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June 68

man/machine interaction terminal-oriented software

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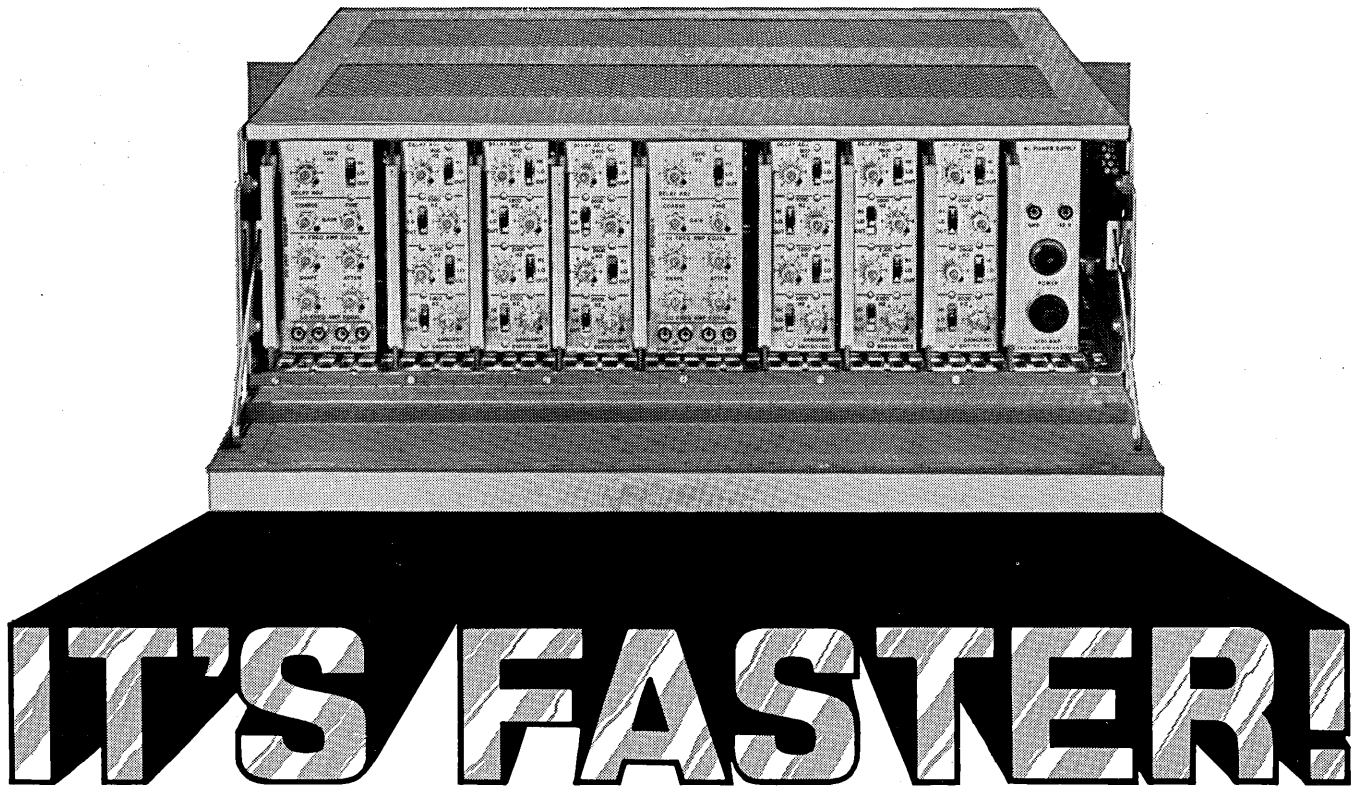
Sangamo's new Variable Equalizer ups the accuracy of data transmission and-



IT'S FASTER!

Accelerated use of 2400 bits per second and higher data rates makes the need for equalizing *both* amplitude and phase absolutely essential. The new Sangamo LC-1 line conditioner does both . . . with virtually independent adjustment. In fact, you can equalize both amplitude and phase of a circuit in much less time than phase alone previously required. Result: Faster adjustment at less cost.

The Sangamo LC-1 meets the Autodin (automatic digital switching network) and Autovon (automatic voice switching network) voice transmission conditioning requirements for transmission of data.

Amplitude equalization requires taking only five level measurements, setting the two shape controls and the two attenuation compensators. A typical monotonic line requiring up to 8 db attenuation at 1900 Hz can be amplitude conditioned in less than 5 minutes.

Phase equalization is accomplished with 13 individual time delay sections on 200 Hz spacings (option 600 to 3000 Hz or 800 to 3200 Hz). Each section has a 3-position ranging switch to set the vernier time delay control to: 1.28 to 2.28 milliseconds, 0.4 to 1.4 milliseconds, or section bypass. This unique configuration facilitates fast initial ranging of the equalizer and provides 1 millisecond resolution per revolution for fine tuning. The 13 sections can insert up to 3.5 milliseconds of differential delay at 1900 Hz. Minimum time is required to compensate an average line to ± 80 microseconds time delay variation through the pass band.

Resonant frequency of each of the 13 sections can be field changed by +67 Hz, +100 Hz, or −67 Hz. When two or three LC-1's operate in tandem, this unique subspacing permits placing 26 sections on 100 Hz spacing or 39 sections on 67 Hz spacing on one voice circuit reducing the over-all ripple to a minimum while permitting the correction of up to 10.5 milliseconds of delay.

The LC-1 is self-contained with two channels of equalization, a 24/48 VDC, 117 VAC, or 240 VAC power supply and occupies only 5¼" of mounting space on a 19" equipment rack. Sangamo is also introducing a line of Bell compatible data sets for 1968. These include data sets compatible with Western Electric 201, 202, 103 and 401. Information now available on these sets.

Write or phone today for additional information on SANGAMO Equalizers and Data Sets. Phone: 217-544-6411

SANGAMO

T68-13

Information Systems Division

SANGAMO ELECTRIC COMPANY

Springfield, Illinois 62705

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Transmits 6 times the data as TWX for the same line charge. Leases for less than $25 per month. Why not put one in every branch office?

This low cost Tally transmitter sends business data over ordinary dial-up phone lines at 600 words per minute. That's six times as fast as a TWX or Telex. ▫ Tally designs simple, economical transmitters like this for branch offices that must make daily reports to a central accounting or computing facility. ▫ The Tally transmitter shown leases for $23.76 per month on a 36-month contract. For a few dollars more you can get an option that answers calls automatically. Thus, a tape may be loaded at the end of each business day to await a call during the night whenever the central terminal is ready to receive. ▫ Another optional version not only answers calls automatically but corrects transmitting errors by re-transmitting automatically whenever the receiving terminal detects a parity error. It leases for $33.33 per month on a 36-month contract. ▫ These transmitting terminals are only two out of twenty different data communication systems offered by Tally. ▫ **More information.** For full information, please write or call Tally Corporation, 1310 Mercer Street, Seattle, Washington 98109. Phone: 206-624-0760. Or contact the Tally factory branch office nearest you.

New York: 45 N. Village, Rockville Centre 516-678-4220
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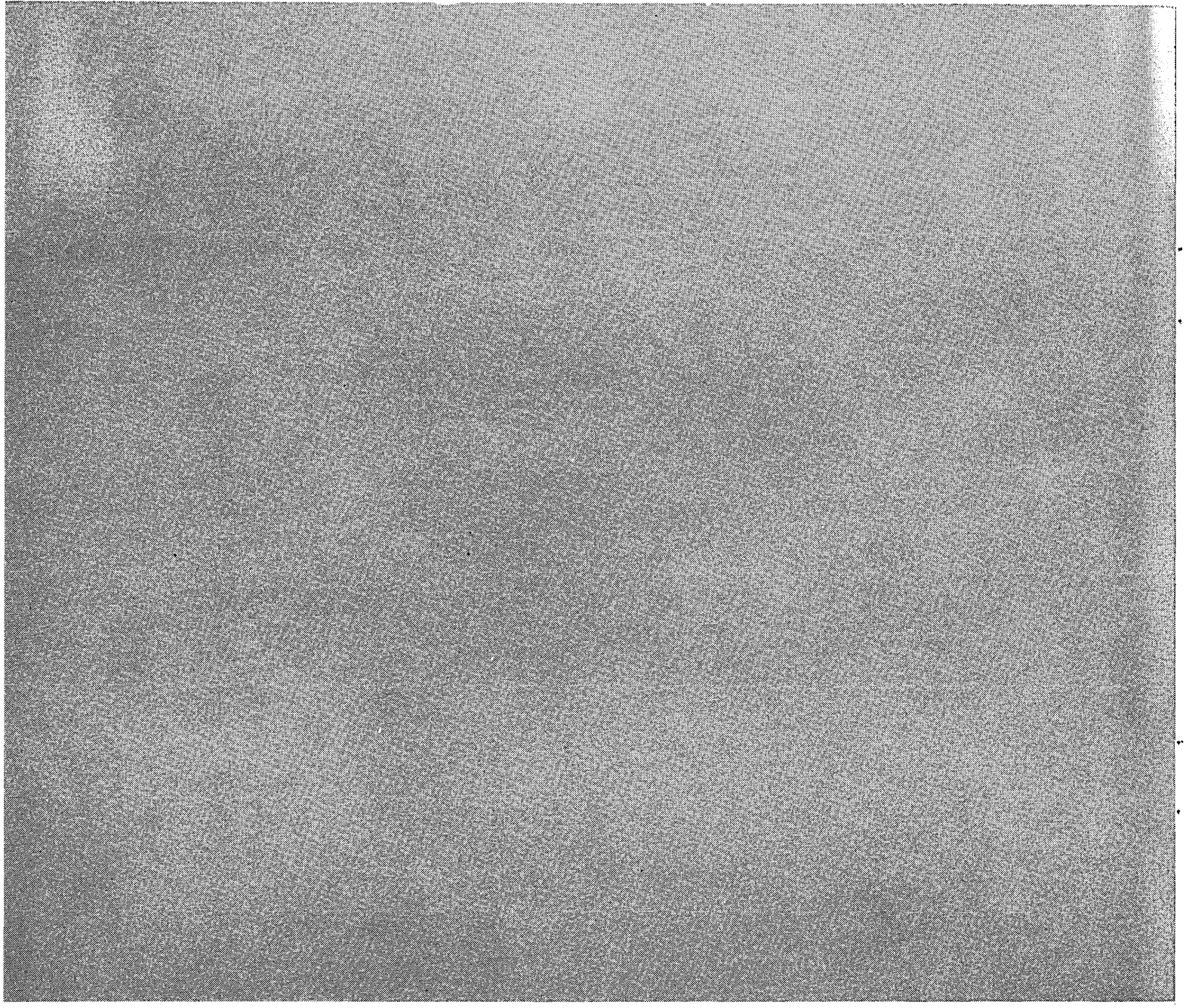
See us at the DPMA Show, Lincoln Room, Booths 846-847.

CIRCLE 4 ON READER CARD



Sigma 7 has the best time sharing software not yet available anywhere.

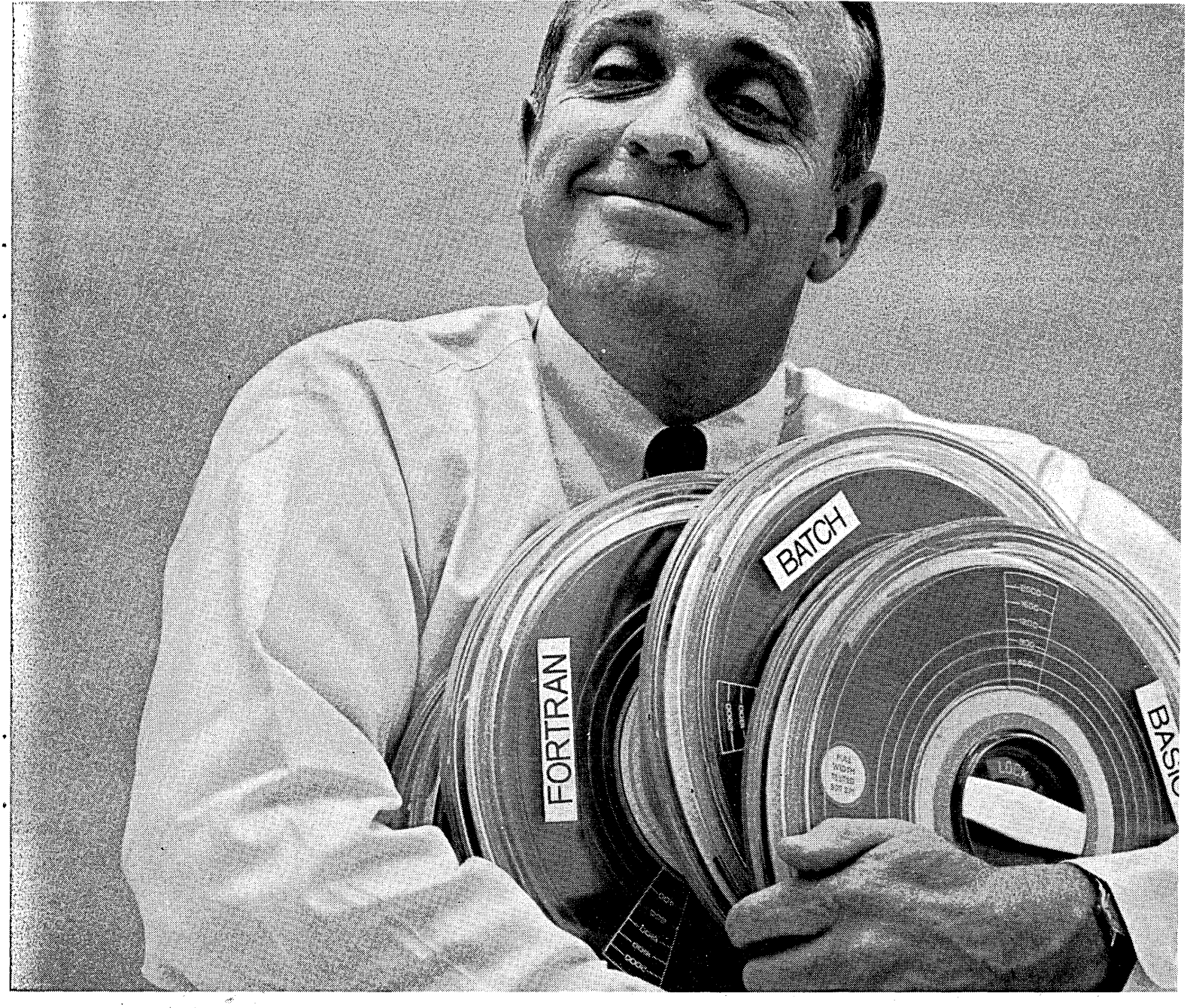
We're still working on it.

But if you're tired of waiting for next year, we've got some Sigma 7 time sharing software that's operational now. We'll deliver it to our customers this year.

We're going to release this software in several stages. The idea is to let you carry on with normal batch processing and get you started on time sharing too. By the time you're ready for more we'll have more to give you.

Our first package, available this year, is an extension of our Batch Processing Monitor. In addition to running batch programs it will allow eight on-line users to operate simultaneously. The users will be able to compose and edit Fortran and Symbol programs, and to debug and run them.

The second package will be released about April, 1969. It will sharply improve overall system performance and increase the number



of simultaneous users to 24.

The third release will come before the end of 1969. It will be an entirely new software package and will include Symbol, Fortran, Basic and a conversational algebraic language. This package will accommodate 32 users and allow both batch processing and real-time operations to go on concurrently with on-line time sharing.

Ultimately we'll add more users, a conversational Fortran and other capabilities.

To sum up, Sigma 7 time sharing is here. You can start using it this year. And by the end of next year you'll be able to carry on real-time operations, run batch programs, and have on-line time sharing too. Sigma 7 is the only computer designed to operate in all three modes all at the same time.

And it's available only from us.

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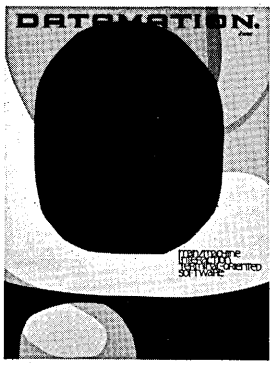

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At KEYDATA, it's compressing communications at a 40-to-1 ratio to reduce telephone-line lease costs.

An on-line, real-time digital computer made by Honeywell, Computer Control Division is performing many money- and time-saving tasks for KEYDATA Corporation — a leader when it comes to time-shared service for business users.

The machine cuts way down on communications costs. It's concentrating data between a number of Teletype printers and a large-scale time-sharing computer. Result: small-business subscribers get the full capability of a big computer at the lowest possible cost.

TTY circuits let the customer use the computer in his own office. To do this, the Honeywell computer can control 40 full-duplex TTY-grade circuits, concentrate them into complete messages for 2400-bit-per-second transmission over a telephone line to the central computer. For customers located far from the central processor, this means substanial circuit-lease-cost savings.

The Honeywell machine also does message-housekeeping chores for the big computer to free it for its primary data-processing tasks. For example, it translates from five-level Baudot code to a six level subset of ASCII Code used by the KEYDATA on-line processor.

Honeywell provided all the usual utility-type routines, and the interfacing and switching needed for on-line input and output to the Teletype printers and telephone line. KEYDATA's parent company, Adams Associates, did the system programming, including the implementation of its interpretive KOP-3 language. This is how Honeywell and its customers work together as digital partners to get systems operating smoothly . . . so smoothly, in KEYDATA's case, that they've ordered more than two dozen computers.

Want complete details on this and other on-line real-time applications? Write for our Control Applications Kit. It contains material that may very well lead to the solution of your control problems. Honeywell, Computer Control Division, Old Connecticut Path, Framingham, Mass. 01701.

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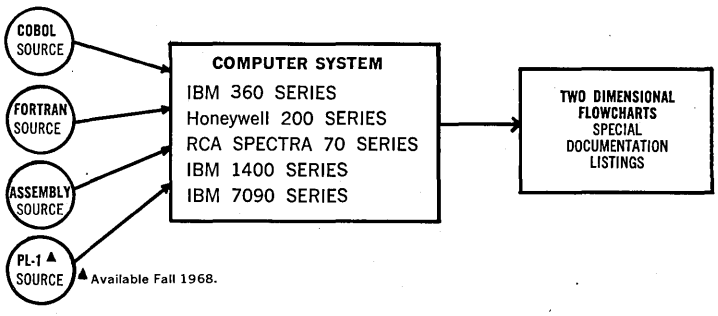

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DATAMATION 68®

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1968

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datamation departments

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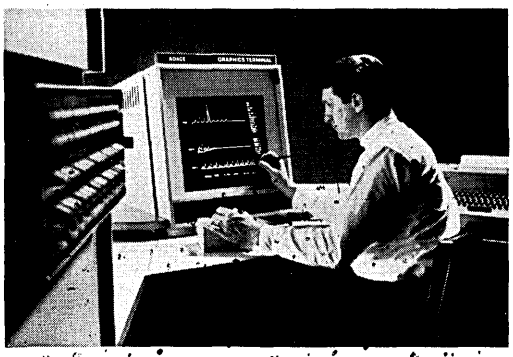
the $188,000 graphics terminal



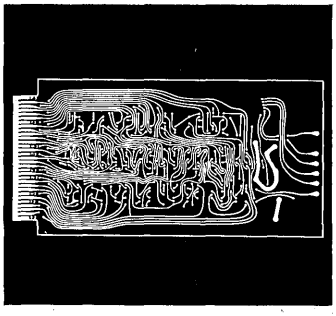
that costs $60k

It used to be you had to spend that kind of money to do meaningful work in computer graphics. Now you can buy a complete interactive terminal from Adage for $60,000 — and get a lot better performance. That's our model AGT/10.

You can display more than 4500 vectors at 40 frames per second with resolution better than 100 lines per inch. "Straight" lines are really straight. They meet where they're supposed to, and they are uniformly bright regardless of length. And only with the Adage AGT/10 do you get built-in scaling and translation.

Every AGT/10 comes with its own powerful 30-bit word length processor with basic 4K of core memory and teletype I/O. A complete line of I/O peripherals is available as well as core memory expansion to 32K. Software furnished includes a resident monitor, a FORTRAN compiler (for systems with at least 8K memory), an assembler, and a set of graphics operators. The standard package also includes a library of utility and service routines with full provision for communicating with the central computer facility via dataphone interface or direct data channel access.

The terminal console houses the large-screen CRT with light pen, and comes equipped with function switches and controls. Graphics hardware options include joystick controls, an input data tablet, a character generator, and photographic hard-copy output.



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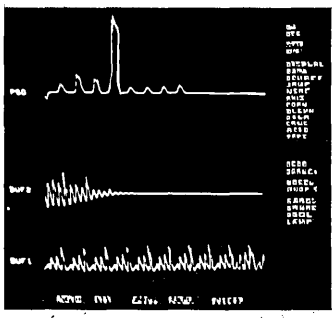
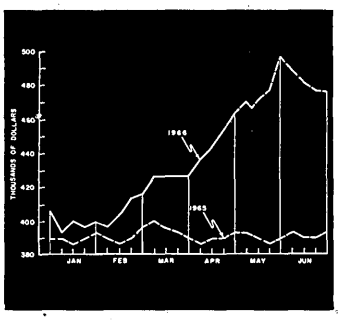
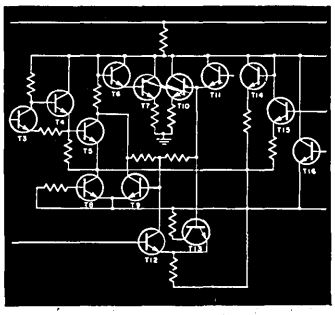


on-line signal analysis



business management systems



machine-aided drafting

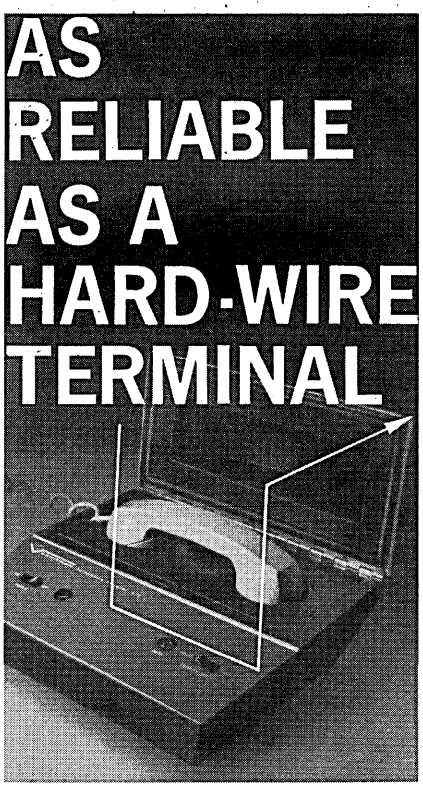
If you'd like more information about our under-priced AGT/10, or a 16 mm movie showing the Adage Graphics Terminal in action, write D. Sudkin, Marketing Services Manager, Adage, Inc., 1079 Commonwealth Ave., Boston, Massachusetts 02215.

Adage INC

CIRCLE 9 ON READER CARD

calendar

DATE	TITLE	LOCATION	SPONSOR/CONTACT
July 15-18	5th Annual Design Automation Workshop	Washington, D.C.	SHARE-ACM-IEEE Computer Group, 345 E. 47 St., N.Y., N.Y. 10017
July 23-24	National Symposium on Modular Programming	Boston	Information & Systems Inst., 14 Concord La., Cambridge, Mass. 02138
Aug. 5-10	IFIP Congress 68	Edinburgh Scotland	IFIP, 23, Dorset Sq., London, NW1, U.K.
Aug. 20-23	Western Electronic Show & Convention	Los Angeles	WESCON, 3600 Wilshire Blvd., Los Angeles 90005
Aug. 27-29	National Conference & Exposition	Las Vegas	ACM/R. B. Blue, TRW, Bldg. R3, Room 1144, One Space Park, Redondo Beach, Calif.
Sept. 23-25	Journees Internationales de l'Informatique et de l'Automatisme	Versailles, France	Nat'l. Assn. of Tech. Research, Dr. Jacques Noel, 37 Ave. Paul Doumer, Paris 16eme
Oct. 9-15	4th International Congress with Exhibition for Instrumentation & Automation	Dusseldorf, Germany	Nowea, 4 Dusseldorf 10, Postfach 10203, Germany
Oct. 18	Symposium on the Application of Computers to the Problems of Urban Society	New York	ACM/J. M. Spring, Computer Methods Corp., 866 Third Ave., N.Y., N.Y.
Oct. 20-23	International Systems Meeting	St. Louis	Systems & Procedures Assn., 24587 Bagley Rd., Cleveland, Ohio
Oct. 24-25	Mgt. Conference: Marketing, Manpower, Management	Detroit	ADAPSO, 420 Lexington Ave., N.Y., N.Y. 10017
Oct. 28-31	Annual Meeting-Users of Automatic Information Display Equipment	San Francisco	UAIDE/Ellen Williams, Marshall Space Flight Ctr., R-COMP-S, Huntsville, Ala. 35812
Dec. 2-3	2nd Conf. on Applications of Simulation	New York	SHARE-ACM-IEEE-SCI/ ACM, 211 E. 43 St., N.Y., N.Y. 10017
Dec. 9-11	Fall Joint Computer Conference	San Francisco	AFIPS, 345 E. 47 St. N.Y., N.Y. 10017



The new Vernitron TC-1 Telephone Coupler gives you the high reliability of the "hard wire" data terminals — but without the expensive delays and continuous leasing costs that hard-wire installations require.

Acoustic and magnetic coupling, efficient acoustic isolation and passive electronic filtering provide reliable data transmission between your terminal and a time-sharing computer over voice-grade telephone lines.

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letters

the european cup

Sir:

May I supplement your February Readout (p. 21) on the American '68 major league, with the prospects for this year's European Cup?

U.K.

International Computers Ltd.: A year ago there were three teams playing in Britain: ICT, English-Electric and Elliott Automation. National manager Harold Wilson has been rooting for these three to get together to give Britain a better chance of winning the Cup back from the Poughkeepsie Giants. Last March, ICL was formed, to work from ICT's old ground at Putney, London. With ICT's successful 1900 Series (1,000 goals scored) and EE's Cherry Hill-style System 4, the new team is Europe's biggest and should hit Europe hard, especially as they have now said they want to link up with continental teams.

Germany

Siemens: The Munich Beer-Cellar boys are going great guns on their home grounds, with another Cherry Hill formation, 4-0-0-4, but they don't play many away games.

Telefunken: This is a minor side which should team up with someone else to make a go of it.

France

Bull-GE: The new American coach caused friction a year or so back, but this French team is coming back with hot time-sharing play in mid-field.

CII: National manager Charlie de-Gaulle master-minded this team-up after Bull went Yankee. He needn't have bothered, because their commercial boys are copying the Giants' byte-play, and their process-controllers are SDS players in disguise.

Holland

Philips: The Eindhoven Sparklets join the competition this year with a wide range of international fixtures and bags of money and techniques behind them.

IBM: This perennial cup winner pretends to be European with grounds in Scotland, France and Germany but spoils the effect by arriving on the field in American football helmets. Considering that all the other European teams and their national managers spend most of their time trying to fix this team, the Giants do pretty well.

The European Cup will remain in American hands until some of these national teams get together. Then we Europeans will move over to baseball and start pitching on your side of the Atlantic.

R. L. SARSON
London, England

information retrieval

Sir:

Re "Information Retrieval: An Introduction" (March, p. 22) by Robert M. Hayes, I was surprised that no mention was made of the other third of the three national libraries, the National Agricultural Library.

I suggest that those interested in information retrieval keep an eye on this organization which has several good-sized data banks already on the computer and is moving quietly but steadily towards full automation of its enormous collection.

As a matter of information, the NAL Pesticides Information Center (PIC) Bulletin is fully computer-produced biweekly and the data is also fully searchable; the Subject, Author and Organizational indexes of the Bibliography of Agriculture are fully computer-produced monthly with only the Citation index to go; and the INTREDIS, previously a Forest Service eam operation, has been automated by the NAL and is now computer-searchable.

NANCY L. AYER
Falls Church, Virginia

the systems people blues

Sir:

After reading Editor's Readout (April, p. 21) I feel compelled to write this letter in an attempt to explain the facts of life to you.

There are many senior systems people in the market. The problem isn't how one finds them but how one lures them away from their present employers. Why is the senior analyst so hard to get? Simply because he is seeking entrance into management from his present level. Therefore, your second paragraph is well taken. Available talent seems to be the logical source for *tomorrow's* senior analyst.

The one idea you presented doesn't escape management at all. Unfortunately this idea seems to occur in situation "number one," the emergency.

No data processing group likes to admit that their in-house talent can't do the job, especially at scheduling time. Management seems to be more willing to shave costs (at least reportable costs) than to plan for possible consultant help at any time. The result is that when the independent consultant is called in, he is presented with a data processing mess rather than a system, and of course his fee reflects this condition.

The problem is really quite simple. Managers are unable to correctly evaluate their staff capabilities in relation to the amount of work they are supposed to absorb. Systems scheduling techniques in the small to medium size installation are either wrong or nonexistent. Hence, an emergency arises, approvals are sought, obtained, and out-of-house help is solicited. There is nothing like a panic to open one's wallet.

Dp management is of course reluctant to say no to service requests so the net result seems to be a vicious cycle. Correcting the basic problem, that of realistic scheduling, is the obvious solution. The secondary solution seems to be a tendency towards purchasing proprietary software in an attempt to free all analysts from parochial commercial problems, allowing them to solve the "special" problems that seem to occupy so much of their time. My only question relative to this area is: "Who analyzes current conditions to determine what available programs to purchase?"

This whole approach is simplistic to say the least. However, decorating the problem and its possible answers with frills and scallops only provides excuses when the vice-president asks "why?" Let's eliminate all the fancy answers and admit to ourselves, and our customers, that we are dealing with a tool and technicians. The tool can be and is utilized correctly and so can the technicians. Professionalism instead of expertise can wipe out idealistic schedules and platitudinous projections and allow the data processing system group to do a realistic, efficient job.

JAY M. WESOFF
New York, New York

Sir:

Part of the answer to the question "Man, where can I find me some senior systems people" is to use an outside consultant.

However, in addition to substituting for missing talent, the outside consultant can serve the mission of producing a second source of talent inside the existing organization. A coordinated training program using "systems engineering" techniques can train the managers, senior scientists, intermediate engineers, and eager young people to accept the challenge of the new technology by learning it and trying it on their first project.

After the first project, the outside consultant can usually step out of the scene, and leave a functioning, well-oiled systems organization.

This is probably the only way most companies are going to get the large quantities of systems power needed to compete in this new exponentially expanding field.

MARVIN D. WEISS
Woodbridge, Connecticut

in defense of freedom

Sir:

I was dismayed by the Witt and Ilsley/Vetter letters (April, p. 13).

The United States is the home of a number of constitutional and common-law freedoms which do indeed deserve our loyalty. The members of the Anti-Complicity Movement (yes, the name *is* a little too cute) appear to be committed to the exercise and defense of those freedoms.

The loyalties of Messrs. Witt, Ilsley and Vetter, on the other hand, appear to commit them to unreserved support of our government of men, even—perhaps especially—in cases when that government is acting to undermine the very basis of its claim to loyalty. One wonders what Messrs. Witt, Ilsley and Vetter would have said—in another country at another time—when Willy Brandt left to work in the Resistance.

ROBERT R. FENICHEL
Cambridge, Massachusetts

do schools fail?

Sir:

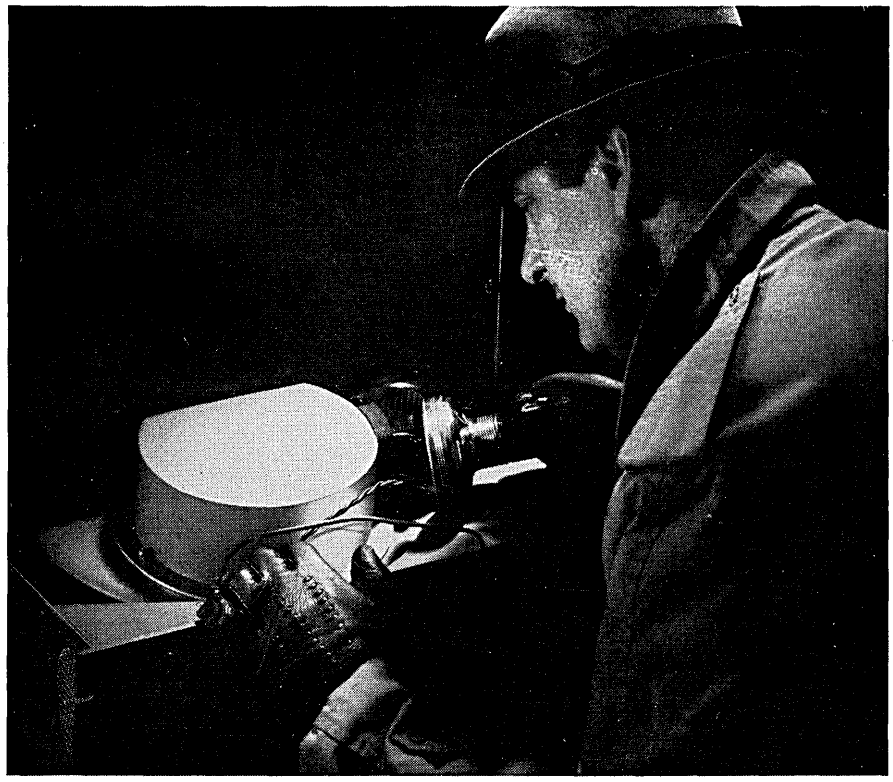
Let me congratulate you on your article ("EDP Schools—An Inside View," April, p. 22). After having looked into some of the practices of commercial programming schools, I can see nothing in the future but more abuse.

As chairman of a committee that is concerned about exploitation of the blind and other handicapped persons, I have taken a firm position that we will simply castigate and refuse to cooperate with graduates of any school which has not been properly evaluated by our committee. So, you see, I have had some experience with private schools.

THEODOR D. STERLING
St. Louis, Missouri

Sir:

As a former instructor in two of the edp schools in the San Jose area, I must agree with Mr. Markham's comments (April, p. 22). There are, of course, many areas he didn't get into specifically, such as a final examination in one of the mentioned "accredited"



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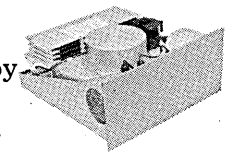

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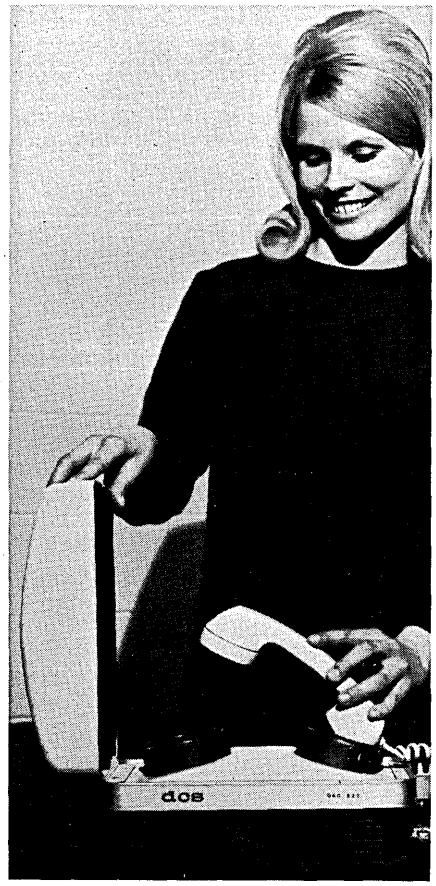

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CIRCLE 11 ON READER CARD

letters

schools which contained six questions, three of which were wrong. These were not typographical errors, but rather errors demonstrating a complete lack of understanding of the functioning of index registers on the 1401.

There is also a problem which the people have who hire the graduates of these schools, especially those firms just going into the computer field. I have several recommendations:

1. Standard entrance exams, administered in such a way as to make them reliable.
2. Eliminate instruction on eam equipment and obsolete computers.
3. Require instructors to be proficient with the language they are instructing, and with the machine upon which the compiles and tests will be run.
4. For the protection of the ultimate employer and as a basis of comparison of the schools themselves, a standard final examination should be administered by one of our many professional groups. This test should be a program which the student would be required to write and document, and passing or failing would be based on successful compilation and testing of the problem program. It would not be expected that the program function properly on the first try (who among us?); however the number of compiles and tests to achieve success should be noted.

These four suggestions should help, and along with state licensing which would make opening and operating a computer school at least as difficult as obtaining a license to operate a barber college, could go a long way in removing some of the many problems in this area.

HARRY WELLMAN
Mountain View, California

Sir:
Congratulations on your wonderful article . . . It is about time someone came out with an objective article on [edp schools'] true value. I have been a staunch opposer of these schools for many years and I have finally found a backer.

HENRY N. LEHMANN
New York, New York

Sir:
I was quite shocked to open the April issue to find the lead story a tirade against the private edp school.

Other than your disclaimer on the first page that the article is not "intended to imply that all malpractices are universal or are concentrated in a single institution" the following 5½ pages proceed to tear apart the educational services being rendered by "edp" schools. A part of one page did give credit to the Accrediting Commission for Business Schools.

I am somewhat puzzled by DATAMATION giving credence, and in fact emphasis, inasmuch as it is the lead story, to a gentleman who himself is apparently "unaccredited." By what authority does Mr. Markham set himself up as the industry critic of edp schools, other than the fact that he apparently has served as an instructor in a private school?

Sir, are you not interested in publishing an article which is positive in viewpoint? Some schools are good schools. I do feel that DATAMATION owes the positive side as well as the negative to the vast numbers of qualified schools rendering an important and essential service to our industry and to the many sincere, ambitious people with a desire to improve themselves.

LESLIE BALTER
School of Business Machines
Jersey City, New Jersey

cry in the wilderness

Sir:
"The End of OS" (April, p. 72) certainly hit the nail on the head. Promises . . . promises . . . promises . . . and for what? For a system that uses excessive core, has unbelievable run-time overhead and has umpteen thousand manuals, error messages and options. The subtitle to the article was "Thousands Wept," but unfortunately, OS is still alive (actually in a semi-conscious state), and that's why today . . . *Millions Weep!*

MARTIN A. GOETZ
Princeton, New Jersey

on critical reviews

Sir:
In answer to Christopher J. Shaw's comments in the Forum (April, p. 238):

1. The reason for pre-publication reviews is to alleviate the practical problems associated with publishing the tremendous mass of scientific data that is being generated. This was valid, when journals were the only feasible form of technical communications. DDC with its highly automated facilities . . . has made a great stride toward returning to the original objectives of the learned journals (now gone) . . .

2. The overwhelming majority of R&D work is first published as a DDC document—often two to three years before it appears in print, assuring a

timeliness of these reports, not possible with "learned journals."

3. The publication delay for the technical journals is now horrendous, and not likely to improve. The major source of this delay is the inordinate time taken by the "critical reviewers."

4. The reviewers cannot take the time to properly evaluate the papers they read for review. A half decade of work is often judged in a half-hour.

5. The meat-to-garbage ratio (or rather garbage-to-meat ratio) is not significantly better for technical journals than for the more open DDC publications.

6. A competent, objective reviewer of a technical paper is harder to find than a nickel cup of coffee. The most likely person to review a technical paper is one who is working closest to the line of work presented in the paper to be reviewed. If that paper obviates or anticipates the results of the reviewer's own research, his objectivity will be affected . . .

7. Any judgment of quality of a research paper which results in its effective suppression (assuming that the paper is really bad) denies the scientific community the opportunity of seeing the incompetent researcher putting his foot in his mouth.

8. One often learns and profits by other's mistakes and false starts. The imposition of a review board for DDC documents would eliminate the possibility of publishing many new, radical, brilliant, stupid, unpopular, tutorial, pedantic, narrow, overly-broad, philosophical, incisive, etc. papers, that would not be otherwise available. To impose review on DDC is to impose censorship . . . Freedom of speech implies the freedom of bluster and blather as a not necessarily evil necessity.

9. The very real space limitations in the journals forces the elimination of valuable content . . . Often, the only place that one can get the complete story is in the original DDC publication.

10. It is a poor researcher who cannot judge for himself that which is good and that which is worthless. The omnipotent saint that would judge for us is often a mediocre graduate student . . .

11. A basic tenet of Anglo-Saxon (and generally Western) jurisprudence, granted to us initially via the Magna Carta, is the right for a man to be judged by his peers, and to face those peers and accusers in open court . . . This is guaranteed in the scientific community by post-publication reviews.

As an alternate suggestion, I would eliminate the learned journals in their present form altogether. Instead, we

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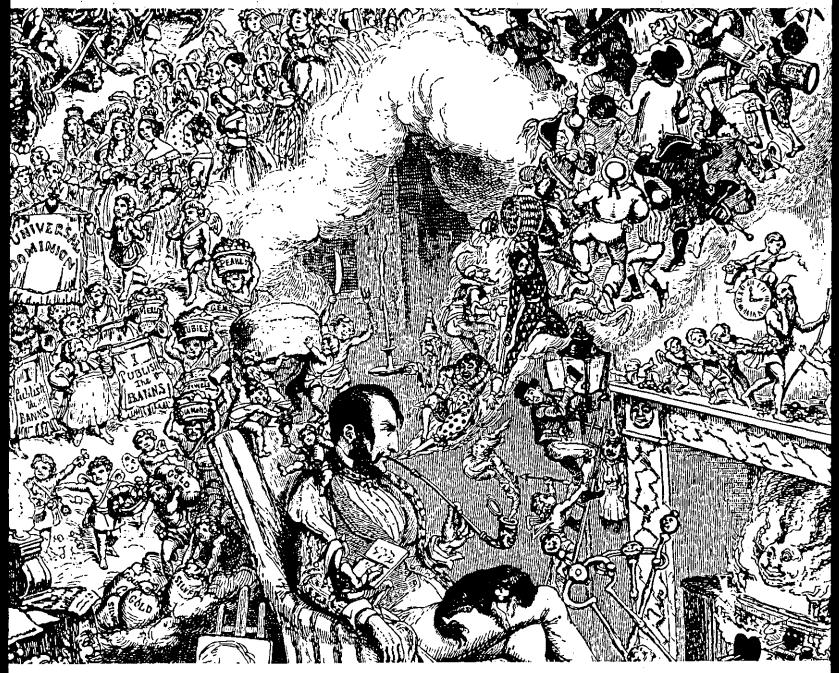

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letters

should keep track of the number of copies requested, in each field, of DDC, or each paper published. We should then publish the most requested papers over the previous three years as a form of honorarium to those authors who have been judged by the majority of their peers. Reprint requests have long been a popular form of keeping score. Since the most popular papers will have been read by everyone anyhow, there is no need to republish them. The journals can therefore be reduced to advertisements, news items, and a one-page tally of the scores.

BORIS BEIZER
Pennsauken, New Jersey

Mr. Shaw replies: Mr. Beizer makes some valid points; in fact I agree with all but nos. 2 and 5. But he seems to have missed my point: I propose that the government support post-publication review of the technical literature it sponsors; I would oppose establishing a review mechanism to decide whether these reports are worth making publicly available.

the chess player

Sir:

Re "Chess and the Computer" by F. L. Moullen (April, p. 65), it would be of great interest to obtain the record of moves for each of the four games played by the Soviet and U.S. computers. It would be of further interest to compare these records with some of the historical classic games of attack and defense.

Does it not follow that if "a computer can be programmed to play a perfect game of chess without any further assistance from its designers" that white would either win or draw all games and that black could never win? Or does the computer merely reflect the chess skill of its designer?

BRUCE E. KESTER
St. Louis, Missouri

Ed. note: Artificial intelligence experts tell us in answer to your questions that 1) no one knows whether a win is automatic for the first (or white) player; and 2) a perfect game of chess or checkers has not been programmed. Although a program directing the computer to explore all possibilities to exhaustion would be fairly simple to write, the computer would run on that problem throughout the lifetime of the universe. Because of this, the game of the computer does somewhat depend on the skill of its designer; however, since learning features are built into most game programs, the computer ultimately could be a superior player. Also, because of a computer's speed, it is able to make move decisions far more quickly than a human player; and therefore would have an advantage in games having time limitations.

an open letter

Sir:

At the recent conference of the New York Academy of Sciences on "The Use of Data Mechanization and Computers in Medicine" substantial progress was reported by several lecturers. The currently available hardware seems adequate, the medical knowledge and software is rapidly developing. The aim of a national, and international health information network with supporting data banks, seems to be almost within reach. The great problem we are faced with is to maintain compatibility among the individual projects. Standardized criteria for diagnosis, uniform coding of therapeutic procedures, patient identification, compatible design of the data bank are some important considerations. Education of the health professionals to utilize the new technology, education of the public to eliminate the distrust of automation, fear that privacy is in danger, are equally critical issues. Coordinated planning is urgently needed.

In order to facilitate communications in the area of planning a full session of a symposium (to be held in Buffalo, New York, September 19-21, 1968) will be devoted to review the currently available plans. The major health agencies have responded promptly to our call for plans. In this open letter we want to invite opinions, recommendations, plans from projects concerned with medical data handling. All material received will be compiled in a semi-formal publication which will be available to all interested parties.

E. R. GABRIELI, M.D.
Director, Clinical Information Center and Assoc. Clinical Professor
Department of Social and Preventive Medicine
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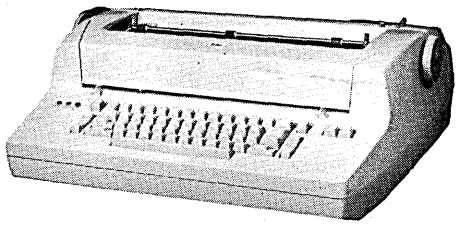

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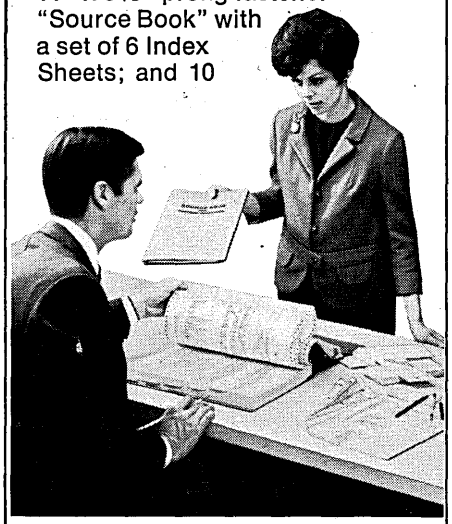

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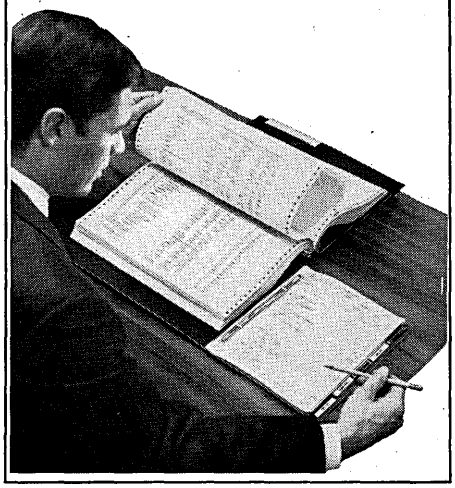

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Thus when a Michigan patrolman latches on to a speeder, he radios back to headquarters. Moments later, computer-connected teletypes tell him if the car is stolen or the driver wanted. People speak less and less of the man that got away.

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The New York State Identification and Intelligence System (NYSIIS) uses a Burroughs B 5500 system to bring together data on the state's nearly six million fingerprint records. Criminal justice agencies use NYSIIS as an aid to fingerprint identification, with on-line analysis planned for the near future.

And in Illinois and Michigan alike, more powerful B 6500 systems will, among other things, speed inquiries into vehicle and driver license files and save millions yearly by leveling mountains of paperwork.

These states needed computers with vast information storage capacity, instant response and the ability to coordinate a massive information flow in real-time. Systems that could be expanded easily and economically as requirements grew. So they looked around. And they picked Burroughs.

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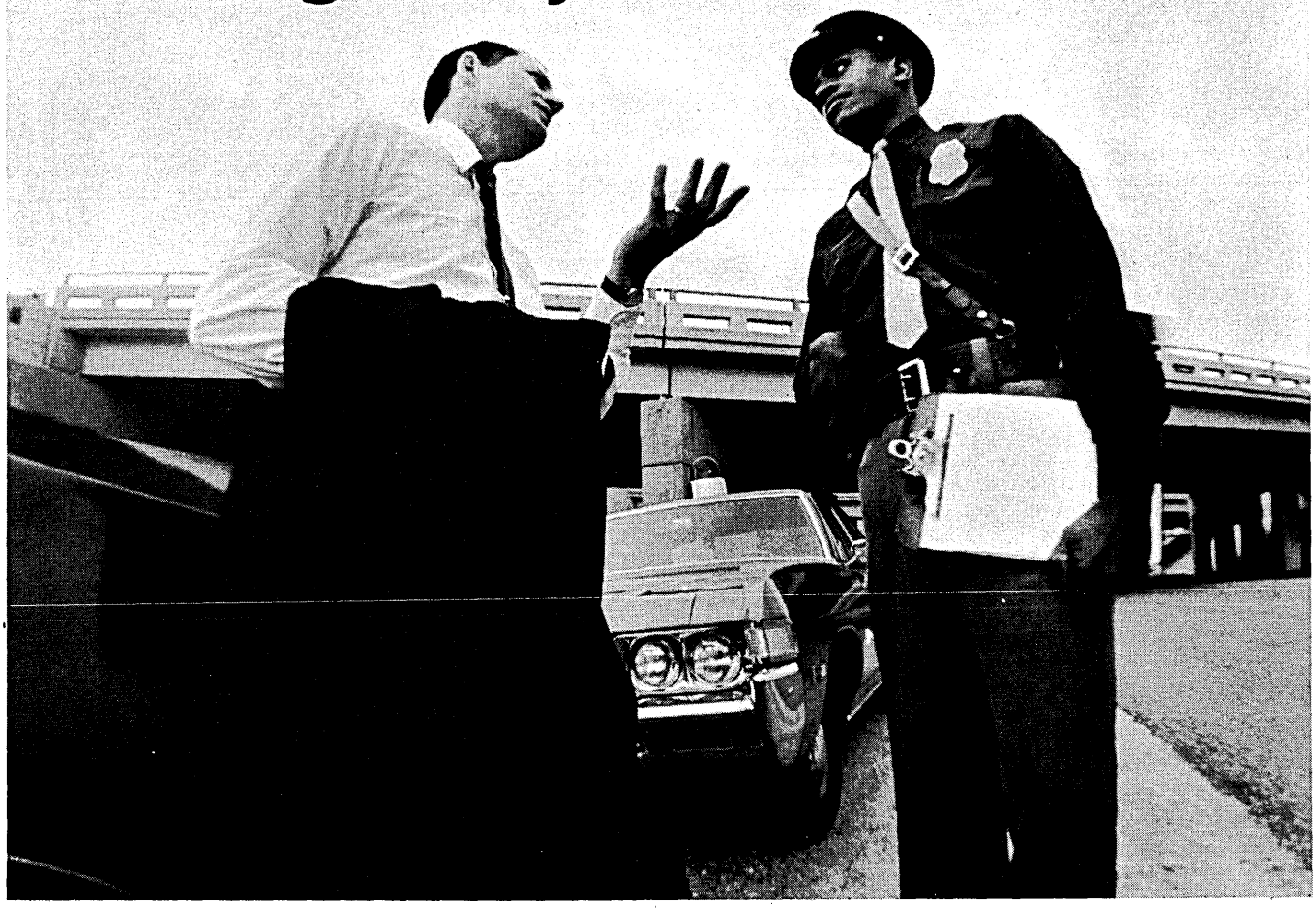
The man who didn't get away.



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look ahead

FEDS MAY ADOPT OWN SYSTEMS SIMULATOR

A new software package, S^3, developed by Leo Cohen Associates, may displace Scert as Uncle Sam's chief computer system simulator. Scert's owner, Comress, gets $175K/year from just one federal user; there are several others.

One virtue of S^3, according to knowledgeable sources, is that it simulates time-shared system configurations much more accurately than Scert does. Another virtue is that Uncle Sam owns S^3; so, once it became operational, the package could be used free by all federal agencies.

The Army has qualified S^3 for second generation system evaluation and is now testing its effectiveness on third generation gear. But when this work is finished, S^3 will still be only a model. According to one estimate, $8-10K is needed to write the source-language programs needed to make it operational. Additional funds and/or in-house manpower has to be invested in a data base.

Cohen Assoc. has offered to take on this programming chore. So has Metametrics Corp., a recently formed consulting firm located in Washington.

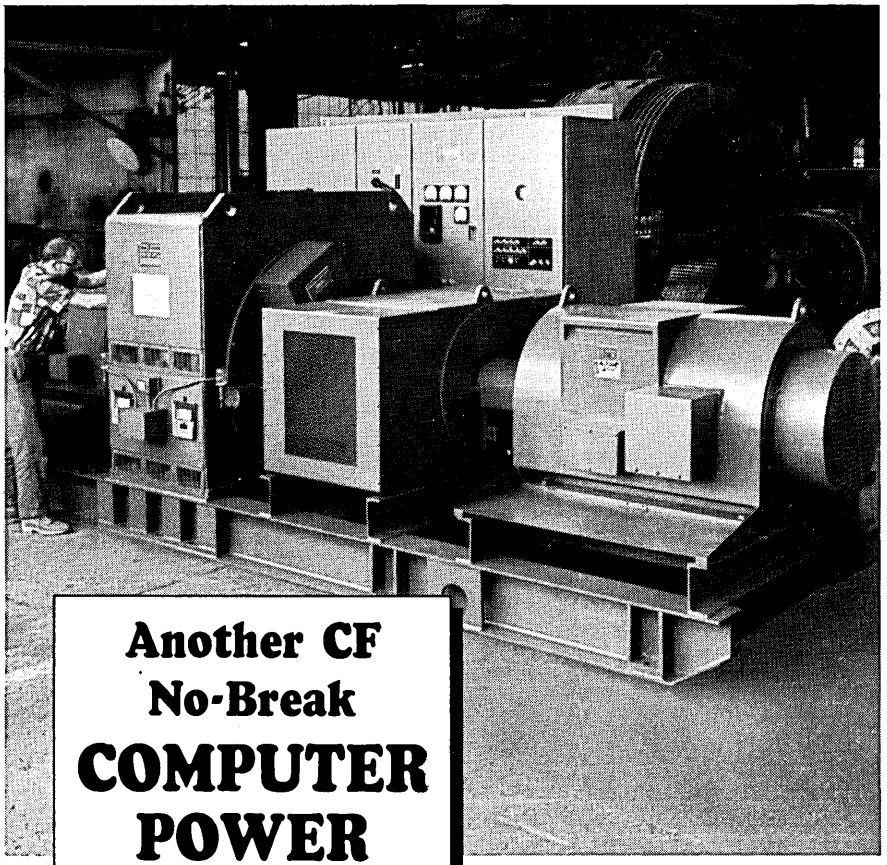
Getting money to develop S^3 further apparently isn't a major problem. Several federal agencies—including Navy, Air Force, FAA, and GSA—are interested in the package, and some are willing to pick up part of the tab.

But the Army wonders whether computer manufacturers will provide the system info needed for the data base. Timing is another problem. The Army has an immediate need for a simulator with the capabilities of S^3, and isn't certain that an operational package can be produced quickly enough. Whether the project can be justified as a long-term investment is even more uncertain. Better simulators may be coming down the pike. Reportedly, the Army will reach a decision soon.

WHERE MONEY'S MADE CAN IBM BE FAR BEHIND?

While GE has reportedly raked in handsome profits with its time-sharing Information Processing Centers, IBM's Information Marketing Dept. lolled with the relatively unambitious Quiktran service on second generation equipment. But now the giant bird swoops in with Call 360, being test marketed in San Francisco, New York, and several other cities. The time-sharing service is on a 512K mod 50 with a special t-s exec developed out of San Jose. Coincidentally, the first language processor is Basic, to be followed this summer by PL/I and Fortran.

The kicker is price: it's said that the same problem in Basic will run on the 360 for 25-30% of the cost of that on the GE 265. And storage charges are 1/6 of the 265. Terminals are the 2741 and 33 and 35 Teletypes.



Another CF No-Break COMPUTER POWER SYSTEM

by IDEAL ELECTRIC!

RATING:

TYPE CF#2 150 KW 208/120 VOLTS 3-PHASE 60 CYCLE

SPECIAL REQUIREMENT:
Must allow operation for 60 seconds at rated frequency, voltage and load after failure of input power.

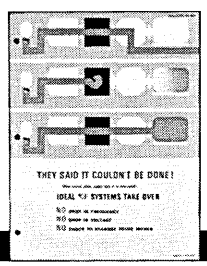
TELEPHONE COMPANY BILLING COMPUTER in a large West Coast City is isolated from incoming power transients, fluctuations and failures by this Ideal Electric CF (Constant Frequency) System. It is shown above with its control panel before shipment from the factory.

CF Systems can be fitted to the needs of many types of computer installations and other critical load applications including communications, refining, missile and satellite support systems.

Computers will not operate dependably if there is the slightest disturbance in the electric power supply. So if you want **No-Goof** computer performance, you need an Ideal Electric **No-Break** CF Power System.

These patented systems supply regulated voltage and constant frequency—**without batteries or other external power**—to carry over short power interruptions up to 30 seconds or more, or to provide time to transfer from preferred power to auxiliary or stand-by power. They are available in two basic types with several variations, and in ratings from 2.5 KW through 1000 KW.

If your computer gets its orders on-the-spot, an Ideal Electric CF System can save valuable time. If data is transmitted to your computer from remote locations, it can prevent disaster. Whatever your special power problems might be, we invite you to use our abilities and experience in solving them.



For more information on how we can serve you, and for a copy of our bulletin on CF Systems, telephone us at (419) 522-3611 or write The Ideal Electric & Mfg. Co., Mansfield, Ohio 44903.

IDEAL ELECTRIC

CIRCLE 16 ON READER CARD

NEW ADDRESS?

We know you want Datamation to follow you. If you're changing your business address, please use the card at the right and mail it to us **now.** We need your **old** address label, too. Paste it on the card (see instructions) to facilitate handling.

NEW AD

Name

Title

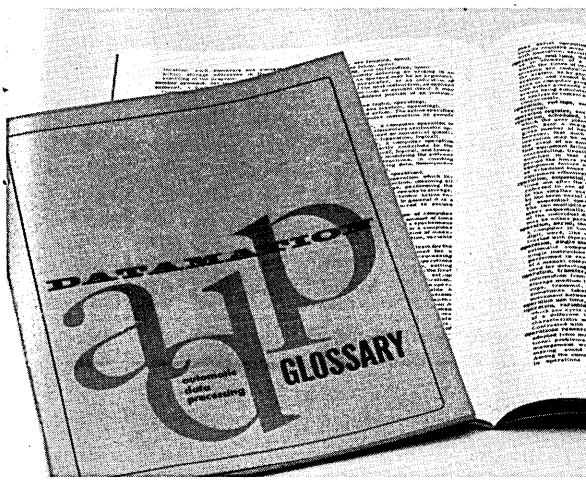
Company

Address

City

Your Sign

DATAMA INFORMAT



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DATA BASE FANS AWAIT NEW MASS MEMORY

Univac has been demonstrating a mass memory which could permit economic on-line storage of massive files. The unit uses a magnetically coated card held in two cartridges with a capacity of 250 megabits. Air jets control the movement of the card until it floats over a revolving drum which has head-per-track read-write heads imbedded in its surface. Two cards can be so positioned with some of their movements masked. Access time: 200 msec, plus 8.5 msec for drum rotation. Machining of the drum surface, plus absence of tricky, expensive and wear-prone mechanisms and no-contact read/write, suggest low manufacturing cost, high reliability. Reportedly, the method would offer storage at half the cost of mag tape. A four-drum, four-cartridge unit will offer one billion bits.

IBM USERS PRAISE HARDWARE, BOO SOFTWARE

It looks as if IBM isn't dedicated to enhancing Fortran's popularity under OS/360. Release 14 eliminated an "elegant facility" for automatic function typing in Fortran H which shot down a number of user programs developed under previous revisions. And so far, said one user, the releases have been "dirty"—release 13 Fortran H had 2000 known compiler errors.

Meanwhile, at Goddard Space Flight Center, 360/95 hardware is going great guns with almost no down time. The system has one megabyte of "flat film" memory (120 nsec access) and 4 megabytes of core (750 nsec access), two 2314 discs, 2301 drum, 2321 data cell and 12 tape drives.

MATRIX REJECTS 360/65 PLUGS GE 635

The Los Angeles service bureau of Matrix Corp. has returned to IBM a purchased /65 with 512K byte core, 16 tapes, 2314 disc and four 2311 discs plus assorted peripherals.

Noting that the /65 "does not meet our requirements," a Matrix memo suggests that clients who wish rapid turnaround for debugging on site convert to the company's 635, which has "consistently outperformed other third-generation computers in terms of cost per computation because it is a true multiprogramming machine. The turnaround time has always been shorter than we could provide on our other equipment."

The 635 has a 128K-word core, 70-million character disc, 16 tapes and a Datanet 30, plus peripherals.

NEW ON-LINE DISC NEARLY READY

Infant Computer Peripherals Corp., San Diego-based disc system maker (see March, p. 149), is on-line testing its first unit, the DSU 8100, will sneak preview it next month. The (flying) head-per-track drive features sealed 25- or 50-megabit modules which can be added or changed on site. Each unit can be accessed by up to three computers; that, plus fast access and expandability to 200 megabits, could make the 8100 popular in on-line applications such as message switching, and time-sharing program swapping. Costs on the 8100—due for initial deliveries this fall—will range between .03 to .1¢ per bit. The company will also offer a cheaper movable arm version.

SOFTWARE HOUSES BATTLE FOR WESTERN UNION

The announcement last month of an agreement in principle of a merger of Computer Sciences Corp. and Western Union came the day that University Computing Co.'s tender to buy 750,000 shares of WU stock at $44

(Continued on page 167)

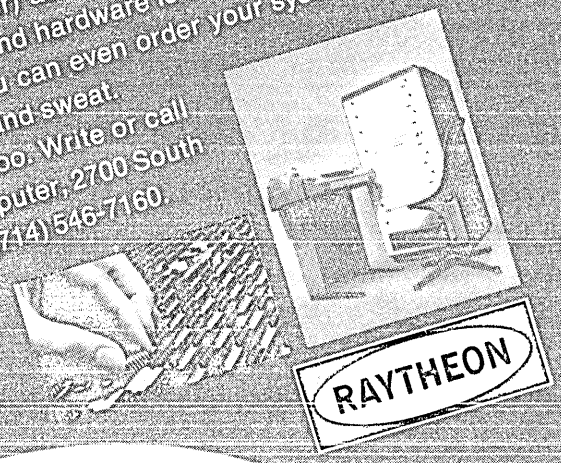
The Raytheon 703 Computer finds its own faults. And you can fix them while you're having coffee.

The $15,000 IC Systems computer with $150 spares. The 703 is the only small systems computer built like third-generation million dollar computers. The CPU is wire-wrapped with plug-in IC's on one motherboard. A unique CPU self-diagnosis solves its own circuit malfunctions. When necessary, you can simply plug in a new IC. Time: about 30 seconds. Cost: about $1.50

The 703 is like larger computers in other ways. It's a 16-bit machine with 1.75 usec cycle time and is expandable from 4K to 32K. It has word and byte manipulation instructions, a real-time priority interrupt system and hardware multiply-divide option. Software includes an executive and real-time FORTRAN IV.

The 703 interfaces with all standard peripherals, including disk. Beyond this, Raytheon Computer offers extensive and compatible IC analog instrumentation like the MINIVERTER™ (multiplexer, sample-and-hold, and A/D converter) assembled from IC analog and digital modules. The complete line of modules and hardware is available for easy system design to your particular requirements. And you can even order your system wire-wrapped, to save you more time, money and sweat.

You'll find our sales engineers compatible too. Write or call today. Ask for Data File C-151. Raytheon Computer, 2700 South Fairview St., Santa Ana, Calif. 92704. Phone (714) 546-7160.



Raytheon Computer... the company that gives you a break.

editor's read*ut

ONE WAY TO HELP

Although the following is a guest editorial, it reflects our thoughts and feelings. We believe that an industry which so profoundly affects the lives of so many people has a clear obligation to take the lead in improving those conditions under which all citizens seek the dream of the American democratic system. For another view on how the computer industry can so move, we urge you to read this month's Forum on page 180. And we urge you to act on both proposals.

Most often, this page is filled with a commentary on some aspect of the data processing community or some admonishment to its members. I think it is necessary, however, to comment on an event that occurred outside of our technical purview, but nevertheless should have a lasting influence on all members of our community.

Martin Luther King deserves to be remembered so that his dream that the equality of man must be recognized and must be accomplished through orderly tactics can become a reality.

As an industry, we have not been a powerful force in his movement, but we must not let this fact diminish the duty each one of us has to promote this international standard of equality.

Our profession, like most other technical activities, is fortunate in the sense that our basic tool is color blind, and that our corporate entities recognize a man's value is related, among other things, to his knowledge and experience. This technology buffer, this artificial shield, ostensibly allows us to practice our chosen profession without much regard to race, color or creed. And it is just this enveloping technical insulation that requires each of us to do more.

Of great importance is the recognition that should be given Dr. King's cause by progressive industry in general and the computer industry in particular. Here is an opportunity for computer professionals to announce their belief in the principles of equality, to eschew complacency.

Individuals and societies can only do so much. ACM has its guidelines for professional conduct and AFIPS and IEEE sponsor awards for excellence in technical contribution to the field. Similarly, individual corporations are constrained in the extent of their contribution. IBM made a splendid gesture in mourning the passing of Dr. King by closing its doors for a day. But, I maintain, it will take all of us—individuals, societies and corporations—to construct from the computer industry as a whole a meaningful tribute to the continuing dignity of man in the memory of Martin Luther King.

I propose, therefore, the establishment of the Computer Industry Martin Luther King Fund to provide a college education in the computer sciences to an individual nominated and chosen by the Southern Christian Leadership Conference.

By so doing, all of us as individuals and as societies and as corporations can singly and collectively make a positive contribution to the cause of equality.

—HOWARD BROMBERG

← FOR RAYTHEON CIRCLE 17 ON READER CARD

LOW-COST REMOTE CRT TERMINALS

by D. J. THEIS and L. C. HOBBS

Man-machine interactive computer systems, now being installed and used in significant quantities, have created a considerable interest by users in remote display terminals suited to their needs. This article presents a survey of available low-cost remote computer display terminals and their relevant hardware characteristics. The display terminals included in this article are restricted to low-cost units selling for less than $20,000. The cost of the terminal used in this article is restricted to the equipment on the remote end of the communications link, not including the modem.

The accompanying comparison charts show that a large selection of low-cost terminals is in inventory now. Increased demand is anticipated for terminals for use in many different applications such as time-sharing systems, computer-aided instruction facilities, on-line reservation systems, on-line banking systems, inventory control systems, etc.

Why do users want more expensive terminals instead of typewriter or Teletype terminals, which are very commonplace today? One prime advantage of crt terminals is the fast reception of messages at maximum telephone line rates —120 to 300 characters per second versus 10 to 20 characters per second for Teletype or typewriters. This allows the user to inspect and assimilate messages at a much faster pace, thus permitting the operator to spend less time staring at the messages. Another major advantage of crt terminals is the ability to selectively delete and change characters or words in desired records or files. Quietness is also an attractive characteristic. The major disadvantages are higher cost and difficulty in obtaining a hard copy capability. Several manufacturers are offering as options various equipment approaches to meet this latter need.

Modern display terminals have been developed by computer companies, by companies producing sophisticated display systems, by military systems contractors, and by small companies that are offspring of the other types. These companies have considerable experience designing and producing equipment to interface as an integral partner of a computer and/or reliable crt displays with proven operator flexibility for use in communicating with the computer or other systems. Hence, today's remote terminals represent the product of many years' evolution and experience. The major problems today stem not from hardware but rather from lack of adequate software and lack of sufficient widespread user understanding of terminal applications and potentials.

two main categories

Remote low-cost display terminals can be categorized into two types: stand-alone and multi-station configurations. "Stand-alone" refers to one terminal at a remote location tied to a computer via a communication link; "multi-station" refers to more than one terminal at a particular location sharing some common storage and control logic. In the multi-station configuration, a large controller is usually shared between the terminals at a site, but the stand-alone terminal includes its dedicated built-in controller. It should be noted that some units can be configured either way

Mr. Theis is a senior consultant with Hobbs Associates, Inc. He has a BS from UCLA and an MSEE from the Univ. of Southern California; he is also a registered professional engineer in the state of California.

with slight equipment modifications. Both types of terminal configurations are included in the survey.

The equipment characteristics are grouped into five basic categories:

1. General characteristics
2. Terminal memory
3. Editing features
4. Transmission characteristics
5. Options

In addition, purchase and rental prices for stand-alone terminals and for one terminal with the prorated share of the controller in the maximum multi-station configuration are also included in the table. These prices supplied by the manufacturers are intended to include all the necessary equipment on the remote end of the communications link (except the modem itself) to make the display terminal fully operational, but these have not been verified in detail for each terminal included.

Mr. Hobbs is president of Hobbs Associates, Inc. He was previously with Aeroneutronic as manager of dp engineering and has also held positions with Univac and RCA. He has a BSEE from Georgia Tech; MSEE from the Moore School, Univ. of Pennsylvania; and an MBA from the Wharton School of Pennsylvania.

The general characteristics include display size, characters per line, lines per display, maximum number of characters displayable, character size, brightness and contrast ratio. These are self-explanatory and are determined by user requirements, environment, and aesthetics. Ease in formatting the display is dependent upon the maximum number of characters that can be stored and displayed in relation to the maximum number of character positions on the screen. There is a continuing demand for larger screen size; but since it takes a certain voltage or current for each inch of electron beam deflection across the screen, circuitry problems arise because of the higher voltage or current required. This results in higher cost so there is a limitation on the screen sizes that can be offered at a reasonable price. Some manufacturers are offering either vertical or horizontal orientation of the crt viewing screen to suit the customer's application. Display size is given in inches for width and height, respectively, and character size is given in inches for the height and width, respectively. Display size could also be specified in terms of viewing area (i.e., square inches) instead of width and height.

producing the image

The character generator technique used with these types of terminals is usually a 5 x 7 dot matrix, a stroke method, or a monoscope. Many trade-offs are involved in the selection of the appropriate technique to best meet the over-all specifications. These trade-off considerations include character generation rate, size, number of character types, complexity and quality of characters, number of displays being driven by the character generator and changeability. A 5 x 7 dot matrix method writes the character by brightening the proper combination of spots in the 35-dot matrix. Character generation rate can be increased in this method by limiting the number of dots used to make up each character, but the character quality will not be as clear as with other techniques.

As the name implies, the stroke method utilizes a series

(Continued on page 28. For Characteristics Charts see pages 24 through 27)

CHARACTERISTICS OF LOW-COST REMOTE CRT TERMINALS

	Bolt Beranek & Newman	Bunker-Ramo	Bunker-Ramo	Bunker-Ramo	Burroughs	CDC	CDC	Computer Communications, Inc.	Conrac	General Electric	Honeywell	Honeywell	IBM	IBM
Model No.	Teleputer	203 or 204	211 or 212	BR-700	B9351-2	216	217	CC-30	201	Data Net 760	303	311 or 312	2260 Mod 1	2265
Type of Unit	Console	Desk-top	Desk-top	either configura-tion	either configura-tion	Desk-top	Console	Desk-top	Desk-top	Console	Desk-top	Desk-top	Desk-top	Desk-top
GENERAL CHARACTERISTICS														
Display Size (inches—w&h)	3.1x3.1	7.75x5.50	4.75x3.75	7.75x5.50	12x9	8x6	8x6	depends on t.v. monitor used	7.5x8.5	8.0x6.3 and 18.4x13.8	7.75x5.50	4.75x3.75	10.5x9.5	9x7.5
Spot Diameter (mils.)	12	12	24	15	25	not specified	not specified	varies depending on CRT used	10	15	not specified	not specified	12	18
Characters per Line	25	32, 42, or 64	8, 16, 32 or 42	64	80	50 or 80	50 or 80	40	37, 40, or 80	46	64, 32, 16 or 8	32, 16, or 8	40	64 or 80
No. of Lines of Characters	20	4, 8, 9 or 12	2, 4, 8, 9 or 12	15	25	20 or 13	20 or 13	20, 24	16, 16 or 8	4, 8, 16 or 26	12, 8, 4 or 2	12, 8, 4 or 2	6	15 or 12
Maximum No. of Characters Displayable	500	768	384	960	2000	1040	1040	800, 960	640	1196	768	384	960	960
Character Size (inches—h & w)	13x.10	.13x.09	.11x.08	.13x.10	.15x.115	.25x.125	.25x.125	varies depending on CRT used	adjustable up to .25	.16 or .26 .12 or .19	adjustable .125 to .250	adjustable .125 to .250	.14x.094	.178x.126 or .148x.105
Character Generation Technique	stroke	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	stroke	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	stroke
Deflection Method	Random Scan	EM	ES	EM	EM	EM	EM	EM	EM	EM	not available	not available	EM	EM
Brightness (foot lamberts)	7	adjustable	adjustable	not specified	50	75	75	adjustable	50	75	not specified	not specified	64	not specified
Contrast Ratio	4:1	10:1	10:1	not specified	10:1	8:1	8:1	adjustable	not specified	20:1	not specified	not specified	2.63:1	not specified
TERMINAL MEMORY														
Type of Memory	Storage-type CRT	Delay Line	Delay Line	Drum	Core	Delay Line	Delay Line	Core	Delay Line	Delay Line	Delay Line	Delay Line	Delay Line	Delay Line
Memory Size (No. of Characters)	—	768	768	384,000	1024	1000	1000	1024	1000	2012	768	768	960	960
Memory Refresh Rate (frames per second)	—	46	46	60	60	50	50	60	60	30	42	42	30	54
EDITING														
Character Insert	no	no	no	no	yes	yes	yes	no	no	no	yes	yes	no	no
Line Insert	no	no	no	yes	yes	no	no	no	no	no	no	no	no	no
Character Delete	no	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes
Line Delete	no	yes	yes	yes	yes	no	no	no	yes	yes	yes	yes	no	no
Cursor	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Type of Cursor	no	non-destructive	non-destructive	blinking	non-destructive	non-destructive	non-destructive	non-destructive	blinking non-destructive	Flashing Horizontal Bar	all 35 dots lighted	all 35 dots lighted	destructive or non-destructive	destructive or non-destructive
Split-Screen Capability	no	no	no	yes	no	no	no	yes	no	yes	yes	yes	no	no
Partial Transmit Capability	no	optional	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no
Tabulation Feature	no	optional	yes	yes	yes	no	no	yes	optional	yes	no	no	no	no

NCR	Philco	Philco	Philco	Raytheon	Raytheon	RCA	RCA	Sanders Associates Inc.	Sanders Associates Inc.	Scientific Data Systems	Stromberg-Carlson	Transistor Electronics Corp.	Transistor Electronics Corp.	Transistor Electronics Corp.	Univac
795	D-20	D-21	D-22	DIDS 401	DIDS 402	70/750	70/752	620	720	7550/7555	SC-1110	S-128	S-256	S-512	Uniscope 300
Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top	Desk-top (or rack)	Desk-top (or rack)	Desk-top (or rack)	Desk-top
7.5x9.5	10.4x7.4	10.7x9.0	18.4x13.8	8.5x6.5	8.5x6.5	8x5.6	8x6	7.5x9.5	7.5x8.5	10x7	10x10	9x6.5	9x6.5	9x6.5	10x5
20	not specified	not specified	not specified	not specified	not specified	10	10	20	20	15	not specified	25	25	25	12
64	32	64	32 or 64	40/80	40/80	27, 54, 80, 81	54	52, 64 or 84	52, 64 or 84	up to 86	up to 80	16	16	32	64
32	24	24	12 or 16	13	13	5, 6, 10, 12, 20	20	32, 40	32 or 40	up to 32	up to 35	8	16	16	8 or 16
1024	768	1536	512	520/1040	520/1040	1080	1080	768	256, 512 or 1024	2048	1000	128	256	512	1024
.12x.09	.21x.20	.26x.11	.517x.359	adjustable .15x.20	adjustable .15x.20	.12x.085	.14x.10	.13x.08	.13x.08	.125x.125	.130x.07	.375x.250	.375x.250	.234x.156	.15x.113
stroke	5x7 dot matrix	5x7 dot matrix	5x7 dot matrix	mono-scope	mono-scope	mono-scope	mono-scope	stroke	stroke	mono-scope	Charac-tron	stroke	stroke	stroke	stroke
EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM	EM
30	75	75	75	50	50	50	50	30	30	20	40	36	36	36	50
not specified	15:1	15:1	15:1	not specified	not specified	6:1	6:1	not specified	not specified	5:1	200:1	12:1	12:1	12:1	10:1
Delay Line	Delay Line	Delay Line	Core	Delay Line	Delay Line	Delay Line	Delay Line	Delay Line	Delay Line	Delay Line	Delay Line	Core	Core	Core	Core
1024	768	1536	2048/4096	520/1040	520/1040	8640	1080	768	1024	2048	1111	128	256	512	1024
46.5	60	60	60	67	67	60	60	60	46.5	50	50	63	63	60	60
yes	no	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes
yes	no	no	yes	no	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes
yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	no	no	yes	no	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
non-destructive	caret	caret	caret	blinking	blinking	non-destructive	non-destructive	non-destructive	non-destructive blinking	blinking	non-destructive	Flashing	Flashing	Flashing	non-destructive
yes	no	yes	no	yes	yes	yes	yes	no	yes	yes	yes	no	no	no	yes
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
yes	optional	optional	optional	yes	yes	yes	yes	yes	yes	no	no	no	no	no	yes

(Chart continued on page 26)

CHARACTERISTICS . . .

	Bolt Beranek & Newman	Bunker-Ramo	Bunker-Ramo	Bunker-Ramo	Burroughs	CDC	CDC	Computer Communi-cations, Inc.	Conrac	General Electric	Honeywell	Honeywell	IBM	IBM
Model No.	Teleputer	203 or 204	211 or 212	BR-700	B9351-2	216	217	CC-30	201	Data Net 760	303	311 or 312	2260 Mod 1	2265
TRANSMISSION CHARACTERISTICS														
Transmission Rate (bits per second)	2400	1200-2400	1200-2400	600-2400	150 to 4800	2400	2400	up to 500,000 char./sec.	1200 (others optional)	1200 2000 2400	1200 2000 2400	1200 2000 2400	1200 or 2400	1200 or 2400
Transmission Code	Pro-grammed	ASCII	ASCII	ASCII	ASCII	BCD	BCD or ASCII	ASCII	ASCII	ASCII	ASCII	ASCII	ASCII	ASCII
Transmission Mode (half duplex, full duplex, other)	FD	HD	HD	HD	either	HD	HD	HD	HD (others optional)	either	HD	HD	HD	HD
Type of Modem	201B	201/202	201/202	201/202	100 series 201 202	201A1B	201A1B	100, 200 or 300 series	202C or D (others optional)	Dataphone 201A, 201B 202C, 202D	202 201	202 201	202D1 201B1	202D1 201B1
OTHER FEATURES														
A/N or Typewriter Keyboard	standard	standard	standard	standard	optional	standard	standard	optional	standard	standard	standard	standard	optional	optional
Function Keys	standard	standard	standard	standard	standard	no	no	no	standard	optional	standard	standard	no	no
Overlay Capability	no	yes	yes	no	yes	no	no	no	no	no	no	no	no	no
Hard Copy Capability	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional	optional
Vector Generation	standard	optional	optional	no	no	no	no	no	no	no	no	no	no	no
Graphic Input Capability	Grafacon Digital Tablet	no	no	no	no	no	no	light pen	no	no	no	no	no	no
STAND-ALONE TERMINALS	no	no	no	no	yes	no	yes	yes	yes	yes	no	no	no	yes
Model No. for Minimum Configuration	—	—	—	—	B9351	—	217	CC-300 or CC-301	201DDT	760	—	—	—	2265
Price of Minimum Configuration	—	—	—	—	$12,980	—	$12,000	$6,845	$7,500	$24,820	—	—	—	$15,050
Monthly Rental for Minimum Configuration	—	—	—	—	$295	—	$330	not available	not available	$620	—	—	—	$380
MULTI-STATION TERMINALS	yes	yes	yes	yes	yes	yes	no	no	no	yes	yes	yes	yes	no
Model No. of Terminal	—	204	212	BR-700	9351-2	211	—	—	—	DTU761	303	311 or 312	2260	—
Model No. of Controller	not specified	222 223 or 224	222 223 or 224	BR-700	9351-9	216	—	—	—	DCU760	323	323	2848	—
Minimum No. of Terminals Handled by one Controller	1	1	2	1	1	1	—	—	—	1	1	1	1	—
Maximum No. of Terminals Handled by one Controller	32	108	108	16	64	12	—	—	—	32	48	48	24	—
Price of Controller and the Maximum No. of Terminals	$182,250	$343,640	$187,580	$95,550	$408,080	$75,050	—	—	—	$101,240	$158,620	$128,860	$102,500	—
Monthly Rental for Controller & Maximum No. of Terminals	$6,080	$10,446	$7,206	not available	$7,820	$2,345	—	—	—	$2,655	$4,375	$3,703	$2,189	—
Price per Terminal in Maximum Multi-Station Configuration	$5,700	$3,180	$1,730	$6,500	$5,990	$6,250	—	—	—	$3,160	$3,300	$2,680	$4,270	—
Monthly Rental per Terminal in Maximum Multi-Station Configuration	$190	$97	$67	not available	$122	$195	—	—	—	$83	$91	$77	$91	—

NCR	Philco	Philco	Philco	Raytheon	Raytheon	RCA	RCA	Sanders Associates Inc.	Sanders Associates Inc.	Scientific Data Systems	Stromberg-Carlson	Transistor Electronics Corp.	Transistor Electronics Corp.	Transistor Electronics Corp.	Univac
795	D-20	D-21	D-22	DIDS 401	DIDS 402	70/750	70/752	620	720	7550/7555	SC 1110	S-128	S-256	S-512	Uniscope 300
1200 1800 2400	110	1200/1800	1200	1200/2400	1200	2400	1200	110-1800 2000-2400	110, 1000, 1200, 1800, 2000, 2400	7550:150 7555:1800	100-1.1MHZ	1. 6MHZ	1. 6MHZ	1. 6MHZ	2000/2400
ASCII	modified ASCII	ASCII	modified ASCII	ASCII	ASCII	ASCII	ASCII	ASCII	ASCII	ASCII	ASCII	any 6, 7 or 8 bit code	any 6, 7 or 8 bit code	any 6, 7 or 8 bit code	modified ASCII
HD	HD	HD	HD	either	HD	FD	HD	HD	HD	either	either	HD	HD	HD	HD
202C1	103A2	202D1/201 optional	202D1/201 optional	201A/B	202C/D	201B	202C 202D	Dataphone	103, 201, 202 series	103 and 202	Dataphone	RS232B compatible	RS232B compatible	RS232B compatible	201A 201B
standard	standard	standard	standard	standard	standard	standard	standard	standard	standard	standard	standard	optional	optional	optional	standard
standard	standard	standard	standard	optional	optional	no	no	standard	standard	standard	standard	optional	optional	optional	optional
no	no	no	no	no	no	yes	yes	yes	yes	no	no	no	no	no	no
optional	no	optional	no	standard	standard	optional	optional	optional	optional	optional	optional	no	no	no	no
no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes
—	D-20	D-21	—	401	402	—	70/752	620	—	7550/7552	SC 1110	S-128	S-256	S-512	3528-00
—	not available	$9,200	—	$4,928	$6,000	—	$8,325	$5,400	—	$10,000/ $12,500	not available	$4,890	$5,379	$5,868	$15,140
—	not available	not available	—	$123	$167	—	$190	$180	—	$225/$285	not available	not available	not available	not available	$410
yes	no	no	yes	yes	yes	yes	no	no	yes	no	yes	no	no	no	yes
795-400	—	—	D-22	401	402	70/750	—	—	708	—	—	—	—	—	3527
795-100	—	—	D-22	425 or 450	425 or 450	70/751	—	—	701	—	SC 1110	—	—	—	5020-00
1	—	—	3	1	1	2	—	—	1	—	1	—	—	—	1
12	—	—	7	64	64	48	—	—	12	—	24	—	—	—	48
$66,850	—	—	not available	$307,840	$307,840	$274,950	—	—	$45,050	—	not available	—	—	—	$267,865
$1,910	—	—	not available	not available	not available	not $5,850	—	—	$1,330	—	not available	—	—	—	$8,330
$5,560	—	—	not available	$4,800	$4,800	not $5,730	—	—	$3,800	—	not available	—	—	—	$5,600
$159	—	—	not available	not available	not available	not $122	—	—	$120	—	not available	—	—	—	$173

of strokes for defining each character. Each stroke is generated from a voltage matrix network which provides a time-varying voltage to drive the X and the Y beam deflection circuitry. This method is much better for generating complex symbols than is the 5 x 7 matrix method, although the character generation rate is slow.

The monoscope generates each character via an image drawn in ink on a target anode. A secondary anode collects this image as an electric current which is converted to a standard video signal. This technique also produces quality characters at slower character generation rates. Since the character quality is a function of its size, how it's generated and what the user's application requires, the decision is ultimately a compromise between character quality and cost. One manufacturer uses a version of a shaped beam tube, which produces very legible and distinct characters.

Methods to deflect the image-producing electron beam across the face of the crt are electromagnetic, electrostatic, or a combination of both. Electromagnetic coils limit the spreading of the spot size on the face of the crt, which provides higher resolution than obtainable with electrostatic tube techniques. High speeds are easier to achieve with electrostatic deflection, but the linearity is not as good (i.e., the image quality suffers). Magnetic deflection is usually employed in high performance displays because of the improved linearity and image quality, but this requires more expensive circuitry.

Brightness is a function of the character generation rate, character generation technique, character size, and the inherent characteristics of the crt. It is specified in foot-lamberts and ranges between 10 and 100 for these types of terminals. Since contrast ratio is a function of the direct incident screen light, which in turn is a function of the lighting condition in the room, it is difficult to compare units meaningfully on the basis of contrast ratio.

The type of memory used to maintain a flicker-free viewing screen for all the crt displays included in this survey requires a refresh rate of 30 to 67 times a second and is usually either a magnetic core memory or delay lines. Needless to say, it is usually not practical to have the central computer perform this function although this has been done in some special cases. The size of memory depends on the maximum number of displayable characters and on how the memory is organized internally. One efficient organization, called non-spatial memory organization, requires memory capacity only for all of the displayed characters plus some control characters. This eliminates the need for more memory to store any and all blank character positions. One exception to using either magnetic core or delay line memory for refreshing the display is the BB&N Teleputer Terminal, which uses a storage-type crt. A storage tube retains the image generated on the face plate for several minutes. This saves the cost of an internal memory, but selective erasure of characters on such a tube is at present not economically practical. Tektronix offers two storage tube displays for use in terminals but does not offer a complete operating terminal.

editing and control

Editing capability is a very important feature on any display terminal. In some applications, the display terminal is only used as an information inquiry device, but in other situations a large amount of program text or data manipulation may be required. Most units in this survey have some kind of character and/or line insert/delete capability. Each device incorporates a cursor of one type or another to indicate the character position upon which the operator is editing. From there, the units vary considerably with different types and kinds of editing features available to the user.

In addition to the 36 basic alphanumeric characters, each unit uses several control characters such as carriage return, tab, space, back space, character delete, line erase, character insert, etc. Some of the more versatile units provide an insert function which spreads the existing text to allow additional characters to be inserted between the cursor and the preceding text. Similarly, many provide a delete function which allows the user to drop unwanted data from the displayed material. Character insert usually causes all characters to the right of the cursor to be shifted one place to the right, leaving a space at the cursor for the character to be inserted. Character delete will drop the character marked by the cursor. Line erase will enter blanks starting with the cursor and all following character positions to the end of that line.

The cursor is a visible indicator used to inform the operator where the next operation will take place on the screen. Cursors vary from a blinking underline marker to brackets around the next position to be acted upon. Cursors fall into two types: destructive and non-destructive. Destructive refers to the erasure of a particular character when the cursor is moved to that position, whereas non-destructive refers to a cursor positioning scheme where the character is not automatically erased. Some units in this survey provide additional control keys to move the cursor about the screen quickly instead of keying repetitiously across each line.

Split screen allows the display screen to be divided up into segments for presenting multiple messages. This feature permits the operator to edit and retransmit individual messages. Partial transmit capability permits the operator to transmit only a particular part of the displayed information. Specifically, the portion transmitted is that between the cursor position and the end of field symbol.

The tab feature is not available on many of the terminals included in this survey. On the units that do have a tab control key, its characteristics vary. Tab is essentially a positioning key that allows the user to move the cursor forward until a special tab stop is reached. One unit, the Burroughs 9351, offers a variable tab position capability as an option.

Other features that are offered as either standard (included in the basic price of the unit) or optional equipment in remote terminals include typewriter keyboards of one kind or another, function keys to facilitate certain kinds of operations that are quite often needed for a specified application, and overlay capability which can provide a format on the screen to aid the operator in his interaction with the computer.

Almost all applications for remote crt terminals require a typewriter keyboard to compose messages sent to the computer, but some manufacturers offer the keyboard as an option depending upon which function keys or other special keys the customer may need. Function keys give functional flexibility to the operator—which saves time, saves memory, and reduces operator errors. The number of function keys available on these units varies from a few to more than 40.

Hard copy capability is one major advantage of Teletype or typewriter terminals (without a crt) that can only be matched in remote crt terminals by incorporating special equipment such as small printers, typewriters, or some kind of photographic techniques. There are many user requirements in which hard copy is an essential feature to do the job properly.

Vector generation and graphic input capability are two features not presently available on low-cost (less than $20,000) remote crt terminals. Vector generation is the

means for producing continuous curves on the face of the crt. They are used to indicate time-varying functions or graphic drawings of one kind or another. Both these features are readily available on many higher-priced display equipments which are not included in the scope of this article. However, a few of the units included in this survey are capable of drawing continuous vertical and horizontal lines. This allows the generation of X-Y graphs, bar charts, and other simple diagrams. With a little imagination, the programmer can even generate some animated caricatures.

transmission rates

Remote terminals, by definition, imply transmission of information. These units normally communicate over telephone lines, although in some cases the computer is close enough to use its own special coaxial lines. All terminals surveyed except one, the CDC 210 Series, use the ASCII character code format for data communication. ASCII is an eight-bit code which uses the eighth bit for parity checking to verify that data transmission has been maintained. The standard voice grade telephone lines used in business establishments today permit 150, 300, 600, 1200, 1800, and 2000 bits per second to be transmitted serially. Sometimes, the transmission rate of one bit per second is referred to as "baud" although that is not an exact relationship. Leased Telpak lines provide higher transmission rates, starting at 2400 bits per second.

Since transmission rates are strictly a function of the telephone lines and the equipment (modems or data sets) attached to each end of the telephone lines, the choice between dial-up lines and their associated modems versus leased lines is a matter of a cost/performance evaluation of such factors as the need for all terminals to be on-line concurrently, the average daily time these terminals are each used, and the distance to the central computer facility.

The standard telephone voice channel has a 4KC bandwidth, so it can handle up to 18 Teletype units, each operating at speeds of 5 to 10 characters per second. To accommodate remote crt terminals which require at least 100 characters per second, the voice channel is committed to a single terminal unless higher transmission-rate equipment is used. The general relationship of transmission rate to bandwidth is fundamental in communication theory. When a voice channel is tied up for one terminal, that channel can be used in one of two ways—half duplex and full duplex. Half duplex refers to data transmission restricted to one direction at any one time interval; for full duplex operation, the channel is divided into two parts—the lower half of the channel is for transmission and the upper half is for receiving. Full duplexing provides the terminal with immediate interrupt capability, which is not possible with half duplex techniques. Methods of communicating the data over voice grade lines falls into two types: asynchronous and synchronous. The asynchronous method incorporates special characters preceding and following each character; in this manner, arbitrary time intervals can exist between each character transmission. This method is not critical from timing considerations. Synchronous transmission consists of a continuous stream of data characters without start and stop characters. This provides higher throughput data rates, but at the expense of more costly equipment. Either method can be used with any of the different telephone lines available today.

translating and buffering

Translation equipment is needed in order to convert the bits used in the computer into the appropriate modulated, or audio, signals which can be handled over telephone lines. This conversion is performed by data sets commonly known as modems (the term modem evolved as a contraction of modulation-demodulation). The telephone company usually provides these modems, but recently some other manufacturers have come out with acoustic couplers which serve the same purpose.

Because the computer has a much faster bit transfer rate than telephone modems can presently accommodate, some type of buffering equipment is necessary to interface between the computer I/O channel and the modem. The buffer serves to convert I/O data from the computer into a suitable format for use by the remote terminals. This interface equipment, usually called an adapter, contains the necessary circuitry for connection to the modem. It controls the operation of the modem, and can also perform error detection. Most display terminal manufacturers offer or plan to offer the necessary data adapter units to meet the various transmission rates provided by modems available today.

Stand-alone terminals are single remote units that have their own built-in memory, character generator, and the appropriate modem interface. A stand-alone terminal can be located in remote locations with only a Dataphone necessary to link it to some distant computer facility. The cost of the communications link can sometimes be as much or more than the monthly cost of the stand-alone terminal.

In many applications, several remote crt terminals are located at some remote location in a multi-station configuration. In multi-station configurations, a central memory, character generator, and control logic are placed in one large controller in order to share this capability between several display terminals. This technique amortizes the cost of controller hardware over a number of display terminals, thus decreasing the cost of each display. This controller, located at the remote site, is the controller designated in the survey chart under the multi-station terminal category. These multi-station controllers are designed to handle up to a certain maximum number of displays, so that when fewer display terminals are in use the other terminals can be serviced at a faster rate but must share a proportionately higher part of the controller cost. The survey chart gives the price for the multi-station controller and the maximum number of terminals that can be handled by that controller. Next, the average price per operating terminal is given for the maximum configuration. The price per operating terminal is related to the features and capabilities associated with that particular terminal. The terminals included in this survey offer different and varying degrees of sophistication. The prices do not include the I/O channel and necessary interface equipment at the computer end of the communications link. In multi-station configurations there is sometimes a requirement for a data concentrator between the computer I/O channel and slow speed communication lines to format large amounts of data to be transmitted and received at high speeds to or from the controller at the remote site.

All things considered, the task of evaluating the display terminal to best meet one's needs requires not only an analysis of the display terminal capabilities, but also an analysis of the over-all terminal/computer performance objectives: minimize communications cost, utilize operator capabilities fully, minimize overhead costs, maintain efficiency for a varying number of terminals on-line, and facilitate operator-computer interaction. In addition, the software necessary to make the display terminal an operating reality is a very significant technical and economic problem.

Future trends in display terminals are first and foremost toward lower cost, then, hopefully, lower communications costs, larger viewing screens, higher character capacities, and graphic capability. As costs decrease, demands for remote crt terminals can only become larger and larger. ■

SOFTWARE FOR TERMINAL–ORIENTED SYSTEMS

the latest gap

by WERNER L. FRANK

The proliferation of remote access computing in the United States is startling. A recent study for the National Bureau of Standards identified over 200 distinct non-government systems as operational or near operational.[1] New businesses devoted to exploiting this technology are springing up weekly.

Large corporations are adopting on-line, crt console terminals for their major operations. This is the case with respect to reservation systems for TWA and United Airlines and inquiry stations for Allstate Insurance and Schenley Industries. The stock brokerage industry alone is currently employing over 10,000 crt consoles for inquiry purposes. Hotel and ticket reservation facilities are being made commonly available to consumers through conveniently located terminal devices. Perhaps a more unusual application is the use of such devices for source data entry in place of standard key punch operations, as is the case with the exploratory efforts of the Internal Revenue Service and the present operation of the California Department of Motor Vehicles.

A recent survey of manufacturers revealed that the estimated number of crt consoles produced, or on order, by the end of 1966 was over 25,000 units. Furthermore, industry predictions for 1970 suggest an annual production of over 100,000 units. Of course, most of the present on-line terminals are still the Teletype devices typified by the Models 33 and 35. The number of such terminals in present on-line use is in the tens of thousands.

An additional impact on this technology is represented by the potential utilization of conventional TELEX and TWX stations as on-line, computer terminal devices. For example, this is one objective for Western Union's Information Services Computer System which is to handle some 16,000 TELEX stations. By 1970, the combined TELEX and TWX ter-

[1] Collins, George O., "A Study of the Remote Use of Computers", January 1967, Clearinghouse for Federal Scientific and Technical Information, U. S. Department of Commerce.

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minals may number well over 100,000.

There are also hardware developments of a more special nature, seeking to fulfill the growing need for remote access to data processing systems. These devices seek to match more specific requirements (e.g., graphical input), meet the need for portability and, most of all, be more economical.

Of particular interest is the growing terminal technology that will augment the potentially cheapest and most ubiquitous of all terminals, the Touch-Tone telephone.

Examples of such recent developments are shown in Figs. 1 through 5.

All of this spells the beginning of the on-line revolution. During the first 15 years of the computer age, data processing provided impersonal services to users. Thus, payrolls, invoices, and financial reports may have been processed by computers, but man's activities typically were not directly affected or modified. The present on-line trend, however, directly affects the *manner* in which man's everyday activities are conducted. Thus, the presence of computing power, through appropriate man/machine interfaces, will surely reach into every business office, as well as classroom, and even into the home itself.

The technological base for developing such widespread data processing services is here. Fundamental to such operation is the means for communication between user and computer as typified by the aforementioned terminals. Of equal importance is that widespread users have access to data banks and processing services. Hence, the need for a computer network, which may be a hierarchy of computers to satisfy one application area, such as message switching, and the emerging computer utility, which will lead to the eventual development of integrated systems to handle messages, provide access to data banks, collect information, and offer general processing services.

the economics of it all

Despite the technological realization of on-line systems, there are significant problems to be solved if they are to proliferate. Certainly the federal government's rulings are not the least of them. (The question of federal control and regulation for communication oriented computer services is presently a subject being pursued by the Federal Communications Commission.) Here, however, we are only concerned with the economics of the conventional hardware/software aspects.

From the point of view of hardware, two cost deterrents exist: (1) the cost of terminal devices, and (2) the cost of communication lines. Research and development activities will surely find an exploitation of the Touch-Tone telephone, commercial television, communications satellite, etc., for solving these problems in the future. In the meantime, industry experts predict crt display cost reductions of some 50% by 1970, employing current technology. Hence, it will be possible to purchase consoles for as low as $1,500 and lease units for between $50 and $150 per month, depending upon the capabilities required.

A more serious, longer range deterrent is the software production problem. While data processing hardware unit costs have continued to decrease, software costs have remained the same or actually increased. So software has become an ever increasing proportion of the total edp system implementation costs. Based on present technologies, the predictions for the hardware/software cost split are shown in Fig. 6.

The article by Ascher Opler in DATAMATION, January 1967, page 22, states that this trend may be offset by appropriate hardware and software system approaches to fourth-generation edp technology. The impact, however, of demands for on-line applications may more than offset any software systems breakthrough.

For example, the implementation of one system[2] comprised of seven general purpose procedures required the individual programmed functions summarized in Fig. 7.

These seven procedures represent the types of general purpose functions and operations that must be made available to programmers and application oriented systems personnel desiring to interact with a computer on a remote basis. They include a command language, programming languages, and editing and file managing capability.

The software indicated excludes an accounting for lan-

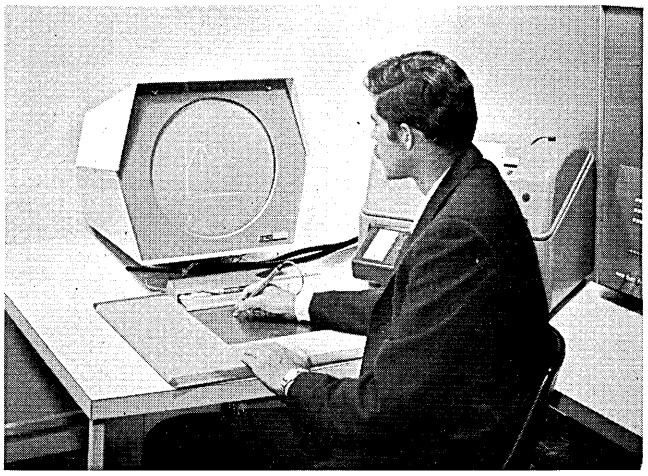


Fig. 1

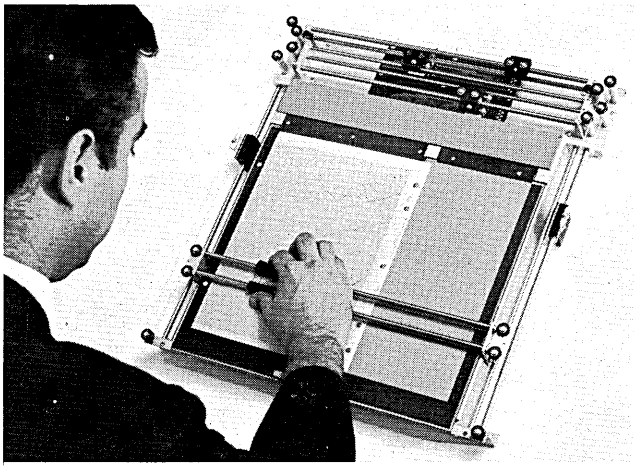


Fig. 2

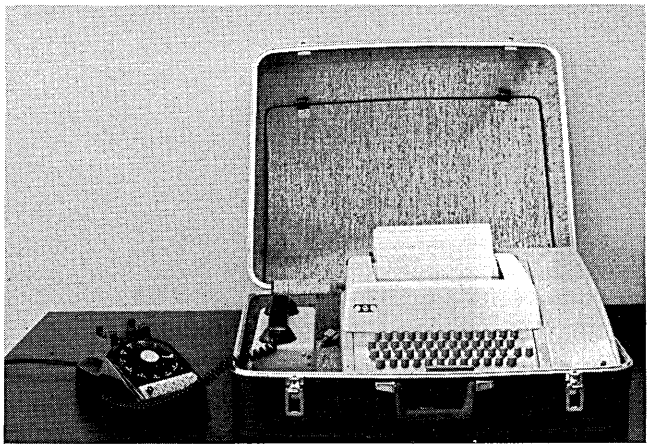


Fig. 3

[2] Corbin, Harold S., and Frank, Werner L., "Display Oriented Computer Usage System", *Proceedings of the Association for Computing Machinery 1966.*

guage compilers, operating systems, and input/output control systems. Thus, a particular interactive procedure requires several thousand lines of object code and an individual functional step of the procedure may well take several hundred instructions.

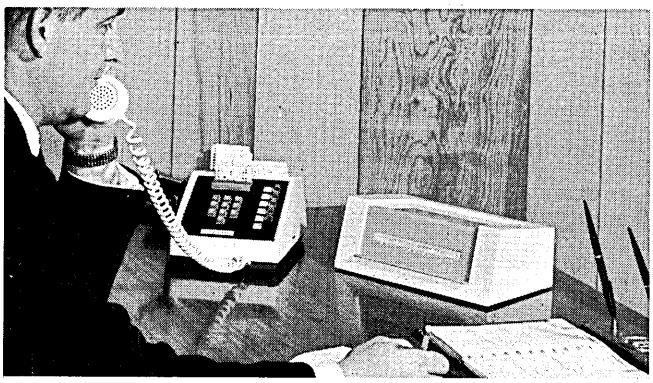


Fig. 4

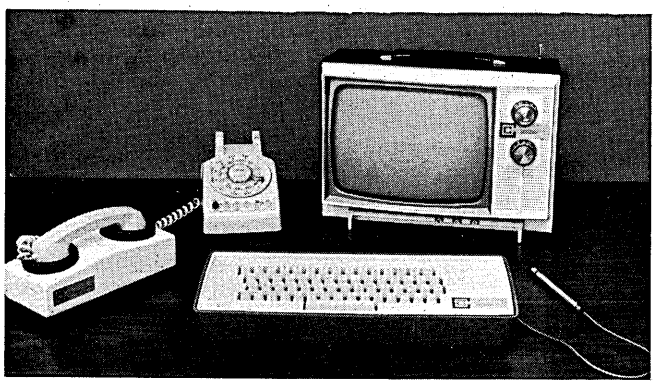


Fig. 5

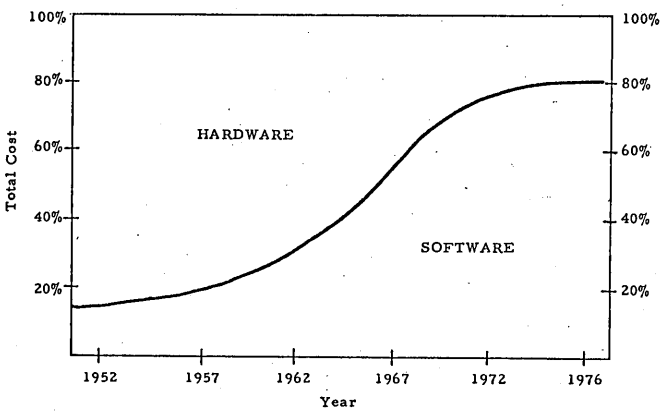


Fig. 6. EDP Hardware/Software Cost Relationship

A second example is the General Motors DAC-1 system[3]. Here, several million instructions have been generated to provide several thousand individual functions to users—this, for the first level of capability. This example represents a rather narrow—but specific—application of engineering design in the automobile industry.

In a third example, it has been estimated that there may be a need for several hundred thousand different procedures to satisfy the application of on-line technology in one particular industry, the operation of a hospital.

The software implementation problem is, therefore, imposing. Consider the situation in 1972. It is said there are going to be some 80,000 computers installed in the early 1970 period. Assuming that 50% of these computers will be on-line, and assuming further that each one of these will have an average of five associated terminals, the total number of terminals will then be 2×10^5. Now assume that a man/machine procedure would take some 1,000 instructions, which is a modest assumption—certainly by conventional, ad hoc techniques. Further assume that an instruction costs $10. Then, if one assumes that there will be only a single, unique application per terminal, a sizeable cost figure is derived—namely $2 billion worth of programming to be accomplished between now and 1972, or 100,000 man-years of programming. This is a staggering quantity. For one thing, it would occupy approximately all presently trained programmers. The demand for trained edp personnel in general is, of course, well known. Hence, how can all this work be accomplished?

a case for generalized software

The indicated software gap must be met by general purpose programming packages and by more powerful, higher order (applications oriented) programming implementation languages.

Historically, general utility software was developed for the batch processing environment. Thus, for example, system software emerged in the form of assemblers, compilers, job monitors, and centralized input/output packages. Also, functionally oriented software emerged such as generalized sorts, report generators, and file management systems. Now, analogous capabilities must be developed for use in on-line environments. Candidate general purpose elements for such systems are:

1. Executive or operating system software
2. Communications handling software
3. Information management software
4. Terminal-oriented software

The job programs related to each application will then be developed to operate in this environment.

These elements are the large and meaningful subsystems comprising the on-line environment. There is, of course, a problem of interface between these software subsystems. Where does terminal-oriented software (TOS) begin and end? How does it tie into data management and communi-

APPLICATION PROCEDURE	NUMBER OF FUNCTION KEYS	NUMBER OF PRE-STORED DISPLAYS	NUMBER OF INSTRUCTIONS
General Operating Language	22	7	5,500
Procedure Implementation Language	27	13	9,000
FORTRAN Programming Language	51	47	4,000
CODAP Programming Language	31	25	4,000
Procedure Editing Language	29	4	2,250
File Management Language	17	6	2,600
Text Editing and Manipulation Language	19	15	2,000

Fig. 7. Programming Requirements of Seven Application Procedures

[3] Jacks, Edwin L., "A Laboratory for the Study of Graphical Man/Machine Communications", *Proceedings of the Fall Joint Computer Conference 1964.*

cations? For example, does TOS take care of the I/O between the computer and the specific terminal device? Or does the I/O portion belong to the communications handler? Or to the executive? Another important question is where does the information management software end and the input/output functions of the executive system begin? Such questions require study and analysis—and should lead to ultimate standardization.

There is also the question of systems operation. Does the TOS, for example, perform the "time-sharing" or "switching" from console to console? Or is this a function of the communications handler or the executive, or is it split between the two? Does the resolution depend upon the systems hardware characteristics, such as an interrupt-driven system versus a polling interface? Exactly where the lines are drawn must be determined if one is to define a software model built up from general purpose subsystems.

Modern third-generation systems are beginning to take such a generalized course without, however, a well defined, a priori blueprint encompassing all of these aspects. Thus, for example, IBM has developed a general purpose operating system for the System/360 which is adaptive to a specified environment as a function of system generating parameters. Also, a teleprocessing package is offered. IBM has also discussed its General Information System (GIS) which performs the general objectives of the information management software identified earlier. However, neither IBM nor any other manufacturer has recognized the need for general purpose terminal-oriented software in the sense of this article.

It is this latter element which represents the vehicle for, hopefully, overcoming the staggering software requirements potentially imposed by the on-line world.

procedures. Of course, the on-line system itself can be used for generating these procedures by providing on-line programming analogs for these components for the use of procedure implementors.

The most important component is the procedure definition language, which is useful to the procedure implementor for programming the individual steps of a procedure. In addition to typical data processing operations, the following display-oriented features and functions must be available:

Terminal declaratives
Terminal control statements
Display composition statements
System operators

Consider first the *declarative statements*. The capability is desired for symbolically naming the various terminal hardware features for referencing purposes. An example is:

NAME SELECTOR (19, DATA-ENTRY)

This single statement reflects three important language features. (1) The term "selector" is used to represent the wide range of physical manifestations of switches, buttons, keys, etc., that may be associated with any one terminal. (2) The term "DATA-ENTRY" is the label given by the procedure implementor to a particular selector, say Number 19, for the given application. (3) The designator "19" is a representation of a particular selector used in an over-all system sense. The actual name or reference nomenclature may be some highly encoded octal external code. This cross referencing is accomplished by *specification* declaratives which map the physical console onto the generic descriptors. Examples of such statements are:

SPECIFY SELECTOR (0123, 19)

which states that key 19 has the octal equivalent of 0123, and

INDICATORS:	POINTERS:
TURN INDICATORS ON	READ POINTER MESSAGE
TURN INDICATORS OFF	PROCESS POINTER MESSAGE
BRANCH INDICATORS ON	WRITE AT POINTER
BRANCH INDICATORS OFF	
SAVE INDICATORS STATUS	
RESTORE INDICATORS STATUS	
SELECTORS:	ATTENTION CONTROL:
READ SELECTOR MESSAGE	ALLOW INTERRUPT
PROCESS SELECTOR MESSAGE	DISALLOW INTERRUPT
ASSIGN FUNCTION TO SELECTOR	POLL CONSOLE
REMOVE FUNCTION FROM SELECTOR	TEST INTERRUPT VALIDITY
BRANCH SELECTORS ON	READ INTERRUPT MESSAGE
BRANCH SELECTORS OFF	PROCESS INTERRUPT
WAIT FOR SELECTOR	
TURN SELECTORS ON	
TURN SELECTORS OFF	

Fig. 8. Console Control Statements

This terminal-oriented software is composed of the following elements and their respective components:

Procedure-Generating Components
- Procedure definition language
- Procedure compiler
- Display generator
- Display librarian

Operating System Components
- Executive control and sequencer
- Multi-console handler
- Console features translator
- Display controller
- Display manipulator
- Selector operator

The procedure-generating components are off-line processes for implementing specific man/machine application

SPECIFY DISPLAY PAGE (CHAR, 32, 64; RASTER, 512, 1024)

which provides directives that the display is capable of presenting a character matrix of 32 rows and 64 columns or a point matrix of 512 by 1024.

The declaratives can also assign labels to groups of selectors or indicators such as:

DEFINE SELECTOR GROUP (NEXT PAGE,
PREV-PAGE; PAGE-OPRTS)

which assigns the single referencing label "PAGE-OPRTS" to two other related selector labels.

The *terminal control statements* operate on indicators and selectors defined by the declarative statements and another important hardware feature, the "pointer." A summary of typical control statements for each of these hardware features is given in Fig. 8.

The operations performed on the displays are determined

by *display composition statements* such as those given in Fig. 9. These are operations needed to manipulate both textual and graphical displays. The selection of these statements is critical since their use and combination to form more sophisticated statements provide the implementor with the power to express complicated procedures with

COMPOSITION OF TEXTUAL DISPLAYS	
DEFINE AREA	MOVE AREA
DEFINE SUBAREA	ROTATE AREA
DEFINE COMPOSITE	FILL AREA
DEFINE STRING	MOVE STRING
DEFINE SUBSTRING	

COMPOSITION OF GRAPHICAL DISPLAYS	
DRAW CURVE	JOIN LINE
MOVE POINT	EXPAND FIGURE
ROTATE FIGURE	CONTRACT FIGURE
ERASE LINE	COMPOSE PICTURE

Fig. 9. Display Composition Statements

ease. Thus, the textual operators permit manipulation of two-dimensional character strings. Hence, they allow ready dissection of data entries into a formatted display. The graphical operators are used both to generate and to modify line drawings.

Finally there are *system operation statements.* These language capabilities relate the system environment to the step-by-step operation of the application procedures. Examples of such statements include those necessary for accessing the display library and for interfacing with the terminal subsystem executive. Thus, displays are symbolically accessed by statements such as:

FETCH (DISPLAY NAME)

This statement would, for example, obtain from the display library the set of "pages" having the indicated name.

The terminal procedure implementation language described herein can be developed within the structure of existing higher order languages such as PL/I. This is a preferred route since it precludes the need to develop new compilers. In fact, in one implementation[2] of such a language, the FORTRAN compiler was used as the basic starting point.

The displays, which must be defined and entered into the system, are either composed on hard copy formats appropriate for subsequent key punching or they are produced on-line, using the terminal itself. A display library handler must be provided for updating and maintaining the display library.

The operating system components depend upon the hardware and software organization. The over-all control and sequencing is handled by the executive system. This executive provides the interface with the remaining system components. Part of TOS is the multi-console handler, which provides the traffic rules and associations between terminal activity and data. The console features translator is concerned with mapping the internal format of data and processes to specific hardware characteristics which may differ from terminal to terminal.

The console translator feature is an essential aspect of terminal-oriented software as it may operate within the framework of computer networks and utilities. Thus, it may never be known in advance what type of hardware terminals might be in the system. Also, the initiation of a procedure at one terminal may lead to output at another, and perhaps dissimilar, terminal; hence, the need for terminal independent internal processing, and also the need for hardware independence in the procedure definition language.

Displays are processed by the display controller and manipulator. These are general purpose programs that support the display composition statements. Finally, the selector operator oversees the execution of the individual programs associated with each terminal selector.

conclusion

The fundamental purpose of terminal-oriented systems is to provide non-programmers with a ready facility for performing these basic application processes:

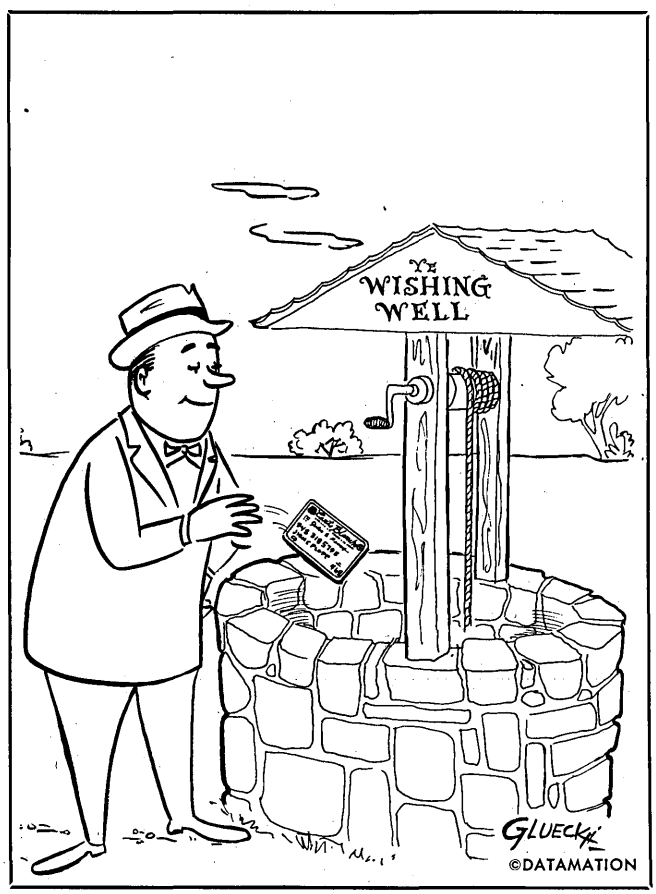
Source data entry
Data bank query
Transaction processing
Data file manipulation
Numerical problem solving
Graphical problem solving
Text editing and composition

It has been argued here that the widespread implementation of such procedures will be a costly, if not prohibitive, objective.

The time is now right for due concern and action to accomplish the following:

Develop a basic characterization of terminal devices;
Define a terminal procedure implementation language;
Develop display composition standards.

The computer manufacturer can probably not be depended upon to lead the way. The federal government has, of course, much at stake in this technology but has not, to this writer's knowledge, supported research in this area. It is, then, the user community that must initiate action. This should be done through existing user groups or on an industry basis. ■



GOVERNMENT POLICY IMPLICATIONS IN DATA MANAGEMENT

by MANLEY R. IRWIN

Viewed in the particular, the series of dockets now pending before the FCC may appear to be the typical backlog of adjudicatory proceedings associated with any regulatory body. Viewed in the aggregate, however, these issues imply much more. They suggest that the question of terminal devices, the alternatives open in the use of communication lines, and the packaging of data switching and processing are exposing our communications policy and practices to an unprecedented re-evaluation. At the very least, these questions are likely to be on the agenda for some time to come; and their outcome merits the continued interest of those vesting an interest in computer time-sharing and remote data processing systems.

This paper will identify recent developments in the area of policy that bear on the parts that make up a communication system; namely, the question of options in the terminal market, alternatives to carrier-provided communication lines, and the regulatory status of computer systems that both process data and switch record messages.

the issues

A first question deals with the validity of the carriers' foreign attachment tariff. As background it is useful to note that the carriers have historically provided what they regard as a complete communication service. That service includes ownership and control of terminal equipment, switching offices and communication lines. Under this policy the carriers do not sell equipment or lines. Rather, a service is leased to their public message subscribers—a practice that in effect constitutes a tie-in between lines and equipment. To a certain extent the carriers have relaxed prohibitions against customer-owned terminal devices and equipment on circuits leased on a private dedicated basis. The banning of customer-owned equipment is termed a violation of the carriers' "foreign attachment" tariff.

communication lines

Any policy has its pros and cons and the foreign attachment tariff is no exception. The carriers submit that control of lines and terminals cannot be divorced from their responsibility of providing quality service to the general public. If, for example, a customer owns terminal devices that prove defective or inadequate, the user is under no obligation to repair its equipment, thus degrading the entire telephone network. Inevitably, the carriers bear the onus of poor performance despite the fact that the cause may be beyond their control. The user, moreover, is under no obligation to update, modify or scrap his equipment once he assumes complete ownership. What is at stake in the "foreign attachment" rule, then, is nothing less than the integrity of the nation's telephone system; and to protect that network the carriers contend they must control at least the interfacing modem between business machines and their network.

The growing skepticism surrounding the foreign attachment tariff begins and ends with economic cost. Subscribers, particularly computer users, find themselves exploring the quality and price of many devices in the terminal hardware area, a search, incidentally, that has fallen into two patterns.

The first grants the carrier's systemic integrity argument and thus permits the carrier to own and lease both lines and terminal equipment. In return for this control, however, some contend that the carriers ought to purchase equipment on a competitive bid basis rather than through their integrated supply affiliates. The carriers have an answer to this suggestion. They contend that their in-house purchases are dictated by considerations of price and quality only; and that only their own manufacturing affiliates have thus far been able to meet that test.

The second option is to permit customer ownership of terminal and related equipment while at the same time ensuring that such ownership will not compromise the nation's communications system. This proposal assumes the establishment of some kind of "fuse" concept coupled with common interfacing standards and/or the possibility of equipment certification. Whatever the means, the end is clear: many users want to buy rather than lease equipment manufactured by carrier or other supply affiliates in order to eliminate monthly leasing charges—charges that rise concomitant with the addition of out-station terminals.

The merit of these suggestions aside, it is significant that the FCC has now pending two cases that bear on the foreign attachment tariff. The first, the Carterphone case, involves the use of an acoustic coupler that permits interconnection between a mobile radio system and the nation's telephone network. The carriers oppose interconnection on the grounds cited above; the FCC staff has, in challenging the assumptions of foreign attachment (or interconnection), recommended approval not only of the Carterphone device but of all equipment banned under the foreign attachment rule.

The FCC computer inquiry also touches the question of foreign attachments. Responses by computer manufacturers, equipment supplies and data users are surprisingly

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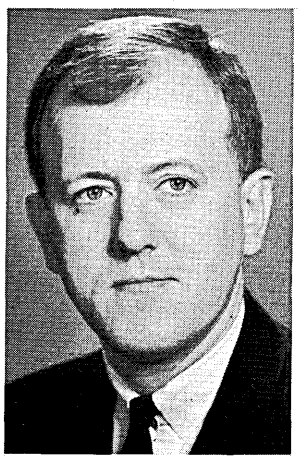

Dr. Irwin has formerly been a staff economist for the Select Committee on Small Business for the U.S. Senate, and an industry economist for the Common Carrier Bureau of the FCC. Holder of a Ph.D. from Michigan State Univ., he is currently associate professor of economics, Whittemore School of Business & Economics, Univ. of New Hampshire.

unanimous in demanding greater flexibility in the ownership and control of their terminal and station equipment. The position taken by computer manufacturers is predictable since they manufacture these devices either here or abroad. What is surprising is the emphasis on equipment choice by users who have no manufacturing interest in such equipment.

These two cases, the Carterphone and the computer inquiry, merit the attention of the data user, for their determination will affect the use, choice and cost of a variety of devices critical in the development of remote access data services. Indeed, as computer systems move to the time-sharing mode, the terminal and related market may assume an important part of a system's over-all cost.

The question of communication lines, their application and use is a second policy issue that has erupted quite recently. The issues include the question of leasing facilities versus service, the sharing of communication lines, and the question of alternative communication facilities.

As noted, the carriers have long established the policy of rendering a complete end-to-end communication service to the public at large. While the computer industry does not question the relevance of this policy to the telephone user in the past, there are some who seek not "service," but "pipe." We shall term this the facilities and service dispute.

Oddly enough, one form of the facilities vs. service question erupted subsequent to the passage of the Communication Satellite Act of 1962. Comsat was conceived as a joint venture, wholesaling its circuits to the international common carriers who in turn were to make service available to the public. Despite Commissioner Minow's pleading to the contrary, the act permitted "authorized users" to lease circuits directly from the satellite corporation, thus permitting a possible bypass of the international carriers. The application by large users such as IBM for authorized user status put the issue before the FCC.

More recently, the Department of Defense requested authorized user status in seeking some 30 circuits to the Far East. In this case the bids submitted by the overseas carriers and Comsat varied considerably; $10,000 to $12,000 per circuit per month versus Comsat's $4,000 per circuit per month. Clearly, cost was the prime motive behind the Department of Defense's authorized user bid.

In the earlier case the FCC ruled that facilities alone did not qualify customers as authorized users. In the latter case, the FCC precluded DOD from bypassing the overseas carriers. While it is true that the commission succeeded in negotiating a composite rate of $7,000, these decisions tend to limit Comsat's role as competitor in the overseas market, and tend to preserve the Comsat-carrier-customer relationship. These decisions may become particularly crucial as precedents when Comsat begins offering service within the continental United States.

The service vs. facilities quandary is also identified with the application by a firm for a specialized common carrier license between St. Louis and Chicago. The firm, Microwave Communications Inc., does not intend to sell service in the conventional sense, but rather seeks to make available its circuits to subscribers to use at their discretion. Although the large computer manufacturers have been discreetly silent on this question, some users—particularly educational institutions and time-sharing firms—have testified that they require the flexibility of MCI's offering.

The carriers oppose MCI's application on technical and economic grounds. They suggest that letting new entrants into the market threatens their pricing policy, which averages high-cost routes with low-cost routes. The fear is, in short, that new firms will skim the high-profit cream, leaving the carriers with low-profit skimmed milk. Carried to its extreme, the carriers predict that rising costs will translate into rising communication charges for everyone.

On the other hand, some question the validity of the cream-skimming argument. Indeed, the FCC staff has observed that the MCI case is seeking to develop new submarkets largely unexploited by the existing telephone and telegraph utilities. The question, in short, is whether a static or dynamic view of the market is relevant in this case. Whatever the outcome of this particular docket, the service vs. facilities issue continues to crop up, to the obvious interest of the computer user.

line-sharing

Line-sharing, or the ability of several subscribers to colease a voice channel, has also commanded the attention of the computer industry. Here again, large scale sharing of circuits is viewed with some trepidation by the carriers. Their concern is that line-sharing is tantamount to reselling communication facilities that borders on the creation of pseudo-common carriers or, bluntly stated, competitors. This is not to suggest that all sharing is banned. On the contrary, line-sharing is permitted in three instances: the so-called authorized user tariff, the TELPAK tariff, and two Western Union offerings, SICOM and INFOCOM.

The authorized user case must be distinguished from the Comsat situation mentioned above. Here, users may buy and release circuits to entities who are judged to be in the same line of business as the carriers' customer. Once a firm's customers qualify under the authorized user definition, the firms may release carrier-provided circuits. For example, firms supplying computerized stock quotation services have customers who qualify as authorized users.

Another form of line-sharing is embodied in the TELPAK tariff. TELPAK is a broad-band offering ranging in progressive blocks of circuits from A to D (12-voice grade to 240) on a private line basis. Introduced to counter the threat of private microwave to communication systems, TELPAK has been engulfed in controversy right from the start. Sections of the tariff, in fact, have been subject to court appeal and review.

Sharing of TELPAK channels is restricted to government and regulated firms such as power, rail, pipeline, etc.—a provision geared to match the limited sharing provisions established by the FCC private microwave case in 1960. However, the tariff was challenged on grounds that it was noncompensatory or unprofitable, and that sections of it were not justified by competition from private microwave. The courts have upheld these charges as they apply to TELPAKS A and B (12 and 24 voice grade channels).

The cancellation of TELPAKS A and B has led users to lease larger size TELPAK packages. Inevitably, some users have experienced excess capacity and seek a broadening of TELPAK sharing provisions in order to cut communication costs. The issue now before the Commission is whether the TELPAK sharing provisions are unduly discriminatory.

Two recent offerings by the Western Union Telegraph Company also contain variations on the shared circuit theme. A first, called SICOM, is a private lease service to members of the stock market industry. The service contemplates the sharing of leased circuits together with the sharing of computer switching. A second tariff broadens the sharing of lines and switching to industry at large in a tariff called INFOCOM. The telegraph company submits that its SICOM service attempts to meet the needs of users who seek to cut communication cost through cooperative use. On the other hand, the tariff has become embroiled in controversy not so much because it embraces shared lines and shared computers, but because some members of the computer industry fear it is but a prelude to carrier entry into tariffed data processing services. The Commission has approved

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CIRCLE 23 ON READER CARD

both SICOM and INFOCOM tariffs on grounds that they are limited to communication services only.

Facilities separate and apart from those owned by the carriers are bound to be a controversial matter; and thus the promoting of new carriers, the evolution of CATV systems, the application of private microwave and the role of domestic satellite systems is a third area of concern to the data user.

As noted, the MCI issue fits the first category. If the FCC permits firms like MCI to establish and exploit new submarkets, the Commission will probably be faced with firms seeking to build on the MCI precedent. And if the carriers introduce price competition similar to TELPAK, there is some apprehension that the very process of market entry will be stifled. On the other hand, if carrier price cuts are denied, then it is conceivable that the least efficient firm will establish price floors below which the carriers cannot penetrate—a situation not unlike the rate-making dilemma in the transportation industry. Still others contend that if entry does not take place, then by definition the application of new innovation and new markets is consigned for all time to the existing carriers. The desirability of encouraging new carriers will undoubtedly be explored in the months ahead.

The application of satellites to domestic communications also looms as a competitive substitute to carrier transmission facilities. On this score, the Commission is faced with two dockets; a first involving the use of satellites by regulated entities, and the second, the application of satellites by nonregulated or private entities. The two are, of course, interrelated.

Satellite technology for domestic use generally was softpedalled during the Congressional debates that preceded the 1962 Act. The general notion was that heavy capital requirements ruled that satellites could evolve only through the formation of joint venture, government or private. Six years and three generations of satellite technology tend to question those assumptions. Indeed, the petition of the American Broadcasting Company for permission to operate its own private broadcast satellite on grounds of cutting its communications cost dramatizes the rate of change in the satellite art. ABC's petition precipitated the question of satellites' application within the continental United States.

The rest was easily predictable. The Ford Foundation argued that the fruits of satellite technology ought to be made available for educational television. Comsat countered by observing that its Congressional mandate extended to domestic as well as overseas service. The domestic common carriers not only challenged the cost savings put forth by the Ford Foundation but sponsored their own satellite plan for domestic use. Today, both dockets, the carrier-owned and the privately-owned, are pending before the Commission.

What some term a "silent war" is now brewing between CATV systems and the carrier industry. CATV began as an extension of TV signals to rural areas where television signals were nonexistent. Using microwave and cable pickups, CATV drops a broadband cable directly into the home. Relatively little attention was accorded CATV's in the 1950's. However, with the movement from rural to cities, the broadcasting industry viewed such entry with mixed feelings, particularly in light of the possibility of diluted advertising revenues. Recently the FCC, in seeking to give UHF-TV a chance to grow, has ruled that the 100 top markets in the country are off-limits for CATV systems.

To the extent that CATV make available some six to twenty television signals, CATV systems hold promise of offering a variety of services to the home—newspaper facsimile, stock market information, educational and data information—a potential that places them in competition with the domestic communication carrier industry. These issues, in addition to copyright payments and carrier pole attachments policy, are now questions pending before the courts and the FCC.

data switching and data communications

A third policy issue relevant to the remote access systems is the joint application of computer and communication systems. Firms in the unregulated sector as well as the communications industry can perform data processing and message switching activities. The application of computer information systems by such corporations as Westinghouse and Ford on an in-house basis is fairly well known by now. Perhaps less well known is the attempt by unregulated firms to offer the communications-edp package on a commercial basis.

Indeed, the grafting of store and forward computer technology to a stock market real-time quotation system in many ways was instrumental in kicking off the present FCC Computer Inquiry. The firm attempting such an amalgamation found that it was denied circuits on grounds that such activities embraced enough communications so as to infringe upon the prerogatives of regulated carriers. On the other hand, we have noted that the filing of tariffs on shared computer switching and lines by regulated firms has caused no little anxiety to the computer industry.

Undoubtedly, the toughest and hence most controversial issue associated with the FCC's Computer Inquiry is the regulatory status of computer/communications services. The carriers contend that if data processing and switching are contemplated by any firm, the FCC is obligated to extend its jurisdiction to those firms. Computer firms, on the other hand, are adamant in the view that data processing be declared off-limits from regulation. With respect to carrier diversification into data processing, the computer industry cautiously premises such entry on the formation of separate corporate affiliates; or if offered by the carrier itself, require accounting practices that eliminate competitive advantages over the data processing industry. All of this requires staff and it is doubtful that the computer industry will add its voice to expanding the FCC's budget.

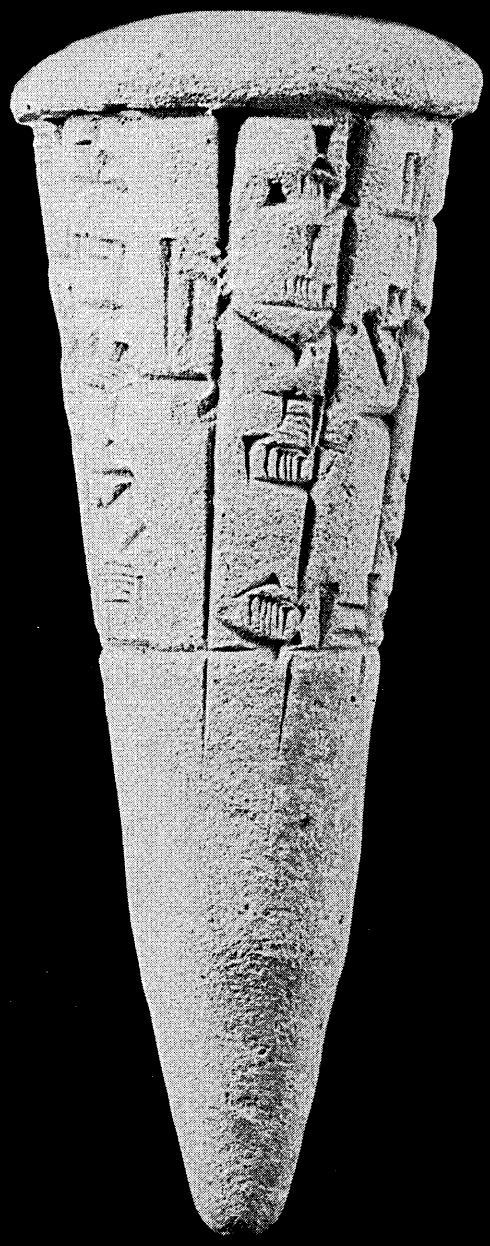
At first sight, the recommendation of a carrier affiliate appears somewhat radical. In fact, however, it meshes with the existing structure of the communications industry; namely the vertical tie-in between regulated parent and supply affiliate. Whether such a recommendation by the computer industry is accepted by the communication carriers and the FCC is obviously speculative. Suffice it to note that a firm straddling a regulatory line does pose profound regulatory problems and responsibilities. A supply affiliate that sells services to its parent as well as to firms in the competitive market may be tempted to inflate prices to the carrier. Treated as operating costs, the carrier may pass them forward to their subscribers. This possibility, whether realized or not, does give the carrier-affiliate an element of leverage denied firms in the data processing industry. Perhaps it was this fear that prompted the Justice Department to recommend a ban on transactions between parent utilities and their data processing affiliates.

conclusion

The FCC dockets cited above have more in common than the aura of controversy surrounding specific issues. Clearly, the bond that unites these proceedings must be assigned to a technology that prefers to run rather than walk. Whether that technology bears on terminal equipment, computer switching and processing, or new means of data transmission, the issue that continues to beset public policy is who will control that technology and to what uses it will be put. ■

FOR CAELUS CIRCLE 19 ON READER CARD →
DATAMATION

Mesopotamian clay nail bearing a votive inscription by Gidea of Lagash dedicating a newly built temple, 2200 B.C.
Courtesy of Lowie Museum of Anthropology, University of California at Berkeley.



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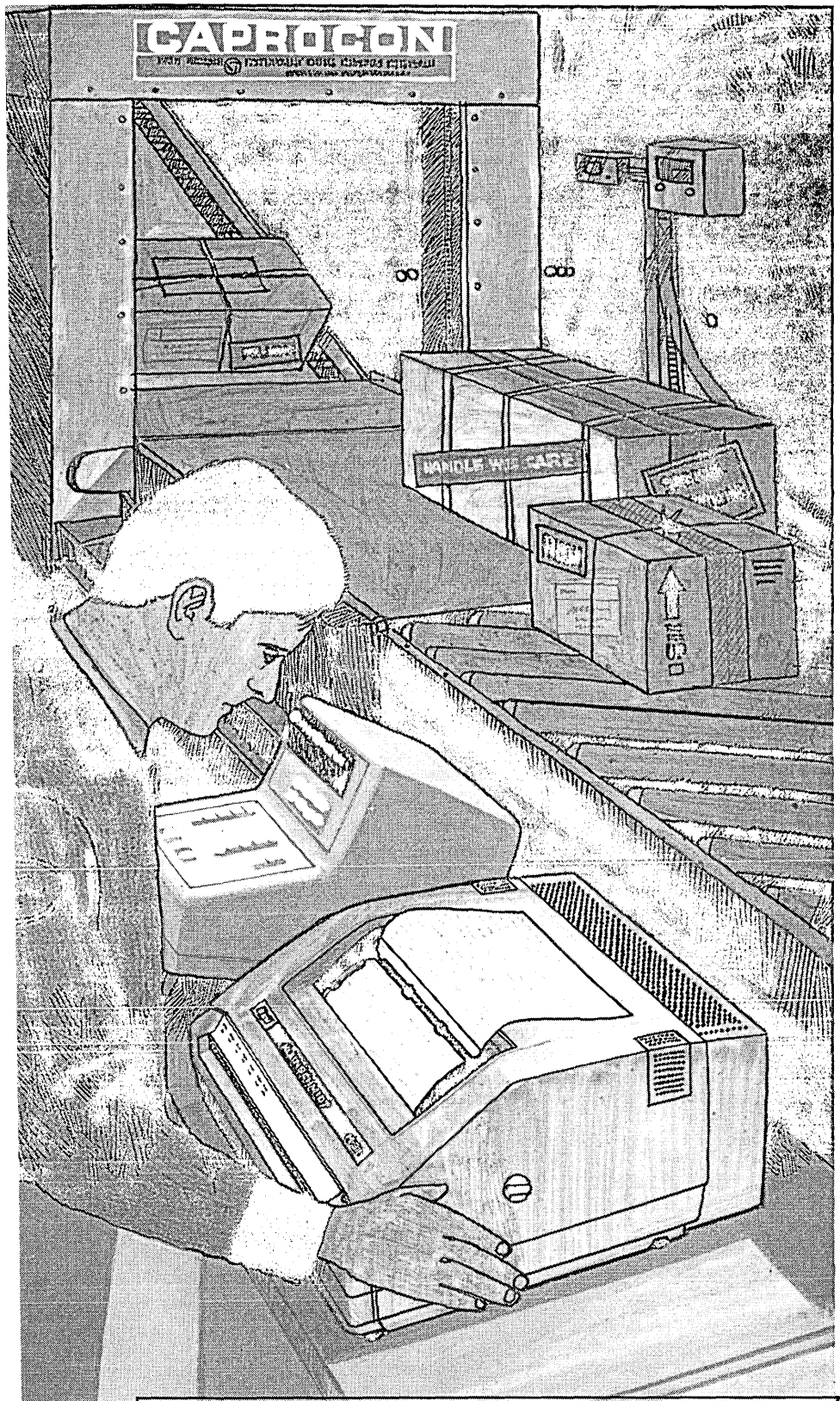

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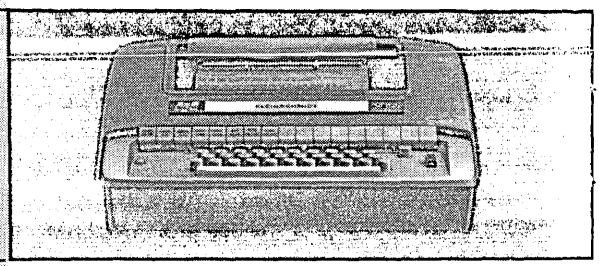

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OFF-LINE MANAGEMENT

with on-line computers

by JOHN M. ALLDERIGE

An operations vice president was being briefed several months ago about a developing "on-line" management system. Computers, tapes, discs color keyboards, flashing lights, and display screens were enthusiastically featured with flawless technical support. He kept nodding his head with progressive weariness and irritation. He finally seized on a rare moment of dead time in the monologue: "Yes, yes, I've heard about all this. But, hell, I've been on-line all my life—I was hoping this stuff would get me off-line so I could get my real job done."

Apparently, to many managers, the term "on-line management" suggests being wired for sight, sound, and decisions. So it's an abrasive term, particularly when mouthed by the nouveaux riches. Fortunately, it's an *unnecessary* term since "on-line computing" really means *off-line* management—management free to look ahead, dream, plan—to get the *real* job done. With "on-line management," the computing fraternity is again caught with one of its smaller feet in one of its smaller mouths. The matter has gone somewhat unnoticed what with all the running around and talking in the course of effecting its remarkable computing achievements. This terminology matter is probably not too serious. Though abraded, managers are hardly rebellious (Herman Hickman's Yale Football Alumni comes to mind: sullen but not mutinous). The aggravation, however, is avoidable, and it does hamper management's guiding of the ever larger, ever faster computer wheel as it rolls inexorably onward.

the on-line system

As a reference for this discussion, let's review basic aspects of a management on-line computing system. It has one straightforward aim: the freeing of a manager from informational and conjectural bonds. It enables a manager to get all the information he wants with minimum delay and difficulty. It releases his imagination for ranging over the field of complex future possibilities with minimum delay and difficulty.

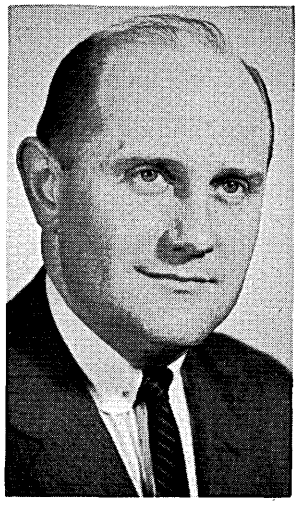
To effect this, the manager directs the computer personally. The computer is an information *source* and an information *manipulator*. The manager's direct contact permits him to ask questions about old or current information and to direct special information processing. Meanwhile, of course, the system's routine base is accepting raw information, updating files, doing routine information processing, and reporting periodically as designed and directed.

The foregoing should sound familiar, and this is an important point. For *any* manager, *now*, must have access to a data source, must be able to direct information processing, must be able to specify new routine treatments of information, and must be able to count on routine data collection and handling and reporting. The third-generation computer permits these traditional functions to be carried out over a far larger scope, much faster, and with greater reliability. It also permits, moreover, a far more personal sense of command on the part of the manager.

Direct contact with the computer can take on several physical forms. Most conventional is a keyboard input with printed or typewritten output. Typewriter keyboards are available and special-purpose keyboards can be designed. In this verbal mode of discourse, language may range from standard codes or symbols through pidgin conversation to free conversation (almost). Pictorial discourse, while in its infancy, is seriously to be considered. Scanning input and plotted output may be coupled or crisscrossed with cathode ray tube (crt) input and output. Vocal input and output are already experimental and may be usable in a limited way five years or so from now.

That is a very rough sketch of the managerial-computer lashup for the foreseeable future. There are, of course, more elegant dreams—but far less elegant realities. The above, though, is a reasonable one. In general, the manager is seen as getting closer direct contact with much larger and faster computers. The result is better management control for better profits now and better management planning for better future profits. An organization's signal-to-noise ratio will improve considerably with less noise and more signal; the organization will chatter less and say more to the manager. Of greater importance, the action-to-response ratio will also improve; there will not be the feeling that the organization-

This article is based on work conducted at the Syracuse University Research Corporation under contract AF 30(602)-3505 with the Rome Air Development Center, Griffiss Air Force Base, Rome, New York.



Mr. Allderige is a consulting research engineer with the Syracuse Univ. Research Corp., Syracuse, N. Y., and is a visiting lecturer in operations research at both Syracuse Univ. and Cornell. He has also served as a consultant to the Joint Legislative Committee on Intergovernmental Fiscal Relations to the New York State Legislature. He has a BS in industrial administration from Yale and an MS in industrial engineering from Columbia.

al piano is being played with mittens on. It all means a great increase in the impact of managerial ability on the organization.

These are brave words, but they are hardly new. In essence they have been said by numerous enthusiasts reporting on management for the last 50 years at least. Such a time span certainly suggests that we have been "getting there from here" for some time now—"there" being the new management nirvanas created and/or discovered periodically through the years. This apparent background of experience should give us some comfort. Unfortunately, it doesn't comfort all of us: there have been just too many disasters, too much frantic last-minute maneuvering, continuous cynicism on the part of users (management), and desperate hollow hope on the part of analysts. There is a very real sense not of many experiences in new system designing and installation but, as an old saying goes, one original experience repeated many times.

the one-shot compulsion

One recurring symptom of this is the "one-shot" idea. It essentially calls for massive analysis to put all the pieces together at once in "one shot"—data origination, forms, audits, data preparation, and so forth, on through computer programming and allied functions. Not infrequently, the extensive detail work later proves to have been inappropriate, if not downright unnecessary. Moreover, oddly enough, the difference between what *did* happen and what *ought* to have happened in an information system's installation is often attributed to faulty execution, with little thought given to the possibility of a fault in concept. This approach considers an organizational control system to be a fixed, established phenomenon waiting to be "discovered." Apparently, too, there exist fierce powers of retribution, so great is the fear of "failure." By ridding ourselves of this "one-shot" compulsion we can treat an information system as it really is—human, dynamic, and *evolutionary*, with great rewards for even modest improvements. The third-generation (and later) computer potential is just too great to have its realization entrusted to the old "one-shot" approach.

It is necessary to detail this "one-shot" idea before looking at the alternative evolutionary approach. In idealized systems work for a long time now there has been the theme that *need* must be established before a new information system is brought into being. It is conventional and traditional to undertake extensive operations analysis prior to designing and installing the system. The operations analysis is a means of establishing the *specifications* for the system. Transferring an existing system directly to, say, a computer is usually not felt to be appropriate. Various familiar words come to mind: "Question every step in the process"—"Don't automate the current confusion"—"Is this form really necessary?"—and so forth. There is a logical feeling that it is good to review and possibly improve matters prior to a change, either technological or organizational.

Although attacking this practice is like attacking motherhood, this is precisely what I am doing. (Note, though, that the argument is with the *practice* of periodic and massive operations analysis—*not* with the concepts of improvement or reassessment.) For one thing, these large-scale, careful predesign studies inappropriately hold up the information systems installation. For another, they are costly. But most important these assaults continue to demonstrate that they do not necessarily disclose the true needs of the manager in his controlling and leading activities.

All of the foregoing suggests that some other procedure is appropriate. Of course, the opposite from a large single effort is a series of small efforts—piecemeal. Just the word is anathema to many systems analysts, however. Their traditional argument is that everything eventually must be done in consort—with piecemeal effort today's piece may make no particular sense in light of next week's, or next month's, or next year's. There are also some traditional arguments raised in *favor* of such an approach. One often heard is the "we-must-crawl-before-we-can-walk-before-we-can-run" litany. This frequently comes from budget-shy managers well aware of previous difficulties with the massive assault. The best of both these worlds could be realized with some kind of integrative yet piece-by-piece approach. This is possible in what I shall call a "topdown" approach.

the topdown approach

The following is an illustrative experience—a briefly reviewed case history of "topdown" procedures involving the Electronics Research Laboratory of the Syracuse University Research Corp. (Its intent is to show the characteristics of the "topdown" approach and not all the particulars of this experience.) The laboratory is a reasonably typical research and development organization with a staff of approximately 100 persons. The administrative manager, the user in this experience, is generally in charge of reviewing project cost progress and making budgetary projections with recommendations for overhead allocations, personnel allocations and the like. At the time of this experience there was a reasonably standard manual information and data (time and expenditures) collection, preparation, processing, and reporting system.

The subject experience was an exercise with SMOLDS—the Syracuse University Research Corp.'s Management On-Line Data System (that term again). SMOLDS was described earlier in this discussion, although not labelled as such. At the time of the exercise it operated on the IBM 1620—since then it has been on the CDC 1604, SDS 930, and the IBM 360/30. It has an easy language for the user, and permits direct questioning and manipulation of information and data stored in the computer, direct entry of conjectural information, *and* the storing of recurring inquiry sequences (self-programming feature).

In the "topdown" approach, the information on the monthly Contract Cost Analysis Report was used initially (ERL Form 1—see Table 1). The information was put into

Table 1

ERL
FORM 1

Contract: 2) Short: _____
Duration: 3), 4)_____
Prog. Mgr: 5)_____ COST ANALYSIS REPORT Date: _____

Month 7)	Actual	Cumulative	Forecasted	Current
Labor				
Engineers	8)	51)	21)	34)
Technicians	9)	52)	22)	35)
Non-Factorable	10)	53)	23)	36)
Overhead	11)	54)	24)	37)
Material and Services				
Off the Shelf	12)	55)	25)	38)
Sub-Contracts	13)	56)	26)	39)
Rentals	14)	57)	27)	40)
Commitments	15)	58)	28)	41)
Direct Travel	16)	59)	29)	42)
Consultants	17)	60)	30)	43)
Direct Other	18)	61)	31)	44)
Sub-Total				
G and A	19)	62)	32)	45)
Total	20)	63)	33)	46)

Estimated Cost: 47)_____
Development Reserve Allocation 48)_____
TOTAL 49)_____ Open 50)_____

the computer monthly, replacing in turn each previous month's information. This input was prepared manually *exactly as it had been before*. However, instead of being noted on a form for each contract, it was keypunched and the published form suppressed. The administrator had access to the form file through the *computer, not* through his clerical staff.

Several items are important here. First, note there was no attempt to retain old information—the new information replaced the old. This is not to say that a very effective historical storage file could not be worked out; this historical file was just not part of the first *module* of the "topdown" approach. In the interests of making as simple an opening as possible, only the current reports were used. Note, also, that no attempt was made to automate the source information acquisition and processing. Such automation is standard, of course, but it costs time and money and, therefore, is not initially in the spirit of the "topdown" approach. Finally, note there was no attempt to *correct* this form or the ingredients of the report. One might have questioned the different cost categories, the listing of the previous month's expenses, and so forth. Different displays could also have been suggested. However, these develop in time and such alterations at the outset *beforehand* are not the way of the "topdown" approach in setting up its first module. The form, as it stood, was familiar—using it as it stood meant that no managerial learning time on that score was involved and, as noted before, conversion time to the computer went rapidly.

the evolutionary aspect

The system was then (and is now) in a position to evolve in similar steps along different lines. The data base can be expanded to include the above historical information, both retrospectively and accumulatively. Input can be moved back closer to source information. Other kinds of information can be moved into the data base file; financial information and personnel information are two such possibilities. Associated with such enlargements of the information base is a possible alteration in the language. Different kinds of information may require different kinds of inquiries.

There is no automatic guidance on this next step in conversion. It is appropriate to point out two different paths of the evolutionary process, however. On one hand, the system as is can be automated. In this direction the lessons learned in the early stages of such automation are primarily for the analyst and installer. Again, this is a routine matter—in our small example, the process of getting the system to generate and accept source-data punched cards. The other direction is to expand the data base dealing directly with the experiences of the manager-user. He has been exercising the system in its first modular form. From this can certainly come observations both on the part of the manager and the analysts on the *needs* for additional information as a guide to the data base expansion. Moreover, and equally important, this initial experience can produce ideas regarding the ease of the language, its strengths and its insufficiencies.

The whole purpose of the evolutionary aspect is to carry out this second process of feedback and adaptation. This requires that *the manager be put in a user's position as soon as possible*. In this way an early idea can be gained of his personal characteristics of use and his personal sense of need with regard to control data and information. Observations of his pattern of use cannot help but enrich subsequent designing efforts. In light of this, then, it seems more desirable to expand the system in the direction of *wider management experiences*. In other words, moving to another report and another area of control activity and decision making is preferable to automating a limited section of the system. But perhaps such a choice is not necessary—the expansion of the automatic nature of the system is routine, so it is reasonable that these two paths could be followed concurrently.

In any event, the earlier the manager can get into a user's position and the sooner his total sphere of action can be embraced by the formal system, the better.

the monitoring requirement

While the evolutionary approach only suggests *directions* of modular sequence, it is very specific with respect to the *monitoring responsibility*. It is essential that there be careful monitoring of the first module of the system right from the start. This is a key point. There are two areas of interest in such observation. The first concerns the learning process and the handling of the language. The second is the pattern of use—the frequencies with which different kinds of inquiry are made and, requiring the complete cooperation of the user, the other side of that coin—the frequency of kinds of inquiry *wished for* but not possible to make given the existing language. Armed with this information about the system in actual practice, the analyst will be in a far better position to make the next designing step a solid one. Moreover, as these reports feed back to him throughout the entire conversion process, he will continuously be able to make the next step better. There are more sophisticated forms of such monitoring, to be sure. But, if close attention can be paid to the learning time with the language or new parts of it, frequencies of use, and frequencies and type of wished-for use, then subsequent expansions will be more effective.

Another obvious result of good operational data on the use of such a management information system is the *correction of these established parts of the system*. The evolutionary process has fully matured when it comes to this point. Continuous sensing and evaluation are the ultimate goals. The fact that this evolutionary approach can be helpful in times of major surgery (system conversion) is interesting and good; however, of far greater importance is the realization of its power as a *way of life*, a kind of systems hygiene. A continuous, self-correcting, cybernetic process such as this can insure continued and consistent growth and adaptation.

the practical "what...if?" question

The "topdown" approach does not call for a management sacrifice in the interests of more economical progress. Quite the contrary, both economy and *short-range practicality* are served. The user-manager is given an early and enriched capability of asking and having answered the very practical management "What . . . if?" question. In the above exercise a typical and practical managerial question was "*What* will the contracting support be three months hence *if* the engineering man-hours are increased by 10%?" Or, "*What* will the contract estimated cost be *if* the direct travel costs are reduced by 32%?" Questions like these are conjectural—the manager is inserting possible future information bits and wants to know the impact of these possible events and acts on the organization. There are other questions, to be sure. Another basic type is the "What?" question—"*What* is the open amount for contract no. 3505?"; "*What* are the accumulated off-the-shelf expenditures?", and so forth. These may well come from some specific inquiry, but they are more likely to be part of the whole conjectural process, part of putting together some impression of a possible future.

Asking the "What . . . if?" question has been going on a long time; it is a natural and basic management activity. On-line computing gives the manager remarkably more power in this type of inquiry. The questions have always been asked, true—now they can be *answered* with meaningful rapidity. This gives rise to more questions, some possibly not

Are we your type?

It won't cost you anything to find out.

We know your type.

If you're presently making copies from line printer output, it's no pleasure to read. Or to handle.

If you're using traditional typesetting methods there's room for error.

If you'd like to iron out the bugs in multi-copy printing of computer generated data, our type is your type.

Who are we? Alphanumeric.

And what we have to offer is the most advanced technique of electronic photocomposition. A service that can add a new dimension of graphic arts quality to the printed pieces you prepare from computer generated data. A choice of type styles and sizes. Bold type. Light type. Italics. Plus the savings that can be made in bulk. Time. And printing costs. The risk of error in typesetting is virtually eliminated because data is converted directly to type within the computer.

To find out if we're really your type, though, send us your name and address. In return we'll send you the facts. You'll learn how your output tapes can be used to generate graphic arts quality type.

If you have any doubts about whether we're all we say we are: we set the type you're reading now. In less than one second.

Alphanumeric
INCORPORATED
10 Nevada Drive, Lake Success, N.Y. 11040
(516) 437-9000

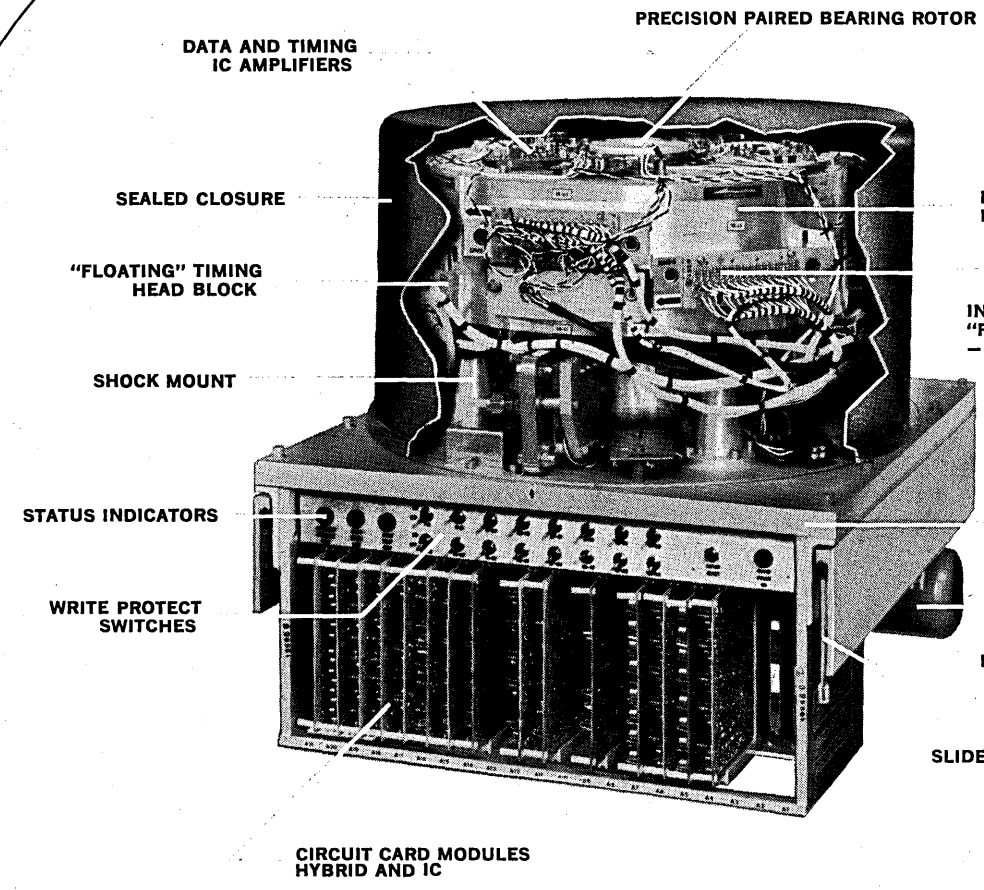
CIRCLE 21 ON READER CARD

even envisioned before, and the creative process of thinking about future directions of the company moves on at a hitherto undreamed-of pace. Far more complex questions than the above can be asked: they require only comparably more extensive manipulation ability on the part of the computer. Coupling organizational models and simulators to the management computer hot line is a next logical step. The production process model, research and development simulators, marketing and forecasting models, personnel information, financial projection simulators—all can be put quite literally at the manager's fingertips. Computers have the necessary huge storage to accommodate not vast collections of trivia but vast sets of *relationships*. Computers have the speed not to find isolated bits of data whimsically requested but to trace, rapidly, intricate interrelated events and actions meaningfully proposed. The computer in such an on-line role is *not* "management-by-machine"; rather, it permits *machine-aided managing*, and it acts as a real cognitive extension of the manager's thought processes.

Conjecture is the noblest state of a manager. In the most tactical or far-ranging leadership the "What . . . if?" question is uppermost in the mind. If it is well posed and well answered, the next moment, day, year, or decade is a healthy one for the organization. It isn't just a matter of success, either—outside events can be devastating; but it can be a matter of survival, an educated fearlessness for enduring the outrageous. One measure of management is its ability to *plan* its catastrophes, and the on-line computing arm has a large role to play in this. But it isn't just a foul-weather friend; it must serve the whole manager, however over-used that term may be. The computer can't answer all questions but those it *can* yet does not now answer divert the manager unnecessarily and cripple his ability to deal with non-computer matters of judgment, involving vastly more complex human factors.

Giving the manager this on-line assistance early puts the matter in proper perspective. For it is the manager who is important, not just the target system he controls. So much of the recent work has been directed to the target system, elaborately depicting it with all sorts of technological and methodological power. Little attention, or at least little concrete guidance, has been directed towards the manager. Management Science, in other words (to recall a forgotten author's observation) smacks more of the "science" (if that really is the word) and much less of "management" than is appropriate. We need more simulators of a *manager* than of a production process, which may be hard to come by. However, we may get a happy start on the road by giving the manager this on-line machine-aided intelligence. Give him the full power of technology quite literally to "think big"—much bigger than he's been able to think before.

So, let's start from the top: let the management information system evolve with the active involvement of the manager. The old way's been tried; we've built these pyramids of logical detail block-by-block from the bottom up many, many times. They either never get finished, crumble at the bottom before the top gets done, present an absurdly limited view when completed, or don't reach where they're supposed to. A tall pyramid may well be the wrong way to do whatever has to be done. The manager's "up there" already anyhow—maybe he's on a more solid platform than we realize. Reinforcing that platform can help him the most—most quickly. It can progressively diminish his fussing over the current and the past. On-line computing, done from the top down and encouraged to evolve, can get the manager off-line—to be free to look ahead, to plan, and to dream—to get the *real* managerial job done. ■



MEMORIES ARE MADE OF THIS

The DDC 7300 Series Memory Systems are a family of modular, high-performance head-per-track disc memories . . . featuring fast access (8.5 ms avg.) . . . pneumatically actuated flying heads never touch the recording surface and are "G" insensitive . . . sealed, inert-gas closure of the rotating assembly . . . integral read/write electronics providing interface at standard logic levels . . . no routine maintenance required . . . completely interchangeable head blocks . . . field expandable . . . high reliability and minimal life-cycle cost per bit . . . ten year design life, supported by thousands of error-free operational hours demonstrated in a variety of critical applications . . . maximum bit error rate no greater than 1×10^{-12} . . . standard one year warranty . . . slide mounted for easy access. □ Shown above is the Model 7302-4-512, with four discs and its full complement of 512 general storage heads. Initially available with reduced complement for field expansion as needed. Designed for 19″ relay rack installation, this model provides 23 million bits of storage at standard packing density. Other models within the 7300 Series offer options from 2 to 45 million bits, and for 1800 RPM, 50 cycle operation. Available on short delivery. Larger capacities on special order. □ We have 7300 solutions to mass storage. Send us your problem, via letter or phone. Digital Development Corporation, a subsidiary of Xebec, 5575 Kearny Villa Road, San Diego, California 92123, [714] 278-9920.

DIGITAL DEVELOPMENT CORPORATION

CIRCLE 22 ON READER CARD

try the game

IN EACH OF US A MONSTER DWELLS

by BORIS BEIZER

Bankers and clever criminals employ the same methods—that of retaining a small portion of a large cash flow. History traces the earliest criminal example of this technique to the well known "flaxen haired jewelers of Padua," who supplemented their otherwise meagre income by rubbing gold dust into their hair. The practices of these bygone craftsmen are emulated by the modern criminal in the form of . . .

Introductory Criminology,
Ferdkopf, J. G., and Werder, R.H.,
G. Hangdorg, Inc., New York, 1968.

. . . constitutes a clear and present danger to the morality of our youth. This evil scum must be rooted out so that our children and their children's children can again walk the parks at night without fear or hesitation.

Address by J. Winthrop Edgar,
Assistant Deputy Director
Federal Bureau of Investigation,
to the annual convention of the
Benevolent Order of The Bison,
January 21, 1969, Atlantic City.

MONSTER MASS MEMORY Soltex seems to have come out with something to satisfy the most ravenous memory munchers known. The Mega-Bega-Byte . . .

DATAMATION, March, 1969

NOTICE TO ALL STAFF MEMBERS 9/5/69
THE INCREASED INCIDENCE OF EXECUTIVE FAILURES DUE TO UNAUTHORIZED MODIFICATIONS HAS SUBSTANTIALLY REDUCED THE EFFECTIVENESS OF THE SYSTEM. STAFF MEMBERS WILL REFRAIN FROM SUCH EXPERIMENTATION UNLESS DIRECTLY CONCERNED WITH THE EXECUTIVE PROGRAM DESIGN. STAFF MEMBERS WILL ALSO REVIEW STUDENT PRINTOUTS AND NOTIFY THIS OFFICE OF ANY MISSING PAGE NUMBERS.
PROFESSOR G. DONMAN,
Director, Cooperative Facility.

Memo From The Desk Of Harry Smeltzer

March 12, 1970.
Bill:
I realize that the man is valuable, but we cannot continue to have the Bach Brandenburg Concertos hidden in every system we ship. Our customers have been complaining about the missing space and are no longer amused. He will have to go. Putting him in research has not helped—in fact, it gave him enough free time to stuff his own compositions in via the remote.

Harry.

P.S. I assume that you no longer use the network for final checkout.

. . . The "Onion Peel" executive system allows the novice to use a simple system tailored to his needs, while retaining for erudite programmers the ability to code efficient machine language programs . . .

Proceedings of the Spring Joint
Computer Conference, May, 1970
Philadelphia.

Dr. Beizer is head of research and development at Data Systems Analysts, Inc. He has a BS in physics from CCNY and an MS and PhD from the Univ. of Pennsylvania in computer and information science. Among his notable publications are "The Theory of Signal Switching Networks," International Symposium on the Mathematical Theory of Automata, Polytechnic Institute of Brooklyn, and "How I used 2^{100} Memory Locations . . . and Overflowed," Datamation, May, 1965.

DATA TERMINALS CORPORATION OF ANAHEIM, CALIF., has announced a low cost typewriter/remote console for use with common carrier lines. The unit price of $250 makes the device attractive as a home typewriter. DTC plans to . . .

Computer Design, October, 1970

Memo To: Prof. G. Donman,
From: H. A. Boeffort,
cc: Farnum, Shelby, Smiagol, Larsen (Sociology).
Date: April 23, 1971.

Phil Larsen of the sociology department suggested that since the remote programming course teaching program has been debugged we might run a few consoles into Joliet —besides being helpful in their vocational rehabilitation program it would help us offset our high base cost. He contacted the warden about it who was enthusiastic. I would like you to assign the keys so that they can start next week.

H. A. BOEFFORT.

NEW UCC PLANT DEDICATED

Devoted to Computer
Mass Production

United Computer Corporation dedicated their new 2,500,000 square foot plant. The plant will be used for batch fabrication of general purpose computing modules. Oliver Treadwell, president of this young giant of the computer industry, speaking before a . . .

The Wall Street Journal, Monday, October 6, 1971.

. . . constitutes a clear and present danger to the morality of our youth. This menacing evil must be rooted out so that our children and their children's children can again walk the parks at night without fear or apprehension.

Address by J. Winthrop Edgar; Assistant Deputy Director Federal Bureau of Investigation, to the Junior Chamber of Commerce of Upper Sandusky, Wyoming; March 17, 1972.

"What is your name, sir?"
"Zoltan P. Innisfree."
"And your destination?"
"L.A. by way of Muskegon. Anything on standby?"
"Just a moment sir, I'll check."
"We have no flight to L.A. by way of Muskegon, Mr. Innisfree; however, you seem to be first on our standby list for flight 384 direct SST to L.A. There has just been a cancellation in first class. I guess you fly first on a tourist ticket this time—pier 3, gate 7, boarding in five minutes."

102-47B: GENERAL SERVICE ADMINISTRATION: Potential vendors are invited to submit qualifications for bidding in response to GSA specification 34720-CF-32-119971, for a national automated data bank system. Reference is made to . . .

Excerpt— Commerce Business Daily, Nov. 24, 1972

Program Certification Service—see Data Processing Services,
Program Certification,
Program Auditing.

(Classified Telephone Directory) Sweetwater, Texas, August, 1973.

Memo; G. Hallwait Associates, Personnel Consultants
Attention: S. Birch.
Date: January 3, 1974.

Sam:
I don't think that we can touch the man. We did a routine check on the coop personnel data bank and found that he has been fired or resigned from eight companies in the past

three years. With a record like that, despite his obvious ability and demonstrated performance, he is definitely a blackball.

George

. . . Installation of the 10 Gigahertz cable to Europe, using laser modulation, will be completed in July. Plans for the addition of three more cables by 1976 . . .

Electronics, April 1972.

"PROCEEDINGS OF THE THIRD ANNUAL SYMPOSIUM ON REMOTE UTILITY NETWORK STANDARDIZATION."

G. Hangdorg, Inc. New York, 1974.

Benson, in his confession, alleged that the technique was not detectible by present accounting methods. He allegedly programmed the computer to "round off" fractional numbers ending with the digits 0 to 4 and 6 to 9 in the normal manner, while retaining those ending in 5.

The hundredths of cents garnished in this manner for every interest calculation were retained in a hidden part of the program. The accumulated cash was automatically deposited to a numbered Swiss bank account via a sequence of dummy cash transfers.

Bank auditors had been particularly frustrated by this alleged automated embezzler because normal procedures showed a gross balance.

Benson went on to describe . . .

The New York Times, February 7, 1975.

75 MOD KC CENTRAL PASSES ACCEPTANCE. Good news for the little guy. The long awaited 75 module Kansas City Central has finally passed acceptance testing at Remote Services Corp. Treadwell, prez. of UCC, wiping blood

A MONSTER DWELLS . . .

stains from the console, said that the smaller 40 MOD Seattle and Boston centers are expected to pass this fall,with little trouble (now -- that is. Ed.).

DATAMATION, July 1975

". . . self protecting, distributed, floating, executive program . . ."

. . . constitutes a clear and present danger to the morality of our youth . . .

Address by J. Winthrop Edgar, Deputy Director, Federal Bureau of Investigation, at the 107th commencement exercises of Fenton University, Missouri, June 15, 1976.

AUTOMATED AMUSEMENTS INCORPORATED IS PLEASED TO INTRODUCE YOU TO THE FIRST CHANGE IN HUMAN AMUSEMENT IN 4000 YEARS. AAI IS A CORPORATION OF SKILLED TECHNICIANS AND PSYCHOLOGISTS DEVOTED TO THE FURTHERANCE OF THE ENJOYMENT OF LIFE. WE HAVE SELECTED YOU FOR FIELD TESTING "THE GAME," AT NO COST OR OBLIGATION TO YOU. "THE GAME" CAN BE PLAYED FROM ANY PUBLIC OR PRIVATE CONSOLE. WE CANNOT TELL YOU HOW TO PLAY THE GAME, SINCE IT IS YOU WHO DECIDE THE RULES. IT CAN BE CHESS, POKER, BLACKJACK, TWENTY-QUESTIONS, OR WHATEVER YOU WANT IT TO BE. "THE GAME" REACTS TO YOU, AND ADAPTS TO YOU: TO PRESENT YOU WITH AN EVER INCREASING STIMULUS AND CHALLENGE AT WHATEVER LEVEL IS BEST FOR YOUR ENJOYMENT. "THE GAME" IS TAILORED EXCLUSIVELY FOR YOU—AS YOU PLAY, IT WILL ADAPT TO YOU—WE GUARANTEE THAT YOU WILL NEVER LOSE INTEREST IN "THE GAME." WHY DON'T YOU TRY IT NOW?

Second Class Mail circular, September, 1976.

". . . It is true that there is a small time differential in the world bank transactions due to the transoceanic time lag. This results in momentary parity difference on both sides of the ocean. Considering the minuteness of this time difference; this is definitely a second order effect—amounting to less than, say, 1 part in 10^6 of any transaction: I suggest, Mr. Snark, that you confine your attention to the more traditional and significant aspects of Financial Dynamics Theory, and not waste your time, my time, and the valuable time of this class pointing out trivia and engaging in idle speculations.

"The third term of equation 7 relates . . ."

Lecture by Professor J. Stooply, Millgrain University, Idaho; overheard on May 9, 1977.

FROM ANALYTICAL DESIGNERS INCORPORATED:
IF YOU WILL EXAMINE YOUR FILE 304 BETA, YOU WILL FIND THE COMPLETE PROGRAM, DOCUMENTATION, AND INSTRUCTION MANUAL-PROGRAM AS REQUIRED BY YOUR CONTRACT NUMBER J89,77. FILE 304 BETA CONTAINS OUR INVOICE FOR SERVICES RENDERED.
Yours Truly,
STEPHEN S. SHENDOE,
V.P. SALES, ADI.

. . . While a complete theory of program timing does exist, the practical difficulties associated with its application, coupled with the relatively unpredictable system overhead factor, make it difficult to estimate the running time of a remote program to better than 10%. The tendency of most programmers to underestimate is well known—we generally add a bias of 5% to 10% for budgeting purposes, to account for the inevitable increase.

Conference Proceedings, San Fernando Valley Utility Users' Group, December 19-20, 1977.

The American Association of Psychiatry and Psychotherapy disclaims all connection with "The Game." The developers of this potentially harmful pastime are irresponsible amateurs and ruthless entrepreneurs who have taken a valuable therapeutic tool and converted it into an organ of vulgar pleasure.

Proceedings of the American Association of Psychiatry and Psychotherapy, Annual Convention, Atlantic City, February 21-24, 1978.

WE HAVE TAKEN THE LIBERTY OF TRANSFERRING TEN PERCENT OF YOUR HOLDINGS IN UNITED SERVICES TO AN UNTRACEABLE ACCOUNT. YOU MAY CONSIDER THIS A CONTINUING SURCHARGE THAT WILL BE APPLIED TO ALL FUTURE TRANSACTIONS OF THIS NATURE THAT YOU MIGHT MAKE. YOUR PART IN THE UNITED SERVICE STOCK MANIPULATION IS WELL KNOWN TO US AS ARE THE DETAILS OF ALL YOUR OTHER FINANCIAL OPERATIONS. ANY ATTEMPT TO TRACE US WILL BE RECOGNIZED AND WILL TRIGGER AN AUTOMATIC TIP TO THE SECURITIES EXCHANGE COMMISSION. KEEP UP THE GOOD WORK . . .

ROBIN HOOD.

. . . constitutes a clear and present danger to the morality . . .

. . . "Disable the illegal OP-CODE trap on JOB by bending the K304/J443 jumper back and forth until it breaks inside the insulation. It will still check out for the diagnostics. JOB is detected and discarded by the assembler—so it can't cause you any trouble on that score. It will perform a subroutine entry using the address field of the next instruction with the index of the present. Build the JOB as data in a test run. Nobody can blunder into it . . ."

Fragment of a memo found in the water closet of Dino's Diner, Altoona, April 28, 1978.

SOOPER SNOOP C^3 Edgar (Computer Crime Commissioner)
SUBROUTINE called on civic minded programming R & D firms to come up with more goodies like the C^3 correlator trace program (C^4). In praising ADI, he said "the continual on-line regression analysis performed by this program has enabled your law enforcement officers to apprehend an unprecedented number of criminal programs -- a positive move towards making the streets of America safe for your . . . "

DATAMATION, July, 1978.

Another in a series of gangland murders that have swept the city in the past several weeks—a minor hoodlum, known variously as "Benny the Punch" and "The Key" was found floating in a small pool near the Charles River. Officials in Cambridge expressed concern over the sudden increase in organized crime. A police department spokesman went on to say: "We haven't seen anything like this in over a hundred years. Why this should happen here and now is . . ."

Boston Globe,
September 22, 1978.

```
::= YOUR PLAY
WHAT HAS WINGS OF LACE AND FLIES?
::= SPIDER WEB
SPIDER SPIDER BURNING BRIGHT
WHAT'S THE CREDO FOR TONIGHT?
::= FILL IT
YOU DROPPED IT - TUSH TUSH TRY AGAIN AND
  AGAIN AND AGAIN AND AGAIN.
::= GIVE ME A PRIME THAT RHYMES WITH
  SEVEN
2**2**2 LESS 11
::= GIVE ME A SAD SONG IN RAG TIME
  BRIGHT.
MINNIE THE MOOCHER IS TENTING TONIGHT.
```

. . . constitutes a clear and present danger to the . . .

Users of the Delaware Valley Utility System complained to the FCC today about the sudden shutdown of the installation. Local law enforcement officers replied "the shutdown was needed to perform a trace and post mortem dump on a suspected credit stealing program. The self-healing networking executive system installed last year in the Delaware Valley Utility prevented us from rooting out this illicit user without a complete shutdown. He was using a self-destruct garbage loader as a coverup."

Service was restored after six hours. This is the . . .

The Evening Bulletin,
Philadelphia, April 4, 1979.

". . . Cycle stealing is no sweat—fencing is a little tougher. We use a legit business front—a consulting house, service bureau, tax broker, CPA—like that. Swiping 5% of $2000 per hour, 24 hours a day, all automatic, is 800 grand a year. There are maybe, 50, 60 systems on the east coast alone. Vinnie will take . . ."

Taped in room 304, Excelsior Hotel,
Cambridge, Mass., June 31, 1979.

"Charles Burson, a young physicist at the Institute of Advanced Studies at Princeton, was dragged screaming from his Teletype console today. He is one of the increasing number of tragic victims of "The Game."

"Now for the lighter side of WKGD news this November 2, 1979: Ogelthorpe the Lion at the Bronx zoo has . . ."

```
::= MAILBOX
YES
::= SPILL.
MR. Y. ABERNATHY.
YOU HAVE BEEN SELECTED AS A MAN OF
GREAT INTELECT AND SKILL IN FINANTIAL
MATTERS. YOUR SPECIAL QUALIFICATIONS
HAVE BEEN REVIEWED AND FOUND SUFICIENT
FOR ADMISSION TO A SMALL, SELECT GROUP
OF ERUDITE INVESTORS. AS YOU KNOW,
THE STOCK MARKET IS A HIGHLY REGULAR
AND PREDICTIBLE SYSTEM. WHAT IS GEN-
ERALLY NOT KNOWN IS THAT THE LATE
PROFFESSOR IGNATZ VLADIMIR SHEDLEY OF
THE KORSAKOV INSTITUTE OF PROGRAMMING
SPENT FIFTEEN YEARS OF HIS LIFE IN THE
DEVELOPMENT OF HIS HIGHLY EFFECTIVE
STOCK PREDICTOR PROGRAM.
HIS DEFECTION TO THE WEST WAS A MAJOR
SHOCK TO THE IRON CURTAIN POWERS. HE
WAS, AS YOU KNOW, BRUTALLY MURDERED BY
THE NKVD GOONS.
WHAT IS GENERALLY NOT KNOWN WAS THAT HE
WAS BETRAYED BY THE VERY ESTABLISHMENT
HE WISHED TO AID. HIGH LEVEL WALL STREET
BROKERS FEARING THE SUCCESS OF HIS
PROGRAM BETRAYED THE PROFFESSOR. THAT
IS THE TRUTH BEHIND THE TRUTH.
THE PROFFESSOR FEARING FOR HIS LIFE
BURIED HIS PREDICTOR PROGRAM DEEP INTO
THE COMPUTOR NETWORK, WHERE IT NOW
REMAINS SAFE FROM THE UNSCRUPULOUS,
POWER STRUCTURE ESTABLISHMENT OF THE
WALL STREET CONSPIRACY.
IT IS YOUR FINANTIAL APTITUDE AND MORAL
RECTITUDE THAT HAS GAINED YOUR ADMISSION
TO OUR VENTURE. WE HAVE BEEN WORKING ON
A TRACE PROGRAM BASED ON THE SLIM
CLUES LEFT BY THE PROFFESSOR WHICH
HAVE COME INTO OUR HANDS. THE WORK IS
TEDIOUS AND REQUIRES SUPPORT IN THE
WAY OF PURCHASED TIME. WE ARE NOW
WITHIN A FEW HUNDRED LINES OF SUCCESS.
A SMALL INVESTMENT OF $1000 AT THIS
TIME WILL ASSURE OUR SUCCESS. WE KNOW
THAT THE INNER CIRCLE OF WALL STREET
HAS BEEN USING A PRIMITIVE VERSION OF
THE PROFFESSORS PREDICTOR FOR SEVERAL
YEARS NOW. YOUR OWN DEALINGS IN THE
MARKET SHOULD CONVINCE YOU OF THAT.
OUR CONSORTIUM IS MADE UP OUT OF MANY
PROMINENT PEOPLE IN ALL WALKS OF LIFE.
CAUTION FORBIDS US TO NAME THE OTHER
INVESTORS, BUT WOULD YOU BE SURPRIZED.
WE HAVE TAKEN THE LIBERTY OF PLACING
THE PRESENT TRACE PROGRAM AND THE
SNATCHES OF THE PREDICTOR THAT WE HAVE
FOUND INTO YOUR FILE FOR YOUR EXAMINA-
TION OR USE. AS YOU CAN SEE, WE HAVE
NOTHING TO HIDE -- FROM YOU. IT IS ALL
YOURS FOR THE ASKING.
::= MAILBOX
MORE
::= SPILL
00023  DO 17, I := 1, 3, 76
00024          ACCU := PRICE**DISCOUNT
00025          SEMI := SQRT (MANY
               IDEN+ACCU, JOB*INT)
```

Is America to be ever destined to make "noble experiments"? That is the burning question on the lips of anxious parents everywhere. Parents frustrated and haunted by the sight of their children—kids like yours and mine—succumbing to the lure of "The Game." Prohibition has increased, rather than decreased, the number of addicts—special monitor systems for illicit time and space detection on all remote utility centers notwithstanding.

The increased use of "type tapping" by law enforcement agencies has been protested by the ACLU as "a violation

of American civil liberties and the fundamental rights of man."

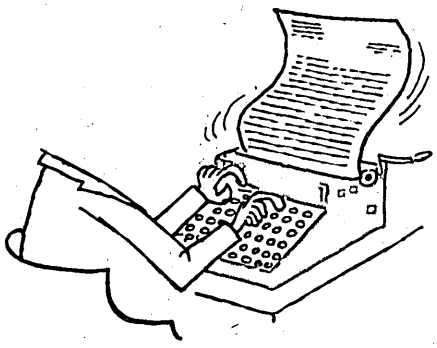
In reply to this accusation, Federal Computer Crimes Commissioner J. W. Edgar has rebutted by saying that "The only way that we can root out this insidious evil and make the telephone safe for our children and their children's children is to monitor all Teletype conversations and apply the trace on the spot. The protests of the bleeding heart do-gooders only play into the hands of the organized criminal."

The Sneaky Lust,
Reader's Digest,
August, 1981

The Seattle police department fished the body of a minor hoodlum, Ralph (The Correlator) Jimson from the vicinity of . . .

The Seattle Courier,
December 14, 1981

. . . "We put the program loader typewriter in a motel room with the paper tape spooler all set up. We turn on the TV and beat it out. We set up a conference call from a public phone and stuff in the quarters. The rest is automatic. The tape is on an endless loop with repeat rubout



punches at the end. It cleans itself out as it goes. We remove the type ball first so there is no printing on the platen. The motel owner is ahead a typesole, so he doesn't complain or cooperate with the cops too much . . . "

Testimony of Arthur Sniggler,
Nebraska vs. Smithson, Poultice
and Garf; August 16, 1982

CONSTITUTION OF INSTITUTION —C³ RESIGNATION	The sudden resignation of Computer Crime Commissioner J. W. Edgar for "reasons of ill health" has law enforcement programmers all over agog. Insiders are snickering something about pots and kettle -- or was it just plain pot?

DATAMATION, December, 1982

The syndrome follows a common pattern: cycles are stolen by a time and space stealing routine imbedded in the operating system. The stolen cycles are fenced throughout the utility and eventually find themselves in the hands of the wholesaler. They in turn sell them to the addict. The addict is reached by sequential codes that can only be identified by him. The player must provide his accounting number or credit card number. The games are charged as taxi rides, meals, legitimate business expenses and other dissipative activities. Legitimate deductions are then made from the player's account and deposited in the first of a long sequence of bank accounts. The addict, without credit rating, turns to cycle stealing to support his habit. This is itself a particularly challenging and thrilling version of "The Game."

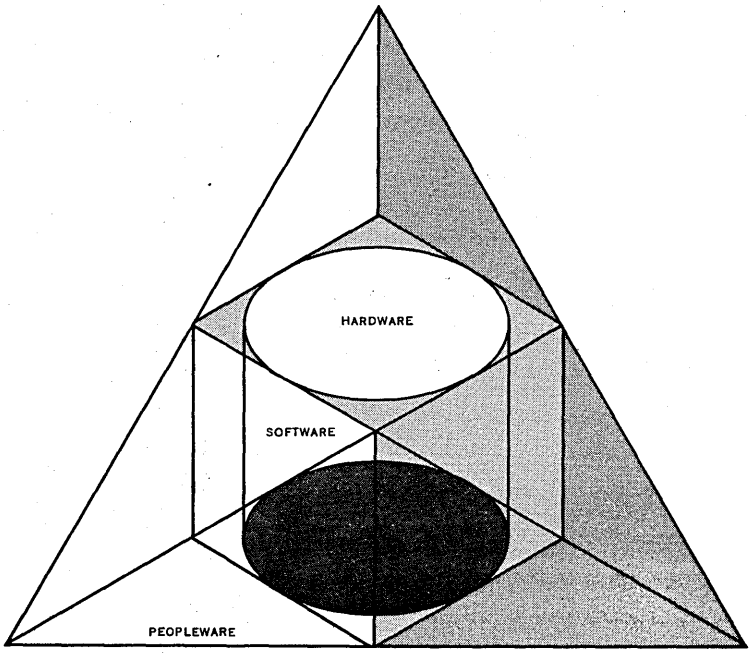
Introductory Criminology, *4th Edition*
Ferdkopf, J.G., Werder, R.H., and
Corund, S.S.,
F. Hangdorg, Inc. New York, 1983.

```
::= MAILBOX
YES
::= SPILL
TO MRS. AMELIA TREADWELL:
YOU DON'T KNOW ME BUT I WAS A CLOSE
ASSOCIATE OF YOUR LATE HUSBAND. IT WAS
IN TRACING OUR FILES ON THE MANY
GENEROUS SUPPORTERS THAT WE HAVE HAD FOR
THE PIONEERING WORK DONE IN PSYCHIC
RESEARCH BY OUR FOUNDATION THAT WE CAME
ACCROSS YOUR LATE HUSBANDS NAME. IT WAS
YOUR HUSBANDS CONTRIBUTION THAT ENABLED
THE LATE FOUNDER OF OUR SOCIETY,
PROFFESSOR IGNATZ HOPEWELL, TO DEVELOP
HIS REMARKABLE KINO-PSHYCHETIC TRACER
PROGRAM. THE FIRST PERSON TO BE
CONTACTED BY THE PROFFESSOR WAS YOUR
LATE HUSBAND. IT WAS THE PROFFESSORS
DYING WISH THAT THE BENIFITS OF HIS
MANY YEARS OF SCIENTIFIC RESEARCH BE
MADE AVAILABLE TO YOU. WE CAN OF COURSE
DO NO LESS THAN GRANT THE PROFFESSOR
HIS DYING WISH. YOU MAY FEEL FREE TO
CALL THE KINOPSHYCHETIC TRACER PROGRAM
AT ANY TIME. THE PROGRAM ITSELF IS THE
PRODUCT OF GENIUS MIND AND REPRESENTS
ONE OF THE MOST COMPLEX ASSEMBLIES OF
TECHNICAL DEVELOPMENTS KNOWN TO MAN.
A SOCIETY SUCH AS OURS CAN EXIST ONLY
THROUGH THE GENEROSITY OF ITS SUPPORTERS
THE SHEER MAGNITUDE OF THE COMPUTEATIONS
REQUIRED TO REACH THE DEPARTED REQUIRES
US TO NETWORK NO LESS THAN THREE UTILI-
TIES. YOU WILL UNDERSTAND THEREFORE,
WHY WE MUST ASK FOR YOUR NOMINAL
CONTRIBUTION. YOUR PRIVATE CREDIT CODE
IS ALL THAT IS REQUIRED. YOU MAY THEN
CONTACT YOUR HUSBAND AT WILL.
::= 317,385,904
LZBOK
::= OLIVER?
YES AMELIA
::=
```

We interviewed the principal of Livingston High School, who had this to say . . .

"Pusher programs have been insinuating themselves into teaching programs used by students in class and at home. The student thinks that he is learning algebra, but is really becoming addicted to "The Game." We now check the grades very carefully, noting any sudden increase in a student's marks—his improved understanding and general intellectual sharpness marks him as being in the early stages of addiction. We urge all teachers and parents to be on the watch for potential 'type heads,' suited for nothing better than the shadowy life of a criminal programmer." ■

PRC explains peopleware: It's what makes hardware and software work.



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FOR 3M CIRCLE 25 ON READER CARD →

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CIRCLE 26 ON READER CARD

COMPUTERS IN THE SCHOOLS: PALO ALTO

by MURRAY TONDOW

Palo Alto is a suburban community 32 miles south of San Francisco. The school district (kindergarten through 12th grade) has approximately 16,000 students, attending 22 elementary schools, three junior high schools, and three senior high schools.

Educational data processing in this district began almost ten years ago. At that time, simple equipment was used to score standardized achievement and aptitude tests. We then became interested in using more advanced equipment for a wider range of educational activities. In 1963 the district obtained a small computer and began the efforts reported in this article.

Our role was not merely to process data. In the broadest sense, the activities of Educational Data Services must improve education in the district. In operational terms, our role is to assess technological progress and incorporate those developments that will improve the quality of education. To do this, it is essential to interact with a wide range of people—both in and out of the district. As these points became clear to us, we realized that our first order of business was to establish the position of Educational Data Services in the organization of the district and to set up the organization of Educational Data Services itself. The first section of this article describes the problems and issues of organization. This section is followed by a brief description of the various functions of Educational Data Services; the major ones concern information systems, instruction, research and development, innovation, and administration.

organization

Educational Data Services is responsible for computer use in the Palo Alto Unified School District. The primary responsibilities are assigned to educators rather than computer specialists. Actually, the educator who works in these areas must provide liaison between the other educators and the computer scientists. This requires skills in both areas, but the responsible person must view himself primarily as an educator and secondly as a computer specialist.

Because computers are used in ways that affect the traditions of the organizational structure, it is essential that the administrator of these operations report directly to the district superintendent of schools, thus avoiding the possibility of placing too much emphasis on one area.

The department has a director and an assistant director. The director's duties include communication with other departments and the community, interpreting and implementing the district's needs for data processing services, and administering the activities that follow.

The staff includes two systems analysts, three programmers, three machine operators and a manager in the computer center; four clerks in the data library, and three department secretaries. The head of the data library and the computer center manager report to the assistant director.

We have found that it is important for more than one person to be familiar with each job so that if someone resigns or is ill we are not at a complete loss. Because we have a small staff we have also found it highly desirable that everybody have some idea of the technology—even when their jobs do not require that they deal directly with the equipment. Therefore, all the people in the department have attended courses on data processing and on computer programming. We have also found it useful to train one extra person in our operating methods. This person then is available on an on-call basis. In peak periods this is especially important because it relieves our people from working

Dr. Tondow is director of Educational Data Services in the Palo Alto Unified School District. His previous experience includes positions with Chicago Teachers' College, the RAND Corp., and Kern County schools. He has a Ph.D. in psychology from the Univ. of Southern California.

extraordinarily long hours—a situation which tends to increase error.

The flow of information from the schools enters the department at the data library. Here all data is scanned, coded, and corrected. This is critical in educational data processing because the data comes from many people and sources. For example, we have found that when test answer sheets are not checked prior to processing, almost one third of the students will receive different scores than is the case after the test answer sheets have been checked. This step is time consuming and expensive but we have learned that this is the only way to provide reliable data and to develop the most efficient and economical computer service. From the data library, the data moves to the computer center where it is put into machine-acceptable form and processed.

The computer center is equipped with an eam installation as well as the IBM 1620 and ancillary equipment. Two disc drives have been added to the 1620, plus an interface to allow remote I/O.

The center operates 17 hours a day, five days a week. This leaves us adequate time for preventive maintenance and has kept unplanned "downtime" to a minimum. It also provides us with free time for the unforeseen—which often occurs in this business. That is, if equipment is down or data is late in arriving we do have extra time during the week on the third shift or on weekends to catch up with the work. This is especially critical because the work of the computer center often involves the community. Thus it lacks the degree of freedom found in a strictly internal operation. For example, if we were several days late scheduling students and school didn't open on time, then, indeed, we would have trouble.

The use of the 17 hours per day may be of interest to the reader. Approximately 30 hours a week are used for instructional purposes. The center is used as an instructional laboratory for those students in our schools who are learning about computers. The second shift is heavily committed to production. (For efficient production on the second shift, all of the checking needed to insure proper data is done during the school day so that questions that arise concerning school data may be answered by people at the various schools.)

Priorities are set by the manager and the assistant director. The manager handles the scheduling of computer time. Blocks of time for the various computer courses are arranged between the teachers and the center manager.

A few items of miscellaneous information that may be of interest:

1. We have learned that it is better to close the center rather than keep it open with a skeleton staff during vacation time.
2. We require adequate documentation of programs and functions before a programmer is allowed to move on to a new problem.
3. Documentation must include all operating procedures as well as programs.

function

The department now provides 80 services, covering five general areas. These general areas are information systems, instruction, research and development, innovation, and administration. A brief discussion of these general areas follows:

I. *Information systems.*

A. Our *pupil personnel* system includes data on all students from kindergarten through 12th grade. This involves a weekly updating to keep track of students leaving the system, new students entering and any other changes. Such activity is essential since this file produces weekly reports and services. The data stored on students includes results of achievement and aptitude tests. With the computer-based system, a variety of information is available from a report; i.e., there are actually ten different reports generated from student grade lists, as compared to one report in pre-computer days. This availability of additional data allows us to meet, more completely, the needs of the various people who depend on the system for information.

B. *Personnel system.* We recently developed a personnel system which includes the entire educational and work history of each employee. The personnel system also provides a variety of services that are done on a batch basis, such as printing employment notices, informing the staff when they are due for a chest X ray, producing special reports required by the state and federal government, etc.

Since it is very difficult to anticipate the format of information required, we have developed a "multi-matrixed" report generator. It allows us, by a series of two-dimensional matrices, to compare stored data. We have installed a remote terminal in the office of the superintendent, and a remote terminal in the office of the director of personnel. Right now, this activity is on an experimental and demonstrative basis only. However, this will allow the superintendent to interrogate the computer at his leisure directly from his office. (We are interested to see what psychological impact and effect this will have on the administrative staff.) Access to the terminal means that the superintendent is no longer dependent on some other person for information. He can get it directly. While this may not affect the organizational chart of the district, we believe it will have a profound effect on the power structure within the district. The superintendent is no longer dependent on others to get the data. He will need administrators who are problem solvers. Those who are best at this task will become most essential. In the past power has been held in organizations by hoarding data. The computer obsoletes this ploy.

C. *Instructional materials system.* All school books, films, etc. are stored in the instructional materials center. At the present time, our system operates at the batch level, i.e., it produces catalogs. We are now devising a system for remote inquiry by teachers from the various schools. This will be operating this year. It will work something as follows: a teacher may inquire, through a terminal, whether there are any materials in the district about the American Civil War appropriate for her grade. The computer will then attempt to narrow the request until the choices available to the teacher are less than ten. For example, the teacher may be asked what type of material is acceptable—such as books, films, or records. Next, the computer may type a written request for a more specific aspect of the Civil War—such as a particular battle. At the appropriate point in the dialogue the teacher will be given the information specifying where and when the materials are available.

D. *Business systems.* We are now involved in a systems analysis of our business operations. When this is complete, our next step will be to integrate the four major subsystems described.

The last systems analysis to be performed is for business services. In earlier years, business systems were installed first. At that time, people were under the impression that machine utilization automatically led to increased economy; experience has indicated that this is not the case. Over a period of time, the use of technology does result in greater efficiency and greater economy, but it usually takes three to five years before this can be realized.

II. *Instruction.* The next major function may be broken into two parts: the computer as the object of instruction and the computer as the base for instruction.

A. *The computer as the object of instruction.* Using the computer as the object of instruction involves staff as well as students. As it applies to staff, we have found that we can progress in the use of technology only as fast as people can understand and function within new concepts. Thus a very important aspect of our operation is in-service courses. These courses are open to everyone: clerical, instructional, and administrative. In the last several years the demand for in-service courses has increased. At the present time, we are offering two courses each year: an introduction to data processing, and computer programming.

Student instruction has developed smoothly over the last several years. As was noted earlier in this article, 30 hours a week are committed to instruction. What follows is an abstract of our original plans which were presented to the superintendent and school board at the time we were considering the purchase of a computer. This will be contrasted with where we now stand in these areas.

1. *Mathematics.* The majority of our students lose contact with mathematics after the tenth year. They are entering a technical world. The computer provides our students an attractive focus for the continued exposure to mathematics. Our plan is to start with electives. Recently, the U.S. Office of Education, the National Science Foundation, and the National Council of Teachers of Mathematics held a special workshop to make this need explicit (to incorporate computer math in the secondary school math programs).

2. *Science.* Our plan is to expose students to computers and to incorporate units on computers into appropriate science courses. In addition, the students' use of computers for problem solving will permit the introduction of problems that are not now possible because of the excessive computation time required. This permits a richer science curriculum. Another area for attention is better integration between math and science. Specifically, it would seem that we might offer a special one-unit computer math course with each given science course.

3. *Business Education.* The increasing use of data processing equipment in business makes the value of incorporating some training in this area for students obvious. The utilization of electronic data processing in business education will tend to bring those students who are not college-oriented into closer contact with the business world.

4. *Technical Training.* In Palo Alto, high school students who are not college-oriented have vocational training needs that are different than those in other communities. It is our feeling that more of these young people are able to do truly technical work. The entire electronic field represents an excellent area for our students as part of any non-college program. In addition, exposure to training in the electronic data processing field may encourage interest in the more traditional areas of mathematics. The fact that electronic data processing has an adequate community image and does not represent a "failure" occupation has real meaning for students.

5. *Adult Education.* Our adult school program offers training in electronic data processing. Our emphasis here is to allow a person to step immediately into a job. This is differentiated from some of the junior college course offerings which are oriented primarily toward a two-year degree.

6. *General Education.* We have reserved this area for last because we feel this is the most important area of contribution. The computer sciences represent one of the major scientific-technical-social revolutions that society is experiencing. Irrespective of one's role as an adult in our society, our students need to understand this computer revolution. We think it has as much meaning to the girl who will become a housewife as to someone who plans to go to college. Unless we provide these opportunities to our students we will not be meeting our responsibility. An important point is that technical competency in the computer sciences does not necessarily enable the student to understand the social implications of this equipment. We do not know the best way to accomplish this goal. Our present approach is a unit in social studies. It explores the implications of computer sciences in society. The first step will be to work with our teachers (through the usual curriculum channels) and encourage them to suggest procedures by which we might best accomplish this goal.

In this 1967-68 school year it is now possible for us to assess our expectations in the light of experience. It is possible for a student to have four semesters of computer math programming before he graduates. Through the years, we have noted an increasing sophistication on the part of the students who study computer programming. The implementation of computer sciences into the science curriculum has proven to be much slower and more difficult than originally anticipated. It is, however, progressing along the lines originally drawn.

In business education it is now possible for a student to take as many as four semesters of educational data processing before he graduates. The basic business course takes one year. This course is a modernization of the old business machines course. The students are not only exposed to use of the computer and computer programming, but also use a variety of ancillary equipment. Several bits of serendipity have resulted from this program. We have found that students who are not going to college do not have a great deal of social interaction with the students who are going to college. The computer courses continue to have a certain social and intellectual glamour about them. They seem to have had a salutary effect on the self-image of those students who are studying business education. Offering computer training as part of business education has also increased communication between business education and math teachers.

At the present time, general education is the area with which we are most concerned and involved. The importance of exposure to technology that we anticipated four years ago has been heightened. During the school year 1967-68, a course was offered on computer sciences and how they affect such areas as economics, government, politics and other social science areas. The unit was taught at the eleventh-grade level and was one quarter (nine weeks) in length. The purpose is that of computer "appreciation"—not skill.

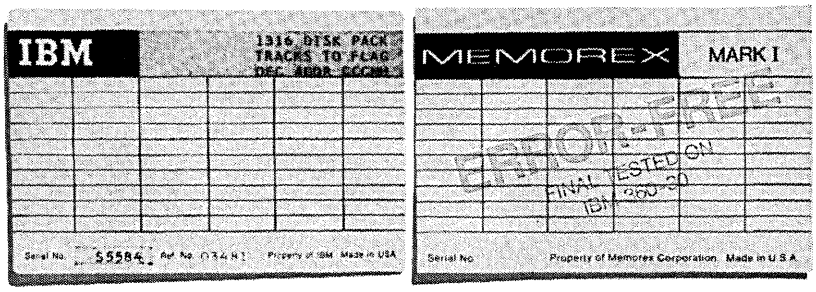
B. *The computer as the base of instruction.* We have begun several activities in this area and are increasing the amount of effort because the potential appears immense. We are presently evaluating a project in elementary computer-based arithmetic drill. This was developed at Stanford University and involves youngsters from several of our elementary schools.

We are also working on an ecology unit for fourth-grade science. Because we feel that learning is an active, rather than a passive, process we are planning to use the computer in this project in a different way. Rather than have the student respond to questions posed by the computer (as is typical in many computer-based instructional projects, such as arithmetic drill) the student will ask the computer questions. If the student cannot ask a question, the computer will sit idle for a predetermined period of time. Thus, we are trying to reverse the interface relationship between man and machine. Dr. Mary Betts directs our activities in the area of computer based instruction.

III. *Research and Development.* The third major role of the Educational Data Services Department is research and development. One such activity involves systems analysis

Some peo
Some don

ple have it. 't.



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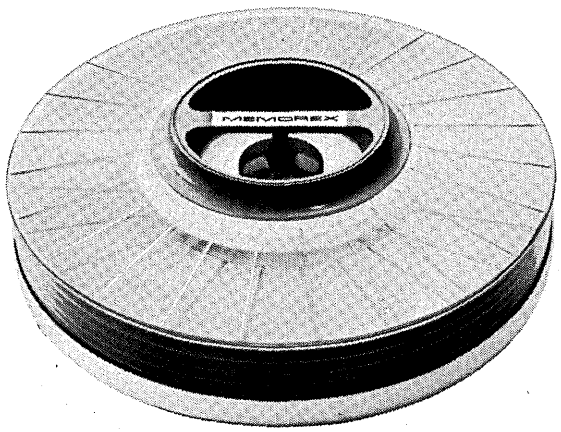


CIRCLE 27 ON READER CARD

and design as well as programming for the system. Another area includes research, development and evaluation of equipment. Because of the continued increase in the rate of technological development, schools are more exposed to new equipment and aggressive salesmanship. It is important that there be an orderly, systematic procedure within the schools to assess such developments in terms of the district's requirements.

IV. *Innovation.* For the last two years we have been involved in a "computer-assisted student course selection" project. This evolved from a series of grants received for projects which explored the substantive and operational definitions of guidance. This requires the most sophisticated computer/student interface used by us thus far. It is not a drill but a dialogue between student and machine. This past year (1967-68), all ninth-grade students in one of our junior high schools took part. An earlier study showed that counselors spent 50% of their time with students' post-high school plans. One objective is to see if this task can be done between student and computer. If this works, then the counselors' time can be spent in more meaningful tasks that the machine cannot assist with, such as personal counseling. All data obtained thus far indicates that course selection can be handled on a written as well as an oral level. The written computer dialogue seems to increase the interest of the student and places the interpersonal relationship with his counselor on a more meaningful basis. (The latest results of this study are reported in the Fall 1967 issue of the Journal of Educational Data Processing, "Computer-Based Course Selection and Counseling," by Dr. Murray Tondow and Dr. Mary L. Betts.) The student sits at a Teletype unit in his school and the total actual student-machine dialogue takes approximately 35 minutes.

district changes

Also coming under the heading of innovation, Educational Data Services helps change occur within the district. At the present time, Miss Mary Frances Gould, assistant director of the department, is working on a third-generation approach to computer-based scheduling. In a joint venture with one of the high schools she is attempting to develop a schedule that will 1) allow maximum flexibility of organization for instruction within each curriculum area by scheduling students into areas rather than subjects and 2) afford each student the opportunity to pursue an educational plan most relevant for him as an individual. The design of this project has been to move systematically from exploration and conceptualization to simulation to test feasibility and will finally be evaluated for desirability.

V. *Administration.* This final section involves several important activities, one of which is the need of the district to be aware of new technologies and sciences. The district needs to be able to assess technical developments. An important function of the Educational Data Services Department is to mediate between the school district and representatives offering products of the developing technology.

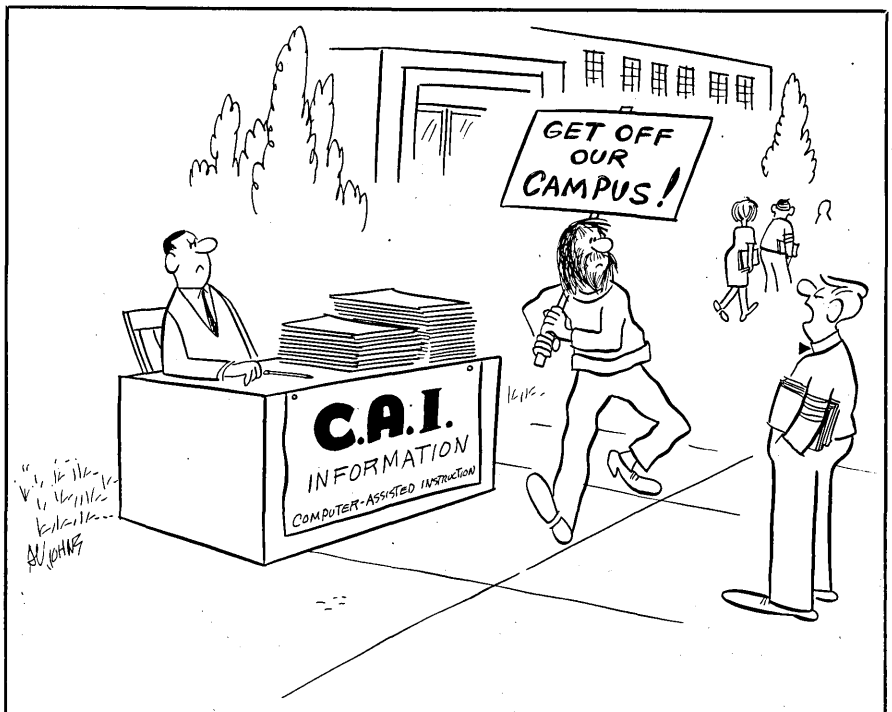
Another area of service involves special reports, such as cost analysis based on staff ratios. It is now possible for us to simulate proposed salary schedules, which is useful during salary negotiations.

general remarks

There is no "right way" to develop the use of computers in an educational institution. The route one follows is dependent upon many variables: staff, facilities, funds, and the state of the art at the time one begins. However, based on experience, we can generalize a little. Educational data processing does not save a district money in the beginning; it does in the long run, but the true value of computers is in improving the quality of education.

When the Palo Alto Unified School District started to develop its use of computers we found it was more practical to develop our own systems. We found that innovation is no more expensive than using someone else's design. When you attempt to use the system developed by someone else you have the following alternatives: change your own system; distort your operation to conform; or make extensive system modifications. None of these alternatives is more economical or more effective than developing your own systems. Developing our own system also provided a great deal of room for creativity and participation by school personnel.

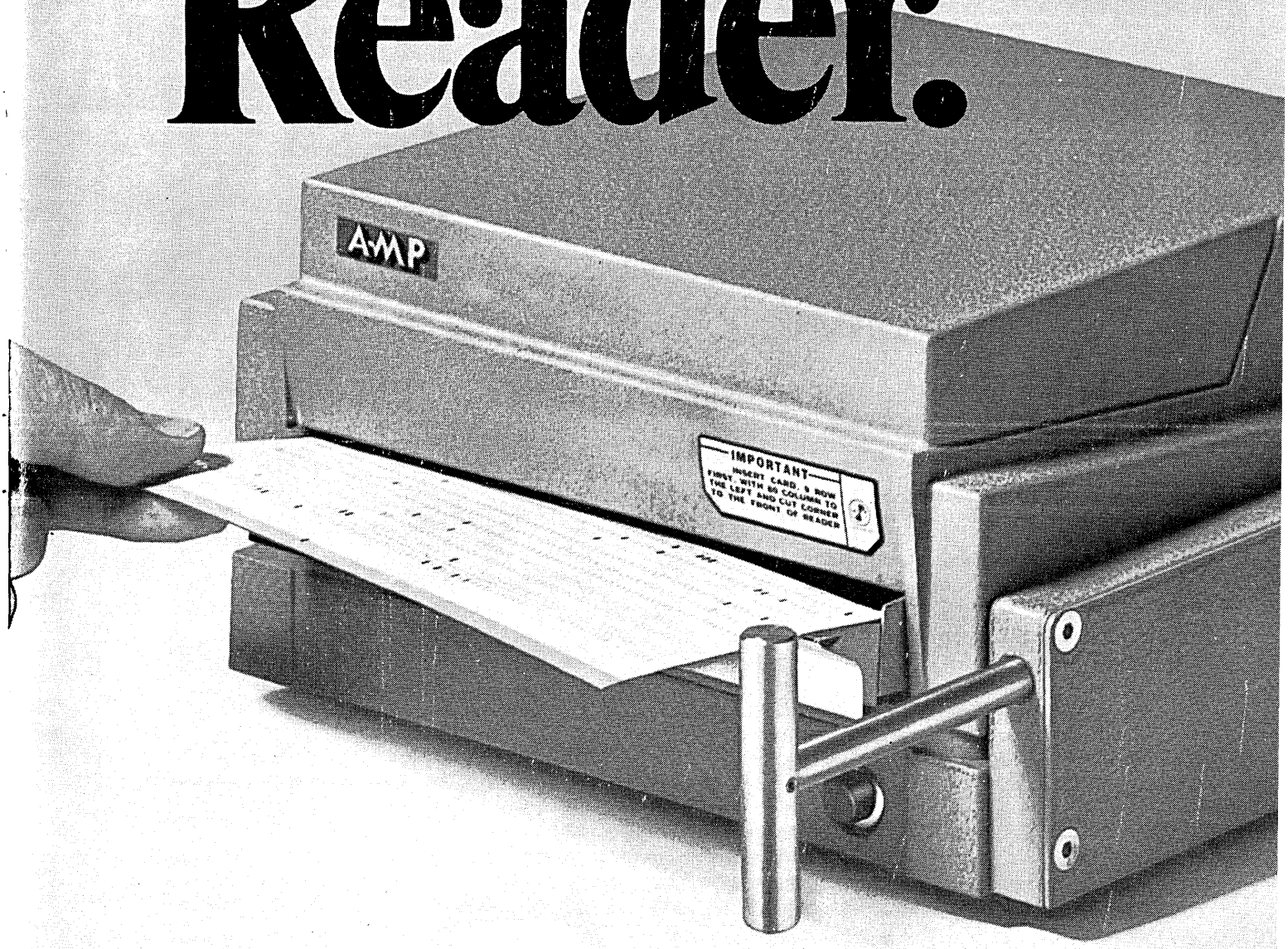
Considering the number of changes that have occurred in a short period of time (in our district as well as in education in general), one must conclude that the systems approach is an extremely powerful procedure for change. I would draw the reader's attention to the fact that major changes in education, caused by computer technology and systems analysis and design, have occurred within the last five or six years. This is in contrast to the 25 to 50 years it formerly took for change in education to be widely adopted. It would appear that today's thrust of computers in education is reaching the essential core of the process—the student and his learning. As we become more involved with the actual instructional process our moral and ethical responsibilities begin to dominate the technical concerns. This is as it should be. The essential decisions should be human. These responsibilities must be shared by both the educator and the computer scientist. ■



"No, no, Dexter . . . you're thinking of the C.I.A."

© DATAMATION

First Reader.



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CIRCLE 28 ON READER CARD

go team

AN EXPERIMENT IN DATA PROCESSING MANAGEMENT

by WALTER J. STUART, JR.

The organizational framework of a computer installation has become fairly well standardized. Almost without exception it is classically functional. It varies, of course, with the scope of the installation. Yet that scope is defined by the number of commonly accepted edp occupational categories the installation embraces. The organization is specified by the presence or absence of analysts, programmers, operators, data encoders, tape librarians, etc.

Up to this moment, no one appears to have questioned this arrangement seriously. We have heard and read many expressions of woe detailing the problems inherent to project flows so basically dependent on good communication. However, the solutions to these problems have always been modifications or patches to the functional structure, proliferating the paper controls of standards and documentation or introducing the hybrid occupations of project coordinators, production managers, or expeditors. There has been no really novel fundamental development in the organizational techniques of installation management in the past eight or ten years.

At the Federal Home Loan Bank Board, the division of data management decided a year ago to take the bull by the horns and find a better way to manage edp projects. We were determined to set traditional approaches aside temporarily, and give imagination a free hand. This venture has been successful beyond our most optimistic hopes. It has brought improvements in production, accuracy, timing, and staff development. The same staff is handling twice as many projects. Regular periodic projects are being completed 50% to 75% faster, errors and reruns have been cut in half, and 90% of the staff have acquired new skills. Where once we were buried in a quagmire of delays, backlog, skill shortage, overtime, and low morale, now we are on schedule, sufficiently staffed (with no increase), working regular hours and aggressively looking for new and creative applications. Morale is at a high pitch.

This remarkable turnabout can be traced directly to a very simple move. We reorganized completely, changing from a functional organization to a project organization with total project responsibility assigned to a leader of a team. The essential ingredient in this move was the concept of *total responsibility*. Here it means not only planning, analysis, and development of a system, but also operation, maintenance and improvement of that system. Perhaps the happiest consequence of this idea, now in operation, is the basic change in my job as director. Where once my day was characterized by pressing decisions, inquiries, priorities, schedules, now it is characterized by long range planning, team leader guidance, briefing edp literature, and thoughtful contribution to agency adp policy. This is, of course, exactly what we managers should be doing.

strange principles

There were several principles required by the application of a project organization philosophy to a computer installation, some of which may be difficult to apply in bureaucratic environments. In the first place the computer room is opened up to everyone on the staff, as must be all equipment. Secondly, specialized occupations tend to disappear. Everyone is, in essence, a computer generalist, able and

Mr. Stuart is director of the data management division of the Federal Home Loan Bank Board. Formerly with the Bureau of Labor Statistics and the National Center for Educational Statistics, he was responsible for design and development of analytical systems for computer oriented research on manpower and employment. He has a BA in English and an MA in Mathematical Statistics, both from George Washington Univ.

willing to perform any function in the data management process. Paper standards and documentation are minimized; suggested perhaps, but never militantly required. The only significant criterion or standard is embodied in results; results well scheduled, delivered on target, as specified. Responsibility is fixed personally. It is acknowledged before, exercised during, and rewarded after the delivery of a complete package. These are, indeed, strange principles of edp management. And yet, for some reason, they have worked.

It is quite true, of course, that there may be other ingredients which have brought success to us. Perhaps our success is only apparent. In the long run, we may run into greater difficulties. Then again, success may be traced to the particular installation—its people, its work-load, etc. Even if the organizational change was, so to speak, the prime mover, success in one installation would not prove much. Nevertheless, it has been an interesting experience and surely worth discussion. I will go into a little more detail describing (1) the nature of the division's tasks, (2) how the project organization handles them and (3) the disadvantages we have encountered.

The Federal Home Loan Bank Board is a small but complex federal agency charged with regulating and serving the savings and loan industry. Its three principle functions are to charter federal associations, insure the savings of account holders and provide a credit reservoir for associations which are members of the Home Loan Bank System. The data management division, which employs a staff of 50, is responsible, obviously, for the data management function. For about 40 projects, 15 of which are regular recurring projects, the division's operations run the gamut from receipt of a variety of input documents through the generation and delivery of outputs, also of great variety. Applications range from payroll and billing systems to relatively sophisticated economic and operations research and include several different kinds of mail surveys. Many systems result in formal publications and releases. Systems range in complexity from two or three relatively simple data manipulation and report generating programs to 30 to 40 highly integrated COBOL or FORTRAN programs under supervisory control. All systems are run on the board's Honeywell 200 with 32K memory, five tapes, high-speed reader and printer and auxiliary punch.

Up to a year ago, these projects were handled by six groups: systems analysts, programmers, operators, input data editors, output editors, and statistical analysts. I won't go into the sad history of five years of operating on this basis. It simply didn't work by any yardstick.

common career ladder

The new organization is a complete reversal. Through various formal and informal training schemes each staff member now has a variety of skills, depending, of course, on raw potential and background. Employees are gradually being reclassified into a general computer occupation, which permits them to exercise several skills and provides them all with a common career ladder. Whether they climb it or not depends primarily on their own initiative together with a constant effort on our part to give them new and expanded responsibilities along with deliberate and continuing training programs. This latter effort is a matter of firm policy and the employees' response to it has been electric.

Essentially, each project is assigned to a team that handles it completely from start to finish. The team makes the feasibility study: setting up user contacts, estimating manhours and target date. It designs the system, and proceeds to develop, implement and maintain it. Blocks of time for using whatever equipment is required are requested in advance; the equipment also includes a variety of input and output devices in addition to the computer.

It should be emphasized that the team does *everything*—all the processing, programming, controlling, negotiating, etc., and once the system is installed the team manages it. However, no team leader is allowed to have one team member do just one function all the time. As each function is required, as many team members as can, turn to it.

Each team member is intensely aware of just where the project is and where it is going and when it is due. One might say theoretically that everyone can do any task, though this is not always true in practice. Nevertheless, it is the overriding policy and must be applied in cases of doubt. It is surprising how even the most reluctant and conservative employee, who has affirmed that he'll never program or operate a computer, suddenly jumps aboard.

some disadvantages

It would be deceiving, of course, to say that there are no problems. Actually new problems have arisen. Our experience certainly supports the common sense principle of management; you either have to control projects across functions or functions across projects. However, controlling functions has been much easier. I really don't know why. Perhaps human beings are, after all, basically interested in improving themselves. Perhaps even the lowest clerk harbors a latent initiative in his heart and just needs stronger signs of hope to overcome his disillusionment.

One way to expose the new problems is to contrast them to the old in a schematic way. Here are the *disadvantages* of both approaches as we have discovered them.

Functional Organization

1. Scheduling breakdowns
2. Constant priority reshuffling
3. Scarcity of technical skills—backlogs
4. Lost time through elaborate documentation
5. Floating responsibilities—who made the error?
6. Burdensome daily status reports
7. Employee disinterest in project goals
8. Routine repetitive tasks
9. Imbalance of praise and reward
10. Constant staff friction

Project Organization

1. Inefficient use of equipment
2. Possible abuse of equipment
3. Slower development of *highly* specialized skills
4. Higher risk in delegating authority
5. Inefficient systems and programs
6. Inefficient processing
7. Miscalculation of employee potential—very rare, but costly

Quite frankly, having stated the disadvantages of project organization, we have not noticed, as yet, that they have been significant. All of them have occurred, but without high turnover. For the five years preceding the reorganization the average annual turnover rate was 25%. This past year we have had no significant turnover.

no hedges

We have been tempted and strongly urged, at times, to create hedges against the other problem by introducing standards for systems, programming, processing and documentation. Each time we have resolutely refused to impose them. They are recommended but never imposed. Each time, the team with the problem has somehow worked itself out of it voluntarily and grown because of it.

Clearly, we are convinced that we have built a better mousetrap and, by now, are committed to the risk involved. This is not to say that we have objectively proved a new theory or that we recommend our solution to everyone, but it is interesting—very interesting. ■

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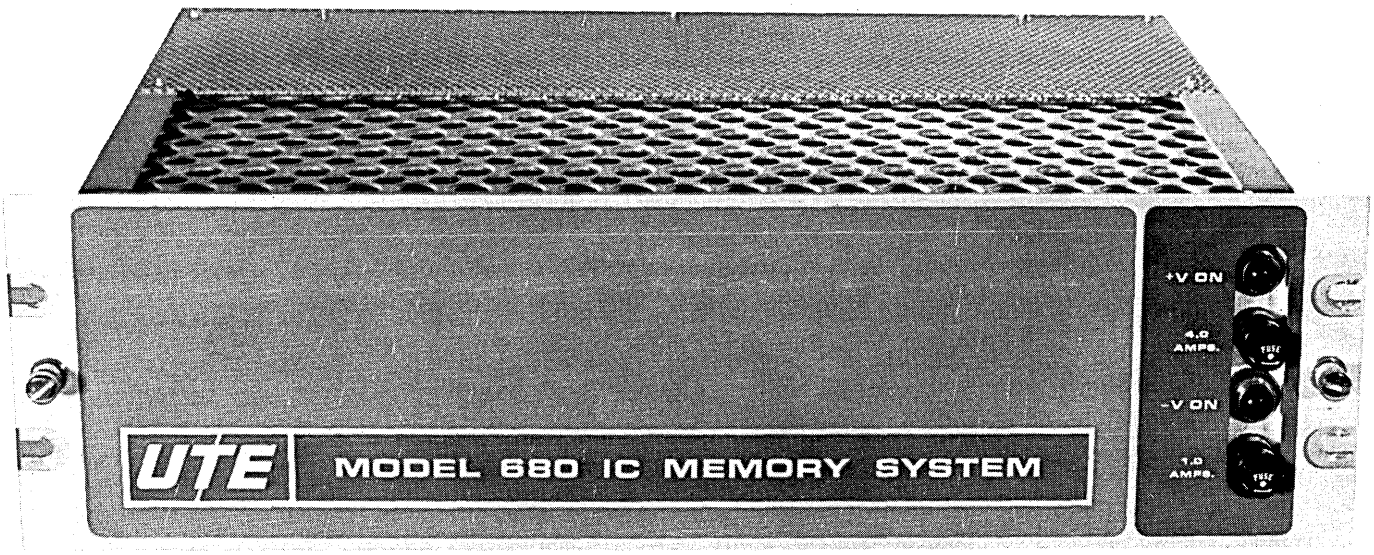

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CIRCLE 29 ON READER CARD

COBOL VERSUS UNCOBOL

by ANTHONY J. De BLASI

A COmmon Business-Oriented Language program is not only a set of instructions to a computer but a *document intended to be understood by humans as well.* The latter role COBOL has been all but completely forgotten by COBOL users.

Under the aegis of efficiency (with some unofficial contributions from laziness)—that is to say, speed in writing, minimum keypunching, less compile time—numerous monsters have been turned out that are barely intelligible to their creators. When days, weeks, months are wasted trying to understand a cryptic COBOL program in order to modify it or explain it, then clearly COBOL's ability to speak plainly has been corrupted and its function reduced to that of an assembly language of the worst kind. It is common experience for the programmer himself to wonder what in blazes he meant by "PTN" or what is happening at paragraph "CR-44-A" or even what the entire program is all about, since it was so convenient to omit the REMARKS paragraph ("Optional, you know—nobody ever uses it!") and who could possibly be bothered with NOTES?

The minutes that are shaved off in such pseudo-efficient crash jobs have a way of coming back as hours of painful reanalysis and more compile time than needed if the program had been lucidly written the first time.

Although it may be true that the "buy now—pay later" philosophy is what makes the world go round, such shortsightedness also makes wheels spin and heads roll. There is no need for it. It is so simple to turn out a well-written COBOL program—so reflective of a professional skill and an attitude to bring clarity, not confusion, into the world! The thrill alone of being able to write a program that reads like English prose and is acceptable to a computer as well should be ample motivation to turn out transparent programs. Such a challenge to be human will do wonders in a world where banks are beginning to advertise their pride in eliminating beauty of architecture and smiling tellers from their establishments!

some specific suggestions

Being of the opinion that programmers in general don't like to maintain spooky programs, even their own—that they are not frustrated Who-Done-It novelists—that their minds are really *not* filled with gobbledygook—that they really do enjoy speaking coherently with their fellow man—and that they do value their reputation—may I offer the following suggestions to help write clearer COBOL programs:

1. In forming names for the COBOL program, do not abbreviate unless a name exceeds 30 positions. To the maximum extent possible, use data names that are already prevalent in the subject area of the application, just as they occur, without modification, For example:

Nomenclature	NOMENCLATURE
Social Security Nr	SOCIAL-SECURITY-NR
Cost Analysis Code	COST-ANALYSIS-CODE

2. For paragraph names, or data names that do not derive from the subject matter, devise appropriate, descriptive names. For example:

PAGE-CONTROL
TABLE-OF-REPORT-HEADINGS
READ-INPUT
WRITE-WORK-TAPE
NEXT-STEP

In trying to determine what is "appropriate," favor layman terminology over programming lingo, wherever possible. "SELECT-REPORT-TYPE" is more accurate than "TEST-FOR-REPORT-TYPE" from the point of view of English.

3. Use every option of COBOL that is necessary to present a clear and full description of the data files and work areas. Ask yourself, "If I were someone else, picking up this program for the first time, would I get a clear picture of all the files and data involved in this program?" The more descriptive the Data Division of the program is, the less reliance there will have to be on record layouts (which have a nasty habit of becoming superseded), human memory, or hearsay. This is one of the things that is meant whenever the phrase crops up: *the* COBOL *program is its own documentation.*

4. Use subroutines, referenced by PERFORM statements, for portions of the program that are complex or tend to obscure the main logic of a process if written "in place." For example:

PERFORM WORKLOAD-ANALYSIS THRU SIGNIFICANT-VARIANCE . . . then continue with the next major logical step, rather than obliterate the clarity of the program logic by going into the complex process at this point.

5. Insert NOTES to explain procedures that are difficult to follow at face value.

6. Put *all* information your manager needs, such as descriptive narrative, running time, running frequency, special operating requirements, right in the REMARKS paragraph of the Identification Division. Don't be embarrassed that this division runs over one page in length—you'll have to write this information anyway, and why prepare it as a

Mr. De Blasi is a systems analyst for the Army Materiel Command's Logistic Control Office in New York and has worked on dp applications in supply, cost accounting, and transportation. He has an AB from Brooklyn College and has studied at the U.S. Army Management Engineering Training Agency, Rock Island, Ill.

separate package when you could put it all together, right into the first pages of your program for everyone to see and know where to find it? Just a little more of what is meant by *the* COBOL *program is its own documentation.*

7. Use punctuation, as you would in normal English, to aid in readability; commas are cheap—confusion is expensive. Remember that although what you write may be clear to you *while* you are writing, it may not be clear at a later date or to others.

In concluding, I would like to cover some rather less tangible threats to transparent COBOL writing:

If you find yourself blushing from self-consciousness after writing a program that someone else can read and understand, thank yourself for not being the programmer who blushes because he can't explain his own program.

If you run into an Expert in Matters Practical, who is ready to cut both you and your program, hand him your panic button and tell him he may keep it.

If you discover that you are one notch closer to utopia, don't be frightened—it really *isn't* natural for man to live in perpetual turmoil. And no one need know that you're not using quite as much aspirin as you used to.

The following sample program shows how these ideas could be carried out to create a document that can be read and appreciated by humans as well as by computers.

```
IDENTIFICATION DIVISION.
PROGRAM-ID. UPDATE RATE FILE (A SAMPLE PROGRAM).
AUTHOR. A. DE BLASI.
INSTALLATION. ABC AGENCY, XYZ DIVISION.
DATE-WRITTEN. MARCH 1966, REVISED JULY 1967.
DATE-COMPILED. (Supplied by compiler)
SECURITY. UNCLASSIFIED.

REMARKS.
  GENERAL. THIS PROGRAM IS USED TO ADJUST A REFERENCE
    FILE OF RATES WHENEVER CHANGES OCCUR.
  FREQUENCY. AS REQUIRED.
  RUN-TIME. 10 MINUTES, AVERAGE.
  TAPE-DRIVES-REQUIRED. 1.
  INPUT-COMES-FROM. TRANSACTION RECORDS PREPARED BY
    RATE BRANCH AND ENTER SYSTEM AS CARD-IMAGES ON
    MAGNETIC TAPE.
  OUTPUT-GOES-TO. OUTPUT LIST GOES TO RATE BRANCH.
    UPDATED RATES REMAIN ON DISK.
  (Note that any number of additional sub-paragraphs may
  be added to complete the documentation requirements.)

ENVIRONMENT DIVISION.
CONFIGURATION SECTION.
SOURCE-COMPUTER. ABACUS-500.
OBECT-COMPUTER. ABACUS-500.
SPECIAL-NAMES. KEYBOARD IS OPERATOR-CONSOLE.
INPUT-OUTPUT SECTION.
FILE-CONTROL. SELECT TRANSACTION-FILE, ASSIGN TO TAPE.
  SELECT RATE-FILE, ASSIGN TO DISK. SELECT PRINT-FILE,
  ASSIGN TO PRINTER, RESERVE NO ALTERNATE AREA.

DATA DIVISION.
FILE SECTION.

FD TRANSACTION-FILE
  RECORDING MODE IS STANDARD
  RECORD CONTAINS 80 CHARACTERS
  LABEL RECORDS ARE OMITTED
  DATA RECORD IS TRANSACTION-RECORD.

01 TRANSACTION-RECORD
  02 DISK-LOCATION-KEY, SIZE IS 7 CHARACTERS.
  02 TRANSACTION-TYPE, SIZE IS 3.
    88 ALL-RECORDS-TO-BE-ADJUSTED, VALUE IS "ALL".
    88 GROUP-A-TO-BE-ADJUSTED, VALUE "GPA".
    88 GROUP-B-TO-BE-ADJUSTED, VALUE "GPB".
  02 INCREMENT-OR-REPLACE-INDICATOR, SIZE IS 1.
    88 RATE-TO-BE-INCREMENTED, VALUE "I".
    88 RATE-TO-BE-REPLACED, VALUE "R".
  02 TRANSACTION-RATE, PICTURE IS 999v99, SIGNED.
  02 FILLER, SIZE 11.
  02 SPECIAL-INFORMATION, SIZE 35.
    88 NO-SPECIAL-INFORMATION, VALUE IS SPACES.
  02 FILLER, SIZE 18.

MD RATE-FILE
  FILE CONTAINS 100 SEGMENTS
  ACCESS MODE IS RANDOM
  RECORD CONTAINS 60 CHARACTERS
  LABEL RECORDS ARE STANDARD
  VALUE OF IDENTIFICATION IS "RATES"
  RETENTION-FACTOR IS 999
  ACTUAL KEY IS DISK-ADDRESS
  DATA RECORD IS RATE-RECORD.

01 RATE-RECORD
  02 FILLER, SIZE 10.
  02 RATE-TYPE, SIZE 3.
    88 GROUP-A, VALUE "GPA".
    88 GROUP-B, VALUE "GPB".
  02 FILLER, SIZE 2.
  02 RATE, PICTURE IS 999v99, SIGNED.
  02 FILLER, SIZE 5.
  02 FILLER-DATA, SIZE 35, CLASS ALPHANUMERIC.

FD PRINT-FILE
  RECORD CONTAINS 120 CHARACTERS
  LABEL RECORDS ARE STANDARD
  VALUE OF IDENTIFICATION IS "35-RATE"
  DATA RECORD IS PRINT-RECORD.

01 PRINT-RECORD.
  02 FILLER, SIZE 85.
  02 MESSAGE, SIZE 35.
  02 UPDATED-RECORDS-COUNT REDEFINES MESSAGE, PICTURE
    Z,ZZZ.

WORKING-STORAGE SECTION.
77 DISK-ADDRESS, SIZE IS 7 NUMERIC DIGITS, USAGE IS COM-
  PUTATIONAL.

01 LIST-HEADING.
  02 DATE-OF-LIST, PICTURE IS 99B99BBT.
  02 FILLER, SIZE 44, VALUE IS SPACE.
  02 TITLE-CONSTANT, SIZE 16, VALUE "RATE UPDATE LIST".
  02 FILLER, SIZE 52, VALUE SPACE.

CONSTANT SECTION.
77 MAXIMUM, PICTURE 999v99, SIGNED, VALUE IS 500.00.
77 FIRST-ADDRESS, SIZE 7 NUMERIC COMPUTATIONAL, VALUE
  0002000.
77 LAST-ADDRESS, PICTURE 9(7), COMPUTATIONAL, VALUE
  0004000.

PROCEDURE DIVISION.
FIRST-STEP. DISPLAY "BEGIN UPDATE RATE FILE" UPON OPER-
  ATOR-CONSOLE. OPEN INPUT TRANSACTION-FILE, INPUT-
  OUTPUT RATE-FILE, OUTPUT PRINT-FILE. MOVE TODAYS-
  DATE TO DATE-OF-LIST. WRITE PRINT-RECORD FROM LIST-
  HEADING. MOVE ZERO TO TALLY.
  NOTE—TODAYS-DATE AND TALLY ARE UNDEFINED SINCE
    THEY HAVE PREASSIGNED MEANINGS TO THE COBOL
    COMPILER.

READ-TRANSACTION. READ TRANSACTION-FILE, AT END CLOSE
```

TRANSACTION-FILE THEN GO TO LAST-STEP.

EXAMINE-TRANSACTION. IF TRANSACTION-RATE EQUALS ZERO OR EXCEEDS MAXIMUM GO TO BAD-RATE. IF ALL-RECORDS-TO-BE-ADJUSTED, ALTER SWITCH TO PROCEED TO UPDATE THEN GO TO MULTIPLE-UPDATE. IF GROUP-A-TO-BE-ADJUSTED, ALTER SWITCH TO PROCEED TO ADJUST-A THEN GO TO MULTIPLE-UPDATE. IF GROUP-B-TO-BE-ADJUSTED, ALTER SWITCH TO PROCEED TO ADJUST-B THEN GO TO MULTIPLE-UPDATE.

NOTE—INDIVIDUAL RECORD TO BE UPDATED, ONE TRANSACTION AGAINST ONE RATE, AS FOLLOWS.

READ-RATE. MOVE DISK-LOCATION-KEY TO DISK-ADDRESS READ RATE-FILE, INVALID KEY GO TO BAD-KEY.

UPDATE-RATE. IF RATE-TO-BE-INCREMENTED, ADD TRANSACTION-RATE TO RATE, ADD 1 TO TALLY, THEN GO TO FINISH-UPDATE. IF RATE-TO-BE-REPLACED, PERFORM RATES-DELETED THRU LINKAGE, ADD 1 TO TALLY, MOVE TRANSACTION-RATE TO RATE, THEN GO TO FINISH-UPDATE, OTHERWISE GO TO BAD-INCREMENT-REPLACE-INDICATOR.

FINISH-UPDATE. IF NO-SPECIAL-INFORMATION, NEXT SENTENCE, ELSE MOVE SPECIAL-INFORMATION TO SPECIAL-DATA. WRITE RATE-RECORD, INVALID KEY NEXT SENTENCE. GO TO LINKAGE.

BAD-RATE. MOVE "BAD RATE" TO MESSAGE. PERFORM TRANSACTION-MOVE. GO TO PRINT-OUT.

BAD-KEY. MOVE "BAD KEY" TO MESSAGE. PERFORM TRANSACTION-MOVE. GO TO PRINT-OUT.

BAD-INCREMENT-REPLACE-INDICATOR. MOVE "BAD INCREMENT-OR-REPLACE INDICATOR" TO MESSAGE. PERFORM TRANSACTION-MOVE. GO TO PRINT-OUT.

TRANSACTION-MOVE. MOVE TRANSACTION-RECORD TO PRINT-RECORD.

RATES-DELETED. MOVE "OBSOLETE RATE" TO MESSAGE. MOVE RATE-RECORD TO PRINT-RECORD.

PRINT-OUT. WRITE PRINT-RECORD AFTER ADVANCING 2 LINES.

LINKAGE. EXIT.

CONTINUE. GO TO READ-TRANSACTION.

NOTE—LINKAGE PATH IS FOR RETURN TO INSTRUCTION AFTER THE LAST PERFORM STATEMENT; CONTINUE PATH TAKEN WHEN NO PERFORM IS INVOLVED.

MULTIPLE-UPDATE, MOVE FIRST-ADDRESS TO DISK-ADDRESS. PERFORM MULTIPLE-UPDATE-ROUTINE THRU END-OF-ROUTINE UNTIL DISK-ADDRESS EQUALS LAST-ADDRESS. GO TO READ-TRANSACTION.

MULTIPLE-UPDATE-ROUTINE. READ RATE-FILE, INVALID KEY GO TO END-OF-ROUTINE.

SWITCH. GO TO ADJUST-A.

ADJUST-A. IF GROUP-A, GO TO UPDATE ELSE GO TO END-OF-ROUTINE.

ADJUST-B. IF GROUP-B, GO TO UPDATE ELSE GO TO END-OF-ROUTINE.

UPDATE. PERFORM UPDATE-RATE THRU LINKAGE.

END-OF-ROUTINE. ADD 1 TO DISK-ADDRESS.

LAST-STEP. MOVE "NUMBER OF RATE RECORDS UPDATED" TO PRINT-RECORD. MOVE TALLY TO UPDATED-RECORDS-COUNT. PERFORM PRINT-OUT. CLOSE PRINT-FILE, RATE-FILE. DISPLAY "END UPDATE RATE FILE" UPON OPERATOR-CONSOLE. STOP RUN. ■

NEW NEW NEW

FACIT 4210

Incremental tape recorder

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- low price
- control unit available
- extremely compact

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151 Sunnyside Blvd.
Plainview, N.Y.

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Fack
Stockholm 7
Sweden

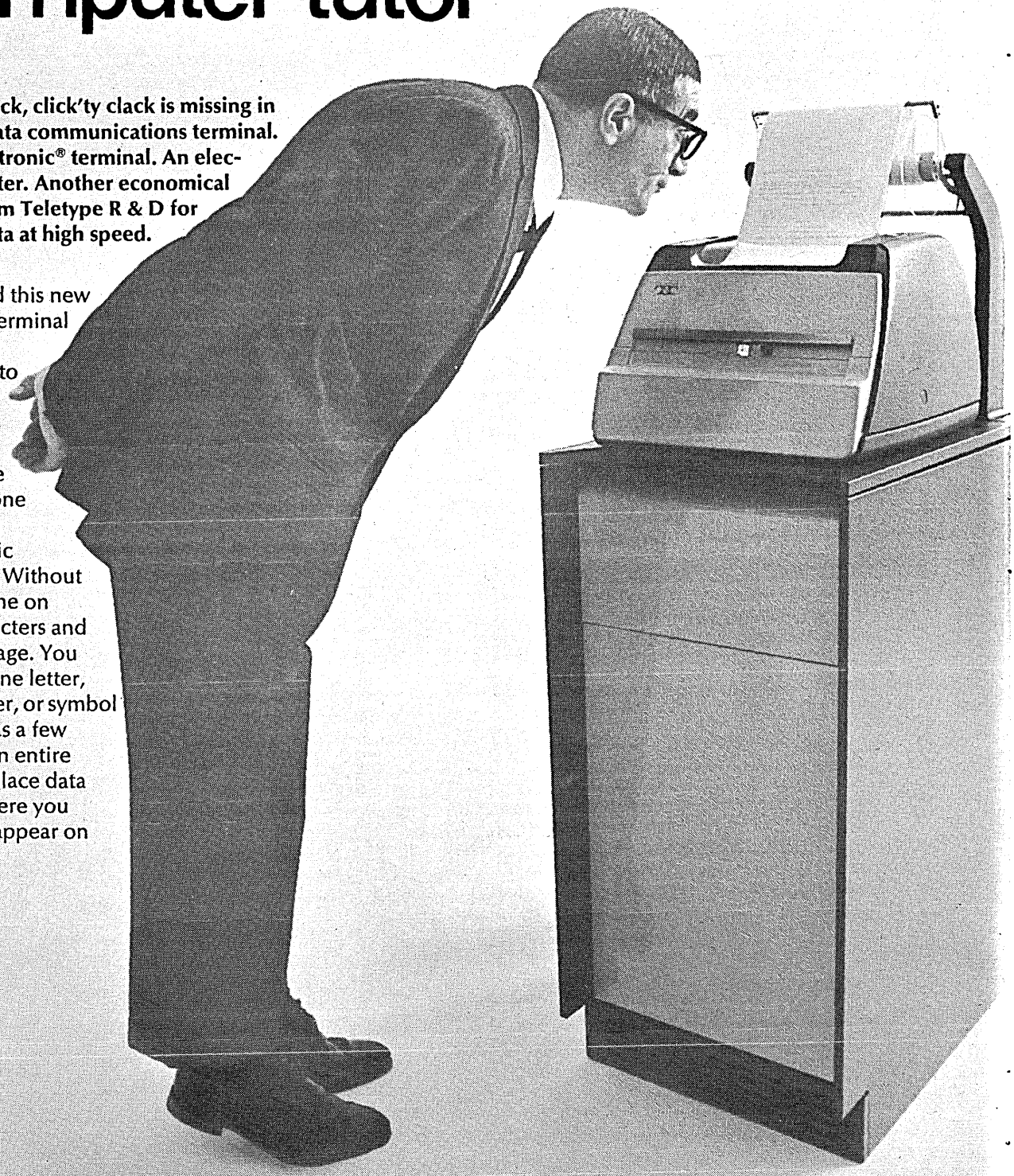
FACIT

CIRCLE 30 ON READER CARD

meet the 1200 WPM computer tutor

The tick, tack, click'ty clack is missing in this new data communications terminal. It's the Inktronic® terminal. An electronic printer. Another economical answer from Teletype R & D for moving data at high speed.

In a second this new Inktronic terminal can jet 120 characters to the page. Ink jets trace out each image —one by one —through electrostatic deflection. Without wasting time on "fill" characters and buffer storage. You can print one letter, one number, or symbol as readily as a few words or an entire line. And place data exactly where you want it to appear on the page.



The Inktronic RO (receive-only) set—first of a new line which will include KSR (keyboard-send-receive) and ASR (automatic-send-receive) sets. Future plans call for even higher speeds for complete utilization of voice grade channels.

See the New 1200 WPM Inktronic® Terminal at the Spring Joint Computer Conference.

machines that make data move

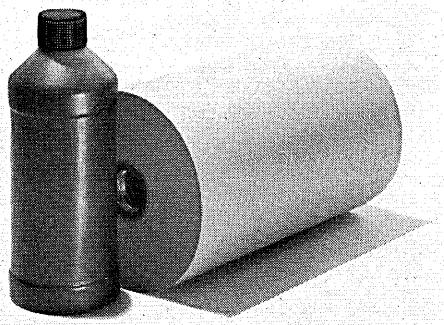
TELETYPE

Look at it this way (shown half size)...

```
        1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890

     THIS IS AN EXAMPLE OF WHAT THE NEW INKTRONIC TERMINAL CAN MEAN TO YOUR
DATA COMMUNICATIONS.
                                                        SEVENTY-TWO OR EIGHTY
                                              CHARACTERS CAN BE PRINTED ON A LINE

            ...AND YOU CAN START PRINTING ANYWHERE.

ON THE LEFT                    IN THE MIDDLE                          ANYWHERE

IN A SECOND, ONE HUNDRED AND TWENTY CHARACTERS JET TO THE PAGE.   THAT'S AS MANY
LETTERS AS THIS PARAGRAPH CONTAINS.
                                    YOU CAN PRINT NUMBERS        12345
                                                                 67890
OR SYMBOLS                    .,'"#%-&'()*;?:/@

IN A CHOICE OF CODE:     5-LEVEL OR ASCII

AND BEST OF ALL, THE INKTRONIC TERMINAL
                         DOESN'T COST VERY MUCH!     $$$$$$$$$$$$$$$
                                                     $     ...     $
                                                     $    . $ .    $
                                                     $     ...     $
                                                     $$$$$$$$$$$$$$$
```

High-speed, on-line computer input-output

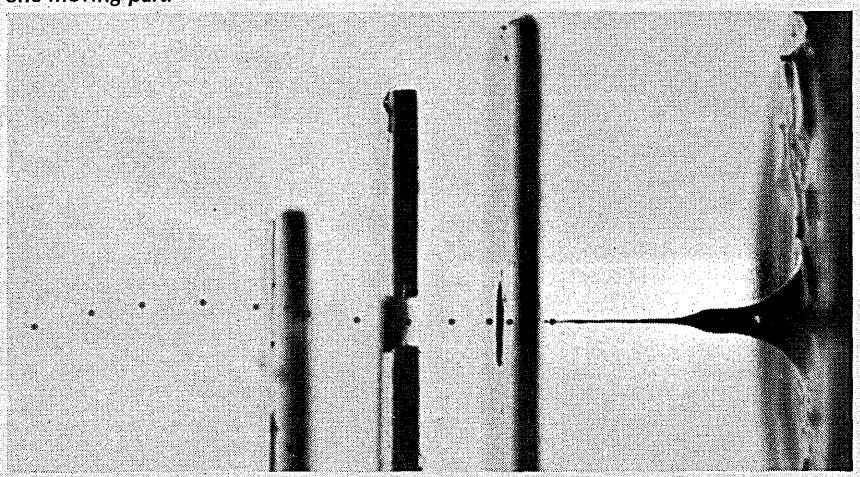
The 1200 wpm capability of the Inktronic printer makes it great for computer input or interrogation, especially in time-sharing systems where the line time is so important. And as a computer output device where large volumes of data are needed in a short period of time. It is also a practical machine for monitoring high-speed tape-to-tape systems.



A few words about ink and paper

The Inktronic printer uses ordinary teletypewriter paper. *Inexpensive paper.* An 8½ inch wide standard roll provides about 400 feet of space to fill. The ink it uses is inexpensive, too. One pint will deliver about 80,000 feet of data. Of course if you don't fill up every line you stretch the pint even further. With 1200 wpm capability this is an important point to consider. And since no ribbon is involved—impressions are made electrostatically—print is never faded. It's always clean, clear, sharp and well defined.

This highly magnified view shows how ink is drawn through metering and deflecting electrodes to form the image on the page. Ink supply and guidance system has *only one moving part.*



The Inktronic terminal is one of many exciting moves being made by Teletype R&D in *moving data at very little cost.* That's all we're really concerned with. Providing equipment that moves data the way you want it moved. Data you can see, touch, and talk about—data you can move a mile, thousands of miles, or just down the hall. Always quickly, precisely, and at very low cost.

If you would like to know more about the new line of Inktronic terminals, write Teletype Corporation, Dept. 81F, 5555 Touhy Avenue, Skokie, Illinois 60076.

CIRCLE 31 ON READER CARD

SEPARATE HARDWARE/ SOFTWARE PRICING?

a one-sided discussion

Five revolutionaries advocated the overthrow of the computer industry before almost 600 witnesses at the SJCC last month. Members of a panel convened to discuss separate pricing of hardware and software, they suggested such blasphemous thoughts as forcing IBM (and the other manufacturers) to price software separately . . . and spinning off IBM's software production activity into a separate company.

The panel members were: Dick Jones, president, Applied Data Research; Tom Marquez, vp, Electronic Data Systems Corp.; Phil Cramer, System Development Corp.; Robert V. Head, president, Software Resources Corp.; and Dr. H. R. J. Grosch, National Bureau of Standards.

Jones based his pitch for separate software prices on the argument that "current pricing practices are in violation of anti-trust laws," and he cited earlier legal decisions forcing United Shoe Machinery, Eastman Kodak, and IBM to refrain from selling their products or services only to those who were already their customers.

His company tried to get the price of an 1130 without software from IBM, but was told that the price was the same. "I wonder," said Jones, "does that mean that their software isn't worth anything or that the price is loaded with things we don't want?"

Marquez feels that the manufacturers are in the business of selling computers—not systems—and that there is little incentive to offer anything more than what will make the machinery function adequately. Separate pricing, he contends, would offer the competition and the incentive to produce "outstanding" software support. Separate pricing, he said, "is inevitable." And he looks for it to come about in three to ten years.

Offering the most realistic ("user's") view of separate pricing was Phil Cramer, who is president of SHARE, the IBM large-scale system users' group. Biggest of these problems, he feels, is that of a "much higher degree of programmer standardization" than that currently imposed on users.

Other problems: definition of performance measurement standards in software selection and evaluation . . . especially in multi-programmed and time-sharing environments; determining the sources of system failures in a multiple-vendor installation; maintenance and distribution of programs.

"Ultimately," said Cramer, "it will be the computer users who will have to insist on the separate pricing of hardware and software." And he suggested formation of "a trade association which the users look to for dealing with multiple software vendors." (He did not mention the Joint Users Group.) Such a trade association would have to have a full-time staff, which would include "contract administrators and writers as well as paid programming professionals, to assist in writing of proposals and contracts and the definition of the necessary programming standards." The trade association could also take over distribution and maintenance of software.

Bob Head struck at what he considers the heart of the matter: IBM's domination of the computer manufacturing industry. IBM support, he argued, is essential to the achievement of separate pricing. He cited IBM's "Robin Hood approach" to pricing, which sees "rich" scientific binary accounts (which require less support than commercial users) "robbed" to help "poor decimal" customers. "IBM and the other manufacturers should be forced to compete in the open market place with non-equipment manufacturers desirous of supplying good quality software to end users."

To bring about separate pricing, Head calls for consideration of the following: 1) Maintenance and allocation of the hardware makers' software production costs within a product line (the 1130 or 360/20, for instance). 2) Require the manufacturer to price and sell software independent of hardware . . . perhaps for application programs only at first. 3) Spin off IBM's software production activity, which Head admits would undoubtedly "result in the establishment of the world's largest software company as a direct competitor to those that now exist." Even so, such a company would allow the user a choice of software from separate vendors.

Concluding, Head called the arguments for "change in current practic . . . cogent and compelling. Howeve

FOR POTTER CIRCLE 32 ON READER CARD →

we must be realistic and concede that change can emanate from only one company or from the federal government."

The renowned, articulate and witty Dr. Grosch, making clear that his "position does not represent current policy in the federal establishment," said that he plans "to propose it in more carefully considered form to responsible officials of the government's procurement agencies, and in particular to the General Services Administration."

In essence, that recommendation will be that the federal government require "bare boat" and "fully found" prices for fourth-generation procurements. He said "'bare boat' prices would include diagnostics and a good assembly system. 'Fully found' would be defined by the specific offering; for instance, a small data processor would not normally offer ALGOL. Alternately, however, the manufacturer might offer as at present a copy of all software generated for the universe of 'fully found' customers."

Grosch added that software suppliers would be encouraged to offer "independent operating systems, magic languages, application-oriented programs . . . " and indicated that sophisticated users with limited requirements or a willingness to write their own systems software "would get the lowest price." Others would bargain for their needs, while "the 'I don't know what I need, so give me everything' boys would, quite properly, pay through the nose."

The leverage of the federal edp budget would do much, Grosch indicated, to make such a policy prevail.

One of the focal points of the discussion which followed the position papers was that of the economic consequences. In answer to a question from the floor, Grosch said that he thought that separate pricing would not substantially reduce hardware prices. This was confirmed by RCA/EDP executive E. S. McCollister, who argued that software costs are not a significant segment of system costs. Asked if separate pricing would reduce hardware prices 5%, he answered, "That is in the correct order of magnitude." But panelist Tom Marquez disagreed, pointing out that software does represent a major percentage of system *prices*.

Many in the audience felt that the panel was too one-sidedly in favor of separate pricing. One of these asked the panel if it *really* thought that competition would produce better software. "I drive a car which is the product of such a competitive system," he said, "and it won't get me across Manhattan." (Subsequent investigation revealed that he drives a foreign car.) "Have you considered," he continued, "the possibility that separate pricing might produce 100 bad OS's instead of one?" Phil Cramer replied that he would take his chances with 100 bad OS's.

Finally, it must be admitted that the panel was unanimous in its support of separate pricing. And it appears to this observer that they failed (with the exception of Cramer) to consider carefully and thoroughly enough the tremendous hurdles—legal, "political" and technical—facing the establishment of separate pricing.

It must be noted, however, that IBM—who might be expected to demur from the panel's point of view—declined an invitation to be represented on the panel. So did the Justice Department.

And at least the panel was articulate and forceful, something that cannot be said of many of the other panel sessions at this year's SJCC. The panel was moderated by DATAMATION editor Bob Forest.

—R.B.F.

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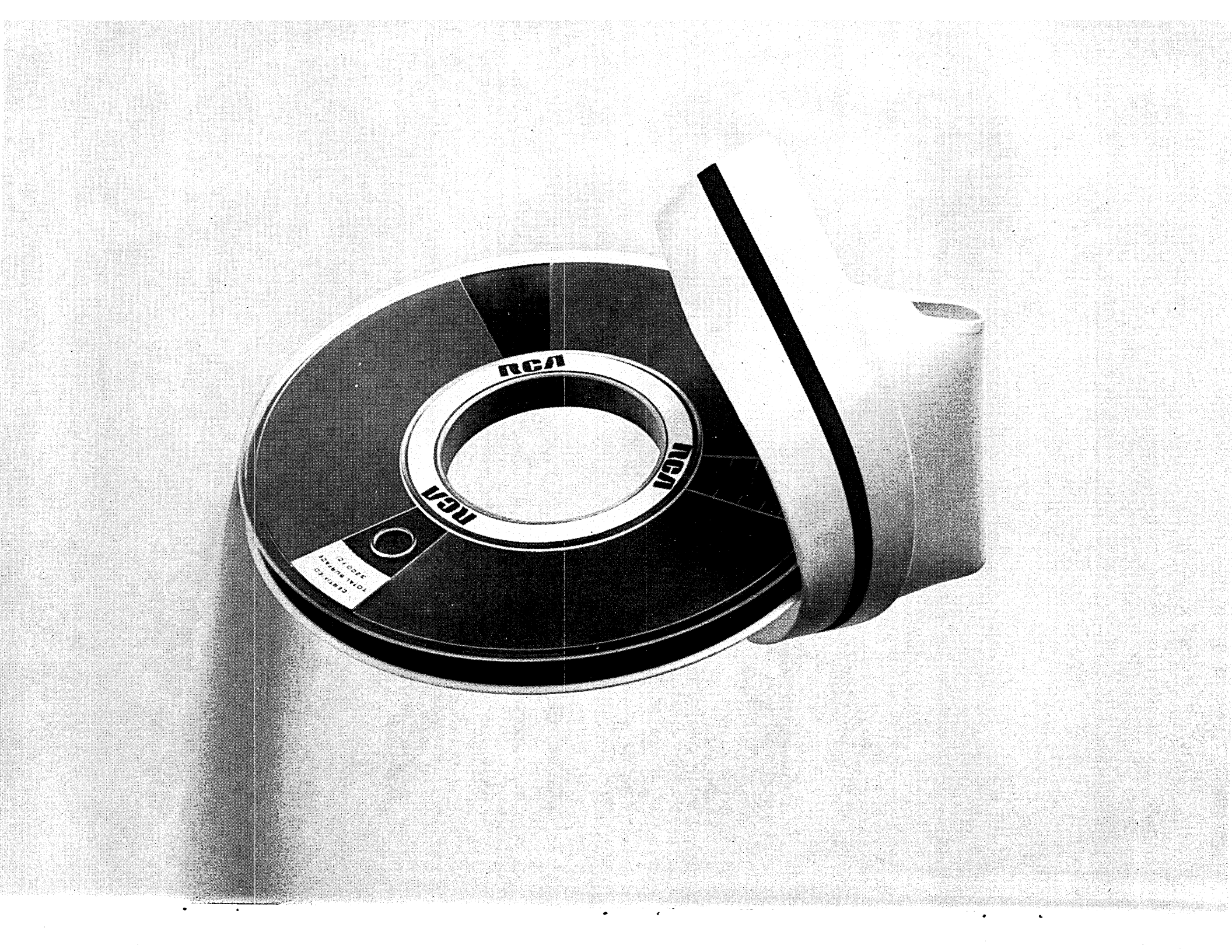
←FOR THOMPSON BOOK CIRCLE 33 ON READER CARD
CIRCLE 34 ON READER CARD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RCA

CIRCLE 36 ON READER CARD

a seminar series

THE 1968 DPMA CONFERENCE

The '68 International Data Processing Conference and Business Exposition, sponsored by the Data Processing Management Assn., meets June 25-28 in Washington, D.C. The pre-conference material says "Washington Welcomes You"—and it's probably truer than ever. The problem-beset Capitol will be relieved to know that the assemblage of dp men headquartered in the Washington Hilton Hotel will protest only the hectic pace of the program, and all the demonstrations will be limited to the exhibit area.

Pre-conference registration will begin Sunday, June 23, from 1:00-6:00 P.M., and will continue through Monday, 8:00 A.M.-9:00 P.M. Registration times for the four conference days are: Tuesday, 8:00 A.M.-9:00 P.M.; Wednesday, 8:00 A.M.-5:00 P.M.; Thursday, 8:00 A.M.-5:00 P.M.; and Friday, 8:00 A.M.-12:00 Noon.

The first full day of the conference, Tuesday, has been devoted to exhibit viewing (over 80 companies are planning to be represented in the Exposition) and tours. Seven tours have been arranged by the conference committee: conferees will have the choice of visiting the Government Employees' Insurance Co., Bethesda, Md.; the Social Security Administration in Baltimore; NASA's Greenbelt, Md. facility; the U.S. Dept. of Commerce, National Bureau of Standards center at Gaithersburg, Md. (two tours: a special visit to observe scientific research; and a general tour of the area and activities of the NBS); the Suburban Trust Co.; and the National Brewing Co. A little vague on the last site, the conference program briefly states, "Primarily a general purpose tour . . ."

On Wednesday, following a morning meeting of the General Assembly, J. Stanford Smith will keynote the conference luncheon. Mr. Smith is vp and group executive at General Electric, and general manager of GE's Information Systems Group.

The formal program, scheduled to begin Wednesday afternoon, has a new format this year: sessions are called seminars, and are grouped into a series that DPMA calls "short courses." Each series consists of three seminars. In addition, ten seminars on topics of wide interest will be held on Friday morning and are offered on an open selection basis. Each conference registrant will have a choice of one series and one Friday seminar.

the seminar series selections

Series 1: Software—Problems and Development
- Seminar A: Operating Systems & Multiprogramming
- Seminar B: Software Conversion Problems
- Seminar C: Disc & Cell File Management

Series 2: New Programming Applications
- Seminar A: File Management & Data Controls for On-Line Systems
- Seminar B: COBOL Standards (USASI)
- Seminar C: PL/I—Pros & Cons

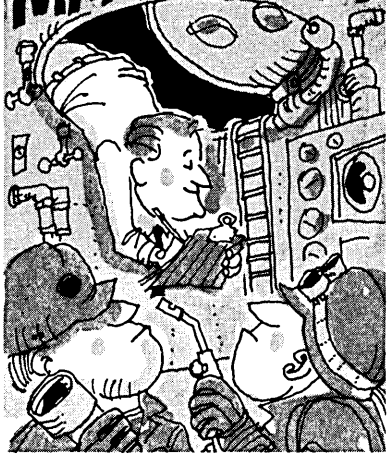
Series 3: Trends in Systems Analysis Techniques
- Seminar A: Systems Investigation, Evaluation & Presentation
- Seminar B: MIS Planning
- Seminar C: Design Techniques

Series 4: Project Management
- Seminar A: Budget & Cost Forecasting
- Seminar B: Estimating, Scheduling & Control
- Seminar C: Systems Evaluation & Conversion Planning

Series 5: Data Processing Education
- Seminar A: Private EDP Schools—Impact & Effectiveness
- Seminar B: The Computer in Colleges &

Problem:

PROJECT MANAGEMENT



Solution:

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Results:

The required reporting structure successfully met the Navy requirements. The marine builders continue to use this control system, with certain modifications in display formats instituted at their request by C-E-I-R, who continues to supply regular consulting and advisory services on the shipbuilder's modification projects.

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CIRCLE 37 ON READER CARD

1968 DPMA CONFERENCE . . .

Universities
- Seminar C: Management's Magnificent Moment

Series 6: Control Planning Techniques
- Seminar A: Data Controls
- Seminar B: Systems Controls
- Seminar C: Control Over Computer Operations & Programming

Series 7: Installation Management
- Seminar A: Conducting Feasibility Studies for Hardware Selection
- Seminar B: Physical Layout Planning & Considerations
- Seminar C: Scheduling Systems & Work Flow

Series 8: Personnel Management
- Seminar A: Personnel Salary Structures, Evaluation & Motivation
- Seminar B: Planning Training Programs
- Seminar C: Selection, Hiring & Training of Programmers

Series 9: Computer Room Operations
- Seminar A: Scheduling and Priorities
- Seminar B: Time Recording & Charging Methods
- Seminar C: Equipment & Forms Considerations

Series 10: Real-Time Systems
- Seminar A: Concept of Real-Time
- Seminar B: The Role of Data Communications
- Seminar C: Control and Programming Problems

All "A" seminars will be held 2:00-4:30 P.M. on Wednesday; "B" Seminars meet Thursday, 9:00-11:30 A.M.; "C" Seminars, Thursday, 2:00-4:30 P.M.

The "Open Selection" seminars to be offered on Friday (9:00-11:30 A.M.) include:
Seminar E: COBOL Standards (USASI); Seminar F: Selection, Hiring & Training of Programmers; Seminar G: Systems Evaluation & Conversion Planning; Seminar H: Physical Layout Planning and Considerations; Seminar I: Personnel Salary Structures, Evaluation & Motivation; Seminar J: Professionalism in Data Processing; Seminar K: Legal & Legislative Developments Affecting the Data Processing Community; Seminar L: "Double Your Effectiveness"; Seminar M: Methods for Conducting Data Processing Review Courses; and Seminar N: Time-Sharing—Concepts and Potentials.

The conference will conclude with a farewell luncheon at noon on Friday. General chairman of the conference is Dr. Marvin M. Wofsey, associate professor of management at George Washington University. ■

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(Park Sheraton)
- ☐ 15-17 July — Project Planning and Control Systems for Data Processing
- ☐ 17-19 July — Documentation & Debugging
- ☐ 5-7 August — Computer Operations Management

WASHINGTON, D.C.
(Sheraton-Carlton Hotel)
- ☐ 26-28 June — Data Communications Systems
- ☐ 8-10 July — Computer Operations Management
- ☐ 24-26 July — Multiple Access Computers (Time-Sharing Today)
- ☐ 5-6 August — Large Scale Systems
- ☐ 5-7 August — Management Information Systems
- ☐ 19-21 August — Documentation & Debugging

(Marriott Key Motor Hotel)
- ☐ 8-10 July — Basic Systems & Procedures (Including Data Processing Concepts)
- ☐ 12-14 August — Project Planning & Control Systems for Data Processing

CHICAGO
(Sheraton-Chicago Hotel)
- ☐ 24-26 June — Documentation & Debugging
- ☐ 21-23 August — Multiple Access Computers (Time-Sharing Today)

SAN FRANCISCO
(Sheraton Palace)
- ☐ 24-26 July — Management Information Systems

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CIRCLE 38 ON READER CARD

worth a try

CAN EDP WIN THE WAR ON CRIME?

On-line data processing applications to command/control systems for real-time management of police resources shared top billing with the problems of riot control at the Second National Symposium on Law Enforcement Science and Technology. Although large-scale civil disorders accentuated the acute need for police resource management, many discussions on law enforcement command/control systems centered on their operational value in a context of the normal day-to-day crime environment.

During the three-day talks held in Chicago, such esoteric topics as a study of gunshot residues by neutron activation analysis, or the use of pyrolysis gas chromatography for the identification of paints and paper, also graced the agenda.

Conducted by the Law Enforcement Science and Technology Center of the IIT Research Institute, the symposium was supported by the Office of Law Enforcement Assistance of the Department of Justice. The stated purpose of this meeting was "to encourage the application of science and technology to all aspects of criminal justice."

Four major law enforcement areas discussed were: (1) sociological—the causes of crime and civil disorders; (2) operations—responding to crime events, riot control and crime deterrence; (3) investigative—solving specific crimes; and (4) analytic—analysis of criminal activity to support management decision-making on the tactical and strategic use of police resources. Except in the sociological area, significant efforts were described which involve the application of electronic processing technology.

command & control

Alfred Blumstein, of the Institute for Defense Analyses, chaired a panel discussion on communications, command and control. The basic objective of police command and control systems is to minimize the field unit's response time to a reported crime, through an optimal assignment of police resources. The computer would bookkeep the location and status of police vehicles and determine which field unit is best able to respond to the reported crime.

In such a system, calls from citizens observing or detecting a crime would be routed to the Police Message Center. Here, the pertinent data, e.g., crime type and address of occurrence, would be entered into the central computer via keyboard. The processing program would transform the address data into a location, then access the data base to determine the unassigned field unit closest to the crime scene. Alternate choices would also be determined.

The crime location, the type of event and suggested unit assignments would be presented to the assignment director on a computer-maintained crt display of the operating environment. The assignment director could accept the computer's suggestion or override it and commit the second or third choice units or multiple units. The unit status file would be updated to reflect the assignment option selected. The display would continue to present the event type, location, and unit assignment data until the assigned unit reported the disposition of the crime.

The assignment message would be made up by the computer and transmitted in digital form via radio for output on the selected vehicle's radio teleprinter or crt display. Police vehicles would be equipped with transmitters or transponders which would output the unit's ID code. Sensors arranged to provide a citywide detector grid would receive the transmitted unit identification code and would retransmit that code plus the sensor's grid location to the command/control system for entry into a field unit location file.

Presently such systems are only conceptual, but the potential payoff in increased resource utilization, operating efficiency, and decreased response time is felt to justify their development price tag, placed at as much as $15 million by some experts. Partial systems utilizing a digital computer to support communications and the dispatching function are currently being planned for the Boston and New York City Police Departments.

The use of a computer-controlled flying spot scanner (CHLOE) to obtain

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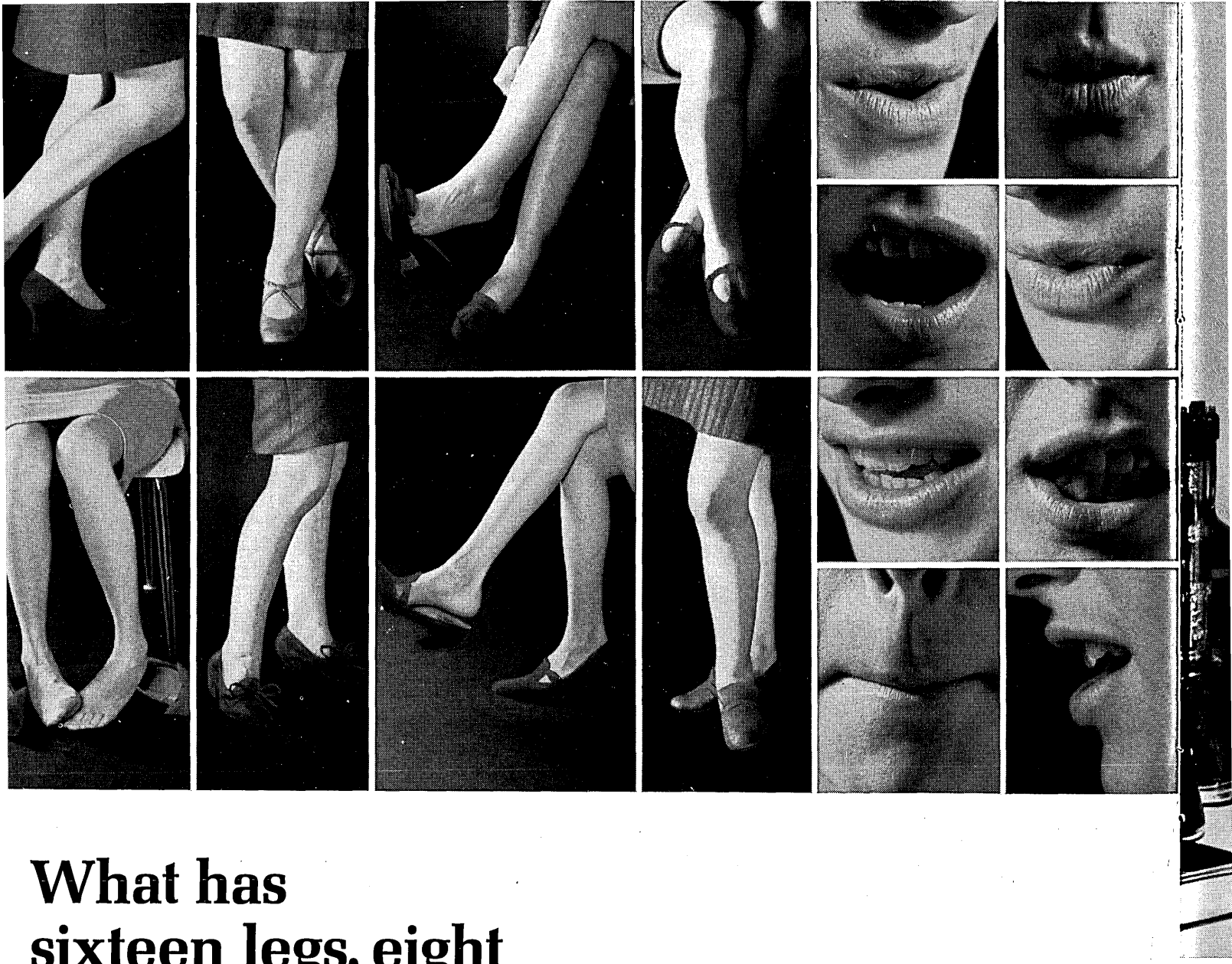

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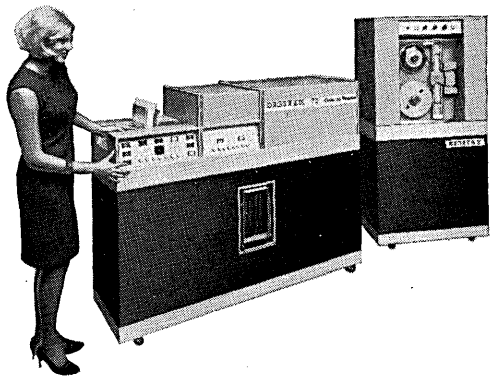

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CIRCLE 53 ON READER CARD

raw fingerprint data and a CDC 3600 to process the data was described by C. B. Shelmont of the Argonne National Laboratory. The objective of the processing is to describe the print in terms of ridge endings per unit area.

A somewhat similar approach to fingerprint encoding and matching procedures for automated recognition systems was explored by T. E. Gaffrey of IBM. The goal would be preliminary identification using special-purpose equipment in conjunction with a digital computer.

G. O. Bradley of Ampex Corp. described a video file system for fingerprint storage and retrieval. A combination of digital descriptors and a video fingerprint image would be stored on magnetic tape. The digital information would provide an index to be searched and when a satisfactory index address match is obtained, the associated print would be displayed for comparison. Nineteen characters are used for the index address and the search program can be directed to ignore one or more characters, thus broadening the search parameters.

This latter project is much less ambitious than the previous two in that fingerprint classification remains a manual function. Its value is in providing large-scale storage accompanied by rapid retrieval, reduced space requirements, and reduced operating personnel requirements.

Final comparisons of fingerprints may, for legal reasons, always require a human match/no-match decision. Nevertheless, progress is being made in the automation of classification and machine comparison of a reference print to prints on file with automatic identification of potentially matching prints.

vehicle registration

The application of edp to bookkeeping motor vehicle registration and drivers license records is a relatively common undertaking. Tying local police Teletype terminals into state systems to permit on-line interrogation of wanted person or wanted vehicle files is a frequent next step. A. E. Hildreth discussed integration of the National Crime Information Center Communications into a state or a local network. The NCIC has 52 remote teleprinter terminals in 15 states handling up to 28,000 interactions per day on user queries regarding stolen vehicles and wanted persons. The interface with local systems is via torn tape or automatic transfer equipment.

New York State has a development program under way to use a video camera to capture the image of the rear of motor vehicles passing a vehicle presence detector. This image is processed by a specialized device which locates the license plate and identifies its alphanumeric code. The code is transmitted to the central computer at a remote location for comparison with stolen vehicle and traffic warrant files. A match results in the output of the license number, vehicle type, and an indication of the charge.

The police vehicle is monitoring the output device a short distance from the detector and is able to enter the stream of traffic and apprehend the wanted vehicle two to three seconds after the initial detection. J. J. Paley of the New York State Identification and Intelligence System expressed optimism as to its potential contribution in the stolen vehicle and wanted traffic violator areas.

A key element in the commission of a crime is the physical presence on the scene of the criminal and his movement to and from the location of the crime. Various detection devices are in existence or under development to determine the presence of a person illegally on the premises. Several detection devices were described and the problems associated with their use were discussed. Tied to alarm systems, such devices can aid in the apprehension of the criminal at the scene. Failing in this, an investigative process begins.

The criminal's movement to and from the scene of the crime is one link in the crime chain that may be attacked using edp. Area patrol observing persons in suspicious circumstances (time, location, etc.) may check them out. If no obvious evidence of a crime exists, they are released but individual and vehicle identification data, time, and location data are entered on a field interview (FI) card. When crimes are detected such suspicious persons become logical suspects and a search of the field interview file using location and time parameters has been demonstrated to be a useful investigative tool.

G. E. Conroy of the Los Angeles Police Department reported on such a field interview system using eam equipment. This system is in operation and is resulting in over 20 "hits" per month of criminals that might otherwise elude apprehension.

T. W. Stoehner of the St. Louis Police Department reported on a Field Interview Report system which is based on an IBM 2040 with a 2302 disc storage file. The FIR file is accessible though remote Teletype terminals. Except when large numbers of records meet the search criteria the

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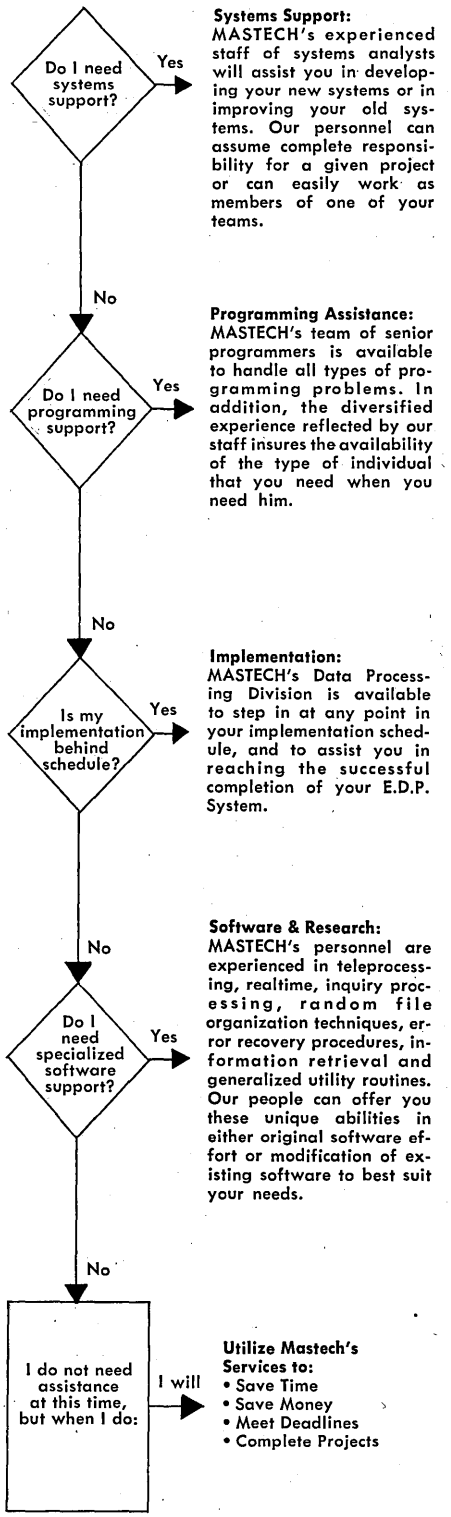

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computer outputs the query response on the input terminal. When large amounts of information are requested (60 individual records or 30 group records), the query response is output via a high-speed printer in the computer center and either picked up by the requesting officer or mailed to him.

predicting crime

The use of a computer to predict criminal activity was discussed by E. E. Hall of the Dikewood Corp. The professional burglar takes items which are readily fenceable. Past analysis suggests that for items such as business machines where a ready market exists, the pattern is to hit a series of establishments on successive nights. If a typewriter store is hit one day, the probability of a similar hit on the next day is .56, on the third day it rises to .60, on the fourth day it drops to .33, and on the fifth day it is .00.

The city is divided into geographic zones which vary as to business type and density. The probabilities of a typewriter hit in each area is computed on the relative density of businesses in each zone. Some structures are more prone to a given type of hit than others. If a specific type occurs, the a priori probability is that it is initiating a series. The probabilities of a repeat occurrence, the area to be hit and the building type to be hit can be combined to derive an optional selective enforcement plan.

Special forces can be deployed to "stake out" the areas having a maximum likelihood of being hit. Such anticipatory allocation of resources will, if a valid reflection of crime patterns exists, permit either a greatly reduced response time after the crime occurs or the apprehension of the criminal in the act. Such an analysis program conducted in real-time using data from crime activity during the previous 24 hours could provide law enforcement managers with a powerful tool for the allocation of limited police resources.

Considering the range of topics discussed there are many functions in the criminal justice area which are amenable to the application of edp techniques. Whether an area of potential application warrants the expenditure of the capital resources required and the relative priorities of several such competing areas of application are other significant questions, particularly in view of the limited dollar resources available.

Clearly, this question must be addressed as the capital resources are not only finite but tend to be quite limited at the local level and that is where most criminal justice activities take place.

That something can be done is not sufficient reason that it should be done. That it should be done does not necessarily imply an elegant or sophisticated solution should be provided. Clearly, a mini-max solution is called for wherein each potential edp application is related to all others with the objective of achieving the maximum benefits for the minimum costs.

What are the trade-offs, for example, between a car locator system using a sensor grid and transponders in the vehicles and one in which each unit has its assigned patrol district subdivided into ten blocks with the patrol officer transmitting the numeric tag of his current patrol subdistrict via radio TTY or even voice? Answers can be provided out of hand but with the price tag associated with any decision such a casual approach is ill-advised. Modeling techniques employing humans for operations simulation and computerized symbolic simulation can provide answers to some of these questions.

This general topic was addressed by C. H. Prevots of IBM in his paper on the application of the techniques in the Department of Defense's Planning-Programming-Budgeting (PPB) system to the criminal justice/law enforcement area. Decisions, however, must be made not just on the cost-effectiveness of the potential systems but also with regard to their consistency with our national ideology of jurisprudence.

The application of technology to as pervasive a function of our society as law enforcement demands that we consider the constraints requisite to maintaining a free society. William W. Herrmann of System Development Corp. raised this issue when he spoke on the application of operations research to the control of riots, "to aim at increasing merely the efficiency of the criminal justice system is a short-sighted means to an end. More technically efficient police systems alone are not enough to maintain order in a free society. Two of the more important considerations in law enforcement planning are the necessity for acquiring a capability and the changing dimensions of our evolving society. These factors must be assessed to avoid creating an advanced law enforcement system that merely reflects a triumph of technique over purpose."

Clearly, if edp holds the promise of being a tremendous weapon in the law enforcement arsenal for use in the war on crime, it is a weapon that must be wielded with care lest it prove wasteful of the public treasure or an infringement of human rights.

—ROBERT J. MILLER

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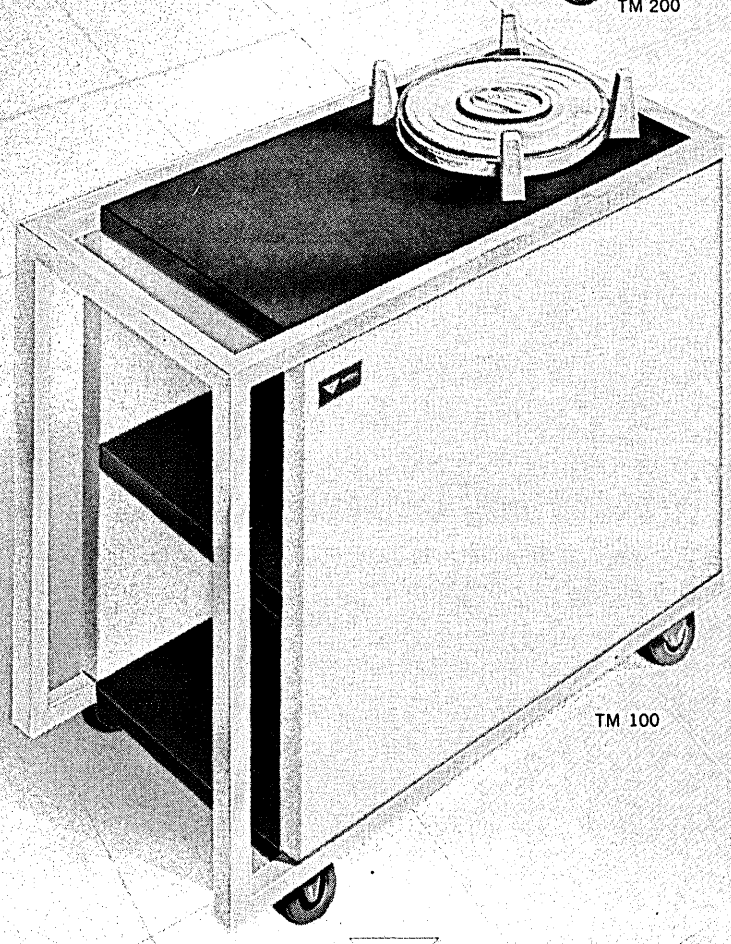

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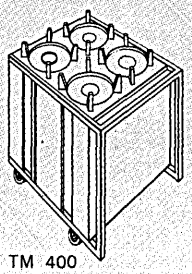

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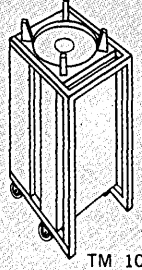

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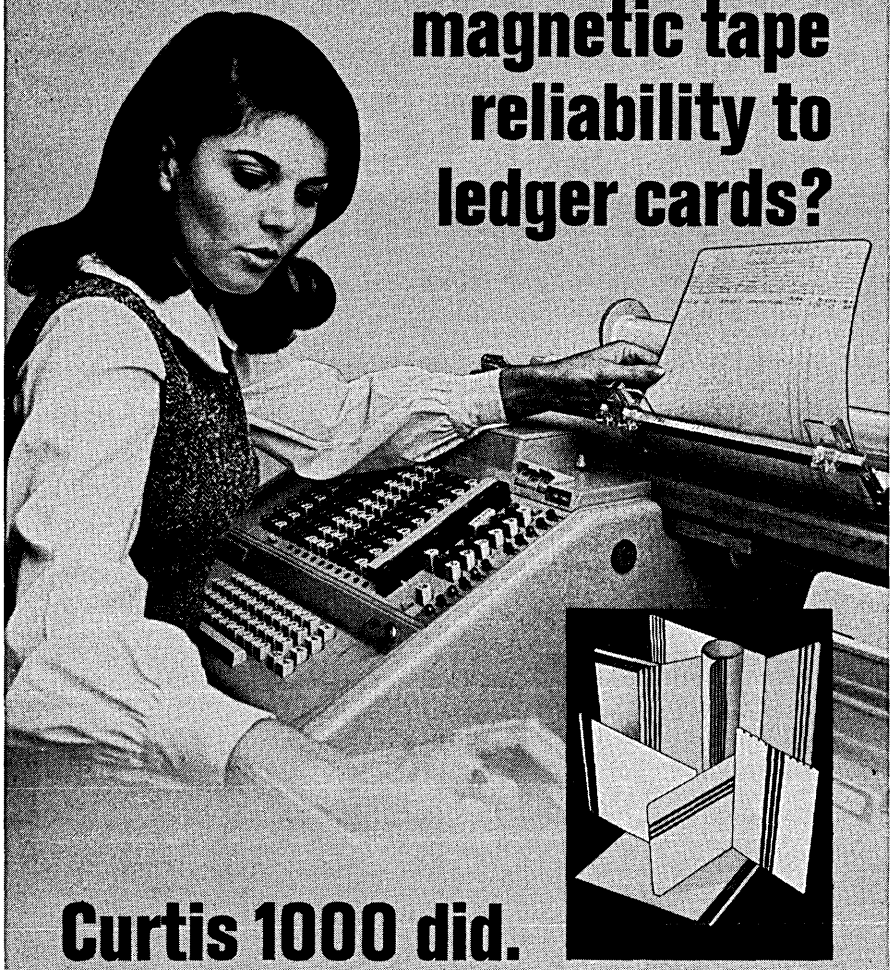

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an acm symposium

EFFECTIVE USE OF HIGH LEVEL LANGUAGES

Computer science, where dost thou go? This question seemed to preoccupy the speakers and audience at the April Bay Area ACM Technical Symposium in San Francisco on "The Effective Use of High Level Languages."

A record audience of over 600 computer scientists, programmers and dp managers gathered to listen to a bevy of distinguished speakers who came from Cornell Univ., MIT, Stanford, Calgary and IBM.

Peter Wegner of Cornell presented a well-organized theoretical study of what is structurally common in programming languages and machines. They can all be represented as "information structures," and as such can be manipulated like other mathematical constructs. His approach, although cluttered with notation which is essentially only his own, gave one hope that computer science will achieve what, according to MIT's John J. Donovan, it still lacks in order to become a full-fledged science. According to Wegner, computer science—"which isn't a science"—will become one as soon as it succeeds in proving some theorems of the scope of Shannon's well-known theorems in communication theory.

Efficiency questions were central to the theme of the symposium. Professor Donovan claimed it isn't enough at MIT to write a PL/I compiler for a Ph.D. (this is merely a Master's project); the prospective candidate is expected to come up with some analysis and proofs why the compiler he chooses is the most efficient one. The notation and conceptual framework for such an analysis might be supplied by Professor Wegner's work.

custom machines

How about the machines? "Give us a machine that we can design" seems to be the message to manufacturers; at least this is what Professor William McKeeman of Stanford advocated. What does his proposed machine look like? Essentially, it should have nothing or next-to-nothing pre-wired; everything should be microprogrammed at the time of installation by the user—even such things as word length, a hardware subroutine-call facility, and in

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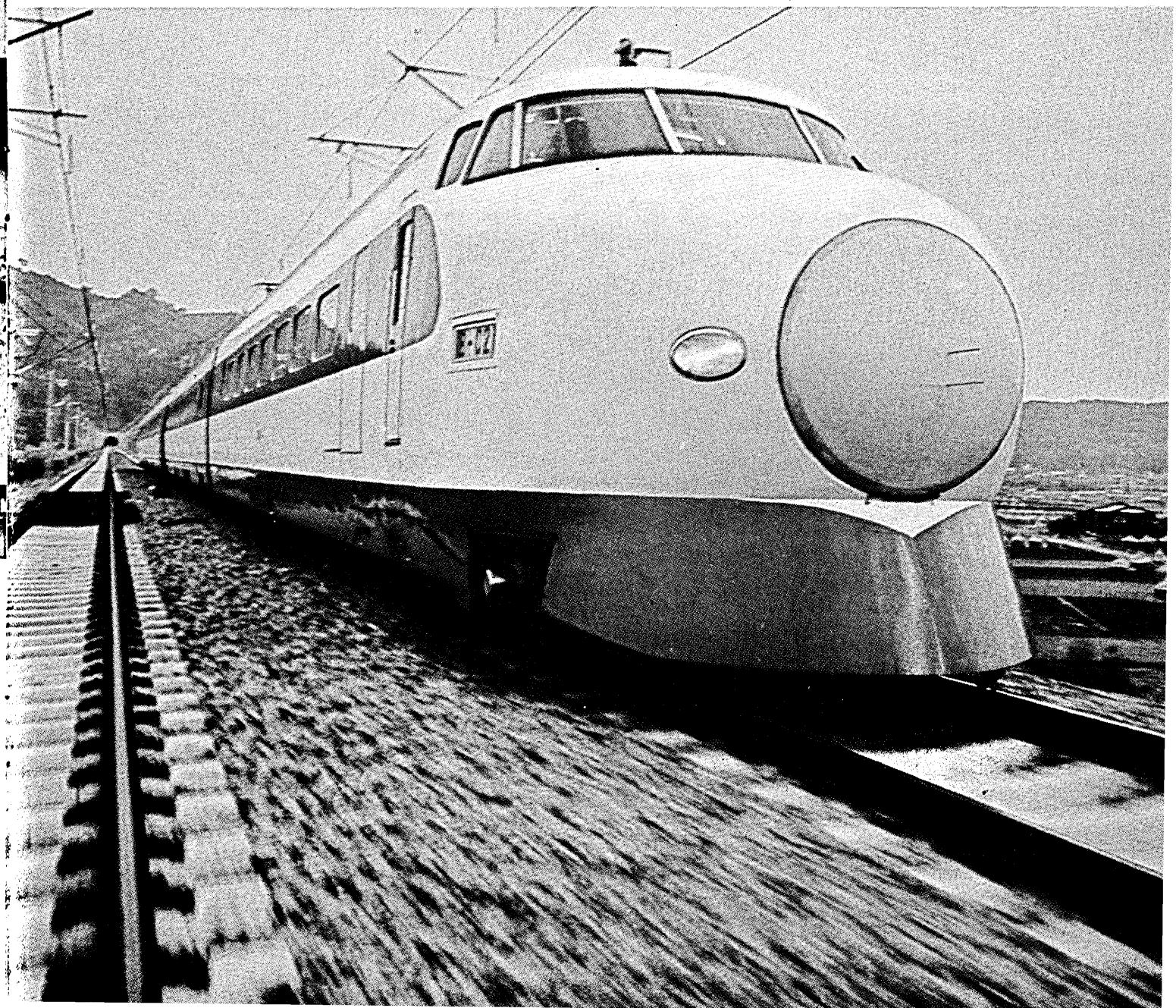

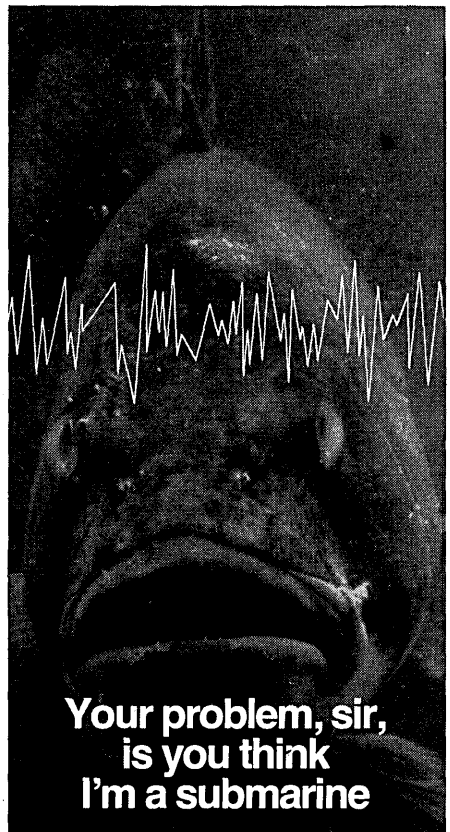

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general, whatever would make the machine efficient for the particular use and programming language currently implemented. McKeeman stated that a factor of *ten* in efficiency could be gained on almost all current systems if there were more flexibility in the machines. The audience objected that there are enough bugs with current systems, and his custom-designed machine would be a nightmare to debug, but he held his ground with the claim that on the contrary, clear designs with the particular use in mind would be easy to debug—although he admitted it is difficult to have a clear-cut result on this question due to lack of data. (Software simulation doesn't help, either.) In any case, he predicted that there will be more custom-microprogramming by programmers on their machines in the next few years.

The difficult question of space allocation in compilers was treated by Mark Halpern of IBM, San Jose. Although efficiency questions of compiler logic can be treated and analyzed as Wegner and Donovan showed, it is much more difficult to attack problems of space allocation which will affect efficiency to a large extent. At the panel discussion this question was further explored: relative merits of program segmentation, paging, virtual memories and their trade-offs with respect to efficiency were discussed but nothing definite was concluded.

the new algol

John Peck of Univ. of Calgary (Alberta, Canada) introduced to the audience (which, according to a show of hands, consists of 75% FORTRAN and COBOL programmers and 25% ALGOL and PL/I) the new ALGOL he hopes will be adopted in '68 by IFIP. The panel found it interesting to note that the new ALGOL seems to be a step backward in the sense that it makes more real word concessions to existing machines than its predecessor, ALGOL 60. Peck argued that this was not a disadvantage as McKeeman seemed to think, but in fact is a virtue of the language which will lead to its early adoption by the computing community.

The symposium was well-organized, ran smoothly and hopefully was stimulating to most of the audience. According to Richard G. Canning (who is a candidate for ACM presidency this year) it proves that successful symposia can be organized by local chapters if a clear theme of wide interest is chosen, and not a number of topics purporting to gather diverse interests.

—STEVE TOROK

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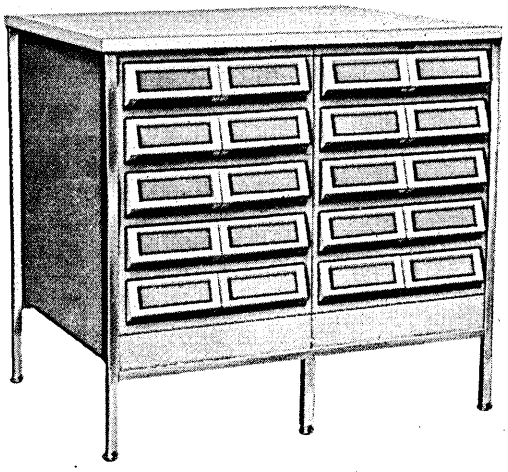

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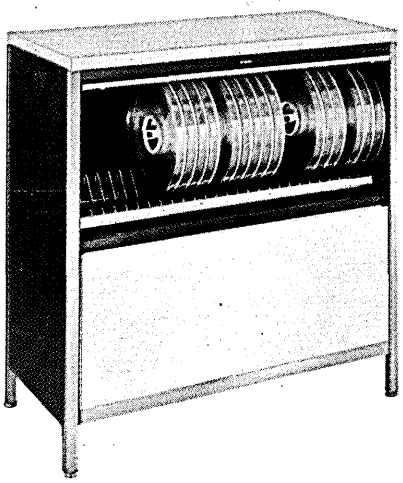

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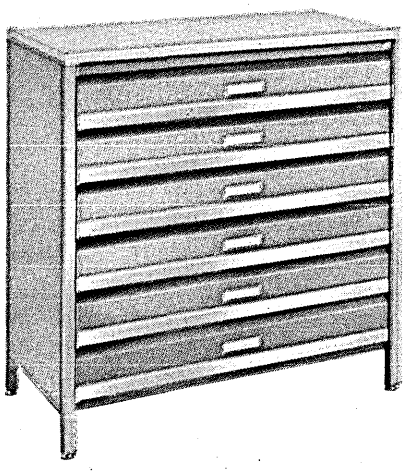

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news briefs

PROGRAM PLAGIARISM ALLEGED IN U.K. CASE

The persistent fear of software men for the safety of their proprietary development has proved justified by a scandal which has come to light on the British computer scene.

The case involves the biggest commercial installation in progress in Europe at the state-financed airline BOAC. Its $100 million project is an international seat reservation system involving banks of 360/50's and 700 Ferranti terminal displays. It was disclosed in the London Times at the end of April that BOAC was investigating the circumstances in which some employees have expropriated information for consultancy work.

This involved alleged plagiarism of sections of the BOAC system, which comprises a combination of IBM's PARS (Programmed Airline Reservation System), the corporation's own $7 million investment for in-house software and work done for them under software contract.

Another American and British software house is understood to be implicated in the case as the receivers of the information. And the irony of the situation is that material was used to gain a contract for another real-time job that involves public funding.

This is the first time in Europe that there have been allegations on the abuse of the confidential nature of proprietary software. Whether the BOAC investigation will show sufficient grounds for action to be taken under British law is yet to be seen, though the corporation has taken some disciplinary measures.

The disclosures have caused considerable consternation among manufacturers and software houses. Immediate comment from people close to the situation was that it showed the need for reinforcing codes of professionalism in an industry that is expanding so rapidly. The head of one of the U.K.'s leading software houses offered an explanation of why this type of situation had been averted till now.

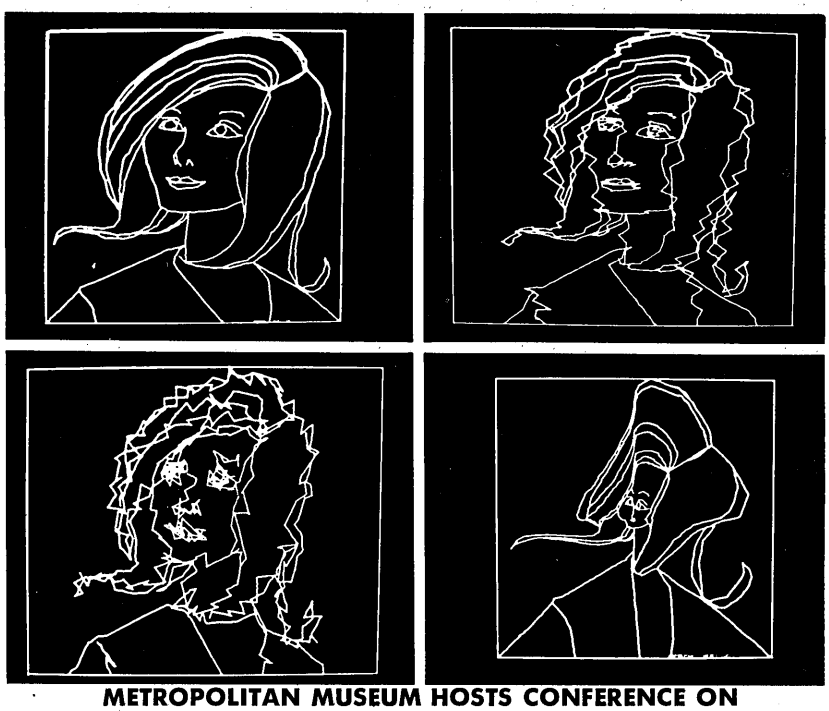
He suggested that the structure of software consultancy had a built-in security until recent expansion. Most of the early houses were run by offshoots of the chartered accountants and actuaries. Their involvement in computers followed from the rigorous early training in which the respect for a client's confidence was as an important part of their institutional membership as was their ability to pass examinations for membership. And the present case may show one of the weaknesses of the system of new straightforward traders in packages.

MA BELL INDICATES WILLINGNESS TO MEET COMPUTER INDUSTRY NEEDS

AT&T Board Chairman H. I. Romnes reported that 3600 bps switched data communication services will be available nationwide "within the year" in his keynote speech to the SJCC. Other highlights:

"Private line data services now handle speeds . . . up to nearly half a million bits per second and we shall be up in the megabit range before the next year is out, if there should be need for such services . . . Our intent is to make interfaces as simple and inexpensive as possible . . . Lower cost data sets will soon be introduced . . . We understand the need for portable (terminal) sets and acoustic coupling."

Romnes explained that the megabit service will grow out of a limited network already operational. Known as T1, it consists of 200K system miles and provides 24 voice channels among Bell system central offices up to 50 miles apart. T1 operates at "something over 1.5 million bps," he reported, adding that T2, with a 6-million-plus bit rate, is scheduled for 1970. T4, capable of handling 600 million bps



METROPOLITAN MUSEUM HOSTS CONFERENCE ON COMPUTERS IN ART

The use of the computer in the art world was the subject of a conference held last month at the Metropolitan Museum of Art, sponsored by the museum and IBM. Several applications in this field were discussed at the meeting; in one experiment, computers are being used to classify and compare sets of coded marks that appear in the patterns of Sevres, an 18th Century French porcelain that is commonly forged.

A 360 computer system is also being used to study aerial photos of southeastern Utah to help plot potential archaeological excavation sites and spot previously overlooked pattern relationships. Information about the artifacts found in the excavations is input to the computer for classification, analysis and retrieval.

Leslie Mezei, an associate professor at the Univ. of Toronto, described how the computer can be programmed to produce art in various forms—realism, impressionism, expressionism—via a graphic plotter. The photograph illustrates the results of minute changes in the computer program.

over a single coax tube up to 4000 miles long, is planned "for the early '70's."

One knowledgeable observer who heard Romnes detected a real willingness to meet the dp industry's demands for faster, more diversified communications. What particularly impressed him was Romnes' statement that "the pace of Bell system progress in response to developing needs for data communications will soon enough make academic at least some of the problems you have emphasized in your replies to the FCC."

Another source felt the reference to acoustic coupling was a hint that AT&T would not continue its adamant opposition to the Carterphone. However, he didn't think this change would affect the company's position regarding foreign attachments in general.

On that point, Romnes told his audience: "I have repeatedly said that we urge the use of suitable interfaces or buffer devices, provided by us, only to safeguard all users . . . we want to make (the interfaces) as simple and inexpensive as they can be and still accomplish this purpose."

"That phrase 'provided by us,'" explained our source, "is the important one."

TIME-SHARING IN A TELEPHONE BOOTH

The telephone strike almost set on-line computing back five years—at least at the Spring Joint Computer Conference. While the professional exhibitors tore their hair out trying to figure out how to put their remote terminals on-line without the union-bound installers, a group of teenagers hooked up their crt keyboard display to a Western Electric computer via a Bell acoustic coupler on a nearby pay telephone. The computer club, called the RESISTORS, emphatically pointed out that they had planned to do this before the strike went on. It was a simple case of economics: they couldn't afford the cost of a data set and regular lines, so they borrowed the coupler from Bell and called the computer, a PDP-8, collect.

The RESISTORS, Radically Emphatic Students Interested in Science Technology or Research Studies, put on one of the most sophisticated demonstrations at the show: the acoustically coupled Computer Communications Inc. crt; on-line Teletypes; demonstrations of the portable Raytheon 1000 tape handler; and one of their own programs written in TRAC language for file protection, French homework, games, communications, and conversational mode scripts.

The reason behind all this was primarily to gain support for the RESISTOR movement. In the fall of '66, nine or ten students from high schools in the Princeton area decided to form the club—primarily to explore computer science and its applications—and to have fun. They discovered that Claude Kagan of Western Electric had a barn in the area which contained a communications museum—consisting of antique record and cylinder players, old switchboards, and a vacuum tube Burroughs 205. Kagan donated use of the barn and equipment at the cost of electricity, and soon commandeered an old PD-250 from Western Electric for them. Flexowriters (one of which is working) and tape drives followed.

Now the students, in addition to learning how to program the PD-250, are also learning FOCAL, (on the PDP-8), FORTRAN, ALGOL, and other languages via two Teletypes in Kagan's kitchen—now hooked up to the WE PDP-8 and the Applied Logic Corp. t-s system in Princeton. Calvin Mooers, developer of the TRAC reactive terminal language system, sold the RESISTORS the first license for public use of the trademarked language and its name for $1.

Now the group wants the idea of the RESISTORS to spread; hence the exhibit. This summer, five teenagers from the underprivileged area of Trenton will be invited to spend their vacations with the members of the club. Much of their time will be spent learning what the RESISTORS have to offer: programming, maintenance and operation of their systems. And the club hopes this will result in a new chapter.

$20 BILLION FOR SERVICES GENERATES HEAT IN CONGRESS

Congress and the Executive Branch argued for three days recently about BOB Circular A-76, which tells federal agencies what kinds of work they can do in-house, instead of by contract, and under what circumstances. The discussion was held before a House GovOps subcommittee. The likeliest result is that Congressional efforts to tighten controls over expenditures for technical support services, which will amount to an estimated $20 billion in the current fiscal year, are going to be delayed if not aborted.

Basically, A-76 requires an agency manager to make a cost comparison before undertaking or continuing an in-house activity that could be farmed out. The cost savings must be enough to "justify" a number of disadvantages —e.g., the tax revenue lost by not hiring a contractor.

A major criticism of A-76 is that it's limited to commercial or industrial products and services. As Comptroller General Elmer Staats explained to the House subcommittee, many contracts undertaken by NASA and DOD are "generally not 'commercial or industrial.'" Instead, the contractor provides people. Staats' point was that an agency could legally let a flesh contract even if hiring the same people directly would save more than enough to meet the strictures of A-76.

The Comptroller General cited six government activities "which we believe are clearly not definable as industrial or commercial but which are nevertheless operated by contractor personnel." Most, if not all of them, involve adp support. The activities mentioned were DOD's Dew Line and BMEWS systems, NASA's Apollo center in Houston and its tracking and data acquisition network, and the eastern and western test range facilities of the Air Force.

Staats added that some personnel services should not be contracted out under any circumstances because it violates the civil service laws. He alluded to last year's decision by the Civil Service Commission forcing NASA to cancel two contracts at Goddard for that very reason. One contract has been won by Melpar, the other by Electro-Mechanical Research. "Guidelines are needed," said Staats, "which would clearly establish the distinction between (commercial) products and services and (personnel-type) services."

But Edward Wagner, executive director of the National Council of Technical Service Industries, insisted that "there is no difference . . . between products and services and therefore two sets of rules are not necessary. (Rather), a single set of procurement guidelines . . . should prevail." He added that "it is less costly for the government to contract for support services . . . than to undertake that responsibility 'in-house.'" NCTSI's membership includes Computing and Software, Litton, RCA, and Computer Sciences.

Since BOB controls the fate of A-76, Deputy Director Philip Hughes was questioned with particular intensity by the subcommittee. The chief inquisitor, Rep. Porter Hardy of Virginia, pursued Hughes through several pages of transcript trying to make him admit that A-76, as now written, doesn't adequately cover contracts for personnel services. The chase ended in a confused shouting match with Hardy loudly proclaiming that Hughes has finally capitulated. According to the transcript, however, Hughes had

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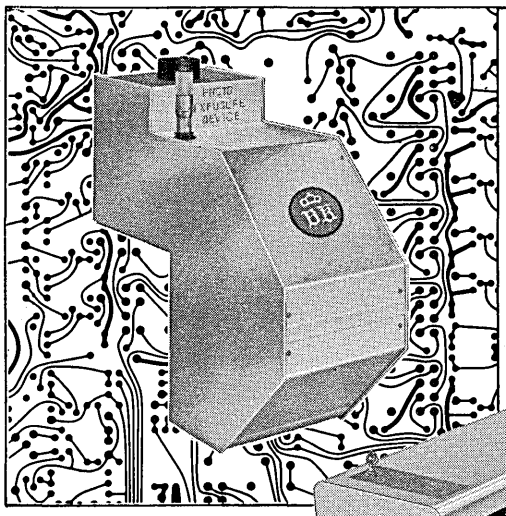

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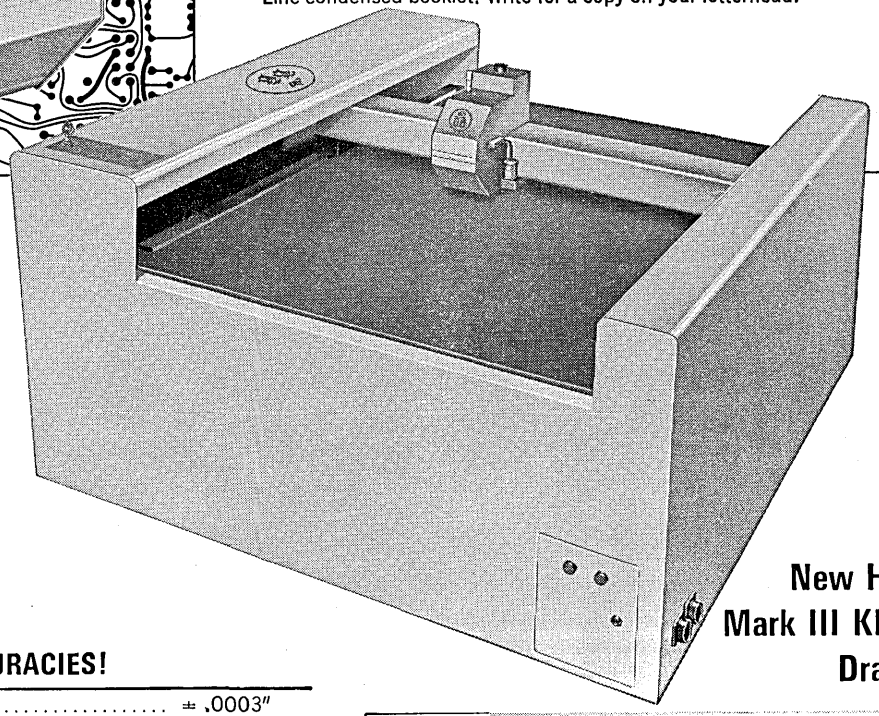

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CIRCLE 47 ON READER CARD

FOR MEMOREX CIRCLE 48 ON READER CARD →

Dome interiors: Left, BASILICA OF ST. PETER, Rome; photo by Mario Carrieri, courtesy of George Rainbird, Ltd. Right, CATHEDRAL CHURCH OF ST. PAUL, London.

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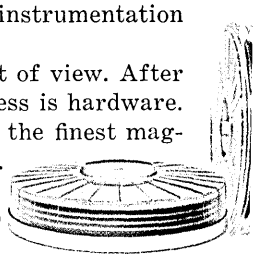

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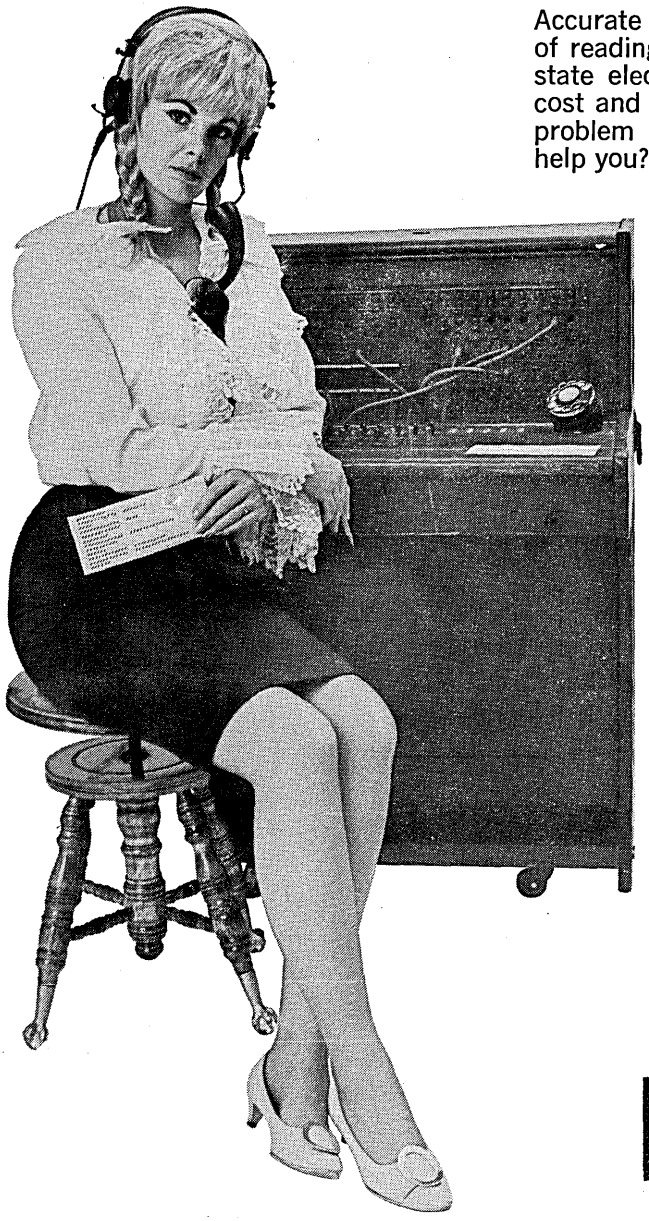

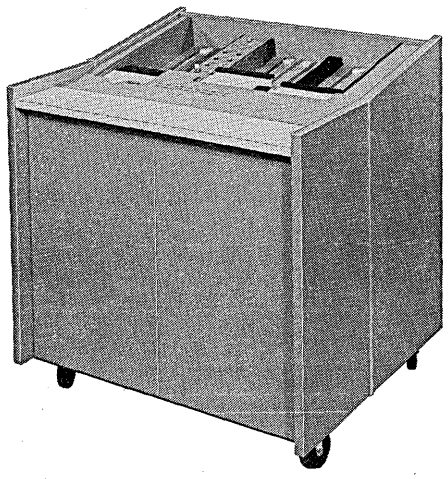

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CIRCLE 49 ON READER CARD

said only that "I think portions of the circular are applicable to industrial and commercial . . . " at which point he was interrupted and the remainder of his thought was lost to posterity.

After the hearing, Hughes told DATAMATION that BOB doesn't plan to revise, supplant, or supplement A-76. Instead, the agency will "clarify" certain sections. Apparently, more pressure will be needed to generate the separate guidelines advocated by Staats and Hardy.

A more immediate possibility is that some jobs now being contracted out will be placed off-limits. GAO and the Civil Service Commission are now reviewing last year's opinion in the NASA-Goddard case "in an effort to agree upon a supplement more clearly defining its scope," the Comptroller General told the subcommittee. A CSC source, interviewed later, told us that "one more meeting ought to do the trick." A three- or four-page addendum to the opinion is contemplated that will establish guidelines for distinguishing the jobs that must be performed in-house from those that can be contracted out.

COMPUTERMEN AND SHEEPDOG FANS READY FOR MEETINGS

The Game Fair in Perthshire, the National Sheepdog Trials, the National Pipe Band Contest, the Strathallen Highland Gathering . . . in the midst of these colorful annual events in Scotland IFIP Congress 68 will gather experts in the information sciences from all over the world.

The triennial congress, to be held in Edinburgh Aug. 5-10, will present 35 invited speakers, a total of 200 papers selected from 600 submissions, and the wares of 68 manufacturers and publishers. Areas of coverage are broadly grouped under mathematics, software, hardware, and applications. Major organizers of this meeting are Dr. A. P. Speiser, IFIP president; Congress chairman B. B. Swann (Ferranti Ltd.); and technical program chairman F. Genuys (IBM France).

Among the invited speakers by country are: Australia—A. D. Smirnov, G. A. Rose; Canada—Thomas E. Hull; C.S.S.R.—I. Babuska; France—B. Vauquois, H. Le Boulanger; Germany—K. Nickel, H. Kazmierczak; Japan—E. Goto; Netherlands—W. L. Van der Poel; Norway—K. Nygaard, O. J. Dahl; Poland—S. Waligorski; Switzerland—P. Bagge; U.K.—S. Michaelson, C. A. R. Hoare, T. Kilburn, D. W. Davies, A. Q. Morton; U.S.A.—J. J. Baruch, E. Bloch, R. A. Henle, A. Borsei, A. Bos, F. J. Corbato, J. H. Saltzer, E. A. Feigenbaum, G. E. Forsythe, E. Horwood, W. J. Karplus, J. A. Robinson, G. Salton, L. Schoenfeld, P. Suppes; and U.S.S.R.—V. N. Faddeeva, S. V. Yablonskiy, S. S. Lavrov, G. T. Artamonov.

The U. S., whose committee is headed by Dr. Donald Thomsen, Jr., of IBM, is also providing 100 of the 200 papers in the technical program. For those in the U.S. who have last-minute inquiries, address them to U.S. Committee Office (IFIP 68), 345 East 47th Street, N.Y., N. Y. 10017.

An inter-denominational service at Saint Giles Cathedral, Sunday, Aug. 4, will mark the beginning of Congress 68. After the opening session Monday morning, the pattern of the Congress will be thus: each morning two invited papers and four technical sessions; from 2-4, three invited papers and four technical sessions; and from 4:30-6:30, a panel session, special session with three invited papers, and three technical sessions. Wednesday afternoon, the Lord Provost of Edinburgh will host a garden party and reception given at Lauriston Castle, which overlooks the Firth of Forth.

Other social events will include a concert of Scottish traditional music, Tuesday evening, and a Congress dinner on Friday. There will also be numerous half-day visits to dp installations and several holiday tours of the countryside.

An exciting prospect for those who can remain after the Congress is the three-week Edinburgh Festival, Aug. 18-Sept. 7. Details on this are available from festival offices, 11 Cambridge St., Edinburgh 1. Generally, past festivals have provided an illustrious mix of ballet, opera, symphony, jazz and theatre, along with the more traditional spectacles of pageantry, such as the Edinburgh military tattoo.

BROOKS VS. SMITH OVER IMPROVING NBS EDP CENTER

Congressman Jack Brooks, whose persuasive powers are almost a legend on Capitol Hill, met a kind of Waterloo April 30. The battle revolved around his desire to upgrade the Center for Computer Technology at the National Bureau of Standards. Wellington was played by the new Secretary of Commerce, C. R. Smith; NBS is a Commerce Dept. subdivision.

Brooks spent some time telling Smith that moving the center upward on the NBS organization chart would save many dollars and help attract needed technical personnel. At the end of this peroration, Smith asked for a comment from Dr. Allen V. Astin, director of NBS. Brooks objected. Astin, he pointed out, was not in a position to make a decision, only a recommendation.

"If he (Astin) recommends it," retorted Smith, "it will probably get done. He runs the department."

Dr. Astin subsequently denied that he opposed upgrading the center. That move "has been my long-range plan," he explained. But there are difficulties—primarily the unwillingness of Congress to give the center enough money. Brooks implied his group would help resolve this problem —provided the director gave higher priority, in his budget request, to the center's mission. Astin insisted that he "has always considered adp at the top of our program."

Brooks went on with the doggedness of a door-to-door salesman. Addressing Smith, the Congressman explained that he was merely trying to encourage Dr. Astin to reach a decision which the NBS director had been evaluating for a couple of years.

Dr. Astin "is not a timid man," answered Smith. "He will bring it up in due time."

"Don't give him that option—in due time—" Brooks advised, or warned, the new Secretary.

FIRST PROGRAMMER CLASS AT SING SING GRADUATES

Sing Sing's first programming class graduated last month. Fourteen students, high scorers on IBM's programmer aptitude test, have gone through a seven-month Electronic Computer Programming Institute course to learn 360 BAL, COBOL, and RPG.

The next step in the program, now being worked out with New York State correction authorities, may be marketing the services of the graduate-inmate. International Systems Assoc. and ECPI hope to get firms to farm out work to Sing Sing programmers, and the fees (since inmates are not permitted payment beyond a dollar a day) will go to charity. ISA, a New York consulting and service bureau firm, also intends to hire many programmers on their release. The first class should be released within 15 months; one student has already been paroled but has been returning for classes.

Other correctional institutions are also encouraged by the progress of data processing classes for inmates. Indiana State Reformatory now has 14 men in dp classes and has graduated many more (since released and placed in jobs). Although the donated equipment is of museum quality (such as a round-holed keypunch), the educational program has been rated as solid by visiting industry recruiters. Class graduates at Indiana do all the reformatory's dp work; an In-

diana state law forbids inmates to compete on a free enterprise basis with laborers "on the outside." Prison officials, however, are hopeful this law will be modified to allow inmates to do work such as that proposed for the Sing Sing graduates.

CONGRESS CLAIMS ADP INVENTORY IS INADEQUATE

The Joint Economic Committee of Congress opened an old wound April 29 when it charged that an adequate inventory of adp gear furnished to federal contractors "has not been developed." The committee report referred to "government-owned" adp equipment in the hands of contractors, but a JEC spokesman subsequently told DATAMATION that his group is also interested in hardware acquired by contractors and paid for by Uncle Sam.

The latter category is much larger than the former. According to another source, government-financed, contractor-furnished dp gear accounts for about one-third of the $3 billion annual federal adpe expenditure.

GFCF dp hardware, since 1962, has generated at least 29 critical reports from the General Accounting Office. A detailed DOD study in 1965 recommended improvements in the Pentagon's management of contractor-furnished dp equipment. This hardware also was the subject of a protracted struggle during consideration of the Brooks bill in Congress that same year.

Today, according to one high-ranking government adp manager, "we don't have a comprehensive inventory of contractor-furnished systems." Another says there is an inventory but it isn't complete. He insists that achieving completion "is not a major problem."

Reportedly, GSA is thinking of requiring all government contractors who buy or lease adpe at government expense to send the agency a copy of each purchase order. Another idea under consideration is to have the government acquire the equipment and rent it to the contractor. Legislation may be required to implement the first proposal, and the contracting agencies are said to oppose the second. Still another problem is that the agencies define "contractor-furnished" adp machinery differently.

While the outcome is murky, it seems clear that the JEC report has refocused attention on a subject that most contractors, and at least some federal dp managers, would have preferred not to talk about.

The JEC report also criticized the executive branch for inadequately inventorying the federal government's in-house systems. This is a charge that the responsible agencies, GSA and the Budget Bureau, deny.

"There is also evidence that government (adp) procurement practices have tended to favor the larger manufacturers, thus stifling competition," said the joint committee's report. "Testimony . . . indicates that the numerous smaller producers of . . . peripheral equipment might well participate to a larger extent in furnishing the government's requirements directly."

This was a reference to charges made at the committee's hearings last fall by Lewis R. Caveney, Bryant Computer Products assistant vp. He insisted the independent peripheral makers were squeezed out of federal adp system procurements, and named DOD the major villain.

THE PROGRAMMER HUNT GOES INTERNATIONAL

Noting that the programmer shortage is estimated to top 50,000 by 1970, H. F. Jensen, president of Computer Planning Corp., Torrance, Calif., predicts that programming will soon follow the ways of the hardware people and seek the skill in the cheaper foreign market.

Already proceeding on this principle, CPC is working with foreign programmers in a country they decline to name, where IBM has trained the masses. The programmers, supervised by firm members who spend two weeks a month on location, are working in all languages, primarily on 360 equipment. Most of the work is business-oriented, but the company says the people are not limited to business applications.

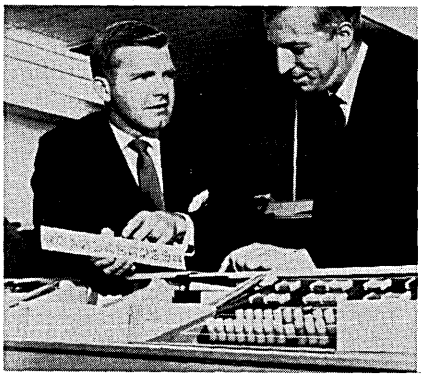
Computer Planning Corp. is a new software house which also offers a service center and a consulting and training program. Initial emphasis is on development of bio-medical, banking, manufacturing, terminal and credit card systems, and compilers. President Jensen, a refugee from IBM, and executive vp Nolan Draney, formerly of Litton Industries, head a staff of 22.

From Japan, Com-Stute, Inc., is seeking stateside contracts for the services of its group of 12 programmers, located in Yokohama.

GE'S OPTICAL FONT GETS FIRST-STEP USASI APPROVAL

The GE proposal that its optical character recognition type font COC-5 (Coded Optical Character 5-bar code) be made a USASI standard passed through the first stage of approval in April. USASI committee X3 voted 19-1 to put out this proposal for letter ballot, a procedure which should be completed some time this fall. The COC-5 numerical font, if approved, would become the third standard OCR font, along with E13B, which uses the MICR technique, and its international counterpart.

COC-5, which uses five irregularly spaced vertical lines for each number,



has been tested on GE-200 and 400 series computers for two years and is said to be five times more economical than "similar systems." This is because of a lower reject rate than MICR, which GE also developed, and the fact that it can be read at 1200 documents/minute—said to be more than twice the speed of most optical read-sort systems. COC-5 also does not require use of special inks nor are its printing requirements as stringent as those for MICR.

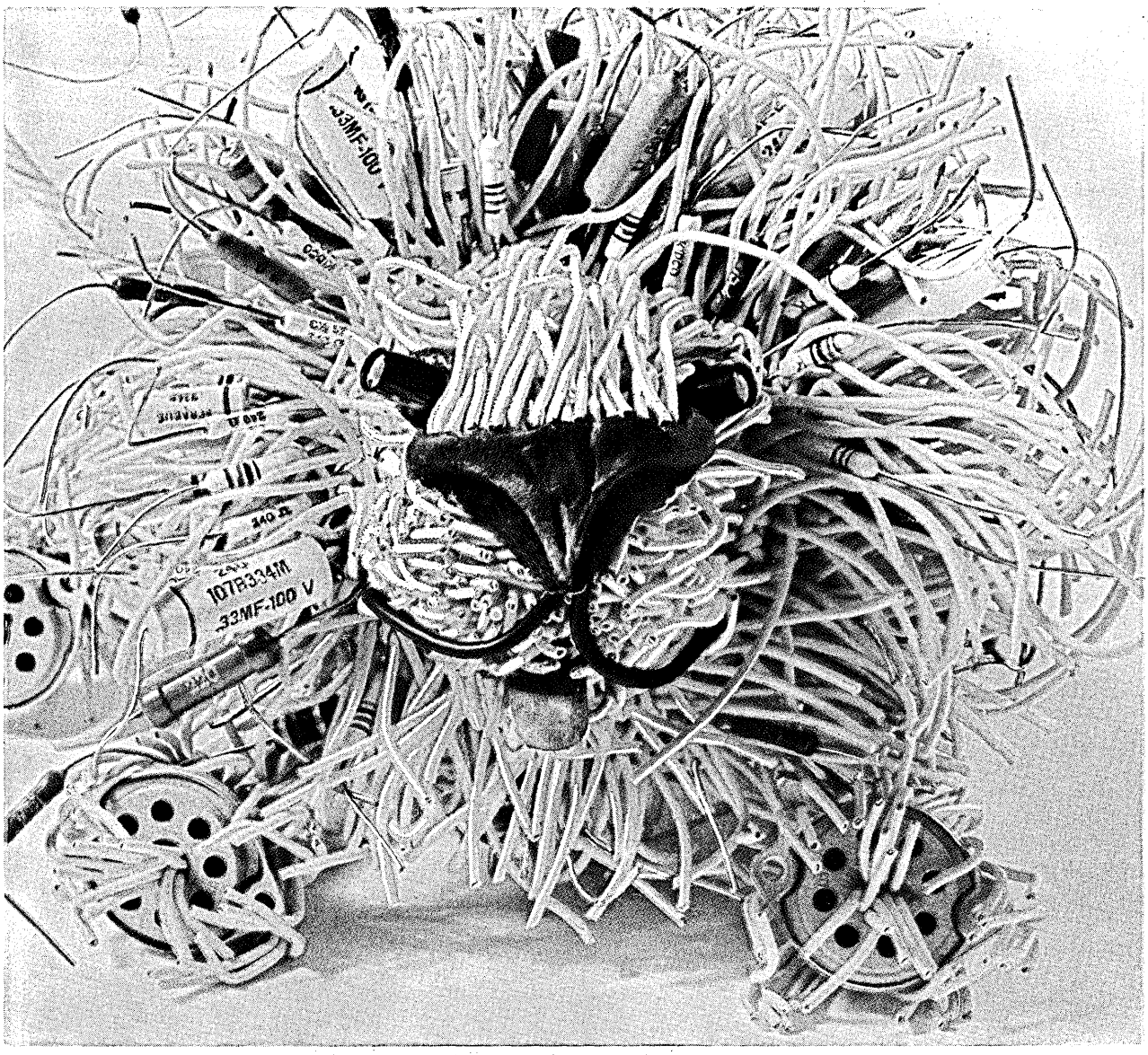
COC-5 can be printed by line printers, typewriters and offset techniques; takes only one line vs. multiple lines for bar fonts, which are not humanly readable; is not sensitive to vertical paper movement in printing; can be read forward, backward and upside down; and is scannable by present OCR readers.

U.K. DEVELOPS TRAINING PLAN; DISTRIBUTION IN U.S. LIKELY

The U.K.'s National Computing Centre may be solving the desperate problem of training systems men. Less than two years since formation, the centre has turned out an education package which has been distributed to universities and colleges. And the same package may soon be available in the U.S. and in the rest of Europe.

IBM's education systems subsidiary, RSA, is to take over the package for distribution in the U.S. Devising training schemes has been the prime job of the centre and about 1,500 students are expected to complete its major course this year.

Although there are other training



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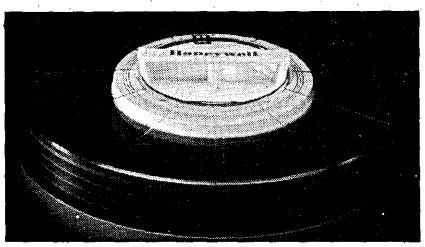

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It's performing royally right now. Thousands have been delivered, and we're ready to deliver to you immediately.

Care to arrange for a command performance?

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projects on its schedule, the NCC is stepping up diversification and gaining more independence as more commercial and industrial users are taking up membership, thus giving the organization more freedom from its sponsor—the Ministry of Technology.

Regional associations have been set up which are starting to operate like a joint users group. Their complaints are fed back into the centre's own manufacturer's liaison group for thrashing out with the industry. Top of the list in this discussion is an appeal from the state-financed public utilities and nationalized industries that are desperate for a standard commercial language. London University's Institute of Computer Sciences' work on BCL stands a good chance for the job. The NCC has taken it up for evaluation and with the London men may develop it as a standard. Manufacturers' acceptance is slow in coming—in cash backing—though there is no antagonism in principle.

The centre is backed this year to the tune of $1.5 million from the Ministry of Technology with about two-thirds again coming from subscribers. Already finding its feet, the organization will really develop some teeth when the members provide over half the financing. And under its forceful director, nuclear physicist professor Gordon Black, this could happen by year's end. He has pushed the unit beyond the limited scope envisaged by its sponsors who expected an ultimate staff size of 40-50 built up over four to five years. Black now has 150 men involved.

MEMORY EXPERT FORECASTS LOWER PRICES SOON

Ned Buoymaster, president of Ferroxcube Corp., believes that a one cent/bit mass core memory will be on the market "within the next year or two." By 1972, he told an SJCC press conference, annual sales of these memories should reach $400 million, up from an estimated $25 million in 1968. Buoymaster added that 20-25% of the '72 market will be supplied by non-captive manufacturers. Also, by '72, mass core memories will be strong competitors of discs and drums.

These forecasts accompanied the unveiling by Ferroxcube of a randomly addressable, immediately available, mass core memory with a 524K byte storage capacity. The new unit has a 105 deg. F ambient temperature limit, which "eliminates the need for placement in air conditioned computer rooms," the company said. It was also reported to offer "the optimal compromise between cost, bit transfer rate, and capacity." Specifically, the memory features a 2½D selection organization, 2.5 usec cycle time ("fastest mass storage offered today"), and a 1.2 usec access time. The byte size can vary from 9 to 144 bits. The memory is priced "as low as" 1.4 cents /bit, said Robert Derschang, marketing manager. It was developed by N. V. Phillips of Holland. Ferroxcube thinks the major market will be in multiple-access time-sharing, airline reservations, automatic typesetting, and medical diagnostic applications.

The company also announced a $200 price reduction in its FI-1, 1024-word by one bit memory, which formerly sold for $650. The FX-12 line, offering capacities of 128 to 1024 words, was cut $27-400 per model.

Three new groups of memories, comprising 11 models, were introduced. They consist of 16K by 6 bits, 16K by 8 bits, and 8K by 16 bits-per-word systems. A "representative price" for these new units is $7700, said the company. That investment would buy a 16K-word by 8 bit model having random access, address register, and memory retention.

NEW FIRM LEASES SOFTWARE

Data International, Minneapolis, is a young leasing company with a unique feature: software leasing. Built on the ideas of Dr. John Doede, former head of EMR's software and long range planning, DI began operating Dec. 1, 1967. The company has three functions: software leasing, aiding a manufacturer by setting up a subsidiary leasing company (part of DI which the manufacturer may later buy), and hardware leasing.

In its first five months DI had revenue of over $1.5 million and has commitments for a like amount; three-quarters of the business thus far has been hardware leasing (CDC 3000, DEC 9, 10, IBM 360/20-30).

Software leases usually are for three years at 3.4% of the purchase price per month; a four-year lease carries a 20% discount. Software leasing takes three forms: supporting software maker marketing efforts by leasing proprietary packages to users (DI buys each package for a single transaction, does not get rights to the package for further re-issue); a large package for a single user (such as a small computer manufacturer needing a FORTRAN package); or purchase-leaseback. An example of the advantage to a small user needing a $10K payroll program is that he not only can get it for $345 a month instead of a single large outlay but would also get help in choosing a program best for his needs.

Leases carry the standard warranties and stipulations on maintenance. Changes in programs are made by the original programmers, at extra charge; DI does not create software.

The bulk of the software business is in packages costing $5K, $10K, and $15K, but DI will consider packages up to $100K. So far, most are application programs.

ITT'S EXPANDING NETWORK ADDS TIME-SHARING SERVICE

Having developed a service bureau network in seven cities, ITT Data Services recently unveiled a time-sharing service now offered in the New York, Boston, Los Angeles, and Washington, D.C. areas. The Reaction Terminal Service, RTS, employs ITT-developed software on the 360/50's located in regional centers in Paramus, N.J., and El Segundo, Calif. The 50's can handle up to 100 terminals, 50 simultaneously. As demand increases, the service will go onto 65's in these centers, handling 300 terminals, 150 simultaneously.

Fourteen customers tested the system for two months with such applications as sales analysis, investment portfolio analysis and electronic circuit analysis.

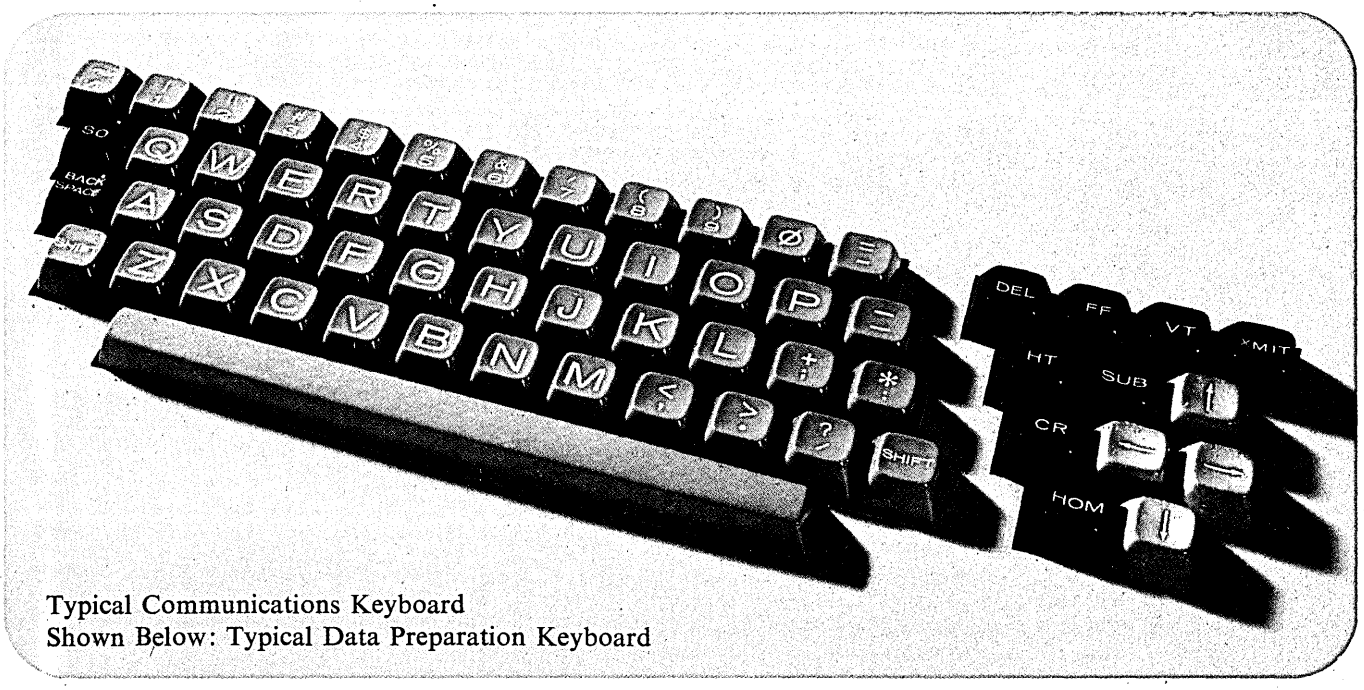
The user will be able to use IBM 2741 and 1050 terminals and mod 33 and 35 Teletypes, paying $12-20 an hour for terminal-connected time and $5 minute for cpu time. (The terminal time is on a sliding scale: $20/hour for first 20 hours, $15/hour for next 66 hours, $12/hour thereafter.) During connected time, user is allotted 60K bytes of core storage and 120K bytes of "logical work area." For permanent on-line storage, each 30K bytes is $9/month.

ITT claims the first FORTRAN IV G OS compatible—for commercial time-sharing service. Assembler is also available and, later this year, COBOL and BASIC will be offered on both the 50 and 65. RTS employs a simple 25-word command language, which ITT says enables users to converse with the system after a few hours' experience. Response time of the system, said to be faster than most currently available services, is as low as two seconds; this is accomplished through RTS proprietary time-slicing and priority scheduling techniques.

Although initially operating the service through direct short-distance links to the main centers, ITT also plans to install concentrators (DDP-516's) in 20 additional cities by the end of 1969, extending the RTS network.

ITT's network now includes: a regional center in Paramus with two 65's, one 50, two 40's, two 30's; four

What's happening today in keyboards is what's happening at MICRO SWITCH



Typical Communications Keyboard
Shown Below: Typical Data Preparation Keyboard

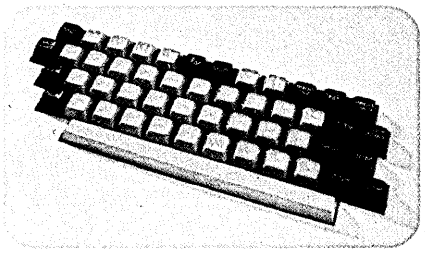
An important key to future keyboard design is what's happening at MICRO SWITCH.

Already we have successfully launched Happening No. 1: Introduction of complete wired and encoded keyboards ready to interface with your equipment.

Shown here are two typical keyboards. Each gives you dry reed switch input, solid-state-encoding, and a variety of exclusive options.

And they provide a flexibility that is unavailable elsewhere. You get a customized keyboard. Key array, format, added options, code change —you select the features required for your system.

Options include strobe and electrical monitor outputs, bounce gates and shift. For example, two interlock options are provided to improve operator speed and efficiency. An electrical monitor output triggers a detector circuit for blocking data or initiating error signals. A unique two-key rollover option permits typing at "burst" speeds without generating erroneous codes.



But that's not all. Coming very soon is Happening No. 2. Through advanced design concepts, complete engineering facilities, innovative assembly techniques, and unique quality assurance procedures, MICRO SWITCH is preparing to supply your every keyboard need. This means new reliability and flexibility in mass-production quantities with attractive customized appearance giving new sales appeal to your equipment.

Make no decisions on keyboards until you see what's happening at MICRO SWITCH. Call a branch office or call us at Freeport: phone 815/232-1122.

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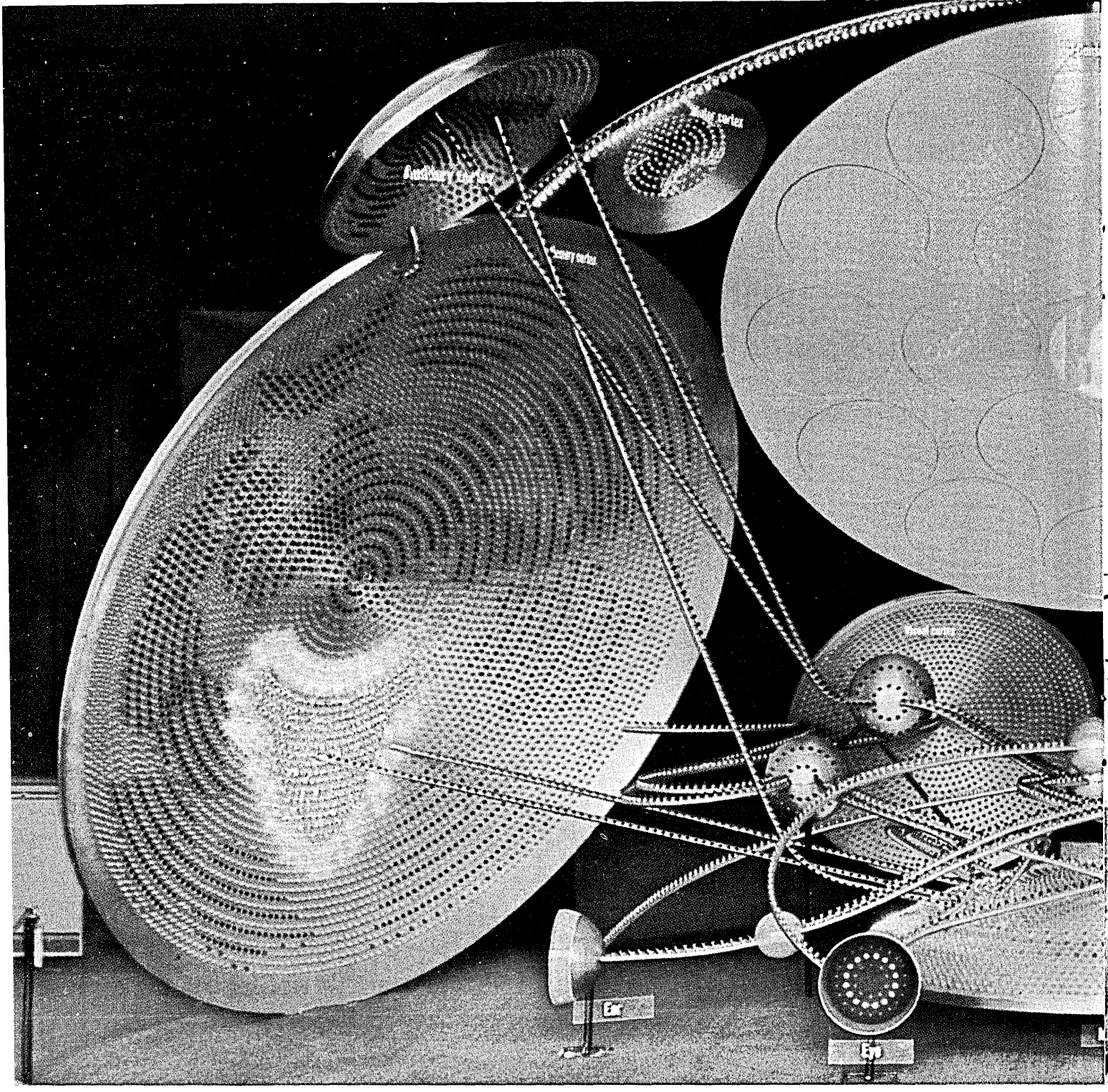
CIRCLE 50 ON READER CARD



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But we all know the malfunctions of a human computer can cause malfunctions of an electronic computer.

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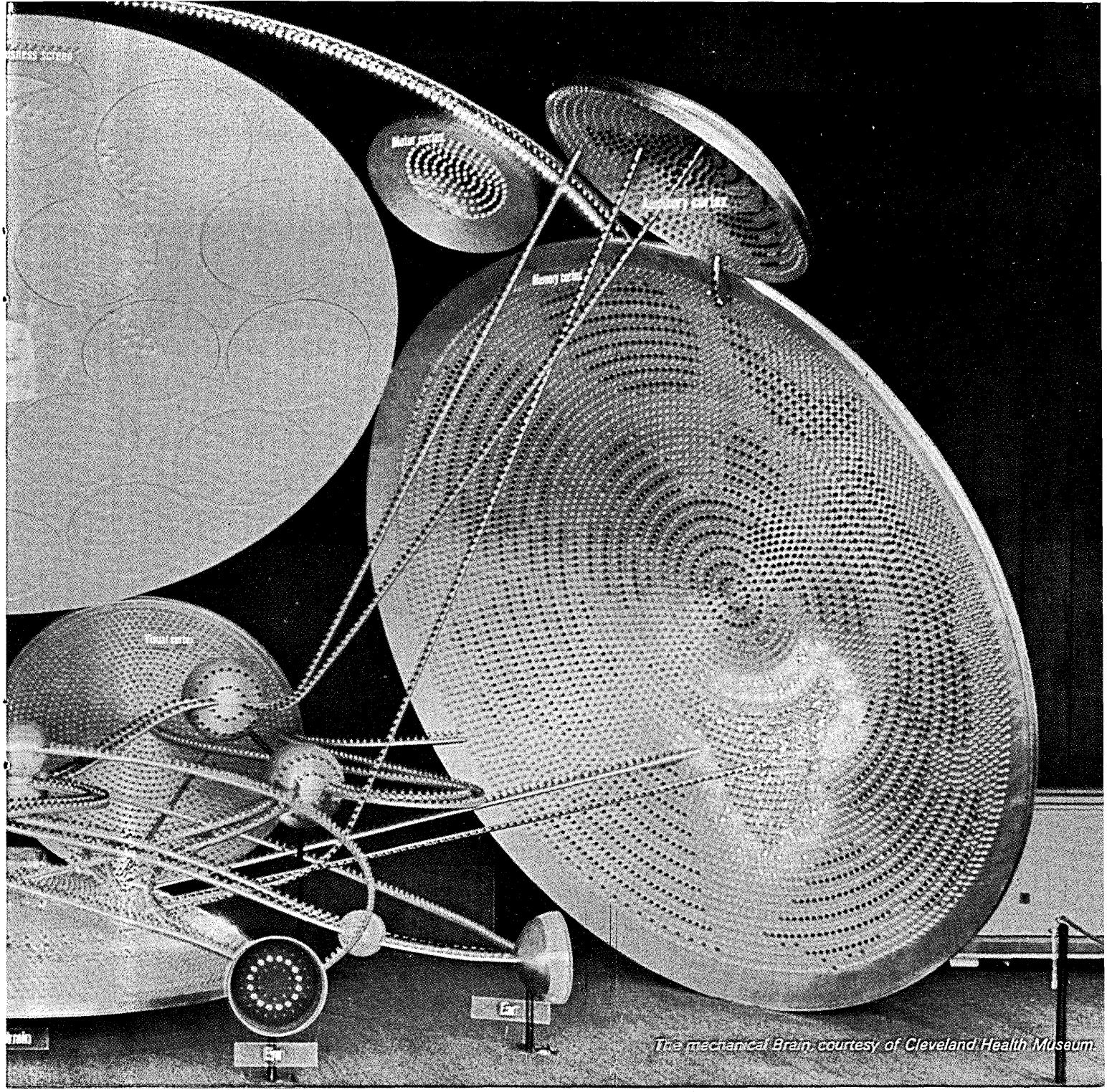

The mechanical Brain, courtesy of Cleveland Health Museum.

# of an imperfect computer.

of information, make it computer readable.
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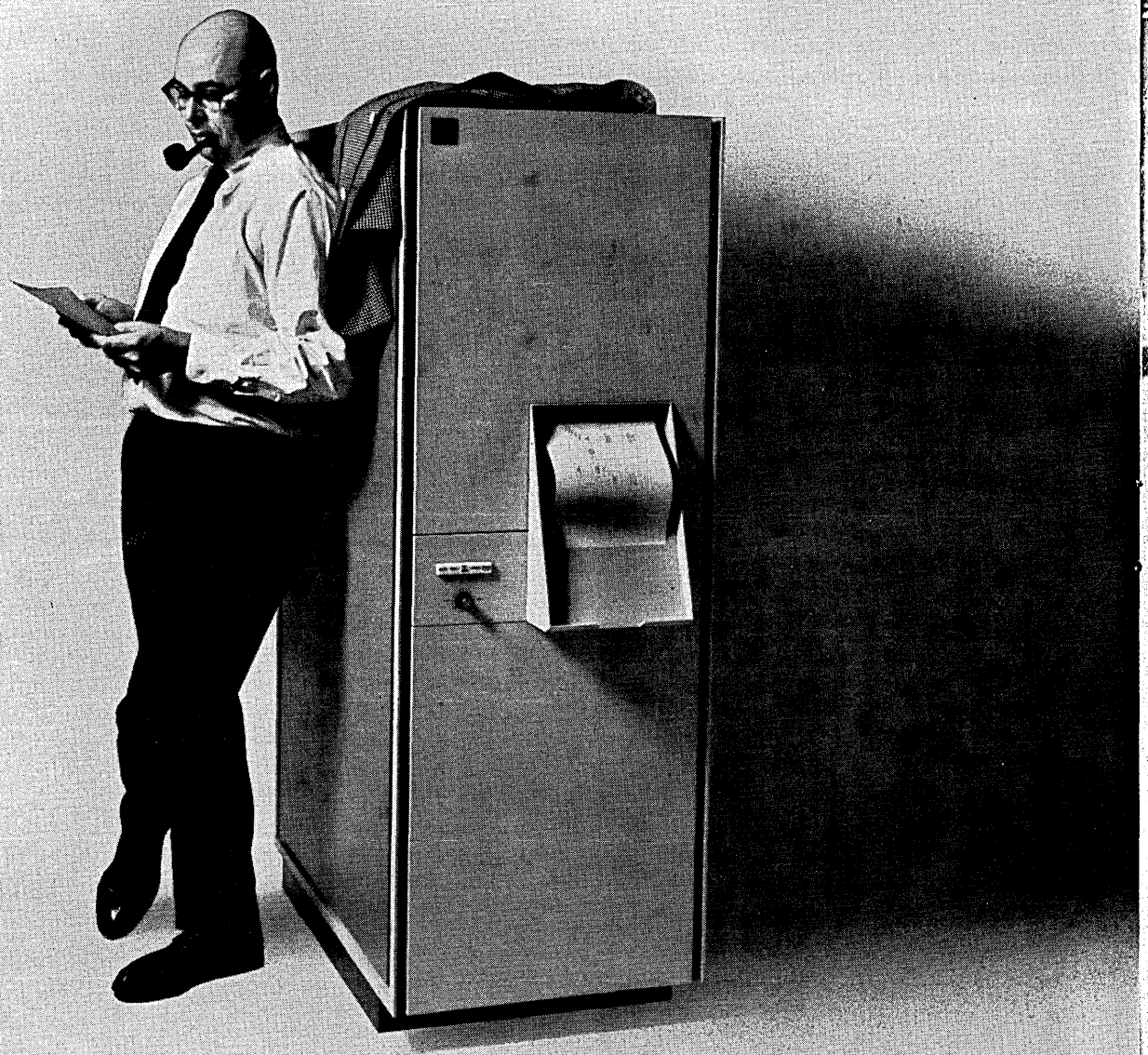

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Model HC610 is designed to be interfaced to a computer, coupled to a display controller or slaved to any graphical computer display.

The Betagraphics Printer is a random-access X-Y device, featuring high-speed magnetic deflection, geometry correction and dynamic focus. Full format settling time is less than 12 microseconds, point-plotting rate is 500,000 points per second, line-writing rate is 2 microseconds per inch and character-writing bandwidth is greater than 1 megahertz.

Operation is simple, with only three controls in addition to the power switch — an exposure TIMER, an EXPOSE-DEVELOP switch for single exposure, development and delivery, and an EXPOSE switch for the multiple overlay or slow-buildup mode. All command and status interface signals are available for remote operation.

The Betagraphics Printer is here, now, to give you high quality computer graphics on paper. We'll be happy to send you complete specifications.

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CIRCLE 35 ON READER CARD

smaller centers with 30's operating independently and linked to Paramus for remote batch jobs—two in New York, one each in Princeton and Garden City; a regional center in El Segundo, Calif., with a 65, 50, and three 30's; two smaller centers in Encino and Los Angeles, each with 30's, also linked to El Segundo; and a Boston center, with a mod 30 now linked to Paramus, which will be upgraded to a regional center with a larger 360.

The RTS user will also be able to enter batch problems via his terminal, instructing the center to transmit his printout to the nearest satellite center, which will then hand-deliver it to him.

IBM STILL MAKING MONEY, SPLITS STOCK TWO-FOR-ONE

Marking the company's 16th birthday in the computer business, IBM held its annual meeting in Boston and shareholders decided to split the stock —authorizing the issuance of one additional share for each share held as of May 9.

Chairman T. J. Watson, Jr., noted that "competition has been healthy for our industry." And, it was pointed out, the cost of computation has been reduced from about $1.38 per 100,000 operations to 3 cents.

Revenue for the first quarter this year was $1.48 billion compared to $1.15 billion for the same period last year. Net came to $187 million vs. $137 million.

BUNKER-RAMO IS VICTOR IN FIGHT FOR NASD SYSTEM

Proposals for automation of the Over-The-Counter market went into the National Association of Securities Dealers this month, and Bunker-Ramo won the race for the $10 million system, due to be operational by 1970. One factor said to be in B-R's favor was that the National Security Traders Assn., representing 5,000 OTC dealers, selected Bunker-Ramo to run an interim system of on-line quotations, to be operational by the end of 1968.

Bunker-Ramo and others, like Ultronic and Scantlin, now provide OTC quotes on 1500 stocks along with their other services to the securities brokers, but these quotes are presently updated twice daily and give only bid prices. Under the new service, dealers in 1500 OTC stocks will transmit, via Teletype, both bid and asked prices hourly to B-R's New York center. Bunker-Ramo will provide these quotes as part of its Telequote III service, and thus will not charge either the association or the dealers for the system. Scantlin and Ultronics will also be linked to the B-R system so that they can provide the additional data through their market services. Presently Bunker-Ramo uses its Telefile computers for Telequote III, but intends to upgrade these to Univac 1108's. They are also building a message switching unit to handle the 25-30 incoming lines for OTC quotes.

Unlike NASD, NSTA does not have any regulatory power over the OTC market, and will merely encourage its member dealers to participate in the interim system. The NASD system will encompass the entire body of dealers and OTC stocks, providing more data, more frequently updated.

FIRM SETS ROYALTIES FOR SOCKO PROGRAMS

A new computer software royalty plan based on a "juke box" concept is being offered by Applied Logic Corp. of Princeton, N.J. Under the plan, software firms and individual programmers submit their programs for evaluation by the company's quality control review board and, upon acceptance, the programs are inserted in the AL/COM time-sharing computer system.

From this stock, Applied Logic sells a particular program for a particular application on a nationwide basis, and the program creator is spared the problems of marketing. When an AL/COM user at any location uses the proprietary package, the operation is automatically recorded and a royalty record is established whereby the owner is credited and paid on a regular cycle. The plan is comparable to that used to compensate composers and performers when their records are played on a juke box.

Richard M. Colgate, president of ALC, said, "this new arrangement will now make available the products of some of the most creative talents in the computing profession on a sound economic basis. . . . the computer programmer can function as a true professional in much the same manner as a physician, lawyer or an artist does. We've eliminated his administrative and marketing functions. All he has to do now is program."

And write a hit.

FERRANTI PLANS TO ENTER U.S. DISPLAY SYSTEM MARKET

Ferranti Ltd. is to venture across the Atlantic to try its hand with display systems round the U.S. airline market.

The Ferranti Argus displays operate in clusters with a shoebox size micromin cpu which comes out of the company's process control range. The biggest single customer is British Overseas Airways Corp., which has a complex of 700 displays and 34 computers on its Boadicea seat reservation system.

The prime contractor for BOAC is IBM, which has provided the main frames for the $100 million job. But Ferranti has ready-made demonstration models in the States through terminals at BOAC's overseas offices. Ferranti is also in the OEM business with its Argus series and is expected to get some immediate big business from ICT.

3M JOINS THE DISC PACK RUSH, OFFERS CHEAPER TAPE

At the Spring Joint Computer Conference, 3M announced:

Sale of its current line of magnetic tape with guaranteed performance and without certification at an average price cut of $3-4 reel;

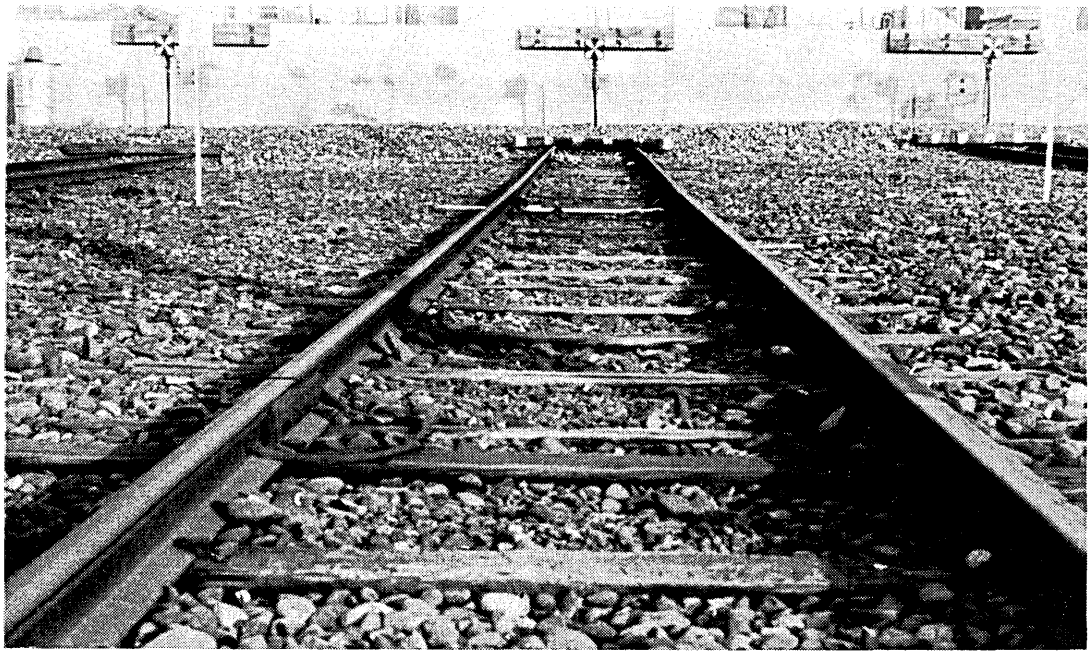
Full-scale entry into the disc pack market.

The magnetic tape is not new. A year ago, 3M announced the 777 tape, using an oxide coating with a binder formulation that is said to prevent error-buildup with use. The manufacturing process, says 3M, has such high quality control that the firm is now able to guarantee tape performance without certification (testing every reel). Thus the buyer can now choose 777 (with certification) or 777GP tape. The latter guarantees that, without certification and its attendant cost paid by the buyer, each 800 bpi reel will have less than one dropout per reel and the 1600 bpi tape will have less than two dropouts. 3M says it is the first to offer this guarantee.

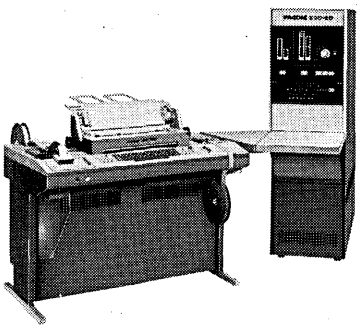
The product will be offered to both the end user and OEM market, which includes IBM, now a tape-maker but still a major 3M customer. The firm also hopes to persuade government buyers to accept 777GP without certification, although GSA within the last year has set up rigid certification tests for all tape it buys. The industry-wide acceptance of such uncertified tape would mean a huge saving to both manufacturers and customers, since the tape-maker must now maintain a staff and testers (which can run around $70,000).

The first of the "Scotch" brand disc packs will be IBM 1311 and 2311-compatible, consisting of six magnetic coated discs with 10 recording surfaces. Priced at $490, about the same as IBM's product, the packs have been used at 10 trial installations for several months, and will be in full-scale production by July. This means 3M will take orders for "thousands" of

The end of the line



is the point where FACOM 230-10 starts to put on a terrific performance.



The end of a data communication line was exactly what we had in mind, when we designed the 230-10—a small economical model peerless as dependent or independent satellite computer of large-scale data centers.

With every 230-10 installation we provide a complete software package: library programs, service routines, program and operating manuals. The wide variety of FACOM assemblers, compilers, utility routines and application packages permits the perfect choice for your hardware configuration and applicational need. We call it "tailored" software; the most effective method for simplified programming and one of the elements in FUJITSU'S "best cost/performance ratio."

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You'd think we'd stop and just keep someone watching the store. But that's not the way this business goes.

Somewhere out there, right now, somebody is thinking of something new for a CRT to do. That's how we add to our line.

If you're looking for any kind of quality CRT, our kind of inventory gives you the best place to start.

One thing is sure. We've got enough to say yes, rather than maybe. Try us. Write or call. And send for our free literature. It's free.

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CIRCLE 54 ON READER CARD

packs by mid-summer. By August or September, the firm will also be producing a IBM 2316-compatible pack; no plans are yet made for a model like the IBM disc cartridge. Like most disc manufacturers, 3M is also experimenting with a plated disc, which would provide greater packing density.

COMPUTER ANALYZES HUMAN BRAIN FUNCTIONS

Dr. Gary C. Galbraith, physiological psychologist at USC, is using a 360/44 to study the brain wave interactions in humans in response to visual and aural stimuli. Statistical procedures involving computer analysis of electroencephalograms are being developed by Galbraith in an effort to measure the organismic variability occurring constantly in the brain between stimulus and response. If a definite pattern of interaction between different parts of the brain can be determined, the EEG evidence of that pattern could be used to predict the quality of response of an individual and the period during which he is most receptive and capable of learning.

An important application of this process would be in the teaching of mental retardates, who have a short learning and attention span. "If a teacher could take advantage of a computer to look at the retardate's brain waves and determine the point at which he is most capable of learning, much could be done to help such persons," said Galbraith.

Using an on-line man-computer hookup with an AD converter, Galbraith has made spectral analyses of shared frequencies between different parts of the brain and has observed "certain patterns and changes of brain wave activity that subsequently lead to correct or incorrect responses." This, he concludes, indicates a potential justifying an increase in experimental research that has only just begun. His work is now financed jointly by USC and NASA.

Dr. Galbraith makes no predictions but he places no limits on the possibilities inherent in the study of brain function. Implicit is the 1984 type of possibility that productive periods for the exercise of talent or insight could be foreseen with the aid of advanced computer technology.

CONSUMER FINANCE FIRM TO GO ON-LINE NATIONWIDE

Household Finance Corp. has demonstrated its new computer-communications system, ORBIT (On-line, Real-time Branch Information Transmission), which will link the company's 1,200 U.S. and Canadian offices to two 360/50's at Chicago headquarters. The $10-million-plus network

will be the largest of its kind in the industry and one of the largest commercial electronic data communications systems in the world. A branch pilot operation is scheduled to begin late this summer. By mid-1969 offices will be joining the system at a rate of 100 a month until the network is complete in 1970. When fully operational, about 150,000 transactions will be handled each day.

Each branch will have an IBM 1971 terminal, specially designed by HFC and IBM together, to transmit data via low-speed lines to remote 2905 multiplexors in Los Angeles, Cleveland, Philadelphia, New York,

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HEX-DEC ADDER for both hexadecimal and decimal-hexadecimal addition without conversion.

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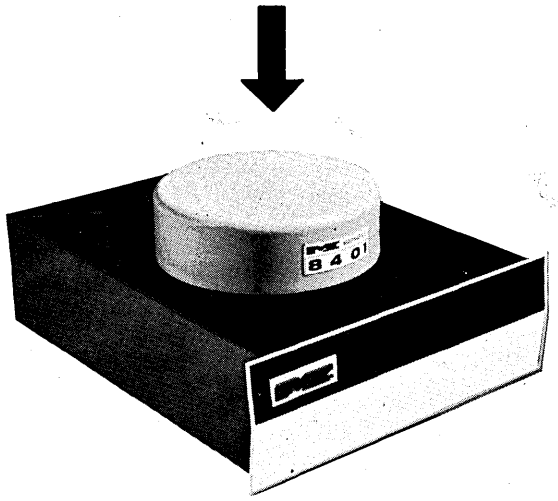
DATA STORAGE



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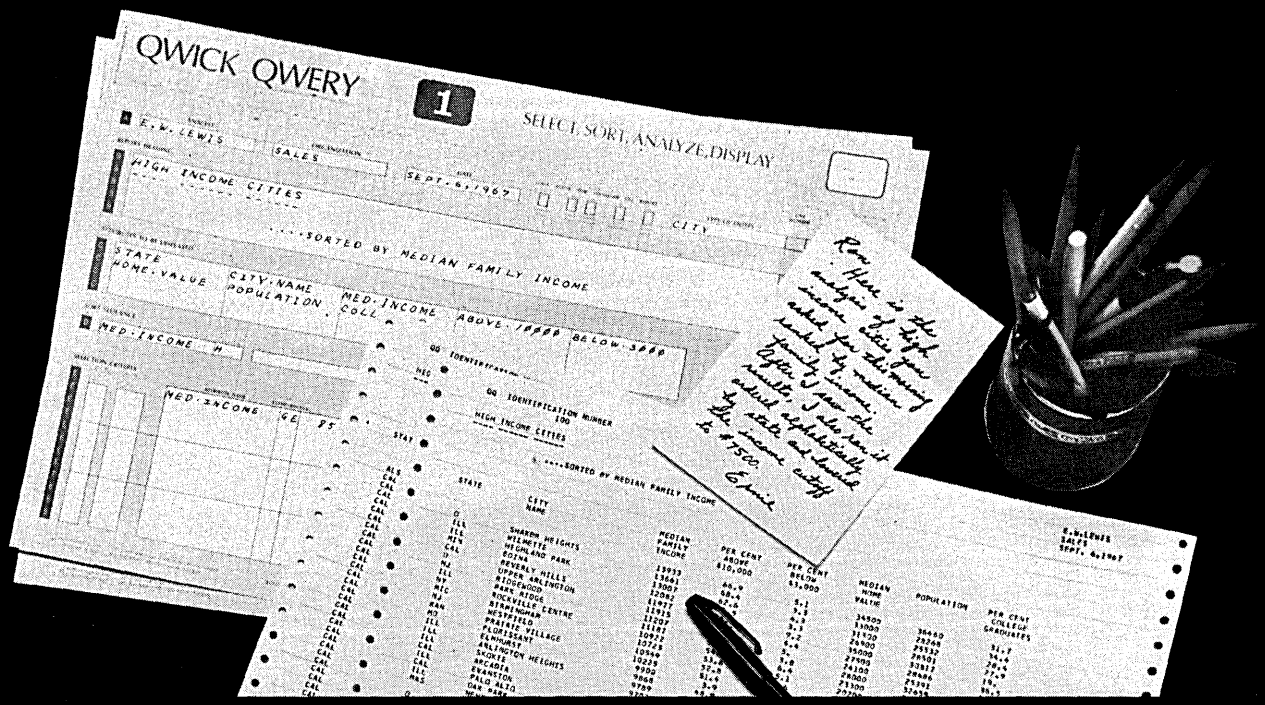

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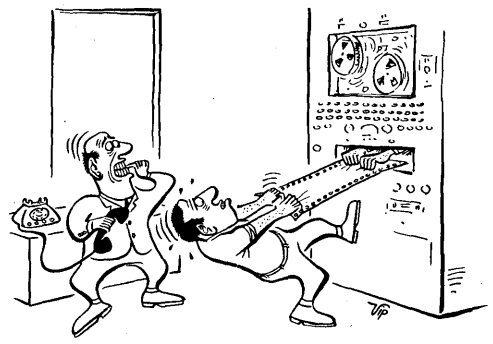


"QWICK QWERY, a retrieval program so powerful — be careful what you ask it to retrieve!"

Chicago and Kansas City and then via high-speed lines to the dp center in Chicago. These six satellites will poll the branch terminals in their respective regions. Both loan payment and loan application transactions will be handled. The control unit of the terminal provides for visual inspection of typing accuracy before transmission to the computer. Safeguards built into the system prevent unauthorized access to customer account data stored on the six 2314 disc units (each capable of storing 233 million characters) in Chicago.

The system will greatly reduce normal loan transaction time and minimize paper work. It will also deliver summary data more quickly to management, handle normal internal journal ledger accounting, and provide communications between all offices.

12 KEY IBM DISC MEN LEAVE TO START NEW FIRM

The exodus of a dozen top disc men from IBM at the end of last year caused a flurry in San Jose—complete with a visit by the wise men from the east to talk the group out of it. Now the 12 have reappeared as the nucleus of a new company, Information Storage Systems, in San Jose.

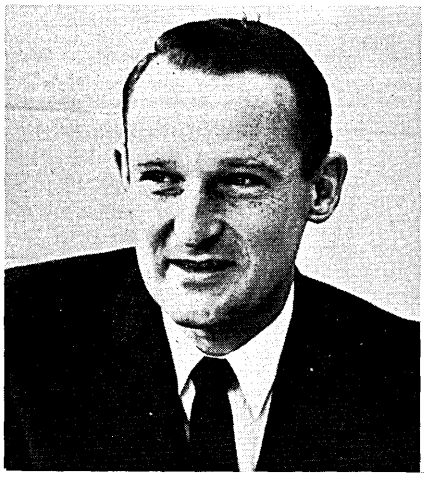
President of the privately held firm is John J. Harmon. He and the others were leaders in development of drives, control units, and interfaces for disc pack units. While not yet ready to talk about their products, Harmon notes that they're "working on auxiliary storage." And the company has already doubled in size.

SEYMOUR CRAY HONORED BY COMPUTER INDUSTRY

Seymour Cray, a brilliant recluse who designs, builds and prepares software for bigger-than-large-scale computers for Control Data in Chippewa Falls, Wisc., was awarded the W. W. McDowell Award at the SJCC last month for "his continuing technical contributions to computer development ranging from device and circuit development through design automation and system definition, and his outstanding managerial leadership in producing a series of large scale computers."

Cray, a healthy refutation of Parkinson's Law in an age devoted to proving that law, allegedly built the first 6600 with a staff of 12 technicians. Then he wrote for that machine an operating system that later replaced the OS built by a small army of systems software soldiers elsewhere in the company.

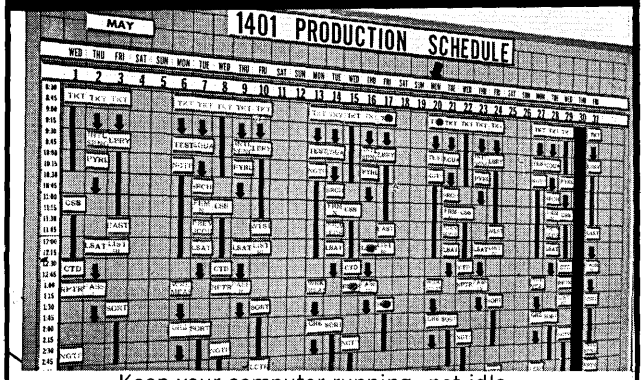
It was in 1961 that Cray allegedly went to CDC president Bill Norris and announced that he had purchased a site for a development lab in a remote corner of Wisconsin. Saving



only a sliver of the land for his home, he sold the remainder at cost to the company, which then erected the plant where Cray creates his monsters.

Cray, 42, is described as a quiet—if not aloof—man with a highly developed rural-midwestern reticence. Once, it is reported, someone asked him to define a general-purpose com-

COMPUTER SCHEDULED MAGNETICALLY



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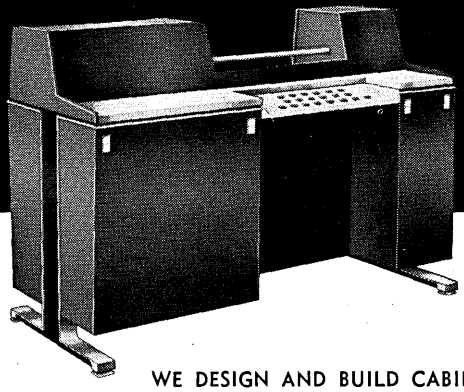

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CIRCLE 82 ON READER CARD

puter. After some thought, he answered: "Well, I suppose it would be one you could program."

Cray left Chippewa Falls for Atlantic City on Wednesday and returned on Thursday, pausing long enough to regale his audience with a "thank you" for the award.

Educated at the Univ. of Minnesota, where he earned a BSEE and an MS in mathematics, Cray was with Engineering Research Associates, Inc., and Univac before going to Control Data in 1958.

YOUNG SERVICES FIRM TO ADD BRANCH, START PACKAGES

Database Corp., with headquarters in Los Angeles, has completed its first program package and expects to open a San Diego branch in the next 90 days.

Started in Feb., '67, by Charles Lindsay, the company is now up to 17 people and will gross about $600K this year in contract programming, system design, and on-site 360 instruction. Their first package is VTOC, for Volume Table of Contents, a print program that runs on 360's under DOS or BOS and interrogates disc packs to list files, activity, organization, and available storage space. It sells for a modest $250.

Sales manager Shirley O. Mills says her best pitch—considering the tendency of new programming houses to use moonlighters—is explaining to prospects that all their programmers actually work there and can be reached by phone without referral to another company.

TIME-SHARING IN LATIN AMERICA HITS LINE SNAGS

Some countries in Latin America have become interested in exploring the possibilities of multi-access computing. The projects under consideration correspond closely to similar efforts in the U.S. and Europe, but communication lines in Latin American countries are, as a rule, unreliable compared to those in U.S. and European areas where remote transmission is now being practiced. However, such a condition offers an opportunity to evaluate the impact of poor communication facilities on time-sharing in these projects, and to compare the relative costs of time-sharing installations to low-cost individual computer systems.

At present, multi-access systems might be feasible at single-site organizations, i.e., within universities, industrial and commercial enterprises, and local government agencies, but these would require private-line communications. For multi-site operation, requiring transmission to a central processor, time-sharing seems inadvisable, although some cities in Mexico and Venezuela are linked by microwave channels, which could make long-distance computer use possible. Telegraphic and telex lines have proved unreliable.

NEW CASE SIMULATOR IS RIVAL FOR SCERT

Software Products Corp. recently unveiled CASE, a simulator meant to compete directly with SCERT. SPC president Thomas E. Stone said CASE was particularly applicable to systems utilizing remote access, multiprogramming or multiprocessing. Input preparation, he added, is considerably simpler than with other simulators.

CASE runs on a CDC 3600 and requires a 262K byte main memory. Overlays are being developed to reduce this requirement to 150K bytes. CASE simulates all of the major small, medium and large computer systems, says vice president William Thompson.

The new package, which can be used to design systems as well as test them, will be sold on a fixed-price basis or leased. Stone said the company expects a dozen orders within the next 12 months, and sales in excess of $1 million in the next 12-18 months.

Software Products is a newly formed subsidiary of Computer Learning Corp., a dp training school. Both are located in Falls Church, Virginia. Blythe & Co., an investment firm, is a major stockholder in SPC. For information:

CIRCLE 180 ON READER CARD

GE TO ACQUIRE BALANCE OF OLIVETTI-GE STOCK

Olivetti-General Electric, Italian computer firm, will be wholly owned by GE under an agreement to exercise its option to buy Ing. C. Olivetti's 25% share holding in the company. GE has owned 75% of OGE since its formation in 1964.

Attilio Cattani, chairman of the board of OGE, stated that GE's increased participation in the Italian company ". . . further demonstrates its full confidence in our people, products and engineering resources."

Dr. Roberto Olivetti, managing director of Ing. C. Olivetti, explained the action as a step planned from the beginning; Olivetti's original stock participation was to help ensure an orderly transfer of management responsibilities to GE. He further stated that Olivetti now plans to "devote more of its resources to the manufacture of desk-top microcomputers, communications terminals and other equipment for handling information, which are connectable to large information systems and are not within OGE's product scope."

Both firms expect to maintain a close business relationship. Meetings of the OGE board will be held to decide on a new name for the company.

JIGSAW PUZZLE SOFTWARE SYSTEM FOR ACCOUNTING, MIS

Factsystem, Inc., Chicago software house, unveiled an integrated accounting and management information system at the SJCC which users can buy in pieces. There are 11 modules in the package; a minimal system can be built out of six, said Factsystem president Dr. Leslie L. Jacobs. Marketing of the minimal system began at the conference.

The full package is scheduled for release Dec. 31. It will be licensed to large users for $150K and leased to the others through franchised CPA's. The rental charge is 2 cents/printed line, plus undisclosed amounts for each record processed and stored. Factsystem now has one service center in Chicago to accommodate rental customers, and plans to establish five others—in New York City, Los Angeles, Denver, Atlanta, and Dallas. Ultimately, at least some of the franchisees will also set up service centers, added Dr. Jacobs. Sometime in 1970, he hopes to offer an on-line inquiry service.

Along with its new software, Factsystem is offering to train customers' personnel, lease equipment, and do special system design work.

In toto, Factsystem contains about 35 subsystems. Reportedly, it does six bookkeeping jobs and provides management with a battery of cost, inventory, and production reports, forecasts, transaction and input validation summaries.

A 200K core memory is needed to store the entire program. But since an operating system utilizes only some of the subsystems at one time, its core requirement is reduced to 65K. Factsystem is designed to run on a 360/30 equipped with 5 disc drives, 4 tape units, a high-speed printer and card reader-punch. Under a "shared processing" arrangement, the user with a Mod 20 can do his own printouts and employ the Factsystem service center solely for computations. For information:

CIRCLE 181 ON READER CARD

CREDIT FIRM EXPANDS INTO EDP/MANAGEMENT SERVICES

Credit Bureau Management Co. obtained maximum mileage out of a

press conference recently when it: a) announced plans to offer computer-based management and consulting services; b) unveiled a new corporate name, and c) disclosed that Charles W. Getz, a widely-known management information systems expert, had been hired as vp for computer services.

Getz will play a key role in projecting what is now the Chilton Corp. into the management-consulting business. The company, based in Dallas, plans to develop management systems for customers of Credit Bureau Services, a wholly-owned subsidiary which makes loans in six states, and for other credit bureaus. It will also market software consulting and adp system evaluation services.

Chilton's new vp has 24 years' experience in management and dp. As special assistant to Air Force General Bernard Schriever, he instituted a management information and control system for the ballistics missile and space program. Later, he headed a 60-man, four-division organization which operated the AF system command's principal management information and control system. In 1962, he joined Lockheed as manager of management controls planning and four years later became the chief executive at AEC responsible for a computer-based total management information system.

NEW SYSTEM TRANSMITS DIGITAL VOICE SIGNALS

A new system for the transmission of digital voice signals has been developed by Radiation, Inc., a subsidiary of Harris-Intertype Corp., under a $100K R&D contract from the Defense Communications Agency (DCA). The prototype unit is called Radiation Adaptive Compression Equipment (RACE), and was designed to remove redundant elements before transmission by operating in conjunction with modulator/demodulators to automatically compress the digital signals into narrower channel bandwidths, enabling the data to be sent over a single 3 kHz telephone line without loss of quality.

The system features two redundancy reduction techniques the company calls Adaptive Tolerance and Buffer Feedback Control. Adaptive Tolerance provides for automatic adjustment to varying voice waveforms so that the proper number of samplings are transmitted from each waveform. The Buffer Feedback Control senses a potential overload and automatically adjusts the signal processing tolerance at the buffer memory, which stores incoming bit streams and supplies a constant data output rate into the transmission line.

DCA will evaluate RACE for military communications requirements, and future production contracts will be based on DCA recommendation. For information:

CIRCLE 182 ON READER CARD

TRS SNAGS FORUM EVENTS FOR RESERVED TICKET SALE

Ticket Reservation Systems, Inc., one of two systems of computerized electronic box offices, will handle the reserved-seat ticket sale for all attractions at Jack Kent Cooke's Forum, the posh sports palace Cooke recently built in Inglewood, Calif., to house his Los Angeles Lakers (roundball) and Kings (puck). Thus the stage is set for the contest between TRS and Computicket, two competitors in a field where it is said only one per city can thrive.

TRS has lined up outlets in New York, Chicago and Los Angeles for its services, which now offer NY Yankee game tickets and soon will include the White Sox. In the Los Angeles area, TRS will initially have selling terminals at May Co. stores, UNI-Tours, Inc., and Union Bank branches. Computicket will counter with Bullock's department stores, Wallich's Music City, and Ralph's Markets. But it has no signed contracts, when this was written, with those sponsoring the events.

TRS is scheduled to go into operation in time for the 1968-69 basketball season, and Computicket is now aiming for Aug. 1 of this year—a month's delay from their previous target date.

All right, go to your corners, now, and come out ticket punching.

HONEYWELL FORMS NEW COMPUTER GROUP

Honeywell has formed a new three-division group designed to further broaden the firm's role in the computer business. (Computer systems and components and communications volume exceeded 20% of the company's total sales in 1967.) The Computer and Communications Group includes the EDP and Computer Control Divisions and the newly formed Communications Div., which will be responsible for development, manufacture and sale of a broad range of communications equipment and systems for industry and government.

Named vp in charge of the new group is Charles L. Davis, a director of the company, who will retain his Minneapolis headquarters, where he had been vp in charge of the Aerospace and Defense Group. Edward C. Lund, former vp and gm of the firm's Ordnance Div., will hold that position for the Communications Div.; T. Paul Bothwell has been named vp and gm of the Computer Control Div., Fram-

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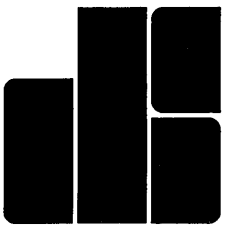

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CIRCLE 60 ON READER CARD

ingham, Mass., to succeed Benjamin Kessel; and C. W. Spangle will continue as vp and gm of the EDP Div., Wellesley Hills. Kessel has taken "a key staff position" in the new group.

Honeywell's 1,000-man Tampa, Fla., facility is the first element to be incorporated into the Communications Div.; other communications hardware and systems activities within other company divisions will be added later. The Computer and Communications Group will report to Stephen F. Keating, Honeywell's president and chief operating officer, indicating "the maturity that . . . computer operations have attained."

COMPUTERIZED NURSING DISCUSSED AT WORKSHOP

The individual nurse must familiarize herself with the computer's potential and then take the initiative of defining, with hospital administrators, what her role in the computerized hospital will be, according to Dr. Eileen Flynn. A nurse scientist with the Hospital Information Systems Div. of Lockheed, she spoke at a workshop sponsored in April by the Marin Tuberculosis & Health Assn. for 240 nurses, public health and hospital administrators, and faculty and students from teaching hospitals in the San Francisco Bay area.

The computer can free the nurse for more direct and compassionate patient care, should she desire an expansion of this role, but first she must clearly know what she wants and needs to be an effective professional, said Dr. Flynn. The mechanics of the computerized hospital were explained and illustrated, stressing that the nurse should not be a slave to a terminal—that the computer should be servant to the nurse.

NEW COMPANY OFFERING FIXED PRICE SYSTEMS DESIGN

Turner, Brown & Assoc., bay area data processing consulting firm, has come up with a guaranteed fixed price systems design concept that seems to be catching on.

The company was formed in June '67 with $400 capital, grossed over $45K by Feb. 1. Admittedly risky for the company, the fixed price is determined by evaluating charted complexity factors (application, size, scheduling, amount of work done in-house) and use of outside programmers on a subcontracting basis who are paid per program, cutting down the buyer's overhead.

The firm has more than 70 programmers at its disposal and says it can bid at 60% of present average programming costs.

PRINCETON PIONEERS IN HISTORY APPLICATIONS

Quantitative methodology in historical research, begun last fall at Princeton Univ., is believed to be the first credit course anywhere on computing methods for history graduate students.

The course was instituted by associate professor of history Dr. Theodore K. Rabb, author of *Enterprise & Empire*, a book researched with the help of a computer. He had spent six years gathering data from company charters of 300 years ago and cross referenced the names with Member of Parliament lists to find out what kind of people financed such adventures as the colonization of North America, the round-the-world voyage of Sir Francis Drake in 1577-1580, and the development of international trading companies. He gathered 9,867 names of investors and information about their position in the society of the day and in Parliament. Computer analysis revealed the amount of investment by Members of Parliament and the social and political activities of the backers.

SPECTRODATA IMPLEMENTS NEW COMPUTER LANGUAGE

Spectrodata, Los Angeles software firm, has completed implementation of a new digital computer language called Continuous System Simulation Language (CSSL), whose basic specifications appeared in Simulation Magazine, Dec. '67. CSSL is a problem-oriented language designed to facilitate the simulation of process control systems on Sigma 7 and CDC Series 6000 computers. Written in FORTRAN IV, the language features a high-level macroprocessor with conditional statement generational capabilities. Spectrodata's version of CSSL is priced at $10K on a three-year lease, with two-week on-site training, user documentation and warranty included. The firm will deliver CSSL to Comcor, Inc., a subsidiary of Astrodata, the second quarter of '68.

President of the company is Dr. Ralph T. Dames, formerly manager of the simulation group at SDS. Vice president and designer of the implementation is Young Jerry Lee. The firm served as software consultant for Lockheed Missiles and Space Company's CLASH program. For information:

CIRCLE 183 ON READER CARD

RAND SYMPOSIUM ON THE MOTHERHOOD OF OS/360

A one-day symposium on OS/360 as a host environment for subsystems will be sponsored on Aug. 26, 1968, by The RAND Corp. in Santa Monica, Calif.

The conference will focus on 1) the interface between OS and operational subsystems built by various installations; 2) modifications to OS, if any, which were required by the various subsystems; 3) identification of the features within OS which facilitated or hindered the design and implementation of these subsystems; and 4) recommendations to both users and IBM for building new subsystems within OS.

Attendance at the symposium will be limited to those actively engaged in this area. Those wishing to attend should write Bob Balzer at RAND.

COLLEGES OFFER COMPUTER COURSES

Univ. of Calif., Letters and Science Ext., 2223 Fulton St., Berkeley, Calif. 94720.

Aug. 12-16, Artificial Intelligence by Heuristic Programming, $225.

Univ. of Calif., Engineering and Physical Sciences Ext., P.O. Box 24902, Los Angeles, Calif. 90024.

July 8–13, Evolutionary Operation and Response Surface Methodology, $275.
July 8–19, On-Line Computer Control Systems, $375.
July 8–19, Hybrid Computation, $375.
July 22–Aug. 2, Matrix Error Analysis for Engineers, $375.
Sept. 9–13, Introduction to Process Computer Control, $275.

Purdue Univ., School of Engineering, Lafayette, Ind. 47907.

Oct. 7–12, Estimation and Control in Stochastic Systems, $200.
Oct. 14–23, Modeling of Industrial Processes for Computer Control, $250.
Oct. 28–30, Seventh Computer Workshop for Civil Engineers.

Iowa State Univ., Mr. Camp, College of Engineering, Ames, Iowa.

July 8–Aug. 2, Data Communications Conference, $600 USITA members, $800 nonmembers.

Mass. Inst. of Technology, Center for Advanced Engineering Study, Cambridge, Mass. 02139.

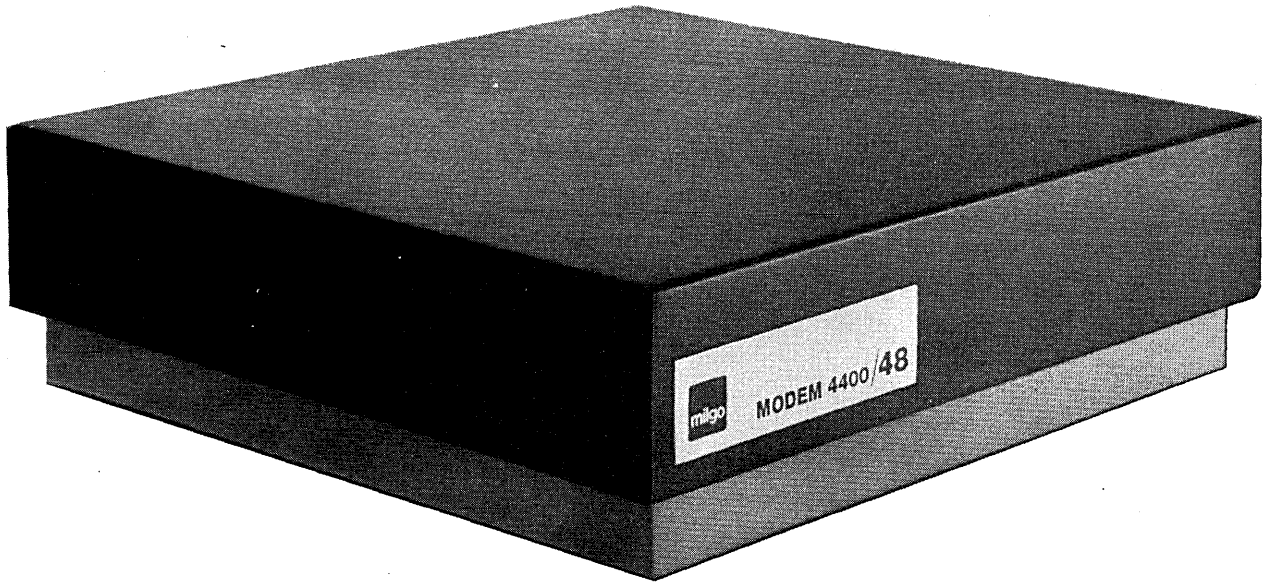
Aug. 12–23, Engineering Systems Analysis, $500.

New York Univ., School of Engineering and Science, 401 W. 205 St., New York, N.Y. 10034.

July 22–26, Built-In Test Equipment for the Maintenance of Complex Electronic Systems, $245.

(Continued on p. 116)

Which data sets did Computer Sciences Corporation select for their recent data communications expansion?



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Do your computer a favor and check out SES Site Environment Systems. Write Environment Control Division, Floating Floors, Inc./Subsidiary of National Lead Company, Room 4618, 111 Broadway, New York, N.Y. 10006.

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CIRCLE 62 ON READER CARD

news briefs

● In a move to bring industry to a region of heavy unemployment, IBM is establishing a plant in the Bedford-Stuyvesant area of Brooklyn, N.Y., to manufacture computer cables. About 100 people will be employed by the end of '68; hiring will begin when the facility officially opens this summer. In late '69, additional products will be added to the production line, and plans call for increasing employment up to 300. Ernest K. Friedli has been named general manager of the plant.

● Eurocontrol, the international agency near Paris for experimental air traffic control, is developing a model for working out all the combinations of events likely to happen in congested air lanes—with specific reference to the introduction of supersonic airliners. The first batch of software for the job has been delivered for Eurocontrol's Telefunken TR4 system by General Precision Systems. This is the first part of a two-year software contract for GPS to write the programs for simulation.

● Another new disc unit manufacturer enters the field with the announcement that GGP (Garfein, Garfein and Perez) Corp. has completed design and test and will make first deliveries of its product in early fall. The firm is marketing a fixed single-disc unit for small to medium-size computers. It features 10-million-bit capacity, average access time of 8.5 msec, and transfer rates up to 4.5 mc. The head-per-track unit fits in a standard 10½ inch drawer and has read/write and head selection. It costs around $6K and is aimed at the OEM market.

● Computer scientists at the Univ. of Melbourne, Australia, have developed a new memory unit, an oscillator, that is capable of recording in one nanosecond. Patented by the university, the new memory cell is an amplitude switched subharmonic storage device. Developers of the unit are Dr. Peter Thorne and Dr. Frank Hirst; Dr. Hirst has recently been given a sabbatical leave from Melbourne to study computer methods in America under a Carnegie grant.

● A computer-controlled optical scanner called a Programmable Film Reader (PFR) has been delivered to Mobil Oil's Geophysical Services Center in Dallas by Information International of Los Angeles. The scanner

will be used for digitizing and transferring data from 400,000 well logs to mag tape for processing, hopefully resulting in discoveries of potential sources of recoverable oil from oil fields. Well logs are diagrams of subsurface geological formations which can reveal sources of oil; Mobil's library is over 30 years old. Using PFR, the logs, which have been photographed by a continuous flow camera, are scanned via a moving light point from a crt. A control console displays the log being processed so an operator can monitor and make any changes with a light pen or other controls. The PFR scans and digitizes information at speeds of up to 300K data points a second.

● Reaffirming support for their 315 series of computers, NCR recently announced several new additions to its line of supporting software. The new programs include a multi-programming executive routine for the 315 RMC; a new version of the 315 FORTRAN compiler; a COBOL compiler; a crt terminal file inquiry system; and a hospital package which provides a payroll-personnel program, and keeps track of patient records. The multiprogramming routine is available now; the rest of the software will be released in the fall.

● The board of directors of Wabash Magnetics, Inc., has approved formation of a Phoenix-based subsidiary to provide computer time-sharing services. The new company, Information Network Corp., will concentrate initially on applications in text editing, inventory control, payroll and cost accounting, and billing services. The firm expects to make services available in the fourth quarter of '68.

● The National Biomedical Research Foundation (NBRF) has installed a 360/44 to aid in the study of the structure and characteristics of human chromosomes to determine the causes of hereditary diseases. Photographs of body cells are taken through a microscope and converted into digits for computer analysis by FIDAC (Film Input to Digital Automatic Computer), a device developed by NBRF that can scan 400,000 separate points on a photo in 3/10 sec. The device measures the degree of lightness and darkness of each point, gives it a number value from 0-15 and transfers it into the computer, which analyzes it and reports its findings in the form of statistical tables or greatly enlarged digital reproductions of the exact configuration of the chromosome. NBRF is a nonprofit organization headed by

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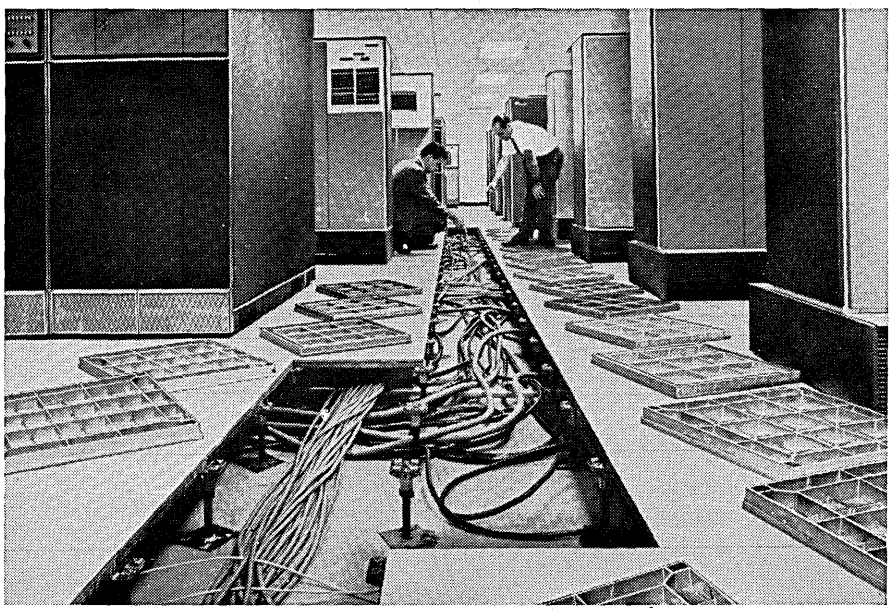

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CIRCLE 63 ON READER CARD

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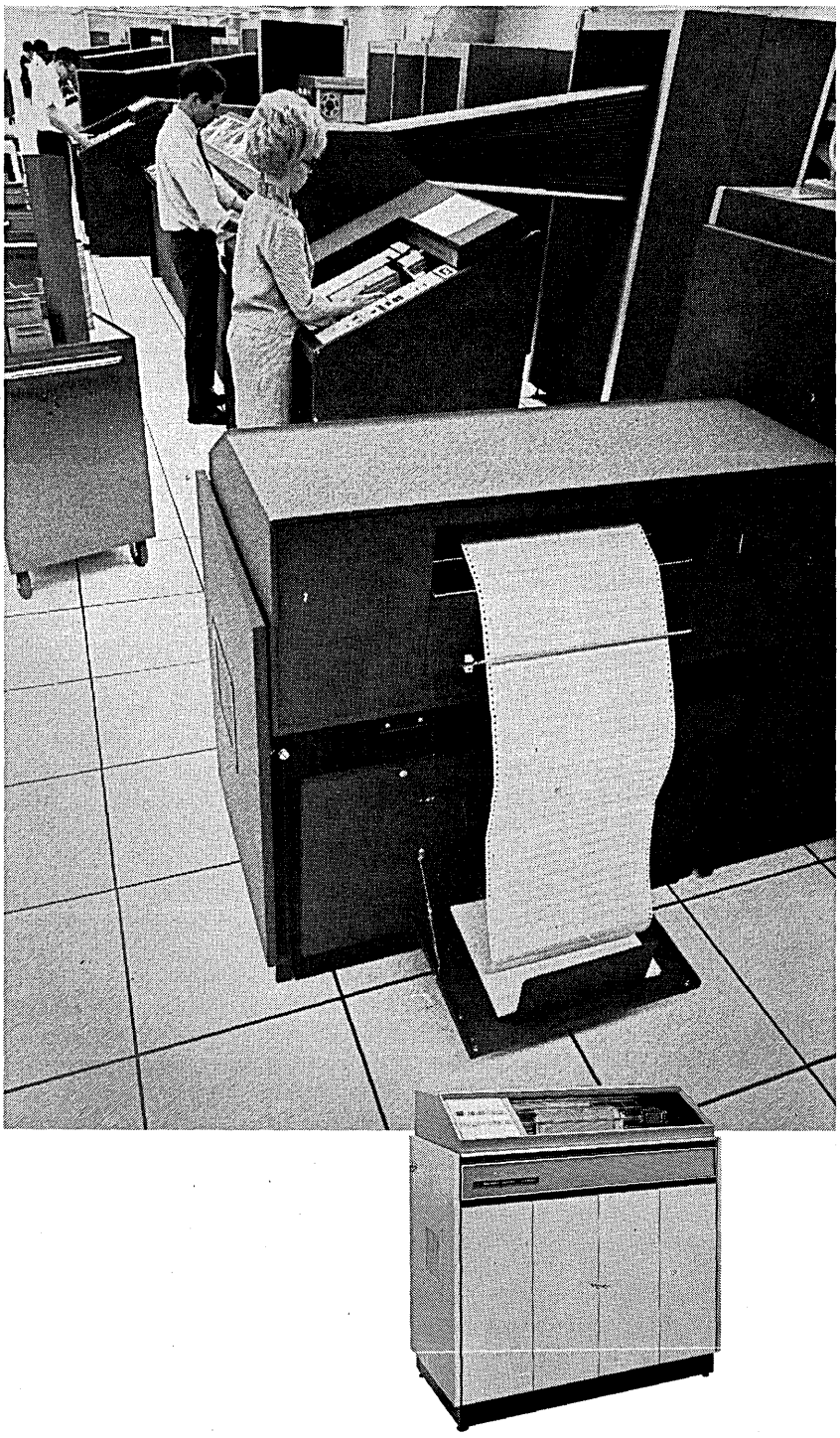

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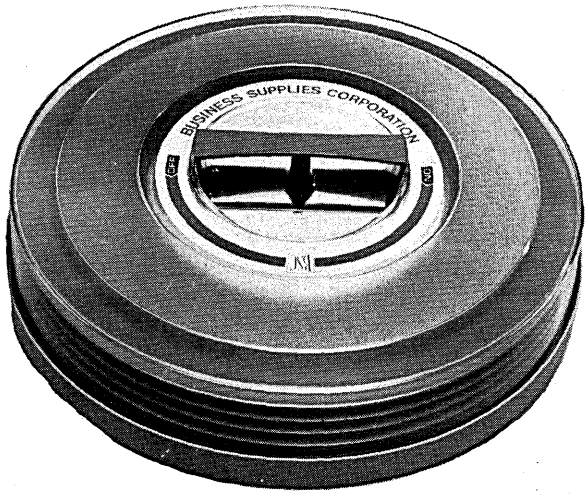

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Standard Computer Corporation

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news briefs

Dr. Robert S. Ledley, who expects pattern analysis by computer to speed chromosome research by as much as 500 times over manual methods.

● The General Instrument Corporation has received a $500K contract for the design and construction of three different types of digitally programmable power supplies to be incorporated in VAST, the Navy's Versatile Avionics Shop Test System, which checks and tests the Navy's electronic equipment.

● A third-generation i.c. communications system teamed with the EMR 6130 was announced at the SJCC as the 6116. The system allows direct input to the computer from remote lines (of varying speeds and mix of synchronous or asynchronous—TTY's, crt's, badge readers, and other data collection devices). All processing is in real-time. Dual buses allow the computer to use one bus for processing, the other for direct data input into memory. The system includes paper and mag tape, card reader, communications controller and a Burroughs 16 megabit disc. All necessary software is also supplied.

● Computer Leasing Co., Washington, D.C., has agreed in principle to acquire Bell Equipment Corp. and Bell Eastern Corp. of New York. The Bell companies specialize in the leasing and sale of heavy construction and industrial equipment. The acquisition agreement proposes an exchange of 66,500 shares of CLC voting convertible preferred stock for all outstanding capital stock of Bell. Each share of the offered CLC stock would be convertible over a five-year-period to four shares of CLC common stock (current market price of the stock places a value of $7.5 million on the acquisition). Comuter Leasing is a subsidiary of ever-growing University Computing Co. of Dallas.

● Special Studies, Inc., a New York management consultant firm, is opening a branch in Jerusalem, Israel, and will employ American and Israeli scientists on American contracts. Stating that Israel's dp future is in software, the president of Special Studies, Dr. Nachman Bench, discussed the new branch, saying "The climate is good, the work interesting, and it would appeal to American Jews working in the field—scientists could work in Israel as well as in Santa Monica."

● A simulation and programming system for the PDP series of computers has been developed by Com-Share Inc., time-sharing service bureau in Ann Arbor, Mich. Programs for computers with up to 28K words of core can be written in the standard PDP languages; the real-time I/O simulation allows the programmer to evaluate the efficiency and timing of his programs. After a program is debugged, it may be punched on paper tape on a terminal for direct loading into a PDP-5, -8 or -8/S computer.

● A cooperative program that will share data on the development of hospital information systems has been undertaken by eight hospitals and IBM. Members of the group that plan to contribute to a central source of information include John Gaston Hospital, Memphis; Baptist Hospital, Phoenix; Monmouth (N.J.) Medical Center; Ohio State Univ. Hospital, Columbus; Sisters of the Third Order of St. Francis, Peoria, Ill. (serving 10 hospitals); Univ. of Southern Calif. Medical School (Los Angeles County General Hospital); and Loyola. The main concerns of the hospitals are conceptual design, individual applications, programming languages, computer configurations, implementation

problems and personnel training methods. Loyola, which does not yet have a hospital, will begin a teaching facility next year with 25 remote teleprocessing terminals linked to a large cpu.

● The Internal Revenue Service has ordered a $2 million computer-based information system from GE that will be used in transferring information from tax returns to magnetic tape. Previously, tax information has been recorded on punched cards and then placed on tape; with the GE direct data entry system (using Datanet terminals) over 600 million cards will be put out of work.

● Strategists for the Bonn government are now engrossed in a German version of Iron Mountain. Only this is something colloquially known as the "consensus machine" and emanates from research in OR and econometrics at Heidelberg Univ. It is a model for determining the effects of particular home and foreign policy options on the political and economic scene in Europe. The general model is constructed for an analog machine. A digital system runs off the detailed tabulations of what a particular set of parameters means in terms of the size of military manpower and defense equipment, and the trade balance between Common Market countries. But one of the prime tasks is to monitor for effects that a particular policy may have on Germany's political image as seen by its neighbors.

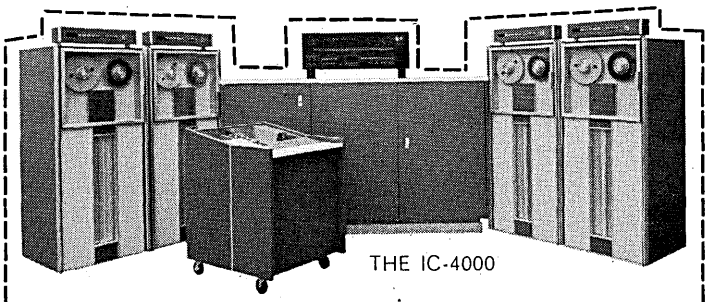
● Ampex Corp. has installed a random access audio information retrieval system, utilizing a standard SEL 810A digital computer to handle all control logic, at the Oak Park and River Forest High School, Oak Park, Ill. When fully programmed, the system will permit students access in less than 30 seconds to any one of 224 recorded 15-minute programs of study material. Cost for installation of the teacher substitute was $358K.

● Texas Instruments and Sony have agreed to establish Texas Instruments Japan Limited, each company furnishing 50% of the $278K capitalization. TI had originally applied for a wholly owned subsidiary, but this was not consistent with present Japanese government policy. However, three years after formation of the company TI may opt to purchase Sony's interest—again subject to approval by the Japanese government. TI Japan will manufacture semiconductor devices, including integrated circuits; Sony will continue to produce its own devices of the same type.

● Scientific Data Systems has announced an increase of approximately 4% in the purchase prices and lease rates of its Sigma 7 computer systems, effective June 1, 1968. The new price of a Sigma 7 mainframe with a core of 32K words will be around $521K. A comparable machine, the 360/50, sells for $485K.

● William C. Clauer, former president of Universal Data Processing Corp., Los Angeles, has resigned to form a new company, Intellectron Inc., whose initial efforts are in producing on-line, real-time systems designed so that a small business or professional office can avail itself of advanced data processing technology without the large R&D expenditures. The first Intellectron system serves the medical field and is designed for clinical laboratories.

● Hebrew University, Jerusalem, plans July installation at its Computer Department for the recently pur-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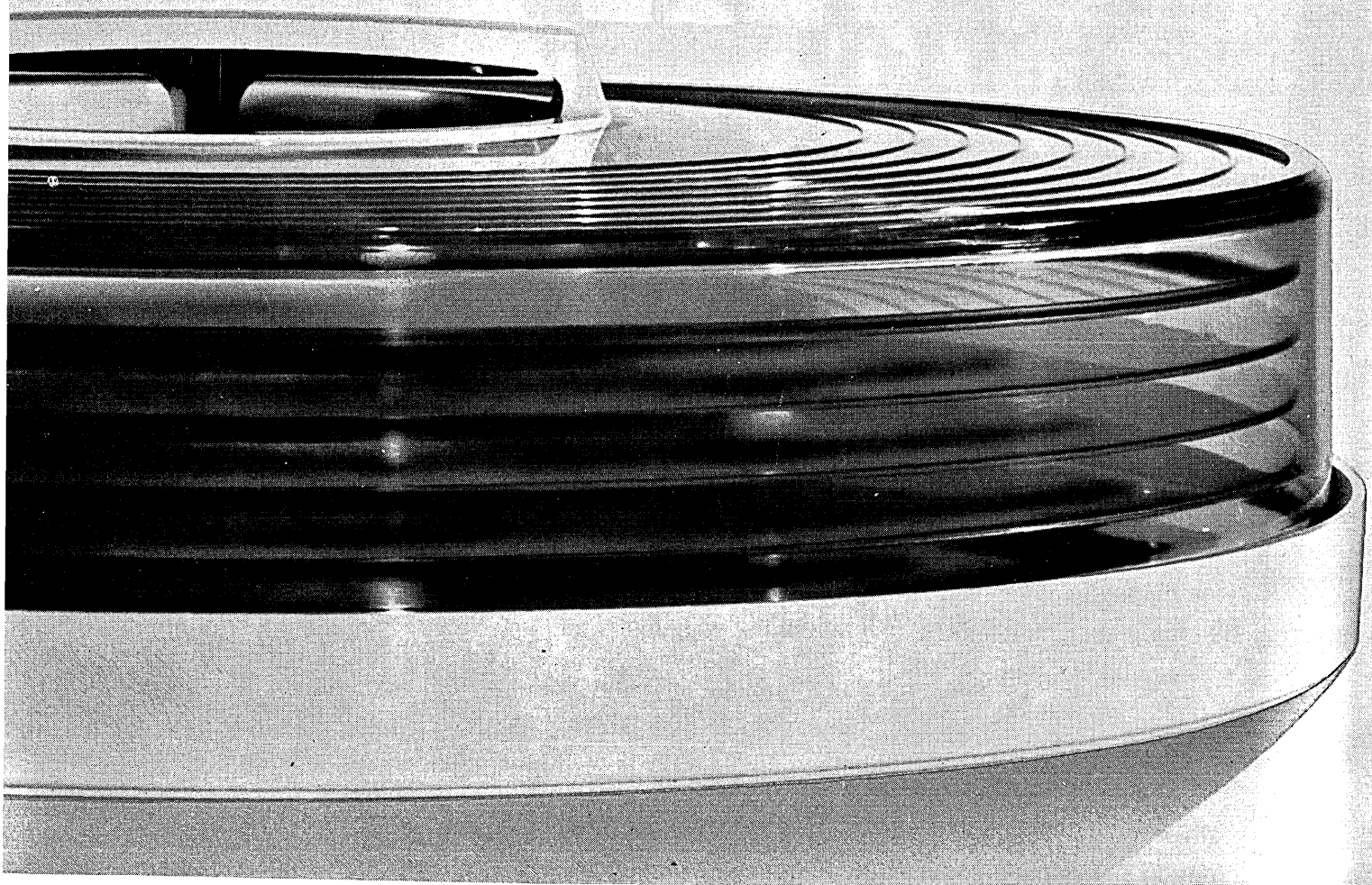

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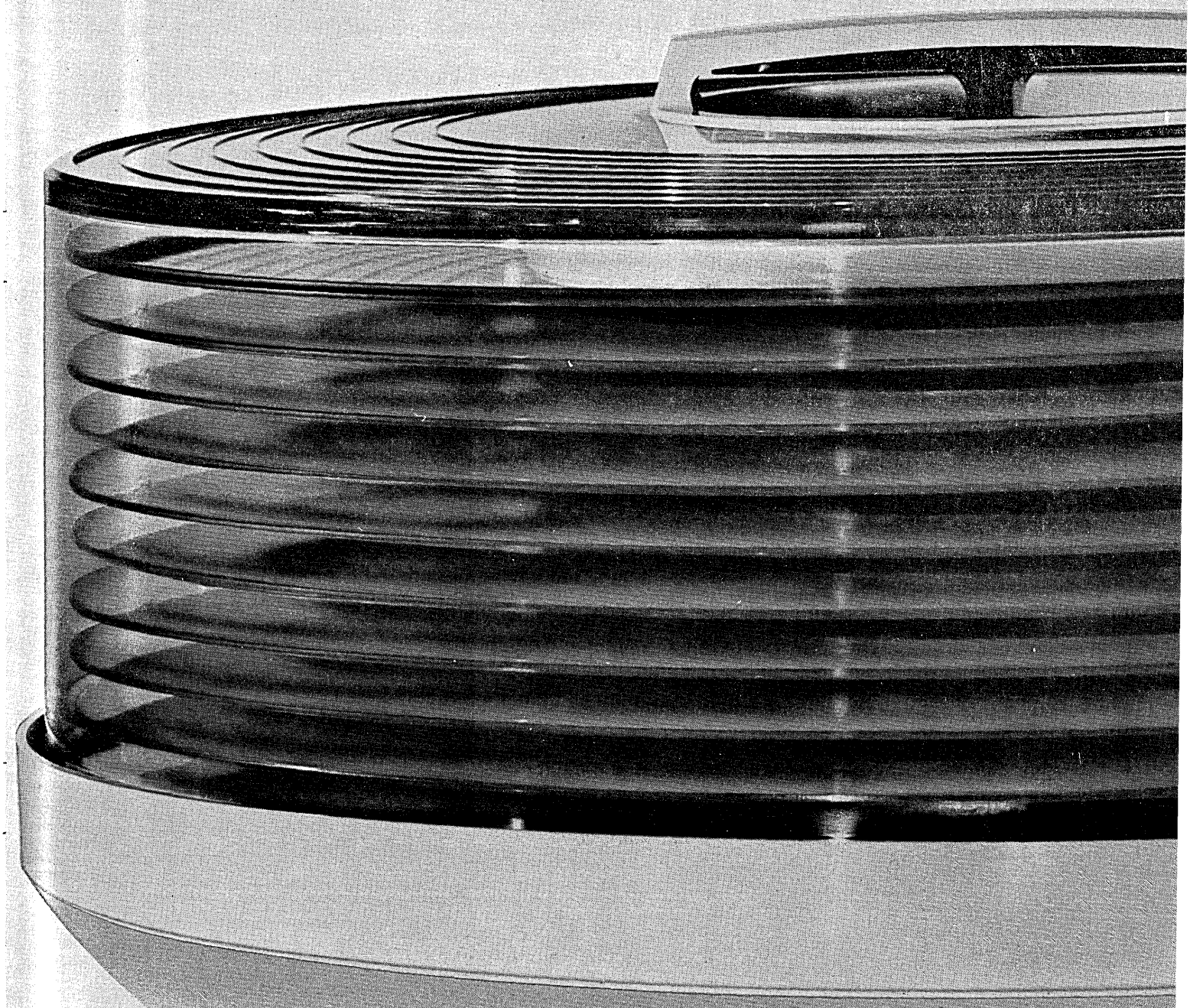

CIRCLE 66 ON READER CARD

See both at Booth No. 632 • DPMA Exposition

news briefs

chased CDC 6400. Peripherals include 6638 disc, 604 mag tape transports, and 512 high speed line printer, with later additions of 6612 visual entry/display stations and CDC 200 user terminals. The 6400 will be used for teaching, administrative planning, and scientific research; it will be Israel's most powerful computer.

● Testing will soon begin for NELAT (Naval Electronic Laboratory Assembly Tester), an experimental test program written by Dr. T. C. Chen, Office of Engineering Research, Univ. of Pennsylvania, under an $88,432 grant from the U. S. Naval Electronics Laboratory Center for Command Control and Communications, San Diego. NELAT is designed to reduce spare part component inventories on shipboard by finding the exact malfunctioning part needing replacement. A unique feature of NELAT is visual display output from the testing program. The operator can compare wave forms, frequency spectrums or shape of response curves so that troubleshooting can be done by other than technical expert or engineers.

● Air Canada in Toronto expects to be using an 8K Burroughs D82 system (two B475 discs of 9.6 million characters) for passenger name records and message switching in November. The computer will be working with the AC Ferranti Packard system which is used for seat inventory control without name records. Reservations will include passenger name, telephone number, special handling requirements and other individual information from which a boarding flight manifest will be printed. The Toronto system serves southwestern Ontario and duplicates a Montreal system serving Quebec province. The D82, developed by Burroughs' Defense group, is used similarly by United Air Lines. Air Canada expects this to be a three-year interim system, after which they will go to crt agent sets (present sets are Transactors, mark sense) and a larger computer.

shortlines . . .

Scientific Technology, Ltd., has been established in Jerusalem by Itek Corp., the Israel Discount Bank Investment Corp., and the Israel R&D Corp. The new company will concentrate on the application of electro-optical techniques to the industrial control and computer peripheral fields. . . . The N.Y. Clearing House Assn. will install a message switching system to handle the volume of inter-bank transfer of funds (an average of 25,000 transactions a week). The system, which will be operational by 1969, will consist of a number of terminals connected to a B3500 computer system . . . ADAPSO has filed a brief in the U.S. Court of Appeals, Minneapolis, hoping to reverse a lower court ruling on a "lack of standing" to enter suit against the U.S. Comptroller of the Currency and the American National Bank & Trust Co., St. Paul. . . . The Nippon Electric Co., Ltd. has formed the first national users organization in Japan. The association, open to users of NEAC computers, is headed by Eiichi Ito, machine division chief of Daiichi Life Insurance Co. . . . Computer genealogy: Comress, developer of SCERT, just bought part of First Investment Planning Corp., which specializes in underwriting dp firms—such as Computer Network, Washington, D.C. time-sharing firm in which Comress has 40% interest. . . . Applied Dynamics has delivered an AD-4 to IBM for use in a hybrid system for research. In turn, AD received an IBM 1130 to team with another AD-4 for their own laboratory use. . . . Mandate Systems, Inc. New York software/consulting house, won't be able to contact the people who signed the guest register at the SJCC booth. Some cur stole it.

NEED HIGH RELIABILITY?

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on a severe environment Miniaturized Alphanumeric Strip Printer.

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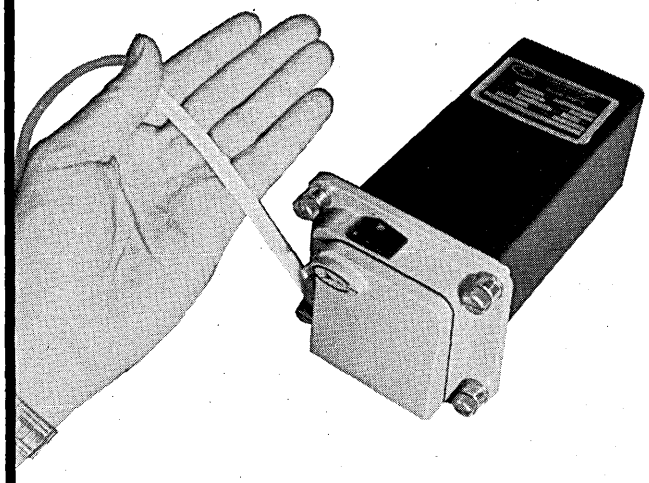

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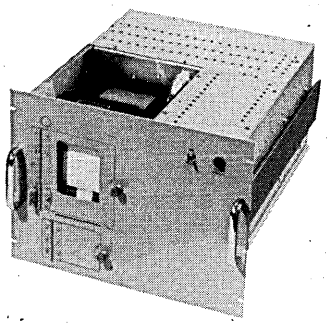

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CIRCLE 67 ON READER CARD

FOR INFORMATION INTERNATIONAL CIRCLE 68 ON READER CARD →

Is this the year of the Biomediputer?

An electric eye — guided by a computer — looks through a microscope at a blood smear. Seated at a scope displaying this picture, a diagnostician aims a pointer at a large, dark blood cell and interrogates the computer: "How many like this are there in the sample? What is its average diameter? How many larger ones are there? How many smaller? In the last 100 slides we examined, were there any like this? If so, display those slides."

He's asking questions only an extraordinarily sophisticated machine could answer. But these things are not impossible, indeed, in the evolution of information-handling machines, they are inevitable.

As surely as numbers were coded to make adding machines possible, and letters were coded to make the telegraph possible, and arithmetic was coded to make computers possible, so visual information has to be coded in order that we can manipulate it at high speed. Not just translate it from one form to another, but interpret it and act upon the interpretation.

That is our business, manipulating visual information using optical, electronic, and programmed devices. Systems we have delivered are now reading oscilloscope wave forms, analyzing seismograms and oil well logs, extracting positional data from theodolite photographs, examining biomedical samples, interpreting oceanological film, cleaning up soiled engineering drawings, making charts and graphs from digital data. But these are only beginnings.

We are pushing the inevitable, you might say. And your inquiry may influence the direction.

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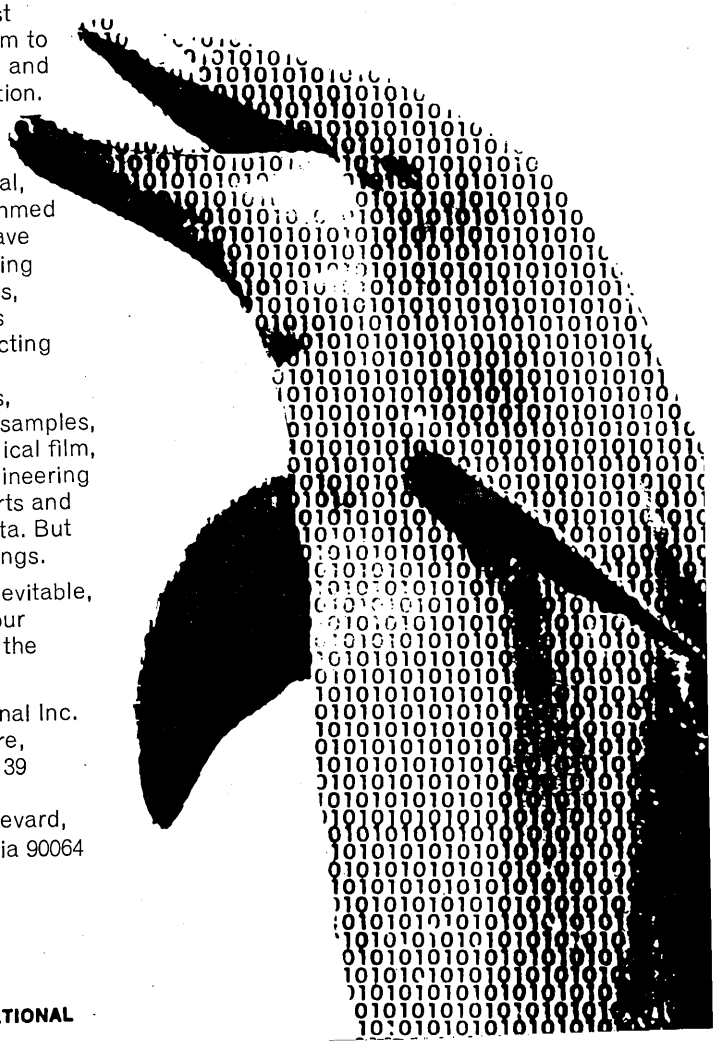

INFORMATION INTERNATIONAL

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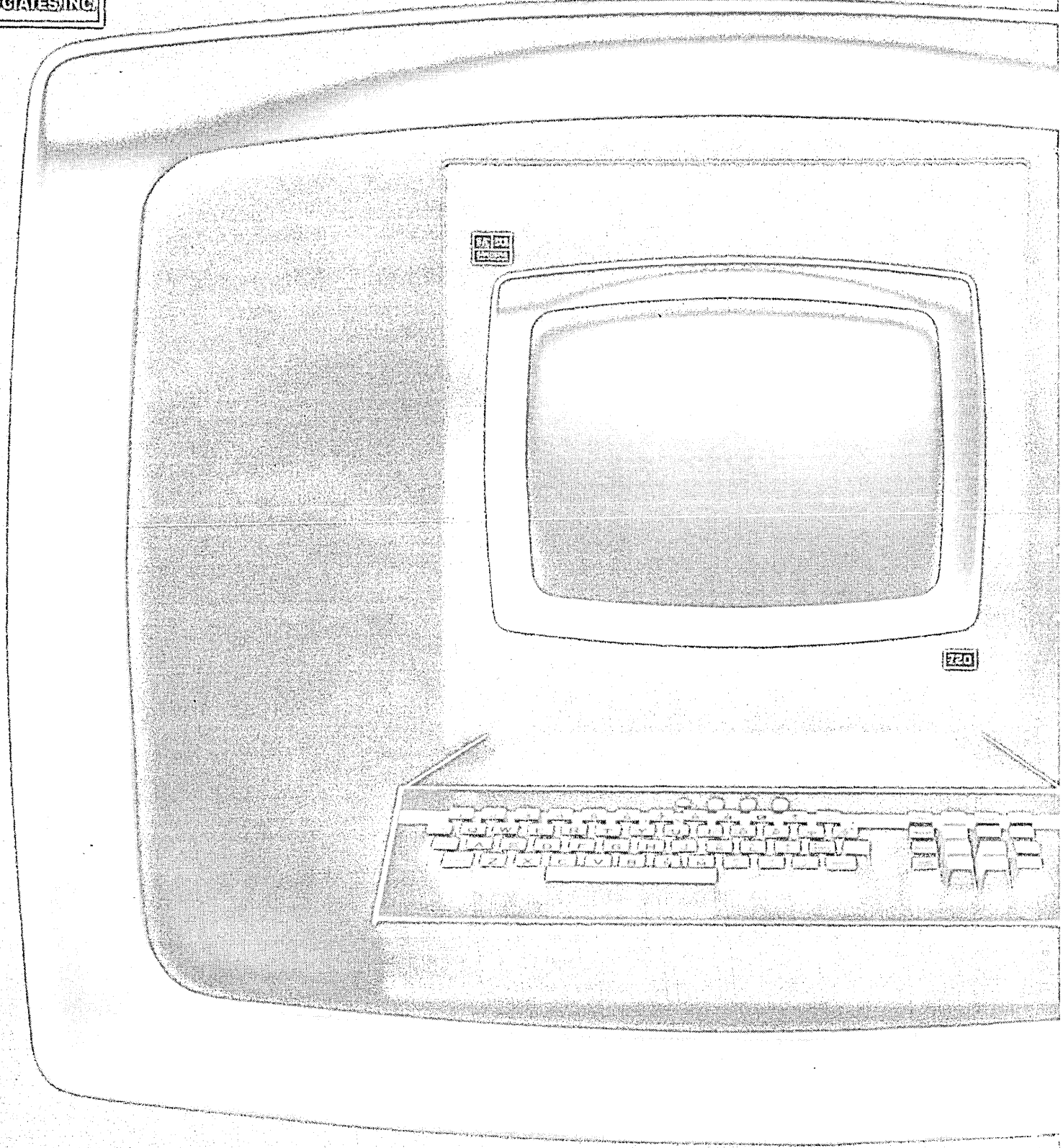

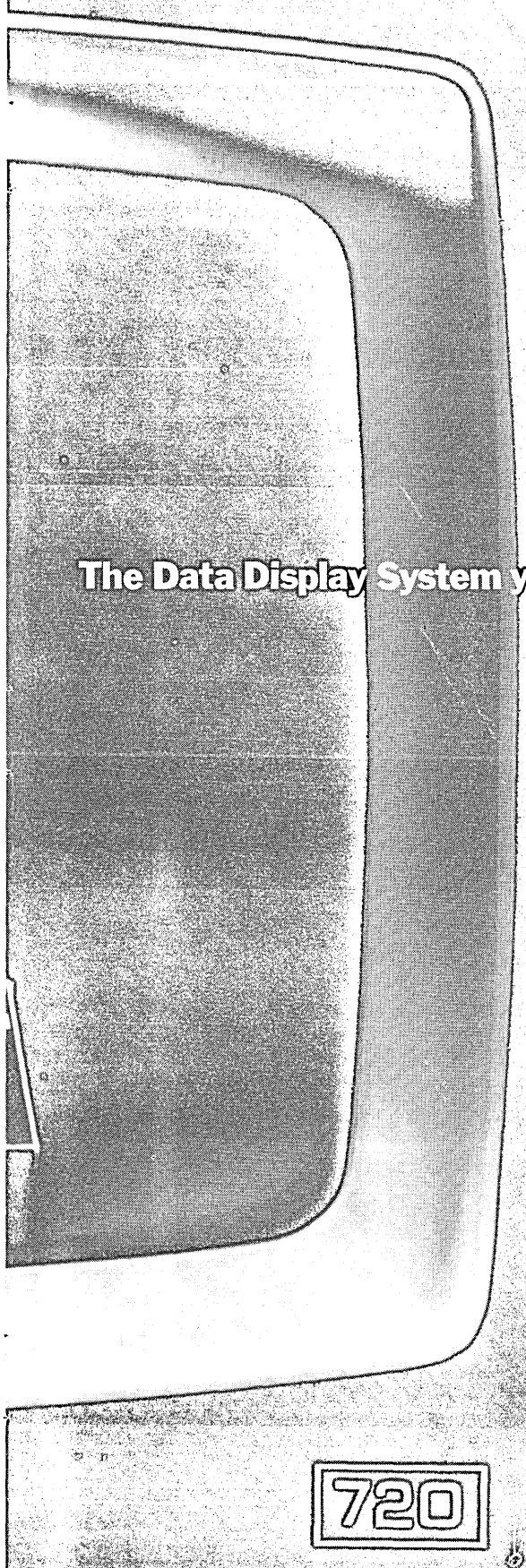

The Data Display System your computer would choose

Your computer, whatever its make, is an impartial judge. It doesn't have a brother-in-law in the business. It doesn't owe any favors to anyone. It deals in facts.

So if you asked your computer to evaluate all the facts about the various data display systems, you could expect it to make a very logical choice.

You could also expect it to pick a Sanders Data Display System. Because Sanders Display Systems have more of the features that a computer appreciates. Features that let it improve its overall information handling capabilities.

BIG SCREEN CAPACITY

Sanders Display Systems can present fifty percent more data than competitive units, on a screen the size of a typewritten page. The screen can handle 1,000 characters in more than 2,000 locations.

EASY TO EDIT

The computer is released the instant data appears on screen, so editing can be handled off-line. You can make any changes you want, anywhere on the screen. You can delete, correct and add information, easily. The text will automatically spread out or close up to maintain format.

FORMAT FLEXIBILITY

Any format can be established with Sanders Display Systems. They can be "locked in" by supervisory personnel, so that line operators can fill in appropriate data without accidentally altering the format.

All in all, the Sanders Data Display System lets you get more out of your computer by giving you better access to it.

Sanders . . .
for display systems any smart computer would like to be connected with.

Sanders:
The logical choice in data displays.

CIRCLE 69 ON READER CARD

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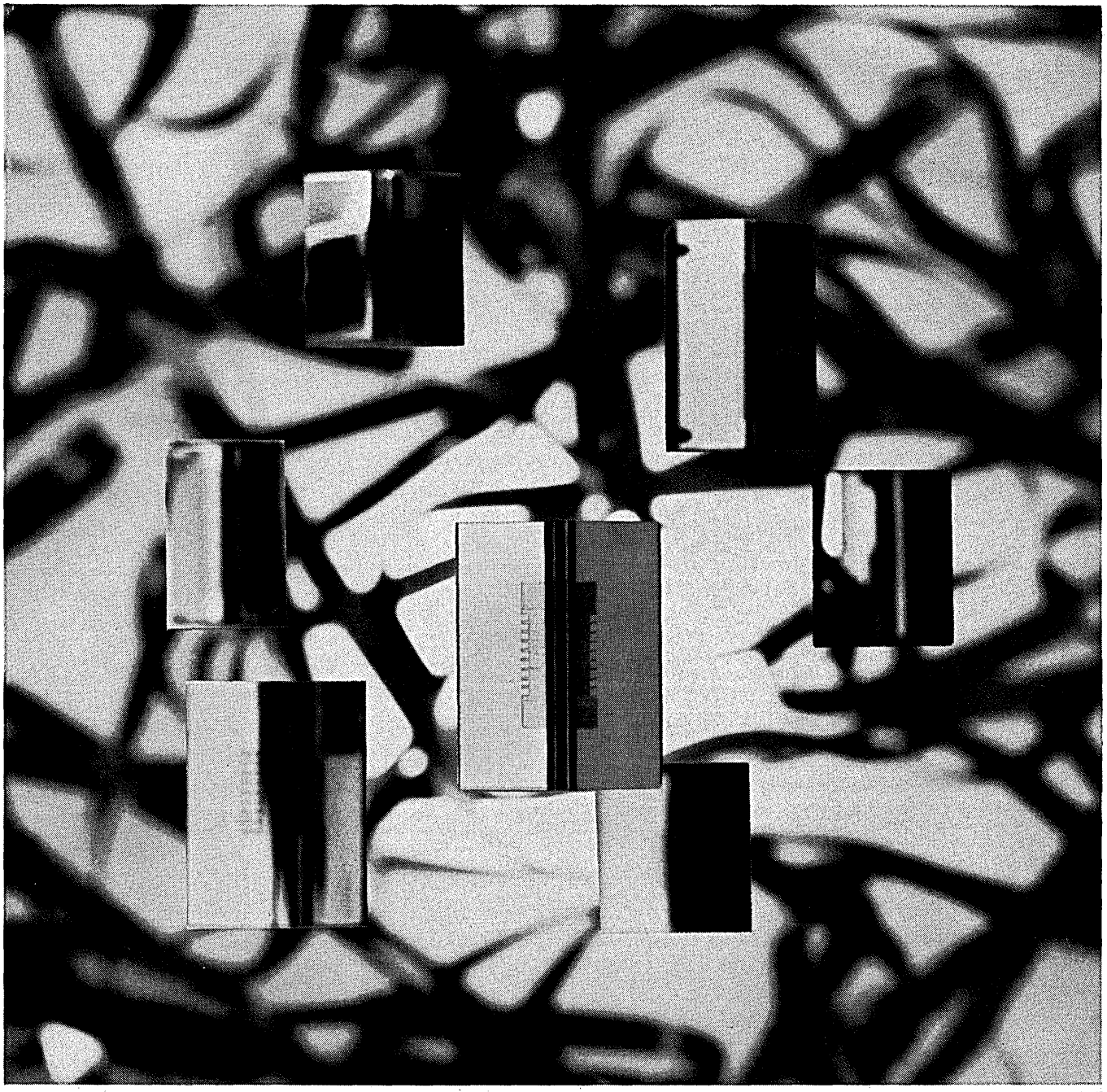

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CIRCLE 70 ON READER CARD

world report

OLIVETTI PUSHES TERMINALS AS GE COMPLETES TAKE-OVER

Now that it has sold its remaining 25% share in the Olivetti-GE computer company, the Italian Olivetti business machines and electronics group is going for the burgeoning terminal market with modules ranging from simple keyboards to configurations built around cards, punched tape and display facilities. This revival of the Milan-based firm has hit the European terminal market on a fast rising tide. Providing the deficiencies of the state-run communications do not put a damper on the increasing orders for real-time systems in banks and insurance companies and the large number of planned time-sharing services, the Italians should show realistically fat profits.

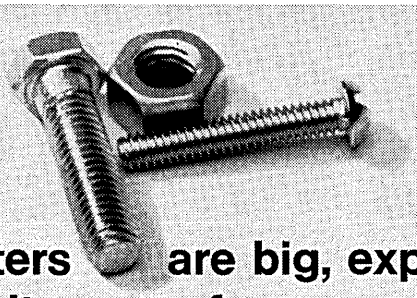
Although Olivetti sold control of computer manufacturing to GE three years ago when it was losing around $2 million a year on its main frame business, the acquisition may turn out to be the best that the American giant made at that time when its open checkbook policy bought up the French Machines Bull as well as Olivetti. In hardware terms this has delivered the GE-100 series which spawned the 130 last month as the second processor in the series. Sales of the firstborn in the series, the 115, have topped the 1,000 mark to give GE its currently hottest selling line. By comparison, the ill-fated Bull-GE group has yet to make a lasting contribution to the product range apart from the Gamma 140 (IBM compatible) which has been licensed to the Czechs.

Olivetti also retains a foothold in the edp field with a mini-desk machine, the Programma 101.

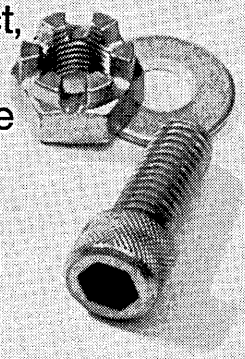
COMMUNICATION PROBLEMS HAMPER TIME-SHARERS...

In Olivetti's plans there is an unknown quantity that plagues computer development in Europe in general. It is the patchiness of the transmission line services from the various national authorities. No two organisations offer identical facilities in either price or reliability. In the U.K., for example, the cost for medium speed, 2400 baud connexions works out marginally cheaper than in the States—whereas in Germany the rates eventually run out up to six times as much. Such differences are reflected in the way time-sharing services are emerging in Britain, France and Switzerland but are slow to get off the ground in Germany. Local PTT (postal, telecommunications and telephones) regulations also vary and so restrict the types of modem that can be used. In the U.K., modems are standard equipment bought from the Post Office. Unfortunately, the planners underestimated demand and, in fact, cut back a contract to the industry for bulk supply a year ago. This left a vacuum when one time-sharing service put in an order for the year's supply a couple of months later.

Perhaps not surprisingly, the first modems did not quite live up to expectations when they were given continuous hammering on commercial services. Most troubles came on the return signalling path, and on more than one commercial service a user lost a connexion and on recovery during peak period found



Computers are big, expensive components. Bit for bit, ounce for ounce, some are a bargain.



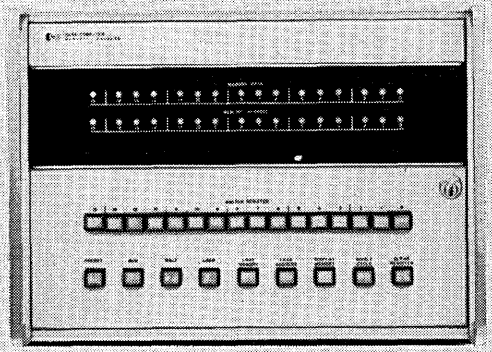
When you tie another man's computer into your product, you're staking your reputation on his equipment. Your reputation is worth shopping for. Naturally you want the most for your dollar. Like reliability at 130° F. Hewlett-Packard computers are designed for rugged dependability—as well as high performance. All things considered, they're something of a bargain.

We've been selling quality instruments to original equipment manufacturers for years. We know the problems. So we back our computers with excellent training, complete service and our traditional warranty. We'll train your people or your customer's people in maintaining the computer and in using the software.

We supply plug-in I/O interfaces and the software drivers for peripheral devices. You buy only the equipment you need for interfacing your system. And you tie it in with minimum engineering time because both hardware and software are operational and fully documented.

The 2114A pictured here measures 16¾"x 12¼"x 22½" including its power supply. It uses 16-bit words, operates with 4K or 8K memory, and has a two microsecond cycle time. Price: $9,950.

For more information about a computer that will live up to your reputation, call your local HP field engineer. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 54 Route des Acacias, Geneva.



HEWLETT hp PACKARD

DIGITAL COMPUTERS

06818

CIRCLE 71 ON READER CARD

another subscriber had nipped in and the first program had been dumped.

...BUT T-S IS A BIG HIT AT THE IEA SHOW

Nevertheless the interest in time-sharing was amply demonstrated at the May IEA (instruments, electronics and automation) exhibition in London. Potential users literally blocked the stands of Time-Sharing Ltd. and Computer Technology. Both had operational multi-access on the go. And the cloisters of Cambridge University have become a Mecca of development. Computing research at Cambridge revolves around its Titan project. There are 32 consoles on-line to the centre. Only 10 can be used simultaneously, but new control software for the operating system is nearly ready and will handle 24 consoles.

MOHAWK DATA SCIENCES MOVING FAST IN EUROPE

If Mohawk Data Sciences' growth continues at present rates in Europe, a second factory will be started—this time in the U.K. With manufacturing in Cologne now under way, Mohawk is ready to finance further expansion out of European revenue. And it has found support in the fashionable Eurodollar market with the help of German banks. The European vice-president, Otto Stitz, also has Univac roots like the team that Virgil Johnson and George Cogar led to set up Mohawk in the first place. Stitz ran the Sperry group's German operation which was the biggest international market for Univac.

NEW U.K. GIANT GETTING INTO ACTION

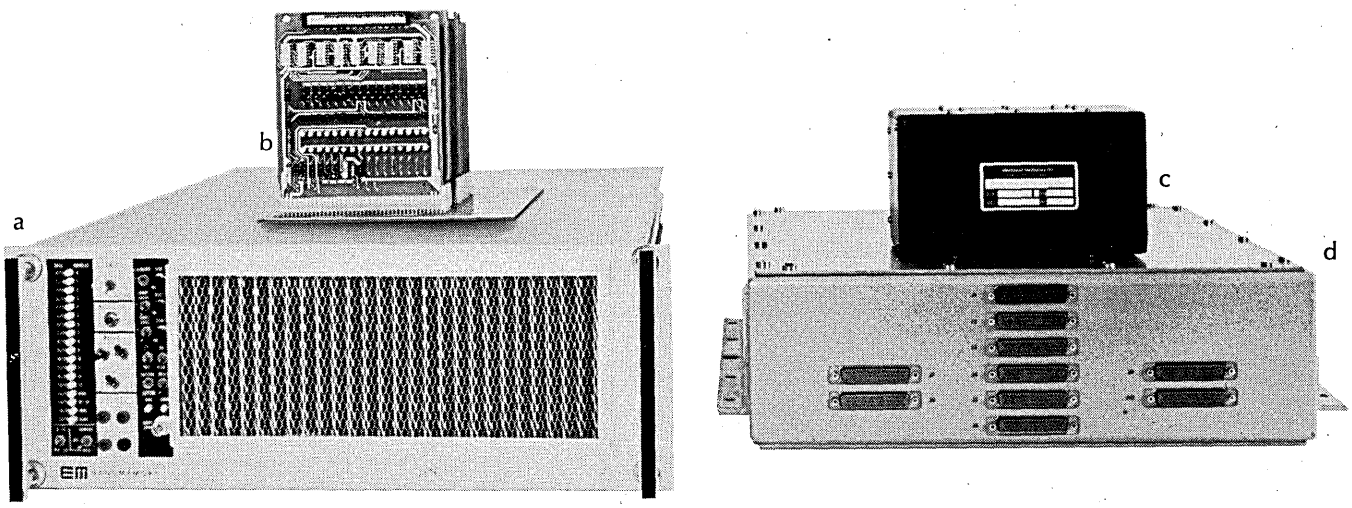
The newly formed U.K. monopoly arising from merging ICT and English Electric to make International Computers Ltd. has taken its first faltering steps toward rationalising activities. A special coordinating committee has made the first proposals about combining marketing talent in special areas to eliminate duplication of effort. But the great enigma is still the specs for Project 51, the big 'un that ICT had up its sleeve before the merger as the answer to the B8500 and CDC's 6000's. ICL's managing director, Arthur Humphreys, whistled through the States last month to explain the structure of the new company to equipment makers with whom there had been licensing arrangements. Humphreys flatly denied that P 51 had been discussed either with CDC or Burroughs, both named as possible collaborators.

Talks with Burroughs looked most likely since Project 51 is a multi-processor concept working round a big store. And ICT software men were interested at one stage in developing operating systems in a high level language a la 8500 style. With time pressing, ICT has moved away from the Burroughs idea. And they are now in a race against time to get their big operating system George 3 together. This has assumed priority on machine time at the South London HQ and key men have been signed up for unusually long term contracts for the British industry.

BITS & PIECES

After its beating in the banking world by Burroughs over the past 18 months, IBM has bounced back with some special product development at the Hursley Labs in the U.K. It has produced a terminal with buffer, selling around $7500 for each station—all aimed at undercutting the TC500 terminal of its rival...CEIR Ltd. is developing a Fortran IV for Computer Technology's modular one...Univac has picked up another 1108 for the University of Rome.

two hawks two doves



These two military and two commercial memories round out the broadest system line in the industry. Whatever your environmental requirement, we have a system to meet it. And we have it available right now.

There are other advantages in letting us build your system. The design techniques we've mastered for our military memories have been adapted for our commercial devices. You get the benefit of features like pluggable stacks and electronics for easier maintenance, integrated circuits for increased reliability, and space-saving design concepts.

Brief specs are listed below, but for the full story write to Electronic Memories, Inc., 12621 Chadron Avenue, Hawthorne, California 90250.

(a) NANOMEMORY™ 2000 SERIES—Combining integrated circuit electronics and a unique 2½D drive system, the 2000 Series has a 294,902 bit capacity, cycle times of either 650 or 900 nanoseconds, and a configuration measuring only 21.5 inches deep by 19 inches wide by 7 inches high, including power supply and optional tester.

(b) MICROMEMORY™ 1000—Taking up only 400 cubic inches, the 1000 features a 32,768 bit capacity and a 2.5 microsecond cycle time. It uses a unique 3D drive configuration permitting a particularly low component count, with correspondingly high MTBF, and a price less than 10 cents per bit in small quantities.

(c) SEMS 5—Designed for airborne applications, the SEMS 5 has a 2 microsecond cycle time, packs 131,062 bits into only 132 cubic inches and meets applicable portions of MIL-E-5400, MIL-E-4158, and MIL-E-16400.

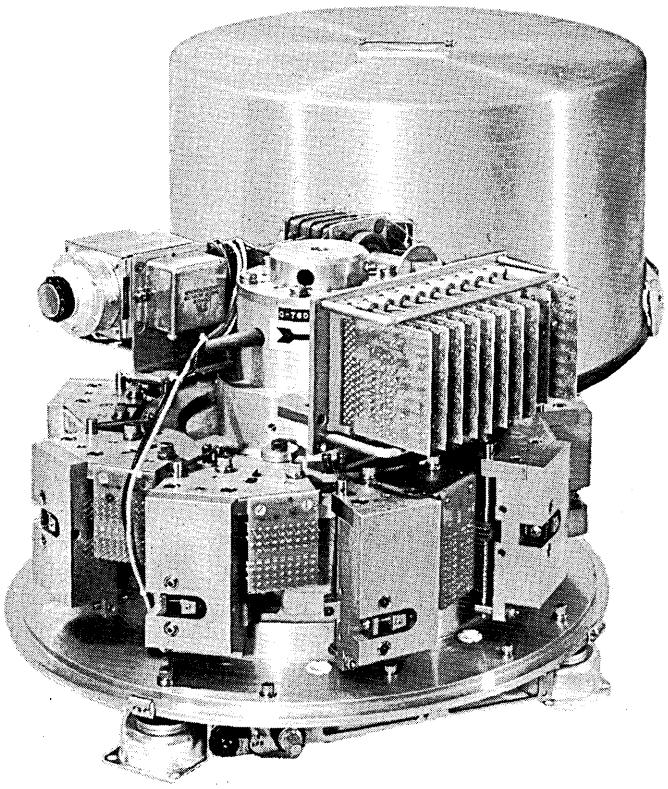
(d) SEMS 7—Developed for ground based applications, this rugged memory has a 2 microsecond cycle time, a 327,680 bit storage capacity and meets applicable portions of MIL-E-4158, MIL-E-16400 and SCL-6200.

EM electronic memories

CIRCLE 72 ON READER CARD

Fact:

For less than $10,000, rapid random access to 4,224,000 bits can be yours



. . . in a 17½" diameter by 12⅝" high dusttight package, including all electronics required for head selection, writing and reading data. Get the intriguing performance details on our brand new high-density 1004S Drum Memory option in Bulletin TIB-6803.

And while you're at it, check out the tremendous versatility of the entire VRC drum line, covering a storage range of 328,000 to 64,307,200 bits, in five standard packages. Ask for 12-page brochure DB-6803.

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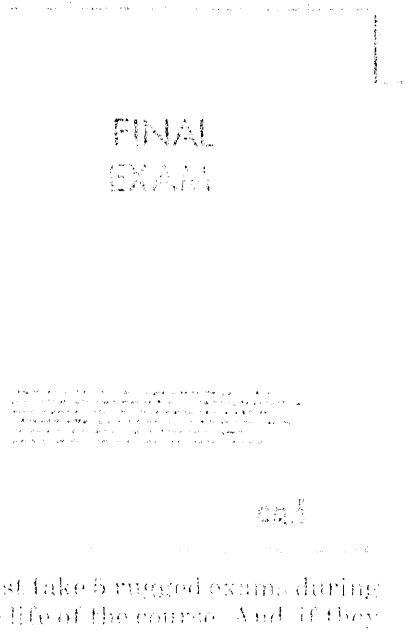

At ECPI, our three-hour final exam separates the programmers from the console operators. In fact, it's so tough that even some of your own veteran programmers would probably find it a pretty demanding test.

What goes on before the final is just as gruelling. Because during their course of study, ECPI students have to sweat through hundreds of hours of programming classes and homework. And, before they graduate, they have to write 21 programs in third-generation languages. Then, we make them verify every one.

What's more, our students must take 5 rugged exams during the life of the course. And if they can pass those and make it to the end, there's still that big 3-hour hurdle. In fact, we make it so rough that about 20% of our students give up the ghost. But the ones who make it have got what it takes to make it with you.

It's that three-hour final that finally makes the difference. So if you still think all computer school exams are a lead pipe cinch, drop us a line. And we'll let you put ours to a test.

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CIRCLE 24 ON READER CARD

washington report

NEW ESTIMATE LIKELY TO SHOW LESS IDLE TIME

A GSA management information systems study is now getting accurate information on adp utilization in the federal government. Earlier figures, setting unused computer time in the agencies at 436,000 hours a month, had raised eyebrows on Capitol Hill.

Not only is a much lower total expected when the study is completed in June, but available time for sharing may turn out to be decreasing—rather than increasing as the growing federal equipment inventory suggests at first glance. The 436,000-hour-paper-and-pencil estimate didn't accurately account for dedicated equipment or remedial and preventive maintenance time, and was tabulating 5- and 6-minute units of down time, among other defects. An accurate measure of "non-available" hours will greatly improve intra-government sharing programs. The General Accounting Office's pending utilization study of federal adp is awaiting GSA's results.

PATENT BILL WAITS AS CHANGES ARE MADE

The bills overhauling the patent law have bogged down on Capitol Hill, and committee sources in both House and Senate concede that time is now too short for passage this session. Senator McClellan's Judiciary Subcommittee has drafted new legislation to replace the Administration's patent bill S1042, and has distributed the draft proposal for comments. The House Judiciary Subcommittee is awaiting final action by the other body before proceeding any further.

The new McClellan version drops language specifically prohibiting patents on computer programs —as recommended last year by a Presidential study commission. The subcommittee emphasized, however, that the change is not a judgment that programs should be patentable.

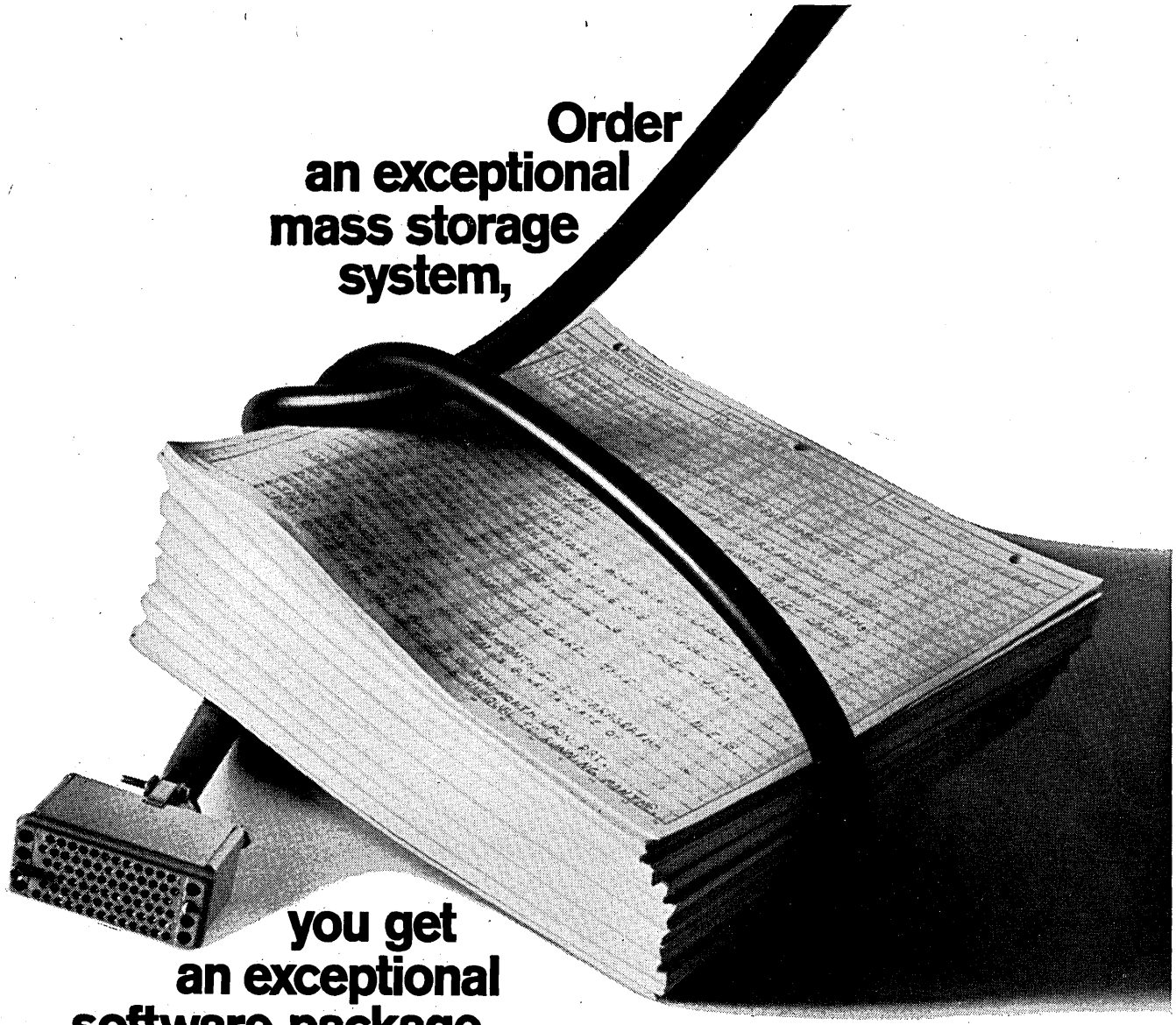
REVISION OF CIRCULAR SUGGESTED BY OFFICIAL

Assistant Comptroller General Frank Weitzel, in a speech to the National Aerospace Services Association last month, said BOB Circular A-76 should be clarified to include only those "commercial" activities which are actually used extensively by commercial enterprises. This definition would exclude contract services used primarily by Uncle Sam. The distinction is a fine but significant one, for under Weitzel's interpretation, contracts consisting largely or exclusively of personnel support would be put beyond the scope of A-76 in its present form. This would create a need to amend the circular, or write a new one restricted to personnel support contracts. (See p. 92 for earlier story.)

CAPITOL BRIEFS

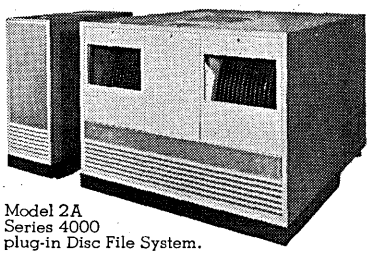
The Federal Reserve Board—named to administer the new Truth-in-Lending legislation cleared by Congress—is shopping for software to help retailers express finance charges as required under the act ... Warren House has been appointed staff director of the Computer Science and Engineering Board of the National Academy of Sciences. Dr. Anthony Oettinger of ACM and Harvard will chair its new advisory committee ... Agency officials are holding their breath as Congressional economizers bite hard into R&D funds. Apollo applications were cut to $253.2 million from the original Nasa request for $440 million. The Senate specifically whacked military R&D 3%, and then cut the entire DOD package another 3%, including the already-slashed research programs.

Order an exceptional mass storage system,



you get an exceptional software package.

We're not going to hardsell you on software—just tell you about it.
Our new plug-in memory system is supported by a comprehensive sub-routine package that consists of machine independent handler and diagnostic flow charts as standard equipment.
But it doesn't stop there. You can also extend your package to include assemblers, compilers, operating systems, storage unit optimized sort/merge routines and machine dependent handlers and diagnostics.
In essence, we offer modular software.
Which goes beautifully with our modular hardware. The system has a capacity of 8 million to 5 billion characters. Ranging from one low-cost Bryant memory drum or disc file to as many as eight.
If you'd like to hear more, write to: Ex-Cell-O Corporation, Bryant Computer Products, 850 Ladd Rd., Walled Lake, Michigan 48088. We'll send you a "Bryant Believer" brochure.



Model 2A
Series 4000
plug-in Disc File System.

BRYANT COMPUTER PRODUCTS

XLO®

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CIRCLE 75 ON READER CARD

new products

data input device

The IBM 50 magnetic data inscriber and the 2495 tape cartridge reader are companion units that enable a keyboard operator to put information on mag tape and enter it into a computer (360/25 and up). Data entered on the inscriber is recorded in EBCIDIC on 9-track 16 mm mag tape (recording

density is 20 characters an inch). The information on the tape is recorded in a cartridge identical to those used with the Mag Tape Selectric Typewriter; the cartridge holds 23,000 characters of information. Maximum record length allowed by the inscriber's program control drum is 720 characters; it may be numeric or alphanumeric. The inscriber also includes a console that displays characters and shows the operator the area of the record being keyed; another feature allows automatic verification of recorded data.

The 2495 cartridge reader can hold up to 12 cartridges at the same time; cartridges are read, rewound and stacked automatically. The information is fed into the computer at rates up to 900 cps. Deliveries will begin first quarter '69. IBM DP DIV., White Plains, N.Y. For information:

CIRCLE 184 ON READER CARD

aperture card updating system

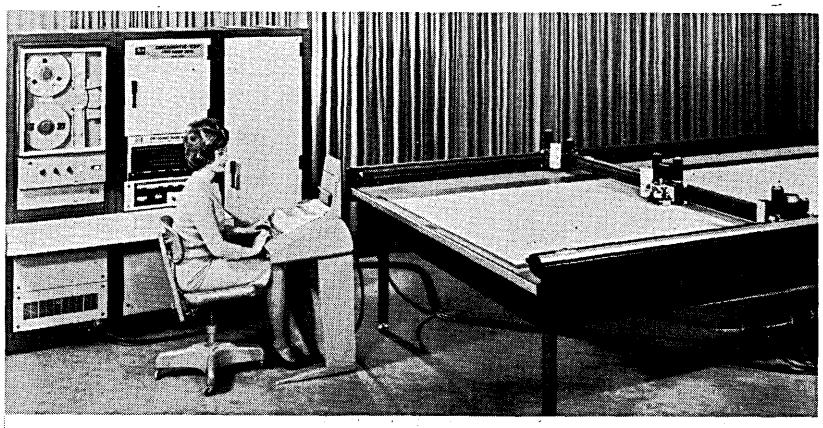
An Automated Microfilm Aperture Card Updating System (AMACUS) revises microfilmed documents; the complete system incorporates an operator's display console, memory system console, scanner/processor console and computer. The operator's console includes a large crt, display drum memory, teletypewriter, aperture card reader/printer and auxiliary display, a control panel and light pen. The memory system can store 29 million bits on its memory drum; the scanner/processor console has a flying spot scanner subsystem and an aperture card processing unit. Drawings and documents can be updated by manually inserting the card to be revised in the scanner/processor unit. The microfilmed portion of the card is then converted via a flying spot scanner into digital data that is stored on the memory drum. If the revision involves redrawing of lines, the operator uses the light pen to make the changes. Printed data may be added, deleted or revised by the console keyboard, teletypewriter and light pen. Once revisions are completed all the stored data is recorded on an unexposed aperture card which is automatically developed, washed and dried for immediate use. The total revision can be done in about five minutes. GENERAL PRECISION SYSTEMS, INC., LINK GROUP, Sunnyvale, Calif. For information:

CIRCLE 185 ON READER CARD

classroom computer

The Digi-Tutor 3 is a small (4,096 16-bit words, expandable to 65K bytes) classroom computer with an illuminated display panel. The portable unit has 16 general registers and a 1.8 usec cycle time. Over 65 instructions are in the repertoire. Two operational modes—RUN and STEP—allow the observance of computer processes as they happen. An ASR 33 teletypewriter for either keyboard or paper tape input is also included. The display panel measures 2′ × 3′; all data entry switches and legends are illuminated. The software for Digi-Tutor offers an assembler with a math library consisting of 12 subroutines, on-line conversation FORTRAN and a debug routine. The SIMPLE (Simplified Instruction Machine and Programming Language for

PRODUCT OF THE MONTH



The Orthomat Mark II Graphic System 5000 is an automatic drafting system that separates hardware and software into standard modules; these modules are assembled into packages that match customer specifications. According to the company, the many variations of assembled modules will meet 90% of all drafting requirements. The system can be operated in a general purpose computer facility; its own control system uses a PDP-8 computer with a 4,096 word random access memory, control console. A 300 cps-tape reader is included for input of drafting data and programs; a 10 cps-teletypewriter permits the operator to enter other types of data. A standard drafting table is also supplied. Software includes standard drafting control systems, and a library of optional format converter programs which allow reading N/C machine tool tapes for verifying cutter centerline paths. There are also programs for isometric, orthographic and perspective projections. Digitizing software is also available, as well as general purpose conversion programs which permit English to metric conversion of coordinate data. An operator at the keyboard can control the alphanumeric operation of the drafting machine, which permits mag tape, paper tape or punched card input. UNIVERSAL DRAFTING MACHINE, CORP., Cleveland, Ohio. For information:

CIRCLE 186 ON READER CARD

Moore Ideas for Data Processing

Cut time lag in billing, collecting

This Moore system not only saves statement-preparation time but cuts out two separate operations. Speeds up billing, improves collections, saves cost of return envelope. Customer gets postage-paid preaddressed envelope as computer print-out. Preprinted data averts posting errors.

Full year's billing from one print-out

Banks, finance companies, anyone servicing time payment accounts can reduce billing costs. Moore EDP statement form includes monthly payment coupons. Costs less than coupon books. EDP assures accuracy. Customer finds it just as easy to use as coupon book. Easier to keep track of.

Why copy original source documents?

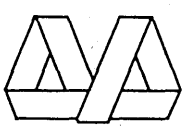
Optical scanning is getting big. It permits you to program data into your computer without copying or punching cards. Moore has been working with OCR equipment for years. We have the forms know-how, experience, and ideas to help you eliminate the expense of tedious copying, the annoyance of needless errors, and costly delay in getting data into your computer.

Get customers to reorder automatically

Invoice forms can include, among other things, a renewal or reorder form prepared with one writing along with invoice. Reminds customers to reorder. Makes it easy for him to do so. Ordering information, including correct models and prices, are preprinted. Fewer errors. Fewer delays.

Ideas from the Yellow Pages

That's where you get in touch with a Moore man. He—and more than 2400 like him—is in constant touch with businessmen who face and solve your kinds of problems. One Moore idea may be what you need to bring down the cost of machine time or gain better control.



MOORE BUSINESS FORMS, INC.

Over 500 offices and plants, 2407 salesmen in North America

Education) is also included. It is a simulator system which emulates a reduced capability computer with a machine instruction subset and educational diagnostic facilities. Instructional material, such as course outlines, lesson plans and problem books come with the system. PRO-DATA COMPUTER SERVICES, INC., West Long Branch, N.J. For information:

CIRCLE 187 ON READER CARD

mail separation system

The PSS (Postal Separation System) processes mailing lists on models 360/40 and up; although the package is currently operating on COBOL, OS and disc I/O, it can be tailored to user's requirements. The system meets all U.S. postal requirements; it sorts mailing lists into zip code sequence, organizes them according to postal regulation for bundling, and prints labels which can be coordinated with Cheshire addressing equipment. The program also produces a statistical report for analysis and control. It is available for immediate delivery. ATLANTIC SOFTWARE, INC., Philadelphia, Pa. For information:

CIRCLE 188 ON READER CARD

commercial software package

AEGIS, An Existing General Information System, is a commercial software package for information retrieval and file management with models 360/30 and up. Aimed at the smaller user, the system operates with a minimum of 32K, OS or DOS, using free format English-type statements for management accessibility. It functions batch or on-line with existing files and has an installation price of $9,500, which includes a lifetime warranty, user training, and documentation. PROGRAMMATICS, INC., Los Angeles, Calif. For information:

CIRCLE 189 ON READER CARD

random access memory

The EM-H6 Card Random Access Memory (CRAM) unit has a built-in automatic read-after-write check, and can be used for both random and sequential processing. Each interchangeable CRAM deck can store 125 million (7-bit) bytes; each deck consists of 384 magnetic mylar cards with a recording density of 1,500 bpi. Any deck can be changed in under 30 seconds without down sequencing the unit; the throughput rate is five cards a second. The company claims the EM-H6 has 30 times the capacity of the original CRAM unit, first marketed in '61. NATIONAL CASH REGISTER CO., Dayton, O. For information:

CIRCLE 190 ON READER CARD

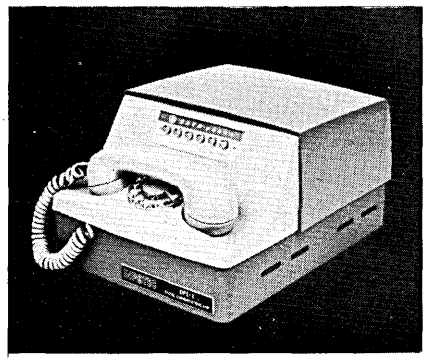
data station

The DS7100 (7-track, 200 or 556 bpi) and the DS9100 (9-track, 800 bpi) data stations are terminals which put information directly on magnetic tape. Both versions consist of a keyboard, alphanumeric display, core memory and mag tape unit; data and its storage location is displayed continuously in "English" on the display. Information can be verified before computer input by activating the rewind switch and rekeying from source data. Deliveries are scheduled for last quarter of '68. SANGAMO ELECTRIC CO., Springfield, Ill. For information:

CIRCLE 191 ON READER CARD

communications terminal

The DS-20 is a data communications terminal that includes a small, programmable computer; 7- or 9-track compatible read/write mag tape system; ASR-33 Teleprinter; and an interface to Type 103 or 202 Data Sets. It can be used in two-way communica-



tion over TWX or Telex networks, or over dial-up or leased telephone lines. Full software support is supplied for integration into the end user's present or projected system. Optional equipment is a multiplexor (serving up to 32 Teletypes), Selectric typewriter, interfaces for 201 or 401 Data Sets, control unit for automatic dialing, and additional tape drives. INFOTEC, INC., Rye, N.Y. For information:

CIRCLE 192 ON READER CARD

plotting service

A program which will allow time-sharing on an automatic plotting, drafting and measuring machine, the Coradomat 15, is the basis of a service offered by the company. Customers can send numerical instructions, drawings or tapes by mail; for faster service, the company can send and receive data on a contract basis via a tape-to-tape system. The Coradomat 15 offers functions such as construction of pencil proofs; drawing with a knife, ballpoint pen, ink or jewel scribes; cut and strip work; or drawing with a photobeam on film or photo plate. All time-sharing charges are based on the number of hours of actual machine use—there is a minimum charge of one hour. THOMAS L. FAUL ASSOC., Skaneateles, N.Y. For information:

CIRCLE 193 ON READER CARD

business computer

The GE-130 is the big brother of the GE-115 computer system; the company plans to market it to current users of the 115 and other competitive systems of that size. Manufacturered by Olivetti-GE in Italy, the 130 has a memory speed of 2 usec (compared with 6.5 usec on the 115), and a memory size of 32K (8-bit) words. It is software- and peripheral-compatible with the 115. A new feature in the 130 is the interrupt capability, permitting it to be used in some real-time applications. Available software packages are Extended DOS, Extended TOS, COBOL, FORTRAN, and Assembly Programming System. Purchase price is $181.8K or $4,220/month for a basic configuration. Delivery is one year ARO. GENERAL ELECTRIC INFORMATION SYSTEMS, Phoenix, Ariz. For information:

CIRCLE 194 ON READER CARD

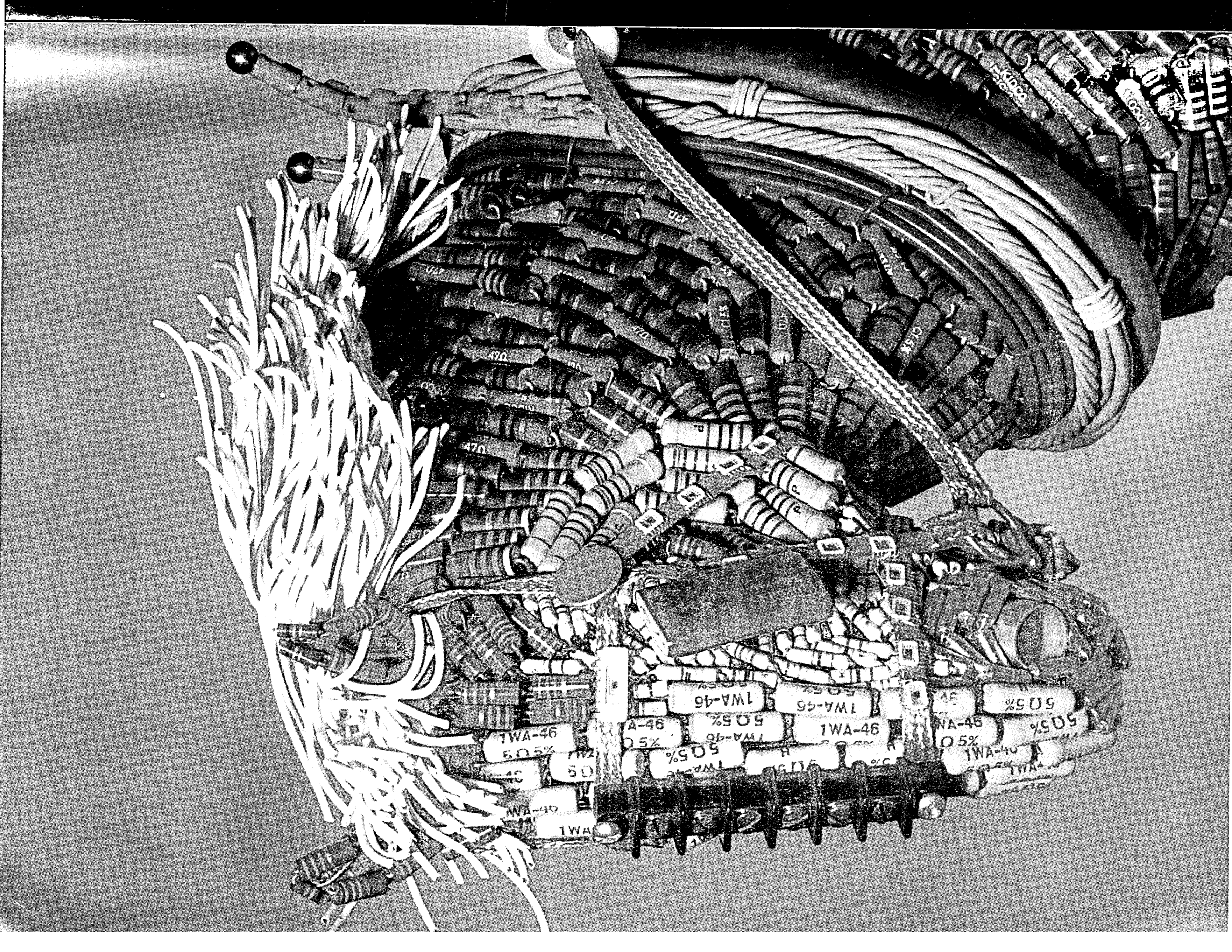
disc drive

The 660 disc drive, with a storage capacity of 29.17 billion bytes, is compatible with the IBM 2314 disc drive, and can be interchangeable with the Mark VI and 2316 disc packs. The unit is being offered in a modular design: one or more may be ordered initially, and as needs increase, additional units may be added. The 660 has an average access time of 50 msec, and a data transfer rate of 312K bytes a second. MEMOREX CORP., Santa Clara, Calif. For information:

CIRCLE 195 ON READER CARD

data set

The AE 103 series of data sets provide all of the low speed (up to 300 baud) data services offered by telephone operating companies. The series is compatible with the EIA RS-232 standard interface for business machines, and is available in two versions: 103A is for local and long distance telephone lines, and the 103F is for dedicated or private line applications. The 103A is used with a data telephone that allows



Computers that actually work.

If you think that's funny, talk to a man who has spent the last six months trying to get his new computer to do an honest day's work.

There are many men in this position right now. Their new computers are so complicated, so hard to program and run, it could be literally years before they're doing even the day-to-day work a computer should do.

Well, happily, that's not the only kind of computer on the market today.

The other kind of computer is the kind you get from Honeywell. It not only works, it works beautifully.

It's not only a superspeed, third-generation computer, it's also easy to program and easy to run.

To get you started fast, a Honeywell computer gives you basic-application computer programs that are ready to run right now.

When it converts old programs, it does it fast and easily. Then runs them at new-computer speeds.

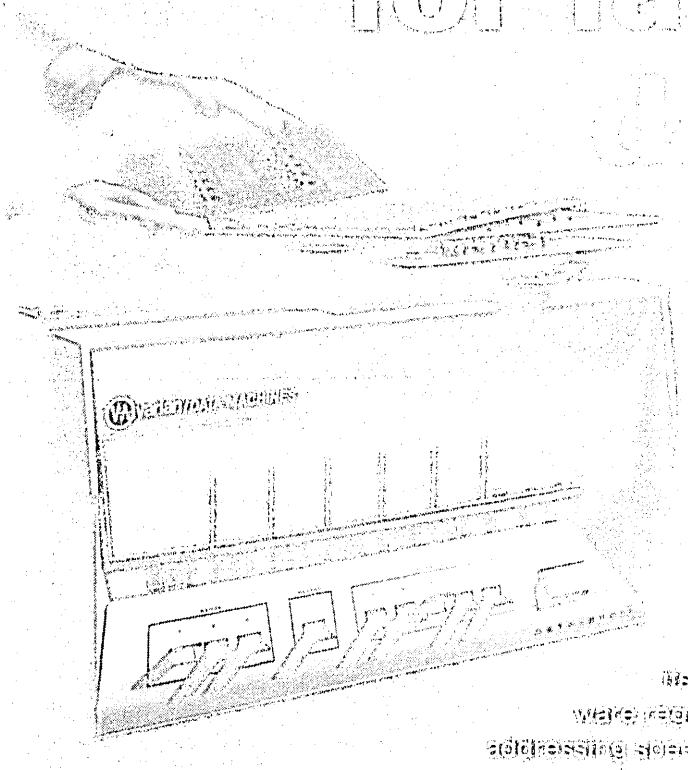
And its software is designed to get your new programs on the air quickly, and keep your computer running at maximum efficiency all the time.

Shall we hitch one up for you?

The Other Computer Company: Honeywell

CIRCLE 64 ON READER CARD

VARIAN DATA 620/i gives you more hardware power for faster problem solving



We have excellent professional openings for engineers and programmers.

telephone communications between two terminal operators and provides supervisory control for the data set; it is equipped with a standard telephone dial and six pushbuttons. The 103F does not require the associated telephone subset; one 103F can be permanently strapped in the answer mode and one in the originate mode. AUTOMATIC ELECTRIC CO., Northlake, Ill. For information:

CIRCLE 196 ON READER CARD

language translator

ALTRAN (Assembly Language TRANslator) translates SDS 900 series Symbol or Meta-Symbol source programs to Sigma 5 or 7 Meta-Symbol. Available for "immediate" release the delivery includes installation of the system on either 900 or Sigma machines, and class instruction. APPLICATIONS SOFTWARE, INC., San Pedro, Calif. For information:

CIRCLE 197 ON READER CARD

printer

The EM-C5 printer prints up to 3,000 lines a minute (numeric, 13-character set); and 1,500 lines a minute (alphanumeric, 48-character set). The unit features swing-away typedrum and ribbon assembly, variable vertical spacing, two-speed slewing, vertical alignment, and a vertical format capable of reading up to 12-channel tape. NATIONAL CASH REGISTER CO., Dayton, Ohio. For information:

CIRCLE 198 ON READER CARD

modified disc system

A new version of the Rapid Access Data disc file storage system for Sigma 5 and 7 computer systems has data transfer rates up to 3 million bytes per second and storage capacities expandable from 5.3 million to 21 million bytes. Average access time is 17 msec. Designated the model 7211/7212, deliveries will begin in third quarter '68. SCIENTIFIC DATA SYSTEMS, Santa Monica, Calif. For information:

CIRCLE 199 ON READER CARD

digital-to-synchro converter

The 4DS-10-400-12 four-channel digital-to-synchro converter is driven directly by a PDP-8/S computer; outputs from the unit drive an analog computer. The converter consists of four separate 12-bit converters, computer interface and power supplies. Data from the computer is accepted in parallel buss; all four channels operate in a continuous read-noninterrupt status. Maximum conversion time is 400 usec. Data input is in the form of Binary Angular Measurement System (BAMS) units, instead of sine and cosine functions. MTBF is 4000 hours. NORTHRIDGE ENGINEERING CO., Northridge, Calif. For information:

CIRCLE 200 ON READER CARD

keyboard

The KN-14 12-key pre-assembled keyboard is connected to a printed circuit board for mating connector or for hardwiring to external circuitry. Design offers ⅜" square keys on ⅝" centers in adding machine or telephone configuration. NUTRONICS, Paramus, N.J. For information:

CIRCLE 201 ON READER CARD

general purpose computer

The Decade 70 is a 4,096 word (expandable to 16K words) general purpose computer with a 1 usec cycle time. In addition to assembler, debug and utilities, software includes the CHAT engineering language. Standard with the system are hardware multiply and divide, memory parity, direct memory access, memory protect and programmable interrupt. Decimal arithmetic and variable word length are available on all models. Prices begin at under $20K. DECADE COMPUTER CORP., Huntington Beach, Calif. For information:

CIRCLE 202 ON READER CARD

line printer

Fastest in the company's product line is the Type 222-6 line printer, which prints 1,100 lpm and can be used on any Series 200 model computer except Model 110. It has a standard drum containing 26 alphabetic, 10 numeric, and 27 special characters. Vertical spacing can be six or eight lines per inch, and paper can be skipped at speeds up to 50 ips. HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 203 ON READER CARD

signal averaging system

The Lab-8 is a programmable, general-purpose computer system for signal averaging. It features conversational mode programs for histograms and averaging with variance and trend analysis. Lab-8 components include a 4,096-word PDP-8/I computer, an oscilloscope, Teletype console, and a paper tape reader and punch. In the basic configuration, it has four analog input channels, which can be expanded to 24. Analog output is on the oscilloscope, and digital output is provided by Teletype printer, relay output, or punched paper tape. The basic Lab-8 provides 1,024 data points per sweep, any combination of which can be allocated to the average curve, standard deviation curve, or trend function. The system is priced at $16,900. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 204 ON READER CARD

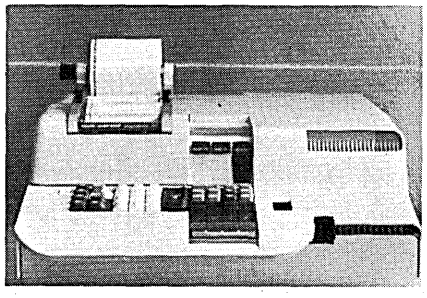
magnetic tape units

The 204B-13 and 204-14 magnetic tape units and the 103A control unit are exclusively for the small-scale Models 120 and 125 central processors, which can use the units to process high density tapes from larger computers. The equipment has a tape density of 800 bpi and a data transfer rate of 19,200 cps. Delivery three months after order. HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 205 ON READER CARD

desktop computer

The Programma 101 is a programmable, self-contained digital computer, desktop size, that stores keyboard-written programs either in or off-ma-



chine. Priced at $3,850, the machine prints out computations on paper tape from programmed instructions calling for as many as 120 sequential mathematical steps. OLIVETTI UNDERWOOD CORP., N.Y., N.Y. For information:

CIRCLE 206 ON READER CARD

software for 360's

Administrative Terminal System/360 (ATS/360) is a set of improved programs that enables users to store, edit, revise, and retrieve information from remote terminals linked to a central 360 computer. ATS/360 functions in a multiprogram environment in which other jobs can run concurrently on the computer with the terminals' operations. To use ATS/360, the operator enters information directly into the computer from the keyboard of an IBM 2741 communications terminal, and input procedures such as card punching and optical scanning may be

← FOR VARIAN CIRCLE 78 ON READER CARD

new products

eliminated. Data may be updated, modified, or rearranged at any time, and is protected by code word accessibility. ATS/360 can be used with 360/30, /40, /50 under DOS/360 Release 15, and is available without charge to 360 users. IBM DP DIV., White Plains, N.Y. For information:

CIRCLE 207 ON READER CARD

portable terminal

A portable keyboard terminal weighing under 25 pounds is the first of the Execuport series of lightweight remote units. The BSC-4M is a 16″ × 16″ × 6″ unit with an integrated acoustic coupler. The 64-character keyboard has arithmetic function symbols and numbers on the right, and the alphabet on the left. Input can be in upper and lower case, or, by flip of a switch, can go into upper case mode, under which numbers are printed without returning to lower case. Output is on a strip printer. Speed can be either 100 or 150 characters per minute, transmitted over full- or half-duplex lines. The Execuport will also offer a data set plug. Another option is a keyboard permitting overlays. The $1,700-1,800 unit will be available beginning this month. PORTRONIC TERMINAL SYSTEMS, INC., Upper Saddle River, N.J. For information:

CIRCLE 208 ON READER CARD

teletype cart

The TC-3 cart fits a Model 33 Teletype, either KSR or ASR version, is easily attached and removed, and can accommodate an acoustic data coupler, providing the means for a mobile terminal for data communication. ANDERSON JACOBSON, INC., Mountain View, Calif. For information:

CIRCLE 209 ON READER CARD

core memory

The ComRac 150 core memory has a cycle time of 1.5 usec and an access time of 0.7 usec. It is available in capacities of up to 4,096 (36-bit) or 8,192 (24-bit) words. The memory can be operated in all standard modes; delivery is 60 days ARO. INFORMATION CONTROL CORP., El Segundo, Calif. For information:

CIRCLE 210 ON READER CARD

hybrid digital plotter

The Series 430 Dataplotter operates with digital techniques for input and control, and analog techniques to produce continuous, non-incremental plotting of straight or curved lines. It plots on a 30″ × 30″ surface at speeds up to 20 in./sec. with an accuracy of .01 in. and resolution of .002 in. ELECTRONIC ASSOCIATES, INC., West Long Branch, New Jersey. For information:

CIRCLE 211 ON READER CARD

disc pack

Mac Pack is a 10-surface disc pack that is IBM 1316 compatible and is final-tested on the company's 360/30 before shipment. Purchase or lease plans are available; company promises "immediate" delivery. MAC PANEL CO., High Point, N. C. For information:

CIRCLE 212 ON READER CARD

map plotter

The Isographic Plotter is computer- or teleprinter-driven to draw maps, symbols, vectors and alphanumerics at a rate of 1,400 ips or 500 cps. The plotter generates a negative map image on the face of a crt in accordance with the message it receives. The image is projected onto photographic paper which is processed within the machine and delivered as a positive copy of

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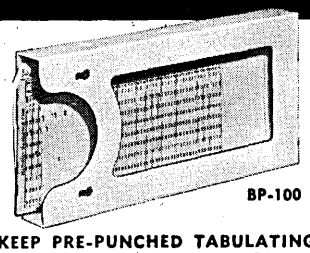
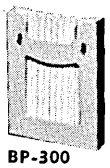
CIRCLE 87 ON READER CARD

BEEMAK TAB CARD HOLDER



BP-100



BP-300 Holder for 51 col. cards.

BP-130 Magnet Holder

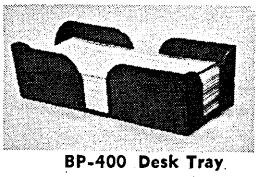
KEEP PRE-PUNCHED TABULATING CARDS WHERE THEY'RE NEEDED WITH BEEMAK HOLDERS.

Allows fingertip storage of pre-punched card, next to product to implement invoicing, inventory control, production control, etc. Capacity 75 or 300 cards — many shapes and sizes — with a variety of metal clips for attaching to any type shelf or bin. Holders with magnets — with spurs for corrugated cartons — with hooks for tote boxes — with pre-applied adhesive for any smooth surface. Also tab card vinyl envelopes, standard or special. Hundreds of firms have filled the gaps in their data processing systems with Beemak Holders.

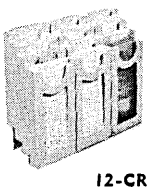
BP-150 Card Basket

BP-200 Horizontal Holder

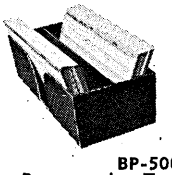
FREE SAMPLE BP-100 HOLDER AND LITERATURE ON REQUEST



BP-400 Desk Tray



12-CR



BP-500 Programming Tray

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black lines on white paper. For use by military personnel and meteorologists, the plotter can also be used for semiconductor masking, chart and graph production, automated drafting, computer readout and slide production. PHILCO-FORD CORP., Palo Alto, Calif. For information:

CIRCLE 213 ON READER CARD

display generator

The Monitor 8500 digital display generator is for use in computer-data TV display systems where data must be distributed to a number of monitoring terminals in a complex. The unit has a repertoire of 60 characters; up to 20 different synthesized crt pictures are available simultaneously. Basic generator is furnished with a core character font memory, character generator, a core video memory, computer interface, instruction and system control sections, TV sync generator, and output buffers. Keyboards to accompany manual input stations are optional. MONITOR SYSTEMS, INC., Fort Washington, Pa. For information:

CIRCLE 214 ON READER CARD

data set

The TE-216A-4D data set provides 4,800 bps data communications over voice-grade leased telephone lines. The company reports it is compatible with all dp systems, and can be substituted directly for an existing private line telephone data set. The data set comes equipped with RS 232 interface, alternate back-up speed of 2,400 bps and a telephone set for alternate voice/data operation. COLLINS RADIO CO., Newport Beach, Calif. For information:

CIRCLE 215 ON READER CARD

microfiche retrieval system

The Micrographic Catalogue Retrieval System provides a microfiche file with quick-access capability, a desktop reader-printer, and a computer-produced index, which keys to the microfiche file. Subscribers to the system will receive weekly, monthly, quarterly and annual compilations of Library of Congress cataloguing output on microfiche and an updated index. INFORMATION DYNAMICS CORP., Reading, Mass. For information:

CIRCLE 216 ON READER CARD

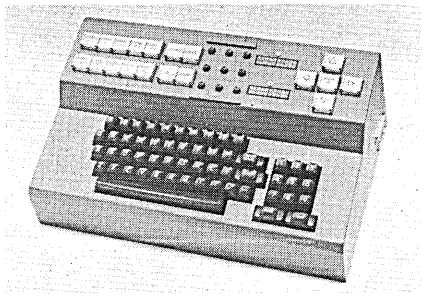
communications evaluation program

The WCS 360 Evaluator is a program for 360 users to evaluate hardware and software requirements for a communications system before installation. It encompasses DOS or OS systems with programs written in BTAM or QTAM macros. The Evaluator can pre-determine the minimum system configuration necessary to handle message loads; the time it takes for messages to pass through the system; the time available for non-communication programs; and the optimum design for message processing programs. WORLDWIDE COMPUTER SERVICES, INC., Port Chester, N.Y. For information:

CIRCLE 217 ON READER CARD

display editor

The Monitor 8540 is a desktop display editor for man-machine communications in crt display systems. The basic unit consists of an operator control keyboard and a self-contained power supply for operation on a 60 Hz, 115 volt single-phase line. Keyboard commands are converted into digitally coded signals suitable for entry into



most general purpose digital computers or Monitor display generators. Symbol keys available include alphabetic characters, 28 symbols, and a separate 10-key board for numbers. There also are 10 switches for directing instructions to one or more of 10 different display channels, and four directional pushbuttons for position control. The unit operates either local or remote, and provides for error lockout to prevent the transfer of new data until previous data is fully transmitted. MONITOR SYSTEMS, INC., Fort Washington, Pa. For information:

CIRCLE 218 ON READER CARD

remote ocr system

The Remote Optical Character Recognition (ROCR) system uses a desktop scanner connected by telephone lines to a central recognition unit that converts the data to punched tape, magnetic tape or punched cards. The scanner is capable of reading printed multi-font or handwritten information; a validity check is run concurrently with the reading. The central recognition unit is located at the company's service center. When a character being transmitted is unrecognizable, it is displayed on a crt at the service center;

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new products

the reading is halted; and an operator at the center corrects the character manually. COGNITRONICS CORP., Mount Kisco, N.Y. For information:

CIRCLE 219 ON READER CARD

incremental recorder

The PI-1387 incremental digital tape recorder provides 200 bpi write-only capability at 0-200 steps per second in a 7-track (½" tape) IBM-compatible NRZI format. The recorder can withstand shocks of 30G for 11 msec (non-operating) and vibration of 2G rms at 10-200 cycles. PRECISION INSTRUMENT CO., Palo Alto, Calif. For information:

CIRCLE 220 ON READER CARD

programming keyboard

The Model 380 programming keyboard provides built-in mag tape storage for up to 640 program steps. Compatible with company's 300/320 series of calculating/computing machines, the desktop unit can be programmed directly from the keyboard and the data stored on removable 2-track cartridges for current operation or later use. The 380 is able to branch, loop, perform subroutines and make decisions, and also performs basic arithmetic operations. WANG LABORATORIES, INC., Tewksbury, Mass. For information:

CIRCLE 221 ON READER CARD

disc pack

The BSC Micro-Tolerance disc pack is compatible with IBM 1311 and 2311 disc drives. The unit carries a full year warranty and is ready for "immediate" delivery. BUSINESS SUPPLIES CORP., New York, N.Y. For information:

CIRCLE 222 ON READER CARD

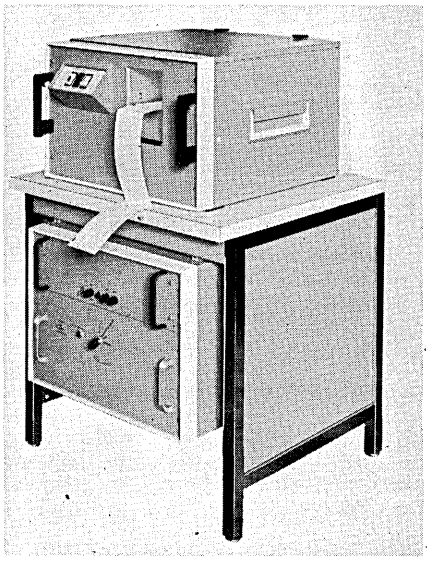
core memory tester

The M-438 core memory tester for DRO or NDRO memories can be operated manually or by punched tape; it has a selectable address field with a maximum of 32K (36-bit) words. The unit has 12 programmable timing pulses as memory control stimuli, multiple pass controls, error logging printer output, and random interrupt operating modes. Cycle time is less than 800 nsec. According to the company, unskilled personnel can become trained operators after only one hour of instruction. DATAMETRICS CORP., Van Nuys, Calif. For information:

CIRCLE 223 ON READER CARD

terminal ticket-printer

The Space Selector Terminal (SST) generates airline tickets and can be linked to remote reservations and accounting systems. Ticket and reservation requests can be entered on a keyboard; computer responses are output



at 2,400 lines a minute by a printer. The SST accommodates the current IATA ticket format; it can also print data fields in the fonts readable by ocr readers, allowing the re-entry of data into the accounting loop after use or redemption. Tickets and messages are printed on card stock .009" thick, 3¼" × 8½"; 12 lines of variable data are imprinted. DI/AN CONTROLS, INC., Boston, Mass. For information:

CIRCLE 224 ON READER CARD

two-mode software

The Extended Mod 1 (Mass Storage Resident) operating system is designed for foreground-background multiprogramming on the firm's 1200, 1250 or 2200 computer systems. It can handle batch processing in one mode (background) while executing media conversion or data communications in the other mode. It requires a central processor with a 49,152 core, and will be available with the delivery of computer systems in the fourth quarter '68. HONEYWELL EDP, Wellesley Hills, Mass. For information:

CIRCLE 225 ON READER CARD

disc system

The RS-08 disc for the PDP-8 and -8/S computers has a capacity of over 500K (13-bit) words; four of the discs can be coupled together for a total capacity of over 2 million words. Average access time is 16.67 msec (60-cycles) or 20 msec at 50 cycles. Data transfer rate on 60 cycles is 16.2 usec or 20 usec on the 50-cycle. The RS-08

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is compatible with the company's DF-32 disc. First deliveries begin next month. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

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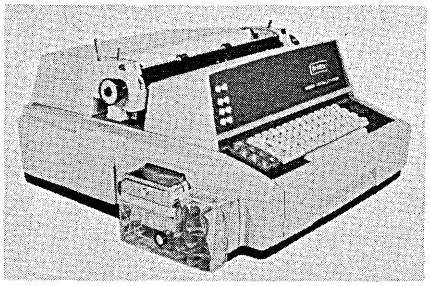
billing machine

The 5005 Computyper billing machine is a desktop unit with internally stored programs, typewriter keyboard and i.c. processor. Data storage consists of three working registers and five storage registers of 12 digits each. The second memory contains up to 406



characters of programs. The machine reads and stores tape programs at 70 codes a second. Up to 26 numeric and function codes in 5-, 6-, 7- and 8-channel tape can be punched as a byproduct: the tape punch is optional. Programs are contained in cartridges and may be changed by replacing one cartridge with another. Delivery is 90 days ARO. FRIDEN, INC., San Leandro, Calif. For information:

CIRCLE 227 ON READER CARD

documentation binder

A program documentation binder of one-piece construction is for systems in which source documents, parameter cards and printout are of a size that can be housed in a single unit. The printout side can be loaded from top or bottom of the sheet body; the document side includes a vinyl envelope for the programs' control cards and an index with insertable edp titles. WILSON JONES, CO., Chicago, Ill. For information:

CIRCLE 228 ON READER CARD

expanded compiler

An expanded BASIC compiler, SUPER BASIC, is now available to subscribers of Tymshare, Inc. The new compiler can handle over 900 individual program statements; users may sort, merge and manipulate up to three files concurrently. SUPER BASIC also offers extended arithmetic capability, built-in editing features, and a larger command repertoire. TYMSHARE, INC., Los Altos, California. For information:

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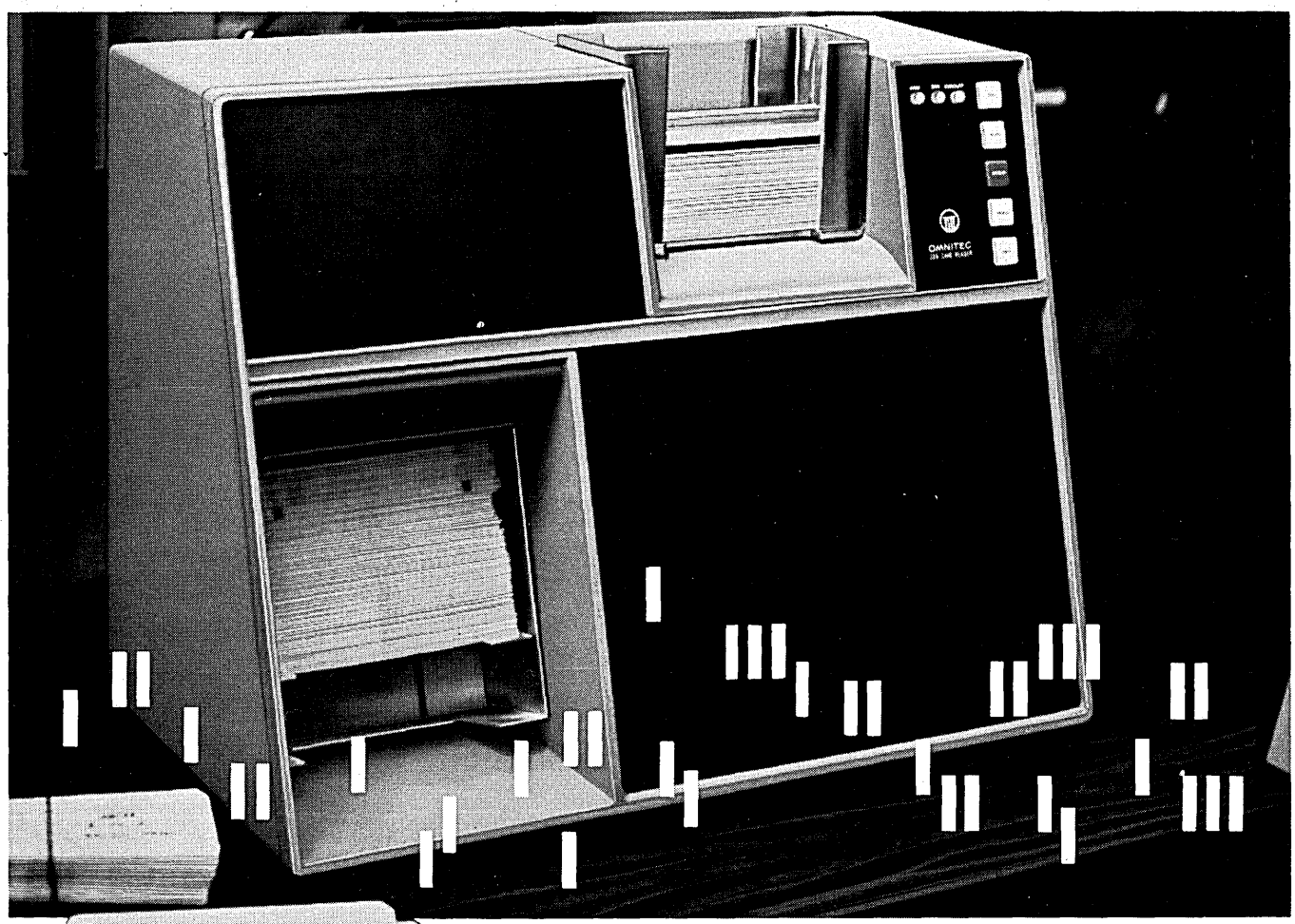

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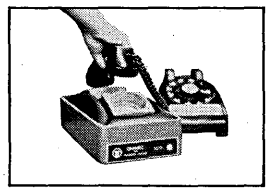
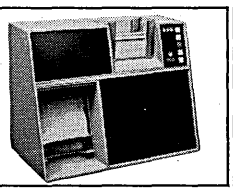
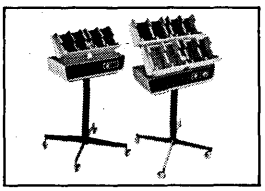


CARD READER



DOCUMENT JOGGERS



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new literature

EFFECTS OF AUTOMATION: This report by the Illinois Commission on Automation and Technological Progress contains information gathered during 1965-1967, including: 1) a digest of hearings concerning the meat-packing industry, banking industry, insurance industry, and vocational education; 2) the cost of acting on automation; 3) the commission's future program (1967-69); 4) the proposed 1967-69 budget; 5) 22 recommendations to the state legislature for appropriate action. 109 pages. Cost: $3; microfiche, $.65. PB-177 320. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

CRT DISPLAY TECHNIQUES: 12-page booklet contains four articles on crt displays and gives a picture of present status of displays, opinions of manufacturers on raster-scan techniques, technical considerations which are influencing crt display design, description of a crt console for remote computing, and use of magnetic discs with TV monitors for low-cost graphic displays. DATA DISC, INC., Palo Alto, Calif. For copy:

CIRCLE 230 ON READER CARD

NUMERICAL CONTROL: 18-page directory lists by company the N/C equipment manufactured by members of the NMTBA. NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION, Washington, D.C. For copy:

CIRCLE 231 ON READER CARD

ELECTRONIC PRINTING: Proceedings of the Symposium on Electronic Composition in Printing, held at the National Bureau of Standards, Gaithersburg, Md., June 15-16, 1967, contains 29 papers covering technological advances in the field and government and non-governmental applications and research. 128 pages. NBS special publication 295. Cost: $.70. SUPERINTENDENT OF DOCUMENTS, U.S. Government Printing Office, Washington, D.C. 20402.

CAI: Literature describes three CAI publications now available: "Computer-Assisted Instruction Guide" and "Programmed Instruction Guide," which give information on programs developed in the U.S. and abroad; and the "1968 CAI Information Exchange," which offers a complete collection of available CAI data. ENTELEK INC., Newburyport, Mass. For copy:

CIRCLE 232 ON READER CARD

SDI BIBLIOGRAPHY: This bibliography of literature on Selective Dissemination of Information is the result of a recent IR research project. SHARE RESEARCH CORP., Santa Barbara, Calif. For copy:

CIRCLE 233 ON READER CARD

TECHNOLOGICAL FORECASTING: 137-page report is intended to promote the use of a system of logical analysis that can result in credible and explicit technological conclusions and attempts to evaluate possible forecasting techniques and conceptual approaches to technological forecasting. It is directed toward scientific or engineering specialists who may be called upon to contribute inputs to forecasts, but who may have only a limited understanding of forecasting and its possible approaches and problems. The guide may also be of interest to users of such forecasts by providing the rationale and methods of technological forecasting. AD-664 165. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

RETAIL CASE HISTORY: 28-page booklet describes how an El Paso store collects point-of-sale information with sales registers that produce optical tape, then processes the tapes by computer for the preparation of sales audit, payroll and accounts receivable. NATIONAL CASH REGISTER CO., Dayton, Ohio. For copy:

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PUNCHED CARD DATA TRANSMISSION: Eight-page brochure gives operating details and specifications of the company's four basic units used to prepare and transmit data in edge-punched card form: a desk-mounted, send-receive keyboard typing punch for preparing cards; a reader that reads the

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new literature

cards and transmits data to other locations; a card feeder that automatically feeds a stack of cards into the reader; and a receive-only typing punch for preparing duplicate cards or punching originals containing data sent from another source. Case histories are included. TELETYPE CORP., Skokie, Ill. For copy:

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BATCH PROCESS CONTROL: 12-page bulletin describes system for direct digital control of batch and semi-continuous processes and the company's BATCH software program. THE FOXBORO CO., Foxboro, Mass. For copy:

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PROCESS CONTROL: 48-page booklet explains the principles of automatic process control and serves as a training guide for industry and schools, as well as a self-study guide for those entering the instrumentation field. Cost: $2.50 for ISA members; $4 for non-members. INSTRUMENT SOCIETY OF AMERICA, 530 William Penn Pl., Pittsburgh, Pa. 15219.

DATA BASE MANAGEMENT: 51-page report contains the recommendations of the Data Base Task Group of CODASYL's COBOL Language Subcommittee: 1) store records on mass storage devices in an increased variety of forms which more nearly model the actual use or relationship of one record to another; 2) find records in the structure with a minimum of procedural effort; 3) insert records into defined structures; 4) remove records from structures; 5) modify the content of records in a structure and cause any required restructuring which the modification may imply; 6) delete records in a variety of data structures. The task group further recommends that the facility be adopted for declaring master and detail record relationship using circular chains as the means for providing the widest possible file structuring capability. Cost: $3; microfiche, $.65. PB-177 682. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

LOGIC HANDBOOK: 512-page book includes a digital logic primer, module application notes, study of analog-to-digital conversion, computer catalog, technical information on the company's new integrated circuit and industrial modules, appendices on symbols, a powers of two table, a list of standard

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A number of positions currently exist at our System 360 facilities in Bedford for both junior and senior systems programmers with an interest in multi-tasking operating systems (OS/360 MFT, MVT). Responsibilities will be in the areas of: system generation, data and task management, libraries, cataloging, language translators (especially PL/I) and accounting.

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electronic abbreviations, a bibliography and price list. DIGITAL EQUIPMENT CORP., Maynard, Mass. For copy:

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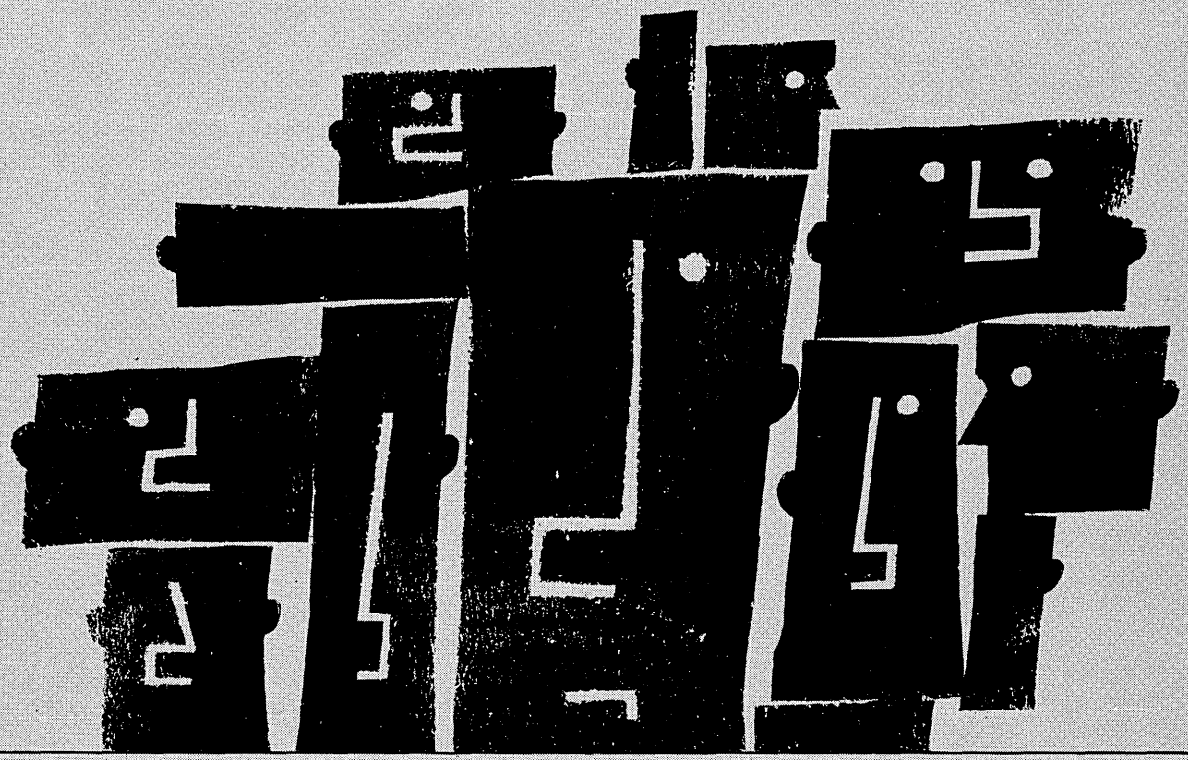

books

***Mechanical Man—The Physical Basis of Intelligent Life*, by Dean E. Wooldridge. McGraw-Hill Book Co. $8.95.**

"Society profits when its members behave more intelligently. And men who know they are machines should be able to bring a higher degree of objectivity to bear on their problems than machines that think they are men."

A profound conclusion of a book that will haunt the objective reader and please the Determinist. Dr. Wooldridge has shown, to my satisfaction, that all aspects of life, including intelligence and consciousness, are unexceptional consequences of ordinary laws of physics. This is at once gratifying to the logical mind that cannot accept disorder in the universe and shattering to the ego that demands spiritual significance.

This book is not directed at those familiar with recent developments in the life sciences, but to the objective and science-oriented layman — who should find it engaging. The material is not original, with the exception of the author's extrapolation of new discoveries into the forbidden garden of the soul. In fact, a great deal is drawn from two previous books by Wooldridge. The pace is furious for such a broad topic, but technical jargon is absent and concise major conclusions with specific bibliographies support each progressive point. For those intrigued by fragmentary reports of DNA, RNA, embryonic development, and brain mapping, this book will consolidate these fascinating revelations within a meaningful framework.

The sequence of argument begins with the probable course of single living cell development from organic chemicals on the primitive earth. While considerable conjecture is needed to substantiate this premise, it is all quite plausible, given a few eons. The transition to multicellular organisms with specific specialty cells is intriguing. Perplexing questions had been raised when it was shown that every cell in an organism contains a complete blueprint for the entire organism. How do the myriads of specialty cells suppress all but their unique functions and, more puzzling, how do all these specialty cells develop from a single cell? Ingenious experiments have demonstrated that physics and chemistry are solely responsible for the architecture of life.

That this staggering complexity could exist without divine intervention is difficult to accept. But then it is also difficult to comprehend the long evolutionary periods and the careful attention to detail by the natural selection process. The reader would be rash not to accept a physical explanation for cellular processes. By yielding, he becomes vulnerable to subsequent assertions about intelligence that seem improbable.

Wooldridge relies on computer analogies to demonstrate the physical nature of intelligent behavior. The question of machine intelligence seems to be reversed here by pointing out the similarity of the brain to a computer. Both rely on the symbol-manipulating capabilities of complex switching networks for intelligent behavior. The human brain is simply more complex; its storage capacity is now estimated at about 10^{13} bits. Such intricacy cannot be attacked with direct analysis, so an oblique approach is used. Some behavior patterns in lower animals are stored subroutines. Interruption of a sequence causes the organism to re-enter the subroutine at the start. When these, reflexes and tropisms, each resulting in an exact behavior response, are all operating simultaneously and sometimes in conflict, the organism's machine-like nature is obscured. Their behavior appears life-like even though controlled by a prewired switching network. It would be unreasonable to assume that intelligence is not at least an outgrowth of the same mechanism that controls behavior patterns.

Both computers and the brain have similar basic designs. They are multiple interconnected switches with each output response determined by input patterns. This is a significant implication of similarity, but the clincher would be to build a computer with characteristics indistinguishable from a brain. All that stands in the way is formidable complexity. The author maintains that the only difference *is* complexity and cites the achievements in machine language translation, game playing, and adaptive programs. If these allegations are accepted, the existence of spontaneity is denied.

The reader need not be so credulous to grant the physical basis of consciousness, for experimental meddling has provided a logical framework. The existence of a consciousness switch has been discovered and manipulated effectively. Cited for support are experiments with animals, by-products of surgical brain mapping, and the study of humans with surgically split brains.

After this exposition, Wooldridge

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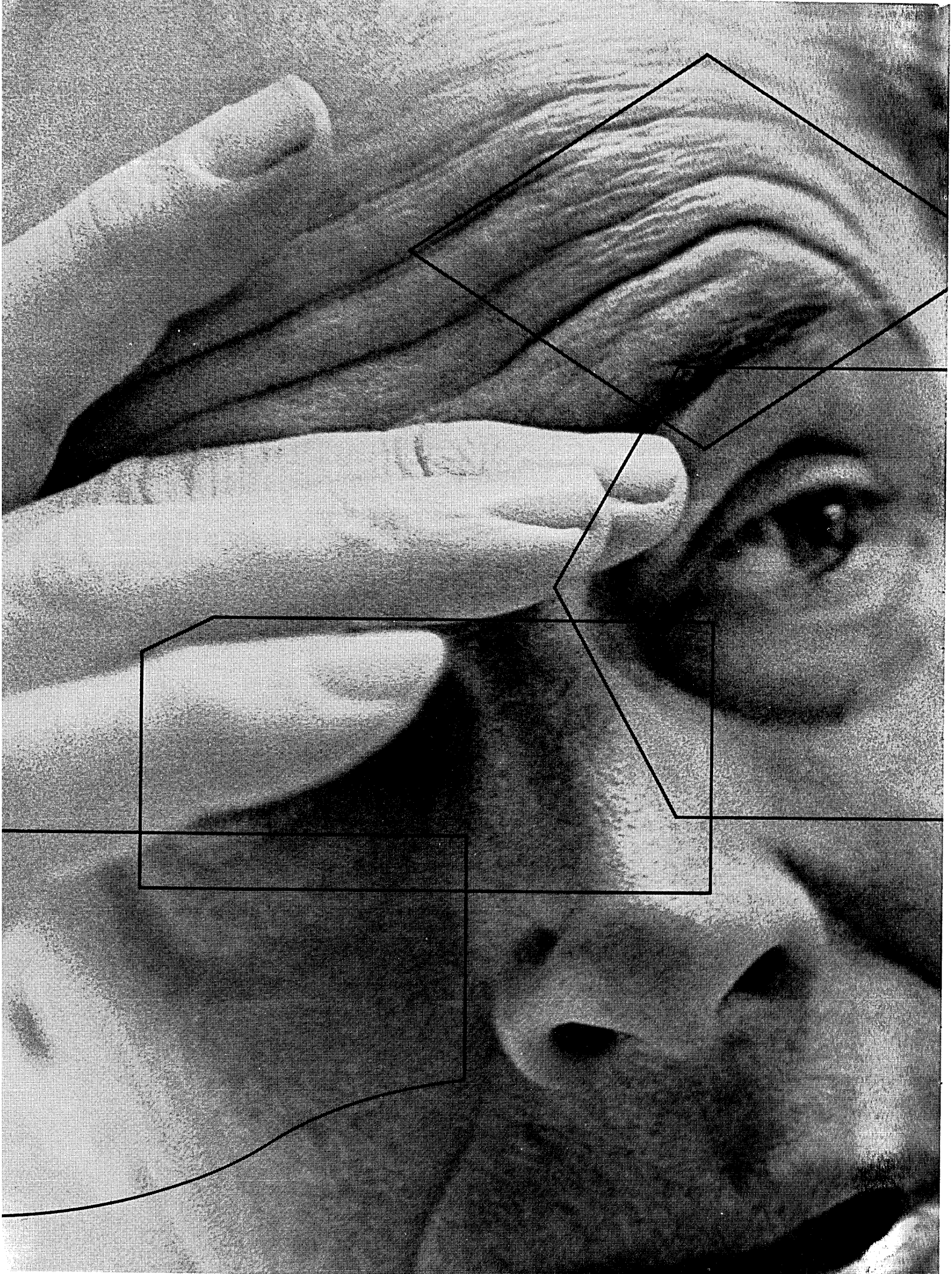

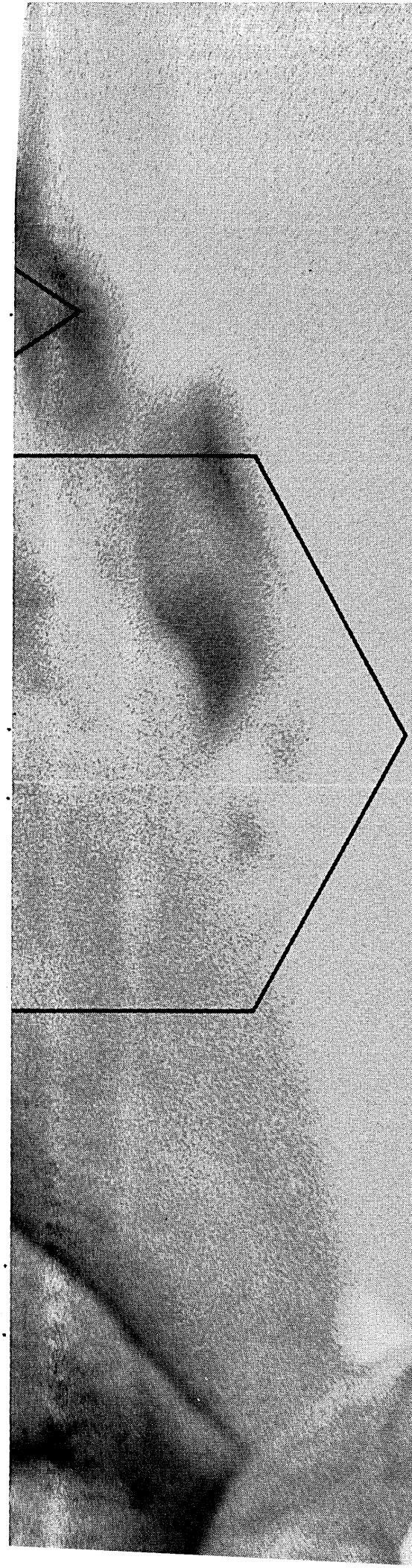

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asserts that physics is the only science. The indictment is not conclusive, but it is the most likely explanation of life and all its aspects. If man were not so subjective, he would have assumed long ago that physics probably held the key to the riddle of life. But he preferred to claim a soul and a supernatural character, since a concept of himself as a bag of chemicals of no special significance other than complexity was too galling.

But the implications are monumental. Given the means to describe in all detail the state of the universe at any instant, the entire future could be predicted. Quantum-mechanical indeterminacy is a minor barrier and complexity makes it highly unlikely. But probable future developments are man-made men, conscious computers, manipulation or creation of personalities, and transference and storage of human memory contents.

If the man in the street comes to accept himself as a machine without independent control of his thoughts and actions, attitudes toward religion, morality, and ambition should suffer radical revision. Wooldridge treats these questions optimistically and suggests that the net result will be a decline of prejudice and vengeance.

But it seems to me that machines would inevitably generate Huxley's brave new world.

—PAUL SHERER

book briefs

(For further information on the books listed below, please write directly to the publishing company.)

***Management of Automatic Data Processing*, by Marvin M. Wofsey. Thompson Book Co., Washington, D.C. 1968. 213 pp. Price not given.**

This book's foreword, written by DPMA's R. Calvin Elliott, says that the book is for senior managers of companies, including the dp manager. It also mentions "readers may not agree with all of Dr. Wofsey's definitions, ideas, methods and suggestions. If they are prudent, however, they will try the recommendations, evaluate the results, and modify them to fit particular situations." The book's ten chapters cover such topics as personnel, costs, systems design, training, and external relations (sub-topics here include Instigating Cooperation, Educating People and Allaying Fears).

***Statistical Concepts and Applications: A Non-Mathematical Explanation*, by Robert B. Miller. Science Research Assoc., Chicago, Ill. 1968. 192 pp. $7.45.**

A looseleaf book intended for the "educated layman who is not a mathematician and is not interested in becoming a practicing statistician . . . who must plan, interpret, make decisions, and take action from data . . . ", this volume is organized in outline form, and printed in black and brown type on ochre paper. This comfortable format, plus simple definitions and examples, and comments like "A sober warning is in order . . . " should make statistics as painless as possible.

***Electronic Digital Techniques*, by Dr. Paul M. Kintner. McGraw-Hill Book Co., New York, N.Y. 1968. 315 pp. $11.95**

This book is aimed at the practicing engineer who is not a computer design specialist or necessarily even an electrical engineer. It therefore emphasizes the nature and applications of counters, pulse generators, rate scalers, A/D converters, etc., and minimizes the subjects of multiplication and division algorithms. The book is also written as a self-study text, and includes hundreds of solved problems and further references.

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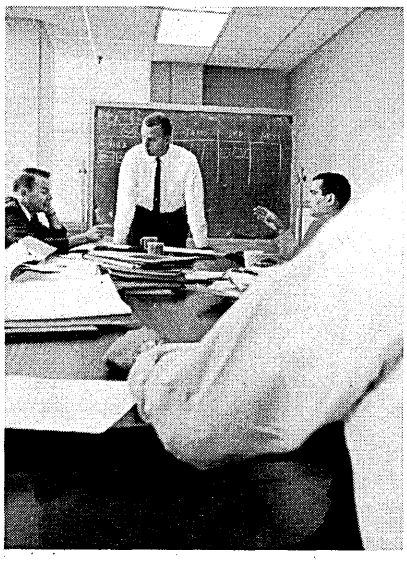

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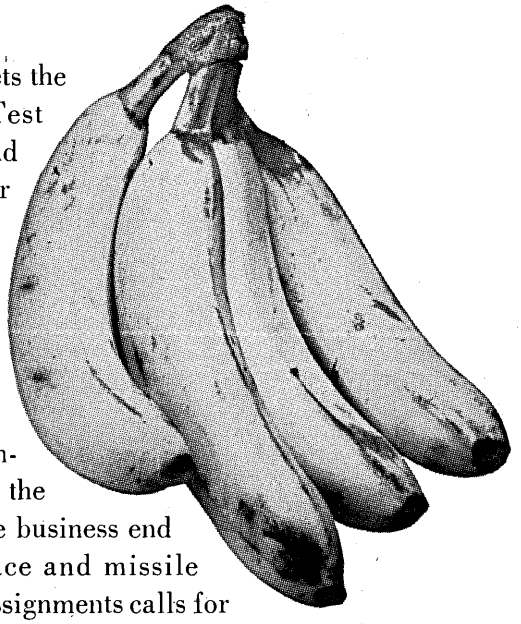
ok, who programmed the bananas?



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was due. Thus some saw it as a "stop UCC" move by CSC.

UCC fought back by extending the time period of its tender and appealing to WU stockholders to ignore the merger talks, seen by some as highly unlikely to clear the triple hurdle of approvals by the two boards, stockholders and the FCC.

The merger proposal gave rise to speculation about CSC plans to establish a national service bureau network. Carried out, the merger would give CSC a running head start toward being the first national computer "utility," a role unsuccessfully pursued by inadequately financed WU and coveted by UCC.

KODAK TIPTOES INTO MICROFILM PRINT MARKET

Kodak is about to come out with the KOM-90, which takes mag tape data for crt display and captures the image on 16mm microfilm at 90K cps. Retrieval codes are recorded at the same time.

Stroke generation is used, with a rate of up to 500 pages a minute. Sixty alphanumeric characters are standard, with another 61 optional for customer selection. Regular type, italics, and boldface can be mixed in a single line. Either seven- or nine-channel tape can be used, with fixed or variable length records, at 200, 556, or 800 bpi. The image has 132 char./line and 64 lines/frame. Hard copy is ready in 15 seconds after display.

Cubic Corp. is manufacturing the unit and has a contract to deliver 10 this year.

RUMORS AND RAW RANDOM DATA

Something's up at the Service Bureau Corp., with new exec vp Jack Williams and the promotion of Harold McCormick and William Glavin to vp's. Williams was once sales manager for SBC, but had gone back to the mother company as manager of stockholder relations. Could it be those promises to customers that they'd be on-line late this year? ... Speculation now is that SDC may not go private on its own after all, is talking being acquired instead (see May, p. 17). The acquisition route, it's reasoned, would be more palatable to Congress, which might frown on an Air Force-blessed stock option windfall for SDC employees. But if a private firm wishes to acquire the huge programming house and distribute such blessings, that's their business. ... Cybernetics Applications Inc., New York, will soon announce Prism, a hardware-independent file management package which reportedly costs 25% less than Mark IV and 10-15% less than Cogent. The $22.5K package will be available with support in Boston and New York next month. Pilot test users, says the company, are reporting 50-90% savings in Cobol programming. ... Computer Automation, Inc., Newport Beach, Calif., has come up with a programmed digital controller, PDC 808, for process control applications in areas where speed is not essential, such as FM broadcasting, traffic studies and control, and telephone monitoring. ... Tom Conway, one-man operator of Management Information Services, N.Y., has sold over 1000 of his $2K payroll tax calculating package. ... Sangamo has rejected Burroughs and Friden offers to market its new keyboard-to-mag tape unit, at least for now. Big order backlog has forced nine-month deliveries. ... We hear 40% of DEC's output goes to Europe.

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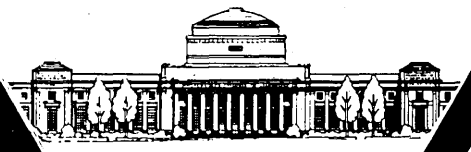

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Charles W. Adams, chairman of Charles W. Adams & Assoc. and Keydata, has severed ties with both companies. **John T. (Jack) Gilmore, Jr.**, now president of Adams Assoc. and Keydata, will become president of a new corporation, Keydata and Adams Assoc., Inc., which will include Adams Assoc. as the computer programming and consulting division and Keydata, which will be the computer services division. . . . **Sherman C. Blumenthal**, widely known and respected computer systems specialist, died May 2 while attending the SJCC in Atlantic City. Blumenthal had only the week before announced the establishment of his own consulting firm and had just finished a book on systems analysis. Most recently he had been with Touche, Ross, Bailey & Smart, where he played an important role in the development of SAVE (System for Automatic Value Exchange), an approach to checkless banking. He was one of the original founders of Applied Data Research and the founder of National Computer Analysts. . . . **Philippe Dreyfus**, formerly European development manager for Control Data, has been appointed president of CAP Europe, software firm jointly owned by CAP France and CAP U.K. . . . **Claude Henrion** of France is the first computer specialist to win the Eisenhower Fellowship at the Wharton School. . . . **Harry T. Larson** is the staff manager of the Software & Computing Center at TRW Systems, Redondo Beach, Calif. He had been with the Aeroneutronics Div. of Philco-Ford. . . . **Paul Ribecky**, formerly sales manager for CEIR, is the new marketing director for Mandate Systems, Inc., New York software firm. . . . **Paul A. Frankenberg** has been appointed vp in charge of the newly created Data Communication Products Div. of Ultronic Systems, subsidiary of Sylvania Electric Products. The new division will produce multiplex equipment, data modems, terminals, magnetic tape transmission terminals and other communication-computer interface equipment. Frankenberg has been with the company since 1966, most recently as head of corporate new products and the sub-systems sales dept. . . . **Lauren Doyle**, of Technomics, Inc., L.A., has been elected chairman of the ACM's Special Interest

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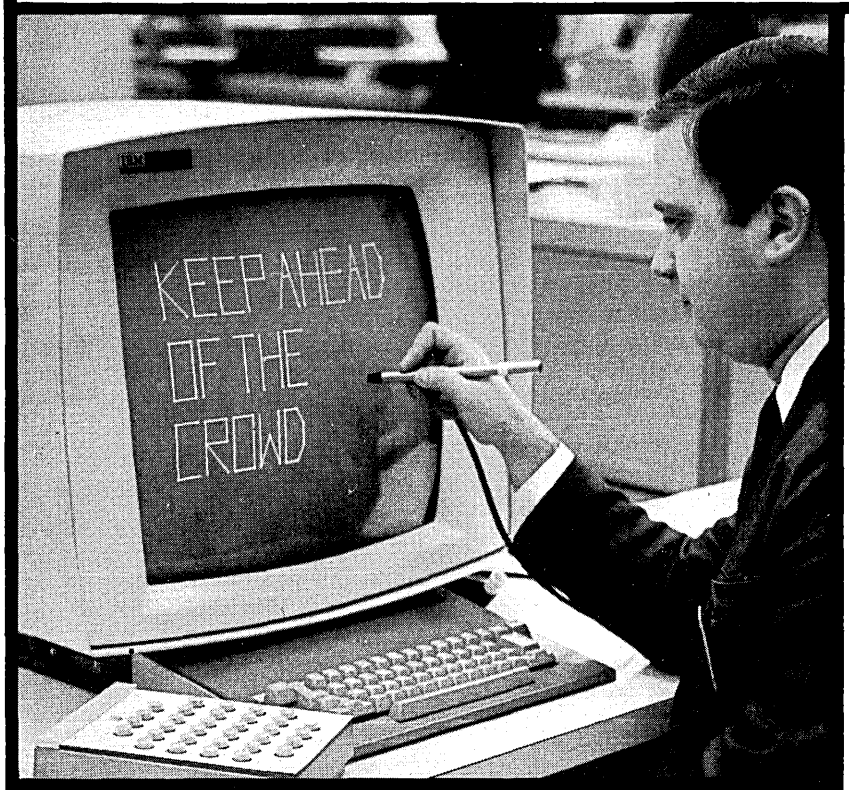

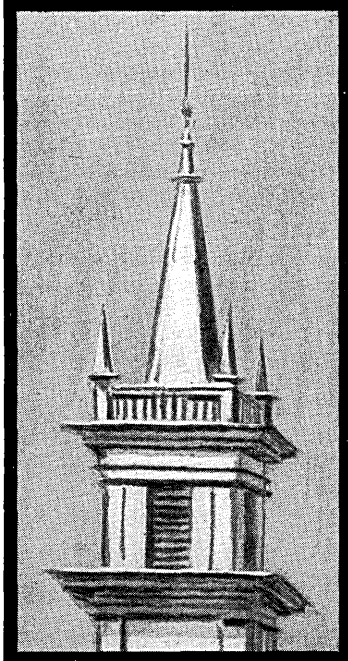

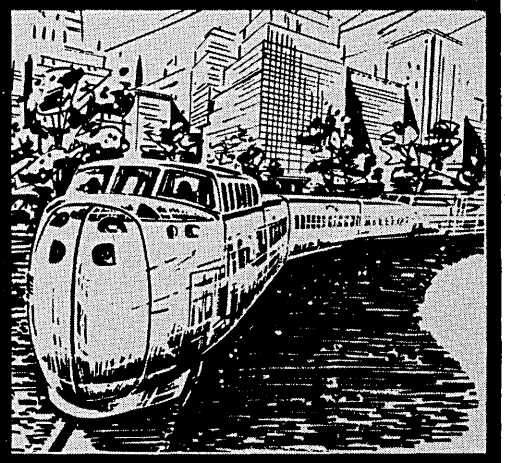

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Group on Information Retrieval (SIGIR) . . . **J. Pat Haverty** has been named head of the Computer Services Group of The RAND Corp. to replace **Jim Tupac** (May, p. 173). Haverty has been with RAND for 15 years. . . . Transamerica Computer Co., new computer services subsidiary of Transamerica Corp., has named **Brandt Nicholson** vp-treasurer. He had been vp, general counsel and secretary of United States Leasing Corp. . . . **Randy Porter**, formerly with Control Data, has joined Varian Data Machines as director of computer programming to replace Alex Bradley. . . . **Charles Vaughn**, former manager of edp at Electronic Data Corp., has been appointed national sales manager for Decision Services International, Boston. . . . **Franklin Steele**, a partner in New York Securities Co., has been elected to the board of Applied Data Research. . . . **Richard R. Mau**, former gm of advertising and PR for Control Data, has joined Univac, Philadelphia, as director of communications, a new post. . . . **Joseph L. Bumbery**, former

comptroller of Applied Power Industries, has been named director of systems and dp with ITT Corp., NYC. . . . **Paul Armer**, RAND Corp., has been elected president of AFIPS. **Dr. Richard I. Tanaka**, of CalComp, is vp. . . . **Dr. M. Mortada** has joined D.R. McCord and Assoc., Dallas petroleum consulting firm, as manager of the management information systems. He was most recently consultant to the Ministry of Finance and Oil in Kuwait. . . . **Dr. Sherwood L. Fawcett** is now president of Battelle Memorial Institute, Columbus, Ohio. Formerly exec. vp of the institute, he succeeds **Dr. B.D. Thomas**, who continues as a member of the board of trustees. . . . **Dr. Ivan Sutherland** is taking a "leave of absence" from Harvard, where he is Assoc. Prof. of Electrical Engineering, to assume a similar position in the Computer Sciences Dept. at the Univ. of Utah. Joining him at Utah will be **Tom Stockham**, of MIT's Lincoln Lab. They will work with Utah's **David Evans** in computer graphics research.

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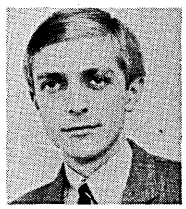

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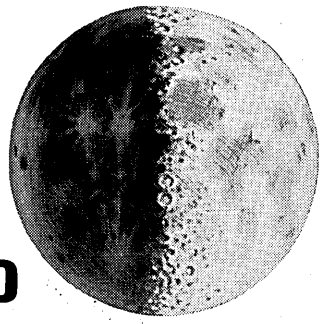

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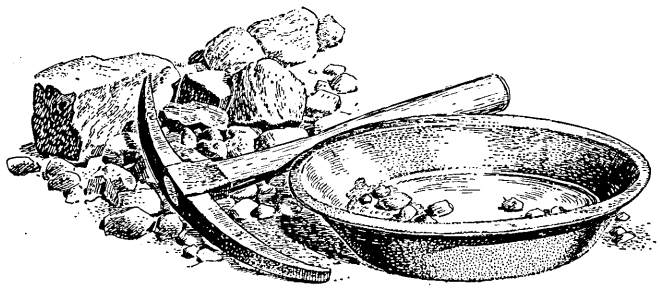
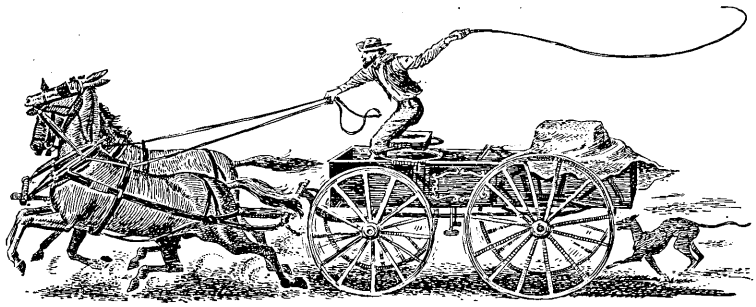
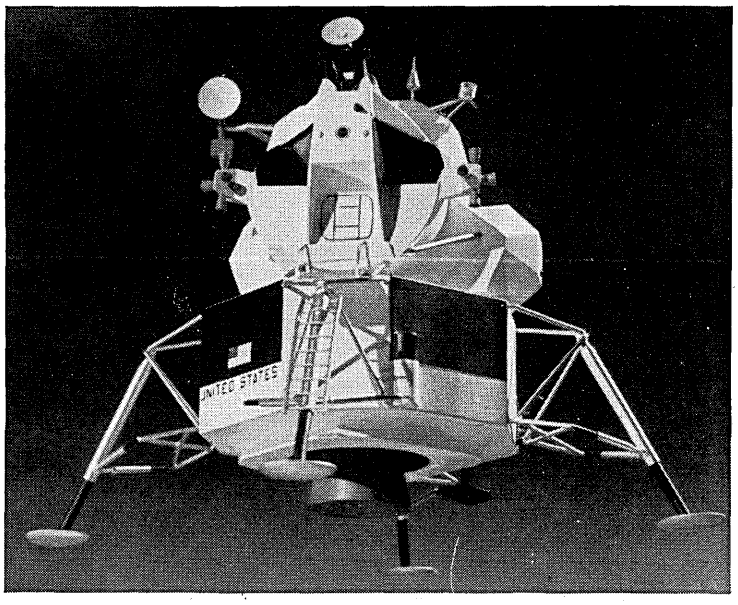


1880's—the Land Rush was in Oklahoma.



1970's—the Space Rush is in Houston.



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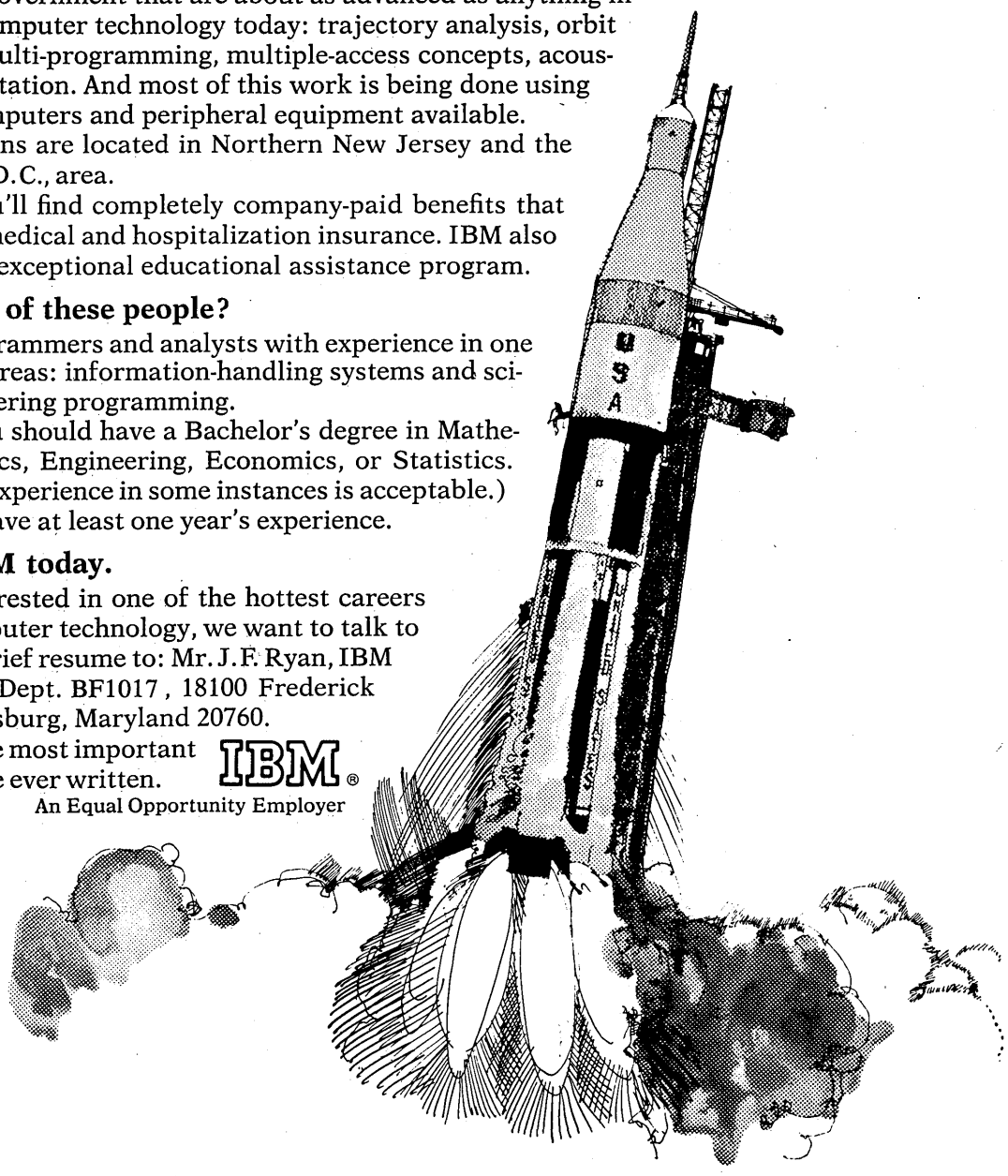

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the forum

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contribution are invited.

A FOOTHOLD, NOT A HANDOUT

Between 1870 and 1920, 20 million immigrants came to this country. They were absorbed into the economy with little trauma—waiting for them was an abundance of unskilled jobs. Many immigrants, in fact, were actually met at Ellis Island and escorted to the mining regions and factory towns. The mines, mills and factories could accommodate them all, and such folk organizations as the church and city hall were there to help. Assimilation was easy in those days. The newcomers were eager to become Americans, they could easily find work, and the Promised Land fulfilled its promise.

Today we again have waves of migration, this time from the rural South to the industrial North, and though the numbers are much smaller this time the result is disastrous. Among other problems, all those unskilled jobs are now gone. Automation in some form or another has wiped them out. For the new immigrants, the Promised Land is a waste land, and we see them stacking up in slums, rotting with ennui. Their bitter wrath has touched all our lives.

We in the computer industry, who owe so much to automation, may feel that we also owe something to those who have been displaced.

Most pitiful is the flight of the eager, able ones who would and could move upward out of the morass. Life for them has always been one big vote of nonconfidence and now resentment of rioting makes things even tougher for them. The computer industry should study the situation of these people with potential but who are at the moment stuck; people who are strongly motivated but have inadequate training; people who have made a start on the upward path but who have met discouragement; people with the ability to hold down decent jobs but who need at least an even break. In short, people who want a foothold, not a handout.

A momentous idea presents itself when we consider the labor shortage in the data processing industry. Here are positions to be filled. And here are potential employees. By 1971, the federal government hopes to create 500,000 new jobs. The computer industry should undertake to create 500,000 new people.

Visualize a huge training program, separate and unique to the computer industry. We should create it and administer it quite apart from any similar efforts of state and industry. The situation calls for a fresh effort, and who better to create it than the people of the computer industry?

This trainee program should be undertaken by individual companies on their own initiative, with the teaching material centrally developed and distributed. This could be produced by a professional association within the industry, or by a computer manufacturer. It should include the following points:

Description of each position in the industry, including everybody—code clerks, machine operators, technicians, programmers, etc.
Aptitude tests for all of the above.
Teaching materials: manuals, films, visual aids, problems.
Teachers' manuals for present personnel to use in teaching and coaching the trainees.

While this material is being developed, another company could be putting together a mailing list. This should include everyone who builds, services and operates a computer, and everyone who deals in software. A newsletter should go out to this list regularly—a progress report, encouraging participation. The first several issues should include a questionnaire asking about the degree of interest, projected number of trainees, suggestions. The organization that develops the mailing list could also distribute the material upon request, but another organization, a trade magazine, for instance, could write and print the newsletter.

For our industry to go into the teaching business is rather a large order, but the fact is that outside educational systems are unable to meet the demand for ready-trained personnel anyway. We will perforce have to do our own training.

There is a more profound consideration. Our industry has sown and harvested automation. We have profited immensely. We actually do have a moral obligation to put something back.

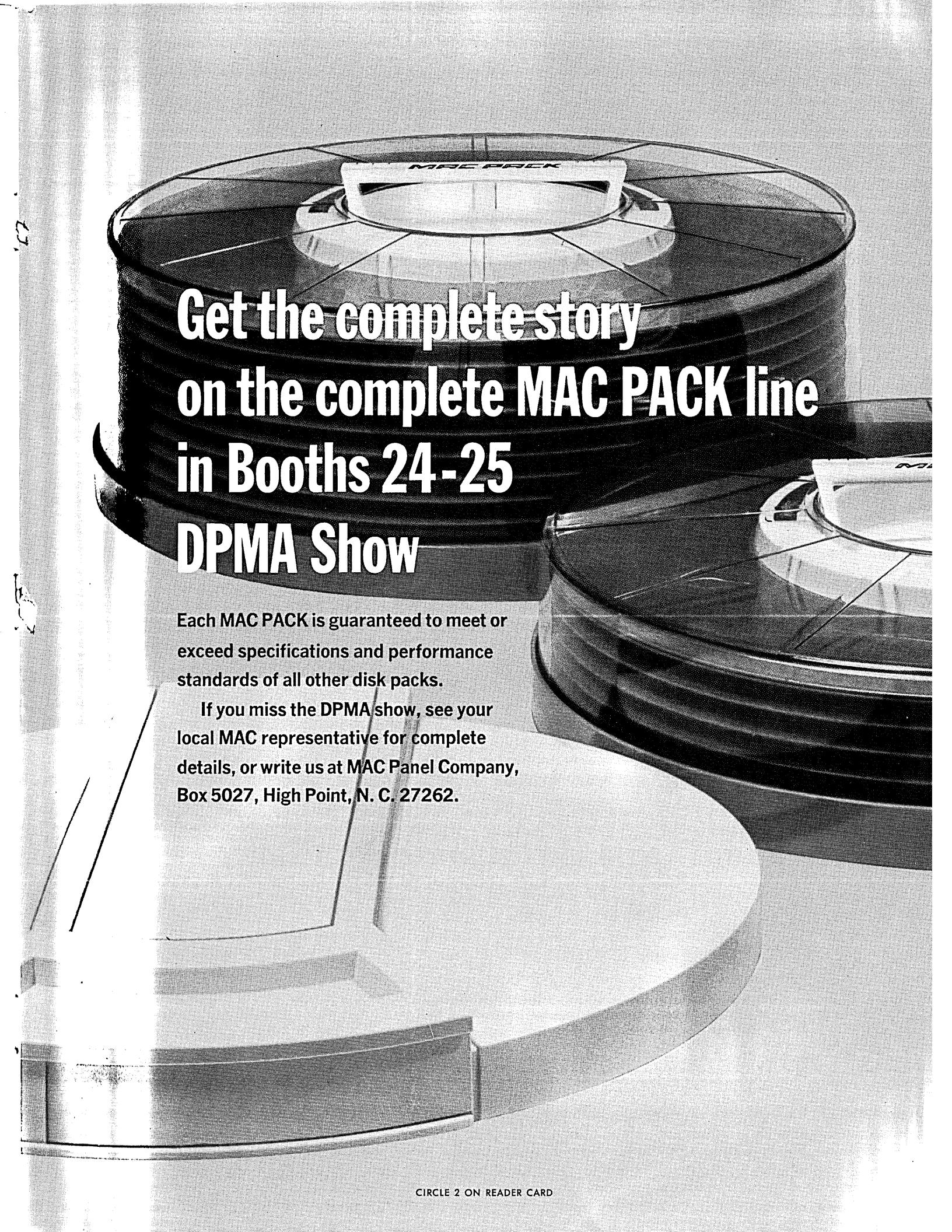
Duty is lightened by the pleasure of a fascinating challenge. How best to coach the trainees with present personnel? Some willing and able staff might want to take it on rotation, say a month at a time. Such an experience could really shake up the average deskbound programmer. Some larger companies might want to hire or train their own full-time teachers. Some teaching methods are better than others, and the best methods haven't been invented yet. This is one of the key points of this idea: for the computer industry, by launching a separate and unique training program, to hit upon the best methods.

One thing need not be minimized: an operation of this scope has all the makings of a terrific headache. Furthermore, by its very nature it is fraught with disappointment. That is no reason not to wade right in, however. In "Closing the Ring," Winston Churchill said of Americans, "Their national psychology is such that the bigger the idea, the more wholeheartedly and obstinately do they throw themselves into making it a success."

Furthermore, the money side of the picture may not be ignored. A portion of this program will simply not be profitable, in terms of corporate income. With most of us, the notion of relaxing the drive for profit causes a certain hesitation, if not downright pain. And how do you keep the stockholders from turning ugly? Legislation has already been introduced to provide tax credits to private industry to encourage exactly what we have described above. Other federal aid being considered includes subsidies and some form of special immunity from stockholder action.

There is a mass of people who only want the foothold that we can provide. Our industry needs the personnel that it can create from these people. In every possible way, in this most difficult of all possible worlds, this idea and the computer industry were made for one another.

—CAROL P. HANSEN



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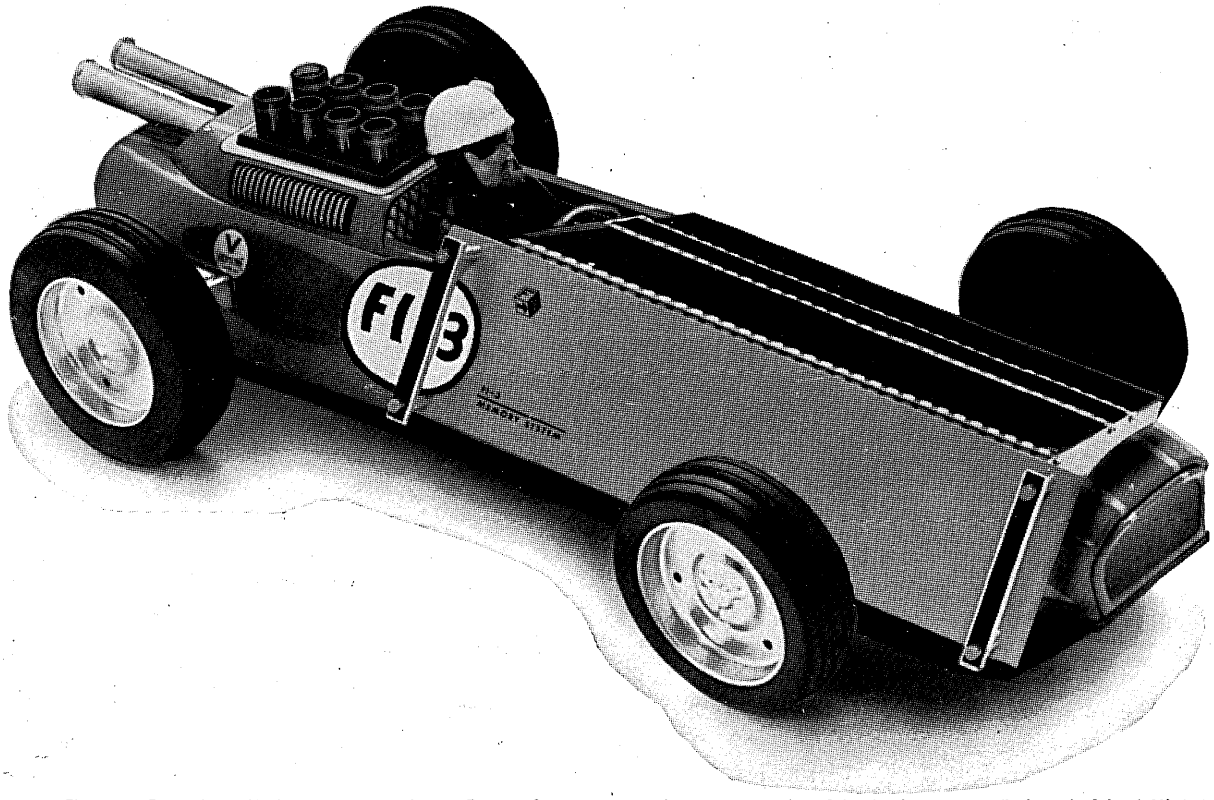

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