

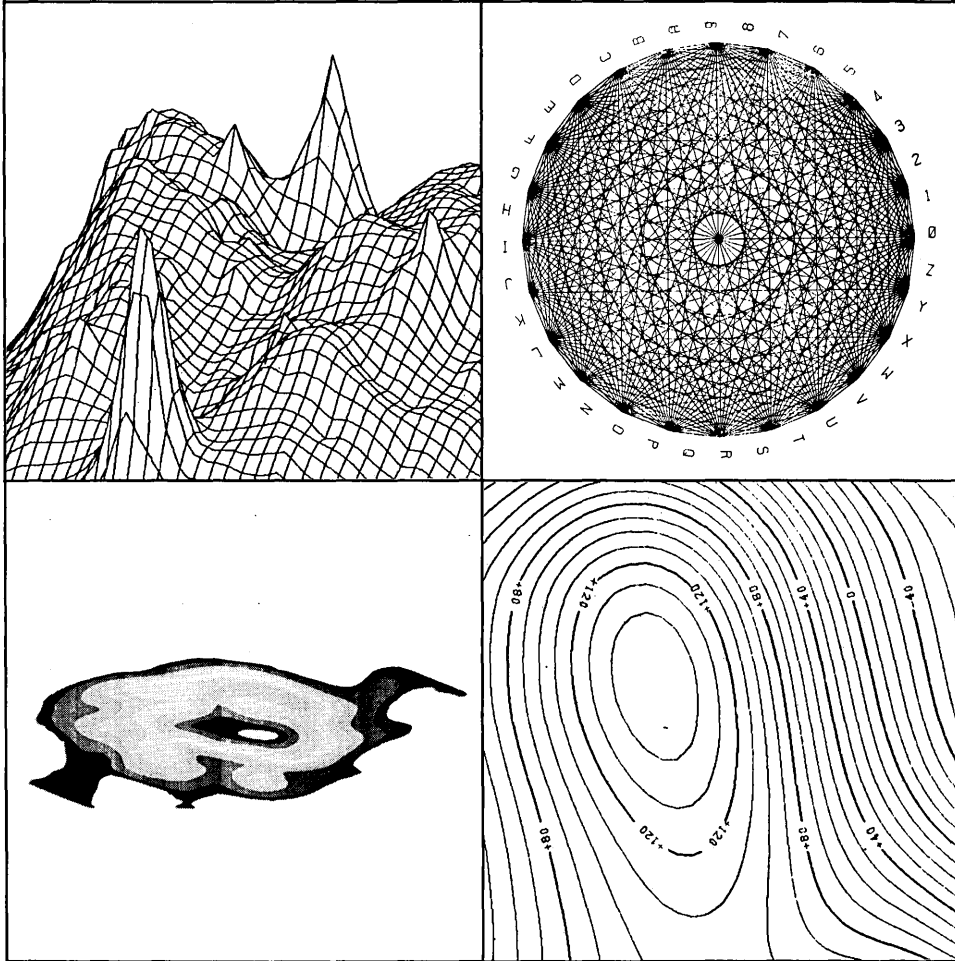
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March



Inside the Storm at RCA

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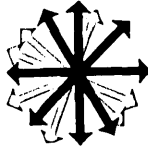
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MEMORY PRODUCTS DIVISION



MARCH, 1972

volume 18 number 3

This issue 111,213 copies

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GARY DE WARD BROWN. Programming—always an exacting task—is becoming more difficult as hardware generations continue to follow in inexorable succession and language piles on language to build a computeresque Tower of Babel. These demands are calling forth a new breed of programmer—better trained, more stable, preoccupied with quality. Some of us will miss the beards, the sandals, and the flamboyance.

About the Cover

The tension was just too great—RCA's rainbow cracked before the computer group could find the pot of gold. Design is by our art director.

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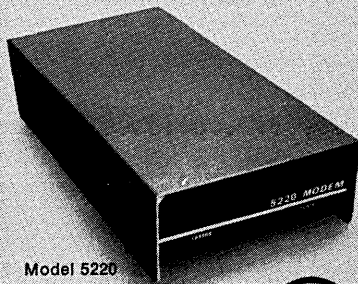
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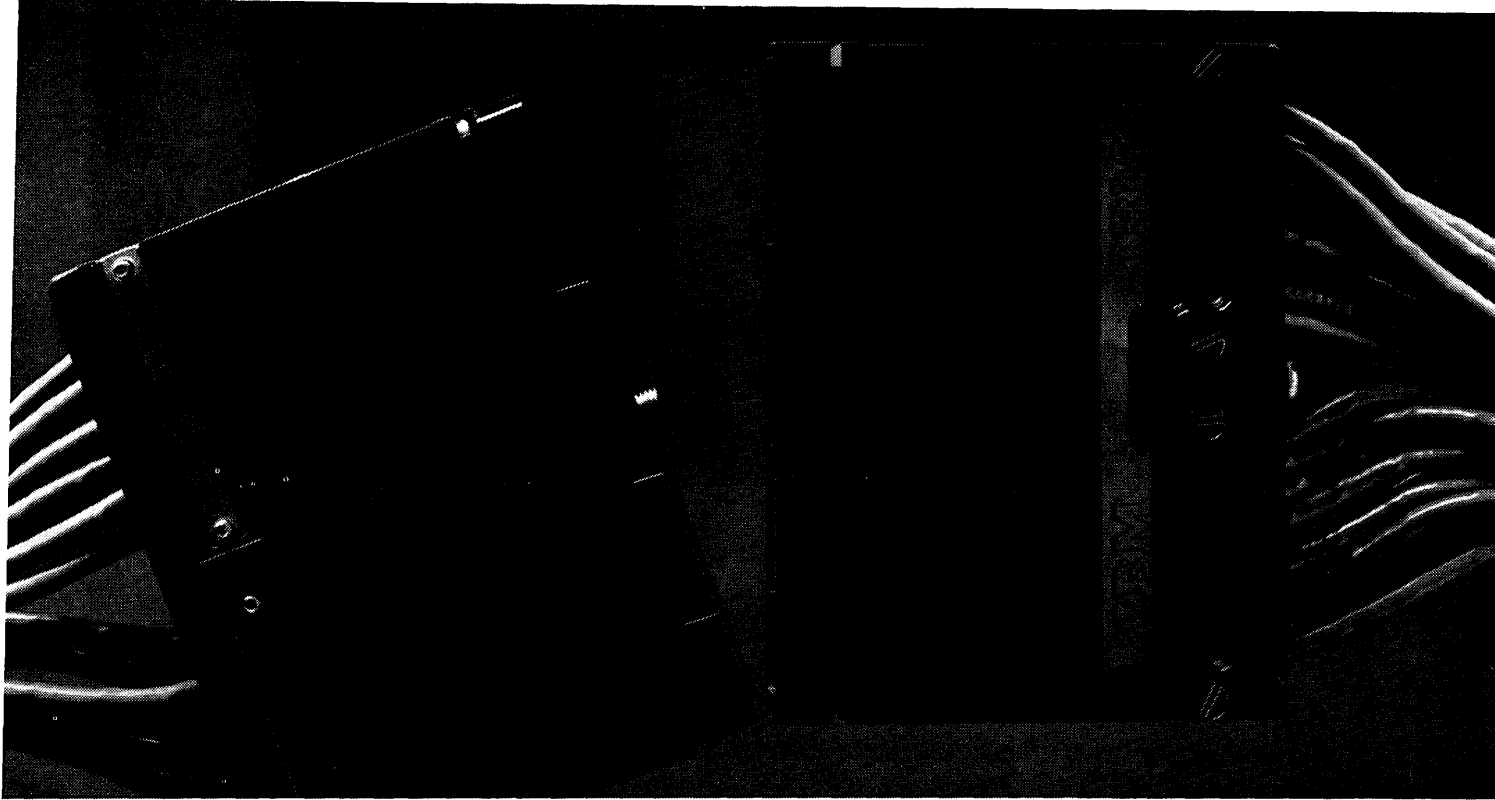
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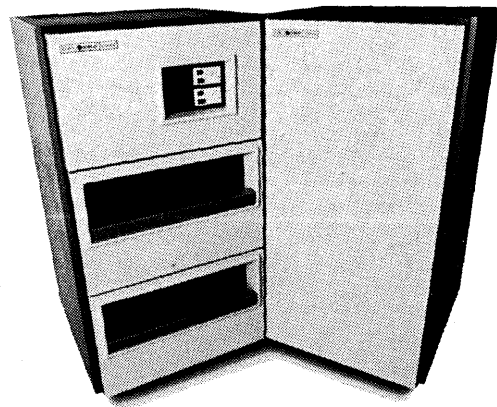
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CALCOMP

Here's how New York State is using a Burroughs B 3500 for pollution control:

Within the next 15 minutes, a Burroughs B 3500 computer will automatically phone one of eleven monitoring stations for a report on New York State's air. Within the hour, it will contact twelve other locations to check on New York's water.

If acceptable pollution limits are exceeded anywhere, the computer will send an alarm message to appropriate authorities.

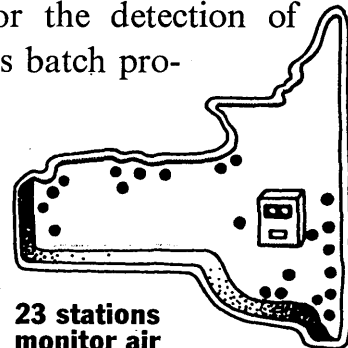
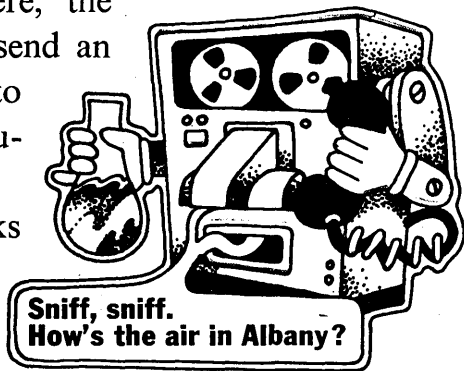
These checks continue around the clock—every 15 minutes for air, every hour for water. The air stations automatically report on 18 air characteristics—some of them prepared by laboratory personnel. The unmanned water stations collect samples, analyze them and report the results—all automatically.

Meanwhile, back at the computer site, a detailed report is printed out daily for the Air Resources and Pure Waters division

—based on data that remains encoded for further analysis. Comprehensive reports are subsequently prepared and used by consulting engineers, industrial firms and governmental agencies for pollution prevention.

Since all this isn't enough to keep a Burroughs B 3500 busy, its spare time is used—by remote data communications—to help elsewhere. While it monitors pollution levels, it also maintains a blood bank inventory for hospitals in the Albany area. And matches donors and recipients for kidney transplant operations. And calibrates equipment used for the detection of radiation. And does batch processing of vital records and information. And performs various mathematical and statistical jobs.

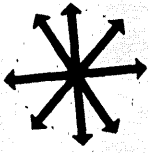
If you're thinking about the environmental state of your State, remember New York's busy B 3500.



23 stations monitor air and water conditions.

Burroughs





Look Ahead

THE SOFTWARE HARDENS IN NEW BURROUGHS LINE

Maverick Burroughs, famous for its far-out hardware, has outdone itself in its forthcoming B-1700 line. The new byte-oriented line, spanning from the System/3 to the B3500, will feature hardware Fortran, Cobol and RPG language processors, running from 120 nsec control store.

Seasoned hardware savants claim it's the most significant development in years. Key advantage of executing programs directly out of hardware is primarily speed, but it will also reduce main memory requirements significantly.

Also in the control store Burroughs is stashing emulators for some older machines it evidently hopes the 1700 will replace: IBM's 1401, Honeywell's 200/120, Burroughs' own B-300, and possibly the ICL 1901. Some configurations of the four or possibly five-model line will impact the System/3 (but won't emulate it) up to the 360/30 and Burroughs own B-2500 (and B-3500?) computers. Monthly rentals range from \$1,500 to \$15K.

AND THEN THEY WARNED THE JUSTICE DEPT.

Few were surprised when IBM in February took a swing at the main memory add-on industry--one that has blossomed in 18 months from a vague concept to today's contingent of more than a dozen firms. Specifically, IBM warned users it might cut off maintenance of systems whose cpu's are substantially altered when memories are expanded beyond IBM's limits. It contends altered machines may be "impractical to maintain."

To expand the memory of a model 30 beyond IBM's 64K limit, 6 address registers and from 100 to 200 read-only storage cards are altered. New hardware logic is added. The methods taken to make these alterations differ among three major independents with installed expansion memories: Data Recall, Information Control Corp., and Advanced Memory Systems. But all three say they offer to provide IBM with documentation for their maintenance people.

Main memory expansions for the 30s became available about nine months ago. They enable users to expand their memories to 128K, and there now is talk of expansions up to 192K and even 256K. This, some observers say, makes it unnecessary to upgrade to a 370/135 or 145. To owners this is appealing; to IBM, appalling.

Although the big computer company was concerned chiefly with expanded 360/30s, it's learned that because of the warning, one model 40 user in mid-February was delaying installing a memory extension although it already had been delivered. Interestingly, that model 40 user was the Dept. of Justice...and its dp department immediately shipped a record of the entire proceedings upstairs to the antitrust division.

ENTER TELEX

Telex Corp., which has sued IBM for trying to unplug it from the tape and disc drive market, plans to square off against the computer colossus in the 370 main memory add-on market. Next month the company will announce a bipolar semiconductor add-on for the 370/145 and 155 with deliveries before year-end. The Tulsa company joins Advanced Memory Systems of Sunnyvale and Information Control Corp. of Los Angeles; the latter will announce a semiconductor product for the 370/155 and 165 soon, and AMS

Look Ahead

announced in January.

In Ft. Lauderdale, Fla., meanwhile, the oem memory house, Datacraft, will announce 4 and 8K extensions for DEC's PDP-11, a market which it claims is worth \$3-4 million a year, and of which it aims for one-third.

IBM VS. GREYHOUND: CHANGE OF VENUE?

IBM seems to be pushing for a quick date for trial of Greyhound Computer Corp.'s suit against it, and word says it may not be in St. Paul, but a location where court schedules aren't so jammed. There are lots of guesses why, such as IBM wants to clear the boards for a consent decree. But one source opines that IBM corporate chiefs want the courts to define, once and for all, the rules for dealing with leasing companies; he claims IBM has delayed some plans until those restrictions are clarified.

UNIVAC: TWO BRIDGES

From the start, Univac's 9700 has looked like a good bridge machine for moving RCA users over to the Univac line. Now it looks like the 1106, already tested and timeworn in the field, may become something of a bridge machine too. The reasoning goes something like this: The 1106 has been knocking out 360/40s and 50s for some time now; the RCA and IBM lines are relatively compatible; thus the 1106 would be useful to RCA users. Univac isn't talking, but we hear there is feverish activity to upgrade the 1106 to a bridge machine.

VIATRON SYSTEMS STILL FOR SALE

If you think that was a Viatron System 21 in the data processing room, you weren't seeing things. Although the Bedford, Mass., company has been in Chapter X since May, we understand it has also shipped about \$5,000,000 worth of System 2111s--primarily in a key-to-cassette with crt configuration. Furthermore, the company has another 1,000 systems available in warehouses. Viatron president Robert Dockser has beefed up the marketing effort with ex-IBMer Thomas Murray, taking over as vp of marketing. Control Data, handling maintenance on the systems, averages only four calls per system per year. Viatron is doing some light assembly work, but has no plans to resume production. But who knows?

HONEYWELL PROSPECTING IN RUSSIA

ICL and IBM have been making all the noise about doing business in Russia, but French-based Honeywell-Bull has a foot in the door too. There was no official word at this writing, but Bull is known to have sold two 600s to the Leningrad branch of Gosbank, the Russian national bank. Add-on potential is mind-boggling, since the bank is the largest in the world. Approval of the order, we understand, is dependent upon the okay of the U.S. government.

THIRD-PARTY LEASES CAN BE SALES, SOMETIMES

Some computer companies who have third-party leasing agreements are making sure the contract allows them to report the transactions as if they were sales, not as deferred income. Last year the American Institute of Certified Public Accountants insisted that lease revenue be reported when earned, even if the third parties came up with large front-end payments. This method of reporting decimated earnings reports and cooled off an already cool money market.

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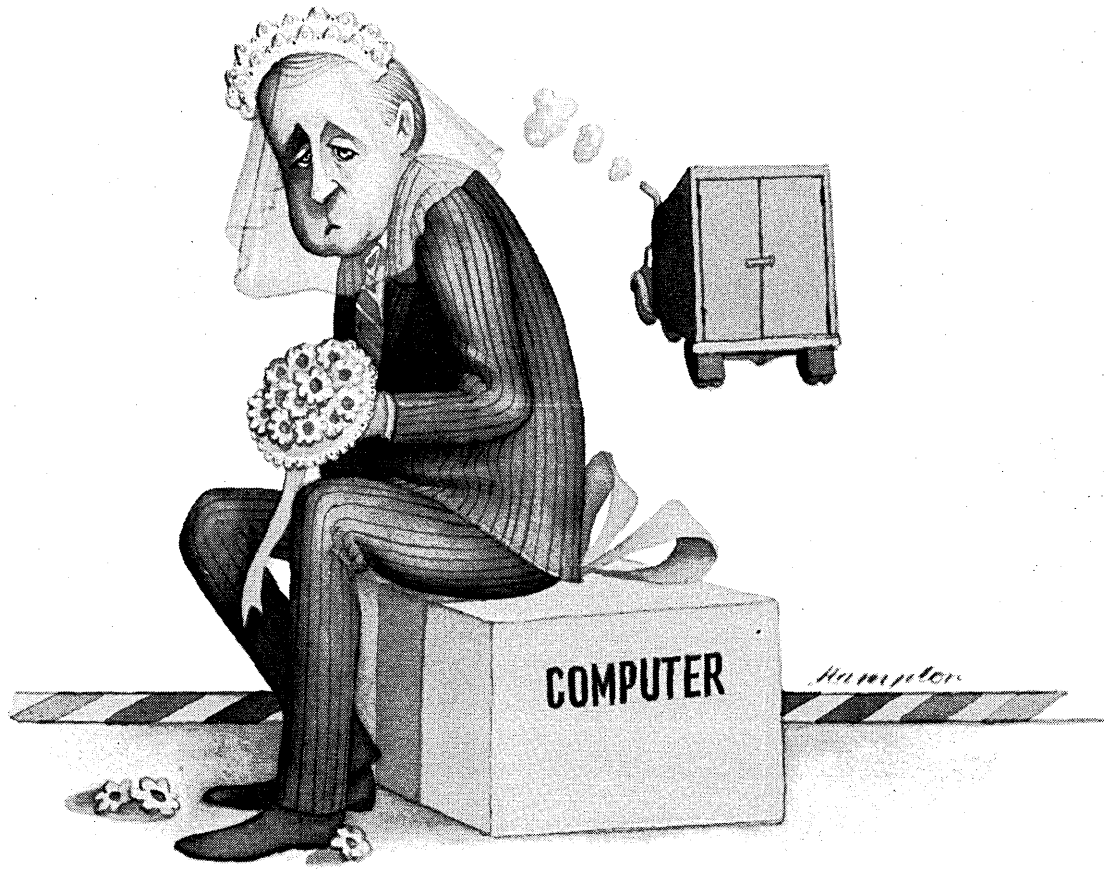
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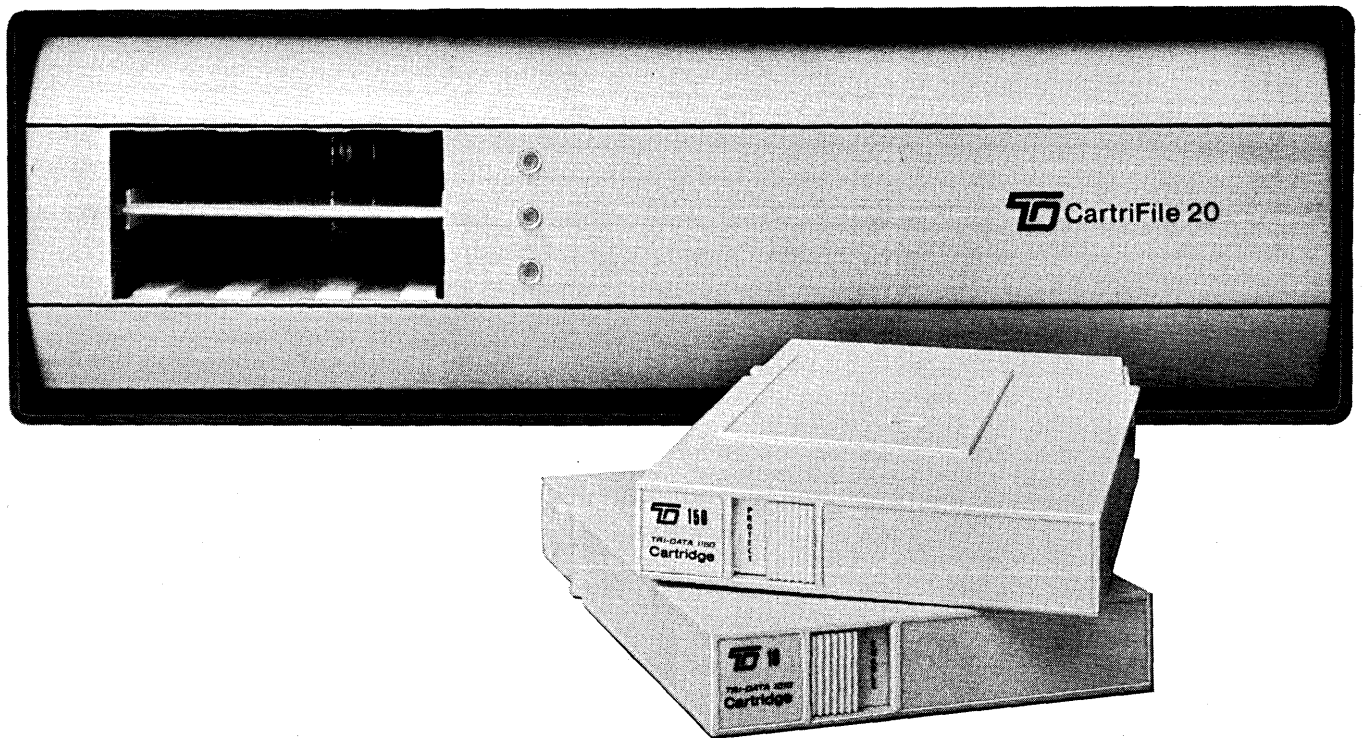


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our own packages (such as Telecommunications Programming System, Payroll System, Fixed Amount Billing, Cosmos, etc.) is proof of ability. On-site Data Center (largest in New England) available for development and implementation. Will travel. Contact John Pryke at (617) 648-8550.



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Calendar

EVENT/SPONSOR	DATE	LOCATION	CONTACT	COST
MARCH				
2nd Technical Symposium of ACM SIG on Computer Science Education	24-25	St. Louis	Dr. David Matula Campus Box 1045 Washington Univ. St. Louis, MO 63130	\$20, SIGCSE \$30, ACM \$35, others
APRIL				
3rd International Congress on Data Processing in Europe	4-8	Salzburg	Arbeitsgemeinschaft fur Datenverarbeitung Kongressburo Feldmuhlgasse 11 A-1130 Wien (Austria)	\$80
ACM SIGCUE Teaching Systems 72 Symposium and Exhibit	5-8	Berlin	Gesellschaft fur Programmierte Instr. D-6200 Wiesbaden Bodenstedstr. 7 West Germany	DM 40, GPI DM 80, others
American Mgt. Assn. 18th Annual Systems Management Conference	6-8	New York City	AMA 135 W. 50th St. New York, NY 10020	\$150, members \$175, others
MAY				
American Vacuum Society 1972 Symposium on Memory Materials and Devices	1	Princeton	Dr. W. E. Loeb Union Carbide Corp. One River Road Bound Brook, NJ 08805	\$15, members \$16.50, others
17th Annual Data Processing Conference	3-4	Birmingham	C. E. Adams Conf. Activities Dir. Box 2987 University, AL 35486	\$35
Spring Joint Computer Conference	16-18	Atlantic City	AFIPS 210 Summit Ave. Montvale, NJ 07645	\$20, members \$40, others
Canadian Computer Show	30-June 1	Montreal	CIPS P.O. Box 1772, Sta. B Montreal 101, Quebec	\$75, advance \$85, at door \$25, students
JUNE				
3rd Annual Interactive Computer Graphics Conference	18-23	Stanford	Dr. David A. Thompson Dept. of Indus. Engrg. Stanford Univ. Stanford, CA 94305	\$495
ACM SIGPLAN Symposium on Computer Program Test Methods	21-23	Chapel Hill	Wm. C. Hetzel UNC Computation Center Chapel Hill, NC 27514	\$35, ACM \$40, others
DPMA International Data Processing Conference & Business Exposition	27-30	New York City	Richard H. Torp DPMA 505 Busse Hwy. Park Ridge, IL 60068	\$90, members \$115, others
Computer Micrographics Technology 3rd Semi-Annual Meeting	28-30	Denver	COMTEC P. O. Box 25605 Los Angeles, CA 90025	\$15
AUGUST				
ACM '72	14-16	Boston	c/o Carol Giltner MIT Lincoln Lab P. O. Box 73 Lexington, MA 02173	\$40, members \$65, others
3rd Annual Academic Computer Center Directors Seminar	21-23	Boulder	E. R. Krueger, Dir. Univ. of Colorado Computing Center Boulder, CO 80302	\$150

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PERFORMANCE SPECIFICATIONS

Capacity

CDS-111 / CDS-133

7.25 M bytes

CDS-114

29.2 M bytes

CDS-214

Per pack — 29 M bytes
Per Unit — 58 M bytes

CDS-215

Per Pack — 58 M bytes
Per Unit — 116 M bytes

Transfer Rate

1.25 Mbits per sec.

2.5 Mbits per sec.

2.5 Mbits per sec.

2.5 Mbits per sec.

Access Time

Track-to-track
Full Stroke

10 msec.
65 msec.

10 msec.
65 msec.

10 msec.
65 msec.

10 msec.
55 msec.

Rotational Speed

2400 RPM $\pm 2\%$

2400 RPM $\pm 2\%$

2400 rpm $\pm 2\%$

2400 rpm $\pm 2\%$

Pack Start/Stop Time

30 sec. to operating speed;
10 sec. to stop

22 sec. to operating speed;
12 sec. to stop.

22 sec. to operating speed;
11 sec. to stop

90 sec. to operating speed;
11 sec. to stop

Disk Pack

Characteristics

Disk Pack Required

IBM 1316 or equivalent

IBM 2316 or equivalent

IBM 2316 or equivalent

IBM 2316 or equivalent

No. of Recording Surfaces

10

20

20

20

No. of Tracks/Surface

203

203

203

406

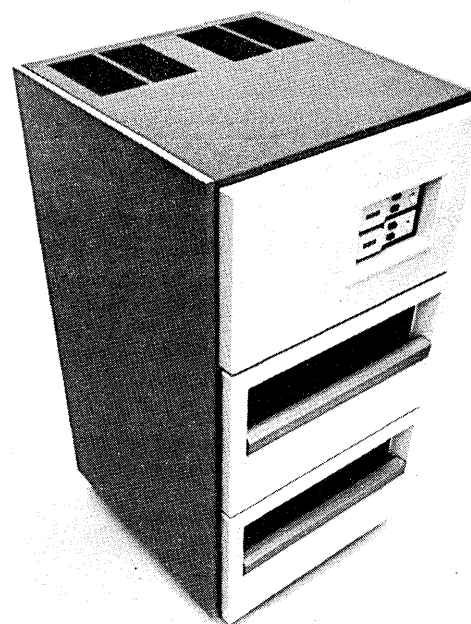
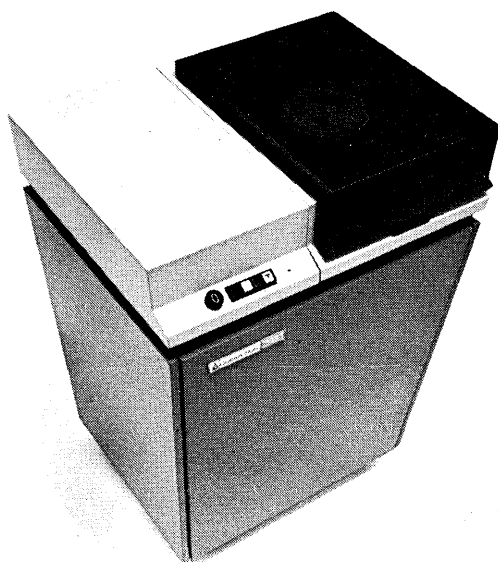
Special Feature

CDS-133: direct replacement for Control Data model 9433/9434

Electromagnetic head positioning and electronic track detenting

Two independent disk drives in a single cabinet

Optical detent sensing



equivalent to" disk drives ..and now a tape transport

CDS-230

Per Pack — 100 M
bytes
Per Unit — 200 M
bytes

6.45 Mbits per sec.

10 msec.
55 msec.

3600 rpm $\pm 2\%$

15 sec. to
operating speed;
15 sec. to stop

IBM 3336 or
equivalent

19 (plus one pre-
recorded surface)
411

High velocity air
flow system



Tape Drive

Tape Speed

Recording Density

Tape Loading

Start/Stop Time

Rewind Time

Transfer Rate

Tape Characteristics

Type

Reel

Hubs

Special Feature

CDS-340

Single Capstan

75 to 200 ips

1600 bpi PE, 800 bpi NRZ-I
(9-track) 800, 556, 200 bpi
NRZ-I (7-track)

Fully automatic with or with-
out cartridge; 7 sec. @ 200
ips, 10 sec. @ 75 ips. Auto-
matic BOT searching.

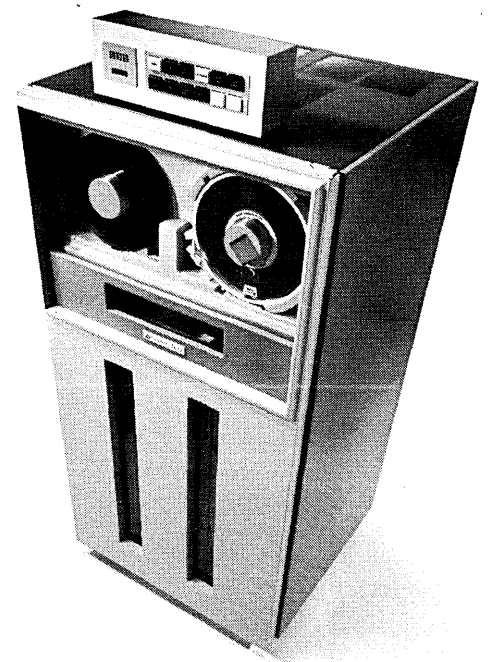
2 msec.

45 sec. to 70 sec. maximum

Up to 320,000 bytes/sec. peak
@ 200 ips.

1/2 inch, 1.5 Mil Mylar, 1600
bpi certified
Standard up to 10 1/2" with or
without tape cartridge
CDS power-operated

Fixed air bearing
surfaces

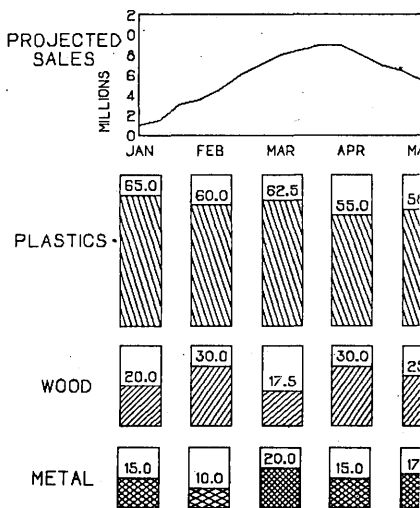


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Most printers tell it the way it is.

The Gould 4800 tells it the way you want it.

When the Gould 4800 printer/plotter delivers information from a computer, it delivers it in whatever form you want. Words, numbers, perspective drawings, charts or graphs.

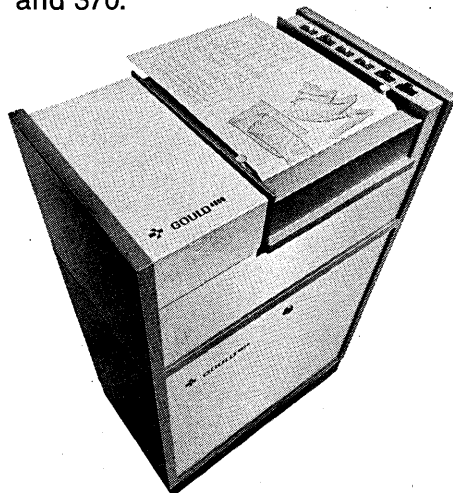


Example: On-time, easy-to-read management reports

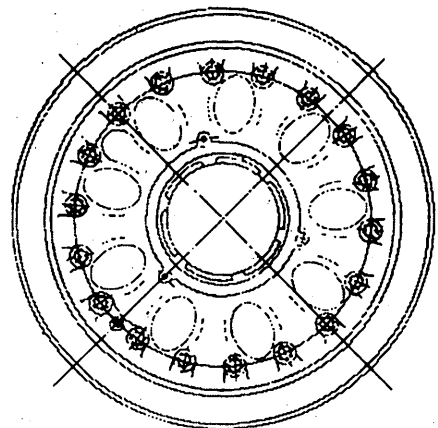
Or any combination of the above because it can handle both alphanumeric and graphics simultaneously.

And it delivers fast. Up to 4800 character lines a minute. That's 6 times faster than most line printers. 200 to 400 times faster than a digital plotter.

Because the 4800 is electrostatic, it operates quietly. Gives you fewer maintenance problems because it has few moving parts. Leases for less than most impact printers. And can be supplied with software and interfacing for most every major computer, including the 360 and 370.



So remember. If you just want words and numbers from a computer, most any printer will do.



Example: Computerized design for aircraft brake drum

But if you want information in a useable form—quickly and economically—you'll want a Gould 4800. And at Gould, service is a commitment. For more information, write Gould Inc., Data Systems Division, Marketing Headquarters, P. O. Box 7255, Denver, Colorado 80207.

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GOULD

DATAMATION

Aren't you tired of paying through your teeth for tape drives?

Until now, what choice did you have? As a 360 or 370 user, you've had to pay with your eye teeth for IBM drives.

Unless you wanted to take some big chances. You could buy some small independent's drives, only he might be here today and out of business tomorrow.

But now, all that's changed.

Now you've really got a choice. Mohawk's 2007 compatible tape drives. Everything you get in an IBM 2401 model 5.

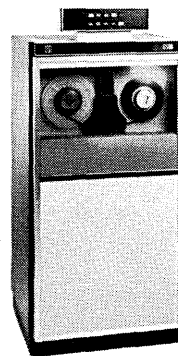
Including simultaneous read/write and vacuum-buffered tape columns.

For only \$270 a month, on a 36-month basis. That saves you \$100 to \$200 rental every month. Or buy it outright for \$9000, saving 50 to 95%.

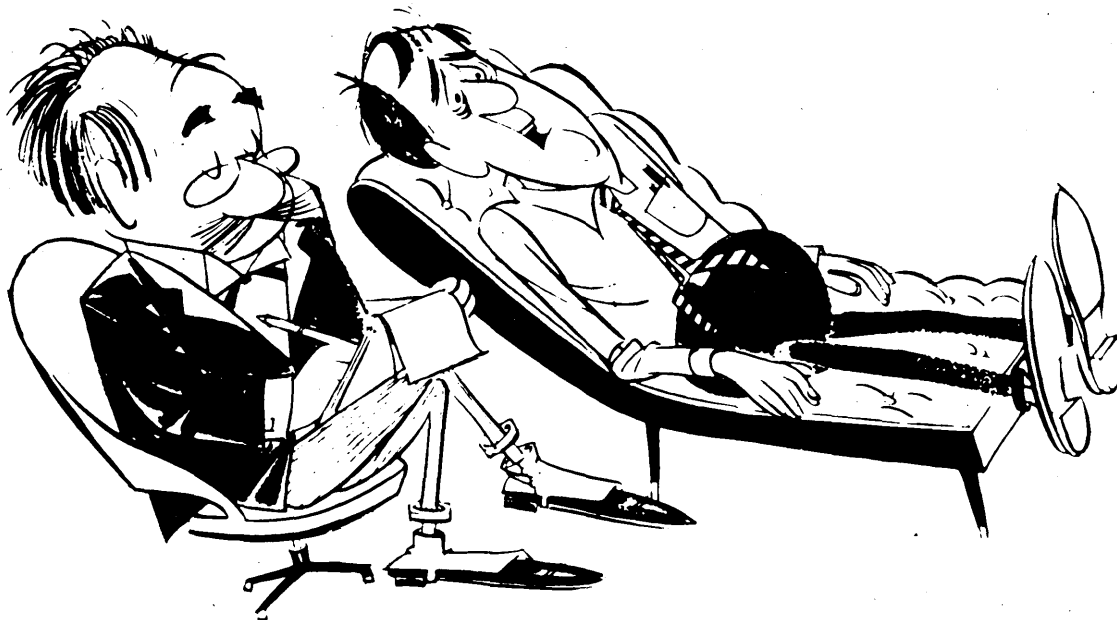
We're not about to jilt you, either. EDP is our only business, and we're in it to stay. As the world's largest independent peripheral manufacturer, we're sound and financially stable.

So we'll be around when you need us. Hard times or not.

And now that you've got a choice, don't wait. The faster you call or write us, the sooner we can tell you all about it. And the sooner you can stop paying all the traffic will bear for tape drives.



MDS is moving in plug-to-plug.



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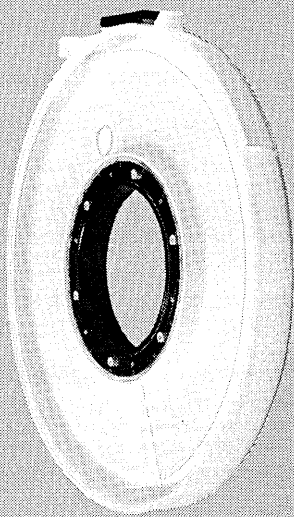
March, 1972

CIRCLE 62 ON READER CARD

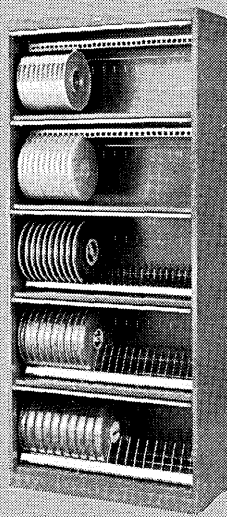
19

Tab has 700 ways to make your computer work better

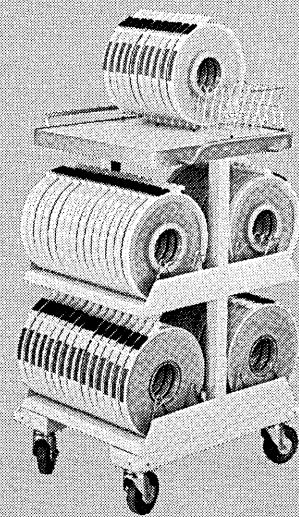
Here are some for Tape



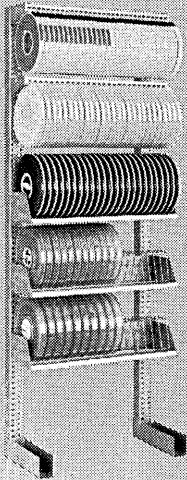
Tab Super Seal features molded-in hook, polypropelene plastic throughout. Get full tape protection, plus a lifetime far longer than ordinary seals.



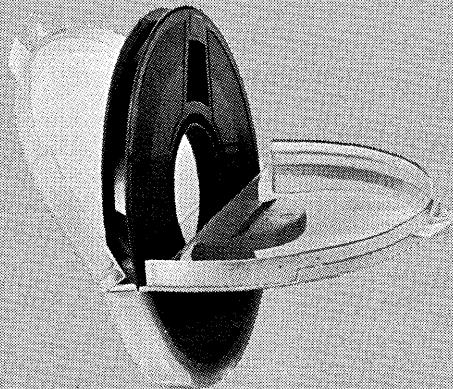
Two, three and five high Tab Data Media Cabinets provide safe, enclosed storage for tape. For security, individual or gang locks are offered.



A full line of compact, lightweight tape trucks that can handle up to 60 reels. Choice of reel rack inserts fits most reel containers. Highly maneuverable, turns around in 30" aisles.



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Exclusive Tab Reelgard one-piece construction assures positive protection for tapes, even if you use open aperture reels. And you get all this at the price of seals.

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CIRCLE 41 ON READER CARD

Letters

Whew

Sir:

After reading your Editor's Readout in the January issue (p. 27), I am beginning to suspect that DATAMATION went semi-monthly in order to see how good it would feel when they stopped!

EDMUND DEWAN
Champaign, Illinois

Submitting to terms

Sir:

In the matter of the ill-informed Mr. Patrick's review of the Vocabulary for Information Processing (Jan. Books, p. 105):

1. The standard is available from the American National Standards Institute, 1430 Broadway, New York, NY 10018 (not BEMA), and the cost is \$6.

2. BEMA did not produce the Vocabulary. It was produced by a committee of volunteers (X3K5 committee of ANSI) who did the best they could within the restrictions imposed.

3. ANSI standards are copyrighted because ANSI funds its own operations out of proceeds. Should a private publisher reap the rewards of an ANSI committee? It is patently not true that "a professor must obtain permission," since it depends on enforcement. ANSI, based on its activities in the past, would not likely sue for infringement on such a basis.

4. Terms in the Vocabulary are defined by people. Terms must be originated by somebody. Sometimes committee members originate terms, but many originate outside the committee through submissions. The committee inspects them all. I find no record of having received any candidate terms from Mr. Patrick. With his vast experience, he should be one of the committee's most prolific correspondents.

5. A draft supplement to the Vocabulary has been prepared. I am sure the committee will be looking forward to Mr. Patrick's contributions to making this document achieve the quality we all desire.

JERRY L. OGDIN
Silver Spring, Maryland

Mr. Patrick replies: I'd like to express my appreciation to Mr. Ogdin for enumerating the major deficiencies in the mechanism that produced the ANSI Vocabulary. He emphasizes the fact that the Vocabulary was produced by a committee of volunteers. That's the first mistake. Unfunded efforts never produce a timely product, and volunteer efforts involving more than one person seldom produce a product of high quality. Volunteer labor should be restricted to defining the scope of a project such as a glossary and debating its format, style, and content. However, the bulk of the effort should have been gotten from a paid staff somewhere.

The second problem involves publishing it under ANSI's banner, if ANSI truly has to rely on revenue from the Vocabulary to continue its standards work. The purpose of a glossary is to be a service to the community; this requires the broadest distribution to create an "instant standard." I would rather see a glossary available through the Government Printing Office at a very inexpensive price or a glossary financially supported jointly by the manufacturers and the professional societies. The ANSI funding mechanism interferes with the distribution of the written work which was in fact created to serve the community. Even if the Vocabulary had been good, the price of \$6 per copy is excessive for the material received.

Several years ago a Datamation editorial called for the community to set up a standing organization of paid professionals to keep a glossary and to adjudicate word meanings for the community in a prompt, efficient manner. No professional society has been willing to do this.

On another occasion Datamation attempted to get the National Bureau of Standards to take on a glossary of computer terms as a primary standard and through the use of government facilities (aided by industry specialists) to promptly create and maintain a glossary for the use of the field. Again nothing was done.

A glossary produced by amateurs on a part-time basis is almost like having none at all. We badly need a glossary so we may enter into contracts, engage in technical debates, specify hardware interfaces, and define program products. Although I am sure Mr. Ogdin and friends worked hard, he confuses effort with quality. I am sorry to hear they are preparing a supplement.

Gray hairs

Sir:

When I noticed the development sketched herein, I returned the tapes



and retired from active programming.

This has been the most effective test tape retention indicator I have encountered so far.

A. JAMES CRAWFORD
Manager-Corporate Data Processing
Colgate-Palmolive Company
New York, New York

Singing the blues

Sir:

With reference to my comments on manufacturer castration (Jan. People, p. 99), it might be noted that it only hurts for a moment.

In addition, the advantages are enormous. Curtailing new developments would force us to use existing technology more effectively (better than the present 50% capacity), which was the context in which I suggested minor surgery.

According to Konrad Lorenz, it also tends to reduce aggression markedly,

and, of course, it provides us with a ready-made corps of alto salesmen, for singing the blues in a recession.

Honi soit qui mal y pense.

DICK H. BRANDON
New York, New York

Hand holding

Sir:

Your Perspective article on the small business computer market (Aug. 1, p. 44) was extremely interesting to us, as we have been active in it for the past two and a half years. I feel that there is a basic misunderstanding of the elements for success in this business.

In serving the small businessman, the equipment is of far less significance than the software applications and the degree to which one is able to hold the customer's hand. Anything less than a dedicated user-oriented organization is doomed to failure and will draw down the potential of the market as a whole.

NORMAN SOEP

President

Search Computer Systems
East Hartford, Connecticut

Compumetrics

Sir:

The article on "Systems Testing . . . A Taboo Subject?" by T. J. Vander Noot in the Nov. 15 issue (p. 60)—as well as other related articles in recent issues of DATAMATION—prompts me to make the following observations:

1. Richard W. Hamming coined the name "compumetrics" to mean measurement of computer systems—as biometrics, econometrics, and psychometrics—at Computer Science and Statistics: Fourth Annual Symposium on the Interface, in September 1970.

2. A Special Interest Committee on Measurement of Computer Systems—SICMETRICS—was formed within the Los Angeles chapter of the ACM and currently meets monthly.

3. "A Structure for Compumetrics—Preliminary Version" has been developed by me, and a bibliography on compumetrics is being compiled by SICMETRICS.

Anyone desiring further information on SICMETRICS may contact me.

ARNOLD F. GOODMAN
18231 Hillcrest Avenue
Villa Park, California 92667

Shadowboxing

Sir:

It is possible to admire, in the abstract, Dr. Beizer's polemic "rebuttal" of Mr. Harrington's criticisms (Jan. Letters, p. 101) for its high level of political sophistication, but the straw man that was destroyed was not Mr. Harrington.

letters

It is all very well to say that the human animal has infinite capability, but to suggest that Mr. Harrington has denied this is simply not true. Mr. Harrington simply stated what he understood to be a fact; namely, that there is no case on record of successful implementation of a software package which approaches the proposed (ABM) package in scope and complexity. Dr. Beizer's "rebuttal" implicitly accepted the truth of this assertion, and I for one am compelled by this fact, and by the fact that the largest projects which have been undertaken have been failures, to conclude that the minimum condition which ought to apply to any proposal of this nature—namely, a reasonable expectation of success—has not been met.

And in saying that the public has not the right to arbitrate this question, Dr. Beizer has denied the single most fundamental assumption which underlies democratic institutions. To say that a well-posed question cannot be answered by a person of average intelligence is to adopt an elitist position which is not justified by any facts of which I am aware.

ROBERT W. MURR
San Diego, California

Building blocks

Sir:

As a result of the many requests for information on computer programs, the National Association of Home Builders has embarked on a program to review the existing computer programs applicable to the home building/construction industry and disseminate this information to our membership. We would appreciate hearing from companies who already have programs for feasibility analysis; single, multifamily, garden, and high-rise construction; mobile home parks; and commercial and industrial developments. Can your readership help?

RICHARD P. TODRIN
NAHB
1625 L Street, N. W.
Washington, D. C. 20036

Handcuffs

Sir:

I take issue with the opinion of Robert J. Robinson which appeared in the Forum on Nov. 15, 1971 (p. 152). The article was entitled "Picturephone—Who Needs It?"

It seems that the general public will take any opportunity to throw brickbats at "Big Bad Ma Bell." The Picturephone was a great excuse to get on the bandwagon one more time. Evidently Mr. Robinson feels that the FCC

should ride herd on the scientists at Bell Laboratories and tell them what to invent, what to pursue, and what to discard. This kind of leash would stifle all ambition and result in "reverse progress."

Does Mr. Robinson remember when the telephone dial system was invented and introduced to the public? Many subscribers complained when they had to dial the telephone number themselves! Public opinion could have prevented its use and created a monster which would have made business and social communication most unwieldy and unbearable.

No, Mr. Robinson, don't handcuff scientists and engineers, in any industry, or we'll end up back in the Middle Ages. Come to think of it, we might be better off!

JOSEPH W. CUTRONA
Clark, New Jersey

P. S. The writer has been employed by New Jersey Bell for the past 25 years and is proud of the Bell System's accomplishments.

Mind's eye

Sir:

Judging from Mr. Whitaker's letter (Jan., p. 103), the subject of hexadecimal graphics is not closed. Here is

D	ID	10
V	V	11
R	R	12
B	I3	13
H	I4	14
F	I5	15

a suggestion in which upper case letters are used for 10 through 15. The figure below shows how the letters chosen can quickly remind the reader of the decimal representation.

JONATHAN K. MILLEN
Bedford, Massachusetts

No nonsense

Sir:

Computer programming is an exact science. You determine the mathematical equation or logic sequence, select the proper programming statements, and run the program. If the correct answer isn't forthcoming, you change things a little bit and try again.

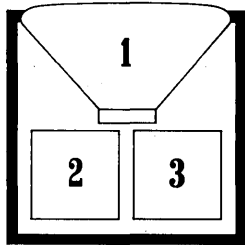
MARVIN H. WALKER, JR.
Atlanta, Georgia

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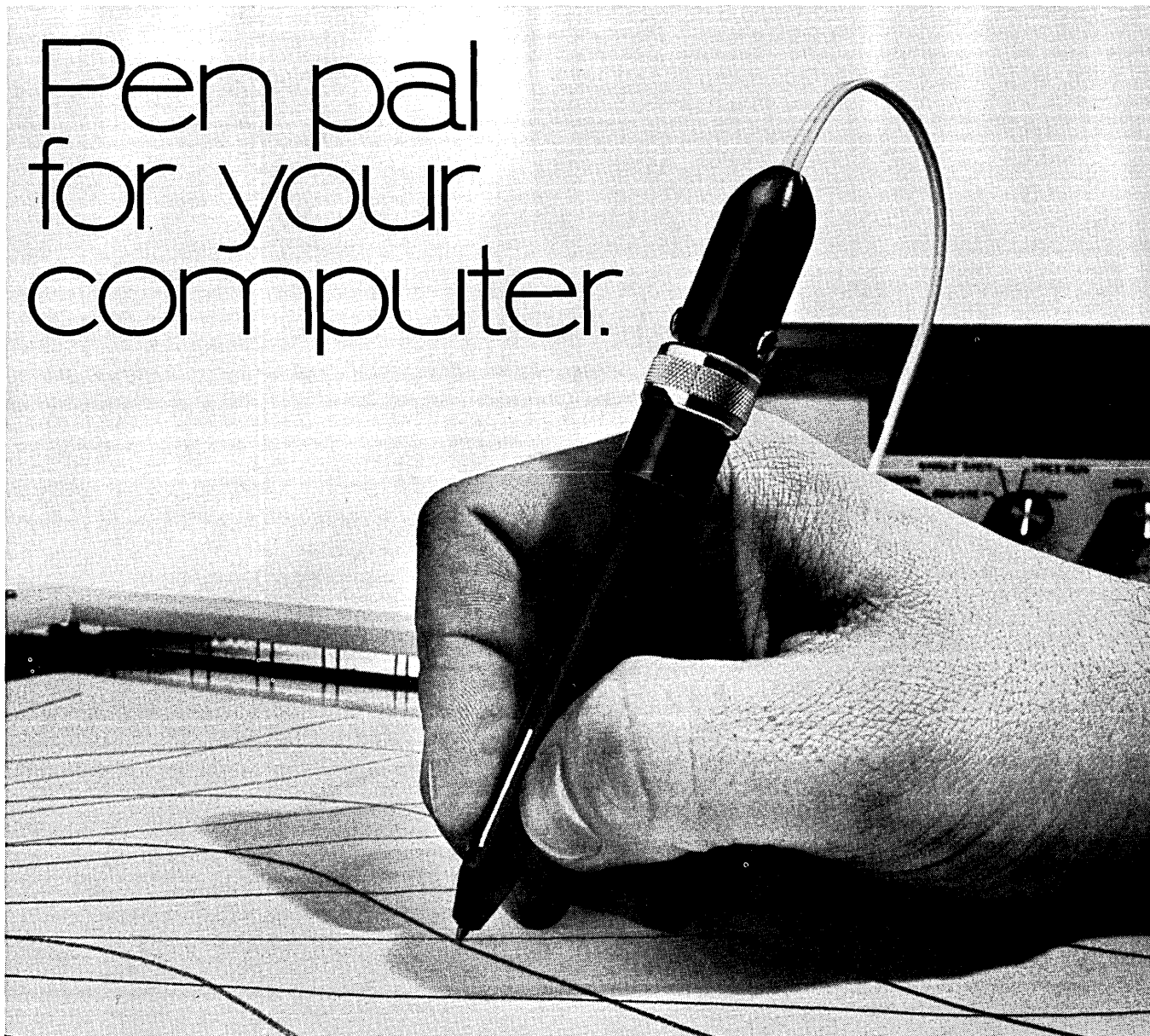
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The graf/pen is a special ball-point pen which, when touched to the graf/pen tablet, a visual display, a CRT screen or a film viewer, creates both a visual record and an electrical spark. The hypersonic sound of this spark is recorded by microphones at the edges of the display surface without interference from ambient noise. These sounds are then digitized into X and Y (plus Z for three-dimensional graf/pens) coordinates. The coordinates are in binary or BCD coding for storage on mag or paper tape or punched cards, for simultaneous display on a CRT terminal, for entry into the computer, or for remote transmission.

Use the graf/pen to enter graphic data from two- or three-dimensional objects. Use it to speed the entry of data

on formatted pages—either printed or projected, for order entry and processing or for inventory control. Or let it help you enter data for process control programs, systems analysis, page make-up, remote audio-visual presentations, data reduction or any number of applications where data entry is difficult or impossible by classic means.

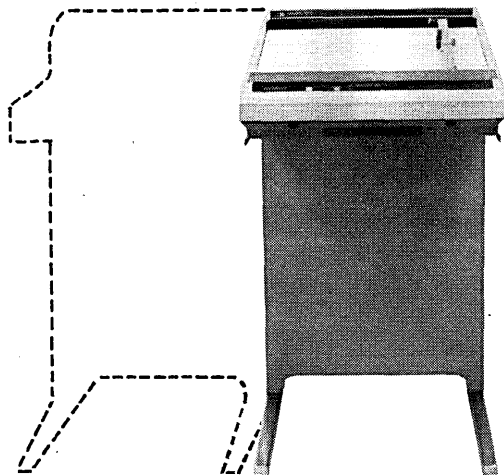
With graf/pen, you won't have any costly interfacing or startup problems. graf/pen is available with tape, card, or CRT memory and/or display systems. The cost for your graf/pen, complete with a 14" x 14" tablet, a stylus and a control unit is just \$2,800. Now that's something to write home about!

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At last, everybody can see their time-share data plotted in smooth, clear graphs. Hewlett-Packard's Model 7200 Graphic Plotter will add a new visual dimension to any terminal in the business. Now, even if you're partial to IBM's 2741, you can have instant graphic solutions to every type of engineering or mathematical problem.

There's no special operation or programming knowledge needed. You control the program. Plot numerical data in points, lines, curves, circles, ellipses, bar graphs or pie charts. Or, manipulate and expand computer data

and plot in finished graphic form. You get smooth lines—not the staircase drawn by the incremental recorder.

Use the HP 7200 simultaneously with your time-share terminal or silence the terminal and use the plotter alone. Because it goes to work when the data comes in, there's no time lag.

Simple manual controls allow you to set the graph limits to fit any pre-printed grid. HP's Autogrip electrostatic hold-down firmly grips any graph paper up to 11x17 inches.

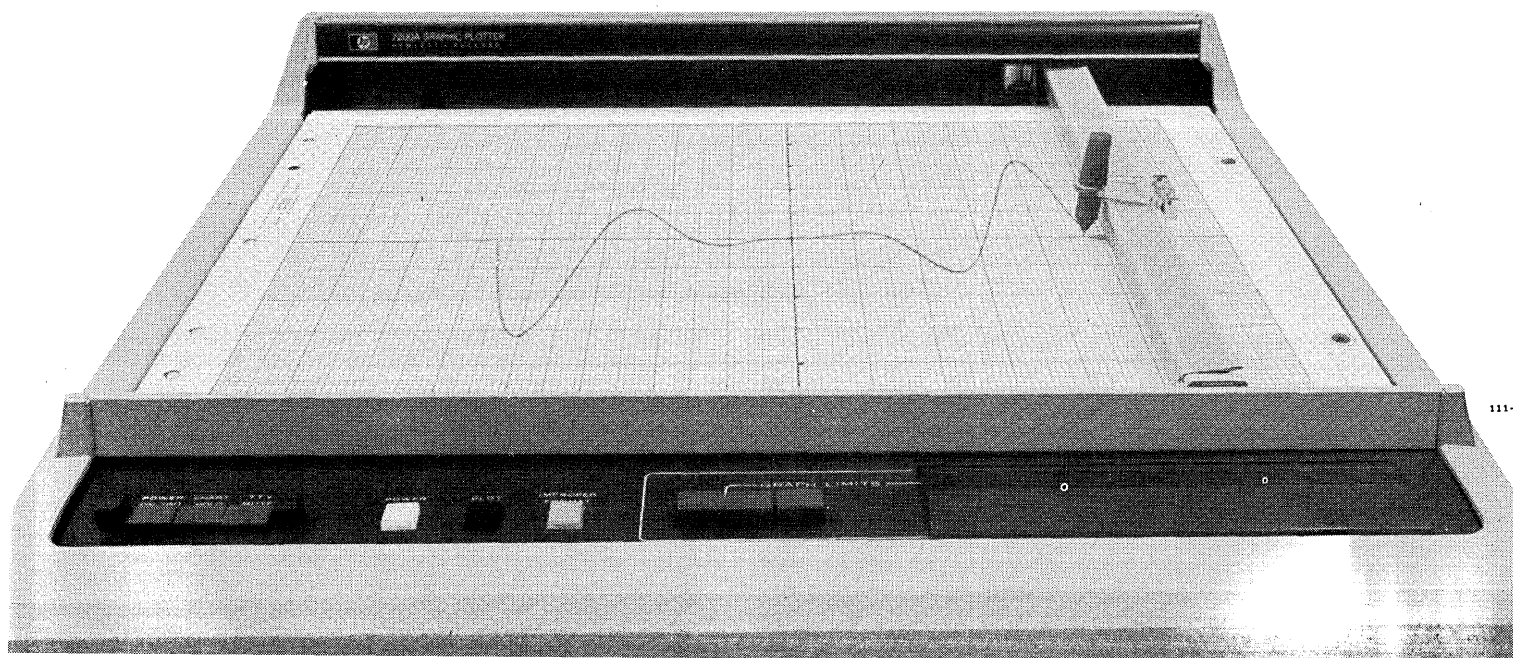
You can arrange to add a graphic plotter to your existing time-share

terminal by contacting Hewlett-Packard. Buy it at \$3,300. Rent it. Lease it. Or lease to buy.

We can match a 7200 with any EIA ASCII terminal in the business... or even IBM's 2741. So now, everybody can be the arty type. For details, contact Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

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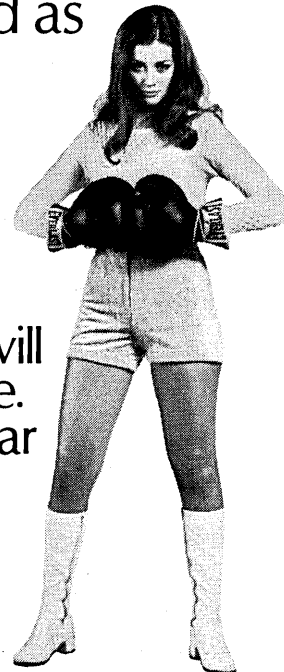
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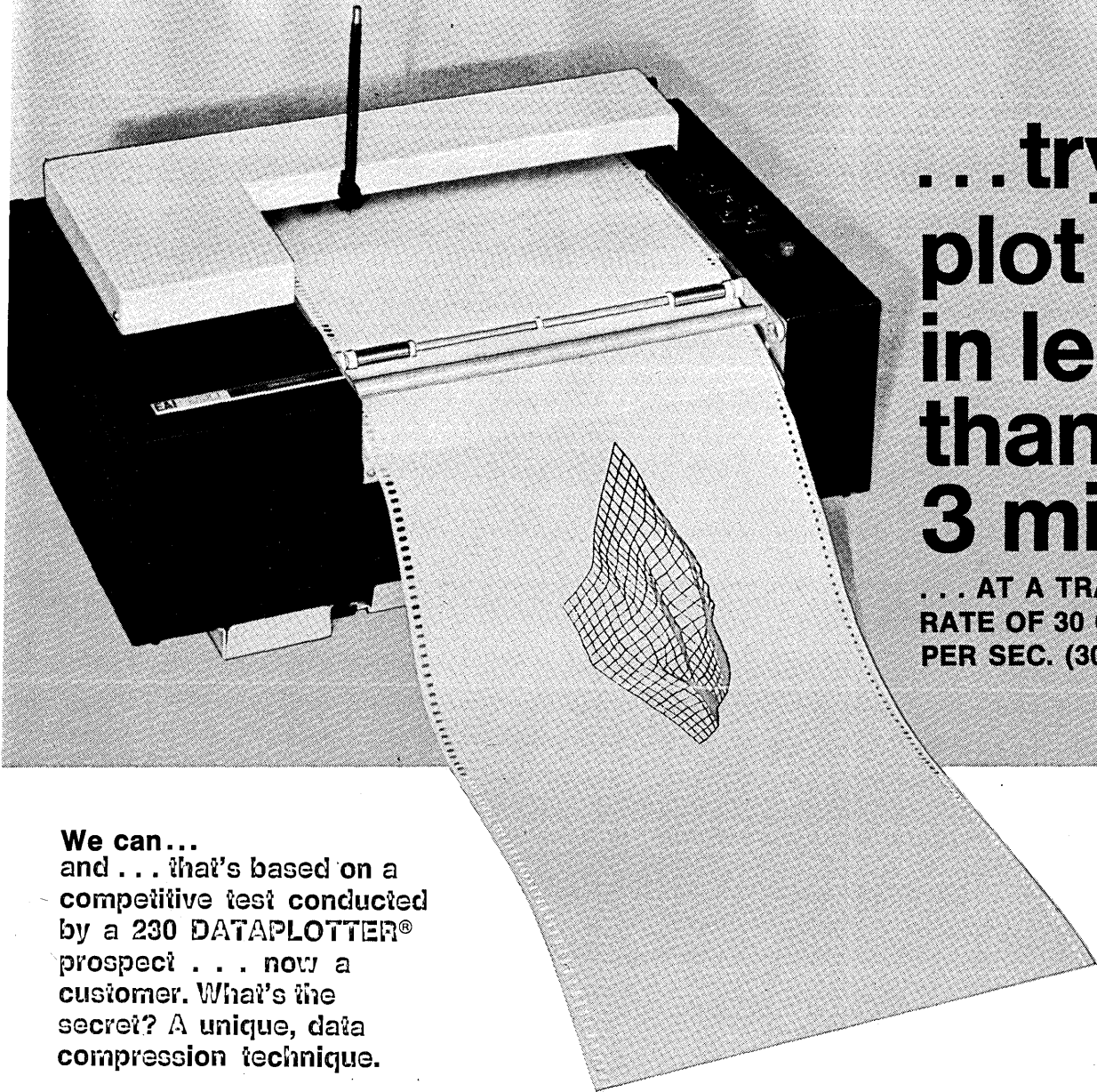


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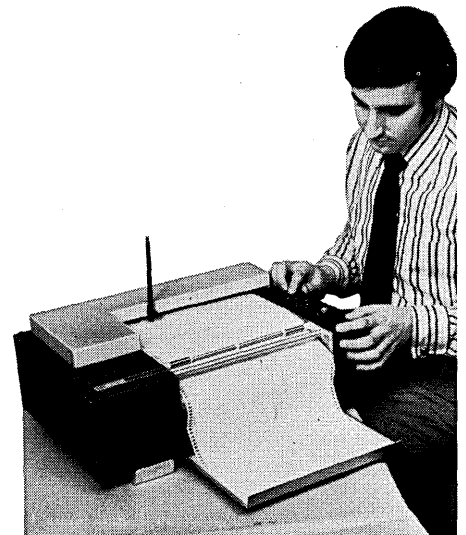
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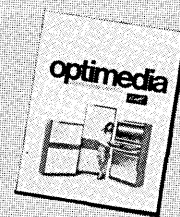
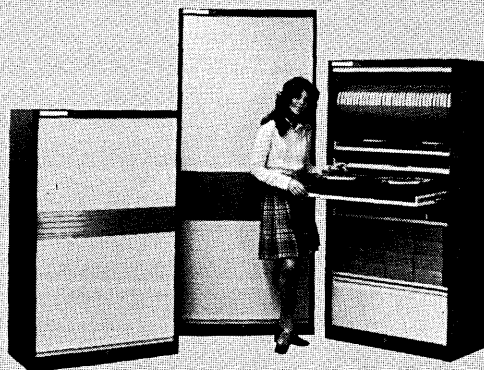
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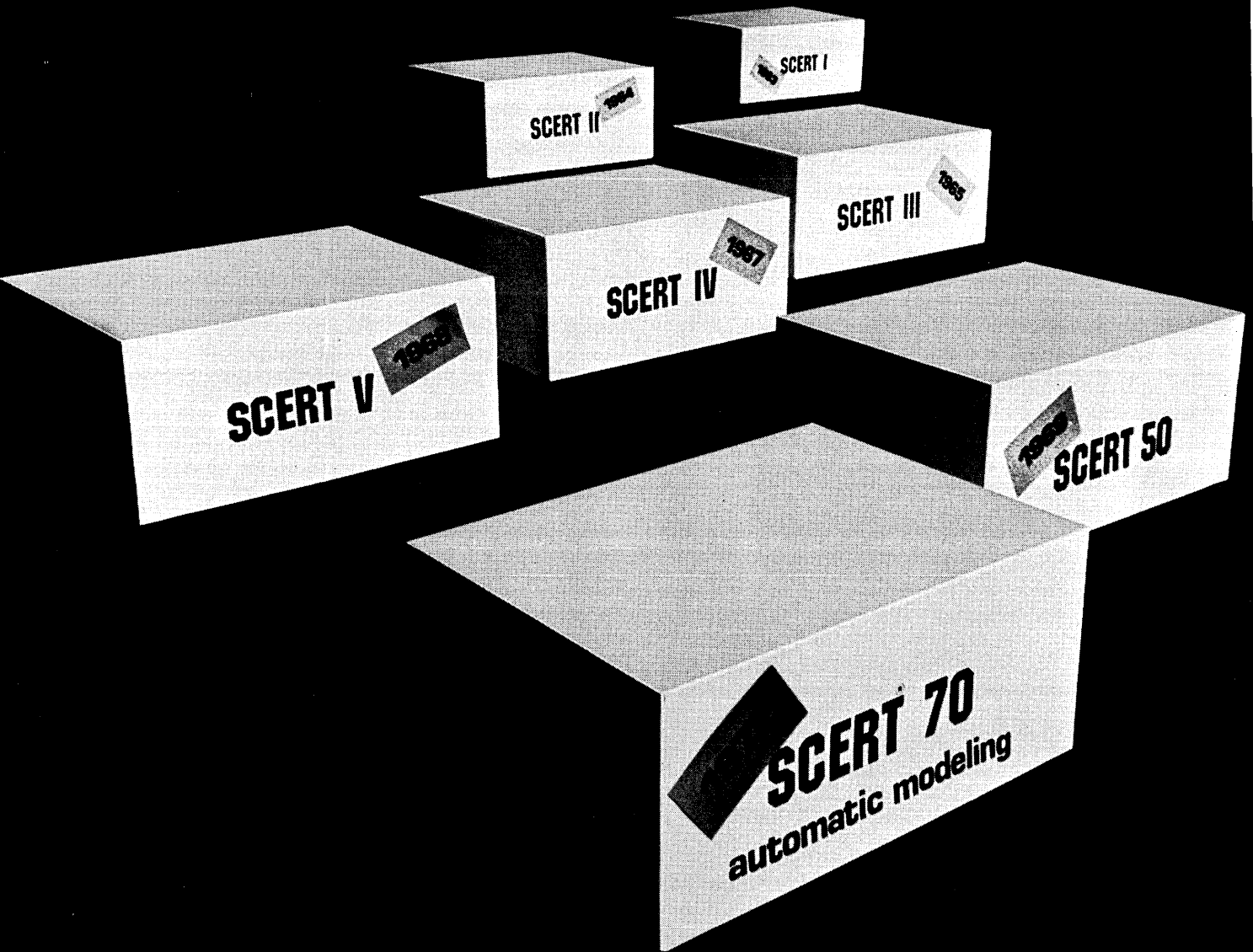


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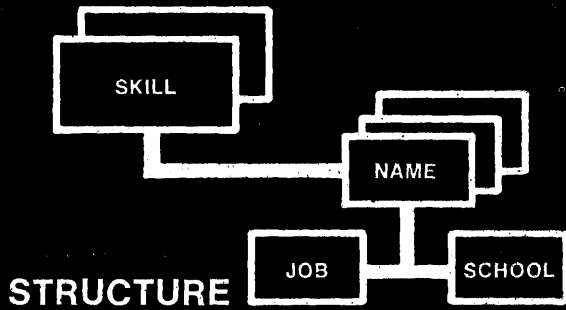
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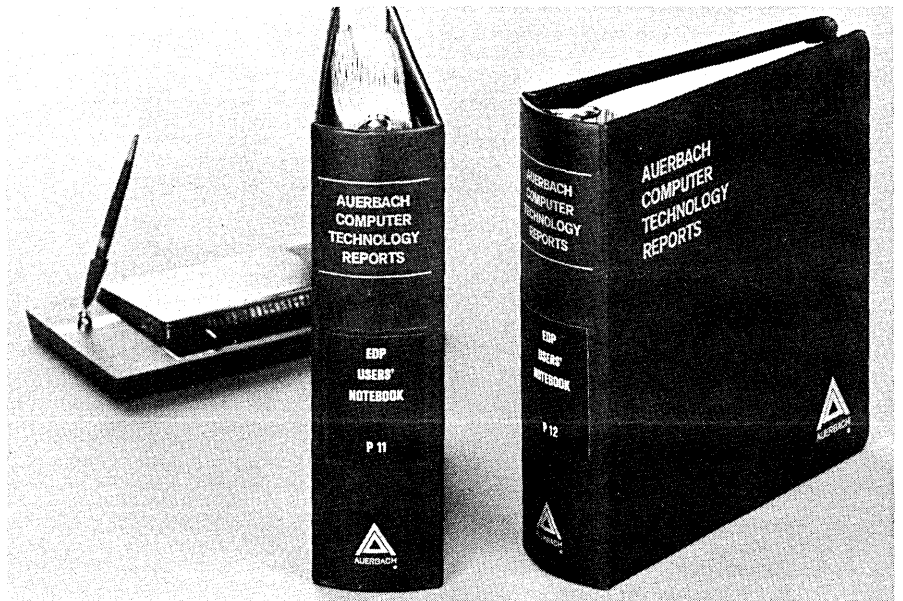
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Curtain Act at RCA

by W. David Gardner,
New England Editor

Early in 1970, the RCA computer people who attended the Marketing Achievement Club meeting in San Francisco realized that something was happening to them and to their computer division—something good. They were a part of a new era—the L. Edwin Donegan, Jr., era—and to just about everyone at the meeting in San Francisco's mammoth Masonic Temple that seemed to be a very good thing indeed.

Donegan was enjoying a meteoric rise at RCA, having just been appointed vice president and general manager of the division after only a year there. Here was a man who was clearly different from the conservative, old-shoe type of managers who had been running the computer division in recent years. Donegan's Irish good looks and enormous vitality were in sharp contrast to the folksy and plodding manner of the former chief of the computer operation, James Bradburn, who, although he didn't know it at that time, would gradually be eased out of the computer operation by RCA corporate management while Donegan would be eased in.

Donegan wasted no time in putting his stamp on the division and he started with the meeting of the Marketing Achievement Club, membership in which is meant to be a reward for sales achievement during the previous year. Gone were the RCA homemade aspects of the meeting and in their place was a slick and smooth production with a stress on visuals. Under the old RCA regime, the emphasis had been on individual recognition and communication among the sales people, while Donegan used the meeting primarily as a motivational vehicle. "Donegan really fired them up," said one ex-RCA man who attended. "Particularly the young

salesmen. When they arrived at the meeting they were proud that they made the club, but when they left they left feeling they were going to do three times better."

There were, however, a few men at the meeting who had silent reservations about ex-IBMer Donegan's first Marketing Achievement Club meeting. To them, the meeting was somewhat more extravagant than they were accustomed to and this caught their eye. For instance, the consultant who worked on the meeting was paid a fee of more than \$100,000 and attendance at the meeting was puffed up to about 1,000 people at an increase in cost by bringing in large numbers of non-sales types. The result was that RCA's Computer Division seemed to have grown larger very rapidly.

But more important, the atmosphere of the meeting had changed sharply. It didn't seem to be a meeting of RCA's

... a microcosm of the problems that would help lead to disaster in September of 1971 ...

Marketing Achievement Club at all; but rather, considering the slick production, a meeting of IBM's 100 Per Cent Club. In this regard, the San Francisco meeting would prove to be a microcosm of the problems that would help lead to disaster in September of 1971 when RCA would pull out of the computer business entirely, in disgrace. Donegan would attempt to transform RCA's Computer Division into an IBM with an almost missionary zeal. If IBM had done anything—anything at all—then the same thing was often good enough for RCA. When he was at IBM, for example, Donegan had attended a meeting of the 100 Per Cent Club at

the very same Masonic Temple. Likewise, in the next two years, Donegan would pick as the sites of RCA's Marketing Achievement Club meetings locations where IBM had held its meetings for its 100 Per Cent Club—the Broadmoor in Colorado Springs and the Fountainebleau in Miami Beach.

Donegan joined RCA in January of 1969. An RCA press release announcing his appointment by the then chief of computer marketing, Edwin S. McCollister, stated that Donegan, who was just past 40, would be responsible for "all field and home office sales department functions, and will make his headquarters at the computer division's home office in Cherry Hill, N.J." RCA documents on file with the Securities and Exchange Commission indicate that Donegan received a basic annual salary of \$75,000, but that figure presumably was inflated by bonuses. It is not entirely clear why McCollister hired a new marketing leader, but the best explanation seems to be that McCollister was tiring of his job after nearly a decade in RCA marketing and he hired Donegan with the idea that the latter would be his replacement. McCollister no doubt was thinking the changing of the marketing guard would take place over a period of years. However, within a year, not only would Donegan overtake McCollister, but he would take over the entire Computer Systems Division and be on his way to a corporate vice presidency. And in another year, Donegan would be under consideration for the presidency of the entire RCA Corp., which, with annual sales of more than \$3 billion, ranked as one of the 25 largest corporations in the U.S.

McCollister was a steady, deliberate type, who quietly compiled an impressive marketing record—during his reign

annual computer division revenues went from \$14 million in 1960 to \$237 million in 1969. He lacked Donegan's glamour and charisma perhaps, but he was decisive and he had a good common touch. As Donegan's star rose at

McCollister found that he became something of an unperson, moved aside by Donegan . . .

RCA, McCollister was to suffer a fate similar to that met by some other old-line RCA employees. McCollister found that he became something of an unperson, moved aside by Donegan and the IBM team he was assembling. Nevertheless, McCollister fared better than some other old-line RCA men, who were simply sacked.

During the 1960s—during the era of Bradburn and McCollister and of A. L. Malcarney, the former group executive vice president—RCA had been taken virtually from the ground up in computers to the point where it had a solid base in the industry. Although RCA went full scale into the commercial electronic data processing field relatively late—in 1958—it had managed a few technological coups. The RCA 501 was the industry's first completely transistorized system and the Spectra 70 product line was the first major commercial system to use integrated circuits. By and large, though, RCA tended to follow IBM's lead by fitting under the pricing umbrella of the Computer Colossus with relatively unexciting equipment. In spite of slight edp profits in 1964 and 1965, RCA's computer operation never settled into a profitable enterprise, largely because of the capital that was constantly plowed back into the rapidly growing business.

When Donegan arrived at RCA in January of 1969 he carried an impressive curriculum vitae with him. In 18 years at IBM he had moved rapidly up the ladder, starting at the bottom as a marketing representative in the Data Processing Division and, with several stops along the way, working his way up to vice president of the Service Bureau Corp. Bigger things were said to have been slated for Donegan at IBM, but he was impatient and ambitious and when the RCA offer came, he jumped. During his first year at RCA, an all-time high was set in the amount of business booked. True, McCollister was still heading RCA marketing, but the gains were in no small part due to Donegan, whose Irish wit, charm and vitality quickly won him supporters—and RCA orders. Donegan's supporters, and he had many from the start, began using words like charismatic and aggressive to describe him. Also, Bradburn and McCollister were very pleased with the way their new marketing man was working out. But there were indications that Donegan seemed to be uneasy about the quaint RCA way of doing things. To him, IBM's way was still the only way and in August of 1969 he began what would eventually turn into a wholesale raid on IBM: he hired Joseph W. Rooney to head up RCA's home office sales department at Cherry Hill.

While Donegan was consolidating his position at Cherry Hill, he was also rapidly making a name for himself at 30 Rockefeller Plaza, RCA's corporate headquarters. When he joined RCA, Donegan kept his home in Greenwich, Connecticut, and he made it a point to visit corporate often.

At 30 Rockefeller Plaza, Donegan found a valuable patron in Chase Morsey, Jr., who also lived in Greenwich.

Morsey was the power behind the RCA throne, the throne being represented by chief executive officer Robert W. Sarnoff. Morsey's official title was executive vice president, operations staff, and in reality Morsey was the No. 2 man in influence at RCA while he held that post during 1969, 1970 and the first six months of 1971—the period during which the computer operation was taken from modest lift-off, to soaring promise, and, finally, to crashing fiasco. Morsey's credentials for his high position in a technology company

L. Edwin Donegan, Jr.: Applying IBM methods without IBM resources.



Curtain Act at RCA

like RCA were slightly unusual—he had worked at the Ford Motor Co. for 16 years, rising to general marketing manager of the Ford Division, and most immediately before his joining RCA, he owned and operated a Ford agency in Arizona. Like Donegan's training and background at IBM, Morsey's training and background at Ford would contribute to the thinking that led to the coming disaster in the RCA computer operation.

Morsey's rise at RCA was so rapid that it was only natural perhaps that corporate gossips quickly began referring to him as RCA's executive suite Rasputin. Robert Sarnoff and Morsey had ascended to power in the late 1960s and they brought with them all the *right* academic credentials and the hip new management buzz words and practices. They represented a departure from the old hard-nosed common sense and deliberate style of the RCA of David Sarnoff, the electronics pioneer who had propelled the company into a position of world leadership in electronics. There was something of the country club and the jet set in Robert Sarnoff and Morsey, and Donegan fit easily into their style.

On the other hand, Bradburn didn't fit. He was a Christian Scientist; he wouldn't take a drink; no one was ever known to have accused him of possessing charm. The inevitable happened: Sarnoff and Morsey forced a Donegan promotion on Bradburn, who was said to have quietly resisted. Bradburn, of course, lost. Donegan was made vice president and general manager of Computer Systems Jan. 1, 1970, and Bradburn retained his old title, but lost a great deal of his power. The skids were greased under him. In December of 1970, Bradburn "resigned from RCA because of pressing personal requirements," according to the official com-

... the suddenness of the management change would prove to be more than the RCA organism could tolerate ...

pany version. RCA insiders, however, say that Bradburn was fired abruptly by Sarnoff. Whatever the circumstances of his leaving, it must have been a difficult experience for Bradburn, who had done a creditable job in building up the computer operation and who enjoyed a good reputation in the industry. (It was expensive for Sarnoff to get rid of Bradburn: SEC records indicate RCA agreed to pay Bradburn about \$230,000 when he left.)

In January, 1971, RCA formed a new organization called RCA Computer Systems with Donegan heading it up as corporate vice president and general manager. Donegan quickly began surrounding himself with IBMers. One exception in the group was an old-line RCA manufacturing vice president, John Lenox; but he was soon fired by Donegan.

Although the change in management took place over a few months, it nevertheless was extremely sudden for a high technology business like the computer industry. Coupled with the massive injection of new IBM blood into RCA, the suddenness of the management change would prove to be more than the RCA organism could tolerate and both factors would contribute to the eventual loss of control of the computer operation. Part of the explanation for the sudden shift in management direction seems to be explained, at least in part by Robert Sarnoff's background. For a decade, Sarnoff had been running RCA's broadcasting affiliate, the National Broadcasting Company, and sudden wholesale management changes in broadcasting are common occurrences.

Donegan proved to be as good a salesman at 30 Rockefeller Plaza selling his ideas on the computer operations as he was out in the field selling computers. RCA had always aspired to become

"It's a funny kind of business. You can be so successful and wait so long for a return."

ing No. 2 behind IBM in the computer industry, but during 1970 the drive to become No. 2 took on a new urgency and a new credibility as well, largely because Sarnoff and Donegan made such a public flap over the issue. In March of 1971, for instance, Robert Sarnoff would tell RCA stockholders the following:

"Our highest priorities today are the establishment of a profitable computer business and capture of the domestic industry's No. 2 position. RCA has made a greater investment in this effort than in any prior venture in its history, and we are convinced that the returns will be substantial.

"This investment has already resulted in a more rapid growth rate for RCA than for the domestic industry as a whole ..."

During this period Chase Morsey seems to have become particularly interested in share of market and RCA targeted 10% of the U.S. commercial edp market as a goal. There are many at RCA who believed that Morsey's automotive background in Detroit—where there is something of a fetish over share of market—was an impor-

tant factor in RCA wanting to grow so rapidly, even at the cost of profitability. Morsey was instrumental in commissioning a \$100,000 marketing report by the Arthur D. Little, Inc., which, in large part, advised RCA on how to go about increasing market share.

However, there can be a danger in growing too rapidly in the computer business, because so much of the equipment is leased rather than sold outright. In a leasing environment, of course, revenues are delayed, but the manufacturer must still bear the full expense of the equipment at the start. Sarnoff once put his finger on this problem: "It's a funny kind of business. You can be so successful and wait so long for a return."

But how do you become No. 2 if you only have 3 or 4% of the edp business? How do you get that critical mass of 10%? Why, you take it out of IBM's hide, that's how. Or, that's how Donegan felt. "We have two options if we want to get 10% of the market," Donegan once explained. "We can get a little out of the hide of each of the other Dwarfs, or we can get it out of IBM's hide. It's easier for us to get after IBM."

In this sense, Donegan resembled Napoleon licking his chops before Waterloo. No one, of course, takes anything out of IBM's hide; it's the other way around and one can only wonder precisely what Donegan was doing during his 18 years at IBM that led him to think otherwise. Before long, Donegan would watch new IBM machines and pricing tactics throw the RCA computer operation from a state of self-inflicted confusion into a full-scale rout.

Still, Donegan persevered. Internally at RCA, his program became known as "Intercept," the idea being that RCA would introduce a new family of computers that would intercept IBM customers and bring them over to RCA. But where would RCA get a new line of computers? At that time, 1970, a new line was under development, internally called NTS (for New Technology Series), but wouldn't be ready for announcement until around the first of 1972. Donegan thought that was too far in the future, so he decided to take the existing Spectra machines, put new skins around them, soup up their memories, and, in effect, reintroduce the Spectra line with a great deal of fanfare and hoopla.

The "new" family was introduced in September of 1970 and consisted of four machines, which the company called the RCA Series 2, 3, 6 and 7, although its internal code name—FS (for Follow Spectra)—was a more appropriate and accurate appellation. The 2 corresponded to the Spectra 70/45,

and the 3 with the Spectra 70/46. The 2 and the 3 were essentially cost-reduced versions of the 45 and 46 with new skins, new memory interfaces and other unimportant changes. The 6 corresponded to the 70/60, and the 7 to the 70/61. The 6 was basically the same machine as the 70/60 with a new skin. The 7 did replace a translation table memory with a content-addressable memory, but, for all practical purposes, both the 6 and the 7 were just price cuts of the Spectra 70/60 and 70/61.

"The point I'd like to stress," said Joseph W. Rooney, Donegan's computer marketing chief when the new series was unveiled, "is that in just about every case, RCA's new series of computers offers, or will offer, the IBM user a very attractive alternative to upgrading his system to either a larger System/360 computer, or a System/370 series

Donegan claimed that guaranteed conversion was "one of the most significant business policy innovations in the history of the computer industry . . ."

computer." That was the crux of the strategy for the RCA series.

At the same time, Donegan described a new marketing concept which he called "guaranteed conversion." The main thrust of the guaranteed conversion plan was that the customer and RCA would agree to a program for converting the customers from IBM equipment (the plan was restricted to IBM users) and if RCA failed to perform as specified, then RCA would pay a substantial monetary penalty to the user. Donegan claimed that guaranteed conversion was "one of the most significant business policy innovations in the history of the computer industry" and RCA embarked upon a massive merchandising and sales campaign to lure users to take advantage of the plan. The plan flopped; over the next several months, the guaranteed conversion plan attracted no more than four takers.

The "Intercept" strategy was planned with detailed knowledge of plans of IBM's 370 line, of which just two machines—the Model 370/155 and the 165—had been announced when the RCA Series was publicly unveiled. Since so many RCAers had come over from IBM, RCA had a good handle on the specifications and marketing strategy on the 145, the 135 and the 125. The 145 and the 135 had not been announced at the time of RCA's announcement and the 125 still had not been announced by IBM at this writing. Donegan simply priced the RCA Series low enough to make it a

more attractive customer buy than what he expected the entire 370 line would offer. He conceded that the RCA equipment couldn't compete in speed, so the key was what Donegan regarded as memory advantages and pricing that the RCA equipment had over the 370 and 360 lines.

"But what about the 145 that is rumored to be very close to announcement?" said Rooney at the unveiling of the RCA Series. "Well, we've studied the question and we have the answer." Rooney's "answer" was that RCA had already come to "certain conclusions" about the 145 and that RCA's pricing of its new machines was an alternative to customers who would consider buying a 145. One week later, IBM announced the 145, but it wasn't the same machine RCA had on its competitive analysis charts. The 145 had a larger memory and a lower price tag than RCA had anticipated.

So much, then, for RCA's competitive stance against the 145. Against the 145, sales of RCA's 6 and 7 were negligible.

RCA made a big fuss about what it termed the success of the new line, claiming that the RCA Series had quickly attracted more orders than the company had expected for the remainder of the year. At first, this was said to have been accomplished in three days, but later the time frame was changed to three weeks. This marked the start of great confusion over RCA's way of logging order bookings under the Donegan regime.

Some three weeks after the announcement of the new line, Donegan

This marked the start of great confusion over RCA's way of logging order bookings under the Donegan regime.

triumphantly proclaimed that "33% of the new orders represent customers coming to RCA for the first time." He didn't say so, but that also meant 67% weren't coming to RCA for the first time. The 67% represented existing RCA customers and that hinted at great problems, because it meant that the new machines could be chiefly impacting RCA equipment rather than IBM equipment.

In general, RCA enjoyed a good press on the new family but Donegan was particularly sensitive to criticism of his new series. For instance, when DATAMATION observed that RCA had simply "reintroduced the Spectra" and that RCA would have to sell 360 technology against 370 technology, Donegan complained to the publication about those observations and other statements that he regarded as slurs.

Many at RCA—particularly some old-

line employees—had expressed fears about the RCA Series impacting the company's existing customer base. The safe way, they argued, would be to wait for the NTS Series, but Donegan would have none of that. The NTS Series consisted of five machines, possibly six, ranging in specifications from a relatively small machine with about one-half the capability of the IBM 360/50 to a big computer with a capability in the range of the IBM 195. The line was scheduled for introduction from September of 1971 to January of 1972 with deliveries slated to begin in the third and fourth quarters of 1972. Steady production runs were to begin in early 1973.

The NTS line was to have embodied several new and unique technological features, which led the RCA people working on it—there were as many as 150 engineers committed to the program at one point—to feel that the

The NTS line was to have embodied several new and unique technological features . . .

series would offer real, rather than imagined, advantages over the 360 and 370 line. The whole line was to be based on virtual memory¹ and a virtual memory operating system was being prepared. The line was to utilize a fair degree of medium-scale integration throughout and the specs called for use of advanced circuitry, such as transistor-transistor logic, emitter-coupled logic, and custom RCA high speed circuits. In addition, the RCA engineers were concentrating on what they regarded as an innovation that would permit the freeing of input/output channels more than previously had been possible with the concurrent result that more of the cpu would be free for computational purposes. There are indications that two or three of the machines—on the low end—were being developed by Siemens, RCA's licensee in Germany. Because of U.S. anti-trust regulations, the two firms had to work at arm's length, but it is known that there was at least some loose co-operation between the two.

The NTS program was slowed down for a number of reasons. First, Donegan moved the engineering group from the large machine—called the NTS 1000—over to work on his RCA Series. Second, Donegan moved the RCA design and engineering leaders aside to make way for a new flow of IBM people, who lost valuable time while they settled into their jobs and while they instituted IBM development practices,

¹Virtual memory employs a memory mapping technique that permits the user-programmer to be unconcerned about the relationship of the addresses he uses and the physical addresses assigned in the computer system.

Curtain Act at RCA

which tended to confuse old-line RCA people. These practices included involvement of marketing people during the design and development stage. In addition, there are indications that Siemens' leadership was becoming increasingly skeptical about Donegan with one result being that Siemens was becoming more independent of RCA. For one thing, Siemens did not introduce the entire RCA Series in Europe. The West German industrial giant felt the new line would primarily impact its existing Spectra base rather than pick up enough new business to make it worthwhile to introduce.

As far as financial matters at RCA were concerned, Donegan remained true to form: he was upset that RCA's computer operation didn't do its accounting the way IBM did its accounting. (IBM uses the conservative operating method while RCA used an accounting combination that utilized both the financing and operating methods.) When Donegan hacked his way through the computer operation's financial thicket (and there are those who believe it took him an inordinately long time to slice through), when he hacked through all the installment purchase contracts, third party sales agreements, in-house sales to RCA, when he finally came to the proverbial bottom line, he found that RCA's computer operation

There was endless internal debate on the accounting practices of the computer unit . . .

was not in the neat financial shape he had assumed it to be in. In addition, the IBMers who joined RCA were generally unhappy with what they regarded as the computer operation's liberal accounting methods. On the other hand, the pre-Donegan RCA financial people regarded the operation's bookkeeping as about average for the non-IBM segment of the computer industry. Whatever the situation, Donegan was unhappy about it and in late 1970 he removed David Campbell as controller. There was endless internal debate on the accounting practices of the computer unit, but this debate would become academic during late 1970 and 1971 as Donegan and his chief financial advisor, W. William Acker, would begin to lose their grip on finances.

On the corporate level, the computer operation was also taking its financial toll and this problem, coupled with other financial pressures, was placing the RCA Corp. in an uncomfortable financial squeeze. In early 1971, the

situation was this: operating earnings had been dropping and the corporation was increasingly resorting to long term financing. The company was stepping up short term borrowing, and it was evident that it would soon need more long term financing, primarily to keep the computer operation growing. In addition, common equity was dropping to about 40% of total capitalization and pretax coverage of fixed charges had dropped in 1970 to slightly more than a troubling three times earnings. Small wonder, then, that there were nervous men in corporate finance.

In early 1971, RCA's top financial man, Howard L. Letts, executive vice president, finance, "retired" unexpectedly, but that was just one signal that all was not well in corporate finance. Many felt that Sarnoff had pushed Letts into early retirement and not long thereafter, Sarnoff's favorite, Chase Morsey, was named to the financial post.

It should be made clear here that RCA was in sound financial condition at the time and still is. The point is that things were clearly deteriorating, and one of the biggest problems was caused by the computer operation in general and by the acceleration of leased edp equipment in particular. It is one of the great ironies of the computer industry that the better you do, the worse off you can be financially. Because the industry is largely a lease and rental business, companies that grow rapidly—and RCA was one—are required to make massive capital outlays, but since much of the equipment is leased, they must wait long periods to get their money back. During late 1970 and early 1971, a feeling began growing at RCA that massive cash inputs into the computer business—the most popular figure bandied about as the investment necessary was \$500 million—could be justified if the computer operation's losses could be stemmed. In 1970 the loss was \$10 million on revenues of \$257 million and there were great hopes that the computer operation was approaching break-even.

In late 1970, the computer operation put together its first business plan for 1971 and it was quickly apparent that the Donegan team anticipated 1971 would be a bumper year for the Computer Systems Division. The 1971 business plan estimated revenues of \$323 million—up from \$257 million in 1970—and a break-even or near break-even in the profit and loss column. Furthermore, the computer operation's long-range plan called for profits of \$12 million in 1972, \$25 million in 1973 and \$50 million in 1974. If the plan's projections were reliable, then Donegan would turn the operation around in 1971. He would be the hero of the computer industry.

There were several management and financial fingers in the pie, including those of pre-Donegan personnel from the Bradburn era, but the first business plan was essentially the creation of Donegan and his financial staff, which was led by William Acker.

No one likes to tell the boss bad news, but there seemed to be a particularly great reluctance among the people surrounding Donegan to bear bad tidings to him and, as some of his critics maintain, he tended to surround himself with organization men who were not used to challenging the boss. Devil's advocates were not popular with Donegan. At any rate, there was bad news aplenty and it took Donegan an unusually long time to get the unhappy message that 1971 would not be the year of the Great Turnaround. The new controller of the computer unit, Carmen Ferraioli, had the final responsibility for accepting the business plan and Ferraioli did not accept the plan, because, it was said, he felt it was overly optimistic.

The computer operation immediately set to work drawing up a new plan but by now the Donegan team had begun to lose its grip on finance and planning. The computer operation worked without a budget from Jan. 1 into April and until then an air of uncertainty hung over the computer operation. When the second plan was presented in April it was strikingly different from the first plan: instead of \$323 million, revenues were estimated at \$261 million, and instead of break-even, a loss of \$36 million was predicted.

One of the purposes of efficient financial controls between corporate and various line operations of course, is that they act as an early warning system for problems in line units. RCA had always maintained adequate efforts in financial operations. However, just as the computer operation began having serious problems, the relationship between corporate and the computer operation's financial units began breaking down; one result was that many problems in the line operation went unnoticed by corporate. That is

. . . during the computer operation's crucial months from December of 1970 to September of 1971 the computer operation had three different controllers . . .

hardly surprising, perhaps, because during the computer operation's crucial months from late 1970 to September of 1971 the computer operation had three different controllers and Acker, Donegan's top financial man, had sparse financial background, having been primarily a marketing type at IBM.

(Donegan, too, never claimed much expertise for himself in the financial area.) At the corporate level, the top financial post was vacated suddenly in 1971 when Howard Letts left as vice president of finance.

"RCA is the first non-IBM computer company running under IBMers," Donegan boasted in late 1970. "We have an 18 to 19 year average in the business, the bulk with IBM . . . We're on the way to a marketing organization as good as IBM's."

In order to build his own organization in the likeness of IBM, Donegan first had to repudiate what had been done by the RCA regime before him. To make way for the new stream of IBM people, there was a wholesale replacement of top RCA people. As soon as Bradburn was fired, one of Donegan's first official acts as chief of the computer operation was to fire Joseph Stefan as general manager of the Magnetics Products Division and N. Richard Miller as general manager of the Graphic Systems Division. H. H. Jones was removed as vice president of finance of the RCA Information Systems Group (another man lost from a key financial post) and named general manager of Magnetic Products. On and on the housecleaning went, spreading through all units of the computer operation. In the field, Donegan installed new regional managers in all of RCA's five regions and 27 new regional managers in 34 marketing districts. A whole new layer of IBMers took over product development. Manufacturing remained relatively stable, although Donegan fired the top manufacturing man, John Lenox.

"When high level people came in from IBM, we were just informed that they were coming," said one former RCA computer personnel officer. "On the lower levels, the personnel office got the message to hire IBM guys, too. Anytime we got someone from IBM, he had an advantage to begin with." The personnel man estimated that 18 of the top 25 jobs at the Marlboro headquarters had been taken over by ex-IBMers. Besides Joseph Rooney in marketing and William Acker in finance, Donegan hired Orville Wright away from IBM to serve initially as vice president of government marketing and, later, as president of the new Systems Development Division. The IBM men hired IBM men and those IBM men, in turn, hired more IBM men.

Along with the IBM people came IBM procedures—and heavy new expenses. From marketing practices and ranking systems on personal performance to a massive reorganization of product development, the RCA computer organization was being patterned after IBM. Employees were ranked according to ability a la IBM—1, 2, 3, 4,

5. An IBM-inspired attrition control program—aimed at determining why people left RCA—was instituted. There was a "Speak Up" program patterned after IBM's in which employees could make known their problems and complaints to higher-ups in RCA. There were new task forces, and new study groups, and new management and development programs—all based on the way IBM did it. There were attempts to book orders along the line of the strict IBM way versus the looser RCA manner, and this overlap created enough confusion so that no one was ever quite certain precisely what the real number of bookings were and how solid orders were.

Orville Wright, who had done a bang-up marketing job in Washington, tripling sales in RCA's office there, was named to head up the new Systems

"But the IBM way of doing things was shoved down our throats . . ."

Development Division, which, once again, was based on IBM's System Development Division. "At first, nobody complained about all the IBM people," said the personnel man. "The old-time RCAers felt the IBM people and their practices were necessary for us to

move ahead. But the IBM way of doing things was shoved down our throats and people began resenting it. As time went on, as it became apparent there wasn't any real progress being made, then the RCAers began resenting the IBMers, too."

In the end, the problem was fairly simple: IBM, with annual revenues of \$7.5 billion in 1970, could afford its highly structured apparatus while RCA's computer operation, with revenues of less than \$260 million, just couldn't.

No one, of course, can blame IBM for Donegan's zeal in attempting to remake RCA into a mini-IBM. But IBM presented RCA with another serious problem in the form of stiff competition, something Robert Sarnoff referred to obliquely when the final collapse came as "the severe pressures generated by a uniquely entrenched competition."

In attempting to fight IBM head-on, and stressing compatibility with IBM, RCA always made itself vulnerable to the Goliath's competitive moves. Because of confusion generated by the new way in which Donegan was booking orders, there was no accurate breakdown on bookings for the RCA Series, but a rough estimate would look like this: of some 225 systems ordered, the overwhelming majority were 2s,



"I'm stirring up a little trouble for AT&T. Care to add anything?"

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Curtain Act at RCA

perhaps more than 150. There were no more than 20 orders for the 3 while the 6 picked up perhaps 25 orders and the 7 no more than 10. Announced one week after the RCA Series, the IBM 370/145—cheaper than expected and with its larger-than-anticipated memory—virtually blocked sales of the 6 and 7 to all but existing RCA customers. When the 135 was announced, in March of 1971, new sales of the 2 dried up. But the crowning blows—the Nagasaki and Hiroshima—were IBM's peripherals price cuts in May, 1971, which put IBM on a par and often below RCA's charges for complete systems. New RCA orders dwindled to a trickle and many old orders turned to water.

The chief result, then, of the RCA Series was to impact the existing RCA equipment base and, because of this, the line was a disaster. Computer people no doubt will debate for years whether this happened primarily because of an overly aggressive IBM or a miscalculating RCA.

In June, the situation was clearly deteriorating further. It was becoming apparent within RCA that the RCA Series was impacting RCA equipment. At the same time, expenses in the computer operation were mounting and it seemed that every time there was a new budget estimate the loss was upped. The loss figure reportedly rose between April and June from \$36 million to the low \$40 millions.

Donegan, however, charged forward. In late June he presided over groundbreaking ceremonies for a new \$16 million headquarters at Marlboro—a move that many regarded as an unnecessary extravagance in view of the tightening financial squeeze. The story that made the rounds at the time was that Anthony Conrad, who was then preparing to take over as RCA's new president, had opposed the \$16 million building project, but that Donegan had obtained approval for it from Robert Sarnoff. At groundbreaking ceremonies for the \$16 million building program, Donegan said: "RCA remains committed to play a major role in the computer industry in this decade."

A month later—just three days before the cost-conscious Anthony Conrad would take over as RCA's president and chief operating officer—Donegan announced the establishment of an expensive new computer operation in the United Kingdom (headed by former IBMers, naturally). RCA had been displaying sensitivity to criticism that it had no edp computer business in the booming European market and the new U.K. operation was the start of a master plan that envisioned the establishment of an RCA computer operation throughout the Continent. True, RCA had no operation of its own in Europe, but its arrangement with Siemens had been a highly profitable one for RCA with annual sales averaging about \$40 million and profits on that of about \$15 million. Furthermore, the cost for RCA to build up a European operation of its own would be astronomical and, given the tight financial status of things

at home, would surely act as a drain on the computer operation for years to come.

On Aug. 10, Anthony Conrad, RCA's new president, arrived in Marlboro with his corporate staff in tow for a full dress review of the computer operation. Conrad had developed a reputation at RCA for being a tough profit-and-loss man, but he was also respected for his fairness. His arrival at Marlboro was preceded by some minor trepidation on the part of the Marlboro people. Already, there had been some

On Aug. 10, Anthony Conrad, RCA's new president, arrived in Marlboro with his corporate staff in tow for a full-dress review of the computer operation.

key changes made in financial operations. Carmen Ferraioli had resigned as controller of the computer operation to take another job and Julius Koppelman had taken his place. Koppelman was taking over some duties from Donegan's top financial man, William Acker. And Chase Morsey was now—on Aug. 10—the top financial man at the RCA Corp., having been appointed executive vice president of finance and planning just over a month before. Morsey attended the Marlboro meeting, too.

The meeting elicited a rather grim picture of the computer operation. (At that time, losses of the entire RCA Computer Systems Div. had been escalated to between \$63 and \$80 million for 1971. The total loss estimates also included figures from RCA's Graphic Systems, Memory Products, and Magnetic Products Divisions, which totaled some 15% of the computer business.) One man who attended the meeting quoted Conrad as saying at the conclusion: "Well, it's not a pretty picture, but at last we have the real picture." When Conrad and his staff left, the Marlboro people had the impression that Conrad felt he had gotten to the bottom of the situation, but that the situation could be handled. At that, Donegan and his team went back to work, attempting to whip the computer operation into line, assuming that they had the full support of corporate to push ahead in the coming years.

The next significant contact between corporate and the computer operation occurred on Sept. 17. Early that Friday morning Donegan was summoned to 30 Rockefeller Plaza from Marlboro. Donegan is reported to have regarded it as just a routine meeting, but shortly after he arrived at corporate headquarters, he was told news he couldn't believe: RCA had decided to pull out of the computer business. Ac-



"I want to open my first meeting of the board of directors with a commemorative poem I've written, entitled simply, 'Dad'."

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tually, the decision had been made before the board of directors' special meeting and a press release announcing the board's unanimous approval had been prepared beforehand. Donegan did not attend the board meeting.

Several weeks later, in his only recorded public statement (other than the press handout) on the decision, to a United Press International reporter in London, Sarnoff would say: "I've been asked why I made the decision when I made it. In July we said we had no intention of getting out of the computer business and yet in September we were getting out. What had happened in between?"

"Well, we had several studies under way and it became apparent as losses mounted that the industry itself was changing, including the problem of uniquely entrenched competition. Finally I came to the conclusion that in view of everything we could not afford the price of staying in. I made the final decision on Thursday afternoon and I called a board meeting for Friday. A decision like that is a little like getting married or divorced—it couldn't be made sooner, it couldn't be made later, I take full responsibility for it."

The decision was a blow to Sarnoff, both to him personally and to his image, which he values highly. Robert Sarnoff had been living in the shadow of David Sarnoff and the son had been attempting without much avail to shake the image of the boss's son ever since he took over as RCA's chief executive officer in 1968. Robert Sarnoff had intensified an aggressive RCA acquisition program during the height of the conglomerate rage, and when Wall Street soured on conglomerates some of that disillusion rubbed off on RCA, which had been transformed from an electronics-based company into a broader based quasi-conglomerate. In addition, Robert Sarnoff had hoped that computers would bring to him and RCA what color television had brought to his father and RCA—profits and prestige.

One of Robert Sarnoff's acquisitions was Coronet Industries, which is a highly successful carpeting firm. The deal which brought Coronet into RCA gave the carpeting company's head, Martin B. Sereteian, nearly 1.5 million shares of RCA stock, more than 15 times the amount of stock owned by Robert Sarnoff, thus giving Sereteian a certain clout on the RCA board of directors because he was the firm's largest single stockholder. Sereteian has the reputation of being a hard driving incisive businessman—a man who will not tolerate fumbling and indecision. Sereteian, along with other RCA directors, Stephen M. DuBrul, Jr., of Lehman Bros. and Donald A. Petrie of Lazard Freres & Co., is said to have become a

critic of the computer operation. Of the decision to pull out of the computer business, Sereteian points out that the directors' decision was unanimous and says simply, "I think the decision was a sound one."

(Some observers believe that Sarnoff's decision to promote Anthony Conrad to RCA president and chief operating officer and, in fact, to downgrade his own position somewhat, was an attempt to placate his critics on the board. When Conrad was named president, incidentally, many of Donegan's supporters were stunned that their man didn't get the post. Donegan—and others—were under consideration for the RCA presidency early in 1971.)

Donegan also found that during the summer of 1971 he lost one of his most powerful supporters, Chase Morse,

The deal . . . gave the carpeting company's head, Martin B. Sereteian, nearly 1.5 million shares of RCA stock, more than 15 times the amount of stock owned by Robert Sarnoff . . .

who had turned against the computer operation. Sarnoff, then, was in the uncomfortable position of presiding over a computer operation that was beginning to give all the appearances of going out of control while a group on the board of directors and at corporate was demanding that he do something about it. Sarnoff did do something; he pulled the whole temple down.

The stunning thing is that RCA decided to scuttle its computer business without consulting anyone in the computer operation to see if it couldn't be saved, or at least to see if sections of it couldn't be salvaged for RCA. The rest of the story is well known. Donegan quickly teamed up with Mohawk Data Sciences Corp. in an attempt to keep the computer operation going pretty much as it had been, but RCA top management rejected the effort and sold its customer base to Univac. MDS said it offered more than Univac and after the MDS offer was rejected by RCA, many RCA computer people complained bitterly that RCA had rejected the MDS offer because RCA management would have lost face if MDS succeeded with the computer operation where RCA had failed. RCA management, which went into a shell of silence about the computer operation after Sept. 17, never offered a full explanation of why the MDS offer was rejected.

RCA's decision to get out of the general purpose computer business had massive consequences—as a result, nearly 8000 people (not counting those who went to Univac) lost their

jobs and more than 500 customers with about \$1 billion of equipment were confused about their future. In all, RCA got a \$490 million pre-tax write-off, and that was about twice the size of the largest previous bust in the history of U.S. business—the \$250 million write-off Ford Motor Co. got for bombing with the Edsel. On the other hand, Wall Street's reaction to the RCA decision was generally good and RCA stock rose on the news that the firm was getting out of the computer business.

The decision was also a blow to the remainder of the computer industry. Because RCA stressed compatibility with IBM equipment, IBM might be expected by some to pick up most of the RCA customers sooner or later. That, of course, will be a plus for IBM, which may be able to add two or three percent of market share to its business, but there could be a minus involved for IBM; the whole incident raises nagging questions of antitrust and monopoly for the company that is generally conceded to have 70% of the computer business. Indeed, shortly after RCA's demise, James Guzy, Memorex's executive vice president, blamed IBM for driving RCA out of business. Also important is the psychological blow dealt the rest of the industry. Many computer users are wary of dealing with anyone but IBM and the clumsy exit of RCA will only tend to make users think twice about doing business with anyone but IBM.

If RCA computer users were upset about the way RCA abruptly left the business, then they should have talked to RCA's employees. The users would have felt better if only because the employees felt worse. In Marlboro, as at other RCA locations across the country, people were laid off in large groups and now only a small cadre is left. Now, as this is written, the Marlboro facility has an eerie atmosphere to it. The inside work areas are nearly silent and nearly empty while outside there is manic activity on the headquarters building, which is an unhappy and constant reminder of the waste of it all. When the workmen look inside the building, now and then they see someone in the nearly-deserted interior. They may even catch a glimpse of L. Edwin Donegan, who still walks the building, but not in the manner of the director of a 10,000-man strong company, but in a quiet and slow step, like Hamlet's ghost. And though it's all over now, there are many who still insist, and, indeed, who will insist until the day they go to their graves, that corporate never gave the computer operation a fair chance.

"If you only knew how close we were to making it," says one of these. "We were so close, so close." □

During the final days and nights of checkout, it looked as though NASDAQ might be still another big on-line system headed for disaster

The Birth of NASDAQ

by W. Frederick Goodyear

In a period when disastrous flops became almost the norm for performance, the NASDAQ (National Association of Securities Dealers Automated Quotations) system complex was successfully put together to provide a new nationwide on-line, real-time service for otc (Over-The-Counter) securities dealers and stock brokers. It encompasses nearly a thousand individual offices equipped with custom-tailored crt terminals. Specially designed message concentrators, each a hybrid of general purpose processors and Bunker Ramo hardware, serve each geographic region.

On what was an empty hillside in Trumbull, Connecticut, until December 1968, is the heart of NASDAQ, a fort-like 40,000-square foot building that houses the multiprocessing, multiprogramming CPC (Central Processor Complex). Over-all, a complex network of more than 30,000 miles of high-speed communications circuitry links everything together.

All of this was completed by Bunker Ramo within days of the original two-year timetable—and has been providing satisfaction to its users and profit for its operator since start-up Feb. 8, 1971.

On Dec. 17, 1968, a contract was signed with NASD, the organization charged by the federal government with regulation of otc trading. Bunker Ramo's commitment was to use best efforts to place the system in operation on or before Jan. 1, 1971. All work was scheduled on that premise, and the project stayed on target all the way, down to the hair-raising gradual erosion of almost the last hour and minute. Obstacles which have wrecked more than one other major system plan were somehow resolved, including a threefold re-estimated increase in load factor after the design framework had

already been frozen.

Still, going into the final stretch, the project had used up the cushion faster than we liked, and the start of payback on Bunker Ramo's investment of over \$25 million seemed to be slipping further off into the future. (The \$25 million figure includes the cost of engineering design, programming, manufacturing of all remote equipment, construction of the CPC site, and equipment at the site and the concentrators.) The inevitable moment of truth—full system test—was fast approaching, and it was painfully acknowledged that all remaining pieces would now have to fall perfectly into place, or Christmas 1970 would not be a particularly happy season.

Those final weeks were hard to believe on several counts—starting with the fact that the system was actually

... it was painfully acknowledged that all remaining pieces would now have to fall perfectly into place . . .

close to becoming operational in only two years. Secondly, it was exactly two years to the day after contract signing that the total complex first was operated in its entirety in any fashion whatsoever. And it was deemed ready for full on-line testing only a short four-day weekend later, on Dec. 22!

Lest anyone not familiar with NASDAQ be misled into thinking that it is only a trivial system, consider what it is doing. In simplest terms, NASDAQ is a flexible and expandable real-time system which allows authorized dealers in up to 2,000 otc market-making firms to advertise to each other their positions in as many as 20,000 otc securi-

ties. Market makers enter and directly modify their bid and ask quotations in the central data base from their own keyboards but, at the same time, the integrity of that data base must be absolutely inviolable. In addition to the direct network of NASDAQ subscribers, which initially included 1,200 crt terminals in 800 locations, information is fed to three other separate nationwide networks. These consist of some 35,000 existing on-line quotation devices. They disseminate only a median or representative bid/ask (RBA) on every issue; RBA's are calculated from the composite quote information. Statistics and various indices are also calculated which are available to all subscribers and are regularly transmitted along with current prices to the news media and wire services.

In the implementation of NASDAQ, individual subscribers' offices are polled by Honeywell 516 processors interfaced with a Bunker Ramo-designed communications front end. These concentrators in four major cities are connected by dual 4800 bps trunks (later upgraded to 7200 bps) to the CPC consisting of two Univac 1108s in Trumbull, functioning under the latest version of the Exec 8 operating system, containing many enhancements jointly devised by Bunker Ramo and Univac. The concentrators in New York City, which handle about 40% of system traffic, are connected by dual 50,000 bps trunks.

The CPC is a completely dual configuration (except for common core) operating in true multiprocessing mode. Either 1108 can support the entire system, although in normal operation the work load is shared equally. Because of the sensitivity of the information handled by NASDAQ, elaborate safeguards and automatic recovery routines have been designed into every aspect of the

system. This is especially true of the data file structure, which perpetuates dual records at all times and when problems arise softly degrades through a set of redundant files to maintain service through anything but a total catastrophe. The reliability objective of the central processing complex is that it not be out of service for more than 10 minutes in any one week or for more than three hours in any year.

Although our choice of Univac 1108s almost in the wake of well publicized system failures caused some raised eyebrows, we had every confidence in our decision. For nearly a year previously, we had been evaluating every suitable mainframe in connection with the NASDAQ proposal, along with other major system studies. One thing was certain—we wanted no part of any paper tiger—it was far better in our minds to accommodate to somewhat severe but already identified limitations than to hope that any undelivered hardware could be put into operation without some traumatic start-up complications. We further reasoned that our concentrator communications system would relieve the 1108s of the heavy processing burden which had been a cause of downfall in at least one previous instance. And although Exec 8 still carried a somewhat tarnished reputation at that point in time, it was our opinion that many of the earlier deficiencies had been already corrected by Univac in later releases. We concluded that the general lack of confidence was unwarranted, and that it persisted only because some users, by undertaking major revisions themselves, had prematurely locked themselves into what soon became obsolete levels of software—a mistake we resolved not to make. In our analysis, although other shortcomings remained, particularly in the way recovery needed to be handled in a real-time system, we were confident these problems could be successfully resolved.

As one might imagine, this effort had many exciting moments throughout its two-year history, but some highlights of that final week starting Dec. 13, 1970, when time had completely run out, might be enlightening.

The setting was this. In order to start operating by January, the system would have to be shaken down completely in the final two weeks of December (a highly speculative premise to begin with). But before even beginning controlled live test operations involving the brokers themselves, authorization would have to be obtained from NASD. This permission would be forthcoming only if NASD was convinced, via acceptance testing, that the system would not only work, but work so well that user confidence was not likely to be shaken by an initial flood

of start-up problems. The week of Dec. 13 just beginning was obviously the only time left in which to accomplish this.

Since the system had never yet been strung together for full-blown operational tests, it seemed a series of miracles was called for. Although there were plenty of misgivings among the wary but optimistic staff, it was felt that there was yet a chance. We had studied, simulated, analyzed, resimulated, and subsystem tested ad nauseum and not a single danger flag or even marginal operation had been uncovered. Time alone was the big enemy, for at this late date, if anything had been overlooked, even a trivial problem could completely wreck this difficult schedule.

There were basically three elements of test and demonstration which had to be presented convincingly to NASD. Firstly, there were the functional demonstrations. Standard NASDAQ input stations would be employed by operators who had been individually provided with a unique "script." This was a clerically developed set of queries and responses which simulated daily operations, including inquiries and updating calls, entered with varying frequencies ranging up to that of anticipated peak periods. The purpose of the script was to demonstrate predictably every possible function, and variation of those functions, through the simulation of several days of typical system operation. As an over-all performance check, the resultant representative buildup of data files could then be compared with predictions calculated in advance of actual testing. This phase had been fairly thoroughly checked out since it had dovetailed naturally with other remaining tasks, and there was little apprehension over possible problems. Much more critical would be the traffic and response time tests

... all entries would be processed and available in the file within five seconds 95% of the time ...

which called for the complete system in operation—the milestone which in itself had not yet been reached.

Contract specs required that the cpu handle 28.6 calls per second, and the test standard was set at 35 calls per second. The response time requirement stated that all entries would be processed and available in the file within five seconds 95% of the time, and that each quote request would be answered any place in the system within five seconds 50% of the time and within seven seconds 90% of the time.

The proposed approach was to provide each concentrator with a traffic test program which allowed it to simu-

late the appropriate peak call rate (plus a contingency) and the distribution of call types that had been predicted for the concentrator's service area. Systemwide, the composite load should then very closely simulate peak traffic requirements with the expected mix of messages as called for by contract. With the system operating under those load conditions, another degree of refinement was achieved by replacing one of the regional concentrators with a similar test concentrator back at the CPC site. Tied into this unit were 20 of the crt on-site terminals, which received a severe pounding during the test period. This test concentrator would make the simulation still more realistic by operating exactly like a live concentrator that was servicing full traffic generated by the test program in yet another concentrator.

Representative response times could then be measured by entering messages competitively into that environment from a variety of typical (one to four terminals per control unit) and extreme (20 terminals per control unit) user equipment configurations. The message inputs would again be carefully controlled by having operators follow the detailed script instructing them exactly what information to enter at predetermined intervals based on a table of random numbers. Individual automatic response timers were provided at each display so that message input and response time statistics could be gathered for the various configurations.

Finally, there would have to be a demonstration which would support BR's reliability calculations. Like most large systems, NASDAQ was designed with redundancy of almost every equipment module, and this was a major factor in organizing it to meet the required objectives. To prove the point, satisfactory system performance needed to be demonstrated while operating in a nonredundant minimum equipment configuration. What better way to demonstrate this than to combine such a fallback configuration with the peak traffic and response time testing just described? Desirable, yes, but rather brave talk when the test programs had yet to be handed out to the concentrator operators.

True to Murphy's Law, the week started with a setback. All the remote concentrator managers had been called in for a Saturday training session to acquaint them with the final version of their respective test programs, as well as their actual operating software. (Up to this point, only local test programs designed to aid in the installation of remote hardware had been used in the concentrators, although communications lines had been checked by testing from the 1108s with simple loopback

Birth of NASDAQ

programs.) It had even been hoped that the first live traffic tests would be conducted out of the New York City concentrator while everybody remained on hand to participate. However, hardware and software bugs together conspired to upset that plan, and the men finally had to return to their sites late Sunday in order to be ready for their other regular duties on Monday morning.

Monday itself also came and went. Although the concentrator programs were debugged on a modular level, it was necessary to send them out without benefit of complete system tests. Extreme conflicts were now arising for system time, and priority was given to the final dress rehearsal for the functional tests scheduled the next day.

The functional testing was a solid success—only very minor and completely explainable questions arose. In fact, it went so well that Thursday's all important traffic test seemed to loom less ominously. However, by late Tuesday night and early Wednesday morning, that earlier premature optimism was fast slipping away as one impasse after another stymied all progress. Some minor bugs in the concentrator routines were detected and quickly resolved. Program patches were relayed to the field, but there remained an underlying problem somewhere which thwarted every attempt at live operation. Although one concentrator, and then another, finally sputtered to life, each time they promptly relapsed before the system could be expanded. Before anything further could be unraveled, it was time for the Wednesday day shift to take over.

All that day, communications software at both ends was examined and reexamined. Under previous, although admittedly simpler test routines, communications had been perfect, and the differences could not be explained. More bugs were isolated and more "patches" resulted, but these in no way alleviated the basic difficulty. Later Wednesday night, the local concentrator being used in the traffic simulation finally seemed to show some promise, but in the field, concentrators were still dying a few minutes after start-up. Although Trumbull was one step ahead of the field and was using a newer and hopefully cleaner assembly, this did not completely account for the difference.

Hours and hours later, a typically devious traffic dependent synchronization possibility was suspected. But again, it was early morning, and time for the day shift which now needed every available minute to polish file

maintenance procedures. Remotely also, the concentrators were needed for checking out new terminal installations—this had also become a critical area as a result of the continuing total tie-up of the system and manpower in the test effort. Too late for immediate testing, sleepy-eyed programmers finally discovered a subtly mishandled interrupt which could sometimes leave remnant bits in a register, and carefully devised another patch. Anticipating perhaps a dramatic improvement, they then tried for a few hours of restless sleep on temporary cots erected in an empty back office while awaiting their next shot at the system Thursday night.

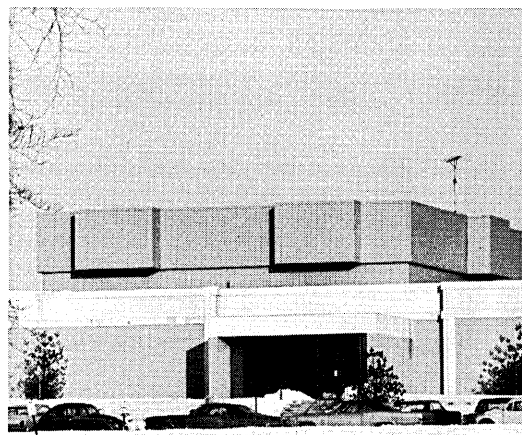
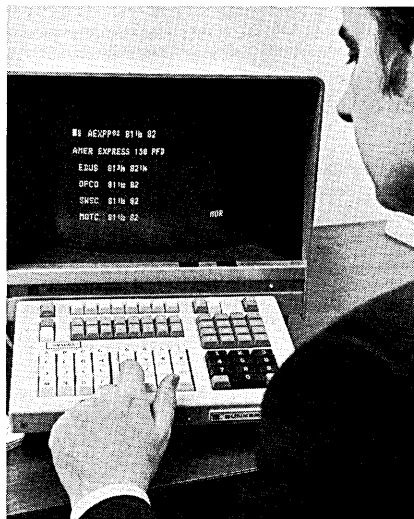
This was Dec. 17, and sometime after midnight going into the 18th, with almost unbelievable ease, all the pieces finally did indeed start to fit together. First one concentrator, then another, followed by all the others, started pumping traffic into the system. Moreover, they continued to operate—perfectly, without missing a beat. That last fix for message handling under heavy traffic conditions had done it. There was a wave of elation, and long months of round-the-clock grinding effort were quickly forgotten as suddenly it was realized that the long-shot effort had a chance of succeeding—it might just still be possible to make the target date.

Any lingering doubts were now dis-

pelled by the success of each additional moment of continuing operation. Every concentrator was now generating more than its tailored share of system traffic, and the CPC was handling it almost casually. Like excited kids, programmers and systems engineers entered every conceivable variety of outlandish message from the on-site terminals to be used in the system response time measurements. Each reply, with no response time delay, reinforced general confidence in the health of the system being born. The only difficulty now was keeping all single communications threads continuously operational—and that was more annoyance than difficulty, because for test purposes the alternate links were simply switched into the system.

Continuing into Friday, all aspects of the operation were rechecked and verified. There was even time to rehearse the various equipment configurations before the upcoming final day of formal testing which had now been postponed to the last possible moment.

Saturday, it was hard to contain our secret excitement as the test began. The NASD representatives knew only that we had been desperately working night and day just trying to get ourselves into position for an honest show at acceptance. Then, as testing progressed, they also began to smile as it gradually became clearly evident that



the system not only worked, but worked almost better than anyone had dared to hope. In fact, after the first obviously successful runs, all input operators were instructed to *double* their input rates, and there was only a barely perceptible difference in system responsiveness. Even under severe fallback conditions where there was only a single thread to each concentrator, only one processor, a third of the drums, and a quarter of the tape handlers in operation, the system continued functioning and servicing queues smoothly.

Permission was granted to turn up the system Monday morning for on-line broker testing. But first, NASD prudently stipulated as one last final precaution that only one I/O unit at each concentrator site and at each NASD office be initially authorized to access the CPC in order to once more recheck all functions on the live system uncluttered by any of the special test programs. Again, Murphy's Law front and center—the system simply would not operate. That day had to be the most frustrating that could possibly follow on the heels of Saturday's success. Each concentrator, after loading its program

by a yet clumsy routine, manually adding all the patches still in existence at that point, and after restarting by a still complicated and poorly coordinated routine between concentrator and the CPC—promptly turned itself off again after processing its very first call!

It was not until after the market had closed, and most brokers had departed for the day, that the problem was unraveled. In their zeal to preclude anyone's entering the system prematurely, a new condition had been imposed upon the concentrator which its software had refused to accept. Concentrators which had been designed to handle something like a thousand terminals simply were not prepared to operate under the extreme case condition of only one authorized I/O, in only one office, on only one line. This special case was easy to fix with a minor program patch once the cause had been diagnosed.

The rest was anticlimactic as Tuesday, Dec. 22, the system started up without fault. Except for a couple of very trivial, odd-ball situations, it responded beautifully. By lunch time, NASD was also convinced. They authorized the entry of live market information into the system for the user shake-down period, and NASDAQ was off the ground and flying. The reaction of the traders and brokers was immediate and enthusiastic, even during the initial shakedown test period.

As a more current barometer of NASDAQ's usefulness, in late October, 1971, the still climbing call rate was averaging 800,000 messages daily and, on busy days, topping a million. It is well that comfortable margins were designed into the system, as well as some graceful avenues for expansion.

Although officially Feb. 8 was the day of formal cutover, this was actually preceded by more than two weeks of full operation without a significant hitch. That operating period had itself followed the intensive initial shakedown during which remaining bugs had been flushed out, operational procedures were refined, and the required level of reliability was routinely demonstrated. All cutover planning had been aimed at ensuring that the system would do everything exactly as expected, and as had been promised when formal operations actually commenced.

The reliability of the NASDAQ system is, by now, an accepted fact of life for the OTC market. Performance of the CPC has attained a record uptime of 99.92% of scheduled time since Jan. 1, 1971, and during a recent 10-week period, subscriber equipment had a 99.52% uptime record. Such reliable service is, of course, vital to the support of any such nationwide, real-time market place.

On Nov. 1, 1971, the system began reporting daily volume figures on every NASDAQ issue to the AP and UPI wire services. This volume information is entered into the system by each market maker for each of his issues immediately after the close of trading each day. The NASDAQ computers sort out all the inputs and provide one figure for each issue so that it is not possible for anyone to know how much trading any individual market maker has done during the day. However, the volume reporting was never before possible and has led to the creation of a 10-most-active list on OTC issues, which is being published by major papers daily and weekly, along with the volume on each individual issue.

The system operation to date, however, is only a beginning. In the future, for example, with only minor upgrading of its present configuration, NASDAQ can handle the reporting by dealers of each side of each trade, including its price and volume, as it is consummated by them over the phone. This locking in of OTC trades will go a long way toward streamlining the clerical and clearing functions which are a major part of the industry's back-office problems. This reporting of each trade, after being compared and verified by the system, also can be fed into a ticker system, which would then provide the public with last price and volume from each trade immediately after it occurs anywhere in the United States. The inclusion of issues traded on other markets, together with all the market makers and specialists involved, awaits only the resolution of those differences that exist between the many interests in the financial community. Indeed, it has now been demonstrated for the first time to the securities industry that the much debated automatic stock exchange is truly feasible. □



Mr. Goodyear has been with Bunker Ramo Corp. since 1957 (then Tele-register Corp.) and is now division vice president, Business and Industry Div. NASDAQ and other on-line systems were developed under his direction. He has a BSEE from Bucknell and is a member of the IEEE.

NASDAQ Quotations for Thursday, Jan. 20, 1972				
NASDAQ FINAL O-T-C INDEX				
	High	Low	Close	Month Ago
Composite	117.72	117.32	117.32	-0.13
Industrial	123.04	122.53	122.53	+0.03
Bank	101.96	101.56	101.56	-0.40
Insurance	121.90	121.43	121.43	-0.17
Financial	118.98	118.42	118.42	-0.22
Transport	124.05	123.40	123.40	-0.59
Utilities	98.08	97.91	97.91	-0.10

THE LEADERS				
	Sales	Bid	Asked	Change
Chubb Corp.	186,500	66 1/2	66 1/2	-1
Cartridge TV	177,200	39 1/2	39 1/2	+3 1/2
Penn Offshore Gas	151,300	9	9 1/2	-1/2
Rank Organ. A	94,900	24 1/2	25 1/2	None
NLT Corp.	83,700	33 1/2	34 1/2	-1/2
Clinton Oil	76,100	2 1/2	2 1/2	-1/2
TDA Industries	69,400	6 1/2	6 1/2	-1/2
Cavanaugh Commercial	68,000	7 1/2	8	-1/2
No. Central Airline	66,900	4 1/2	4 1/2	-1/2
Kemperco Inc.	62,600	42 1/2	43 1/2	-1 1/2

TOTAL TRANSACTIONS					
	Thursday	Wednesday	Tuesday	Monday	Friday
Issues Traded	2,850	Advances 705	Declines 757	Unch. 1,388	
	10,412,800	10,435,800	11,006,700	9,590,800	9,043,100

Nearly a thousand offices of OTC market-making firms already have NASDAQ crt terminals such as the one pictured at the far upper left displaying a typical message on an OTC stock. A network of more than 30,000 miles of high-speed communications circuitry links everything together. Headquarters is the Bunker Ramo computer center in Trumbull, Connecticut, shown at the upper left. Inside the fortress we see NASDAQ's Univac 1108 central consoles.

The single way to store 100,000,000 bytes. The 7330 Disk Drive from ITEL.

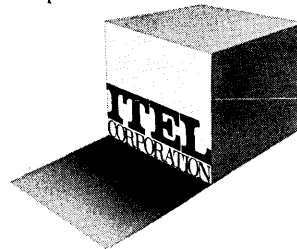
Now there's a single-spindle storage subsystem for massive data bases up to 100 million bytes: the new ITEL 7330 Disk Drive. Using standard IBM 3336 disk packs, the ITEL 7330 increases storage capacity more than three times over previous models to 800 million bytes for an 8-drive subsystem. It's plug-to-plug compatible with IBM System/370. And it's quick on the draw; average access time is just 27 milliseconds.

The ITEL 7330 provides the high-capacity storage needed for management information systems, teleprocessing, multiprocessing and time-sharing systems. It offers a number of advantages over its IBM counterpart and other disk storage

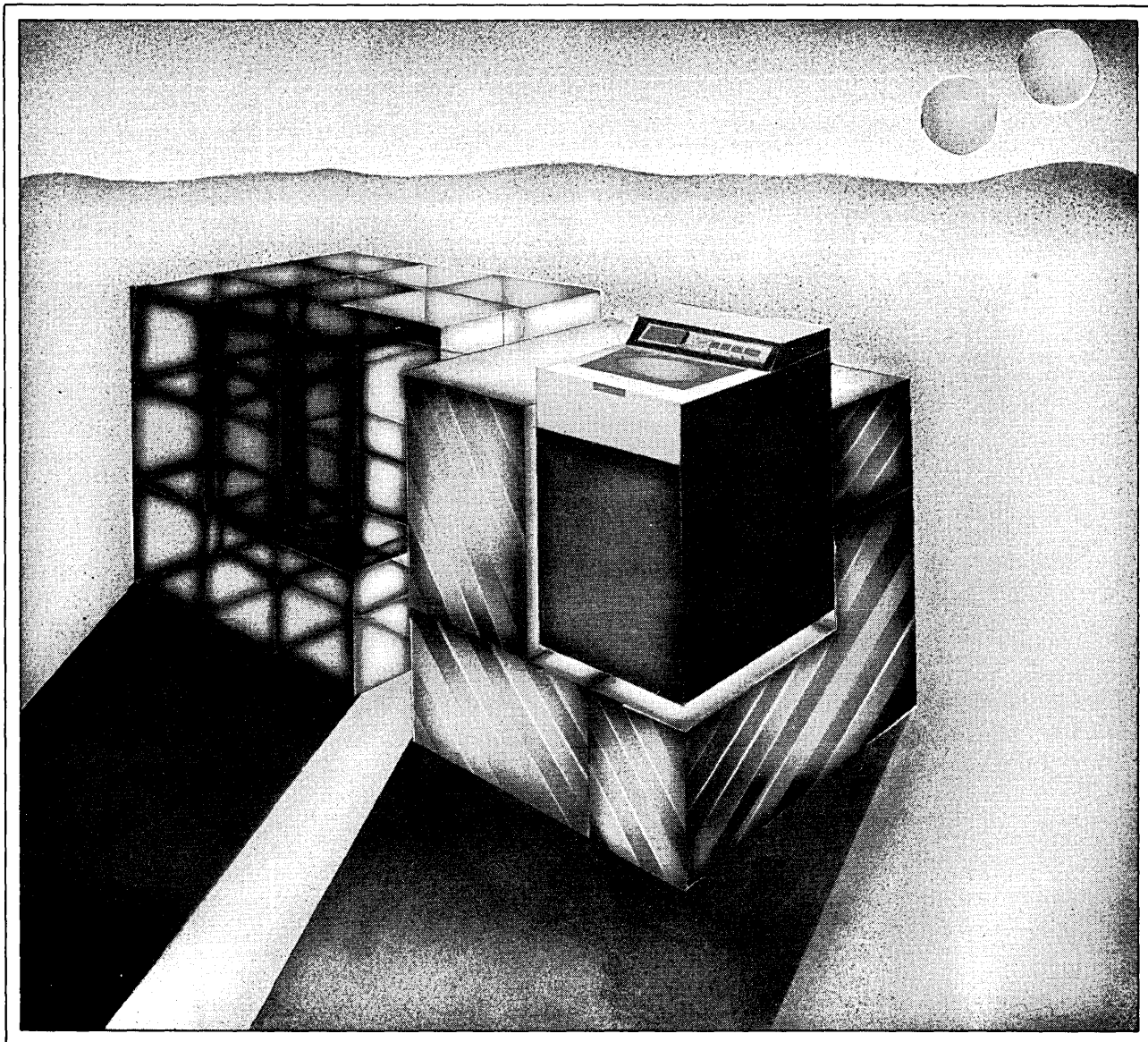
units. Each 7330 has a single spindle, so you can specify from 1 to 8 drives under one controller for maximum flexibility. The unit has a waist-high slide-back cover, for quick and easy disk change. All internal components are easily accessible. And its compact size means substantial savings in floor space. Reliability is insured through absolute air filtration, disk pack brushes, electromagnetic actuators and closed-loop optical servo positioning.

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Since the first step toward solution is problem definition, here is a ranking of issues facing the computing field—in inverse order of importance

Problems and Priorities

by Fred Gruenberger

During the years from 1958 through 1971, on the day preceding the FJCC, an invitational one-day discussion session has been held to consider and possibly solve some of the problems of the computing field. (From 1958 to 1968 these sessions were held at The RAND Corp.) The theory has been that a group of about 15 experts in computing, meeting in a relaxed atmosphere and bouncing ideas off each other, might shed some light on problems of mutual concern. Some of these sessions were fruitful; some were duds.

Year after year, there was one agenda topic suggested by Paul Armer that

“How can a program that works right for 124 cases not work on the 125th?”

led all the rest; namely, a proposal to list, as the first order of business, the current problems facing the computing fraternity, and to put the list into priority order. The first step in solving problems is to define what the problems are.

In what follows, let me distill the views of a great many people on this subject, add some of my own, and

attempt to put the resulting list into some sort of order. My list is in *ascending* order of importance; the least important problems come first.

standards

1. STANDARDS. Standards are nice things to have, and there are precious few of them in our industry. Those we do have are too often only guidelines (i.e., there is no way they can be enforced). We have, for example, a standard specification for a FORTRAN IV compiler. It should follow then that two compilers that both claim to adhere to the standard would process a source deck to yield equivalent results. Yet we know that this isn't the case. No two FORTRAN compilers are alike, even while claiming adherence to the standards.

Standards are a touchy subject, and one that evokes much heated discussion. Everyone seems to follow the same old reasoning: “let's standardize my way.” The point in this discussion

is not the lack of standards, or the proliferation of multiple standards, or the lack of enforcement procedures for existing standards, but the *problems* of standards and the apparent fact that far more energy is burned up in standards work than the results seem to warrant. There may be more important problems to worry about, and it may be that realistic standards are established in the market place, rather than in committees.

We were recently informed, for example, that ANSI had reported out a standard for terminal keyboard arrangements. The “standard” turns out

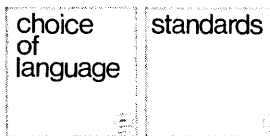
... we don't even know how many computers there are, or how many programmers.

to be two keyboard arrangements, magnificently incompatible with each other. The people who make keyboards will probably converge on a standard of their own if it is in their own interests to do so. If it is not in their own interests to standardize, then the presence of an industry standard will be honored like the FORTRAN standard; i.e., by ignoring or bypassing it.

Problems and Priorities

Bob Bemer has suggested that instead of issuing standards or certifying standards, we seek a mechanism for simply *registering* standards. This would shortcut the time-consuming process involved in the current procedures and allow for all possible variations. Then at least each vendor could specify which registered standard he was following. Consider, for example, the collating sequence of a machine. At the moment, we have one of these per machine type; no two are alike. If standards could be registered, we might still have a unique collating sequence for each machine, but there might be an impetus for some designer to match an existing standard when designing the next machine.

2. CHOICE OF LANGUAGE. It's fun to debate the relative merits of PL/I and COBOL; the use of FORTRAN for business applications; the place remaining for assembly language; the need for bigger and better packaged



programs. The proper decisions in these areas can be considered one of the problems of our field—but a minor one. The debates are healthy, and should continue. But, as with standards, the decisions will be made in the market place. The energy devoted to the problems of the choice of language is all out of proportion to the size of the problem.

3. SCHOOLS AND CURRICULA. This is another minor problem—the construction of proper curricula for organized courses leading to a degree in computing, or information process-

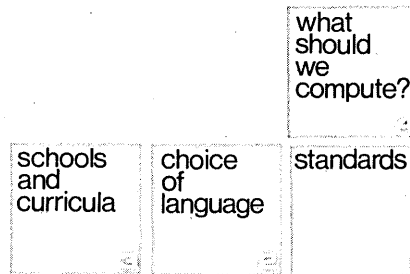


ing, or console operation, or what have you. Regulation and control of for-profit edp schools is a matter of some concern. These matters are being worried about, by groups that should be competent to handle them.

4. WHAT SHOULD WE COMPUTE? We are getting to broader problems that should concern all of us. The larger sense of the problem listed here is the social responsibility problem, which is a matter of individual conscience. Each person who regards himself as a full time computer man (I hesitate to use the word "professional,"

since that leads to another large debate) should worry about whether his daily work appears to him as socially acceptable and responsible. Herb Grosch puts it this way: if, for several days in a row, the answer to that question is "no," then he ought to give some thought to changing employers.

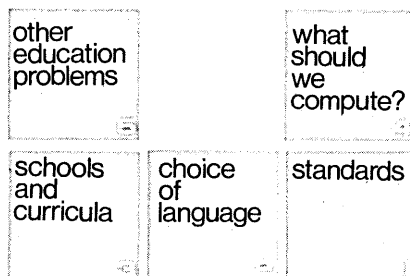
There is also a narrow sense to the question "What should we compute?" which is this: what sort of problem constitutes intelligent use of a computer? Having access to computing power (and to most students, research work-



ers, programmers, and users, computer time appears as almost a free good, since he personally is never charged for it) there is a temptation to use it for solving any problem that involves manipulating symbols. But the presence of the computer has not made obsolete or vitiated other means of solving problems, including: desk calculators; punched card machines; analytic solutions; graphical methods; paper and pencil methods; and the method of picking up the telephone to ask someone who might know whether or not this problem has already been solved or how to solve it.

Each of us can cite glaring examples of computer time committed to problems that should have been solved by other means. It's an education problem, and sensible computer education is too important to leave to educationists.

5. OTHER EDUCATION PROBLEMS. A sense of cost-effectiveness is sadly lacking in our industry. There is the matter of gross inefficiency: the computer run of an hour that could have been done in five seconds. But there is also the question of optimization. It's nice to conserve computer time, but there are times when something else should be minimized, such as programmer time, elapsed time, key-punch time, and so on. As a trivial



example, suppose we need an arccosine subroutine. Which of several well-known algorithms should we use in the subroutine? That's hard to answer in a vacuum. Is this to be a library subroutine, or one for a particular problem solution? If the latter, how many arccosines do we expect to calculate? Should we perhaps waste the machine a little, and use an easily coded scheme that will save a lot of brain strain and shorten the elapsed time? Perhaps. What is needed is a sense of cost/performance ratios, and such a sense is the result of experience. Maybe it can be taught; we ought to try. The fact that very few computing courses touch on such subjects is one of our problems.

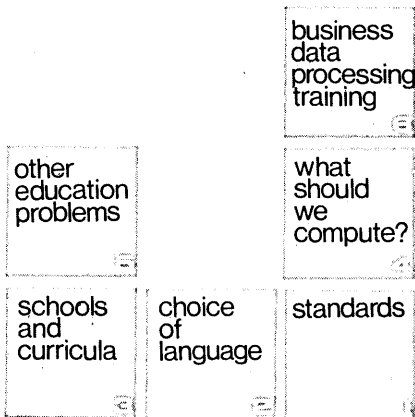
Another education problem concerns text and reference books. There are now over 80 texts on FORTRAN. It stands to reason that some of them are excellent. It also follows that some of them are truly awful. The problem is how to encourage the spread of the good ones, and arrange to quietly kill the bad ones. I think the unflinching sign of the poorer texts is that they claim to require no background for either the student or the instructor. They are written by people who have been in computing for all of a year, and this fact should be evident from a casual perusal of the book. The good books, on the other hand, assume some prior knowledge (particularly by the instructor) and also assume that there will be lots of hard work done in learning to use the language.

In the particular case of FORTRAN texts, the good ones take some pains to foster good computing along with the FORTRAN rules. The bad ones (the worst of which don't even have the FORTRAN rules correct) either neglect completely what one might do with the language, or suggest uses that are finger exercises. In any event, schools should be encouraged to select a text by some other means than a random number generator (but if that method is used, for heaven's sake don't use the random number generators that appear in the FORTRAN texts—most of them are awful).

6. BUSINESS DATA PROCESSING TRAINING. Something like 70% of our industry involves business data processing (as opposed to scientific computing). The business use of computers, involving the care and feeding of files, accounts for about 70% of the machines, of the money, and of the people. It is time to worry about the training of people for this area. Most existing curricula neglect it rather pointedly. This is a serious problem, since good training in file manipulation should call for the student doing what he learns. Not only are real files hard to come by, but anything realistic in

the way of file processing calls for large amounts of main frame time, which is costly.

Nevertheless, it seems to me that we have saturated the world with matrix inverters and neglected those who will have to create large business systems. I submit that the intricacies of file processing cannot be covered in a few



hours in a course in matrix algebra. Business installation managers repeatedly testify that a new hire (supposedly well trained) needs a minimum of six months of on-the-job training before he can be trusted near the master files.

Philip Dorn put it this way:¹

Far more important is the ability of a programmer to remember that he is an employee, that his primary loyalty is to his employer and not to his profession. This inability of programmers to identify with the needs of their employers has led to many clashes in the past (and will possibly lead to more in the future).

Most programming managers in large corporations tell the same story repeatedly (although regrettably few people listen). Please, they say, give us well-educated MBAs, not Computer Science graduates. We need men with a general understanding of marketing, finance, manufacturing, etc., not well trained compiler writers. The last thing most large corporations need is experts in list processing or ALGOL syntax. While this may seem a terribly narrow view, it has been repeatedly proven in both scientific and commercial data processing that programming can be taught to bright, well-motivated and well-educated people, but that company identification and a general feeling for "business" can almost never be taught.

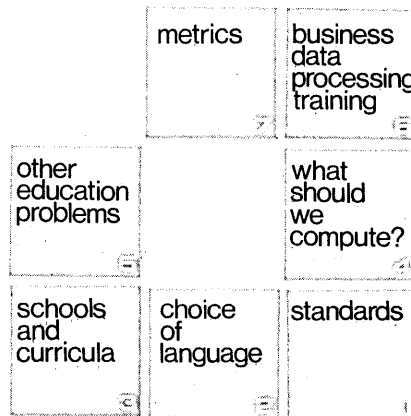
7. METRICS. How do we go about measuring things in the field whose heart is the ultimate in precision equipment? Our industry is notorious for not being able to measure anything (we don't even know how many computers there are, or how many programmers). Our rating scheme for

¹ In the book, *Information Systems for Management*, Prentice-Hall, 1972.

machine power reduces to counting the additions-per-second operating speed. We lack any performance standards; the best we seem to do for rating programming skill is to count lines of code per day, and any programmer who couldn't arbitrarily increase that figure would be a poor programmer indeed. Students can be off in their estimates of running time for a given task by a factor of 1000 (either way)—but do the pros do much better? Every day companies buy packaged software that promises to cut running time by a factor of three; the package actually cuts the running time by 10% or so, and the buyer doesn't even sense the difference.

Let me suggest an exercise to make this point convincing. Take several tasks that have been completed in your shop. Note down for each task the known statistics: lines of code; elapsed time between genesis and production; man-hours of programming; number of debugging and testing runs and total cpu time for them; and total cost to production status. Then ask a group of experienced programmers who are not familiar with those tasks to estimate each of those parameters. Care to bet in advance on their ability to estimate correctly within a factor of three?

We ought to be able to measure our work better than all this. In every shop, everyone knows who the top program-

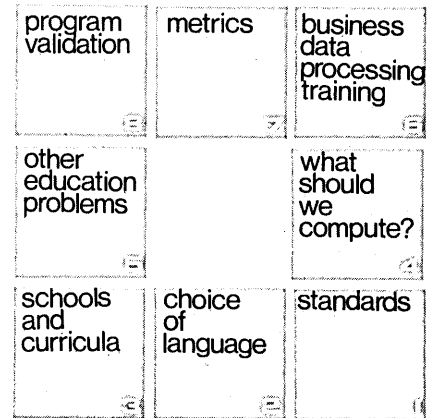


mer is, and everyone knows who tail-end Charlie is, so I suspect that metrics are possible. I also suspect that one of the reasons why we don't establish better metrics is that the people most concerned don't really want to know (in the same way that teachers' groups will oppose any suggestion of merit raises). Whenever any objective study is made of machine efficiency (measuring, according to arbitrary definitions, the ratio of the time spent on useful work to total power-on time), the results are so discouraging that the study is quietly suppressed.

8. PROGRAM VALIDATION. How does one certify that the results flowing off the line printer are correct? Surely this question is as important as the

question of what to compute and the mechanics of how to do it. The world certainly doesn't need more people who can produce garbage and not even know it.

Techniques for program validation (which is completely distinct from debugging) should be taught from the time of the first routine that anyone



sees. If the beginner learns looping through the FORTRAN DO-loop facility, he will probably start with a loop to add 100 numbers. The very next thing he should be exposed to is the (to him) awkward and nasty question, "How will we test this routine to guarantee that it works?" And he shouldn't advance to the next loop until he knows a correct testing procedure for the first one.

Admittedly, this concept is difficult to teach. In fact, in my experience it is the single most difficult topic in the curriculum. Even after three semesters of exposure to this concept, a student will still blithely commit an untested program to production and then wonder why the output makes no sense. It is even more appalling that so-called professional programmers can totally neglect to test their programs at all—and they surely must have been burned many times at such failure. I can forgive the beginner who says, in effect, "I wrote the program myself, so the results must be correct," or "it worked in one case, so it must work in all cases."

In 1964 we were shooting a film of some eighth graders learning computing. At the class's open house, one boy was running a program he had written that calculated cube roots. He was explaining his program to his parents, and we were shooting with synchronized sound. We ran out of film just as his program blew up in his face. I'd give a lot to have had another few seconds of film, to record his classic remark, "How can a program that works right for 124 cases not work on the 125th?"

For an eighth grader, it's amusing. It's not funny when the same remark is made by a college graduate (in Computing Science, of course). And it gets

Problems and Priorities

less and less funny when it's repeated by people with years of experience. That's how all those horror stories we keep reading about come into being—some clown either didn't test his program, or tested it badly, or tested it in the wrong range.

Examine your favorite introductory text (say, the one you learned from). With luck, it may have a page on debugging. It may have a thought or two on program testing, but probably nicely confused with debugging. The subject ought to be important. The fact that it seems not to be could be one of our major problems.

9. OUR IMAGE. This is, I think, our most serious current problem. We like to think of ourselves as at least senior technicians and at best scientists (we keep hearing references to Computing *Science* as a discipline). What is the picture that the public has of us? At best, we seem to rank with auto mechanics and bookkeepers (both honorable occupations, I hasten to add, but not awfully prestigious). At worst, we are associated with witch doctors, con men, and high priests of an oddball religion. The public seems to think that a lot of us are nuttier than fruitcakes. How did we get into such a mess? It's been easy. First, as a group we've assumed that the wonders we work will be understood by the public, and this despite 20 years of vivid experience to the contrary. Looking back,

technical disciplines. We have been terribly derelict in explaining ourselves to the masses.

Our second error has been in assuming that the popular press feels some responsibility in reporting our activities. It's the other way around: the writers for the popular press are almost completely irresponsible. Their business is sensationalism, no matter how slick their pages.

We had a classic round of this irresponsibility in March, 1961, when *Life* ran an article, "The Machines are Taking Over." In April of that year, Dan McCracken and I presented a counterattack in *DATAMATION*, "Irresponsible Reporting and How to Combat It." The article closed with this summary:

1. Disabuse yourself forever of the idea that publicity—any publicity—is always good for you and your company.

2. Do not permit yourself to be quoted on any subject that can be distorted by careless writing, without a guarantee that you will have the right to review the article before publication. This will reduce the number of times you get quoted, but see Point 1.

3. Have no contact with reporters from magazines that have consistently demonstrated their irresponsibility (primarily a few of the mass-circulation magazines). Take this literally. If you are approached for an interview, don't talk. Don't allow pictures to be taken. Don't even supply background information. This sounds harsh, and it is. The fundamental fact is that no publicity is far better than grossly distorted publicity.

4. Take positive action to present the public with a fair picture of the computing industry by writing accurate articles yourself. You obviously can't publish in staff-written magazines, and special writing standards make it pretty tough at the major magazine level, but this shouldn't keep you from trying.

5. Do not distort the public's conception of computers by coy tricks like games of Tic-Tac-Toe on the console typewriter, or Jingle Bells on a loud-speaker. No amount of talking can repair the damage that a poor demonstration causes.

Well, the public never saw that, and neither did *Life*. Recently we had to go through the whole charade again. The November 20, 1970 *Life* had an article on artificial intelligence, with lots of quotations attributed to Marvin Minsky. Professor Minsky issued a letter the following month, crying "foul." The key sentence in his letter is the following:

"When the writer asked for an interview we were reluctant, but because it was clear that he would write a story in

any case we decided we might be able to make it better."

Of course. If you were a reporter, and wanted to produce a nice sensational, irresponsible article, that's just how you'd do it. Go to some expert, pour on some oil ("Gee, Professor Blivis, everyone has told me that you're the greatest"), and then slip in that little hooker: "We'll turn out an article anyway, so spill something good to help us make it sound great." All one can say to the victim of such chicanery is, "Now you know. Welcome to the club." But the damage is done.

And that, I think, is one of the biggest and most serious problems facing us right now. Our image is tarnished; we must look like knaves or charlatans to the public. I suspect that it will be a good long time before the image improves.

		our image
program validation	metrics	business data processing training
other education problems		what should we compute?
schools and curricula	choice of language	standards

it's amazing how little about computers has appeared in the popular press written by computer people. We have talked to ourselves, in our technical journals, but the public doesn't read *DATAMATION* or the ACM *Communications*. Since the application of computers directly affects everyone, our situation is different from that of other

		our image
program validation	metrics	business data processing training
other education problems	IBM	what should we compute?
schools and curricula	choice of language	standards

I shouldn't overlook PROBLEM NUMBER 10: IBM. When a large industry is dominated by one company—well, discussion of that problem could take a whole issue of *DATAMATION*. □



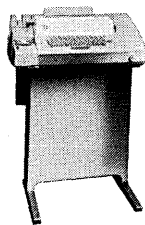
Mr. Gruenberger is now an associate professor at San Fernando Valley State College. He has an MS in mathematics from the Univ. of Wisconsin, where he was supervisor of the computing laboratory. Active in the computing field since 1948, he was at RAND for eight years and at Informatics for two years before joining the State College faculty.



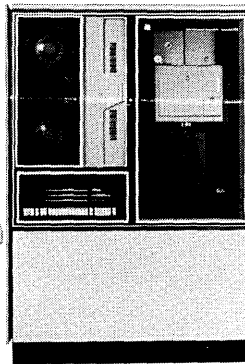
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DATA HANDLING SYSTEMS

 **GOULD**

Computer people have long been interested in being known as professionals, but now that the Dept. of Labor has ruled that programmers and analysts are not exempt employees, there is a note of urgency in improving their status

In Search of an Identity

by Milt Stone,
Contributing Editor

The Computer Professional... management summary

The new American definition of professional is "supercompetent"—that's what a computer professional is, in some well defined area. He is not a classic professional; e.g., a lawyer.

It's inevitable that a generally accepted, comprehensive, mandatory (in some cases) system of testing and certifying the various computer professionals will evolve from



presently established certification efforts.

The pressure for a more effective certification program comes both from

within the industry and from the end users of computer output. The motivation is to protect:

The general public from the computer user

The computer user from the supplier of hardware, software, services

The employer from the computer employee

... by upgrading the conduct and performance of Computerman as an individual.

The DPMA Certificate in Data Processing program is limited in scope, superficial in some respects, but well

OPERATIONS RESEARCH was born during World War II, just before computing as we know it began. Since then, OR has been used to route garbage trucks, to plan our national stance if we are attacked, to mix minimum-cost sausage, to plan our national force structure if we should decide to attack, to...

Curiously enough, the Operations Research Society of America has not yet published a code of professional ethics. Computerman has written several. The Institute of Management Sciences does not have a professional certification procedure. Computerman has several—and several are in the works. Neither OR society spends much time discussing the social implications of operations research—which is, after

all, only a bag of tools and an approach to a problem.

Behind the search

What pushed Computerman—who also works with only a bag of tools and an approach to a problem—into his accelerating search for recognition, an identity, status as a classic professional? The answer seems to be a series of negative factors.

1. To many observers, large numbers of Computermen look like empire builders and snobs. The inner forces that drive those two groups could quite predictably manifest themselves in an aggressive campaign to achieve professional recognition.

2. From the start there have been computermen who are fakers. Behind

the various drives for certification and licensing is the difficulty in many cases of distinguishing the good guys from the bad ones—and the desire to simplify the process.

3. In the academic world, the computer-based faculty feels somewhat obliged to scrap every step of the way for recognition as the preachers of a separate and special gospel, computer science (see "The View From Academia," p. 55). In pushing for professional status for Computerman, they are also advancing their own cause on campus—a separate and highly regarded department.

4. Computer-enlarged goofs (in banking, billing, elections, etc.) and computer-aided crime (in the same areas) made an early appearance. As a

established. However, these factors are working against the use of the CDP as an immediate jumping-off point for the more comprehensive program required:

Polite but formidable opposition from the academic community

Polite but formidable opposition from ACM/AFIPS and ACPA

The absence of a well-funded agency with clout enough and support enough to pull societies, faculties, and individuals together into a unified certification program that is extended and improved at a crisp pace. □

result, there was early recognition of the need for common sense competence and good old-fashioned honesty—components of professionalism.

5. Old-fashioned causes and controversies (having to do with war and peace, abundance in the midst of starvation, and the like) made new appearances—often with the accompanying involvement of a new tool, the computer. To some Computermen this called for involvement—not in the clothes of a citizen but in the uniform of a profession—and thus for increased pressure to find an appropriate uniform.

6. Finally, the anticomputer economic backlash has in many cases turned the top computer job over to an administrator, a non-Computerman.

The Dept. of Labor's recent and unflattering putdown of the analyst and the programmer (i.e., by ruling that both are nonexempt employees) has strengthened the argument that both can be managed by non-Computermen. This is both a threat and a final motivation for the push to professionalize. Nonprofessionals rarely manage professionals.

The drive to make a profession out of an occupation includes (1) proving that the work is professional in the accepted sense, (2) setting up a prescribed apprenticeship—preferably to be served in the classroom, and (3) handing down—as from above—standards of conduct that define ethics in terms of the unique activities of the occupation.

The recognized ones

What's a professional? There are classic professional fields—religion, medicine, law—and there are classic descriptions of professionalism. Two facts of life distinguish the classic professional transaction from the ordinary business relationship: (1) the client relies heavily on the reputation of the individual and the standards of the profession to insure the quality of the services he receives; (2) frequently there is no choice—he must use a lawyer, he must seek a doctor, the law requires that he use a public accountant.

In his Wall Street office, Chase

Manhattan Bank's Charles Block asks the key question: "Is the computer professional really that kind of a professional?" Block's credentials for supplying the answer are impressive. Possessor of an advanced degree in math, he started as an applied mathematician using desk calculators, slide rules, and analog computers to solve the problems he encountered. As they became available, he graduated to IBM's CPC and digital computers. From there he went into data processing consulting (Arthur D. Little, Inc.) and then on to Chase where he is a vice president.

Computerman's status? "Today, he is not a professional, but he may become one in five to ten years," says Block. "At least he is a paraprofessional."

The new meaning

But common usage has changed the meaning of the word. In Los Angeles, Programmatic's Marion Bell (BA in math—12 years in the business) says: "I saw Jane Powell in a show once, and I thought, wow—what a pro!"

A young programmer in Denver says, "Yes, there is such a thing as a computer professional. He's like the pro in any field—interested in the job, learning about it, studying it, growing with it. Professional is not by decree—it's a state of mind."

In Minneapolis, Jack A. Lever says a computer professional deals at the top levels of an organization and turns

In Search of an Identity

data into information. Lever is Pillsbury's top computer professional.

In Manhattan, an "in-house, freelance consultant in hardware and software" for an international conglomerate curls up, shoeless, in his chair and guesses that "A computer professional is anybody I talk to on an equal level. It's a question of attitudes, not diplomas—interest in computing, interest in working, interest in the organization. The real computer professionals are scarce in the big industrial firms—maybe 5% of the department."

Continental Airlines' Pat Cashman, who considers himself a professional, is in charge of the swing shift control area in operations. He articulates the commonly accepted definition of a professional: "He's someone who is extremely proficient in what he does—enough so that the store can be left in his hands."

All across the country "professional" now means "supercompetent." Jack Nicklaus, Peggy Fleming, Henry Aaron, Billie Jean King are professional. Charlie Brown is not.

Is OJT the way?

If being a computer professional means being competent, the next questions are: Competent in what?—How do you get there?—What's the regulation apprenticeship? One set of answers is provided by the academics (see "The View From Academia"). But overeducation is something to guard against, too.

Susan Wright, Washington, D.C., programmer/analyst, represents a large segment of her peer group when she says that a professional doesn't need any special level of education—he needs on-the-job experience. There's no correlation between success on the job and courses taken at school. She stopped studying for a master's degree because "they weren't teaching me a thing I didn't know. My work experience got ahead of my education."

From his higher foothold on the totem pole, John A. Gosden agrees. He's vp, technical services, for The Equitable in New York City. A youngish-looking veteran of almost 19 years in computing (LEO Computers, Auerbach, MITRE), he has two math degrees from Cambridge Univ. and is an active and respected member of ACM.

But Gosden thinks that on-the-job training is the way to learn. He feels that he has been lucky enough to work under very competent managers, learning by seeing the right way to do things.

Right and wrong

Does Computerman need a specially prepared, well-defined, ethical code to guide him in his work? Is his work so different that a general understanding of right and wrong won't do? The Univ. of Tennessee's Robert M. Aiken sums up the reasoning of those who believe so:

"The computer professional of the '70s must be aware of being a public servant . . . of the social impact of his activities and the consequences of the research and business practices he is following."

And Alan Taylor, in organizing the small (300) but highly vocal Society of Certified Data Processors, talks about the need to make mandatory by 1973 the use of error-checking routines in printouts distributed to the public (for example). What Taylor is really saying is that the professional data processor is duty-bound to protect the public, to guard against, "watch for and report inaccurate or illegal computer output"—that insistence on the part of professional societies that "de-certifying" would follow failure to follow good practice would be a mighty deterrent to sloppiness, perhaps to illegality.

But knowing good practices is "competence" and using them is "common sense." As for ethics and morals—you live your life with or without a consideration of them, depending on your style. Working with a computer doesn't change that. After all, as Albert L. Connelly, of Idaho Falls, recently wrote to his fellow ACMers:

"The computer professional relates to society through the application of a computer science which he has a large part in forming and in implementing applications thereof, but only a small part in determining to what ends applications are made. The owners of computers decide to what ends the machines are to be used. Most computer professionals do not even own a mini-computer; they work for those who own computers, as employees, as subcontractors, or as consultants. Any code of how a computer professional is supposed to relate to society must take this reality into account."¹

The way it is

To summarize, this is the way the majority of Computermen and their customers (not clients) see it:

A professional in our business is a guy with good intentions who is "supercompetent." There's more than one level and one flavor of professional. Each needs an accepted way of proving that he has the credentials (not the degrees) *before* he goes to work.

And he needs it now. What's in order is a year-by-year upgrading and extension of the certification tools presently available—not a master plan for a five-year effort to produce new measuring sticks.

The Classic Professional . . .

his individual style

"1. A type of activity which is marked by a high individual responsibility and which deals with problems on a distinctly intellectual plane.

"2. A motive of service as distinguished from exclusive preoccupation with making profits.

"3. A motive of self-expression which implies a joy and pride in one's work and a self-imposed standard of workmanship—one's best.

"4. A conscious recognition of social duty, expressed, among other ways, by guarding the standards and ideals of one's profession and advancing it in the public understanding and esteem, by sharing advances in professional knowledge, and by rendering gratuitous public service, in addition to that for ordinary compensation."

Hallmarks of his group

"1. A body of knowledge held as a common possession and to be extended by united effort.

"2. A recognized educational process for acquiring the requisite specialized knowledge, in the ordering of which the professional group has a recognized responsibility.

"3. A standard of personal qualifications for admission to the professional group based on character, training, and proved competence.

"4. A more or less formal recognition of status either by one's colleagues or by the state as a basis for good standing.

"5. An organization of the professional group devoted to its common advancement and its social obligations.

"6. Contact with other professions to obtain their assistance in the handling of problems which may be on the borderlines between the definite subject matter covered by either of them.

"7. The existence and utilization of a subprofessional group of persons who work with the members of a professional group and assist them by performing some of the simple routine procedures, under professional guidance.

"8. A standard of conduct governing the relationships of the practitioner with clients, colleagues, and the public."

*as seen by an engineer-educator, the late Dr. W. E. WICKENDEN, who was President of Case School of Applied Science. *The Second Mile*

1. *Communications of the ACM*, January 1972.

The Professional at Work . . .

irreverently seen

"The legal profession has devoted centuries to the all-important task of building a proper image for itself—the image of a discipline so complex, so arcane, so unimaginably difficult that no mere layman could even begin to understand its workings. Anything that damages this image violates a basic tenet of legal ethics . . . 'Legal learning,' as one lawyer frankly but anonymously admits, 'is the art of making

simple things complicated.'"

PETER M. SANDMAN
The Unabashed Career Guide

Computerman set up shop late—in the 1940s. But in this short period of time he's acquired at least one of the outward appearances of the professional . . .

"Realize that most of the computer technicians are complicators, not simplifiers. They're trying to make it look tough. Not easy. They're building a mystique, a priesthood, their own mumbo-jumbo ritual to keep you from

knowing what they—and you—are doing."

ROBERT TOWNSEND
Up the Organization

. . . but it's obviously not a good image to have . . .

"True professionals have a thoroughly organized knowledge of their field and can talk about it in simple, direct language. They are rare because it takes a disciplined mind and long hours of hard work to become truly professional." □

Advertisement for Pace College

The View From Academia

Herb Grosch says it simply: "At a trade-school level you learn how to use computers. As a university undergraduate you learn what to use 'em for. In graduate school you learn how to be a professor." In industry there's general agreement with that stance—not especially by all but definitely by the silent majority.

From the campus of the Univ. of Maryland, Dr. William F. Atchison rebuts the position: "The deemphasis on academics, the feeling that a computer professional really doesn't need an advanced degree, is a passing trend." Atchison, who runs the computer science program at Maryland, has three advanced degrees (math, chemistry, physics).

Educating computer people is a business, and it's a big one—lots of teaching jobs, money and prestige in the academic world are at stake. More than 100 universities offer graduate degrees and more than 100 colleges and universities offer bachelor degrees in computer science.

The science approach

What is computer science? The professors (ACM Curriculum Committee) say this: "Computer science is not simply concerned with the design of computing devices nor the art of numerical calculation. It is devoted to the *representation, storage, manipulation, and presentation* of information. The computer scientist is interested in discovering the pragmatic means by which information can be transformed to model and analyze the information transformations in the real world."

"Curriculum 68" is the most widely used blueprint for designing courses of study in computer science. It was produced by 12 professors, led by Atchison. Fifty-three other professors also helped. A pseudo-industry opinion was supplied by three representatives of Bell Labs, two apiece from GE and IBM, and one each from DOD, RCA, Midwest Oil Corp., and J. P. Stevens and Co. (tex-

tiles).

It turns out that a practical approach to the information problems of the real world requires a "strong mathematics background"—and then a patient march through an obstacle course designed to show how that background can be applied to the design and/or use of data structures, programming languages, translators and interpreters, operating systems, special purpose systems and computers (of a variety of organizational philosophies).

What then? Well, after four years of that, the professors hope that the best

consulting operations can stay in operation? We're talking about the difference between the number of pure physicists, chemists, and mathematicians we need compared to their equivalent engineer-types who work in the application areas."

The National Academy of Sciences has a Computer Science and Engineering Board. Their "desirable" graduation rate for computer scientists (at all degree levels) would be 16,000 annually through 1980. R. J. Spinrad, a PhD who has managed programming for XDS, predicts that they'll be employed in the following way:

	Share of All Graduates	Function	
		To Solve Problems*	To Build Tools**
By User	88%	90%	10%
By Manufacturer	10%	40%	60%
By Educator	2%	30%	70%

* Working in applications areas

** Building computers, operating systems, languages, etc.

of the crop will move on to more of the same in graduate school—"the future leadership of the computer science community depends on it." Alternately, a four-year graduate can go into systems programming (a "rapidly growing profession"), or into graduate work in another field, or into applications programming. But they do admit "that the majority of applications programmers in such areas as business data processing, scientific research, and engineering analysis will continue to be specialists educated in the related subject matter areas."

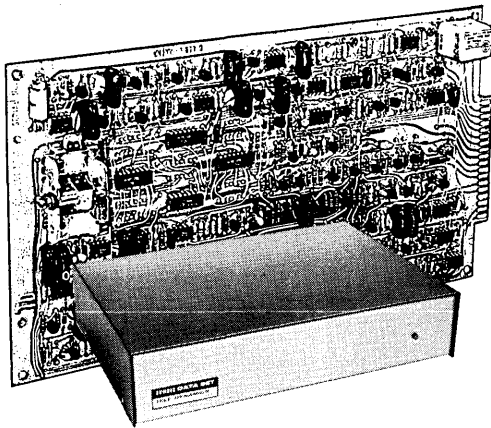
"Amen to that," says Stan Fisher, associate director of CUNY's graduate center computer facility. "Developing the tool (computer science) is a lot of theoretical work that has to be—but the number of people required is small. How many systems programmers do the manufacturers need? How many

To produce managers

Meanwhile, the business school professors see it another way (as do the faculties in engineering and the "non-computer" sciences). They speak through another ACM committee—on Computer Education for Management—nine professors who have real-world support from Russ Armstrong of Weyerhaeuser and Bob Benjamin of Kraftco. The three motivating forces for this group are (1) a desire not to be gobbled up by the computer scientists, (2) money in the form of an NSF grant, (3) a different set of attitudes.

For example, they point to the lack of an adequate body of knowledge on which to base educational programs in business systems. They have discovered that "mathematically oriented individuals soon find that the organizational data processing environment is more complex than that of the scien-

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In Search of an Identity

tific problems"—and the systems are more complex. They note that "most computer science departments are not yet teaching data processing or doing much research in the field."

In the last five years, the business schools have moved aggressively to take advantage of the omissions of the computer scientists. More than half of the 139 members of the American Association of Collegiate Schools of Business require comprehensive computer work—in fundamentals of programming and systems analysis, computer applications in functional courses (e.g., financial applications in the finance course), computer-based business games, and design of computer-based management information systems.

Enter information analysts

Leaders in the race to combine courses in management, management science and computer science into one curriculum—another approach—have been Jim Emery (Wharton School), Gordon Davis (Univ. of Minnesota) and Michael Morton (MIT). By next fall, over 40 more business schools will be offering an option in information processing—turning out a new breed, the *information analyst*. His job will be to communicate with management, identify information requirements, communicate them to the systems designer—who must then communicate with the programmer through design specs.

The idea is that the analyst will be a business specialist, getting his degree from a business school with an information processing option. The designer will be a computer specialist, getting his degree in computer science with an option in systems design provided by the business professors. Since analyst and designer took some common courses, they'll be able to communicate effectively—at least with each other.

Producing the "grunts"

Nobody on the four-year campus level has much to say about the 125 private dp schools in the U.S. with accredited courses in computer programming—or the more than 700 schools with nonaccredited courses in dp. But Dr. John Maniotes, who heads a two-year computer technology program on Purdue's industry-oriented Calumet Campus, feels that the product of the "trade" school is likely to be a poor communicator—orally and in writing. ("That's a common defect," says Robert E. Wise, Annapolis graduate and marketer for Hughes Aircraft,

Communication at Woodie's . . .

At "B" schools where an information processing option is featured, the new breed—information analysts—are being produced. Info analysts are hybrids, two-thirds management oriented, one-third data processing oriented. They are communicators. Woodward and Lothrop, the Washington, D.C., retailer, has them now, in several flavors.

Susan Wright is a programmer/analyst. She's 30, has a BA in math, has worked in dp for over eight years. At "Woodie's," she's involved in the de-

velopment of a computerized merchandise ordering and inventory control system.

Her job, in the middle of a chain of communication, is to translate needs of the system users into specifications for the system designers. The complete chain? From the merchandise buyers (the users)—to the director of merchandise information (who knows everything about the buyers and something about dp)—to Susan—to the system designers—to the programmers. □

Fullerton, Calif. "Us computer guys don't write good.")

There are more than 250 two-year dp programs in the junior colleges and technical schools. Maniotes says of them: "They emphasize the practical rather than the theoretical—the solution of dp problems using the 'hands on' approach which is currently lacking in computer science programs."

Two Certificates That Are

The only established certification process in the U.S. for computing or data processing is the annual examination for the Certificate in Data Processing (CDP). This year about 2,900, including a sailor on sea duty in the Pacific, took the exam at \$50 a head. In previous years 20,000 have been tested; about 40% have failed. By mid-1972, when this year's results have become known, there will be about 12,500 CDP holders.

The 27,000-member Data Processing Management Association, developer and administrator of the program, says that the CDP "identifies those data processing people in management-oriented positions who have acquired a core of knowledge . . . A principal purpose of the CDP program is the preparation of individuals for more responsible positions. . . ." As Don MacPherson, DPMA's education director, says: "Because of the nature of this industry, people tend to be very preoccupied with the technical demands—we wanted to encourage them to get back to school, to get a broader perspective and understanding of business."

The CDP tests that broader perspec-

Up the degree

On one point nearly all are agreed. The view from academia is, as Bill Atchison puts it, that licensing or certification of professionals is bad partly because this inevitably brings in the government and political considerations—mostly because the possession of an advanced degree is a much better indicator of merit. □

tive by asking multiple choice questions (because the grading is easier) in five areas: data processing equipment, computer programming and software, principles of management, quantitative methods (which means the basics of algebra, accounting, and statistics), systems analysis and design. Each fall MacPherson presents a new, upgraded set of questions to a six-man Certification Council (which presently includes two prominent ACMers, Paul Strassman and Sol Pollack). The questions are reviewed and revised in a three-day meeting. In the spring, after the examination, the scores are considered by the same group in order to determine the pass/fail cutoff point.

What does the CDP prove? To begin with, that the holder has at least five years of experience—a requirement for taking the exam. MacPherson says that "It's not the feeling of the Certification Council that the exam measures competence." He refers again to the "core of knowledge." Dick Canning, who in the past worked with DPMA on the CDP, concludes that "the examination measures awareness more than it does proficiency."

For one New England firm the CDP measures acceptability to the first plateau. They advertised in the Boston *Globe* for a senior data processor with 10 years of experience or a CDP.

The CDP is 11 years old. DPMA is also the administrator of a two-year-old project, the Registered Business Programmer Examination. First given in the fall of 1970, the examination has

attracted over 1,700 candidates at \$40 a head. About 40% have passed. The RBPE asks multiple-choice questions about business applications programming conventions and practices.

Whatever the CDP examination and the RBPE measure, one thing is for sure: DPMA has mastered the logistics of administering a nationwide testing program—and does it at a profit. □

Two Certificates That May Be

The Association of Computer Programmers and Analysts (ACPA) was born in 1970, according to its president, as a result of a series of rejections. Business grunts—programmers and analysts—were turning thumbs down on three societies; ACPA president Paul Notari ticks them off:

"The ACM? Too academically oriented. Too above the business programmer. The DPMA? Too nontechnical. Too noncomputer-oriented. The ASM (Association for Systems Management)? A lot of them don't have the basic appreciation of what programming is. There was no association catering to the business programmer and analyst, talking to him in his language about his problems."

So "with less than \$10,000 cold cash," Notari and some friends set out to build an organization designed to appeal to the rank and file in business systems design and programming. Now based in Washington, ACPA has about 1,200 members, concentrated mainly in the East. They're struggling financially, very much alive professionally.

The most ambitious project to date, and most worthwhile if they can finish the job, is to design and establish a Commercial Programmer Qualification Examination. The plan is to have versions of the exam suitable for measuring the ability of the applicant at several different levels. City Univ. of New York's Stan Fisher describes the concept of the entry level test:

"The candidate will write a business program either in COBOL, which is primary, or in the language of his choice. Then he'll be given a program written in a hypothetical machine language and a manual for the language. He'll have to make some corrections and additions to the program. Then he'll get a dump—again in the hypothetical language. He'll have to indicate what he has found at certain locations.

"The goal is to see if he can pro-

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gram, if he understands some primary computing concepts that are not demonstrated in compiler languages, to see if he can get the information he needs from a manual, to see if he's going to be useful in the business environment. This is a pass/fail sort of thing—either he can do the job or he can't."

Very interesting—but when will this type of qualification exam appear?

The American Federation of Information Processing Societies (AFIPS) was slow to become involved in the question of certification. When they did move, the effort took on the appearance of a research study into an unknown but highly political area.

The start was a roundtable meeting (January 1970) which showcased AFIPS/ACM leaders interacting with Willard Wirtz, former U.S. Secretary of Labor, and a select half-dozen representatives of industry and the general public. The roundtable concluded that "the basic reason for discussing professionalism in the computer field is the concern that some publics should be protected from incompetent technical performance and unethical behavior"—notably the general public from the computer user, the consumer from the supplier of computer products and services, the employer from the employee.

They also concluded "that the 'individual' is the key to protection." The recommended program to achieve protection was a model of problem-solving technique: develop a set of universal job descriptions; develop minimum standards of job knowledge; assess existing examinations as measures of minimum job knowledge; develop needed certification testing programs; institute a public information program.

After two years of activity, AFIPS' Professional Certification Committee will have completed the first steps by the end of the summer. Dr. Ray Berger, Los Angeles-based consultant in theoretical, experimental, and measurement psychology—and the testing of programmers—is drawing heavily on past work for the Navy and current input from "expert" programmers to produce updated specs for a business programmer, a scientific programmer, and a systems programmer.

Typical statements of the tasks involved: prepare file layouts and record descriptions, and communicate technical matters with nontechnical personnel by transforming technical terms into commonly understood phrases.

Typical statements of required knowledge: blocking of records and curve fitting.

Committee chairman Donn Parker,

Stanford Research Institute, says, "AFIPS' official position neither endorses nor rejects the concepts of certification. But before we could certify computer programmers, we would have to know what a computer programmer is. We will engage in research and development activity and produce enough technical information and knowledge on the subject so that AFIPS can make a reasonable decision on what has to follow.

"The things that society expects before granting professional status to the occupation are job description and certification . . . 1975 sounds like nice

round number for achieving this kind of thing. We could have a certification activity started and running by 1973, but that doesn't take into account all of the political and organizational ramifications of the thing.

"Like what's going to happen relative to DPMA—so I'd give that another couple of years."

Very interesting, too, but are all these *separate* trips really necessary?

(NEXT MONTH: The insiders—onward and upward. Or, how to succeed by staying close to the world of computers.)

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Also Sprach von Neumann Chapter Six

by Eric Blodax
with Illustrations
by Stew Burgess

THE PRECEDING EVENTS: The Author, launched inadvertently into a career in electronic digital numerology at the Airship Foundry, survives the early days of this black art. After indoctrination in ivory towermanship with an insurance company, he returns to the Airship Foundry to advance into system building. Finding life again beginning to pale in the massive tin-bending industry, he launches a career as an

tuted, as holding the foundation of a real, lasting, and viable business. On the other hand, the needs of the government, in space and military programs, were real enough. And the software companies fulfilled many of these needs, and fulfilled them well. The government had need to hire the best talents in computing. As is often the case with such needs, they could not all be fulfilled through service enlistments or civil service, and so they were met by the contracting route.

Thus, for a goodly number of years, the government was the chief buyer of heavy talent in computing, and it paid, in general, better than the world of commerce.

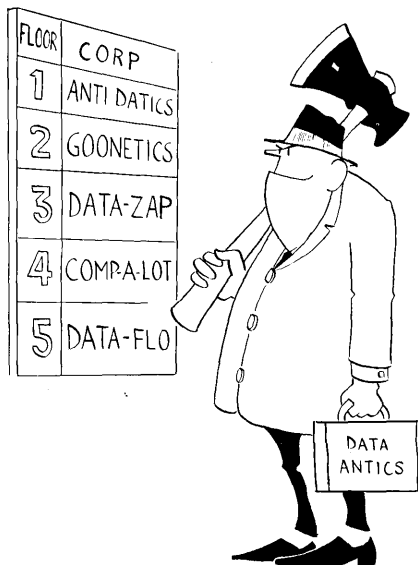
So it was at Data-Antics, the first of the companies in which I occupied a three-window office. Our chief customer was the government, though we always dreamed of becoming a "commercial" house for the grass always looks greener in the other pasture. In order to work for and deliver to the

government, we had to sell to the government, and this need provided some of our most fascinating activity.

Sales of software to the government, like all such sales of ill-structured and poorly-defined things, required a good deal of ceremonial claptrap for their consummation. It was not sufficient to have a good insight into what was apt to be bought, and where, and when; and to have good field sales coverage and customer rapport; and to know those who one thought to be "the right people." One also had to write a proposal for each contract award.

The pitch

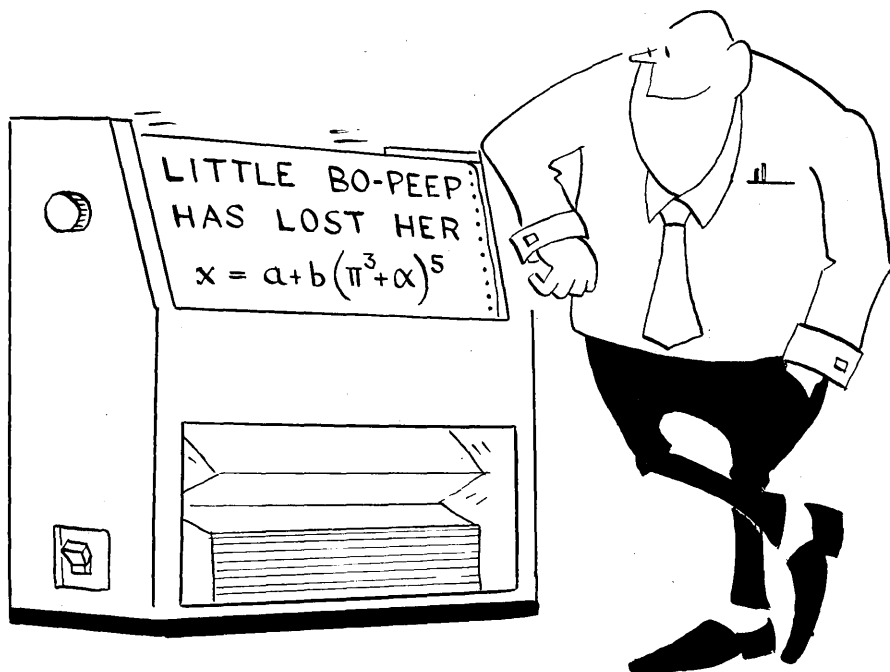
The technical proposal, or at least submission of some document purporting to be one, is a necessary, but not sufficient, condition for a win. Our problems frequently lay not in the fact that we were disorganized or undermanned for such efforts, but rather that we were overorganized. A software company, by its nature, is staffed with



independent consultant to management and other folks.

Deciding to leave the world of the consultant, and to progress upward with the latest thing, namely, the wholesale and retail promotion of software, I had first to pick a company and carve out a place within it. There proved to be little lack of places to look, for just about everybody who could spell "program," and even some who spelled it "programme," had launched his own software venture. Some were more soft than others.

In retrospect, it seems honest to admit that I could never bring myself to believe in the concept of the software company, as it was then usually consti-



literate and intelligent people. Nearly all of them can write specifications and code with some skill; ergo, in their own minds, at least, they can read and write anything.

Further, the management—at Data-Antics, at any rate—was several tiers thick, and was organized not only horizontally and vertically but also diagonally. Therefore, on any effort, it was usually possible to determine that it lay within the jurisdiction of at least three different management committees and chains of command, ad hoc or otherwise, and the number of important opinions put forth was equal to at least the permutations of these.

Therefore, the typical proposal effort at Data-Antics often left unanswered such minor questions as:

1. Who is in charge?
 2. What are we proposing?
 3. Why?
 4. What does the customer want?
 5. What does the customer think he wants?
 6. What do we think he wants?
- and so forth . . .

In spite of this we won an astounding number of contract awards. This may well have been due to the fact that the chief executive of Data-Antics was a most remarkable and indefatigable salesman in his own right; he paid a good deal of attention to personal selling, and he knew his own familiar corner of the market very well. By the time he had done his work, things were pretty well in the bag. We might have submitted "Mary had a Little Lamb" as a technical proposal, and no one would have noticed the difference.

As the contracts at Data-Antics grew in volume and number, the various management committees felt constrained to inject an ever more opulent "big company" atmosphere into the day-to-day proceedings. Big companies, so the belief went, are characterized by being totally organized for every conceivable situation, and by having everything studied and pre-planned.

Unfortunately, as they must to all software companies, the arm-wavers came to Data-Antics. They were hired in amongst the real programmers, from whom they were indistinguishable by race, creed, color, or resume, and, when the grisly facts revealed themselves, they had, of course, to be let go. This posed a manifest problem for a small company like Data-Antics.

In the first place, it was almost an insulting thing to let someone go. Growth was the watchword of the hour, and it was sung in the halls and worshiped in the staff meetings as though it had some intrinsic goodness or glory or tangible mass of its own. To let someone go, regardless of the reason therefore, was anti-growth, and

therefore a bad thing.

Further, it seemed to Data-Antics management most unscientific and disorderly simply to call some poor arm-waver in and say, "Fred, you're canned. Kindly pick up your check."

There must be a reason

Thus it came to pass that a most elegant series of management procedures was structured, dealing with the various ways to let some dumb clod go. There was "dismissal for cause" and "termination for good of the organization." There was "dismissal for reason but without prejudice" and there was "enforced disciplinary leave of absence." So monumental did this set of procedures become, and so ectoplasmic the paperwork affiliated with it, that it tended almost to topple of its own weight, and it became a subject of hilarity in the halls where remarks could be heard like: "Oh God, I hope they don't give me number seven. I'm going to ask for number four!"

The compulsion to appear to be as much as possible like a big company, or, at least, a cracked-mirror image

We sometimes gave a good deal of attention to cultivating a particular potential customer, and in so doing, we neglected other potential, possibly closer to home. One of the higher-ranking vice presidents of the Financial Mother Corporation had established himself as a hard-driving go-getter, a pot-stirrer, and more or less general loudmouth. We developed the fixation that he was on to a most large, important, and rewarding contract about to materialize. We decided that we should be his little brother for supply of software. To this end, we made an appointment with him for a briefing in Washington, D.C., where he was reported to be rushing through. When we arrived in Washington for the briefing, he had left for San Francisco.

Undaunted, we flew to San Francisco, and sat outside a meeting he was attending for seven hours. He came forth from the meeting on the dead run, reporting that he was sorry, but he had to be in Los Angeles immediately.

We tried invading his cab at the Los Angeles Airport, but were fended off by his troops. We besieged his hotel,



thereof, became at times almost an obsession, and it could be observed as a rather general illness afflicting software companies at that time. It is probably true that we gave too little thought to the premise that the strength of a small company may lie in things like ingenuity and flexibility, and capability to generate new forms of organization rapidly. All are things missing in most big companies.

but were never able to penetrate to the inner sanctum.

At 5:00 p.m. the great man emerged from his meeting to announce that he was on his way to Washington, D.C., immediately. He was very sorry, he announced, but he would try to make time for us as soon as possible.

We were clever enough to put our briefing troops on his airplane in the first class compartment where he could



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CIRCLE 8 ON READER CARD

Also Sprach von Neumann

hardly avoid us. All the way to Washington the time was spent in trying to give him an informal briefing with the Financial Mother troops trying to fight us off.

In Washington he said that he had really been deferring us long enough, and he made a firm appointment to give our briefing a full hearing the following day in his hotel suite at 9:30 p.m. promptly. We arrived at 9:15 and were ushered into the presence at 10:10 sharp.

The great man went to sleep in the middle of our briefing. The following week he left Financial Mother for a job that paid more.

Time for a change

After a time I felt that I saw more opportunity with a different software company with a different outlook. I left Data-Antics to join Ante-Datics.

Like most software companies of the time, Ante-Datics had most of its backlog in contracts with the U.S. federal government. However, there was a concerted effort to sell things in the commercial world. This led to some rather peculiar episodes.

Some of the older hands at Ante-Datics could not understand why it was that, in selling something to just another business, one did not necessarily have to write the kind of long-winded technical proposal that one sent to the government. This resulted in sending to such potential customers as banks a tall stack of official-looking numbered forms certifying the fact that all pencils used in writing code would be made in the United States, that the facility where the work would be done possessed a valid security clearance, and that shipments made through the Panama Canal would be properly marked. The resulting confusion in the bank was the kind of thing that served them right.

At Ante-Datics I was in a branch office rather than the central and home office, and I began to contract and develop that insidious disease which I had seen in others but had not personally experienced heretofore: the affliction known as "branch manager's blues." It is a little-studied but very widespread phenomenon that all weenie-level employees in a home office view all personnel in branch offices as "the enemy." No matter what so-called service the home office performs, you can bet your tushi that it's all honked up.

The home office of Ante-Datics did centralized billing and collecting for the company. In our struggling office

we had a lovely and profitable contract to supply software troops to one of the big computer builders. The contract was for a year's duration. Each month for twelve months the site manager called regularly to report that the billing from the home office was in error—again. This call either preceded or followed by forty microseconds the call from the corporate controller reporting that the customer had not paid his bill.

The home office also maintained what was purported to be a centralized personnel file. This was based on the purportedly good idea that it was always better to transfer an existing employee than hire a new one at another office. After I received the fourth abysmal ignoramus who had just checked in as a transfer from the Thule, Greenland, branch, I gave up on the transfer method. It overlooked the essential human fact that no branch manager in his right mind is going to transfer his good people if he can help it.

The home office personnel troops also collected resumes of all applicants who were not hired, and they kept these in a vast, dusty, and nonautomated tub file. They had on file everyone who had ever stumbled in thinking he would like to be a programmer, beginning with Noah's son Shem.



Some of the resumes were written in Sanskrit. Perusing this great archive was an interesting lesson in the way people write resumes and the apparent steady percentage of kooks in the population. One memorable resume which I found in the file consisted of a single page of employment history, plus 19 Xeroxed pages of business cards of everyone the applicant had ever met who had a card.

No help

Trying to fill an urgently vacant position or set of positions by calling on this home office file was a waste of time. The idiots who tended it wouldn't know a programmer if he fell on them from outer space, and, besides, the file

was in alphabetical order, more or less, and there was no way to reference it by purported skill. A request for help resulted in higher overhead for the month, and a full wastebasket.

Another source of confusion resulted from the fact that all contracts were lumped together in the monthly report, and they were not really categorized. Most of the government contracts were on a man-hour or T and M basis, which was a pretty good way to go if you could book it. The commercial contracts were lumped into the pot, and they were insignificant in volume by contrast. However, this lumping procedure sometimes resulted in rather weird discussions. The corporate controller, for example, spent half an hour of a management meeting viewing a commercial, fixed-price contract with alarm because "not enough labor has been expended on it."

Our commercial contracts with the big computer makers provided some exciting hours. Often we got in on the really big flaps, and they could be lots of fun. We contracted very late in the game to help supply the software for a giant new family of computers, and we worked under most tight schedules, some of which we helped to set ourselves, believing that it showed a lot of moxie to set and achieve a schedule that the customer thought to be impossible. In order to keep these schedules, we had to have a lot of expediting help when we worked on the customer's premises.

We were scheduled to meet a critical design review on Wednesday of one of the particular hell weeks, and, as the world usually goes, we worked up until two in the morning of the previous day. In order to go into design review we had to have some hundred copies of our work so that all the high-ranking evaluators could evaluate it. So that we could have the copies, the customer put the full facilities of his giant print shop at our disposal. We put our material into work at 2:30 a.m. and were promised the bound copies at 8:00 the next morning. We rolled out of the sack early on evaluation day and rushed to get our material. We were most unfortunately disappointed. In the dark of night the giant print shop, supplied and supported by one of the nation's industrial greats, had run out of paper.

Dealing with some of the industrial greats had its trauma. There are some vast companies of impeccable reputation who apparently appreciate the opportunity to hire useful help, and pay for it promptly and graciously. They are the exception. The general rule seems to be: "The larger the outfit, the longer you can wait."

Some companies with their names on well-known products throughout the land apparently have whole depart-

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Model 2040 - an easy way to move into a medium-sized system. Series 2000 hardware and software plus the lean price structure of Model 2040 make this model the perfect introduction to a new world of multiprogramming and communications.

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Model 2060 - with more memory and I/O capacity than the 2050, Model 2060 can help you build solid multi-partition access capabilities with data base file structures.

Model 2070 - doubles the I/O capacity of the 2060. It's the big medium system for advanced communications networks that require a lot of peripheral capacity, interactive data base processing, and high job throughput.

Model 2088 - a dual-processor with large system performance at medium system prices. It offers high internal transfer speed, 1M

character memory, vast peripheral resources, and the Mod 4 High Up-Time real-time operating system for critical data communications and processor-shared file activities.

CRT console for improved operation

The Type 220-8 Visual Information Control Console offers interactive message transfer, status display, and better operator control of any medium-scale Series 200/2000 system. A solid-state full data keyboard with numeric pad is used for data and parameter entry. An adjacent control panel provides hardware system control functions. Screen size is 1920 characters (24 x 80 matrix). You can add another display screen, a serial printer, and a remote 23" display monitor. The console, keyboard, and display are arranged in a free-standing desk-like configuration.

Check 280 on reader service card.

Disk peripherals for better data access

High performance, large capacity, removable disk pack drives are featured peripherals with Series 2000. Types 275, 277, and 279 drives offer two or three

SERIES 2000 MODELS					
	2040	2050	2060	2070	2088
Memory (K = 1,024 char.)	49 to 131K	98 to 262K	131 to 512K	131 to 512K	512K to 1 mil.
Cycle Time	1.6 μ s/ char	1.6 μ s/ 2 char	1.14 μ s/ 2 char	1 μ s/ 4 char	.75 μ s/ 4 char (each processor)
I/O Channels (all variable speed)	12	12	16	16	32
Peripheral Address Assignments	32	32	48	80	192
Operating Systems	Mod 1, OS/2000, Mod 4				Mod 4 High Up-Time System
Other Features					
Interactive CRT Console (1920 char. screen)	Opt.	Opt.	Opt.	Std.	Std.
Floating Pt. Hardware	Opt.	Opt.	Opt.	Std.	Std.
Typical System Rental Range	6-13K	12-17K	16-24K	22-40K	37-70K
and Purchase Range	240-520K	480-680K	640-960K	880K-1.6M	1.5-2.8M

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Check circled reader service card numbers above for information on specific models



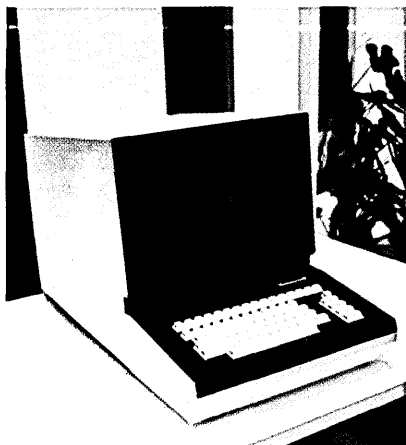
Series 2000 Model 2060

spindles per control, expandable to eight per control. The control on Type 277 and 279 drives buffers data independent of the CP for more efficient I/O and peripheral operation. Fast access times and high data transfer rates make these devices especially well suited to Series 2000.

Check 286 on reader service card.

Visual improvements in CRT's

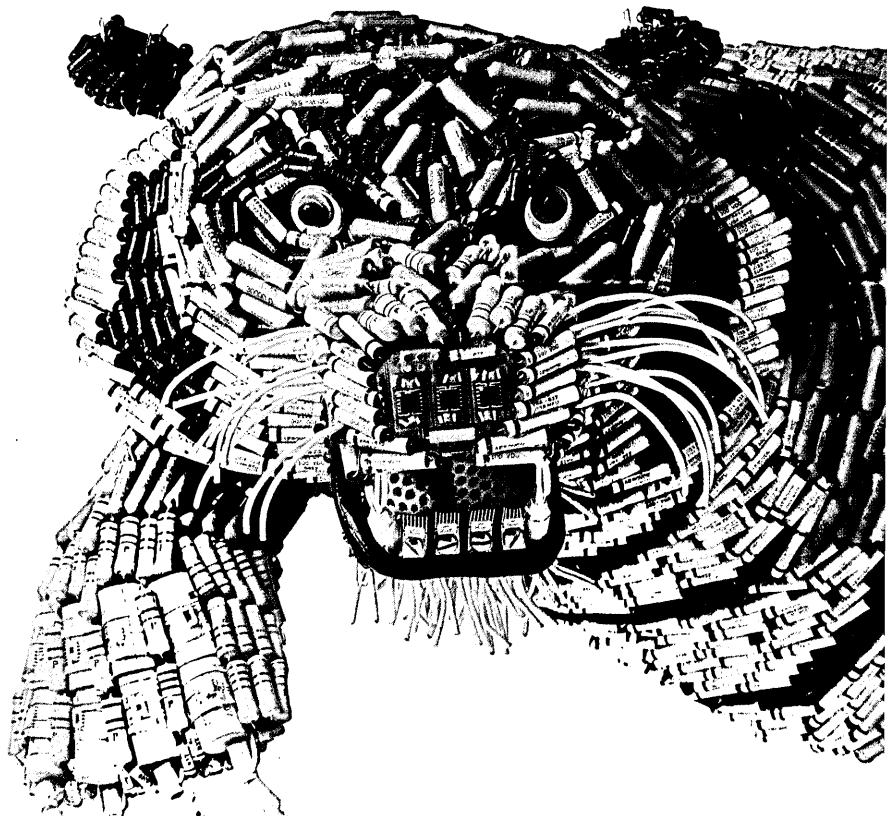
Models 765, 775, and 785 of the 700 Series offer single, dual, or clustered CRT keyboard/display capabilities. All models feature solid-state keyboard and multiple-key depression without error. Models 775 and 785 include an adding-machine-like numeric pad for data entry. All models include vertical and horizontal line drawing, automatic tabbing, message flashing, and data entry repeat capabilities.



Check 287 on reader service card.

DISK Specifications/Devices	Type 275	Type 277	Type 279
Seek Time (ms) Min.	20	10	10
Ave.	57	34	30
Max.	120	60	55
Latency (ms)	12.5	12.5	8.3
Ave. I/O Rate	208,000	714,000	1,074,000
Disks/Spindle	11	11	12
Min. Spindles/Control	2	3	2
Capacity/Spindle	18.4M	64M	133.3M
Max. Capacity/Control	147.2M	512M	1.06B

CRT Specifications/Devices	Type 765	Type 775	Type 785
Transmission Mode	asynchronous	synchronous	synchronous
Speed (bits per second)	1200	2000/2400	2000/2400
Display Capacity	1012	1012	2024
(lines x characters)	22 x 46	22 x 46	22 x 92
No. of Units per Control	1-20	1-20	1-20



A responsive operating system: OS/2000

As many as 10 job operations plus five data transcription routines can be processed concurrently under OS/2000. Jobs in multiple variable partitions (MVP) with hardware protection are scheduled by a Job Scheduler which fits in any available 8K area of memory. Partitions are shuffled dynamically within memory to accommodate larger jobs, and no recompilation of programs is required to insure their ability to reside in a given area of memory. (See figure below.)

The Input Reader, scheduled within a partition, processes job control information and stores resource information on disk. The Job Scheduler acts on this information to schedule a job according to memory and peripheral resources required and scheduling priorities assigned. Peripheral resources are allocated from a device-pool to ensure dynamic device reassignment.

To accommodate an urgent priority job, a roll-out/roll-in capability will roll an active job out of memory onto a disk, then roll it back into memory upon completion of the urgent job.

Beyond scheduling priorities, a user-selectable dispatching priority scheme governs the amount of processor time received by jobs and allows for maximum system control and throughput. Linear dispatching, "round robin" dispatching, or combinations of the two can be selected.

Complete flexibility in input and output media is available. Dynamic device reassignment lets the user defer selection of print and punch media until execution time. Added facilities for data transcription offer efficient access to print and punch files while concurrently processing batch jobs, data base demands, and communications transactions.

Data communications control. An OS/2000 Communications Controller provides the software link with either the DATANET 2000 communications processor or the Type 286 Multi-line Communications Controller.

For DATANET 2000, the link provides the means for sending data to a symbolic terminal and retrieving data from symbolic queues. Software resident in DATANET 2000 removes line

control, message handling, and queuing and routing functions from the central processor. With the Type 286, the OS/2000 Communications Controller controls overall communications activity and flow of data.

Data base management.

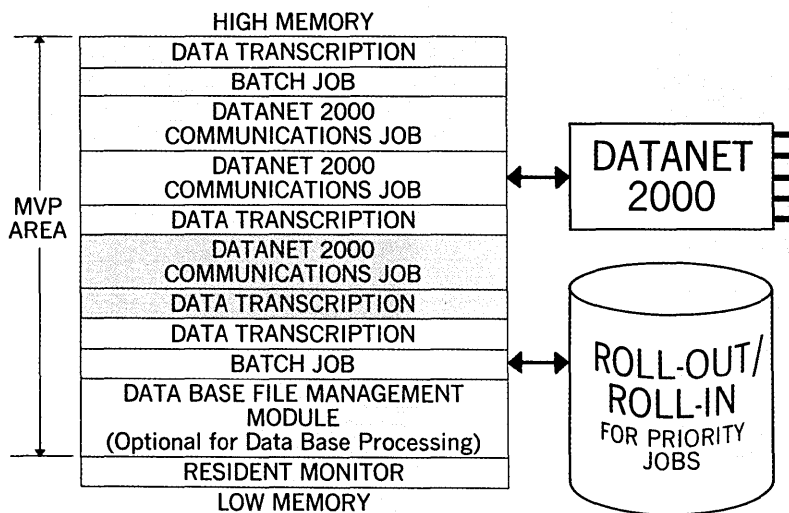
Once all user data is consolidated in one data base file, the Data Base File Management module of OS/2000 acts as the interface between user programs and the base. The data base eliminates data, program, and file redundancies, since it uses only one set of data accessed by any job partition or remote communication device.

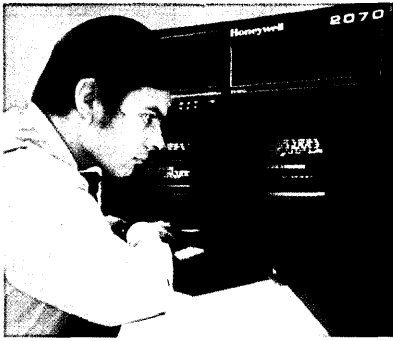
Multiple paths for data access are provided through stored data descriptions, multi-indexing, chaining, and linking capabilities in the module. The flexibility of access and use is given a high degree of privacy and protection with a system of security keys to prohibit unauthorized access. A chronological transaction file records all activities updating the data base. Thus, if the base were damaged logically, this file could be used to reconstitute the damaged portions.

Easywriter. Easywriter is a simplified data description language and processor that enables information requests to be written in English keywords and common arithmetic symbols. Non-programmers can apply Easywriter language to interrogate and to generate reports from standard disk and tape files. A self-teaching form is provided to guide the beginner through basic report formatting. Extended capabilities can then be mastered as needed. Easywriter requests can be initiated via normal system input or remote terminals.

Full ANS COBOL compilation in 32K. The OS/2000 COBOL Compiler requires only

A SNAPSHOT OF OS/2000 IN ACTION





Operator control with OS/2000 and the Type 220-8 CRT Console.

32K of memory to compile all elements of the COBOL language as defined by ANSI in USA Standard COBOL X3.23-1968, except Report Writer. These language elements include the table handling facility, rerun facility, and sort facility. In addition, to enhance OS/2000 communications capability, the COBOL compiler supports a subset of the CODASYL COBOL communications facility. User communications programs can issue COBOL SEND, RECEIVE, and IF MESSAGE statements.

A Call/Cancel facility allows a program to be separated into more manageable parts, so each part can be handled in the language most appropriate (e.g., COBOL, Fortran, EasyCoder Assembler); all parts are then regrouped at execution time. A debugging facility allows the user to set up a debugging algorithm providing access to pertinent information in a source-language orientation.

Dynamic status reporting.

This feature provides immediate or deferred display of vital system status information on jobs now running, jobs queued to run, print/punch output queued for transcription, system resources, and memory maps.

Job accounting. System resources for each job are accounted for and logged on disk as follows:

1. Account identity
2. Job and program names
3. Date
4. Start time, end time, and elapsed time
CP time (on selected processors)

5. Amount of memory used
6. No. of various devices used
7. No. of input cards
8. No. of output cards
9. No. of lines printed
10. Job termination status

Recovery/Restart.

Extensive facilities for recovery and restart include restoring memory partitions according to checkpoint images and repositioning and restoring selected tape and disk files. The user has complete control over the frequency of recording recovery information.

Honeywell compatibility.

OS/2000 is fully compatible with Honeywell's proven and effective OS/200 operating system.

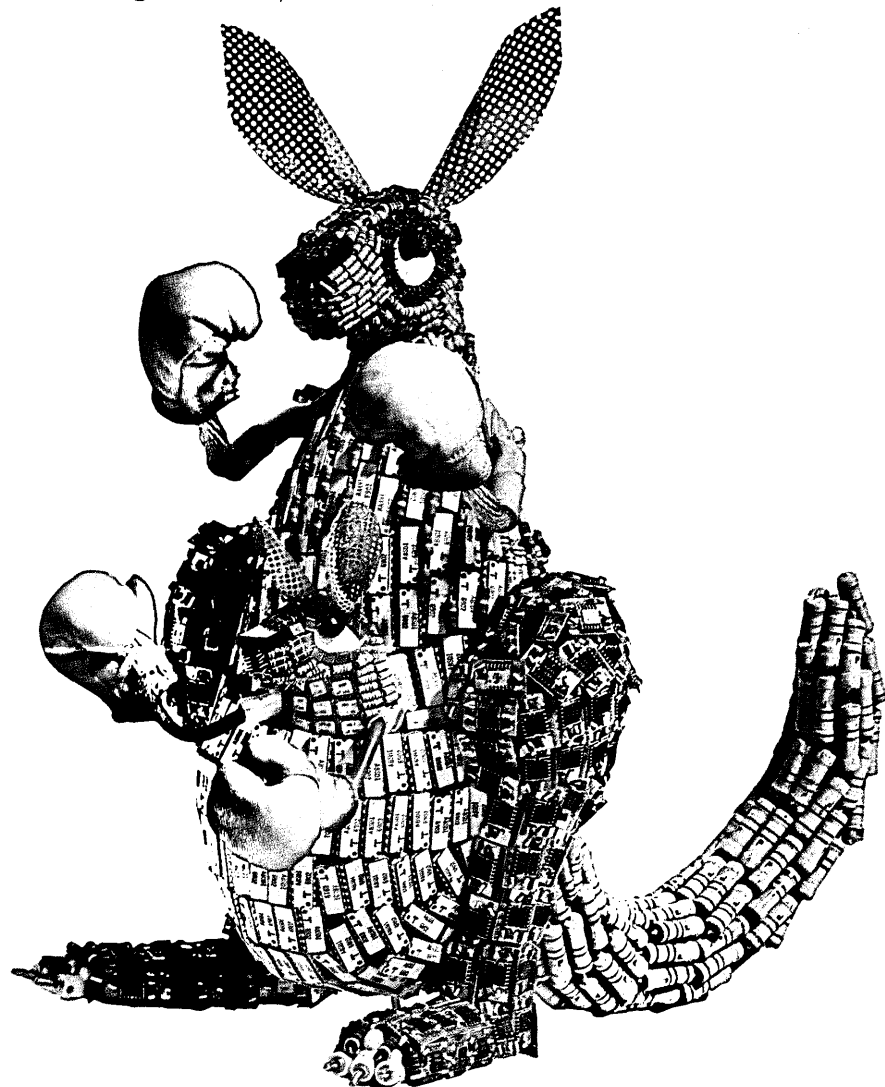
The popular Mod 1 compatibility features of OS/200 are also included in OS/2000. Most programs written for Honeywell's Mod 1 Operating System can run without change under OS/2000.

The benefits of OS/2000 design integration are also available with medium-scale Series 200 systems starting with Model 1015.

Competitive compatibility.

Higher-level language compatibility is offered in COBOL, Fortran, and RPG. And I/O compatibility is provided with 9-track tape peripherals. Whether you're currently using IBM, Burroughs, Univac/RCA, or NCR equipment, informative guidelines and a range of conversion aids are provided in the following areas:

- Language Translators (COBOL, Fortran, RPG)
 - Data File Transcribers
 - Utilities (card, print, and tape)
- Simulators are available for IBM 1400's and 7000's, Burroughs 100/200/300/500 series, and Univac 1004. And we have a Conversion Technology Center to act as a focal point for the distribution of all aids in converting to Series 2000. Check 288 on reader service card.



Responsive data communications: DATANET 2000

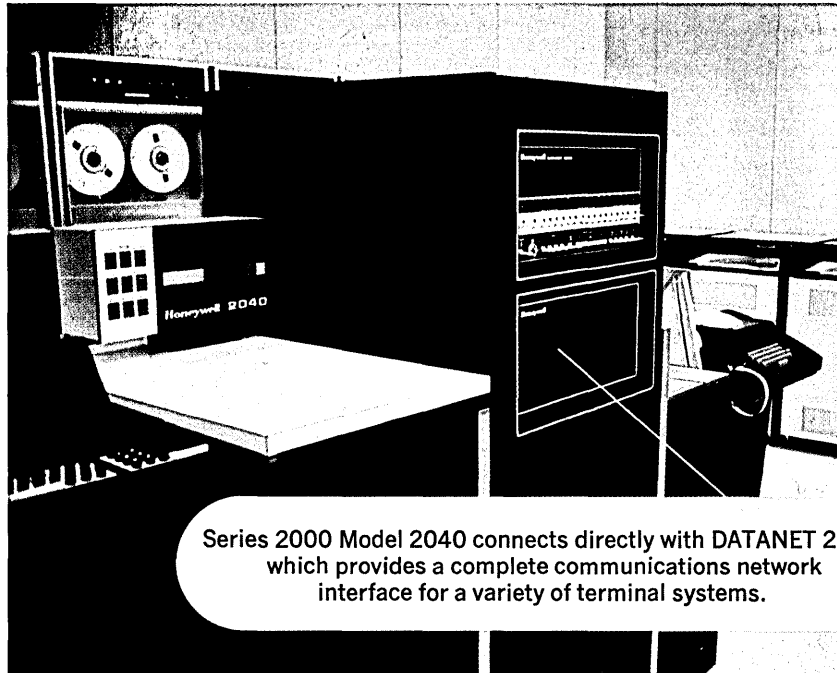
The sophistication and productivity of large-scale data communications comes to the medium-scale user through the distributive power of DATANET 2000.

Communications benefits:

- **Throughput** – off-loading of the CP with front-end control of communications functions increases computing capacity and information throughput. Network operation through DATANET 2000 can accommodate more activity faster.
- **Power** – a fast, self-contained programmable miniprocessor expedites data handling while multiplexing up to 120 lines.
- **Flexibility** – front-end processing (FEP) software can support a vast range of data communications terminal and line requirements.
- **Simplicity** – the burden of communications control rests with DATANET software routines for such tasks as monitoring, conversion, and transmission. User SEND/RECEIVE statements in COBOL initiate transmission.
- **Reliability** – solid-state big-board technology with loop-back testing and longitudinal and cyclical redundancy checks ensure high up-time and data integrity.
- **Efficiency** – You can stabilize data processing costs because DATANET 2000 brings large-scale data communications to you without the cost of a large-scale mainframe.

A communications package

Information processing using data communications can offer tremendous payoffs with the right combination of system elements. It is essential that the hardware and software elements of the system be integrated and controlled. DATANET 2000 offers this approach with an advanced miniprocessor for network and CP interface that comes complete with software to integrate and control the overall system.



Series 2000 Model 2040 connects directly with DATANET 2000, which provides a complete communications network interface for a variety of terminal systems.

The DATANET 2000 has a memory processing unit and I/O facility of its own. Its extremely fast cycle time of 385 nanoseconds per byte coupled with a set of 75 instructions provide effective data handling, control, computing, byte-handling, logical, shift, and I/O operations. A basic memory of 24K 8-bit characters is expandable in 8K increments up to 65K with an optional 512K characters of storage on a high-speed fixed-head disk.

High-speed CP interface is via an 83KC read/write channel directly connected to the Series 200 or Series 2000 mainframe. To interface the network, a basic communications controller provides multiplexing for up to eight lines operating at up to 10,800 bits per second. Line control is expandable in 2-line groups up to a maximum of 120 lines.

DATANET 2000 software provides the crucial controlling and interfacing that put the system in motion. Off-loading the information processor, the FEP's resident monitor performs the code translation, queuing, polling, and

error handling normally included as CP overhead. These activities are performed by FEP hardware and software so that only message content is forwarded to the CP. Data transmission commands to the FEP interrupt routines take the form of Series 2000 COBOL SEND and RECEIVE procedure calls.

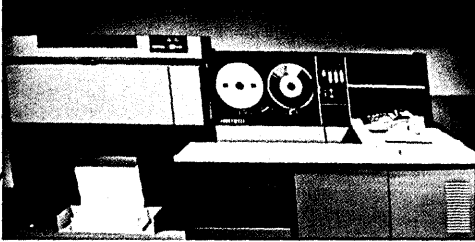
Standard FEP interrupt routines handle incoming and outgoing data and maintain message queues in memory or on the optional fixed-head disk. Errors are handled by FEP software. Communications system initialization and loading, linkage to the CP, and operator intervention capabilities are also functions of the FEP software.

Honeywell has been installing data communications systems for years. Our DATANET 2000 concept offers an extremely simplified, low-cost way to increase your information processing capability dramatically. We've made it easy for you to have DATANET processing regardless of the terminals you are now using.

DATANET 2000 can interface most popular teleprinter and voice-grade terminals including

- Teletypewriter Models 33 and 35
- Honeywell 700 Series CRT's
- Honeywell Type 2440 Remote Transmission Terminals
- IBM 1050's
- IBM BSC-oriented equipment

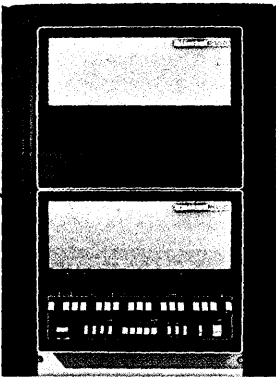
Check 289 on reader service card.



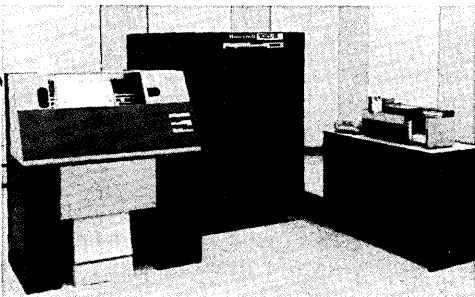
Honeywell's KeyNet key-to-tape data entry/communications terminals come with varied attachments such as a line printer, adding machine, and automatic program loading feature.

Communicates at 2000 bits per second.
Rental Range - \$237-317. per month

Check 290 on reader service card.

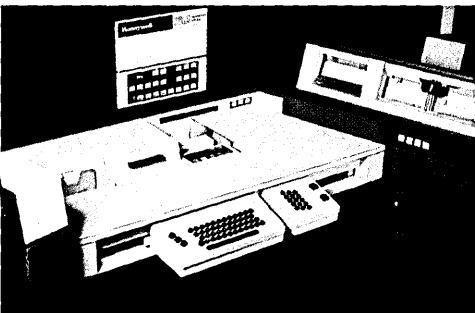


Honeywell's family of minicomputers provides high-speed computation and I/O for a variety of communications and control applications.



Our Model 5 remote batch terminal offers 4 to 12K bytes of memory and a variety of card, print, tape and disk peripherals. Communications speeds can vary from teleprinter-grade to 10,800 bits per second. Rental Range - \$838-2,700. per month.

Check 291 on reader service card.



Our Model 58 can serve as a satellite system for transaction or batch activities supported by 5 to 10K bytes of memory, card equipment line printers and disks (up to 11.5M bytes of storage). Communicates at 2000/24000 bits per second.

Rental Range - \$848-2,400. per month.

Check 292 on reader service card.

Minicomputer systems for communications and control

Honeywell can expand your computer into an information network. All it takes is a self-contained, functional minicomputer system working with your mainframe. Honeywell minicomputer systems provide reliable, high-speed communications and control capability that you can use in a variety of ways to meet your specific applications:

Production Line Control - Minicomputer systems sense real-time operating control data directly from critical points on a production line to provide control information for the line as well as corollary data to affected departments. Result - improved productivity, real-time control, and better data distribution.

Inventory Control - Inventory transactions are recorded by remote CRT terminals and concentrated onto fewer high-speed lines for transmission to a master inventory data base for updating. Result - real-time monitoring and display of inventory status.

Reservation Systems - Multiple minicomputer systems collect data from CRT terminals operating at low speeds then concentrate and edit the data for high-speed transmission to the mainframe-resident reservation scheduler. Result - world-wide reservation verification instantaneously at reduced line costs.

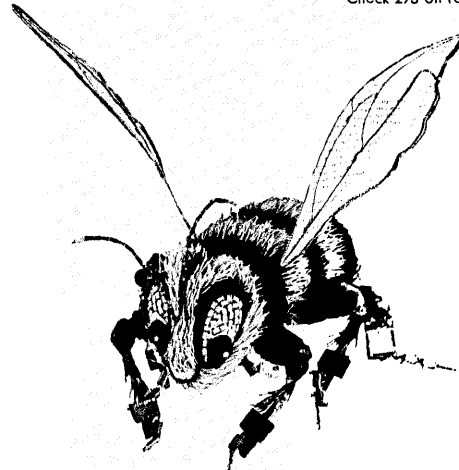
Credit Verification - Credit information is collected from terminals via minicomputer systems for forwarding to a mainframe for processing. Result - a significant reduction in communications line costs.

Sales Order Processing - Sales information is accumulated by a minicomputer system serving several sales offices. Sales information is sorted by product and orders are transmitted to a warehouse for processing. Hierarchies of minicomputer systems then consolidate data from sales regions for centralized management reporting. Result - faster order cycles, improved inventory control, and timely sales analysis.

Program Development - Minicomputer systems with card and disk peripherals are placed at strategic remote locations for program testing and debugging. Allows pretesting on site before remote batch entry to mainframe. Result - increased programmer and mainframe productivity.

Over the years, Honeywell has installed minicomputer systems for all types of companies, and we've developed the communications and control software to help in just about any application you have in mind. And our minicomputer systems can communicate in binary synchronous mode, so you'll find them right at home working with IBM 360/370 systems.

Check 293 on reader service card.



Another measure of response from The Other Computer Company

Industry-specific application packages

Response/2000 relates specifically to the user's business environment. Honeywell's industry-specific system designs and pre-coded packages for various industries have capitalized on this approach and enjoyed wide acceptance. Series 2000 adds even more meaning to our proven approach.

Manufacturing. Honeywell's Factor, a management information system for manufacturers, adds several new dimensions with Series 2000. Manufacturing applications available reach into important areas such as management sciences, numerical control, production scheduling, and inventory control. Many of these tools can now be tied together in a data communications and data base environment for increased efficiency and productivity.

Check 294 on reader service card.

Banking. Series 2000 and OS/2000 support a full array of peripherals and terminals for banks including extensive MICR capabilities and an advanced 700 Series of high-performance CRT devices. Honeywell's long list of banking packages plus the data communications and Central Information File (CIF) capabilities available with Series 2000 can significantly increase your bank's information processing capacity.

Check 295 on reader service card.

Health Care. Honeywell's total involvement in the health care industry resulted in the Hospital Computer Sharing System (HCSS). HCSS handles complete patient administration and accounting functions for one or more hospitals. Series 2000 and DATANET 2000 add a new dimension of data communications productivity to such a system.

Check 296 on reader service card.

Distribution. Honeywell application systems for distribution control center on MI•DIS, a system design for total control of all distribution functions. MI•DIS offers many subsystems such as

PROFIT II, for total inventory control, and Vehicle Scheduling, for fleet control. Response/2000 broadens the MI•DIS concept with data base and data communications techniques.

Check 297 on reader service card.

Real-time service network

Honeywell has built a solid reputation on the ability and responsiveness of its team of field engineering representatives. In over 200 field offices in the United States, over 3,000 field engineers apply themselves in installing and maintaining as many as 550 different product line items.

Each field engineer reflects a complete background of education, training and experience. Such individual capability is complemented by a sophisticated real-time service information network with: ALERT – a system that notifies field engineering management of any problems not resolved within a predetermined time. So, additional resources can be coordinated to solve the problem quickly.

RAMP – a reliability assurance maintenance program for computing the preventive maintenance needs of each product and then developing a schedule that takes into consideration customer constraints. The result is efficient preventive maintenance and better systems availability.

FIRM – a centralized inventory ordering and control system to

ensure sufficient inventory levels at all field locations.

The success and capability of this service arm of Honeywell is demonstrated by the demand for our specialized force of engineers who maintain the equipment of many smaller manufacturers in the computer industry.

Check 298 on reader service card.

A Computer Company you can believe in

Honeywell has a history of success stories, not the least of which is our recent acquisition of General Electric's computer operations. This merger made Honeywell Information Systems a powerful international organization with nearly 12,000 computer systems installed worldwide, over 10,000 field support people, and almost 50,000 employees overall.

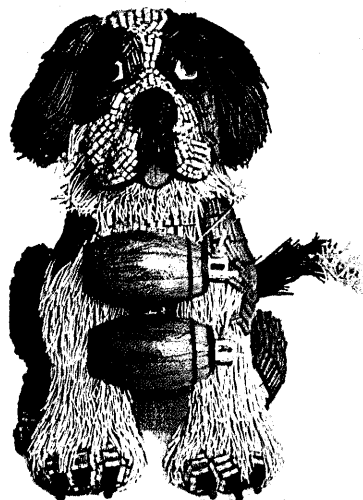
We offer products in all industry categories from printer ribbons to huge Series 6000 multidimensional processing networks. Our vast software and applications systems resources are proven user benefits that come to you without additional charge. Our business and industry services such as time-sharing, remote batch processing, contract programming, and computer time are offered worldwide.

Basic customer education programs are available at no extra charge through Honeywell field education centers throughout the country. Tuition-based education courses are offered to the general public through Honeywell's Institute of Information Sciences, with education centers in Boston, New York, Chicago, Detroit, Atlanta, and Los Angeles.

Check 299 on reader service card.

Honeywell Information Systems has grown, because we have learned that our growth depends on our ability to be responsive to you. Response/2000 is committed to this concept.

For more information about any product or service, check the reader service card or just drop a note to Honeywell Information Systems (MS 061), 200 Smith St., Waltham, Mass. 02154.



Respond

Also Sprach von Neumann

ments staffed and trained in the expertise of losing invoices and muddling paperwork. The small company, dealing with such massive and terrifying bureaucracy, is often placed in a severe and sometimes near-fatal bind. We encountered such difficulties rather too often than was healthy for anyone prone to ulcers.

Where's the money?

One example of the horrifying facts revealed itself in the actions of an electronics company of apparent high repute which failed to pay its bills for a period longer than six months. Though the amount was a small payable to the customer, it was a hell of a big receivable to us. After numerous quiet inquiries, we finally managed to raise our corporate voice to what we thought was a reasonable representation of a strident tone. After much mucking around of the "who's scaring whom?" variety, we were ushered into the august presence of the financial vp of our large customer. This flinty-eyed fink calmly informed us that we could either settle for 75 cents on the dollar, or we could wait longer. We settled. At no point was there argument about quality or delivery. It was a squeeze play, pure and simple, and we were a perfect squeeze. From episodes like this we learned to do better next time.

Education in the way the world often is came in most undesirable form from the customers in which mutual receivables were involved. It turns out that there is a vast difference between Mr. Small owing a big company money, and the big company owing Mr. Small. In the former case, Small is given to understand that his offense is probably several degrees beyond high treason, and that debtor's prison ought to be revived in the land. Where the big company is able to do some real arm twisting, like shutting off an essential service, you can bet your left arm it will be shut off, and promptly too, regardless of the fact the payables end of the same company owes you 15K, overdue.

Experience is a great revealer, if not always a great teacher, and as time passed, I learned some of the chicken infighting tricks to use in my own behalf. When the Electronics Customer Company owed us 20K, and was vastly overdue, I began calling the president every 15 minutes. He was always alleged to be "in conference," or on the airplane, probably between Sioux Falls and Albuquerque or else between East Orange and Deer Lodge. After a month of this bull, I began to get more

desperate. A friend of mine with a big office in a friendly big company got me a D & B report on Electronics Customer. Most of the facts it revealed were of no use, but one was. There was a bank president, Mr. A., on the board of Electronics Customer. I started calling the executive vp of Customer, and finally, by disguising my voice, got through to him on a Saturday morning at the local golf and country club. I informed him in high dudgeon that we needed to get paid immediately, or we would be forced to call Mr. A. and ask him to pay us. The check arrived three hours before the next airmail.

But the outstanding collection feat of a small company was that credited to my friend, Moose Clawhammer. Moose ran a small, starving company called Clawhammer Service Industries International, and he did odd jobs for big electronics firms, including sweep the floor if it paid. Moose was in a big sweat because he had a badly overdue receivable from one of the biggies, and it was about to send him down the tubes unless he could do something.

Even though Moose is about seven feet tall and five feet wide, and uglier than a bull gorilla, he can be very charming when he has to be. He got on the phone and, with a magnificent

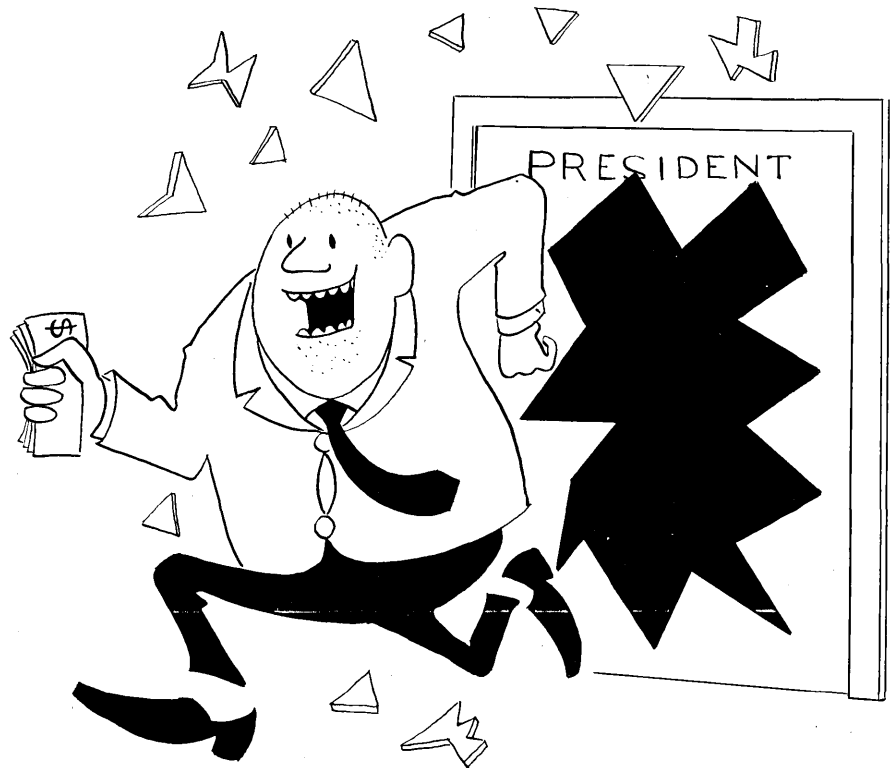
Moose was ushered into the presidential office. He strode across the 70 feet of rich pile carpet, up to the giant Honduras mahogany desk. Moose had his bill clutched firmly in his massive hand. He waved the bill under the president's nose, scaring him half to death, and bellowed in a voice that shook the building: "You son of a bitch! You're killing me! Pay my bill! I won't leave till I get paid!"

And with that terse statement, Moose laid down on the president's desk, the bill clutched firmly in his hand like a lily adorning the chest of a corpse.

The President of Biggie Consolidated came completely unglued. He pressed every button at his disposal, summoning his secretary, the whole executive staff, and the whole security force.

It was a memorable day at Biggie Consolidated. But it was even more memorable for Moose Clawhammer. He got paid.

While affiliations with software companies provided an education in versatility, it did get trying at times, what with things like the remote manager's blues to contend with. After what I considered to be enough years of it, I began to think that it might be



snow job, conned the secretary of the president of Biggie Consolidated Industries into booking him for a friendly social visit with the president to discuss the forthcoming United Crusade to help the poor, ill, and unfortunate. Moose did not add that he considered himself to be high on this list.

When the appointed time came,

fun to work with a real, honest-to-gosh hardware company. With all my hard-acquired, senior-level experience in the wild world of computing, I had never worked in a company that made computers. Maybe it was time to send out the old resume.

(We have been promised a seventh, and concluding, chapter.) □

"READY" is one of many messages INFOREX gives your operators to increase data throughput.

HERE ARE SOME OF THE OTHERS:

CANCELLED
COLUMN ERROR
DBL KEY
END OF FILE
ENTER LABELS
EOT
ERROR
FIELD FULL
IN PROCESS
INTERRUPTED
INVALID KEY
JOBNAME BUSY
LABEL OVERFLOW
NAME USED
NO JCS
NO JCS END
NO PROGNAME
NO RECORDS
NO UPDATE
NOT IN JOBFILE
NOT READY
PROCEED
READY
RECORD < 16
REKEY
STAT NOT C
STAT NOT I
STORED
TAPE BUSY
95% FULL

We built these messages into Intelligent Key Entry™ Systems because we believe a truly responsive system can significantly cut data entry errors and simultaneously increase data throughput. For example:

Our 125-character display screen does a lot more than provide a visual check on the operator's work. If she makes an error in procedure, it tells her exactly what is wrong. Gives her the status of the job at any time. Issues instructions. Lets her resume work quickly and accurately after an interruption.

It helps the supervisor, too. She can use any station to check jobs in process or get a reading on each operator's performance and accuracy at any time.

EXPANDABLE CAPACITY

The Inforex Shared Processor System 1301 is designed to handle

from 1 to 8 keystations. It has a disc capacity of 5,000 user records, based on 125 characters per record, and rents for as low as \$120 a month per keystation.

System 1302 offers a larger disc capacity of 18,000 user records and accommodates from 1 to 16 keystations. Rent is as low as \$101 a month per keystation.

Both systems are completely compatible. Keystation operation is identical. And the 1301 can be expanded to 1302 performance as growth requires.

Write for full data to help evaluate Intelligent Key Entry Systems in your operation. We would also be pleased to have you check with present users on System performance and service. Inforex, Inc., 21 North Avenue, Burlington, Mass. 01803. Offices in major U.S., Canadian and European cities.



CIRCLE 76 ON READER CARD



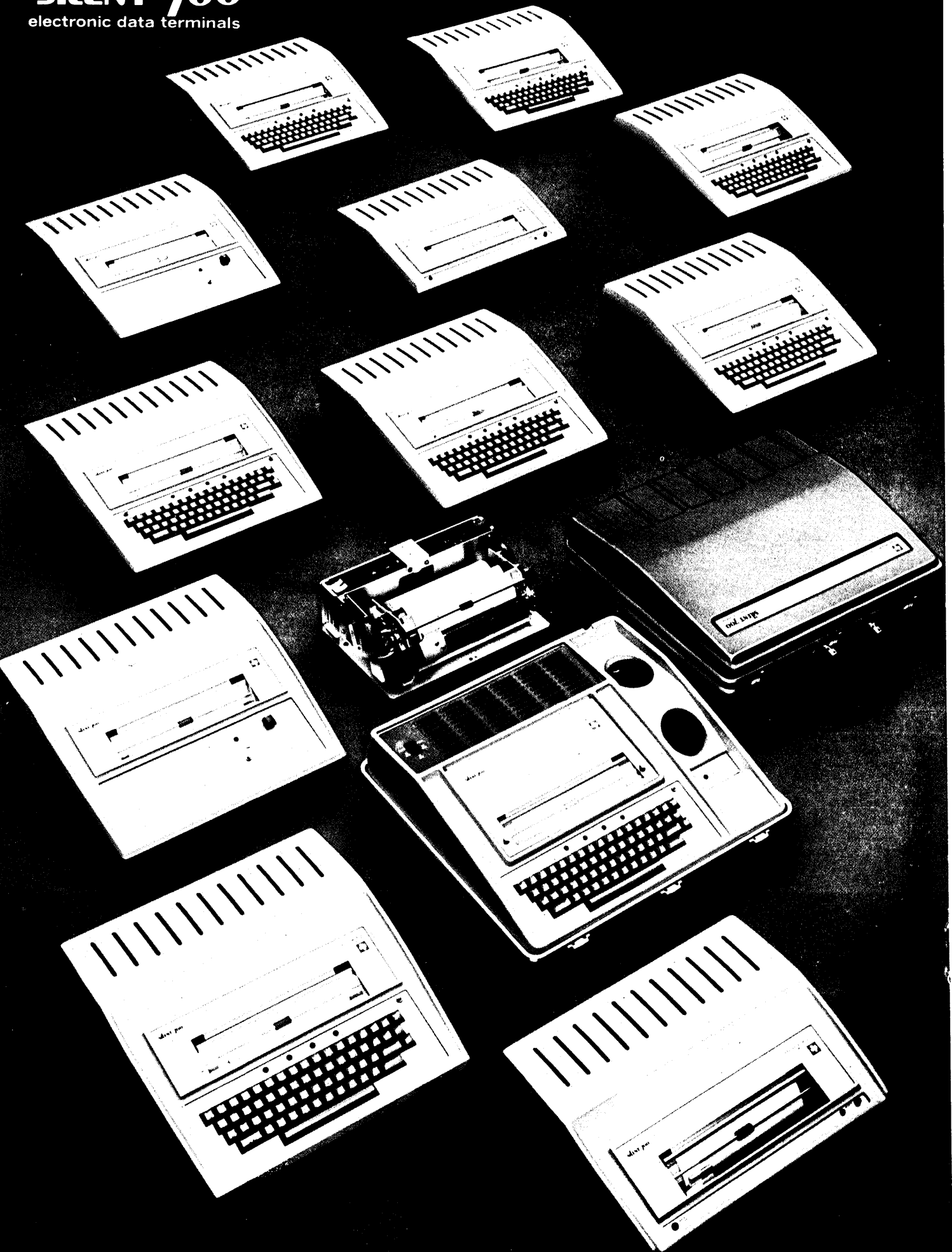
READY

INFORM



SILENT 700

electronic data terminals



30 characters-per-second “Silent 700” terminals

**faster, quieter
and more reliable than
conventional teletypewriters
...and they reduce your
communications line costs.**

*Silent 700** data terminals print at speeds up to three times that of conventional terminals. In typical time-sharing applications, this means less computer connect time and reduced direct distance dial charges compared to 10 characters-per-second terminals.

The reliability of *Silent 700* terminals means further improvements in the efficiency of your system. No preventive maintenance is required. Under normal usage, they will operate

a year with only one or two remedial service calls. And they have a useful life expectancy several times that of mechanical teletypewriters.

Silent 700 terminals operate as their name implies. They are virtually silent ... quiet enough to be used in business offices, banks and hospitals without distraction.

Call the nearest TI office listed below to find out which of 14 *Silent 700* terminals is designed for your job.

Models are available in keyboard teleprinters, hard copy printers, and portable timesharing terminals, with a choice of standard interfaces, options and built-in data sets to tailor a *Silent 700* to your requirement.

All are backed by an established leader in industrial electronics . . . Texas Instruments Incorporated, P.O. Box 1444, Houston, Texas 77001. Telephone (713) 494-5115, ext. 2126.



*Trademark of Texas Instruments Incorporated

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TEXAS INSTRUMENTS
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News in Perspective

Simulation

Modelers Study Quakes, Pollution

Around the world, computer modeling is increasingly being applied to the solution of environmental problems. A mathematical model has been constructed to gain a better understanding of the rising water levels flooding Venice, Italy, and to find a solution to this problem. In Sweden, models will enable environmentalists to study the effects on fishes, and the stuff they feed on, of warm water pumped into the sea from coastal nuclear power plants.

In the U.S., a model that enables air pollution to be predicted was recently announced by IBM. Mitre Corp., in Bedford, Mass., has developed a three-dimensional model of a hurricane. The idea isn't merely to gain a better understanding of hurricanes, but to design a radar system with which to map and track the storms, as well as scouting new ones. What the Air Force's Air Weather Service wants to do is to map a storm's size, position, and water content from the safe distance of 150-200 miles.

Earthquakes are also being modeled. Data from the Rangely oil field in western Colorado has been plugged into a model in Menlo Park, Calif., where members of the U.S. Geological Survey are working on earthquake prediction and modification. A deterministic model under development and refinement there by Dr. James M. Dieterich of the National Center for Earthquake Research brings together both geologic and seismic information, along with visual observations of slippage.

At Rangely, an oil company for the last 10 years has been injecting water into the ground to force more of the oil out. This injection procedure has been creating quakes along a fault that runs through the field. When the pumping was stopped and the water extracted, the number of quakes dropped drastically and then stopped. Several months later, reinjection of water was initiated with the hope that earthquakes would start up again. But the fluid pressures had dropped so low that it has taken them longer than anticipated, and as a result the quakes haven't yet started up.

Data obtained to date, however, has been plugged into Dieterich's model.

"What I've done is to take the friction parameters for the Weaver Sandstone, which is the oil-producing sand, and combined them with stress data from the field and fluid pressures there . . . For the first simulation, I took a very simple and analytic solution for fluid pressure changes along a fault zone, given the rate of injection and the permeabilities of the region . . ." And the model generated earthquakes.

"Roughly speaking, the number of earthquakes in the time interval agreed with the number at the Rangely station," Dieterich says. "That's within a factor of five or so. Something like 30 earthquakes in a period of two months, and between the magnitude of 1.0 and 2.5. That's a little higher than was experienced at the field." Currently, he's modeling the injection rate in an attempt to predict when the quakes should start up again.

Dieterich, who uses finite element modeling, has one-, two-, and three-dimensional models. The latter, he says, must solve 1,500 simultaneous equations for each step in movement — say, along a fault — and go through 50-100 steps for a given simulation. Solving these 75,000 equations requires 20 minutes on a CDC 7600 located at the Lawrence Radiation Lab in Berkeley, Calif.

Earthquake prediction, control

"I'm kind of skeptical about earthquake prediction," he notes. "I think it will be easier to profitably *modify* earthquakes, prevent large ones, than it will be to predict them."

In agreement with this is Professor Morton Duke of UCLA, who says, "In my opinion, it will be 500 years before anyone will be able to predict earthquakes with any useful degree of accuracy." Duke, however, acknowledges that some people are more optimistic than he on this.

But John K. Swearingen, vice president and general manager of Environmental Research Corp., Las Vegas, says, "Earthquake predicting has a similarity to weather predicting. Both deal with natural forces that people have some understanding of." His company, which has two computer models,

studies fault areas and past behavior to estimate the magnitude of future tremors. For any plot of real estate, then, the company will predict how much the ground — or any structure on it — will shake with a quake of a given magnitude.

In Southern California, water is also being pumped into the Santa Fe Springs oil field, where a team from Caltech has installed seismometers to record earthquake activity. But the idea there is to see if so-called microquakes, of small intensity, can be produced artificially in an attempt to prevent large, catastrophic quakes. Data telemetered from the seismometers is fed into a computer at Caltech's Seismological



AIR POLLUTION concentrations of sulfur dioxide over the New York City area during a 24-hour period were predicted to within 15%, or 0.05 parts per million, by an experimental IBM program.

Laboratory in Pasadena, Calif., where a mathematical model of the oil field is maintained.

Can water be pumped into the ground to lubricate a fault so that microquakes replace the big ones? Dr. Charles B. Archambeau, professor of geophysics at Caltech, believes it can. "It is desirable to replace large rapidly occurring movements over large portions of a fault, which result in dangerous earthquakes, by either a series of small movements over smaller portions of the fault or by very slow 'creeping' movements over parts or all of the fault," he says. "The injection of water at depth along a fault may do one or both of these."

Getting together in the computer industry costs less than you'd expect.

Something new in connectors gives you something new in economy for interconnections between peripherals and to mainframes. It's our new AMPLIMATE* connector, which uses gold-plated, phosphor bronze, crimp-type hermaphroditic contacts, with three-point contact to assure high performance.

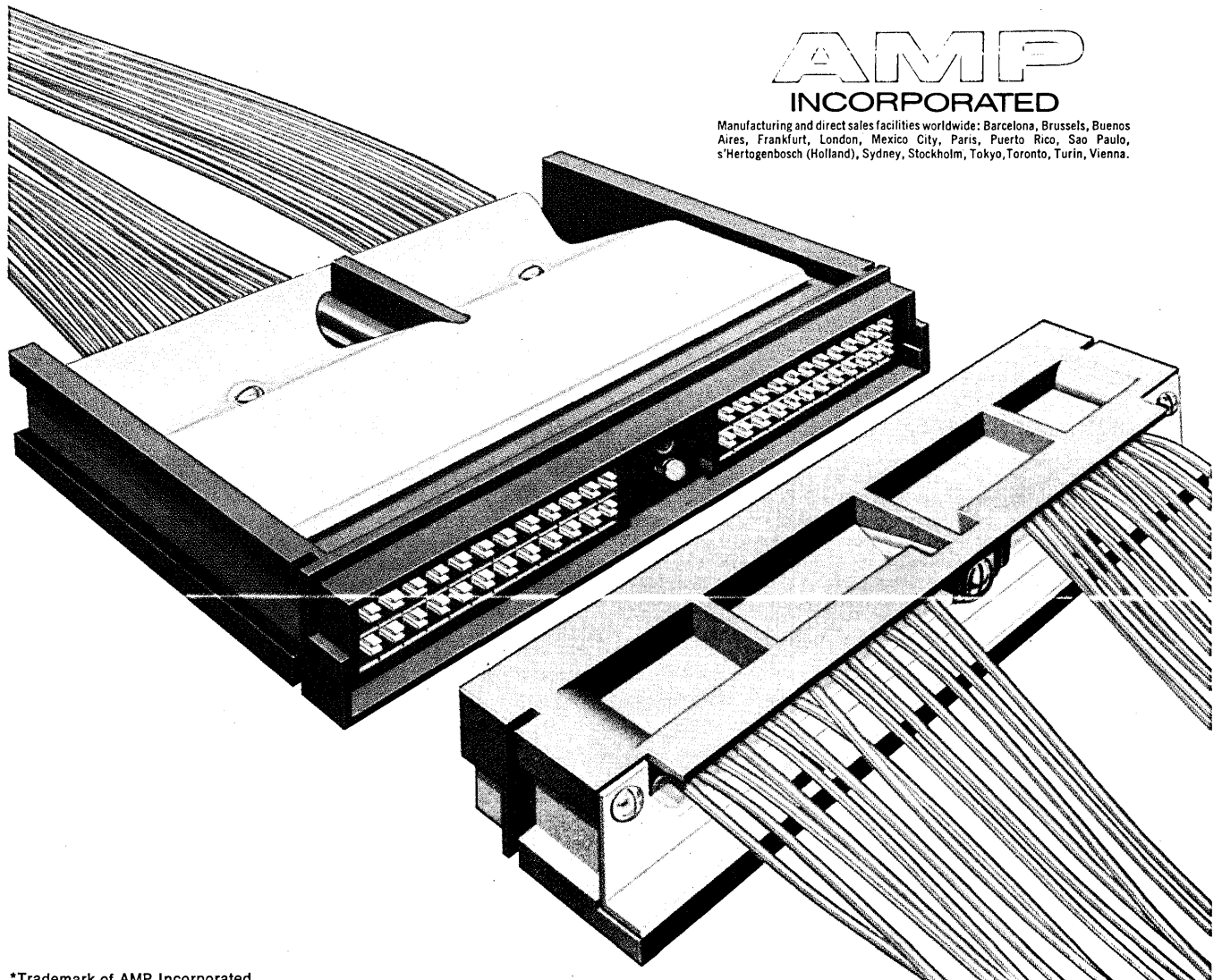
You save on material because of the AMPLIMATE connector's economical price. You save on labor costs, too.

Because you can use our high-speed automated terminated machines instead of manual methods. And you have fewer parts to put together because of our one-piece connector housing construction. No need for heat-shrink sleeves; egg-crated cavities in the housing give you the insulation you need.

And lest we forget, the AMPLIMATE connector not only mates with itself, but also with a 48-position hermaphroditic connector widely used in the computer industry.

Get the facts on getting together, by writing:

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Manufacturing and direct sales facilities worldwide: Barcelona, Brussels, Buenos Aires, Frankfurt, London, Mexico City, Paris, Puerto Rico, Sao Paulo, s'Hertogenbosch (Holland), Sydney, Stockholm, Tokyo, Toronto, Turin, Vienna.

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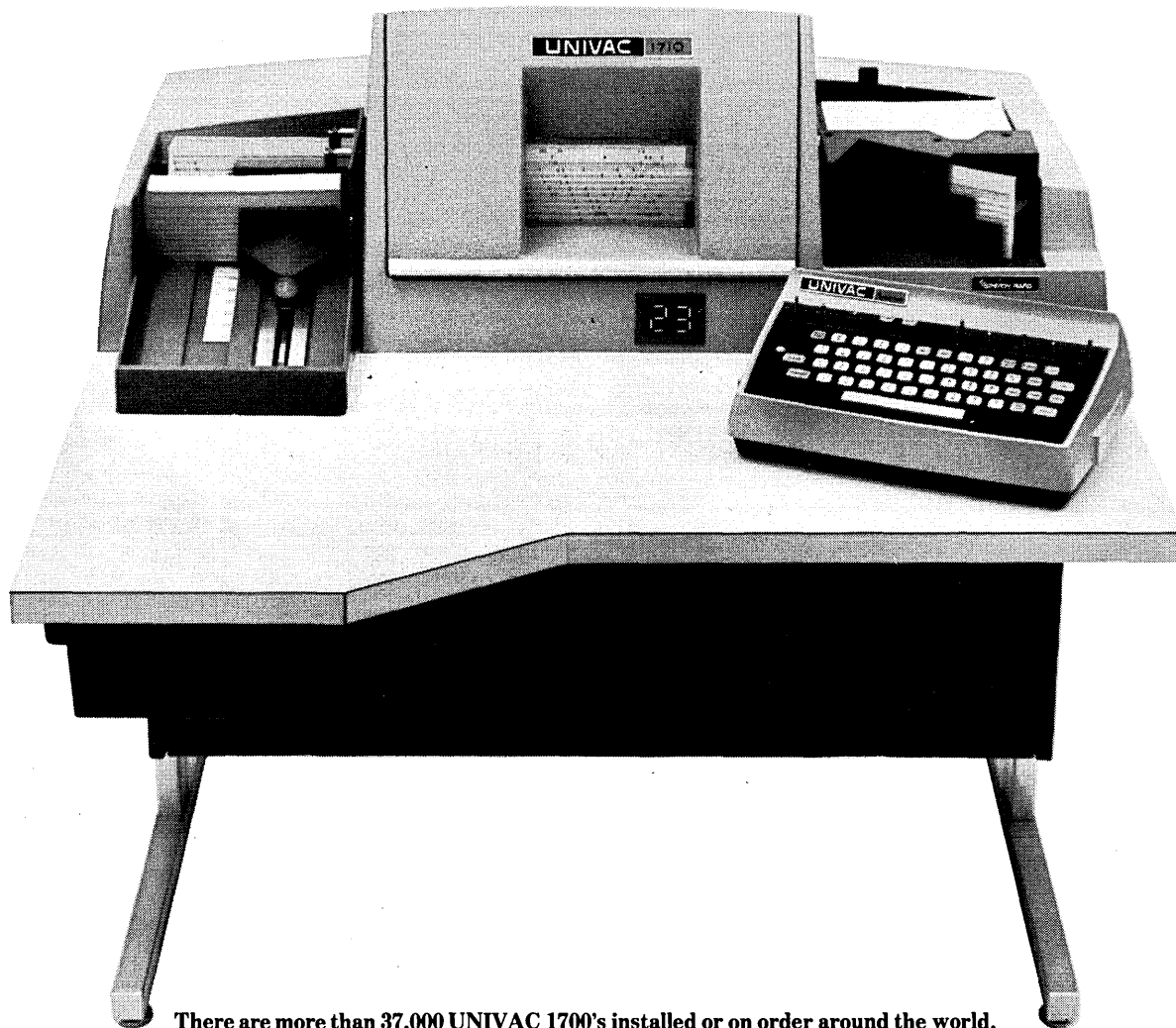
Univac 1700 keypunches. More machine features essential to production.

There are operator convenience features that mean a great deal to total card production. Such features as our auxiliary input, select stacker, fully movable keyboard, and positive program control.

UNIVAC® 1700 Key punches offer them. Competing machines do not.

DP Managers and Key punch Supervisors both should hear what Univac is doing to please operators and make their work go faster and easier.

Why not call your local Univac representative today 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

It makes sense. The famed San Andreas fault that runs for some 600 miles from northern California down to the Gulf of Mexico reputedly moves about two inches a year. That is, the land to the west of the fault moves toward the northwest by that much, relative to the land to the east. Eventually, this movement builds up the strain that could unloosen a temblor. The longer the fault segment that ruptures, the greater the quake. In the San Francisco quake of 1906, which had a magnitude of 8.25, the maximum slip along the San Andreas was about 21 feet. And that represents 126 years of accumulated strain.

With mathematical models, it's also possible to do something about air pollution. Like, predict it. A major pollutant of the air over eastern and midwestern cities is sulfur dioxide, a byproduct of the fuel burned both for heating and to produce electricity. Under certain atmospheric conditions, the stuff hangs in the air and can be worse than smog. It would thus be helpful to be able to predict that tomorrow, or the day after, certain atmospheric conditions over the city portend a heavier than normal concentration of sulfur dioxide.

Enforcement agencies could then reduce operations at or shut down plants and refineries, and perhaps even cut the use of electricity. With this capability, too, city planning agencies could study the effect on air pollution of a proposed power plant or large apartment complex, and attempt to locate them accordingly.

Researchers at IBM's Scientific Center in Palo Alto, Calif., apparently have come up with such a capability. A team of air pollution meteorologists, a mathematician, and a programmer has developed a program that can accurately predict sulfur dioxide concentrations in areas of up to 1,600 square miles. The model and the predictive ability have attracted the attention of the Bureau of Air Pollution Control in Allegheny County, Pa., which with IBM has started conducting experiments.

Obviously, a steady rainfall or a strong prevailing wind will blow away air pollutants. That's how San Francisco gets rid of its smog, much to the chagrin of communities to the south. New Jerseyites blame their polluted air on New York City, Chicagoans on nearby Gary, Ind., and the Dutch even blame the Germans.

But since no one has yet come up

with fans strong enough the blow the filthy stuff out to sea, meteorologists like IBM's Dr. L. J. Shieh are taking a different tack. As the principal investigator on this project, Dr. Shieh takes meteorological data, combines it with an inventory of emission sources, and comes up with a prediction. Factors include predicted wind speed and direction, atmospheric and turbulence properties for the area, and any vertical temperature gradients and inversions. His emission inventory includes commercial and residential buildings that emit relatively low levels of sulfur dioxide into the atmosphere, as well as large contributors like power plants, refineries, manufacturing plants, and incinerators.

This data for New York City was recently assembled, weather predictions for January 11, 1971, were input, and a trial run made. "Our computer-assisted predictions, averaged over a 24-hour period, were within 15% of actual conditions recorded in the area," Dr. Shieh said. The program, written in FORTRAN and run on a 360/50, produced a series of two-hour predictions showing anticipated pollution levels over a three-day period. Each two-hour prediction took five minutes on the computer. Accuracy to within 15% apparently is the closest anyone has yet come. Before this project was initiated, according to Dr. Baxter H. Armstrong of the center, the best anyone had done was to come "within a factor of two."

For Easterners, all this may be comforting news; it certainly has piqued the interest of pollution fighters in Pittsburgh. But what about the lowly Southern Californian, driving his sports car with tears welling in his eyes? Can carbon monoxide be predicted with equal ease? No, says Dr. Shieh. Unlike sulfur dioxide, carbon monoxide bakes in the sun and undergoes a photochemical change. Besides, there's no inventory of emission sources which includes a traffic count of freeways and surface streets. So, if computers can't help, there's still the idea of huge fans blowing out to sea.

— Edward K. Yasaki

Italians Model Fall of Venice

The Italian city of Venice, a unique monument to the development of Western culture, is deteriorating at an in-

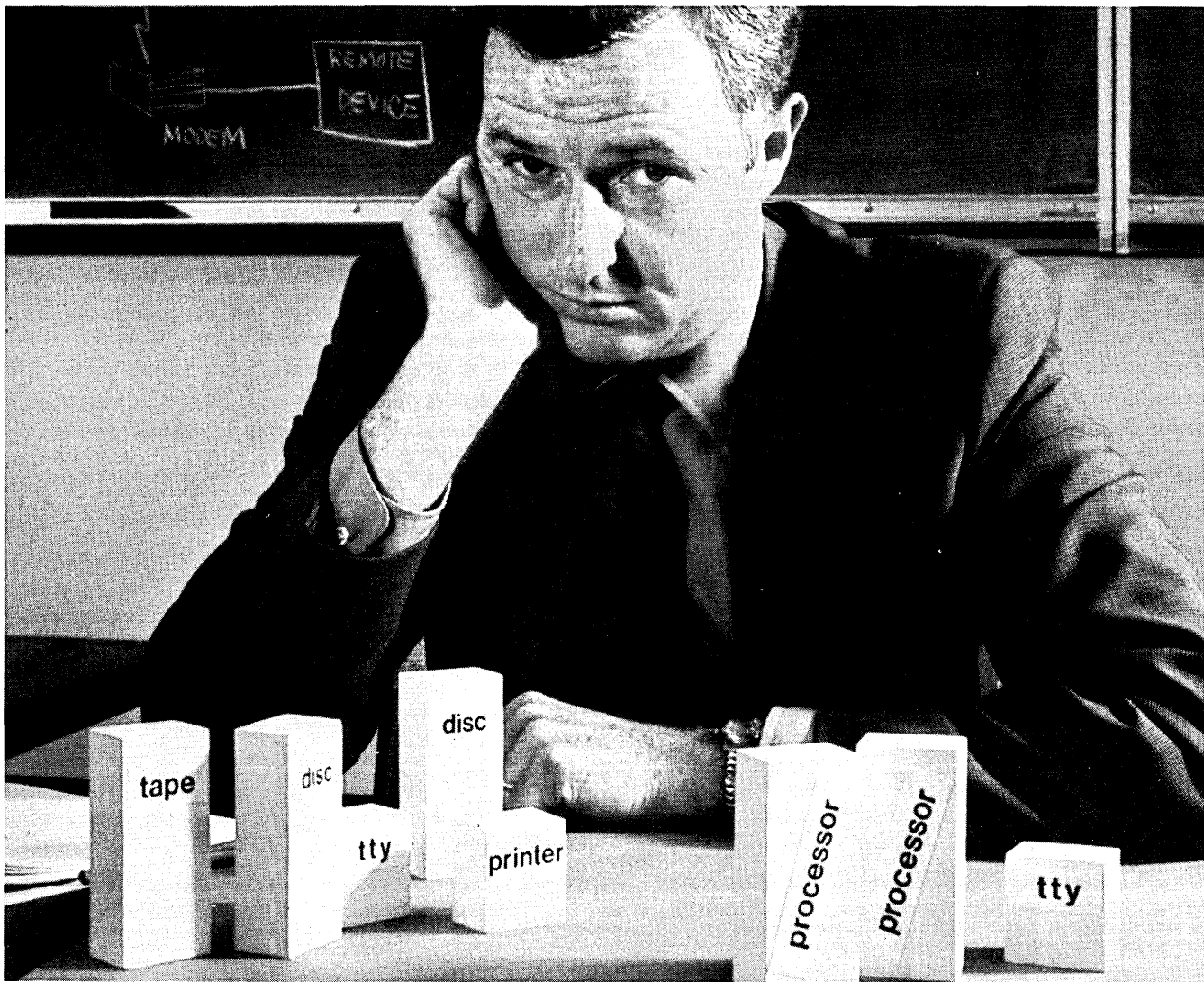
creasing and alarming rate. It is the victim of storms in the Adriatic Sea that flood the city, of air and water pollution, and of land subsidence. But the island city, built in the center of a lagoon, is now the subject of numerous studies aimed at delaying its destruction. A laboratory was set up in the city by the Italian National Council for Research to evolve the necessary mathematical models for the simulation of the systems involved. The computing and programmers are being supplied by an IBM Scientific Center set up there, equipped with a 360/44.

From work with a physical model and field surveys, an assessment has been made of sluice gates to harness the tides and stop the flooding, while continuing to flush and clean the city's canals. One cause of the poor flushing came from an earlier diversion of two rivers that formerly emptied into the lagoon. They used to produce deep channels as they swept into the Adriatic, but their courses were altered to go around the lagoon. Ironically, there are now plans to create new deep channels in the lagoon, but for bigger shipping to get to the industrial mainland. According to the model, these channels would carry chemical effluent across the lagoon in the city's canals.

The current computer model took into account such things as the resistance to wave propagation by friction on the lagoon bottom, the effect of banks and coastal defenses on the hydrodynamics, and the continuous modifications caused by storms and surges in the Adriatic. The model considered the lagoon as a grid of squares, each 200 x 200 meters. This provided more than 12,000 positions, and calculations show the changes that could come from building different types of sluice gates. These predictions also show the associated dredging and channelling needed to reduce otherwise adverse effect of building sluice gates.

With another model, they're examining the cause-and-effect relationship between the sinking of the city and the withdrawal of water from some 50,000 artesian wells in the vicinity. It is a real problem, for the city is sinking at the rate of almost one centimeter per year, 10 times the rate measured 35 years ago. One theory has it that the sinking would stop if the wells were no longer used, but this is discounted by Dr. G. Frassetto, director of the CNR, who seeks to model the water table under Venice and all the way back to the mainland.

This sinking is aggravated by sewage



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COMMUNICATION / COMPUTATION / CONTROL

and garbage dumped into the lagoon, producing sulphides in the water that blacken the walls of building as canals overflow their banks. In addition, the combination of a frequently occurring natural sea mist combines with industrial fumes from the mainland, motorboat exhausts, and heating systems to produce air pollution damage. In practice, all these factors interweave with each other, and in a unique set of climatological conditions they produce a problem of unimaginable complexity.

Companies

CDC: The Joint Venture Catalyst

Control Data Corp. and National Cash Register have come to an agreement in principle that has implications for everyone in the industry . . . in the world. On paper at least.

The agreement, which probably won't be finalized until mid-year, is simply to develop standards and compatibility between their two product lines and to form a third company to manufacture three different peripherals. This is significant, but not yet quantifiable. The third company, as pointed out in the press conference by presidents William Norris of CDC and R. Stanley Laing of NCR, will offer economies of scale and sharing of research and development costs to the parent firms, but initially it is limited to tape drives, punched card equipment, and high-speed printers. Perhaps the venture will offer more flexibility in accounting to them as well.

More interesting is the compatibility effort. Part of this is NCR's planned development and production of a "swing" processor which will bridge the gap between the two lines. Hence, both firms' users may in a few years have a full range of computers available, presumably requiring minimal conversion in the move up or down and obtainable through a single vendor.

Rather than producing a decline in the number of competitors through merger or acquisition — and the dreaded concentration of power — this may lead instead to the strengthening of two companies who have suffered financial setbacks in the last two years. Certainly, they will introduce each other to new markets, directly or indirectly. Control Data undoubtedly bought more time

and leeway from its bank creditors, restless after what third and fourth quarter losses did to CDC's net worth. NCR, whose earnings were clobbered by a 16-week strike in Dayton and a down economy (fourth quarter will show a loss), will unload some of its manufacturing burden and can concentrate on the increasing number of electronic terminals it is announcing. In addition to the third company, NCR is selling its disc drive facility in Hawthorne, Calif., to CDC.

So far it looks good for many, though none can say how good. But what does it mean for the world market, besides two potentially stronger U.S. firms? Think of this. CDC, International Computers Ltd., and Compagnie Internationale pour l'Informatique get together in 1970 to form a standards-development organization called Multinational Data S.A. Then in 1971, CDC and CII agree to develop a medium-scale computer that CII will build and oem to CDC. Then CDC and NCR announce their accord, and at the same time CII announces a joint marketing effort with Germany's Siemens and the Netherlands' Philips (see story below). Now NCR, according

to Donald Eckdahl, vp of manufacturing operations, is considering joining Multinational Data — which, by the way, is

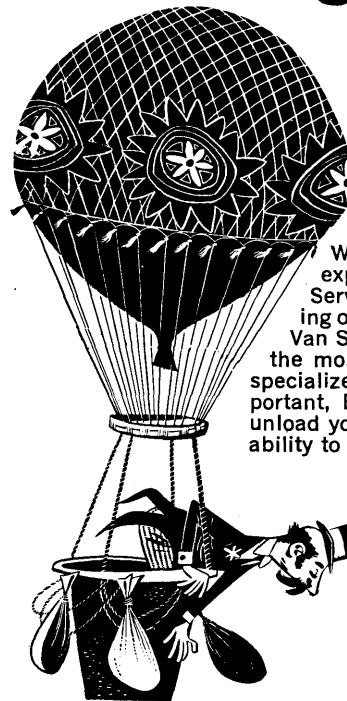
IBM's Thoughts Before the Fact

While no other computer manufacturers would comment on the CDC-NCR agreement, IBM did in effect, in a February 1971 counterclaim against the Control Data antitrust suit. It said two meetings had been held during 1969 between representatives of CDC and those of "another major domestic data processing equipment manufacturer" where cooperative efforts were discussed.

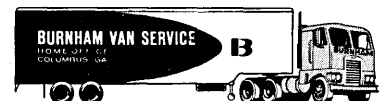
Section 209 of the counterclaim states: "Sometime prior to Sept. 14, 1970, CDC had successfully convinced the same competitor to enter into, according to Chairman (William) Norris, a 'joint marketing operation . . . on the use of big computers in banking systems.' "

An antitrust expert feels the Justice department could obliterate the agreement; but since both firms presented their plans to the Justice department before the announcement, it is likely to go through. □

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currently working on 30 different standards. And it's heard that Siemens and Japan's Hitachi, both of whom were RCA licensees, and Germany's AEG-Telefunken also are considering membership.

Does the computer industry have the makings of a multinational entente that could carve up "spheres of influence" or develop widely used standards not of IBM's making? Or are these merely efforts of small, weak, or temporarily faltering companies — cancellable as each entity sucks in strength or surrenders?

Four factors brought NCR and CDC together, and some or all form the basis for Multinational Data's existence and the various agreements listed above: losses in computer operations, the need for greater economies of scale, the complementary product lines, and the strengths of each in differing technological and industry markets.

Control Data, the catalyst for much of this cooperative activity, has developed one of the largest peripheral-making organizations in the edp industry. It has oem agreements with almost all mainframe makers in the U.S., including NCR, and several abroad, including ICL and CII. In the late 1960s, it concentrated on convincing many oem partners that standards and compatibility were the routes toward strength against IBM. Hence Multinational Data and the CDC agreements with NCR and CII.

CII agreement to change

The current agreement with CII may change, according to CDC's business strategist George Rich, because NCR will provide CDC with the medium-scale computer CII was to make. Rich is hopeful of another arrangement with both CII and Siemens. Compatibility between their lines is still the obvious goal; there is speculation that NCR ultimately may license CII to build the "swing processor" that will be CDC-compatible and emulate other computers.

Establishment of a multinational standard through the cooperation of computer companies in all parts of the world encourages development and manufacture of products in accordance with standards for hardware and software compatibility, as contrasted to the current situation of having to conform to the de-facto standards of IBM in a highly disadvantageous manner. "The independence of each manufacturer is maintained," Norris told the press.

It's clear, then, that CDC is trying to make its line the top end of the lines of several companies. Few firms can afford the cost of developing large-scale computers, and CDC cannot divert its present resources to develop smaller systems — at least not yet, which is a natural fear of many who would join such an "entente." There have been many rumors in the past about a super-computer being developed by two or more European firms, but Control Data has been arguing an increasingly accepted philosophy: Manufacturers must concentrate less on "product uniqueness" and more on developing problem-solving expertise and marketing support for targeted industries.

Meanwhile, in Dayton

How does the CDC accord with NCR fit that neat philosophy? The complement between them isn't simply "cash registers and supercomputers." The core of NCR's base has been banking, retail, and other customers of decades and millions of cash registers and accounting machines past. But despite its late third-generation entry, NCR does

How NCR Could Swing It

NCR's computer designers have been asked to design what they term a "swing" processor in addition to developing the lower end of the new CDC/NCR line. The term swing was chosen because the middle model will hopefully be able to run in three processing modes: totally NCR, totally CDC, or emulation of other manufacturers' machines. NCR will say only that this last mode will include some "obvious" machines. We don't suppose one can get more obvious than the middle of the 370 line.

No one knows yet what the NCR/CDC combine line will look like architecturally, but one thing seems apparent: NCR won't want their precious Century series customers to face massive conversion problems when they try to rise above the Century 300 performance level. The 300 is the top of NCR's current line.

A fairly powerful byte-oriented computer, the 300 has roughly the performance of a 370/155. But it's quite a jump from here to the low end of CDC's 6000 and Cyber series. Even the baby in the 6000 line, the 6200, is rated at 1.2 million 60-bit additions per second, roughly twice the power of the 300. This,

have more than 3,000 Century systems installed in those and other industries, such as manufacturing and hospitals. It is pushing the concept of a total package for various industries, which includes applications software, computers, and a broadening range of electronic terminals for point-of-sale, banking, accounting, etc. (though there are no figures on the success of that push). It does have a customer base developed by its 80 data centers worldwide. Put to the wall, NCR will admit only that there are "lots" of its users who would like to move up past the Century 300, top of NCR's line.

Control Data has been known for its large-scale number-crunchers and an ever-dwindling market among government-funded scientific customers. But it is laying claim to a large-scale data communications and data management capability that transcends the "scientific" label.

Rich claims that many banks, particularly in Europe, are beginning to look to CDC for large communications systems, and similar trends are developing in manufacturing and transportation. Conceding the accomplishment of IBM's PARS package for the airline in-

then, is the gulf that the swing processor will try to fill.

To do it, the designers won't have to push the state of the computer-design art, but the way the pieces will be put together probably won't remind you of any other computer introduced to date. Neither NCR nor CDC has used microprogramming for instruction implementation in the past, but this machine will almost certainly use it. It's known that an NCR design group is current on microprogramming, and that group will probably want to put as much logic in the control stores as possible so the machine will emulate efficiently.

A writable control memory, together with a "floppy disc" arrangement—like that used on the semiconductor models of the 370 line—would seem to be a good bet.

So, technically the machine can be built. Good, fast circuitry is available to the designers, and they'll probably want to make use of it so that no drastic drop in performance occurs when emulating. This, together with the problems of I/O interfacing and file manipulation, will challenge the NCR/CDC design group to build a machine that isn't too expensive. We wish them well.

—M.W.C.

dustry, he claims that IBM does not provide the computer/communications configuration available from the likes of CDC. He says the industry "will be surprised" by CDC developments in these markets.

Perhaps one can begin to see the overlap between the two companies. They've said they will compete with one another, buying each other's gear oem and putting their own labels on it. Legally they can't divvy up markets under antitrust laws. But Rich says that each company is strong in certain markets and can't change overnight — so they will "sell the markets they know best."

How CDC and NCR will operate when they are in the full bloom of their compatibility certainly isn't clear. No technical or delivery time information on the "swing" processor was available at writing. Wall Street sources say NCR is privately saying the processor won't be out for two years. The firms' announcement said that it will operate in three modes — "totally NCR, totally Control Data, and emulation of other manufacturers' systems."

For their future product lines, the firms will use "similar architectural concepts and related software." Both companies have new product announcements due this year. NCR's will be "evolutionary" systems replacing the Century 100 and 200, we hear. One is supposed to be cheaper than the 100 and fall between the 50 and 100 in capability. The second is to be cheaper than, but equal in power to the 200. The company would not comment on whether the machines will use techniques, like microprocessing, which could ease the move to the "swing" processor (see "How NCR Could Swing It").

— Angeline Pantages

International

Europe's Three Join Forces... What Now?

After pussyfooting around for over four years, three of Europe's computer manufacturers have managed to agree on terms on which to join forces. The three partners involve the computer divisions of two of the largest companies in Europe: the Netherlands' electrical and electronics group, Philips, which is ranked about number three in the industrial league table with an employed capital over \$2.5 billion, and the West German electrical engineering combine of Siemens, lying about eighth with \$1.4 billion. Their partner is France's Com-

March, 1972

pagnie Internationale pour l' Informatique, or CII.

Distinguished absentee is the U.K.'s ICL, which has a bigger market base than the other three together. The value of machines installed by ICL is estimated at \$1.2 billion, compared with \$400 million for Siemens, \$102 million for Philips, and \$62 million for CII.

The big surprise came when a reluctant Philips eventually decided to join the grouping. In all the long negotiations during a painful shake-out of the industry, Philips has been cool to respond, even though the progress of its recent expansion into commercial edp is known to be behind market expectations. Nevertheless, it was a last-minute decision to make the irrevocable commitment, and there is no doubt that the restructuring still happening in the U.S. computer industry had an impact on the final meeting on Feb. 1 when the deal was fixed.

As always with a major turnaround, there are more questions raised about problems ahead than those answered about difficulties leading to the marriage. The generic term "computer products" is about the only common denominator a pessimist might find in a quick scrutiny of the product ranges. Among the issues also to be sorted out are arrangements for some working agreement with ICL; the future for Multi-national Data which was created by CII-CDC-ICL for technology exchange between allies in a common cause (the denting of you-know-who); and a decision about who takes responsibility for what.

Joint statements from two of the participants said Siemens and CII would maintain their separate identities in the computer field. For those who have watched the rise and fall of computer empires, this carries an ominous ring. There are formidable political hurdles, for example. Both Siemens and CII have depended for survival on direct financial intervention from their respective governments. Indeed the French, under Plan Calcul, created CII.

The Siemens way

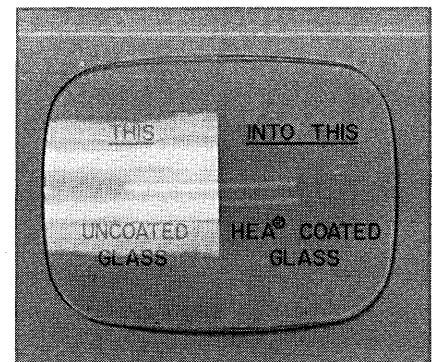
All three arrived at the negotiating table through different routes. Siemens has similarities with GE in the heavy electrical engineering and control fields (but without the aerospace side). In the early '60s the control automation activities gave birth to an edp group. Entry into this field came when IBM had close to 90% of the German edp market. Siemens dropped in-house design work for a technical license made eight years

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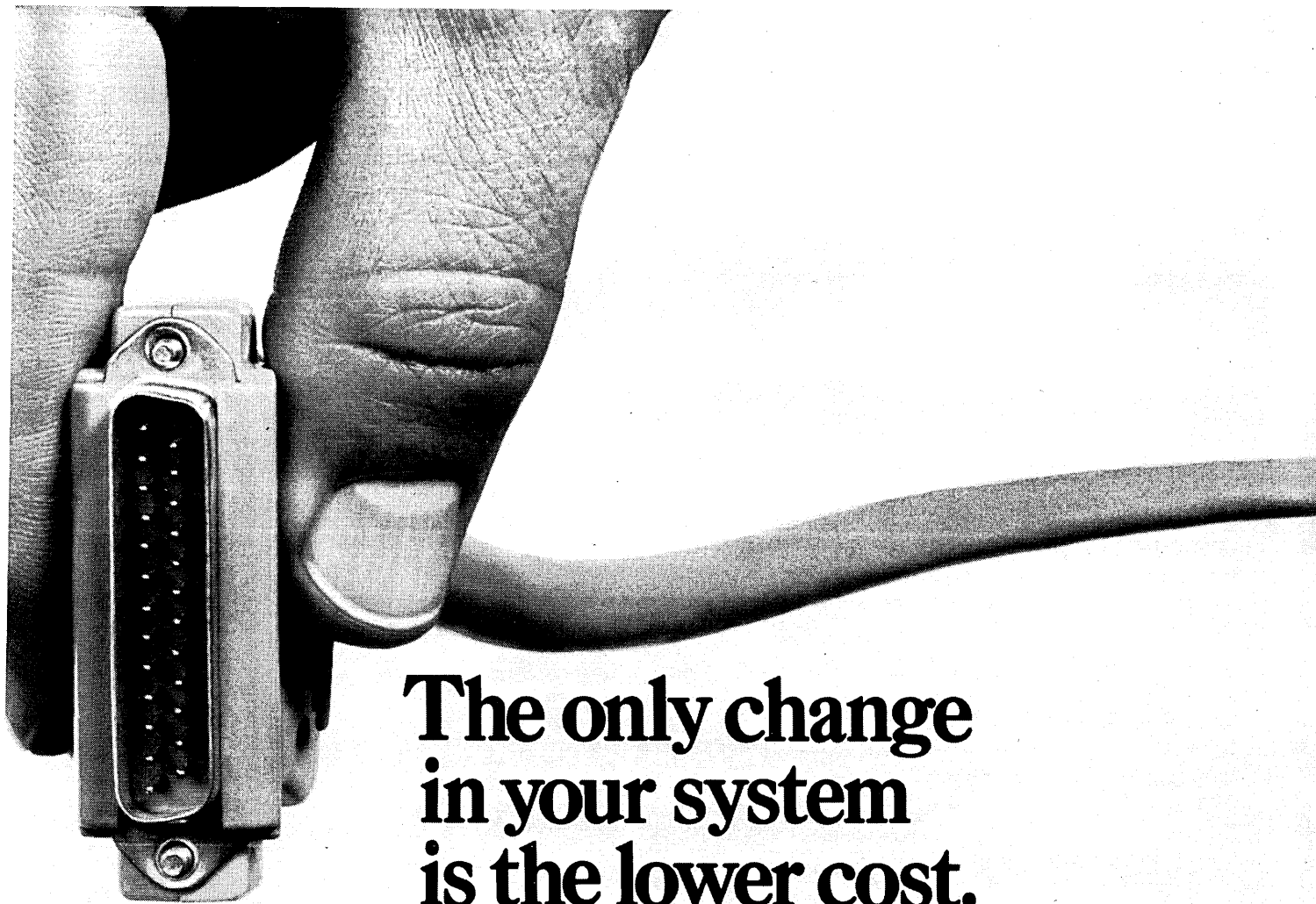
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ago with RCA for Spectra 70.

Initially, quantities of the 70 were imported direct from the United States and factored under the Siemens label. In the process, design modifications covering both the component technology and logic were made when an in-house production line was established. The U.K.'s ICL also concluded a license agreement with RCA for Spectra 70. An interesting aspect of the RCA affair is whether or not a direct development of the overseas market might not have led to survival, or equally, earlier disaster. There are precedents for both to be seen in other corporations.

Between 1967 and 1971 the German government gave research and development grants of \$25 million a year to industry for computer work. It was divided between Siemens and AEG-Telefunken. Since '71 a further \$1.2 million has been earmarked through '76, but it is subject to modification with economic hiccups of the GNP. In fact, there are indicators of difficulties. They are no more than ripples at the moment, but the Bonn advisers have problems in sustaining the German industrial economic miracle as a permanent way of life.

The funds from Bonn for computer development will be conditional. Fingers already have been burned on some overambitious hardware at AEG-Telefunken. So now grants are intended for software, education, and training to the neglect of terminals and data input sectors. Finance groups have been receiving encouragement for development of independent leasing, which has been slow to get off the ground. A government directive was also issued for a planned reduction by '75 of the share of IBM's business in government to 60% from 80%. By 1969 Siemens was estimated to have about 13% of the German market, 2.5% in Benelux, 1% in France, and 0.8% in Italy. Since then — and very much against the trend in European houses — Siemens has expanded its share, moving toward 20% in Germany, where total installations are expected to more than double to 19,800 by 1975-76.

The French connection

In France it was different. True, CII was spawned under de Gaulles' *France gloire* program. But it had roots in the public demise of one of France's greatest companies, Compagnie des Machines Bull, in the late '50s and early

'60s at the merciless hands of the IBM marketing machine. Bull Machines had a punched card base in Europe equal to that of the U.K.'s ICT. One of its early ventures into the computer field was with the then-giant Gamma 60. Many people in Europe cut their teeth on this

Computer Installations in France

1966	1,554
1967	2,173
1968	3,202
1969	4,110
1970	4,939
1970	5,850

great beast. But it was a commercial guillotine for Bull Machines, among other technico-economic failures, to hold, let alone expand, the market base. Just as Siemens turned to RCA for the Spectra 70, Bull earlier licensed the RCA 301 to stem the 1401 flood (ICT did the same in the U.K.).

Apparently RCA had examined both of these companies as possible acquisitions. Neither looked attractive, but later developments showed the licensing method of exporting can have a short-lived term in the market.

The outcome was the GE take-over of Bull Machines to buy a European foothold. It turned out to be an open-ended financial commitment. Yet since Honeywell inherited the Bull group from GE, the French group is beginning to look (ironically) like a new Phoenix. Be that as it may, the blow dealt to French independence in a field in which they should have been self-sufficient was more than enough to conjure up Plan Calcul. Incidentally, the plan has entered its second five-year phase. True, it was far from all pride. Restrictions on big machines de Gaulle wanted for his defense aircraft, missile design and H-bomb calculations made Plan Calcul inevitable.

Creating an edp industry from the electrical and electronics groups was an inherently complicated business. But the nepotistic character of the French industry, with interlocking interests of a comparatively small group of banking houses and industrial families, made it easier in Europe than it might have been elsewhere. The main shareholders in CII are Thomson-CSF, CCE, and Schneider. The product range began with the American SDS series made under license. This is emerging only now and

obviously impacts directly on parts of the Siemens line. So far CII has only 6-7% of the French market.

Philips came through yet another route into computers. This huge European group is entrenched in components and telecommunications equipment throughout the area, and it has a big hold on the consumer durables market in tv, radio, and broadcasting in general. Much of its early experience came with wired program processors for message-switching centers, first in the military and then big civil telecommunications networks such as airlines. There are postal, telephone, and telecommunication authorities also using Philips processors on public networks. As a separate development, Philips Industries produced desk-top electronic billing machines. These business machines developed along more sophisticated stored-program lines as the automatic data processing world grew.

The difficulty has been in reconciling all these different interests into a composite group. At one stage the small Dutch firm Electrologica, with a superb reputation in the scientific field in Europe, was bought by Philips. This was followed by the acquisition of a visible record system from the German firm Siemag and the ultimate grouping for edp development as the Philips-Electrologica division.

Although differing from CII and Siemens in not relying on government handouts, Philips' grip on 8% of the Netherlands computer market and little elsewhere shows the vital role played by governments.

Unkind though it might be to suggest, anyone seeing a job advertised for a product planner to this new grouping may well be advised to book a psychiatrist before taking the job.

Planning problems may be what Multinational Data — the ICL-CDC-CII portmanteau company — encounters also. (To add to the complexity, this company is headquartered in Brussels.) The purpose of Multinational was to find the development requirements of the three parents which could be shared to avoid wasteful overlap. With the regrouping of interests, the role of Multinational, if it is to continue to have one, is as a focus for anti-IBM philosophy. In fact, ICL sees this organization as providing an alternative to the standards imposed by IBM.

The overall direction of the Siemens, Philips, and CII grouping appears to be along the lines of IBM-type architecture. Deliberately, ICL kept away from the trend set with the 360 by producing the

news in perspective

1900 series; and the production of an emulator for the 1900 in the depths of IBM is as much a compliment to the one as it is a measure of some hurt felt by the other.

In the next range coming through the development shop, ICL is designing to bridge the incompatibilities of existing series, while still retaining independence. Their view of being trapped into copying IBM technology is to have self-imposed a two-year technology penalty.

At the moment, the three-way link between Siemens, CII, and Philips looks scarcely cohesive enough to disturb IBM. But combined efforts with Multinational Data might produce a ripple.

— Pearce Wright

Guarantees Change on Leases Abroad

Exporters of dp equipment will find the Export-Import Bank's new lease guarantee program particularly appealing. Encompassing both full-payout and non-full-payout leases on new or used equipment negotiated by U.S. firms with overseas customers, the program pays the lessor enough to cover virtually all of his loss when due to lessee defaults. This includes interest on the lost investment.

The bank offers guarantees protecting the lessor against "political" and "comprehensive" risks. Political risk coverage protects the lessor against loss due to war, expropriation, and inability to convert or transfer local currency. Comprehensive coverage insures the lessor against these political risks, plus the more mundane possibility that the lessee will go broke before he pays off his contractual obligation.

If the lessee defaults on a full-payout lease, the lessor recovers an amount equal to the original value of the leased equipment, less whatever has been paid by the lessee up to that point. In addition, the lessor collects about 6% interest on the money he has lost (specifically, he collects the Treasury rate for similar maturities, plus 1%). For non-full-payout leases, the terms are basically the same except that the lessor's retained interest in the equipment is subtracted from total equipment value, along with lessee payments up to the time the default occurs.

The new program succeeds an earlier one which excluded non-full-payout leases and didn't insure the lessor against loss of investment interest. Also,

March, 1972

an Eximbank lease guarantee could not be transferred if the lessor sold the related contract to someone else. This provision has been eliminated, but some others remain. As in the past, Eximbank will not guarantee leases negotiated with customers in Eastern Europe and in about half a dozen other countries which have defaulted on their obligations to the U.S. Also, the term of the lease must be limited in order to qualify for Eximbank protection. Equipment valued at \$150K or more can be leased for no more than five years; if the value is between \$25K and \$150K, the maximum lease term is four years; and below \$25K, it's three years. Used equipment leases will be insured for no more than 85% of the original equipment value.

Management

IBM Restructures, Trims, Shuffles

Like many of the major manufacturers today, IBM has been restructuring and trimming its organization and shuffling the positions of its key executives. In January, it broke its Data Processing Group into two operating groups — one for marketing and services, the other for development and manufacturing.



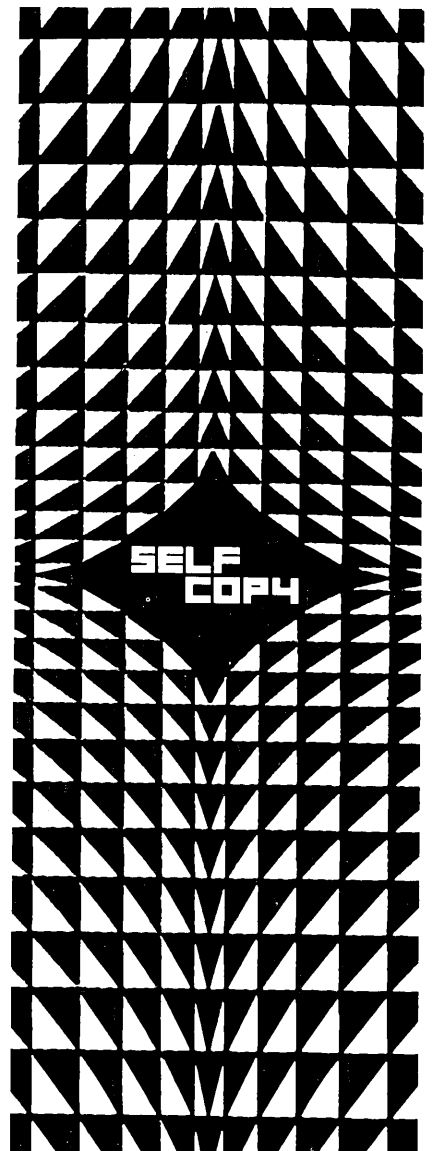
McKay



Opel

And the power was shifted from the hands of one man, George B. Bietzel, formerly group executive of the DPG, to two men: Dean McKay, senior vice president and now group executive for marketing and services; and John Opel, senior vice president and group executive for development and manufacturing. Bietzel, recently appointed senior vice president, moves over to head the Office Products, Federal Systems, and Information Records divisions, as well as Service Bureau Corp. and Science Research Associates.

Board chairman T.V. Learson explained the new organization this way:



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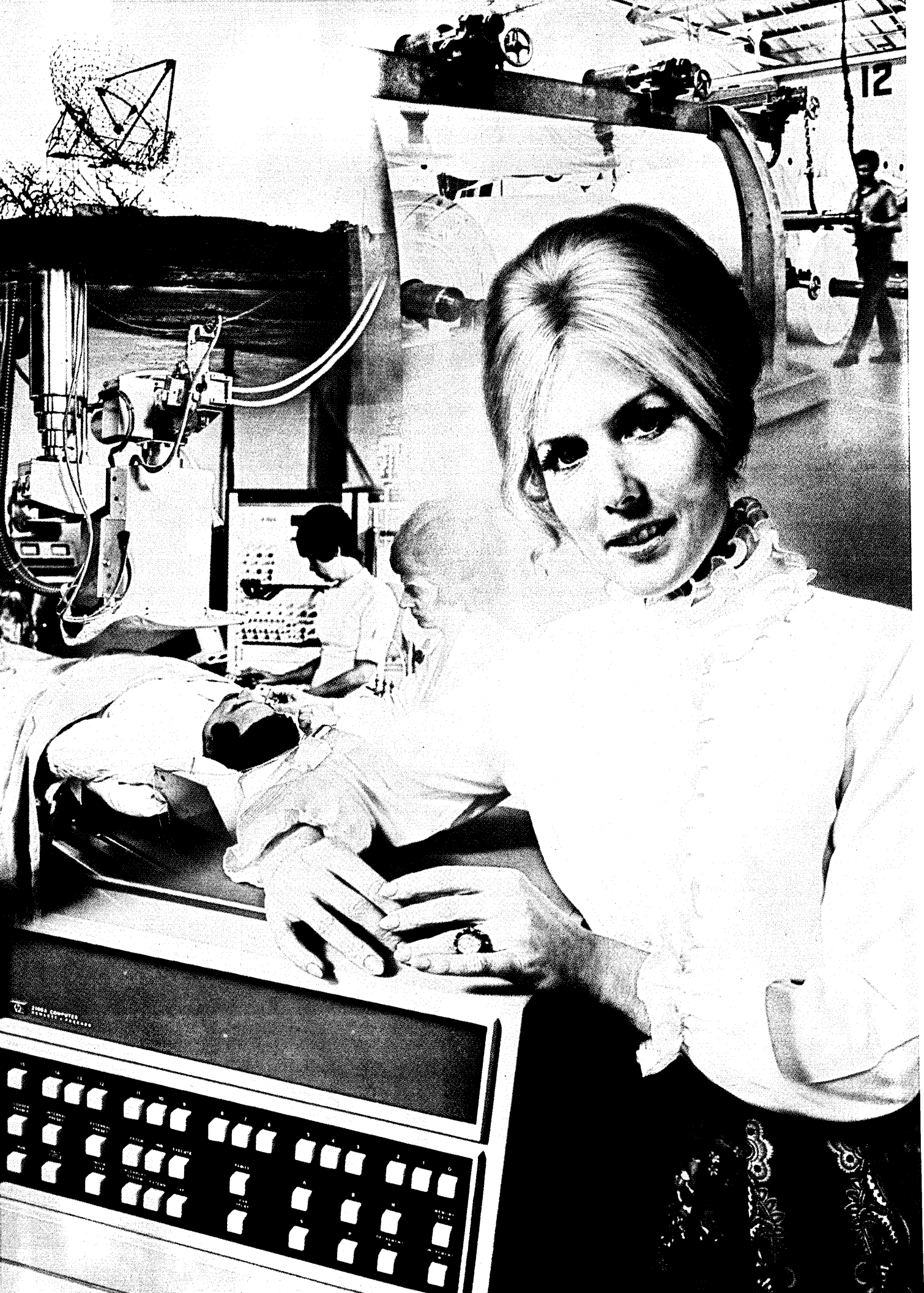
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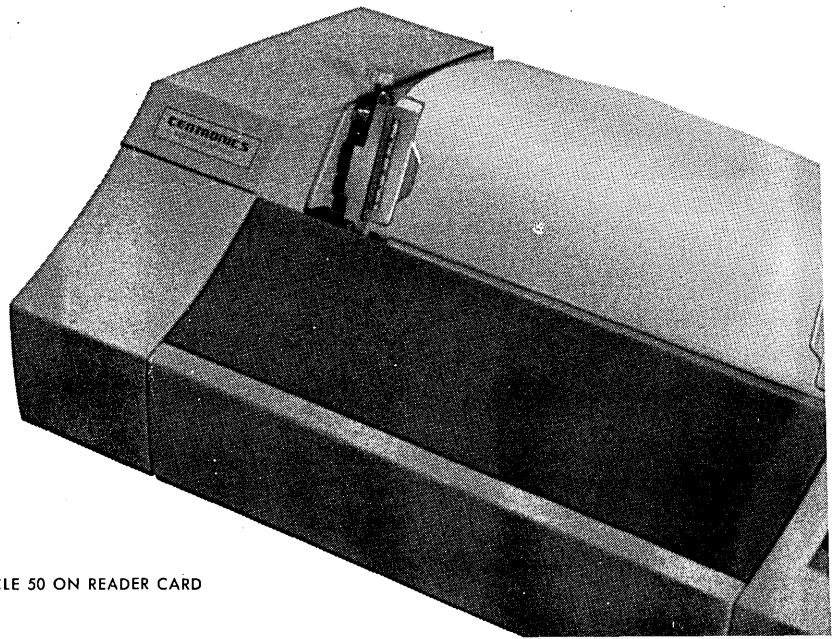
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news in perspective

"With the marketing group we shall step up the effort in customer applications development to take advantage of new and developing opportunities with a wider use of advanced computer products. Establishment of the development and manufacturing group takes into account the increasing importance of semiconductor technology and its integration in the design and manufacture of systems."

The changing of the palace guard always provides a field day for IBM watchers. One speculates that the division of marketing and manufacturing power at the top was a means for Learson and president Frank Cary to exercise closer control of major decisions involving trade-offs between the two. "There was too much power in the hands of one man, Beitzel," he said.

John Opel has inherited the System Development Div., System Manufacturing Div., and General Systems Div. Opel, 46, worked his way up through the marketing ranks from 1949 to 1965 when he shifted into DPG and corporate posts. Some see him as the major figure in the changes, in charge of all the pricing and profit calculations. "A young Learson," one ex-IBMer called him. "Smart and tough." Dean McKay, 50, is now in charge of the Data Processing Div., Field Engineering Div., and an addition shifted from what is now Beitzel's domain, Advanced Systems Development Div. ASDD specializes in new applications-oriented products and research. McKay, like Opel, was a member of the Management Committee before this appointment and since 1946 had likewise moved through marketing to corporate jobs.

The Management Committee, which assists the top-level Management Review Committee, now consists of Cary and senior vice presidents Warren Hume and Robert Hubner. Hubner vacated the position now held by Beitzel.

Some see the change for Beitzel, "definitely a Watson man," as a fall from favor — the result of Learson's ascendancy. Ask any IBMer, and he'll tell you that below the president level IBM doesn't keep its top men in the same spot for more than a few years because of the pressures of responsibility and only sometimes because of performance.

A man to watch outside the group executive positions is the head of the industry market groups, Joe Henson,

vice president. Industry marketing, which falls under the Data Processing Div. is receiving increasing emphasis and resources as IBM steps up its assault on problem solving for vertical industries.

Systems' Value Hard to Pinpoint

Both information systems managers and their user management customers agree that information systems' contributions to company profitability and growth have been minimal or unassessable.

A study of the attitudes and viewpoints of nearly 600 computer users indicates that 41% of all managers of departments or functions using the computer feel this way. "Surprisingly, 30% of the systems managers agree," according to the report of a joint study conducted by *Datamation* and the American Management Association.

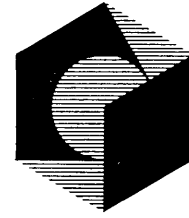
Results of the study were disclosed this month at the AMA's annual Systems Management Conference in New York by Robert B. Forest, editor, and Milt Stone, contributing editor, of *Datamation*.

Big disparities in the viewpoints of the two groups were revealed in their beliefs about the effects of computer-based information on middle management. Four out of five user managers see the greater accessibility of information as tending to eliminate some layers of supervision or management. Not so, say 62% of the systems managers canvassed.

Another point of disagreement: 70% of the user managers surveyed feel that computer use will not measurably enhance the effectiveness of long-range planning. But 84% of the systems managers disagree, and 20% of them feel it already has.

Both groups agreed on the requirements for tomorrow's systems manager. He'll need only a limited amount of technical knowledge but a lot of knowledge of the total company and its long-range plans. He will have to be a professional manager and an effective communicator.

Nevertheless, the study reveals that less than 2% of either group believes that writing still is important to the information systems manager, and only one in five places any value on speaking proficiency.



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news in perspective

A Professional Is a Professional Is . . .

The federal government, through the Wage and Hour Div. of the Dept. of Labor, has ruled that computer programmers and analysts are not professionals and therefore are nonexempt from the Fair Labor Standards Act regulations on minimum wage, overtime, and equal pay provisions.

The rulings of the Wage and Hour Div., following lengthy hearings last December, provided more guidelines as to when such data processing people might be considered exempt; but the published results have far from pleased the industry, as reflected in reactions from dp organizations.

The note in the revised Wages and Hours Div. rulings that caused most displeasure was that the academic requirements for data processing are too varied to call for its recognition as a professional field.

But the rulings did set down criteria that can exempt programmers and analysts who perform managerial,

supervisory, or administrative duties; and some in the industry saw this as a step in the right direction.

Jerry Dreyer, executive vice president of the Association of Data Processing Service Organizations (ADAPSO) saw the revisions as "a step forward." But, he said, "they still leave a big question mark for employers." He referred particularly to a section of the revised rulings that will exempt programmers and analysts if "50% of their time is devoted to duties directly related to management."

"If there's any management responsibility . . . any creativity . . . even if it represents 10% of total time," said Dreyer, that should be enough. The ruling leaves the creativity level unconsidered, he said. "The big question to be resolved is what constitutes a professional. Rules must be revised to accommodate our new industry, and new ground rules have to be established."

The question of what constitutes a professional and the inferred lack of this status for programmers and analysts by title alone seems to be the biggest burr in the craw of dp professional

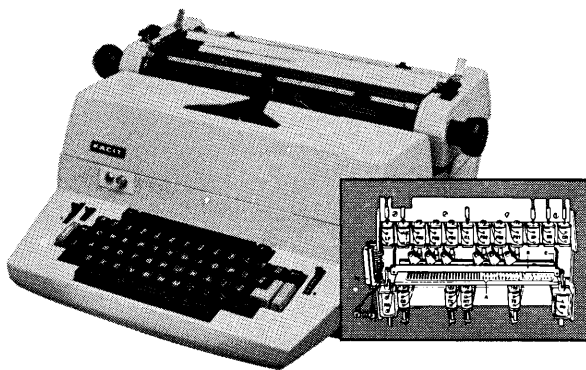
societies and concerned programmers and analysts.

For the most part, concerned professional groups saw the ruling as an incentive to come up with some new level of achievement and/or certification measure that would lead the feds to accept dp personnel as professionals.

Walter Carlson, president of the Association for Computing Machinery (ACM), said he will propose that ACM membership be made the criteria to acceptance as a professional. It would, he said, mean that ACM would have to be a lot more considered in its membership standards, but "we can come up with the same kind of thing technical engineering societies have which would mean more rigorous screening and maybe even membership examinations.

"We could do what the British Computer Society already has done. The British government accepts a member of BCS as a professional."

ACM as an organization has not taken an official stand on the Wage and Hour's guidelines, but Carlson feels the industry is in "a period of discovery," and "we must do what we can to shorten the discovery period."



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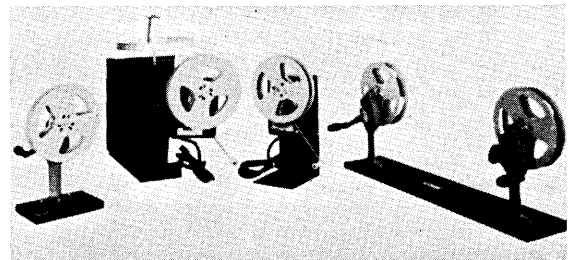
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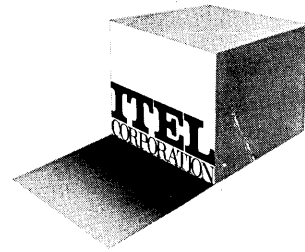
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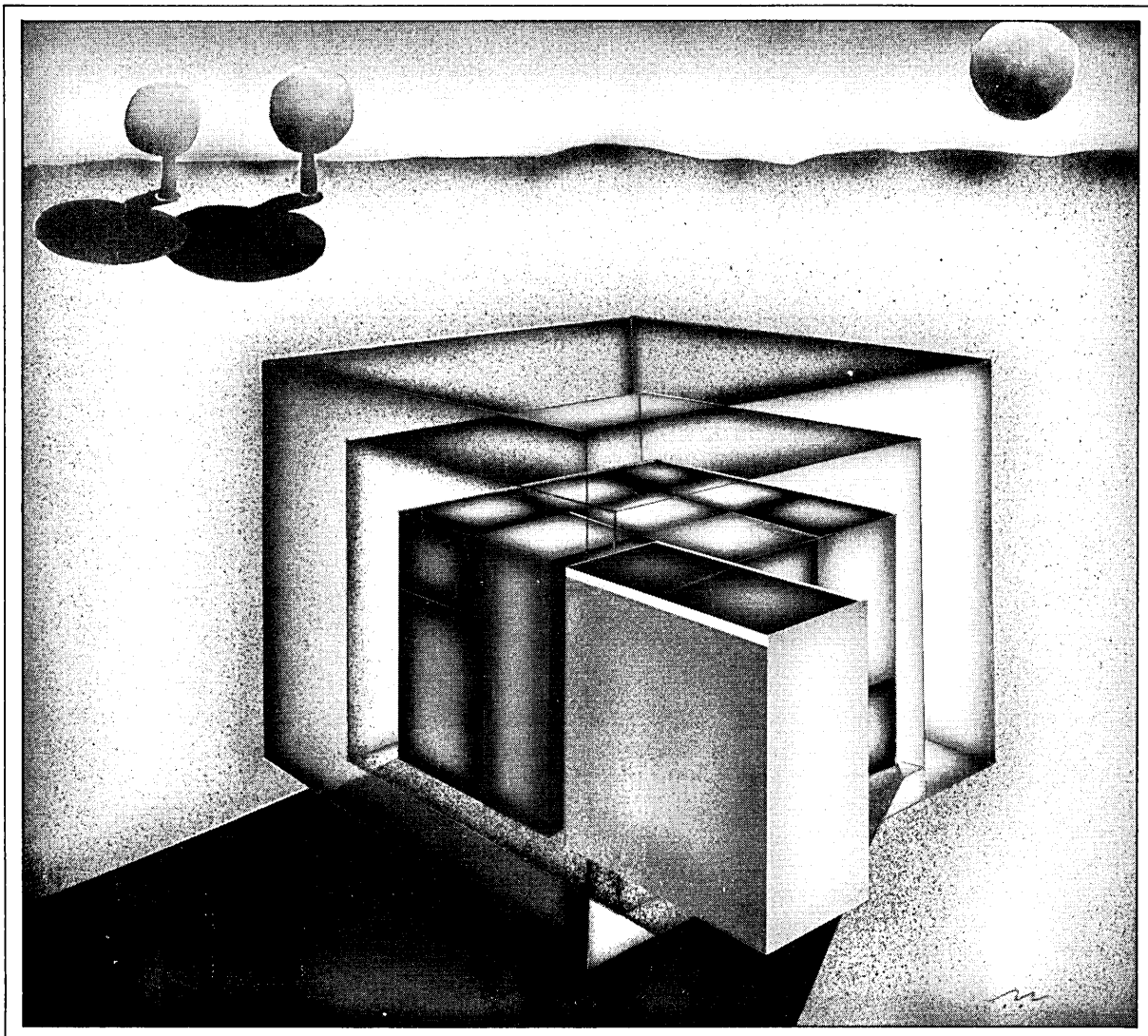
The Monolithic Main Memory from ITEL means savings in cost. Savings in speed. Savings in maintenance. And, in some cases, savings in floor space. It's completely compatible with IBM System/360 and 370. Handles all memory size changes. And it can be leased as well as purchased, so you can meet

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news in perspective

The Data Processing Management Assn. (DPMA) is adopting a similar "period of discovery" position. DPMA's Don MacPherson said the organization was adopting a "wait and see" attitude but noted that while all federal rulings regarding data processing bring numerous inquiries from DPMA members to DPMA headquarters, "this one has brought in more than the average number. These people are looking for more information."

Paul Notari, president of the relatively new Association of Computer Programmers and Analysts (ACPA), which was formed to both "upgrade the professional status of programmers and analysts and to look out for their well-being," reflected for his organization attitudes and reactions similar to those expressed by Carlson of ACM, Dreyer of ADAPSO, and MacPherson of DPMA.

Notari, like ACM's Carlson, testified at Dept. of Labor hearings that preceded the new Wage and Hour revisions. "For the most part," he said, "they accepted the recommendations I made." He referred to the portions of the new ruling which make some programmers and analysts "exempt" if a portion of their time is spent in management-related work.

But generally Notari was "dissatisfied" in the revision as formally published, and like others in the industry he feels "basic creativity" was ignored. He also feels a yardstick must be made acceptable to the feds, and he sees as the most plausible yardstick an exam his organization currently is preparing. It's a programmer certification exam that has been in the works almost since ACPA was born about a year and one-half ago and which Notari feels will be complete and ready this summer. He said the Certified Data Processor and the Business Programmers examinations now in existence don't have the scope the ACPA exam will have for really "testing ability to program and per se establishing programming as a profession." He feels his exam will be acceptable to federal agencies as a test for a "professional."

Notari said the "hour-by-hour" compensation ruling implied by nonexempt status is "demeaning to a professional. It will ultimately downgrade salaries even though it might immediately bring a lot of overtime to individuals. People just starting up a data processing oper-

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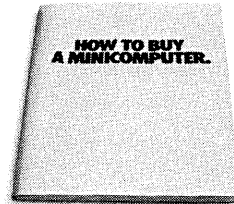
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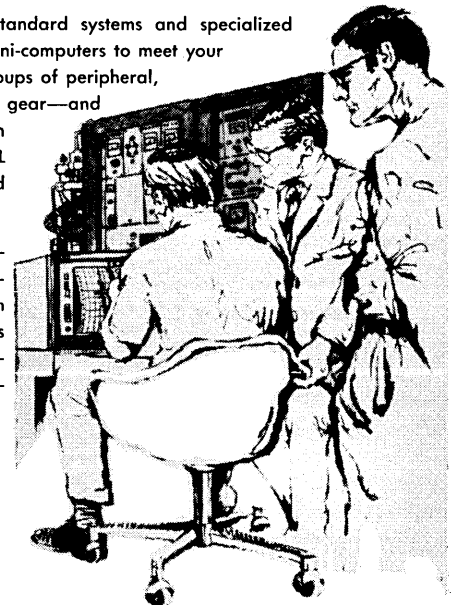
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Photomicrograph of the XCF core memory

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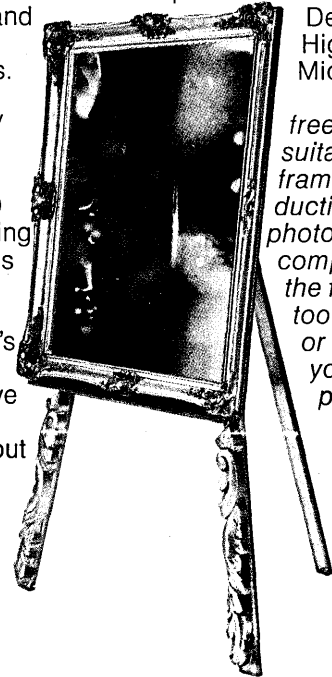
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ation where people normally might willingly work 50-60 hours a week just for salary might give the idea up when calculating wages and hours and overtime costs."

Notari said ACPA surveyed its members before his appearance at Labor department hearings and got a response from 40%. Of this 40%, he said, 80-90% were with him on the "we are professional idea," but there was a vocal minority that wanted ACPA to be a union and who might welcome organized unionization.

The Communications Workers of America was the most vocal organized union represented at the professional status hearings, and Notari said its representatives indicated they planned an active organizational campaign among programmers. But Fred Hassen of CWA told a *Datamation* reporter the union has no plans for such a campaign; and most dp organizations feel that campaign or no campaign, programmers are not ripe for unionization.

There's money and there's status, and then there are both. Like most wage earners, programmers and ana-

lysts probably would like both, but status seems to come first right now; and possibly that means more money in the long run.

— Edith Myers

Banking

Paperless Banking Over Paper Hurdle

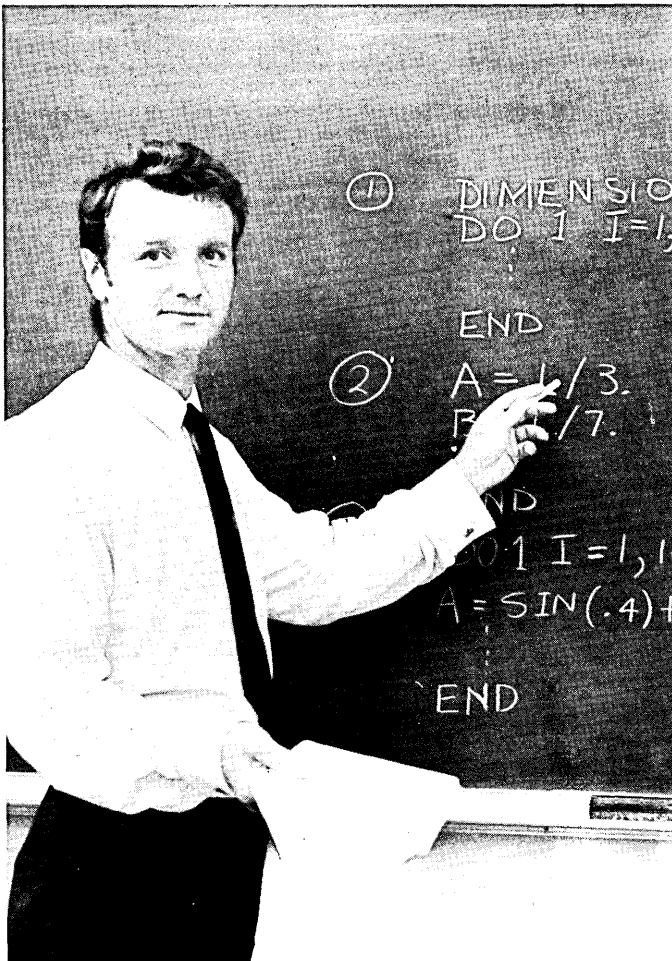
It took a mountain of paper to do it, but paperless banking and the checkless society should be a partial reality in California this month.

The Special Committee on Paperless Entries (Scope), a group of banks, clearing house associations, and representatives of the Federal Reserve Board, in January accepted as complete and satisfactory and made final payment on an automated clearing house system designed by Touche Ross & Co. In early February the system was reported to be working "perfectly" with test data; the FRB was training operational personnel (only partially

handicapped when their lead man decided to resign and return to dentistry school); and the 90 banks committed to participating in the project were educating staffs and customers. At the same time a myriad of legal agreements, awaiting approval of all the whereas' and therefores from an army of lawyers for all parties concerned in the project, were the only things standing in the way of the system's operational implementation as a pilot program.

Among the legal loose ends were articles of incorporation for a new statewide clearing house association just for the project. By mid-February all legal agreements, including these articles, had been approved by counsel for all Scope member banks, and all that was needed was their review and approval by senior management committees of the Los Angeles and San Francisco Clearing House Associations, which were scheduled to meet late last month for this purpose.

"It's just a formal procedure now," said a Scope spokesman, who noted that three questions raised by member banks in review of legal agreements would be resolved, if this were deemed necessary, by minor changes in procedure and were unlikely to delay im-



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plementation of the system.

One bank questioned a provision in the system which permits a depositor, when he notes what he considers a debit in error on his statement, to go to his bank, fill out a form, and get immediate credit. In current practice it would take five or six days to get a debit reversed. The objecting bank felt the new practice would invite depositor abuse. Another bank worried about the fact that the system assigns prime responsibility for information input to the system to the originating bank and would like receiving banks to bear a share. Two other banks would like to see a sharing of legal responsibilities among all member banks to protect small banks from becoming captives of a large depositor company and facing the possibility of being rendered insolvent.

Whether or not policy changes would be incorporated as a result of these questions, it appeared certain the system, first of its kind, would go on the air this month, watched closely by 18 clearing house associations throughout the country which are investigating paperless entries. A group in Boston, which indicated it would — given a successful pilot program in California — get a similar project going at least citywide, and

possibly district wide (including three or four states), sent representatives to California last month to study the system; and they reportedly liked what they saw.

The project is expected to remain in pilot status about a year.

Government

Dp Figures Big in R&D Request

The Nixon Administration wants Congress to make \$17.8 billion available for federal research and development in Fiscal Year '73, starting July 1, \$1.4 billion more than this year. A substantial percentage of the new money has been earmarked for programs that lean heavily on dp systems. Actual outlays for the coming year are programmed at \$16.48 billion, \$700 million above the FY'72 level.

R&D authorizations for space and defense agencies plus AEC are programmed at \$12.4 billion; \$5.4 billion has been allocated to the civilian agencies. Each of these figures is \$700 million above the comparable one for

FY'72.

Development of "fast, safe, pollution-free transportation" seems to be the top-priority civilian R&D program goal for the coming year. The Administration wants \$666 million authorized in FY'73, 46% more than this year. The money will be spent on projects such as improved mass transit systems, quieter truck and aircraft engines, air traffic control, and short take-off/landing aircraft. Regarding mass transit, the President, in his budget message, said that "work will be accelerated on personal rapid transit which provides individualized, nonstop service for commuters, and new work (will be) undertaken on dual-mode systems for metropolitan areas, which might combine the convenience of the automobile with the efficiency of a rapid transit system . . ."

Altogether, there are 10 "principal program changes" planned in the federal government's support of civilian R&D next year. Roughly 40% of the \$5.4 billion which the Administration plans to put into civilian R&D is earmarked for these projects, and they will soak up nearly 90% of the increase in civilian R&D funds.

In his budget message, Mr. Nixon stressed the need to "turn science and

Datacraft has a major advantage in price/performance comparisons — we are more powerful than the 16-bit computers and there are only a few cases where we are not toe-to-toe competitive with the larger and much more expensive 32-bit machines.

But these are only generalities.

Prove your own price/performance comparison. Write to me for a free deck of benchmarks. You'll have no problem running them. They're universal benchmarks designed for a FORTRAN IV compiler.

With the deck of 26 cards I will also send you a memo on the advantages we have with our 24 bit word length. Our family of Datacraft 6024 computers may not be a "machine for all seasons," but if you run these benchmarks then you'll see why we think we can give you a very favorable price/performance for the experienced user.

The DC 6024 series is a family of 24-bit, high speed, digital computers addressable at byte, word, and double word level. The family consists of:

MODEL	FULL CYCLE TIME	PRICE
DC 6024/1	600 nanoseconds	\$51,400
DC 6024/3	1.0 microsecond	\$32,800
DC 6024/5	1.0 microsecond	\$10,900

The DC 6024/5 is expandable in 4K memory modules up to a 65K word maximum. Models DC 6024/3 and DC 6024/1 are expandable in 8K memory modules up to a 65K word maximum. All models are software and I/O compatible.

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P. O. Box 23550, Fort Lauderdale, Florida 33307

Jim, please send me a deck of benchmarks so I can run my own price/performance comparisons. I understand the DC 6024 digital computer is ideally suited for applications requiring real-time control and/or complex calculations. My application is one of the following which I have circled:

- | | |
|-----------------------------|--------------------------------|
| Simulation systems | Communications systems |
| Wind tunnel testing | Medical analysis & monitoring |
| Process control | Training devices |
| Scientific experiments | Pollution analysis and control |
| Data acquisition | Optical character recognition |
| Nuclear experiments | Computer output to microfilm |
| Chemical analysis | Satellite processing |
| Engineering problem solving | Other _____ |

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technology to the service of man." The "incentives" program is meant to do just that. He described it as a "series of experiments to find better ways to encourage private investment in R&D, including investment by small entrepreneurial R&D firms which have made significant contributions to the generation and exploitation of innovative ideas." In 1973, he added, the Administration will also "review carefully our policies in areas of economic regulation which may unnecessarily restrict wider utilization or development of new technical advances."

The National Science Foundation will get \$22 million for the incentives program in FY'73, and the National Bureau of Standards will get \$18 million, assuming Congress approves. Probably, this money will be used to set up joint research activities between government agencies on one hand and universities, trade, and professional groups on the other. Laboratory facilities as well as costs are to be shared.

The biggest chunk of civilian R&D money, \$1.4 billion, is earmarked for HEW. Part of it will be used to establish a National Center for Health Services Research and Development. The center, through regional medical programs, "will support . . . application of the latest technological advances both patient care and the design and management of medical facilities." Another hoped-for result will be development of systems for coordinating "emergency room activities, ambulance services, and communications networks with (a) community's health care delivery system."

NSF, which gets a hefty 16% increase in its R&D budget authorization, intends to spend a major share of it on "problem-oriented research," including improvement of municipal services. NSF grants to colleges and universities will increase 14% in FY'73, from \$391 million to \$446 million. The "Computing Activities in Education and Research" program will be cut slightly, from \$21 million to \$20.5 million. Meanwhile, \$10 million is earmarked for initial development of a very large array radio telescope system, which will be the world's largest.

Among civilian agencies, the Law Enforcement Assistance Administration is scheduled to spend nearly twice as much on statistics-gathering activities in FY'73, and about 37% more on grants to state and local police jurisdictions for intelligence and information systems.

Airlines

Two 195s Replace Airline's Twin 65s

Eastern Airlines plans a big "take-off" for its System One reservation system in November, when it hopes to switch



operations from twin 360/65s to redundant 195s. The giant water-cooled supercomputers should offer three to four times the capacity of the 65s, purchased in 1968. To purchase the 195s Eastern will pay about \$18.5 million, dwarfing the cost of the new Doral Computer Center near Miami which houses them.

The only other upgrading alternative, according to an EAL spokesman, was the 370/165, considered "not viable,"

The statistics outlays are projected at \$25.36 million; those for intelligence and information systems amount to \$24.36 million.

The Center for Computer Sciences & Technology, one of the troika that develops and implements federal dp policy, wants to increase the quality of federal software in the coming year, reduce teleprocessing costs, and make government dp systems more cost-accountable.

Center technicians are now in the throes of defining the characteristics needed to measure software quality and system cost-effectiveness. The aim is to crank these characteristics in rfp's, in the form of performance requirements, so that software and systems acquired by the feds provide the desired capabilities. The center will also work with manufacturers to develop hard-

ware and/or software that can measure the parameters desired in systems and software.

due partly to conversion costs. The company estimates its conversion to the 195 will cost about \$1 million. Asked if EAL were locked into IBM, a data processing executive mentioned its Sabretalk, a higher level language that might someday offer "freedom."

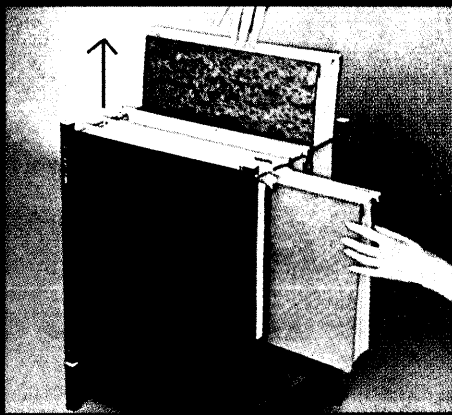
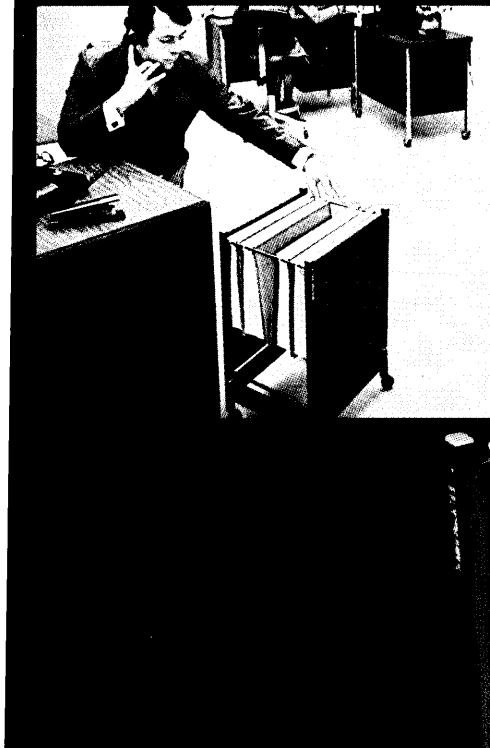
The 195s offer capacity and capability beyond EAL's current reservations work load of approximately 500 million messages a year from 3,000 agents. So EAL undoubtedly will sell time and ser-

vices to help feed the supercomputer's voracious appetite.

Eastern already has sold some systems software to other airlines and plans to go after remote job entry and facilities management contracts. Asked if the company had considered setting up its computer services as a separate company, a spokesman said, "We've been sniffing around that tent but haven't entered it."

The teleprocessing project, basically, involves analysis of existing broadband communication services to find the most cost-effective ones for specified uses. By nudging federal users into a smaller group of bandwidths — through directives from the Office of Management and Budget, for example — it is hoped that costs can be cut. The analyses will also be distributed to big private users of data communications. To cut costs further, the center will look for ways of improving broadband communications hardware.

Encouragement of further standards activity within particular industries is another key activity the center plans for the new year. A conclave for retailers, cosponsored by the National Retail



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Merchants Assn., is scheduled this month at NBS headquarters in Gaithersburg, Md.

The center has asked Congress for \$3 million next year which, with money collected from other sources, will give it a budget of \$8 million. — **Phil Hirsch**

Communications

AT&T Tariff Changes Questioned

A sweeping investigation of AT&T charges for modems, connecting arrangements, and multiplexors was announced by the Federal Communications Commission last month. In the process, the whole question of whether present restrictions on the use of foreign attachments gives Ma Bell an unfair economic advantage over independent terminal manufacturers seems likely to get a thorough airing.

The investigation was precipitated by complaints from the Independent Data Communications Manufacturers Association (IDCMA) — a group of modem makers — regarding recent tariff

changes proposed by AT&T. Specifically, the phone company asked permission to lower rates for Type 201A and 201B modems, set rates for automatic data access (connecting) arrangements, enlarge the potential market for its multiplexing equipment by offering these units separately from data concentrators, and establish rates for a new modem (Type 202). All of these changes were scheduled to become effective early in February. The commission suspended them for the "full statutory period" — 90 days, ending next May 4.

IDCMA members are unhappy, partly because they feel Ma Bell is using her monopoly position to raise rates in non-competitive markets, while lowering them in competitive sectors. The recent complaint to the commission mentions that the reduction in Type 201 modem rates was proposed shortly after AT&T asked FCC permission for a general increase in installation and monthly charges for most private line services, including Telpak.

Last month, the commission suspended this latter tariff change until May 4. After that, the new rates will become

effective, but the phone company will have to keep track of how much extra it collects from each customer until the commission decides whether the new rates are fair. They will be the subject of a separate investigation proceeding in parallel with the one on modems, connecting arrangements, and multiplexors.

A key issue in the equipment tariff investigation is whether Bell has supplied adequate supporting data. The independents don't think so. For example, they say that Bell, in proposing to reduce monthly rates for Type 201 data sets (from \$72 to \$47), has changed the service life of the equipment from five to eight years without explaining why. The independents suggest that an adequate explanation is hard to find because the 201 is an old piece of equipment, subject to technical obsolescence, which AT&T admits is not selling well. "Further, at least one AT&T operating company (Ohio Bell) has recently sought a rate increase for the model 201 data set . . . AT&T should not be entitled to use any special form of pricing to meet competition when the commission itself cannot effectively assure that the pricing will be not used to monopolize."

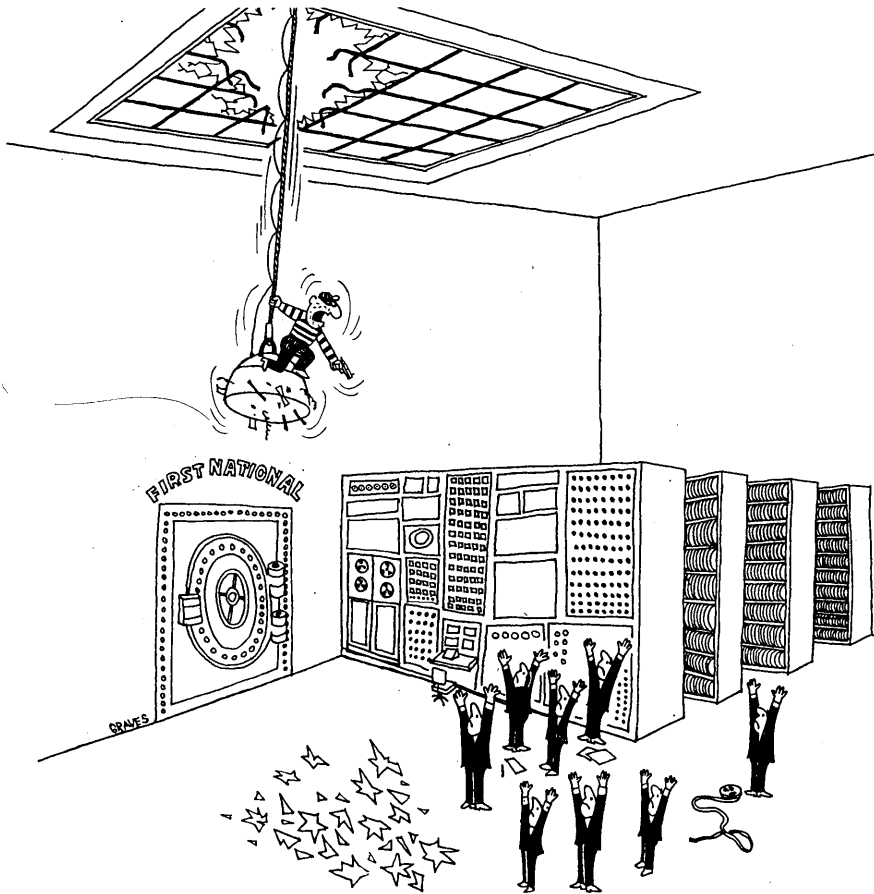
Blame the Computer

Computer Blamed for Gift Hold-up

The latest computer foul-up charge could lead thousands to blame a computer for Christmas presents not received.

Mission Pak Industries, Inc., which for years has been dispatching cellophanned holiday packs of fruit from Southern California throughout the country, levied the charge as an excuse for the fact that several thousand packs intended and promised for holiday delivery still hadn't gone out in the early months of this year.

The charge "isn't fair," said Dave Miller, president of Commercial Computing Co., Beverly Hills, Calif., which provided software for handling deliveries and ran the programs through Remote Computing Corp.'s Los Angeles service bureau. "Except for being one week late with labels for the first truck scheduled to go out," he said, "we were on time all the way. If we had been on time with those labels the truck still wouldn't have gone out on time because the goods weren't ready." Miller said subsequent deliveries were delayed because goods were not ready and "because they couldn't

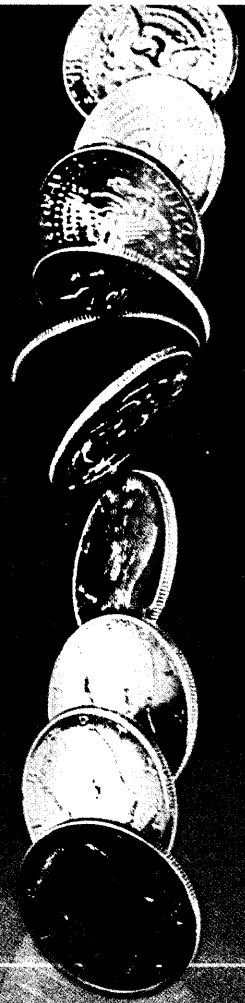


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Before taking costly chances on data communication equipment...

There are some
important questions
you need answered



Teleprinters Data Sets and Multiplexers: a value analysis

Most of the things
you should know
AND HAVE TO ASK



Q When should a company start to consider a data communication network?

A When mail delivery of data to be processed is too slow for your business needs.

Q What are the major advantages of a CRT terminal and a teleprinter?

A A CRT (Cathode Ray Tube) provides a momentary visual display.

A teleprinter provides printed permanent data with multiple copies. CRT's are also available with printed copy. All have advantages to meet specific requirements.

Q What are the advantages of an electronic teleprinter over a mechanical teleprinter?

A While a mechanical teleprinter is low in cost initially, there are major advantages and cost saving features in an electronic teleprinter worth considering. Features like quietness, small size, high speed, and reliability. Higher speeds mean a savings in operator time and line time and cost. Having fewer mechanical parts, an electronic printer's high reliability should mean reduced maintenance costs.

Q Is noise a factor in teleprinters?

A Absolutely. With electronic printers, you can place them in your front office — they're quieter than standard typewriters. This eliminates soundproofing rooms or isolating machines.

Q There are a number of options on an electronic teleprinter. Are they cost savings advantages?

A Yes. This allows you to tailor your machines specifically to each application. Or, you can change as the need arises. General Electric's TermiNet* 300 printer offers you over

20 easy-to-install options to upgrade systems. This eliminates complete re-equipping of a system as your network increases. For example, if you don't have error checking in your network, but decide to add it at a later date — you simply plug in a new circuit board — at minimum cost.

Q Is there a way I can obtain more capacity from my existing communications network?

A Yes. Consideration should be given to the use of multiplexer equipment to carry different transmissions over the same data path. General Electric's DigiNet* 150 and 160 multiplex equipment meets this requirement. These multiplexers are employed in the world's largest time-sharing network — the General Electric Information Services network.

Q Is it necessary to buy special test equipment for installation and maintenance of modems and multiplexers?

A No. Not if you buy features like the ones built into General Electric's data communication products. Built-in testing and diagnostics provide Total Line Control. General Electric's TLC enables the user to rapidly isolate his network problems.

Q Is quality control an important consideration in data communication equipment?

A Quality control is extremely important whether it be teleprinters, modems, multiplexers, concentrators, etc. At General Electric for example, we take extra care to see that you get the best product performance possible.

General Electric's space technology experience has been useful in establishing rigid quality control procedures. After every component and sub-assembly is checked, final tests including vibration and noise are made. Then the entire system is checked, not once, but twice.

Q Is a nationwide network of maintenance service important?

A Data communication equipment requires regular maintenance and service. A nationwide network of locally available servicemen with factory training, special test equipment,

and spare parts provide the capability to get back on line quickly and efficiently. Downtime can be far more costly than any difference in hardware cost.

Q What about user-oriented product documentation?

A In order to best utilize hardware, it's highly recommended that you have complete detailed product literature on all facets of its operation. General Electric feels this to be very important and has developed a full set of user-oriented documentation for all of its equipment.

Q Should I buy or lease this equipment?

A Since General Electric both sells and leases this equipment, we feel we can give you an unbiased answer. Buying this equipment over the long term is less expensive. However, should you want to spread your costs, GE can offer you attractive lease rates.

Q Is it important to do business with a company that has received large repeat orders?

A We think so. It certainly indicates product acceptance and experience. GE has presently shipped 10,000 TermiNet 300 printers which are being used in a wide variety of applications.

Q Is doing business with a company who has single source responsibility important?

A Yes. A single source for data communication equipment gives you single source for service.

Q What about systems capability?

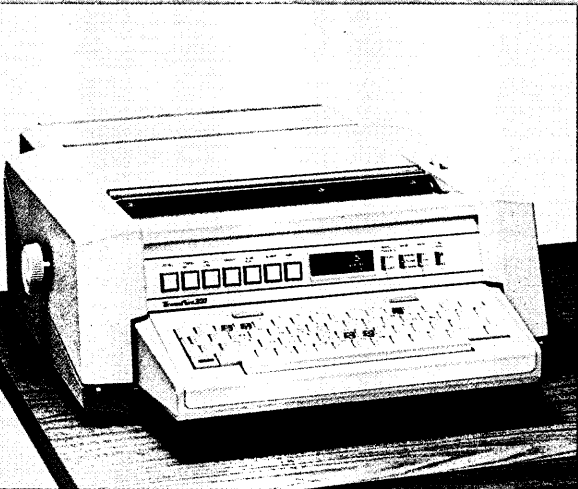
A If you do need systems capability, General Electric has an organization of experienced data communication engineers to help solve your problems.

This may take the form of offering you complete system design and application assistance. Or, the assurance that any one of General Electric's products will be compatible with your system.

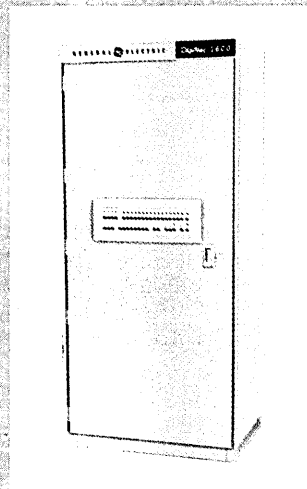
*Registered trademark of General Electric Company, U.S.A.

For data communication products, systems and service

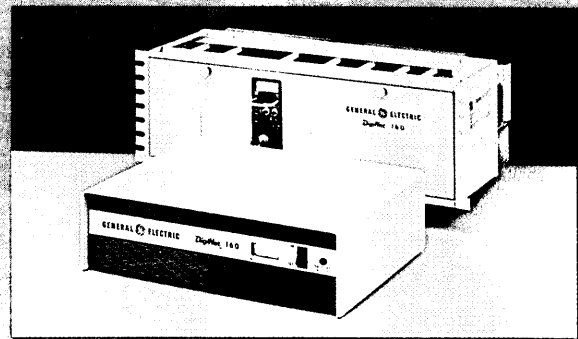
One of your best answers
is General Electric



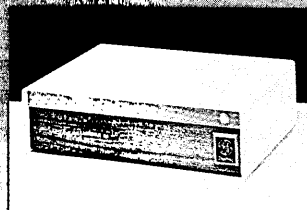
TermiNet 300 Printer—Selectable printing speeds of 10, 15, and 30 characters per second. Prints an original plus 6 copies with all 96 characters of the ASCII code set. Operates more quietly than an office typewriter.



DigiNet 1600 Data Concentrator—Low-cost communications processor. Reduces line costs by consolidating up to 256 terminal inputs for transmission over a minimum number of voice-grade lines.



DigiNet 160 Multiplexer—Offers the most cost effective means of connecting low-speed terminals in diverse locations to a central computing system. Optimum results are obtained when used in conjunction with the data concentrator.



DigiNet 880 Data Set—Short haul, high speed data set designed to communicate between Remote Job Entry terminals and central systems at significant savings over conventional methods—switch selectable speeds of 2400, 4800 or 9600 BITS/SEC.



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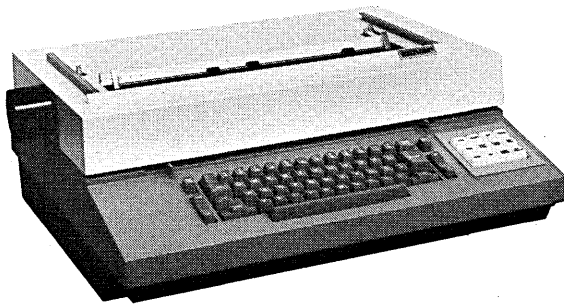
But Miller wasn't mad. Last month, as partial payment for his work for Mission Pak, he'd signed an agreement with the firm that gives him rights for a year to market the mailing lists Mission Pak compiles from names of its givers and giftees.

Shortlines

Comma Corp. said it does not plan to increase maintenance prices on units of IBM dp systems currently under its maintenance agreement contracts in force in 1972 . . . Dr. John E. Bertram, IBM director of engineering, is general chairman for the 1972 Spring Joint Computer Conference . . . International Reservations signed an agreement linking Italy's national hotel reservations to its system . . . ITEL Corp. agreed to provide its 3330-type disc drive to Telex Corp. on a nonexclusive basis . . . Com-Share Corp., Ann Arbor, Mich., completed its first quarter of profitable operations . . . Joan Van Horn is still after IBM. She told the Association of Programmers and Analysts in a Bethesda, Md., meeting that "IBM users should expect to share in a refund of IBM's ex-

cess monopoly pricing of at least 10% of their bills for the last seven years if the Justice Department is successful in its suit." . . . But IBM is still going strong. The Goliath opened a new 22-story headquarters building in Japan . . . Technology Service Corp., Santa Monica, Calif., exercised an option to acquire 75% of the outstanding stock of K/Tronic, Inc., Cupertino, Calif . . . Digital Computer Controls, Fairfield, N.J. computer manufacturer which has gained fame and/or notoriety as a copier of other minicomputer firms' products, has grown through acquisition of National Data Systems, Inc., a firm engaged in minicomputer system design and programming . . . System Kaihatsu Kabushiki Kaisha (SDI) will handle installation and support of all the ASI-ST family of general-purpose computer software in Japan. The software is produced by Applications Software, Inc. . . . Cambridge Memories, Inc., Newton, Mass. received a second phase Air Force contract to evaluate the radiation hardness characteristics of its proprietary magnetic film memory using Domain Tip Technology (DTT) . . . Pertec Corp., Los Angeles peripheral manufacturer,

agreed in principle to acquire Eikon Data Systems, Inc., Chatsworth, Calif., producer of low-impact printers . . . United Data Centers, Greenwich, Conn.-headquartered network of data centers, has acquired Dynafacts, Inc., Wichita, Kansas-based network of five centers and the owners of the Dynatax automated income tax system . . . DPMA has a new offering for its members. It's a new video tape management development seminar being made available through an arrangement with Advanced Systems, Inc., Elk Grove, Ill. . . . The Shell Oil Co. and Applied Data Research announced jointly that ADR will be marketing and supporting Shell's AMBUSH, a general linear programming software package . . . Inforex, Inc., Burlington, Mass., data entry firm, has a new partner. It's United States Leasing International, St. Paul, Minn. The two companies have entered into an agreement under which USLI will purchase \$7.1 million of Inforex equipment in 1972 with provision for a purchase of an additional \$7.2 million worth in 1973 . . . Through an agreement between Canadian Overseas Telecommunications Corp. and Western Union International, Inc., Angle/WUI customers in Canada and the United Kingdom have gained access to the CCTC computerized switching system. □



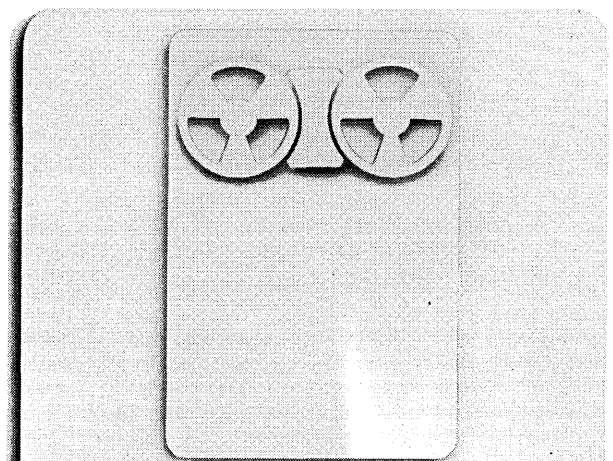
This is the new Novar MOD II. It has both software and communication compatibility with the 2740 Model 2. There is one big difference, however. The 5-40 MOD II transmits at up to 2400 baud.

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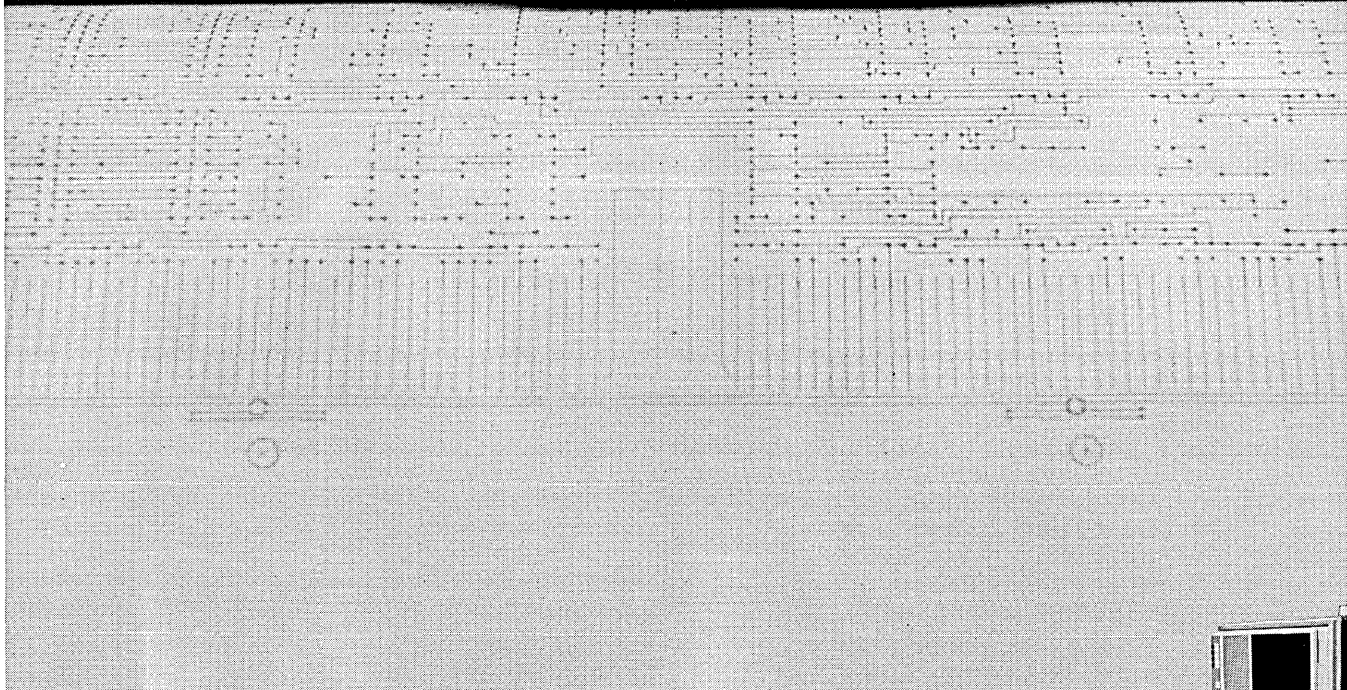
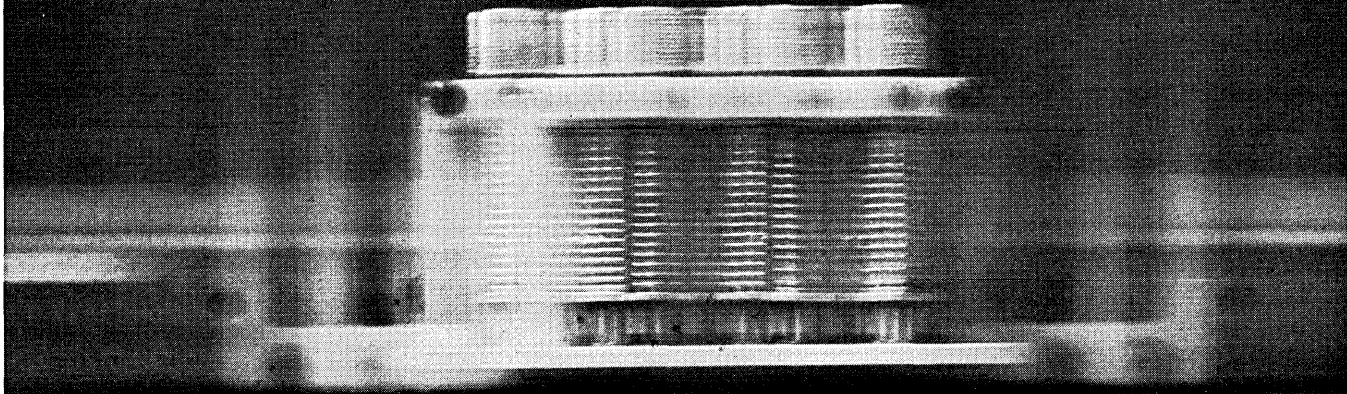
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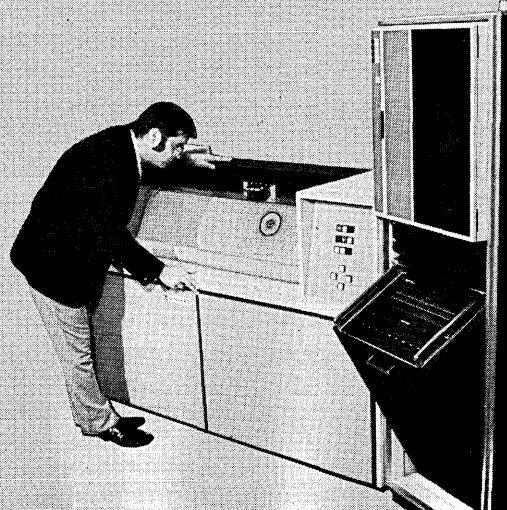
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Product Notes . . .

One of the more familiar sights during preventive maintenance—that of the IBM customer engineer vacuuming out the line printer—is disappearing. During the development of the model 3211 line printer, it was found that dirt particles collected so fast that maintenance would have had to be scheduled much more often. So a high-speed air pump and vacuum cleaner have been added to the 3211 to remove the foreign matter. Yes, IBM makes the vacuum.

Consensus number two in minicomputers, Data General, of Southboro, Mass., delivered its 2,000th Nova mini in December, nine months after number 1,000 went out the door. But DG is still well behind Digital Equipment Corp.'s estimated 13,000 minis. DEC has recently agreed to purchase core production and testing equipment that RCA won't be needing any more.

A de facto microfiche standard has been created by the Dept. of Defense's adoption of 48X reduction (270 frames per fiche) instead of the more common 42X. DOD is now in the process of putting its catalogs on 16mm roll film, 24X and 48X fiche, but by April of next year only 48X fiche will be available to government contractors.

Computer Automation, Inc., Newport Beach, Calif., has had to stop blowing its air horn to celebrate orders of \$10K or more. A recent large order would have required over 100 bursts, and both the law and neighbors said no.

370 Semiconductor Memory

ITEL is the first firm to announce semiconductor replacements for the memories on all the 370 models introduced so far. That includes the core storage on the 370/155 and 165 models and the monolithic main stores on the 135s and 145s.

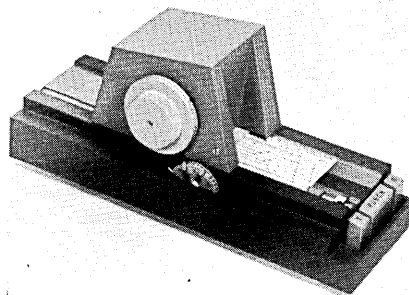
The monolithic main memory modules are built for the vendor by Advanced Memory Systems of Sunnyvale, Calif., and are said to be transparent to the 370 user. If that's indeed the case, then there's lots to be gained by going to these units. They draw less power than core, generate less heat, are said to be more reliable than core, and in the case of 2-megabyte 155s and 165s the floor space necessary for memory can be reduced by 75%.

Two-year leases run about 90% of whatever IBM gets for similar-sized chunks. Each additional year on the lease contract drops the rental rate another 5%, and there are no extra shift charges. The memories will be available in 1973: for 135s, Feb.; 145s, Nov.; 155s, July; 165s, Sept. ITEL CORP., San Francisco, Calif. For information:

CIRCLE 225 ON READER CARD

Manual Card Punch

As sophisticated as dp has become, there always seems to be a use for products like the model 429 hand-operated card punch. Some significant advances have been made over competitive equipment like the IBM 010. First, the 429 isn't even electric. Second, where the good old 010 had to be



backspaced to put multiple punches in a column, the 429 can put 36 alphanumeric and 27 special character punch codes into the card at the push of a button. And third, the 429 prints out the punched character. There are even six adjustable tab stops for handling any card format. The 429 sells for \$475. COMPUTER ACCESSORIES CORP., Huntington, N.Y. For information:

CIRCLE 220 ON READER CARD

Schematic Processing

The principal competitive advantage the Drafting System I has in processing electrical and chemical process drawings is that it eliminates the intermediate step of copying the engineer's drawing onto grid lines before the digitizing process can begin. The system consists of a 48-inch square digitizer and stylus, and a paper tape punch. Three pieces of paper are taped to the digitizer: a rough sketch of the circuit, a sheet of paper that acts as a keyboard and control panel, and a symbol selection sheet. The operator then touches the terminals of the symbols in the sketch, marking his progress with the stylus. The output goes to a paper tape punch.

The software supplied with the system is for IBM 1130s and 360/370s, and Nova 1200 computers. It processes the paper tape input to straighten all the lines; determine symbol orientations, labels, and label positions; and produce a finished drawing. The price for the digitizer, paper tape punch, and software package is \$17K. A complete turnkey system, including a 16K 16-bit minicomputer, plotter, disc file, paper tape reader/punch, console, digitizer, and software, can be supplied for around \$40K. DESIGN AIDS, INC., Anaheim, Calif. For information:

CIRCLE 217 ON READER CARD

Upgraded 1106

When the 1106 was announced about three years ago, it appeared to be a "poor man's" version of the powerful 1108—its memory cycle time was twice that of the 1108's 750 nsec for pulling two words. Now the 1106's performance has been brought somewhat closer to the big brother with the offering of 1-usec core for the 36-bit word computer, called the 1106 II. It would seem a sure thing that current 1106 users will go over to the mod II, since the price difference for the cpu with 128K of memory is only \$62,790 (\$411,750 for the 1106 vs. \$474,540 for the 1106 II). Rental on the processor/memory unit is \$13,100/month on a five-year contract. First deliveries are scheduled for this month. UNIVAC, Blue Bell, Pa. For information:

CIRCLE 221 ON READER CARD

End User Modem

Quite a bit of thought has gone into this modem, particularly in the test/checkout features, to help users quickly locate the source of communication problems. The modem is called the multiple data station, and it's available



It's as dependable as a PDP-8.

We don't know anyone who's tried to drive a Mercedes-Benz non-stop, 24 hours a day, seven days a week, for two years straight.

But we do know someone who's done just that with a PDP-8. And they weren't even trying. They simply plugged it in and let it go.

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selected it simply because more PDP-8's come off the production line every month than all the other minicomputers put together.

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And it's just possible they liked

the idea that PDP-8 comes from a big computer company. With over 1400 sales/service engineers scattered all over the world.

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Digital Equipment Corporation,
Maynard, Massachusetts 01754.
(617) 897-5111.

in 4- and 16-channel configurations for central sites and 1- and 2-channel stand-alone boxes for remote sites. Automatic dialers and transmission speeds of 300 and 1200 baud may be intermixed. Generally, the modems are equivalents for Bell 103E and F, 202C5 and 202C6, 202D, and 801A and C, and also some of the IBM family. Some of the testing features include a square wave signal for checking out the modem, a thumb-wheel switch for addressing the modem to be tested, status lights, a busy out switch, etc. A station with 16 103-type answer-only modems is \$3680. Delivery is approximately 45 days ARO. VADIC CORP., Palo Alto, Calif. For information:

CIRCLE 222 ON READER CARD

Communications Unit

"Tin Can" is the interesting name applied to this PDP-11 based product that can take any of the following forms: a controller for store-and-forward and message-switching environments, communications line concentrator, front-end for message processing for a computer, or a monitor for on-line inquiry systems. It's the software that decides what "Tin Can" should do, and it can mix the applications above because of multiprogramming capability. All types of lines and line speeds, different character codes and transmission modes can be accommodated, and systems can be expanded up to 300 circuits. It's a little hard to price a typical configuration with all the possibilities offered, but a PDP-11/20-based system with 500K words of disc storage and supporting a 16-line, 2400-baud message concentrator would run in the neighborhood of \$50K, including necessary software and installation. CYBERMATICS INC., Fort Lee, N.J. For information:

CIRCLE 219 ON READER CARD

Bank Computer

Banks that process 6-15,000 items per day are offered a packaged configuration based on the byte-oriented HIS 100 series. Called the model 105 banking system, it includes an 11-pocket MICR reader-sorter that operates at 550 documents per minute, 16K of memory, a disc sub-system for storing 9 megabytes, a 400-cpm card reader, a 300-lpm (132-column) printer, and a voice-grade communications control unit. The 105 can be used off-line, or as a batch terminal. Honeywell is bundled, and the applications programs available include MICR entry, demand deposit accounting, savings accounting, installment loan accounting, and

product spotlight

Credit Verification

At last, products that realize the many advantages of holography are coming out of the laboratory, and this one may soon be as familiar a sight in retail establishments as the cash register.

HOLOSCAN, in its initial form, is offered as an off-line credit verification system that has a capacity of 250,000 credit card numbers. The clerk enters the credit card number into a 12-key terminal, causing the cassette containing the film recording medium to be searched. In less than two seconds the terminal indicates credit approval, VIP accounts, memory busy, an input error (retry), or a light code signifying credit rejection. There are also four lights for specific credit level limits in the particular card. The HOLOSCAN system can be multiplexed for handling up to four terminals, and another option is a printer that stamps the credit card number on the sales slip for audit trail purposes.

A service called HOLODAC, for Holographic Data Conversion, is offered the user of the HOLOSCAN system. The user supplies a tape of whatever is to be recorded on the cassette, and the manufacturer promises 24-hour turnaround upon receipt of data. The user may specify any frequency for this service, which is priced at under \$2 per cassette. Negotiations are under way between the HOLOSCAN manufacturer and a national data transmission company to handle file updates in that manner.

Many patents are pending on the HOLOSCAN system, preventing us from describing the workings of the system

proof and transit. The configuration described above rents for \$2975/month on a one-year lease. HONEYWELL INC., Wellesley Hills, Mass. For information:

CIRCLE 226 ON READER CARD

Serial Printer

It takes more than one product to stay alive in this industry, and so, as a follow-on to its very successful disc drive, this manufacturer is introducing a serial printer called the HyType I. It prints at 30 cps across a 132-column line, drawing from a stock of 96 ASCII characters. The unit can type up to eight carbon copies, and a tabbing feature helps it do graphing. Also featured are right and left justify, half-line, and



in detail, but the memory mechanism is relatively simple, and ought to be reliable. Holograms are unaffected by ambient conditions, including magnetic fields (something to think about lately when sending information aboard aircraft). The cassette would have to be almost totally destroyed before information couldn't be read from it, since each number is recorded across a large area of the film. Scratches, and even tiny holes in the film, just add a little "noise" to the entire groups of data. Pricing depends on specific applications, but a four-terminal system, multiplexor, and holographic memory, would run approximately \$850 per terminal.

The concept isn't limited to credit verification — there is already interest from real estate firms, airlines, and other businesses for storing information other than credit cards using HOLOSCAN. And the manufacturer says the unit can be easily expanded up to 50 megabits to support other applications, which should interest oem's. First units of the credit verification application go in the field this month. OPTICAL DATA SYSTEMS, INC., Mountain View, Calif. For information:

CIRCLE 216 ON READER CARD

proportional spacing. The vendor estimates a 100,000-printer-a-year market for replacement gear for billing/accounting machines, terminal printers, and IBM MTSr's; and prices of the HyType I are adjusted accordingly: \$1K in quantities of 1,000. DIABLO SYSTEMS INC., Hayward, Calif. For information:

CIRCLE 224 ON READER CARD

Plotting System

The COMPLIT series of digital plotters can now be attached to the Mohawk 2400 series batch terminals introduced last year. The BTC-7/2400 controller can handle either DP-1 or DP-3 plotters, both of which plot on Z-fold paper at incremental rates up to 300 steps

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CIRCLE 12 ON READER CARD

hardware

per second. Plot lengths can be up to 144 feet, and plot widths are 11 inches for the DP-1 and 22 inches for the DP-3. Complete with software support, the BTC-7/2400 controller, DP-1 plotter, and plotter stand rents for around \$300/month on a one-year contract. Delivery is 30 days ARO. HOUSTON INSTRUMENT, Bellaire, Texas. For information:

CIRCLE 223 ON READER CARD

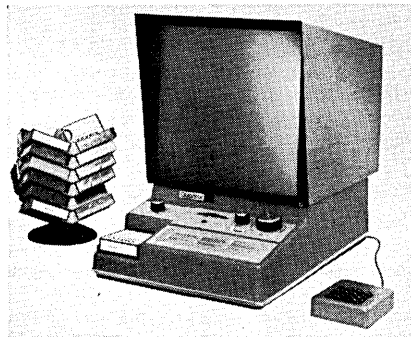
Disc Storage

Here's the latest double-density 2314-type disc offered to 360 and 370 users. Doubling the number of tracks to 406 on each disc surface results in 58 megabytes per pack, or 466 megabytes for a full eight-pack DS-324. The only software change necessary is in the equipment table to allow addresses ranging from Hex 0 to F. Average access time is 32 msec, and the unit has a fast start-up time of 22 seconds. A two-year lease on an eight-drive unit is \$4325/month, including maintenance. Production deliveries are scheduled for right about now. AMPEX CORP., Marina del Rey, Calif. For information:

CIRCLE 232 ON READER CARD

Microfilm Terminal

The model 310 16mm computer output microfilm terminal consists of a display and a keyboard for controlling its operation. The film cartridge, which can contain up to 3,000 pages of information, is loaded into the unit by hand, where it is then automatically threaded and advanced to the first



page. The average access time is eight seconds, and pages can be rotated through 360° of orientation, if desired. The 14 x 14-inch screen has 24X magnification power. The 310 can also be used semiautomatically by the operator using "up" and "down" keys to change pages. The terminal is priced at \$2495 and can also be leased. QUANTOR CORP., Cupertino, Calif. For information:

CIRCLE 227 ON READER CARD

Numeric Keyboard

The KBG-25 numeric keyboard consists of the numerics 0-9, decimal point, eight keys for customer selection of any combination of 128 functions or symbols, and a single key for carriage return/CR-LF rubout/X-Off functions. It operates at 10, 15, or 30 ips, and is available in ASCII, EBCDIC, Baudot, and BCD for \$295. An RS-232 interface for the pad is \$35. EASTERN DYNAMICS CORP., Brentwood, N.Y. For information:

CIRCLE 218 ON READER CARD

Fastrand Replacement

CalComp is the second (see last month's Hardware for the first) firm to announce a disc system replacement for Univac Fastrands. The model 1144 is logically and electronically compatible with the Fastrands for attachment to Univac 1100 or 400 series computers. It can be equipped with enough spindles to make it look like a model II or III Fastrand and provides an average access time of 12.5 msec to either 22 or 33 million 36-bit words, depending on model. A dual-channel controller permits simultaneous i/o on separate drives in the same data bank, from two processors, or from two i/o channels on one processor. Rental for a 6010 Fastrand II replacement is

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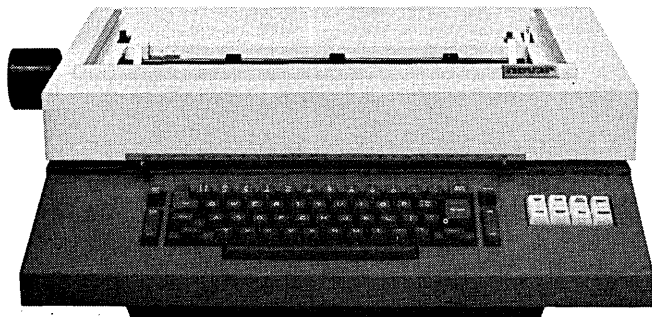
\$18.50

The MIT Press

Massachusetts Institute of Technology

Cambridge, Massachusetts 02142

CIRCLE 38 ON READER CARD



The new Novar 5-40 MOD I is designed for use with in-house data collection and entry systems presently served by the 2740 Model 1. There are differences however—the Novar unit is smaller, lighter and self-contained, sells for \$3500, rents for \$95 per month.

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GTE INFORMATION SYSTEMS INCORPORATED

CIRCLE 43 ON READER CARD

\$3850, excluding maintenance, with delivery scheduled 90 days ARO. CALIFORNIA COMPUTER PRODUCTS, INC., Anaheim, Calif. For information: CIRCLE 230 ON READER CARD

PDP-15 Memory

The DMS-15 is an add-on core memory for the PDP-15 computer, billed as being much cheaper than DEC's memories. It has a maximum of 800-nsec cycle time and is available in sizes from 8-64K. It recognizes 18 bits of address, allowing index registering to 128K core. A boundary register locates the add-on memory above the main memory in core space. A 32K system is about \$25K including interfacing and installation. Delivery is 60 days ARO. DIMENSIONAL SYSTEMS, INC., Waltham, Mass. For information: CIRCLE 260 ON READER CARD

Mark Sense Sorter

The Sorter 1000 optically reads both sides of standard mark sense cards at 1000 cpm. The sort and/or selection sequence is programmed into the sorter by means of a program deck that precedes the data deck. The program remains there until changed by another program deck, which may contain up to 256 instructions. The number of

card pockets on the 1000 can range from three to infinity, according to the manufacturer. A six-pocket model rents for \$750/month on a three-year lease, including maintenance; and the model 1000 is available 90 days ARO. DIGITAL DEVELOPMENT CORP., San Diego, Calif. For information: CIRCLE 228 ON READER CARD

Oem Minicomputer Line

The popular SPC-16 and SPC-12 product lines are the basis for nine new minis from this manufacturer. The models 16/40, 16/60, and 16/80 have 16-bit memories expandable from 4-16K. The cycle times are 1.44 msec, 960 nsec, and 800 nsec, and read-only memories that halve those times are available. These machines all feature eight interrupts, a tty controller, power supply, real-time clock, console, partitioned processing, and block memory protect for \$5550, \$6550, and \$8550, respectively. The 16/45, 65, and 85 versions have external I/O packaging, with memories expandable up to 32K with the same performance specs as the 40, 60, and 80. Prices for these three are \$3950, \$4950, and \$6950.

The SPC-12/10, 12/15, and 12/20 models all feature 2.3-usec cycle times in memories expandable from 4-16K, tty controller, one interrupt, power fail/

auto restart, and a real-time clock as an option. They differ in I/O capability: the 12/10 has external I/O packaging, while the 12/15 and 12/20 have 7 and 19 internal I/O slots. The prices of these units are \$2890, \$3480, and \$3980.

The software includes the entire library developed for the original SPC models: 20 different operating systems, FORTRAN and BASIC compilers, machine control routines, I/O and utility routines, etc. Deliveries on the new equipment are scheduled for 60 days ARO. GENERAL AUTOMATION, INC., Anaheim, Calif. For information: CIRCLE 234 ON READER CARD

Paper Tape Reader

The TRM9300B reads all standard 5-, 6-, 7-, and 8-level tapes at 300 cps. Up to 60% light transmissivity can be tolerated without adjustment by the unit, which uses light-emitting diodes. The unit can stop in character and contains no gears, belts, pulleys, clutches, capstans, or brakes. The price to oem's is \$545, and availability is about one month. ELECTRONIC ENGINEERING CO. OF CALIF., Santa Ana, Calif. CIRCLE 236 ON READER CARD

Paper Tape Option

A paper tape punch is now available for storing the input from the Graf/Pen data


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SYSTEM/3

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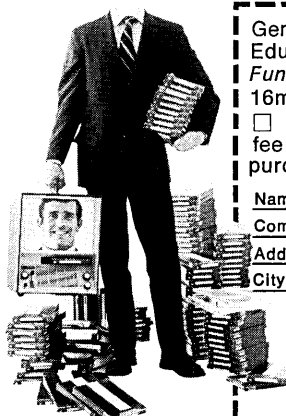
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CIRCLE 97 ON READER CARD

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entry products. The complete system, including the ballpoint pen that generates sound signals, the 14 x 14-inch tablet, control unit, and paper tape punch is priced at \$5995 (binary recording) and \$6295 for BCD. SCIENCE ACCESSORIES CORP., Southport, Conn.

CIRCLE 237 ON READER CARD

PROM Programmer

The model 7121 is used to program PROM's (Programmable Read Only Memories) in one of three modes: manual, semi-automatic, or fully automatic. The unit takes a Hollerith format punched card for automatically fusing the desired bit pattern. Interfaces, card formats, and control panel can be customized to the user's needs. Basic systems start under \$6K, and delivery is typically 90 days ARO. WARSHAWSKY, SAYRE AND ASSOC., Los Angeles, Calif.

CIRCLE 238 ON READER CARD

Light Pen

The series 6000 light pen is offered to oem's that are building graphic terminals. The pen is activated by pressing the tip against the crt screen, and it is attached to the electronics unit using fiber optics. Single units are priced at \$350. NORMAN JONES, INC., South Merrimack, N.H.

CIRCLE 239 ON READER CARD

Data Simulator

The digital data simulator can be used to develop and check out peripheral equipment such as mtu's, discs, and drums. The unit does bit-for-bit compare and stops on error showing character read and character expected. The format of testing information is entered through buttons and switches on the unit. The price is \$2200. COMPUTER SYSTEMS, Palos Verdes Estates, Calif.

CIRCLE 240 ON READER CARD

Fiche Reader

Black-and-white, full-color, and diazo fiche and film of up to 4 x 6 inches can be displayed with the MicroVu II. It features a vertical indexer to permit the user to select any desired row on fiche having up to eight rows, with individual frames located by horizontal scanning. The viewer only weighs 7½ pounds. Standard is 20X enlargement, with 24X optional. The price is \$129.50. DASA CORP., Andover, Mass.

CIRCLE 241 ON READER CARD

Modem

The Tele-Signal model 881C permits the use of tty models 33 or 35, equipped with a standard control unit for Touch-Tone or rotary dial operation, on the TWX and Data Phone switched networks. It is a replacement for the WE101C and the AE101C. Without a DAA interface card, the 881C sells for \$495; with it, it's \$565. SINGER TELE-SIGNAL, Woodbury, N.Y.

CIRCLE 242 ON READER CARD

Disc Formatter

A disc formatter for easing the interface problems between the controller and the

drive is available to oem's purchasing this company's 5000 series disc units. The device performs data transfer control and error checking for up to four discs. It can be equipped with a ROM for applications requiring one. Basic prices start at \$1660. PERTEC, Los Angeles, Calif.

CIRCLE 243 ON READER CARD

S/3 Disc Cartridge

Users of the IBM 5444 disc drive (or equivalent) are offered a cartridge for that drive for \$160. The 15-inch diameter unit stores nearly 2.5 megabytes. WRIGHT LINE, DIV. OF BARRY WRIGHT CORP., Worcester, Mass.

CIRCLE 244 ON READER CARD

S/3 Media Storage

A cabinet for storing IBM 5444 disc cartridges is available in colors to complement the S/3. It holds up to nine cartridges, or eight cartridges and five program card trays in a roll-out shelf. The unit can be combined with other units for larger capacity storage, and each cabinet has a lock on it. The price is \$126. WRIGHT LINE, DIV. OF BARRY WRIGHT CORP., Worcester, Mass.

CIRCLE 245 ON READER CARD

Cassette Option

A cassette with editing capability is offered to users of this firm's PortaCom portable data terminal, increasing the transmission rate of the unit from 10 to 30 cps. Data can be entered in an off-line mode for subsequent transmission. The price for the unit is \$1450. DATA PRODUCTS CORP., Woodland Hills, Calif.

CIRCLE 246 ON READER CARD

Graphic Display

The 6611/6612 keyboard and monitor are designed for use with the company's model 6500 and 6600 display systems. The 14-inch tv monitor has over 250,000 individually addressable points, or room for over 3K alphanumeric characters. The 6611/6612, including 95 ASCII characters and 20 control codes, is priced at \$1500. DATA DISC, INC., Sunnyvale, Calif.

CIRCLE 247 ON READER CARD

Forms Imprinter

An imprinter is offered for this firm's series 1500 forms bursters for slitting, imprinting, bursting, and stacking of continuous forms. Rubber patches are used for the imprinting of signatures, rates dates, slogans, or advertising messages. Basic prices start at \$4395. THE STAN-DARD REGISTER CO., Dayton, Ohio.

CIRCLE 248 ON READER CARD

Oem Cassettes

The MT-6 digital cassette features bidirectional operation at 7.5 ips, phase-encoded recording at 800 bpi, and read-after-write checking from the dual-gap head. It's intended for the communication system, point-of-sale, and machine tool controls markets. The unit is priced at \$1K. TEAC CORP. of AMERICA, Montebello, Calif.

CIRCLE 249 ON READER CARD

The MT-5 series of digital cassettes is similar to the MT-6 line above, but is



computer bookshelf

System Analysis for Data Transmission, by James T. Martin, IBM Systems Research Institute. A detailed explanation of all important considerations in the design and implementation of teleprocessing systems. 1/72/ approx. 784 pp./ cloth (88130-0)

Introduction to Teleprocessing, by James T. Martin, IBM Systems Research Institute. A basic introduction to the entire subject of teleprocessing containing references to all other James Martin books in the series. 1/72/ approx. 208 pp./ cloth (47981-6)

Programming the IBM 1130, 2nd ed., 1972, by Robert K. Loudon, Memorex Corporation, and George Ledlin, Institute of Chemical Biology. This revised edition emphasizes programming techniques and applications using the 1130 as an entry point into the world of computers. 1/72/ 448 pp./ paper (73027-5)

System/3 Programming: RPG II, by S. M. Bernard, IBM Corporation. A step-by-step approach to RPG II programming using illustrations, summary sections, test programs, and sample programs. 2/72/ 400 pp./ 6x9/ cloth (88169-8)

Design of On-Line Computer Systems, by Edward Yourdon, E.L.I. Computer Time Sharing Inc. An integrated discussion of all major components of an on-line computer system. 5/72/ 576 pp./ cloth (20130-1)

Business Systems and Data Processing Procedures, by Frank J. Clark, Genesee Community College, Ronald Gale, IBM Corporation, and Robert L. Gray, State University of New York, Binghamton. A two-part examination of business systems including their organization, nature, and scope; and an overview of systems analysis and systems improvement. 1971/ 288 pp./ cloth (10768-0)

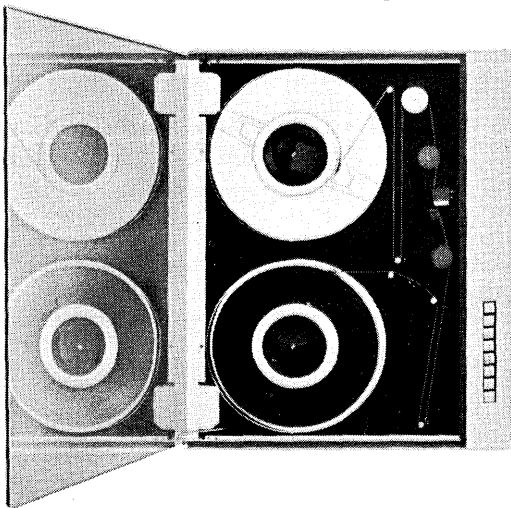
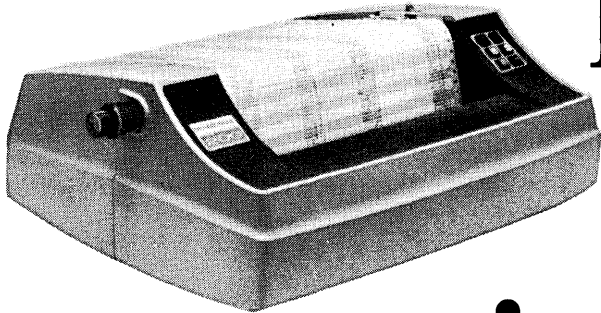
Debugging Techniques in Large Systems, (1971/ 148 pp.) cloth (19731-9), **Formal Semantics of Program Languages**, (4/72/ approx. 264 pp.) cloth (32906-0), and **Computer Networks**, (Forthcoming), all edited by Randall Rustin, Courant Institute of Mathematical Science, New York University. This series of books originated in three symposia in areas of current interest in computer science. The symposia were presented by the Courant Institute of Mathematical Sciences of New York University. The emphasis at the meetings was on the discussion of open problems rather than on presentation of solved problems.

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hardware

offered in read-only and write-only electronics. The start/stop time is something under 25 msec, and the price for these fully packaged units is \$595. TEAC CORP. of AMERICA, Montebello, Calif. CIRCLE 250 ON READER CARD

The DPC-201 transport drive is a bidirectional, single-motor, dual-capstan Philips-type unit available in one or two tracks with 6-, 8-, or 12-ips run speeds. Oem's can also obtain face or edge loading models, data electronics, and a capstan motor servo. The price drops below \$200 per unit for medium-size orders, and the units are available now. 3M CO., St. Paul, Minn. CIRCLE 251 ON READER CARD

The AJ 700 is a Philips-type cassette deck offered to oem's. The asynchronous unit can be ordered as a one- or two-track deck, with speeds up to 15 ips. The basic unit is priced at \$350 in 100-unit orders. Optionally available are data electronics; heads; read/write, read-after-write, and read-only electronics—for around twice the basic unit price. ANDERSON JACOBSON, INC., Sunnyvale, Calif. CIRCLE 252 ON READER CARD

Microfiche Display

A portable, upright reader for displaying ultrafiche images, the 27-pound model

455-3 is a smaller, lighter version of the vendor's PCMI reader. It is capable of displaying images at normal size from reduction ratios of 150:1. The price is \$450. NATIONAL CASH REGISTER CO., Dayton, Ohio. CIRCLE 253 ON READER CARD

Tape Subsystems

A number of tape subsystems with various capabilities are offered to NAKED MINI and ALPHA minicomputer users, as well as to users of the older 116 and 216 models. Read/write models with 7-inch reels start at \$7K, with read-after-write models using 10½-inch reels priced at \$9400, including controller. COMPUTER AUTOMATION, INC., Newport Beach, Calif. CIRCLE 254 ON READER CARD

Performance Measurement

Version 3 of the CUE (Configuration Utilization Evaluator) line of measurement products features more comprehensive reporting, including the ability to point at suspected contention points in the system, a cpu/channel report, logical channel/device utilization report, and even a direct access head movement activity report. CUE-Version 3 may be purchased for \$8800, or leased. BOOLE & BABBAGE, Cupertino, Calif. CIRCLE 255 ON READER CARD

Medical, P/C Graphics

The GX-200 is a solid-state raster-scan graphic display available in four-color systems for one channel at \$7500 (each additional channel, \$2K), or eight-color models for \$8500, one channel, with addi-

tional channels priced at \$3K. Interfaces for most minicomputers run \$1-2K. RAMTEK CORP., Palo Alto, Calif. CIRCLE 256 ON READER CARD

Bipolar RAM

The series 2000 bipolar random access memory can be ordered in configurations ranging from 512 to 8K words of 8 to 36 bits each. The TTL/DTL-compatible line is of the nondestructive readout type and has a cycle time of 100 nsec. Including drivers, sensing, and decoding electronics, 4K of 16-bit words runs about 13¢/bit. INTEGRATED MEMORIES, INC., Wilmington, Mass. CIRCLE 257 ON READER CARD

Buffered Tape Transports

This manufacturer's 5000, 6000, and 7000 lines of tape transports can now be obtained with character buffers ranging from 256 to 2K characters. Prices start at around \$3500, and the drives can be used in plotting, COM, data entry, or communications applications. PERTEC, Chatsworth, Calif. CIRCLE 258 ON READER CARD

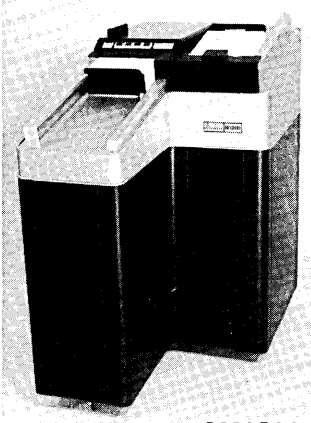
Oem Card Reader

The model 600 reader is a standard 80-column unit that reads at demand rates of 400 or 600 cpm. Fiber optics handle the reading chore. The deck and electronics, without cabinet, in quantities up to 24, is \$1350. The components also are sold separately, and a diagnostic panel is offered as an option. TRUE DATA CORP., Newport Beach, Calif. For information: CIRCLE 259 ON READER CARD

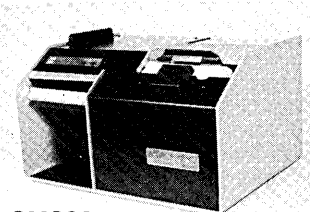
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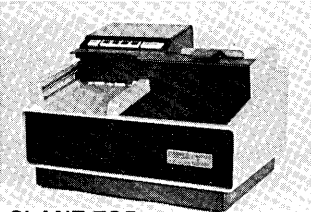
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OM 1200 This model fills the need for

an economical, high speed, large capacity punched card reader. Reading speed: 1200 cpm.

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CIRCLE 57 ON READER CARD

Software & Services

Software Notes . . .

It's estimated that transportation accounts for 20% of the gross national product, which probably explains the increasing number of route optimization programs announced lately. IBM has just captured one of the biggest plums available to vendors of these programs, installing a system called FIRST (Fast Information Retrieval for Surface Transportation) at Consolidated Freightways' Portland, Ore., data center. It's claimed that Consolidated, the nation's largest motor common carrier, can trace in seconds its 8,200 tractors and trailers by location, cargo, driver, or ETA at next destination.

"It amazes me that with the high level of development of computer simulation techniques, engineers still would rather build expensive breadboard models of equipment," says Mitre Corp's hurricane simulation project leader Richard Jordan. "They're quite willing to spend \$100K on prototypes, and when you tell them they can get the same results on the computer for a lot less money, they think you're crazy!"

Access to a computerized file of personal and professional information, together with a three-minute video tape audition, is being offered to casting departments in tv, movies, legitimate theater, and advertising agencies by Utopia Talent and Tape Service of New York. The object is to cut down on the time required to match players and parts.

Data Editing

EDITOR is an ANSI COBOL package that generates COBOL edit programs for running on IBM 360 and 370 gear (both OS and DOS) and the Univac 1108. It's claimed that less than an hour is required to create a program that can process 100,000 raw data records; edit 25 fields with 10 look-up tables for alpha, numeric, and parametric values; provide for key field, card type, and action codes; logically compare selected data elements; create a master file of valid records; output erroneous records with errors and fields identified and allow for new fields on the next update (anywhere in the record); and print hash totals on selected fields. A few control cards are all that is required. A minimum of 50K bytes of memory is needed, and EDITOR sells for \$6400, including training and documentation. The first 10 buyers get edit and file maintenance programs generated free to the buyer's specifications. GROUP OPERATIONS, INC., Washington, D.C. For information:

CIRCLE 271 ON READER CARD

Circuit Optimization

There are numerous circuit analysis programs in existence that take element values as input and calculate responses. Then the user tries to adjust the circuit so the output (responses) will be more what he's after. MAGIC (Modern Analytical Generator of Improved Circuits) goes about the circuit analysis task "backwards" (depending on your point of view) in that it takes as input what the final circuit performance specs are supposed to look like, and then works back to adjust circuit values to produce the desired result. MAGIC can be used on circuits ranging from DC to microwave. The FORTRAN IV program can be purchased for \$25K for a CDC 6000 series computer (17K words required); there is an additional charge for other machines. MAGIC is also offered as a service from United Computing Systems, Inc., in Kansas City. SCIENTIFIC SYSTEM TECHNOLOGY, INC., Dallas, Texas. For information:

CIRCLE 272 ON READER CARD

Memory Allocation

Ampex would really rather not say what's in its Management System program for 360 models with auxiliary storage. One source describes the BAL module simply as "witchcraft," but we do know that it in some way augments the memory allocation functions of OS/360 MVT and MFT to more effectively

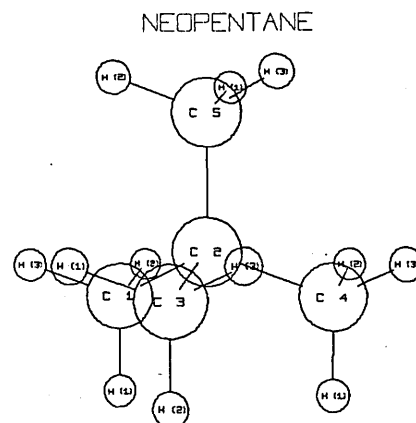
use the combination of the two memories. In the case of 360s with Ampex's ECM attached, it's claimed that a 15% throughput increase was realized using the program. (There has been suspicion that 360s were executing programs in LCS-type auxiliary memories rather than in main memory, so perhaps this program has put a stop to that.) The program sells for \$5K and rents for \$125/month on a two-year contract. AMPEX CORP., Marina del Rey, Calif. For information:

CIRCLE 273 ON READER CARD

Molecular Modeling

Chemists need no longer construct "tinker toy" models of complex organic molecules to predict their properties, or see how they might be changed. Though such "ball and stick" molecule construction probably has some therapeutic value, it's time-consuming (therefore expensive) and seldom gives an accurate picture of the molecule anyway, since the bond angles are fixed by the holes drilled in the balls representing the atoms.

An alternative is OMMP, for Organic Molecule Model Program. These computer-created perspective drawings are



correctly scaled, with relative atomic radii and bond lengths, can be drawn from any point around the molecule, and have hidden lines removed to add realism to the picture. There are also reports describing the molecule geometry in numerical terms, a bond angle report, an inter/atomic distances report used in estimating nonbonded interactions, and a dihedral angle report for evaluating the geometry of rings and multiple bonds.

The input for many molecules is the molecular formula coded in a simple line notation. The program then calculates the coordinates for the atoms. The present program, which allows up to 124 atoms per molecule, is supplied

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software & services

as a FORTRAN IV source deck of 5,000 cards for \$5K. The program requires typically 16K bytes of memory on 360s, and can also be shoehorned into machines as small as a 16K (16-bit) IBM 1130. A plotter is required. OMMP is also offered as a service, with a charge of around \$20 per molecule depending on output options. AMPERSAND CORP., York, Pa. For information:

CIRCLE 270 ON READER CARD

Bill of Material System

A master parts file and a product structure file comprise this bill of materials processing system, providing parts and subassembly requirements and forecasts, and also supplying part and labor cost information at various production stages. Explosion and implosion reports are generated, as are subassembly picking lists, etc. The program is written in BAL and RPG and requires at least 32K bytes of storage under either DOS or OS. The price of \$12K includes installation, one-year warranty, and documentation. DATAROYAL, INC., Nashua, N.H. For information:

CIRCLE 261 ON READER CARD

360/OS Accounting

ABACUS is an accounting and billing program for OS/360 MVT and MFT (with or without HASP) that should be of particular interest to service bureaus and data centers that are required to account for computer time charges by customer, project, or programmer. ABACUS handles accounting for both block-time entries and multiprogramming mode, extracting data from the standard SMF in OS as input. The reporting features include production of billing and utilization information daily, month-to-date, and monthly. The billing algorithm is said to be easily modified. Selected accounts may be processed for discrete periods. The price of the package is \$2500. APPLIED DATA RESEARCH, INC., Arlington, Va. For information:

CIRCLE 274 ON READER CARD

Real-time OS

All of this manufacturer's DC 6024 family of computers are capable of running DMS (Disc Monitor System), which requires 12K (24-bit) words on the 6024/5 and 16K on the 6024/1 and 6024/3, a tty, and a disc unit. DMS processes foreground programs using a priority structure to allocate memory and CPU usage. These programs can be core resident or may be cataloged on disc and initiated by external inter-

rupts, such as through the console, or called by another foreground program. Additionally, there is a timer scheduler that can initiate programs. If memory space is insufficient for the foreground programs, background processing is automatically rolled out onto disc and automatically called back in when memory is again available. The OS also prevents unchecked programs from transferring into critical foreground tasks. The price for the DMS is \$5K, with a one-week training course offered at \$250 per person. DATA-CRAFT CORP., Ft. Lauderdale, Fla. For information:

CIRCLE 275 ON READER CARD

Wholesale Distribution

STARS is the name of this wholesale distribution package available for the Singer System Ten. It includes accounting programs such as billing, accounts receivable, inventory control, sales analysis, accounts payable, general ledger, and payroll. File maintenance, inventory receipts and adjustments, cash posting, and invoicing can be done interactively with the program, potentially eliminating coding, keypunching, and editing of input. The entire system is priced at \$9K, including documentation and on-site assistance. Portions of the system are sold separately. INFORMATION MAN-

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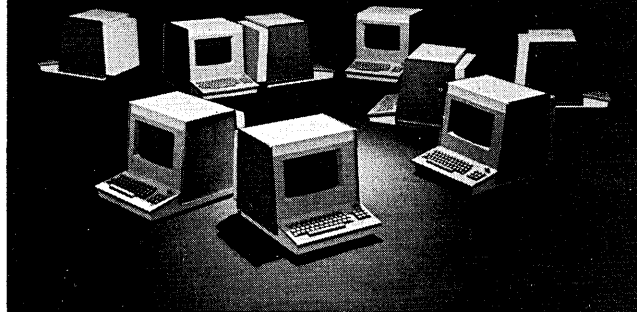
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The Economist



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CIRCLE 56 ON READER CARD

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CIRCLE 277 ON READER CARD

Mailing List Analysis

Using SELEX, it is possible to evaluate mailing lists by almost any criteria, including sic numbers, geographical location, Zip code, size of sale or sales, or similar factors. SELEX can then be instructed to pick "nth" names for test mailings. Sequential series of data are handled using up to 104 decision-making variables. The BAL program requires about 8K bytes on 360/370 computers and is priced at \$3K, including documentation and installation. TECHSYSTEMS, INC., Chicago, Ill. For information:

CIRCLE 276 ON READER CARD

Dispatching/Routing

More and more programs similar to this vehicle dispatch and distribution planning program are appearing, and certainly some time in the future nearly all firms with access to a computer will have one to efficiently schedule the delivery of its wares. This one is said to handle any number of vehicles for delivery and pickup to any number of customers. The FORTRAN IV package is also sophisticated enough to handle simulation of numbers and types of

vehicles, warehouse locations, and routing. Also computed are the vehicle mileages, load and unload times, travel times, and fleet statistics. Typical memory requirements are 120K bytes, and the price is \$12K. The program can be leased for \$200/month. STEVENSON & KELLOGG, LTD., Vancouver, British Columbia. For information:

CIRCLE 262 ON READER CARD

Real-Time Exec

Offered to Nova and Supernova users having the minimum 4K on these systems is the RTOS for handling i/o timing, data buffering, priority interrupts, and task scheduling. It resides in 1K of memory and also requires the real-time clock feature. Concurrent processing, such as reading and writing data blocks while monitoring other devices, is another feature of the RTOS. It is available immediately for no charge. DATA GENERAL CORP., Southboro, Mass. For information:

CIRCLE 263 ON READER CARD

File Management

Users of this firm's 2500 computer are offered a submonitor for controlling up to 32 fixed- or moving-head disc units and other peripherals such as card readers, line printers, paper tape equip-

ment, and crt units. Some of the features include FORTRAN IV compiler/load/go capability, mass storage housekeeping, automatic storage space allocation, and the accommodation of variable-length records. The file management monitor operates under either the W 2500 Monitor II or Monitor V operating system and requires at least 16K 16-bit words. Westinghouse is bundled. WESTINGHOUSE ELECTRIC CORP., Orlando, Fla. For information:

CIRCLE 264 ON READER CARD

Report Generation

Datatrieval is intended to facilitate information retrieval and printout using a series of user-prepared input statements. The load-and-go BAL program features table look-up and all forms of arithmetic operations. Finished reports can be printed in a variety of formats, with self-centering report titles; one, two, or three columns of column headings; group or detail printing; up to nine spaces between each line, etc. Datatrieval requires a minimum of 48K on 360 models 25 and up running os or pos. The price is \$6K. A Spectra/70 version is also available. FORTX DATA CORP., Chicago, Ill. For information:

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OS Data Set Dump

DS/DUMP provides users of os 360 the ability to dump any os data set, regardless of organization, record, length, block size, device, or RECFM, according to its developer. The 4,300-byte BAL package prints the information in both HEX and BCD, 40 bytes to a line, and doesn't require any JCL to dump the first 100 records of a file. Control cards are present, however, for bypassing records, terminating the dump at a specific location, or printing samples of the file. The price for DS/DUMP is \$195, and it is offered with a money-back guarantee. ARKAY COMPUTER APPLICATIONS, Lowell, Mass. For information:

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services . . .

Product Safety Analysis

With everyone becoming increasingly safety conscious, here's a computer-based service that provides a systematic and quantitative analysis of possible modes of product failure, including human error, whose occurrence could lead to user hazard and/or equipment malfunction. The procedure is based on a closed-loop fault-tree concept that identifies, analyzes, ranks, and corrects (if desired) potential safety hazards.

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The cost of the service is difficult to pin down since it depends largely on how complex the product is and the amount of engineering analysis required. IIT RESEARCH INSTITUTE, Chicago, Ill. For information: CIRCLE 278 ON READER CARD

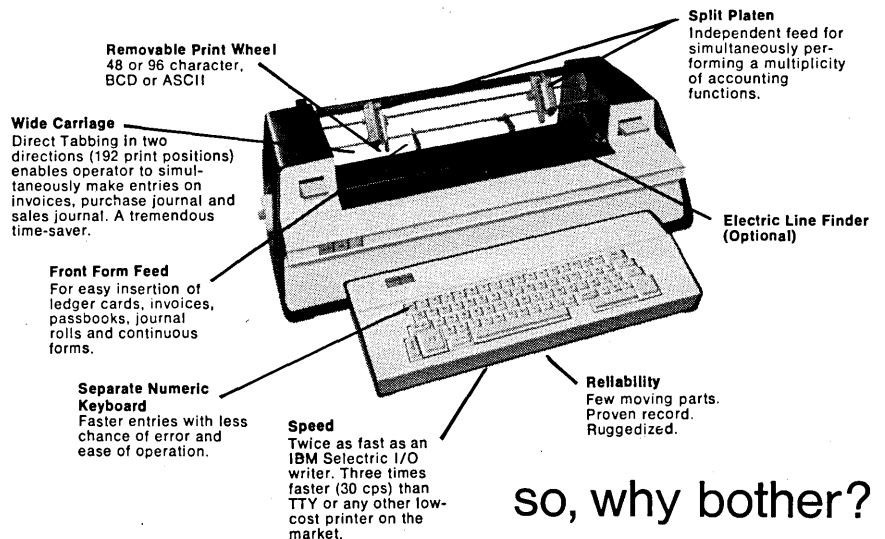
MOS Wafer Processing

Evaluation of both standard or silicon gate type MOS wafers is performed by this firm from customer-supplied circuit masks. The price of testing five areas per wafer is \$200, and delivery is approximately two weeks. Service on custom MOS circuitry is also offered. MOSFET MICRO LABS, INC., Quakertown, Pa. For information:

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March, 1972

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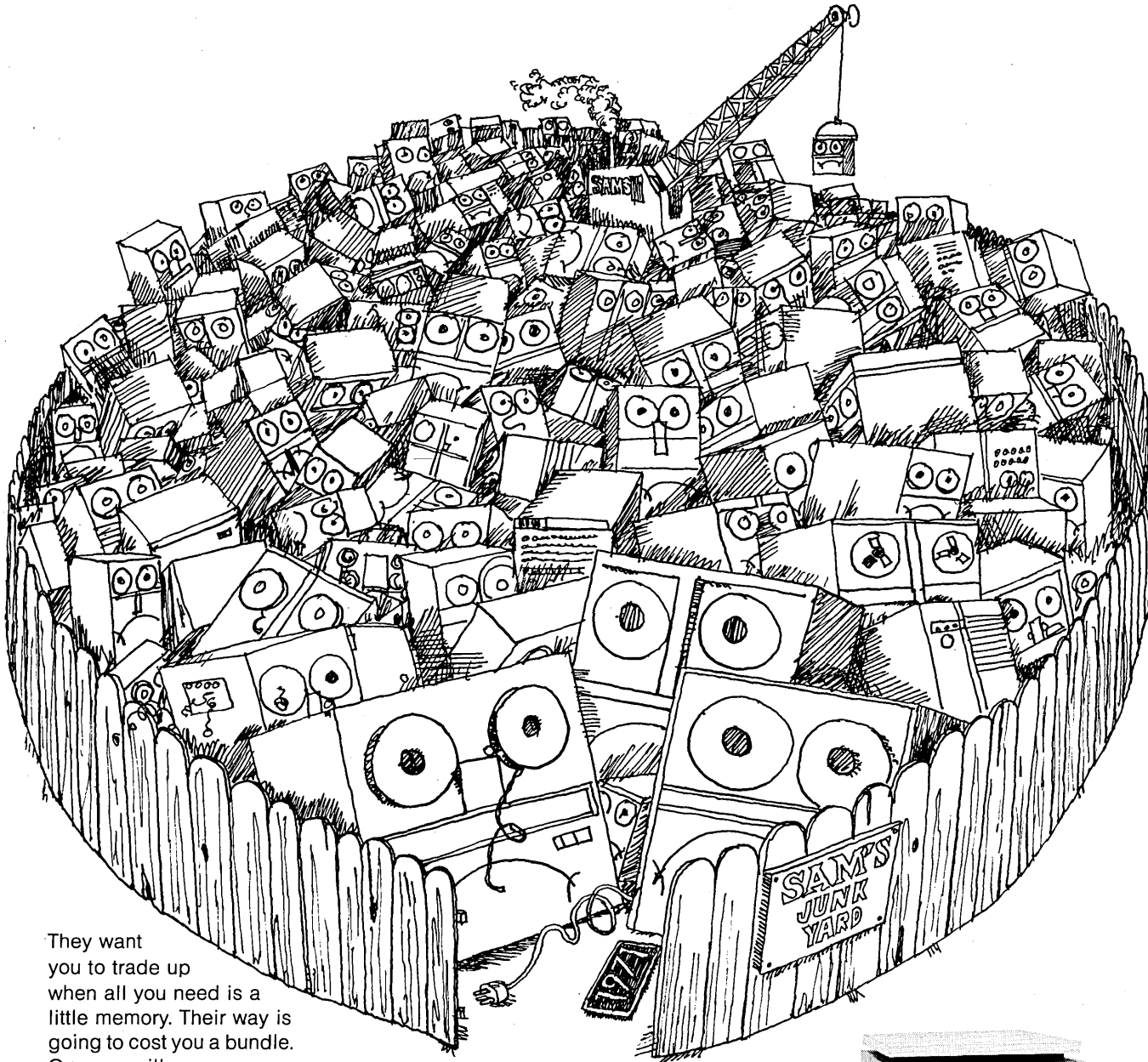
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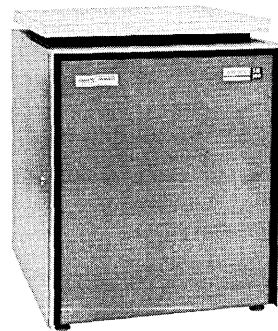
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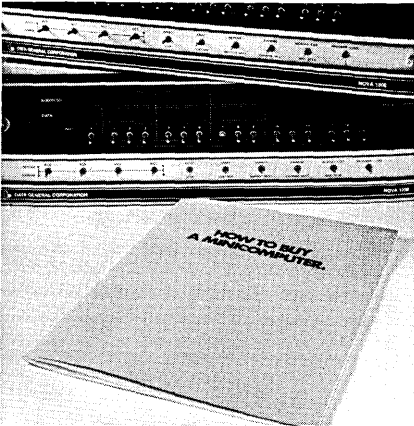
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Literature

Buying a Mini

"How to Buy a Minicomputer" is a 32-page pamphlet which provides answers to 17 commonly asked questions about what to look for in minicomputers. It



covers minicomputer architecture, new memory techniques, types of instruction sets, and available software and peripheral equipment. DATA GENERAL CORP., Southboro, Mass. For copy:

CIRCLE 201 ON READER CARD

Transportation DP

Proceedings of the Transportation Data Coordinating Committee forum on "Computer Based Data Exchange Systems" contains papers by representatives of shippers, railroads, motor carriers, steamship lines, airlines, banking, and government on progress being made in the conversion to computerized data systems for transportation and physical distribution. Copies are priced at \$6. TDCC, 1101 17th St., N.W., Washington, D.C. 20036.

CULPRIT for TOTAL

Brochure describes a special version of the CULPRIT information retrieval and report generating system being developed for use with the TOTAL data base management system. CULLINANE CORP., Boston, Mass. For copy:

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Maintenance Brochures

Two brochures describe services and operation of a computer services organization. One, intended for computer and peripheral manufacturers, describes available maintenance services with details of cost and obligation. The other, a six-page foldout, describes services offered to computer users on behalf of manufacturers. RAYTHEON SERVICE CO., Burlington, Mass. For copy:

CIRCLE 204 ON READER CARD

DP Courses

Twenty-page catalog lists all data processing courses offered by this vendor. It contains descriptions of 25 courses for four categories of data processing personnel. BRANDON APPLIED SYSTEMS, INC., New York, N.Y. For copy:

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DP Accessories

Catalog of data processing accessories covers noise suppressors, paper handlers, terminal tables, and portable tape handling equipment for computer terminals. The products are designed for Series 32, 33, and 35 Teletypes and IBM 1050, 2740, and 2741 terminals. TERMINAL DATA CORP., Silver Spring, Md. For copy:

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Assistantship Directory

"Fifth Annual Graduate Assistantship Directory in the Computer Sciences" contains information about graduate assistantships and fellowships available in university computer science departments and university computing cen-

ters. It is available free to student members of the Association for Computing Machinery and at \$5 to others. ACM, 1133 Ave. of the Americas, New York, N.Y. 10036.

Communications Systems

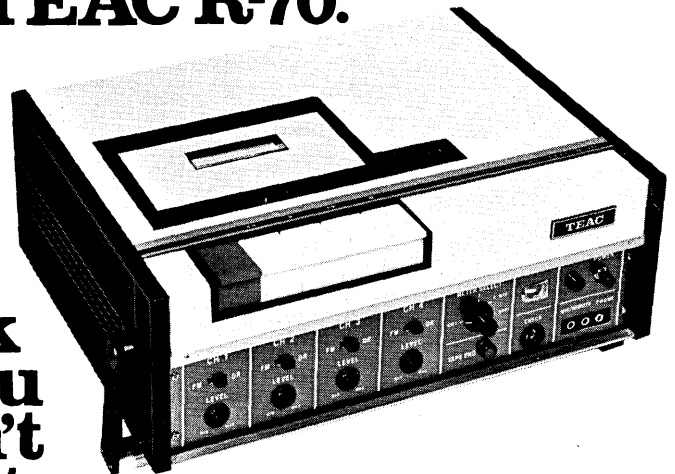
A 16-page brochure describes total information systems and computer communications equipment, including message switching equipment and remote communications terminals. Each system and product described is illustrated with picture and diagrams. COMPUTER COMMUNICATIONS, INC., Culver City, Calif. For copy:

CIRCLE 202 ON READER CARD

Front-end Processors

"All About Programmable Communications Processors" is a report covering 66 stored-program communications controllers from 34 manufacturers. The 28-page publication analyzes the pros and cons of the computer-based systems widely employed as front-end communications processors, message switching systems, and line concentrators. Copies are priced at \$10. DATA-

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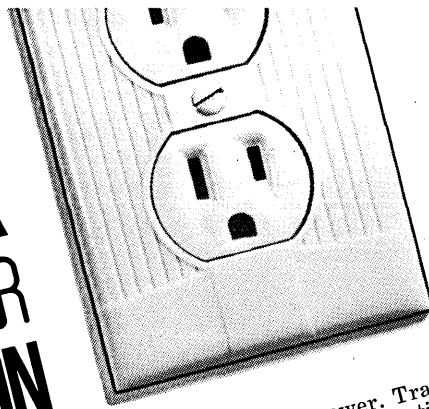
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Communications Monitor

Four-page brochure describes a data transmission test set which includes an audio line monitor that allows a user to detect abnormal conditions by listening to the signals transmitted over the line. INTERNATIONAL COMMUNICATIONS CORP., Miami, Fla. For copy: CIRCLE 209 ON READER CARD

Voice Adapter

Data sheet describes vendor's Model 804 Voice Adapter for high-speed, dial-up modems used on leased two- and four-wire lines. The 804 features a standard telephone set replacing the dial with a lighted indicator. It sends a signal to the other end when the handset is lifted off-hook. The adapter reacts by turning on the light and sounding a buzzer. PARADYNE CORP., Clearwater, Fla. For copy: CIRCLE 210 ON READER CARD

Film Directory

Revised "Directory of Films for Data Educators" contains descriptions of 350 films selected from the offerings of 55 film libraries. For each film, the source where it can be rented or purchased is listed, together with the rental fee, if any, and the film's running time. Copies are \$2.25 with order. SOCIETY OF DATA EDUCATORS, 2-76 Union, Northfield, Vt. 05663.

Overseas Markets

A service for overseas market development is described in a bulletin which says that the "Global Profit Enhancement Plan" is specifically tailored to the needs of computer-oriented companies wishing to expand their business overseas through direct sales, licensing, joint ventures, or subsidiaries. INTERNATIONAL RESOURCE DEVELOPMENT, INC. Ramsey, N.J. For copy: CIRCLE 207 ON READER CARD

Data Communications

Data communications equipment, telephone equipment, and remote control supervisory equipment are described in a 16-page, short-form product catalog which also covers typical applications of the equipment and lease or buy arrangements available. PULSE COMMUNICATIONS, INC., Falls Church, Va. For copy: CIRCLE 208 ON READER CARD

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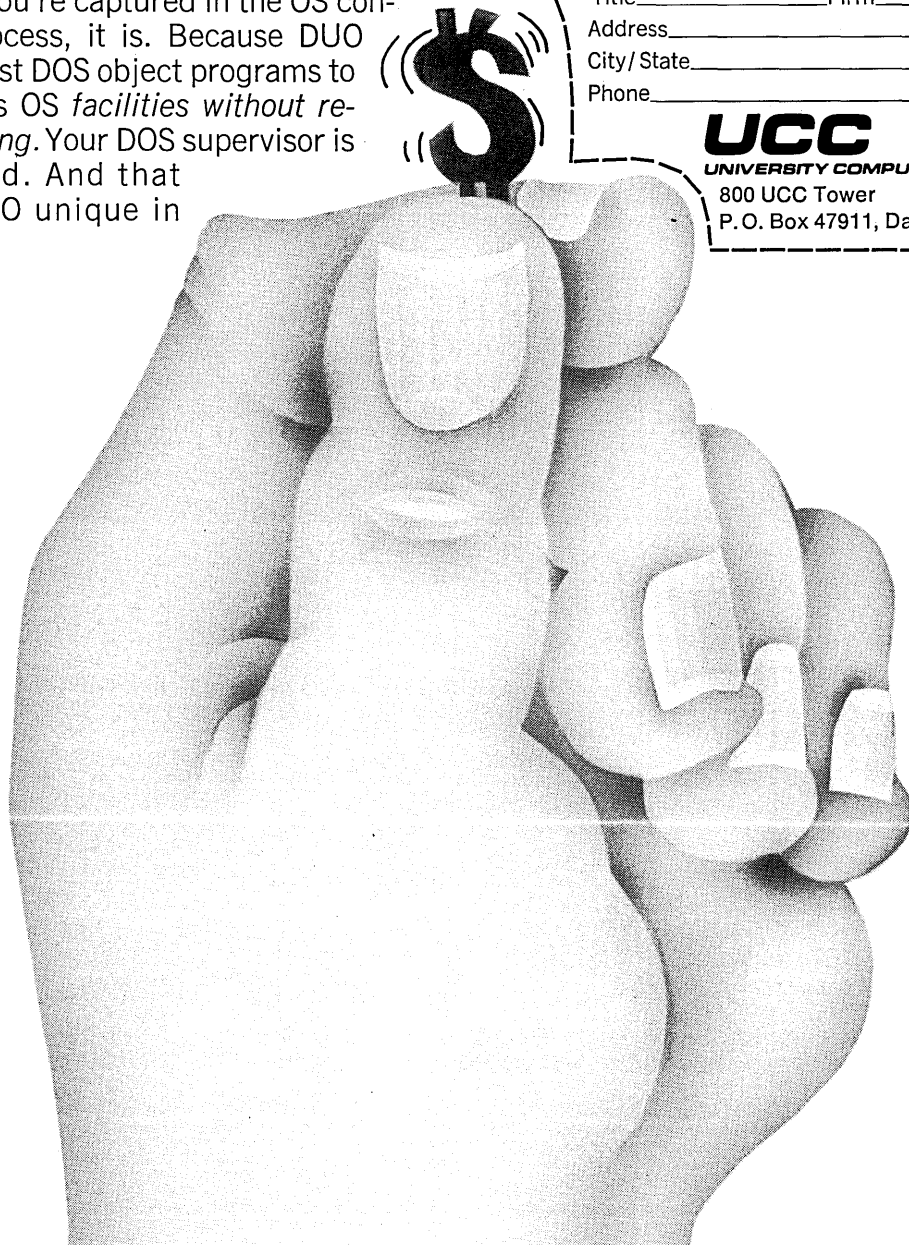
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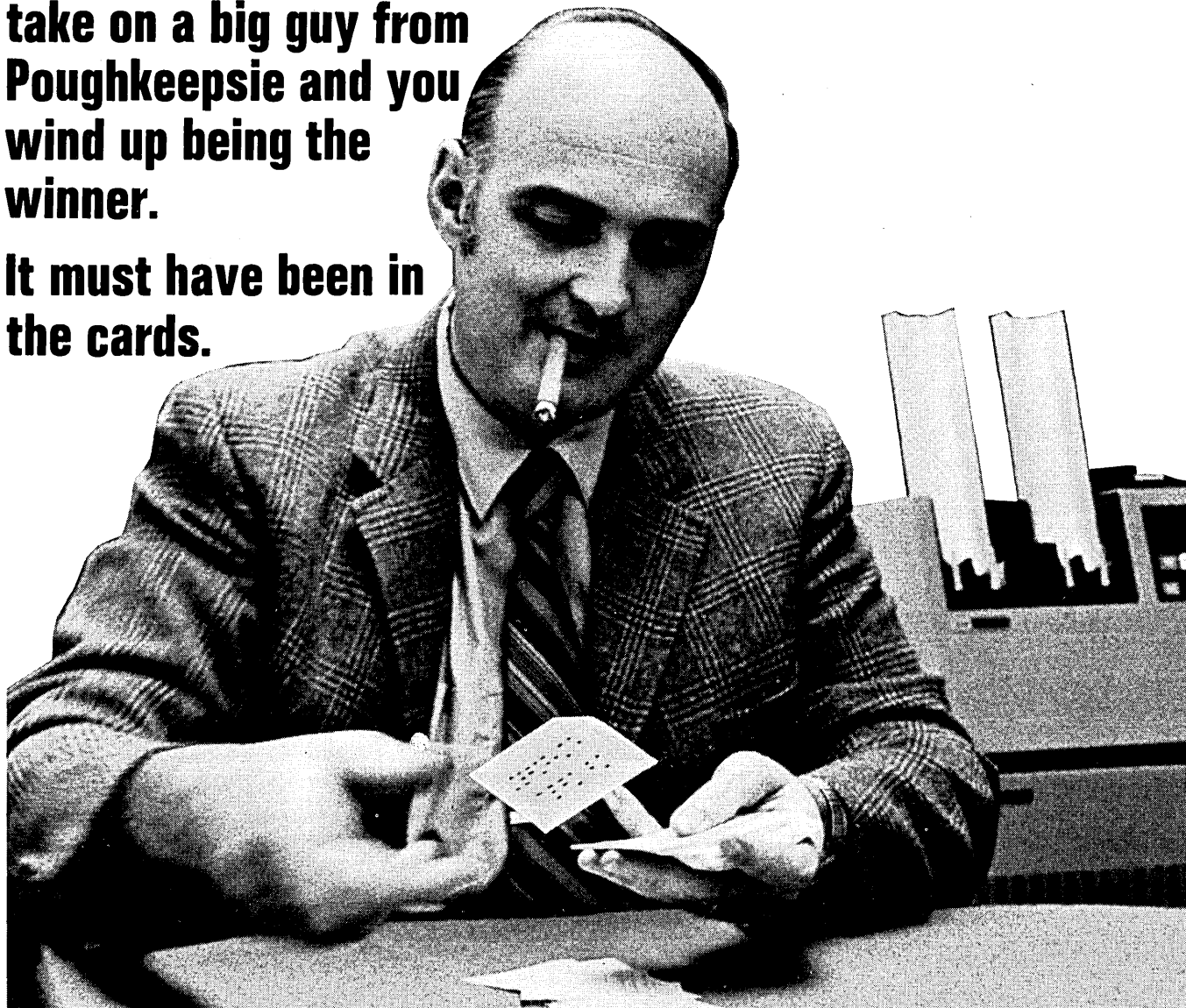
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Books

Computer Programming, System/360

By Ivan Flores
Prentice Hall, Inc. 1971
370 pages. \$12.95

This volume is the latest in what is now a considerable selection of works by Dr. Flores on communication with a computer. It is organized, in general, as a textbook, and covers the entire macroworld from bit level to JCL.

Graph theory is introduced early (in chapter 2) and interwoven into the discussions of program structure here and there through later parts of the book. Some crusty programmers will view this as an extra layer of frosting on the cake, and an intrusion into the cluttered world of quasi-reasoning that is programming today. Even Dr. Flores, in the preface, admits that graph theory "has not won much popularity." Yet, he builds it well into his over-all reasoning, which seems to be that computer programmers ought to understand what they think they are doing, manifestly not a viewpoint that will win instant worldwide acceptance.

The book covers the essentials of command structure of an imaginary computer with the likely name of FLAPJAC for which is structured, of course, the FLAP assembly language. From this the reader is led gently by the hand up to and through the programmer-visible attributes of the IBM System/360 family until the entire fragrant garden that is Operating System/360 is spread before him in all of its floriferous majesty.

Discussions of the physical and logical aspects of pertinent pieces of hardware are interspersed here and there. Chapter 11, for example, is devoted entirely to input/output devices. While one could hardly view this as a definitive manual of hardwaremanship, there is sufficient equipment-related material to give the reader a feeling of comfort.

Treatment of the subject in this volume can well be described as "in depth." Consideration of the scope of the work leads one to contemplate what a complex world it is in which the programmer works these days. While some may consider some of the topics trivial, there is a good deal of solidity present, and the book is well organized and well thought out. This presentation of many of the things that a programmer ought to know and practice doubtless includes many things that are, unfortunately, not always well known and well practiced, accounting, perchance, for the too frequent reputation of software as something delivered late and inoperable.

Here and there through the volume topic words are printed sideways in the outer margins, adjacent to the paragraphs which they describe. The reader may be well advised to have a strong arm or prismatic glasses if he insists on reading all of these. Sufficient type faces are used in the book to make Mr. Mergenthaler happy that little of his artistic work has gone unrecognized here.

If there should be a second edition, it might be well for the official eyeballers of Prentice-Hall to pay a bit more attention to correct preparation of the illustrations, some of which induce considerable wonder by using different

nomenclature, indices, etc. than the text which refers to them. The mistakes, however, are at least printed neatly.

This volume is recommended for the libraries of those who bemuse themselves with the teaching of programming, surely one of the world's more esoteric careers. It is a worthwhile thing to have around for the practicing programmer. He may, through familiarity with the book, be induced to apply some of the methods and disciplines explained therein. By so doing he is more than a little likely to improve his work and its end results.

—Jackson Granholm

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People

There's good news and bad news for surviving software companies in the opinion of FRANK WAGNER, new executive vice president of Informatics, Inc., Canoga Park, Calif. But Wagner sees the good outweighing the bad for the software company he joined during its infancy in 1962.

The bad news: price problems are brewing and there is increased competition with in-house capabilities.

The good news (at least for Informatics): there is no price problem with their Mark IV file management system because "people are beginning to be willing to



pay the necessary price for a quality product" and there is a "growing recognition" of systems products—a combination of hardware and software where a basic system is custom-altered to fit specific customer needs—of which Informatics already has three offerings and is readying two more. And for the whole software industry, the good news is that "large numbers of incompetent or weak organizations have disappeared, and surviving companies are in better positions than they had expected to be."

Wagner called his latest appointment a confirmation of a shift in his operating responsibilities that has been taking place over "several months" as WERNER FRANK, an Informatics vp who had been in charge of eastern operations, phased out of Informatics to assume the presidency of Equimatics, a joint venture with Equitable Life Assurance Society (January, p. 61). Wagner said Informatics is "looking at" other similar ventures into vertical markets. Wagner, who established the first engineering computer group at North American Rockwell in 1952, is a founder and former president of SHARE and the only honorary member. He likes to make predictions and prophesied in 1966 in his publication, "How the Computing World Went On-Line," that a trend would be established this year toward the basic processes of every major enterprise becoming dependent upon on-line computers and that trend would lead to a "fait accompli" (if you're not doing it that way, you'd better be ready to explain to your boss why not) by 1978. He still holds to this.

Continuing the controversy between proponents of the oxide-coated disc memory and the plated disc is Dr. ROBERT S. SMITH, who has returned to Data Memory, Inc., Mountain View, Calif., as manager of magnetic disc operations. Dr. Smith says, "The advent of MOS will put the squeeze on oxide technology."

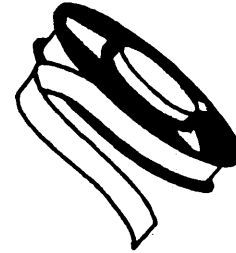


Robert S. Smith

He adds that the plated disc, with its higher bit-density capability, will be relied on more and more. In explanation, he says the IBM 3330 packs about 4,000 bpi, and it was a struggle developing this capability, whereas the plated discs are packing 'em in at up to 8,000 bpi—and in labs, this goes up to 12-13,000 bpi.

UniComp, Inc., Northridge, Calif., minicomputer company, will make a strong bid for profitability

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people

under new president EUGENE W. STEWART, who moved into his job from the NavCom Systems Div. of UniComp's parent, Hoffman Electronics Corp. UniComp, formed in 1969, hasn't made it into the black. Sales of some \$700,000 in 1971 put it "close to the break-even" point, according to a Hoffman spokesman, but the corporate 1972 budget calls for sales of better than \$1 million and "a modest profit." Toward this end, the firm not only has a new president and a new facility (up to 10,000 sq. ft. from 3,000) but will get a bit more control from the parent company and will be working closely with NavCom.

Stewart was director of engineering for NavCom and was involved in the division's military marketing efforts, which Hoffman feels will be an asset to UniComp. Stewart said initially his efforts will be toward strengthening UniComp's marketing, but ultimately a product line expansion is contemplated.

When Ed McCollister became marketing manager of ElectroData Corp. in the early '50s, he was pleasantly surprised to receive a hard-sell pitch from an employee the moment he showed up unknown at the firm's booth at a Philadelphia computer conference. The salesman was SIBYL ROCK, who was honored last January when she retired from the company, now part of Burroughs Corp., after a distinguished 34-year career in mass spectrometry, applications engineering, market management, and systems analysis. From 1958 until



Sibyl Rock

her retirement, she had been responsible for the development of computer product specifications.

Miss Rock well remembered one of her first assignments as a "traveling saleslady" at a conference at Louisiana State Univ., where, with no funds for an exhibit booth, she set up shop on the stairway leading to the exhibit hall and pitched the attendees from there. She recalls that this sales approach did little to sell ElectroData wares, but

had a beneficial effect for IBM customers: IBM apparently considered her a threat and stepped up its deliveries of the 650 computer to these customers.

Miss Rock feels that although there is less discrimination against women in the computer industry than in most others, few females are active in computer design or ever reach department head levels.

The people at Burroughs threw a going-away party for her in Pasadena this January and read a letter from old boss McCollister, who recently left RCA Computer Systems for Burroughs in Detroit: "You have a lot of nerve retiring a few weeks after I return," he said. "I was counting on you to break me in as you did before at the computer conference in Philadelphia." At the party Miss Rock was presented a cake bearing a rainbow and the proverbial pot of gold, and a sweepstakes ticket to make the promise materialize. We hope it's a winner.

With attendance continuing to sink, the Joint Computer Conferences will be under close scrutiny of the sponsoring technical societies for whom the shows have been a major source of revenue. One such group is the 17,000-member IEEE Computer Society. Its newly elected president, Dr. ALBERT S. HOAGLAND, says the society intends to present the sponsoring American

Federation of Information Processing Societies (Afips) with forceful "guidance." In the past, says the 45-year-old IBM scientist, member societies tended



Albert S. Hoagland

to accept the JCCs as handsome revenue producers and often neglected to see whether they really served the technical information needs of their members. Hoagland won't say any more than this—until his society presents its recommendations to Afips sometime this month.

The new president says the society will concern itself with the professional and economic well-being of members. "We should be more than just a publishing and conference management group and get more involved within the context of our members' careers." Another goal, more exchange of technical information with the 27,000-member Association for Computing Machinery.

Hoagland, a PhD from UC Berkeley, joined IBM in 1956 and was director of technical planning for the Research Div. in Yorktown Heights, N.Y., before moving last September to Boulder on a temporary assignment with the Systems Development Laboratory.

When GEORGE A. HOWARD took over as executive vice-president and chief operating officer of Edutronics Systems International, Inc., last month, he trimmed the staff of the Los Angeles-based publisher of audio-visual edp training aids by 25 and was predicting an "immediate turn around to a profitable operating mode." □

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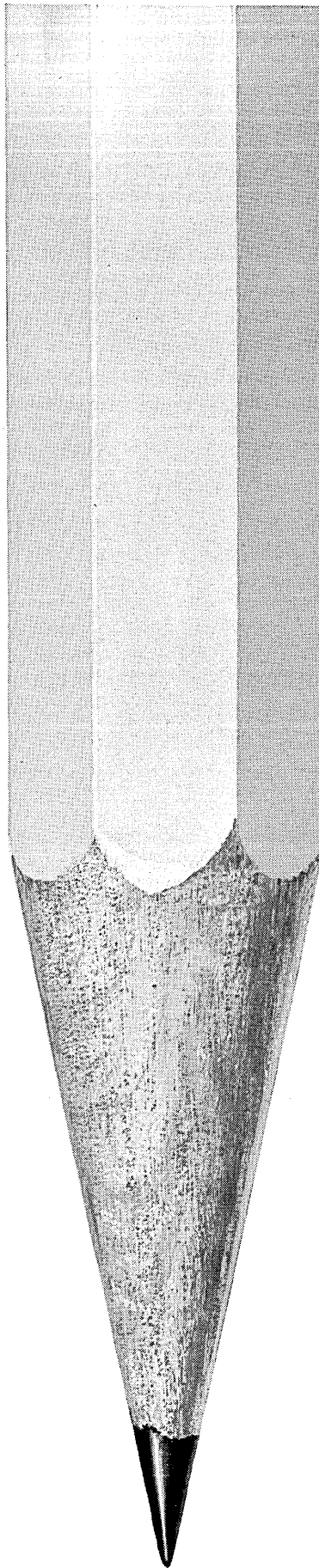
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DATAMATION

Look Ahead

continued from page 8

The new agreements eliminate any clauses that get the leasing company off the hook if a customer defaults. Storage Technology signed such an agreement with Decimus, Inc., and now has the blessing of its auditors and the Securities and Exchange Commission to declare as direct sales the \$7 million worth of tape drives it will sell to Decimus over the next three years. Under similar agreements, Telex Corp. is reporting as sales a \$6 million agreement with PepsiCo; and in Cupertino, Calif., Quantor can register as sales its \$1.25 million commitment from Transamerica Computer Corp.

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FAST SHUFFLE IN FAST FOOD MARKET

Two billion hamburgers later (see May 15, 1971, p. 79), the nation's biggest fast-food chain has yet to narrow the field of point-of-sale contenders for its business to one. McDonald's, which has been working for some three years with Documentor Sciences and has ordered Documentor systems for a small number of its almost 1,600 stands, now has ordered eight System Ten's from Singer Business Machines to test in a different (to McDonald's anyway) kind of ordering system based on keyboard entry and separate order-taking and bill-paying stations. Another one-time contender for McDonald's business, TRW Systems, which once had a System 1300 point-of-sale system installed in a McDonald's on a test basis, won't be knocking on McDonald's doors --or any other--any more. At writing TRW was close to agreement with a "major corporation" which would purchase System 1300s on an oem basis and market them under a joint label.

RUMORS AND RAW RANDOM DATA

Users are wondering if Call/360 and CP/CMS--time-sharing operating systems--will be supported under System/370. They say IBMers questioned about it either grin or say "no comment"...Documation, Inc., Melbourne, Fla., will show a 180-card/min. reader at SJCC which can be hard wired or acoustically coupled to the dial-up telephone net...IBM, which courts a reputation for not laying off staff for economic reasons, had 1.4% fewer employees in 1971 than in '70, according to its annual report, which also showed an 11% increase in sales...One competitor's reaction to the CDC/NCR cooperative accord: "The blind leading the deaf"...Women's Lib version of a recent bumper sticker: "Ms. Bell is a cheap mother"... One of the most significant awards this year--the BOTCH (Best Of The Computer Hardware)--will be presented at the 20th annual Digital Computer Assn. bash on Friday, March 17, at Rodger Young Center, L.A. Call 213-346-3410

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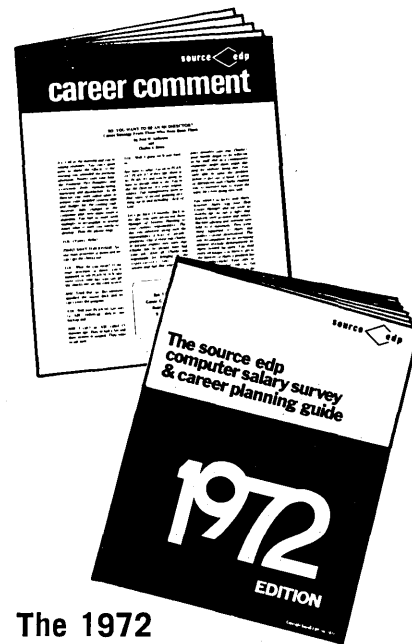
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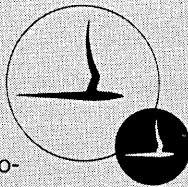
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The Forum

Programming: the quiet evolution

The age of computer hardware is easily measured in generations; the first characterized by vacuum tubes, the second by transistors, and the third by integrated circuits. Computer software does not advance in generations in which new developments make old ones obsolete. Programming has progressed from machine language to general-purpose high-level languages to specialized, problem-oriented languages without discarding anything. What could not be converted for a new computer was emulated.

Many changes are discernible in the still-young programming profession, but the changes have had little to do with the revolution in hardware. Programming is a very human field and its changes derive more from human needs than technological possibilities. A look at this fascinating profession is in order.

Programming in the 1960s was influenced perhaps as much by the mood of the times as by the newness of the profession. The nation's economy sustained an unprecedented period of growth with no serious reverses, and we began to think and act as if affluent. The computing industry and the programming profession not only shared, but greatly exceeded this growth.

The mood of the 1970s contrasts sharply with that of the 1960s. We have suddenly awakened from the euphoria of the 1960s to find ourselves facing a harsh reality. The world we knew and the values we regarded have changed.

Computer security at one time meant protecting our information from belligerent nations. It now means protecting our physical machines and data from the excesses of society. We worry about the destruction by our own citizens and less about foreign enemies. This has reduced the visibility of computers. A computer displayed prominently in an office window is no longer a status symbol; it is an insurance problem.

Many companies, particularly in the aerospace and defense industries, are experiencing sharp budget cuts, and now the gap between programmers and jobs appears narrow. Programmers and managers are learning the true meaning of cost effectiveness. Managers suddenly discover that they are free to assign programmers to tasks suited to their skills rather than to their tastes. Undoubtedly the economy will turn around, making the budget constraints less severe, but we will remember them.

The charisma of the aerospace and defense industries has faded, not because of the budget cuts, but because of the Asian war. In the early 1960s advertisements for programmers abounded in pictures of missiles, war planes, and other accouterments of destruction. Today we would find such advertisements repelling. Everyone has been disillusioned by the war; some because they believe our country to be in the wrong; others because our mighty technology and resources have proved unequal to an army of peasants—none of whom have college degrees. We can all agree that national defense is more palatable when it deters Russia than when it

invades Cambodia.

The space program reached its goal of the moon, and further developments will for some time seem anti-climactic. Past successes must now be consolidated. The taxpayer, gazing up through the smoggy air, is beginning to question whether the money might better be spent elsewhere. And so the space program will decline in popularity. In fairness it should be noted that the public, unenthusiastic about Columbus, was even less impressed by Leif Ericson. But then he had a problem common to many programmers—he didn't document well and so his discoveries were of little value.

Research too is losing prestige. Like all professions, research is interested in perpetuating itself. Thus the stereotype research project, rather than recommending a course of action, concludes by suggesting that more research is needed.

And now ecology is making past successes look like long-term disasters. This is unsettling because we are brought up to believe that progress is sacred and yet we find that progress pollutes. We know that nature deals harshly with animals that foul their own nests. Has research and science somehow failed us? The question beginning to form is why spend all that money on research to come up with short-range benefits that lead to long-range ruin?

Research, with the public as a patron, has been a field of glamor and money—so much so that PhDs are rapidly becoming a glut on the market. The researcher, shrugging off distractions to concentrate on just his thing, groused that the public did not recognize his good ideas and pay to implement them, disdaining to take the time and effort to explain why his ideas were good. The public may soon be less inclined to pay researchers for just good ideas. The researcher may not retreat to his position in the Middle Ages when he was a penniless ascetic in a long, shabby coat bending over his formulas and calculations in a dusty attic, but he may change his image.

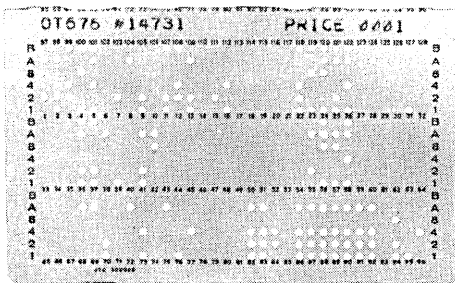
We entered the 1960s with the disturbing thought that computers might someday be able to "think." After all, if computers could prove theorems in plane geometry, play chess, compose music, and solve calculus problems, why could they not be said to think? Granted the computer could not write music like Mozart, but how many people can? This worry has since disappeared. We began to realize that it is easy for a computer to solve calculus problems just because it is a computer, and we are impressed only because it is hard for us. We soon lost interest in some of the computer's exotic capabilities because the market was already flooded with people who could write poor music and play amateur games of chess. Finally we discovered many things that humans can do very easily, such as recognizing a face in a crowd, that we cannot conceive of a computer doing. Man enters the 1970s secure in his position as an intelligent machine.

Slowly we began to see a growing menace from an entirely different direction. An old man is suddenly told that he has a bad credit rating, but he is unable to find out why and get it changed. A housewife receives an incorrect computerized bill and is unable to get it corrected. An engineer is abruptly dismissed from his job because a computerized dossier shows his name on the attendance list of a tea sponsored by a group once considered subversive. Computers can store and manipulate vast amounts of information, but it seems that if once the computer begins to process its information, events move inexorably forward to their conclusion, justly or unjustly, without the individual being able to change them. There is no court of last resort and little human

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intervention to protect us from a computer that knows neither compassion nor mercy.

Little wonder we felt uneasy about completing our census reports. The computer's long memory allows our actions of years ago to remain with us always; information about an individual has no statute of limitations. The abuses of information we have seen so far have been relatively minor with no harm intended. Will this always be so? Each of us is vulnerable to the misuse of the records we create in our daily lives. As an admittedly extreme example, how many marriages would survive if each wife were mailed an itemized accounting of all her husband's expenditures, including flowers, lunches, cocktails, and motel rooms? Would not some of our past be better forgotten?

The information revolution may have less impact on individuals than the industrial revolution, but the solution of some of the affected has been the same; machines were smashed. Programmers, inclined to treat the computer as a toy, are saddened to think of how its misuse can ruin lives. Even more sobering is the responsibility they have suddenly had thrust upon them.

Programming in the 1960s was a field of intense excitement. New people with varied backgrounds entered this informal, unstructured field with no training and scarcely any idea of what programming was. Many had never seen a computer before becoming programmers, and they stumbled into the field only by happy chance. Almost everything they did had never been done before, and it was always a success. If it turned out badly, they could simply call it research. Jobs were plentiful, and the field was easy to enter because no experience was necessary. Good programmers could dictate the problems they worked on, and for them the field was almost as much entertainment as it was occupation. The emphasis was largely on inventiveness, cleverness, and exotic solutions to problems. Programmers seldom paused to worry if they had the right problem. Small wonder that compilers were built for languages that no one wanted to use. It was the ideal time to be a programmer.

Programming, whether because of the newness of the field, the nature of the work, or the uniqueness of the demands, attracted many unconventional people. Programmers tended to be an eccentric lot. Not that they were the first hippies, but they did not look like accountants. Programming was also a convenient place for the misfit college graduate who either couldn't get a job in his major field, or who was disenchanted with the field he happened to choose. Programmers had such diverse backgrounds as music, mathematics, engineering, geology, English—and some had no formal training at all. These people with their varied backgrounds contributed much to the computing profession in new, fresh ideas. They made programmers fun people to be around. In the future, this type of person will have a harder time breaking into programming because the positions will be taken by graduates with degrees in computer science. Programming will become more conservative and traditional.

Many programmers suffered a great shock in the mid-1960s with the transition from second to third generation computers. It was catastrophic for the machine-language programmer; much of his skill and knowledge, learned over a period of years, became valueless. Equally appalling was the realization that programs that had taken years to develop would never run again. How sad to see the work of years suddenly disappear overnight! Much of the loss of the computer's mystique can be traced to the conversion from second to third

generation. Upper management became very disen-
 chanted as time losses and conversion costs disrupted
 the entire company.

Computer programming is a completely man-made
 science with no natural laws. The computer's repertoire
 of instructions corresponds to natural laws, but when
 the computer changes, the entire science and body of
 acquired knowledge, even down to the vocabulary,
 changes also. There is some compensation in the new
 opportunity to learn, and the security of having to re-
 write some old programs, but few programmers find the
 latter very stimulating. The experience has made pro-
 grammers feel insecure in their knowledge, but very
 secure in their occupation. It has also made program-
 mers value compatibility—known as tradition and
 stability in other professions. As a gauge to how much
 programmers have changed, the "reset to zero" was
 called a technological innovation in the past decade, but
 it would be called planned obsolescence now.

The public, generally in awe of computers and the
 men who instruct them, had little notion of what
 computing was all about in the past. But computing as
 a glamor profession is now giving way to ecology. As
 computers become better known, they begin to lose their
 mystique. We notice how unimpressed students at the
 Univ. of Illinois were with the new ILLIAC IV super-
 computer.

The public used to forgive programmers their errors
 because they thought programming such a dark science
 they were amazed it could be done at all. In the future
 programmers will be held accountable for their actions.
 Past California elections illustrate this. We witnessed
 the sad spectacle of voters waiting for ballots to be
 counted while a programmer finished his debugging.
 There was much wrong with the computerized balloting
 in California besides the programming, but the pro-
 ceedings did little for programming prestige.

Public familiarity with computers and the consequent
 loss of prestige will force other changes. In the 1960s
 people took pride in computer-generated reports. "Look,
 this was done on a computer." In the 1970s they will
 likely say "Look at this ugly printing!" Perhaps we shall
 one day see upper- and lower-case printers and key-
 punches, and even standard 8½ x 11 computer output.
 We will certainly see more human engineering.

The programmer's image will probably change as he
 enters new fields of responsibility. The public is careful
 about the type of person it allows to handle its money,
 process its tax and credit reports, and count its ballots.
 Perhaps programming will begin to look much like the
 accounting profession, complete with formal auditing
 procedures. The sad loss in this will be the beards and
 sandals.

Programming, like the accounting profession, has a
 strong requirement for quality. It is not too far wrong to
 say that if a program is not perfect, it will not run.
 And yet programmers have not been overly concerned
 with quality. Perhaps this is because our society is more
 attuned to quantity than to quality. This is immediately
 impressed upon anyone who has purchased a new car.
 Quantity is made a virtue even when it is unwarranted.
 Thus a cigarette proudly asserts the inconvenience of its
 longer length, and a potato chip is touted as the world's
 noisiest. Americans leaving the Louvre always seem
 vaguely disturbed. "I thought the Mona Lisa would be,
 well—bigger."

Our preoccupation with quantity can be explained by
 our history as an expanding country of vast size, but
 that is changing. We find that quantity pollutes and we
 must control it. "Nothing in excess," as the ancient
 Greeks said. And so we must turn our vast energies

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slowly away from sheer quantity and direct them instead toward quality. This is particularly true of programming because it is such an exact science where errors in credit ratings, counting ballots, and billing credit cards are highly visible and annoying to the public. However, the transition will be slow and hard for everyone.

The coming emphasis will also be on producing a finished product. It is perhaps a universal constant that the last 20% of the apparent job takes 80% of the time and effort. We have all noticed buildings seemingly spring up overnight only to remain empty for a year while the finishing touches are applied. A traveler bound from Chicago to Manhattan knows that when the 747 begins circling Kennedy Airport, the grueling part of the trip has just begun. In the past, when a programmer said that he had the job all programmed with just a few more bugs to correct, the job was considered all but done and passed on to some unfortunate trainee. Now we know that only the easy part is done. The final check-out, documentation, and production engineering will take 80% of the total time and effort.

Programmers will take the extra time needed to give polish to a finished product. Cleaning up a system will be a necessary part of programming. Programmers will take pride and even aesthetic satisfaction in doing a competent job through to completion. Greater emphasis will be placed on production engineering computer jobs to adapt them to their environment and users. We already see such tools as IBM's System/360 Job Control Language; a complete new language for facilitating program execution. Programmers will spend much less time coding algorithms, and more time maintaining existing programs.

The action in programming during the 1960s was

definitely in the scientific fields: aerospace, national defense, and research. Now there seems to be a marked drift towards commercial programming. One sees good scientific programmers migrating to the commercial world. This is partly because of its greater security, but perhaps it is also because the commercial world presents a new challenge. As has been pointed out, solving calculus problems is easy with a computer. Conversely, report writing is hard, file management is hard, data validation is hard, documentation is hard, program maintenance is hard, and working in profit-oriented industry that pays strict attention to costs is hard.

Past predictions about computers generally glossed over software with a sentence or two to the effect that new computer languages would soon arise to solve the programming bottleneck and make programming simple for everyone. This chimera is still pursued, but programming remains expensive and time consuming. The tools developed a decade ago are still the mainstays, and debugging and documentation aids are as primitive as ever. Programs are so personalized that there is little value to a half-finished program without the programmer who wrote it.

Programming, rather than becoming easier, is getting harder. Computer software always trades power for convenience, flexibility for simplicity, and capability for compatibility. Old programming languages never die, and so a new language complicates programming by giving yet another language to learn. Computer programs have an aesthetic impact that engenders requests for changes from even the most unlikely people, but little has been done to make program modification and maintenance easier.

For the foreseeable future, programming will remain exacting and require skill, patience, and training. As programming grows more complex and as it loses its novelty, fewer nonprogrammers will be tempted to try their hand at it. No economies of scale are as yet discernible in programming, and so the general rule remains that the fewer programmers working on a task, the better its chances for success. Mass production of computer programs remains as far away as ever.

The programming profession is now developing a much more critical eye. Some now find it mildly humorous that ALGOL could be designed without any input/output. By the end of this decade, it may become a computer cliché similar to building the boat in the basement. Suggestions for developing new programming languages are beginning to be prefaced with apologies and met with dismay. We are even beginning to look critically at the industry's glamor children, time-sharing and computer graphics.

We clearly see the dangers of microprogramming and languages for writing operating systems, the two latest programming rages. Programmers will consider microprogramming a license to develop their own personal computer. If languages for writing operating systems makes them easy to create, then no doubt we shall have them by the hundreds. Thoughts of long-range compatibility, already staggering from too many programming languages, would be bleak indeed.

Thus it would seem the programming profession will become more stable and traditional. Programmers will have more formal training and will mature to become more thorough, with a pride in competence and a preoccupation with quality. Some old-time programmers, finding that they no longer fit in this changed profession, will drift on to other fields.

—Gary DeWard Brown

Mr. Brown has been with the computer sciences department at RAND since 1962 and is now head of the systems and operations group.

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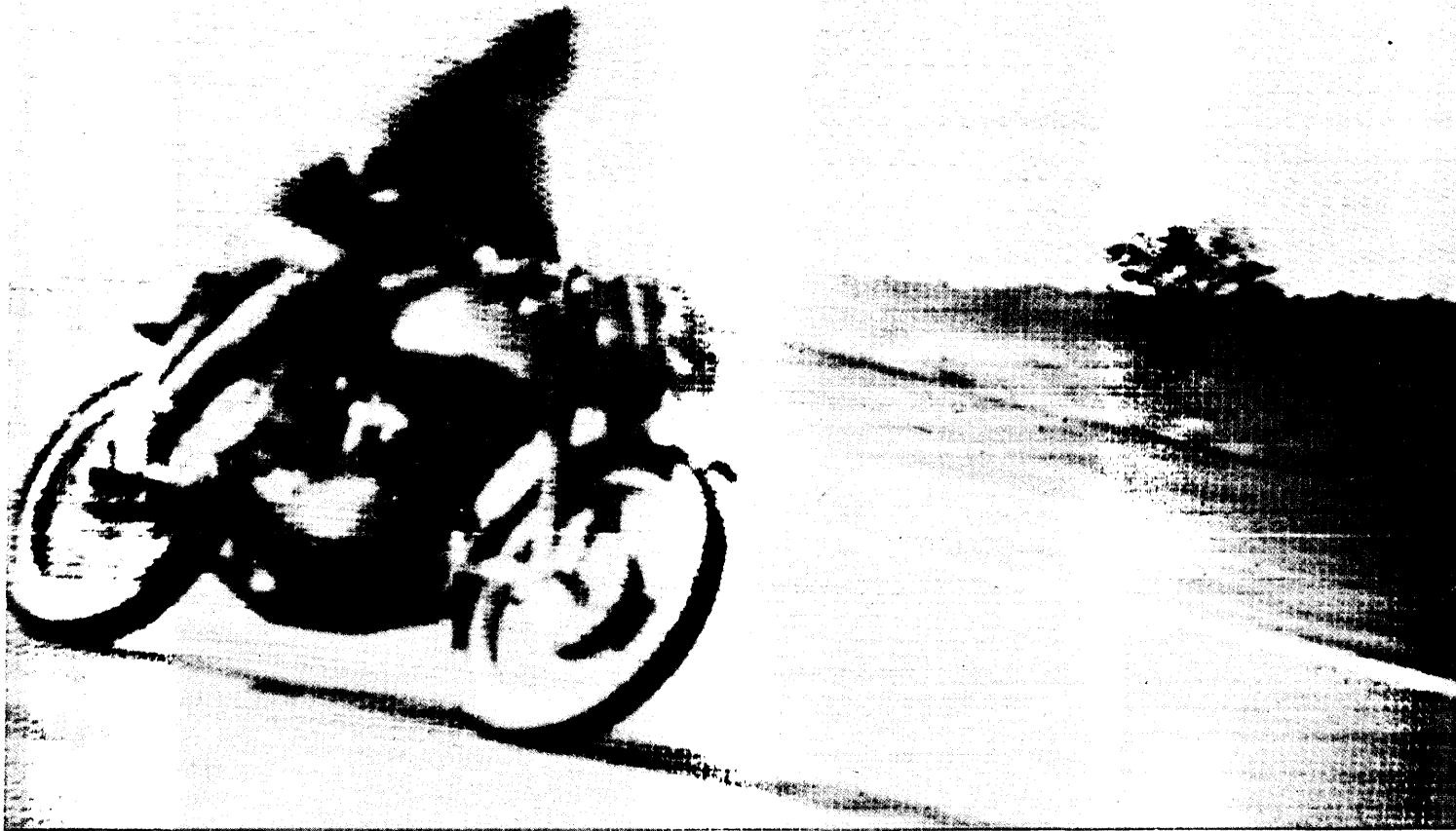
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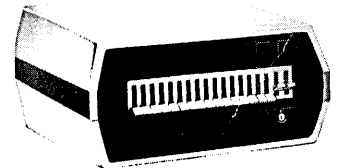
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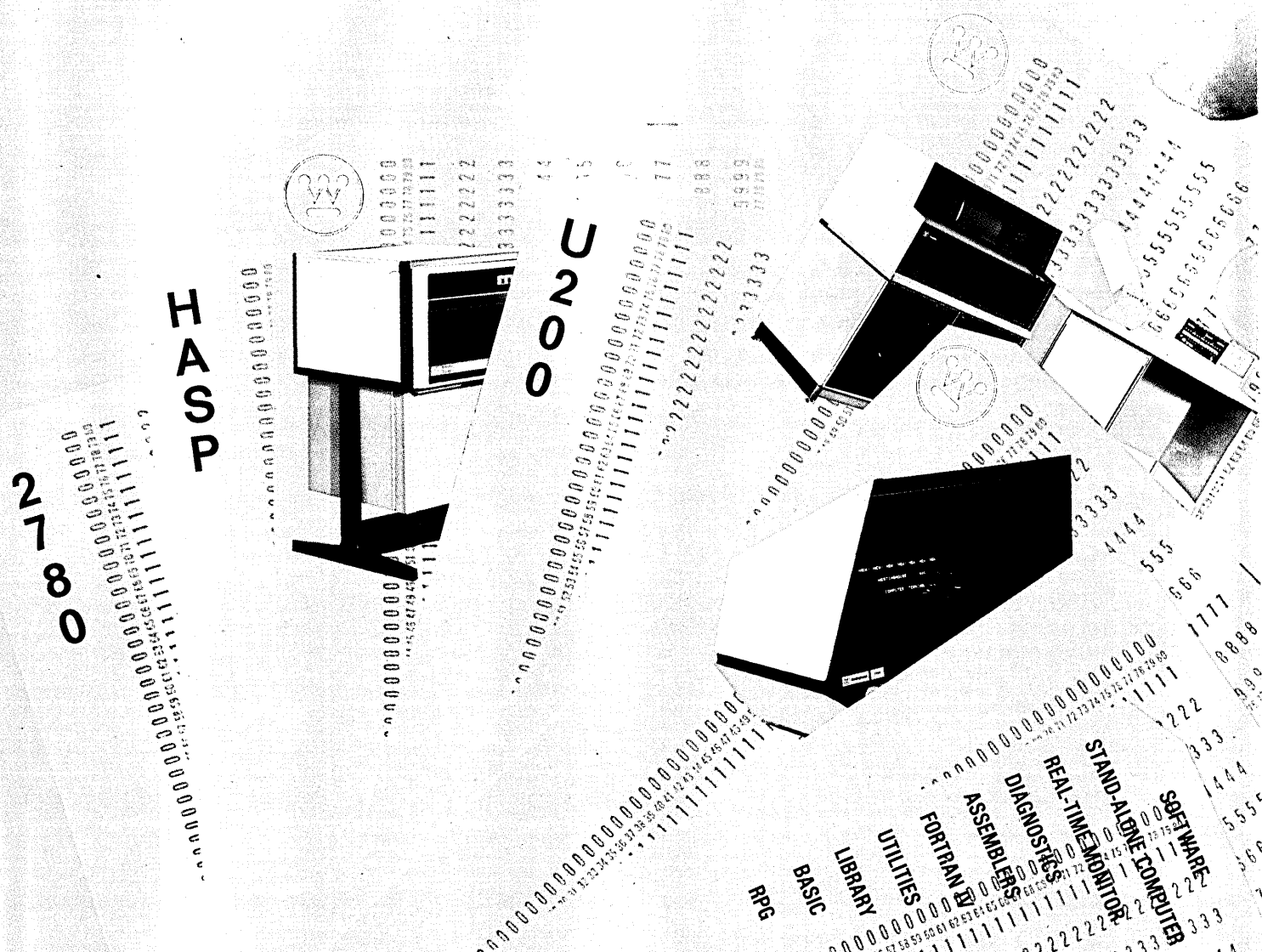
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