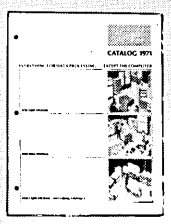
DATAMATION®

71
December 1

OPTICAL CHARACTER RECOGNITION

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

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



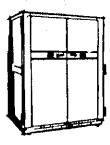
It's so easy to solve your data processing accessory needs with the Wright Line Catalog

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

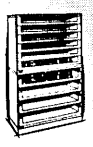
2. If additional information is needed when ordering or planning installations, call your local branch office and ask to have one of Wright Line's more than 125 field specialists call on you.

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

Everything for data-processing . . . except the computer



DATA-BANK SAFES



DISK STORAGE

CARD FILES

TAPE STORAGE

SYSTEM/3 ACCESSORIES

Wright LINE

DATA PROCESSING ACCESSORIES

WRIGHT LINE • A DIVISION OF BARRY WRIGHT CORPORATION, 160 GOLD STAR BLVD., WORCESTER, MASS. 01606

CIRCLE 17 ON READER CARD

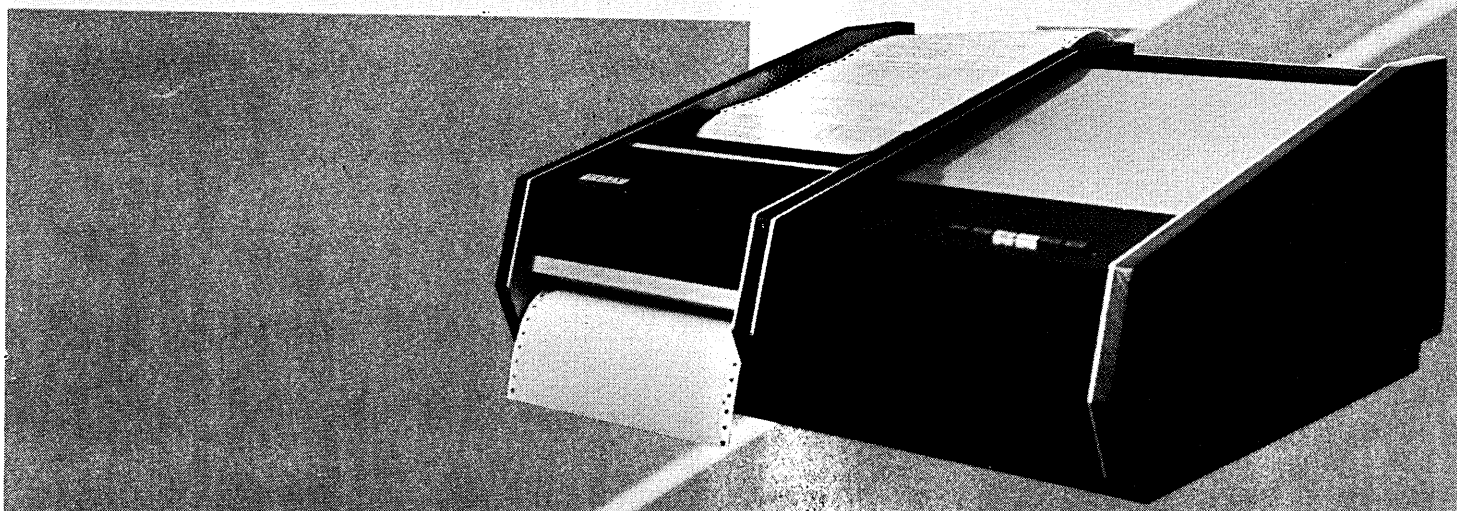
NEW TALLY PRINTER TERMINAL

100 lines per minute, install it, forget it.

Line after line. Month after month. Copy after copy. Good environment or bad. The new Tally line printer consistently gives you crisp, multi-copy printout without downtime. Without worry. Without adjustments. Initial customer installations have proven it. The most reliable impact printer to hit the market. Ever.

A truly innovative design . . . a print mechanism with only two moving parts. Simplicity . . . nothing to adjust. Virtually maintenance free. Truly exciting.

You should have one. Let's communicate. Call us now to arrange a demonstration.

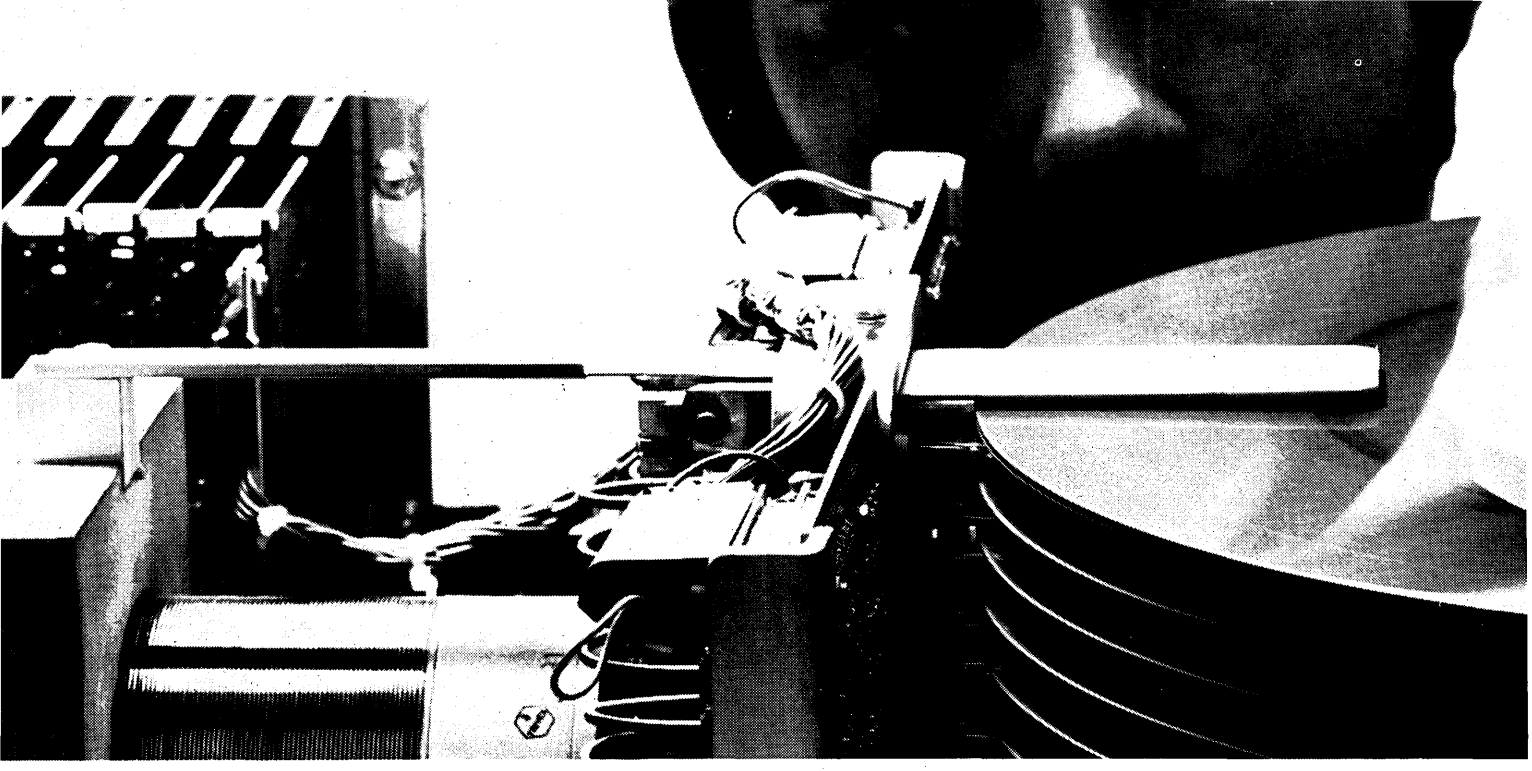


TALLY

DATA TERMINALS • PRINTERS • DISC MEMORIES • CARD READER TERMINALS • PAPER TAPE PERIPHERALS

TALLY CORPORATION • 8301 S. 180TH ST. KENT, WA. 98031 • (206) 251-5500

CIRCLE 4 ON READER CARD



Look at a CalComp disk drive. It's faster than IBM's.

Now look at the leases.

A CalComp lease assumes that CalComp is going to be improving their equipment all the time.

An IBM lease assumes the same thing. Except, they won't write you a 3 or 4-year lease.

We will.

If you want to add equipment we'll do it without lengthening your lease. Or as your performance requirements grow, we'll re-write the lease with no penalty.

IBM won't.

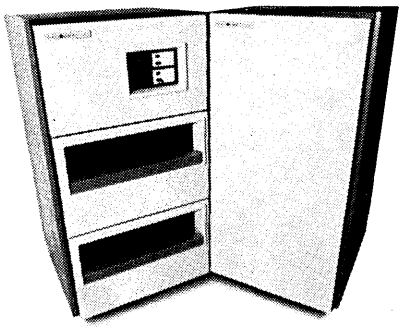
And CalComp is faster than IBM. The start and stop time is faster. And the access time is faster. So you'd get more for your money, even if CalComp equipment cost as much as IBM.

Except, it doesn't.

CalComp is less to lease. And less to own.

So look at a CalComp disk drive, then look at IBM's. Then compare leases.

Then write us at California Computer Products, Dept. DM-12-71 2411 West La Palma Avenue, Anaheim, California 92801. Or call (714) 821-2011.



CALCOMP

DATAMATION 71®

DECEMBER 1, 1971

volume 17 number 23

GENERAL

MANAGEMENT

COMMENTARY

About the Cover

A steady gaze at ocr machines focuses on the sudden increase of users. Although costs are coming down, there's no really clear view of this expanding market. What the machines see is still what you get. Design is by our art director.

departments

DATAMATION®

DECEMBER 1, 1971

volume 17 number 23

This issue 110,337 copies

Circulation audited by Business Publications Audit BPA

ABP Member, American Business Press, Inc.

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

DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $25 annually in the U.S. and Canada. Reduced rate for qualified students. Foreign subscriptions are on a paid basis only at a rate of $38 annually. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, O. and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000, Greenwich, Conn. 06830. Copyright 1971, Technical Publishing Company. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 North Zeeb Road, Ann Arbor, Michigan 48106.

Printed by Beslow Associates, Inc.

The Xerox Mini Disc.

A small contribution to improving your memory.

Frankly, the introduction of the Xerox 727 fixed-head mini disc will not revolutionize the industry.

Our specs are good, but not unique: Disc speed 3600 RPM; average access 8.3 ms; 50,000 bits per track; data transfer rate of 3 Megabits/sec.; and a 3.2 Megabit storage capacity. (You can hook up to four units to a single controller and get 12.8 Megabits capacity.)

So why are we entering a crowded field with a high attrition rate?

Because we do have something unique to offer: a reliable product from a reliable company.

We've been making discs for several years now, and using them in our own systems. We've installed over 1000 and they've run up an enviable reliability record. Now you can get the same technology in a smaller package and at a smaller price.

So, while the reliability of our hardware contributes in a small way to improving your memory, the reliability of our company will make a large contribution to your peace of mind.

To get more information call (213) 679-4511, ext. 1147, or write to Xerox Data Systems, 701 South Aviation Blvd., El Segundo, California 90245.

Xerox Data Systems

XEROX®

CIRCLE 7 ON READER CARD

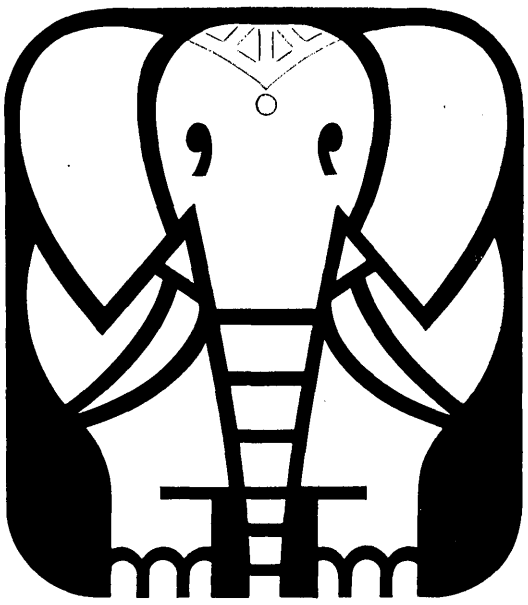
WHY PAY MORE FOR VIRTUAL MEMORY?

You don't need to. Not when Burroughs offers you a whole series of moderately priced systems (the B 2500, B 3500 and B 4500) with built-in virtual memory performance.

These systems use Burroughs unique simplified program segmentation technique, dynamic memory management, and a comprehensive Master Control Program. In this way they deliver full virtual memory performance without costly "extras"—like extra programing, extra-complex hardware, extra operating considerations.

Virtual memory performance means, of course, that your Burroughs computer doesn't have to have a very large main memory for the sake of a few very large programs. Rather, you save money by getting the work done at less cost with a more efficiently used machine.

Burroughs introduced virtual memory performance to users of medium size systems back in 1966. Isn't it time you found out more about it? Ask your Burroughs representative for information. Or, write to us in Detroit, 48232.



Burroughs

UNIVAC, RCA TALK CUSTOMER BASE SALE...

Still a possibility, as this is being written, is the acquisition by Univac of RCA's customer base. We hear it consists of 550 customers and 1,000 computers, 700 on rental and 300 purchased. Negotiating over this were 3-man teams from both firms, RCA's group coming from corporate rather than the Computer Div.

Univac's ability to use the user base was questionable prior to its introduction last month of the 9700 which offers 360 compatibility and could be a move for 70/35 and 45 users. One big problem in buying the customer base would be getting user approval for the transfer of contracts. A $60 million offer by Telex for a "sanitized" customer base was turned down by RCA, which apparently would like to transfer some responsibility with its equipment. Xerox was rumored to be considering buying RCA's West Palm Beach plant.

AS IBM PLAYS IT COOL...

IBM has memoed its sales force not to go into RCA installations uninvited. Salesman getting an order from a refugee RCA user will be put through a "grand inquisition" to make sure he did not violate the edict, say sources.

AND ONE USER THREATENS SUIT

In the first week in November, Marketime Corp., N.Y. City data center and leasing company with 10 purchased Spectras, sued RCA alleging "damages due to the RCA withdrawal from the computer business," to the tune of $110,414,126. Nine of the firm's systems are on long term leases.

ICL WEIGHING CONSOLIDATED RESCUE

When we last looked, ICL still was trying to make up its mind whether it would bail out troubled Consolidated Computer of Canada. An ICL team has been probing the Consolidated operation for weeks now. The way we hear it, the deal would involve ICL getting some 35 or 40% of the data entry firm.

MEET ME IN ST. LOUIS OH HARD WORKING 195

IBM's monstrous 360/195 computer has found a welcome home in St. Louis where McDonnell Douglas Automation Co. plans to install a second machine this month. All of this despite published rumors that the big computer utility didn't feel the reliability of the 195 installed last July was up to what IBM had promised. When this second 195 is operational around Feb. 1 the company will send back to IBM two 4-megabyte 360/85s--one from St. Louis, the other from Long Beach, Calif. The 85 at Long Beach will be replaced by a 370/165, but the center there will be able to access the 195 in St. Louis.

ALL IN THE FAMILY KIND OF...

Two former executives of Computer Development Corp., an Orange county, Calif., minicomputer manufacturer which both opened and closed its doors in 1970, have formed two new minicomputer companies, both in Orange county. One was unnamed at writing. The other had been hastily dubbed MCC. The first, headed by former CD president Bill Roessl, had purchased design rights

to the defunct firm's 16-bit CD 200. MCC (the initials were "picked from the air" when a selected name didn't pass the search test) is headed by one-time CD vp, engineering, Richard Pasternak who says his firm's mini, now in design stage, will be "bigger, better, faster and cheaper" than the CD 200. MCC is backed by "another California corporation." We hear it's a big DEC customer.

VIATRON ALUMS DO THEIR THINGS

It had to happen sooner or later: Viatron spin-offs are beginning to turn up around Boston. One ex-Viatron man, Homer Carney, president of Business Information Systems of Waltham, has installed an on-line file management system in a small bank. Another Viatron alumnus, Steve Kaczeus, has designed a low cost printer for Printer Technology Inc. of Woburn and ex-Viatron engineers, George A. Kwasniewski and Dietrich Jung are developing an "ecological engine" for Idea Development Laboratory of Medford.

CONTROL DATA EYES DATA ENTRY MARKET

We hear that Control Data is taking a hard look at the shared processor data entry market. The product CDC is evaluating is a key-to-disc system made by one of its affiliates in Israel. We understand that some systems have already been installed and that they are of the larger sophisticated types rather than the smaller garden-variety turnkey systems.

A FINAL TEST FOR UNICON

Precision Instruments Inc.'s first Unicon, a trillion bit laser memory system, moves into the real world this month as it begins final acceptance testing at NASA's Ames Research Center, Moffett Field, Calif. The testing is expected to be completed by late January. In the meantime, PI's first Unicon customer, Amoco Productions in Tulsa (formerly Pan American Petroleum) is still waiting, perhaps to see how things go at Ames. This firm's original installation date of March 1970 was pushed ahead several times and now is indefinite, say spokesmen for Amoco and PI.

RUMORS AND RAW RANDOM DATA

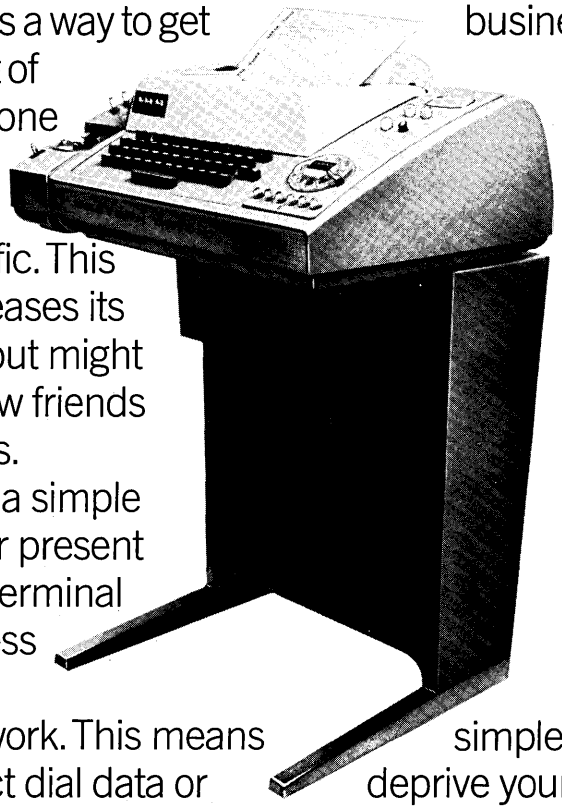
IBMers who want to read the unexpurgated version of Datamation's interview with chiefs Learson and Cary shouldn't look on their own bulletin boards. The excerpt IBM developed leaves out a couple of cherce quotes, like Cary's "I haven't had any nightmares" when asked if he worries about wiping out the competition...A new big "gun" from IBM could be a head-per-track disc pack code named Winchester File, combining fixed and floating heads, which themselves are the recording medium and which ride directly on a magnetic surface. IBM is said to have invested millions on a special plastic used in the device under development in a non-IBM facility and expected to reach the marketplace in a year... For those who are still waiting for Frank Marchuk's CG-100 laser computer to manifest itself, here's something else to wait for--an atomic computer called Brain One. Marchuk announced this new computer in showmanlike fashion in the closing statements in a speech before a recent Diebold Research meeting in Florida...

Data-Phone* users can now access the whole world.

(The TWX switch does it.)

Chances are your company doesn't use its Data-Phone teleprinter terminal 100 percent of the time. But they pay for it 100 percent of the time.

Now there's a way to get a lot more out of your Data-Phone teleprinter: use it for message traffic. This not only increases its productivity but might make you new friends in high places.



By adding a simple switch to your present Data-Phone terminal you can access the world via the TWX network. This means you can direct dial data or messages to 42,000 other TWX subscribers. In addition, you can dial 200,000 overseas firms via international communications carriers.

By January 1972 you'll also be able to send messages to over 40,000 Telex subscribers. And you can now contact any business firm, plus 200 million citizens of the United States with Mailgram, via Western Union and the U.S. Postal Service.

All this is done with a simple little button, the TWX switch, that is installed right on your present teleprinter.

For something so simple, how can you deprive your company of getting in touch with the world?

So get in touch with Western Union. Call your local sales representative.

*Registered trademark of AT&T.

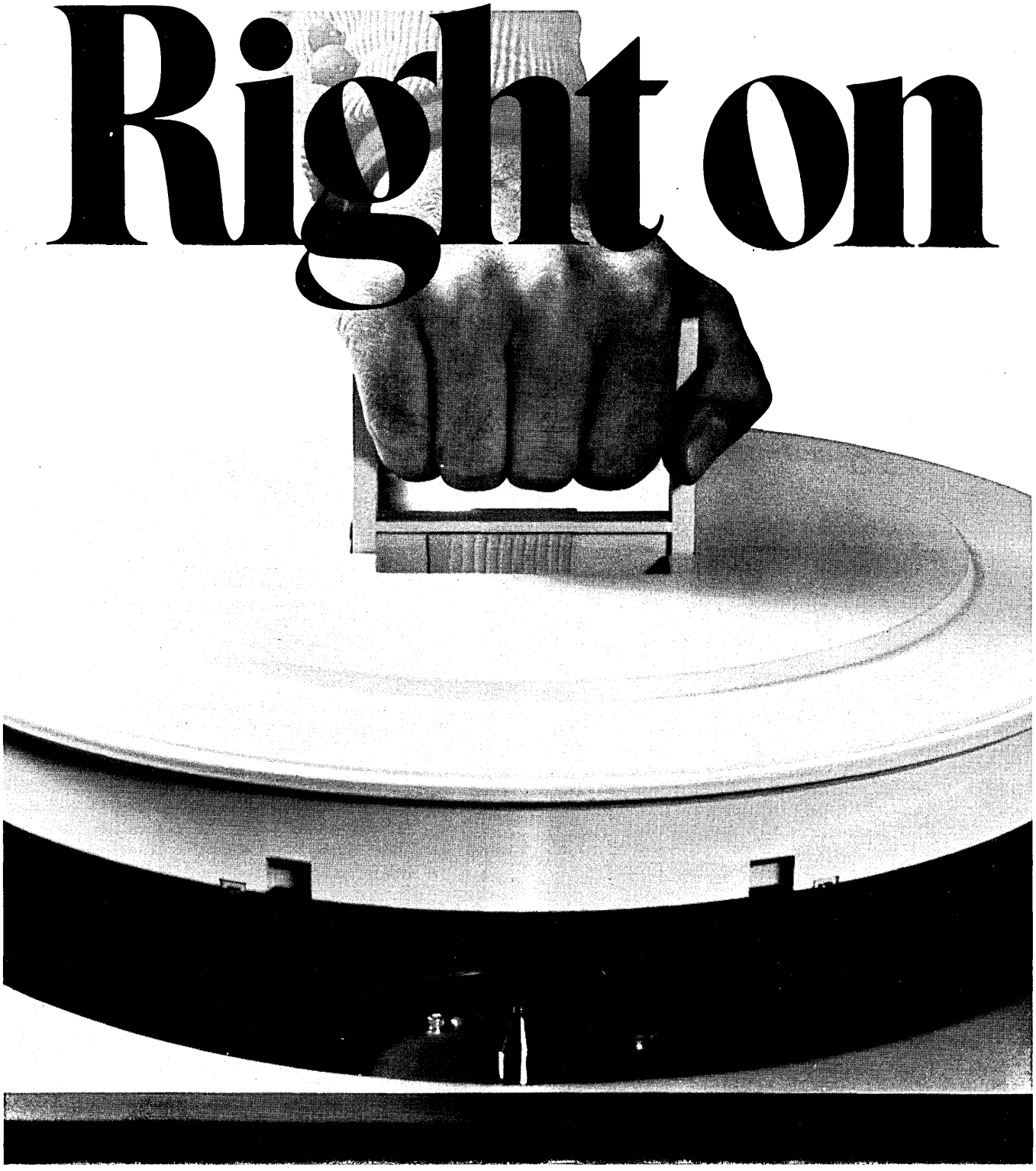
western union

That's where the disk goes. Right on top of the new Caelus CD 348 micro-mini drive. Just like a big system. Quick. Easy. The CD 348's removable disk plus a second one that's fixed give you random access to 48 megabits. And in a package only 8¾ inches high.

Sixty millisecond average access time. Contains its own power supply and 0.3 micron air filtration system. Can be configured to any OEM requirement. And the price is right.

Get right on it. For a demo or specs, call (408) 298-7080 or write, Caelus Memories, Inc., 967 Mabury Road, San Jose, California 95133.

Right on



Caelus CD 348 Drive

Caelus Memories, Inc. is a subsidiary of Electronic Memories & Magnetics Corporation

A new OEM product from Facit with a wide range of applications Facit 4552 alphanumerical strip printer

If you manufacture communications systems or systems for printing short messages, complete them with the Facit 4552. A strip printer with clear, distinct print-out and flexible character repertoire.

Easy to connect up. Features integral control circuitry and is obtainable with a character memory. Small, handy, dependable—designed for the majority of applications.

The ideal printer for every low-cost communications system where short messages in hard copy are required.

Ask for technical information from your nearest Facit representative.

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FACIT

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more than "equivalent to"

the CDS · 340 magnetic tape transport

200 ips tape speed, bi-directional. Dual density. 7 or 9 track. 320K bytes/second, transfer rate. 45 second rewind time . . .

These are the basic specifications for a high performance tape transport, and right now there are several manufacturers that meet them. But, as an OEM, you probably need a tape transport that *more than just meets the specs*. That's why we've designed one for you and your customers that's a little better in a lot of ways.

For example, our CDS 340 includes such features as: Digitally-controlled single capstan drive. Loop-position sensing by multiple vacuum switches. High speed in-column rewind under capstan control. Electrically-operated reel/hubs. Automatic load. Fixed air-bearing surfaces. Write pre-emphasis. Precise read equalization. Modular construction. Industry-standard tape path geometry.

Of course there are other tape transports that offer some of these features, but only Century Data offers them all. That's why our CDS 340 is more than "just equivalent to . . . ".

Century Data SYSTEMS, INC.
1270 North Kraemer Blvd., Anaheim, California 92806 (714) 632-7111
A subsidiary of California Computer Products, Inc.

CALENDAR

DATE	EVENT/SPONSOR	LOCATION	CONTACT	COST
Jan. 6-7	ACM SIGPLAN Conference on Proving Assertions about Programs	Las Cruces, NM	J. Mack Adams Computer Science Dept. New Mexico State Univ. Las Cruces, NM 88001	$34, members $44, others $8, students
April 10-12	IIA 4th National Meeting	New York City	Information Industry Assn. 1025 15th St., NW Washington, DC 20005	$100, members $150, others
April 17-19	NCS 9th Annual Meeting and Technical Conference	Chicago	Numerical Control Society 44 Nassau St. Princeton, NJ 08540	$110, members $140, others
May 16-18	Spring Joint Computer Conference	Atlantic City	AFIPS 210 Summit Ave. Montvale, NJ 07645	$20, members $50, others
May 21-24	ASM 25th International Systems Meeting	Miami Beach	Assn. For Systems Mgt. 24587 Bagley Rd. Cleveland, OH 44138	$125, members $175, others
June 27-30	DPMA International Data Processing Conference & Business Exposition	New York City	Richard H. Torp DPMA 505 Busse Hwy. Park Ridge, IL 60068	$90, members $115, others

Univac 1700 keypunches. The mix that means more performance at lower cost.

The UNIVAC® 1701 Keypunch both punches and verifies.

The 1710 punches, verifies *and* interprets in one work station. By combining 1701's and 1710's to achieve a mix that exactly meets your needs, you invest your dollars where they'll do the most for you.

As a result, Univac can offer you a total installation balance that is far and away the best and most economical available.

Make us prove it. We're ready to. Call your local Univac representative and ask for a presentation at your convenience.

There are more than 37,000 UNIVAC 1700's installed or on order around the world.

UNIVAC
SPERRY RAND

CIRCLE 19 ON READER CARD

LETTERS

To be continued . . .

Sir:
I'm on the edge of my seat!

I read Edith Myers' article about Frank Marchuk in the July 1 issue (p. 52). I read his lawyer's reply in the Oct. 1 issue (p. 17).

Tell me, did he "unveil a working model of his CG-100 Laser Computer"?

You referred to him as Frank Marchuk, his lawyer as Dr. Frank Marchuk; does he have a PhD?

Please fill in some more details of the Great Laser Computer Controversy.

RONALD W. DELPORTO
Erie, Pennsylvania

We do not now have the answers to these questions; we will supply our readers with more information as it becomes available.

Shame sham

Sir:
According to Harry R. Carlton (Letters, Oct. 1, p. 17), if Laser Computer Corp. fails, it is all your fault.

Shame on you.

MICHAEL WOODARD
Sacramento, California

Sloppy copy

Sir:
The notice on p. 51 of your Oct. 1 issue that "Telex Corp. has followed up a temporary injunction issued by a district court in Tulsa prohibiting Information Storage Systems, Inc., and its new parent, Telex Corp. . . . " should be changed to read "and its new parent, Itel Corp. . . . " This error is causing us a great deal of embarrassment and some confusion in the market place.

It would be greatly appreciated if you would print a correction of that statement.

G. HARRY ASHBRIDGE
Vice President, Product Planning
Telex Computer Products, Inc.
Tulsa, Oklahoma

The item should have read as follows: Telex Corp. followed up a temporary injunction issued by a district court in Tulsa prohibiting Information Storage Systems, Inc., and its new parent, Itel Corp., from marketing its double-density disc storage subsystems with announcement it would actively market ISS 5625s and 5650s in the North American IBM end-user market.

Gobbledyguck

Sir:
As a member of DBTG and a long-time user of data base management systems, I am replying to LeRoy R. Guck's letter in your Sept. 15 issue (p. 12) describing Burroughs' objections to the DBTG report.

I could understand objections based on reasons such as: "we are playing follow the leader," "we can't afford to develop another data base management system," or "we don't have people available for implementation." However, in this case, it is an outrageous presumption to base objections on user requirements. In my opinion, Burroughs' objections are so much gobbledygook.

Mr. Guck is confusing the role of the self-contained (problem-oriented) and host language (procedure-oriented) systems. Self-contained systems such as GIS, IMS, and MARK IV fill an important need for the nonprogramming user. Host language systems such as IDS, IMS, and DBTG also fill a need for the programming user who must be concerned with performance and flexibility.

If given the choice, users want *both* capabilities, depending on application program requirements. The distinction between these classes of systems is recognized and discussed both in the April 1971 DBTG report and the new CODASYL Systems Committee report on "Feature Analysis of Generalized Database Management Systems," May 1971.

The DBTG recognized that the DBTG specifications represented a large step forward for both implementors and users alike, and specified a subset of the DBTG specification which would permit implementation on smaller scale computers. A subset implementation provides user and implementor insight, reduces implementation costs, and allows a wider range of users to benefit from the capabilities provided.

B. F. Goodrich Chemical Co. has nearly completed a DBTG subset implementation for IBM's 360/370 computers called Integrated Database Management System (IDMS). IDMS will be used to convert an IDS on-line order entry system, which has been operating since December 1966, to an IBM 370/155 early in 1972. We had to do this software work to obtain capabilities not available from our vendor. The cost of implementation is currently about 35 man-months, with completion estimated at about 60 man-months. Beyond this, we plan to work on a query language based on IDMS which will interface to a common data base. When completed, we will have both self-contained and host-language capabilities.

RICHARD F. SCHUBERT
B. F. Goodrich Chemical Company
Cleveland, Ohio

Fan club

Sir:
Please! Spare me Alan Taylor, CDP.

While I respect Mr. Taylor's right to write letters to the editor (Sept. 15, p. 11) . . . his picayune attacks against COBOL, ISAM, IBM and now Mr. Coyle; stating incomprehensible percentages does not, I feel, belong in the glossy pages of DATAMATION.

In regard to Mr. Coyle's original article (June 15, p. 48) on ISAM: I regard it as an excellent technical paper. It demonstrates the gains a user may realize by using in-house resources: available software with documentation, and the services of an intelligent technical analyst . . .

LEW GORDON
Patrick AFB, Florida

Secret files

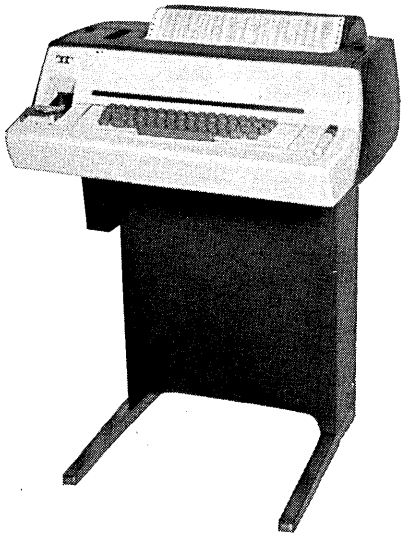
Sir:
In the article, "Retention of Data . . . for the Long Term," Sept. 15 issue (p. 30), Mr. Menkus discusses Dr. Alldredge's suggestion that "all essential documentation relating to a computer file (be) put into both human and machine readable form and placed at the beginning of the file." The advantages mentioned of using this approach are very valid.

One potentially large disadvantage exists in the fact that, should a file which contains highly confidential data be acquired by nonauthorized personnel, it would be very easy for nonauthorized personnel to retrieve confidential information. When file definition information is not on the volume, it is very difficult to determine the confidential information fields.

Investigations into new ap-

Right! It's a new low-cost, wide-platen data terminal

It's the Teletype® model 38. And its capabilities go far beyond the wide format aspect of operation.



The new model 38 line design incorporates many of the things that made the Teletype model 33 so popular: It's a modular line. Exceptionally reliable. Extremely economical; costs very little for all of its capabilities. It's really a logical extension of the model 33 design concept and is system compatible with it.

. . . the important differences

```
      1         2         3         4         5         6         7         8         9         10        11        12        13
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123

      model 38 prints a 132 character line

                                    Generates all 128 ASCII code combinations

                                                                  Prints in two colors if desired

      PRINTS IN UPPER and lower case

                                 Accepts standard 14-7/8" fan-fold computer stock

                                                                     Offers a variety of interface options

.....,and doesn't cost very much!!!!

                                                                 On a price performance basis you won't find a better buy!
```

The model 38 prints 132 characters per line at 10 characters per inch. This wide format enables you to send and receive data using the same fan-fold computer paper stock used in your computer room. So you can move the data generated by your computer to any number of remote locations across the nation without time-consuming reformatting problems.

The model 38 generates *all 128 ASCII code combinations*. You can print the full complement of 94 standard graphics, including upper and lower case alphabet characters. And it provides all the functional control necessary for easier operation.

If you would like to input computer data in red and receive output data in black, or vice versa, the Teletype 38 terminal has this capability, too.

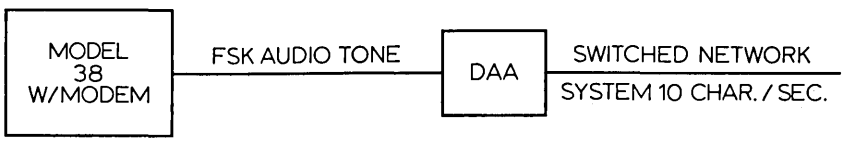
As you can see, the 38's format flexibility makes it easier to get your data in and out of the computer. And it broadens your on-line capabilities as well.

. . . the line is complete

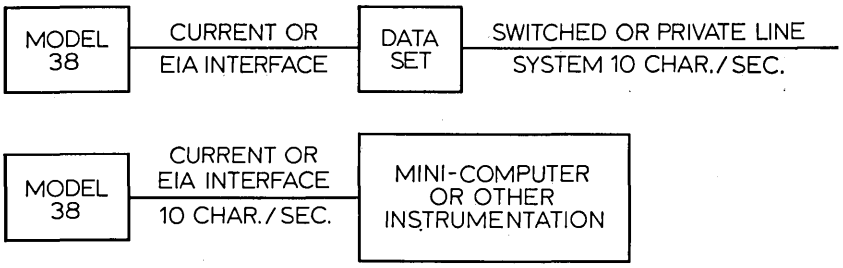
The Teletype 38 terminal is available in receive-only, keyboard send-receive and automatic send-receive configurations. Which means all of the reports, forms, and tabular material you generate can be moved *instantly* to all office, plant, warehouse, and sales locations that need the data using a terminal that best fits system requirements. Saving valuable time, and providing more efficient and profitable operation.

. . . plug to plug compatibility

The model 38 is available with several Interface options, operating at 10 characters per second (110 baud).

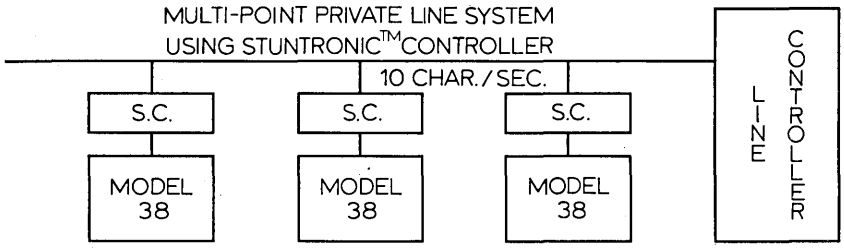


The terminal can be equipped with a built-in modem with simple two-wire, audio tone output which connects directly to the data access arrangement.



A second interface option is really two options in one. The set is equipped with both a voltage interface that conforms with EIA Standard RS-232-C *and* a current interface of 20 or 60 ma.

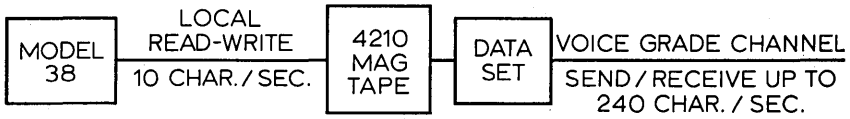
This means you can readily fit the model 38 into just about any switched network, private line or time-sharing system going without special "black box" engineering. Or use it to add maximum input/output capabilities to your minicomputer at a realistic price.



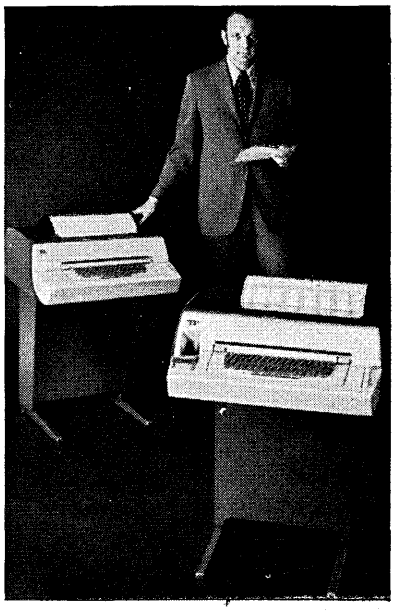
You can even use the model 38 in multi-point "selective calling" systems by adding a Teletype Stuntronic™ station controller.

. . . automatic send-receive operation up to 2400 words per minute

For systems requiring higher speed capabilities, the model 38 can be used with the Teletype 4210 magnetic tape data terminal. This combination provides on-line speeds up to 240 characters per second. The 4210 uses compact 3″ x 3″ x 1″ magnetic tape cartridges that hold up to 150,000 characters of data. Tape recording, editing, and correction functions are extremely simple.



If you are generating heavy-data loads in a teleprocessing or remote batch processing system, the on-line time saving aspects of this terminal combination are exceptionally dramatic. It is also possible to send or receive data on-line with the model 38 at 100 wpm using the optional built-in modem, if required.



So take a close look at this new wide-platen terminal offering. If you would like more information on the model 38, or any other part of the total line of Teletype data communications equipment, write: Teletype Corporation, 5555 Touhy Ave., Dept. 81-29, Skokie, Illinois 60076.

We would like to be of service.

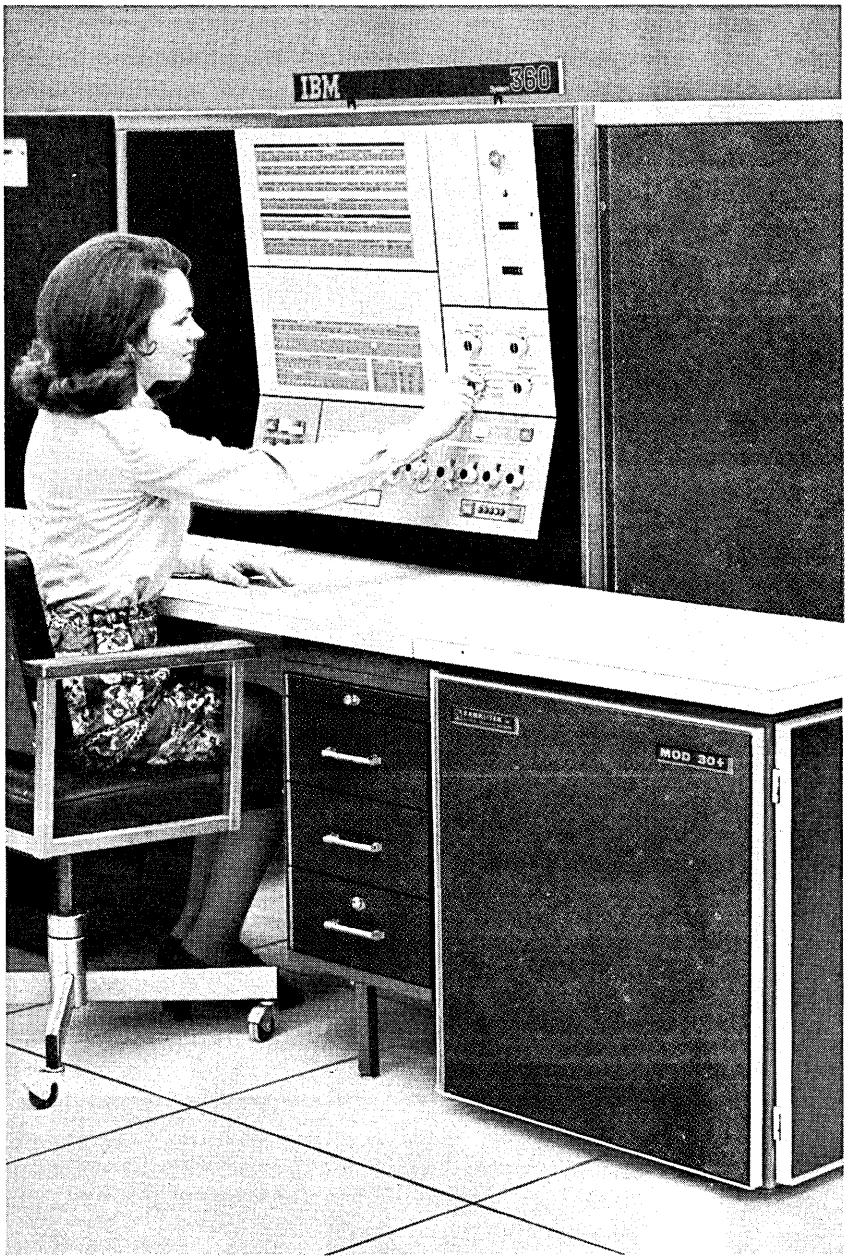
TELETYPE

machines that make data move

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

360 CORE YOU CAN TRUST

MODELS 30+, 40+, 50+, 65+



Who has Fabri-Tek produced core memories for over the past 15 years?

Hundreds of companies, including:

CDC	Canadian Westinghouse
XDS	RCA Ltd. (Canada)
RCA	Ferranti (Canada)
Honeywell	GE (Canada)
DEC	Northern Electric (Canada)
GE	DeHavilland (Canada)
Burroughs	Elliot (England)
Varian	Nixdorf (Germany)
NCR	Olivetti (Italy)
Collins	Marconi (Scotland)
H-P	ICL (England)
Bell Telephone	Honeywell-Bull (France)
IT & T	AEG-Telefunken (Germany)
Univac	English Electric (England)
Litton	Phillips (Holland)
CFTH (France)	CII (France)

And yes — even IBM!

Now you can capitalize on this expertise, as this growing list of 360 customers and users are doing:

Boothe Computer Corp. • Dearborn Computer Leasing • Levin-Townsend Computer Corp. • National Computer Rentals • Intertek, Inc. • Diebold Computer Leasing • Gant Shirtmakers • Chicago, Milwaukee, St. Paul and Pacific R.R. • Eagle Discount Supermarkets • Medtronic, Inc. • Accounting Corp. of America • Rome Research, Inc. • Weldon, Inc. • Certified Grocers Co-op • MAI Equipment Corporation • Kentucky Farm Bureau Mutual Insurance Co. • Graco, Inc. • U.T.L. Computers Inc. • E.B.S. Data Processing Inc. • Day's Inc. • Rockland State Hospital • Trans Union Systems Corp. • Univ. of R.I. • Computoservice, Inc. • Professional Computer Associates • Faultless Starch Co. • Waldbaums, Inc.

Nationwide Service: Over 900 service representatives from Sorbus, Inc. provide you with 24-hour field maintenance in over 90 cities in the U.S.A. Canadian service available through MAI Canada Ltd. in 12 Canadian cities.

We back our products, and you can be sure we're going to be here to service your 360 memories — and provide spare parts — for as long as you need. And furnish your next generation memories as well.

Reliability and dependability:

Our 360 Core Extension Memory systems have been on-line and fully operational since the summer of 1970, with an exceptional up-time record.

Find out for yourself! We would be pleased to supply customer reference lists.

Our complete, high-performance line:

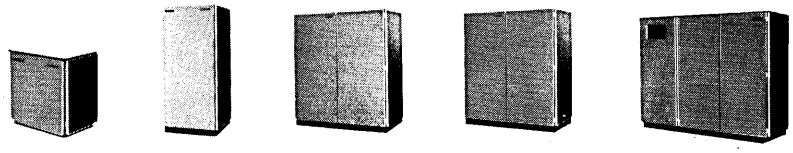
MOD 30+ expands main memory of 360/30's to 128 K bytes.
MOD 40+ expands main memory of 360/40's to 512 K bytes.
MOD 50+ expands main memory of 360/50's to 1024 K bytes.

Fabri-Tek also offers the LCM+ large peripheral core unit to expand memory capabilities of 360/50 and 360/65 processors.

Let us show you how a real leader can perform: Fabri-Tek, Inc., 5901 South County Road 18, Minneapolis, Minnesota 55436. Phone 612-935-8811. TWX 910-576-2913.

From Fabri-Tek: Leader in memory technology for over a decade.

FABRI-TEK® INC.
MEMORY PRODUCTS DIVISION
Leader In Memory Technology For Over A Decade.



proaches within the data processing environment must always include the possible effect on the edp controls and the security of data.
STEPHEN F. PIRON
New Brunswick, New Jersey

Wherefore art gallery

Sir:
We have been looking for some time for a source for reproductions of computer-generated art. If you or any of your readers know of any source for this material, we would appreciate any information that you can supply.
P. H. KOOLISH
Hartley Data Service, Inc.
4849 Golf Road
Skokie, Illinois 60076

Satellite launch

Sir:
The Computer Dept. of Westinghouse Electric Corp. initiated a strong, deliberate and active commitment to the remote batch terminal market with the introduction of the Westinghouse 2550 Satellite Processor. Aggressive sales and advertising/publicity efforts have established the Westinghouse 2550 as a solid competitor in the remote job entry field. In view of these facts, it is particularly perplexing to have been excluded from the Sept. 1 survey, "Trends in Remote Batch Terminals" (p. 20). The editorial's five survey guidelines most perfectly describe the Westinghouse 2550 . . .
W. M. BRITTAIN
Westinghouse Electric Corporation
Orlando, Florida

The Westinghouse 2550 Satellite Processor, designed for both remote (ASCII- and EBCDIC-compatible transmission at up to 9600 baud) and stand-alone business and scientific dp, features an 8K (expandable to 64K) programmable controller, 300-cpm card reader, and a 300-lpm, 132-column line printer for $1,168 monthly rental (not including maintenance) or $34,500 on purchase. Additional I/O devices include a 300-cps paper tape reader, 110-cps paper tape punch, 60-cpm card punch, ASR keyboard/crt, disc, and 7- or 9-track tape units. The 2550 can emulate CDC 200 and IBM 2780 and HASP terminals.

The price is wrong

Sir:
Please note that two major discrepancies appear in the Universal Terminal listing (p. 23) in Messrs. Theis and Hobbs (Sept. 1) article and summary of RJE equipment—the monthly rental without maintenance and sales price. The sales price has been reduced to $20,000, and the monthly rental of $875 *includes* $200/month maintenance.
KEITH MILLIGAN
President
HETRA
Melbourne, Florida

Real-world APL

Sir:
I have just completed Mr. Reeves' Forum article "APL—A Potential Liability?" in the Sept. 15 issue (p. 71) and find I must take exception to his remarks.

I believe his entire thesis is weakened tremendously by his first statement. I know of no programming language in which a user can become proficient through "sporadic" (his word) use. Having been a user "sporadically" of APL for about 1½ years, I find it able to solve all of the problems we have encountered at least as fast, if not faster, than other languages. We have introduced field engineers, with no prior programming experience, to the system and have gained immeasurably in time and training in that they are productive in days instead of weeks. I agree that it is not a panacea, however; no language will ever reach that happy state.

As for his example, had he written BOMB as follows:

```
∇ R←BOMB X
[1]   →OK×⍳X≠0
[2]   →0×R←X
[3]   OK:R←÷X
∇
```

then selection would have preceded evaluation. I think this is a poor example to "prove" his point that left-to-right interpretation is better than right-to-left, an argument I do not intend to get into.

To answer his final question on notation, I will simply state that it is a necessity because it helps people communicate. Many disciplines use it. Being a chemical engineer, I find notation invaluable at times in talking to other chemical engineers.

In conclusion, I feel Mr. Reeves has forgotten that there is a real world out there with real people; and if a system can solve most of their problems with ease, then it's a good system, although maybe not the best. As I said earlier, I don't think we'll ever create the best because someone will always create the counter-example.
GEORGE P. STICKELER
King of Prussia, Pennsylvania

Board games

Sir:
It scares me a little to come flat up against someone with enough clout to command your Forum (Sept. 1, p. 79), but the fact is that the SAGE system never worked. The situation it was designed to deal with never materialized, and now that it is being dismantled, we'll never know whether it would have worked.

What happened was that the system and its various parts were put through ever more elaborate tests, simulations, and games—some of which involved real airplanes and simulated battle damage.

The tests were successful according to the umpires, so Dr. Beizer calls the system "viable."

I think it is worth recalling that the Maginot Line was a howling success under similar conditions. In fact, up to almost the last minute, it was about as successful in German war games as it was in French; and then an upstart tank commander kicked the board over.

For a long, sad history of similar blunders by military experts, all very knowledgeable people, I refer you to Andrew Wilson's *The Bomb and the Computer* (Delacorte Press, New York, N.Y., 1968).
LEONARD F. ZETTEL, JR.
Buffalo, New York

A grasp of hasp

Sir:
In his article (Aug. 1, p. 24), Mr. Larson mentions a number of ways to improve output performance using OS/360 FORTRAN. He neglects the most basic method of improving output performance from all modules of OS/360—HASP. HASP's output handling techniques make programmer considerations—number of buffers, size of buffers, size of the data set, and device separation—unnecessary. I heartily recommend it to any OS shop wishing to improve system performance.
WILLIAM MOSTELLER
Collingswood, New Jersey ■

CMC offers to sell we don't believe in:

The 8080™ Card to

you something

Tape Converter.

You want the truth? We'll give it to you straight:

We think that punched card data entry is an idea whose days are numbered. Our KeyProcessing™ Systems prove it every day. But we know that there are a lot of punched card systems clicking right along. The 8080 was designed for those systems.

We're not anti-card. We're pro-computer. Our mission is to help you squeeze every last bit of efficiency out of your existing mainframe. That's what the 8080's all about.

There's nothing tricky about the 8080. It's a complete, stand-alone system that lets you convert from cards to tape completely independent of your mainframe. In fact, if you want, it lets you convert from cards to tape completely independent of your computer room. Anyone can operate the 8080 (no special training or skills required). You can put the 8080 adjacent to your keypunches and completely avoid tying up your expensive computer and your expensive computer's expensive personnel. For peanuts (the 8080's so inexpensive, we're embarassed to advertise its price).

Using the 8080 is simple. So very simple. Just dump in your cards and take the tape off; fully recorded, in computer compatible blocks.

You save on mainframe time. You save on peripherals. You save on salaries. And you save on lugging all those cards around.

Call your CMC sales representative. If you want his honest opinion he'll tell you about KeyProcessing. If you must use cards, he'll tell about the 8080. You'll like what you hear. And just wait till you hear the price...

CMC Computer Machinery Corporation, 2231 Barrington Avenue, Los Angeles, California 90064. (213) 477-1585.

CMC 8080
is a trademark of Computer Machinery Corporation

Lower machine costs and better systems design are making optical character recognition a more attractive alternative for data input

OCR Enters the Prac

Two and a half years ago, when I prepared a survey of OCR equipment for DATAMATION, there were only 10 manufacturers and approximately 1,000 machines in the field. This is a poor track record, indeed, for a product which had been available for 15 years. Today, however, there are 26 manufacturers, and best estimates of installed machines are of the order of 3,000. Even if this figure is somewhat high, there clearly have been more machines installed in the past two and a half years than in the previous 15 and it appears that OCR has turned the corner to become a viable input technique.

Many new developments have aided this increase in machine population, including the increasing availability of solid state optical elements. In general, however, the principal reasons for the increasing use of OCR have been continuously increasing input costs coupled with better systems design and reductions in machine cost. The only truly new development in the field has been the availability and limited use of OCR terminal devices, in particular those marketed by CDC, Cognitronics and Recognition Equipment. (Viatron has also produced a device of this type but its current availability is open to question.) These devices permit the utilization of OCR systems on a remote basis. The simple systems, such as the CDC unit, usually perform the reading at the terminal site and therefore require relatively low level communications line usage, while the more powerful units, such as the Cognitronics remote unit, send digitized information to a central computer, which accomplishes all character recognition functions.

Jobs up, costs down

One of the proposed applications for terminal devices has been to read transfer information typed on the rear of stock certificates, thereby permitting a standard stock certificate to become a machine readable document for purposes of brokerage backroom operations. Whether or not this application will ever become a reality is not now clear, but it does have several advantages over the punched card stock certificate which has been proposed: primarily, the ability to use existing stock certificates, and secondarily by providing an inbuilt audit trail in that the source document is available throughout the entire transaction since it becomes the machine readable document.

The most significant change in the specifications of OCR machines to date, however, has been continually decreasing prices. For instance, there are now many readers available at an installed cost below $100,000 and several whose prices are below $50,000.

As prices have declined, the number of applications for OCR systems has been expanded. In the past, the chief concern of most users was the replacement of card (keypunch) systems where return documents were processed. This philosophy spurred the development of credit card charge slip, utility billing, and subscription fulfillment systems. Despite this, there is little realization, even among data processing people, that the large gasoline and financial credit card systems would simply not be possible without reliable, high speed, OCR charge slip readers, and by far the largest volume of credit card processing is done in an environment of multiple machine installations where each of the machines is in the $750,000-1 million range.

The increase of potential applications has taken some strange turns. Those who remember the original MICR development will recall the original insistence on non-optical reading to gain the reliability which was not felt to be possible with the OCR systems then available. At least one company is now manufacturing an OCR system specifically intended to optically read the MICR numbers on checks which have been rejected as unreadable by MICR systems. Other well-known traditions have suffered as much. One frequently voiced statement, that a $100,000 reader is economically feasible in a retyping system when used to displace 30 keypunch stations, should certainly be reviewed. I personally have never quite believed this statement, as I have found that an examination of each individual installation will disclose other factors, such as fast turnaround, changes in training procedures, etc., that may have a significant impact on the cost effectiveness of an installation. Nevertheless, this statement has frequently clouded the OCR issue because of a tendency for many potential users to assume that the use of OCR systems is limited to applications which involve more than 30 keypunch operators. In many retyping situations today, a figure of approximately 25 operators would be closer to the truth, since the cost of operator salaries, fringe benefits, and to some extent, keypunch rentals, has gone up.

The decreasing cost of machines, with units in the $25,000 to $50,000 range which are now at a level of capability far beyond that possessed by $100,000 machines when this statement was originally made, tends to indicate that it is possible to replace on the order of 8 to 12 keypunch operators and come out ahead financially. Even this figure should be used with caution, however, since if it is possible to read source documents directly or if previously typed keypunch

transmission documents can be read, a situation exists where there is almost no limit to the number of people displaced. In general, it can no longer be said that there is a lower limit on the use of OCR systems.

Manufacturers of supplies for OCR applications have also contributed to increased accuracy by supplying special forms, better ribbons, etc., thereby allowing the improved reading capabilities, when combined with better error detecting systems, to permit the use of OCR in areas previously not considered. Such applications as direct input for printing and publishing are becoming more common, with both Compuscan and ECRM gearing up to capture significant portions of this market.

tical Stage

by P. L. Andersson

The most prevalent feature newly added to machines is the ability to read handprint in some manner or other. Both page and document readers are being equipped with this feature, which tends to improve the ability of OCR systems to accept direct human input. Handprint, of course, has the advantage over mark reading in that it is a natural way for people to enter data and avoids errors caused by placing marks in incorrect columns.

Once again, the computer industry has been guilty of overselling a concept, and the use of some handprint machines has been discontinued, simply because there was little realization on the part of the user that a certain amount of training was necessary for day to day entry of numeric information this way. Installations where training factors have not been neglected have usually been successful. Whatever the problems, they are not insurmountable, since the State of New York has successfully used a handprint entry system to read the social security numbers of drivers' license holders, with the numbers handprinted by the drivers themselves on the annual renewal application.

The two and a half years since the previous article appeared have not been without attrition among the ranks of manufacturers—notably Philco, which has discontinued all OCR equipment, and Farrington, which filed bankruptcy earlier in the year and has now been absorbed by Lundy Electronics and Systems, Inc., where this equipment will be used to augment Lundy's line of MICR equipment. Infoton is also in the process of being acquired by Optical Scanning Corp., and other changes will probably be announced before this appears in print, so the list of manufacturers is quite fluid.

A guide to the charts

In the chart (pages 24 through 27), most of the headings are self-explanatory, but remember that the reading speed in characters per second may not always be consistent with the document feed speed since these two functions can operate independently. For example, if a machine has a strictly manual feed coupled with a very high reading speed, the throughput can be quite low when the operator is more than moderately fumble-fingered. Also, the throughput, while *limited* by the maximum document and character speeds, may be considerably below that indicated by the combination. The only way to really determine throughput is by a test on actual documents. All specifications listed here are subject to changes, particularly pricing, so it is important to check with the manufacturer before a decision to buy a particular machine is made. It is also important to consider the financial stability of the manufacturer, his ability to provide proper maintenance in your area, and the support services he can provide, when attempting to decide between competing machines.

All in all, during the course of preparing this chart, the most surprising change from previous years has been the number of new suppliers entering the field. Many small companies are bringing new, flexible, and well engineered products to the market place. Companies new to the OCR arena have also introduced large machines with a considerable degree of flexibility. Many of these units utilize microfilm as the input media in order to avoid the troublesome paper handling problems which arise with a truly multi-font scanner.

The exact direction of the OCR market is not yet clear; however, the continuing trends of lower cost with limited capability, special-purpose rather than general-purpose machines, and larger machines with sophisticated multi-font capability are all clear. It cannot be too long before these developments will force many data processing managers to reevaluate their thinking concerning OCR.

VENDORS

Allied Computer Systems, Inc.
589 Boston Post Road
Madison, Conn. 06443

Burroughs Corporation
Industrial Marketing Division
Second Ave. & Burroughs Road
Detroit, Michigan 48232

Cognitronics Corporation
41 East 28th Street
New York, N.Y. 10016

Compuscan Corporation
900 Huyler Street
Teterboro, N.J. 07608

Control Data Corporation
Rabinow Division
1425 Research Blvd.
Rockville, Md. 20850

Data Recognition Corp.
908 Industrial Ave.
Palo Alto, Calif. 94303

ECRM, Inc.
17 Tudor Street
Cambridge, Mass. 02139

Honeywell Information Systems, Inc.
Subsidiary of Honeywell, Inc.
60 Walnut Street
Wellesley Hills, Mass. 02181

Information International, Inc.
12435 West Olympic Blvd.
Los Angeles, Calif. 90064

Input Business Machines
12111 Park Lawn Drive
Rockville, Md. 20852

International Business Machines Corp.
Highway 52 & Northwest 37th Street

OPTICAL CHARACTER RECOGNITION EQUIPMENT

Name of Company	Equipment Model	Document Feed Type	Document Transport Type	Document Size (Inches)	Documents Per Minute	Scanner Type	Recognition Type	Type Font	Character Set	Reading Speed (ch./sec.)	First Installation	Approx. Base Price
Allied Computer Systems	Readoc Document Reader	Friction	Belt	Length: 2.375-8.51 Width: 2 to 3.5	8	Optical	Matrix Matching	OCR-A IBM 1428	Numerics	20		$ 19,000
Burroughs	B9134-1 Reader-Sorter (Checks & Documents)	Friction	Conveyor Belt & Roller	Length: 5.94-9.06 Width: 2.69-4.06	1,625 Max.	Magnetic or Optical	Matrix Matching	E-13B CMC-7 OCR-B and OCR-A	Numerals, Four Symbols (Five Symbols OCR-B and OCR-A)	2,400(MICR) 3,000(OCR)	1970	$ 96,000
Cognitronics Corporation	System/70 Page Reader	Friction	Roller	Length: 3.25-14.00 Width: 4.00-8.50	(1)	Laser	Feature Analysis (Topological)	All mach. generated numerics - Hand printed numerics OCR-A	OCR-A plus special symbols	25-50	1970	$ 33,600 46,000
CompuScan	370 Microfilm Page Reader	Microfilm	Film Reel	16 or 35 mm.	N.A.	Flying Spot Scanner	Matrix/Feature Pattern Learning	All Typewritten or Printed Fonts	Alphanumerics Punctuation Special Symbols	----	1969	$ 900,000
	170-173 Page Reader	Manual or Auto		Length: 5 to 11 Width: 3 to 11	60	Fiber Optics	Pattern Leaning	Typescan OCR-A	88 Alphanumerics U.C. & L.C.	100	1971	$ 37,500
Control Data Corporation Rabinow Div.	915 Page Reader	Vacuum	Conveyor Belt	Length: 2.5 to 14 Width: 4 to 12	Max. 400	Multiple Photocell	Matrix Matching	OCR-A	Alphanumerics Punctuation	Max. 370	1965	$ 142,000
	921 Document Reader	Vacuum	Drum	Length: 4.5 to 9 Width: 2.6 to 4.5	1200	Laser Mech. Scanning	Matrix Matching	OCR-A, OCR-B Farrington 7B, Handprint	Numeric & Symbols	2,000	1971	$ 44,500
	936 Document Reader	Vacuum	Belt & Roller	Length: 2.25 to 8.5 Width: 3.00 to 5.50	Max. 1500	Optical Parallel Photocells	Matrix Matching	OCR-A, 1428, 407-1, 1428E , Selfchek 12F, 7B Mark Sense, Handprint	Numerals, three Symbols OCR-A Alphanumerics	Max. 750	1969	$ 160,000
	955 Page Reader	Vacuum	Conveyor Belt	Length: 3.75 to 12.6 Width: 4.8 to 11.1	Max. 300	Optical Array	Matrix Matching	OCR-A, Farrington 7B, IBM 1428, 407-1, OCR-B E13B	OCR-A Alphanumerics Other Numerics	500	1970	$ 200,000
	Multi-Font Page Reader	Vacuum	Conveyor Belt	Length: 3 to 14 Width: 4 to 12	Max. 5940	Optical Parallel	Matrix Matching	OCR-A, Royal Elite, IBM Prestige, 1403, 557 E13B & Selected Fonts	UC/LC, Alpha. Numerals only as required, Mark Sense	Max. 14,400	1969	$1,500,000
	Remote Terminal	Manual Insertion	Roller	Length: 3 in min. Width: 1 in min.	Average 10/min.	Optical Mask	Direct Area Matching	ASA Font (others optional)	Numerics plus Symbols	Max. 15	-----	- - - - - - - -
Data Recognition	700 Document Rdr.	Friction	Roller	Length: 4 --- Width: 2.8 to 3.51	66	Optical	Feature	Selfcheck 7B	Numerics	16	-----	$ 80,000
	710 Card Rdr.	Friction	Roller	3.25 x 7.6	100	Optical	Feature	Selfcheck 7B	Numerics	16	-----	- - - - - - - -
ECRM	Page Reader	Friction	Roller	8-½ x 6 8-½ x 48	2	Optical	Feature Analysis	IBM Courier 12 Royal Lancer 12	Alphanumerics U.C. & L.C. + Special Symbols All Punct.	50-80	1970	$ 89,000
Honeywell	MRS - 200/205 Document Reader	Friction + Vacuum	Conveyor Belt	Length: 5.25 to 9.0 Width: 2.5 to 4.15	Max. 1,200	Magnetic or Optical	Analog Wave-form Analysis (MICR) Inbuilt Code (OCR)	E13B, CMC-7,COC-5	Numerals, Limited Symbols	Max. 2,400	-----	$ 2,080R
	DRD-200 Doc. Reader	Friction + Vacuum	Conveyor Belt	Length: 3.5 to 8.5 Width: 2.5 to 4.19	1,200	Optical	Inbuilt Code	COC-5	Numerals, one Symbol	2,400	-----	$ 1,200R

Name of Company	Equipment Model	Document Feed Type	Document Transport Type	Document Size (Inches)	Documents Per Minute	Scanner Type	Recognition Type	Type Font	Character Set	Reading Speed (ch./sec.)	First Installation	Approx. Base Price
Information International	Grafix I Microfilm P.R.	Microfilm	Film Reel	16 or 35 mm film	3,000	CRT Flying Spot	Feature Recognition	Programable Multifont	Alphanumerics Symbols & Punct.	2,000	-----	$1,200,000
Input Business Machines, Inc.	RIT 200 Page Reading Terminal	Manual Auto. - Opt.	Roller	Length: .5 to 11 Width: 2.0 to 9	40/min. ± 100/min. Auto	Optical Array	Pattern Correlation	OCR-A or IBM 1428 Handprint optional	Numerals + five symbols	100	1971	$ 5,000
International Business Machines	IBM 1428 1 II & III Document Rdr.	Friction	Vacuum Drum and Conveyor Belt	From: 2-1/3 x 3 To: 4-7/32 x 8-¾	Max. 400	Optical Mechanical Disc	Matrix Matching	IBM 1428	Alphanumerics Symbols OMR	Max. 480	1963	$ 134,440
	IBM 1282 Self Punch	Friction	Card	51 or 80 Column Cards	Max. 200	Optical	Matrix Matching	1428, Farrington Selfchek 7B, 1428E	Numerals Three Symbols-OMR	N/O	1964	$ 69,840
	IBM 1287-I Journal Tape & Document Reader	Friction + Tape Spool	Belt & Roller	Max. 5.91 x 9.00 Min. 2.25 x 3.00 Journal Rolls 1-5/16 to 4-½ x 18" to 200'	(1) Max. 750 (Doc.) Max. 3,400 lpm (J.T.)	Optical CRT Scanner	Curve Tracing Matrix Matching	Handprinted Numerals Special Char. +5, 1428, 1428E, Selfchek 7B, OCR-A - 1 &, 3 NOF, 3/16" Selected Gothics	Numerals, Special Symbols, Mark Read Upper Case Alphabetics (MOD 3 & 4	Max. 2,000	1968	$ 122,220
	IBM 1288 Page Reader	Friction	Belt & Roller	Max. 9 x 14 Min. 3 x 6.5	(1) Max. 444	Optical CRT Scanner	Curve Tracing Matrix Matching	Handprinted Numerals + 5 Spec. Char. OCR-A Alphanumerics, 3/16" Selected Gothics	Upper Case Alphabetics Special Symbols Mark Read, Numerals	Max. 1,000	1970	$ 223,390
International Computers Limited	8401 Document Reader Sorter	Vacuum	Drum	Length: 4.75 to 13.0 Width: 3.0 to 8.5	Max. 300	Optical Photocell	Matrix Matching	OCR-A, OCR-B, Mark sense, Others Optional	Alphanumerics Special Symbols	Max. 550	1969	$ 90,000 (OEM)
	8692 Document Reader Sorter	Air Jets	Air Jets & Belts	Length: 4.5 to 8.0 Width: 3.0 to 4.25	Max. 1,200	Optical Photocell or Magnetic	Matrix Matching	OCR-A, OCR-B, E13B Mark sense, Others Optional	Alphanumerics Special Symbols	Max. 2,400	1970	$ 58,300 (OEM)
Litton Systems (Canada) Ltd.	Page Reader	Vacuum	Roller	Length: 7.5 to 11 Width: 3.25 to 8.5	15	Optical Array	Matrix Matching	OCR-A, Mark Sense	Alphanumerics plus symbols	Max. 540	1971	$ 90,000
	Document Reader	Vacuum	Roller	Length: 7.5 to 11 Width: 3.25 to 8.5	120	Optical Array	Matrix Matching	OCR-A, IBM 1403 12F & 12L, OCR-B	Alphanumerics plus symbols	-------	-----	- - - - - - -
Lundy/ Farrington	3010 Document Reader	Vacuum	Drive Rollers	Card Stock: from: 2.2 x 2.75 to: 8.5 x 6.0 Documents: from: 2.625 x 2.75 to: 8.5 x 6.0	Max. 440	Optical Mechanical Disc	Stroke Analysis	Selfchek 7B, 12F and/or Selfchek 12L IBM 407 IBM 1428 OCR-A	Alphanumerics, Punctuation Marks, Special Symbols	Max. 400	1967	$ 2,920R
	3020 Self-Punch	Vacuum	Drive Rollers	Standard Tab Cards: 51 or 80 column	Max. 500	Optical Mechanical Disc	Stroke Analysis	Selfchek 7B, 7 BR, 12F and 12L IBM 1428 OCR-A	Numerals Special Symbols Punctuation	Max. 600	1969	$ 2,635R
	3030 Page Reader	Vacuum	Drive Rollers	From: 4.5 x 5.5 To: 8.5 x 14	(1)	Optical Mechanical Disc	Stroke Analysis	Sekfchek 12F and/or Selfchek 12L, OCR-A	Alphanumerics, Punctuation Marks	Max. 400	1967	$ 3,625R
	3050 Page Reader	Vacuum	Drive Rollers	From: 4.5 x 5.5 To: 8.5 x 13.5	(1)	Optical Mechanical	Stroke Analysis	Selfchek 12L or OCR-A Only (either, not both)	Alphanumerics Special Symbols Punctuation Marks	Max. 400	1969	$ 2,345R

Name of Company	Equipment Model	Document Feed Type	Document Transport Type	Document Size (Inches)	Documents Per Minute	Scanner Type	Recognition Type	Type Font	Character Set	Reading Speed (ch./sec.)	First Installation	Approx. Base Price
Lundy/ Farrington	4040 Journal Tape Reader	Tape Spool	Vacuum Conveyor	Length: to 350 ft. Width: 1-5/16 to 4-½ in.	6,000 lpm	Flying Spot Scanner	Stroke Analysis	Selfchek 7B or 12F IBM 1428, NOF, OCR-A	Numerals Special Symbols Limited Funct.	Max. 2,000	1969	$ 3,150R
	System 7,000	Pneumatic	Air Jet	Length: 4.5 to 8 Width: 3 to 4.25	1,200	Photocell Array	Feature Analysis	OCR-A, OCR-B, Farrington 7B, Mark Sense	Numerics + Symbols, Optional OCR-A Alphanumerics	2,400	1972	N. A.
	9610 Document Reader-Sorter	Friction	Roller & Belt	Length: 5.8 to 8.75 Width: 2.5 to 4.25	Max. 600	Magnetic & Optical	Matrix Matching (MICR) & Inbuilt Code (Optical)	E13B & CMC 7 (MICR) & Optical Bar Code (OBC)	Numerals, Special Symbols	1,200	-----	-------
National Cash Register Co.	420-2 Journal Tape Reader	Automatic Tape Spooling Device	Tape	Journal Rolls Width: 1.31 to 3.25 Length: 10 to 1560"	52 lines per sec.	Optical Mechanical Disc	Inbuilt Code	NOF	Numerals, Special Symbols	Max. 1,664	-----	$ 68,000
OCR Systems Inc.	System 1000 Document Reader	Friction	Vacuum Belt	Length: 2.6 to 8.5 Width: 3.5 to 8.5	400	IC Photo Diode Array	Programmable Matrix & Feature	OCR-A, OCR-B 428	OCR-A Alphanumerics Others Numeric		Late 1971	$ 69,000
Operations Analysis, Inc.	OAI-2 Card Reader	Friction	Roller	51 or 80 Column Tab. Cards	300	Fiber Optics	Matrix Matching	Handprint, Bar Code, Hollerith punching	Numerals + 16 Alpha., 5 symbols	Max. 1,400	1971	$ 600R
Optical Business Machines, Inc.	System One Page Reader	Vacuum	Friction Capstan & Pinch Rollers	Length: 3.25 to 14 Width: 3.25 to 8.5	40	Optical, Laser + Diode Array	Matrix Matching	OCR-A, Handprinted Numerals	Alphanumeric + Symbols (64 char.)	330	1971	$ 25,000
Optical Entry Systems	OES-III	Friction	Drum	Length: 2 to 6 Width: 2 to 9	Max. 240	Optical Array	Matrix Matching	OCR-A, Handprint Mark Sense	Numerics & 6 Alpha & Symbols	100	1971	N. A.
Optical Recognition Systems, Inc.	OCR-71 Optical Check Reader	Friction + Vacuum	Belt & Roller	Length: 6 to 8.75 Width: 2.75 to 4.25	450	Optical, Mechanical Scan	Feature	E13B, 1403, 1428 Numerics, OCR-A Alphanumerics	Alphanumerics, Special symbols, Punctuation	600	1971	$ 85,000
Optical Scanning Corporation	Opscan 17	Friction	Roller	Length: 4 to 11 Width: 2 to 8-½	6	Photocell	Matrix	Handprint Mark Sense	Numerics & Symbols	20	1971	$ 5,750
Orbital Systems	Document Reader	Friction	Drum	Length: 4 to 7.5 Width: 3 to 4	Max. 130	Optical	-------	OCR-A, 1428, 1428E, Selfchek 12F, Mark Sense	Numerals, special Symbols	108	1970	$ 30,000
Recognition Equipment, Incorporated	Electronic Retina Document Reader	Vacuum	Conveyor Belt	Length: 3.25 to 8.75 Width: 3.25 to 4.74	1,200	Optical Photocell Matrix	Matrix Matching	Handprint, Multiple Type Fonts, Mark Sense	Alphanumerics, Punctuation, Special Symbols	Max. 2,400	1964	$ 730,000
	Electronic Retina Rapid Index Page Reader	Vacuum	Belt & Roller	Length: 3.25 to 14 Width: 4.88 to 14	Max. 30	Optical Photocell Matrix	Matrix Matching	Handprint, Multiple Type Fonts, Mark Sense	Alphanumerics, Punctuation, Special Symbols	Max. 2,400	1964	$ 740,000

Name of Company	Equipment Model	Document Feed Type	Document Transport Type	Document Size (Inches)	Documents per Minute	Scanner Type	Recognition Type	Type Font	Character Set	Reading Speed (ch./sec.)	First Installation	Approx. Base Price
Recognition Equipment, Incorporated	Input 3 Document Reader	Vacuum	Belt & Roller	Length: 3.75 to 9.0 Width: 2.25 to 6.0	60(1 line) 7.5 (4 lines)	Optical Photocell Array	Matrix Matching	Extended Numerics: OCR-A, OCR-B, 1428, 1403, Handprinted Nos. Mark Sense, + 12 Control Characters	Numeral, special symbols, handprinting	30 to 75	1971	$ 33,000
	Input 80 Page Reader	Vacuum	Belt & Roller	Length: 4.0 to 14.0 Width: 5.75 to 9.0	300(1 In.) 37(30 In.)	Optical Photocell Array	Matrix Matching	Up to 14 fonts, Hand-printing, Mark Sense	Alphanumerics, special Symbols, Handprint	1,200-3,600	1971	$ 446,000 665,000
Scan Data Corporation	100/300 Page Reader	Vacuum	Conveyor Belt	8.5 x 14	(1)	Optical Flying Spot Scanner	Feature Analysis	Handprint, Multiple Type Fonts	Alphanumerics, Punctuation, Special Symbols	Max. 800	1968	$ 400,000
	200 Page Reader	Vacuum	Conveyor Belt	8.5 x 14	(1)	Optical Flying Spot Scanner	Feature Analysis	OCR-A, OCR-B, 1403 Selected Typewriter Handprint	Alphanumerics, Punctuation, Special Symbols	Max. 800	1969	$ 175,000
Scan-Optics Inc.	20/20 Page & Document Reader	Friction	Belt	Max. 9 x 14 Min. 3 x 4.5	Max. 500	Optical	Feature Analysis	Selfchek 7B, 12F and/or Selfchek 12L IBM 407, IBM 1403 OCR-A, Handprint	Alphanumerics Symbols	Max. 2,000	1970	$ 120,00
Univac	2703 Document Reader	Friction	Belt	Length: 3.00 to 8.75 Width: 2.75 to 4.25	300 600 Opt.	Photocell Matrix	Matrix Matching	OCR-A, Univac H-14 Mark Sense	Numeric, Special Symbols	Max. 1,500	1969	$ 42,000

(1) Dependent upon number of lines and fields within lines to be read.

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Mr. Andersson heads the consulting firm of Andersson Associates, which he founded in 1964. He was previously with Univac for seven years and before that with RCA and GE. He has a BS in mechanical engineering from the Univ. of Pennsylvania and has done graduate work in electrical engineering, marketing, and business administration.

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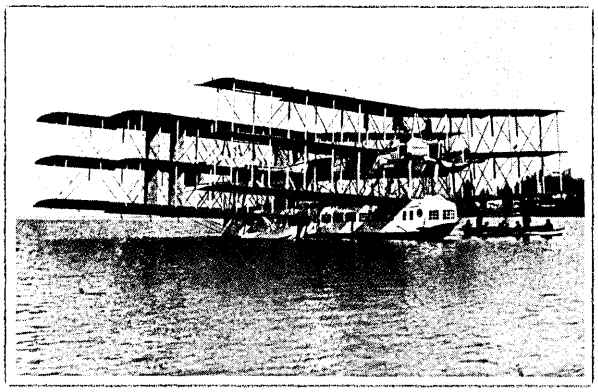

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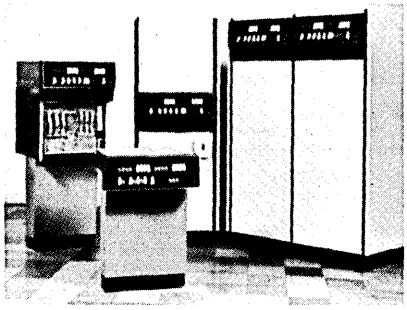

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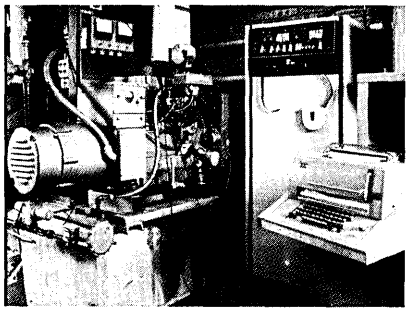

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Concerning the Nature of the Game—Book II

De Ludi Natura Liber

"The principal problem of human memory is not storage but retrieval. The key to retrieval is organization, or, in even simpler terms, knowing where to find information that has been put into memory."

—Jerome Bruner

The picture one gets from the trade press of a management information system has a business executive sitting at his desk with a crt terminal. Word comes that Quigly has been drafted. The executive, entering some easy to learn and powerful command language orders the data bank: "Get me the file on Quigly." The system shoots the Quigly file back onto the screen. So far we merely have an automated filing system with certain advantages over conventional systems.

If, however, the executive queries the data bank: "How many of our employees are eligible for the draft?" a true information system is assumed, and under the current state of the art, whether or not the executive receives an answer will depend on whether or not some programmer anticipated this question at the time he designed the indexes. If the programmer did not anticipate it, the system will fail.

There has been a great deal of confident talk, and as much well-founded concern, about the data banks of the future. Data that was at one time kept by numerous agencies in geographically remote locations is being centralized and organized for rapid access with the advent of modern computers. The special implications of this situation aside, it is nicely illustrative of the current state of the art: the industry is capable of supporting large, convenient filing systems.

It is clear, however, that those who talk about such tools as management information systems envision much more than simply storage and retrieval systems. But the technology for information systems has remained stubbornly elusive. The hardware to support an information system of considerable sophistication is already available; in fact, many have purchased the requisite hardware assuming an information system would follow, only to be disappointed after years of programming effort. The fact is that programming cannot yet support a true information system, although many advanced filing systems exist. The reasons for this are many and complex.

The difference between designing an information retrieval system and an automated filing system lies in the ability of the system to respond to general, complex, unanticipated, and ambiguous inquiries. This design problem can lead programmers to brooding over some very fundamental questions, namely: what is information? and how can it be most usefully organized and retrieved? Unfortunately, there is a strong temptation to ignore such questions and continue to program using such techniques as table look-up and keys—that is, the technology of a filing system. The result may include as many cross references as the programmer can dream of, but this will never be sufficient. To proceed thus drags the programming profession even deeper into C. P. Snow's problem of the two cultures—the widening gap between technology and the humanities. At present, the English Romantic poets have much more to teach us about information than does computer science. (See Wordsworth's "Ode: Intimations of Immortality from Recollections of Early Childhood" in this connection.)

At present, the English Romantic poets have much more to teach us about information than does computer science.

It is now possible to retrieve data from configurations of bits, as in a filing system; in the future it may be possible to retrieve information from data. This article presents a first step toward true information retrieval. The approach used is to examine the notions programmers currently have of addresses, indexes,

and their relationship in order to broaden them into concepts which are more general and useful.

In the traditional sense, an index simply provides a way of finding an address. The organization of current data banks is somewhat analogous to a reference book. An index of subject matter refers to one or more addresses. In the case of a book these would be one dimensional page numbers. In general, we simply consider an address to be an n-tuple; for example, (54), (34, 56, 25), and $(a_1, a_2, \ldots, a_n)$ are addresses where an origin, interval, and co-ordinate system is assumed. In a computer address, the elements of an n-tuple may represent such things as a machine cycle, a disc search subroutine, a storage hierarchy shift, etc. The point is that an address has a unique location in space and/or time associated with it, and that given the address, the contents of the location can be retrieved using some algorithm. In current systems the user is rarely aware of physical addresses, only index entries. It is hoped that in future systems the user will rarely be aware of index entries, only information content.

In general, there are two ways of locating a data item. One can either scan for it, looking through all of the data on hand a piece at a time until one finds what one is looking for, or one can address directly the piece of data one wants. If the latter is possible, it implies that the former, or some equivalent, has been performed at some previous time. This explains two types of basic indexing already familiar to programmers: table look-up, which gives a keyword address association based on some convention (commonly alphabetical order, as in the case of a book), or a computed subscript, which provides the address of data that has certain known properties by virtue of its association with the particular subscript. A third proposed technique involves attaching a large number of "tags" to small units of data; however, this technique is the equivalent of keyword indexing and is subject to the same failings.

Data banks designed using the techniques just described have two principal shortcomings. First, suppose someone needs a piece of data and it had not occurred to the designer of the indexes that anyone would ever be interested in retrieving such an item. If the person were using a book, he could try searching related topics. This entails a number of complex mental processes that current data banks cannot duplicate. Second, suppose someone needs some information which is the function of several or even numerous data items. Again in the case of a book, one could begin checking a number of related index entries and conduct a broad search. But in the current automated systems the user is without recourse unless the system designer has anticipated the specific information request and included it as a special case in his indexing scheme.

Using addresses and indexes, a program can turn a series of bits into a useful data bank. However, the necessary intellectual advances to solve the problem of turning a data bank into an information system have not been made. When this breakthrough comes it will be more important to programming than the first FORTRAN compiler.

A. M. Turing had a major design advantage in 1936 in that he had no computer. He envisioned storage as homogeneous, an endless tape extending through the executive in either direction, with the logic controlling the behavior of the machine imbedded on the tape as data. The essence of the situation has not changed, although the appearance has changed radically. For technical reasons (that is, costs) we are now faced with myriad storage hierarchies with resident logic and data. Programmers have lost sight of the logical homogeneity of storage, and I/O has been reified into an architectural status which is misleading. The only "necessary" I/O involves terminals, that is, communication of logic and data with humans (a feature which Turing's machine lacked). All other so called I/O exists only for cost reasons and will probably be phased out as the technology advances (we have the technology to program them out now, but not efficiently). We must avoid the mistake of letting idiosyncrasies of current storage devices dictate the conceptual architecture of our information systems.

Secundus

by Lucian J. Endicott, Jr., and Peter H. Huyck

Not so obvious, but becoming more current, is the notion that logic is also a function of addressing.

Much computer architecture is now coded by engineers.[1] Increased communication with these information designers can help put new techniques at the disposal of programmers. An example of this, relevant to the question of indexing and addressing, is the technology of associative memories. Associative memories add a compare operation to the conventional read and write. They are frequently known as content addressable because a selected word is compared to every word in storage in parallel, i.e., simultaneously, and a signal is produced to indicate a match. It is this content addressable quality that leads one to feel that associative memories extend regular data indexing in the direction of information indexing.

A full associative search is both parallel and content oriented. A language with string handling capability (such as PL/I) in conjunction with the logical operators, can provide the content feature associative capability. Strings can serve as indexes to some less accessible storage hierarchy (commonly discs) in a retrieval system which includes not only data but something beginning to resemble information.

A combination of associative and serial searches suggests itself for best performance and cost and, in

1. See "De Ludi Natura," **Datamation**, Feb. 1, 1971.


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DIGITAL COMPUTERS

fact, associative and serial searches can be seen as the extremes of a spectrum of possible search strategies. Of course, associative searches still retrieve only symbols. But, by allowing an increased complexity of symbol interconnectedness, associative search techniques seem to allow us to get a first whiff of information from our data.

In a digital computer the address space is discrete; therefore any address may be characterized as an n-tuple of integers. The addressing function is best characterized as one of "putting," where "finding" is a recapitulation of the addressing algorithm. Further, to put something in discrete address space is to map the continuous world of experience into discrete form; hence it is at the juncture of addressing that analysis is important.

It is possible to characterize all digital computation as a function of only two actions: addressing and comparing. This characterization complies with the intuitive notion of the Turing machine consisting of only a tape (discrete address space) and an executive (to compare). It also parallels the possible reduction of all logical expressions into two operatives.

Addressing may be a true primitive, and in fact may subsume both instruction sets and parallelism. Information organization and retrieval is obviously a function of addressing. Not so obvious, but becoming more current, is the notion that logic is also a function of addressing. The reason for the emergence of this view is empirical: new machine manufacturing technology makes memory logic extremely attractive, and indications are that memory logic will totally supplant present ALU implementations. Memory logic does not alter what is done, nor does it fundamentally alter the process—it only makes the structure of the process "real."

If a machine (hardware, software, and data) is finite, then it can be shown that the machine is deterministic and closed (that is, it loops without input). Each state can be represented as an address space. Each address space can be stored and referenced by a linear address space whose one-tuples are the machine cycle. Therefore, any program can be expressed by an index of machine cycles. It follows that parallelism can be expressed as a function of addressing. In practice, "parallelism" is used to denote both bus width and sequence control as if these were two different entities. But from the foregoing, as well as from the conceptual implications of the Turing machine, it would seem that "sequence control" should be considered a "system cycle" (defined as the lowest common multiple of all the machine cycles in the system). Then by use of the system cycle the various machine cycle address spaces can be referenced by a linear address space whose one-tuples are the system cycle.

A true information system will permit ambivalent and unanticipated inquiries. Organization is clearly the key to this objective as suggested in the quotation from Jerome Bruner. The degree of organization required calls for a generality of the indexes which has not yet emerged. Although we may not expect to be able to design such a system, we might expect to design a system to learn to do such indexing, that is, dynamic, self-modifying indexes. This is known as facilitation in human psychology. We would then have a high-level index compiler whose completely contingent coding would produce a time abstracted, tracking model of the data bank.

From the observations that have preceded, a first possible definition of information can be attempted: information is bits organized in such a way that the addressing structure is isomorphic to that set of conventions to which we have given the name deductive logic. It is interesting to note from the Turing discussion that just as the logic resides in the data, the data resides in the logic. Computation systems can then be thought of in relation to information systems in the following way: a computation system has data to be found in the future embedded in its logic prepared in the past; an information system has logic to be found in the future embedded in its data prepared in the past. ■

Suggestions for Further Reading

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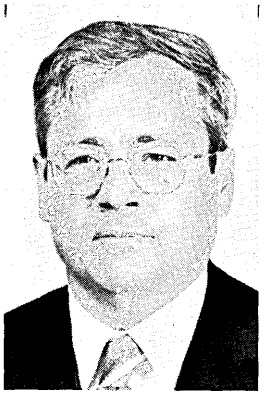

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The art of managing programming—a random environment operation—will progress only if there is a change in the basic decision-making structure

Needed: a New Planning Framework

Apparent contradictions are presented in the introduction to this article. How does the writer plan to "manage" a "random" activity? For that matter, how do words like "art" and "random" apply to such a systematic, scientific field of endeavor as computing? Those of us close to the day-to-day realities will find the "art" and "random" terms more defensible, but we have always been led to believe that this is the result of inadequacies on our part rather than having an ill-fitting structure in which we do our job.

The theme of this paper is that the planning and decision-making framework that programming management is supposed to use is not appropriate in a number of respects and that a more reasonable one must be developed. Moreover, a new framework that will be more appropriate for the more significant programming development projects will also be better than the present one for many of the most challenging general management tasks of the future.

Before attempting the formulation of a new framework, we should identify the elements that make the old framework unrealistic. I will take examples from programming projects, but the key issues are relevant in many other areas although this is not always obvious. This similarity may be demonstrated by the growing practice of referring to all study, analysis, and planning tasks as software in addition to the more conventional programming. It is important to note my examples are taken from "systems" programming where the tasks are relatively large, technically demanding, and interactive and have a vaguely defined set of resources and requirements. I wish to eliminate from discussion the set of programming tasks in which the following are not true—they are as well suited to conventional techniques as any design or mechanization task.

1. *The "product" delivered is really the satisfaction of a need on the part of the user rather than the supplying of a system or item.* This distinction gains significance when you realize that the needs of the user change in the process of development for a number of reasons. The development effort must be organized to accommodate this reality rather than treat it as an unwelcome perturbation in an otherwise ordered existence. The reasons for the changes in the user's needs are not all one sided and in the normal course of events can be as much of an advantage to the supplier as a burden to him. This will be true if the effort is structured to accommodate change and if the development group does not expend unnecessary effort resisting it. One of the most fundamental reasons for these changes is that the very existence of the "product" changes the user's requirements and educates him to possibilities. Whether this is an advantage or disadvantage to the implementer is mostly a function of his organizational framework. Every manager is aware that changes have always been unavoidable, but the development effort is always organized as if "this time it will be different."

2. *The effort is almost always performed by "experts" who, though qualified, do not have experience in this type of task or with the current type of equipment.* In other words, there is seldom available the required expertise—it must be developed in the course of producing the result. Typically, this is the most time-consuming and expensive part of the whole effort. Proof of this statement is easily found in the common experience of having to completely redesign and implement a system at the last minute. Typically such redesign takes less than 10% of the time of the original implementation because the programmers know how to do it the second time around. The implication that nearly 90% of the original "design" effort was education and organization is largely correct. The implications of using improper labels will be discussed later.

3. *Programmers are hard to manage and, perversely, the best ones seem to be the hardest to handle.* This is a fact of life. If the organization can only accommodate "manageable" types, a large segment of the most productive and creative programmers are not available to it. Often these "unmanageable" types are merely badly managed. However, even with the current professional marketplace, any aggressive programming development group will have a few prima donnas and will need to find a way to use their talents.

4. *The consequences of low quality performance are generally hidden and have a disproportionately high impact on the end result.* As an example, the performance of an extremely expensive hardware configuration will be degraded to a fraction of its capability by very subtle inefficiencies in the programming. Also, usually there is no objective measure of system efficiency because there is nothing comparable against which to measure the end product. Money spent on software systems is vastly more productive of performance improvement than hardware advances. Factors of two to three are commonplace; improvements measured in orders of magnitude are not uncommon. Lest we boast of our technical cleverness in achieving such an improvement, why was the system designed and used for so long, so inefficiently? How many other grossly inefficient systems are performing without anyone's awareness?

Systems are getting bigger. One result is that there are more people who have to work closely for a long period of time. More specifically, the implementers of these systems not only have to be cooperative, they must also be able to communicate. Consequently, the "best" design is frequently the one that is most easily understood and safely modified by all the members of the team that will be interacting with it over the life of the project. Often this is not the design that is most technically satisfying or efficient in operation. Generally, moderate inefficiencies can be tolerated in 90% of the system and the other 10% can be "tuned up" with a good technical team after the system is running.

Programmers are notoriously poor communicators in both the written and spoken forms. Many systems programs have been written without design reviews, design specifications, or any comments in the code. This works reasonably well when only a few individuals are involved, the duration of the effort is short enough that the originators complete it, and the level of complexity is relatively low. Not many systems meet all these criteria.

On a reasonably large project one man cannot be the technical decision-maker. For one thing, there aren't enough mental giants to go around. Even if there were, it is plainly foolish to organize with an implied dependence on a few key individuals. The alternative is painful but necessary—cooperative, group decision making. The senior technical people must jointly resolve their problems, compromise their designs, and still take personal responsibility for the results that are not completely of their own choosing. Decision making and responsibility no longer have a one-to-one relationshlp.

Operational system objectives are ambiguous. Projects are often specified in terms of end use rather than produced product. A good example is a requirement to deliver a computing system that improves city traffic flow 20%. The systems where the objectives are spelled out in the producer's terms, such as system data-handling capacity, compiled statements per second, etc., are less frequent. A key point is that the contractual relationships are very imprecise under these conditions. Significant factors that can upset the performance actually produced are virtually impossible to predict and can be contractually defined only with great difficulty. The only answer to this is a harmonious, completely candid relationship between the customer and the producer. The performance specification must be viewed as an evolving record of the system design. The very thought of managing such a project is painful to most managers, but many customers now know that they do not have to allow the supplier to deliver his product, irregardless of whether or not his problem is solved.

Really dynamic growth and challenging projects will go to organizations that are willing and able to operate in the following fashion:

1. *Structure the management and planning in a way that recognizes the fluidity of the task.* Specifically this means that detailed planning, although more necessary than ever before, must be treated in a manner very different from previous practice. Task breakdown, level of effort, time for completion, individual assignments, preliminary design decisions, and milestone definitions should always be treated as tentative. The plan should have alternative approaches and responsibility overlap.

The usual practice is to make a single plan and allow some undefined pad for each task because the planner suspects that future conditions will not be as expected. Present planning recognizes this same uncertainty, but simplifies it by assuming correct analysis and design and then adding a factor for unknowns. In the proposed approach, the task is assumed to be only partially defined; contingent plans for the unknowns are laid out depending on results at future points in time. Milestone events can be points at which tasks are completed and/or new plans are made which use one of the alternatives. (This approach is used to some extent in research projects where it is clearly recognized that the task is only partially known.)

A corollary of the above is that the plan or the design definition was not made in heaven and is subject to review. The plan is merely a record of the best thinking done with information available at the time. It is only a tool for the convenience of those responsible for the project and should be changed at their discretion. Obviously all change is costly, but this is a normal trade-off situation.

2. *Insist on adequate documentation and organize the paper work system so that it is as painless as possible.* The only way to integrate a system design besides trying it out functionally (i.e., on the computer) is to communicate that design to all concerned. The least ambiguous way to communicate the complex details of the design is to write them down. Most programmers (system analysts, engineers, managers, etc.) hate to do this because it forces them to commit themselves before they are ready, and, even worse, it displays for the readers of the document all the weaknesses of the design (the designer?). This is precisely why it is necessary.

There are two important areas for which management must provide if the documentation is going to be available and useful in the implementation of the system. The first is the easiest, although it is often not provided due to mistaken ideas about economy in support services. The second is far more difficult. This first area covers the mechanics of producing the document. Clerical services should be abundant and of high quality with additional help such as technical editing, drafting, and junior technical skills readily available. No technical staff member should ever have to wait in line for document reproduction, to proofread typing, reorganize a specification to fit a required format, redraw a flow chart from a rough sketch, or wait more than a day for proofed typing to be returned. If he does and he needs it sooner, management is spending dollars to save pennies in support services.

The second area addresses the fact that by documenting a design, the designer exposes himself to the criticisms of everyone and he must be able to defend everything that he writes. If the organizational structure is threatening in any way, nothing is going to be documented until it is completely defensible. Of course the excuses heard will never mention this, but it will be a prime reason why nothing ever gets written up until it is all finished (after the most important need for it has passed).

Sometimes the threat is not real but the individual

has become accustomed to organizations that are threatening and is instinctively defensive. With patience, this problem can be dealt with. More often the threat is real and it is management's fault. This is a complex problem and cannot be solved in an isolated way. A number of writers in the field of organizational development (Argyris, Bennis, Drucker, Likert, McGregor and others) have dealt with this. An article by Chris Argyris, "Resistance to Rationalized Management Systems" (Innovation Magazine #10), provides a good description of the reasons organizations are secretive and defensive. Strangely enough, the article was written because of the opposition to management information systems that he had discovered. My experience in the computer industry bears out Argyris' contention that better information is not really desired because it is threatening. No wonder the complex software systems take so long to integrate—everyone is afraid to communicate in the design stage and they have good reason to be afraid.

3. *Design and implementation must be reviewed by another individual at least once.* This will be agreed to by everyone, but in my experience, technical review is either an occasional, emotional experience which is more trouble than it is worth, or it is not done at all in any realistic manner.

Technical review needs two ingredients (among others) before it can be efficient and effective. The first ingredient is timely and adequate documentation, as mentioned in item 2 above. Without documentation, review meetings are a waste of everyone's time because none of the attendees have really analyzed the design so that they could review it constructively. No comments need to be made about the salesmanship, one-up-manship, and sheer boredom that frustrates any serious attendee of these sessions where the participants are not prepared. In addition to having the documentation available, management must make it clear that it must be read and allow time for this to be done. For large projects it is advisable that certain senior technical staff members have this as their primary area of responsibility.

More subtle but more important is the attitude with which the technical reviewers approach the task. If their viewpoint is that they want to integrate the design being reviewed with the rest of the system (including their own area of responsibility), and the purpose of the review is to accomplish that, then there is the basis for an effective design review. This means that the whole system is being reviewed in the light of the design under discussion, and it should be true that other portions of the system design will be scrutinized and could be changed as a result. Only in this way will the problems that would otherwise show up in system integration be exposed. This whole issue is, of course, just another aspect of the nondefensive relationship among the members of the organization.

The preceding suggestions obviously were "fix-it" kinds of answers. My experience has shown that they relieve many of the problems, but create new ones when applied in the existing order. For one thing, few organizations can tolerate such things as constantly changing contractual requirements, total honesty with the customer, and admittedly tentative design as a continuous fact of life. This is particularly true of the higher-management types, who seldom see the underlying reasons for these conditions but observe the outward manifestations limited by all of the contradictions of their own organizational concepts. An even worse problem is sometimes experienced by those members of the development team who are accustomed to clear responsibility delineation and authority to go with it. They refuse to be critically reviewed by their peers and cannot accept overlapping responsibility. This working environment is incompatible with their experience and habits.

All of which paints a discouraging picture. What can be done? I don't know, but I feel that in all but a few organizations, the existing companies will never be able to adapt themselves to function effectively. New organizations, with no commitment to existing attitudes and techniques and composed of individuals that are not afraid to deal honestly with each other and with their customers, are going to be the profitable problem-solvers in the future. What is more, the members of this team will be accustomed to ambiguity in authority and responsibility. These groups will be able to function effectively with constantly changing objectives and ill-defined interfaces. Many of the youngest technical people are very well suited to this and will probably gravitate to positions of responsibility because of their effectiveness. Organizations they head will be the exciting growth vehicles of the '70s, just as most of the exciting growth companies of the '60s were newly created and were not committed to the old ways of doing business.

The beginnings of the '70s have already been painful enough to convince many of us in the computer business that things will be different. However, most of us will attempt to avoid the logical conclusions and will cling to the old ('60s type) ways. We then become the objects of the very kind of criticism we directed against the old industrial firms—that of being out-of-step with the times.

If there is any solution, it is to organize for the temporary and the ambiguous. This requires a different viewpoint and tolerance for the lack of security inherent in this environment. There may be no alternative, however. An aircraft production superintendent, viewing idle assembly buildings, said "The only thing wrong with this company is that it needs another 5,000-plane contract." He was right—they were perfectly well organized to build 5,000 planes any time anyone wanted 5,000 planes. ■

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PERSPECTIVE

an interpretive review of significant developments

Wimmix Award Draws Fire Over Procurement, Conversion Costs

"From now on, we're gonna offer the cheapest systems possible, regardless of how lousy they are," said one loser shortly after Honeywell walked off with the big one — a $51.3 million contract to update the Worldwide Military Command and Control System (Wimmix). CDC, IBM, and Univac were the also-rans. For both the government and the bidders, it was possibly the longest, most complex, most acrimonious dp procurement on record. Each company submitting a bid probably spent a record amount to prepare it — between $3 million and $6 million apiece, according to one estimate.

Henry Forrest, CDC senior vp, said, shortly after the award was announced, "If an over-auctioneering environment coupled with relaxed specifications and extended benchmark qualification periods are allowed to become a way of life, the industry will — and already has in the case of RCA — look elsewhere to do its business."

There were comments in the same vein from Burroughs, RCA, and Univac. One possible result is that a federal commission now studying government procurement will be asked to take a closer look at the way dp equipment is procured. Help may also be sought from Congress — most probably from the Joint Economic Committee chaired by Sen. William Proxmire.

The Fine Print

Honeywell offered to sell DOD 35 systems, with specified software and other support, for $51.3 million. The federal supply schedule price of the same systems was about $40 million higher. To obtain the discount, which amounts to approximately 75% of the $51.3 million purchase price, the Pentagon must buy the systems within one year after they're delivered. Included in the saving is 570 man-years of free systems analysis and engineering assistance. Maintenance is priced at a maximum of $6200/month the first year and escalates about 45% by 1978.

The contract obligates DOD to order nine Wimmix systems by next June 30; up to 26 more can be ordered within the following year. The first system will be delivered next January to SAC headquarters at Offutt AFB, near Omaha. The last system must be in place by December '73. The contract includes 25 software packages but excludes any conversion or application programming. This work will be done by DOD in-house or by separate contract. Honeywell is probably assuming that it will get most ot these contracts. In fact, one source says the company must get add-ons to turn a profit on its Wimmix bid. Honeywell officials insist they'll make money on the contract as is.

Honeywell based its bid on a souped-up version of the GE 645 and 655 (now called the H6050 and H6070). One observer says the company had to invest relatively little in these machines, since they were already developed when GE's computer business was acquired last year. Thus, Honeywell could come up with a bid that reportedly was $20 million below the one submitted by the nearest of its rivals (allegedly Univac).

This figure, as well as the others, shouldn't be considered precise because the contract gives Wimmix managers a great many options, and the cost of the buy fluctuates depending on which combination of options is chosen. Three basic system configurations were specified, for example, but bidders had to offer a maximum and minimum size of each.

Award ot the Wimmix contract represents a major victory for technicians within the Joint Chiefs of Staff, who have been insisting for years that the system is needed and is being adequately planned. If and when the full story comes out, Deputy Defense Secretary Packard will get much of the credit. For, on the day before the contract was signed, Packard called Rep. George Mahon, crusty chairman of the House Appropriations Committee, and persuaded him to OK the buy. The committee previously had been extremely critical of Wimmix. We understand that Packard turned Mahon around by pointing out that if the pending contract wasn't signed immediately, several Wimmix users would have to negotiate separate buys for new computers, and this would further complicate the already-difficult job of developing a centrally managed hardware- and software-compatible Wimmix network. Reportedly, Packard also mentioned the industry's need for a shot in the arm, and promised to keep a tight rein on deployment of the system — thereby responding to the committee's chief discontent.

But if the House committee is mollified, other Wimmix critics aren't. They insist that key questions, which should have been answered before the rfp was put out on the street, still haven't been settled. As a result, Wimmix users are now locked into a system that may not be the best obtainable and may not even be adequate. If that's true, they say, the whole investment is suspect.

These are some of the questions that allegedly haven't been answered:

The Secretary of Defense still hasn't decided when to phase out the "second standard" IBM systems that now support some 30 Wimmix commands. Wimmix managers have only a rough idea of what it will cost to convert existing programs and know even less about the technical difficulties involved. An effective data management system is crucial, yet DOD is currently evaluating three candidates and doesn't really know whether any of them can be made sufficiently machine independent, or what the cost of this independence will be. The project is to be managed and supported centrally — a technique that hasn't always worked in the past, particularly with complicated systems; yet key elements of the management organization remain to be worked out. The hardware being acquired from Honeywell was designed, for the most part, more than two years ago, and the workloads specified in the contract depend on data collected five years ago; so there is a real possibility the "new" systems won't last six years, as contemplated by DOD planners.

—Phil Hirsch

RCA Versus Its Users: "Divide and Conquer"

They referred to it alternately as "the wake" and "the funeral." One delegate called it "an exercise in futility." Another said he wanted "to punch one of them in the nose." When asked one of whom, he replied, "I don't care. Anybody'll do. That's how frustrated I am."

It was the RCA Computer Users Association meeting in late October in San Francisco. A suggestion made during a new members' orientation session on the evening preceding the formal opening of the meeting strongly hinted at the focus of the sessions to come. It was for creation of a special interest group on class actions. And while this group didn't hold any formal meetings during the three-day conference, Bob Farmer, director of data processing for Orange County (Calif.), who volunteered to chair the new group, seemed to take the job seriously.

In spite of the undercurrents of emotion and a program that had to be constantly changed, CUA president Dave Rau and members of his executive board did an admirable job of conducting a businesslike conference and developing, in a relatively short time, a position paper that seemed to please everybody.

But RCA called the shots as far as corporate participation went. And maybe that was as it should be, for RCA picked up the tab. It could very well have been the last RCA-financed CUA meeting. Corporate spokesman Joseph W. Rooney, president, RCA Data Processing Div., assured the group that RCA would continue to support the CUA — which involves, among other things, paying for every third CUA meeting — "for as long as the organization adheres to its original charter." The feeling among CUA board members was that RCA would consider some of the actions taken at the San Francisco meeting as outside the original charter and would withdraw support. "But we don't feel that our intents and purposes have changed a bit," said Rau.

The original program called for Rooney to address a general session from 10 to 11 a.m. the first day of the conference. This was to be followed by a half-hour break after which Rooney would spend an hour answering questions both written and from the floor. It didn't quite work that way. Until Rooney walked into the Hotel Mark Hopkins' Peacock Court at exactly 10 a.m. on Monday, Oct. 25, CUA officials didn't know where he was staying, if he were indeed in San Francisco.

What Rooney said in his 20-minute (not one-hour) talk has been widely reported, as has been the disappointment his remarks evoked in CUA. His parting comments were that he would see individual users in 15-minute sessions in his suite and that appointments could be made through Rau. He didn't come back to answer questions until 3 o'clock that afternoon, and they were questions that had been submitted to him in writing and which he had had a chance to sift beforehand. For the most part his answers were as evasive and general as his earlier remarks and were received with the same disappointment. Someone said afterward that he'd counted the number of times Rooney used the word "individual." He used it more than 20 times. "They're determined to divide and conquer, and they're going to do it."

Most of those who had an individual audience with Rooney reported that the sessions were "short and pleasant." Some said he answered their questions "as much as he was able, even calling back east in some cases, but answers for the most part were hard to come by." One who got an answer that itself implied another question was Robert J. Conroy of Owens Corning Fiberglas Corp. He wanted to know how long RCA's Cherry Hill data center would continue to be operated. "We need that back-up." Rooney's answer was that the data center will continue "for as long as RCA's corporate MIS is run on RCA equipment." The implied new question is, of course, how long will that be.

The position paper adopted by CUA at the meeting said CUA "is absolutely and unalterably opposed to the manner in which the RCA Corporation has chosen to effect this dissolution." The language in the corridors and during the breaks was much stronger. Words like brutal, irresponsible, and ruthless were common, as were phrases like a black eye to the industry, a body blow to the industry.

And there was a lot ot talk of legal action both in and out of the sessions. Many felt the CUA as a group should have legal counsel; and while no final decision was made on this point, the executive board was going to look into it. One of the strongest cases for having legal counsel was made by James N. Haag of the Univ. of San Francisco, who described what USF planned to do and suggested this course of action as a guideline for others. He said USF dp people had gone to the school's law school dean with their RCA contract (lease/purchase) right after the announcement. They'd received an "off the top of the head" opinion from him that they could get out and get all their money back from RCA and maybe more. This would be based on asking RCA for 5% of original machine value for loss of revenue. USF was a Bay Area test site for RCA and derived revenue from this. They would ask another 10% for additional conversion costs which they would not have had to incur had they been able to upgrade to new generation RCA equipment. Another 20% would be sought for loss of resale value. They checked resale value of their equipment after the announcement and found it had gone down by that amount. And then there would be a percentage asked for damages, which could go as high as 60%. For USF, damages could include such things as loss of prestige in the community of universities, loss of alumni giving because they were made to look bad, and students trained on obsolete equipment unable to get jobs.

A big pitch made by Haag was: "Don't sign a certification document under pressure." Certification is a kind of renegotiation process RCA is going to go through with each of its customers and, according to Rooney, they hope to complete this within 30-45 days.

Few users liked the term certification. One who was particularly offended by it quipped: "It seems to me we ought to be certifying RCA. But then I don't think any of us would want to certify them." "Ha," responded another, "the most trusted name in electronics!"

—Edith Myers

NEWS SCENE

RCA Autopsy: The Cause Was Within

When C. Allen Burns was preparing a talk last August to be delivered at the Univ. of Calgary in October at a meeting observing the centennial of Babbage's death, he decided to call it "The Autopsy of a Company." It was to be about RCA Computer Systems.

Burns thought then that he would be dissecting a company on the verge of death, that he would be predicting its demise. Instead it turned out to be an autopsy after the fact. His big point: "RCA was in no way disadvantaged by IBM's entrenchment. The problem was within. The death should be attributed to suicide or cancer."

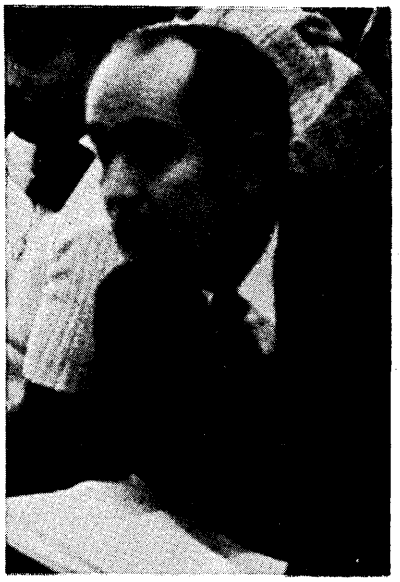
Burns was the architect of the Gemini computer (Aug. 15, 1970, p. 39) and a founder of ill-fated Computer Operations, Inc., which planned to build it but ran out of money a year ago and folded. He was a systems architect for RCA when he was preparing his talk in August. He left RCA's employ as a voluntary lay-off the Friday before the meeting in Calgary. At Calgary he painted a picture of an organizational nightmare, "top heavy with management" and riddled with "technical incompetence."

He said that prior to the influx of IBM people who followed L. E. Donegan, Jr., into top spots in RCA Computer Systems "RCA was engineer dominated and was building irrelevant stuff."

Burns described Donegan as "very shallow technically" and said he made a mistake in concentrating his early efforts on straightening out the marketing organization without "ferreting out the rat nests in the development program at the same time.

"All of the IBM guys were IBM people out of IBM water, but they didn't know it. RCA was just big enough so that it seemed to them they were still at IBM, but it wasn't big enough for them to get away with acting like they were. They made the mistake of believing the technical people, which was OK at IBM but not at RCA. Too many of the old-line RCA technical types were absolute incompetents."

Prior to the arrival of the IBM people, said Burns, RCA was planning a new product line, a total of five machines to match 370/135s through 165s, to be developed by both RCA and Siemens. RCA was to do the smallest, the largest, and one in the middle; and Siemens, the two on either side of the middle. With the arrival of the IBM contingent, he said, "machines were decommitted one by one until only the 155 equivalent was to be built." This was Project Alligator, and according to Burns it was a technical nightmare. "At first the planned machine wasn't even going to be compatible with the Spectra 70. They took care of that, but there was no review of hardware organization; technology developed for larger machines was kept in where it wasn't needed and made production incredibly expensive."



JOSEPH W. ROONEY: President of RCA Data Processing Division seconds before the not-too-pleasant task of answering questions from delegates to RCA Computer Users Assn. meeting in San Francisco (see p. 41).

Of RCA's software operation, Burns said: "Before the IBM influx the software arm was run like a university. Nobody had any idea of specs or hardware development practices. They built things by letting them grow like Topsy." He said the operating system for the 70/46, TSOS, "grew like Topsy with a malignancy."

While Julius Koppelman was looking over the books (Nov. 1, p. 42), Burns said there were "two technical types from corporate roaming around talking to the technical people (himself included) and piling up enough info to predict an impending technical disaster."

And the RCA board, armed with financial bad news from Koppelman and hints of a technical disaster to come, says Burns, "were confronted by an oblivious Donegan who walked in with a five-year plan which would cost $500 million. That did it. If he'd said anything else, they might not have acted as precipitously as they did."

Burns called RCA's personnel practices, particularly the way they handled layoffs following the announcement, "straight out of the 19th century." He said employees who had joined RCA after April 1 (himself included) got no vacation pay. There was one week's severance pay allowed for every year of service up to 25 years, and those with less than one year got two weeks' severance plus two weeks' "in-lieu-of-notice" pay. The catch, he says, is that the lieu-of-notice pay comes two weeks after layoff, and the severance one month after that. He predicted there will be a class action taken against RCA by employees and said "a big-name lawyer has taken an active interest."

But the big danger, as Burns sees it, lies in "letting the story that it was all IBM's fault be perpetrated. For the good of the industry, this nonsense must be put to bed; otherwise the government will step in and a bureaucracy will be created that will be much harder to live with than IBM dominance.

"RCA has long said it was going to be number two in the computer industry. It was — number two to get out — and unless the other companies start cleaning their own houses and setting about being truly competitive, there will be three-way photo finish for the number three spot in the next couple of years."

Hardware... From a Think Tank?

Trimmed to fighting weight in its second year as a publicly owned compa-

ny, one-time think tank System Development Corp. is a contender in a new arena. SDC has gone into the hardware business.

SDC introduced its first hardware offering, its System/One smart terminal (Nov. 15, p. 84) at the Fall Joint Computer Conference. And the reason SDC expects it to succeed in the market place is appropriate to a former think-tank: "It's the smartest."

SDC's soft-spoken head man, Dr. George Mueller, who was a senior vice-president at General Dynamics Corp. and a NASA associate administrator before being handed the tough job of turning SDC into a commercially profitable company, doesn't see introduction of the System/One as a departure for the firm. "We've always had a hardware capability. We just wanted to use some of our knowledge."

And they're proceeding carefully. No production schedule had been set up prior to the FJCC introduction. Production was to be determined by reaction. SDC had at this writing just one prototype unit which was demonstrated for prospects at the company's Santa Monica, Calif., headquarters prior to being shipped to Las Vegas for the Fall Joint.

Having determined reaction and production, the company planned to begin marketing the system only in Southern California through its own staff and "selected representatives." Then, when their service and maintenance capabilities had been tested, the system would be marketed nationally through reps.

SDC, best known as a software company, claims to be the oldest in this field and the biggest "in terms of dollar volume of contracts completed." It's big in urban systems, and one of its biggest jobs in this category could make the company big in communications. It's a $3 million program establishing a communications network for the Los Angeles County Sheriff's department. This, in fact, says Dr. Mueller, "was our first real excursion into hardware. We use computers to do communications, and while it's a project tailored to a specific user, we hope others will see it and want something like it."

Dr. Mueller has managed to make SDC profitable. In fiscal 1971 ended June 27, the company earned $131,000 compared to a loss of $553,000 the year before. And while first quarter '72 figures were not available at this writing, he said the quarter's earnings exceeded those for the whole 1971 fiscal year but fell below 1971's first quarter. "How do you explain that to stockholders?" One way might be to tell them how SDC has "trimmed to fighting weight." Dr. Mueller reorganized the company into two general groups — Plans and Programs and Service Functions — under two group vice presidents, James B. Skaggs, operations, and Gordon Selby, corporate development. He charged Skaggs and Selby with cutting indirect expenses ... "like my salary." They didn't cut his salary, but they did cut indirect expenses, which were running at $14 million annually, by $2 million — and most of this was salaries. The reorganization and trimming took about three months and some 200 people left SDC during that time, but only half of these, Dr. Mueller said, left because of the reorganization. The rest left because the work they were doing "just wasn't there any more."

DR. GEORGE E. MUELLER
"Not a departure"

A special feat for SDC in its 1972 first quarter was attaining profitability in its time-sharing operations. They closed down their East Coast time-sharing center in mid-1971 because "there just weren't enough customers." Those eastern customers they had were put on a multiplexor in Washington tied into the West Coast center which operated a 360/67 due to be upgraded to a 155 by January. This operation "broke even" in fiscal 1971. Dr. Mueller hopes System/One will boost their time-sharing sales.

SDC's new boss likes his job. "This is fun. I'm really getting to know the people."

IBM Suspends Rental Hikes

Users should be watching IBM for pricing moves now that the wage-price freeze has given way to the control boards. In October, IBM suspended the rental and maintenance increases it announced July 28, bowing to government edicts; they were to have been effective Nov. 1.

But it did uphold the purchase price increases on System/370 processors and 12 submodels of System/3, effective with the announcement. The increases on the 155 and 165 cpu's are about 8%; on the 135 and 145 processors with internal memory, 5.3-8%; and System/3, 6%. The effect is an increase in the already large purchase:lease ratio of the 370, temporarily hurting the few leasing companies dealing in that family.

The question is whether and when IBM will reinstate the rental and/or maintenance increases due on the 360 and 370 cpu's and some peripheral gear (Sept. 1, p. 53) and how the price control board will react. Obviously IBM wants those increases, but if there is any noticeable and unwanted trend toward purchase due to benefits like the investment tax credit, the firm could conceivably leave things as they are for a few more months. This, of course, must be traded off against the loss in revenue due to the peripheral price changes last spring and how much was to be offset by the cpu rental hikes.

On the legal front, IBM, in its trade secret suit against Memorex involving the 3330 disc drive, has now filed for a preliminary injunction to prevent Memorex from using any IBM trade secrets or confidential information pending the outcome of the trial. This is an intermediate step in the lawsuit (which asks for a permanent injunction among other things) and is based on documents and depositions of pre-trial discovery.

Overseas Earnings Give IBM Profit in Third

Despite the recession, and contrary to predictions by some prominent securities analysts, third quarter earnings of IBM increased. The figures were $2.27 per share last year to $2.31 this year.

According to data published by

Burnham and Company, however, IBM's pretax net earnings were $508 million for the quarter, down from $514 million last year, but higher than the first and second quarters of this year. And IBM's tax rate decreased from 49.5% last year to 47.4% in this year's third quarter, apparently as a result of the elimination of the 10% surcharge and increases in foreign earnings, although overseas income was not broken out in IBM's nine-month report. Burnham and Company noted that the effective devaluation of the dollar relative to foreign currencies may also have contributed to earnings.

For the nine months as a whole, after tax earnings were $772,827,469, up from $742,272,425 for the corresponding period in 1970. Net earnings before taxes were $1,471,227,469 and $1,469,772,425, respectively. Chairman T. Vincent Learson commented that "There have been no material changes in the trends previously reported. . . . Net orders booked continue to be adversely affected by a high rate of discontinuances of data processing equipment formerly installed on a rental basis. This appears to be largely due to economic conditions and is reflected in the increase of 12.5% in rental and service gross incomes over the corresponding nine months of 1970."

SEARCH to Try Satellite System

Project SEARCH (System for Electronic Analysis of Criminal History), the federally funded 20-state project to develop and evaluate an automated interstate system of criminal history retrieval, will go on the air Dec. 6 with a satellite communications experiment in fingerprint transmission following correction of problems which delayed an originally scheduled Oct. 1 start-up.

Participants will be the Los Angeles Sheriff's Dept. (LASD), the California Bureau of Criminal Indentification and Investigaton (CII), and the Florida Dept. of Law Enforcement (FDLE), which will plav the part the federal government would play in an actual working system.

LASD will make use of its Ampex Videofile-based ORACLE (Optimum Record Automation for Court and Law Enforcement) storage and retrieval system, transmitting prints from the system via an earth station input system to CII. CII will search its files for a match, transmitting those fingerprints it can't identify to FDLE via the Hughes ATS-3 satellite.

SEARCH coordinator Paul Wormeli said problems involved in setting up earth stations and a malfunction in the ATS-3 were among the causes of the October delay. The experiment is scheduled to last six weeks and to accomplish measurement of time intervals; definition of resolution requirements, both lines per inch and gray scale, using both analog facsimile and digital facsimile equipment; determination of the degradation effect of a facsimile store-and-forward capability; determination of the maximum signal-to-noise ratio allowable; and collection of cost data and related information to allow comparisons of a projected satellite system with alternative systems.

While Others Worry Burroughs Booms

What with GE and RCA departing from the computer industry, many persons have taken to speculating on what firm will give up next. But one dwarf that isn't mentioned in such conversations is the maverick Burroughs, which goes its own way and makes a profit.

When Burroughs president Ray W. Macdonald spoke to a luncheon meeting of the New York Society of Security Analysts recently, no one questioned his firm's commitment to computers. Indeed, the spirit was jovial. And with good reason: Burroughs' nine-month earnings rose 10% to a record $40.5 million, and revenue was up 5%.

Macdonald is optimistic, not just for Burroughs and the computer industry, but about the economy as a whole. He thinks Burroughs is "stronger than we have ever been in our 85-year history." As for the computer industry, Burroughs rejects the argument that the computer market has reached a state of "overcapacity," or a plateau. Rather, "we feel that a relatively unlimited market opportunity exists today. There *is* a large computer population installed throughout the world. However, much of this equipment is obsolete in terms of its ability to satisfy today's rapidly changing demands."

As for the national economy, Macdonald feels an upturn in the business cycle is beginning, and he suggested that many youthful observers, spoiled by nearly unbroken business gains in the '60s, overreacted to the present recession because they had come to believe that business cycles were a thing of the past.

Lockheed Aims High in Core Replacement Market

Lockheed Electronics last month was zeroing in on the end-user market for core replacement memories for the IBM 360 series and was starting high, focusing on 360/67 users.

Ian Ebel, who joined the firm in October and was charged with the job of, as he put it, "getting those core replacement boxes moving out the door," said he targeted the 67 users because "we're the only ones who can supply their needs. It's a small market but the only one in which we have exclusivity." He hoped to have the 67 market "tied up" by this month and move on to 65 users "where we have a lot of competition."

Lockheed has been selling memories on an oem basis since 1959 and, says Ebel, "doing very well at it." The attempt to sell plug-to-plug replacements for core memories under Lockheed's own label is a new one. Ebel says they plan to look over the 370 market once they've established a firm 360 base. They have five 360 versions, Models 2, 3, 5, 12 and 13. The 2 is the basic building block for the others; the 12 is the 360/67 version.

Japan's Big Six: Trend May Be to Consolidation

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industry. But the government, foreseeing the importance of such an industry, nurtured what was there and encouraged its growth. Open competition from manufacturers abroad was stifled by the imposition of import quotas and tariffs, while domestic producers were encouraged to license technologies developed elsewhere. To fund the leasing of systems to users, it joined the manufacturers in forming an organization just to serve this purpose. And, of course, government agencies and ministries leaned over backwards to acquire their systems from Japanese firms, rather than Yankee peddlers.

What resulted were six dominant mainframe makers, dubbed the Big Six. But it became apparent that Japan couldn't support six computer manufacturers, so the influential Ministry of International Trade and Industry has been encouraging them to merge, consolidate — whatever it takes to come up with two or three strong firms that could compete effectively in world markets.

The first step in this direction was recently taken with the announcement that Fujitsu and Hitachi, currently numbers one and two in volume of sales, have agreed to share in the development, production, and marketing of future lines. Contrary to earlier reports, however, the two companies have not agreed to merge their computer operations. Instead, they will pool their r&d efforts on the next generation, which we understand will be a whole family of compatible computers, possibly extending up to the 360/195 class. Meanwhile, both companies will reportedly continue to market their current lines independently.

In time, observers see a merger of these two firms' computer operations, forming a company with significant size and capability. At the end of the latest fiscal year, March 31, Fujitsu had computer sales of almost $190 million, and Hitachi's came to some $180 million. That total would be close to what Burroughs had during its last fiscal year in the way of revenue from the sale of computers and related gear — $404 million.

All along, Fujitsu has been the only one of the Big Six with no ties to a foreign company. Lacking these ties, it was the first to attempt to market computers in the U.S., although there's now some question as to whether it did or did not have an arrangement to do so with Automation Sciences Inc. of Jersey City, N.J. Hitachi, the other partner to this agreement, had a licensing deal with RCA Computers, and the latter's collapse apparently made this joint effort possible, perhaps even necessary.

Anticipated now are link-ups between Nippon Electric, a Honeywell licensee, and Toshiba, left out on the limb by GE. As already reported in these pages, these two have had discussions — none too encouraging, we hear — that may be continuing. That leaves a more imminent pairing: Mitsubishi, licensed with Xerox Data Systems, with Oki, tied in with Univac.

TI's New Mini Has Price Appeal

That minicomputer oem market is looking more and more like an Australian tagteam wrestling match, with the newest entry into the business — Texas Instruments, Inc. — already doing battle with the other major contestants, Digital Equipment Corp., Data General Corp., and Varian Associates.

TI's earlier entries into the mini market were somewhat less than successful — it took TI a year to sell a machine to an outside customer — but the new model, the 960A, has a low enough price tag and good enough specifications to merit immediate and serious attention in the market place. In fact, even before the machine was introduced at the FJCC, TI had a few firm orders in hand.

"We've already established our production run," said Richard C. Jennings, TI's manager of computer marketing. "The 960A is already being used extensively in-house, and we'll be delivering to outside customers in January."

The 960A carries a $2850 price tag for a basic model with 4K of semiconductor memory. The new 16-bit machine is aimed primarily at the traditional process and industrial control market. Jennings said that the machine has been "thoroughly tested in-house" and is "highly reliable." He added: "We think we're ready. We chose not to announce the machine until it was producible."

Jennings said that TI would also continue its efforts in selling minicomputers as parts of systems. TI's earlier minicomputers are the 980, which sells for $6800, and the 960, which sells for $8450. Neither machine has sold well.

For one thing, the new TI machine is interesting because it pits semiconductor memories against core memories on a low pricing level. Customers interested in fast execution times and other high-performance functions will be interested in the new semiconductor memory machine, while core will appeal to customers who need high stability in their applications. TI is also offering the 960A with core, but at a substantially higher cost — $4600 with 4K of memory. "Our big push is on the MOS semiconductor memory," said Jennings. "TI makes MOS, but TI doesn't make core."

Jennings said that TI has software available for the new machine, which was designed around the 960. In addition to FORTRAN, TI is offering a general-purpose TI software translator, which, Jennings said, enables customers to write their own programming language. Some software will be sold too. Peripherals, including printers and discs, will also be available.

The new machine will be marketed through TI's Digital Systems Div., whose headquarters is in Houston. Jennings pointed out that the division already had a national marketing and servicing force in place, and he added that the force is being beefed up to handle the new machine. Surprisingly, TI is not offering a discount schedule for orders of less than 100 machines.

TI's move into the computer business could cause some problems for the large electronic components company. The firm also supplies to virtually all of its 960A competitors, who could take a dim view of buying components from a competitor. Some observers believe that TI announced the older 960 and 980 machines in the spring of 1970 to test the reaction of its minicomputer customers. The feeling is that TI decided to go ahead with the 960A when the firm encountered no resistance from its minicomputer customers because of the two other machines.

Another obvious question raised by TI's move was whether other semiconductor and components manufacturers would follow suit. Motorola has been marketing a minicomputer, but it

hasn't sold well. Fairchild Semiconductor once announced plans to enter the minicomputer business, with a brace of machines, but pulled back without delivering any.

The minicomputer oem business had been appearing to be narrowing down as Hewlett-Packard and Honeywell seemed to be backing off from the fierce infighting that has been the order of the day in that business, particularly between Digital Equipment and Data General. TI's entry into the market — plus the recent entry of Philips into the same market — indicates that there are still some potent companies around that want to get into the scrap.

Second Step to Unite Software Firms Taken

Software firms of the U.S. are uniting. Or are they?

In Denver this fall, 56 people showed up for the first meeting of the newly formed Software Section of ADAPSO (Association of Data Processing Service Organizations), and 27 of them decided to join. But in Washington, D.C., home of the three-year-old Association of Independent Software Companies (AISC), that organization of nine companies said it was "interested in some of ADAPSO's goals," but for the time being wasn't accepting an ADAPSO offer to amalgamate.

Larry Welke, first president of the Software Section, said AISC has been invited to take part in its activities and attend meetings. But Welke, head of International Computer Programs of Indianapolis, said he wasn't expecting any immediate display of interest from AISC. The latter organization, whose members include such large houses as Informatics and Planning Research Corp., has devoted virtually all of its attention to government matters, particularly what it sees as a proliferation of in-house dp services in government — services it feels should be provided by independents.

Last month AISC helped form The National Council of Professional Service Firms in Free Enterprise, a Washington-based organization of three professional societies and eight companies. Heading it is Robert Krueger, president of Planning Research. It essentially will plead the same case as AISC but embrace all types of govern-

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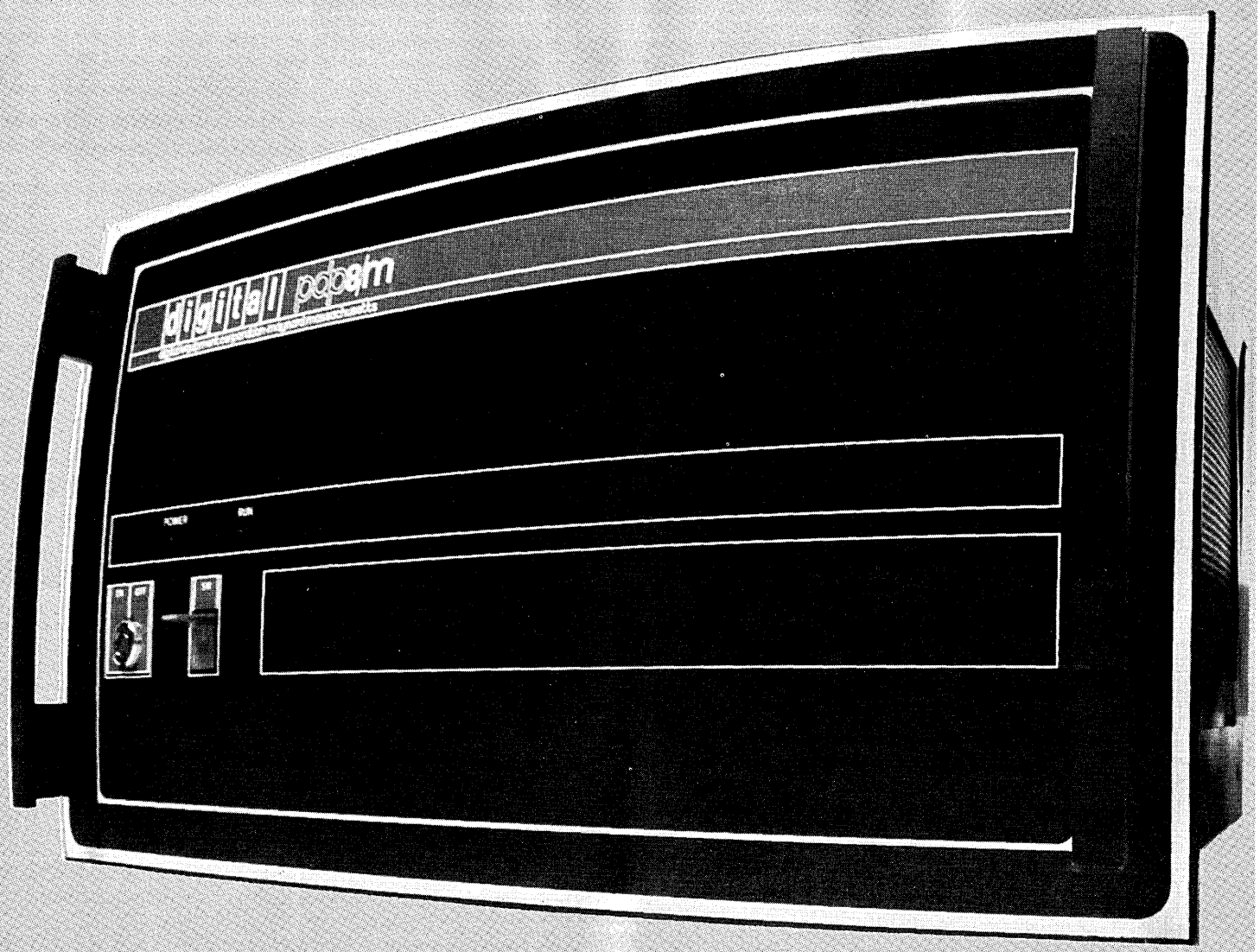

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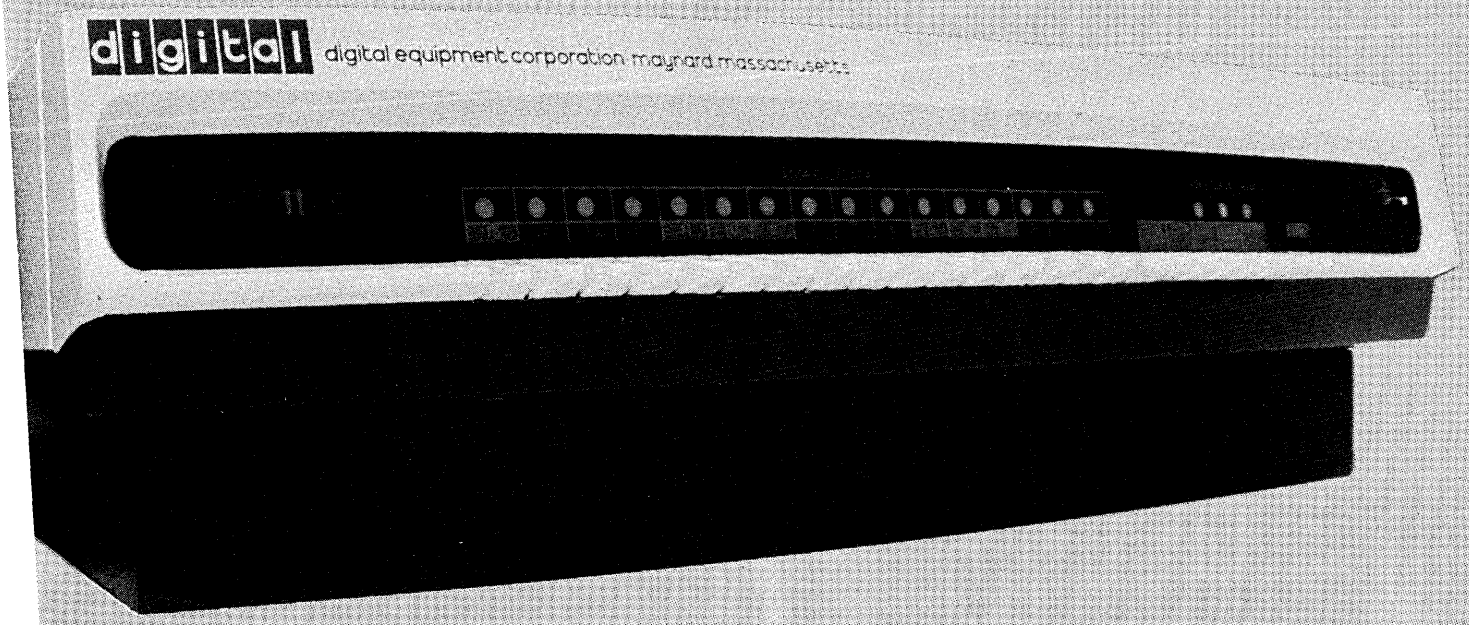

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ment-owned services it feels should be provided by independently owned professional service firms.

Bernard Goldstein, president of ADAPSO, said other matters of mutual interest besides government issues should be given the attention of his organization. A dissenter was Joan Van Horn, president of VIP Systems Corp., Washington, who distributed a letter during a joint meeting of the 157 persons who attended the general meeting in Denver and said the association should move its headquarters to Washington from New York "to be closer to the people they should be talking to most."

Miss Van Horn, who has an antitrust suit against IBM and who folded her company last spring after IBM repossessed the firm's 360/40 for nonpayment of back rental charges (May 1, p. 65), said the organization should be "insulated" from IBM's influence. "This is vital," she said, "to permit ADAPSO to contribute meaningfully to discussions on the IBM problem on behalf of the best interests of its members."

Welke said the Software Section will have a newsletter to keep software houses abreast of events affecting their businesses. Meetings will cover marketing, financial, and some government-related subjects, he said. One goal is to establish standards, such as a standard procedure for documentation of programs, but the success of this will depend a lot on the number of firms who take part and whether they are sufficiently representative of the software industry.

At present this is doubtful. A major software company, Computer Sciences Corp., does not belong to either association and is a member of still another group, the National Council of Technical Service Industries. System Development Corp., of Santa Monica, has joined ADAPSO — but that won't help a unity move, since one of AISC's complaints has been SDC's "privileged position" with the Air Force (Aug. 15, 1970, p. 37).

Goldstein is optimistic. "We had 56 software houses talking to each other in one room today," he said. "That's the first time in history so many have ever been together — even by accident. It's a start."

French Firm Refines Port-a-Punch Idea

Remember the IBM Port-a-Punch — the little hand-held device introduced several years ago to punch 80-column cards with a pencil through a transparent guide? A small firm in Paris, Perfo-Guide International, 4 Rue Fabre d'Eglantine, has refined and expanded the idea to the extent the designer of IBM's device might not have thought possible.

A hopper has been added for blank cards, a stacker for completed ones. A guide automatically strips off the chad as the card is moved to the output hopper. When completed, the card is pushed back toward the input hopper and then guided to the bottom of the output hopper so that the cards remain in order. Jean Tsuk, the head of Perfo-Guide, said he has designed several variations, each for a specific application.

Tsuk thinks salesmen — and sales managers — will love it. "It is hard to persuade salesmen to fill out report forms on their calls. But they might be persuaded to punch a few holes in cards, guided by questions on each card."

Tsuk said some models for inventory control have hard-copy capability; that is, a user retains a ledger record of what has been punched on the card. The firm has sold "several thousand" of the units in France and is now seeking U.S. distributors. The highest priced version is $50.

NEWS BRIEFS

SJCC to Automate

Last month's Fall Joint Computer Conference in Las Vegas probably was the last JCC to have manual registration. Jacquard Systems, which debuted a computerized system for trade show registrations last summer at the Western Electronic Show and Convention, said they'd received a verbal commitment from JCC organizers for operation of a similar system at next year's Spring Joint.

Univac Offers OCR-B

Beginning next month, Univac will provide a numeric subset of OCR-B, the

NEWS SCENE

easy-to-read font developed by the European Computer Manufacturers Association. It is the first time Univac has offered the ECMA font, and it is being made available worldwide. The new font consists of 14 characters — the numerals 0 to 9 and the signs for plus, more than, less than, and long vertical marks. It will be available on Univac 9200, 9200 II, 9300, 9300 II, and 0768-00-99 printers. A special selection feature will enable the Univac 2703 Optical Document Reader to read OCR-B.

GTE Enters Maintenance

GTE Information Systems Inc. has entered the third-party maintenance field via its Ultronic Systems Corp. field service force. Service will be provided for vendors of peripherals by the 300-man staff based at 64 locations. Ultronic field service began in 1961 and has serviced a range of communications products, including multiplexors, crt terminals, printers, and modems. Plans call for the service network to be expanded to 90 centers with 550 personnel next year. GTEIS says third-party maintenance is currently a $150 million per year business, growing at 15-25% annually.

SHORTLINES

Precision Instrument Co., Palo Alto, Calif., has completed and delivered its first Unicon trillion-bit laser mass memory. The memory will be used as a mass storage unit for Illiac IV and has been installed at NASA's Ames Research Center, Moffett Field, Calif. . . . A lot of people want to come to the rescue of RCA users these days. Value Computing Inc., Cherry Hill, N.J., is one. VCI has scheduled a series of seminars "to present IBM 360 and 370 systems in an objective way, relating them to the RCA frame of reference." . . . Burroughs Corp. formed a new division to be responsible for all activity connected with the B 5700, 6700, and 7700 and to conduct development programs for future large-scale systems. It will operate out of corporate headquarters in Detroit . . . Electronic Associates, Inc., West Long Branch, N.J., purchased all outstanding stock of Process Analyzers, Inc., Houston manufacturer of single and multistream process chromatographs in stand-alone and computer-compatible models. ■

Mini Monitor

The Dynaprobe-8000 Programmed Monitor is said to be the first commercial application of computers monitoring other computers. It includes not only the vendor's black box, but a PDP-11/15 minicomputer. Use of the mini eases dealing with difficult measurement problems associated with such advances as paging and dynamic resource allocation. The system extracts measurements of the efficiency of operating systems, user programs, and file structures. It sells for $23K. Deliveries begin next month. COMRESS, Rockville, Md. For information:

CIRCLE 506 ON READER CARD

The Un-Mini

"The 1616 is not a minicomputer," says its manufacturer. Rather, it's a 16-bit $16K computer with LSI and MSI, which, in competitive tests, "matches or exceeds many of today's small and medium scale computers." Directly addressable memory ranges from 4 to 64K words with a cycle time of 750 nsec. Software includes an assembler, I/O handlers, text editor, debugging aids, diagnostics, a FORTRAN compiler, system monitor, macro assembler, and library. A host assembler and processor simulator for running on the Univac 1108 is also available. The 1616 has both industrial and military versions. Delivery is three months ARO. UNIVAC, Blue Bell, Pa. For information:

CIRCLE 505 ON READER CARD

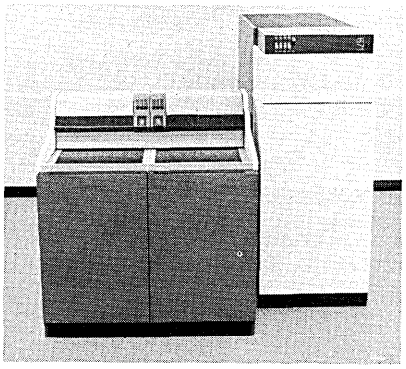
Channel Selection

The Contention Channel Expander selects one out of two, three, or more full-duplex channels and connects it to a single data and control signal interface. Applications include port sharing, intercity contention, multipoint polling, and automatic fallback. It can be used with modems, terminals, multiplexors, and front ends, and is normally supplied with RS-232 interface circuits. One CCE cabinet can hold up to 16 contention triads. Dual triads without power are $230 each. Delivery is 45 days ARO. TIMEPLEX INC., Norwood, N.J. For information:

CIRCLE 509 ON READER CARD

Disc Storage

The race among major peripheral manufacturers to offer the first electronically and logically compatible 3330-type disc system to end users has apparently been won by this firm with its model 3670. While capacity and data transfer rates have necessarily stayed the same as the 3330 at 800 megabytes and 806 KB, respectively, the average access time has been shaved to 27 msec by using an advanced voice coil. Probably the feature that will interest potential customers most, however, is the price. Since the first 3670 system deliveries won't begin until about this time next year, rental rates haven't been determined as yet. But purchase prices will be 8-10% under IBM's $357,200 announced price, and there will probably be comparable rental savings. MEMOREX CORP., Santa Clara, Calif. For information:



CIRCLE 510 ON READER CARD

Minicomputer Printer

One of the most frequently heard complaints in this industry comes from minicomputer users who can't find a relatively fast though inexpensive printer to complement their small-scale systems. And though the initial market thrust for the PRINTEC-100 will be toward oem's, help for the individual user must be on the way. The PRINTEC-100 prints a 64-character ASCII set across a 136-character line at 100 cps. The price in lots of 100 to oem's is $1760 each. Prototypes are currently being tested by several large oem manufacturers. PRINTER TECHNOLOGY, INC., Woburn, Mass. For information:

CIRCLE 516 ON READER CARD

Communication Network

The first product from this firm is a communications system allowing up to 256 devices to communicate over a single telephone line, radio link, or twisted-pair wire. These devices might be sensors, controllers, data entry devices, displays, or computers, and a unique code is sent along the line for each device so that only that device responds to the command. Individual plug-in circuit boards at each device on the line convert the data into the desired format, which can include analog to digital and D/A if needed. Markets where the Receptors system is expected to find acceptance include process monitoring and control, production monitoring, credit verification, security systems, and hospital patient monitoring. Prices for the turnkey system (excluding software preparation if a minicomputer is needed to implement the system) start under $10K. RECEPTORS, Redondo Beach, Calif. For information:

CIRCLE 519 ON READER CARD

Selectric Terminal

The Terminal/1472 is a modified Selectric typewriter compatible with the IBM 2741 terminal. It features an all-electronic keyboard that provides half- and full-duplex transmission. In full-duplex mode, each character is verified by the computer before it is printed out. The data rate is 14.8 cps with parity checking on each character. Tabs may be set and cleared under computer control. Codes available are correspondence and BCD. Serial and parallel inputs and outputs are provided for EIA RS-232B transmission for controlling such devices as cassettes or paper tape equipment. Single units are priced at $2900. Delivery requires 30 days ARO. COMPUNETICS, INC., Monroeville, Pa. For information:

CIRCLE 514 ON READER CARD

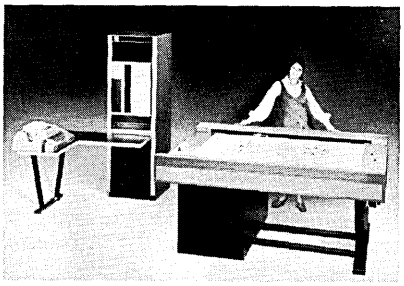
Disc storage

Double-density 2314-type disc storage systems such as the 23142 make sense for installations planning on keeping their 360 equipment around for awhile. The 23142 doubles the 2314 capacity, cuts the access time, etc., without increasing the floor space. But such drives may be around a lot longer than we suspected at first, since they have more attractive cost/byte ratios than even the much publicized 3330 at its current price. And the 23142 hooks up to 370s too, offering a real alternative to the 3330 for unsaturated 370s. No hardware or software changes are required for attaching the 23142 system to the selector channel of either system. The transfer rate is 312 KB, with an average access time of 35 msec. Monthly rental for a full eight-drive configuration (plus an off-line spare) is $4750, including maintenance. The 23142 systems are available now. CONTROL DATA CORP., Minneapolis, Minn. For information:

CIRCLE 515 ON READER CARD

Plotting System

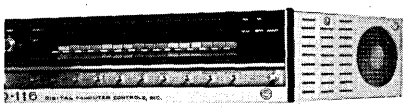
A Nova minicomputer and the vendor's DPS-7 plotter (Nov. '69, p. 301) are combined to provide a programmable system, the DPS-8. The user can select from up to 20 files stored on mag tape and command the plotter to draw the selected plots automatically. The system can be used remotely, or it can be expanded to become a stand-alone central processor. The price of $66K for a basic system includes a 30 x 30-inch plotter, with a 45 x 60-inch plotter offered as an option. MILGO ELECTRONIC CORP., Miami, Fla. For information:



CIRCLE 508 ON READER CARD

Minicomputer

The D-116 16-bit minicomputer is, in effect, a second-source Data General Nova 1200, being "plug, program, and mechanically interchangeable"



with that machine. A 4K version of the D-116, featuring extensive MSI/LSI circuitry, is available 30 days ARO for $5100. DIGITAL COMPUTER CONTROLS, INC., Fairfield, N.J. For information:

CIRCLE 511 ON READER CARD

S/3, 360/370 Mag Tape

Magnetic tape capability has been added to the System/3 Model 10. The 3410 magnetic tape subsystem consists of one 3411 tape drive containing the control electronics for itself and up to three additional drives. (If the system is attached to 360s or 370s, up to six drives can be handled by the 3411.) The drives can be 12.5, 25, or 50 ips models, with the two faster models offering dual-density 800 and 1600 bpi recording. The design of the drives is different from those we've seen before from this vendor, with the reels mounted nearly horizontally. Depending on speed desired, the monthly rental for first drive (3411) ranges from $535-$855, with subsequent drives ranging from $240-$385. Deliveries are scheduled for the fourth quarter of next year. IBM, White Plains, N.Y. For information:

CIRCLE 517 ON READER CARD

And Small Cards

Announced with the 3410 tape subsystem was the model 2596 96-column reader/punch for use with System/3, 360, or 370 cpu's. It reads at 500 cpm, punches at 120 cpm, and has an optional feature allowing cards to be interpreted. This unit rents for $845/month and sells for $29,575. First shipments are scheduled for the second quarter of next year. IBM, White Plains, N.Y. For information:

CIRCLE 518 ON READER CARD

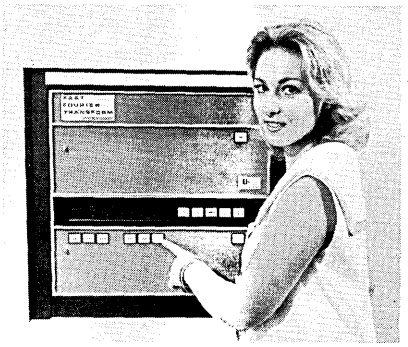
Disc Storage

The same technology that went into this manufacturer's RAD large-scale disc unit for its own computers has now been applied to a line of oem small-scale head-per-track discs. The three models of the 727 Mini Disc vary only in their 800,000 and 1.6/3.2 megabit capacities. The average latency time of 8.3 msec and the 3 MHz transfer rate are the same for all three versions. Prices start at $6K for the smallest unit in single quantity, and deliveries are immediate. XEROX DATA SYSTEMS, El Segundo, Calif. For information:

CIRCLE 512 ON READER CARD

FFT Processor

Here's something we haven't seen in a while—a Fast Fourier Transform processor. It's called the 2030, and it



can handle arrays of up to 32K complex variables, with typical transform times on the order of 35 msec for a 1K complex variable array. Interfaces are available for a long list of well-known computers, and there are hardware options for doing Cartesian-to-Polar and Polar-to-Cartesian conversions, and array multiplication. The basic price for the 2030 is $9900, not including the interface module. Delivery is 90-120 days ARO. UNICOMP, INC., Northridge, Calif. For information:

CIRCLE 513 ON READER CARD ■

SOFTWARE

HASP Scooped

The latest HASP replacement is SCOOP (Simultaneous Capture Of Output Processing). It is said to result in throughput time savings of about 33% in certain test job mixes. SCOOP is a continuous spooling monitor residing within the IBM DOS supervisor. It can be installed in a 10K MPS DOS and will capture on disc all or selected output data from the partitions, whether intended to be printed or punched. It requires 632, 840, or 1048 bytes of memory, depending on whether spooling is desired in one, two, or three partitions. The package includes a program for printing and punching the records from disc. The price is $3250. AIDS ASSOCIATES INC., Huntington, Conn. For information:

CIRCLE 501 ON READER CARD

Decision Making

Billed as a decision-making tool, SCAMP produces models consisting of a series of rows of descriptive and numeric information. It is intended for use in forecasting and comparative cost studies. According to the vendor, the SCAMP user need only have a knowledge of algebra to be able to create his own models. SCAMP enables the user to select and organize a number of factors, relate them to one another in a prescribed manner, and examine the result. Versions are now working on 64K 360/30s and up. It's written in FORTRAN. The documentation is $25, and the source deck is $1250. SCOTT ASSOCIATES, Lansdowne, Pa. For information:

CIRCLE 502 ON READER CARD

Distribution Planning

A FORTRAN IV program called ADM (Aid in Decision Making) maximizes a general function of up to 50 variables having the value of 0 to 1. Typical uses for the program would be for planning distribution networks, or optimum sales territory deliniation, or in urban planning. It is written for unconstrained problems but can be modified for constrained problems at additional cost. ADM requires at least 110K bytes of memory on 360 models 50 and above, depending on the amount of data. The package is offered for sale at $15K and can be rented for $750/month. It is supplied in source deck form by mail, including a user's manual and input and output samples. MORDECAI WALLENSTEIN, Ramat-Gan, Israel. For information:

CIRCLE 503 ON READER CARD

RPG Materials Processor

RPG programs can be used to access files of the IBM Bill of Materials Processor through a set of BAL macros that run on any System/360 or 370 hardware under DOS; thus, COBOL programming of one-time reports is unnecessary. The package includes the necessary macro instructions and a manual. In an average configuration, it requires about 2K core. The price is $250. DIGITAL SOLUTIONS, Troy, N.Y. For information:

CIRCLE 520 ON READER CARD

Programming Aids

Users should be able to reduce programming time and cut machine time through three programming aids: The first, called COBUREF, is a compiler post processor which adds cross-reference and index information to the source listing. It runs on most machines supporting COBOL. The price is $200. The second, called PIPER, or program interrupt processor, systematically "fixes" data exception errors and re-executes the interrupted instruction. It is written in BAL and runs on System/360 under OS. It requires about 3K additional core at execution time, and the price is $300. The third programming aid, TABTRAN, translates specially formatted decision tables into COBOL or FORTRAN source code. The COBOL version is $3900 and requires about 46K, while the FORTRAN program is $3200 and requires around 60K. It can be adapted for most machine supporting COBOL or FORTRAN. WESTINGHOUSE TELE-COMPUTER SYSTEMS CORP., Pittsburgh, Pa. For information:

CIRCLE 521 ON READER CARD

Project Management

The Mark III project management system combines various features of PERT, CPM, and other cost, resource allocation, and earned value programs. Information regarding project plans, schedules, status (progress vs. cost), resource curves, manpower histograms, and project summary information is produced in the form of Gantt-type bar charts and graphs, and also as printer listings to facilitate detail analysis. The 225K-byte FORTRAN program is currently available for IBM 360 and 370, Univac 1108, CDC 6600, and GE 635 computers. Rental charges are $1250/month for the first year, decreasing incrementally down to $250/month. PROGRAM CONTROL CORP., Van Nuys, Calif. For information:

CIRCLE 522 ON READER CARD

Savings Accounting

Nearly all forms of bank time deposit accounts can be handled by the Bankserv Savings Accounting System, developed at the Zions First National Bank in Salt Lake City. It processes certificates of deposit, passbook savings, Christmas club accounts, and automatic transfers from checking accounts for savings plans. It accepts MICR, punched card, or magnetic tape input and handles up to 20 different savings instruments. It requires a 64K 360/30 or larger. The price is $22,500. ARTHUR S. KRANZLEY AND CO., INC., Cherry Hill, N. J. For information:

CIRCLE 504 ON READER CARD

Teleprocessing Monitor

The Teleprocessing On-Line Monitor (TOM) provides the interface between applications programs and a telecommunications network. It accepts and edits messages, activates the proper processing module, and causes output messages to be transmitted to the user, thus relieving applications programs of terminal handling and other systems functions. It is written in BAL and will run on any DOS 360/30 model or larger with a 40K foreground partition. TOM will support model 2260 crt's and 2740 terminals. The purchase price is $7500, or the program can be rented. FRANKLIN DATA SERVICES CORP., Springfield, Ill. For information:

CIRCLE 523 ON READER CARD ■

BOOKS

***The Technology of Computer Music*, by Max V. Mathews with the collaboration of Joan E. Miller, F. R. Moore, J. R. Pierce, and J. C. Risset. The M.I.T. Press, Cambridge, Mass. 1969. $12.**

This book is primarily written to show the reader how music synthesis has been accomplished with the well-known MUSIC V computer program. The book is arranged in three main sections: introductory comments on digital waveform processing, examples and description of the MUSIC V program and interesting results of some psycho-acoustical experiments in relation to music.

The author's presentation of this material is well organized; he first gives the reader an intuitive feeling for the subjects discussed and then includes many explicit examples. Mathematical models of sampling theory and digital waveform processing are included as well as some specific examples which demonstrate important results of the mathematical theory. The book has the format of a textbook and includes exercises to test the reader's understanding of the material, bibliographies at the conclusion of each chapter, and an index of subjects at the end.

MUSIC V is a three-pass computer program consisting of subroutines which allow the user to specify parameters of sound waveforms such as frequency, duration, amplitude, pitch quantizing, attack and decay characteristics and envelope shaping, etc. Those who can read FORTRAN (with its annoying convention of letter "O's" crossed) are able to see exactly how a computer can be programmed to generate various music waveforms. Readers who do not wish to wade through routines of code are given the essential information in graph form, which is easy to follow and understand.

Recently there has been much interest among musicologists in the use of electronic equipment. The approach taken in this text is one extreme, that of synthesizing musical waveforms digitally. This method requires large amounts of storage, powerful computational facilities and a lot of time. For instance, on a third-generation computer as much as one minute to several minutes of computer time is needed to compute a second's worth of musical output. However, this method of music production is very general and facilitates the synthesis of different sounds and many melodic lines capable of complex interplay.

Another approach, on the other extreme, uses electronic music synthesizers such as the Moog to produce music by purely analog means. The Moog consists of various voltage regulators such as potentiometers and variable capacitance circuits which determine the various parameters of sound waveforms. Although some repetitious background rhythms may be programmed in this instrument, the Moog is essentially a monophonic instrument; but it is capable of producing varying sounds in real-time. Composers of *musique concrète* have also used the switching capability of electronic devices in organizing "electronic music." The notion here is to record sounds in an analog fashion on magnetic storage equipment and then selectively merge portions of the recorded sounds together with the aid of electronic switching circuits. Many musicians are now experimenting with electronic modulation, amplification and distortion of the sounds produced by voice and common musical instruments. Another musical effort is under way at the University of Utah to create a hybrid musical instrument capable of real-time production of music by combining the sound generating capabilities of an electronic organ and the switching power of an electronic computer. This will facilitate the creation of many interacting polyphonic melodies, each of which may be selectively "colored" by analog filters. The continuing merger of technology and music is creating excitement and is opening new doors of interest and exploration.

In conclusion, *The Technology of Computer Music* is valuable to those who plan to use a computer to synthesize and process digital waveforms, and it is interesting to those who want to see how this has been done with MUSIC V.

—Alan C. Ashton

BOOK BRIEFS...

***Theory of Optimal Control and Mathematical Programming*, by Michael D. Canon, Clifton D. Cullum, Jr., and Elijah Polak. McGraw-Hill Book Co., New York, N.Y. 1970. 297 pp. $18.50.**

This book has three aims: to present a unified theory of optimization; to introduce nonlinear programming algorithms to the control engineer; and to introduce the nonlinear programming expert to optimal control. It can be used as a graduate text or as a reference book.

The first part of the book shows that optimal control and nonlinear programming problems are equivalent to a simple canonical form of a mathematical programming problem. Necessary and sufficient conditions of optimality are derived for this canonical problem and are then specialized to obtain a number of specific results for nonlinear programming and optimal control problems.

The second part presents a selection of linear and nonlinear programming algorithms and shows how these can be used for the solution of discrete optimal control problems.

***An Introduction to Business Analysis*, by Ronald DeMasi. Addison-Wesley Publishing Co., Reading, Mass., 1969. 206 pp. $8.95.**

This book is, as it says, an introduction to the initial activities of systems analysis. It covers such subjects as: communications, human relations, the computer aspects of systems analysis, as well as interviewing techniques needed to gather systems information. The author gives step-by-step presentation of a case study, as well as standards for systems flowcharting, office layout diagramming, organization charting, aids for the preparation of form analyses, and examples of forms and charts for evaluating interviews and other systems analysis procedures.

***Theory of Automata*, by Arto Salomaa. Pergamon Press Ltd., Headington Hill Hall, Oxford, England, 1969. 275 pp. $12.**

This book deals with mathematical aspects of automata theory, rather than applications. Exercises are given, but they are theoretical rather than numerical, and are independent of the text. There is also a bibliography, and symbol, author, and subject indexes. ■

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PEOPLE

At the FJCC last month, AFIPS presented the 8th Annual Harry Goode Memorial Award to **Dr. Allen Newell,** a professor at Carnegie Mellon Univ. and Rand Corp. consultant, for outstanding contributions to the information processing industry. Newell has concentrated primarily in the field of artificial intelligence and is a developer of the General Problem Solver program (GPS), which provided the first detailed simulations of human problem-solving behavior . . . **Gordon M. Binder** will head all financial operations, including the functions of controller and treasurer, as vp of finance for System Development Corp. Binder comes from Swedlow, Inc., Los Angeles, and has also held financial posts with Litton Industries and Ford . . . **Richard V. Plat,** former vp and treasurer of Waltham Industries, has joined Computer Machinery Corp., Los Angeles, as vp, corporate finance, and will serve as chief financial officer for all CMC operating companies in the U.S. and Europe . . . **Desmond H. Pitcher** has rejoined the Univac Div. of Sperry Rand Ltd., London, as managing director after a two-year stint as managing director in the U.K. for Mohawk Data Sciences . . . **Dr. John Pierce,** pioneer in satellite communications, has retired from Bell Labs to become professor of engineering at California Institute of Technology . . . **Maury Ronayne** has been appointed head, systems analysis section, defense planning and policy section, international secretariat, NATO, Brussels. He had been a technical support manager for the U.S. Defense Communications Agency . . . **Stanley B. Scheinman** has filled the new post of senior vp and chief finance and administration officer of MCI Communications Corp., Washington, D.C., a microwave common carrier that now provides customized communications services between Chicago and St. Louis and plans to cover 165 cities . . . **James Dobbie,** former director of engineering for Raytheon Computer Operations, has joined Varian Data Machines as vp, engineering . . . **Charles D. Martin,** the new corporate development vp at Systems, Science and Software, La Jolla, Calif., comes from Digital Resources Corp., Long Beach, where he was vp of marketing . . . **Kenneth De Witt,** former vp/gm, has been elected president of Sonex, manufacturer of I/Onex telemetry equipment and data communications systems. **Harold Weinberg,** a company founder and president/chairman, has stepped aside as president but remains chairman of the expanding firm, which recently announced its Marketline stock quotation system . . . Consultant **Norman Reilly** has joined Medical Systems Technical Services Inc., Rolling Hills, Calif., and New York City design services firm in the health care field . . . **John E. Dzien** has been elected president of Auto-trol Corp., Denver-based digital graphic and data systems manufacturer, to succeed **Thomas G. Rittenhouse,** now president of Precision Grinding Wheel Co., Philadelphia. Both firms are subsidiaries of Electronic Assistance Corp. . . . **John D. Kerin** has been promoted to vp of Singer Information Systems Co., New York City . . . **Benjamin Kessel,** a founder of Computer Control Co. (then Honeywell Computer Control Div., now part of the HIS Systems Components operation—see Sept. 1, p. 54), and his wife were among those killed in the BEA plane crash in Belgium in October. Kessel left Honeywell in 1968 to form GFK Associates, a management consulting firm, and was active in many Boston-area community projects and computer industry development in Israel . . . **A. C. Buehler, Jr.,** was elected chairman of Victor Comptometer Corp. to succeed his late father. Also, **George W. May,** president and chief operating officer, will assume the responsibilities of **Alvin F. Blakewell,** vice chairman of international operations and research who has retired but remains a director . . . At URS Systems Corp., San Mateo, **Richard Q. Praeger,** president of Madigan-Praeger, a URS subsidiary, has been elected chairman; and **Arthur H. Stromberg,** president, has been elected chief executive officer. They succeed **Richard De Lancie,** who had held both positions and remains vice chairman of the board and chairman of the executive committee . . . **R. Blair Smith,** ex-IBM salesman and father of SABRE and DCA (which begat SHARE, etc.; see Sept. 1, p. 30), has been elected to the board of directors of Ryder, the truck leasing firm. Smith recently retired from IBM after almost 21 years with the company. ■

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CIRCLE 28 ON READER CARD

WORLD ROUNDUP

T-S SYSTEM FOR SMALL AIRLINES

Now there's a time-sharing system for small airlines and airports, capable of handling passenger reservations, seat allocations, manifests, weight and balance sheets, and assorted goodies. It's based on dual PDP-8s with Bunker Ramo displays, and it's a product of Cable and Wireless (a communications carrier responsible for managing much of the world's submarine cable traffic) and Scientific Control Systems, U.K. Lopac, as it's called, was developed at Hong Kong airport as part of a communications facilities management job by Cable and Wireless.

Estimates are that Lopac is viable on a multi-user basis when departures reach 8,000 flights a year, or 250,000 passengers. Used by one airline, it should be economic at 5,000 flights a year. Prices range from $600K to 1.2 megabucks.

MONEY WOES DOWN U.K. SERVICE FIRMS

Whatever confidence there was in the remote access services business took a hard blow with the collapse of Autonomics Ltd., second of the two big U.K. service firms in this field to hit the deck. The first was Interact 75, a service offered by Baric Computing Services, a joint ICL-Barclays Bank operation. Seen as the only likely winner from all this is IBM's terminal business systems.

The Autonomics service, designed for the uninitiated and small user, was based on Modular One processors from Computer Technology with a special terminal and language for the business user. But as in the past, customers were mainly experienced users with their own ideas of where a service like this might plug the gaps in their own systems. Thus, both technically and commercially, things never went as predicted.

Autonomics was launced a year ago by the Miles-Roman computer services group after the two well-known entrepreneurs, Charles Ross and Michael Gassman, had raised about $8 million through merchant bankers, Kleinwort Benson. Another $1.5 million came as a loan from the National Research Development Corp., government-backed venture capital organization.

At the time of the trouble, orders had been booked for 150 terminals, which would cost Autonomics some $2.4 million. When funds for these terminals never emerged, they were paid for out of working capital. Add to this the problems of hardware and software slippage. Add also a 'down economy. Result: the jitters. And the main backers put in a receiver.

No small factor was the earlier demise of Interact 75, a similar system that cost Baric some $6 million. And the 4,000 or so branches of Barclays Bank were expected to be ready openers to this market.

By and large, the judgement of investors in the computer business has not shown itself this year in the brightest light. Banks were the big losers earlier when the Rolls Royce off-shoot, Systems International, went, just before the parent firm took a nosedive. There must be a moral somewhere.

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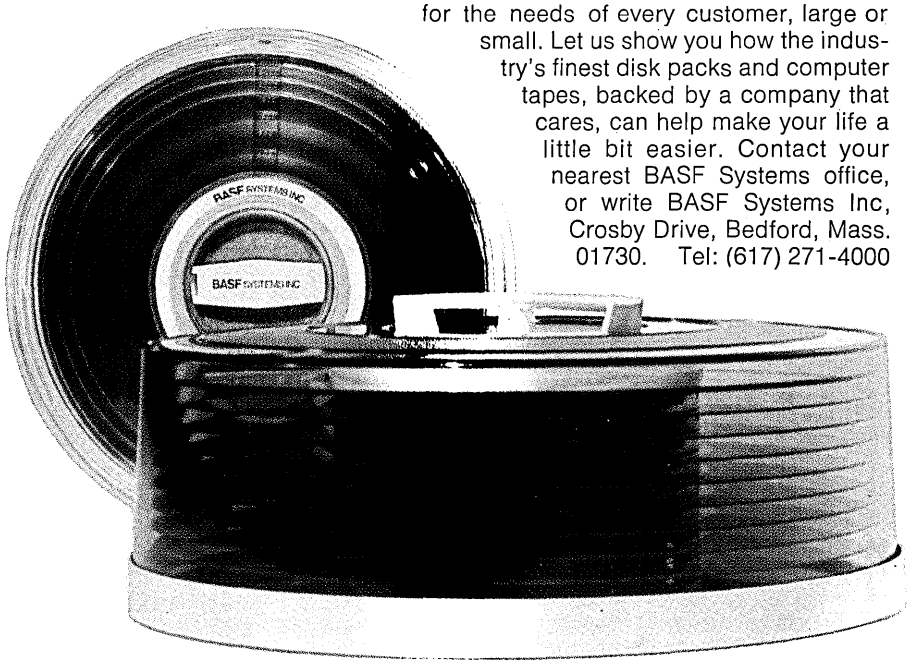

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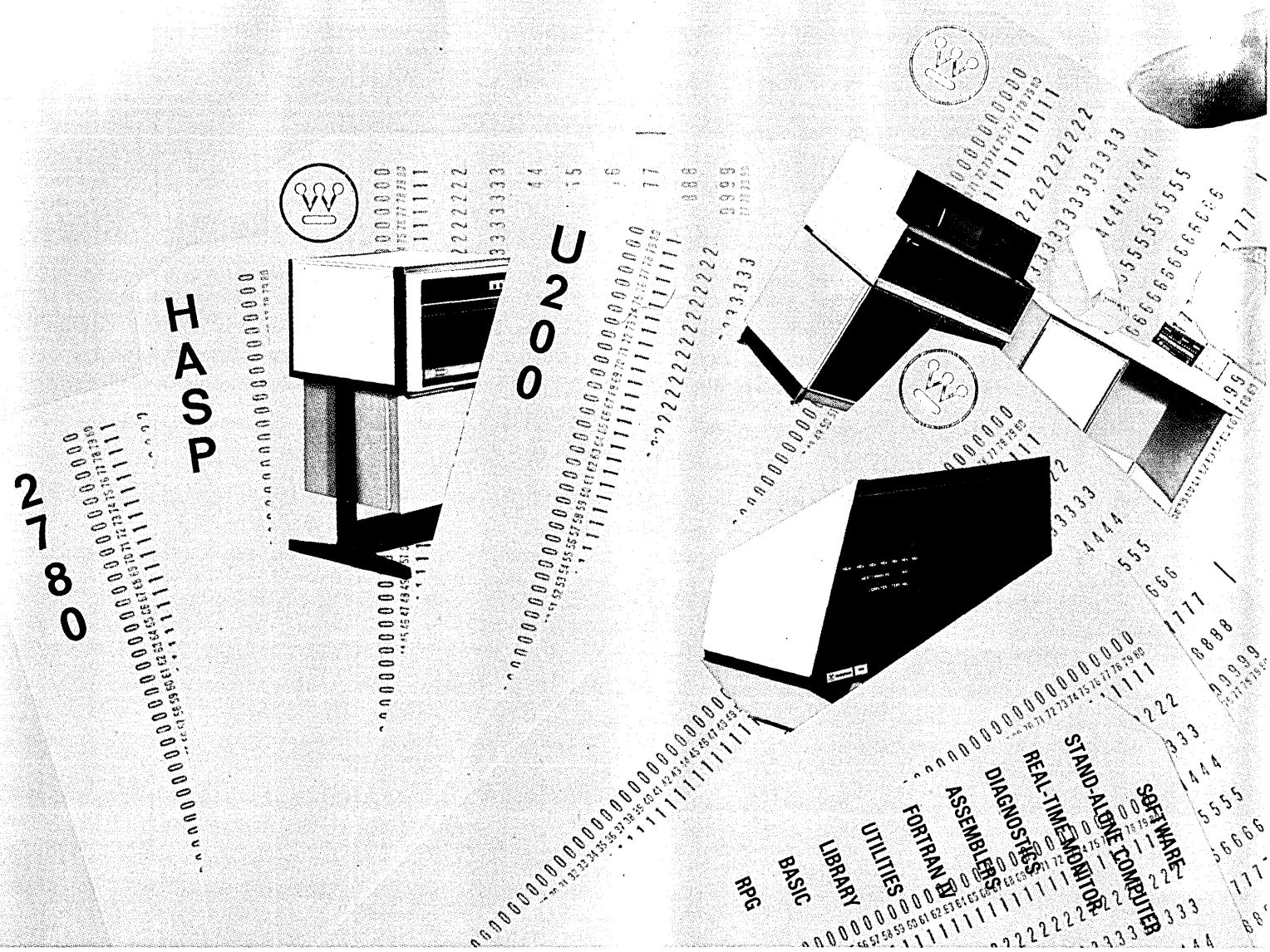

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