

# MODERN

MARCH 1970



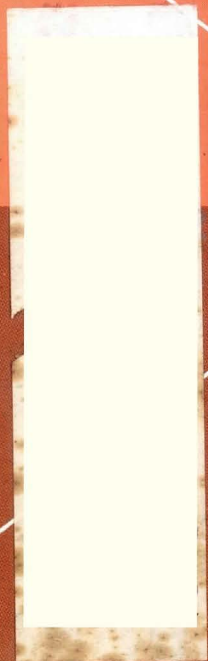
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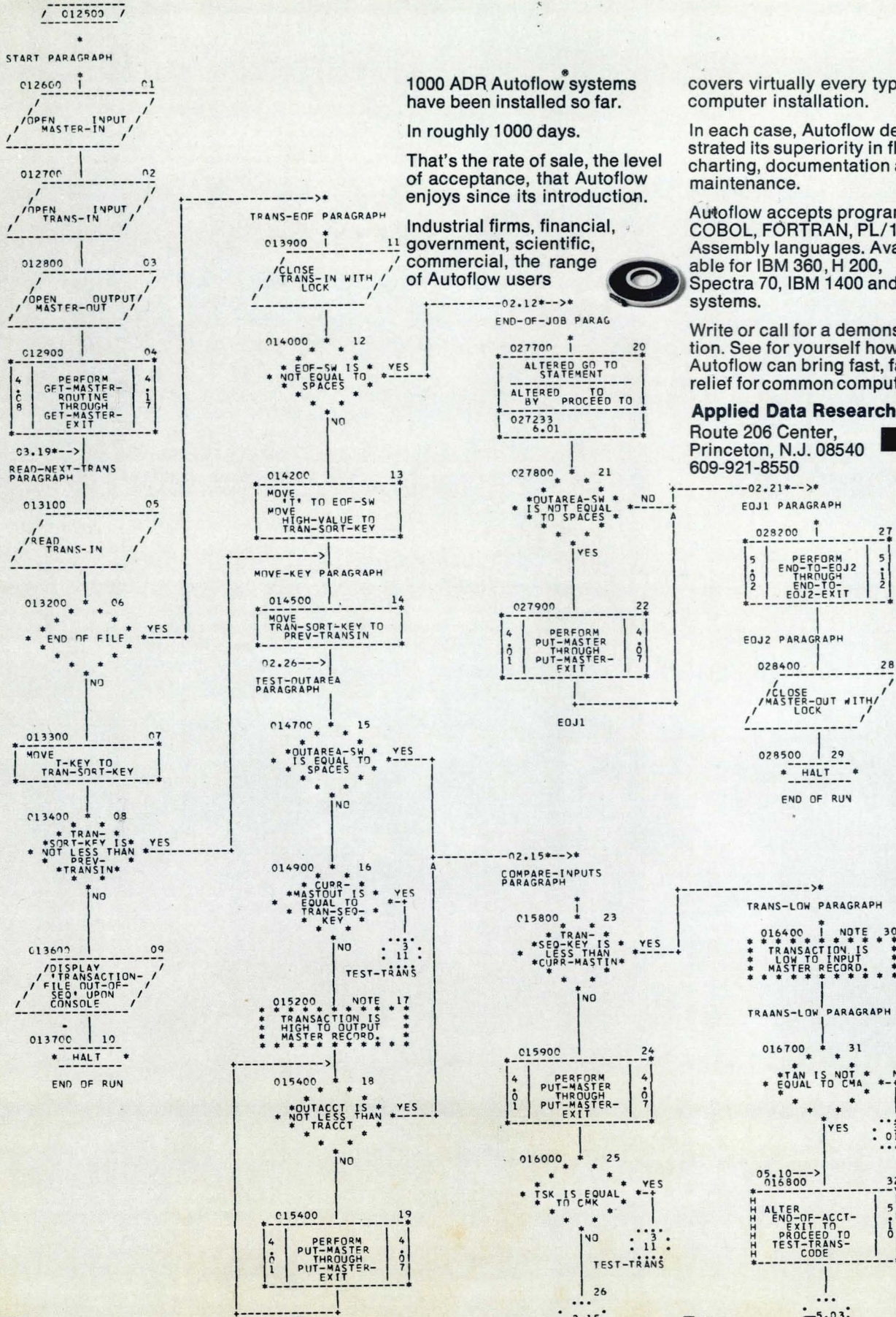
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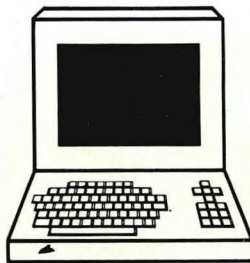
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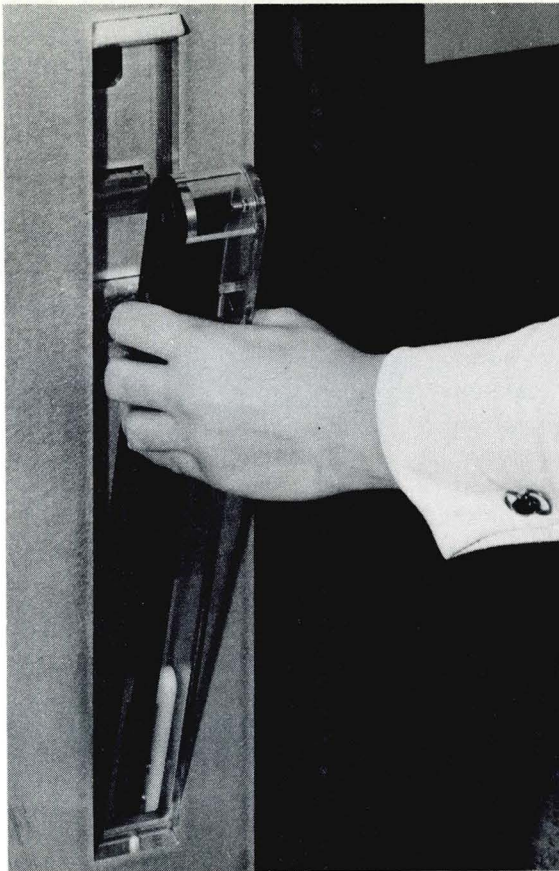
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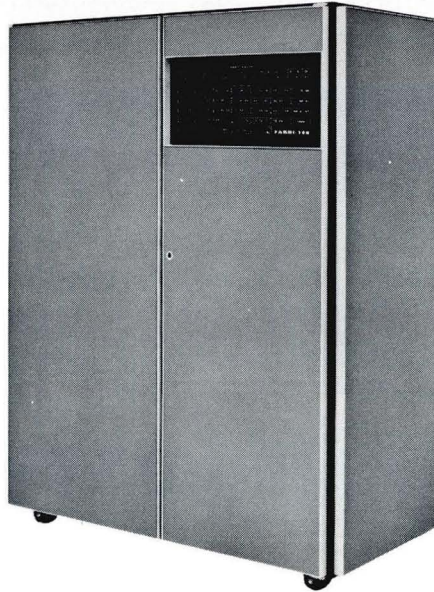
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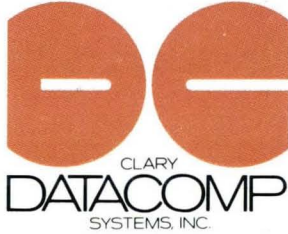
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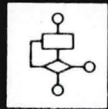
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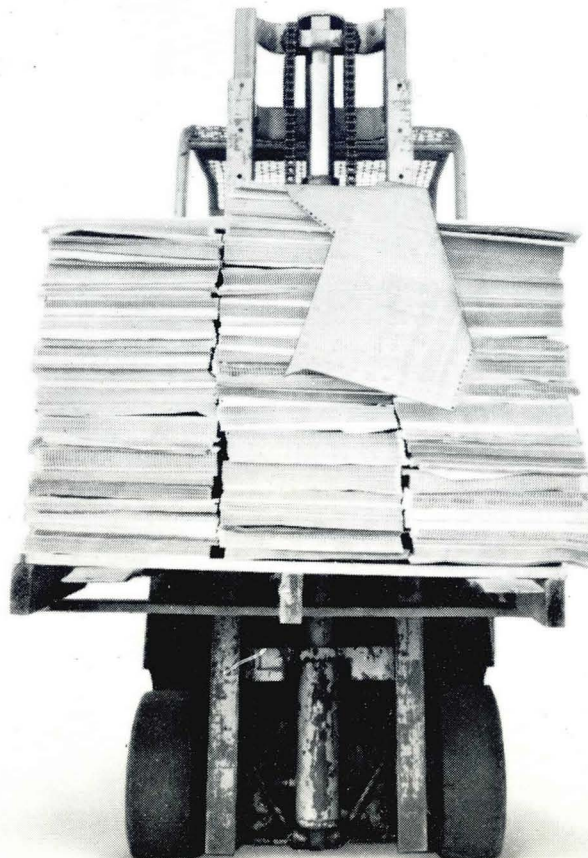
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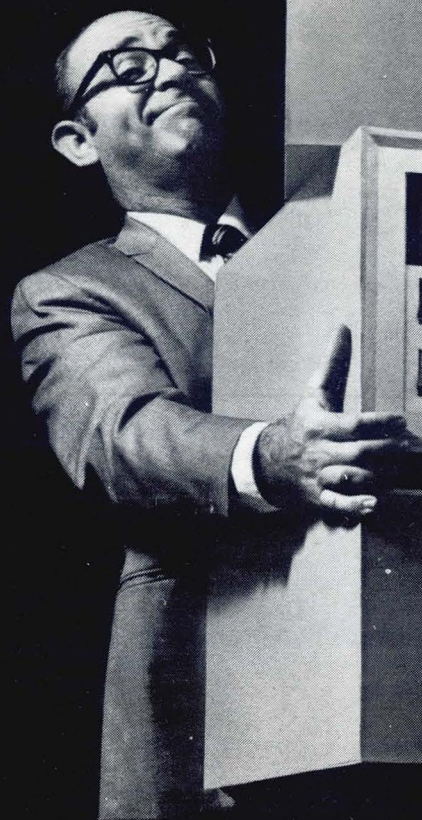
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# If you insist on spending \$30,000 for a small computer, buy 2½ MACs.



Ridiculous? Sure. But so is paying 30 grand to get the features that MAC gives you for only \$11,950.

First, you get a 16-bit parallel word computer with a repertoire of 72 hardware instructions. A basic 4K memory. A programmed data channel, handling up to 255 devices. And MAC's four priority interrupts in hardware—with automatic store/restore.

Another big MAC feature is its raft of options. Like up to 64 interrupt levels. Memory expansion to 64K. Multiply/divide hardware. Memory parity. Power fail and restart. Remote control panel. Automatic bootstrap loader. Multiplexed or direct memory access data channels. Plus a com-

plete array of peripheral equipment.

So get the features you need and still save money with MAC. Buy one now and we'll give you an option on the other 1½.

Write to MAC, Lockheed Electronics Company, Data Products Division, 6201 East Randolph Street, Los Angeles, California 90022.

## LOCKHEED ELECTRONICS

A Division of Lockheed Aircraft Corporation

# Only Sanders can format, display and input complicated source documents...

NEW ENGLAND MACHINERY, INC. Nashua, N.H. 03060				
CUSTOMER'S ORDER NO: 114	INVOICE DATE 7-16	INVOICE NO. 04721		
SOLD TO: SMITH DISTRIBUTORS, INC. 43 TAYLOR ST. CONCORD, MASS.		CUSTOMER NO. 50341		
SHIP TO: Above	MAKE ALL CHECKS	SALESMAN: VALI-23		
SHIPPED VIA: Truck Prepaid	PAYABLE TO	NEW ENGLAND MACHINERY, INC. Nashua, N.H. 03060		
TERMS: 25 10 Days Net 30				
QUANTITY	STOCK NO.	DESCRIPTION	PRICE	AMOUNT
50	11202	SWIVEL	2.00	100.00
10	13102	LOCK SHOES	1.20	12.00
100	17203	BRAKE NUTS	.40	4.00
2	45612	CASTINGS	50.00	100.00
20	73414	CLAMPS	3.50	70.00
1	31562	STANDS	4.00	4.00
30	14341	WEIGHTS, LEAD	.05	1.50
30	14342	WEIGHTS, BRASS	.15	4.50
8	23561	WHEELS	2.00	16.00
10	13912	PULLEYS	2.25	22.50
40	43647	SPROCKET	1.00	40.00
1	72143	JACKET	3.00	3.00
12	64561	NIPPLES	.50	6.00
2	52341	CASTINGS	1.00	2.00
24	14572	GEARS	1.50	36.00
		FREIGHT		57.00
				478.50

ITEM	QTY	STK NO	AMOUNT
01	***	*****	*****
02	***	*****	*****
03	***	*****	*****
04	***	*****	*****
05	***	*****	*****
06	***	*****	*****
07	***	*****	*****
08	***	*****	*****
09	***	*****	*****
10	***	*****	*****
11	***	*****	*****
12	***	*****	*****
13	***	*****	*****
14	***	*****	*****
15	***	*****	*****
16	***	*****	*****
17	***	*****	*****
18	***	*****	*****
RECORD TOTAL		FREIGHT	*****

Take a look at that invoice. It might fit on 20 punched cards. Perhaps some of the key-to-tape units around might be able to handle it in 10 segments. But Sanders has a better system. The System 6000\* Display Data Recorder.

The operator taps a key. Instantly, a replica of the source document—we call it a format—appears on the screen. Then the operator simply types information into the blanks. Logically. In the same order and position as on

the original source document.

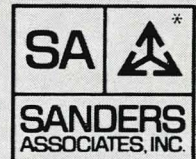
Notice two things. First, the System 6000 recorder has room for the complete record—up to 1024 characters. Then, observe how the unique dual-intensity feature calls attention to the variable data. If there's an error, it's easy to spot. Corrections are done by overtyping.

Once all the data is correct—and only then—the operator enters it on computer-compatible tape. Incidentally, there's no tape pooling because up to 12 units can share the

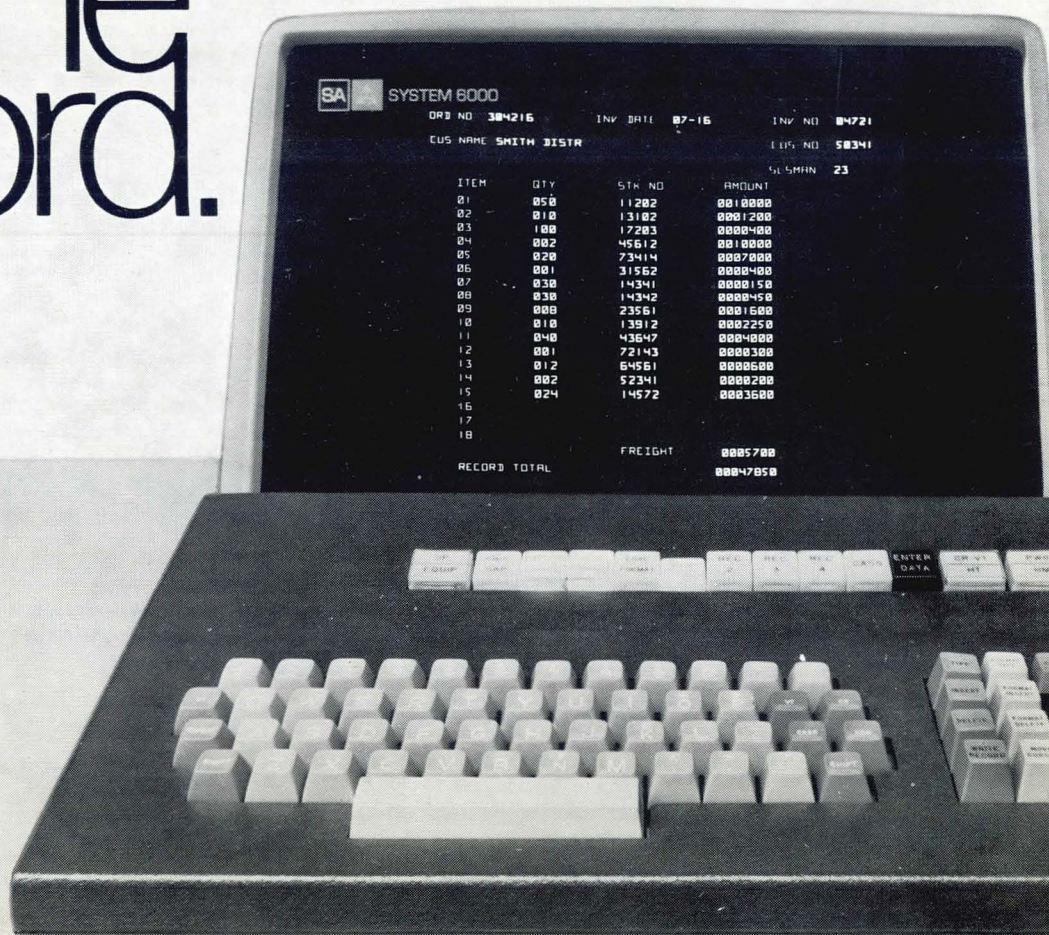
same reel. And the operator can select many formats from a changeable tape cartridge.

Let Sanders help get data into your computer. In one piece. Call your nearest Sanders sales office, or contact Marketing Manager, Data Systems Division,

Sanders Associates, Inc., Daniel Webster Highway S., Nashua, New Hampshire 03060. Or call (603) 885-4220. \*TM, Sanders Associates, Inc.



without breaking  
the  
record.



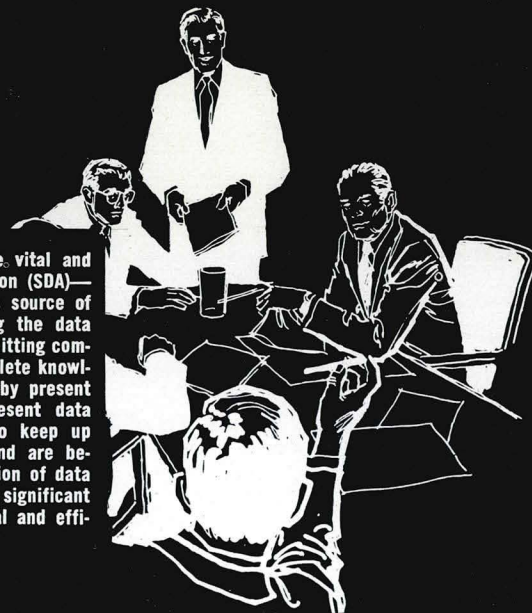
CIRCLE NO. 18 ON INQUIRY CARD

# SOURCE DATA AUTOMATION

A two-day seminar sponsored by Faim Information Services, Inc. and Modern Data.

The basic concepts of SDA—how they can be applied to your EDP operations—this seminar is specifically directed to executives and managers who have to make decisions on the applicability of SDA to their EDP operations.

This seminar is directed towards the vital and timely topic of Source Data Automation (SDA)—a technique for capturing data at its source of origin and automatically transforming the data into a machine readable language permitting computer processing. The need for a complete knowledge of SDA is vital as exemplified by present data processing input problems. Present data preparation techniques are unable to keep up with the data processing progress and are becoming too costly. By proper automation of data destined for the computer system significant savings can be achieved in economical and efficient aspects.



## SEMINAR OUTLINE

### Introduction To Source Data Automation

Fundamental principles of the Source Data Automation design concept: definition of terms; basic purpose; design philosophy; interface with the EDP system; benefits; how it can fit into your system.

### Source Data Automation State-of-the-Art

A discussion of the various types of SDA equipments available, their characteristics, manufacturers, their strong and weak application areas. Types of devices to be described will be:

Optical Character Readers  
Mark Sense Readers  
Bar Code Readers  
Remote Scanners  
Magnetic Readers

Keyboard-To-Tape Devices  
Portable Data Recorders  
Alphanumeric Display  
Terminals  
Touch-Tone Telephone

### Economics Of Source Data Automation

A quantitative comparison of various Source Data Automation devices considering total system costs, volume of data, error rates, operating factors and various data preparation complexities. Specific breakeven points will be presented graphically.

### Decision-Making Criteria In Source Data Automation

Description of factors that need to be considered in SDA device selection; a quantitative methodology for SDA selection given with specific examples.

### Implementing And Operations On SDA System

Description of actual SDA application in which problems and solutions in operating an SDA system will be discussed.

### Trend Analysis Of Source Data Automation

A discussion as to the SDA State-of-the-Art technology for the 1970's including technical breakthroughs, equipment marketing, and application areas.

## SDA STATE-OF-THE-ART REPORT

Included with the seminar will be a newly-published Source Data Automation State-of-the-Art report describing present commercially-available SDA equipment and their characteristics. The text will cover the topics discussed at the seminar in full descriptive form and contain SDA equipment comparisons in terms of performance and cost. Included in the price is a one year updating of report so as to include newly-announced equipment. Updating frequency will be at least quarterly or sooner depending upon SDA equipment news.

## INSTRUCTORS & SPEAKERS

### Lawrence Feidelman, Director & Principal Instructor

The seminar will be under the personal direction of Mr. Lawrence Feidelman, who is a noted authority in the Source Data Automation field. He has performed Source Data Automation studies for the government as well as industry. He has written numerous articles and lectured on the Source Data Automation field. He is a frequent lecturer for the American Management Association, has lectured on SDA for American University and various professional societies. He is presently Assistant Vice President and Manager of the Cherry Hill office of FAIM Information Services, Inc. He received his B.A. degree from New York University and his M.S. degree in Computer Information Science from the University of Pennsylvania.

### Bennett Landsman, Instructor

Mr. Landsman, a senior systems analyst with Faim, has recently completed a Source Data Automation study for the Department of Agriculture and an equipment Source Data Automation design analysis for a data processing company. He is a major contributor to the Faim SDA State-Of-The-Art report.

## GUEST SPEAKERS

### Washington, D. C.

Dr. Frank G. Burke  
Director, Educational  
Programs  
National Archives and  
Records Service  
Washington, D. C. 20408

Mr. George Bernstein  
Special Ass't to the Director  
Research and Development  
Division  
Naval Supply Systems  
Command  
Bldg. #3 Crystal Mall  
Washington, D. C. 20390

New York ..... To be announced  
Boston ..... To be announced

## REGISTRATION

Registration for the seminar, including the SDA State-of-the-Art Report with a one year equipment updating, is \$210. Checks should be made payable to Faim Information Services, Inc. and forwarded with the registration coupon below. Your registration will be acknowledged by return mail.

Faim Information Services, Inc. 1020 Kings Highway North Cherry Hill, New Jersey 08034			<input type="checkbox"/> Check enclosed <input type="checkbox"/> Bill me <input type="checkbox"/> Bill my company
Gentlemen: I plan to attend your Source Data Automation two-day Seminar at the following location:			
<input type="checkbox"/> Washington, D.C. <input type="checkbox"/> New York City <input type="checkbox"/> Boston	Date May 19 & 20 June 16 & 17 July 14 & 15	Hotel Hotel Sonesta Warwick Hotel Hotel Sonesta	
Hours: 9 A.M.-5 P.M.			
Name _____		Title _____	
Company _____			
Street _____			
City _____		State _____ Zip _____	
Phone _____			
Important Note: There will be a late cancellation fee of \$25.00 if cancellation notice is not received at least one week prior to start of seminar.			

# How to be a rich and happy time share computer manager...

## *PICK UP a Technitrend Computer Port Selector*

Off the shelf NOW . . . Technitrend's new *high-speed switching AS-1000S Automatic Computer Port Selector*, that floats all connecting computer ports between in-calling terminals. What follows? — added profits . . . as the AS-1000S automatically keeps all your I/O ports fully loaded during peak demand — never an inactive port while customers are queuing! Ports need not be tied up by dedication to any incoming lines . . . but are available, when inactive, for use by local or distant customers.

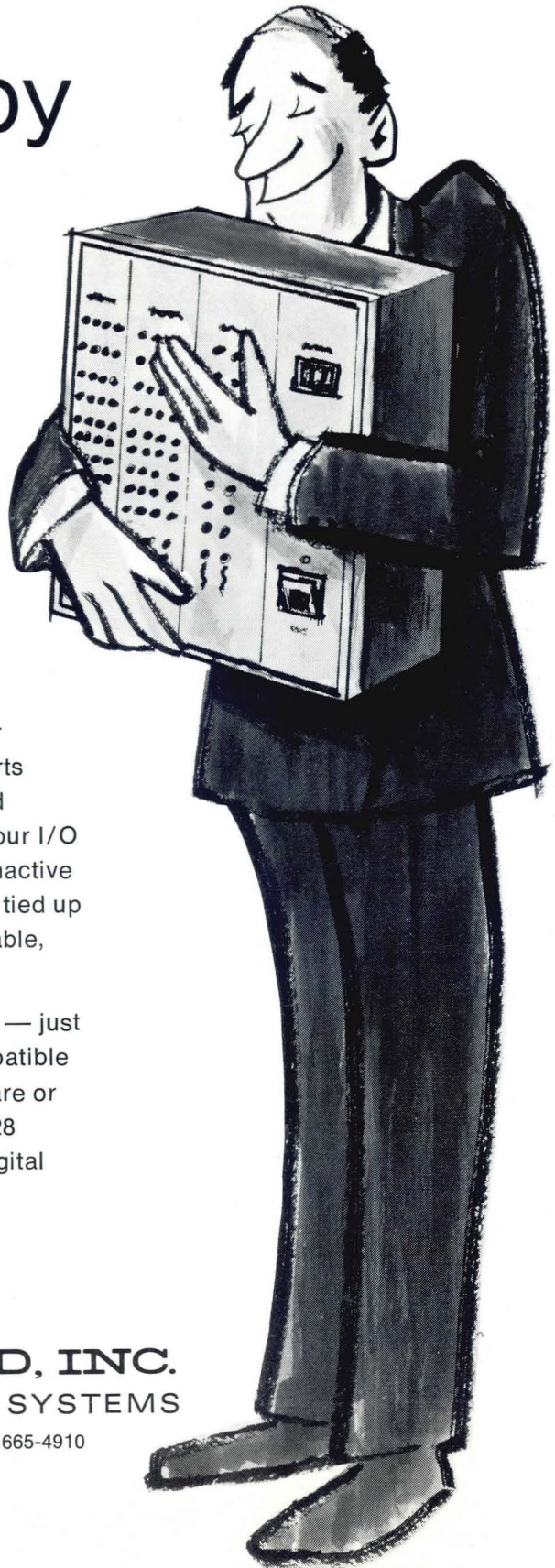
The AS-1000S is easy to install, requires no adapters — just plug in line and port connectors . . . completely compatible with all time share computers. No changes in hardware or software . . . accommodates any size system up to 128 lines for 64 ports. Even has an optional, automatic digital answer back when all ports are busy.

*Write or phone for literature.*



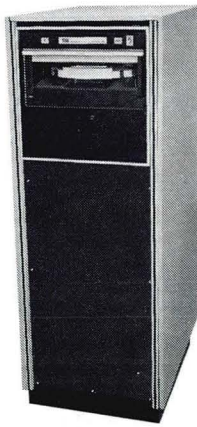
**TECHNITREND, INC.**  
DATA COMMUNICATIONS SYSTEMS

7300 North Crescent Boulevard • Pennsauken, N.J. 08110 • (609) 665-4910



CIRCLE NO. 19 ON INQUIRY CARD

# Now, a Disk Memory Drive, less than \$3,000.\*



A good Disk Memory Drive doesn't have to be expensive.

We're reproducing and delivering single-disk, removable-media, disk drives to major computer manufacturers at prices that are an industry breakthrough.

These disk drives, which utilize the IBM 2315 disk cartridge or equivalent, are built to meet the needs of the mini-, small-, and medium-size computer manufacturer. Conservative design and rigorous testing

ensure ultra-reliable and consistent performance.

So if you spend more than \$3,000 for a single-disk memory drive, you'll spend too much... a Disk Memory Drive doesn't have to be expensive to be good.

For further information and complete specifications, contact Jim Flynn at Computer Memory Devices, Inc., 5170 West Bethany Home Road, Glendale, Arizona 85301. Phone (602) 939-9444.

\* In OEM quantities.

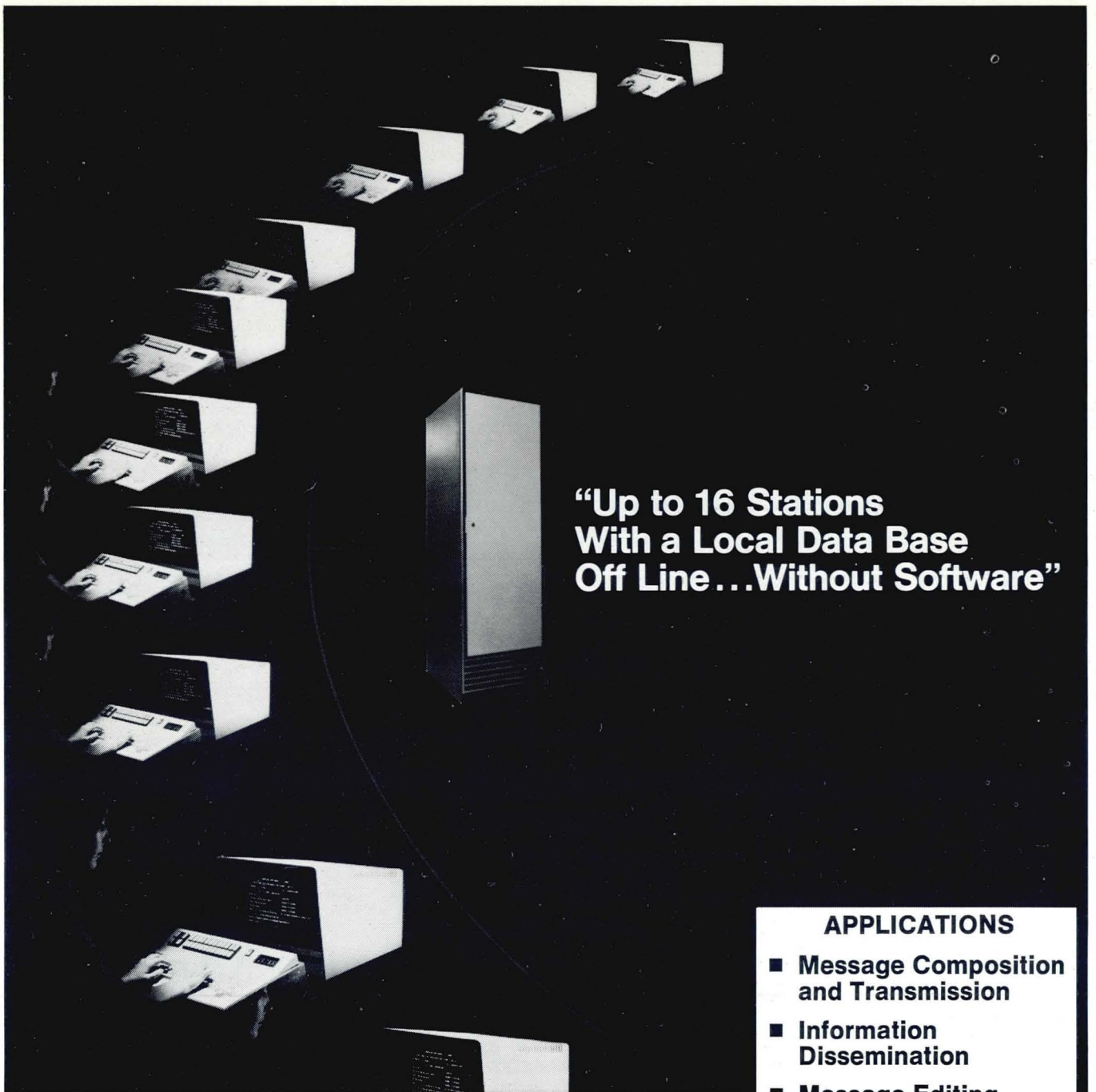


**Computer Memory Devices, Inc.**

5170 West Bethany Home Road, Glendale, Arizona 85301

CIRCLE NO. 20 ON INQUIRY CARD





**“Up to 16 Stations  
With a Local Data Base  
Off Line...Without Software”**

#### **APPLICATIONS**

- **Message Composition and Transmission**
- **Information Dissemination**
- **Message Editing**
- **Data Base Update**

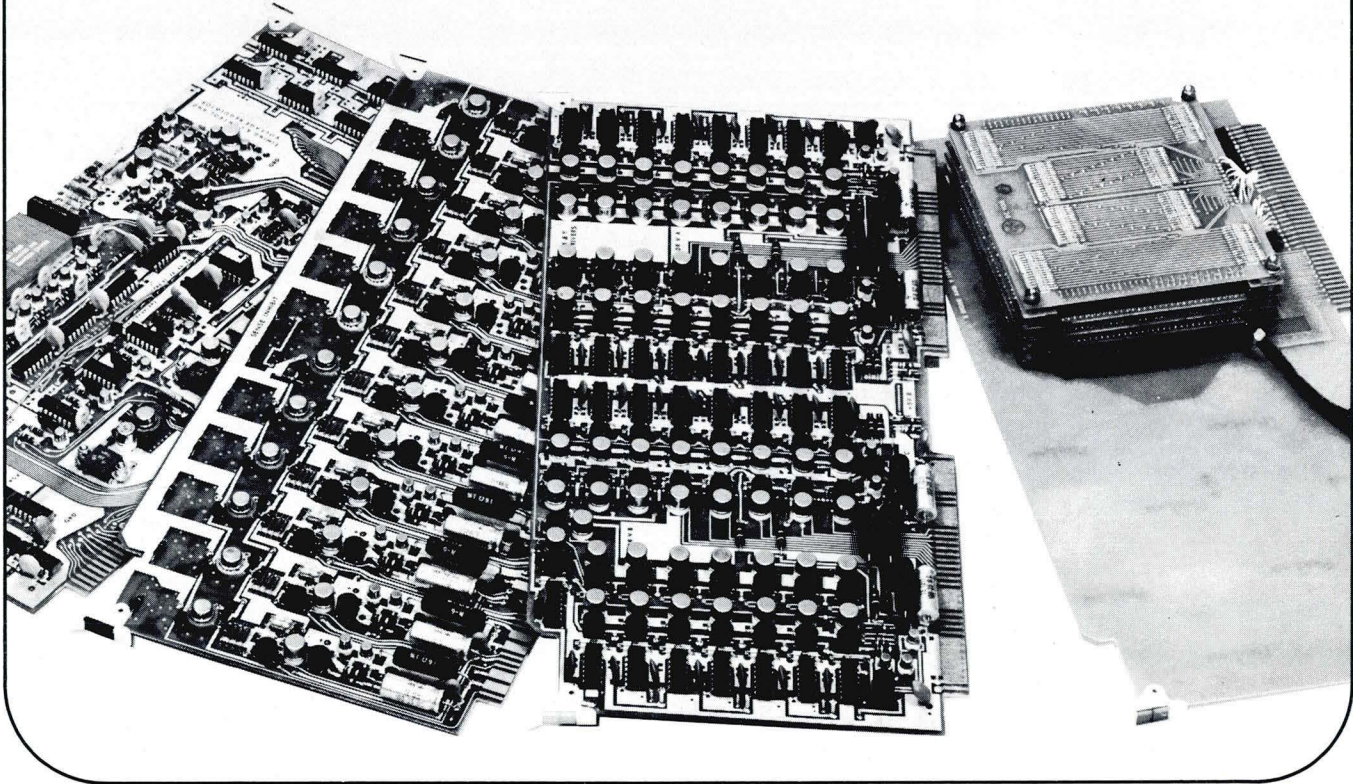
## **The BR-700 Information System...**

... is a stand alone, off-line data information display system operating from its own local data base... Since the BR-700 is a completely self-contained system, the local data base may be accessed, altered, and data refiled without software... The controller and the local storage is field expandable to service 16 operator stations... Off-line message composition and validation assure error-free transmissions

... The BR-700 has provisions for communicating with printers, mag tape, modems, computers, and other operator stations of the system... Bulk data transfers may be accomplished into and out of the BR-700 storage at high speed when communicating with a central data bank... For additional information contact the Bunker-Ramo Marketing Department.

 **THE BUNKER-RAMO CORPORATION**  
DEFENSE SYSTEMS DIVISION  
8433 FALLBROOK AVENUE • CANOGA PARK, CALIFORNIA 91304

CIRCLE NO. 21 ON INQUIRY CARD



## Datacraft's DC-34 Core Memory: 4K x 18 capacity, 750 nSec cycle. A revolution at \$1776 each.\*

Our DC-34 core memory is a bunch of cards waiting for a frame that has sockets and a couple of power supplies. You tick off the configuration and we shuffle the cards. We'll work with any length word up to 40 bits and still stick with our standard core planes. And we'll stack our planes up against your total memory requirement — the sky's the limit. Speed is your option, not ours. Go ahead and test us. We haven't found any track too fast for our DC-34. The make-or-buy decisions are all on our side. Buy.

Describe your Central Processor and we'll give you a memory. Let your engineers see their families this weekend: Datacraft already figured out how to build your CPU memory.

\*Price quoted is for quantities of 100 or more, plus applicable taxes and options desired.

Call your nearest  
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 Memory Man.

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 Central: (312) 775-7594 • Southwest: (713) 643-2114 • Rocky Mountain: (303)  
 794-4231 • Far West: (213) 542-5515

See the new Datacraft DC 6024/3 Computer in booth 24007 at Convention Hall during the SICC in Atlantic City.

CIRCLE NO. 22 ON INQUIRY CARD

CIRCLE NO. 23 ON INQUIRY CARD →

# Draw your own conclusions with this new time-share terminal.

Now you can have a time-share terminal that lets you see your data graphically— instantly — as it prints out on your Teletypewriter. Now you can plot for comprehension, for meaningful report illustrations, for permanent records. And do it while the time-share data's coming in.

The HP 7200A Graphic Plotter is the first major advance in time-share flexibility since the Teletypewriter itself. The Graphic Terminal feeds from standard EIA ASCII inputs and automatically plots computer data in points, lines, curves, bar graphs, pie

charts, or any other useful engineering, mathematical or business graphics you need. Plot directly from the Teletype keyboard, too, or silence the Teletypewriter and use the plotter alone.

It's the end of the graphic time lag.

The HP 7200A is easy to use and requires no special operating or programming/language knowledge. It plots smooth lines, not the staircase drawn by the incremental recorder. And it lets you position the graph where you want it on any type or size of graph paper up to 11" x 17".

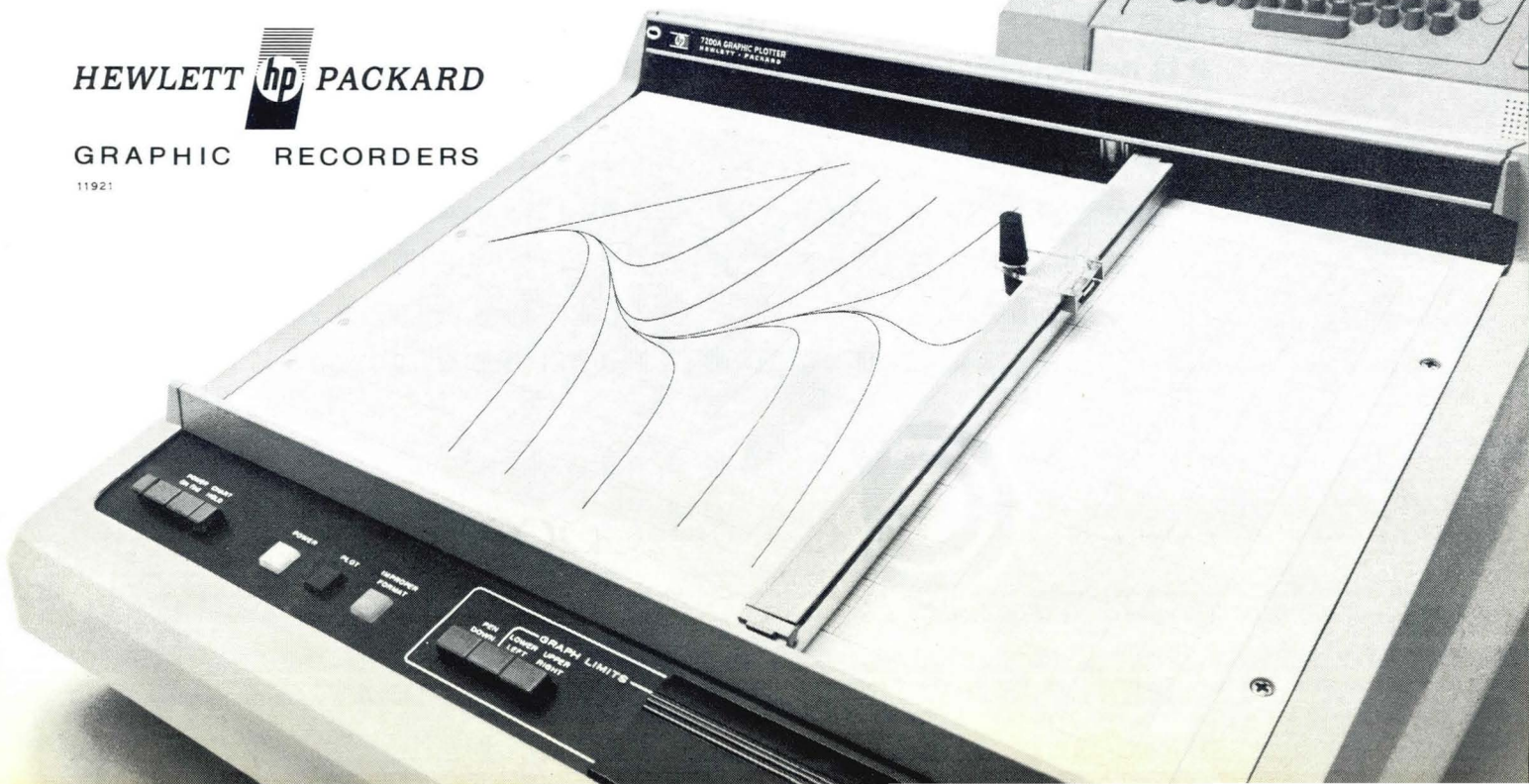
Talk to your time-share service about

Hewlett-Packard's new 7200A Graphic Plotter. If your service doesn't offer it yet, have them give us a call. The Graphic Terminal. For people who can benefit from a dash of art with their cold hard data.

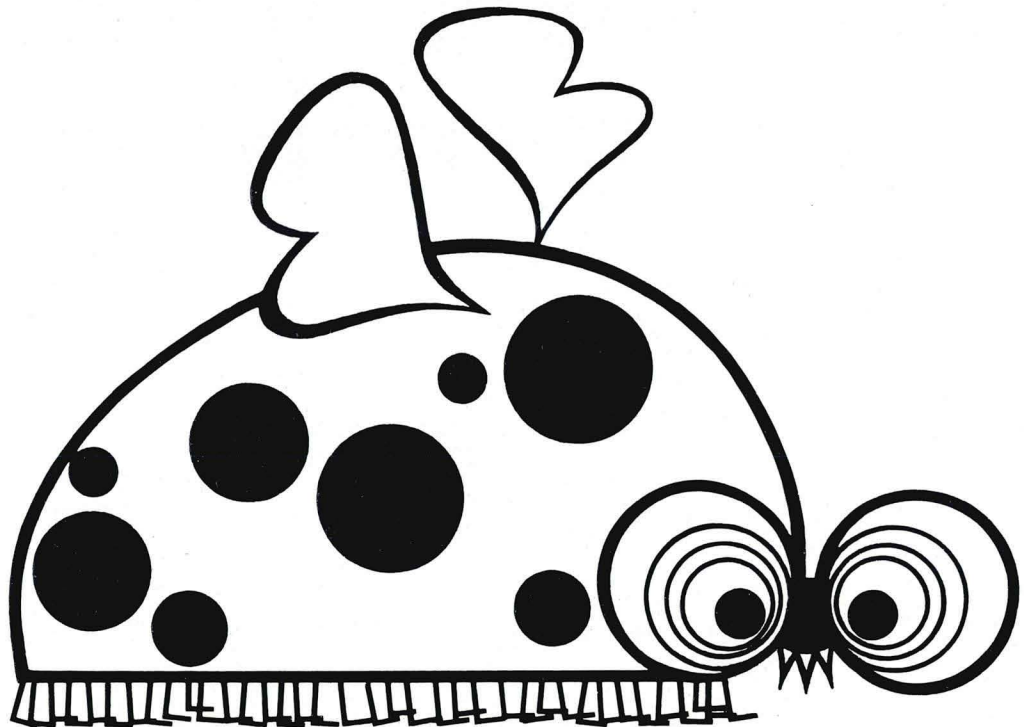
HEWLETT  PACKARD

GRAPHIC RECORDERS

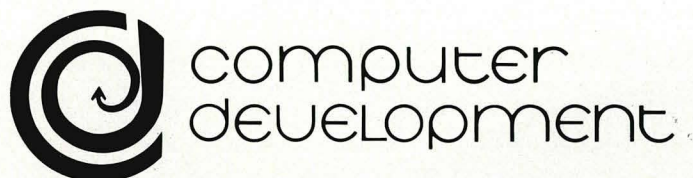
11921



NO WAY 



This is a specimen of the great speckled computer bug. It is normally found under the covers of many computers. We feel there's **NO WAY** for computer bugs to go but *out!* Computers should *give* service, not *require* it. Our computer is not yet on the market, but it soon will be — and without bugs. Since we plan to market it in OEM quantities, it's in everyone's best interest — ours as well as yours — to be sure that all the bugs are eliminated.



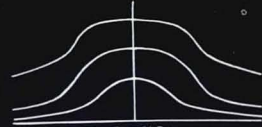
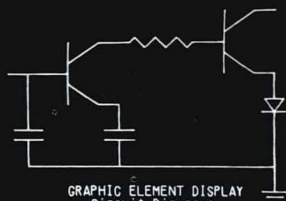
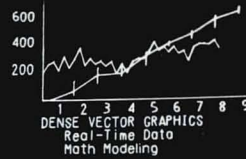
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CIRCLE NO. 24 ON INQUIRY CARD

# Graphically speaking!

The Computek Series 400 CRT Display System provides full interactive graphics. And costs only 10% more than present teletype systems. Completed problem solutions are presented within seconds. This graphically understandable solution means more creative think time. Your communication to the computer is enhanced by function buttons, cursor buttons, a joystick, or a highly sophisticated graphic tablet. The Series 400 System is being used with most computers.

For further information write or call --

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READY





### SECURITIES INDUSTRY STILL FIVE YEARS BEHIND

According to Miss Gloria J. Neises, president of Compu-Data Reporting, Inc., a Chicago-based company which provides computerized reports on portfolio performance for individual and institutional investors, the paperwork logjam in the securities industry won't be broken during 1970. The major reason given by Miss Neises for this dour prediction is that the industry is at least five years behind times in applying computers to its back office and customer service problems—and it may be another five years away from catching up. "The securities industry didn't begin taking a serious look at its data processing problems until 1968, when rapidly-accelerated trading volumes began creating the well-publicized back office paperwork explosion. Brokers just weren't spending as much as they could have on data processing before the storm and their recent profit picture hasn't helped.

Although some progress has been made by some of the larger firms since 1968, most brokerage houses and exchanges are about where the insurance industry was in the early 1960s, she believes.

### FCC STUDY

Dittberner Associates, a consulting firm headquartered in suburban Washington, announced receipt of a nine-month R&D contract from The Federal Communications Commission entitled, "*The Development of Recommendations to the FCC on Interconnection Issues.*" A major area of the study effort will be to assist the Commission and the Common Carrier Bureau to interpret and digest the technical information presently being gathered by the National Academy of Sciences. In addition to the interconnection issues, Dittberner Associates will also analyze items related to privacy and security as they relate to interstate communications and the newer communication systems and technologies.

### SPORTS DATA

The well-established American mania for sports statistics will be further appeased when Control Data Corp.'s "Cybernet" system of data centers goes on-line to the offices of the American Basketball Association. The joint CDC-ABA venture will provide virtually instantaneous computerized statistics on ABA teams and players to sports fans and media throughout the nation.

### NCR SEPARATES EDUCATIONAL PRICES

Under a new pricing plan recently put into effect by National Cash Register, all educational courses have been priced separately. Each NCR Century Series computer user, however, will receive a basic educational allowance as part of the rental or purchase price of his system, and will pay extra only for educational services above that allowance. A user of an NCR Century basic system, for example, will receive an educational allowance of \$2250; for the user of an NCR Century 200 basic system, the allowance will be \$3150. For each \$1000 of monthly rental above the rent paid for a basic system, or for each \$50,000 of purchase price above the price of a basic system, the educational allowance will be increased by \$450.

"This new policy offers a decided advantage to the customer in that he can determine in advance precisely how much educational assistance he will receive without extra cost," said Charles L. Keenoy, NCR marketing vice president. "Also, it gives the customer great flexibility as to how his basic educational allowance can best be used to meet the needs of his operating personnel." The new policy will not affect customers who have already placed orders for NCR Century Series computers for the initial term of their rental contracts.

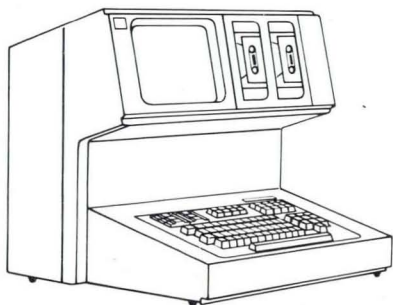
The announcement of the pricing structure for educational services and its related customer allowances is the second made by NCR in the computer pricing area. Last fall, the company announced a comparable pricing approach concerning the systems support it provides.

### NMA FORECAST FOR SEVENTIES

The nation's microfilm industry is growing so rapidly that it will be a multi-billion dollar industry by the mid-Seventies, an official of the National Microfilm Association predicted. "We at the NMA estimate that the annual growth of our industry is approximately 18 per cent per year," said Karl Adams, Jr., NMA President. "Already it is estimated that microfilm is a \$300 to \$500 million business annually—for what we call conventional microfilm." Likening the prospective market for Computer Output Microfilm equipment as holding "a tiger by the tail," Adams stated that "COM hardware manufacturers jumped from five to more than 35, and COM service companies from 10 to more than 100 in one year. Current estimates indicate growth in the COM field from today's \$100 million for equipment and film to over a billion dollars in five years."



## Now, people who know their job can talk to their computer



Anyone can talk to a computer using our new Key-Cassette terminal. He can call direct for immediate two-way communication. Or he can enter data on tape cassettes for fast, low cost, batch transmission. (Each cassette contains the equivalent of 1/5 of a mile of paper tape or 1400 punch cards.)

No special skills or complicated procedures are necessary. Each Sycor terminal contains a mini-computer that we program to fit the job. It guides the operator step-by-step, checks input and reduces errors. The keyboard is as simple as a typewriter. The video screen displays

each step for checking and editing by the operator.

Off-line you can search a cassette file, insert changes, sort information, or copy records. On-line it will transmit or receive data unattended. With an optional printer, multiple copies are provided.

Our terminals are installed worldwide and we deliver within 90 days.



**SYCOR inc**

## BOTTLENECK SEEN IN COMMUNICATIONS

Austin A. Harrison, president of MCI New England, Inc., said a growing shortage of interstate telephone circuits will become especially critical for the computer industry because its transmission needs are increasing 50-100 per cent each year. "By 1975, machines will use more communications capacity than people over the nation's long distance lines," Mr. Harrison said, "and there is mounting evidence that the country will need from 125,000 to 200,000 interstate circuits—more than the telephone network will be able to supply. Much of this added capacity will be needed by firms in New England."

There are now about 260,000 interstate circuits, compared with a projected need for almost 900,000 by 1975, Mr. Harrison pointed out. "To meet this demand, capacity would have to be expanded by 29.2 per cent in each of the next five years—more than twice the present growth level." Even if enough circuits could be supplied by the Bell companies, Mr. Harrison said, business communications will be severely handicapped if they remain confined to the three basic bandwidths now offered.

MCI New England last month applied for Federal Communications Commission approval to provide 72 microwave communications channels as a common carrier between Boston, Providence, and New York.

## X3 HOLDS FIRST MEETING OF 1970

American National Standards Committee X3, Computers and Information Processing, held its 37th meeting at Scottsdale, Arizona in late January. The following are among the matters covered in the two-day meeting, by the committee. (1) Authorized a letter ballot to approve EIA Standards RS-232-C, *Interface Between Data Terminal Equipment and Data Communications Equipment, etc.*; and RS-366, *Interface Between Data Terminal Equipment and Automatic Calling Equipment for Data Communications*; (2) Accepted a report from the subcommittee on interface standards (X3.9) giving a schedule for development of functional electrical and physical channel I/O interface standards; (3) Requested the Standards Planning & Requirements Committee (SPARC) to review and submit recommendations to X3 on the proposed scope and program of work of the Composite Language Development Group, which is considering the feasibility of standardizing PL/1; and (4) Voted to support a recommendation to investigate the desirability of an international standardization program for magnetic tape cassettes for digital information interchange.

## EFFECTS OF UNBUNDLING

Two major spokesmen in the software and services market recently expressed views on the effects of unbundling. Paul D. Oyer, President of Oyer Professional Computer Services, Inc., characterized the data processing industry as "confused" over the ramifications of IBM's decision to unbundle. He predicted that users will have to mature and crawl out from under the "Linus Blanket" of the manufacturer and face up to the realities of an unbundled computer world.

Speaking at a day-long seminar in New York sponsored by his firm, Oyer, a veteran of 19 years in the data processing industry, traced the history of manufacturer- and independently-developed software before IBM's unbundling, and described the effects the announcement would have on both user costs and IBM organization. User costs would increase, he said, but could be minimized by careful planning, training, and selection of alternatives from outside services. IBM would be restructured into separate sections for: Education and Training; Software and Consulting; Maintenance; Leasing, Marketing, and Sales; and Manufacturing. Oyer predicted that further down the road each of these sections would become separate subsidiaries, with IBM itself little more than a holding company. "IBM will remain, though, a leader in the computer industry for a long time, and they will always be a tough, seasoned competitor," he said.

A different, but non-opposing, view of the consequences of unbundling was expressed last month by Dr. Walter F. Bauer, pres. of Informatics Inc. of Sherman Oaks, Cal. Dr. Bauer sees IBM as gaining no more than 40% share of a projected \$2 billion a year proprietary software market in 1975, considerably less than its penetration of the hardware market—estimated at 70%. During 1970 and 1971, he said, separate pricing will have an increasingly beneficial effect on all proprietary software, which, while it currently only totals some \$30 million of the estimated \$4 billion software industry (much of which is accounted for by free software supplied with hardware by manufacturers and in-house software developed by customers), it will triple to \$100 million in 1971, reach \$2 billion annually by 1975, and \$5 billion by 1980.

This rapid growth of proprietary software, Dr. Bauer said, is the result of three developments—the rapid growth of the computer industry itself; the growing reduction in in-house programming; and the increased development and acceptance of software products.

Dr. Bauer predicted that "IBM will move more slowly in developing proprietary software than it did when it went after the hardware market. IBM software already in use or announced as non-separately priced items cannot be sold. Further, its new products must be a quantum jump from older versions, and the IBM software design and development cycle is much longer than commonly believed." IBM's marketing organization, he said, so effective in hardware, is only indirectly qualified in software sales. "The selling of software separately by hardware firms, however, will create a surge of interest and acceptability of separate purchase of hardware and software."





# low cost group therapy

## WANG'S NEW 3300 The First "BASIC" Time Sharing System Under \$20,000

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Dept. 3A1, 836 North St., Tewksbury, Mass. 01876  
Tel. (617) 851-7311

- Please send more information on the 3300. I want to know how much it can help me in the final analysis.
- Please send a price quotation on a \_\_\_\_\_ user system.

NAME/TITLE \_\_\_\_\_  
 ORGANIZATION \_\_\_\_\_  
 ADDRESS \_\_\_\_\_  
 CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

The 3300 is a time sharing mini-computer system for only  $\frac{1}{4}$  the cost of subscription services or other in-house time sharing systems. That, in itself, is very therapeutic. And any anxieties about communicating with a computer can be eliminated by BASIC. The popular conversational language, ideal for beginners and experts alike. It's simple to get involved with a 3300. Begin a system with just one terminal if you like. Then add hardware as needed to accommodate up to 16 users, or to broaden system capability. It's truly mind expanding.

 **WANG**  
LABORATORIES, INC.



# INTERNATIONAL NEWS

**EUROPEAN CHALLENGE**—The U.S. computer industry faces a new challenge as several European companies [Siemens and Telefunken of Germany, Compagnie Internationale pour l'Informatique (C.I.I.), Philips of Netherlands, Olivetti of Italy, and British International Computers Ltd.] jointly plan to market a super-computer in the 1975-'80 period. The U.S. Dept. of Commerce points out that more than rivalry for commercial markets is involved. Also at issue is the feeling by each country of the necessity to develop a computer industry to provide the technology which is integral to its total economy and which, for security purposes, cannot be left in control of foreign companies. This has led to the push by France, Germany, and Great Britain, to develop their own computer industries.

**SHORTAGE OF BRITISH PROGRAMMERS**—The National Computing Center, in London, has presented its 1,000th basic certificate in systems analysis, reports the Financial Times of London. The course was developed by NCC to meet the urgent need for systems analysts in a computing industry which has grown in Britain at the rate of about 1,000 machines annually for the past three years. The "short-fall" this year in analysts and programmers has been estimated by two ministries at 15,000 to serve a computer population of around 7,000 — 4,000 of which are in the \$75,000 and over class.

**GROWING FRENCH CAPACITY**—France now probably has more than 6,000 computers, according to a report of Comite France Actuelle. The private association of businessmen reports that the number of computers in France has been doubling every two years. With a higher percentage of large-scale systems, France is believed to have the highest average computer capacity of any country in Europe. The association estimates that by 1975 there will be 20,000 computers worth \$1.7 billion in use in France.

**CANADIAN SCIENCE POLICY**—The place of science and technology in government institutions is examined in a report just published by the Organization for Economic Cooperation and Development on Canadian Science Policy. Canada is the tenth country to be studied in the Organization's program of reviewing national science policies. The report deals in particular with economic growth and the problems of industrial specialization in relation to domestic and foreign markets. Topics studied include government policy concerning multi-national firms; the encouragement of industrial research; efforts to improve liaison between the university, industrial, and governmental sectors; and methods of allocating government research grants. The report recommends the creation of a post of minister responsible for long-term scientific development. In the words of the report, he would be the custodian of an innovative society and Canada's minister for the future.

## QUICKLY AROUND THE WORLD

Ferranti's automation systems division has begun production of what is claimed to be the least expensive on-line computer available in the United Kingdom. The London Times reports that the basic Argus 600 computer, costing about \$4080, is intended for use with equipment requiring a relatively-simple computer or programmable control device.

According to an unconfirmed report published in London, an order for a superconductor computer worth over \$2.4 million has been placed by Telefonaktiebolaget L. M. Ericsson, the Swedish telephone and telecommunication equipment manufacturer, with International Computers. Designated the 1906A, the computer is scheduled for delivery in 1972 in a mixed magnetic tape and disk configuration.

**U. S. EXPORTS**—Assistant Secretary of Commerce Kenneth N. Davis, Jr. expects 1970 to bring about some improvements in the U.S. trade balance. Commerce believes that exports of computers and parts will continue their strong growth patterns. (See table at right.) Although production by U.S. subsidiaries overseas supplies a sizable portion of foreign requirements, Commerce says EDP equipment produced in the U.S. continues in strong demand in world markets. "As in the case of many other technologically advanced exports, the competitive advantage of U.S. computer producers over foreign manufacturers lies, to an important degree, in serving a large homogeneous, domestic market which permits the development, testing, and profitable manufacture of new products."

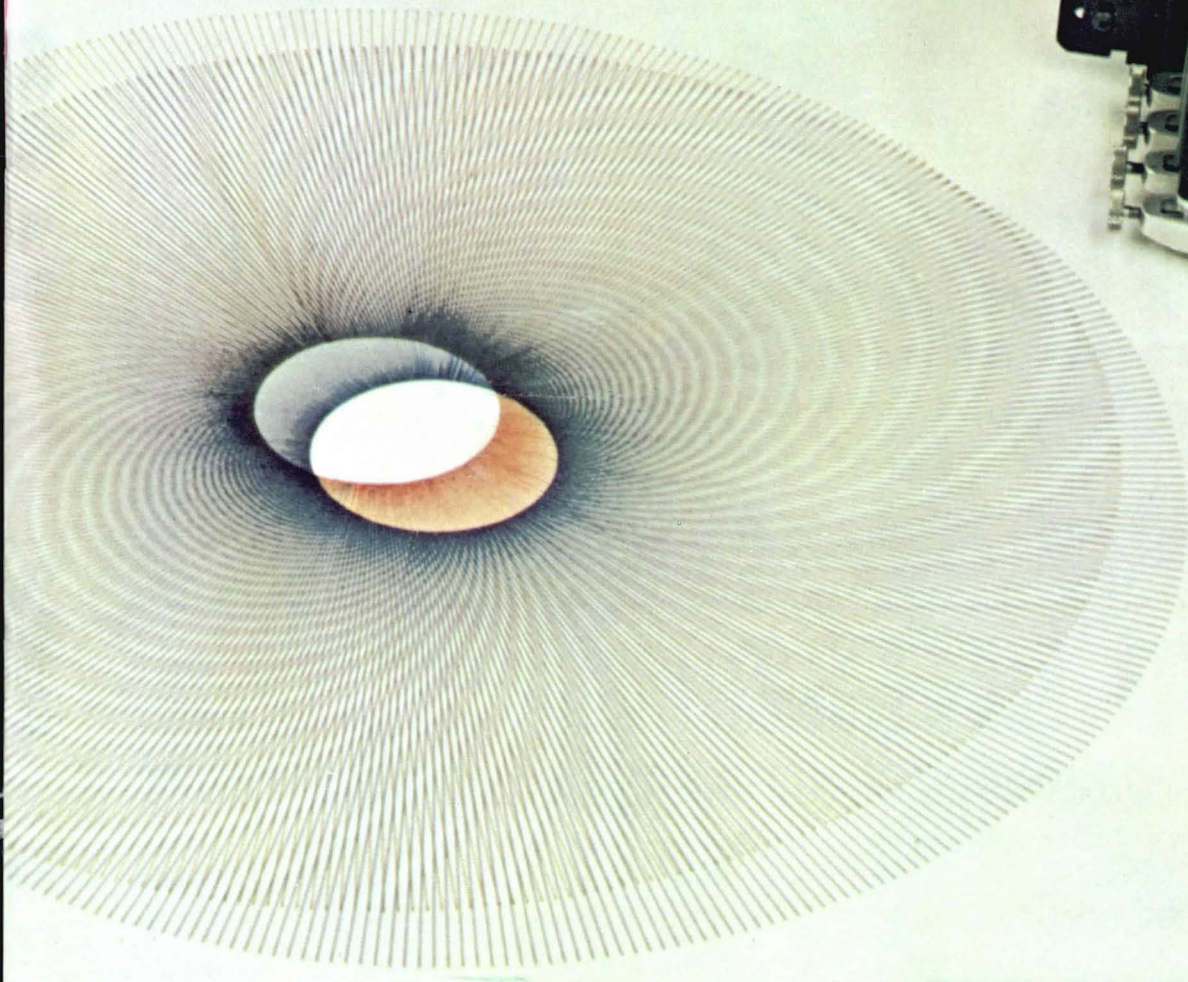
**U.S. Exports of Electronic Computers and Parts,<sup>1</sup> 1967-1969**

Country of destination	1967		1968		1969	
	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total	Amount (thousands)	Percent of total
Total	\$432,517	100.0	\$486,431	100.0	\$636,499	100.0
West Germany	68,761	15.9	81,724	16.8	105,645	16.6
United Kingdom	65,403	15.1	79,778	16.4	93,951	14.7
Canada	64,248	14.9	66,141	13.5	92,583	14.5
France	67,112	15.5	62,087	12.8	80,181	12.6
Japan	54,707	12.6	59,352	12.2	79,630	12.5
Hong Kong	10,159	2.3	19,677	4.0	24,923	3.9
Italy	15,335	3.5	16,963	3.5	11,646	1.8
Netherlands	11,673	2.7	14,370	3.0	23,139	3.6
Switzerland	8,224	1.9	10,120	2.1	8,813	1.4
Sweden	7,158	1.7	10,081	2.1	13,045	2.0
Australia	9,136	2.1	9,750	2.0	12,824	2.0
All other countries	50,601	11.8	56,387	11.6	90,119	14.4

<sup>1</sup> Parts accounted for 27% in 1967, 23% in 1968 and 29% in 1969. Source: Bureau of the Census.

For more information on the insert ad on page 32A  
PLEASE WRITE ON LETTERHEAD TO: EAI Dept. D,W. Long Branch, N.J. 07764  
OR—SEE IT AT SJCC

# It's computer-graphics state-of-the-art.



That completely unretouched photo of a double starburst is right off the revolutionary new EAI 430 DATAPLOTTER. It isn't there just to look pretty. It's there to demonstrate a couple of important things.

We deliberately offset the centers of the two starbursts. That produced the moiré effect.

The perfect symmetry of the moiré shows the 430's ability to plot smooth straight lines at any angle. Precisely positioned. And it plots these lines with resolution of 0.001 inches. Smooth-line resolution. With no sawtooth effect.

Moreover, the symmetrical moiré pattern underscores the 430's repeatability of 0.003 inches in each axis.

How come such performance?

It's because the 430 is a new concept in plotters. It's a hybrid plotter.

It combines an analog plotter's speed and smooth-line quality with a digital plotter's reliability and stability.

Did we mention speed?

Take a slew speed of up to 30 inches/second for openers. Line drawing up to 20 inches/second. Curve drawing up to 16 inches/second. Point and symbol plotting up to 300 characters/second.

The 430 gets its speed from another entirely new concept in plotter technology. A unique "look-ahead" capability. It lets the plotter optimize its speed to conditions coming up. Saves extensive computer time. Reams of tape. Only EAI has it.

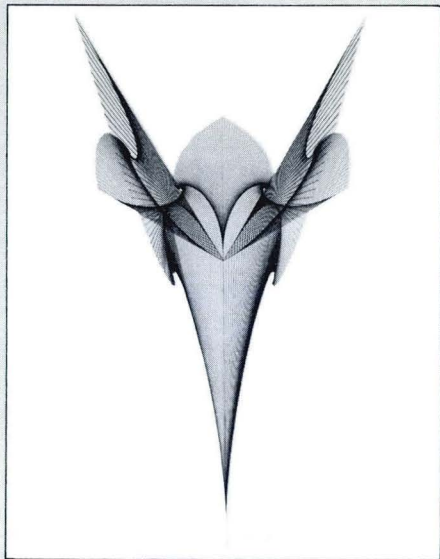
The EAI 430 has six-mode operating capability. A four-pen assembly. An optional 48-character symbol printer. Complete EAI software and systems support.

Now. What's the prettiest picture you can think of?

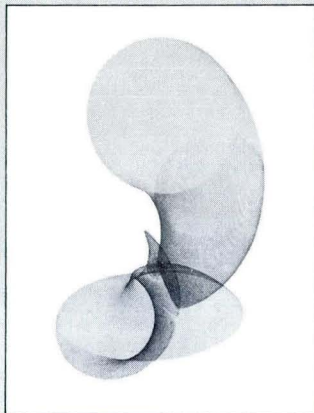
If it's an EAI 430 reducing your masses of digital data into graphic form better, faster and less expensively than anything around, we're waiting to hear from you.

Electronic Associates, Inc., Long Branch, New Jersey 07740.

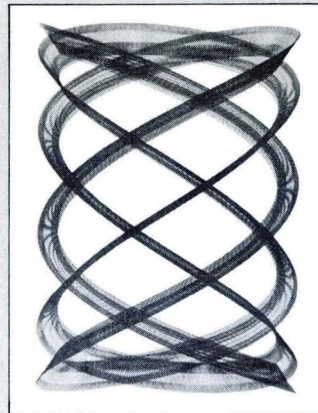
**EAI**®



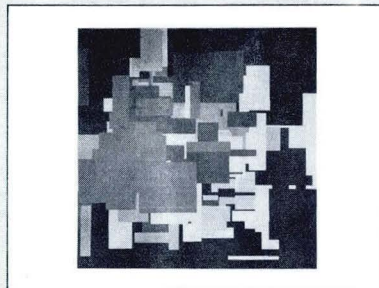
HUMMINGBIRD



INSPIRATION



PLEXUS

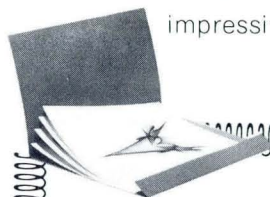


IDEALIZED BRUSH STROKES

# SPECIAL OFFER!

## full color reproductions of computer-generated artwork

Here is a unique opportunity to own a distinctive and unusual set of four prints from the 1968 Computer Art contest. Each print is 12" x 16" and is reproduced in magnificent full color on heavy weight quality paper suitable for framing. Symbolic of the computer industry, these attractive and interesting prints are ideal for decorating your office, den or home. Packaged in a handsome folio, they make distinctive gifts for friends or business associates. Each is imprinted on the back with a description of the programming technique, computer and plotting equipment employed to produce the art. Everybody in the computer field will want a set of these beautiful and impressive prints. Send for yours now. Supply is limited.



### ORDER FORM

Gentlemen: please send your folio of computer art prints.  
Enclosed is my  check  money order for \$10.00.

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

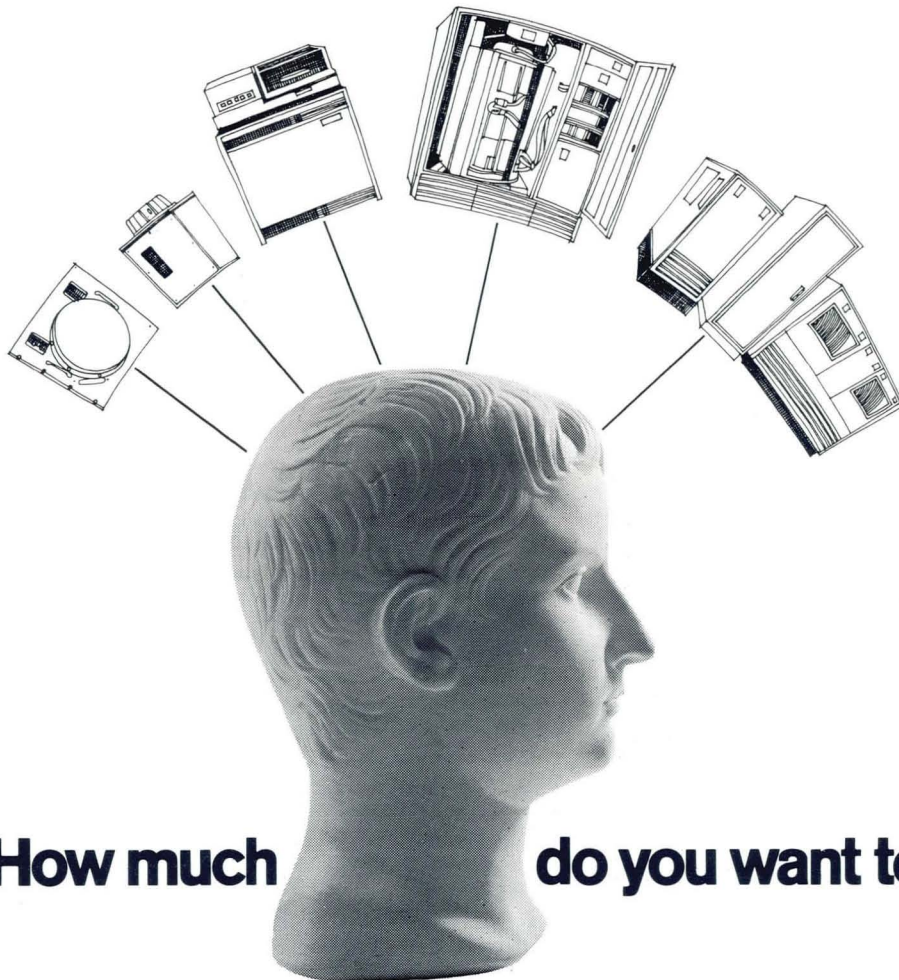
ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

*For orders of more than 10 sets, write for quantity price list*

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## How much do you want to remember?

Bryant is the largest independent manufacturer of magnetic memory drums, disc files and complete memory systems in the world—and we're widening our lead. Which means that just about anything you

need, you can have—from the desk size, mini-priced CLC-1 to our multi-billion bit 4000 disc file system.

And since we're not bound to any particular processor, we'll mix and match the pieces best suited to you. Then bring them all together in a memory system that's compatible with almost any

computer you can think of. Write for details. Bryant Computer Products, 850 Ladd Rd., Walled Lake, Michigan 48088. We'll tell you all about the new products we'll be introducing in the next seven months.

**A match  
for any  
computer**

## **BRYANT COMPUTER PRODUCTS**

A UNIT OF



**EX-CELL-O CORPORATION**



## ORDERS AND INSTALLATIONS

Data General Corp., in business only since April '68, is already reporting a profit. (See Box Score of Earnings, page 37.) The company first offered its shares to the public last November 19. Data General also announced plans to expand its facilities. The company has agreed to enter into a 20-year lease for an additional 150,000 square feet of space to expand its executive offices, research center, and manufacturing facilities in Southboro, Mass. Data General's facilities, with the new space, will total approximately 220,000 square feet. Provision is also being made for further expansion through an option to lease an additional 60 acres of land adjacent to the company's present headquarters. The company currently occupies 30,000 square feet and has 40,000 square feet under construction.

A \$1.5 million contract for production of flight telemetry hardware for Minuteman missiles was disclosed by Radiation Inc., a subsidiary of Harris-Intertype Corp. The contract is for on-board telemetry gear to be manufactured for Boeing's Missile & Information Systems Division, Seattle, Wash.

A two-year \$2.4 million contract for on-line computer software services has been awarded by Western Union to Cybermatics Inc. The contract calls for the design and implementation of software improvements for Western Union's national multi-computer data communications system.

Burroughs Defense, Space and Special Systems Group, Paoli, Pa., has received a U.S. Navy Contract in the amount of \$1,350,000 for development and production of compact, lightweight alphanumeric CRT display systems. Most of the units will be used aboard the aircraft carrier Nimitz, presently under construction.

The John D. Kettelle Corp. announced the award of a \$325,000 contract to provide the Aerospace Defense Command with systems analysis and programming services in support of the Ballistic Missile Early Warning System.

University Computing Co. plans to purchase \$36.3 million worth of Univac 1108 computers and related communication subsystems from Sperry Rand's Univac Division. UCC reported the equipment being purchased is presently leased to various federal agencies and is used in the Government's "Autodin" communications network and the U.S. Air Force global weather network. Aggregate annual rentals under GSA terms are approximately \$17 million.

A \$995,000 contract for digital data link equipment for operation at information rates up to 100 megabits per second has been awarded to Raytheon Co. by Northrop Corp. The equipment will be used in the U.S. Navy's Joint Inflight Data Transmission System (JIFDATS). The systems include airborne and surface-based encoding, multiplexing, and modem equipment to be used in the transmission of data collected by reconnaissance aircraft.

Data-Design Labs of Cucamonga, Cal. announced receipt of a contract exceeding \$700,000 from the Naval Air Engineering Center, Philadelphia, Pa. for the design and manufacture of shipboard computers for weapon control/direction systems. The production contract follows the successful testing of a prototype computer developed under a previous Navy contract.

Litton Industries has awarded a contract in excess of one million dollars to Precision Instrument Co. for purchase of Precision Instrument's Model PI 1207 R/W Incremental Digital Tape Recorders. Litton plans to incorporate the recorders into its new 9209 Converters that convert text originated on IBM Magnetic Tape Selectric Typewriter (MTST) cartridges to computer-compatible magnetic tape.

Fernmeldetechnisches Zentralamt (FTZ), the research and development dept. of the German Postal, Telephone and Telegraph Service, has acquired an \$8 million UNIVAC 1108 Multiprocessor Computer System from Sperry Rand's Univac Division. The computer will be installed at FTZ's headquarters in Darmstadt.

Outokumpu OY of Finland, one of Europe's leading metals producers, has negotiated the purchase of an undisclosed number of Honeywell H316 minicomputers from Honeywell Ltd. in Scotland. The computers will be used for an on-line X-ray fluorescence analyzer recently introduced by the Finnish company for use in mineral concentration and ore processing plants.

A contract in excess of \$3.5 million for several thousand memory systems has been received by Ferroxcube Systems Division. The memory systems will be utilized in Univac's new Model 1701 Verifying Punch and Model 1710 Verifying Interpreting Punch (VIP) keypunch equipment.

Systems Engineering Laboratories, Inc., has received an order for 40 Systems 810A computers from Fairchild Graphic Equipment, a division of Fairchild Camera and Instrument Corp. Fairchild will use the real-time computers in its Comp/Set 330-1 automatic typesetting systems.

Beneficial Finance Co. has announced plans for a nationwide data processing network which will connect nearly 1700 loan offices to two IBM S/360-65s located at BFC's Morristown, N. J. computer center.

Eclectic Computer Corp. of Dallas has received an order in excess of \$100,000 from Philco-Ford Corp. for thirteen Model 640 tape systems. The tape systems, which include an Ampex TMZ magnetic tape transport and Eclectic's Model 640 Controller Interface for the PDP-8 computer, will be part of an optical scanning system for use by the Post Office Dept.

# IT USED TO TAKE GUTS TO BUY A NOVA.



Sorry, pal.

But if you're the kind of guy who delights in sticking his neck out, Nova is no longer for you.

Used to be.

But that was nearly 400 deliveries ago.

Now, the only kicks you'll get from a Nova will come from the performance, cost, and loads of peripherals and software we offer.

For instance, you can buy a Nova in its basic 4K configuration with 16-bit word length, multi-accumulator design, data channel, and Teletype interface for \$7950. Or you can get it with a lot less for a lot less.

Or you can buy a Nova-based system.

Which includes such good things as read-only memory, compatible mag tape units, a variety of discs, A/D, D/A, and communications equipment.

Finally, there's our software.

And the only thing we have to say about that is what our customers say: specifically, it includes all the right things and it's working in hundreds of applications.

Still looking for more?

Supernova.

Everything Nova is and then some.

Including an add time of 300 nanoseconds from read-only memory, 800 nanoseconds from core, making it the fastest mini computer in the world.

What's more, Supernova is still brand new.

Which (we can assume) means it still takes a certain amount of guts to buy.

Here's your chance, pal.

Data General Corporation, Southboro, Mass. 01772 (617) 485-9100

## DATA GENERAL

Makers of Nova and Supernova mini computers.



## CORPORATE AND FINANCIAL

**MERGERS & ACQUISITIONS:** **Auto-comp, Inc.**, a Bethesda, Md. firm specializing in computerized information and photocomposition systems, has acquired **Autocode, Inc.**, a Washington-based firm which applies computer technology to the codification of statutes and ordinances . . . **The Computer Exchange, Inc.** has agreed to acquire all of the common stock of **Computer Synergy, Inc.**, an Oakland, Cal. data processing facilities management firm . . . **Computer Response Corp.** of Washington, D.C. has announced the acquisition of the **Institute of Modern Procedures**, a data processing school also located in Washington . . . **Diversified Computer Services, Inc.**, itself in business less than a year, announced it had concluded negotiations calling for the immediate acquisition of **Data Process Services, Inc.** and **Wingate Personnel, Inc.**, each of New York. Both companies were acquired on a pooling of interest basis . . . **EECOTEL Computer Corp.**, founded jointly by **Electronic Engineering Co.**, of California (EECO) and **Total Systems Inc.** of Bridgeport, Conn., to produce and market computer systems for hotels and motels, is now a wholly-owned subsidiary of EECO. All EECOTEL activities will be taken over and managed by EECO with a gradual reduction in Total participation throughout 1970 . . . **National Tape Corp.** and **Efficient Leasing Corp.** announced a possible merger of the two companies . . . **Fisher-Stevens, Inc.**, direct mail and data processing service organization in Clifton, N.J., has acquired **Advertising Distributors** of Washington, a D.C. firm providing computerized direct mail services . . . The acquisition of **Comps Inc.** by **Growth Industry Computing** has been completed. Comps was acquired for an undisclosed amount of Growth shares . . . **Intech, Inc.** of Minneapolis announced an agreement to purchase approximately 60 percent of the outstanding common stock of **Data Methods Corp.** of Denver. Intech is a software development and facilities management company. Data Methods provides real-time management services . . . **International Systems Associates, Ltd.**, a data processing firm, has acquired **Computech Inc.** (a subsidiary of **United Data Centers**) for an undisclosed sum . . . **International Tele-**

**computer Network Corp.** and **The Matrix Corp.** announced an agreement in principle whereby ITN would acquire substantially all of the assets of Matrix. ITN is a time-sharing and data processing service company with principal offices in Bethesda, Md. While engaged in a similar type of business, Matrix, with principal offices in Los Angeles and Boston, emphasizes remote job entry . . . **Intranet Industries, Inc.**, will become **Intranet Computing Corp.** through the exchange of  $3\frac{1}{8}$  shares of Intranet Computing for each of the currently outstanding shares of Intranet Industries . . . Directors of both **IteI Corp.** (San Francisco) and **Intercontinental Systems, Inc.** (Palo Alto) have approved an agreement whereby ITEL will acquire Intercontinental through an exchange of common stock . . . **Micromation Technology Corp.** of Chicago has completed the acquisition of **LV Computer Systems, Inc.**, New York. MTC also reported selling the assets and a majority of the business of its **Systems and Services Division** to **University Computing Co.** Until the sale, this division operated three computer-output-to-microfilm service centers in Chicago, New York City, and Arlington, Va. . . **Information Network Corp.**, a wholly-owned computer time-sharing subsidiary of **Wabash Magnetics, Inc.**, merged into **Peripherals, Inc.**, a wholly-owned computer hardware subsidiary. Both firms are based in Phoenix, Ariz. The name of the merged company will be **Wabash Computer Corp.** . . . **Precision Magnetics, Inc.**, Minneapolis developer of high-speed memory systems, has purchased the **Oscar A. Schott Co.**, a designer and manufacturer of custom-built magnetic components and systems . . . **Scientific Resources Corp.** of Philadelphia announced plans to combine four subsidiaries into a single operating entity. The four subsidiaries are **Hybrid Systems, Inc.**, **Mauchly-Wood Systems Corp.**, **Paragon Systems, Inc.**, and **Digital Seismic Corp.** These companies, located in the southwest and California, will be headquartered in L.A. . . **Systems Engineering Laboratories, Inc.** of Ft. Lauderdale, Fla. and **Spectral Dynamics Corp.** of San Diego have approved an agreement whereby Spectral will merge into a new subsidiary of **Systems** . . . **URS Systems Corp.** of

San Mateo, Cal. plans to acquire **Remote Computing Corp.**, an L.A.-based computer network information service . . . **Western Operations, Inc.**, San Francisco computer planning and management firm, has acquired **Information Systems Management Corp.** of Richland, Washington as a subsidiary . . . **University Computing Corp.** has acquired **National Mail Marketing**, formerly Automated Mailing Service of Dallas. UCC also announced that it has acquired from **LTV Aerospace Corp.**, a subsidiary of **Ling-Temco-Vought, Inc.**, half the 71 percent interest LTVA held in **Computer Technology Inc.** together with a \$2.5 million CT debenture and all outstanding warrants to purchase CT common stocks. In exchange, LTVA received \$20 million in cash, all of UCC's ownership in the **Academy of Computer Technology, Inc.**, and 100 percent of the outstanding common stock of **Alcorn Combustion Co., Inc.** The agreement, which gave UCC a 35.5 percent interest in CT, also contained provisions for a management contract and options to buy-back several subsidiary properties. The option on one of these CT subsidiaries, **Service Technology Corp.**, was exercised by CT in late January, with the result that STC will be resold to LTVA for its shareholders equity (not to exceed \$2.5 million) as of Dec. 31, 1969.

### WESTINGHOUSE FORMS SUBSIDIARY, EXPANDS DIVISION

Westinghouse Electric Corp. announced the formation of a new subsidiary and the expansion of an existing division in "major moves aimed at marshalling the company's resources for penetrating the computer services business." The new subsidiary will be known as the **Westinghouse Tele-Computer Systems Corp. (WTSC)** with headquarters in Pittsburgh. It will concentrate on commercial and industrial markets, especially manufacturing, and will provide information systems analysis and design, programming, time-sharing and remote terminal computing, and computer and telecommunication facilities management. The company's Civil Systems Division now becomes responsible for systems planning and consulting services in Federal, State and local governments as well as institutions such as hospitals. The expanded division will also be able to call upon the new subsidiary for programming support and computer services.



RECENT ENTRIES IN THE COMPUTER FIELD: **Business Computers, Inc.** will specialize in the purchase, refurbishment and placement of used computers and peripheral equipment. The company is located in Dallas . . . **Comma Corp.** describes itself as the first nationwide, independent computer maintenance company. Based in N.Y.C., Comma plans to establish service locations in all major cities across the country . . . **C.M.P.R., Inc.** (Computer Marketing Planning and Research), has been formed in Los Angeles. The company will perform marketing research specifically designed to meet the needs of the computer and the computer peripheral industries . . . **Decision**

**Data Corp.**, headed by a team of former Univac management personnel, will design, manufacture, and market a broad line of peripherals, subsystems, and related auxiliary equipment. The company is located in the Philadelphia-area community of Warminster, Pa. . . . **Facility Management and Support, Inc.** has been organized in the Chicago area by a group of former EDS systems engineers. FMS will provide professional data processing facility management as well as operations, programming and systems design support . . . **Health Auto-Data, Inc.**, formed as a subsidiary of Quanta Science Corp., will provide complete technical and management services to

plan, design, equip, operate, and maintain automated, computerized medical screening centers under lease-contract to physicians. The company is located in the Washington, D.C. area . . . **Pegasus Data Sciences**, a company which will operate computer studies centers in the Bay Area and central California as well as market video-assisted instruction products to business firms and other institutions, is being formed in San Francisco . . . **Pitney-Bowes, Inc.**, and **Alpex Computer Corp.** announced that they intend to form a new jointly-owned company for the manufacture and sale of computerized point-of-sale register systems developed by Alpex. The new company will be named **Pitney-Bowes-Alpex, Inc.**, and will be headquartered in Danbury, Conn.

### BOX SCORE OF EARNINGS

Company	Period	Revenues	Net Earnings (Loss)	Earnings (Loss) per Share
Automatic Data Processing	6 mos. 12/31/69	16,815,471	1,385,131	.28
	6 mos. 12/31/68	12,273,421	988,003	.20
Beckman Instruments	6 mos. 12/31/69	64,937,565	1,926,946	.56
	6 mos. 12/31/68	63,149,141	1,491,871	.44
Bradford Computer & Systems	12 mos. 12/31/69	4,570,000	537,000	.39
	11 mos. 12/31/68	905,000	5,139	.004
Burroughs	Yr. 12/31/69	759,336,000	55,199,000	3.32
	Yr. 12/31/68	655,560,000	43,301,000	2.64
Central Data Systems	6 mos. 11/30/69	908,876	75,100	.17
	6 mos. 11/30/68	340,422	46,859	.14
Computer Communications	6 mos. 12/31/69	4,585,845	251,066	.21
	6 mos. 12/31/68	2,633,116	(81,756)	(.09)
Computer Environments	Yr. 10/31/69	3,064,000	150,000	.35
	Yr. 10/31/68	1,047,000	64,000	.17
Computer Micrographics	Yr. 8/31/69	993,627	(37,210)	(.05)
	Yr. 8/31/68	631,794	75,641	.13
Computest	6 mos. 11/30/69	4,536,191	296,698	.32
	6 mos. 11/30/68	2,685,601	198,687	.21
Dashew Business Machines	3 mos. 11/30/69	1,001,000	61,000	.025
	3 mos. 11/30/68	978,000	119,000	.05
Data General	3 mos. 12/20/69	1,115,000	88,000	.05
	Yr. 9/27/69	1,034,000	(268,000)	(-)
Data Products	9 mos. 12/27/69	31,614,313	1,436,496	.22
	9 mos. 12/28/68	26,119,520	1,391,050	.23
Dataram	6 mos. 10/31/69	979,711	41,850	.055
	6 mos. 10/31/68	190,728	(113,860)	(.202)
Digital Equipment	6 mos. 12/27/69	60,876,200	6,288,500	.67
	6 mos. 12/28/68	37,542,000	3,461,400	.39
Hewlett-Packard	Yr. 10/31/69	325,537,000	25,585,000	2.02
	Yr. 10/31/68	271,688,000	20,825,000	1.66
Itel	Yr. 12/31/69	40,437,000	3,288,000	.86
	Yr. 12/31/68	9,761,000	488,000	.17
Raytheon	Yr. 12/31/69	1,285,134,000	35,232,000	2.35
	Yr. 12/31/68	1,196,507,000	30,444,000	2.03
Sperry Rand	9 mos. 12/31/69	1,246,460,000	56,733,000	1.66
	9 mos. 12/31/68	1,161,661,000	55,361,000	1.62
Systems Associates	Yr. 6/30/69	1,699,130	(696,459)	(.68)
	Yr. 6/30/68	1,092,946	10,273	.01
Sys. Engrg. Labs.	24 wks. 12/12/69	9,143,736	733,167	.33
	24 wks. 12/13/68	7,047,703	558,093	.27
Telex	9 mos. 12/31/69	39,544,262	3,905,407	1.89
	9 mos. 12/31/68	24,868,540	1,078,718	.56
Trilog Associates	Yr. 7/31/69	1,483,786	25,206	.25
	Yr. 7/31/68	621,784	38,373	.44
Worldwide Computer Services	Yr. 4/30/69	126,969	9,804	.05
	Yr. 4/30/68	92,570	5,677	.04
Xerox Corp.	Yr. 12/31/69	1,482,895,000	161,368,000	2.08
	Yr. 12/31/68	1,224,352,000	128,950,000	1.68

### TYMSHARE, FRENCH FIRMS IN JOINT VENTURE

A new company that will provide time-sharing services throughout Western Europe has been formed by Tymshare, Inc. of Palo Alto in collaboration with CEGOS Informatique of Paris, a large management consulting firm which currently operates a number of medium- and large-scale in-house computer systems, and Credit Lyonnaise, France's second largest bank. CEGOS-Tymshare, with headquarters in Paris, expects to begin offering time-sharing services throughout France early this year. Initial CEGOS service will be based upon computers identical to those in service for Tymshare's U.S. operations. Tymshare recently entered into a similar business venture with a major Canadian computer service company, EDP Industries Ltd. of Vancouver, to provide time-sharing services in that country.

### ITT ENTERS PERIPHERALS MARKET

International Telephone and Telegraph Corp. announced its entry into the U.S. data peripheral equipment market with the formation of a Data Equipment and Systems Division to be headquartered in East Rutherford, N.J., and headed by Andreas H. Kruse, vice president, who formerly held a group staff marketing position with the ITT Data Services Division. The new products (of which several were shown at the recent COMPSO show in N.Y.) will range from peripheral equipment, such as data printers and visual terminals, to security monitoring systems, front-end processors and concentrators.



## DC DATASCAN

**MORE ATTENTION TO PATENTS** — The Justice Dept.'s recent formation of a new patent unit in its Antitrust Division signals increased attention will be given to patents and their antitrust implications. The new unit will handle litigation involving restrictive practices in the licensing of patents and technology. In recent months Justice has challenged the legality of a number of patent and know-how licensing practices. These have included agreements not to contest the validity of patents and agreements dividing fields-of-use. Richard H. Stern, who is both a lawyer and an electrical engineer, has been named to head the new unit.

**GROSCH SAYS NO TO IBM SYSTEM/3** — Dr. H. R. J. Grosch, Director of the National Bureau of Standards' Center for Computer Sciences and Technology, has advised the Bureau of the Budget and the General Services Administration against procuring IBM System/3 equipment. He pointed out that all computers now brought into the Federal inventory must have ASCII capability. Waiver procedures are authorized "only under compelling circumstances of particular applications." System/3, said Dr. Grosch, "does not conform to the ASCII requirement. Its clear incompatibility with existing hardware and software, both IBM and competitive, hinders Government efforts at interchangeability of equipment and programs."

**MORE FROM SMALL BUSINESS** — General Services Administration has told the House Small Business Committee that small companies are getting more of the Government's EDP hardware and software business. In fiscal 1968 small business EDP equipment firms were awarded Federal Supply Schedule contracts totaling \$6.4 million. GSA explained that the reason this volume dropped to \$4.9 million in fiscal 1969 was that certain previously small companies became large businesses. Present indications are that fiscal 1969 volume accruing to small business firms will double or triple in fiscal 1970. GSA has initiated action which enables businessmen to apply to only one agency (GSA) to get on all bidders' lists for EDP equipment, supplies, and services. The new system is intended to minimize paperwork and agency contacts, and provide more adequate and current information on nationwide procurements, enabling small businesses to compete more vigorously.

**COMPUTER SNOOPING** — Sen. Sam J. Ervin (D-N.C.) has called for restraints on the use of secret computer banks to gather and store information about private citizens. In a letter to Treasury Secretary David M. Kennedy, Sen. Ervin said he was concerned about Secret Service guidelines for developing mechanized dossiers. These guidelines, he believes, threaten first amendment freedoms. Secretary Kennedy in his reply assured Sen. Ervin that there was nothing for him to worry about.

**WRIT OF HABEAS DATA** — Alan F. Westin, a noted legal scholar and professor of public law and government, suggested in a recent Washington speech that a "writ of habeas data" should be required to justify the use of computerized information against an individual just as a writ of *habeas corpus* requires that the state justify an individual's imprisonment. Those living in this electronic age need the same kind of writ to command the government and certain private organizations to produce the data they are using to make judgments about an individual, he said.

**UTILITY CRIME** — Some utilities are basing requests for rate increases on padded books, according to Sen. Lee Metcalf (D-Mont.). "Use of modern information storage and retrieval systems (by regulatory commissions) would certainly discourage this type of *ultra*-white-collar crime by prestigious companies," Sen. Metcalf wrote the Bureau of the Budget. He urged that more money be budgeted for computerizing regulatory commission accounting procedures.

### IN BRIEF

The Senate Small Business Committee has recommended that the Dept. of Justice's Law Enforcement Assistant Administration continue and expand its activities in assisting the development of new technological systems and devices to prevent criminal activity directed at small business.

Data Systems Analysts, Pennsauken, N.J., contractors and consultants in computer software, applications, and selection, has received President Nixon's "E" Award for boosting sales of U.S. products abroad.

Western Electric Co., New York, N.Y., has received a \$4,427,260 modification to a previously awarded contract for software and programming for the Safeguard Ballistic Defense System. Work will be done at Whippany and Morris Plains, N.J. The Safeguard System Command, Huntsville, Ala., is the contracting agency.

# Octoputer & Co.

When you go Octoputer, a 3 billion dollar communications company backs you up all the way.

Getting a new computer system is no joke. It involves lots of money. And important decisions, like the maker and the equipment.

And then getting the equipment going and keeping it going.

RCA's making it all easier. We make your decisions easier.

Most of our salesmen started as systems men.

They've put systems together. They know your problems.

So they know what you need at least as well as you do.

We make getting a computer easier.

Check our new plan that buys you a computer at 15% off.

No other computer maker has a plan like it.

We make the switch-over from your old system easier.

Our systems men are known

as some of the best in the business. Just ask our customers.

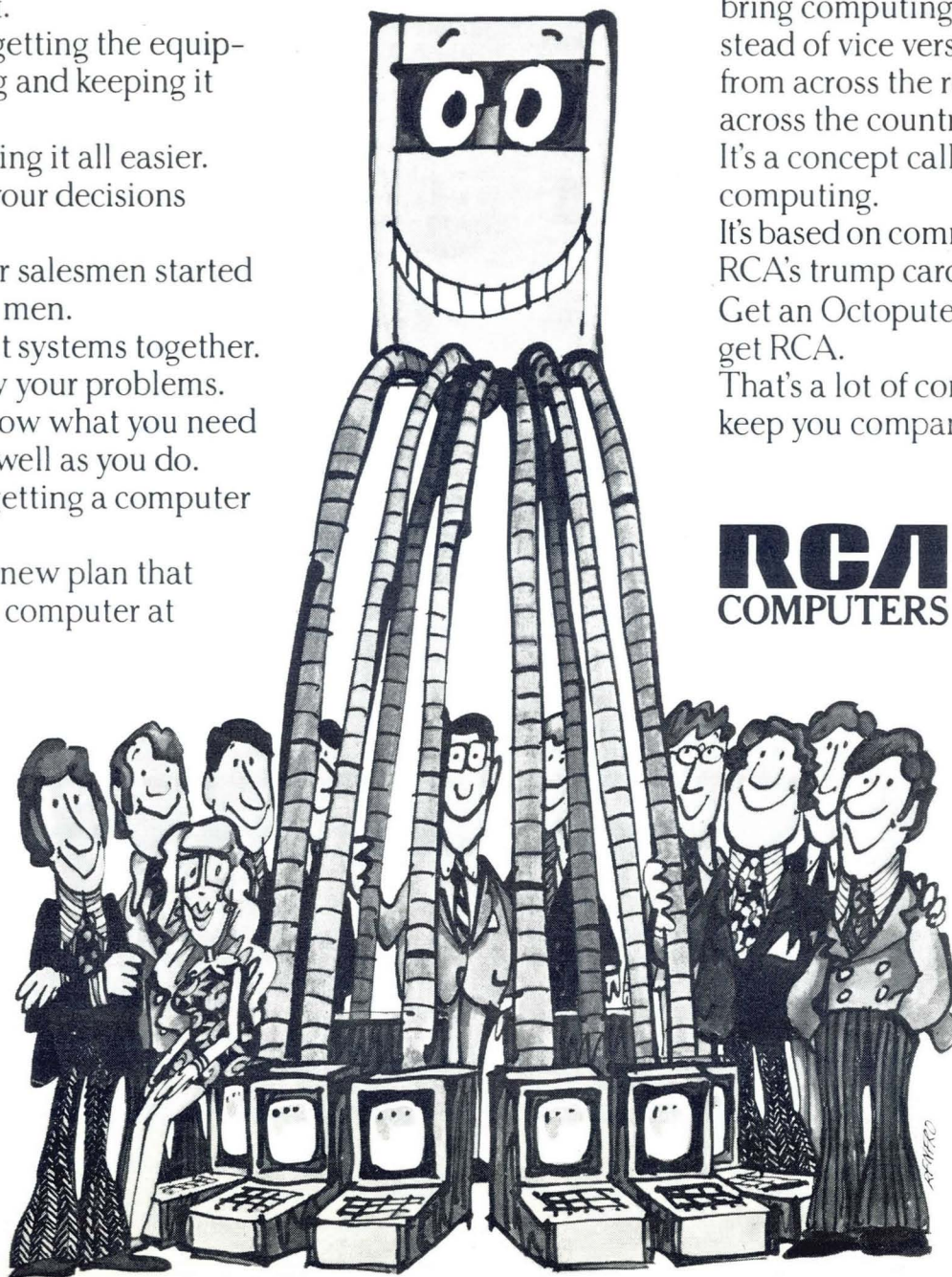
We've made computing easier, too. The Octoputers bring computing to you, instead of vice versa. Use yours from across the room or across the country.

It's a concept called remote computing.

It's based on communications, RCA's trump card.

Get an Octoputer, and you get RCA.

That's a lot of company to keep you company.



**RCA**  
COMPUTERS



## CORPORATE PROFILE

Featured this month:

### COMPUTER COMMUNICATIONS, INC.

(over-the-counter)

701 West Manchester Blvd.  
Inglewood, Cal. 90301

**DIRECTORS:** Dr. Robert Fagen, Chairman of the Board of Directors and Pres., Computer Communications, Inc.; Hugh F. Colvin, Pres., Unitek Corp.; Henry S. Forrest, V. Pres., Control Data Corp.; Dr. Louis Garfin, V. Pres., Pacific Mutual Life Insurance Co.; William M. Lendman, Corporate Financial Advisor and Consultant; Ray W. Sanders, Pres., Computer Transmission Corp.

**BACKGROUND:** Computer Communications, Inc. (CCI) is a California corporation organized in 1966 as a systems company specializing in the computer communications field. It provides all or any portion of computer-based systems, including the central processor, computer interfaces, multiplexers, communications interfaces, remote operator terminals, and software.

**FACILITIES:** The firm maintains corporate offices in Inglewood, Cal. CCI and its subsidiaries have a total of about 630 employees operating out of 10 major plant locations in the Los Angeles area and in Minnesota with a total of over 130,000 square feet of space, and with sales offices and systems centers in eight major cities.

**PRODUCTS AND SERVICES:** CCI's products and services are as follows.

◆ **Communications Stations:** CCI's initial product, the CC-30 Communications Station, was introduced in August, 1967. The CC-30 is a low-cost input/output display terminal designed for high-speed, on-line access to a computer. CCI was the first to utilize a commercial television set as a display device. Unique features of the terminal include the capability of displaying both alphanumeric and graphic data and the flexibility to add optional input/output devices such as light pens, card readers, line printers, magnetic tape, and disks. The CC-33 Teletype Compatible Display Station permits the replacement of Models 33 and 35 Teletype units with the new generation of display stations without altering Teletype-oriented software. In March, 1969 CCI introduced the CC-36 Tele-video Conversational/Batch Station which includes a keyboard, a television screen, a card reader, a line printer, and an interface to a data set for remote communication.

◆ **Multiplexers:** CCI provides two types of multiplexers — the CC-72 Remote Multiplexer and the CC-70 Programmed Buffered Multiplexer. The CC-72 allows up to 32 remote stations to share a single transmission line to the computer site. The CC-70 "front-end" multiplexer

controls and buffers multiple communications lines and provides a single connection to a central processor data channel. The CC-70 and other "front-end" systems are built around the CC-701 Communications and Control Processor, a CCI developed "minicomputer" first announced and demonstrated in November 1969.

◆ **Channel Adapters:** CCI channel adapters interface configurations of CC-30 Communications Stations directly with the I/O channel of a computer. CCI has provided channel adapters for several computers including IBM System/360 and 1130, the CDC 3000 and 6000 series, the XDS Sigma series, and DEC PDP series.

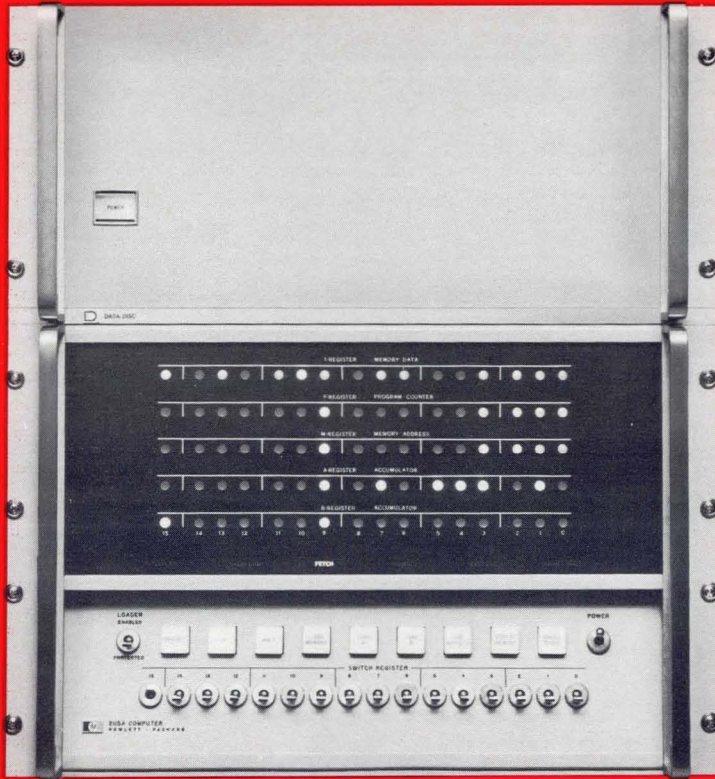
◆ **Communications Software:** CCI provides a communications access method for the use of CCI terminals on an IBM System/360 computer. This software system, which runs under either OS or DOS, allows a System/360 user to communicate with any configuration of CCI terminals by means of generalized input/output statements.

◆ **Services:** CCI also offers computer-related services in the areas of systems management and analysis, contractual programming and development, and engineering design. Although these capabilities have been employed to expand CCI's product line, they have also been used on projects completely unrelated to CCI products. Examples include the entire logical design of the central processing unit and I/O modules for a real-time computer system built by a large electronic systems corporation; initial conceptual design of a multi-computer real-time data processing complex which resulted in a contract award to the CCI client; an extensive FORTRAN IV package for real-time processing on an 8K, 16-bit computer; and a comprehensive business data processing system for the IBM 1130 computer.

**CURRENT POSITION:** CCI has been able to support rapid growth and still achieve and maintain profitability despite heavy research and development costs which are expensed. ■ **Acquisitions:** In September 1969 the firm acquired General Fabrication Corporation, a Minnesota manufacturer of core memories, printed circuits, and wired panels. In the same month it acquired WESCAL Industries, Inc., a Los Angeles manufacturer with four divisions covering computer systems, computer components, memory disks, and aerospace. ■ **Joint Venture and Affiliate:** In July 1969, CCI, in cooperation with Capital Management Corporation (an affiliate of Blair & Co.), established a joint venture partnership with Disk Research and Development Corporation for financing the development of a proprietary fixed-head-per-track disk file. DRDC will supply over \$60,000 of capital to Computer Communications over a 12- to 18-month period for development and preproduction of the high-performance disk. Also in 1969, CCI cooperated with Blair & Co., Inc. and several independent investors in the founding of In-telecom, a corporation chartered to develop, operate, and sell total computer-communications on-line systems and

# \$7,500

## 46K Memory



Plug-compatible secondary mass storage is now available in a 46,080-word unit for your Hewlett-Packard 2114B/2115/2116 minicomputer.

It's expandable to 368,640 words and offers transfer rates up to 176,000 16-bit words/second.

At \$7,500 the DATA DISC comes complete with installation, 1-year service, and controller — ready to go to work with your existing HP software. Delivery: 30 days.

Circle No. 1 on reply card.

# \$7,500

## 32K Memory



Plug-compatible secondary mass storage is now available in a 32,768-word unit for your Varian 620/i minicomputer.

It's expandable to 262,144 words and offers transfer rates up to 120,000 16-bit words/second.

At \$7,500 the DATA DISC comes complete with installation, 1-year service, and controller — ready to go to work with your existing Varian software. Delivery: 30 days.

Circle No. 2 on reply card.



# DATA DISC

DATA DISC, INC., 1275 California Avenue, Palo Alto, California 94304 (415) 326-7602

# Attention mini computers.

No mini computer has ever enjoyed choosing a printer.

Mainly because there have never been any appropriate printers to choose *from*.

On the one hand, there were little typewriter-type printers that were much too slow for high-speed mini computers.

And on the other hand, there were big superspeed printers that were designed for big superspeed computers. And they were much too expensive for mini computers.

Those were the choices.

And if the mini computer didn't like it, it was "Sorry, pal, take it or leave it."

Not much fun.

So if you're a mini computer, you'll be glad to know there is now a printer that was designed specifically for you.

It's not too slow. It's not too expensive. It's exactly right.

So rejoice, mini computers.

Rejoice.

## Nortec's mini line printer.



Nortec 200 is 132 columns, prints at 200 lines per minute, produces crisp type on up to 6 copies. The entire unit, with all electronics including buffer controller, ready for direct hookup to computer, is as little as \$6000 in OEM quantities. It's just a little larger than an electric typewriter. The \$6000 price includes these standard features: IBM-compatible vertical format unit, front-opening yoke assembly for easier forms loading and ribbon changing, self-test feature for testing electronics and mechanism. Nortec Computer Devices Inc., a Consumer + Technical Company, Ashland, Mass. 01721, (617) 881-3160.

services. Because of its original role, Computer Communications now owns 22½ percent of Intelcom, which was obtained for a nominal investment. In May, CCI received a long-term contract to design, develop, and supply proprietary total computer communications systems for Intelcom.

The first phase of the program is a \$500,000 design and development effort. CCI will also design and develop a totally integrated message switching system and brokerage back-office processing system for Intelcom, which has a contract to supply services to Blair & Co., Inc. The brokerage system is being produced under an additional \$750,000 contract. In December 1969, Intelcom, which has headquarters in Minneapolis, filed a registration statement covering a proposed public offering of common stock to finance these developments and the Blair brokerage contract.

**OUTLOOK:** When Computer Communications, Inc. was formed three and a half years ago, the "computer communications" industry was not yet identified or named as such, the "terminal business" had not yet proliferated, and the need for "turn-key" total computer systems was not fully recognized. The rapid growth of CCI parallels the industry's growth in these areas. In addition to the growth in sales volume and the early attainment of profitability, CCI has continued to expand its technical organization.

**FINANCIAL SUMMARY:** Cumulative losses in the first two years were \$280,000 and the past six consecutive quarters have been profitable. The first year resulted in revenues of \$150,000 in development or service contracts. The second year resulted in revenues of \$1,000,000 of which 80 percent was standard product sales and 20 percent was service, and the last year resulted in revenues of almost \$2,800,000 with essentially the same sales mix. Computer Communications entered fiscal year 1970 in a very good cash position. Through a successful public offering in October, 1968 approximately \$2,300,000 was netted, of which \$300,000 was used to retire short-term bank indebtedness. Prior to the recent acquisitions, CCI had been able to maintain growth in sales and other internal operations without significant cash requirements. Consolidation with the subsidiaries on a pooling-of-interest basis is shown for the first time in the first quarter of fiscal year 1970. For purposes of comparison, the corresponding quarter of fiscal 1969 is shown as consolidated rather than as originally reported. As of September 30, 1969 there were 1,138,832 shares of common stock outstanding.

FISCAL YEAR ENDING JUNE 30

Year	Revenues	Net income (Loss)	Net income (Loss) per share*
1969	\$2,784,258	\$171,696	\$0.18
1968	1,004,214	(99,152)	(0.16)
1967	156,369	(175,400)	(0.50)
**1st QTR/70	2,290,783	116,892	0.10
**1st QTR/69	1,138,798	(87,353)	(0.10)

\*Based on average and equivalent shares outstanding during period.

\*\*Reflects consolidation with subsidiaries on a pooling-of-interests basis.



*Courier*  
the Leader in Terminals  
and Terminal Systems Design

There is more to our Executerm Terminals than styling. Each is human-engineered for functional ease in operation, for reliability and for maximum use. Modular construction and circuitry reduce service time to an absolute minimum.

Each is designed for use in a complete remote terminal system of any size or as a single terminal station. Whether you have one office or a hundred and regardless of their geographic locations, Courier will design a complete system to meet the needs of your organization.

For further details on the operation, applications and installation plans, write or phone our Marketing Department.



CIRCLE NO. 32 ON INQUIRY CARD



# COMPUTER STOCK TRENDS

	COMPANY	EXCH.	VOL.		PRICE	NET CHG.		P/E	
			(SHARES IN 100's)	1970 HIGH		1970 LOW	FROM MONTH AGO		EARN./SHR. (LATEST 12 MONTHS)
<b>SUPPLIES &amp; ACCESSORIES</b>	ACME VISIBLE RECORDS	OTC	-----	47.0	31.0	39.0	- 3.4	1.88	20
	ADAMS MILLIS	NY	458	22.3	11.2	11.7	- 2.2	0.87	12
	BALTIMORE BUS. FORMS	OTC	-----	27.4	18.4	18.4	- 2.4	0.92	19
	BARRY WRIGHT	AM	944	29.2	17.6	18.2	- 5.4	0.86	20
	CAPITOL INDUSTRIES	AM	936	56.2	29.0	43.0	-10.4	1.82	23
	DATA DOCUMENTS	OTC	-----	44.4	26.0	30.2	- 2.2	1.77	16
	DATA PACKAGING	OTC	-----	30.2	17.6	23.0	0.0	0.77	30
	DENNISON MFG.	NY	2312	54.7	17.1	18.4	- 6.2	1.96	9
	DUPONT	NY	3519	165.4	96.1	96.1	-11.0	7.35	13
	ENNIS BUS. FORMS	NY	284	19.0	17.4	17.6	- 0.6	0.92	18
	GENERAL BINDING	OTC	-----	43.0	28.0	29.0	- 1.4	0.76	38
	GRAPHIC CONTROLS	OTC	-----	28.6	15.0	15.0	- 1.0	1.10	13
	LEWIS BUS. FORMS	OTC	-----	23.0	16.0	16.6	- 2.2	0.86	18
	MEMOREX	NY	10494	173.7	65.0	120.2	-27.6	1.83	65
	3 M	NY	4496	118.4	94.0	100.2	- 9.3	3.21	31
	MOORE CORP. LTD.	TSE	-----	38.0	34.7	35.3	- 2.2	-----	---
	REYNOLDS & REYNOLDS	OTC	-----	48.4	30.0	43.4	- 1.0	1.27	33
	SAFEGUARD INDUSTRIES	AM	556	25.4	10.0	14.4	- 0.2	0.52	26
STANDARD REGISTER	OTC	-----	31.0	23.0	29.0	- 0.6	1.93	15	
UARCO	NY	314	39.2	25.3	37.4	2.5	2.21	16	
WALLACE BUS. FORMS	OTC	-----	40.2	27.4	36.6	- 3.2	2.16	16	
<b>SOFTWARE &amp; SERVICES</b>	APPLIED DATA RESEARCH	AM	435	40.0	19.0	19.0	- 4.4	0.65	29
	APPLIED LOGIC	OTC	-----	24.4	14.6	14.6	- 3.0	0.07	---
	ARIES	OTC	-----	19.0	3.3	4.4	- 3.4	-----	---
	AUTOMATIC DATA PROC.	AM	4643	47.6	21.7	43.3	0.4	0.56	76
	BOLT, BERANEK & NEWMAN	OTC	-----	19.0	7.4	9.4	- 0.6	0.32	28
	BOOTHE COMPUTER	OTC	-----	45.4	21.0	21.0	- 4.4	1.62	12
	BRANDON APPLIED SYS.	OTC	-----	17.0	5.6	6.4	- 2.2	-----	---
	COMPUTER APPLICATIONS	AM	1115	21.7	6.0	8.0	- 3.3	0.22	36
	COMPUTER ENVIRONMENTS	OTC	-----	16.0	6.4	12.4	0.4	-----	---
	COMPUTER EXCHANGE	OTC	-----	18.0	4.0	6.2	0.0	0.08	75
	COMPUTER INVESTORS	AM	314	25.0	7.6	10.4	- 1.7	0.38	26
	COMPUTER METHODS	OTC	-----	12.4	1.2	1.4	0.0	-----	---
	COMPUTER PROPERTY	OTC	-----	15.0	9.0	13.2	1.2	-----	---
	COMPUTER SCIENCES	NY	12908	34.6	19.4	28.2	- 5.6	0.74	37
	COMPUTER TECHNOLOGY	OTC	-----	36.0	5.2	6.4	- 5.7	0.12	50
	CTC COMPUTER	OTC	-----	24.0	14.0	13.0	- 6.0	-----	---
	COMPUTER USAGE	OTC	-----	40.0	5.4	6.6	- 1.0	(d)1.58	---
	COMPUTEROLOGY	OTC	-----	6.4	1.4	2.0	0.0	-----	---
	COMPUTING & SOFTWARE	AM	2944	75.6	37.0	69.2	3.6	1.11	62
	COM-SHARE	OTC	-----	23.0	11.4	14.2	0.2	-----	---
	CYBER-TRONICS	OTC	-----	15.0	7.0	13.0	- 0.1	0.11	118
	CYBERMATICS	OTC	-----	15.0	6.4	10.4	0.0	-----	---
	DATA AUTOMATION	OTC	-----	30.2	13.0	17.0	- 7.0	-----	---
	DATA DYNAMICS	OTC	-----	16.0	3.4	3.7	0.0	-----	---
	*DATA NETWORK	OTC	-----	10.4	2.3	2.7	- 1.1	-----	---
	DATA PROC. FIN. & GEN.	AM	2552	60.2	22.0	23.2	- 7.7	2.56	8
	DATA SYSTEMS ANALYSTS	OTC	-----	11.0	2.4	4.6	2.0	0.06	66
	DATRONIC RENTAL	OTC	-----	16.0	4.4	7.6	2.2	-----	---
	DEARBORN COMPUTER	AM	1188	52.6	19.1	21.2	- 2.4	2.05	10
	DECISION SYSTEMS	OTC	-----	8.6	3.0	4.0	0.7	-----	---
	DIGITAL APPLICATIONS	OTC	-----	15.0	3.0	4.2	0.2	-----	---
	DIGITEK	OTC	-----	15.0	2.7	2.7	- 0.5	-----	---
	DPA	AM	1077	13.5	7.6	7.7	- 2.0	0.86	8
	EFFICIENT LEASING	OTC	-----	15.4	2.4	3.4	0.4	-----	---
	ELEC. COMP. PROG. INST.	AM	438	38.2	7.6	9.2	- 1.4	0.14	64
	ELECT. DATA SYSTEMS	OTC	-----	153.0	34.0	144.0	- 6.0	0.39	369
	GREYHOUND COMPUTER	AM	417	28.5	11.4	11.6	- 1.6	1.25	8
	INFORMATICS	OTC	-----	30.2	11.0	16.0	- 4.6	0.09	177
INTL. COMPUTER	OTC	-----	17.0	3.4	3.4	- 2.6	0.07	48	
*INTL. COMPUTER SCIENCES	NAT	700	7.7	2.2	2.4	- 1.1	0.20	12	
LEASCO DATA PROG.	AM	12862	54.0	19.6	21.1	- 8.3	2.71	7	
LEVIN-TOWNSEND	AM	3394	57.4	12.1	13.2	- 5.4	4.03	3	
LMC DATA	OTC	-----	8.2	1.6	2.5	0.6	(d)0.01	---	
MGMT. ASSISTANCE	OTC	-----	14.7	2.0	3.1	0.2	(d)2.07	---	
NATIONAL COMP. ANAL.	OTC	-----	22.0	4.4	6.6	0.0	-----	---	
PLANNING RESEARCH	NY	2943	53.2	23.7	43.7	- 3.5	0.68	63	
PROGRAMMING METHODS	OTC	-----	27.0	13.0	22.0	1.0	-----	---	
PROGRAMMING SCIENCES	OTC	-----	37.0	11.4	30.4	5.4	-----	---	
PROGRAMMING SYSTEMS	OTC	-----	11.4	3.2	4.2	1.0	0.16	25	
SCIENTIFIC COMPUTER	OTC	-----	8.4	2.4	3.4	0.6	0.12	25	
SCIENTIFIC RESOURCES	NY	4724	26.4	10.3	11.4	- 1.2	(d)0.78	---	
STRATEGIC SYSTEMS	OTC	-----	37.0	2.3	3.2	0.6	-----	---	
SYSTEMS CAPITAL	OTC	-----	34.0	5.0	5.4	0.0	-----	---	
TIME SHARE	OTC	-----	13.4	5.3	5.7	0.4	0.13	38	
URS SYSTEMS	OTC	-----	31.2	17.1	24.4	- 3.4	0.56	42	
UNITED DATA CENTERS	OTC	-----	7.0	3.2	5.0	0.0	-----	---	
UNIVERSITY COMPUTING	NY	12874	155.0	55.0	62.7	-34.0	2.51	24	
US TIME SHARING	OTC	-----	16.0	5.2	11.4	4.0	-----	---	



(d) Deficit

\* New listing in this issue

All security prices and net change are expressed in dollars and eighths of dollars (e.g. 62.2 is 62 $\frac{1}{4}$ ). Trading volume is not given for over the counter stocks. ALL DATA COMPUTED BY SCANTLIN ELECTRONICS, EXCLUSIVELY FOR MODERN DATA.

COMPANY	EXCH.	VOL. (SHARES IN 100's)	1970 HIGH	1970 LOW	PRICE 2-6-70	NET CHG.		P/E RATIO
						FROM MONTH AGO	EARN./SHR. (LATEST 12 MONTHS)	
AMP	NY	4524	59.0	32.5	53.0	- 2.4	1.89	28
AMPEX	NY	4738	49.7	32.4	40.7	- 6.6	1.42	28
APPLIED MAGNETICS	OTC	-----	24.6	11.2	23.0	2.2	0.39	58
ASTRODATA	AM	8362	36.3	13.1	15.2	-18.3	0.28	53
ASTROSYSTEMS	OTC	-----	13.4	5.6	6.2	- 2.4	0.34	17
BUNKER RAMO	NY	4761	17.5	9.4	13.2	- 1.0	0.43	30
CALCOMP	AM	2037	37.4	18.2	25.2	- 2.4	0.56	44
CHALCO ENGRG.	OTC	-----	8.4	3.0	5.0	0.0	-----	---
CODEX	OTC	-----	47.4	15.0	23.4	- 5.4	0.26	88
COGAR	OTC	-----	94.0	57.0	73.0	5.0	-----	---
COGNITRONICS	OTC	-----	38.4	11.4	12.0	- 1.6	(d)0.22	---
COLLINS RADIO	NY	2036	69.6	24.1	25.5	-10.6	2.50	10
COMCET	OTC	-----	50.0	27.0	39.0	- 8.0	-----	---
COMPUTEST	AM	729	33.5	14.2	23.7	- 3.1	0.64	35
COMPUTER COMM.	OTC	-----	48.0	30.0	27.0	- 9.0	-----	---
COMPUTER CONSOLES	OTC	-----	26.0	8.0	18.4	- 3.4	-----	---
COMPUTER INDUSTRIES	OTC	-----	52.0	12.0	22.0	- 1.0	-----	---
CONRAC	NY	415	59.3	22.4	25.0	- 6.0	1.54	16
DATA 100	OTC	-----	19.0	15.4	15.4	- 1.2	-----	---
DATA PRODUCTS	AM	10746	27.7	12.3	22.0	- 2.0	0.33	66
DATARAM	OTC	-----	16.4	8.4	10.4	- 3.4	(d)0.46	---
DATASCAN	OTC	-----	32.0	15.0	25.0	3.0	-----	---
DIGITRONICS	OTC	-----	22.4	12.6	13.0	- 0.4	0.18	72
ELEC ENGRG. OF CAL.	AM	125	28.3	10.0	11.3	- 1.2	0.10	110
ELEC MEMORIES & MAG.	NY	6675	42.3	21.4	35.6	- 2.7	1.01	34
EPSCO	OTC	-----	20.4	4.6	4.6	- 2.0	0.17	23
EXCELLO	NY	725	37.3	22.4	22.7	- 1.6	2.63	8
FABRI-TEK	OTC	-----	12.7	5.5	7.0	1.0	0.16	43
FARRINGTON MFG.	OTC	-----	37.4	13.0	13.4	- 3.3	(d)0.06	---
GENERAL INSTRUMENT	NY	6610	43.2	20.0	20.6	-10.1	0.54	37
GERBER SCIENTIFIC	AM	576	39.3	20.2	35.0	- 3.1	0.68	51
GRAPHIC SCIENCES	OTC	-----	70.0	28.2	30.0	- 9.2	(d)1.37	---
HI-G	AM	-----	33.4	9.5	9.6	- 2.2	-----	---
INFORMATION DISPLAYS	OTC	-----	21.4	9.4	16.4	1.4	-----	---
ITEL	AM	-----	37.5	14.2	20.4	- 2.5	0.86	23
LOGIC	OTC	-----	23.0	7.0	12.6	- 1.4	-----	---
MILGO	AM	14572	84.4	17.7	70.2	2.7	0.65	107
MOHAWK DATA SCIENCES	AM	10098	89.1	59.6	76.2	3.0	1.15	66
NORTH ATLANTIC IND.	OTC	-----	22.0	5.4	6.2	- 0.4	-----	---
OPTICAL SCANNING	OTC	-----	118.0	40.0	47.0	- 6.0	(d)0.45	---
POTTER INSTRUMENT	AM	3714	46.0	23.6	33.0	- 4.5	0.85	38
RECOGNITION EQUIP.	OTC	-----	76.0	52.0	71.4	- 3.0	(d)0.51	---
SANDERS ASSOCIATES	NY	2661	61.7	20.1	21.6	- 5.1	0.59	35
SANGAMO	NY	1853	43.4	19.2	26.2	0.1	0.60	43
SCAN-DATA	OTC	-----	85.0	27.0	35.0	- 7.0	-----	---
SEAELECTRO	AM	866	15.6	6.6	9.4	- 2.3	0.20	45
TALLY	OTC	-----	36.0	15.0	19.0	1.4	(d)2.73	---
TELEX	AM	14483	111.6	20.6	107.0	14.4	1.74	61
TEXAS INSTRUMENTS	NY	5370	140.2	94.6	125.2	- 2.6	3.06	40
TRACOR COMPUTING	OTC	-----	7.4	5.2	6.0	- 1.0	(d)0.47	---
VARIFAB	OTC	-----	13.0	4.4	4.0	- 0.6	-----	---
BECKMAN	NY	1927	63.4	43.7	42.4	- 5.0	1.46	28
BURROUGHS	NY	6274	172.6	120.6	154.0	- 4.6	3.32	46
CONTROL DATA	NY	17659	159.2	60.6	69.0	-50.2	3.11	22
*DATACRAFT	OTC	-----	20.0	6.0	14.0	0.0	-----	---
DIGITAL EQUIPMENT	AM	4307	124.0	54.4	114.6	9.7	1.06	107
ELECTRONIC ASSOCIATES	NY	1547	25.2	8.1	8.3	- 2.2	.07	114
GENERAL ELECTRIC	NY	11137	98.2	69.1	70.1	- 6.4	4.10	17
HEWLETT-PACKARD	NY	2508	114.5	75.2	100.6	- 1.5	2.02	49
HONEYWELL	NY	4719	157.2	107.6	135.0	- 8.4	4.15	32
IBM	NY	10914	387.0	291.6	344.6	-20.0	8.21	41
LITTON INDUSTRIES	NY	22318	74.4	24.3	25.6	-10.6	2.39	10
NCR	NY	9345	171.6	108.0	142.4	-18.0	3.91	36
RCA	NY	10944	48.1	30.1	30.3	- 4.1	2.44	12
RAYTHEON	NY	3596	50.2	26.4	29.4	- 3.6	2.35	12
REDCOR	OTC	-----	49.0	25.0	26.4	- 5.0	0.14	185
SCIENTIFIC CONTROL	OTC	-----	43.4	1.5	7.6	5.0	(d)2.43	---
SPERRY RAND	NY	14815	55.4	34.2	36.1	- 1.1	2.27	15
SYSTEMS ENGRG. LABS	AM	6526	53.7	26.1	43.4	- 4.1	0.76	56
SYSTRON DONNER	AM	690	32.3	13.5	21.4	- 7.1	1.07	19
VARIAN ASSOCIATES	NY	5312	37.2	22.6	25.2	- 3.0	0.93	26
VIATRON	OTC	-----	58.0	14.2	37.6	6.2	(d)0.83	---
WANG LABS	AM	2941	61.4	36.6	41.6	- 8.6	0.77	53
WYLE LABS	AM	1417	20.2	6.3	7.2	- 1.7	0.53	13
XEROX	NY	17951	115.6	85.0	102.5	- 1.7	2.03	50
AVERAGES	COMPUTER STOCKS		47.8	23.2	31.1	- 9.6%	1.06	29.3
	DOW JONES INDUSTRIALS		811.31	744.06	752.77	- 5.9%	3.78	12.6



Stock Talk is a regular monthly column prepared by **Spear & Staff, Inc.** especially for MODERN DATA. Investment questions of general interest will be answered, as space permits, in this column.

Address questions to:  
Dept. RAS  
Spear & Staff, Inc.  
Babson Park, Mass. 02157

The period from early 1967 through late 1968 was one of investor exuberance for building materials stocks. Along with recovering from its depressed state of 1966, the group was also in favor because of the feeling that the housing boom "was just around the corner." Hopes dimmed in late 1968 as money rates continued to stay at historically high levels and it appeared that inflation had become an even more stubborn foe than previously expected. In 1969 the group, as a whole, was weak, as was the general market. Now, in 1970, with quite a bit of speculation circulating about the possibility of a recession occurring, the industry should feel right at home.

Indeed, the building industry, in particular the housing sector, has lived with recession-like conditions on and off for a decade. Tight money and inflation have wielded the force of a wrecking ball on the industry. Housing, as compared to the rest of the economy, has suffered disproportionately from these problems. Housing starts in the last ten years have remained nearly constant while other areas of the economy have experienced rampant growth.

Increasing social, political, and economic forces are pressuring Government into alleviating the troubles of the industry. The need for decent shelter for a multitude of Americans, the deterioration of the cities, and the continued population growth are immediate problems for which solutions are imperative. The government is taking a more favorable attitude toward financial institutions who engage in mortgage lending, however, final resolution of the housing crisis will undoubtedly have to await the return to peacetime economic conditions and a relaxation of the tight credit policies prevalent today. New technologies in building will become increasingly important and should figure prominently in solving the housing dilemma in the next decade.

Unfortunately for all concerned, a sizeable gap exists between the demand for housing and its supply. A nationwide outcry for rent controls, a drop in the vacancy level to 2.3%, and the rapid growth of new household formations all attest to the need for more and less expensive housing. The latter represents the bulk of the demand. It will be recorded that in 1969 some 1.2 million new families were formed. This is largely a result of the coming of age of all babies born during the baby boom of the mid-

late 1940's. It is estimated that this group will grow four times faster than the population as a whole in the next few years and should continue to grow about twice as fast as total population through 1980. We expect that new family formations will average somewhere around 1.3 million in each of the next 10 years.

Additional demand comes from the replacement market. Nearly 500,000 units are demolished yearly by national disasters, highway building, and urban renewal. There also exists a formidable amount of deferred demand which has been building up since mortgage rates began approaching high levels in 1966. This factor is difficult to estimate but some economists feel it may equal as many as 500,000 units. A 100,000 unit market is estimated to be necessary annually to provide for the luxury of a second or vacation home for the affluent American.

In analyzing the demand factor, perhaps the most obvious need is that of renovating and upgrading the slums of the cities. The Housing and Urban Development Act of 1968 stated the objective that an average of 600,000 new units be constructed annually between 1968 and 1978 to meet the need for low and middle income housing. Under properly stimulated conditions, it is conceivable that total demand could result in housing starts above the 25 million mark over the next decade. Indeed, The President's Committee on Urban Housing (the Kaiser Committee) in 1968 recommended "a goal of producing at least 26 million new and rehabilitated units by 1978, including 6-million-to-8-million federally subsidized dwellings for families in need of housing assistance." However, if historical precedent means anything, optimism toward this goal's realization must remain guarded. The Housing Act of 1949 authorized the construction of 810,000 public housing units in 6 years but in reality the funds appropriated by Congress were sufficient to build only 200,000.

For housing to have its day in 1970-1980, a good many of the conditions that exist now must be altered. The industry, which never fully recovered from the 1966 "credit crunch," did not succeed in building enough housing to meet the demand in each of the past three years. This year when the market could absorb 3 million units an estimated less-than-half will be built. The major factor responsible for this is the excessively high prices for housing which is an offshoot of rampant inflation.

These rising costs for conventional housing are causing many firms to experiment with factory-built homes. In the 1950 to 1967 period, total construction costs rose 65% while hourly construction union wages advanced 113%. While factory-built housing would seem to provide a solution to the labor cost problem, the industry will have to "gear up" for mass production which may take more than a year.

Several new technologies in building materials are now being experimented with which will assuredly change the face of the industry in the next decade. Aluminum, steel, plastic, and concrete are some of the promising materials

for factory or systems building. One company, Universal Papertech, is selling a very low-cost house made out of specially treated paper-like material.

Federal Home Loan Bank loans to the S & L's, the Kaiser Committee recommendations, the Housing and Urban Development Act of 1968, and Romney's program all lend assurance that the government is sincere about solving the housing shortage problem. Once involvement in South Vietnam abates significantly, it is very likely that the phenomenon of "defense conversion" will take place. That is, a rethinking of national priorities will undoubtedly occur, causing a switch in funds from the defense area to segments of severe domestic plight.

In summary, a solution to the housing problem will occur only when inflation is brought under control, new technologies are created to meet demand at a reasonable price and money begins to flow back into the mortgage market. The need is already apparent and will continue to grow.

Building materials companies are still eagerly awaiting the coming housing boom. It is definitely approaching but the big question is when. Should credit restrictions be eased in early 1970, it is likely that housing starts will show an upturn by the beginning of the third quarter. However, the first half of the year looks relatively unexciting for the building industry. Careful selection when purchasing stocks in this area is vital.

---

## INCOMING MAIL

Q) *Brown Company has paid no preferred dividend since 1968. When dividends accumulate are they ever paid? Should these shares be held? M.K.*

A) After a series of quarterly losses Brown Company negotiated the sale of its Canadian subsidiary and several other operations. Proceeds from these sales were used in part to meet debt and interest obligations. Under terms of these loans, annual loan pre-payment of \$3.75 million must be earned in the preceding fiscal year before preferred dividends are distributed. On that basis it will be some time before the dividend is resumed and the \$2.1 million in arrears is repaid. Preferred stockholders voting as a class can upon default of six quarterly dividends—five have already been passed—elect two company directors. This puts Gulf & Western, holder of 69% of the common and 41% of the preferred, in a good position to seat two more directors. G & W, a conglomerate with substantial land development interests, is no doubt attracted by Brown's extensive holdings in Northern New England where land development is gaining momentum. Hold only if you can afford risk.

Q) *Would you kindly give me some information on Alphanumeric? I bought it at \$35, and it is now selling at \$13. R.E.*

A) Alphanumeric was one of those "Wall Street Wonders" that crop up from time to time. Shares were eagerly bid up to \$84 in 1968 in spite of a record of operating losses and no sales dating back to 1965. The "concept" that inspired the frenzied buying was a high-speed computerized photocomposing, typesetting, and printing system. Equipment sales reached \$640,114 in 1968 with a deficit of \$1.2 million. Through September 30, 1969 sales were \$2.1 million and the operating loss had been cut to \$287,190. However, the small—equal to \$0.01 a share—profit reported in the third quarter would probably not have been earned under the company's previous accounting policy but in the second quarter management elected to defer certain development costs and amortize these over a three-year period. The company has a service center in New York City which offers a full range of printing services. Similar centers in Los Angeles and Chicago have been opened recently. These centers are expected to begin contributing to sales and profits. The sophistication and cost-speed ratio of its equipment is unquestioned but under today's market conditions investors are looking for profits as well. Given a hot market Alphanumeric could once again show real bounce.

Q) *At present I have a sizeable profit in Masonite. With the future of the housing industry being rather uncertain, do you think I should continue to hold my shares? S. J.*

A) Yes. Masonite is the largest manufacturer of raw and unfinished hardboard accounting for 50% of domestic output. While this is primarily a one-product company, the many applications which have been developed for this product have broadened marketability. Some 22% of "Masonite" sales go for new housing, 25% to the repair and renovation markets, 18% to the commercial and institutional markets and the remaining 35% to general industry, especially furniture and automotive. Masonite—intent on protecting itself from further instability in the housing market—plans further penetration of the more stable area of home improvement. In fiscal 1969 earnings rose from \$0.69 a share to \$1.96 a share on a 24% increase in sales which reflected growth in the remodeling and non-residential construction area, higher income from the sale of timber and new products. We expect these influences to continue to have a beneficial effect on fiscal 1970's results. A recent acquisition of Molalla Forest Products, Inc. is Masonite's second important one in the field of forest products. By 1972 Masonite expects sawmill sales to have reached \$40 million. While the building industry is expected to place more emphasis on cost in the next decade, Masonite's product line should continue to "hold its own" because of its relatively low cost. Products should be easily adaptable to most new innovations in housing. ▲



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## GREAT FLOPS I HAVE KNOWN

A high point of the SJCC promises to be the panel on Lessons of the Sixties. At that time we can consider why Data Processing is a multi-billion dollar industry, but most people have so little to show for it. One of the reasons must be the enormous number of systems that are designed, programmed, debugged, tested, and documented — but never run. They don't go into production for a number of reasons:

- » No real time is left for production.
- » The system is dependent on a large data base which has never been assembled.
- » The person who insisted on the system has been hired away by Cogar.
- » The system was built as a package, but nobody bought it.
- » The system cost so much to build that everyone involved went bankrupt

and so forth.

I think it's possible that fully half of the systems built have never done anything. And there must be an elite corps of 5-year systems men who have never touched one that works.

It is interesting to consider a few case studies. For obvious reasons, the names have been omitted. The essentials are all true.

**case study one:** The project was an active management information system for a merchandise mart. The system would perform central billing for items purchased from 200 private wholesalers. At billing time, the buyer would undergo a credit check, a payment verification, and be assigned a time and location to pick up his combined purchases. The computer was to run an automated conveyor network that would move all purchases for a particular buyer from the various points of sale to the loading dock assigned to him and make them all arrive on time.

The conveyor together with its queueing and switching system had already been built but nobody knew what its capacity was. The project was begun in the faith that a 360/50 could run the conveyor at the necessary capacity. A simulation effort was begun at the same time. Midway through the development project, the simulation was completed, showing that the average day's purchases would take six days to deliver to the loading docks.

The project was cancelled for some convenient reason having nothing to do with the real problem.

The Systems Scene is a regular monthly column written by Jerome Wiener and Thomas DeMarco of **Mandate Systems, Inc.** Readers are invited to submit comments and questions on new developments in systems to: **The Systems Scene, MODERN DATA, 3 Lockland Avenue, Framingham, Mass. 01701**

**case study two:** Twelve people began work on a management information system for a large conglomerate. The stated goal of the system was to permit the organization to be run from the top. All computing facilities were to be grouped into the one system to take advantage of Grosch's law.

A considerable amount of ecstatic hand waving was performed over the concept of the computer's modeling certain metal markets. This would enable the company to buy its principal raw materials at advantageous prices and alter its inventory policy to reflect coming changes.

After almost two years of work it was conceded that none of the acquired companies had any intention of giving up its own computer center much less operational autonomy. Furthermore, no one had the slightest idea of how to model the market.

**case study three:** A medium-sized city with a severe traffic problem decided to install a reactive computer system to control stop lights. A complete simulation was performed. The simulation indicated that traffic flow would be eased by 15% (of something).

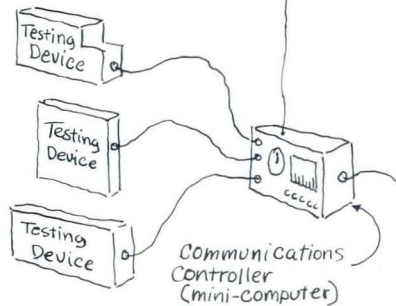
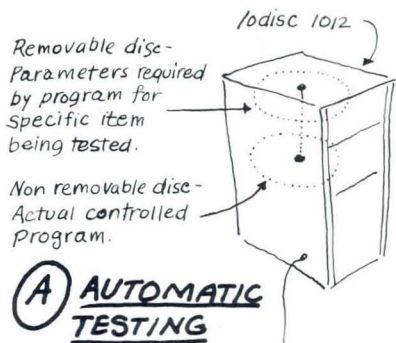
The system was put into effect and traffic stopped dead. The simulation was run again and used to prove that traffic couldn't possibly have stopped dead. The system was abandoned. The simulation lives on.

**case study four:** Three bidders were paid to submit detailed proposals for a large industrial development project. The procuring organization (the Government, who else?) specified that the project should be managed with the aid of an on-line Management Information System.

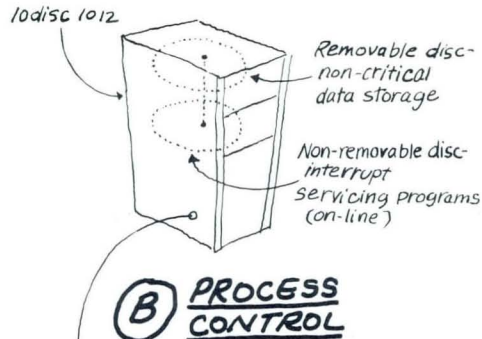
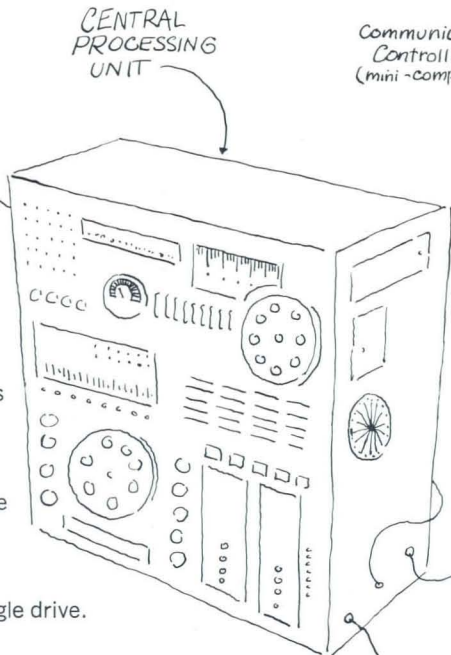
Since the MIS would have to function from the first month of the project, each of the bidders was instructed to develop their own system. The contract was awarded and two of the three systems were junked.

Maybe you have a story to tell. Maybe you'll send it to me care of **MODERN DATA**. Maybe I'll start an abortion clinic. ▲

# The ABC's of Data Storage

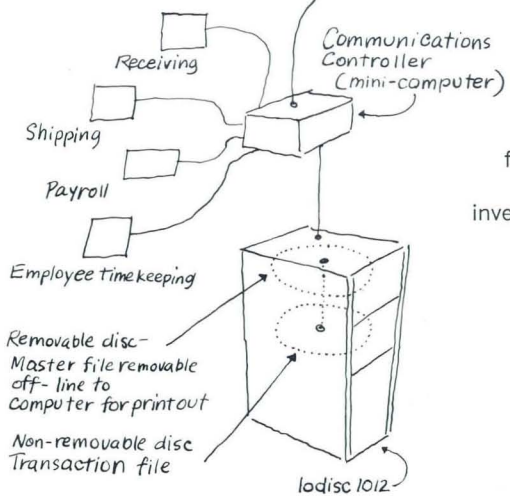


The IODISC 1012, with a removable disc in combination with a non-removable disc, has specific advantages in automatic testing applications. The removable IODISC cartridge provides storage for the test parameters and collects output data. The non-removable disc remains on-line for storage of the basic test control programs. The result: performance flexibility of two separate drives at a price "almost" as low as a single drive.



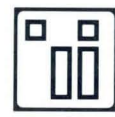
Many process control applications require that high-priority interrupt-servicing routines be on-line at all times. The non-removable disc of the IODISC 1012 provides for the storage of the operating system, the control program, critical "read only" data and interrupt-servicing routines. The IODISC cartridge provides off-line storage for lower priority programs and raw data. This combination of a removable and non-removable disc on a single drive gives the user increased system capacity and flexibility. And with substantial savings over the cost of two separate disc drives.

## (C) COMMERCIAL DATA PROCESSING



The IODISC 1012 gives increased system capacity and flexibility in order billing and accounting applications. The non-removable disc of the 1012 provides temporary storage for the by-product outputs of billing operations. Control and formatting programs are entered via the IODISC cartridge. At specified intervals the master file cartridges for inventory, accounts receivable and sales analysis are updated from the fixed disc. With a 2.7 million character capacity, the IODISC 1012 drive can handle the typical data processing operations for small business payrolls, inventory and invoicing. The IODISC 1012 is the "almost" drive — "almost" the performance of two separate disc drives and "almost" the price of just one drive.

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ON-LINE

## MEASURING BY DECADES

On-Line is a regular monthly column concerned with various developments in computer technology particularly in the areas of computer graphics and computer-aided design. The author, Thurber J. Moffett, is a nationally-recognized expert in interactive graphic systems. Readers are invited to submit comments and questions regarding subjects covered in this column to: **On-Line, MODERN DATA, 3 Lockland Avenue, Framingham, Mass. 01701**

Measuring by decades makes comparisons easier. The panorama of the '60s provides needed perspective — it reteaches us some of the lessons we somehow must continue to relearn.

IBM's unbundling announcement, coming in the decade's eleventh hour, is my candidate for the single most significant event of the '60s. It promises to take half of the '70s before its impact is assimilated. This one was in the making a long time. Its genesis can be traced to the early '60s and its eventuality foreseen even then. I can remember Herb Grosch saying quite early that programmers are not going to inherit the earth—only the software business. The lesson being, once again, that the forces in a competitive dynamic economy sooner or later cause dramatic shifts in favor of the buckmaker. Our system is, thankfully, designed that way; but we sometimes forget its most subtle axiom—for somebody to make a buck there must be a market. All the expert prognosis in the world can't make a market — enough people must want it. People now want better software.

They also now want better interactive graphics—both software and hardware. A lot of us remember the wild early days of the '60s when talk of an overnight interactive graphic systems revolution was

half believed even by the most cynical. The whys behind the present crow eating by those then reasonable-sounding voices of the past have already been much probed, dissected, analyzed, and reappraised. Maybe the graphics market **was** over-estimated, but there were those who somehow made graphics work. At least for them.

From the vantage of the '70s it is easy to see how they did it. They did it by responding to a market need—a limited, parochial need in almost every case, to be sure—but one which targeted some realistic void nevertheless. As one of my readers recently paraphrased, "graphics is what you make it." He was one who has made it.

So the '60s Replay has it all there: from the disappointments over the slow growth of the interactive graphics market to the splashes of encouragement provided by the brilliance of a handful of individual performers. After all, what was there to work with? At one end of the market there were the \$10-\$20 per hour simple non-vector, alphanumeric consoles, and at the other end the \$150-\$200 per hour sophisticated vector, light pen, and keyboard consoles. Nothing much was in between, not even reasonable software support for the extremes. The closing moments of the '60s saw this situation finally reacting to good old-fashioned market pressure; the people who wanted the gaps filled were almost trampled in the uptake. The stage is now most certainly set. Graphic interactive systems will go big in the '70s—almost ten years late. They will go now because the market is here now and understood now.

This is all by way of cautioning those who would paint the '70s golden—be sure there's a buck to be made in every brushful. ▲



## WHAT HATH BABBAGE WROUGHT DEPT.

I first encountered computers and Fortran in 1963 and used an IBM 1620. In those days, we used a pre-compiler to indicate any gross Fortran errors, allowing the compiler to spend less time and core on error detection routines. A card that started in column 5 instead of column 7 would have produced a very simple, concise error message:

```
ERROR 04 LINE 0001 + 0001
```

The software didn't know what was wrong, but it knew it couldn't handle it the way it was presented.

Today, using an IBM 360/50, the same situation presents us with the enclosed error messages:

**MODERN DATA** will pay \$10.00 for any computer-or EDP-related item worthy of publishing in our "WHAT HATH BABBAGE WROUGHT DEPT." Humorous "information" for consideration may include weird memos or operating instructions, unusual incongruous documentation, and off-beat items of a general nature (for review by our offbeat editors). Send all submissions to: **WHBW Dept.**

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```
**WARNING** COLUMNS 1-5 OF CONTINUATION
CARD NOT BLANK.
```

```
***ERROR*** MISSING OPERATOR.
```

```
***ERROR*** SYNTAX ERROR—SEARCHING
FOR SYMBOL, NONE FOUND.
INVALID (BEFORE X)
```

```
***ERROR*** ATTEMPT TO RE-DIMENSION
A VARIABLE. X
```

```
***ERROR*** VARIABLE WITH VARIABLE
DIMENSIONS IS NOT A SUBPROGRAM
PARAMETER. INVALID X
```

```
***ERROR*** VARIABLE DIMENSION NEITHER
SIMPLE-INTEGGER VARIABLE NOR
S/PAAMETER. INVALID I
```

```
***ERROR*** MISSING OPERATOR.
UNEXPECTED-BEFORE
```

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Submitted by: **Gerald Pfarner**  
Troy, New York

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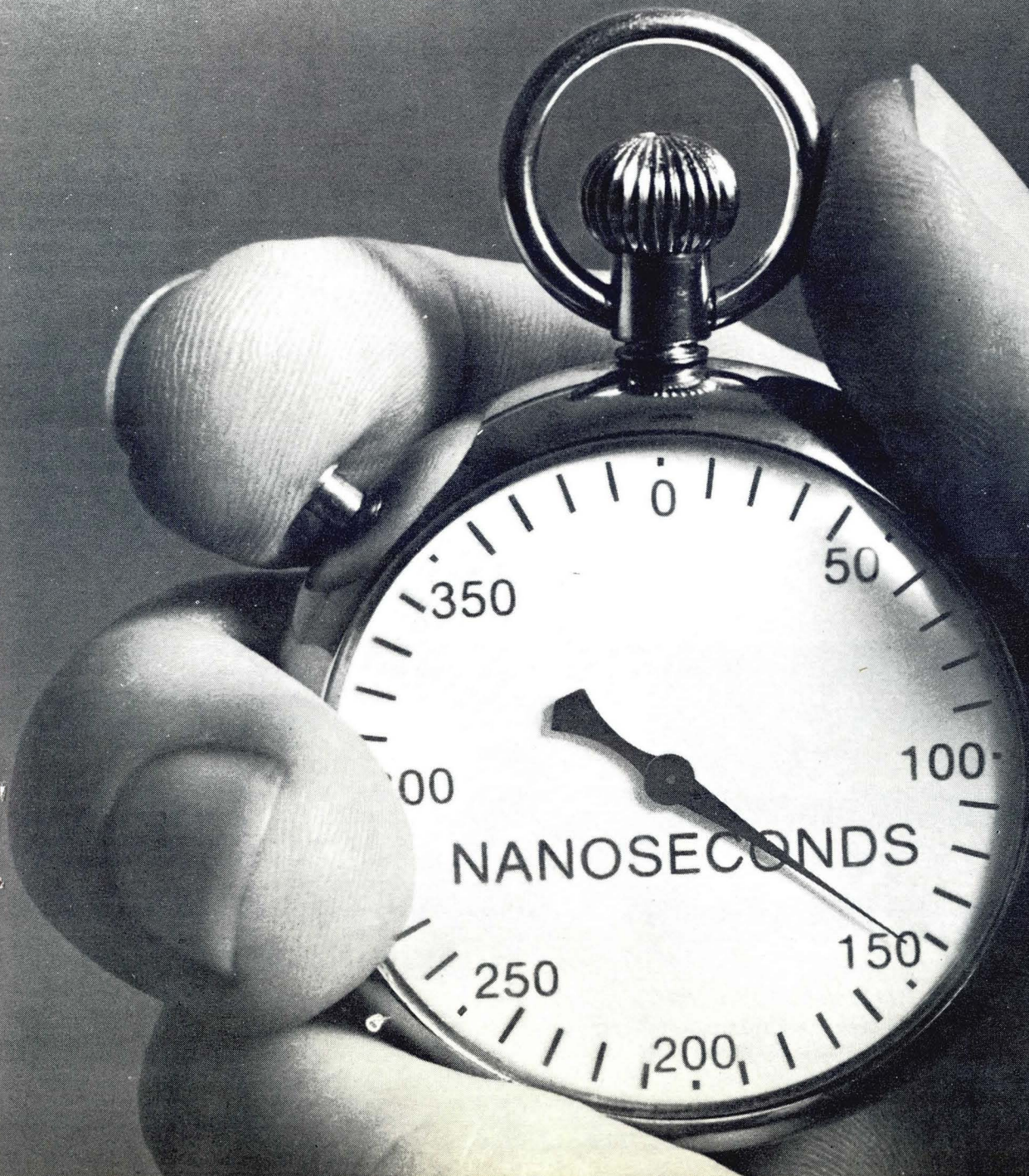
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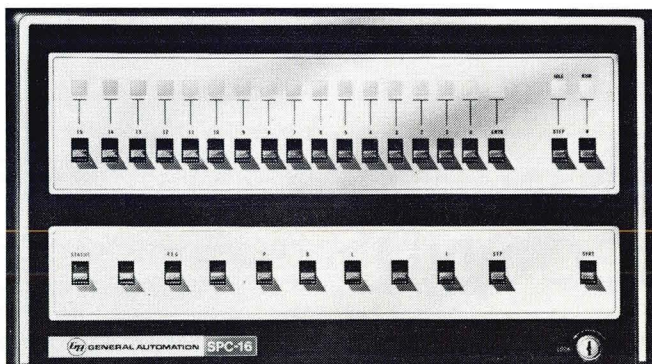
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In this column, we will be discussing a systems design concept, known as Source Data Automation (SDA), which is presently having a heavy impact on data processing systems and functions. The SDA concept can rightly be called a fourth-generation concept. Its basic purpose is the capturing of data at the source of its generation directly into machine readable form and thus eliminating the unnecessary retranscription of data; in particular, the elimination of keypunching.

The need for a complete knowledge of SDA is vital, as exemplified by present data processing input problems. Present data preparation techniques are unable to keep up with data processing progress and are becoming too costly. By proper automation of data destined for the computer system, significant cost savings can be achieved and efficiency can be increased.

The major surprise about SDA is why it has taken so long to catch on. The savings in dollars, accuracy, efficiency, and computer throughput time have been documented. However, keypunch equipment sales are not showing marked declines. The reason for this relatively slow change in input has to do with certain factors as:

**Knowledge**—most computer users do not fully understand the complete SDA concept or how it might be used to their advantage. In fact, few companies have actually calculated the possible cost savings that can be gained through SDA equipment. Also, the multitude of companies presently manufacturing SDA equipment (consisting of all possible SDA combinational features except the one in which you are interested) only confuse the issue. It is hoped that with the increase in SDA articles, seminars, and demonstrations of equipment, potential users will become more familiar with the capability of Source Data Automation equipment.

**Change**—resisting change is quite normal especially when it may involve significant initial cost and training of personnel. However, the overall advantages make such problems insignificant. The alternative is simply to add on more keypunching machines and put off the decision, but not the problem, to another day.

**Computer companies**—computer companies have not actively marketed SDA equipment. Although most computer companies manufacture SDA equipment, their marketing is de-emphasized. The "largest of the group" is still pushing the card.

**Editor's Note:** This column introduces Lawrence A. Feidelman, a well-known expert on Source Data Automation. Formerly a manager of the Auerbach Corp., Larry Feidelman is presently the manager of the Cherry Hill, N.J. office of Faim Information Services, Inc., a consulting firm specializing in the design, development, implementation, and evaluation of computer-based systems for commercial and government clients. Among the many consulting jobs on the subject, Mr. Feidelman participated in the National Bureau of Standard's study on the effects of OCR on Source Data Automation and he recently conducted a study for the Library of Congress on the utilization of multi-font OCR readers.

Source Data Automation is a monthly column written by Lawrence A. Feidelman and the staff of **Faim Information Services Inc.** Questions and/or comments from readers will be answered or discussed in this column as space permits. Address correspondence to: **SDA, MODERN DATA, 3 Lockland Avenue, Framingham, Mass. 01701**

**Input system concept**—most SDA equipment marketing does not emphasize that SDA is an input systems design concept rather than just a new piece of equipment. The potential user cannot purchase an SDA device without doing a systems design to determine the best manner to process his data. Without such a system, the user cannot appreciate the advantages of each equipment and make a proper cost comparison.

There are, of course, many other reasons relating to present business conditions such as appropriate personnel and investment problems. However, the tide is turning towards the acceptance of SDA and new equipment is about to flood the market. The 70s will be the decade of SDA. Recent reports by government and business further substantiate this prophecy. Some companies will tread softly and slightly change their input system to modified keypunching while others will take giant strides to some form of communication or OCR system. The decisions will be made, in some cases, on intuitive judgment or, in other cases, on thorough economic studies. The present variety of equipment certainly gives the small as well as the large company a chance to improve its input system.

Source Data Automation is more than just an equipment selection. It involves consideration of ease of data preparation at the source, proper location of keys, editing control features, forms design, possible portability of recording device, means of data transmission to the computer, decentralized vs. centralized data handling, personnel training, data volume, and many more.

After having stated some considerations associated with SDA we may now outline the purposes of this column.

- To increase the awareness of the general concepts of Source Data Automation.
- To keep the reader up-to-date as to what types of Source Data Automation equipment are available, their cost and performance characteristics, and the present SDA State-of-the-Art.
- To inform the potential user as to the intricacies in SDA design and analysis.
- To air user problems and indicate possible solutions.
- To aid the user in getting the most for his money.
- To present the SDA manufacturers' point of view.

We hope that this column will help educate users in the SDA State-of-the-Art, enabling justifiable SDA system selections. The next few articles will discuss the SDA concept, how to determine your readiness for SDA, types of equipment available, their uses, and procedures of beginning an SDA study.

We hope that readers will submit comments, questions, and solutions on the subject of Source Data Automation. We will attempt to present as many as time and space permit. By such discussion, we hope to make this truly a two-way column. ▲



## COMMUNICATIONS CLINIC

### "ERLANGS, CCS, & OTHER MYSTIC SYMBOLS"

Communications Clinic is a regular monthly column written by the staff of **Berglund Associates, Inc.** Questions from readers on any aspect of communications and its integration with computers will be answered, as space permits. Address questions to: **Ralph Berglund, Data Communications Editor, 1060 North Kings Highway, Cherry Hill, N. J. 08034.**

One of the strange and wonderful subjects encountered by computer systems professionals in dealing with communications is traffic engineering. This is the art and science of determining quantities of circuits and equipment required to provide service. The subject is of infinite importance to operating telephone companies. Its mastery is required to assure sufficient intra-office, inter-office, and inter-city talking paths and switchgear and to maintain an economically acceptable grade of service. By grade of service, we refer to the magnitude of delays or numbers of unsuccessful attempts in making telephone calls. All of us have experienced delays in inter-city calls before we hear the tones being forwarded. In such cases, the call has been held pending availability of switching or signaling equipment or a talking path. Similarly, we have all experienced the 120 buzz per minute busy tone, indicating non-availability of equipment or circuits to forward our call. The traffic engineering problem is to specify sufficient circuits and equipment to avoid presenting an undue amount of such frustration to users.

#### IMPORTANCE IN INFORMATION SYSTEMS

Basically, the mass of this discipline is of importance to the common carrier plant and PBX engineers and to managers of large corporate telecommunication systems. Portions of the subject, however, can be of great significance to information system designers. This is particularly (perhaps entirely) true where the system must handle numbers of calls from random sources. Primary examples are air travel, automobile rental, and room reservation services. Another major class of such systems is that of credit card sales au-

thorizations, whether on a store basis or covering the whole country. The increase of audio response systems, and their emphasis on Touch Tone input (or the non-Bell tone input terminals) suggest an increasing amount of switched network random input. Finally, time-sharing service suppliers, holding themselves out to the public for random use, must have adequate service to meet such random demand reasonably.

One way to cope with this general problem is to estimate the most possible input traffic, double that for safety, and then order facilities to handle that load. That, of course, would probably be untenably expensive — the situation that brings on most engineering. The designer must really plan for the best grade of service for the least cost and that is traffic engineering.

The basic input parameters in traffic engineering are numbers of calls and length of calls. These two parameters are usually lumped into one parameter called CCS, meaning hundreds of call seconds. If a system is to receive 90 calls within an hour, each call averaging 75 seconds, the CCS "presented" to the system is  $(75 \times 90)/100$  or 67.5 CCS per hour. Another parameter occasionally encountered is the Erlang, a measure of traffic intensity, i.e., the average number of simultaneous calls. More specifically, it is:

Erlangs = CCS per 100 seconds.

So, in the example,

$$\begin{aligned} \text{Erlangs} &= \frac{67.8 \text{ CCS per hour}}{3600 \text{ secs per hour}} \times 100 \text{ seconds} \\ &= 1.88 \end{aligned}$$

or, the system will have an average of 1.88 calls simultaneously per hour.

In most cases of interest to computer systems people, average call length or "holding time" is the time during which a caller is connected. In a VAB (Voice Answer Back) system for example, holding time for planning purposes would exclude the time spent by the caller waiting for dial tone, dialing, routing, and ringing. Holding time for our purposes would begin when the VAB system went "off-hook" and end when it returned to "on-hook." Similarly, in a reservation or attended sales authorization system, holding time is from off-hook to on-hook. An exception would be in such systems where an ACD (Automatic Call Distributor) is utilized. The ACD

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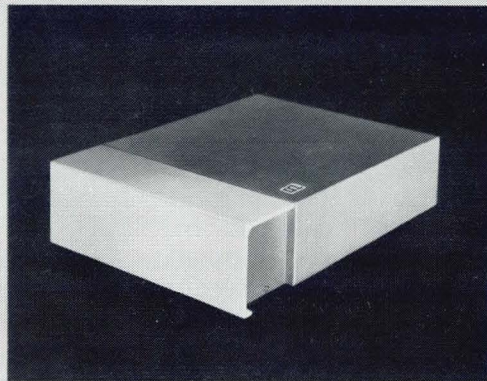
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**COMMUNICATIONS CLINIC . . . . . Cont'd**

can go off-hook and put the caller on a recording ("Reservations are busy . . . please hold on"). Hence, in the peak period where attendants cannot immediately respond, holding time is longer than actual attendant performance time.

Another point to be made about CCS or presented load is that it should be based on the peak period of system operation, typically the peak hour or peak half-hour. The theories and concepts of traffic engineering are generally based on the "average busy hour." In arriving at this figure, however, the designer may want to insure that he is using the highest hourly rate. For example, if calls are likely to occur at the following rates:

<b>Peak Hour</b>	<b>Peak Half Hour</b>	<b>Peak Quarter Hour</b>
100	56	28

The peak rate is over the half or (same rate) quarter hour and the peak hour rate is actually 112 calls, not 100 calls. If the designer were to design on the basis of 100 calls, there would be insufficient facilities to handle the peak rate of 112. Therefore, those calls would not be answered and the system would "self-adjust" (an unbundled euphemism) to a peak rate consistent with the available facilities. This may be economically necessary. In any event, it is a value judgment type of problem.

**DESIGN THEORY**

In general, traffic engineering involves a set of time varying demands (calls to our VAB system), a group of facilities to serve these demands (the VAB unit with input ports), and a service level or criteria to be met. Given some knowledge of the time varying demands (quantity and duration) how does one specify the facilities for various service levels? The answer to this stems from the fact that years and years of study\* on operating telephone systems have shown that telephone traffic closely approximates a Poisson probability distribution. Underlying this are the assumptions—and general characteristics of real systems—that there is a large number of subscribers originating calls at random and independent of each other. The fact of a probability distribution also conveniently lets us specify grade of service in terms of lost or busy or blocked (preferred term) calls per N tries. For example, we can talk about a grade of service of one blocked call per hundred tries, or ten blocked calls per hundred tries, or two blocked calls per thousand tries. Standard terminology for these would be P.01, P.10, and P.002 respectively, mean-

ing a probability of that many blockages in that many attempts. The actual Poisson formula to obtain the probability of calls being delayed, an infinite series summing exponential products over factorials, would just clutter up this discussion. Anyone requiring it can obtain it by writing to the author. More practically, the formula has been calculated into tables of the type shown below. These tables yield the trunks (or VAB ports) required to provide a certain grade of service for a certain load of CCS presented per hour

Trunks	P.001	P.010	P.100
10	107	149	224
20	323	399	523
30	571	675	836

The table above states that if we have 107 CCS presented, and wish to provide for not more than one blocked call per thousand, we should provide ten trunks. It also says that if we have ten trunks and a load of 224 CCS, we will probably frustrate 100 out of every 1000 callers. **TABLES EXIST FOR P.001, P.005, and P.010 THROUGH P.100, FOR 1 TO 100 TRUNKS. READERS DESIRING A COPY OF THESE TABLES MAY HAVE ONE AT NO CHARGE BY CIRCLING 60 ON THE READER SERVICE CARD.**

**THEORY APPLICATION**

Assume that a VAB system is to be installed to support estate planning calculations of insurance salesmen. All salesmen within a WATS Band I and Band VII territory are to be served by this system. How many Band I trunks are required, how many Band VII trunks are required, and how many ports are required on the VAB system?

Assume that the sales force distribution and its working habits are such that the following is determined to be the case:

	Band I	Band VII
Peak hour	9:00 to 10:00 pm	8:00 to 9:00 pm
Peak hour calls	122	48

Note that since the Band I and Band VII peak hours are not the same, we do not know the system peak. That will be between 9:00 and 10:00 p.m. because of Band I, but it will be greater than 122 calls because of calls coming in during that hour from Band VII. Assume that the analyst dug further then, and determined or forecast that the system peak would be 158 calls. The next step would be to determine average holding time per call. This would include:

- Touch Toning of input data and queries (approx. 2.5 char. per sec, manual)
- CPU response time
- Audio response (approx. two words per second)

\*Dating to its first determination from studies of a Newark, N.J., central office in 1916.



The analyst should probably develop a weighted holding time according to expected volumes of different types of calls, i.e.,

$$\begin{aligned} a \text{ calls} \times t_1 \text{ seconds} &= at_1 \\ b \text{ calls} \times t_2 \text{ seconds} &= bt_2 \quad \text{etc.} \\ \text{weighted holding time} &= \frac{at_1 + bt_2 \dots}{a + b + \dots} \end{aligned}$$

Assume that for this example, the weighted holding time was 150 seconds. Thus, our CCS loads are:

<b>Band I</b>	<b>Band VII</b>	<b>System</b>
122 calls	48 calls	158 calls
× 1.5 CCS	× 1.5 CCS	× 1.5 CCS
<u>183</u>	<u>72</u>	<u>237</u>

Looking these loads up in the tables, we could determine needs for various grades of service.

Band Trunks	Band VII Trunks	VAB Ports
P.001 14	9	17
P.010 12	7	14
P.050 10	6	12

Final selection, then, is a value judgment tradeoff between trunk cost and grade of service.

## CLOSING REMARKS

First, we talked in terms of WATS but the logic describes total trunks independent of the service. Type of service should still be selected on a cost effective basis. If WATS is the service to be used, traffic engineering concepts further apply to specifying the mix of full and measured circuits. Perhaps we can cover that in a future Clinic.

Second, the concept of a lesser number of VAB ports than the total of Band I and Band VII trunks is somewhat academic. It was done to reinforce basic concepts and to emphasize the concept of a system peak which might differ from a trunk group peak. The reason it is academic is that we do not know of a telephone company or independently supplied concentrator that would enable a user to service (in the P.010 case) 12 Band I trunks and 7 Band VII trunks with only 14 VAB ports — Flush Tank Float Valve & Concentrator Company, take note.

Third, traffic distribution approaches a Poisson distribution. As with every such statistical generalization, there will be exceptions. At minimum, installed systems should be monitored with trunk usage registers or their equivalent. These registers would provide a data base for continued optimizing of the system. ▲

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## SURVEY OF PROGRAM PACKAGES—Programming Aids

This month's **SOFTWARE FORUM** constitutes the first of a continuing series of articles which will survey commercially-available, supported program packages. The present article, "Programming Aids," deals with packages that can assist programmers in generating code, debugging and testing, creating JCL, and producing documentation.

It is our aim eventually to cover the largest areas of program packages on an every-other-month schedule. Thus, the next three articles will discuss "REPORT GENERATORS AND DATA MANAGEMENT SYSTEMS," "UTILITY PROGRAMS," and "APPLICATIONS PROGRAMS," respectively.

### GENERAL POLICIES AND PROCEDURES

We are attempting to be as comprehensive and accurate as possible. With few exceptions, the information used to make up this month's survey was extracted from questionnaires mailed to known sources. Occasionally, these questionnaires were not returned. There is also, of course, the possibility that we missed a source. If such was the case with respect to your company's Programming Aids packages, we sincerely apologize for the omission. However, since additional articles will continue the survey in other areas, and all will be updated, so that we will not compound the error, please request appropriate forms from: **MODERN DATA, PROGRAM SURVEY, 3 LOCKLAND AVE., FRAMINGHAM, MASS. 01701**

We reserve the right to exercise our own judgment in the selection of programs to present in the survey. In general, we do not include programs for which the availability of subsequent support is dubious. Thus, we have omitted programs from isolated individuals, banks, or other corporations not primarily in the business of selling and supporting software. Such sources

have traditionally been least able to furnish vigorous support when it is most required (probably because it is usually a part-time venture for them). Although this may be unjust in a few cases, it is the only reasonable means we have to provide some assurance of the availability of proper support.

We have also adopted the policy of omitting very low-priced programs (generally under \$100) on the theory that they cannot be adequately supported for this amount of money.

Needless to say, there are many packages available from IBM and other computer manufacturers. Some are supported, and many more are unsupported. For example, besides the 13 supported Programming Aids packages included in this article, IBM also offers approximately 40-50 unsupported Aids programs of every description, in addition to many computer simulators and emulators and a great variety of macros.

### WHAT IS A PROGRAMMING AID?

Classification in this industry is difficult, and there are many gray areas. For example, a cross-referencer could be either a debugging tool or a documenter (we have called it a general-purpose aid). For our purposes, Programming Aids were categorized as follows: [1] Conversion, Translation and Simulation Programs [2] Debugging and Testing Programs [3] Documentation and Flowchart-Producing Programs [4] Job Control Language (JCL)-Producing Programs [5] Preprocessors for Decision Tables, Shorthand Languages, etc. [6] Languages [7] Other General-Purpose Programming Aids.

We recognize that the classification we have used is subject to argument, but our primary intention was only to create manageable groupings — not to create classifications and definitions. This has led to many

Software Forum is a regular monthly column written exclusively for **MODERN DATA** by Ken Falor and the staff of Cullinane Corporation. Mr. Falor is Mgr., Marketing Services Division, for Cullinane—and also functions as product manager for engineering and marketing software. He was previously director of advertising for Veeco Instruments and subsidiaries, including Lambda Electronics Corp., and before then, was engaged in R&D work on magnetrons and crossed-

field devices at Raytheon Company. Mr. Falor received a B.S. degree in elec engrg. from Michigan State Univ., and is the author of several published technical articles.

Questions from readers on any aspect of software will be answered, as space permits, in this column. Address all questions to: **Software Forum, MODERN DATA, 3 Lockland Avenue, Framingham, Mass. 01701.**



compromises. For example, program library facilities, report generators, and data management systems — while certainly important aids to the programmer — will be made the subject of a separate article.

### WHY USE THEM?

Many of the programming aids covered here can be extremely valuable to data processing facilities. They can help programmers make programs better, faster, and at less cost. They can remove much drudgery and allow programmers to spend their time and talent in more rewarding and interesting work. They can improve the effectiveness of junior programmers. They can also be selling points in your recruitment of programmers. In fact, the day could come when good programmers won't want to work for you unless you have at least some of these simple aids.

One of the principle problems inhibiting more widespread use of these programs in the past was a simple lack of awareness of their existence. The (supported) program package business is just beginning to come into its own; supplier promotion and the availability of program surveys (like this one) have been rare or non-existent.

### WHERE TO USE THEM

One is tempted to go through the list as if it were a supermarket where programming time was on sale at half-price or less. However, such benefits can accrue only if the system is reasonably compatible with your way of doing things and the particular programming and budget situation you have at your facility.

If you are fortunate enough to have good, experienced programmers who write clean code, you might forego an automatic tester in favor of a cross-referencer or test data generator, so that what they have to do anyway will be done more quickly and cleanly. On the other hand, if you have a bunch of trainees, an automatic tester, checker, or standardizer may be just what you need to help clean up the code **before** it is run.

If creation and revision of JCL is a considerable daily effort, you should look at the automatic JCL-producers.

If you have to convert some AUTOCODER programs but haven't had any time to do it for so long that the problem is catching up to you in terms of machine time, you might try a converter. Although complete redesign and reprogramming is certainly to be preferred, there is no question that converters and trans-

lators save a great deal of reprogramming time. They do, however, require some manual intervention for untranslatable or inefficiently translated code. If you have a problem and simply don't have the programmers, get a converter or try a conversion service. Of course, flowcharters also help a great deal in program conversions.

If personnel turnover is a problem, and/or documentation has become a burden, some of the flowcharters and other documentation aids may help and also reduce the learning effort of new staff members.

For some applications, the decision table preprocessors and COBOL shorthand programs can save much programming time. Someone may have to learn how to use decision tables — why not that programmer who is always complicating his programs with tricks? Decision table techniques are good "tricks," they are more understandable by management, and self-documenting as well.

### HOW TO BUY THEM

A basic requisite is to understand thoroughly what the package does, how it does it, and how it fits in with your situation. In the case of programming aids, it would be wise to ask several programmers to look over your choice of packages. There is no use getting a package that won't be generally used.

To assist you in your evaluation, many companies will give you, and most will sell you, a trial use of their program, especially for program conversion. Program converters are routinely offered as a service as well as sold as a package. Many will also give you references on users of their package, and this can cut short a good deal of evaluation time that would otherwise be needed prior to purchase of a package.

### THE TABLES

Tables 1-7 describe the basic characteristics of more than 100 supported Programming Aids packages. The statements in the "Description" columns of the tables are usually the words of the supplier. They are furnished to assist you in understanding the system — what it is, and what it does.

The hardware information generally refers to the minimum configuration. Where modifications are necessary for a larger machine, different configuration, or different operating system, the supplier will often make the few necessary changes free of charge. However, it is worth checking out.

File data abbreviations are "S" for **Sequential**, "IS"

TABLE 1 • CONVERSION, TRANSLATION, AND SIMULATION PROGRAMS

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
Austin Systems Co., Inc.	LIOCS (Logical I/O Control System) 1400 Simulation	Enables 360 software to read 1400 data and produce data acceptable to 1400 programs. Improves operating speed over 1400 emulation, with 4K less core. Includes index sequential key and direct access search. (S, I, DA)	IBM 360		\$5,875
Communication Dynamics Systems, Inc.	AUTO-BAL Conversion	Converts Autocoder to 360 BAL. Non-translatable statements are flagged as to type. Possible errors due to indexing or address modification are flagged and converted. Options include symbol table, cross references, unconverted statement list, possible trouble statement list, flow charts. Two disks or tapes.	IBM 360/30 65K		\$4,500/3 yrs, \$2,000/1 yr., 20-40¢/statement
Computer Methods Corp.	COBOL Conversion	Translates second-generation COBOL to third generation COBOL. Over 95% translation. Three tapes.	IBM 360/30 65K	ALC, COBOL	\$5,000
Computer Sciences Corp.	EXODUS 1400 Program Converter	Translates 1400 programs to 360 BAL in four phases. EXODUS I converts 1440 progs., EXODUS II 1401 progs. Each \$12,000. One disk (S, I)	IBM 360/30 65K	BAL	\$12,000
Compuvisor Inc.	CVS 1401-360 Simulator	Simulates 1401 card or tape systems on 360/OS. "Automated operator" commands. May be multiprogrammed with other jobs.	IBM 360/30 60-128K	BAL	\$6,000
Datamation Services Inc.	SIM 1401-360 Simulator	Load and run simulator to run 1401 programs on 360. No compilations. Programs run faster than on 1401.	IBM 360/40	BAL	\$10,000
Decision Science Inc.	SIMUL8S PDP-8 to 360 Simulator	Simulates PDP-8 on 360. Also assembles PDP-8 programs on 360.	IBM 360/40		\$1,500
IBM	ACCAP Autocoder-to-COBOL Conversion Aid Program 360A-SE-19X	Converts Autocoder or SPS source to COBOL. Diagnostic messages. Two disks.	IBM 360/40 131K		
IBM	COBOL Language Conversion Program 360C-CB-701	Converts second-generation COBOL to 360 Cobol Level E or F. Three tapes.	IBM 1401 8K	COBOL	
IBM	Data Conversion & Label Processing Subroutines 360A-SE-23X	Converts second-generation data files to 360 formats during 360 program processing (non-permanent). One tape.	IBM 360		
IBM	Data Conversion Utility I 360A-SE-15X	Converts 1620, 1401, 1440, 1460, 1410, 7010 data files to 360 format. One or two tapes.	IBM 360/30-BOS 8K		

for Indexed Sequential, and "DA" for Direct Access. Price abbreviations are "NA" for Not Available, "OR" for On Request, and "Negot." for Negotiable. The prices given are for outright purchase unless otherwise indicated. We have given careful attention to the compilation of this information, however, prices and other factors are highly subject to change. Consequently, we suggest that parties interested in packages obtain information from the issuing company before preparing their purchase orders. Table 8 lists the sources of these packages and their assigned Reader Service Inquiry Numbers.

Finally, be sure to know exactly what you're going to get. Will you get the source program? Who installs it? Is there any training included? How does the documentation look? Most of all, try to get a warranty for bugs for at least a couple of months. Somehow, there is nothing more depressing than having to debug a debugging program.

#### FUTURE ARTICLES

Our next article, "REPORT GENERATORS and DATA MANAGEMENT SYSTEMS," scheduled for May, will include programs that file, update, and extract data.

The "UTILITIES" article planned for July will include management and scheduling programs for computer facilities, as well as data communications systems aids and other common general-purpose programs.

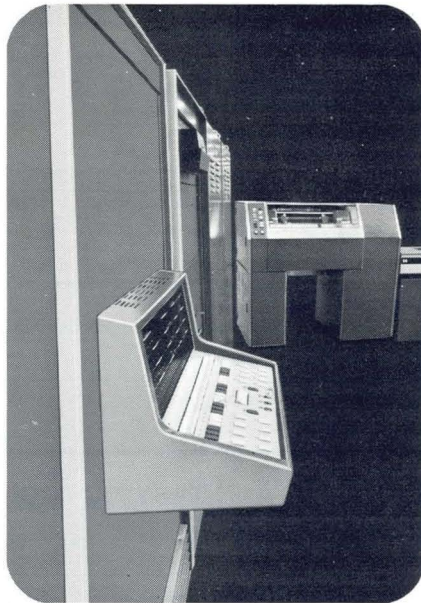
The "APPLICATIONS" article in September will include financial, project management, and business simulation programs. Applications programs for specific industries or trades will be covered in supplemental survey articles at some future date. Other types of programs, such as those for document storage and retrieval, mathematical problem solving, graphics, time-sharing, and numerical control (N/C) will also be covered on a supplemental basis. At all times we shall keep in mind that MODERN DATA is a magazine for users, not researchers. ▲

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bility to handle up to 448 different I/O units. With a transfer rate of 40 bits per microsecond, you'll be kept plenty busy feeding our DC 6024.

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CIRCLE NO. 44 ON INQUIRY CARD

TABLE 1 • CONVERSION, TRANSLATION, AND SIMULATION PROGRAMS . . . Cont'd

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
IBM	Data Conversion Utility II 360A-SE-20X	Converts 705, 1410, 7010, 7000 series data files to 360 format. One or two tapes.	IBM 360/30-OS	BAL	
IBM	Data Conversion Utility III 360A-SE-26X	Converts 1620, 1400, 7000 data files to 360 format. One or two tapes.	IBM 360/30-TOS, DOS 16K		
IBM	FORTTRAN Conversion 360C-FO-702	Converts FORTRAN II to FORTRAN IV. Three tapes.	IBM 1401 8K	FORTTRAN (1401)	
IBM	1400 RPG to 360 Converter 360C-RG-700	Converts 1401 and 1440 RPG to 360/20 RPG. One disk or three tapes.	IBM 1401, 1460 8K	RPG	
Information Management Inc.	UPGRADE Program Conversion	Translates 1400 series object code to COBOL source code. COBOL labels generated contain 1400 address for debugging. 1400 constants converted to proc. div. literals to facilitate subsequent maintenance. Five tapes. (S)	IBM 1401, IBM 360 16K	Autocoder	\$50,000 or 60¢/source card
Management Systems Corp.	TACOS Program Conversion	Converts 7070/74 Autocoder 76 to COBOL 360. (S)	IBM 360/50 160K	COBOL, ALC	\$18,000 or \$12,000 lease
United Computing Corp.	UNITE I, II, III Computer Simulators	Simulates XDS 900, 9300, CDC 3000 to run object decks on XDS Sigma 5/7. Simulates all load button & bootstrap operations. Provides built-in trace, snapshot, and breakpoint debug features.	XDS Sigma 5/7		
URS Data Sciences	POLYTRAN COBOL-to-COBOL Translator	Combines manual methods and mech. tools to convert from one COBOL to another.	IBM 360/30		

TABLE 2 • DEBUGGING AND TESTING PROGRAMS

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
Aero-Flow/Computer-Aided-Design	HELP FORTRAN IV Debugging	Debugs FORTRAN IV by rapidly checking sequence of operations during execution. Also checks arithmetic result of equations.	GE Mark II, others.		\$225
Computer Methods Corp.	TESTPAK Testing System	Selects records from live files to test application program. Structures selected records or creates files for testing. Operator intervention or live-file testing eliminated. Prints all or snapshots of input and output files of program under test.	IBM 360/30-OS, DOS 40K RCA Spectra 70 70K	ALC	\$11,050 for OS. or \$361/mo./ 3 yrs. \$9,500 for DOS or \$311/mo./ 3 yrs.
Computer Services Corp.	TESTCUBE	Creates up to 99,999 records for tape, disk seq., or IS. Random or controlled data. Auto increment, decrement, control totals, exceptions	IBM 360-DOS		\$1,500
Data Sciences Corp.	PCDM Program Check Debug Module	Continues program when check interrupt occurs in testing. Permits location of multiple bugs in one run.	IBM 360/25 2K	COBOL, BAL	\$750
Field Enterprises Educational Corp.	AUTOTEST Test System	Automatically tests programs. Disperses data for input files. Prints output files. Uses parameter control cards.	GE400	BAL	\$750
Gerber Products Co.	Test Data Generator	COBOL file description plus control cards generate sequential tape, disk, or card test files to user specifications.	IBM 360/30-DOS	COBOL	\$300
Robert M. Hornaday & Assoc.	DATAGEN Test Data File Generator	Creates sequential tape or disk test files. User defines files and fields, program automatically increments/decrements alphas for fields, etc.	IBM 360/30-DOS 8-27K	BAL	\$500

TABLE 2 • DEBUGGING AND TESTING PROGRAMS . . . Cont'd

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
Hoskyns Systems Research Inc.	TESTMASTER COBOL/360 Program Testing	Checks programs for errors, generates test data and test program. Eliminates files from testing, makes JCL identical for every test, continues test even though several errors are found. Object deck same as production deck (no TRACE or MONITOR statements).	IBM 360	COBOL	
IBM	BPS AUTOTEST 360P-PT-045	Aids debugging BPS object programs. Allows exchange, addition, or deletion of instructions without reassembly. One tape.	IBM 360/30 16K		
Information Management Inc.	TDG/IMI Test Data Generator	Automatically creates test data for COBOL programs. Tests over 90% of program. Based on data division. Specified in English-like language. Four tapes.	IBM, RCA, Hon., Univac 64K	COBOL E or F	\$9,000
Interface Systems, Inc.	TESTGEN COBOL Test Data Generator	Acts as processor. Reads COBOL program, checks for errors, generates data to test program. Also prints data, totals of numeric fields, program listing, data name map, errors. Several control options. Uses coding forms.	IBM 360	BAL	\$3,000
Macrodata, Inc.	MACROGEN Test File Generator	Modifies tape and disk files. Creates files of test data. Similar to former 1400 series "Disk record load," but expanded.	IBM 360-DOS		\$350
Macrodata, Inc.	MACROPRT Test File Printout	Has ability to call out and print any portion of tape or disk file during debugging. Operates in unusual "file protected" environment.	IBM 360-DOS		\$250
Macro Services Corp.	DEEP/360 (Data Exception Error Protection) Program Debugging	Aids debugging of programs. Prints address of error, corrects it, and proceeds - bypassing if error is serious. Error count produced.	IBM 360 3K	BAL	\$225
Management & Computer Services, Inc.	DATAMACS Test Data Generator	Test data generator for COBOL programs. Uses control cards mixed in data div. Compiling produces tape or disk file.	IBM 360-DOS, OS 32K	COBOL	\$4,500
Mandate Systems, Inc.	XBUG DOS Console Debugging	For on-line debugging of BAL/DOS programs. Inserts break points, interrogates registers, core locations, PSW; alters program- or data-flow, etc.	IBM 360-DOS	BAL	\$1,000
Roper Data Services	AUTOPATCH Patching	Generates REP cards. Eliminates hexadecimal calculation. Lists patches. Speeds debugging.	IBM 360 16K	BAL	\$500
Scorpio Data Systems Inc.	MAIN-GEN COBOL Maintenance Generator	Generates COBOL maintenance programs. Simplified input required; abbreviated description of master file. Reduces keypunching, coding, computer testing. Three disks or tapes (S, IS)	IBM, Hon, Burr, Univac, RCA. 32K	COBOL	\$6,500
Superior Computer Sys.	ITRACE Program Trace	Traces .360 programs instruction-by-instruction, each time showing PSW, instruction, and changes in register and memory contents. Automatic stepping.	IBM 360/25		\$120
Synergetics Corp.	PRO/TEST Test Data Generator	Generates any file on disk or tape with fixed or var. length records in ascending or descending sequence with random, sequential, or user-specified values. Free-form operand coding. Extensive parameter defaulting. Prints selected or complete listing of generated file. One disk or file. (S, I, DA)	IBM 360/30 32K H200 16K	EASY-CODER	\$3700 or \$500 + \$195/mo.
Synergistic Software Systems, Inc.	FILEMAKE Test File Generator	Creates sequential or indexed sequential tape or disk files. User defines files and fields, program automatically increments/decrements alpha or numerics for fields, etc. Fields may also be varied and repeated randomly. (S, IS)	IBM 360/30 32K	BAL	\$1,250
Turner, Brown & Associates, Inc.	TBATDG Test Data Generator	Makes tape files by parameter cards; creates random data as desired.	IBM 360, Hon 200	COBOL	\$500
Worldwide Computer Services Inc.	CIP Console Interface Program	Debugging aid in either automatic or interactive mode. Intercepts all program checks, operator interrupts, or unrecoverable errors (RCA); prints error-statement, type, and location. Allows selective module dumping in graphics and hex with an address every 16 bytes. Printer dump runs 3 times faster than executive dump. For COBOL and BAL.	IBM 360/30, RCA Spectra 70/35 65K	BAL	\$1,000 or \$45/mo.

TABLE 3 • JOB-CONTROL-LANGUAGE-PRODUCING PROGRAMS

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
American Software & Computer Co.	Automated JCL Generator	Improves DOS control of systems. Eliminates entry of JCL by maintaining disk library of JCL. One disk. (S, I)	IBM 360/30 32K		
Automatic Information Management Inc.	COLT 360 JCL Generator	Produces 360 JCL from high-level definitions. Documents. Produces diagnostics. One disk, one tape. (S)	IBM 360/30 64K	COBOL E & F	\$15,000 for OS., \$6,000 for DOS, or \$350/mo.
Computer Audit Corp.	JCL/360 Control Statement Generator	Generates JCL statements from defined parameters. Saves 50% programmer time. Lists input parameters, JCL; punches control cards. Each control statement alpha-sequenced and identified with job name.	IBM 360/40 (OS: PCP, MFT, MVT) 70K		\$4,950 or \$240/mo.
CRC Computer Radix Corp.	JCL GEN Job Control Generator for DOS	Generates DOS JCL from meta-control language	IBM 360/30 16K	BAL	Negot.
IBM	TEST/360 Control Card Edit & Analysis 360A-SE-25X	Checks and edits JCL. Aids debugging of JCL. Gives diagnostics, core req., summary of specs. One tape.	IBM 360/30 64K	BAL	
Turnkey Systems Inc.	JOB CONTROL Generator	Generates DOS job control and sequenced data. User establishes master library.	IBM 360 24K	COBOL	\$1,700

TABLE 4 • DOCUMENTATION AND FLOWCHART-PRODUCING PROGRAMS

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
Application Programming Co.	DYNACHART Flowcharter	Produces modular flowcharts for COBOL programs, program listing, cross-reference list, diagnostics. Connects all on-page lines. One disk or three tapes.	IBM 360/30, RCA Spectra 70 32K		\$4,900/3 yr.
Applied Data Research, Inc.	AUTOFLOW Flowcharter	Translates source language to two-dimensional flow charts. Complete statement analysis, page allocation, line drawing, and rearrangement of source input performed automatically. Reduces manual documentation, maintenance, and re-programming costs. (S)	IBM 360/25, 1401, 7090; Hon. 200; RCA Spectra 70 32K	Any	\$4,200 and up, depending on language
Aries Corp.	AUTODIAGRAM-MER II Documentation System	Produces flowchart plus unmatched label table, label cross-reference table, diagnostics, formatted records, and report page. Used for COBOL, FORTRAN, and BAL.	IBM 360/30 32K	BAL	\$3,200 + \$800/yr.
Boston Computer Software Corp.	DOCUMATIC Documentation System	Produces English-language descriptions of 360 RPG programs. Two-dimensional I/O record layouts. No control cards needed. May also be used as training aid or debugging tool.	IBM 360/20 8K 360/30 24K	BAL	\$1,600 and up, or \$40/mo and up
California Computer Products Inc.	FLOWGEN/F Flowcharter	FORTRAN flowcharter. Uses Calcomp plotter. Fits standard 8½ x 11 pages. On-line or off-line. Versions for 1130 FORTRAN and FORTRAN. Two tapes.	IBM, RCA, Hon, Univac, Burr., GE. 64K	FORTRAN	\$4,500, or \$30/mo. 1130 FORTRAN, or \$40/mo. FORTRAN
Century Computer Services Inc.	FLO-IT RPG Flowcharter	Generates flowchart of RPG source program.	IBM 360/20 8K	RPG	\$1,000
Computer Time-Sharing Corp.	AUTODOC Automatic Documentation	Automatically prepares documentation for COBOL & FORTRAN source programs. Produces flow charts, reference lists, error lists, source prog. lists, report and record layouts, cover page.		COBOL	
Compress, Inc.	COMCHART Flowcharter	Flowcharts 360 BAL, RCA Spectra 70 BAL, and all versions of COBOL. Utilizes a special flowcharting language to assist in program design. Includes comprehensive cross-references for COBOL. One disk or four tapes. (S)	IBM 360/30-DOS, OS 32K RCA Spectra 70/35	COBOL	\$1,225 for one yr., \$1,825 for 10 yrs.
IBM	Flowchart 360A-SE-22X	Produces flowcharts from special input language usable by non-programmers. Two disks.	360/30-DOS 32K	BAL	
Information Systems Leasing Corp.	REWRITE COBOL Logic Charter	Rewrites COBOL program so it becomes its own logic chart.	IBM 360/30; RCA Spectra 70; Burr.	COBOL	\$750
National Computer Analysts	QUICK-DRAW Automatic Flow Charter	Flowcharts COBOL; FORTRAN; BAL/ALC, AUTOCODER, SPS, PL/1. COBOL (most systems): data name cross-ref., diagnostic list, paragraph name cross-ref., page size options, skip-over centerfold, copy. BAL/ALC: data tag cross-ref., equate table, modified instruction list, diagnostic list, page options. FORTRAN: symbol cross-ref., page options, specialized DO loop process, page size options. Requires about 50 disk cylinders. (S)	IBM 360/25-DOS 32K, OS 65K; RCA Spectra 70/35 45K	COBOL, BAL	\$4,200- \$5,700
Polytechnic Software International	360/20 RPG Program Documentation System	For documentation, debugging, maintenance.	IBM 360/20		\$400



TABLE 5 • LANGUAGES

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
Advanced Computer Techniques Corp.	HELP Highly-Extendable Language Processor	A general-purpose macrogenerator in natural language. Extends and/or alters standard languages, creates application-oriented procedural languages, etc.			\$15,000
Adpac Computing Languages Corp.	ADPAC Language	May be used as high-level assembler, a complete program generator, or a subroutine generator. Takes 50-75% less machine time to compile and debug.	IBM 360/25-TOS, DOS, OS; others.		
Affiliated Computer Systems, Inc.	TIMSAVER Language	Reduces programming and machine time. Simple to use (said to be easier than COBOL; as efficient as Assembly).	Hon 200, 12K	EASY-CODER	Negot.
Athena Programming	FORTRAN V for Large Core	Compiles FORTRAN V to take full advantage of large core by object program. Price also includes continuing bulletins for changes, new routines, and other support.	Univac 1108 128-256K	FORTRAN V	\$2,000/mo.
Bonner & Moore Associates Inc.	MISSIL Management Info. System Symbolic Interpretive Language	Assists development of management info. systems on small general-purpose computers. Said to require less-skilled programming staff.			OR
C.A.C.I.	SIMSCRIPT 1.5 Language	A compiling and subroutine library for simulation and large-scale discrete modeling.	IBM 360/40		\$12,400/2 yr.
Computer Systems	Univac Assembler	Two-pass assembler for UNIVAC 1005. Said to be two to four times faster than mfg.'s. Special diagnostics.	Univac 1005, 4K	Assembly	Negot.
Decision Systems Inc	COBOL 20 Compiler for 360/20	Compiles COBOL for 360/20. Upward-compatible with existing IBM compilers to facilitate later changeover to larger machines.	IBM 360/20, 8K		\$10,000 or \$1,000 plus \$300/mo. for 3 yr.
Digitek Corp.	FORTRAN IV Compilers	FORTRAN compilers for many computers. Partly written in an independent assembly language called POP (Programmed Operators and Primitives); user writes some special interface programs.	IBM, RCA, Hon, GE, Univac, CDC. 4-8K	BAL, Assembly POP	\$14,000-\$20,000
Fimaco, Inc.	BOCOL Basic Operating Consumer-Oriented Language	Reduces learning time by streamlining COBOL instructions. Requires only one pass for compiling and processing. Input of environmental, equipment, and formatting information does not require separate definition.	IBM 360 20K; Hon. 200 12K		\$5,950
IBM	MATLAN Matrix Language 360A-CM-05X	For matrix manipulation and computation. Two disks.	360/40 128K	FORTRAN IV/H, BAL	
Mnemotech Computer Systems, Inc.	MNEMOSYS Compiler	Generates programs for analysts' specs. Includes file maintenance, retrieval, editing, reports, processing (up to 7 files simultaneously). Uses fixed-form file and field definers, free-form English statements.	IBM 360/30 32K		Negot.
Printing Industry Computer Assoc. Inc.	ULTRA-X Universal Language for Typographic Reproduction Applications	Simple statements to define formats. "One-tenth the instructions required by previous methods." Eighty-four two-char. words. Two disks, four tapes.	IBM 360/30-DOS 65K	BAL	Negot.
Software Services, Inc.	FORESIGHT Planning Language	Aids in creating a management planning model.		FORTRAN	\$3,500
Systematic Design, Inc.	SDL Systematic Design Language	For artwork, drafting, computer graphics. Also includes post-processors for several plotters.	Any	FORTRAN IV	\$10,000
David Turetsky Assoc.	BYTE FORTRAN Language	A FORTRAN based on byte manipulation which is said to improve the efficiency (speed) as much as 4 times over standard 360 FORTRAN. Also creates a compatible environment for 1130 FORTRAN on the 360.	IBM 360-DOS, OS, TOS.	FORTRAN	Negot.
URS Data Sciences	POLYSYN Translation System	Generalized macro language to assist writing of language-to-language translators.	IBM 360/30; RCA Spectra 70.		OR

TABLE 6 • PREPROCESSORS FOR DECISION TABLES, SHORTHAND LANGUAGES, ETC.

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
AIM	COAX COBOL Abbreviations	Permits use of abbreviations during initial writing of program, expanding them later according to supplied dictionary.	Any, 32K	COBOL	\$7,800 or \$325/mo.
Ancom Systems	COBOL Documenta- tion & Debugging	Permits abbreviation of data names, creates cross-reference list, converts to full-name COBOL program.	IBM 360/30	COBOL	\$1,000
Automated Information & Management Systems	AIMS V COBOL Processor	Produces complete COBOL program from non-programmer input data. Two disks or one tape. (S)	IBM 360/30 65K	COBOL E	\$15,000 or avail. on lease
Automation Science Inc.	AUTOFORCE COBOL Standards Enforcer	Establishes simplified COBOL with several use aids and checks out all programs to that standard with error diagnostics. Permits use of macros, standard routines, automatic correction. Keeps history file for programmer evaluation.	IBM 360/30	COBOL	Approx. \$10,000
Boothe Resources International, Inc.	DOSRELO Self-Relocate Preprocessor	Reads BAL, COBOL, or RPG program and generates output card deck which, with original program, is self-relocating version of program. Eliminates special programming, multiple core cataloging, etc.	IBM 360-DOS 26K		\$3,500
Compumatics Inc.	COMPUTRAN Preprocessor	Uses shorthand notation to reduce coding time. Decision table concepts produce modular, better-organized program. Automatically provides advanced debugging and documentation aids. Two disks or four tapes. (S, IS)	IBM DOS, OS- MFT,MVT 24-32K; Hon., RCA, Univac	COBOL E, F	\$6,995 or \$250/mo.
IBM	DLTP Decision Logic Translator Program 360A-CX-32X	Translates decision tables to FORTRAN. Limited & extended entry. Two disks.	IBM 360/30-DOS		
Information Industries, Inc.	DETRAN Decision Table Translator	Decision table translator and COBOL preprocessor which creates a proc. div. from tables. Code is optimized; tables are diagnosed for faulty logic. Produces optimal branching patterns and common action subroutines, thus minimizing core req. Reduces time and cost of development. Three disks or tapes.	IBM 360/30 32K; RCA Spectra; B3500, 5500; Univac 1108; CDC 6000	COBOL	\$15,000 life- time license or \$500/mo.
Information Management Inc.	DETAP/IMI Decision Table Processor	Produces source code from user-supplied decision tables. Limited entry, extended entry, mixed entry. Built-in testing for redundancy, contradiction, and completeness. Bounded conditions. Special logical operators. One disk and one tape perf.	Any support- ing COBOL. Full, 100K; Compact, 32K; Basic, 32K	COBOL	Full \$14,500 or \$512/mo. Compact \$9,500 or \$338/mo.; Basic \$5,500
Information Management Inc.	MAGIC Multipurpose and Generalized Inter- face to COBOL	COBOL shorthand, syntax checker, standards enforcer and output formatter. Uses short codes for COBOL reserved words and EQUATE feature for user-declared synonyms. Line-by-line syntax checker and parameter-controlled standards enforcer. Output formatter that produces full-format COBOL source decks in easy-to-read fashion.	IBM 360/30 32K	COBOL, BAL	\$8,000 or \$285/mo.
Information Processing Corp.	CALM COBOL Automatic Language Modifier	Permits COBOL to be written with abbreviated statements. Expands abbreviations, provides some standard COBOL editing, generates certain entries, and makes a standard COBOL deck.	IBM 360/25-DOS, TOS, OS 16K; RCA Spectra 70	BAL	\$2,500
Information Science Inc.	COBOL SHORTHAND	Produces programmer coding in identification, environment, and data division by 50%. Provides keypunching savings and reduces errors in programming.	IBM 360 16K	COBOL	\$900
Information Systems Leasing Corp.	DETOC Decision Table Processor	Decision table processor. Converts to COBOL. Uses treed logic and optional ELSE rule. Provides initial action set rule performed before table logic is entered. Also includes order numbers so actions may be executed in any sequence. One disk.	IBM 360/30-DOS, OS, 32K; RCA Spectra 70, Burroughs, Univac.	COBOL E or F	\$5,800 or lease
Pioneer Data Sciences	SPEEDBOL	Permits COBOL to be written with abbreviated statements. Abbreviates frequently reserved words as well as procedure and data names. Processor expands abbreviated words.	IBM 360 11K		\$300
Republic Systems & Programming, Inc.	COBOL Preprocessor	Produces complete COBOL program from simple entries in special forms. Complete error check and diagnostics.	IBM 360/30 32K		\$6,500
Software Marketing Inc.	DECISUS/Limited Decision Table Preprocessor	Converts decision tables to COBOL program. Limited entry tables. Checks for completeness, contradictions, redundancies.			\$6,000
Software Marketing Inc.	DECISUS/Mixed Decision Table Preprocessor	Converts decision tables to COBOL program. Permits mixed entry. Also checks for completeness, contradictions, redundancies.		COBOL	\$9,000
Trilog Associates, Inc.	DDT FORTRAN Decision Tables	Converts decision tables to FORTRAN. Both limited and extended entry tables. Produces diagnostics. Allows for ELSE feature.	IBM 360, Univac 1108, GE 635	FORTTRAN	\$15,000/3yr.
Trilog Associates, Inc.	SMP System Manage- ment Processor	High-level language precompiler, decision table translator, and source language file maintenance system. Decision table translation technique ensures completion of definition and elimination of redundancy. Flags contradictions. Automatic error corrections. One to six disks or tapes. (S, DA)	IBM 360, RCA Spectra 70, 131K	COBOL, FORTRAN, PL/1	OR (lease)

TABLE 7 • OTHER GENERAL-PURPOSE PROGRAMMING AIDS

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
Applied Data Research, Inc.	ROSCOE Remote OS Conversational Operating Environment	Permits users to create, manipulate and maintain source programs, obtain immediate syntax checking of programs and JCL statements. Gives summaries of printed output from problem programs.	IBM 360/40, 64K		OR (lease)
Basic Computing Arts, Inc.	FORSAN Fortran Cross References	Reorders statement nos. and their references. Produces new source; and cross-references.	Most		\$500 lease
D. R. Black Management Consultants	Program Optimization	Analyzes COBOL program and lists by percent and time (MS) spent on each paragraph and no. of times paragraphs are normally used. One tape.	IBM 360/30, Burroughs, RCA, 4K + prog.	COBOL	\$5,000
Bonner & Moore Associates, Inc.	FACTS Fortran Analytical Cross-Reference Tabulation System	Analyzes source data in eight user-specified reports. Produces cross-referenced lists, inter-subroutine cross-referenced lists.	IBM 360/40, SDS Sigma 7	FORTRAN	OR
Boole & Babbage	SMS/360 Systems Measurement Software CPE Configuration and Program Efficiency	Provides MSM/360-PPE and -CUE data on a single program running in OS-PCP. No changes required to software or hardware. Equiv. to SMS/360 PPE & CUE together.	IBM 360 128K	COBOL & FORTRAN	\$12,500
Boole & Babbage	SMS/360 Systems Measurement Software: PPE Problem Program Efficiency, DPPE (PPE for DOS)	Measures efficiency of programs running under OS and DOS respectively. Provides histogram of usage of each portion of program, I/O compute ratios, etc. Used in prog. development or to test production programs. No changes to program or system required.	IBM 360—OS 128K, DOS 64K	COBOL, FORTRAN	\$7,500 for OS, \$6,000 for DOS
Cambridge Computer Associates, Inc.	CROSSTABS Cross Tabulation	Creates cross-referenced listing of program elements with frequency of use and other statistical data. Provides multi-dimensional contingency tables with weighting. Non-programmer may use. (S)	IBM 360/30—DOS, OS 32K	BAL	\$4,500 to \$13,500
Caywood-Schiller, Assoc.	COMPAT-F	Extends FORTRAN to use full I/O capability of 360/30	IBM 360/30—DOS, TOS 8K	FORTRAN	\$1,000
Communications Dynamics Systems, Inc.	REF-BACK COBOL Cross-References	Produces cross-referenced list of data names and procedures by pages and lines. Indicates fields used as subscripts, qualifiers, or data files. Called from core library by one card during compilation.	IBM 360—DOS 10K		\$750
Computation Planning Inc (COMPLAN)	BEEF 2/360 String Manipulator	Permits 360 FORTRAN and COBOL programmers to manipulate and test bit and byte strings. Has 52 callable operations of 9 types: string manipulation, decision making, searching, conversion, character code transformation, etc.	IBM 360		\$4,750, also avail. on lease
Computer Results Corp.	COBOL-AID Cross Ref. Listing	Cross-referenced listing for single and multiple programs. References data names, literals, library name by procedure div., page and line number.	IBM 360/25 32K GE 415, 425, 535 16K	COBOL	\$350
Computer Sciences Corp.	EPG-II Edit Program Generator	Checks accuracy of input data. Includes compiler that generates error identification programs using 360 assembler. Uses 5-char. mnemonic codes in statements to define I/O, files, records, tables. Specifies tests to be performed on each input field. Lists errors.	IBM 360—DOS, OS		\$6,000
Data Management Concepts Inc.	RPGAID Cross Referencer	Expands file descriptions and gives cross-referenced listing. Includes indicators. For IBM, RCA, and UNIVAC RPG.	IBM 360/25—DOS, OS 24K	BAL	\$450 (lease)
Data Systems Analysts, Inc.	SYSTEM 6403 Program Analyzer	Predicts program performance by deter. mean value and std. deviation of run time and core or channel utilization. Batch or interactive versions. Fast (printer-bound). <i>Input</i> is flowchart with time, space, channel rqmts. for each prog. step, probability of various decisions, and number of times loops will be taken.	IBM 360/30 65K	FORTRAN IV	\$8,600

TABLE 7 • OTHER GENERAL-PURPOSE PROGRAMMING AIDS . . . Cont'd

SOURCE	NAME	DESCRIPTION	COMPUTER	COMPILER	PRICE
Infodata Systems Inc.	COP Customer Orienting Program	Tailors master decks of proprietary packages to a customer deck. Edits master deck, such as inserting customer name, deleting cards, editing TXT cards. Four tapes. (S)	IBM 360, Univac 9000 16K	BAL	\$1,000
Macrodata Inc.	MACROGEN File Generator	Creates COBOL programs including JCL for generating disk and tape files, and modifies them. Parameter control cards. One disk or tape.	IBM 360/25-DOS, TOS.	COBOL	\$350
National Sys. Planning	Disk Optimizer	Prepares table showing ramifications of using every reasonable blocking factor, given logical record size and file organiz. Shows percent live data storable on each track and each cylinder, total access time, rotational delay, transfer rate, no. of cyls. req. under each condition. (S)	IBM 360/25 24K	COBOL	\$300
Roper Data Services	DOS Macro Extension Language	Set of 25 macros for common clerical requirements in BAL such as setup of edit masks, turning lists on and off, setting up print lines.	IBM 360/30-DOS, TOS.	BAL	\$750

TABLE 8 • REFERENCE LITERATURE

For more information on the proprietary software packages described in this article, circle, on the enclosed reader inquiry card, the numbers listed below.

Company	Reader Inquiry Card Number	Company	Reader Inquiry Card Number
Adpac Computing Languages Corp., San Francisco, Cal. ....	75	Data Management Concepts, Inc., Chicago, Ill. ....	117
Adv. Computer Techniques Corp., New York, N.Y. ....	76	Datamation Services Inc., New York, N.Y. ....	118
Advanced Mgmt. Systems, Inc., Santa Ana, Cal. ....	77	Data Sciences Corp., New York, N.Y. ....	119
Aero-Flow/Computer-Aided Design, Westfield, N.J. ....	78	Data Systems Analysts, Inc., Pennsauken, N.J. ....	120
Affiliated Computer Systems, Inc., Dallas, Texas ....	79	David Turetsky Assoc., New York, N.Y. ....	121
AIM, Encino, Cal. ....	80	Decision Science, Inc., San Diego, Cal. ....	122
American Software & Computer Co., Atlanta, Ga. ....	81	Decision Systems, Inc., Paramus, N.J. ....	123
Ancom Systems, Los Angeles, Cal. ....	82	Digitek Corp., Los Angeles, Cal. ....	124
Application Programming Co., Moorestown, N.J. ....	83	D. R. Black Mgmt. Consultants, Pittsburgh, Pa. ....	125
Applied Data Research, Inc., Princeton, N.J. ....	84	Express Software Systems, Inc., New York, N.Y. ....	126
Aries Corp., McLean, Va. ....	85	Field Enterprises Educational Corp., Chicago, Ill. ....	127
Athena Programming, Redondo Beach, Cal. ....	86	Fimaco, Inc., Philadelphia, Pa. ....	128
Atlantic Software Inc., Philadelphia, Pa. ....	87	Gerber Products Co., Chicago, Ill. ....	129
Austin Systems Co., Hingham, Mass. ....	88	Hoskyns Systems Research Inc., New York, N.Y. ....	130
Automated Information & Mgmt. Systems, Cincinnati, Ohio ....	89	Infodata Systems Inc., Arlington, Va. ....	131
Automatic Information Mgmt. Inc., Encino, Cal. ....	90	Information Industries, Inc., Wayne, Pa. ....	132
Automation Sciences Inc., Jersey City, N.J. ....	91	Information Management Inc., San Francisco, Cal. ....	133
Basic Computing Arts, Inc., Mountain View, Cal. ....	92	Information Processing Corp., Dallas, Texas ....	134
Bonner & Moore Associates, Inc., Houston, Texas ....	93	Information Science Inc., New York, N.Y. ....	135
Boole & Babbage, Palo Alto, Cal. ....	94	Information Systems Leasing Corp., Glenside, Pa. ....	136
Booth Resource Int., Inc., Los Angeles, Cal. ....	95	Interface Systems, Inc., Ann Arbor, Mich. ....	137
Boston Computer Software Corp., Boston, Mass. ....	96	Macrodata, Inc., Union, N.J. ....	138
C.A.C.I., Santa Monica, Cal. ....	97	Macro Services Corp., Boston, Mass. ....	139
California Computer Products, Inc., Anaheim, Cal. ....	98	Management Systems Corp., Dallas, Texas ....	140
Cambridge Computer Associates, Inc., Cambridge, Mass. ....	99	Mandate Systems, Inc., New York, N.Y. ....	141
Caywood-Schiller Assoc., Chicago, Ill. ....	100	Mnemotech Computer Systems, Inc., New York, N.Y. ....	142
Century Computer Services, Inc., Elk Grove Village, Ill. ....	101	National Systems Planning, Atlanta, Ga. ....	143
Communication Dynamics Systems, Inc., Westchester, Ill. ....	102	Pioneer Data Sciences, Wilbraham, Mass. ....	144
Compumatics Inc., Chicago, Ill. ....	103	Polytechnic Software Int'l., Leonard, Mich. ....	145
Computation Planning Inc., Bethesda, Md. ....	104	Printing Industry Computer Assoc., Princeton, N.J. ....	146
Computer Audit Corp., Washington, D.C. ....	105	Republic Systems & Programming, Inc., Secaucus, N.J. ....	147
Computer Conversions, Inc., Jenkintown, Pa. ....	106	Robert M. Hornaday & Assoc., Chicago, Ill. ....	148
Computer Methods Corp., Los Angeles, Cal. ....	107	Roper Data Services, New York, N.Y. ....	149
Computer Procedures Corp., Valley Stream, N.Y. ....	108	Scorpio Data Systems Inc., Tallman, N.Y. ....	150
Computer Results Corp., West Springfield, Mass. ....	109	Software Marketing Inc., New York, N.Y. ....	151
Computer Sciences Corp., El Segundo, Cal. ....	110	Software Services, Inc., Los Angeles, Cal. ....	152
Computer Services Corp., Southfield, Mich. ....	111	Superior Computer Systems, New York, N.Y. ....	153
Computer Systems, San Rafael, Cal. ....	112	Synergetics Corp., Burlington, Mass. ....	154
Computer Time-Sharing Corp., Palo Alto, Cal. ....	113	Synergistic Software Systems, Inc., Houston, Texas ....	155
Compuvisor Inc., Ithaca, N.Y. ....	114	Systematic Design, Inc., Dallas, Texas ....	156
Comress, Inc., Rockville, Md. ....	115	Trilog Associates, Inc., Philadelphia, Pa. ....	157
CRC Computer Radix Corp., New York, N.Y. ....	116	Turner, Brown & Associates, Inc., San Leandro, Cal. ....	158
		Turnkey Systems, Inc., Norwalk, Conn. ....	159
		United Computing Corp., Redondo Beach, Cal. ....	160
		URS Data Sciences, Burlingame, Cal. ....	161
		Worldwide Computer Services Inc., Hartsdale, N.Y. ....	162

# A dirty tape can make a computer look stupid.

Dirty tape causes data dropout. And data dropout puts computers down. And that costs money.

That's stupid.

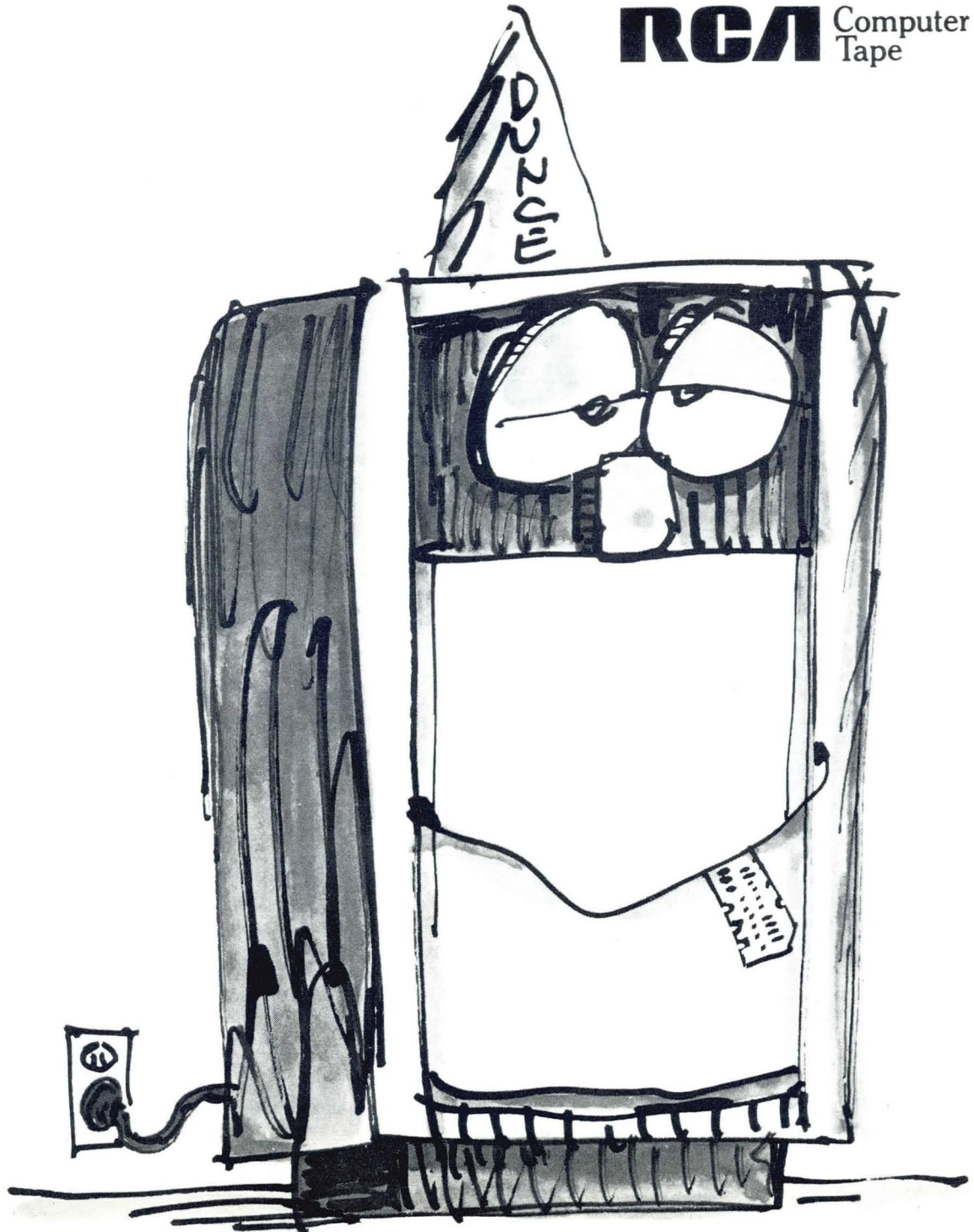
An intelligent solution is clean tape. RCA Computer Tape.

It starts cleaner because every inch of every reel is tested and certified in the most impeccable of white-room conditions. (We don't think statistical testing is good enough.) And it stays cleaner, longer.

Result: Fewer dropouts and more efficient computing.

Smart computers need clean tape. Write RCA Magnetic Products, 201 E. 50th St., New York 10022. Clean tape is all we know.

**RCA** Computer Tape



CIRCLE NO. 40 ON INQUIRY CARD



## THE DICOMED 30 IMAGE DISPLAY SYSTEM

*A practical system for digitizing, transmitting, and displaying photographic images.*

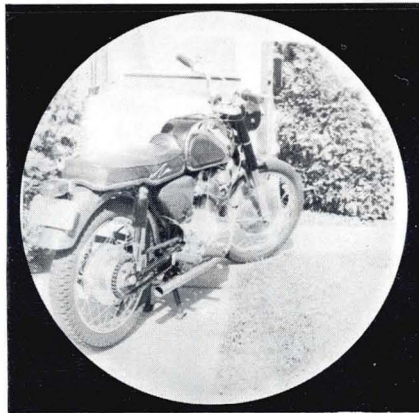
The digital computer has contributed greatly to storing, transmitting, and reproducing information. Its capabilities in processing words, lines, and numbers are virtually limitless. But when information must be communicated even more accurately than in words, lines, and numbers, pictures are essential.

Halftone photographic images can now be transmitted over telephone lines or high-speed digital transmission links for accurate reproduction and immediate viewing at their destination. Or they may be enhanced by a computer to even better quality than the original.

The Dicomed 30 Image Display makes this both possible and practical. Dicomed Corp.'s direct-view display employs a storage-type cathode ray tube to reproduce halftone pictorial information in little more than a minute. Its 1024 x 1024 matrix produces a resolution array of over one million points. Each point has 64 separate intensity levels, combining with the high resolution for what Dicomed claims is the most accurate soft copy image in existence. The Dicomed Corp. is located in Minneapolis, Minnesota.

The image painted on a Dicomed 8-inch screen resembles another soft copy device—television. But the Dicomed 30 far surpasses TV in quality. TV flickers and fades because of the continual flow of data needed to display a picture. The Dicomed 30 needs no refresh memory and can display an image until erased.

Digital transmission of pictures has been possible previously, but not practical. The problem has been one of reconvertng the digits into a picture. One technique involves using a film recorder to place the picture on small-format film. This hard copy frequently requires most of 24 hours



Unretouched photo of an actual image displayed on the Dicomed 30's CRT screen. The printing process cannot equal the Dicomed 30's high resolution so the image is not reproduced at 100 percent.

to develop a print. Another output device can reconvert digits into a larger image, but consumes valuable hours to render a vague picture consisting only of lines. The Dicomed 30's output requires from 80 to 100 seconds for a clear, accurate image.

Typical systems would include a picture digitizer for input, a computer, and the Dicomed 30 for pictorial output. The digitizer scans the photograph, converting points into bits. The bits are then either manipulated by the computer, or simply transmitted from location to location. The digitized data is then reconverted by the Dicomed 30 into pictorial information.

An application of this kind using the Dicomed 30 exists at the University of Missouri, where research in computer-aided interpretation of X-rays is currently in progress. The University of Missouri's Radiology and Electrical Engineering Departments are using a Dicomed 30 not



The Dicomed 30 — a direct-view CRT Image Display for high-resolution pictorial information.

only to reproduce, but enhance X-rays; enabling radiologists to use the computer to extract more information from an X-ray, and increase the accuracy of their interpretation. While still experimental, it is expected that the system will allow medical people to discover afflictions that would not necessarily show up in normal X-ray procedures, thus permitting corrective treatment at an earlier stage. In addition, the ability to transmit X-rays between locations will save precious time and eliminate the risk of transporting original X-rays.

The Dicomed 30 can be utilized in any application where pictures are needed. It means a look at an accurate reproduction with virtually no waiting. One picture is worth a thousand words.

**For more information  
on the Dicomed 30,  
Circle No. 61 on Inquiry Card.**

# If you've been wanting someone to build a low-cost digital tape drive with Hewlett-Packard quality, HP just did.

We've taken the OEM experience we've gained from putting almost 4000 digital tape systems in the field. Added what you've told us you'd like to see in a low-cost tape drive for small computers and off-line applications. And produced the HP 7970.

It has all the features you're looking for in a digital transport: IBM and ASCII compatibility, 25 ips speed without program restrictions, DTL/TTL compatible interface. Seven or nine track capability with simple field conversion. Standard 10 1/2 inch reels. Plus handsome appearance, fingertip push-

button controls, backlit indicators for quick operational status checks, dual gap head for read-after-write error checking capability.

It also has HP's exclusive trouble-free design and rugged construction, with cast aluminum frame, automatically milled to precise reference planes. The tape transport components are mounted to this frame on precisely indexed bosses to assure that tape path tolerances are routine. The HP 7970 also has electronic deskewing, direct drive motors, single capstan, and dynamic braking that eliminates mechanical adjustments. Plus

the back-up capability of 141 Hewlett-Packard sales and service offices around the world.

So if you want a low cost digital tape drive with HP quality, call your Hewlett-Packard field engineer for more information on our new 7970. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

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# In data acquisition, Raytheon Computer is at the head of its class.

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At their Davis, California, campus, one of our 16-bit computers is part of a mobile data acquisition system. It handles a variety of experimental problems involving multiplexed signals, feedback controls and real-time analysis of incoming signals.

For them, we've included disc storage, magnetic tape, analog/digital and digital/analog converters and a clock that generates automatic interrupts and time-of-day information.

For you, we'll include anything you need. All the standard peripherals. And a number of not-so-standards, like the Raytheon Computer Array Transform Processor.

And we'll interface to anything you have. Analog or digital, data processing or

process control, one-of-a-kind or OEM.

For the heart of the system, choose from the Raytheon Computer family of CPU's. Cycle times from 900ns to 1.75 $\mu$ s, prices from under \$10,000. All with direct I/O to the CPU, 4 addressable registers and 74 instructions that include bit and byte manipulation.

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## EDP OUTLOOK

*The Commerce Dept. polishes its crystal ball; sees continued growth in mainframe and peripheral shipments, software packages.*

The U.S. Dept. of Commerce, in its Annual Industrial Outlook Report, predicts shipments of EDP systems to rise to \$4.9 billion in 1970 — a 17 percent increase over 1969 shipments of \$4.2 billion. Medium-size computers are expected to account for a lesser share of these as small- and large-scale computers increase their share.

### PERIPHERAL EQUIPMENT

Computer peripheral equipment is increasing as a percentage of total computer system shipments. Peripheral shipments, estimated at \$5 billion in 1969, should increase to \$6 billion in 1970. Among the fastest growing peripherals, about 20 percent per year, are optical character reader devices, key data recorders, visual display devices, disk packs and drives, memories, remote terminals, and data transmission equipment. These items should contribute to total peripheral shipments of approximately \$11 billion in 1975.

Over 90 percent of all peripheral equipment is produced by computer manufacturing companies. Commerce believes this percentage may fall off somewhat in the next few years as independent peripheral producers gain a larger share of the remote terminal sales and increase their sales to end-users instead of to OEMs.

R&D expenditures by independent peripheral firms of nearly 10 percent of sales were required in the 1960s to enable them to compete with the well-financed mainframe computer companies. This, says Commerce, has led to many technical advances and lower prices.

Memories comprise the largest share of the total peripheral market with estimated shipments of over \$1 billion in 1969. Other large segments include I/O devices, magnetic tape transports, and data transmission equipment.

### TIME-SHARING EXPANDS

The explosive growth of time-sharing is evidenced by Commerce's prediction that half of all computer installations by 1975 will be used for time-sharing. Commerce's industry sources value the time-sharing market at approximately \$200 million in 1970 and \$2 billion by 1975.

### SOFTWARE BOOM

Today there are over 1,000 software companies in business, and the boom which started several years ago is expected to continue at an even greater pace in 1970 as the impact of the price unbundling is felt. "As a result of the unbundling, software programming packages are expected to play a major role in the future," say Commerce industrial specialists James N. Carr and Stephen T. McClellan. They point out that "presently only 6 percent of software is purchased as opposed to in-house development valued at \$500 million, but the demand for software packages is expected to approach \$2 billion by 1975." Estimates of software total value range from \$3 to \$6 billion in 1968, from \$6 to \$10 billion in 1970, and to about \$20 billion by 1975. ▲

**The only thing  
Raytheon Computer does  
is your job.**

**Faster.**



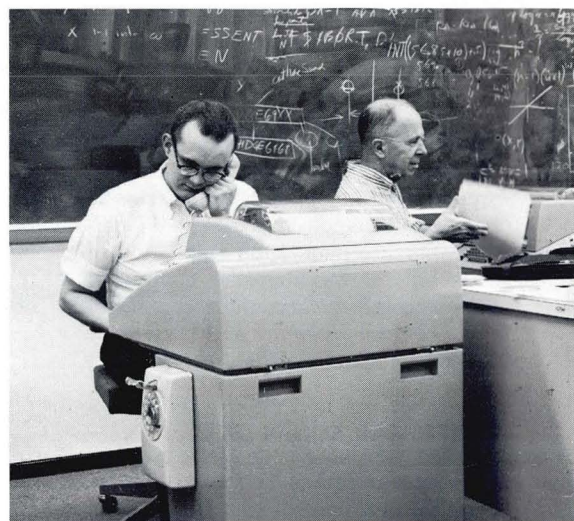
**RAYTHEON**



## THE DUAL ROLE OF TIME-SHARING IN EDUCATION



Hanover, N. H. High School students work with terminals as a visiting delegation of Japanese educators looks on.



Professor and student at Dartmouth College's Engineering School.

**T**IME-SHARING can benefit secondary education as both an administrative and a pedagogical tool. Schools utilizing time-sharing in this dual role have found costs within their budgetary constraints.

Today, the time-sharing industry accounts for approximately 15% of all computer industry revenues and over the next decade is expected to be one of the fastest growing segments in this dynamic field. Until recently, however, time-sharing was a relatively new phenomenon in secondary education. When the concept was introduced, industry people as well as educators too readily attempted to apply it to sophisticated and unproven techniques such as computer-aided instruction (CAI). While such techniques do have a future in education, the enormous costs and effort associated with their development prohibit their early use for all but experimental-type programs. Yet, time-sharing appears to be making progress both as a teacher's aide and as an administrative workhorse. The following discussion will focus on its current applications in these areas as well as some developments that we might expect in the next few years.

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**Editor's Note:** Schools can experiment and benefit today from the use of time-sharing computers. The author believes the practical aspects of time-sharing hold more promise as an educational resource than do those of Computer-Aided Instruction (CAI).

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### DEVELOPMENT OF OBJECTIVES

The primary goal of time-sharing is concurrent, effective utilization of a single computer by multiple users. Time-shared computer response is almost instantaneous. All systems elements are connected to the central processor, and the system responds to a query within a time period which is short enough to assure that the situation will not have changed materially. Four elements are necessary: a central processor, communications links, remote input/output devices, and a conversational language.

Time-sharing can trace its ancestry back to 1940, when George Steibltz of Bell Labs demonstrated the

RICHARD T. BUESCHEL, MODERN DATA editorial consultant, is president of Time Share Corporation. He started in the computer field in 1956 on the Whirlwind computer, worked on SAGE at Mitre and held various management and technical positions at Honeywell. He received his AB at Dartmouth and MBA at Northeastern University.



Terminals in use at Dartmouth's Tuck School of Business.

possibilities of data telecommunications to participants in the Mathematical Conference at Dartmouth College. This first demonstrated data link connected Bell's N.J. facility with the Hanover, N.H. campus. In 1952, data retrieval systems using telephone circuitry became operational: the first at American Airlines, and later in the year, a larger system at the Toronto Stock Exchange.

Although these early systems used memory storage devices, it wasn't until IBM's RAMAC appeared in 1956 that a general-purpose computer with memory capabilities became feasible. And in 1958, AT&T installed dataphones which could enable a teletypewriter terminal to communicate with the computer. Thus, the hardware ingredients for time-sharing were assembled — a central computer with mass memory capabilities, a communications carrier that could handle data, and early peripherals in the form of dataphones. These components waited three years for their effective combination.

The first truly time-shared system was initiated at MIT in November 1961. The innovative CTSS (Compatible Time-Sharing System) utilized an IBM 7090

to service eight users. The experimental groundwork laid by CTSS soon paved the way for the establishment of the first prototype commercial system.

In May 1963, the Rand Corporation took a major step in developing the fourth component, a conversational language, by implementing the JOSS language on the Johnniac Computer. JOSS, to a real degree, was the forerunner of such modern conversational languages as BASIC, and represented a new philosophy at the time it was written. JOSS was the first language to place programming within the capability of the ultimate user. The continuing development of easy-to-learn conversational languages remains a necessary concomitant to hardware development if time-sharing services are to reach their full educational potential.

The ability to service simultaneous users has advanced steadily since 1964. Today the largest operational system is at Dartmouth College, where its GE 635 can support over 120 simultaneous users. Systems capable of supporting several hundred users are forecast for use by 1970.

#### TIME-SHARING IN SCHOOL ADMINISTRATION

Time-sharing is now being used in primary and secondary schools for administrative chores such as classroom and subject scheduling, record keeping, general accounting, state and government reporting, dietary management, and grading. While these functions could be performed on almost any computer, time-sharing brings to a school certain unique advantages, such as: [a] the resources of a larger computer than the school could normally support, [b] programs shared among many schools and users, and [c] an on-site computer that is available when needed, but free of idle computer overhead. The special nature of a school computer is that it is required only at periodic intervals and, unlike industry, not on a continuous production cycle.

Another advantage is that time-shared systems with user-oriented programming languages permit administrators and teachers to formulate and implement their own systems directly — without the need to consult professional programmers and computer operators. This ability to interface directly with the computer provides the greatest promise for the educator.

A costly area of concern to today's schools is scheduling. Many schools currently use a computer service to schedule students several weeks before the term

begins. Those who have used such services or have a computer available are aware of the problems: not all students' classes and instructors can be matched without individualized attention; the computer program, if not well thought out beforehand by school officials, may produce unrealistic schedules; and most important, last-minute changes and switches of classes and assignments can produce chaos. The use of a time-shared computer overcomes most of these problems. Last-minute changes can be made and, almost immediately, a new schedule can be analyzed for the impact of these changes. Individual requirements can be fitted into the schedule as they occur, and results can be produced and refitted several times to get the proper schedule.

Grade reporting and distribution can immediately be analyzed by inputting the grades into the computer and then examining such factors as standard deviation, median and average score, adjusted scores, term averages, and even graphing grade distribution.

In summary, time-sharing lends itself well to those administrative functions where school personnel need to retrieve specific data, would like to try out alternatives and manipulate information, or desire to enter information into the computer directly.

### TIME-SHARING IN THE CLASSROOM

Somewhat underpublicized is the value of general time-sharing as a pedagogical tool. General time-sharing (i.e., not rigidly structured as in a CAI mode) perhaps holds the greatest potential of all in the classroom. It works a substantive change in the potential of individual students. It is student-oriented and -initiated in contrast to the "canned" dialog of CAI. It allows the student to ask his own "what if" questions. The student can modify his program while still at the console or Teletype. By modifying his parameters, he can ask "what if" questions as they occur to him; by limiting printout to the particular information or variables being examined, he can get immediate responses to a whole range of premeditated or spontaneous questions. The time-sharer can mold his program as he goes, to follow a changing train of inquiry.

Since the pace is the student's own, the challenge and potential are correspondingly magnified. Professor Kemeny, of Dartmouth College, recently stated that any student using Dartmouth's time-shared computer has sufficient power at his disposal to solve all the WW II calculations performed at Los Alamos in a single afternoon! And secondary and even primary school pupils are using this great potential.

The use of time-sharing in schools is not restricted to the science or math subjects. Students in secondary schools now use time-sharing in geography, social studies, history, and language classes. Time-sharing fosters independent study and research in a subject as

well as being responsive to pre-developed class exercises the teacher can use in a flexible manner.

The computer is no longer mysterious. Students "converse" with it using simple languages like BASIC. They do not have the reticence that seems to intimidate those who did not have this type of computational asset available in their schools. They are the first of a new generation of students who consider the computer as simply another instructional tool.

### THE STATUS OF CAI

Computer-Aided Instruction (CAI) has received voluminous publicity, but its demonstrated performance to date falls far short of its trumpeted potential. The technology is now available — the substantive pedagogical input is lagging. This is not, however, to say that CAI's potential will not eventually be realized. It is simply very early in a game that has proved to be a slow contest.

CAI comes in many varieties, but generally consists of a time-shared computer and a specialized terminal (unlike general time-sharing) which has a console screen for displaying visual material, an audio component for spoken messages, and a keyboard and/or light pen for student response. The typical CAI program flashes words and pictures on the screen, and instructs the child to respond by means of the keyboard or light pen.

An advantage of CAI is that the child's errors are corrected instantly: he gets immediate reinforcement for every correct response he makes. Another advantage is that detailed records of his performance can be kept on the computer and analyzed later. But the major problem is the high cost of the CAI system, which normally requires a terminal for each student. Also, there is not yet any reliable body of research that indicates whether students learn more successfully through these programs than through conventional methods of instruction. And finally, there is the difficulty of producing good CAI material. This will take some time to develop.

### THE FUTURE

It is safe to predict that the base of educational computer power will continue to broaden through the implementation of time-sharing. Storage costs are not as inhibiting in academic use as they are commercially, where the need for large data bases is far more pronounced. Inexpensive time-sharing computers, such as the Hewlett-Packard 2000A and DEC's TSS-8; and inexpensive non-specialized terminals, such as Viatron's (\$35 a month), are becoming increasingly available. And time-sharing programming languages are progressively becoming easier to learn. In summary, general time-sharing is now working a quiet revolution in the schools. ▲



### NEW MULTIPLEXERS

Two new time division multiplexers from Tel-Tech are the TTC-2000 concentrator, which is intended primarily for point-to-point communication links and the TTC-3000, (shown), designed for multi-point networks. Both the TTC-2000 and the TTC-3000 will transmit up to 38 full-duplex channels of data over a single 3KHz Type 3002 voice-grade circuit. The channels may be 110, 135, 150, or 300 bps. The multiplexer can be easily expanded at any time, starting with as few as two channels, by simply plugging in additional channel cards. Operations flexibility is also enhanced by the fact that either unit can be used with any modem, including built-in Tel-Tech data sets, and terminal input/output speeds can be intermixed. Operation is fully automatic, all interfaces are standard EIA RS 232B, and a built-in error control eliminates terminal disconnects. *Tel-Tech Corp., Silver Spring, Md.*

**Circle No. 189 on Inquiry Card.**

### SMALL DISK MEMORY

The PI Disk Memo is a head-per-track rotating memory designed to service many applications in which minimum access time is required at minimum cost. It offers an average access time of 8.5 msec at a cost of less than 3/4-cent per bit. A relatively small unit (10 1/2" x 10 1/2" x 7"), the PI Disk Memo is available in two models, the "800," with storage capacity of 256,000 bits, and the "1600," with 512,000 bit capacity. Typical applications include: program back-up, line buffering, memory refreshing, and core extension. *Peripherals, Inc., Phoenix, Ariz.*

**Circle No. 210 on Inquiry Card.**

### MULTI-FONT COM SYSTEM

The CalComp Graphics Output System 900/1670 is a high-speed, high-resolution off-line COM system that draws at the rate of 500,000 increments/sec. and prints at a rate of 5,000 lines/min., depending upon the size and variation of software generated type fonts. Any type font or variation can be used — in any language. Options include a forms projector with 16 program-selectable forms and a high-speed character generator which increases the average printing rate by 100%. Cameras are available for 16mm or 35mm sprocketed or unsprocketed microfilm, or 105mm microfiche. The system is composed of a Model 900 Controller, a stored program device; the Model 937 Magnetic Tape unit, providing up to 30,000 byte/sec. input to the controller; and the Model 1670 microfilm printer/plotter, featuring a programmable raster of 16,384 x 16,384 positions. Base price is \$130,932. *California Computer Products, Inc., Anaheim, Cal.*

**Circle No. 180 on Inquiry Card.**



### DATA SET

The Model "C" acoustically-coupled data operates in either the originate or answer mode, thus permitting terminal-to-terminal conversations. The Model C is equipped with carrier detect circuitry in addition to having the answer/originate capability. Communicating on either full- or half-duplex lines, data rate is greater than 300 baud, compatible with all Selectric and Teletype printers. The portable unit is housed in a solid walnut case. Unit price is \$425. *Livermore Data Systems, Livermore, Cal.*

**Circle No. 194 on Inquiry Card.**

### TAPE READERS

Three low-cost OEM tape reader mechanisms for use as data communications terminals are compact table-top units which can house modems within their cabinets. Star-wheel sensing is used to sense the holes in the tape, providing contact closures to connected equipment. A chopper disk and associated light source and photocell provide a synchronizing or strobe signal. An end-of-tape switch can be used to signal end-of-transmission. Model 61 is a uni-directional variation of the tape reader. A synchronous motor drives the tape reader mechanism at a constant speed of 60 cps; Model 62 is a bi-directional version with a reversible synchronous motor drive; Model 63 is a bi-directional tape reader mechanism with facility for stopping on a character in both directions. *Computer Mechanisms Corp., Carlstadt, N. J.*

**Circle No. 177 on Inquiry Card.**

### CRT TERMINAL

The Executerm 60 IBM-compatible CRT terminal is a "stand-alone" unit which can operate under OS/DOS, BTAM, or QTAM. It can operate as a remote terminal similar to the IBM 2265, or in a multi-station environment by use of an adapter, i.e., the IBM 2260. This can be achieved without affecting the number of displayable characters per terminal. The Executerm 60 is available with 6 lines of 40 char or 12 lines of 40 char. Hard copy is available as an option, as well as line addressing. Operating speeds are 1200-2400 bps. *Courier Terminal Systems, Inc., Phoenix, Ariz.*

**Circle No. 182 on Inquiry Card.**

### TAPE-TO-CARD

The SMI Tape-to-Card Converter utilizes existing 029 keypunches while retaining all standard keypunching features. Three models are available. Prices begin at \$97.50 per month including service. *SMI, St. Louis, Mo.*

**Circle No. 190 on Inquiry Card.**

## NEW PRODUCTS

### CREDIT CONTROL SYSTEM

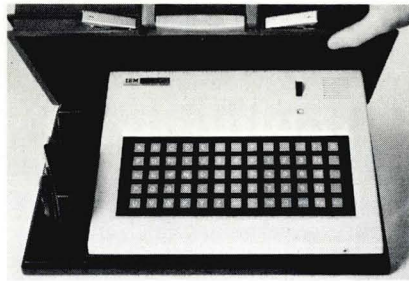
The CREDITMASTER system is a high-speed, on-line credit control system consisting of five basic parts: central processing unit, distributors, authorizers, hard copy printers, and counter-top units. In a typical retail department store operation, the main store, branch stores, and central credit office are all interconnected by low-grade data lines and in-store telephone wire pairs. Telephone-size counter units are placed at most cash register locations in all stores, with access to the central computer through distributor-multiplexers (1 for every 96 counter units). Authorizer units may be located in the central credit office or in branch authorization stores or in both places to permit credit authorization personnel to take appropriate action in cases of questionable credit or fraud. In a typical transaction, the salesperson takes the customer's credit card, keys the card number into the counter unit, places the card and a sales slip into the unit, and closes a door which completes a circuit and sends the information to the central processing unit. Panel lights indicate the status of the customer's credit, and any invalid indication also locks the credit card in the counter unit without imprinting. *Digital Data Systems Corp., Pennsauken, N. J.*

**Circle No. 176 on Inquiry Card.**

### CRT TERMINALS

The TeleTerm family of three alphanumeric desktop displays provide 27 80-character lines (fixed and variable data fields) with blinking and scrolling capabilities. The TeleTerm 1 is Teletype-compatible. The TeleTerm 2 and the TeleTerm 3 (a replacement for the IBM 2265) are higher-speed block transfer displays with lightpen options. All units are available with optional printer, cassette recorder, or built-in data set. Monthly lease prices begin at \$90. *Delta Data Systems Corp., Cornwall Hgts., Pa.*

**Circle No. 213 on Inquiry Card.**



### IBM PORTABLE AUDIO TERMINAL

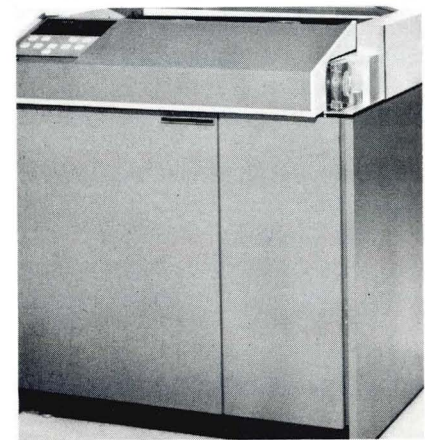
Built into an attache case, IBM's new 2721 portable audio terminal will rent for \$20 a month. The terminal has 60 keys — 26 letters, 10 numerals, and 24 special characters and controls — which can be adapted for specific applications with the use of plastic keyboard overlays. Operation is continuous

for at least eight hours on rechargeable batteries, or the 2721 can be plugged into any 110-volt AC line. (It has a battery charge indicator and an automatic charger.) The terminal measures 16" x 9" x 4" and weighs less than 10 lbs. Storage space is provided for the power cord, auxiliary earphone, extra keyboard overlays, and the acoustic coupler that covers the telephone mouthpiece during transmission. The 2721 uses IBM's elastic diaphragm switch technology (EDST) — flat, pre-wired switches that eliminate mechanical key linkage. The terminal communicates with S/360 Models 25, 30, 40, 50, 65, 75, and 85 through an IBM 7770 audio response unit. Purchase price is \$600. *IBM, White Plains, N. Y.*

**Circle No. 181 on Inquiry Card.**

### TAPE-TO-TAPE CONVERTER

The Litton 9209 Converter transfers typewritten data between MTST/MTSC cartridges and computer-compatible magnetic tape. Operating independent of computer or MTST support, it transfers text data from 300 or more MTST/MTSC cartridges to a single reel of computer-compatible magnetic tape. An optional code conversion software package enables users to access data directly to and from a computer. Text data can then be located and retrieved either automatically or manually at a search rate of 100 inches per second. This allows users to perform text editing under computer control for such applications as file updating, or text editing and purging, and to transfer the data back to MTST/MTSC



cartridge format for revision or final publication. The Litton 9209 Converter is priced at \$21,400 and leases for \$470 per month plus maintenance. *Litton Industries, Meltonics Systems Development Div., Sunnyvale, Cal.*

**Circle No. 195 on Inquiry Card.**

### NON-IMPACT PAGE PRINTER

In its standard configuration, the 1200 is a 1200 lpm asynchronous page printer with a one-line, 80-character buffer. Input is bit-parallel, 7-level ASCII, a byte at a time, with +5V a logical "1" and 0V a logical "0." Data is accepted in a 2 ms increment once every 50 ms, initiated by control signals from the printer. A strobe pulse initiates the transfer of 80 bytes or one line of

information. The 1200 comes out to a standard RS 232B interface. Specific computer interfaces are available on an optional basis as well as a 5-page buffer controller. Parity check is also optional. Plain roll paper with a cutter is standard but fanfold continuous forms are available as an option. The 1200 uses dry developer and toner. *Path, Stamford, Conn.*

**Circle No. 175 on Inquiry Card.**



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## DATA PRODUCTS

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### PG-303A Test Pattern Generator.

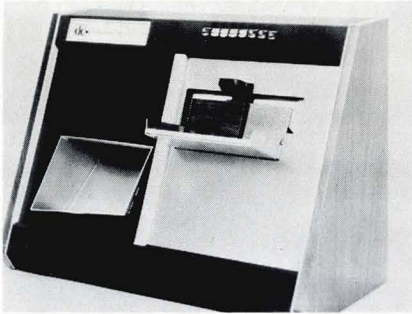
Provides 5 and 8 level "fox" test message,  
a 511 bit psuedo-random pattern,  
and a pushbutton programmable  
one to six character sequence  
with pauses for answer-back checking.  
1 to 49% bias, and end distortion in 1% steps.  
Free running, sequence scan, character step,  
or bit step modes.



### DMS-303A Distortion Analyzer/Error Count Test Set.

Allows digital distortion analysis  
of peak, bias, and end distortion  
of composite character, or any  
selected transition. Features parity error  
check and count, plus pseudo-random and  
reversal pattern generation and bit error count.

## NEW PRODUCTS



### REMOTE CARD READER

The Cardliner 30 accepts Hollerith-coded cards and outputs ASCII code at 300 baud. It can be operated with CRT and GE Terminent 300 terminals or used independently. Cardliner 30 is the latest family of remote card reading terminals which simplify mechanical handling of cards by incorporating only two moving parts: picker knife and rotary feeder. All models are desk-top-mounted and are packaged in contemporary office styling with woodgrain side panels. *Data Computing, Inc., Phoenix, Ariz.*

Circle No. 207 on Inquiry Card.



### DIGITAL MAG TAPE CASSETTE

Specifically designed for digital data recording, cassettes are available with 300 and 150 ft. tape lengths and are certified after final assembly to "zero" dropouts. The cassettes are designed for operation at search speeds up to 120 ips, forward and reverse, and read and write speeds to 15 ips. External dimensions conform to Phillips standard cassette specifications. *Information Terminals Corp., Mountain View, Cal.*

Circle No. 201 on Inquiry Card.

## COMMUNICATIONS TERMINAL

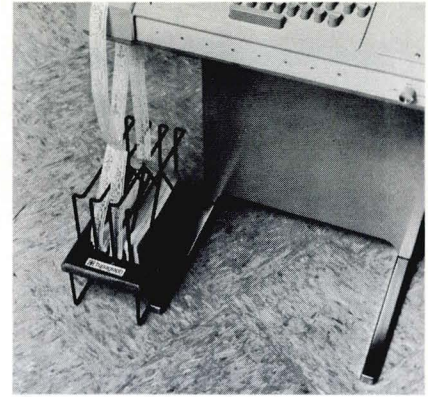
The ASC 1170 is a modular computer system designed for specific utilization as a communications terminal. The basic ASC 1170 terminals utilize the ASC 1100 processor employing core memory expandable to 32K bytes in 4K modules and featuring a 1.1 microsecond full memory cycle time. A read-only memory is also incorporated. Available software includes data compression, validation, formatting, and compatibility programs for use in information retrieval, remote inquiry and other real-time, conversational, or batch-processing applications. Normal communications transmission rates employed are 2000 to 4800 baud, full- or half-duplex, with EBCDIC or ASCII coding conventions. The system is priced from \$12,000. *Applied Systems Corp., Detroit, Mich.*

Circle No. 217 on Inquiry Card.

### GRAPHICS PLOTTER

A computer graphics hard copy printer which is also effective for X-Y plotting, facsimile, line printing, and automatic drafting needs only 5 seconds to place 1,000,000 fine black dots in a 10" square. Each dot is positioned by digital logic to form desired patterns such as alphanumeric characters, geophysical contours, engineering drawings, and financial graphs. No digital-to-analog conversion is required for the Info-Max Printer/Plotter. For facsimile, electronic raster scanning can be done at any speed up to 200 lps. Asynchronous operation for expanding compressed data is inherent. In drafting applications, it prints an 11" x 17" engineering drawing in eight seconds. In line printing, the Info-Max Printer/Plotter will print 8,000 alphanumerics per minute. Alphanumerics from computers or internal character generators are formatted at 800 lpm. The basic unit holds a 250' roll of 11" paper, but rolls up to 2,000' can be accommodated. The unit can also handle fanfold paper. *Info-Max, Palo Alto, Cal.*

Circle No. 197 on Inquiry Card.



### PAPER TAPE STACKER

A paper tape receiver and dispenser that eliminates the traditional mess of tape piled on the floor stands directly under the tape reader and punch and accommodates 500 feet of fanfold paper tape in each of 3 individual pockets. One pocket receives from the punch, one feeds to the reader, and the third receives from the reader. Made of teak and velvet-finished steel rod, the stacker weighs 4 pounds and measures 12" x 6" x 12". The \$30 price includes a box of high-quality re-creating fanfold paper tape and an adaptor to permit use of fanfold paper tape with Model 33 ASR teletypewriters. *Typagraph Corp., San Diego, Cal.*

Circle No. 187 on Inquiry Card.

### PDP-10 SWAPPING DRUM

A high-speed, fixed-head drum memory, which can significantly increase the number of simultaneous users in a typical PDP-10 time-sharing configuration, features a storage capacity of 345,600, 36-bit words, access time of 8.3 milliseconds (at 3600 rpm), and a transfer rate of more than 240,000 words per second. Four RM10B units can be supported by a single control unit. Priced at \$50,000, the RM10B operates under the principle of a flyball governor as a fail-safe system against costly head crashes. Under this principle, the drum, which is slightly tapered, automatically retracts from the 540 heads in the unit whenever rotation drops below 65 per cent of the device's operation speed. *Digital Equipment Corp., Maynard, Mass.*

Circle No. 216 on Inquiry Card.



## MAGNETIC-SENSIBLE ENCODING

Synchron is a distinctly-different encoding technique which involves actually implanting individual bits of code as discrete physical units in the medium itself. The coding is imbedded in, and protected by, the medium. Synchron code can be severely abused without altering the information. Density is 420 bpi. External magnetic fields, high temperatures, or other forms of mistreatment will not affect the data, since Synchron is a physical, rather than a magnetic recording technique. Synchron encoding is read from the plastic surface of a credit card with a specialized device said to be less expensive than other types. Encoding is self-synchronizing with the reader. Recorders are available for attachment to existing machines making cards, tags, etc., in which case imprinting, embossing, and encoding occur at the same time. Encoding need not be isolated from printed matter. Both sides of a credit card, for example, could be utilized completely for man-readable information over which the Synchron code would be magnetically readable. *Synergistics, Inc., Natick, Mass.*

Circle No. 205 on Inquiry Card.

## TV SCANNER

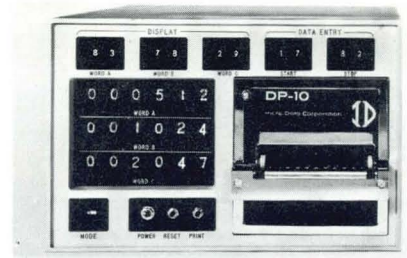
The Megadata S/R 1000 attache case-sized digital scanner converts any TV set into an instant communication station over which computer information can be displayed. An electronic alphanumeric keyboard provides the "conversational" communication link with the computer. The requested information and detailed replies are instantly displayed on the TV screen. Programs being televised are automatically blanked out in the set to allow the S/R 1000 to function. The scanner enables any time-shared computer system to be accessed simply by telephoning the computer's number after attaching the S/R 1000 to the TV set's antenna terminal posts. *Megadata, Deer Park, N. Y.*

Circle No. 184 on Inquiry Card.

## DATA ACQUISITION SYSTEM

The DAS 8000 Series system consists of a single compact housing with all IC plug-in assemblies for systems components including scanner control, comparator, digital clock, programmer, serializer, source select, and program computer interface. A six-digit numerical display serves as a time-shared readout for channel ID, time, and calendar. Comparator status is displayed above the data, and provision is made for up to eight flags to be displayed below the data for indicating system conditions such as standby, display only, recorder ready, comparator error, time error, recorder error, and other desired status symbols. The system scans up to 600 channels of analog signals—random or sequential scanning—with speeds up to 23 channels per second, and records with up to 16-character words (32 optional) on any input media. *Cimron Div. of Lear Siegler, Inc., San Diego, Cal.*

Circle No. 179 on Inquiry Card.



## DIGITAL DISPLAY AND PRINTOUT

The DP-10 digital display and printout for monitoring data acquisition systems contains an MOS/FET temporary memory. Operators may select any three data words from a data frame being recorded for display as a 6-digit decimal word or for decimal printout on 3" paper tape. Standard entry includes time words (BCD), external digital characters (BCD), or converted analog data (binary). Converted analog data is entered in 11-bit binary form and converted to the decimal equivalent for display or printout. *Incre-Data Corp., Albuquerque, New Mexico.*

Circle No. 200 on Inquiry Card.

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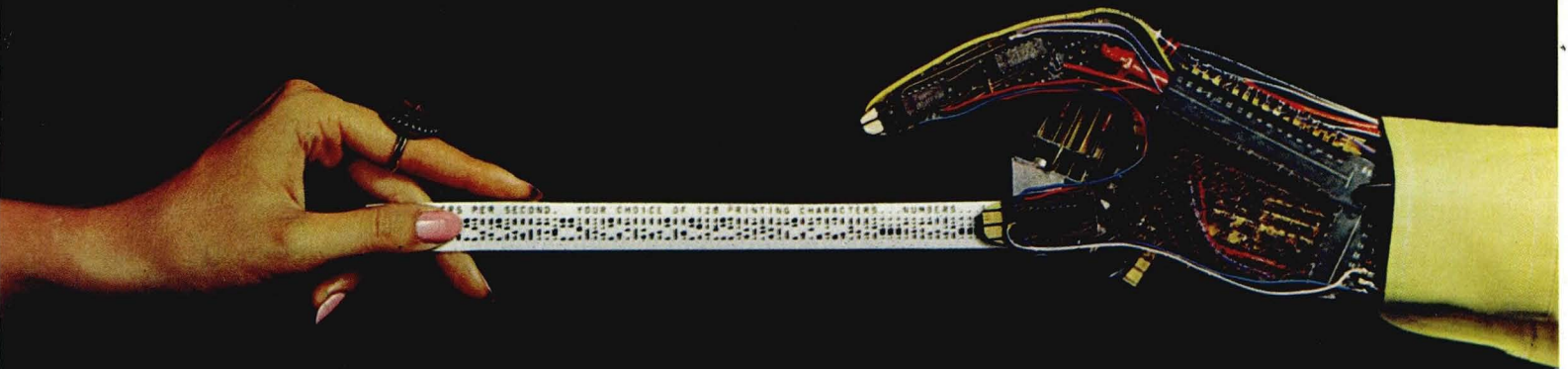
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CIRCLE NO. 46 ON INQUIRY CARD

# Dual Image... A New Data Entry Media



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Operators will find Dual Image perfect for data capture. Each character keyed is immediately visible, just like a typewritten line. Data is then transmitted over standard voice grade lines at 120 characters/sec. Your computer gets the most

data per dollar. Since the computer and the keyboard can activate the same printer, both the inquiry and response can be printed next to each other on the same tape...providing a permanent hard copy record too!

### Correcting Non-Valid Data— Dual Image Really Shines

Source document errors are quickly discovered using the computer's editorial ability. Data unacceptable to the computer is "returned to sender" with white space replacing questionable data. Correction means simply filling in the blanks, and re-transmitting. No more time wasted in finding that the computer would not accept your input...no more hooking of the right correction to the wrong record. Suspense files are gone...memory needs are eased!

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## NEW SOFTWARE AND SERVICES

### S/360-85 TIME

Users of data processing services are now able to purchase computing time on an S/360 Model 85 on a shared basis. The new services will be marketed in the north-eastern U.S. by EDP Resources, Inc., which has an exclusive agreement with Systems Dimensions Ltd. of Ottawa, Canada, owner of the new \$11 million IBM system. The Model 85 is the most powerful IBM computer currently available for both commercial and scientific applications. *EDP Resources Inc., New York, N.Y.*

Circle No. 247 on Inquiry Card.

### 1130 RETRIEVAL SYSTEM

An interactive data retrieval program, for use on an IBM 1130, is designed to operate directly from the console or, if the 1130 is so equipped, via a remote terminal. Batch mode processing is also possible. The program handles both the numerical and textual fields of a data bank with equal ease. Selection of a particular subset of data can be accomplished by prescribing that certain properties be "greater than," "less than," "equal," or "not equal," to some value or that they "start with," or "contain," some element. Sorting of the selected data can be on the basis of numerical value or alphabetical order. The output of the selected and sorted subset of data can be directed to either the console, a remote terminal, or a line printer. Furthermore, the particular subset items to be listed can be chosen interactively, or prestored instructions can be utilized. Complete freedom, including the insertion of global headings, local headings, date, and paging is available to the user. *Aeronautical Research Assoc. of Princeton, Inc., Princeton, N. J.*

Circle No. 236 on Inquiry Card.

### EDUCATIONAL SERVICES

Pace Computing Corp. has announced a 58-course expanded curriculum in Advanced 360 Technology. Pace-Plan '70 is composed of four elements: On-Site '70, Pace-Site '70, Site-Plan '70, and Project '70. On-Site '70 is an extension of Pace's previously-announced plan to provide OS/360 education at the client's location with continuing consulting support. Under Pace-Site, the company is offering five modular programs composed of a total of 18 courses to be presented at its Technical Center in Arlington, Va. Site-Plan '70 offers regional presentations of the Pace curriculum to meet the needs of clients from more than one firm desiring education in the same subject area. Project '70 employs capabilities in local OS/DOS batch processing, Datatext, APL, Conversational Remote Batch Entry (OS/MVT CRBE,) and Remote Job Entry (OS/MVT RJE). *Pace Computing Corp., Arlington, Va.*

Circle No. 254 on Inquiry Card.

### INTERACTIVE DATA MANAGEMENT

DS/1, an interactive data management system operates under DOS on S/360s beginning with the Model 30 (min. 32K core) and with either 2311 or 2314 disk storage. DS/1 accepts inquiry, updating, or error-correction commands typed in standard English phrases and responds similarly. The user can count how many entries in the file meet criteria he specifies at the terminal, print the entire contents of the qualifying entries, or print selected information in any order he desires. Basic monthly lease price is \$350. *System Development Corp., Santa Monica, Cal.*

Circle No. 250 on Inquiry Card.

### DYNAMIC MULTI-TASKING

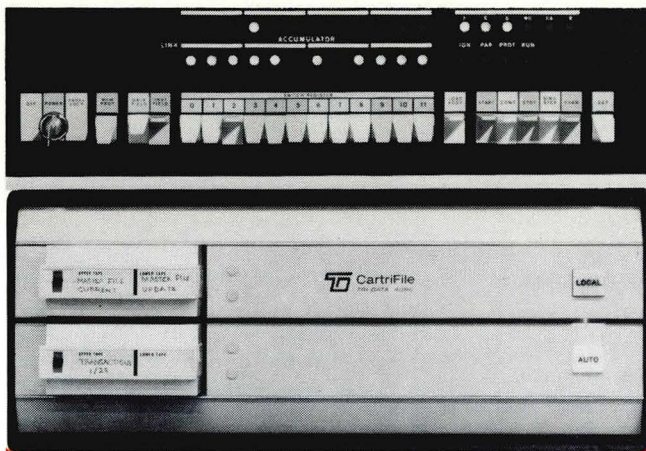
Dynamic Multi-Tasking System for DOS users consists of a partition control program and user program linkages which allow up to nine independent user programs (Cobol, Fortran, or BAL) to be executed concurrently as subtasks within any of the three DOS partitions. DOS is never altered in any way, and minimum modifications of user programs are required, with no coding of multi-tasking macros by the user. The mix of user programs executing as subtasks and the assignment of peripherals to those programs are dynamic conditions controlled by the user rather than being inflexible. *Western Systems Inc., Salt Lake City, Utah.*

Circle No. 263 on Inquiry Card.

### REVISED PERT PLOTTER

EZPERT, "Release Two" is said to be 30% faster than the previous version, which was designed and developed in accordance with specifications defined by major government agencies and PERT user organizations. EZPERT automatically produces plots of PERT networks without manual intervention. The program is modularized, hardware independent, and has over two dozen optional special features for user flexibility. EZPERT interfaces directly with the user's PERT/TIME system (e.g., PMS/360, CDC P/T, Univac P/T, Burroughs' PROMIS, Honeywell P/T, USAF P/T, NASA P/T, etc.); and with most computer-driven digital plotters (e.g., drum, flat bed, CRT, microfilm, laser, etc.). EZPERT is sold by perpetual use license for a one-time charge of approximately \$25,000 for the standard package with standard interfaces. Optional features are available for \$250 up. Custom features desired are individually negotiated. The EZPERT standard package is available in either activity or event format. An option permits the user to plot both types of networks. *Systonetics Inc., Anaheim, Cal.*

Circle No. 258 on Inquiry Card.



## Replaces Paper Tape

CartriFile Magnetic Tape System does the job of a paper tape reader and perforator — at higher speeds (up to 667 8-bit bytes/second) — with greater data reliability and mechanical reliability. Cartridge loading allows fast changes in program sequences. Data logging capacity is increased because each plug-in cartridge stores as much data as two 10" reels of paper tape (240,000 8-bit bytes) — *and they are reusable thousands*



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CIRCLE NO. 48 ON INQUIRY CARD

# Keyboards for OEM's

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## NEW SOFTWARE AND SERVICES

### INCOME TAX SERVICE

The Multicomp Tax System differs from other computerized income tax return preparation systems that use the "batch processing" method in that preparers do not fill in tax data on prescribed input forms that are then mailed to a processing center. No particular input forms are required for the Multicomp System. The preparer may enter the tax data in random sequence directly from original source documents on a terminal connected to his office telephone. The computer organizes and stores the data as it is received and computes and prints the completed tax return on the preparer's terminal. Each item of data is checked as it is entered, and the computer responds immediately with an appropriate error message whenever incorrect entries are attempted. The new system is said to enable the professional tax preparer to obtain completed tax returns in a matter of minutes, despite the complexity of the return. After all the data is entered, the computer analyzes it and prints a comprehensive diagnostic report that calls the preparer's attention to apparent violations of statutory requirements, inconsistent data, and overlooked deductions. Errors disclosed by the diagnostic report are corrected and the computer then determines the method of computation resulting in the lowest tax. The corresponding federal and state income tax returns, with necessary supporting schedules, are then printed on the typewriter terminal. The system is being offered for the 1969 tax season to tax professionals in the Boston and New York metropolitan areas. Plans are already under way to establish Multicomp Tax System offices in most major U.S. metropolitan centers. *Multicomp Inc., Wellesley, Mass.*

Circle No. 253 on Inquiry Card.

### IBM KEY-TO-DISK

DATA/360 simulates the functions of an IBM 29 key-punch and 59 verifier on IBM 2260 display stations. Users enter data from their 2260s to an IBM 2311 or 2314 direct access storage device, bypassing punched cards in those applications that do not require unit records. The operator can verify the accuracy of the data being entered from the screen, backspace to correct errors, and resume keying data. In addition, key verification can be accomplished by re-entering the data and allowing the computer to compare it with the original entry. DATA/360 will run on an IBM S/360 Model 30 or larger with at least 65,000 bytes of core storage. It operates under DOS and is written in Assembler language. Scheduled for delivery in the fourth quarter of 1970, DATA/360 will support up to 24 IBM 2260 display stations. It is being offered under a license agreement at a monthly charge of \$50. *IBM, White Plains, N.Y.*

Circle No. 252 on Inquiry Card.

## SOURCE PROGRAM MAINTENANCE

The Delta Source Program Maintenance System stores all source programs on tape, thus eliminating the need for card deck manipulation. Options available to the user include: full program maintenance; listing of source programs; reproductions of up to three source decks; compilations and runs from tape; addition, deletion, and resequencing of source programs; and changing program identifications. *Delta Data Systems, Inc., College Park, Md.*

Circle No. 241 on Inquiry Card.

## FIXED ASSET ACCOUNTING

Fixed Asset Accounting Package is written for any S/360 tape or disk configuration. A version is also available for the Model 20 MFCM card system. The package handles the four major depreciation methods. Conversion from declining balance to straight line is effected automatically by program control. There are fifteen programs in all, including file load and maintenance, updating, and reporting capability. The entire package may be purchased for \$3600. *McCormack & Dodge, Needham Heights, Mass.*

Circle No. 260 on Inquiry Card.

## REPORTING SYSTEM

A Simultaneous Reporting System allows a selective retrieval of reports upon request. The user fills out inquiry cards which generate his desired report. A maximum of forty reports can be produced in one pass of a given data file. The system consists of three phases: the first edits the inquiry cards and builds an inquiry table; the second utilizes the inquiry cards to select the desired records prior to printing a report; the last step sorts the Inquiry Data File; and summarizes, and prints multiple inquiry reports. *Chilton Computer Co., Dallas, Texas.*

Circle No. 235 on Inquiry Card.

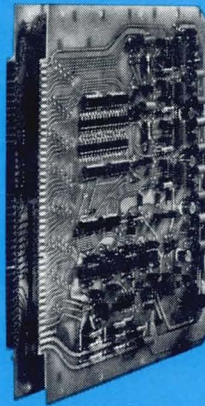
## PROJECT CONTROL PACKAGE

PAC (Project Analysis and Control) is available for computers with direct access storage devices. The system stores information on projects being designed and/or programmed by each individual segment of the project. It provides information to analyze the time and cost of each project and segment of the project, provides estimated completion dates and cost figures, and flags potential problem areas. Core requirements are set at 65K with disk storage, although it can be implemented on a 32K computer using available "pull down" routines. *International Systems, Incorporated, King of Prussia, Pa.*

Circle No. 246 on Inquiry Card.

# SMALL BARGAIN!

Up to 4K x 6 • 5  $\mu$ s • 135 cu. in.—\$1326.  
PDM-12 STANDARD Core Memory Systems



Let's face it! While the PDM-12's *small size* makes it great for applications where space is a premium, it's the *small price* that surprises so many people.

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# THE STANDARDS!

Ultra-reliable 2K or 4K x 8 or 9 at 3  $\mu$ s  
PDM-13 STANDARD Core Memory Systems

The Planarstack construction of the PDM-13 has a lot more going for it than low cost. The flat-plane continuous wiring eliminates most of the plane-to-plane solder connections that are a serious cause of failure in conventional memories.

Better heat transfer is assured by our proprietary matrix bonding technique. And, the use of DTL and TTL integrated circuit logic is an important reliability factor.

Mostly, however, it's the word "Standard" that signifies maximum dependability.



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## NEW LITERATURE

### TAPE MEMORY

Description and performance specifications of Ampex Model TMZ digital tape memory system is contained in new brochure. The TMZ is priced at \$3,600 in production quantities. It is designed for a wide variety of on-line and off-line uses, ranging from minicomputers, terminals and keyboard-to-tape systems, to stand-alone print stations and data acquisition systems. *Ampex Corp., Redwood City, Cal.*

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### SYSTEMS COURSES

Two brochures outline upcoming courses designed for Systems Analysts and General Management to be held in New York City and Washington, D.C. during March and May. *Wiley Systems Inc., Bethesda, Md.*

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### RUGGEDIZED 620/i

Ten-page brochure describing the Varian R-620/i, a ruggedized version of the Varian 620/i, discusses its design, specifications, and instructions. *Varian Data Machines, Irvine, Cal.*

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### INTERACTIVE DISPLAY SOFTWARE

Software packages available for the IDIOM Interactive Graphics Display System are described in a concise 8-page booklet which outlines the function and use of such packages as the Fortran package, MOS master operating system, IDAS and DAS programming system, AID debugging package, TED text editing subroutine, TRAK light-pen tracking program, and a variety of graphics routines. *Information Displays, Inc., Mt. Kisco, N.Y.*

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### SOFTWARE PACKAGES: MAKE OR BUY?

Booklet discusses the pros and cons of developing your own computer software versus purchasing existing software packages. The booklet outlines areas to be considered in estimating in-house costs of software development and what to look for in procuring packages already developed. *Computing Corp. of America, Inc., Englewood, Colo.*

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### EDP TEXTBOOKS

A free 28-page catalogue of books on data processing-related subjects includes books written for managers with limited experience of DP, as well as technical texts on specific information science applications. *Brandon/Systems Press, Princeton, N.J.*

Circle No. 310 on Inquiry Card.

### MODEM APPLICATIONS

A 12-page illustrated applications brochure on two high-speed data sets discusses various facets of the Rixon "Sebit" Models 72 and 96 including such items as theory of operation, applications, actual modem operation, test results, and detailed specifications. The Sebit-72 operates at pushbutton selectable speeds of 7200, 4800, and 3600 bps over C-2 conditioned circuits. The Sebit-96 operates at 9600, 6400, and 3600 bps over C-4 conditioned circuits. Price is \$9,950 for either unit. *Rixon Electronics, Silver Spring, Md.*

Circle No. 324 on Inquiry Card.

### CASSETTE STORAGE

A peripheral system that expands the information storage and retrieval capabilities of minicomputers is described in two brochures. The Compu/Corder 100 magnetic tape transport can access data within an average of 12 seconds along 300' of tape utilizing a high-speed direct-access mode. Storage capacity of each unit is 3.6 million bits. Note: The recording density of the Compu/Corder 100 is 1000 bpi. The figure used in our January *New Products* section was the result of a typographical error. *Sykes Datatronics, Inc., Rochester, N.Y.*

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*These securities have not been and are not being offered to the public.  
This advertisement appears as a matter of record only.*

NEW ISSUE

# Ads

\$3,000,000

## American Data Systems, Inc.

10,000 Shares Common Stock

3,000 Common Stock Purchase Warrants

*We negotiated the direct placement of these securities.*

## White, Weld & Co.

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LOS ANGELES MINNEAPOLIS NEW HAVEN PHILADELPHIA SAN FRANCISCO  
LONDON PARIS ZURICH GENEVA CARACAS HONG KONG MONTREAL

January 29, 1970

CIRCLE NO. 50 ON INQUIRY CARD

## COMPUTER-AIDED LOGIC DESIGN

A 16-page brochure describes DART — Design Analysis and Review Techniques—a new free-field computer program to optimize the effectiveness of engineering talent while conserving time and expense between product inception to production. Input to the program starts at the logic diagram. System analysis, including error detection and correction, documentation, and the production of punched paper tape for numerically controlled wiring are all procedures within the capability of DART. *Data Technology Corp., Palo Alto, Cal.*

Circle No. 316 on Inquiry Card.

## AUTOMATIC TIME STUDY SYSTEM

E-DAC, an automatic time study system, is described in a 4-page, illustrated brochure. The system eliminates the need for reading a stopwatch, writing down times, calculating and classifying data, and analyzing results. Elemental times and events are recorded and printed on paper tape. A complete computer analysis and data bank service compiles and stores the data and prepares a summary report for \$3.50 per report plus \$0.01 per line of data. *Baxter Electronics, North Anson, Maine.*

Circle No. 309 on Inquiry Card.

## PROGRAM LIBRARY UPDATE SYSTEM

A 14-page brochure describes Cullinane Corp.'s "PLUS" Program Library Update System. The \$1500 program is a means of centralizing all source programs on a tape or disk library with a simple one-card control. *Cullinane Corp., Boston, Mass.*

Circle No. 315 on Inquiry Card.

## HIGH-SPEED PRINTER

A 16-page brochure outlines the ability of A.B. Dick Co.'s Videojet high-speed ink jet printer to print data from phone lines at 250 chars/sec on any continuous business form, including offset masters. *A.B. Dick Company, Chicago, Ill.*

Circle No. 301 on Inquiry Card.

## TIME-SHARING CAPABILITIES

"An Introduction to VP/CSS" is the title of a capabilities brochure from Computer Software Systems, Inc. The 17-page brochure discusses the concepts and advantages of various types of time-sharing as well as the customer support programs and educational services provided by CSS. *Computer Software Systems, Inc., Stamford, Conn.*

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## COBOL SYSTEM

New literature describes improved version of Atlantic Software's SCORE Cobol Program Generator, reporting and file management system. New capabilities include multiple input and output file handling, automatic matching of master and detail files, and execution time date retrieval. *Atlantic Software Inc., Philadelphia, Pa.*

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It's no dream. Our incredibly low price is absolutely for real. How? Simple. No blue sky over-engineering, no idle parts sitting — and costing — till user requirements catch up. This keyboard display terminal is a completely self-contained, stand alone unit: with keyboard, video presentation, control and refresh electronics, data phone interface, and power supply. Just plug in and you're on line. It's available for immediate delivery. For further details, write for our free brochure or call collect.



Infoton

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SECOND AVENUE, BURLINGTON, MASSACHUSETTS 01803 (617) 272-6660

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# Foxboro is doing unheard of things in computer control systems.

In a cement plant, a Foxboro system supervises and controls production of over 12,000 barrels of cement a day, by optimizing blending costs. The optimization program directs automatic X-ray spectrographic analysis of raw materials. The supervisory program's results determine direct digital control of blending, raw mill, kiln, cooler and finish mill operations.

In a refinery, a Foxboro system provides supervision and direct digital control of 100,000 barrels per day at nine plants. It handles flow integration, proprietary control calculations, plant accounting, feedforward control, periodic and demand logging and non-interacting control. It also calculates liquid, steam and gas flows at 200 streams per minute on a running daily basis, and compares it to the previous day's total.

In a power plant, a Foxboro system monitors over 1,000 variables on a triple-unit power plant, executing alarming, logging, trending and performance calculations. It also maintains a running history for 50 points in each unit and prepares trip sequence records for 30 points whenever a unit begins to fail.

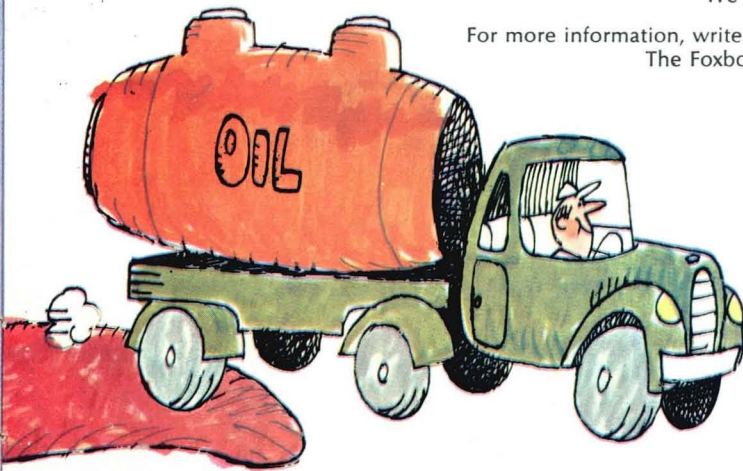
These are only a few of our accomplishments. New computerized process control systems, larger, more advanced and more complex, are being developed at Foxboro now. Today.

Tomorrow, Foxboro systems could be working anywhere, from Argentina to Zambia.

They'll demand the talents, skills and dedication of a wide range of specialists. Software systems designers, applications programmers, computer systems engineers, process control engineers and other professionals with experience in digital process design are invited to join us in creating these new systems.

We offer you the opportunity to change the world, around the world.

For more information, write or call Tom Bryant (617) 543-8750, Professional Placement Office, The Foxboro Company, Dept. M, Neponset Avenue, Foxboro, Mass. 02035.  
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It comes with our own vacuum tape drive.  
All for under \$3000.**



Our V-SERIES transport is the simple solution to problems of pampering magnetic tape. The plastic cartridge shown above houses standard 8½" reels and tape. The reel is put into the cartridge, the cartridge is put into the tape drive, the tape is threaded

and advanced to the load point automatically. The system eliminates contact between the non-technical operator and tape. It also protects the tape in a non-computer environment.

The V-SERIES is unique in other important respects. Operated entirely

by vacuum, it has only one mechanical moving part. Our "subtraction modularity" principle gives you a choice of packs to fit your specifications and price—from a rack-mounted deck to the complete unit. \$1700 to \$3000 in quantities of one.

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CIRCLE NO. 52 ON INQUIRY CARD



**at 27 lbs.,  
the Execuport 300  
is the lightweight portable  
data transceiver that  
does a heavyweight job.**

Meet the champion. Lightning fast. Quietly professional. Truly versatile. Solidly reliable. Always ready to go to work . . . anywhere. That's Execuport 300, our thermal page-printing data transceiver.

*How fast?* A switch lets you choose among three speeds: 10, 15 or 30 characters per second.

*How quiet?* In stand-by, all you hear is the hum of the cooling fan. In operation, the sound of the printhead is an unobtrusive tapping. *How versatile?* The keyboard provides 96-character USASCII capability, including symbols and lower-case alphabet.

*How reliable?* As dependable as today's solid-state technology can be.

And, best of all, Execuport 300 is ready to go to work . . . anywhere. Keyboard, thermal page printer, solid-state control logic, telephone coupler, data access jack and interface, plus a universal interface for peripheral accessories—all components are enclosed in an attractive, integral carrying case.

Weighing in at 27 pounds, the Execuport 300 is a lightweight doing a heavyweight job. Is it any wonder we're claiming the title this early in the game?



**COMPUTER TRANSCIVER SYSTEMS INC.**

123 Pleasant Avenue, Upper Saddle River, New Jersey 07458