division will be responsible for supporting all of the company's current and future international operations . . . John C. Lobb, D. F. Barnes, S. S. Pallow, and J. F. Wilson are the latest four executives to resign from Astrodata, Anaheim, Calif., which is still operating under Chapter 11 of the Federal Bankruptcy Act . . . Dioptrix Inc., San Diego manufacturer of microfilm equipment, has elected Rexford E. Ryan chairman of the board and Newlon D. Benner president. Elmo R. Nosari, former president, resigned but remains on the board. Meanwhile, Melvin L. Wilson, who had been director of manufacturing at SEL's Systems Peripherals Div., was appointed director of operations. The company is moving this month into new headquarters in the Kearny Industrial Park in San Diego . . . Richard P. Daly, former president of Aries Corp., Washington, D.C., has been named president of Comserv Corp., Minneapolis facilities management, consulting, and services firm . . . New Project MAC director at MIT is Prof. Edward Fredkin, founder of Information International, Inc., and professor of electrical engineering at MIT since 1968. He succeeds Prof. J.C.R. Licklider, who wants to devote full time to teaching and research in dynamic modeling, computer graphics, and computer networks . . . In its campaign to become "a chief supplier of data communications and interactive terminal equipment in the U.S.," IRT Data Equipment and Systems Div. appointed Louis H. Benzing general manager. Benzing comes from Sanders Associates, where he was gm of the Information Systems and Geospace Electronics Div.'s . . . Edward M. Lee, Jr., has been promoted to president of Information Handling Services, Denver-based micropublishing subsidiary of Indian Head. Former president Richard J. Powers moves to parent company headquarters in NYC as a director and vice chairman of the board. ■

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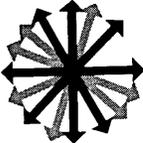
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# THE FORUM

## COMmentary

**C** As a manufacturer, and obviously a proponent of computer output microfilm (COM) systems, I am concerned about the editorial opinions recently expressed in some important trade and financial publications. Electronic News, Barron's and Computerworld have recently expressed considerable reservation about the COM industry. While their opinions are respected, and their intentions unquestioned, I feel that the record can and should be set straight on COM, its growth, history and future.

Almost all of the opinions stated reflect the editorial judgment that COM hasn't lived up to the predictions of "several thousand installed units by 1975." I believe this is simply a case of overreacting to originally overoptimistic predictions. In reality, there is a strong, documented growth trend now taking place within the COM industry—though admittedly a bit behind schedule.

Let's look at the facts. Barron's, in an article entitled "COMing or GOing" (March 15, 1971), states that there were approximately 50 COM units installed at the end of 1968 (covering the 1960 to 1968 period); 432 COM units at the end of 1969, and 763 COM units at the end of 1970. This is a two-year growth of 1,420%—most compelling figures, especially so in 1970, the worst eco-

nomic year anyone under the age of 40 has seen. In that year the cumulative COM population almost doubled!

How does COM's growth relate to the computer market as a whole?

A conservative estimate is that there are approximately 30,000 general-purpose computer systems currently installed. Converting that number to the number of sites by using the ID multiplier of .75, we come up with the figure of 22,500. A recent Computerworld survey stated: "In two or three



years, around 18% of the survey respondents (computer users) will use some form of in-house micrographic equipment or outside service." Using these figures, we arrive at 4,050 prospective sites, i.e., installations that might use COM by 1973. And the overall computer market—both domestic and overseas—is certainly not standing still.

The Barron's article also stated that according to Computerworld "COM represents less than 4% of the \$2.5

billion output equipment base." In round figures, that is an approximately \$100 million market. The article continued by predicting that COM would experience a conservative "45% growth" in 1971. That is another \$45 million. Based on an average COM equipment price of \$75,000, that would mean an additional 600 COM units sold and installed in 1971, almost doubling the 1970 net new installations.

Just numbers? Maybe, but I have the strong feeling that COM is about to "happen" and the figures developed by independent sources seem to confirm this. It is going to "happen" because:

1. More potential users are understanding what COM can really mean to them.
2. COM equipment is being introduced that is simple to operate and support—equipment that eliminates film processing and handling and the need for skilled technicians.
3. We are beginning to see COM equipment that has justifiable price/performance characteristics.

The "COM happening" isn't going to just take place. It will evolve from the availability of simple, reliable and economical equipment that is professionally marketed and stresses education, comprehensive analysis and on-going support.

—Charles Askanas

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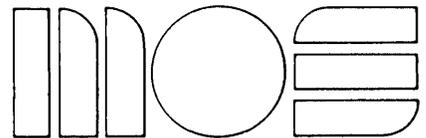
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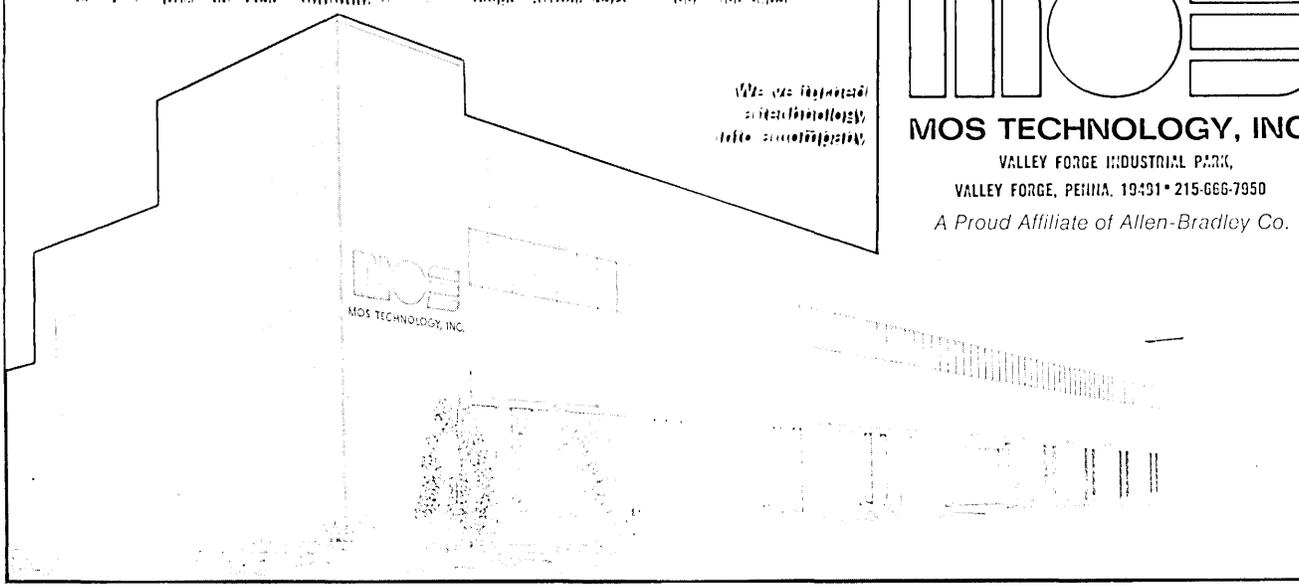


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