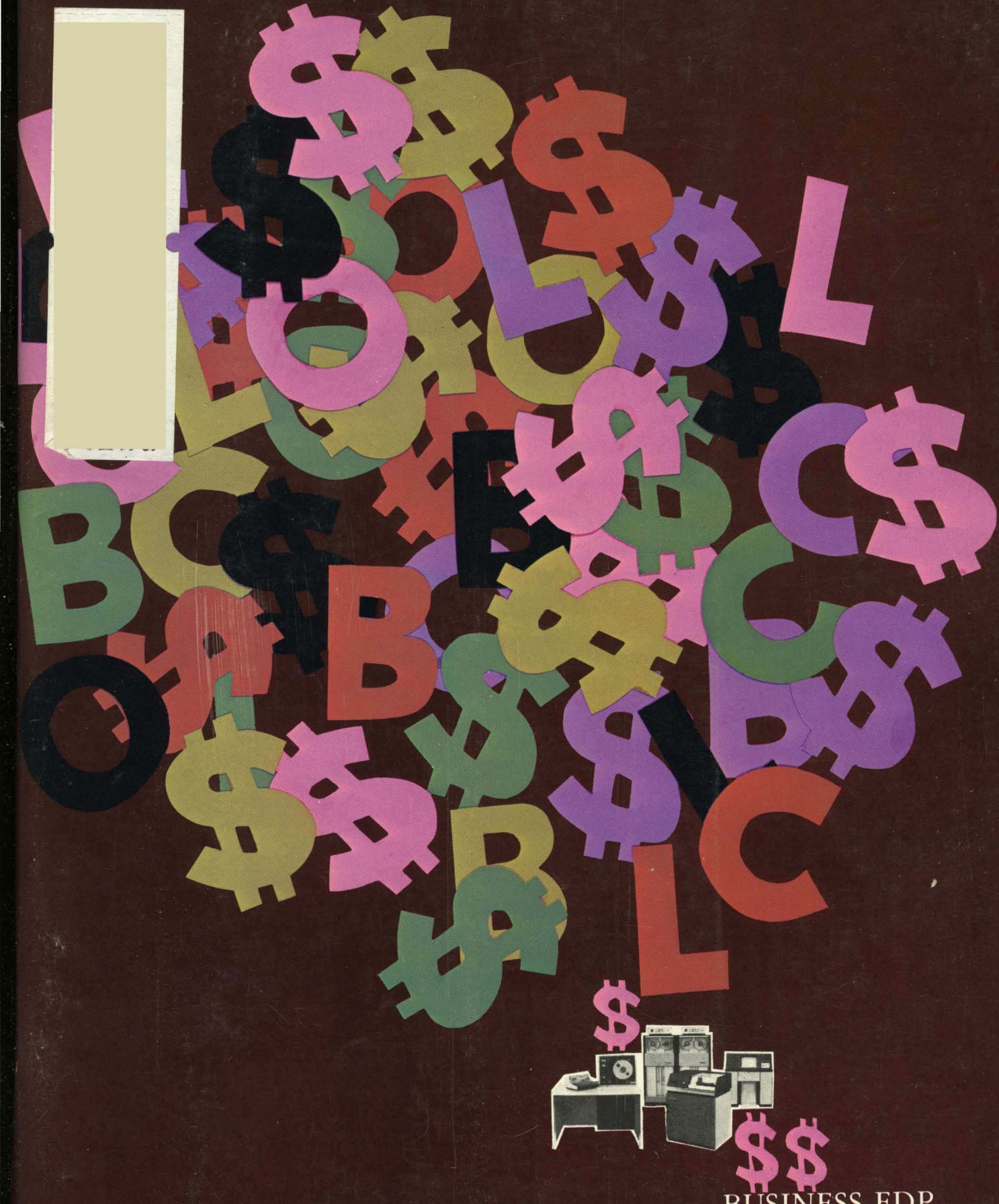
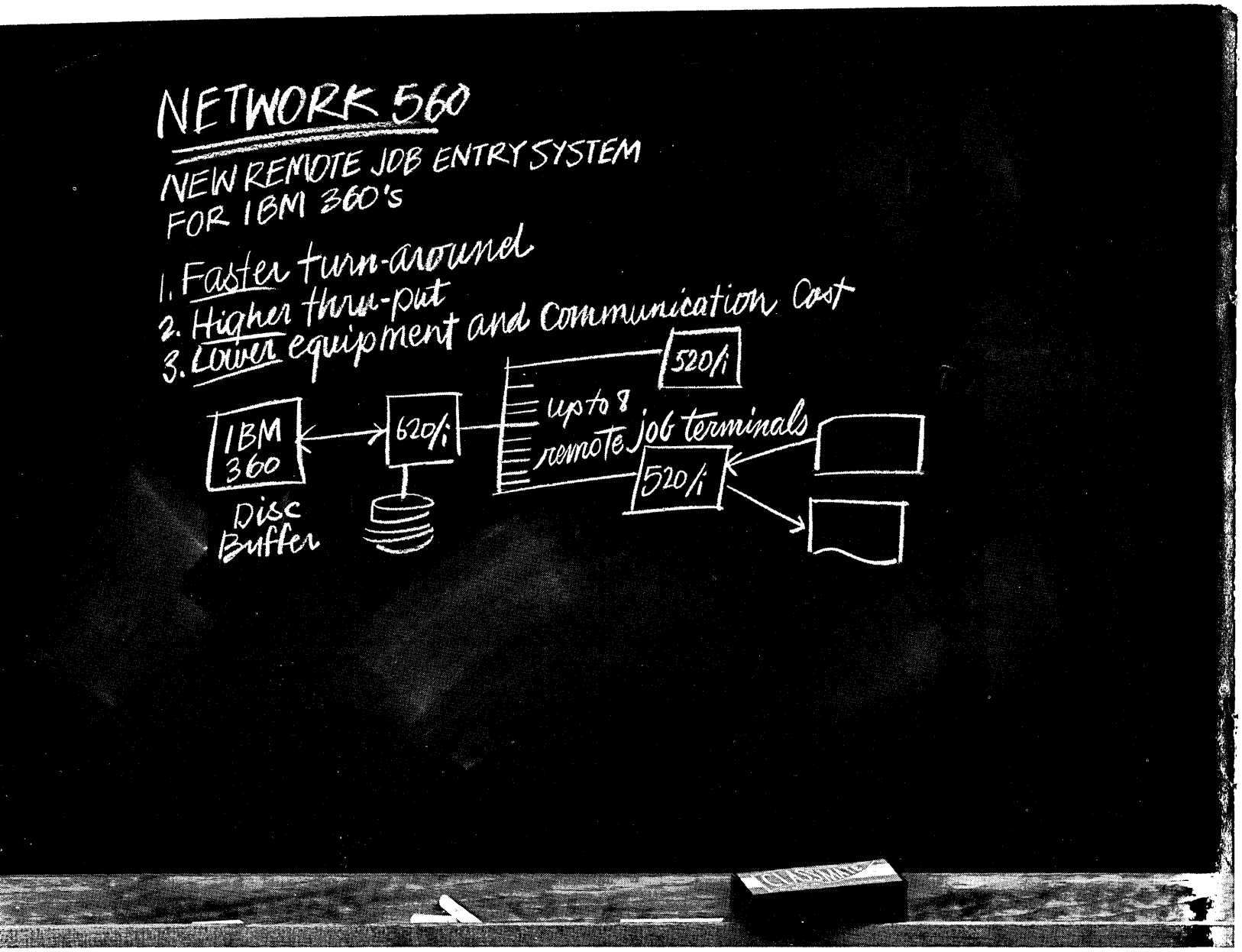
DATAMATION® 69
June



BUSINESS EDP

special sneak preview; HOW WILL IBM UNBUNDLE?



Now try to erase that from your mind.

Not that you'd want to. Because Varian Data's new Network 560 Remote Job Entry System offers demonstrable advantages to every user and seller of 360 computer time.

This batch terminal package, as indicated above, is a complete turnkey system using standard full duplex telephone lines. Just plug it into your 360, and you're in business. All hardware and software are included, so no changes are necessary to existing programs, operating procedures or hardware.

And, since the Network 560 is as compatible to a 360 as one of its own tape units, the new system can be installed virtually overnight.

So if you agree that greatly increased earning capacity and equally lower equipment and communications costs make sense, then it's time your 360 and the Network 560 got together.

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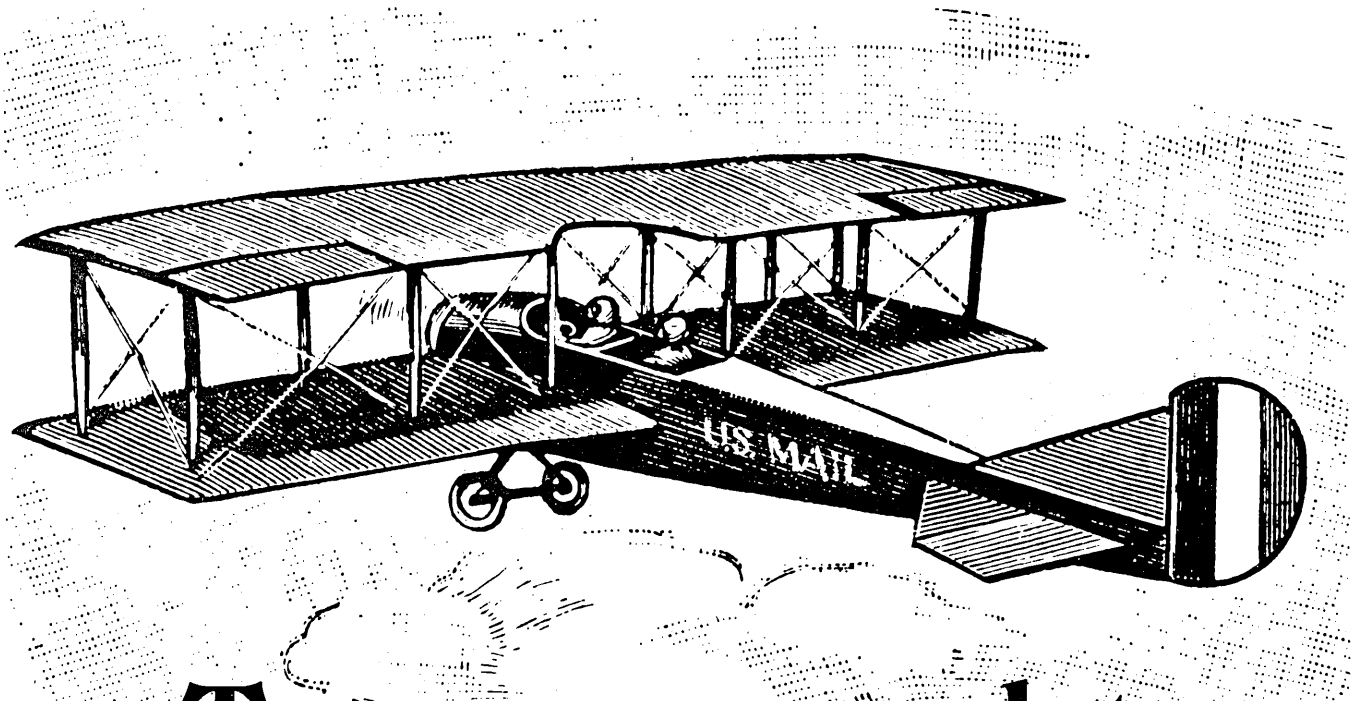
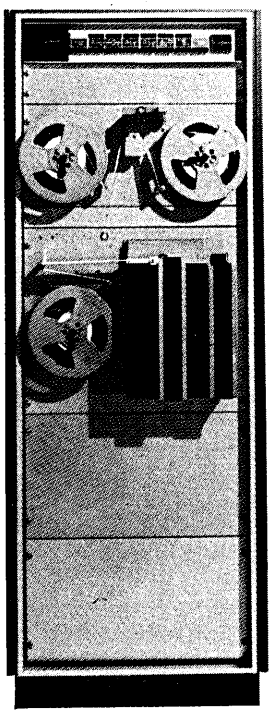
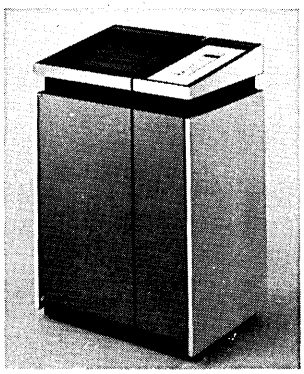
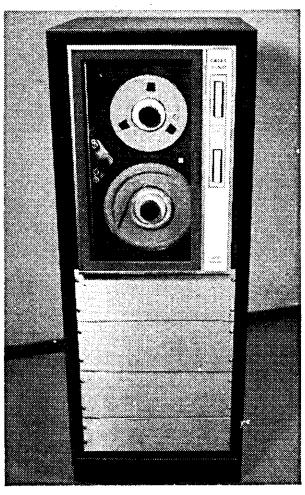


To move more data faster for less, talk to Tally.







Tally makes the broadest line of data communications equipment on the market today. And if you have a "mixed bag" systems problem which calls for data entry or high speed printout in conjunction with data communications, we have the answer. Tally systems take source data from perforated tape, magnetic tape, or punched cards and transmit it at 1200 words per minute (12 times faster than TWX) over ordinary telephone lines. The new Tally Serial Printer prints out hard copy data at 60 characters per second. The Tally 4031 "stand alone" send/receive ½" magnetic tape terminal operates with any Tally transmission system to provide computer compatible tape.

Tally has a nationwide network of service stations working directly with the Seattle Test Center to solve any problem quickly and economically.

For full information, please write or call Tally Corporation, 8301 South 180th Street, Kent, Washington 98031. Phone: (206) 251-5500. TWX: 910-423-0895, or contact one of the regional offices listed below.

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TALLY

See Us at DPMA, Montreal

CIRCLE 4 ON READER CARD

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We're after the tough jobs, the big ones. We're talking about price/performance ...good response time...and freedoms that time-sharing hasn't granted you before. Things like:

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The things you can do with AL/COM time sharing are limited only by your imagination.

AL/COM has the bugs worked out. We've been up for 3 years. We can connect you with teletypes, line printers, CRT's and multiplexers. We speak eight languages . . . BASIC, FORTRAN IV, COBOL, etc. We're adding others. AL/COM solves problems in science, engineering, and banking. It's for operations research, marketing and statistical analysis, and bridge building . . . for management information, investments, and manufacturing. We even do little problems well.

When comparing time sharing services, you can't include AL/COM with the others.

AL/COM service stands out because we've interlaced a string of multiprocessing AL-10 systems, with one computer backing up another in each system, and a second dual system backing up the first . . . and we'll soon have ten. They're all side by side, but as close as your local phone. Think about that... central files... back-up... speed . . . reliability . . . distributed nationwide by the AL/COM Time-Sharing Network.

When you select AL/COM you get a nationwide network of computer software professionals.

We bring AL/COM to you through a nationwide network of professional software organizations. We're more than reps, dealers or branch offices. We're AL/COM Associates; local, independent firms, among the best in the industry. Systems and applications expertise is an integral part of the AL/COM network. This means you have the largest group of independent computer software experts to help you solve problems more efficiently, right at your elbow . . . through AL/COM. Two new "Associates" are selecting AL/COM each month. Why don't you?

In just 30 seconds, you can arrange for a demonstration of the world's best price/performance computer time sharing service.

Experiencing AL/COM is believing. We'll benchmark AL/COM against your present system. Compare the response, the speed, the cost. Do you have a problem you can't solve on your present system? Try us. We're after the tough ones.

It takes guts to start a revolution

Revolutions are started by people dissatisfied with the way things are. Success depends on a change for the better. That's what AL/COM is all about . . . and it's revolutionary.

Contact us for information or demonstration

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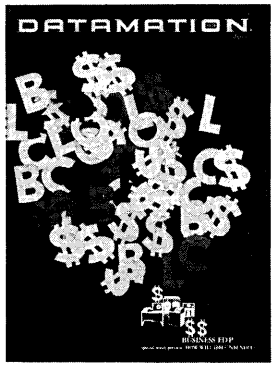

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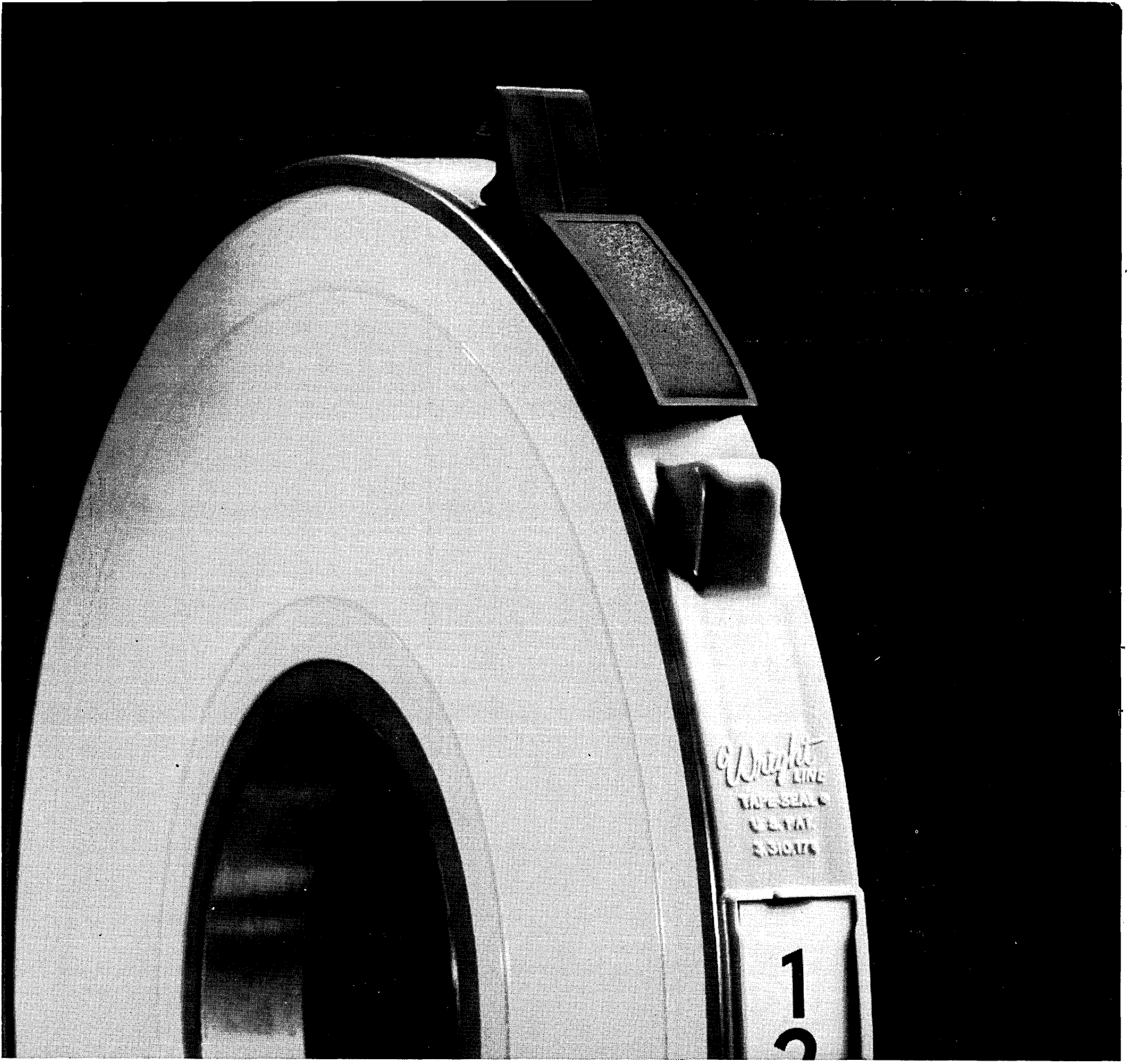

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DATA PROCESSING ACCESSORIES

CIRCLE 8 ON READER CARD

DATAMATION 69®

june
1969

volume 15 number 6

datamation departments

Introducing the third-generation typewriter.

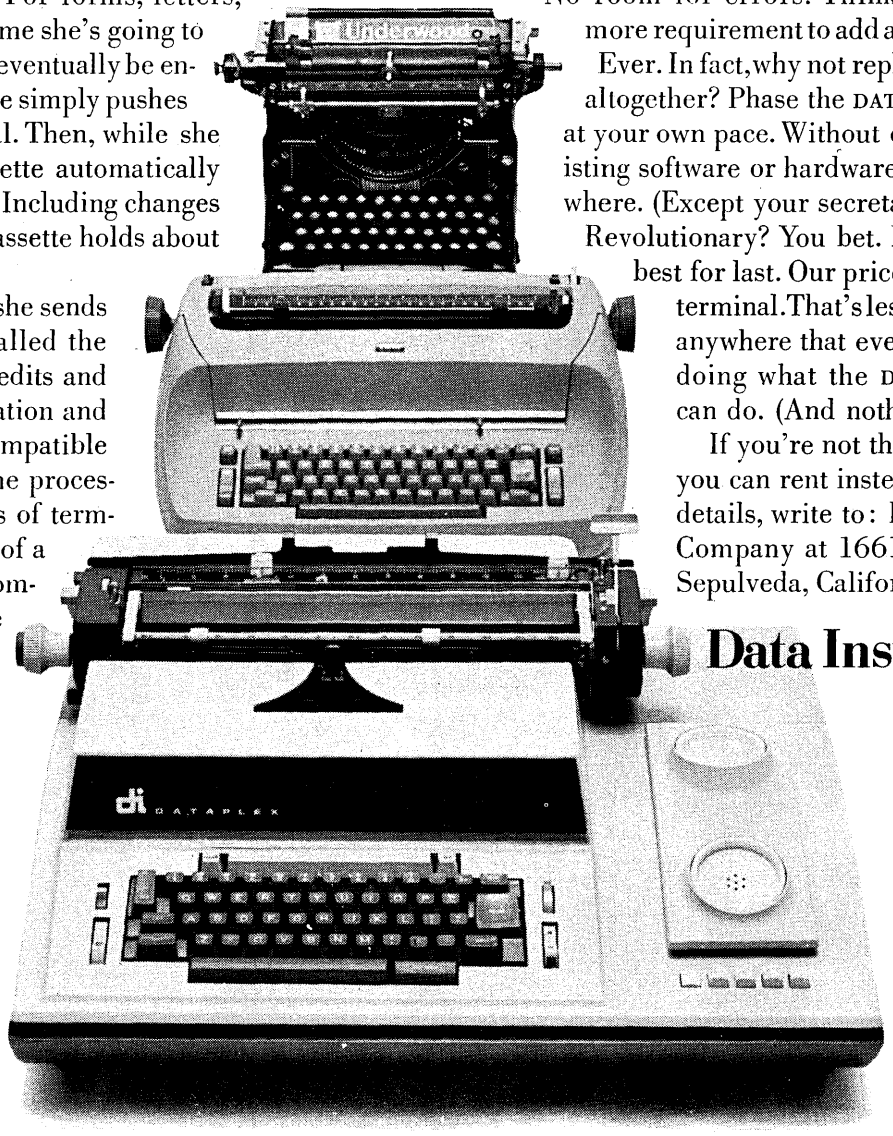
Now there's a way to prepare information for computer input at the same time it's being typed. Without interfering with office routine. Without *any* computer hookup. Without turning your secretary into a data processing expert. It's called the DATAPLEX™ System. And it works like this:

Your secretary uses a DATAPLEX Terminal just like an electric typewriter. For forms, letters, memos, anything. Any time she's going to type something that will eventually be entered in the computer, she simply pushes a button on the terminal. Then, while she types, a small tape cassette automatically records the information. Including changes and corrections. (Each cassette holds about a normal day's work.)

At the end of the day, she sends the cassette to a unit called the DATAPLEX Processor. It edits and formats cassette information and translates it into tape compatible with your computer. (One processor can handle hundreds of terminals.) The unit consists of a cassette reader, a mini-computer, a computer tape transport and an input/output writer (for interrogating and logging). But, the most important component of all is a new proprietary software package that bridges the gap between business language and computer language. We call it FORMOL.™ Format Oriented Language. The whole process is fast and simple. No keypunching. No verifying. No room for errors. Think about that. No more requirement to add another key punch. Ever. In fact, why not replace keypunching altogether? Phase the DATAPLEX System in at your own pace. Without changing your existing software or hardware or anything anywhere. (Except your secretary's typewriter.)

Revolutionary? You bet. But we saved the best for last. Our price: $2,850.00 per terminal. That's less than any system anywhere that even comes close to doing what the DATAPLEX System can do. (And nothing really does.)

If you're not the possessive type, you can rent instead. For complete details, write to: Data Instruments Company at 16611 Roscoe Place, Sepulveda, California 91343.



Data Instruments

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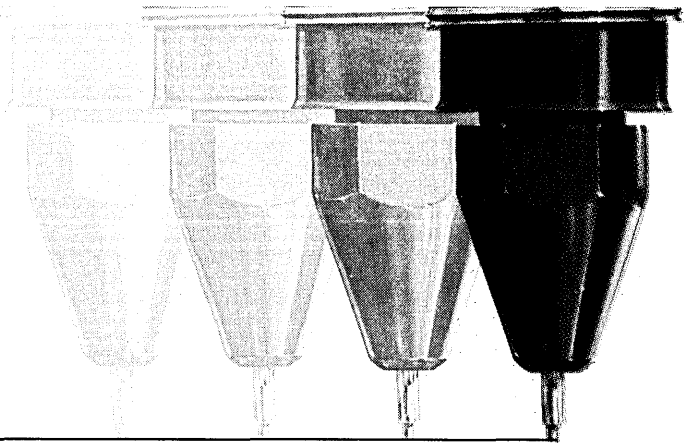

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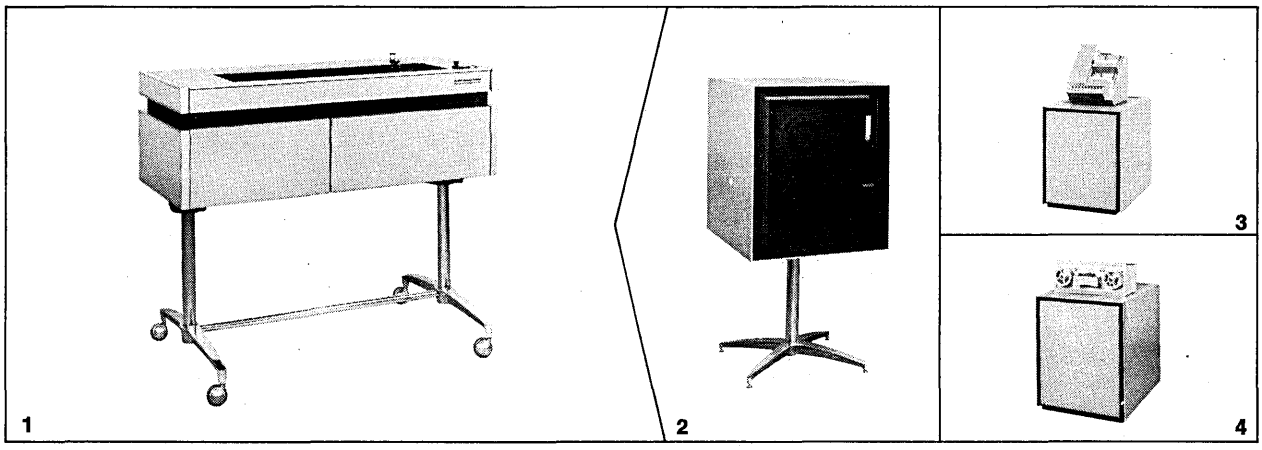

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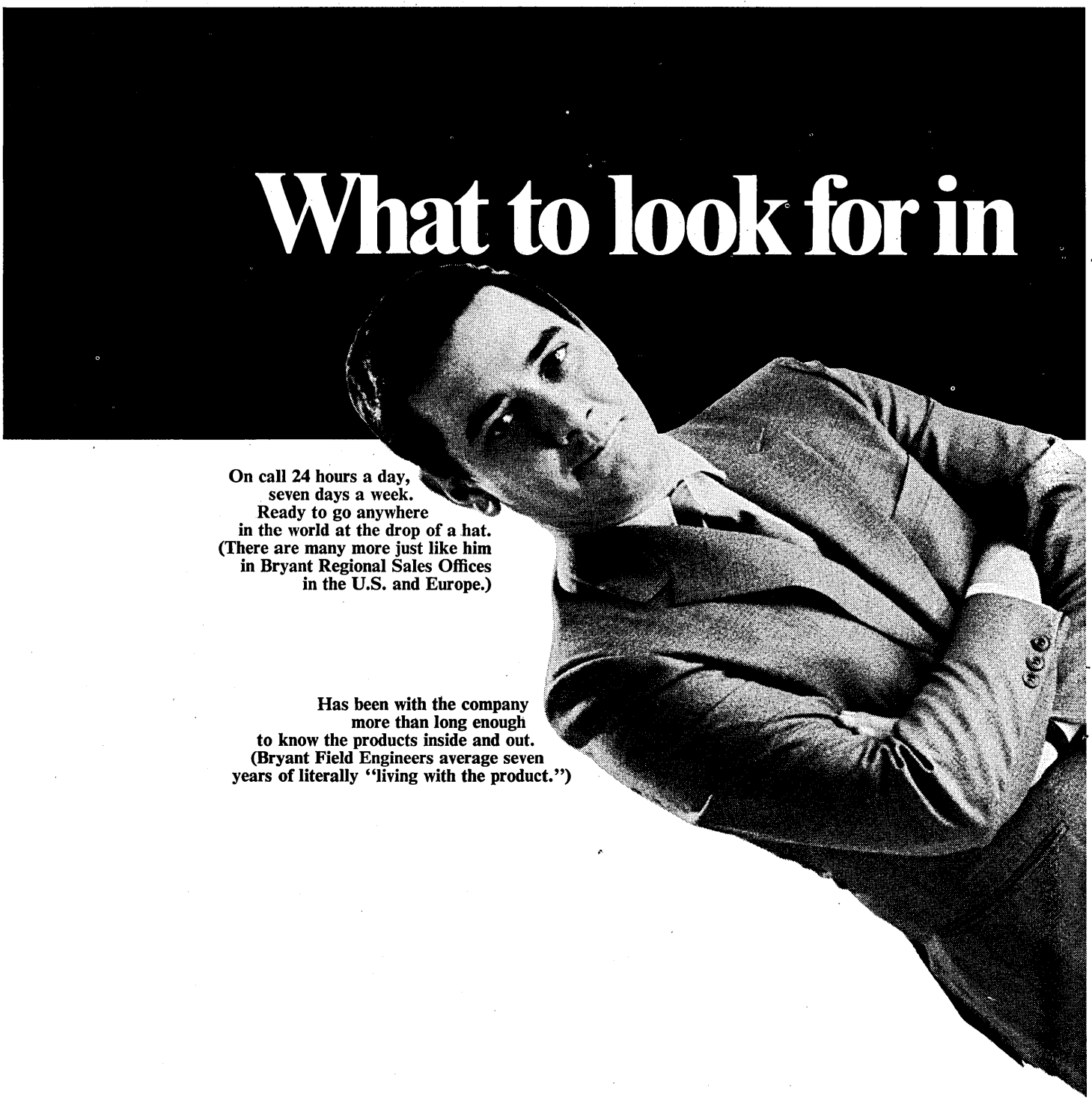

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You'll probably never need him again,
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an EDP field engineer.

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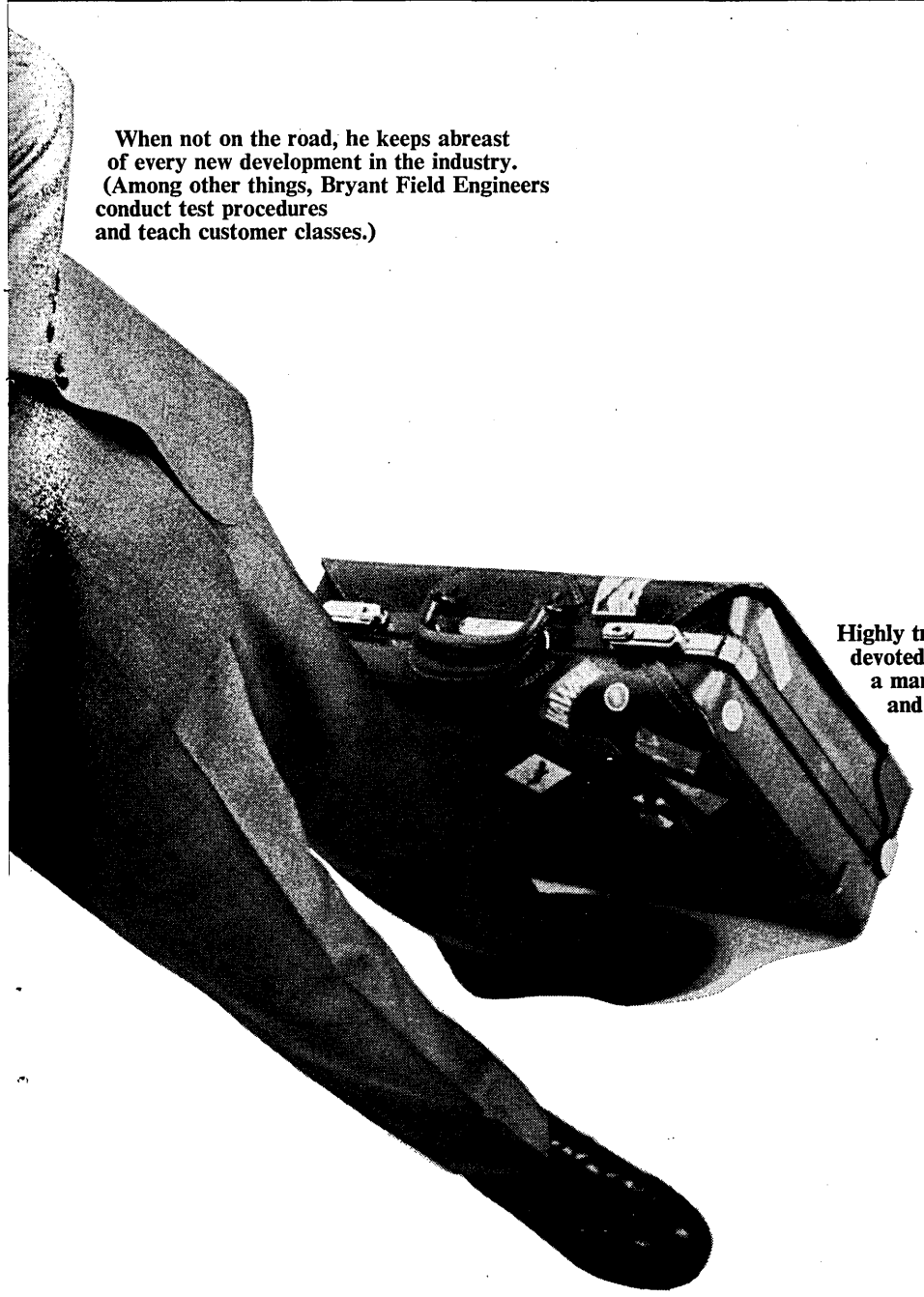

Highly trained, well educated, devoted to the industry; a man who loves the challenge of diagnosing and solving customer problems. (That's our man.)

A match for any computer

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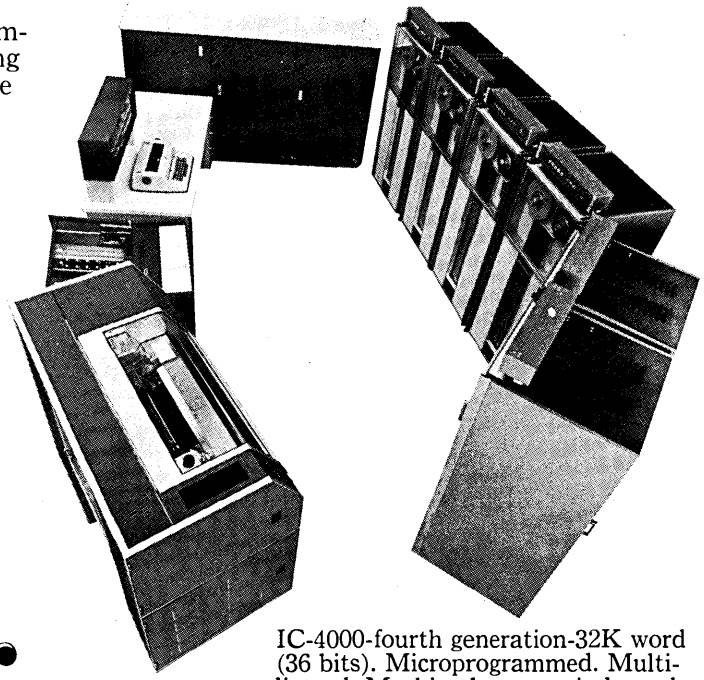

IC-4000-fourth generation-32K word (36 bits). Microprogrammed. Multilingual. Machine-language independent. Other models for time-sharing, remote job entry, and other innovative applications.

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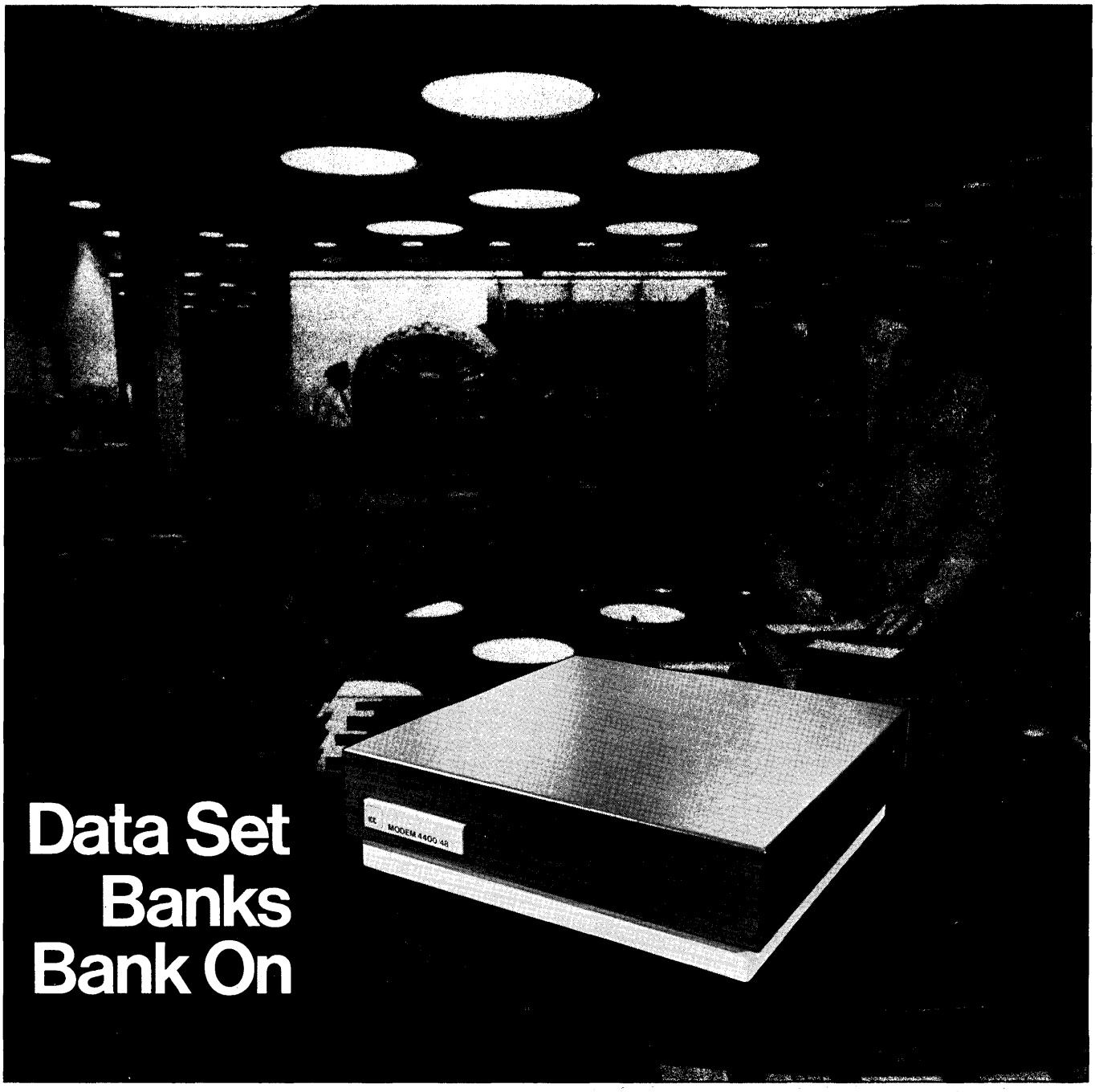

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CIRCLE 13 ON READER CARD

machines that make data move

TELETYPE®

data's wait-less wonder

Hold tight. It's Teletype's Inktronic® terminal. A data terminal many times faster than the ordinary page printer. Zaps 1200 words to the page per minute. Electronically. It's another answer from Teletype R&D for moving data economically at high speed.

* * * *

Off the ground and moving: Inktronic terminal. A space age terminal that doesn't tinker with time. And one time won't tinker with. Moves data on-line at 1200 wpm. And will have higher speed capabilities for tomorrow. Helps you get more in and out of the computer practically. And monitor high speed, tape-to-tape systems with new ease and economy. The line includes the KSR (keyboard send-receive) set shown here. And an RO (receive only) set. An ASR (automatic send-receive) set is coming.

Printing's unique space walk

The Inktronic terminal is different. There's no type-box. Prints through electrostatic deflection. Ink literally leaps to the page to form a character. For ink droplets carry a negative charge and are drawn to the page through a series of electrodes that cause it to trace out the shape of the character called for. Each character is made up of a number of dots.

No waste space

Inktronic terminal doesn't kill time or waste space on "fill" characters or buffer storage. It prints only the characters called for. Cleanly. And puts them on the line where you want them. You can print one character as readily as a few words or an entire line.

In orbit with ASCII

Inktronic KSR will generate up to 128 code combinations and can print 63 alphanumerics. Take your choice of an RO set with 5-level or ASCII code, or a KSR set with ASCII.

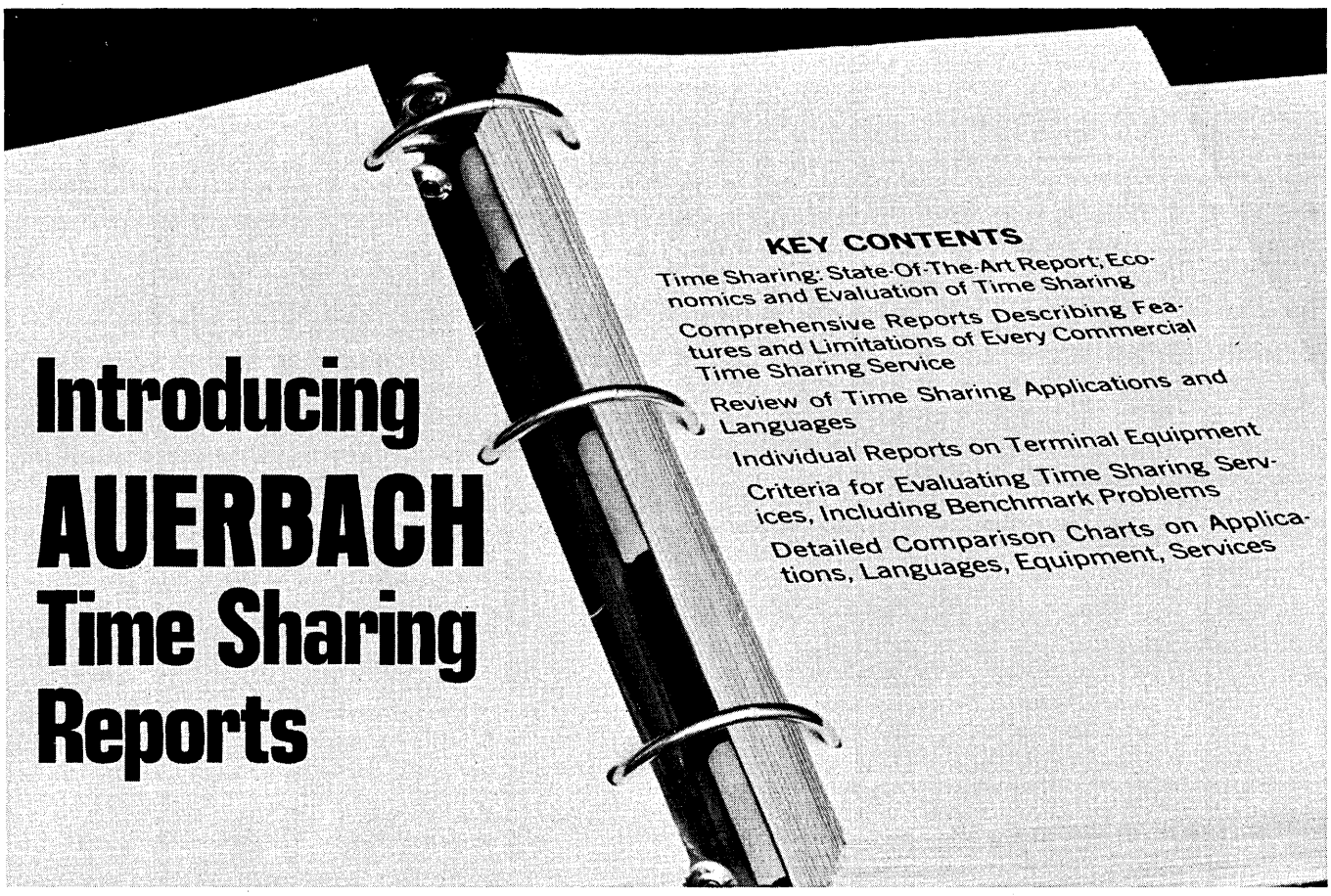
Keeps data tracking at less cost

The Inktronic terminal uses ordinary teleprinter paper. Inexpensive paper. A standard 8½ inch wide roll provides about 400 feet of data space. The ink Inktronic terminals use is inexpensive, too. One pint will deliver up to 15 miles of data. With a 1200 wpm capability these are important points to consider. Maintenance? Really low. The ink supply and guidance system has only one moving part. And you get more data on and off line faster which means greater economy, too.

The Inktronic is one of many exciting moves being made by Teletype R&D *in moving data at very little cost.* If you would like more information, contact Teletype Corporation, Dept. 81F, 5555 Touhy Avenue, Skokie, Illinois 60076.

CIRCLE 14 ON READER CARD

See New Teletype Equipment at Booth Nos. 624-626 DPMA Show



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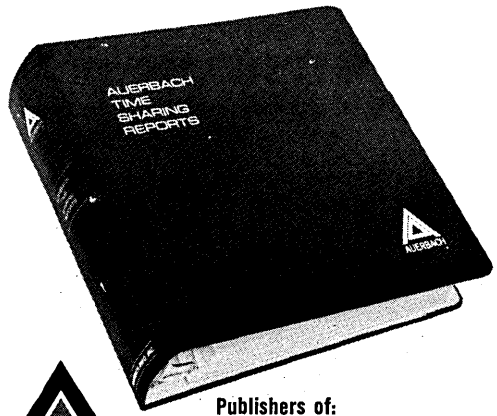

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Clevite's new hardcopy electrostatic printer zipped out the facing page in 1.8 seconds flat. That's up to seven times faster than most printers on the market.

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Clevite 4800 is an electrostatic printer. So it is quiet. (Think about that next time you're trying to make yourself heard above a chorus of impact-line printers.) And no impact means less wear and tear on the printer, less maintenance and downtime.

Beyond the computer.

Clevite 4800 has uses beyond the computer. In communications it can replace banks of teletypes and prints out data transmitted by telemetry, radio microwave and/or land lines. And it prints out graphic displays from CRT's using a TV raster display memory. The Clevite 4800 whips out full pages of alphanumerics and graphics as fast as signal sources can feed it. You may have other application ideas. Let's kick them around.

A word from the sponsor.

Clevite 4800 is based on proprietary equipment and proprietary paper. There is nothing else quite like it. It's faster, more versatile, quieter and more dependable. Yet, the Clevite 4800 printer's low price will surprise you. Let's talk soon. Clevite Corporation, Graphics Group. 37th and Perkins, Cleveland, Ohio 44114.

CLEVITE

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CIRCLE 19 ON READER CARD

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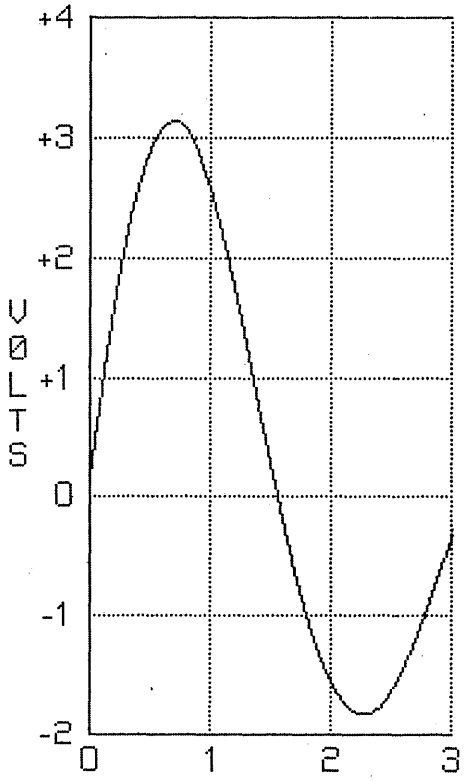
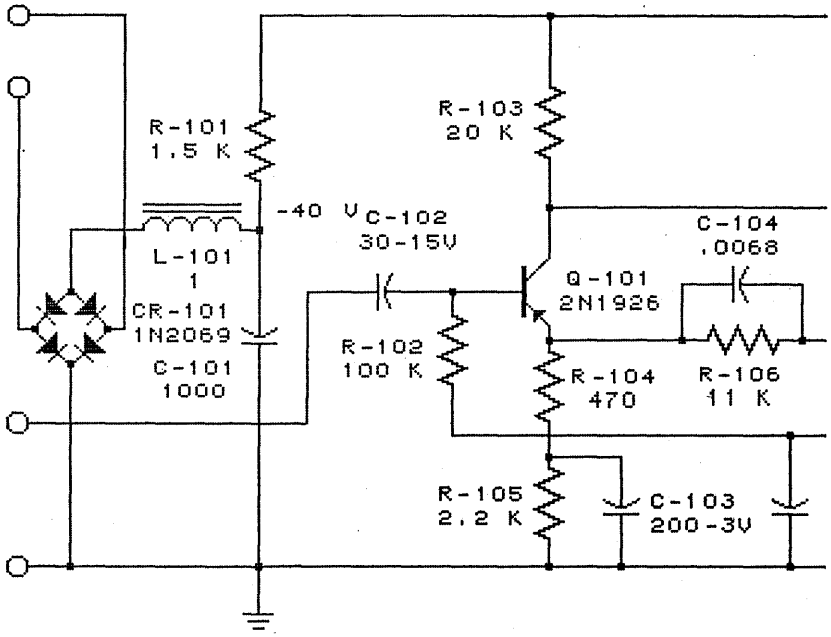
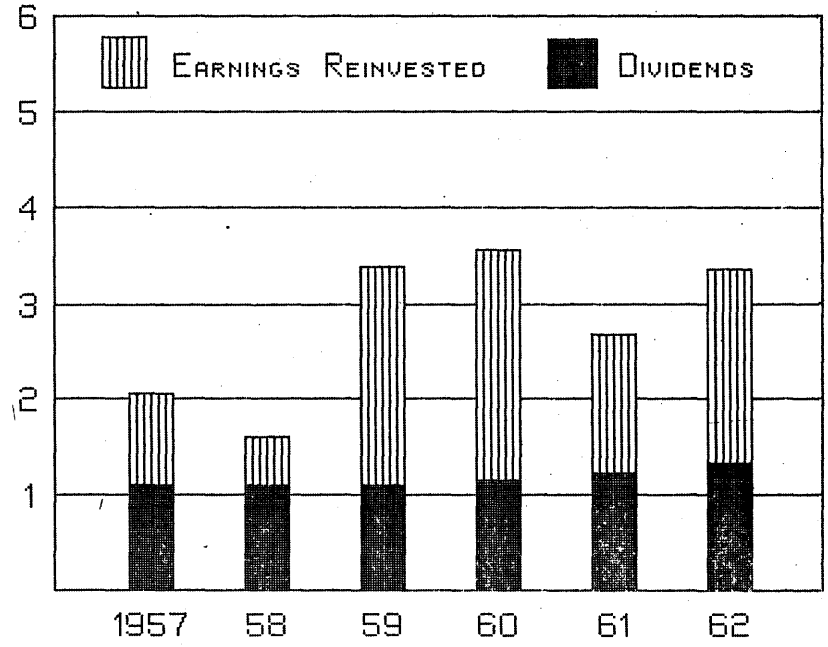




CLEVITE 4800

ABCDEFGHIJ
KLMN0PQRST
UVWXYZ
1234567890



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THESE CHARACTERS ARE N0MINALLY 10 UNITS HIGH BY 7 UNITS WIDE. S0ME CHARACTERS ARE 1 UNIT WIDE AND 0THERS ARE 9 UNITS WIDE.

abcdefghijklmnopqrstuvwxyz
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THESE CHARACTERS ARE N0MINALLY 10 UNITS HIGH BY 6 UNITS WIDE. THE HEIGHTS VARY FR0M 6 T0 14 UNITS. THE WIDTHS VARY FR0M 1 T0 9 UNITS.

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CARDLINER 15 / Operates at 14.8 CPS ■ Decodes your standard Hollerith cards to EBCDIC and to IBM correspondence code and is compatible with IBM 2741, Dura 1031 and Datel ■ EIA-RS 232B Interface. ■ Has fast eject option ■ Uses serial-photo-optic reading mode ■ Has only two moving parts, for simple operation and trouble-free service.

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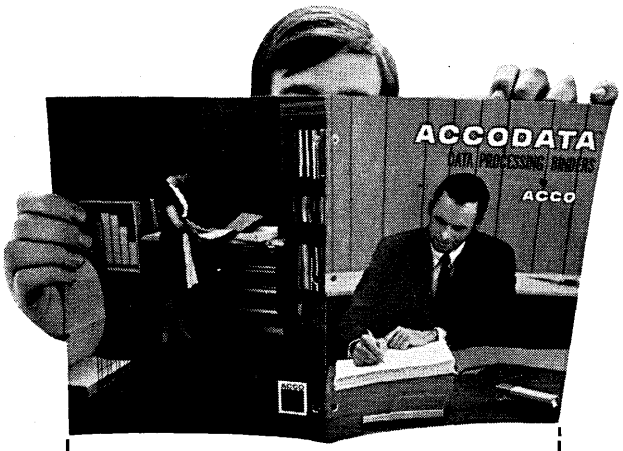

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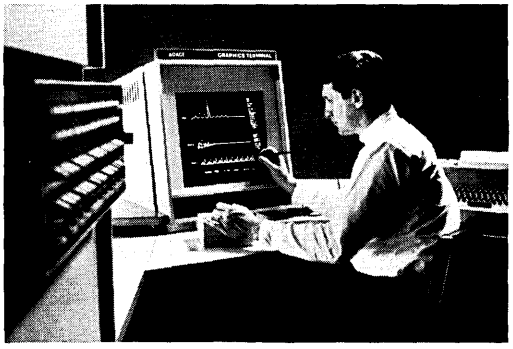

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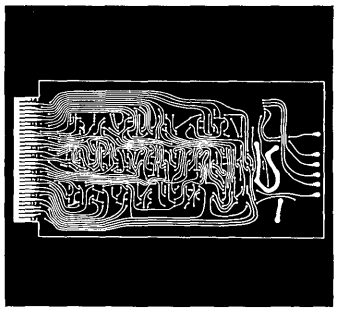
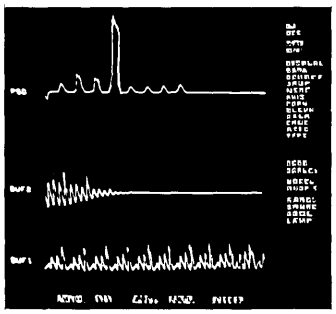
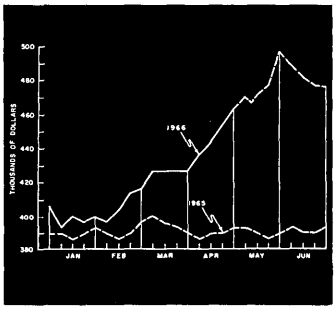


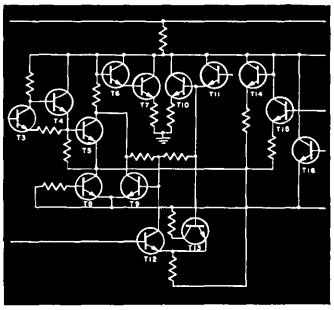
printed circuit layout



on-line signal analysis



business management systems



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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.

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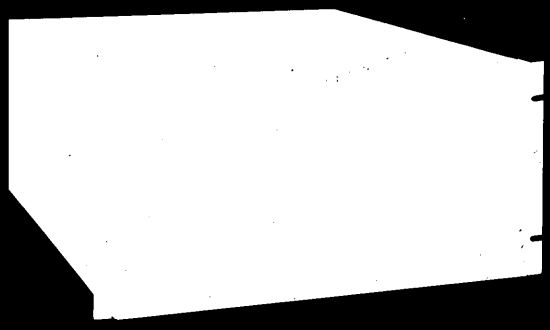
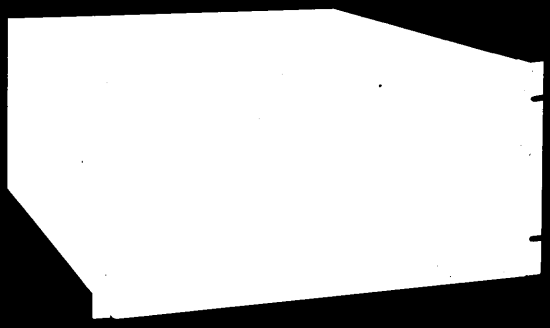
calendar

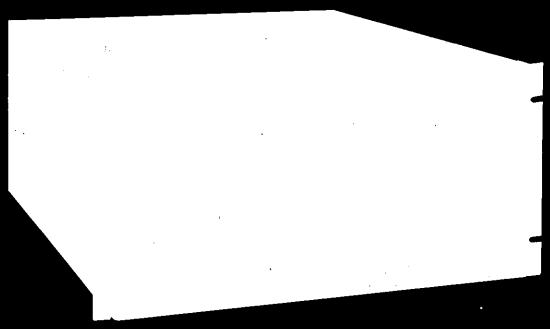
DATE	TITLE	LOCATION	SPONSOR/CONTACT
June 30 - July 1	Continuous System Simulation Languages Conference	San Francisco	ACM/Robert Brennan IBM Scientific Center, 2670 Hanover St., Palo Alto, Calif. 94304
Aug. 5-8	World Conference on Records	Salt Lake City	Genealogical Society 79 South State St., Salt Lake City, Utah 84111
Aug. 11-14	14th Annual Photo-optical Instr. Program	San Francisco	SPIE/Henry Sander 216 Avenida del Norte, Redondo Beach, Calif. 90277
Aug. 11-15	4th Australian Computer Conference	Adelaide, Australia	ACC 69/Dr. W. Hill Univ. of Adelaide, Adelaide, S. Australia 5000
Aug. 19-22	Western Electronic Show & Convention	San Francisco	WESCON, 3600 Wilshire Blvd., Los Angeles, Calif. 90005
Aug. 24-25	Programming Langs. Definition Symposium	San Francisco	ACM/James Painter IBM Research Lab. Monterey & Cottle Rds., San Jose, Calif. 95114
Aug. 25-29	Datafair	Manchester, England	British Computer Soc. No. 23 Dorset Sq., London N.W. 1, England
Aug. 26-28	Nat'l Conference & Exposition	San Francisco	ACM 69, P.O. Box 2867, San Francisco, Calif. 94126
Sept. 7-11	11th Annual EDP Conference	Los Angeles	NRMA 100 W. 31 St., New York, N.Y. 10001
Sept. 15-20	Int'l Symposium Design & Application Logical Systems	Brussels, Belgium	Dr. J. F. Florine, Laboratoire d'Electronique, University Libre de Bruxelles, Brussels 5, Belgium
Sept. 17-19	Int'l Computer Mining Applications Symposium	Salt Lake City	AIME/Mr. Alfred Weiss, 1356 Kennecott Bldg., Salt Lake City, Utah
Sept. 28-Oct. 1	Int'l Systems Meeting	New York City	ASM/Richard L. Irwin 24587 Bagley Rd., Cleveland, O. 44138
Oct. 1-5	32nd Annual Meeting	San Francisco	ASIS 2011 Eye St., N.W., Washington, D.C. 20006
Oct. 27-31	11th Annual Exposition	New York City	BEMA 235 E. 42nd St., New York, N.Y. 10017



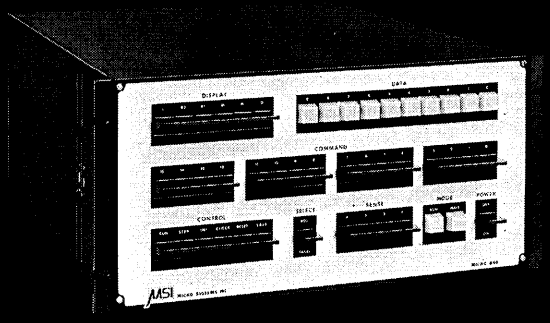
COMPUTER α



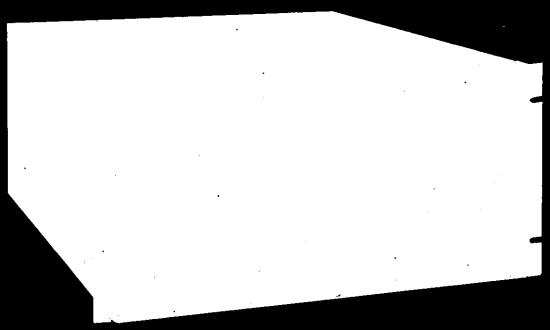
COMPUTER β



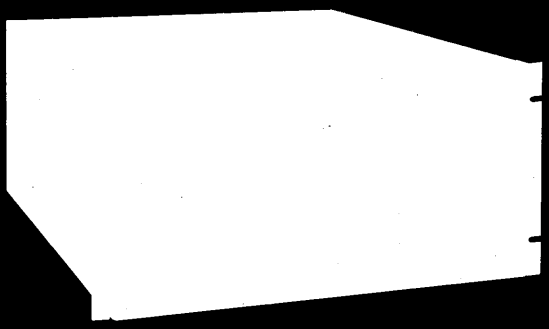
COMPUTER γ



MICRO 800



COMPUTER δ



COMPUTER ε

COBOL spoken here. Just one of the PDP-10 languages for on-line program development. With COBOL, time-sharing users can develop, edit, and debug data management programs on-line. Run them too. Equally well under time-sharing and batch processing.

PDP-10 speaks more than COBOL. FORTRAN-IV, MACRO-10, BASIC, and AID. And all these programming languages are re-entrant. That is, one copy is shared by many users to make efficient use of core. Protected, too, by hardware to prevent accidental destruction.

PDP-10 COBOL has another special feature. The programs that a user develops for his particular application are also re-entrant. Like the compiler, they can be shared by other users.

But that isn't all. The PDP-10 serves up to 63 time-sharing users with all these languages. Simultaneously. And handles program development, batch processing, and real-time operations. All at the same time.

More voice in software. More choice in hardware. Low cost. The PDP-10 speaks your language.

PDP-10

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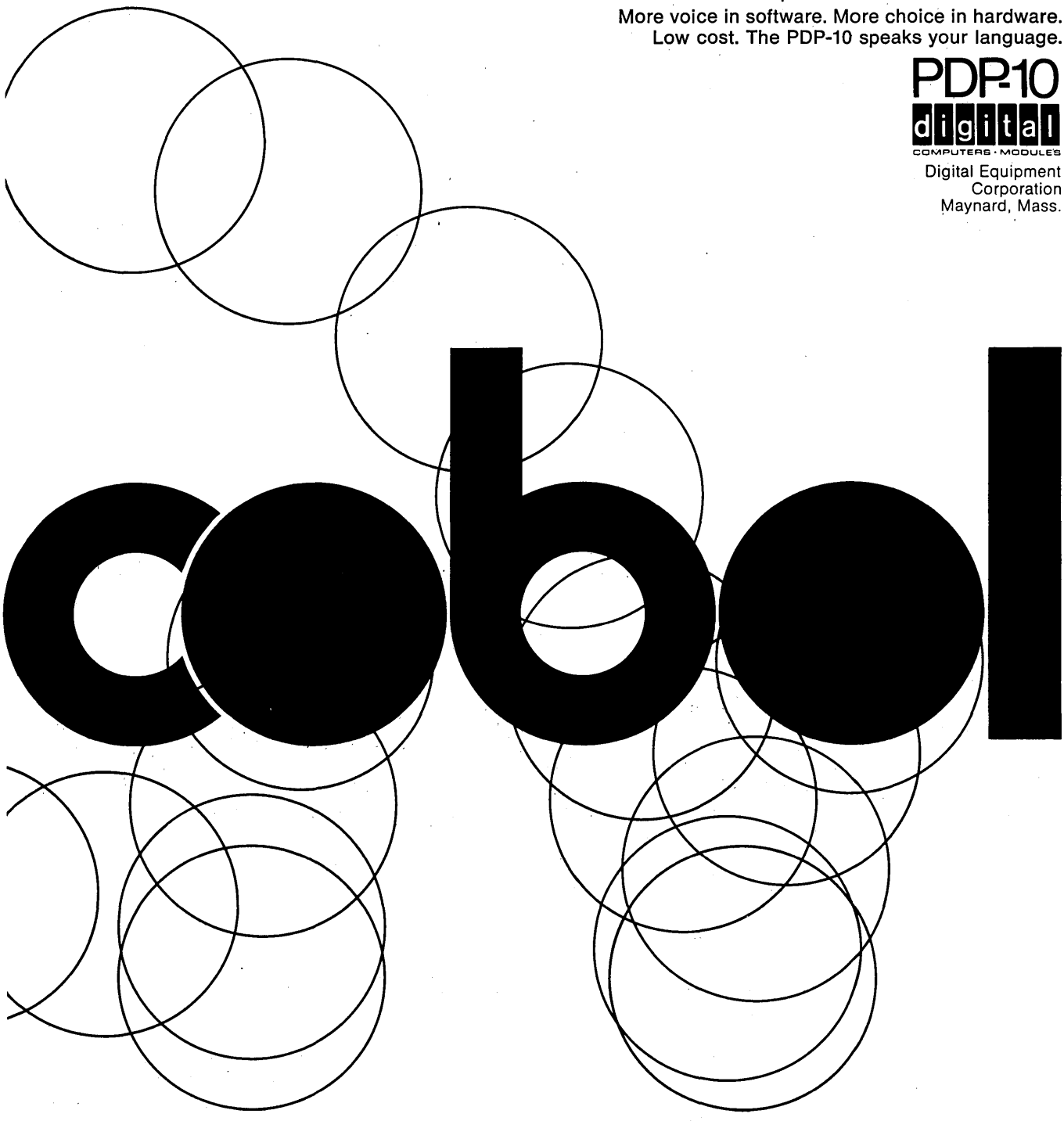

CIRCLE 24 ON READER CARD

letters

that's a switch

Sir:

In your February, 1969 issue, page 103, you reported that the Lockheed-Georgia Company had ordered a four computer system, implying Decade computers, from the Redcor Corporation. This is totally erroneous.

Earlier this year, we negotiated with Redcor for a data acquisition system employing Varian 620 processors. When Redcor, through an internal policy decision, replaced the Varian 620 with Decade 70 processors, our evaluation team found the proposed system would not satisfy the defined specifications and negotiation with Redcor was terminated. Further, the newly announced MAC 16 produced by Lockheed Electronics Company, was investigated and found well suited for the application under study. The system, utilizing four MAC 16's, is now under construction.

Would you please take action to correct the misleading statement in a future issue of DATAMATION, a magazine our computing professionals find highly informative, current, and normally quite factual.

R. C. SAWYER
Lockheed-Georgia Company
Marietta, Georgia

rhyme time

Sir:

I was interested to see the letter from Deena Koniver in your February issue giving a rhyme for memorizng π. I have long known another rhymng mnemonic for π which was ascribed to Dr. Johnson of dictionary fame, which goes as follows:

3 1 4 1 5 9
Sir, I send a rhyme excelling,
2 6 5 3 5 8
In sacred truth and rigid spelling:
9 7 9
Numerical scribes elucidate,
3 2 3 8 4 6
for me the lexicon's dull weight.

RALPH TOWNSEND
Darien, Connecticut

see and compare

Sir:

I read with interest an item in the News Briefs section (p. 109) of your March issue describing the Soviet computer BESM 6 as comparable to a Control Data 3200. Having seen installations of the BESM 6 in both Moscow and Novosibirsk, and having spent some time discussing the machine with Soviet computer specialists, I believe a more appropriate comparison is with a CDC 3600, which is also a 48-bit machine, rather than with a CDC 3200, which is a 24-bit machine. Of course the BESM 6 does not have the addressing capability or large memory capacity, or indeed the modularity of the CDC 3600, but on the other hand, it has hardware features designed specifically for time-sharing such as paging and memory protection.

Your readers may be interested to know that the letters BESM form an acronym for the Russian words which stand for big electronic computing machine.

SOL X. ZASLOFF
Scientific Data Systems
El Segundo, California

kludge judge

Sir:

As one of a small but dedicated group of Kludgephiles located in sekludgion in the scenic southwest, I welcome a new addition to the Kludge literature (reference 5). However, I also feel obligated to protest the editorial policy of DATAMATION, which can only be described as a shotgun approach to Kludgeology. Even a superficial glance at the DATAMATION published Kludge literature (reference 1 to 5) reveals that the individual contributions, albeit individually of excellent quality, do not adequately reference one another and generally reflect a disorganized approach to this extremely important area.

By contrast, our group of Kludgephiles is adopting a Systems Approach to Kludgeology. While it is obvious that this approach will lead to extraordinary results, we are not yet ready to make a full disclosure of the fruits of our research. However, it is possible to communicate a little of the flavor of our results by the following example of our Kludge Klassification work.

This work, involving a penetrating analysis of past and present Kludges, has revealed that all Kludges divide into two basic Klassifications, namely the "Genesis Kludges" and the "Darwinian Kludges." Genesis Kludges, of course, are Kludges that were Kludges from the moment of conception, while the Darwinians are systems which, once of clean design, have evolved into Kludges by the action of certain irreversible processes. We are presently examining the possible relevance of the Second Law of Thermodynamics to Darwinian Kludgeology.

If you can encourage your future Kludge authors to adopt a somewhat more scientific approach to this field, I feel certain that significant further progress will follow immediately, for new Kludgeians will then be able to stand on the shoulders of their predecessors instead of on each others toes (see reference 6, in which Hamming states that one of his major complaints about the computer field is that whereas Newton could say, "If I have seen a little farther than others, it is because I have stood on the shoulders of giants," while Hamming is forced to

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Salt Lake City, Utah 84111

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TJ-1

CIRCLE 25 ON READER CARD

conclude, "Today we stand on each other's feet.").

(Dr.) Ignatz J. Kranfield
Kludgephile Associates
Scenic Southwest

REFERENCES

1. "How to Design a Kludge", J. W. Granholm, DATAMATION, Feb. '62, pp. 30-31.
2. "The Master Plan for Kludge Software", M. L. Morris and A. O. Arthur, DATAMATION, July '62, pp. 41-42.
3. "The Konscience of a Komputer Konservative", I. V. Goody KKK, DATAMATION, Oct. '62, pp. 60-63.
4. "A Kludge Komputer Lexikon", K. Korluth KKK, DATAMATION, Dec. '62, pg. 21.
5. "The Genesis of Superkludge", N. Nattkarl, DATAMATION, April '69, pp. 132-133.
6. "One Man's View of Computer Science", R. W. Hamming, Journal of the ACM, January 1969, pp. 3-12.

Editor's note: We couldn't agree more with (Dr.) Kranfield, and we forwarded his letter to the author of reference 5, confidently expecting support in the delicate area of Kludge Klassification, only to receive the following, somewhat intimidating, reply:

Frum the Desk of

The Creative Director

THE **FINKLESTEIN** CORPORATION

Mr. Robot B. Forrast, Eq.
DATAMATIon Mazagine
94 So. Los Robles Ave.
Pasadena, California 91101

Dear Mr. Farst:

With regards to your forwarded communication frum the kludgephile Associate of Scenic Southwest, please be advised that amung my several responsibilities of a corporate nature is that of being in charge of public relations for the corporation.

With regard to design of Kludge machines, please be adviced that we are in the process of copywriting the terms "Geniusis" and "Darwinianen" with respect specifically to the mikrocircuitry under secret development in our reserch laboratories on the premises hear. These are, as a matterof fact the presise terminology used by your correspondant, and we bring this to your attention at this time in order to avoid a potential error or conflickt of interest at a later date, asking you to bare in mind, of course, that the precise nature of our in-house research is not for public consipation.

Our files contain considerable background information on the history of kludge design, and our reserchers are most highly qualified on the subjects so you may rest insured that we are not "talking through our hats" or "beating around the" bush and have the mocksie to see threw any shallow plan or fake as case may be.

So we suggest to you with all dew respect and seriousness that you advize youre coresponDents that they have probably been preceeded in the state of the art. This is two bad, and we hate to discourage eager peeple but it cant be helped.

Your's very truly

Nathan Nattkarl
Creative Director

"WE DO GOOD WORK OVER AND OVER AND OVER AND OWER.

WE DON"T MAKE KNEW MISTAKES. WE ARE CONSISTANT."

argument in passing

Sir:

Sverre Storoy's letter (March '69) stated that "Passing arguments from a PL/I program to a FORTRAN subroutine is very simple," with reference to SSP/360. I am afraid I cannot quite agree. While PL/I and FORTRAN (and most other processing programs of OS/360) use the same linkage registers, the significance of the argument list pointed to by General Register 1 is somewhat different in the case of arrays.

In a PL/I-compiled subroutine call, the address constant for an array parameter points, not to the array, but to an array dope vector, which contains a virtual base address, subscript multipliers, and subscript bounds for the array. In a FORTRAN-compiled subroutine call, on the other hand, the address constant for an array parameter points directly to the array, and a FORTRAN subroutine called from a PL/I program will reference words in the array dope vector (and, terrifyingly, the whole Dynamic Storage Area) as though they were elements of the array parameter.

Those routines from SSP which use purely scalar arguments are less likely to give trouble but still may create problems in a multi-tasking environment. The mystifying report that "At our installation, the SSP/360 is used by both PL/I users and FORTRAN users, . . ." is difficult for me to reconcile with the facts of PL/I, unless those users know so little about their problems that the certainly erroneous results (where, indeed, results of any sort are obtained) are not recognized. I suggest that, when the PL/I version of SSP is received by Mr. Storoy's installation, it be used to check the results of some of the programs which used the matrix manipulating routines from SSP. I suspect that some people are in for a shock.

James V. Doody
Niagara Falls, New York

peculiar commodity

Sir:

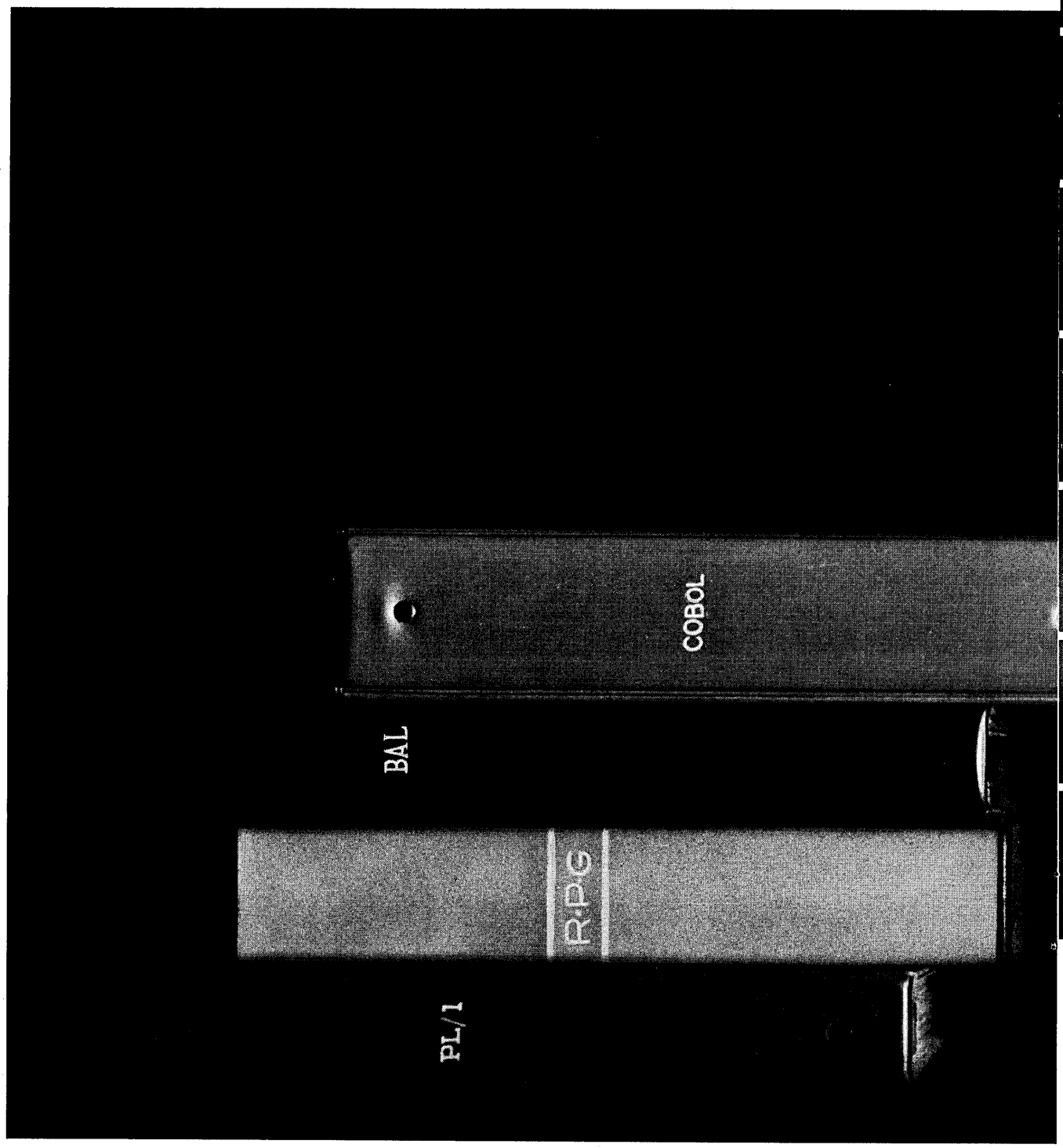
The opening letter in the April "Letters" column, from Mr. Horne on the subject of software patentability, is so prominently placed that it will escape the eye of few of your readers. I trust most of them will be able to see through the fallacious arguments put forth by the writer, but I would appreciate the opportunity to rebut.

The writer begins by confusing *memory* (the collection of neurons and other matter which constitute the brain's retentive capability) with *memory* (the process of altering the state of the brain so that specific facts are retained). It is clear, I believe, that the electronic counterpart of the former is indeed patentable; what is unclear is whether the electronic counterpart of the latter is patentable.

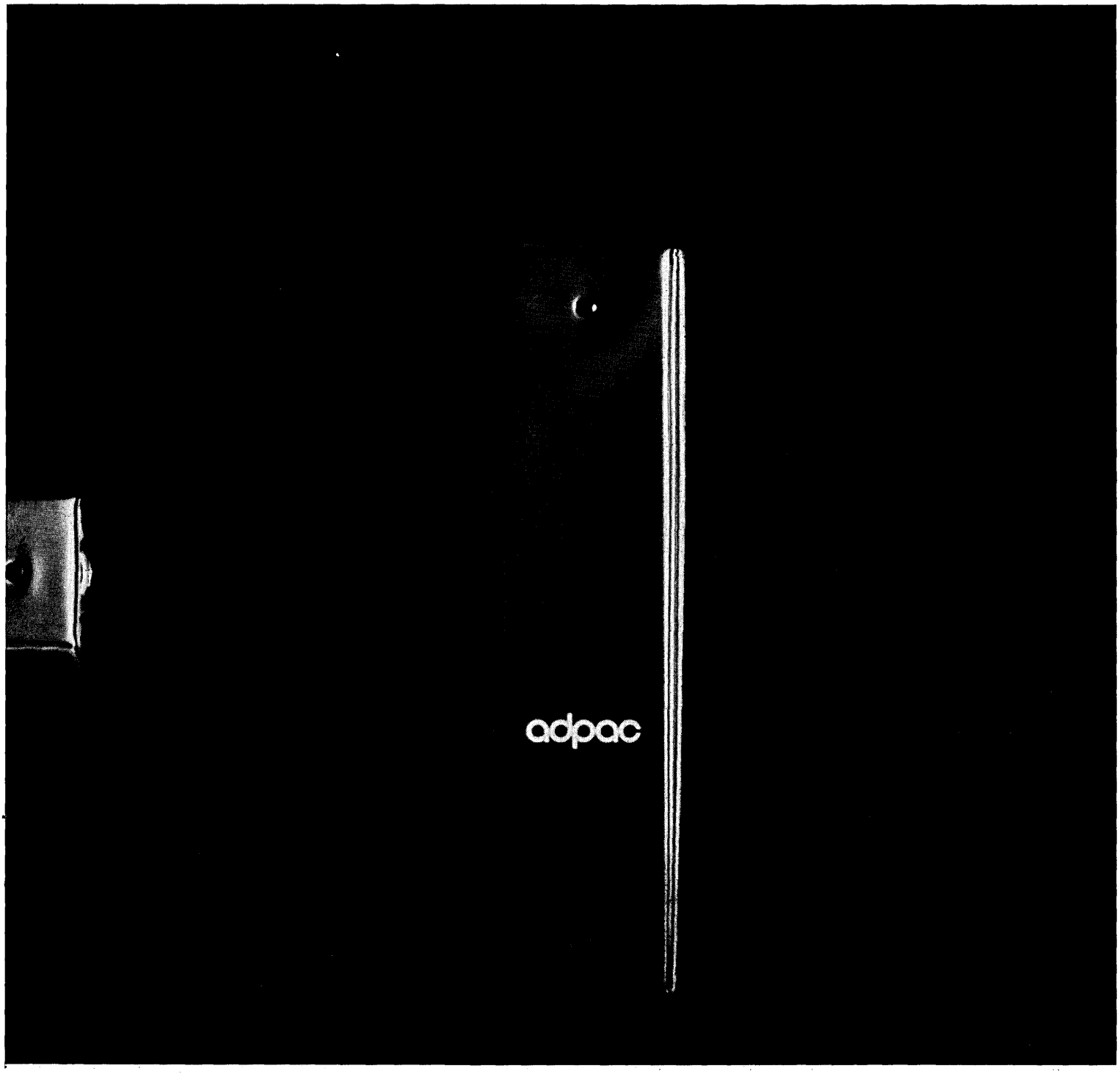
The writer's conclusion, that " . . . the program is more like the core, providing a capability, than it is like the process itself," is indefensible. The computer, when first plugged into the wall, is capable of many electronic states, each of which corresponds to a program. But a program never exists—in the computer or out—except as a state: a particular alignment of magnetic cores and flip-flops, a particular choice of punches in a card, etc. A program is an expression of a *choice* in the state of the computer, but is not a tangible thing in itself.

Software is a peculiar sort of commodity. It shares, with such states of mind as opinions, convictions, facts—even religion—the trait that it can be transmitted to someone else without depriving the originator of anything (except, perhaps, uniqueness). This

(Continued on page 261)



These computer languages are free.



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COMPUTING LANGUAGES

CIRCLE 26 ON READER CARD

look ahead

IBM RUMORS DROWN IN ALPHANUMERIC SOUP

Latest fullpruf, undeniabul, bonafidie rumor on IBM's next line of systems is that there are three planned models currently called New Systems or NS, which may be called 360's or something else. NS-2 is supposed to be a 360/50 replacement, announced before year end. It'll be 2.2 times the add speed. NS-1 will impact the 30 and 40 and will be sprung sometime next year, although there may be a 360/30 I in the meantime to bolster the ailing 30. Then there's the NS-0, which is smaller than the NS-1 and won't be detailed until 1972.

There's also an idea floating around IBM-Germany that a baby called NS-T (for Threshold) would be nice to have. It's targeted for 1972/73, would carry a $500/month price tag, be smaller than the NS-0, and partially replace the unannounced model 3.7.

Further "firm" facts are that the NS line will be compatible with the 360 line, although it won't run 360 code as efficiently as its own new code. Its new operating system will be separately priced. Its channel commands will be different. And its control units may be integrated into the cpu.

Another number bandied about is the 360-T, which could be the NS-T, but may be a 360 with hardware translators for ASCII.

DEMOCRATS SEEK TO CURTAIL BANK EDP

Democrat members of the House Banking Committee reportedly agree that a one bank holding company bill--nearing final form at press time--should prevent OBHC's from "auditing or other professional functions in the field of accounting." The provision seeks to exclude OBHC's from dp service bizness.

And, we're told, the Democrats want the Federal Reserve Board alone to decide what OBHC activities are legal under the bill's guidelines. They favor a judicial review which would allow service bureaus, others who feel victimized by OBHC competition, to sue. As currently drafted, this provision also allows the court to decide if the Fed was acting properly in permitting OBHC operations.

The Democrats also oppose a grandfather clause safeguarding existing OBHC activities, regardless of the new legislation.

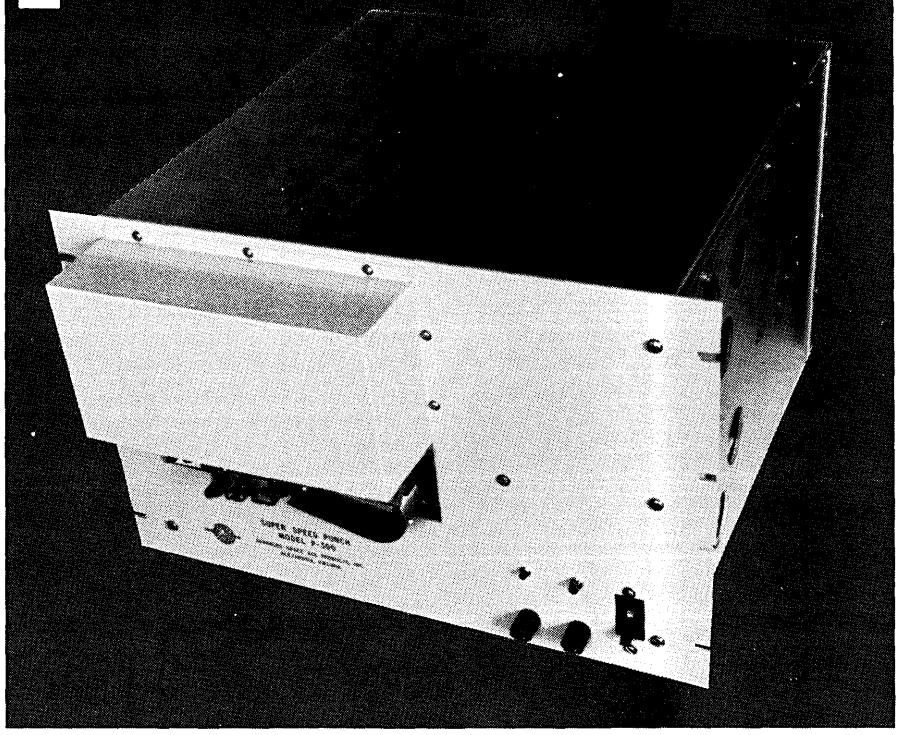
FRIDEN FUSSES, FIDGETS, EYES TIME-SHARING

Friden, which so far has confined its edp efforts to calculators, terminals, writing machines and the like, is reportedly cautiously weighing a more ambitious entry--a small-scale, business-edp-oriented time-sharing system.

The system, reportedly now in the prototype stage, will offer 1-10K "locked" core for each user, plus a central memory, including a firmware exec. User files will be maintained on disc packs. It's said to have 20 slow-speed lines, each up to two

(Continued on page 39)

powerful puncher!



ASAP's Model P-300 Paper Tape Punch—310 Characters Per Second. This close tolerance, heavy duty perforator packs a 310 characters per second punching capability! ASAP's peripheral engineers have transformed Teletype Corporation's DRPE Punch into a remarkably compact (less than 15" x 20½" x 21") high performance puncher that has enhanced the use of paper and mylar tape.

ASAP engineering has automatically synchronized the electro-mechanical and electronic assemblies. No operator adjustments are required throughout the speed range, and interface with computers, modems, peripherals and data sources is easily achieved.

The P-300 is available in either table-top or relay rack models.

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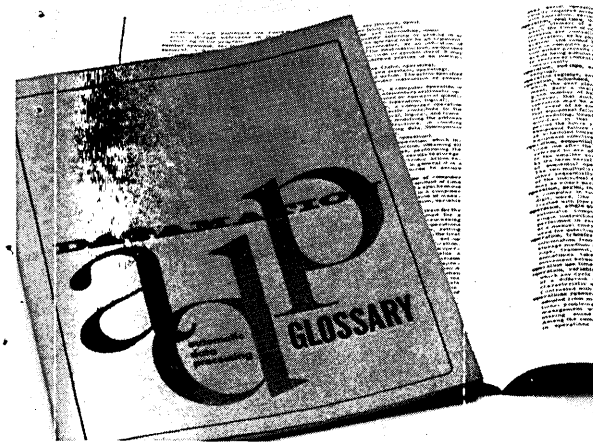

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miles long, with each line able to handle 10 remotes. A high-speed line will accommodate mag tape, card gear. Target price for a basic system: $500/month.

We understand that Friden will test market the system, described by one source as "a very simple machine" which augments rather than competes head-on with available T-S systems. It's said to be especially good for little jobs and for remote data entry.

One of the big questions is how much money it will take Friden to educate its large, but relatively unsophisticated (in terms of edp) sales force to peddle the new system. And we understand that parent firm Singer has given them a relatively modest six megabucks to get the new bird flying.

SDC HESITATES AS KEY PEOPLE FLEE

System Development Corp., reportedly close to going public last year, has instead been talking to many suitors since then--hoping that the right acquisition-minded company would come along. Now the go-it-alone plan is alive again, but the long delay is taking its toll.

Latest notables to move on include Jules Schwartz, head of the technology directorate (and father of Jovial); John Ottina, vp and head of the military systems division; Bill Warren, vp of air operations; Lee Page, manager of engineering, Pacific systems; and F.A. Maresca, marketing man in the commercial systems division.

They are said to be going as a group to join King Resources, a $50-million-assets oil exploration outfit mentioned recently as a possible candidate to take over SDC. The group's job is to consolidate King's computer operations, but the betting is that more adventuresome activities will follow. Although King's headquarters are in Colorado, the group will operate from the Los Angeles area.

During the same week, Harold Ozbekhan also resigned; he has been director of corporate planning.

This latest wave of departures would seem likely to speed up SDC's plans--and, since the hunt for an acquirer doesn't seem to have been successful, the most likely announcement is still its conversion into a publicly held corporation.

MILLIONAIRE MAKES THOUSANDS IN THE COMPUTER INDUSTRY

Bonnie Boncompagnie is on the board of Advanced Computer Techniques, NY software firm. He has been chairman of the board of World Commerce Corp., a director of the United Fund, and an ex-Italian naval officer, among other things. He owns a 100-foot yacht. The 73-year-old multimillionaire became impressed with the dynamism of the industry while working with ACT and began to dabble in some systems analysis for the firm. So now he makes $12K a year as "industry advisor, senior systems analyst."

ACT, by the way, is now boasting the "most beautiful computer center in New York," since it has installed a GE-130 at the Julliard School of Music, on the first floor of the Lincoln Center for the Performing Arts. ACT will perform computer services for the school while developing its own proprietary packages on the system.

IBM STILL TRYING TO EMULATE CDC

IBM, which has stubbed its toes on supercomputers several times, is still evidently having trouble getting its Big Ones under way.

We hear that the Mohansic Lab project came to a near standstill when head man John Danmeyer left to join the enemy, CDC. And an anemically financed (two

(Continued on page 231)

If you have to service time-sharers while running batch.

Get one Sigma.

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editor's read*ut

LET'S HEAR IT FOR THE USER

In the last five years, the computer manufacturers have spent hundreds of millions of dollars to revamp their product lines, and the customers have bought the products. It has all been a thundering success for the computer industry, but for the middle range of user the benefits seem to be marginal.

I refer to businesses (and local governments) paying from $4,000 to $15,000 per month for computer equipment. These users are not in the computer business nor are they in businesses created by the computer. They deal in the things of everyday life: food and clothing and household goods, industrial equipment and supplies, services and finance. They use their equipment to process information and to prepare (hopefully useful) reports for sales, production, and financial management. The applications are mundane, and the budgets are often tight; the installations are very unglamorous.

Considering the costs of personnel and supplies, an installation that pays from $4,000 to $15,000 per month for computer equipment has an annual data processing budget of from $100,000 to $500,000. Such an installation is a major management headache. The costs may represent a significant percentage of the profits before taxes. The problems are too complex for an RPG approach. The environment does not attract career professionals in data processing.

The computer manufacturers now offer far more in potential processing capacity per dollar than they did five years ago. In any product line, a typical $7,000 configuration of today might be theoretically more powerful than its ancestor by a factor of two, or four, or more—depending on the problem mix. And the new gear is delivered with millions of dollars worth of systems programming.

But the key to the success of a computer installation was—and is—the quality of the systems and programming personnel. Five years ago, most installations were dependent on a "whiz" programmer—defined as the only one who could modify *the* update run.

Now most shops use COBOL or the equivalent. Management has been told that programmers do not have to be as clever as they used to be, that the computer produces some minimum standard of documentation, and that the programs can be recompiled for other computers.

But there is a catch. Now an installation must have a new kind of whiz programmer who does little besides keeping the operating system and compiler up to date. A new element of overhead has been added to computer operations, and today—as five years ago—management finds itself subject to blackmail by some young person who generally feels more loyalty to the computer business than to his employer.

The middle-range user is urged to use software that absorbs a substantial proportion of the capacity of his new computer. Core is much cheaper than it used to be, but the extra core is eaten up by the resident supervisor and the atrocious code compiled from so-called higher-level languages. Cycle times are much faster than they used to be, but execution times are adversely affected by the redundant instructions in the supervisor and in the compiled code. Spooling is now common with small configurations, but large blocks of computer time

must be reserved for compilations, for bringing the installation "up to date" with the latest versions of the operating system, and for recompiling and retesting with the new releases.

Most installations go through a stage of using new equipment to emulate old equipment. With new pricing policies for overtime, fast internal speeds, and improved peripheral gear, an increased volume of work can be handled at a reduced outlay for computer rent.

But such an installation is stuck with over-age systems and programs. The technical staff is restless about not being up to date, and for company management the sales representative confuses a COBOL-supported random-access device with a "Management Information System." Under the combination of practical and social pressures, the decision is made to redesign and reprogram using the latest software that comes with the new equipment.

Now what happens? The *new* system requires more equipment. Almost always, the rental on the new configuration exceeds the rental on the old computer equipment previously released. The software of today is too much overhead for the typical $7,000 configuration.

Who knows of an installation that reduced its data processing costs after converting to new equipment? I don't, except when operating in the socially-unacceptable emulator mode.

Starting from scratch, is it now easier or faster to put a new application on the air than it was five years ago? Maybe, but only if the application is rather straightforward.

Has the management headache been eased? I don't think so.

For a typical business installation, the $7,000 computer system (equipment plus software) of today is remarkably close to the computer system of five years ago. Acknowledging the vast improvements in equipment specifications, has the investment in software all been a great waste? Or have we merely asked users to substitute a fastback model for tail fins? Considering the problems that manufacturers have with sales plans (which greatly penalize the salesman for reduced rentals), the latter possibility cannot be lightly dismissed.

I prefer a charitable explanation: first, that conflicting visions of *nomoreprogrammers* and *managementinformationsystems* confused those responsible for developing software specifications; second, that the software of today does in fact contain the seeds of new approaches in using computers; third, that it was all a necessary iteration in the development of a new technology.

For the middle-range user, computer installations are a drain on profits, a problem in personnel management, and a delay factor in any change or expansion of company operations. If these management problems are not solved, the customer paying less than $10,000 per month in rent may vanish. Service bureaus will boom, but the manufacturers will suffer. Charitability aside, the existence of the service-bureau alternative and the pressures of the market should force the industry to do better the next time around.

—LOUIS B. MARIENTHAL

how to learn from others

THE COMPUTER AND FUNCTIONS OF MANAGEMENT

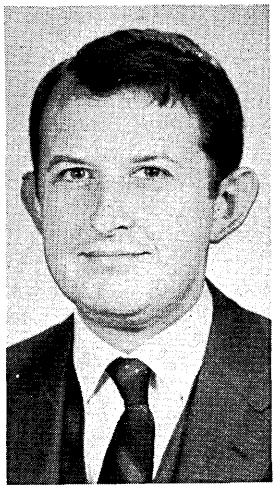
by C. Ridley Rhind

Followers—and most of us *are* followers—in the data processing world are facing an increasingly difficult problem today.

Most of us would like to reap the advantages pioneered by others—and will work hard to do so—but we find that this policy offers less and less guidance on "what to do on Monday morning." The development time for major data processing projects is getting longer and longer as their complexity grows greater, and the follower in this field, therefore, is on the horns of a dilemma. On the one hand he does not want to embark on a complex project until he has seen someone else prove it out; but on the other hand he may have to wait years to see his competitor's results, and those years represent a lead time which he can only with difficulty retrieve.

Nor is this a phenomenon restricted to the computer world. As Peter Drucker said in *Practice of Management:*

"It is the essence of economic and technological progress that the time span for the fruition and proving out of a decision is steadily lengthening. Fifty years ago Edison needed only 2 years or so between the start of laboratory work on an idea and the start of a pilot plant operation. Today, it may well take Edison's successors 15 years. A half century ago a new plant was expected to pay for itself in 2 or 3 years; today, with capital investment per



Mr. Rhind, an associate in the San Francisco office of McKinsey & Co., Inc., has specialized in management information and computer systems studies. Formerly a marketing manager for IBM, Ltd., in the United Kingdom, he has an MBA from Harvard Univ.

worker ten times that of 1900, the payoff period in the same industry is 10 or 12 years."

A human organization, such as a sales force or management group, may take even longer to build and pay for itself. And a successful data processing system which has to be woven into the fabric of the firm as a whole must be classified as one of the most complex products of any organization.

evolutionary progress

My own view is that, whatever our present situation, the best way for most of us to move forward in making more profitable use of the computer is to build on what we have and to follow the lead of a few pioneers. Gradualism rather than revolution must be the philosophy of success. In other words, I believe that we must make *evolutionary* progress in the data processing department in the same way that we make evolutionary rather than revolutionary progress in almost every other sphere of corporate—and, indeed, human—affairs.

This isn't the way to go, according to some prophets; but I observe that, with few exceptions, this *is* the way things have happened in data processing. As you look back over the past eight or nine years, it's difficult to differentiate between the Integrated Data Processing we were talking about in 1960, the Management Operating Systems we were talking about in 1963, and the Management Information Systems that have recently been all the rage.

To be *evolutionary* in the development of data processing applications and to be also a *follower*, it is necessary *first* to know where you stand in relation to others, and what sort of thing the leaders are doing. If you wait too long to follow, you can fall a long way behind; but if you commit yourself to unwise developments you may well find yourself one of the last of the dinosaurs.

Try to talk about the use of computers in business today and you immediately run into one major source of confusion. Operations research (OR) is now almost synonymous with computer work in many people's minds; yet some OR work is still done without computers, and the majority of computer departments have no qualified OR staff. I believe we have to draw a clear distinction between:

1. Applications of the computer which depend for their usefulness principally on an analytic approach which is highly technical and properly the preserve of professional operations researchers, and
2. Computer applications which are no less technical but which depend for their value on being closely attuned to the methods of working and styles of management of the organization for which they are developed.

I would call the two types of applications operations research applications and information systems applications; it is my purpose here to discuss only the latter.

profitable information systems

The key to identifying profitable information system applications must be to set out with the deliberate purpose of using the computer to improve profits by helping managers —*specific* men in a given organization with *specific* responsibilities—to do their work better. This immediately raises a series of questions: Who *are* the managers in whose hands the company's profitability rests? What can be done to make the computer a help to them? Through whose agency can they set computers to work to make profits?

Profit must be the objective; that is the ultimate measure of the computer's effectiveness, and we should not shirk it. Too often the data processing manager's philosophy resembles that of the White Queen, whose rule "Jam tomorrow, and jam yesterday, but *never* jam today" so confused Alice in Looking Glass Land.

We can answer these questions and help ourselves design *evolutionary* plans for the data processing department if we try to determine which managers computers are helping today. In trying to come to a conclusion on this point, I find it useful to think of the management of a corporation as being carried out on three levels, distinguished from each other by their respective time horizons.

First, there is the long-range direction of a corporation, and by long-range I mean three to 10 years into the future. This management function is often referred to as strategic planning, and it is commonly the prerogative of the highest echelons in the corporate structure.

Second, there is the medium-range direction of the corporation—say one to three years. This is commonly carried out on a functional basis. That is to say, the work of directing a corporation in the medium term is done cooperatively by functional executives.

Finally, there is the short-range management of the corporation by the day, week, and month. This generally goes on *within* functions or departments; and it is very often concerned with logistics—the supply and distribution of goods. In any case it almost always requires the precise manipulation of detailed data. The managers in charge of these operations are operating managers.

Managers' responsibilities fall generally into one *or* another of these three classifications. At least in large organizations, very few individuals are concerned with more than one classification.

Can the computer help managers at each of these three levels equally? I wonder. The philosophy that supports and recommends the development of total management information systems would claim it is possible to serve all managers alike—one hears much talk of hierarchical data bases in this connection. And certainly all of these managers work for the same organization and their actions are closely interrelated. None can function without the others; but do all managers require the same *kind* of information? Can the computer help them all with one encyclopaedic system? Let us consider each management category in turn—the long, medium, and short range, or the work of strategic, functional, and operating managers.

strategic management

At this level of management the principal concerns of the manager must be the external environment rather than the internal operation of the corporation, and the future rather than the present. To the extent that he allows activities internal to the corporation to preoccupy him, the strategic manager will become a victim of "management myopia." But the computer—as a repository for information—handles internal and historic data best. Its perspective is opposite to that of strategic managers. In fact, it has been suggested that the computer and the new information technology may aggravate the danger of executives becoming internally oriented—myopic—in that they may be encouraged to trust the computer for all their information. In Peter Drucker's words:

> "The relevant outside events are rarely available in quantifiable form until it is much too late to do anything about them. The relevant events are often qualitative and not capable of quantification. When they should be of concern to the executive, they are not yet 'fact,' for a fact after all is an event which someone has defined or classified, and above all has endowed with relevance. The truly impor-

tant events on the outside are not yet fact, they are not even yet trends. They are changes in trends. Such changes, however, have to be perceived. They cannot be counted, defined, or classified."

And Drucker points to the disaster of Ford's Edsel, where all quantifiable evidence promised that the lead balloon would fly. The computer as the handmaiden of OR techniques may serve to help strategic managers unravel the uncertainties of the future—but not on the basis of the historic, internal information it can store.

Not only is it often *difficult* to use the computer in analyzing the outside world in the future; it may even be dangerous because misleading. Strategic managers beware!

functional management

Managers charged with looking after the corporation's interest in the medium term may find the computer much more useful. The current best seller, *The American Challenge,* by Jean-Jacques Servan-Schreiber, starts out with the sentence:

"Fifteen years from now it is quite possible that the world's third greatest industrial power, just after the United States and Russia, will not be Europe, but *American industry in Europe.*"

Later in the book, the author attributes the success of American corporations in Europe to their superior management ability and specifically to their ability to use computers constructively. He writes:

"With the help of computers, which simplify problems of correlation, a direct relationship has now been worked out (by the Americans) between laboratory data, production problems, and marketing forecasts—all of which help give the firm a comprehensive view of the problems involved."

Compliments should generally be accepted gracefully and not analyzed—but in this case we may learn something from analyzing Servan-Schreiber's admiration for things American. What Servan-Schreiber has in mind, I think, is the ability of American corporations to structure their management and planning approach and look specifically at six aspects of a new venture. They will:

1. Take a hard, numbers-oriented look at their potential markets
2. Estimate their own market performance in the light of probable competition
3. Design marketing and selling efforts to achieve this performance
4. Plan capital expenditures to match production to the marketing plan
5. Control manufacturing operations by budgets
6. Control sales forces by performance measurement and incentive plans.

Undoubtedly, the computer can play a vital role in each of these separate components of the planning and management function; it can be of great help, and there need be no mystery as to the basis for its contribution. The internal and historic perspective of the computer is here not so out of tune with managers' objectives.

operating management

Finally, in *most* corporations those managers charged with carrying out the daily operations of the corporation can really benefit from computers. Yet in most corporations such managers—other than clerical and accounting managers who in most cases have been well taken care of by computer departments—are but poorly served. Some corporations are very much more advanced than others in the applications of the computer to the problems of operating managers; but few have come anywhere close to exhausting the profitable possibilities. The potential is so great that it justifies separate treatment.

case histories

The use of the computer to help operating managers in a corporation is particularly dependent upon the nature of the corporation and how it makes its money. For example, a corporation in Southern California in the business of mortgage financing, title insurance, and home and apartment construction sought to find a leading indicator of activity in local real estate markets. Customarily, real estate brokers seek a preliminary title report as soon as a homeowner approaches them to sell his house; and insurance covering title ownership is issued at completion of a sale, or a little before. This corporation believes that by studying the relationship between the rate of applications and closings it can develop a new economic leading indicator which will show where activity in the real estate market is declining and where it can be expected to advance over the next few months.

To get the same information with regard to *new* construction, it is only necessary to look at the rate of new building permit issues—this is an excellent leading indicator. But there has been no good leading indicator to use in forecasting activity in the sale of already constructed property. The corporation believes that by using the computer to analyze records of applications and closings it gains a 60-day advantage over its competitors in directing its sales activity toward specific real estate brokers in areas expected to be active in the mortgage business over the next few months. Now *that* to me is a good information system, if it works. Not only is the information all available, but the company knows exactly what it will do with the information and how to analyze it. If only as much could be said for all the management information systems that are so confidently touted at the moment!

Here is another computer application likely to help operating managers make money. White Weld and Co., New York investment bankers, now have their "Analystics" system on the air. This is a system that White Weld intends to market to financial institutions such as banks, pension funds, and insurance companies, where it is important for security analysts to have the best possible opportunity to come to well-informed conclusions on the individual stocks that may make up their portfolio. White Weld has stored on computer files 20 years' financial information—balance sheets and income statements—on more than 1,000 leading U.S. corporations and is now offering as a service to connect securities research departments to this data bank via telephone lines to their own terminals. They have also prepared a special programming language which will enable these securities analysts to construct their own programs extremely quickly and simply. This information system is unusual in that there is a standard, manageable body of information which is commonly required by many hundreds of individuals across the country, and the information is already quantified.

White Weld's notable contribution is to make this information readily available to interested parties through an interactive terminal system and through the development of a specialized programming language. I wish that all the conversational programming systems—or interactive programming systems—which I hear confidently recommended could have as good a chance of success.

All of us should learn to look for a well-developed data base and a real need for continuous repetitive analysis and calculation when selecting information system applications. And it helps to have an alert audience such as White Weld can hope to enjoy.

Here, taken from a General Electric publication, is a final example of computers helping operating managers. The

Greyhound Corp. has installed a computerized message-switching station capable of handling 40,000 messages every 24 hours as routine and of accepting probably 50% more at peak periods. That is one message every 1.4 seconds. The messages to be switched originate from 200 stations on Greyhound's 35,000 miles of private Teletype wire. Phase I of the system is in operation, and its principal purpose is simply to expedite dispatch of messages between the 200 stations. Using the computer, the average time between the sending and receipt of a message has allegedly been cut from 2 hours to 2 minutes; and already managers perceive an improvement in their ability to schedule available bus equipment. Phase II of the system will seek to systematize the recording of bus utilization in real-time so that as a bus is withdrawn from maintenance and put into service or its availability changed in any way, the record for that bus will be brought up to date at once. As a result, the division equipment controls supervisors will be supplied with completely reliable, up-to-date information on the whereabouts of each and every bus in their territory—which, it is hoped, will enable them to achieve a 5 to 6% improvement in equipment utilization. The corporation has 5,000 or more buses on the road, and the money involved is clearly significant—enough to justify real-time processing.

These three corporations have thoughtfully evolved their computer systems to match the requirements of the environment in which they operate. They have had an eye fixed closely on potential profit, and have designed their computer systems with that purpose foremost in mind.

application development trends

Up-to-date information—which the computer can supply—is vital principally to managers with short-time horizons. Strategic—or long-term—and functional—or medium-term—management does not require such immediacy in general. But for operating managers, when they need information, they need it fast. On October 24, 1929, when stock prices plummeted, the Wall Street ticker fell an hour and more behind before 11:00 a.m.; the panic was aggravated by *ignorance*—lack of information. Up-to-date spot quotations on the bond ticker hinted at a panic, and imagination did the rest. And long after a recovery—specious, as we now know, but reassuring then—might have started, the ticker ground out dismal news to perpetuate the panic. Similar situations—where lack of information breeds excited reaction—occur often in business today, and often represent an opportunity for computers to help. But I believe that in general, computers should be expected to reduce the "ignorance" of *operating* managers rather than that of strategic managers.

There is no lack of examples of computer applications—particularly in the area of operating management—that are worthy of emulation by alert, profit-minded followers. Unfortunately, as has been said, it is very difficult these days to pursue effectively the policy of being a follower. The only way to do it is to keep modifying and changing existing systems so as to keep them up to date with important trends in the data-processing world around us—the trends *not* in hardware design, but in application development. And unfortunately today many computer professionals are much more oriented to computers and software than to applications and corporate profits.

It cannot be assumed that the company's data processing professionals are in touch with application trends. In fact, the biggest danger facing corporate data processing departments today may well be ignorance of the outside world and a naive misunderstanding of the nature of corporate managers' responsibilities. This tendency cannot be regarded as temporary, nor can professionals who exhibit the symptoms of specialization be despised. The situation was neatly summarized 100 years ago by the British political commentator, Walter Bagehot. He lived at a time—before computers, but not before paperwork problems—when civil service and industrial departments were getting very large; the benefits of size and the problems of bureaucracy were being explored and Bagehot was worried then, as we are worried now, about the inefficiencies of bureaucratic management. He wrote:

> "If left to itself *any* bureau or department (e.g., a data processing department?) will become: *technical, self-absorbed, and self-multiplying*. It will be likely to overlook the end in the means; it will fail from narrowness of mind; it will be eager in seeming to do; it will be idle in real doing."

"Real doing" is what profit-minded management should demand of the computer and the professionals who run it. The president will not be disappointed if corporate computer professionals are operations-oriented, if corporate computer systems are kept up to date with the needs and wants of operating managers, and if applications are consistently designed to help *specific* managers do *specific* jobs better. He *will* be disappointed if computer men promise to provide him with information that subsequently proves useless or misleading; or if they demonstrate lack of understanding of corporate managers' jobs; or if they become mesmerized by the elegance of their own solutions, the beauty of their own systems and machines. ■

COMPUTER PROJECT SELECTION IN THE BUSINESS ENTERPRISE

by M. H. Schwartz

With continued speeding up of both the tempo of American enterprise and the introduction of new technology, business executives and government officials are increasingly facing and are becoming increasingly conscious of competing investment demands. Computer projects are rapidly becoming significant competitors both with one another and with all other investment demands. For some time now, it has been the rare larger-size organization that has not generated more computer project ideas than available resources could deliver, that has not been confronted by more project demands than it could fulfill. This problem is now filtering down to smaller organizations.

Just recently a banker told me that he could either convert his present "second generation" automated demand deposit accounting system to a lower-cost third generation system or he could automate his manual loan accounting system. He could not do both this next year. He asked my views on which to do. I advised him to do the loan accounting project—innovate for large new opportunities rather than improve marginally on opportunities from which the cream has already been skimmed and focus on information potentials rather than paper pushing. No matter the size of the organization, deciding what to do and what comes first is a perplexing task. In the face of increasing competitive drives and increasing competitive opportunities and threats, we must come to grips with computer project selection on a measured, analytic basis.

Effective screening, selecting, and evaluating computer projects require: (1) criteria for (a) making judgments, recommendations, and decisions about authorizing and maintaining projects and (b) assigning and shifting resources and (2) a system, a method, a set of procedures. These requirements are compelling. In many ways, the requirements are identical with those associated with any major investment. Considerable thinking has been focused for years on clarifying the issues and attempting to solve the problems that have been identified. The literature on the subject, which is now quite large, emerged when business managers recognized the need for careful rationalization of

Reprinted with permission from the Journal of Accounting, April, 1969, pages 35-43.

Mr. Schwartz is assistant controller for information systems with the Atomic Energy Commission. Previously he spent 18 years with the Federal Reserve System, initially as an economist, then (beginning in 1954) as a computer specialist. His degree is in economics from the University of Illinois. He has written about a wide variety of edp topics and is founding co-chairman of the new Society for Management Information Systems.

decisions on plant and equipment expenditures and has recently been considerably expanded in association with growth in the number and variety of competing opportunities for research and development.

We can now expect that serious attention will increasingly be given to the selection of computer projects. None of us can any longer afford to plunge into the beckoning opportunity without serious reckoning of costs and returns. We must seriously focus on producing the most valuable output of our available human and machine resources. This can be a ferocious task with technically naive top managements, which presents the computer manager with a difficult but most meaningful challenge.

I shall draw upon the R & D literature and shall discuss both criteria and systems for employing them in the selection of *de novo* computer projects and in the determination of which ongoing projects should be continued and which should be "put on the shelf."

criteria

Authorization for computer projects in a business enterprise should be based upon: (1) quantifiable impact on P & L whether in the form of new earnings or savings, (2) qualitative factors, and (3) institutional criteria. (Special cost-effectiveness analysis is required in government enterprise *in lieu* of P & L impacts.) "Quantifiable impact" means that we have been able to estimate, with reasonable confidence, the *explicit* cost/earnings relationship for a project—"visible dollars." Qualitative factors really represent *implicit* future dollar values—presently invisible, unspecifiable dollars that we feel reasonably confident the business will earn from improved financial analysis, improved marketing, improved operations. Qualitative factors must be analyzed not only for (1) projects whose benefits cannot be specified in dollar terms, but also for (2) projects measurable in dollar terms—management may frequently override dollar comparisons in favor of compelling qualitative comparisons. We should beware monolithic dependence on the "strictly business" appeal of estimated dollar figures (whose crudeness and inadequacy are often neglected). The essence of qualitative factors is their nonquantifiable but ultimately very significant impact upon P & L in the business organization and upon the quality of performance at a given level of expenditure in the government organization.

Institutional criteria also relate, ultimately, to improved earnings and performance. These criteria are mainly concerned with keeping balance in the organization by deliberately distributing projects over the longer run in accordance with corporate objectives, corporate organization, and other institutional factors. Also of institutional importance is the availability of particular human resources for particular projects and the significance of projects to the human beings in the computer complex.

dollar impact on p & l

Once annual and cumulated cash flows of costs and returns have been carefully computed, a cost/earnings priority analysis may be performed. Needless to say, the cost figures should be painfully comprehensive. All of the people and equipment costs should be laid out. All too frequently many real dollar costs of implementing and running a new computer system are not adequately allowed for in systems planning. Efforts to ferret out all the potential returns are often far greater than efforts to identify and estimate all the potential costs.

Fig. 1 shows a possible summary cash flow for a particular project of the kind many of us present to our management. Such figures, taken at their face values, may be seriously misleading, however. Is a return of $1,300,000 over five years adequate for an investment of $900,000? Is the project really worth undertaking?

There are two techniques for answering this question. One is to compute the implied rate of return on the outlay. If the rate at least equals the institution's rate of return objective, the project begins to show financial appeal. Holding other things equal, the greater the rate of return, the higher the priority of the project and the more the resources that should be applied to it.

Rate of return calculations sometimes have tricky effects and many people, including this writer, prefer to compute the "present value" of the future net earnings stream, using the institution's rate of return objective for the discount calculations. Costs for projects whose development lives exceed one year should also be discounted. The purpose of the discount calculation is to bring consideration of the time value of money into the financial presentation. Many readers are perfectly aware of the significance and methodology of this calculation, and they need no comment on the matter. Many of us, however, while strong on the technical content of information systems, in fact do not appreciate and therefore do not give appropriate weight to the need for discounting. I have seen huge proposals made, even in financial organizations, that present only the unadjusted streams of earnings or savings, thus exaggerating the dimension of the earnings or savings.

COST-EARNINGS ANALYSIS
QUANTIFIABLE DOLLAR IMPACT BASIS
(IN THOUSANDS OF DOLLARS)

YEAR	PROJECT COSTS	EARNINGS	CASH FLOW
1968	500.0	0.0	−500.0
1969	400.0	100.0	−300.0
1970		350.0	+350.0
1971		400.0	+400.0
1972		450.0	+450.0
FIVE YEAR TOTAL	900.0	1300.0	+400.0

NET OF ALL OPERATING COSTS OTHER THAN TAXES

Fig. 1

Fig. 2 shows the effect of discounting the cash flow for the illustrated project. In contrast to net earnings of $400,000 over the anticipated life of the system, discounting shows that the present value of the system is negative in sign. Compared to alternative typical uses of funds in the organization, the project will lose $48,000. On the basis of a proper financial analysis, other things being equal, this project should not be undertaken. A more fully rounded analysis of the potentials of the project, say for the improvement of management information, may demonstrate that despite the negative dollar picture the project should be undertaken. But that is a different matter. Alternatively, more complete analysis may reveal that, particularly in view of the "true" dollar implications, the project is very definitely not worthwhile. The point is that the computer manager and the top manager should not be misled into selecting a project on the basis of simple undiscounted cash flow.

comparing projects

So far we have dealt only with the dollar significance of a single *particular* project. Most of the time, top management must make choices from a number of alternative projects. Indeed, we owe it to our managements to present them at budget and planning sessions with alternatives in two

senses—alternative projects that would serve alternative purposes and alternative approaches to individual projects. Only then can management deal adequately with decision making for computer activities.

It turns out that even discounted cash flows are inadequate when two or more possibilities are being considered. A million dollar project and a half-million dollar project may show similar discounted returns. It is obvious that the half-million dollar project is preferable, other things being equal. When a number of projects and approaches are being reviewed, a *relative* measure of discounted returns is needed for lining up priorities. A very convenient and significant priority measure is the computed present value dollars of net savings (or of net earnings) per present value dollar of project costs. In strictly dollar terms, the ratio tells management what output is yielded per dollar of input. Other things equal, projects should be ranked according to this measure.

COST-EARNINGS ANALYSIS
QUANTIFIABLE DOLLAR IMPACT BASIS
(IN THOUSANDS OF DOLLARS)

YEAR	PROJECT COSTS	EARNINGS#	CASH FLOW	CASH FLOW DISCOUNTED* TO "PRESENT VALUE"
1968	500.0	0.0	−500.0	−416.5
1969	400.0	100.0	−300.0	−208.2
1970		350.0	+350.0	+202.7
1971		400.0	+400.0	+192.8
1972		450.0	+450.0	+180.9
FIVE YEAR TOTAL	900.0	1300.0	+400.0	− 48.3

#NET OF ALL OPERATING COSTS OTHER THAN TAXES.
*CASH FLOW DISCOUNTED AT 20 PERCENT RETURN, BEFORE TAXES.

Fig. 2

A comprehensive annual budget review should also embrace ongoing projects, partly to bring new information and the lessons of experience with the projects into play and partly to determine if any existing project is of lower priority than one or more possible new projects. Should one or more ongoing projects be shelved? The ratio is highly useful in making this determination. The numerator should contain the latest revised figures of savings or earnings, discounted from the present time, and the denominator should show only remaining costs. Spent costs are sunk costs; they are gone; and while they may teach valuable lessons, they have nothing to do with determining current priorities. Thus, a project with costs behind it is worth continuing if *additional* costs in relation to returns are low. High past costs should not be considered as supporting a project in the effort to "make the costs good"—they are gone; nor should they work against a project whose remaining costs are *now* favorable in relation to payoff.

Visible, estimatable dollars are not alone sufficient, however, for adequate priority determination. There are many highly desirable computer projects that management senses the need for without being able to specify explicit dollar returns. A banker, for example, may decide to put teller operations "on-line" in order to speed up window transactions, thereby reducing customer waiting time and increasing teller productivity. The costs of such a project can certainly be identified but the returns are virtually impossible either to predict in advance or to measure afterwards. Compelling competitive threats or opportunities often justifiably stimulate action on *qualitative* grounds that importantly bear upon earnings in ways presently unspecifiable in strict quantitative terms.

The judgmental weighing of qualitative factors is the best presently available substitute for dollar measures where dollar measures cannot be made with confidence but where dollar earnings high in relation to costs may nevertheless be anticipated with confidence.

qualitative factors

A number of qualitative factors may be revealed by study of the potential contributions of the computer to the activities and problems of a business enterprise. Increasingly, we are focusing on what can be done to strengthen management, in contrast to the focus of the past on improving paperwork processing. Indeed, an American Management Association program was devoted mainly to the direct management-serving roles of electronic data processing. I shall limit myself to noting four broad categories of qualitative contributions of computers, the first of which is appropriately management information for decision making. But before moving on to particular qualitative considerations, I wish to stress that qualitative analysis must always also present the fullest possible cost statement, for economic feasibility and economic implications are the ultimate basis for resource expenditures.

Decision making. Decision making stands upon three foundations—human attributes, information, and analysis. Decision making in business occurs within many broad areas—personnel, finance, production, marketing. Improved summary statistical information and sharpened analysis will surely add to business earnings by improving decisions and hence performance. Projects that show *significant* promise of contributing *substantially* to the information flows and analytic procedures available to management should be given a high priority status. For example, an automated accounts receivable system not only provides for reduced costs of processing and speeded up billing; perhaps more importantly it can be a first step towards automating information flows that will help improve corporate cash management, that will significantly contribute to more effective use of corporate cash resources. It is difficult to quantify in advance the payoff of successive automation projects that increasingly enhance the financial manager's capabilities of minimizing deposit balances by the synchronization as much as possible of the streams of payables and receivables and maximizing short run investment earnings from freed-up cash. But a cash managment information system can be a most important profit-yielding reward of computer-based financial transactions processing.

Operations. Earnings from production and marketing are heavily dependent upon the speed, quality, and accuracy of transactions data processing. Projects that show *significant* promise of contributing *substantially* to the speed, quality, and accuracy of data processing should be given a high priority status. Of course, judgment must be brought to bear on the expense side—gilding the lily must be avoided. Achieving speed where speed is not profitable is a waste of resources.

Competition. Judgments about the competition are difficult, but they are necessary in the priority setting process. Suppose a firm has to choose which of two automation opportunities to exploit this year, say systems S1 and S2; suppose further that S1 is an innovation in the industry while S2 is already in use by a major competitor; suppose the dollar cost/earnings analysis is similar for the two systems; and suppose over-all budgetary considerations dictate that only one of the two be implemented this year. Management would need to analyze and judge between S1, which opens up the opportunity for leadership and an early start, and S2, which is demanded in response to a competitive threat. Even were the two systems of greatly different dollar benefits, management would want to weigh the competitive angles in setting final priorities—for it may find that it prefers the project with the lower quantifiable dollar benefit in favor of competitive intangibles.

The firm's image. This is a self-explanatory qualitative factor. Nowadays all companies are eager to show leadership—in using computers as well as in other ways. This is a meritorious factor that calls for balance. No organization

can be first, or even among the first, in all activities.

Analysis of the dollar impact upon P & L and of the qualitative factors of a project deals with the more visible benefits of the project. Effective management and effective priority setting also depend upon maintaining institutional balance in the allocation of computer resources over and beyond the more visible benefits.

Certainly some kind of balance must be maintained among the various organizational units of a firm. Nobody, nor mathematics, can say what a "fair" share is; the solution to this problem requires great judgment and "give and take." This means, operationally, that a project of less visible benefit may occasionally be given priority over a project with presumedly more visible benefit if the latter comes from an area already well endowed with projects and the former comes from an area for which little computer work has been done. The historic record is clear in too many firms: operating potentials have starved information and analytic potentials, seemingly because the visibility of the operating payoff swamped all the rest.

There are a number of institutional criteria that make for an institutionally balanced set of projects over time. Among the criteria are:

1. *Corporate objectives and corporate plans.* Certainly no project should be undertaken that is at variance with corporate objectives or corporate plans. In a sense, over-all objectives and plans are constraints. But they are more than constraints. It is the other side of the coin that is less obvious, namely that the full spectrum of objectives and plans is often forgotten. Sometimes a costly computer project would justifiably support a fundamental business objective that bears only very generally and in no way measurably on the fortunes of the business. A commercial bank, or any business firm for that matter, may deliberately seek to develop an unprofitable system in support of a community need in the interests of fulfilling an objective to participate constructively in community affairs. This is a broad institutional objective. Such objectives belong among the considerations in determining project priorities.

2. *Management aspirations.* Management by hunch is playing a decreasing role in American business enterprise. But it is not, nor should it be, always inappropriate. The instincts of the manager are among his most valued attributes. While every effort should be made within a business enterprise to lay out the analytical basis for computer projects, if only to keep application tweakers at bay, there are occasions when a far-seeing idea of a manager should be pursued despite skimpy evidence. While this argument runs contrary to my basic theme here, room must be left for human beings to work out their affairs in the human context. All too often, and this I regret saying, *technicians are capable of working against good ideas that roll in among them from line managers.* In the same vein, top management must occasionally give in to technical drives. At least a limited number of "way-out" projects must be pursued. Overemphasis on "sure things" and on conservative criteria is likely to lead to long-run weakness. "Crazy" ideas should not be allowed to drain off resources, but ideas should be openly explored before they are classed as "crazy."

3. *Divisions and departments.* Some kind of balance must be maintained in project allocation among various major units of a business; there is some kind of "fair" share for each major activity. In the end, of course, division of resources must be on the basis of efficiency in their use. But how be sure that all the alternatives are being considered? One way is consciously to study potentials in relation to the structure of the organization. A banker might ask: Are we doing enough for loan accounting and loan management? Are we neglecting our correspondent responsibilities? What alternatives might we explore for presently unattended areas? This kind of review leads to the opening up of new potentials and to the widening of long range systems planning.

There is no need to labor the notion of institutional criteria any further. There are other meaningful institutional points of view—customers, markets, services and products, improvements vs. innovations. A final institutional criterion that merits special attention, however, has to do with the human resources that make up the electronic data processing effort.

Human resources. Current work has to be geared to the resources available—mainly the skills and abilities of ongoing staff. To be sure, consultant organizations are a useful extension of existing staff, but effective use of consultants does depend in part on the ability of the using organization to negotiate with, monitor the progress of, and implement consultants' work. So some (managerial) local resources are also required for effective use of external resources. The human resources upon which computer projects depend involve:

1. Project management
   a. For internal projects
   b. For consultant projects
2. Project technical staff (could be furnished by consultant)
3. Project administrative staff
4. User area staff
5. Affected area staff.

On balance, a project is best not undertaken, no matter its seeming priority, if there is not adequate supervision and staff to prevent wholesale waste of resources. The emergence of desirable projects that present staff cannot handle should be recognized and staff resources should be augmented or reshaped accordingly.

a concluding note on criteria

The discounted cash flow analysis, and priority analysis in general, may be extended several degrees of sophistication in the effort to portray and to cope with the uncertainty of future events: (1) ranges of costs and earnings may be specified *in lieu* of single figures; (2) probabilities may be assigned to the single figures or to ranges; and (3) the costs and earnings figures, along with weighted criteria, may be analyzed with the help of operations research models. Each of the three advanced methods has its advantages, notably to provide for sensitivity analysis of possible errors of estimate as well as to make clear to all parties that the estimates are in fact literally estimates and therefore subject to inevitable errors.

The notion of modeling the possible consequences and impacts of each of a set of projects and approaches is appealing and I look forward to improvements in project selection in the large organization along these lines. Great strides have been made in government and in a number of large corporations with the use of mathematical systems analysis for cost/benefit studies and for probing the alternative implications of possible decisions across the whole spectrum of planning and budgeting. We can expect recently developed methodologies, now actually about 10-15 years old, to filter down to major decisions in business generally, including decisions concerning computer systems design and implementation.

We want *to fortify judgment* of top management with as sharp an analysis as possible; and management will increasingly look towards increasingly systematic study of alternatives and consequences. In the meantime, great improvements can be made simply by a laying out of the variables, their best estimated values, and their likely significance to

the organization.

All organizations have some kind of project selection system, whether they recognize it or not. Too many systems, however, are highly informal, nonquantitative, discontinuous, and highly personal. Many, many firms that study product and services development and marketing in great cost and earnings detail fail to give similar attention to computer project development. This I take to be transitional, reflecting the newness of the computer in business. Sooner or later most business firms will put individual computer systems development projects through the same sort of wringer that other capital and major expenditure projects go through. In fact, a few organizations have already swung too far towards the other pole: they have selection systems that are rigorously structured to the point of inflexibility and they demand quantitative explicitness that is unreasonable.

The first kind of system—which is not "systematic" and can only be called a "system" in the broadest sense of the term—is to be deplored, for its major output is frustration and misdirected efforts. The second extreme is much less undesirable; but when it focuses on form rather than content —a not uncommon sump for intelligence among the affairs of men—it too generates more frustration than enlightenment. Between the poles there is a reasonably broad band within which effective project selection is feasible.

The major ingredients of a meaningful project selection system are:

1. Selection criteria, which are the bedrock of a system.
2. Project generation and formation, which stem mainly from *research* into potentials and problems and from *planning* for uses and solutions.
3. Documentation, which conveys systems plans, purposes, implications, and justifications to top management.
4. Organized review and analysis, which is conducted by top management against the background of explicit criteria in the contexts of the annual budget cycle and long-range plans.
5. Project decisions which are made by top management.

The crucial underlying element of each of the five ingredients is management involvement. *Top management* must lay down the criteria, must guide and support research and planning, must communicate its desires on documentation, and must become enmeshed in the review as well as in the decision making in which priority analysis terminates. *Line management* must participate directly, substantively, and deeply in research and planning and of course should contribute wherever feasible elsewhere in the range of activities that lead to priority determination. Above all, line management must share very greatly in the shaping of individual computer projects: *each manager is no less responsible for his information system than he is for any other aspect of his sphere of activities.*

We have already reviewed selection criteria in considerable detail. Research and planning are treated richly in a number of ways in many other papers so that they can be taken for granted for our immediate purposes.

There is one aspect of research and planning, however, that I believe we should consider, for it is intimately tied to the project selection process. In all but the smallest organizations, the results of research and the broad planning for project proposals should be shared by some sort of users' committee drawn from line management throughout the organization. Such a committee might be called a "systems planning committee" or "systems steering committee." It should be chaired by either the data processing senior official or by a superior official who is either a member of top management or is especially close to top management. All proposals for computer projects should be approved by such a committee, if indeed the project proposals are not generated by the committee. Final recommendations should be prepared by the committee, acting on behalf of the entire organization, for top management review and decision. The role of the committee is a vital one, for only through such a committee can an organization that has reached mature use of computers be reasonably sure that computer resources are institutionally directed in a balanced sort of way.

This brings us to the matter of documentation of project proposals for management study and decision.

project documentation

For management to be adequately informed on the significance and desirability of alternative computer projects, or even of a single project if that is all that is proposed within a particular budget cycle, they need broad information (for each project) about (1) objectives, (2) costs and returns over the life of the application or system to be spun out of the project, (3) qualitative and institutional factors, and (4) plans for development and operations. Project proposal documentation can be visualized as a four-part package, each part devoted to a major aspect of the proposal. Similar documentation should be presented for both ongoing projects and for proposed projects, except that history and status information should be embedded in the documentation for ongoing projects. Finally, in addition to individual project packages, there should be the summary recommendations of the systems planning committee. While prepared last, the summary should be the initial package presented to top management.

Part I—Objectives. The statement of project objectives is best handled in *narrative* form. It should specify no less than the problem and the requirements analysis that presumably have triggered the project proposal, the various purposes to be served and contributions of the project, the nature of the new system, the bases for financial and technical feasibility, and the place of the project in the long-range automation plans of the organization. The narrative should also point up problems that are likely to emerge, particularly the potential impacts on people, and on organizational structure. Anticipating all of the problems is of course virtually impossible, but every reasonable effort should be made to perceive negative fall-outs both as a result of the sheer conduct of the project and as a result of implementation and operations.

Part II—Financial overview. Like the narrative statement on objectives, the financial overview should be presented in rather broad terms. A good over-all electronic data processing framework will contain institutional standards for estimating costs and returns and presumably estimates for each project will be consistent with those standards. Proposal documentation should show total costs of the development project, annually, broken down by salaries (including fringe benefits), consultant fees, machine costs, space costs, data conversion costs, training costs, and all the rest. The financial plan should also present estimated financial magnitudes associated with utilizing the system to be developed. Proposals for replacement systems should show the net financial impact, annually, of the new system based upon a presented comparison of projected total costs of both the old and new systems over the anticipated life of the new system, also in terms of salaries, equipment, and other major costs. Improved earnings, say from improved marketing capability, should also be specified where feasible. The mass of details that necessarily underlie summary figures should not be loaded onto management, but they should be organized and presentable in the event that need arises for an examination of the basis for the summary estimates. The grand summary financial table for each project should contain annual figures for costs, earnings or savings, raw cash flows, and discounted cash flows.

It should be noted that *annual* cash flows are particularly

important, in contrast to lump sums. The timing, as well as the magnitude, of expenditures and/or earnings may bear importantly on the selection decision. There is a danger here, however, *for constant skimming of the cream in favor of short-run payoffs may leave a residue of sour milk.*

Part III—Qualitative and institutional considerations. Fig. 3 shows one useful way that qualitative and institutional considerations may be brought into summary focus. For each criterion, qualitative and institutional, either "high" value or "low" value may be checked off, the choice depending of course upon subjective and intuitive measures. The purposes of the form shown are, specifically, to force out the analytical basis for subjective values and generally to cast qualitative and institutional considerations into as specific and analytic a framework as possible.

COMPUTER PROJECT PROPOSAL
(PART III—Qualitative and Institutional Considerations)

CRITERIA	Value High	Value Low	Comments
Qualitative:			
Decision Making, Information	____	____	_____
Decision Making, Analysis	____	____	_____
Operations Data Processing, Speed	____	____	_____
Operations Data Processing, Quality	____	____	_____
Operations Data Processing, Accuracy	____	____	_____
Competitive Factors, Take lead	____	____	_____
Competitive Factors, Catch up	____	____	_____
Image of Firm	____	____	_____
Institutional:			
Corporate Objectives	____	____	_____
Corporate Plans	____	____	_____
Balance Among Firm's Units	____	____	_____
Customer Relationships	____	____	_____
Markets	____	____	_____
Balance Among Services and Products	____	____	_____
Improvements to Existing Systems	____	____	_____
Innovative System	____	____	_____
Human Resources	____	____	_____

Fig. 3

The form may be used in at least two ways. Projects with a large number of "high" checks are in general more valuable to the organization than projects with a small number of "high" checks. Alternatively, in the interest of bringing some sort of balance into a long-range sequence of projects, certain projects may be selected because they are the *only* ones that give high checks to otherwise neglected particular criteria.

Many organizations that have formal procedures for selecting industrial research and development projects go so far as to assign relative weights to each criterion, compute a total weighted score for each project, and rank projects accordingly. There are certain advantages to scoring systems, but they certainly do not avoid subjective valuations—the assignment of weights and the checking of criteria are still subjective.

No doubt the handling of qualitative and institutional criteria must be shaped in accordance with the character and modes of the particular business enterprise. The choice of criteria—the chart shows only *one possible set*—and the weighing of criteria are really evolutionary within each enterprise. The main issues are not which criteria and how to weigh them, for these issues can be worked out with experience. The central issue is criteria or not; it deals with bringing as much analysis to bear as is possible in the effort to minimize *ad hoc* influences in the development of corporate computer and information systems.

Part IV—Plans. Three project subplans belong in presentations to top management. These are (1) systems development plan, (2) systems conversion plan, and (3) systems operating plan. They may be presented in broad tabular form, largely in terms of phases, stages, and milestones. Over-all Gantt charts or over-all PERT charts are very useful supplements to tabular formats. Review of the plans helps give management insight into the whole systems development activity and provides them some firm bases for performance measurement and evaluation as well as enriching their information basis for current project selection. Plans also stimulate questions on alternative approaches, thereby contributing to the formation of the eventual project and implementation of the new system. As in the case of the financial overview, management should not be swamped with details of the technical planning apparatus. Rather, details should be collated and held in standby should particular discussions call for greater detail.

Summary documentation. While last in preparation, first in presentation to top management should be a recommended total package. The recommendation should be structured parallel to the individual project packages so as to facilitate analysis of the parts in the context of the total. The narrative, the financial statement, the analyses of criteria, and the project plans for recommended projects should be presented in aggregated form so that the entire systems effort may be appreciated as a whole both for the coming budget year and for the years ahead covered by the proposals. The recommendation should deal with ongoing projects that should be shelved and with potentially new projects that should be deferred. The individual project documents now appear as supporting evidence and justification for the recommendation.

While burdensome to prepare, the documentation is invaluable. Top management will be in a position effectively to review and to accept or modify the proposed plans and budgets either in the aggregate or in terms of particular projects. This is the final station of the project selection system—rational, measured, analytic decisions for action.

the broad principle for resource allocation

I have attempted, in this paper, to be as practical and pragmatic as possible. I should not neglect to remind you, however, that there is a powerful theoretical foundation for solving the broad problem we have been considering. Implementation of the theoretical principle goes beyond our present information generating capabilities, but that difficulty, presently insurmountable, should not stand in the way of conscious attention to the principle.

In principle, a business should adjust expenses of each project activity—whether computer, marketing, branching, acquisitions, new products—so that estimated marginal discounted net incomes are equal throughout the firm. Budget allocations should be shifted so that a dollar spent for any project will not yield a lower net income than if it were spent anyplace else. This will yield the greatest net institutional income for any given total budget.

Thus, expenses for computer projects should be increased as long as the estimated marginal discounted net income from those expenses exceeds that for the rest of the firm and should be decreased as long as the estimated marginal discounted net income is less than that for the rest of the firm. The principle for resource allocation among computer projects is of course identical: expenses for each computer project should be increased so long as the estimated marginal discounted net income from those expenses exceeds that for other computer projects and should be decreased so long as the estimated marginal discounted net income is less than that for other computer projects.

While none of us can yet specify the marginal values, especially for qualitative and broad institutional improvements, the essential logic belongs in the forefront of our thinking when we attempt to determine what is the most efficient way to reach institutional profit objectives. ■

MANAGEMENT CONTROLLED INFORMATION SYSTEMS

by D. L. Fisher

This article* describes what I believe to be the real problems in business data processing. And I have coined an expression which hopefully conveys a meaning quite different from the current popular term "Management Information System (MIS)." MIS was called "Integrated Data Processing" a decade ago.

The term I prefer to use is "Management *Controlled* Information Systems (MCIS)." MCIS is a system for processing data in accordance with management's specific needs for insight into the nature of business events. Hopefully, after acting on the information, management will gain understanding of the consequences of business events.

The six components of business data processing are:

1. Identification of the problem.
2. Description of the problem.
3. Design of the system to solve the problem.
4. Programming the system.
5. Implementation of the system.
6. Support of the system.

Each of these six aspects of data processing is equally as important as any other. Inadequate or incomplete handling of any of these will certainly create problems for the programmer-analyst which may be virtually insoluble.

identification of the problem

As soon as we begin investigating an application in an effort to identify the problem we have begun a substantial undertaking. To begin with, when you walk into a potential user's office you really are unaware of this man's needs, wants and expectations. He may have called you up and asked you to come over to see him because he had an inventory problem he would like to talk over with you. Now, did he mean the creation of a stock status report or did he mean

*This article is substantially the same material the author used as an ACM National Lecturer, 1967-1968.

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a real-time system to control the inventory of bits and pieces, assemblies and finished goods?

Coupled with our uncertainty is the potential user's lack of knowledge of data processing. If you use computerese on a line manager in the shipping and receiving department or on a gang foreman in a steel mill, you will create doubt in the user's mind that you are capable of understanding his problem. I have received some strange looks from production managers when they inadvertently use a data processing buzz word. So, be alert to the fact the user may find computerese meaningless. Not to use data processing terminology is hard to do. Most of us spend 80-90% of our time talking shop, and to drop the lingo and still communicate with someone about business can be a difficult job. Thus, in the beginning we don't know what the user wants, and he doesn't understand what we are talking about. The easiest way to overcome this dilemma is to pick up the user's jargon as quickly as possible.

organizational structure

As if the communication barrier just described were not enough, there are other difficulties precluding the identification of the problem. A very important consideration is the organizational structure in which the potential user must operate. Invariably, a major problem in business data processing is the company's organizational structure . . . both in the beginning when you are trying to identify the problem and determine what the user really needs, and in the implementation phase when it becomes necessary to get the user to effectively make use of the data you are providing him.

In a study of accounts receivable for a large manufacturer, I recently tried to find some method of improving the company's cash flow. Some aspects of the order entry-accounts receivable procedure were mechanized. The company had millions of dollars in receivables over 60 days old. Their problem was not one of systems design or the right language or the right hardware. Their problem was organizational in nature. The Accounts Receivable Department was organized by customer. The Order Entry Section of the Marketing Department was organized by product. The organizational structure created most of their difficulties. The primary recommendation to them was to reorganize the Order Entry Section by customer and move the accounts receivable clerks and the order entry clerks into the same room, thereby consolidating their files and directing their efforts towards their customers' satisfaction. In six months their receivables balance was cut in half.

When this company has gained sufficient experience with its new organization, it will be time to consider a new data processing system to solve problems that did not exist before.

It is a fundamental responsibility of the systems analyst to determine the extent to which organizational relationships affect the user's operations. Experienced business systems analysts are well qualified to analyze organizational relationships. Often times the people we are trying to help are unable to see their predicaments simply because they are too intimately involved. Most people spend their lifetime doing a rather limited-in-scope functional task. People who are in this situation tend to view their part in the overall company structure through a narrow tube. The sum of all the views through all the narrow tubes makes a strange looking big picture.

Working on a variety of applications during their careers tends to give programmer-analysts the ability to view a problem in its entirety. We know darn well that if we do not turn that switch off we are going to ABEND. We also know that if we don't provide for a transaction to do a file maintenance change on the Zip code in the customer master file, that the day after we implement the system the Post Office Department will discover a new numbering technique and all the Zip codes will have to be changed.

When we go into a department or company to analyze a problem, we had better look in all the nooks and crannies or we will certainly have problems in the end. All too often analysts have the experience of thinking, "if I'd only known about that aspect of the problem earlier." The time to ascertain all the aspects is during the problem identification and description phases.

forms and labels

So then, how can we go about identifying the problem? The first thing we know is that our potential user receives a great deal of data on a variety of forms from many sources, much of which is either inaccurate or too late to be helpful. We've already discovered half the problem—the communication half. The crux of the communication problem, especially in large organizations, is embodied in the proliferation of forms. In departments of large and small companies, I have discovered there were three or four times as many forms as there were unique elements of data. One company had 200 elements of data and over 1000 different forms. Another company with less than 500 employees had ten elements of data and 48 different forms just to get an order in house. I really don't think that any old forms get thrown away, just new ones created.

Thus, one of the first things to do in identifying a problem is to analyze all the forms and the data on the various forms. Then try to determine what combinations of data have real meaning to the user. Information comes about as the result of interpreting data.[1] Understanding comes about as the result of acting on that information. Thus, data and understanding combinations of data is of prime importance in understanding business problems. The author has designed some computer programs to assist in this analysis which will be described later.

Another aspect of data analysis is the variety of names the same data has on the different forms on which it appears. For example, you will discover many instances of multiple labels for the same data, such as noun, description, name, article, nomenclature, particulars, item, unit, and all these labels apply to the same data. With so many different labels for the same data, communication among the various departments in a company is difficult. Your job as an analyst will also be difficult.

One of the suggestions made in my article in the January, 1966, *Communications of ACM*,[2] was the establishment of standard element of data names and the explicit definition of each element. Not only should such standard names or labels be used within the data processing function, but they should also be used as the field names on the forms manually processed in all departments. The advantage of standard data names is the alleviation of the communication problem.

Presently, you will usually find a variety of labels for what appears to be the same data. Occasionally, the same name will be applied to different data. For example, the label "DESCRIPTION" on the invoice may be the catalog name of a finished good. The label "DESCRIPTION" on a shop work order may include dimensions as well as the name of the item.

If you add to the standard name and definition of an element of data a few more characteristics of that element, you will enable programmers and analysts to find all the data they need to understand each element. These addi-

[1] Montalbano, M.S., "Expressing Program Logic," *Data Processing Digest*, September, 1968.

[2] Fisher, D.L., "Data, Documentation and Decision Tables," *Communications of the ACM*, January, 1966.

tional characteristics are:

1. The length or size of the data;
2. the type of data, i.e., alpha, alphanumeric, etc.;
3. the minimum and maximum values allowed for the data;
4. the source of the data (or the department or person responsible for its accuracy);
5. the normal edit pattern to be used with the data, if applicable;
6. the file codes for all the files in which the element resides.

The determination of these characteristics of all the elements of data in a system will serve as a dictionary of data to be used by programmers and analysts. The data names used in programs should always begin with the root name in the dictionary. Multiple occurrences of the same data in a program can be easily handled by the simple expedient of suffixing their names.

systems flow charts

In summary, a large part of identifying the problem should consist of the analysis of the data and data names on the forms passing through a department. In conjunction with analyzing the data on forms is the determination of how the data is used in the department, where it comes from, and where it goes.

I have written a program to draw systems flow charts of data processing systems.[3] And I have successfully used the program to analyze the manual document flow through an organization in an effort to identify problems. Used properly this technique is a powerful tool. In addition to documenting the normal data flow, the informal lines of communication can also be uncovered; i.e., the calling of someone to get additional data about some event.

It often happens that the problem in manual systems, and data processing systems too, for that matter, is that the right data is not delivered to all the people who need it. Using the combination of a systems flow chart of the document flow and an analysis of data on forms, the identification of the problem becomes easier. The problem will usually be organizational in nature and will probably include defects in the data flow. Hence, the first steps in the evolution of a system are:

1. Identifying and defining the data to be processed by the system;
2. understanding the present data flow and the people involved; and
3. determining the characteristics of the organizational structure which inhibit or deter the timely dissemination of data to the people who need the data to take actions.

description of the problem

The procedures described in the previous section lead into the next phase of business data processing—the description phase. By the time you have done an investigation such as that described above you will understand the problem adequately to be able to generate an accurate description of the procedures in use. The clerks in various functional areas interpret various combinations of elements of data to determine what course of action they should take. Since these condition-action rules are the way in which clerks operate, decision tables are an excellent means of describing these rules. Decision tables are especially useful in understanding complex procedures. They will also assist in the identification of the combinations of the variables that will have to be included in the computer processing of the data. The reader is referred to an article by Mike Montalbano for a definitive treatment of decision tables.[4]

Many problems are not complex enough to warrant the construction of decision tables. Perhaps just the condition portion is all that is required, and in some cases a brief narrative description of the problem may suffice. I use decision tables because they are hard to misinterpret, unlike narrative descriptions, which are often ambiguous. In any event, problem description consists, in part, of determining what combinations of the data the line personnel use to get information about the event described by the forms they process.

By the time you have identified and described the problem, you will have acquired complete understanding of the problem so that you are ready to design a system. If an organizational change is called for, you may want to delay the systems design effort until the new organization has brought different problems to light. If you design a system at this point, probably what you will do is simply automate manual procedures.

All during the identification and description phases you should have been educating the functional user as to what combinations of data are being used to operate his area. If it were necessary for you to design forms and you did so correctly, they should be easy to keypunch from. If you put the keypunched data in a file, you will have created a data base.

Now you can approach the department or company management and stimulate their imagination by suggesting that you can sort and consolidate the data in ways they have never considered or thought possible. For example, how many marketing managers who have never had their department automated consider reports of salesmen's effectiveness in terms of how much profit each generates, instead of the classical dollar volume of sales?

Sales analysis reports are often by territory, region, customer or dollar sales. Why not by date of the customer's order or by quantity ordered or by transportation charges or by tax? We are often too eager to assume there is no additional information to be gathered by combining the data in a non-traditional way. At the same time, the potential user may have called on the data processing department before, and he may figure if he can get just one report from the computer people he's doing well. We as programmer-analysts are not in a position to make value judgments about what is good for a potential data processing user. We can apply our systems experience to assist management in cleaning up forms, and in identifying organizational problems. We can also provide an economic method for management to retrieve data combined in unusual ways. Occasionally, a department manager knows exactly what he is looking for in a report. If that is the case, there is no problem.

I recently worked with a client who had installed his first computer, and who is approaching the problem of establishing a data base in just the fashion described above. This particular company is a small ethical pharmaceutical manufacturer. After the middle managers have tried various combinations of the available data, they will be able to do several things:

1. Understand the data they presently have;
2. know what additional data will be desirable to have in the data base;
3. be capable of designing a data processing system to provide them the information they need. Or perhaps I should say they will know what combinations of the data are most important to their decision-making process.

The strategy of implementing this approach has been oversimplified. The point is that the resulting system will

[3] Fisher, D. L., "Systems Flow Charter for IBM 1401," PID Number 1401-02.0.039. An IBM Type III program.
Fisher, D.L., "Systems Flow Charter for IBM 360/DOS," PID Number 3600.00.2.002. An IBM Type III program.
These programs can be obtained by contacting an IBM branch office.

[4] Montalbano, M.S., "Tables, Flowcharts, and Program Logic," *IBM Systems Journal*, September, 1962.

be a Management *Controlled* Information System. This is the second stage in the evolution of a system.

Although the tasks of systems design and programming are complex on occasion, they are considerably less substantial than those of problem identification and description. Hence, these aspects of systems development will not be discussed in this article.

implementation

The implementation phase is the next crisis we have to face in systems development, unless of course we overlooked a terse little statement in some job control manual; then the programming-debugging task may also have been a crisis. I do not include program debugging, thread testing, parallel processing, etc., as part of the implementation phase; they are part of the programming phase.

Implementation means the *continued acceptance* of the outputs of the system *by the user*. If you adequately executed the identification and description phases, the implementation phase will not be so painful. On the other hand, if you blew the first two phases, the fastest running, most sophisticated system ever installed will be for naught.

There are two troublesome phrases in the definition of implementation. They are *continued acceptance* and *by the user*. You can explain how a system works to an individual and he will understand. You can explain all the actions he has to take when he gets an error message, and he will understand. He will understand every one of your careful explanations. But when you lift up the covers and tell him to crawl in because he's going to have to live with this beast, right away he becomes a moralist!

A decade ago I worked on the Air Force's Automatic Resupply Logistics System (ARLS). ARLS is still in use today. It is a management by exception system. That is, the weapon system managers (which is the space age name for a supply clerk) only receive a printout from the system when they have to take an action. In other words, the system never tells them when they do something correctly, only when they make a mistake. In fact, the system really plays big brother because it keeps track of how many times it sends the same error message to a clerk. He will get a message like: THIS IS YOUR 3RD NOTICE . . . THIS IS YOUR 4TH NOTICE.

ARLS is really a sophisticated system by any of today's standards. The system schedules engineering changes on installed assemblies; it directs SAC squadrons to return materiel whose shelf-life time has been exceeded and automatically replaces the item without telling the weapons system manager. If you will, it is a system to control inventory. After the system had been running for more than a year (system start-up was in 1959), we began to hear rumblings from the user. "We've got to get a look at our assets. We don't know where we stand."

Get the proper picture from the user's point of view. These clerks had from one to 10 years' experience with regular old Air Force supply procedures. You know the kind . . . where you call up for a left-handed widget and the clerk checks his ledger card and says, "Gee, sorry, but I'm out. How many do you need? Ten, huh? Well, it'll take a week or so to get those in, O.K.—ten ya say. Well, just to make sure, I better get 100!"

These clerks went through intensive training on what the system was going to do and how they were to interface with the system. Still, we'd often get phone calls asking for help. We'd go over to see the clerk and he'd have two or three printouts spread out on his desk to prove to us he had done all the things he was supposed to do. When we walked up he would say, "Just look at it! Look at what the machine did to me!"

These people were serious. They really thought the machine was doing things to them. This is the implementation problem—and a very real one at that. The author cannot emphasize enough just how serious this kind of problem can be for a system. In the case of ARLS the hundreds of supply clerks became so uneasy that we were pressured into providing a *one time* listing of all the assets at all the SAC squadrons. This listing was a stack of one-part paper well over a foot high for each of the weapon systems.

When the clerks got that listing, they were jubilant. "Boy! That's just what we need. We've got to have that *every week!*" Thus, with one report they blew more than a hundred man-years of design effort right down the tubes. Do you know what they really used the report for? When they got an error message about the assets at one of the SAC squadrons, they would run over to the report and look it up. When they found it, they would heave a sigh of contentment and say, "Yep, the machine did it right again." Their insecurity was being handled for them.

There is a valuable lesson to be learned from this story. What is it?

The user exists within an organizational structure. It is in this environment that we must consider the user of a data processing system. When we ask the user to live with a system in his native habitat of a functional operating organization, he is apt to find deficiencies in the organization or the system or both. This is the complex and hard part of business data processing. Education and training will not suffice to solve this problem. It seems that to achieve the enduring support of the user, he must *feel* the system is his system. Telling him, "Look, you know this is your system," or "We did this for you" is inadequate. Computers have been around long enough now that the user gets darn suspicious when you tell him all the things you are going to do for him. You see, he may remember the last thing you did for him.

The user has got to feel he contributed to the development of the system. He must take pride in the system, if he is to continue his acceptance of it. One way to attack this problem is to help the user discover exactly what data it is he uses and how the data can be combined in different ways to get different information. You come very close to being a clinical psychologist in this effort. You do not tell him what he ought to be doing; he must discover for himself his real needs and wants. The resultant system will be a Management Controlled Information System.

support of the system

The final phase in the evolution of a system is one that never really ends—the support phase. There should be a special effort within each data processing department made up of one or more people whose sole purpose is to debug existing production systems and install new subsystems. If you are running under a supervisor such as OS or SCOPE, the maintenance of the manufacturer-supplied monitors should be another function of the support group. The people assigned to this task should possess good judgment and have been in the business for five years or more. How large the group should be is a debatable question. A minimum of 10% of the programmer-analyst staff is an adequate starting point.

The tasks which fall under operational support are to:

1. Debug operating programs,
2. install new subsystems,
3. maintain monitors,
4. update the documentation of an operating program,
5. make authorized changes to operating programs,

6. assist users in the interfacing with the system,
7. conduct classes for users on how to prepare inputs to the systems and on how to utilize outputs from the systems,
8. be available at all times to assist operations and scheduling in running operational programs,
9. serve as the final authority as to the completeness of new programs I call "operational,"
10. write so-called "one-time" reports,
11. determine whether program failure was due to:
    bad data
    wormy code
    machine malfunction
    operator error
    scheduling error, etc.

Some tasks which do not belong in this area are:

1. New system development;
2. program debugging, thread testing, and parallel processing;
3. hardware selection.

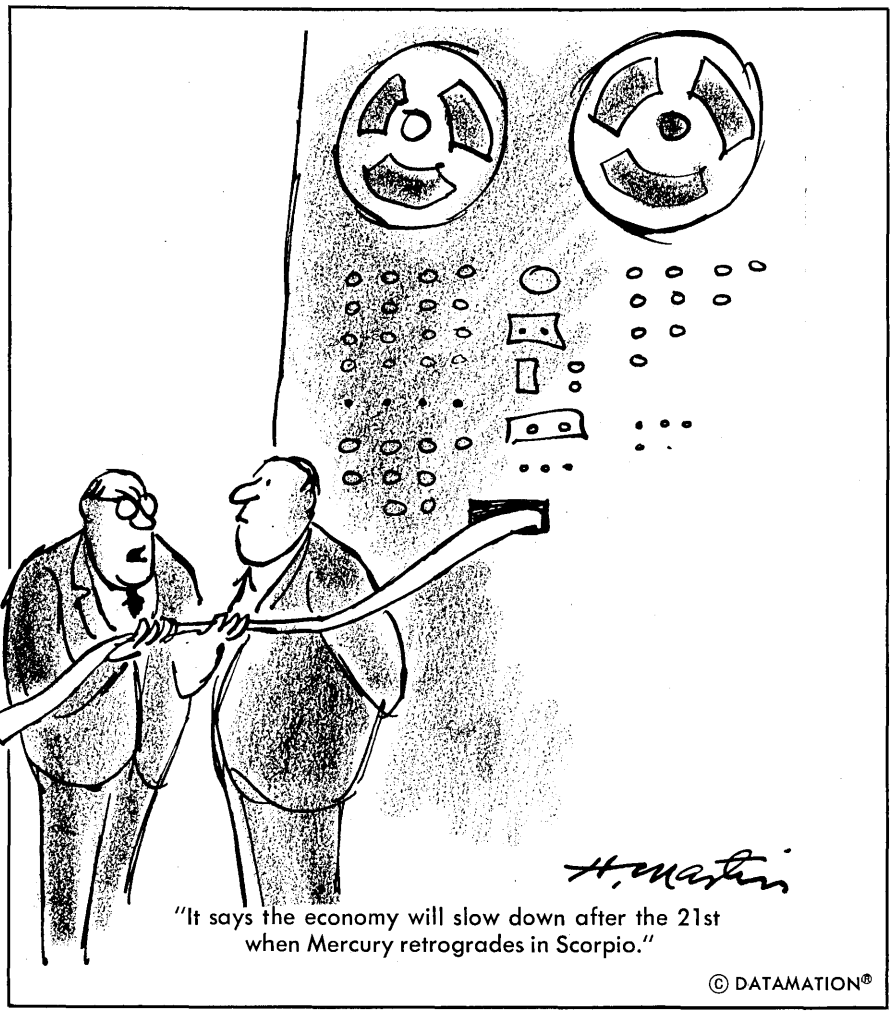
The tasks of this group seem considerable, and in many ways they are; however, by the time programs are turned over to this group they should contain no known errors. There are several considerations which must be analyzed if a support function is to be successful.

For instance, there were 10 of us in the support group in San Bernardino. There were about 500 programs in the system. It was our responsibility to perform the tasks listed earlier. To do those tasks we had the last AUTOCODER listing, 1-30 pages of actual patches that any number of people may have placed in the object decks, a program flow chart which had little resemblance to the actual code, and a current systems flow chart. In most cases, there were obsolete narrative descriptions of the objectives of the programs.

We did have one other document which, in the author's judgment, was the only thing that enabled us to, first, write the system in a couple of years and, second, to keep it going. That document was the element of data definitions or dictionary described earlier. We went through our problem, identifying and defining every element of data the system was to handle. The resulting definitions became our authority for what each piece of data in all the master files really meant. Unique names were assigned to each element of data. Only these authorized names were used in coding.

We had to monitor the programmers for a few weeks, but negative sanctions stopped the wails of self-appointed geniuses who pleaded that standardization stifled their creativity. As a matter of fact, we discovered that standardization promoted maturity, and when coupled with negative sanctions, standardization will also greatly accelerate the development of intellectual honesty.

We in the support group were often asked questions such as: "Who uses the element of data 'document-control-number'?" or "How many programs actually use the 'shelf-life-time'?" Occasionally someone would reach the conclusion that a particular element was no longer required because none of the programs used it. One of our jobs was to answer such inquiries. Often we spent days and even weeks trying to determine the answers to such questions. It is my belief that the extensions of the basic concepts of standardization of data names and definitions will greatly minimize the efforts required to answer such questions.



conclusions

In summary, I feel that certain conditions prevail today just as they did more than a dozen years ago: 1) Many managers view data processing as a kind of sorcery that has a propensity for costing more than was budgeted and achieving less than promised. I believe this condition to be the result of system designers neglecting the user. 2) Programmers tend to be as whimsical today as they were a decade ago. This condition is probably due to a proliferation of data processing managers who spend more effort coddling their subordinates than they do establishing sound procedures and realistic objectives. In a sense, many programmers are like teenagers; they really want discipline and direction. 3) Many companies with their second or third generation computers are still using them to handle rudimentary accounting problems rather than using them as a tool for analyzing their plans and controlling their operations. I know of one user who wrote a payroll system for an IBM 650, then acquired an IBM 1410 to run the 650 program interpretively and currently is emulating the 1410 interpreter on an IBM 360/50.

Finally, the last five years has seen a gradual shift on the part of knowledgeable management from believing what data processing hardware and software people tell them to requiring that they be shown results . . . not more promises. ■

toward the center

DATA PROCESSING'S EVOLVING PLACE IN THE ORGANIZATION

by Frederic G. Withington

In the good old days data processing functions fit easily into organizations—computational functions into engineering or R & D, accounting functions into the comptroller's organization; nobody had a problem. The advent of the integrated system with time-shared and data-base-oriented management information capabilities has changed the picture, though. The old arrangements do not seem to work anymore, a variety of organizational experiments are being made, and a trend seems to be emerging. The purpose of this article is to explore the forces at work and present what appears to be the consensus about the desirable new organizational pattern.

In early 1968, Arthur D. Little, Inc., conducted a private survey of eight large, multidivisional organizations. In all eight, computers had been used for 10 years or more, and in all eight the initial pattern of computer management was completely decentralized. In the 1964-1965 period each had computers and programming groups scattered among its divisions. Each group was then entirely independent of any other, and reported only to its divisional management. Corporate-level computing resources were rare, and where they existed their sole function was to fill special data processing needs of corporate management.

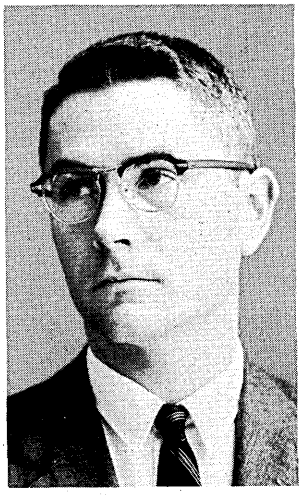
Between 1964-1965 and early 1968, the eight organizations had changed as follows:

Three had completely centralized system analysis and programming. All computer personnel received their assignments from corporate headquarters, though in two of the three they were still physically located in the divisions. Computers were still dispersed through the divisions, but their procurement, operation, and management were also controlled by corporate data processing management.

Three of the organizations had centralized systems analysis and programming of standardized interdivisional programs, but still permitted divisions to develop programs for internal use. In each, about half of the corporation's computer personnel were located in the corporate staff, and about half in the divisions. In all three corporations, as time passed, one after another of the important data processing

(Continued on page 65)

This article is based on a chapter of Mr. Withington's forthcoming book, The Real Computer: Its Influence, Uses, and Effects, scheduled for publication in the fall by Addison-Wesley Publishing Co., Reading, Mass.



Mr. Withington has been a management consultant with Arthur D. Little, Inc., for the past nine years and before that held various positions with the Burroughs Corp., the ElectroData Corp., and the National Security Agency. In addition to the book from which this article is taken, he is the author of The Use of Computers in Business Organizations, published in 1966 by Addison-Wesley.

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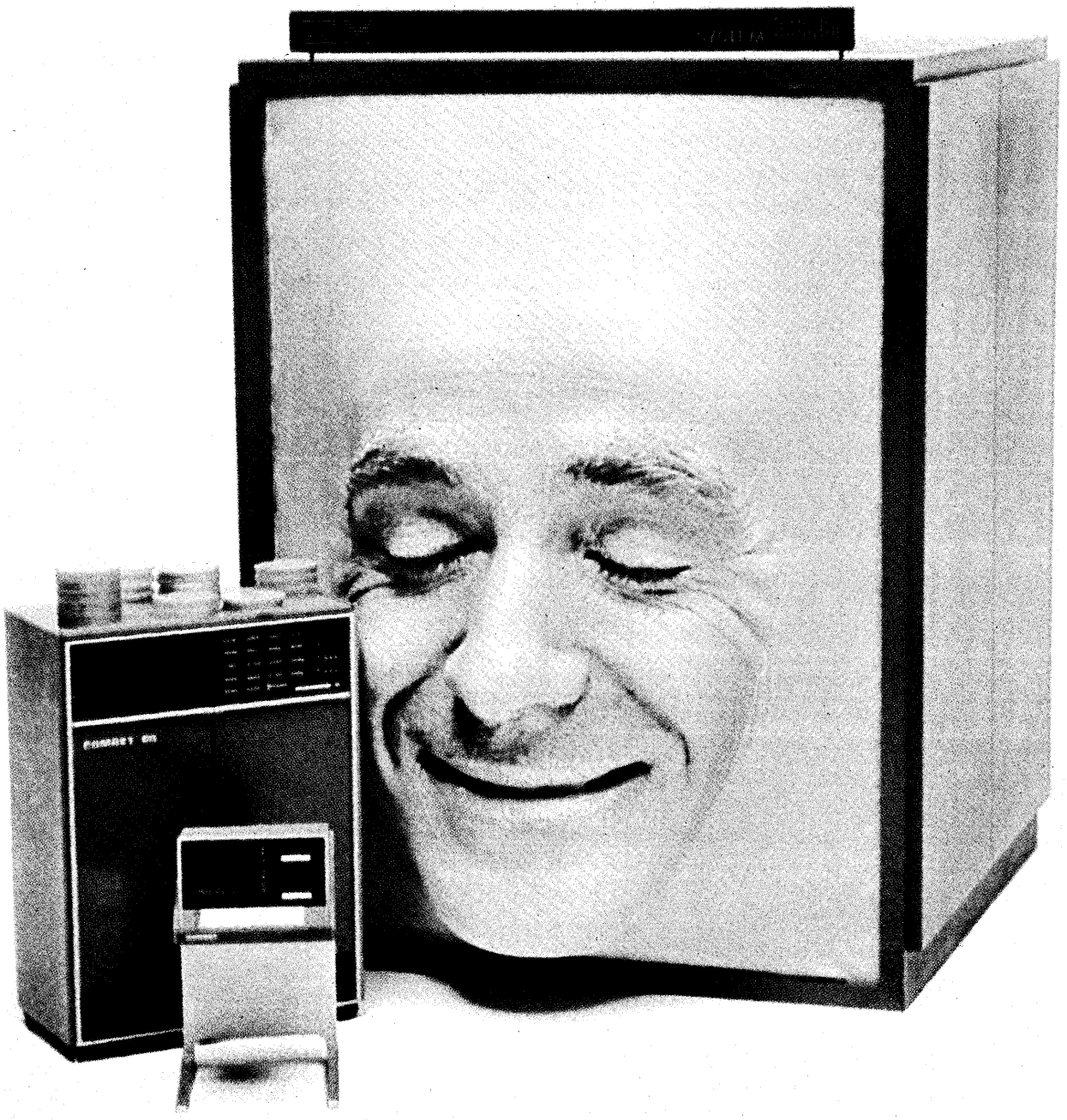

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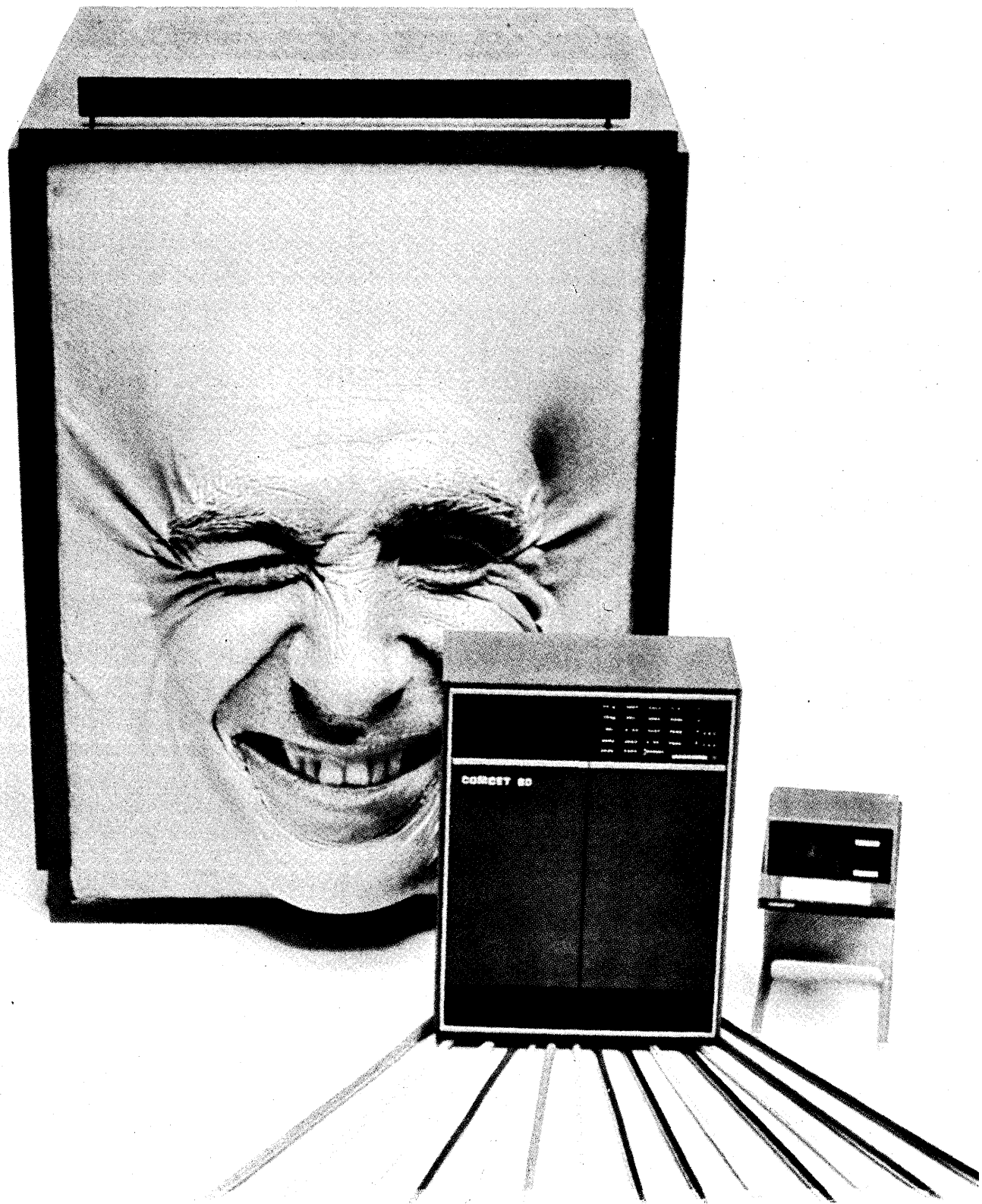

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functions were being redefined as company standards or interdivisional applications, and thus being transferred from divisional control to corporate control. However, in each corporation both divisional and corporate management believed that there would always be unique programs required by single divisions and that some programming resources would always remain in the divisions.

Two of the eight companies remained decentralized, with all data processing personnel distributed among the divisions and reporting to divisional management. In both, however, there was more corporate influence on divisional data processing than there had been three years earlier. Corporate data processing groups had been established to "consult with and assist" the divisional data processing groups in evaluation and acquisition of advanced equipment, in solving problems and in personnel matters. In both cases, the corporate data processing group had been asked to establish improved systems of accounting codes for uniform financial reporting throughout the divisions.

In summary, all eight of the organizations started with completely decentralized computer programming and operations. Three of the eight had become completely centralized, three others were partly centralized and becoming increasingly so, and the two that remained decentralized have established centralized "consulting" groups whose influence was increasing.

As this study convincingly shows, there is a strong trend in large multidivisional organizations toward centralizing the management of the data processing resource (in smaller organizations, it would necessarily be more centralized from the start). The reasons why this is so are not difficult to perceive; there seem to be three primary ones.

desire for standardization

Obviously large organizations will make some effort to standardize data processing procedures, if only to reduce wasteful duplication. But how are standards established, and how is compliance with them enforced? No one division is in a position to consider the needs or observe the performance of other divisions equitably; it is almost mandatory that a corporate staff group perform the function. It follows, however, that the corporate staff group will "meddle" in the data processing procedures of the divisions and must seek authority to enforce compliance with its standardized procedures if it cannot obtain compliance voluntarily. As the following true story suggests, friction may result.

An aerospace company with five geographically separated divisions had its corporate headquarters at the site of the largest division. All five divisions had installed computers at one time or another. In two divisions the computers performed both business data processing and engineering computations, while in the other three relatively small computers performed business data processing alone.

Corporate management, as part of an attempt to revitalize the company, instituted a "profit center organization" across divisional lines to provide more responsive and explicit measurements of performance, and to increase operational flexibility. In support of this profit center organization, they developed a computer-based accounting and reporting system in which all activities and charges were reported in a uniform, detailed manner and measured against anticipated performance. Management assigned the authority for development and installation of the standardized reporting system to a corporate staff group especially established for the purpose.

At the same time, management became aware of the existence of large time-shared computers that could perform both engineering computation and data manipulation for management more responsively that the relatively simple machines the divisions had installed. Management was attracted to the time-sharing concept, and wanted to study the desirability of replacing the separate divisional computers with a large, time-shared central one available through remote input-output devices to all the profit centers in all the divisions. Since this replacement of equipment would universally affect every computer and every program, management understood that the study would be a long and complex one, best performed by an objective, central group.

In view of these two considerations, management decided to assign complete authority over the corporation's data processing functions to the corporate staff group initially established to develop the new financial reporting system. The head of this group was entitled "corporate director of data processing"; he reported directly to the executive vice president for operations. Some thought was given to making the post subordinate to the corporate comptroller, but since a primary concern was with the computing support of research and engineering activities, and also since it was anticipated that computers would be used more extensively in production and industrial applications, it was judged desirable to separate the post from any one functional affiliation.

Since the corporate headquarters were at the site of the largest division with the largest programming staff, it was convenient to transfer the staff and equipment from divisional control to that of the new director. The computers and personnel of the outlying divisions were also organizationally subordinated to the director, but for the time being they continued to respond mostly to their divisional managers.

The first difficulty arose when the corporate director began to assign the most senior system analysts from the divisions to develop new corporate-wide procedures. There were objections from the divisions these system analysts had previously served that they could not be spared from pressing divisional assignments. The manager of the central division was particularly concerned because, as he pointed out, the other four remotely located divisions continued to obtain most of the services of the data processing personnel they originally had, while his central division, by accident of physical co-location with headquarters, had lost the use of its computer personnel to the new directorate. The director had to concede the justice of this contention, and began to make up his system development teams for corporate applications using personnel from the remote divisions as well as from the central one. He also found occasion to borrow a few people from the remote divisions to apply to an important problem of the central division, thereby demonstrating that under some circumstances they could gain as well as lose by the organizational change. Each of these borrowings was accompanied by a struggle with the affected management, though, so the director did less borrowing than he had expected. He also postponed the planned study of a centralized, time-shared computer because he now perceived that the standardized programs for it would require years to develop.

The next difficulty arose when the standardized financial reporting system was ready for implementation and was presented to the divisional managers. To a man, they rejected it as inapplicable to their unique operations, too time consuming and difficult to support, and requiring a change from existing methods so radical as to be impracticable. A process of negotiation ensued in which:

The diplomatic ability of the director of data processing was tested;

The ability of his system analysts to develop a single, universally applicable coding system from a mass of divergent detailed requirements was tested; and

The determination of top management to persevere with

the installation of the common profit center system was tested.

At the time this is written it is still not clear what the final result will be. It is clear, however, that the process of centralizing the data processing organization in the interests of standardizing procedures and equipment has brought with it a host of problems.

shortage of personnel

Few organizations have as many programmers and systems analysts as they would like. For many, the shortage grows worse rather than better as they attempt increasingly ambitious computer applications. Even though new personnel are continually hired, the most experienced are likely to leave for better opportunities elsewhere. The increased technical demands of advanced systems (e.g., data communications technology, time-sharing computer systems, and the accompanying software) call for knowledge and experience not found among most companies' programmers. Companies therefore tend to find that the quality and quantity of their computer-trained personnel is an increasingly tight constraint. In order to use the personnel optimally, they find themselves compelled to bring them under central management so that they can be assigned to the most important projects of the whole company rather than just to those of divisions.

This process is exemplified by the case of a certain large electric utility holding company, which consists of many semi-autonomous local electric utilities operating under a corporate management that views its role as that of over-all financial manager for the group. The individual companies have for years been installing and using computers for engineering, accounting and customer billing functions. The corporate management appreciated that the companies were duplicating one another's data processing efforts by preparing programs many times over for such functions as customer billing, and knew that savings would result from doing them centrally. However, they felt that the healthy competition they were able to foster among the companies benefited all by improving the quality of the programs, and that, in principle, any interference in the management of the individual companies would do more harm than good.

One by one, the affiliated companies have become interested in advanced computer systems. In most cases, they are interested in time-shared computer systems with inquiry consoles in the offices where customer service and billing matters are handled. The clerks, using the inquiry consoles, can obtain complete and up-to-date information so that better service can be provided when a customer calls with a question or request for service. These time-shared computers involve more complex equipment and programs than the companies are used to. They cost more than previous computers did, and much of the experience of the companies' programmers is not applicable. Corporate management discovered to their sorrow that the price of duplication had become unreasonable, since there were no more than a handful of computer programmers and system analysts throughout the corporation who were experienced with time-shared systems.

Reluctantly, and after much study of the problem, corporate management instituted a centralized data processing authority to develop standard programs to be used throughout the company for the time-shared customer service applications, and transferred the few experts in time-shared computers to the corporate authority. As far as possible they left other applications in the hands of the affiliates, but they appreciate that once the present effort is successful other corporate-wide time-shared computer applications will almost surely follow. Also, now that the thrust of new application development is shifted to the corporate staff, it is there that most improvement in experience and ability will occur rather than in the affiliates.

The company has instituted centralized control over their data processing, and knows it will grow, but they did not and do not want to do so. They assert that they saw no alternative, that the shortage of competent personnel forced them to standardize programs and manage the personnel resources centrally.

growth of applications complexity

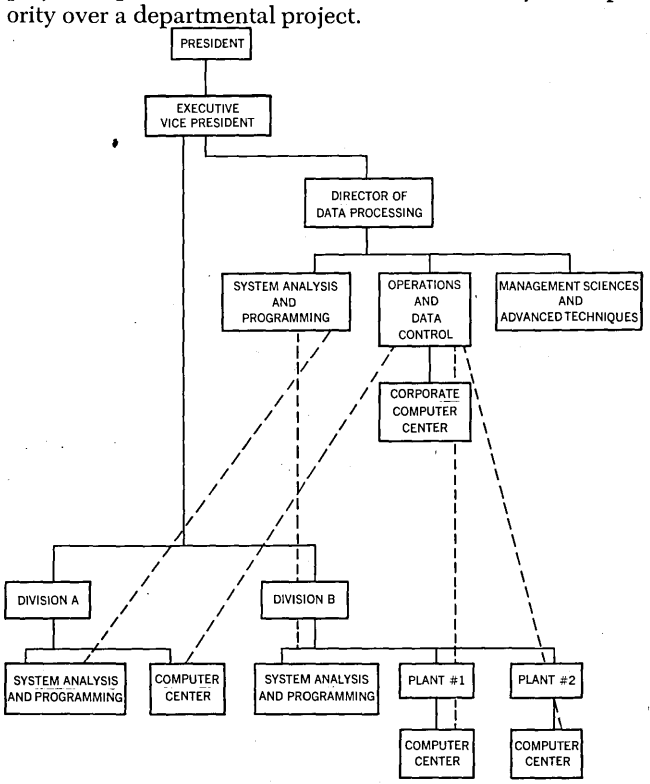
This problem, associated with the shortage of personnel, derives from organizations' desires to institute steadily more complex computer applications. In the case of the electric utility holding company, the shortage of personnel would not have been so severe if the company had not become convinced that time-shared systems were desirable. Such advanced systems usually incorporate data from more than one functional part of a company, and serve more than one functional part. As the applications of computers spread across the business it becomes impossible for a functionally-oriented group to deal with them, to have a balanced knowledge of the several functions, or to avoid parochial viewpoints. Only the company-wide view of corporate management is appropriate. A vivid example of the need for this view is found in an automated bakery which installed a computer for controlling production and for operating its freezer warehouse. After considerable effort the production control and warehouse operations were running well, and the team of production department people who had developed the computer programs decided to undertake more advanced applications. They felt that the next step was to tie in their production control system with the ordering of raw materials for production, so that the inventory management and production scheduling could be performed as a single process.

While the production department's team was developing its computer applications, another team within the comptroller's department developed a set of financially oriented computer programs. Starting with the payroll and conventional accounting procedures, this team, too, had progressed steadily toward more sophisticated computer applications. They had successfully programmed the purchasing and accounts receivable functions of the company, and decided that their next step, too, was the management of raw materials inventories. They felt that since they were responsible for the purchasing system and for the company's financial resources it was logical for them to control the expenditure of money for raw materials. The production people did not see it that way; they felt that the ordering and management of raw materials was a natural by-product of the physical needs of production schedules for which they were responsible.

Both parties agreed that each had to work closely with the other's programs and data, but each felt that it should be in charge of the effort because its contribution was the most important. Corporate management found this confusing, and was unable to decide in favor of either of the parties. Finally, with the advice of a team of consultants they decided to do away with both the production and the financial computer programming groups, and to merge them into a single one reporting to corporate management. This radical change was intended to eliminate the cause of the disagreement, and management hoped that the two groups would find a way to work together on the new, broader computer applications that necessarily transcended the old functional lines.

Enough large organizations have completed their change to centralized data processing to make clear the general form of the new organizations. As Dean found in a survey of

108 manufacturing organizations[1], the trend is toward the establishment of a central data processing executive (sometimes a vice president, sometimes not—a frequent bone of contention) reporting directly to the top management of an organization. This executive is explicitly not placed within any of the functional departments of the organization, because the applications for which he will be responsible will transcend functional lines. The programming and system analysis resources of the company report directly to him; thus, perhaps for the first time, a significant line function is found reporting directly to the office of the president or the executive vice president. In many cases, large organizations also permit groups of programmers and system analysts to remain physically dispersed among the departments, partly because of the inconvenience of and resistance to wholesale moving, and partly because computer applications remain that affect only individual departments which may still be permitted to be implemented entirely within the department. However, in all cases these personnel are subject to assignment by the central authority, and if a corporate-wide project requires their services it almost invariably takes priority over a departmental project.



Most large organizations have (so far) continued to use numerous computers located where the work is, rather than completely centralized computing equipment at corporate headquarters. In cases where the files to be used by corporate management dictate their consolidation in one place, the computers follow; but as long as the files of information pertaining to the departments, plants and dispersed facilities are primarily updated by and used by personnel there, economics invariably indicate that the equipment should remain there, too. The reasons for this are simple: long distance data communications are expensive, there is mutual interference between large numbers of different kinds of jobs run at the same time on the same machine, and there is competition for priority of service. This does not mean, however, that the departments have any more control over the equipment than they have over the personnel. Because of standardization of programs (and often equipment), and because of the increasing difficulty of evaluating and selecting new types of equipment and programs, the specification of equipment and control of its operational use are also performed by the corporate authority. The equipment, then, is located wherever the work is; but the kind of equipment selected, the programs for it, and the way it is used are under complete central control.

[1] Neal J. Dean, "The Computer Comes of Age." *Harvard Business Review*, January-February, 1968.

emerging structure

The accompanying figure depicts the approximate organization structure that seems to emerge. Naturally, peculiarities of particular organizations cause variations from this general structure; even the personal characteristics of the managers involved may do so. However, this figure is sufficiently representative to be instructive.

The corporate director of data processing reports to the executive vice president or whatever corporate executive is responsible for the organization's operations. Sometimes this is the president; sometimes it is the senior financial executive, but only in cases where the senior financial executive has broad corporate responsibility. The trend is unquestionably away from affiliating data processing with financial management. Dean's study supports this, and other impressive evidence is provided by a survey published by the Japan Computer Usage Development Institute[2] which contrasts the organizational status of computer installations in Japan with those in the United States; 157 Japanese firms were surveyed and 250 American. In 62% of the Japanese organizations, the computer operation reported directly to central management; this was true in only 6% of the American firms. By contrast, the finance or accounting department was responsible for computer operations in only 18% of the Japanese firms whereas 78% or the American firms assigned computer operations to the financial management function. These figures would tend to prove conclusively that there is no intrinsic association between data processing and the financial function—that the traditional association between the two in America has arisen more from habit than from intrinsic desirability.

In the United States, to a much greater degree than in any other country, the computer was preceded by less versatile data processing techniques—punched card systems, accounting machines and the like—that were used almost exclusively for accounting and financial data processing. In most organizations these were the only data processing machines in use at the time the computer was first introduced, and it was natural to apply the experience of the personnel in the financial organization to installing and operating the new (and, initially, apparently similar) tool. It has now become apparent that the computer tends to outgrow the inevitably somewhat parochial viewpoint of finance, and associate itself with the broader viewpoint of the central management group.

The system analysis and programming functions report to the director of data processing. Most system analysts and programmers are centralized and report directly to him. These people work on the organization's standard programs and those directly supporting corporate management. They also spend part of their time on programs designed to support individual divisions. If the staff is large, as it typically is in a large organization, system analysis and programming may well constitute two separate and co-equal organizational units rather than one as shown here. However, some organizations prefer to keep all systems analysts and programmers in a "pool" and assign them as teams; there seems to be no clear trend one way or the other.

development group

Operations and data control is responsible for the operation of the corporate computer center in the usual manner, and a third group, here called "management sciences and

[2] *Computer Utilization in Japan*, published by Japan Computer Usage Development Institute, 1967.

advanced techniques," also reports to the director of data processing. It takes many names and is sometimes more than one unit, but its functions are always more or less the same. This group is responsible for the evaluation and development of hypothetical and experimental data processing techniques that might be used by the organization in the farther future. Usually, the operations research analysts of the company will be found in such a group, and the personnel engaged in the development of simulation models, optimizing techniques, and the like. As these applications become demonstrably feasible and can be selected for definite adoption, responsibility for their detailed planning and implementation moves over to the system analysis and programming group. The advanced techniques of data processing go hand in hand; the same personnel are likely to be associated with both areas.

The organization may have any number of divisions; two are shown here arbitrarily, reporting through the executive vice president to the president. Because each probably has an identity, geographic location, and product line of its own, it will have data processing applications unique to it. Each is therefore permitted to retain a system analysis and programming group to be devoted to divisional programs, or to assisting the corporate group with implementation of standard programs as the relative priorities dictate. The final authority over the assignment of these people necessarily resides in the director of data processing, but he usually finds it necessary to be responsive to the desires of divisional management.

This "tug of war" between the demands of the corporate group and the demands of divisional management for the services of the data processing personnel on division staffs is obviously a potential source of continuing difficulty, but most organizations seem to find this compromise arrangement preferable to either total concentration of the people in a single location or to total decentralization. It is often observed that a continuing competition for resources leads to a healthy, continuing re-examination of project priorities.

As indicated above, the computers are found where their work is. A single computer center is shown for division A, and for division B two computer centers located at manufacturing plants. Each of these is responsible, above all, for providing adequate service to the plant or division served. However, each is also responsible to the director for satisfactory operation of standard procedures and for maintenance of the accounting control and personnel standards established by the director. Here again is a source of friction; authority over the computer centers is divided between the "customer" directly served (the plant or division) and the central directorate which establishes and monitors the methods of performing the work. Friction occurs, but again most large organizations seem to have found this divided authority preferable to either one extreme or the other, because experience tells them that both corporate and divisional requirements must be represented in the management of the computing centers, and experience also proves that with a spirit of cooperation on both sides such an arrangement can work well.

Centralization of data processing at the corporate level poses new problems of allocating data processing costs. When the divisions employed their own computers and programmers they paid for them, sometimes allocating the costs to still lower levels and sometimes not, but in any case having a clear measure of divisional data processing cost to evaluate against its effectiveness (assuming they took the trouble, which few ever did). When the major data processing cost is incurred at the corporate level, though, and most of the effort goes into standard programs to be used by all the divisions, how can the cost be divided fairly among the divisions? This question is not easily answered, because:

There are many variations between one extreme where the corporate group works almost entirely on divisional assignments and the other where it works entirely on central ones, so many compromises are arrived at.

Some residue of corporate cost always remains that cannot fairly be charged to any division, and the more applications are standardized the more they must be supported by corporate management. Apparently, standardizing the data processing function implies centralizing its financial support.

size affects structure

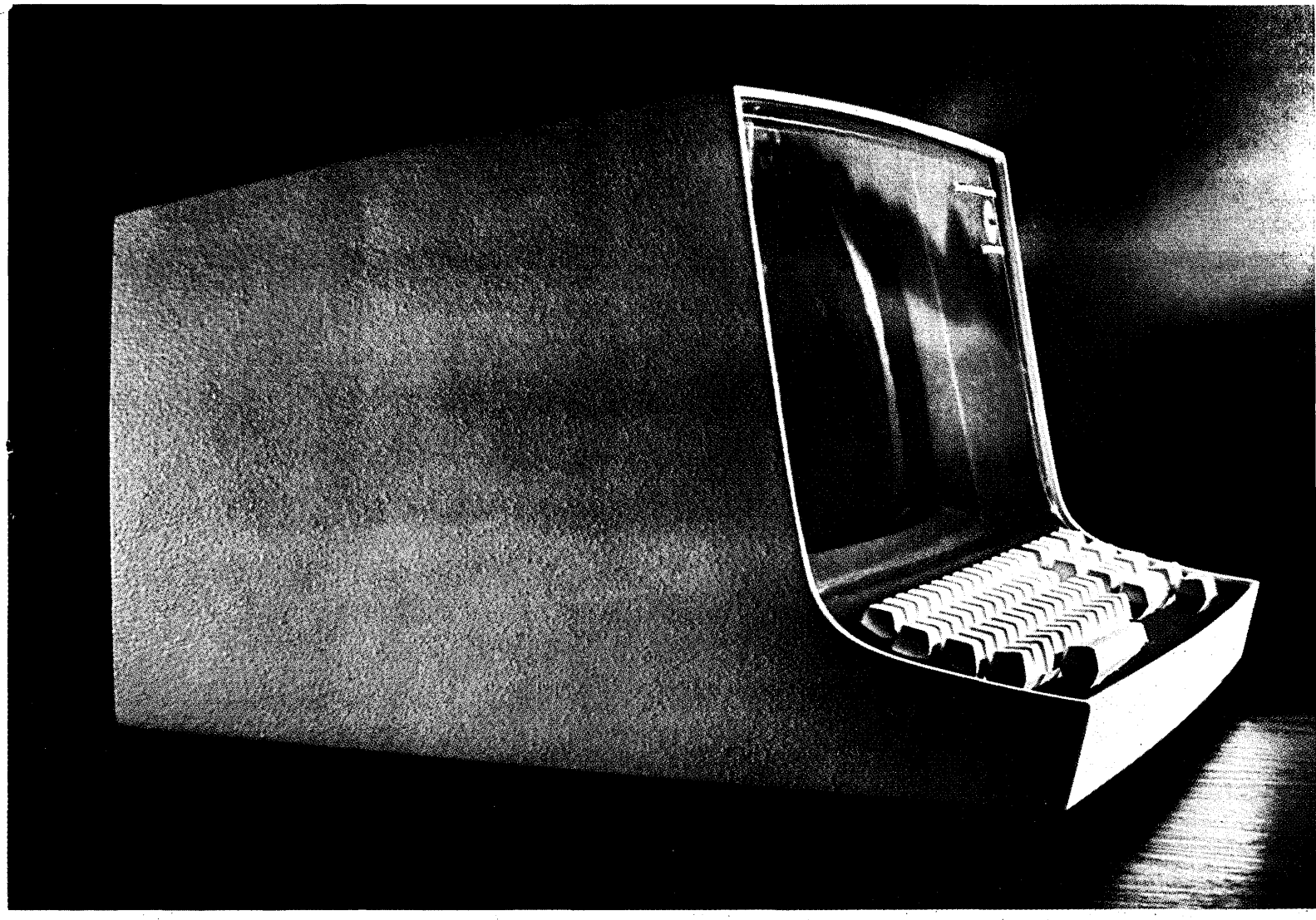
While the large organization centralizes its data processing because of the increasing complexity and breadth of applications and because of the shortage of resources, the smaller organization must look to other alternatives; there are no separate pools of programming and system analysis talent to consolidate. At best there is one relatively small group, and management may despair of the possibility that their few people will ever be able to deal competently with all the increasingly complex data processing applications they would like to attempt. The same difficulty faces the smaller research laboratory and college because the researcher requires increasingly sophisticated computing facilities, and the small research establishment is likely to have difficulty obtaining and supporting the specialized technical staff needed to acquire and support it.

For the smaller organization, a different kind of centralization of data processing seems to be emerging, though in a small way so far. Because the data processing services required by smaller organizations often have an element of commonality (e.g., computational time-sharing services for scientists, inventory record keeping and accounting for retail firms), service bureaus become a possibility. They are obviously growing fast; more than 20,000 small business organizations[3] now subscribe to the services of organizations providing computers and general programs for groups of users having common needs, and computational time-shared services also have many thousands of subscribers. These data processing services are growing rapidly, and represent an important new element of the data processing industry. It appears, then, that the small organization can join the trend to centralization of data processing by sharing the support of a central service with other users having common interests.

In summary, it is clear that the data processing activities that support the operating functions of organizations are being centralized more quickly and dramatically than the line functions of the organizations. Broadly speaking, data processing is a staff function rather than a line one, so this is perhaps logical; line functions traditionally demand more layers of management supervision and more dispersion, while staff functions, such as purchasing, contracting and personnel, lend themselves to central administration. It might have been anticipated that when shortages of data processing resources (relative to management's aspirations) began to pinch, the increased efficiency associated with centralizing a staff function would become the dominant factor.

The "good old days" of organizational simplicity are gone, then, but good riddance to them. The new complexity is a direct result of the increasing importance of the data processing function, and accompanies increasing opportunities and professional challenges. Life always becomes more complicated as you grow up. ■

[3] Frederic G. Withington, *The Market for a Computer Utility Industry*, published in *Computers and Communications—Toward a Computer Utility*, F. Gruenberger, Editor, Prentice-Hall, 1968.



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BUSINESS TIME-SHARING: USER ECONOMICS

by James C. Hammerton

This article explores the economic basis for the use of a time-shared system by businesses. The method adopted is to examine five cases of organizations in the early stages of using such a system. The summation of these experiences suggests that, where favorable economic factors are found, they are strongly supported by other considerations. Where the economic factors are less favorable, these other considerations can be determining.

The organizations in question are small businesses with sales in the range of $1-18 million. Although there are as many as 15,000 businesses in this range, the marketing picture is not reassuring unless ways can be found to broaden the potential market to include larger businesses.

market identification

According to a previously stated definition[1], a time-shared system "is a system which places a data-processing capability at the immediate service of a number of independent remotely located users." This definition is adopted here for the purpose of delimiting the scope of the discussion. The emphasis is on "independent users" and on "immediate service," the latter implying response times of the order of seconds and minutes rather than hours or days.

Ten years' experience with these types of systems suggests that the technology on which they are based has outstripped the uses to which it is put. Perhaps at a time when technology makes peace on the moon more realizable than peace on earth, this should no longer be surprising. The problem is a familiar one; namely, that the economic system tends to allocate resources to advancing the state of the technology rather than to exploiting the technology—the end user gets lost in the shuffle.

A case can be made for (against?) the time-sharing "business" as a landmark in this misallocation of resources. The sophistication of the facilities' developers contrasts with the almost complete disregard of the needs and motivations of the users. This disregard can be underscored by identifying the principal market segments for time-shared systems and, then, considering the current penetration of them.

The market segments are (1) university-based problem-solving, (2) computer program testing, (3) scientific and engineering applications, and (4) business applications. On a judgmental basis it may be asserted that the segments as listed are ranked approximately in descending order by current sales volume; in ascending order, of identifiable profit contribution to the user; and in ascending order, of potential market size.

These correlations are no accident. University use has been spurred by academic interest in the development of interactive systems. This interest has led to proliferation of languages, systems, and graduate theses. It has not, however, even in the campus environment, led to conviction that the desired end-result is to make every student a com-

[1] James C. Hammerton, "The Impact of Independent Time-Sharing on Independent Business." Total Systems Newsletter, American Data Processing, December 1966.

Mr. Hammerton is a unit manager in the Information Systems Div. of the Xerox Corp. He was formerly a product planning manager with the Bunker-Ramo Corp. and has been working with real-time and time-shared systems since 1959. He has an MS in physics from Cambridge and an MBA in economics from New York Univ.

puter user in order to equip him for his career no matter what that career may be. Computer program testing on an interactive basis has some dollar justification, but it also has a recognizable element of self-serving. To programmers chafing under the turnaround times typical of computer job shops and thinking back nostalgically to the days when they were permitted to sit at a computer console, interactive computer use is the way to restore their former status.

Scientific and engineering uses appear to rest on a more solid base because they have been subjected to the test of the marketplace. The commercial time-sharing service suppliers from General Electric down are in business catering to this type of use. However, the success of these ventures, as judged by the rate at which new suppliers enter the market, is founded not on economic grounds but on other and less tangible reasons. The principal one is professional interest. Scientists and engineers who have long been aware of the computer are provided with a method of using the computer, which is easier, psychologically better attuned, but not necessarily more efficient than the more strictly regimented methods in common use. The time-sharing terminal can be justified on the grounds of providing highly paid professionals with adequate tools. If the payoff is not too obvious, management can seek refuge in the thought that an engineering department must keep up to date in order to retain its better personnel. A second reason for the success of time-sharing in the scientific and engineering environment is the ability of low-level managers to authorize operating expenditures to pay for the time-sharing services.

At the bottom of the list of market segments based on the criterion of current volume of use are business applications. No professional expertise is at stake in these applications. The requirement is to get a job done more quickly, more accurately, and if possible, for less money. As with any other product or service, ultimate success may rest on special features, excellence in packaging, well-honed advertising, and salesmanship. However, in the business market segment, more so than in the other segments listed above, the time-shared service must be economically sound. This should be taken to mean that the same or better performance must be available for less or equal cost.

A January 1966 "Computers and Automation" Market Report identified the first-line customers for the Keydata Corp.'s services as "manufacturing and distribution firms with $3-5 million in sales." In that there are approximately 15,000 such firms in the United States, the report concluded that "the potential market . . . should be considerably greater than supplier capacity for many years to come."

Three years later there is no evidence that the potential market has evolved into an expressed demand. Keydata's growth may have stalled for internal reasons but, presumably if there really is a market for business-oriented time-shared services, other vendors would have risen to the bait during the intervening years.

One explanation is that the market is largely illusory. Dr. Kleiman[2] in a recent article leans to the view that "for most business applications, especially of the housekeeping variety (payroll, accounts receivable), time-sharing offers limited attractiveness. . . . " He argues that this limited attractiveness can be offset only by large investments in marketing efforts and, hence, that the growth rate, if positive, will necessarily be low.

An alternative or complementary view is that the user economics have been neglected almost completely and, hence, the marketing efforts have no underpinning. What discussion there has been of economics has been on the economics of the vendor's situation. This, of course, is important since it determines the pricing policy of the vendor and, hence, the cost to the user. However, the vendor economics do nothing to establish the soundness of the user economics.

This article offers a sample of five businesses as an initial report on user economics. The sample is small and inadequate, but larger than zero.

[2] Herbert S. Kleiman. "The Time-Sharing Market: Assets and Liabilities." Datamation, November 1968.

basis for economic justification

The five businesses in the sample are described individually. An economic justification is presented in an attempt to establish the fundamental soundness of the time-shared services. In practice one or more of the factors referred to below may be as influential as the economics in recommending the services to the user organization. However, the ability of the time-shared service to do the same or a better job for less than or equal cost is necessary in order to set up a "good" sales situation.

Three ground rules have been adopted in order to introduce uniformity into the sample case studies and, hence, to avoid the necessity for those qualifications which are essential in practice but tedious in a summary.

The first ground rule is that the cases do not distinguish the user organization's length of experience with the time-shared system. All of the organizations have contractual commitments. However, at the time the studies were made —1967—only one had a year's experience to report. Consequently, although the studies are a step removed from feasibility studies, they are not based on straightforward reporting of stabilized systems. Regardless of the individual situation, a comparison is made of (1) the "time-shared system" and (2) the "previous system."

The second ground rule is that the "previous system" is accepted as the datum system without questioning its desirability, efficiency, or proneness to error and failure.

The third ground rule is that a uniform set of charges for the time-shared services is used. In practice, particular applications may be serviced most cheaply by different time-shared systems because of their different pricing policies. For the case studies a set of charges has been assumed which are very close to the prices used by Keydata Corp. of Cambridge, Mass.

These charges are as follows:

1. Terminal Equipment	
Receive-Only (RO) Printer	$100.00/month
Keyboard Send/Receive (KSR)	$113.50/month
KSR plus RO	$170.00/month
2. Communication Charges	
Channel terminating charge	
first terminal	$ 30.00/month
each add'l terminal	$ 10.00/month
Mileage charge (up to 100 miles)	$ 2.34/month
3. On-line File Storage per 1000 words	$ 2.50/month
4. On-line Transactions	
Invoices	$ 0.075 each
Bill lines, A/R cash posting, Misc. inventory, File maintenance	$ 0.025 each
Inquiries	$ 0.015 each
5. Off-line Reports per 1000 lines	$ 3.00

In the interests of clarity, but at some expense in realism, the conversion costs have been ignored. These are not inconsiderable. The user-organization is under pressure to conform to the procedures built into the time-shared services since it can be assumed that a one-time programming charge is incurred for modifications to the services. Consequently, the user may have to introduce major modifications

to the operating procedures of the "previous system."

case a

Information requirements. The user-organization is an appliance wholesaler. The business involves buying (and maintaining) an inventory of appliances from 20 or so manufacturers and distributing these appliances to 500 dealers in the area. Inventory availability of 1500 stock-keeping units is maintained in order to answer queries estimated to average 15 an hour. Two thousand invoices are prepared monthly for billing the dealers; an average invoice consists of header information and four line items. Payables are processed by the preparation of 400 unit records, each having a header and, on average, ten line items. The processing of receivables and payables results in updating of inventory status.

Reports are maintained on outstanding promissory notes, sales analyses, and accounts receivables. The size of these has been estimated at approximately 10,000 lines of print.

Previous system. The "previous" system was largely manual and employed 7½ clerks at an average annual wage of $6,000. A monthly listing of promissory notes was obtained from a service bureau for an annual charge of $4,000. The total cost incurred was therefore $49,000.

Time-shared system. The time-shared system is based on a clerical staff of 3½ persons of whom two are engaged in answering phones and writing orders, one is operating the terminal and processing receipts, and the half person is 50% of a clerk in the credit department. The annual personnel costs are, therefore, $21,000. The terminal is a combination KSR and RO printer. The estimated monthly costs for the time-shared service are as follows:

1. Terminal Equipment	$170.00
2. Channel Terminating Charge	30.00
3. On-line File Storage	110.00
1,500 stock units	
500 dealers	
20 vendors	
2,020 × 22 words (avg.) × $2.50/K	
4. On-line Transactions	516.00
Sales $0.175 × 2000 = 350	
Purchases $0.325 × 400 = 130	
Inquiries $ .015 × 2400 = 36	
5. Off-line Reports	30.00
10,000 lines × $3/K	
Monthly Total	$856.00

The annual cost is therefore $10,272 or approximately $10,300. Hence, the total annual cost is $31,300 of which $21,000 is for personnel; and $10,300, for time-shared services.

Comparison. The time-shared services appear to provide a $17,700 advantage over the manual system currently in use. A more conservative estimate of the new system includes an additional clerk and a second terminal, thereby providing lighter loading of the terminal operator and a measure of fallback. These additions increase the annual cost of the system by $6000 and $2160 ($180x12) for a total additional cost of $8160. This reduces the cost advantage to $9540. Even under the more conservative assumptions, the economics of the time-sharing services are attractive.

case b

Information requirements. The user-organization is a distributor of building materials and a fabricator of some parts; for example, doors and windows.

The business involves maintaining inventory on 5500 items purchased from 36 suppliers and sold to 700 customers. The suppliers are classifiable in three categories: "major," applicable to the two suppliers providing 50% by value of the items sold; "typical," applicable to the next 10 most active; and "occasional," reserved for the remaining 24 suppliers. Of the 700 customers, 400 are active and only these receive a monthly statement.

The business activity results in 100-200 invoices per day with an average of three items per invoice.

In the absence of any information about purchased items, it is assumed that as with Case A the number of requisitions averages about 20 per day for a monthly total of 400 and the number of items per requisition averages 10. The usefulness of the time-shared services in making inventory availability inquiries has not been explored.

Previous system. The "old" system was operated by a supervisor, two full-time clerks, and a part-time clerk. One of the clerks operated a Friden Computyper, which was used to prepare source data for processing by a service bureau. The other clerk maintained a perpetual inventory record. Typically the time of the part-time clerk was split approximately equally between supporting the full-time clerks and an unrelated activity. The supervisor was a senior clerk and performed routine work in addition to her supervisory duties. The average monthly bill from the service bureau was $750.

Using an average annual wage of $6000 for the clerical staff and $7200/year for the supervisor, the wage bill was $22,200/year or $1850/month. The total system cost is, therefore, $2600/month or $31,200 per year.

Time-shared system. The time-shared system is based on a clerical staff of two persons, one of whom is the former supervisor. Perpetual inventory is maintained as a by-product of receivables and payables processing and there is a reduction in the other filing and posting functions. The terminal equipment is a KSR and RO combination. The estimated monthly costs are as follows:

1. Terminal Equipment		$170.00
2. Channel Terminating Charge		30.00
Mileage Charge (10 miles)		24.00
3. On-line File Storage		
5500 stock-keeping units		
400 active customers		
36 vendors		
5936 × 22 words (avg.) × 2.50/1000 = $326		
4. On-line Transaction		
Sales (150/day, header + 3 items)		
3300 × $0.15		500
Purchase (per Case A)		130
Inquiries		–
5. Off-line Reports		
Statements (400)	$12	
Stock Status (5500)	17	
Sales analyses	12	
Accounts receivables (400)	9	50
		$1230

Hence, the total estimated annual cost is

Personnel	$13,200
Service	14,800
Total	$28,000

Comparison. The time-shared system provides the same service at a cost which is approximately $3000/year lower—a reduction of 10%. No attempt has been made to "fine pencil" the savings by estimating reduced file space, reduced floor space, and so on.

case c

Information requirements. The user-organization in this case is a manufacturer of leather goods, such as handbags and wallets, and an importer of similar items. Imports are

principally of European origin. They constitute 40-50% of the sales volume and in effect complement the manufactured product line. Sales volume is in excess of $1 million. Customers are mainly retailers, gift shops, and similar outlets. Some 800 items in an average of two colors are handled. The number of active customers is between 8000 and 10,000.

Business activity tends to concentrate toward the end of the year. Sixty to 65% of annual sales volume occurs the last six months. Average invoice production is 75 per day throughout the year and 150 per day during the months from September on. Peak activity may be as high as 250-300 invoices per day. The average has 14 items. Of these 10-11 items are in stock typically and 304 items have to be back-ordered.

The data processing involved is invoice preparation, credit checking, inventory checking, accounts receivable, and commission accounting.

Previous system. The previous system for doing this data processing was entirely manual and was done by the equivalent of two clerks. One girl was employed full time, a second girl spent half time on the preparation of commission statements, and a man spent half time on inventory control.

At an average annual wage of $6000, the total wage bill was $12,000.

The owner of the firm investigated the use of IBM equipment and the services offered by a local service bureau but without concluding that his operation would be improved significantly.

Time-shared system. The owner of the firm is an "enthusiast." Perhaps because of this and in part for back-up reasons, he contracted for two keyboard printers (KSR's), one of which is associated with an auxiliary printer (RO). He employs one clerk full time and one clerk part time (estimated at 50%). The spare capacity enables the owner to cope with his last quarter's rush. Some care in scheduling work would enable all of it to be done through one keyboard.

However, with the procedures used, the annual wage bill is $9000. The estimated monthly costs are as follows:

1. Terminal Equipment		
KSR plus RO	170.00	
KSR	113.50	
		$ 283.50
2. Communication Charges		40.00
3. On-line File Storage		
1600 stock-keeping units		
10000 customers		
11600 × 22 words (avg.) × 2.50/1000		638.00
4. On-line Transactions		
Invoices (100/day:header + 14 items)		
2200 × 0.425		935.00
5. Off-line Reports		
Statements (2000) × 10 lines =	20,000	
Stock status (1600) × 1 line =	1,600	
Accounts receivable		
(10,000) × 1 line =	10,000	
	31,600	
× $3/thousand		100.00
Monthly total (approx.)		$2,000.00

The statements are figured at two header lines and eight other lines. At 100 invoices per day and allowing for say 10% "second" orders in a month, the number of active customers in a month is 2,000. Stock status and accounts receivables are figured at one line per record.

The total annual cost is, therefore,

Personnel	$ 9,000
Service	24,000
	$33,000

This is nearly three times the cost of the previous manual system.

case d

Information requirements. The user organization is a liquor distributor with annual sales at the time of the study of $18 million. A number of salesmen visit retail outlets routinely and mark up standard order sheets by hand to show the kinds and quantity of liquor required. Because of the hand markings, the orders are processed by experienced operators with a knowledge of the inventory items and of the customers. This input problem precludes the possibility of using an "off-line" service bureau without transcription of the source data. The processed orders result in an invoice which is used as both a "picking" and a "packing" slip. Back orders are rare.

The active customers number 4,000, and the inventory items, 3,000.

The business activity in an average month consists of 6,000 invoices with an average of five items per invoice. Other transaction activity estimated by the executive vice president is as follows:

6,000 cash postings to the receivables file (remittances)
5,000 miscellaneous inventory postings (inventory additions)
1,000 file maintenance entries.

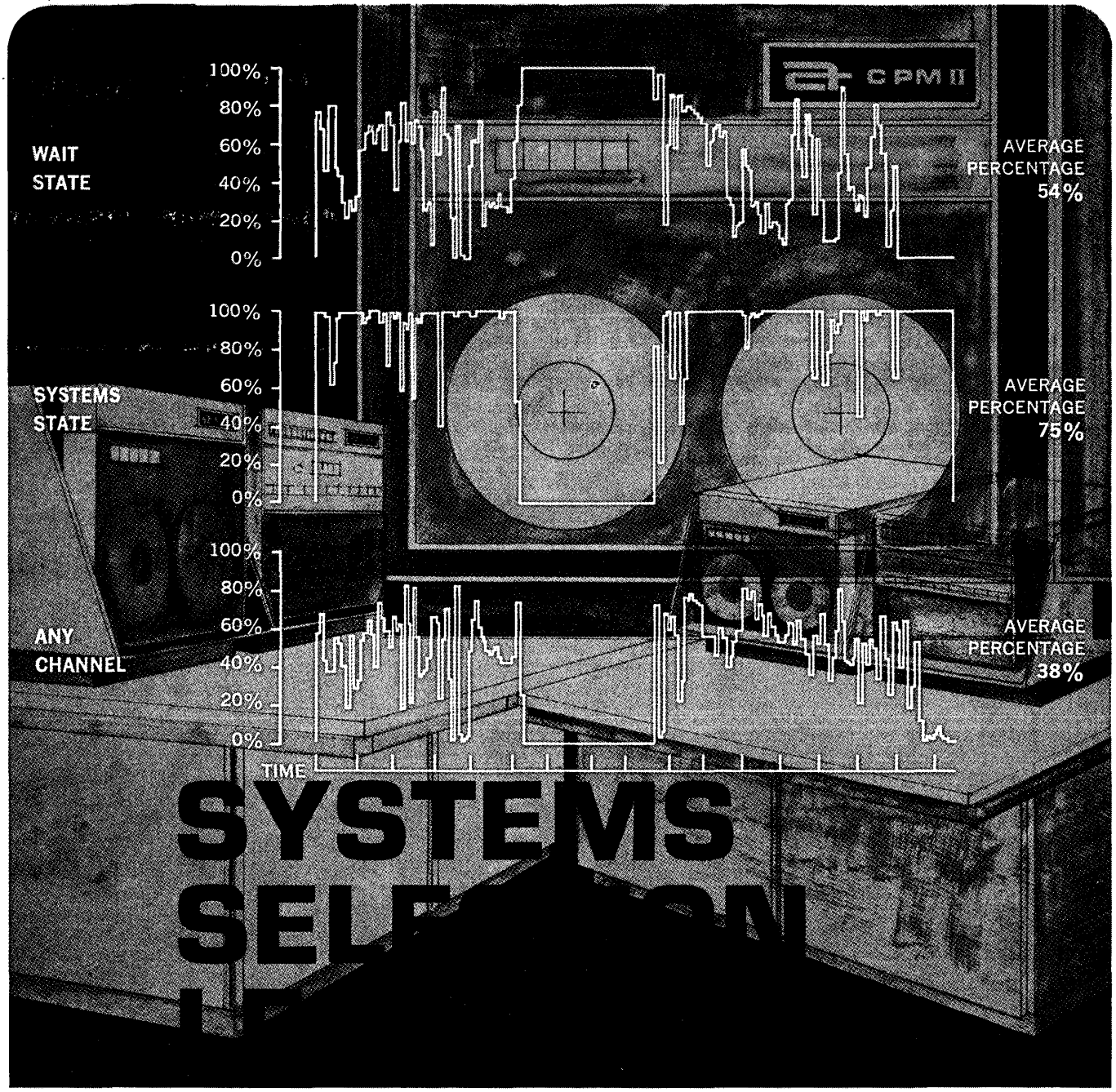
The latter consist of customer address changes, new customers, adjustments, and the like.

Previous systems. In the year prior to converting to the time-shared system, the organization used two systems: a tab system and an IBM 1440 system. The change from the tab system was initiated by the executive vice president in order to obtain a system with greater flexibility for producing control reports, sales analyses, and other management summary reports. At the time that he was considering upgrading his information system, the time-shared system was not operational. The investigation of computer-based systems resulted in the selection of an IBM 1440 installation.

The annual costs of these two installations (the tab equipment and the IBM 1440 systems) were summarized as follows:

1. Tab System		
Equipment		$18,000
2 402's, Keypunch, Verifier }	$1500/month	
Staff		
2 Tab operators @ $6,000		12,000
2 Keypunch operators @ 4,000		8,000
	Total	$38,000
2. Computer System		
Equipment		$40,800
IBM 1440, 2 disc drives, Keypunch, Verifier }	$3400/month	
Staff		
3 Junior operators @ $4,000		12,000
1 Senior operator @ $6,000		6,000
1 Supervisor/Programmer/Analyst		8,500
	Total	$67,300

An 80% increase in cost was involved due principally to the increased equipment rental but also in part to the need for a programmer/analyst. This represented an ambitious expansion of the company's information system. The executive vice president, however, was prepared to justify and support the expansion. In actual operation the weakness of the computer-based system was the restricted number of



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skilled personnel. The senior operator had the potential for upgrading into a junior programmer. However, in the first few months of operation, it was evident that the efforts of the supervisor/programmer/analyst were a prerequisite to obtaining any output but the most routine.

The key employee in question, according to the executive vice president, was loyal, able, and hard working. A change was precipitated when he was taken sick, and it was not clear that he would be willing to return after he recuperated. At this juncture the executive vice president faced up to the lesson of his recent experience and decided that it would be necessary to have at least two programmer/analysts on the staff. The demonstrated need for this increment in personnel costs prompted him to consider alternative courses of action.

He investigated reduced equipment configurations, notably an IBM 1401 G and a Univac 1004 in order to keep total costs more in line. However, he also investigated what a time-shared system could do for him.

Time-shared system. The time-shared system requires the use of two terminals (KSR's) and an auxiliary printer (RO). Other than this there is no equipment at the company's premises and no requirement for air-conditioning of equipment.

The personnel needed are a supervisor ($6,000) and two operators ($4,000 each), a total annual wage bill of $14,000. The operators work directly from the salesmen's order forms. Invoices are prepared on line. Inventory adjustments and receivables updating take place at the same time. "Off-line" reports are delivered by hand. These include standard and special reports. Based on his IBM 1440 experience, the executive vice president estimated the volume of these at 120,000 lines of print. Accounts payable are maintained outside the system. An estimate of the number of inquiries was made by the executive vice president based on 50/day. These inquiries are the time-shared equivalent of random consulting of paper files under an in-house system.

The estimated monthly costs for the time-sharing services are as follows:

1. Terminal Equipment		$ 283.50
KSR plus RO	$170.00	
KSR	113.50	
2. Communication Charges		40.00
3. On-line File Storage		385.00
4,000 customer records		
3,000 stock records		
7,000 × 22 words (avg.) × $2.50/thousand		
4. On-line Transactions		1515.00
6,000 invoices @ 0.2	$1200.00	
(header @ .075		
plus items @ .025		
6,000 receivables		
postings @ .025	150.00	
5,000 misc. inventory		
posting @ .025	125.00	
1,000 file maintenance		
entries @ .025	25.00	
1,000 inquiries @ .015	15.00	
5. Off-line reports		
120,000 lines @ $3/thousand		360.00
	Total	$2,583.50

The monthly cost is therefore close to $2,600 or $31,200 per year. The total annual cost for information processing is, therefore,

Personnel	$14,000
Time-shared services	31,200
	$45,200.

Comparison. The economics of the time-shared system as compared with those of the computer-based in-house system are attractive. As compared with the tab system, an 18% increase is involved. However, there is a many-fold increase in performance in terms of useful information delivered from the system.

The user company was, of course, a "soft" sell for the time-shared service. The progressive approach of the executive vice president to his job led him into an overly ambitious expansion of his data-processing equipment configuration. In the wake of problems with the administration of this installation, he was wide open to any alternative which offered the same kind of outputs without the administrative worries of how the outputs were produced.

case e

Information requirements. The user organization in this case is a distributor of a full line of paints servicing 300-400 retailers. Sales are in excess of $1 million annually. The president and owner is expansion-minded and has moved in the direction of vertical integration by acquiring two paint manufacturers. He looks to further acquisition in related paint and chemical product lines. The current product line consists of 700-800 items differentiated by brand, color, and size.

Orders are received by telephone and by mail. There are an average of 15 items per invoice. Back ordering is not a major problem. Items not in stock are canceled or back-ordered in accordance with customer instructions.

The business activity averages 30-50 orders per day or 660-1100 per month.

The primary information processing consists of invoice preparation, credit checking against existing dollar balances and account aging, maintenance of accounts receivables, preparation of monthly statements, and inventory control of finished goods. Additional but less voluminous processing is done in connection with ordering from suppliers, maintenance of accounts payable, payroll preparation and other general accounting tasks.

Previous system. Formerly all of the primary information processing was done by seven clerks. The accounts receivable clerks used Burroughs accounting machines. Inventory was maintained on a Kardex file. All invoices were prepared manually.

The annual cost of the previous system excluding machinery was as follows:

1 supervisor @ $7,200	$ 7,200
6 clerks @ 6,000	36,000
	$43,200.

Time-shared system. The time-shared system for the primary information processing requires a clerical staff of three persons using two terminals. The annual personnel costs are $19,200, one person being the former supervisor.

The estimated monthly costs for the time-shared services are as follows:

1. Terminal Equipment		$283.50
1 KSR plus RO	$170.00	
1 KSR	113.50	
2. Channel Terminating Charges		40.00
3. On-line File Storage		66.00
800 stock units		
400 customers		
1200 × 22 words (avg.) × $2.50/thousand		
4. On-line Transactions		545.00
1100 invoices @ 0.45	$495.00	
(header @ .075 plus items		

(Continued on page 79)

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@ .025)		
1100 receivables postings @ .025	27.50	
400 customer statements @ .025	10.00	
500 miscellaneous transactions @ .025	12.50	
5. Off-line Reports (estimates) 10,000 lines @ $3/thousand		30.00
	Monthly Total	$964.50

This corresponds to an annual cost of $11,574 or approximately $12,000. Hence, the total annual cost averages

Personnel	$19,200
Service	12,000
	$31,200.

Comparison. The time-shared services appear to provide an annual saving of $12,000 or 28%. No difficulty in handling the volume of business through the two terminals is anticipated. However, the terminal operators are the order takers; and the length of time taken to service a call is to some extent customer dependent. At the time of the study, insufficient experience was available to gauge whether the two terminals would be adequate. If they prove inadequate to maintain service at the required level, an alternative peak time arrangement will be necessary. This could require part-time attention of a clerk to hold an incoming call or it might eventually require another terminal. Under either of these circumstances, the economics of the time-sharing service remain attractive.

CASE	PREVIOUS SYSTEM TYPE	PREVIOUS SYSTEM COST	TIME-SHARED SYSTEM SERV.	TIME-SHARED SYSTEM PERSON	TIME-SHARED SYSTEM TOTAL	DIFFERENCE	NO. OF CLERKS PREV.	NO. OF CLERKS T-S
A	Man	49,000	10,300	21,000	31,300	17,700	7½	3½
B	Man	31,200	14,800	13,200	28,000	3,200	3½	2
C	Man	12,000	24,000	9,000	33,000	(21,000)	2	1½
D1	Tab	38,000	31,200	14,000	45,200	(7,200)	4	3
D2	Comp	67,300	31,200	14,000	45,200	22,100	5	3
E	Man	43,200	12,000	19,200	31,200	12,000	7	3

summary of case studies

The case studies are summarized in the chart above.

The obvious message of this summary is that where an organization has a large clerical staff doing essentially manual—i.e., non-machine-aided, information processing—the economic justification for the time-shared system is well founded, particularly if the organization is prepared to go all the way with the time-shared service. Where the organization—for example, Case C—has kept its clerical staff to a minimum, the economic justification is nonexistent or unimpressive.

The case studies have not attempted to account for related savings; for example, less floor space, fewer filing cabinets, and so on. However, it is not anticipated that doing so would alter the message contained in the above table.

The message will come as no surprise to those who have been involved in the automation of clerical work from tabulating machinery onwards. Those that are already "hooked" on the value of information but who have not considered automation of the means for producing information represent the softest selling situation.

With respect to the stated objective of this article, the case studies demonstrate that time-shared systems in common with other types of data processing have a fundamental economic soundness. Given enough work to do, a time-shared system provides a "good" solution.

non-economic justification

This suggests two other questions that are pertinent to the future role of time-shared systems in business data processing. These questions are (1) "Why and when is the time-shared system solution preferred to the small, in-house computer solution?" and (2) "Why is the time-shared system accepted even when no cost savings are apparent?" The answers to both of these questions lie in the less quantifiable but no less real factors involved in the relationship between the supplier of and the subscriber to time-shared services.

With respect to the first question, the persons contacted during the case studies made the following comments:

1. Elimination of most of the responsibility for operating the machinery is a major plus factor;
2. Administration of a programming effort is avoided;
3. The user-organization no longer relies on a key programmer who cannot be offered a career opportunity and who belongs to a profession in great demand;
4. There is less commitment to the time-sharing supplier so that the contract can be terminated if performance is unsatisfactory.

With respect to the second question, the following opinions and statements are relevant:

1. Better-looking, itemized invoices are produced;
2. Improved inventory control and forecasting;
3. Less difficulty absorbing peak order volume;
4. Clerks less harassed so that they have more time to be cordial to the customers when orders are phoned in.

Another reason, not specifically alluded to during the studies, is that a small, well-run clerical operation is usually dependent on one or more key persons. Converting to a time-shared system reduces this dependence.

It is also of interest that the complaints about the time-shared service were not about cost but about performance. These were as follows:

1. Downtime on the computer;
2. Restrictions imposed by the software; e.g., inability to calculate discounts by item rather than by customer total;
3. Delay in cutting in the terminals;
4. Nondelivery of promised off-line reports.

the marketing picture

The foregoing presents a marketing situation which is not untypical. The manager/owner of a small business has a potential or expressed need for more information to run his business in a way which capitalizes on the advantages of smallness and offsets the advantages of his larger competitors. The value of this information in terms of increased sales or decreased operating costs exceeds the cost of providing the information. If the need has been expressed, the manager/owner is already convinced of this; and he is willing to pay to get the information. However, he has to be convinced that the time-shared system is the best solution. Time-sharing has several factors in its favor as noted above

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—little responsibility for software or hardware, less floor space, no personnel problems, ability to cancel.

Against these advantages, of course, must be stacked the time-honored arguments against the use of service bureaus. As listed in one reference[2], these are:

1. Control of the user's information processing is in the hands of the bureau;
2. The service bureau's personnel don't know anything about the job;
3. The processing is too inflexible for the competitive situation;
4. The data are confidential but may not be treated appropriately;
5. The bureau may raise its prices;
6. If the bureau's installation has unscheduled downtime, which jobs are given priority?

The time-sharing salesman must be able to counter each of these.

how small is small?

All of the economic information in this article has been gathered from small businesses in the range $1-18 million of sales. The reasons given for preferring a time-shared service to an in-house computer are pertinent to small companies but not so obviously pertinent to larger companies.

From a marketing standpoint, this introduces the question of how large does a company become before an in-house system becomes the preferred solution. Is it necessarily true, as is commonly supposed, that above a certain size a company will find its own installation either cheaper or more effective or both?

The early marketing efforts of time-sharing salesmen were based on the premise that the size of the average user was small. Sales to schools, colleges, and independent professionals were the basic market segment attended, unfortunately, by a high ratio of hand-holding expense to revenue received. A supplementary segment consisted of departments within large companies which were "trying out" the system. These customers were not regarded as permanent since it was assumed that their companies would eventually be motivated to install their own time-shared system.

The proponents of the "computer utility" argue in the other direction—basing their argument on the economies of scale inherent not only in larger central processors and larger and more hierarchial storage but also in communication channels. While the inherent economies are rarely disputed there is little evidence to support a claim that they have been realized in practice.

To some degree, the tendency of companies to regionalize or even to centralize their information systems supports the notion that the bigger installation provides cheaper costs per unit of work than the small installation. This tendency might, therefore, be added to the factors favoring use of time-shared service bureaus by medium-sized as well as by small businesses. Part of this tendency is attributable to the difficulties of running small programming groups effectively. The contention (hope?) is that the administrative difficulties associated with a group of intelligent, highly mobile professionals may be less overwhelming the larger the group. If true, this also supports the use of time-shared services by medium-sized companies. In fact, to the degree that the technology becomes more complicated and more multifaceted, the businessman who wants to run his business effectively but has no desire to master the mysteries of information technology and of the professionals associated with it may be expected to look towards the time-shared service supplier for salvation. ■

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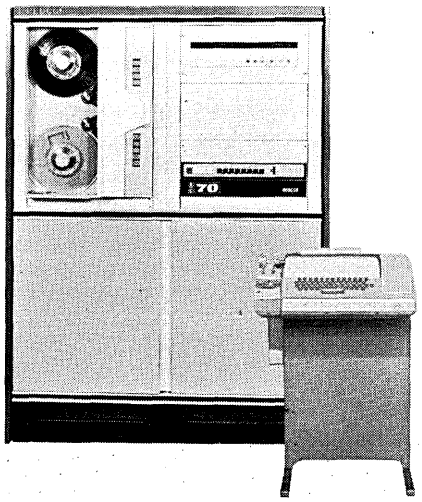

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THE NAME IS THE NAME OF THE GAME

by James McCrohan

Even the casual reader of computer trade magazines must be aware of the many dangers that beset the industry today. They range from the prevalence of unprincipled job hopping to the irrationality of government procurement regulations to some lingering doubts about the precise specifications of fifth generation machines. But no one to my knowledge has fingered an even more terrifying prospect confronting us guys in computers—the rapid shrinkage of the word pool available for naming new companies. Consider the welter of Data's, Computer's, Applied's and System's that adorn those magazine pages carrying new business announcements, and you'll understand why the available vocabulary deserves to be ranked along with arable land and oil reserves as a diminishing resource.

There are, however, a few variations remaining on these old word themes for companies yet to be formed. In the spirit of conservation, in the hope of stretching out our available verbal resources, let us consider how the language might be pressed into further service by the entrepreneur of tomorrow.

Computer is a big favorite certainly, perhaps the biggest, for as is well known the boys on Wall Street dig it. Hence any company namer is well advised to consider the word closely. An obvious title for a new business, and one that will doubtless be formed soon, is Computter, whose market is that very large group of people who just want to fool around with a computer. Stock bearing that name should at least treble on the first day of trading. A subsidiary would be Computt, improving your game through automation. And would you believe Compudder, Inc., for more productive dairy herds?

Now for those software types who wish to turn the computer loose on the field of music, Computoodle would not be a bad choice. For those who would restrict themselves still further, say to the trumpet or French horn, it's only a short leap to Computoot. Compurr, Inc., for scientific cat breeding is perhaps something of a stretcher, but most everyone would get the right doggy feel from Compoodle.

Programmer also means something in our money marts, and there are a number of desirable entries left here. Programma, Inc., has something of a Grecian ring but it could be used very nicely by a group of elderly lady programmers who want to do their own thing. Programmatical might well be a venture in bringing the computer to bear upon proper parsing and tensing of the English that appears in our trade pubs; it also has the virtue of a subtle connotation that the venturers are not quite sure it can be done. Programammoth is obviously a house that tackles only big jobs (or ancient elephants), while Programmini deals with the trivial, or maybe it designs contemporary skirts for ladies. Programmamary is the sort of enterprise that might prove a bust.

Systems is another favorite. System might well be focusing its efforts on municipal engineering, while Sys-E, Inc., is making men out of overprotected youths. Systemptation could be an automatic guard operation while Systemper is likely to be a bunch of veterinarians who see a good thing in pooling their puppy knowledge. Systempo—we're back to our computerized music. A phonetic neighbor of System is Cyber, also in great demand by the name crowd. Some farsighted souls might think of Cyberia, Inc., when we make that final accommodation with the Russkies. Cyberns—a company started by a mod crew for those hirsute jobs. Cybernadette might be the computerized way to arrange a pilgrimage to Lourdes.

Why restrict ourselves? Infotrauma; the computer pushes into the psychiatric ward. Logicoup is working on a system either for Wall Street or Las Vegas. Tineshare would probably bring us to a real-time fork in the on-line road, while Appliplexy is a group of short-tempered programmers working it out.

Then we come to the great Data family. Data-Ta is naturally the brain child of some Ivy League programmers. Datamour is our newest computer mating scheme. Datamare, dedicated to the improvement of the breed, or perhaps picking winners at Aqueduct. Datomic I think someone is using and may well be going over with a bang. Datasun has astrological connotations, yes, but I prefer to think of a few Japanese programmers making their way in our crowded world of computers. ■

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A LOOK AT UNBUNDLING

by Angeline Pantages

"Armonk, N.Y., ?/?/69—From the fortress in the apple orchard here, word has come down that International Business Machines Corp. has decided to postpone any announcements on separate pricing of services until it has held further negotiations with the Justice Dept.

"IBM feels that its main strength in dealing with the hastily drawn government action lies in its separate pricing policies . . . and it's not about to lose whatever barter power it might have by public announcement of those policies.

"In other words, IBM will float some trial balloon policies with the Justice Dept. in an attempt to negotiate a settlement. They expect the suit to be dropped before the year is out . . . and a Consent Decree to be held in abeyance until the effects of mutually agreed-upon separate pricing policies can be analysed and assessed . . ."

Or: "It was announced today that IBM has begun an evolutionary program of changing its marketing structure. The first step is establishing the Field Engineering Division as a separate entity with separate pricing of all maintenance. At the same time systems programming has been consolidated and cost studies are under way to determine the feasibility of a separate organization to offer this service. . . ."

Are the above fictional news releases only fanciful, or has IBM announced a postponement between our writing this and the time you are reading it? Or will IBM make a token first announcement and then make its approach to the Justice Dept.? The opinions of executives in the industry—plus the presence at IBM of heavyweight legal talent and Justice experience of Burke Marshall and Nicholas deB. Katzenbach—indicate that such a possibility is being strongly considered within the numerous IBM task forces set up to study separate pricing.

But it is only one of a seemingly infinite number of considerations for the behemoth in arriving at what the altered face of IBM business will be. After countless interviews and discussions we found that for each argument there was a counterargument. For each conclusion, there was a "but-if" or "that's nonsense" answer. Each element that can be separately priced has its impact internally and externally. In other words, the issue seems to raise more questions than it answers.

There is little value in attempting at this time to arrive at final conclusions. Instead, this article will present some of those questions and the way industry experts answered them.

goals of appeasement

Few people feel that IBM will announce the entire package July 1, or whenever its first announcement will be. It may know by then what some of its ultimate goals will be, but it must first put its policies to the test and perhaps modify the long-range plan on the basis of this experience.

IBM, it is said, must please or appease many people:

1. Itself and its investors. Profits must be held at the current level; correspondingly, it must move to protect the products and services that will have both a short-range and long-range effect on those profits.
2. The user.
3. The Justice Dept., provided with canon law to protect free competition and punish a monopoly, if it can figure out how.
4. The competitor, who is "all" the rest of the peope offering wares in the market place and you can hardly please all of them all of the time.
5. Control Data, DPF&G, and now Applied Data Research, who are "some of the people" variously referred to as the "Avengers" and "Captain Ahab." And we're not sure whether all will be appeased by separate pricing alone.

In retrospect, IBM management made several "errors" in the past few years—and they were mistakes that put Number One in the position today of separate pricing "under the gun." These include: ineffectiveness in forestalling the growth and/or the complaints of the leasing companies, who now own over $250 million in IBM computers; the development of time-sharing services under the IBM organization rather than under subsidiary Service Bureau Corp.; and announcing separate pricing plans too late.

Other events contributed but the leasing companies, armed with strong financial backing, developed such lung power that they probably did the most to rouse the Justice Dept. to "bundling" (of services under a single price) and IBM's alleged use of its services to discriminate between buyers and renters. Had IBM unbundled sooner it might have appeased the government (as user and suer), and those private firms that have now filed suit.

time-sharing decision

The entry into time-sharing services was a different matter. We are told IBM, after much deliberation, chose to develop its time-sharing effort because it was considered vital to the ultimate growth of the company. The choice was made at the risk that the 1956 Consent Decree's ban on IBM entering the service bureau business, except through SBC, would be interpreted to include time-sharing services. IBM

and the Justice Dept. had gone 'round and 'round arguing the matter.

When it became plain that IBM was heading into antitrust trouble, the time-sharing services were transferred to SBC and plans were announced for separately pricing yet-undetermined services by July 1 of this year. IBM was confident, we're told, that the more time that passed without Justice Dept. action after these announcements, the better were their chances that nothing would happen—especially since a new political administration was coming into power. But Control Data and Data Processing Financial and General in rapid fire action filed their suits, and, most shocking, the Justice Dept. filed a few days before President Nixon took the oath. In an unusual show of anger, IBM ran a nationwide ad disclaiming that it had stifled competition in the industry.

In any case, IBM is now faced with a shotgun separation. Even if the giant firm thinks it will benefit by putting a price tag on any or all of its services, it may be forced to do things differently than it would have if it were purely voluntary. This is one strong reason why IBM may wait and negotiate with the Justice Dept.

considerable considerations

In attempting to please the affected forces, IBM must consider numerous aspects of separate pricing: what, if any, alterations will be made to the current philosophy of structuring costs, what services are separated, how they are priced, when each new policy will be announced, when it will become effective, who will market each service, how will it be marketed, what past and future equipment will be affected? Ask yourself, will IBM be condemned if they price too high (by the user), too low (by the competitor)? And under each element that may be separately priced, there is the question of what part of it, if any, may be dropped from the list of services (the nonsupported software package, for example). Too, if IBM's policy in any area makes it vulnerable to excessive competition, it must decide with what lawful means, as through technology, it can protect itself. And what services would IBM offer—by choice or force—to those who are not equipment users? There's more, *no doubt*, but you can fill in the blanks as we go along.

What IBM offers to the renter of its equipment are the following: pre-installation consulting, a 90-day warranty on equipment, prime-shift maintenance, systems and applications software and its maintenance (plus some nonsupported offerings), and education on several levels from executive orientation to operator training. It's a neat bundle that means the user does not *have* to go to more than one vendor for most of his system needs.

single-source organization

IBM has the organization for these services under one profit center—the 150,000-man (estimated) Data Processing Group. This group is broken down in the following way:

Components Division (develops, manufactures and purchases electronic components used in dp systems);

Systems Manufacturing Division;

Systems Development Division (via U.S. and European Labs, develops IBM's regular product line, does systems programming—called Type I—and maintains it);

Field Engineering Division (maintains edp equipment and is trained to do in-field maintenance—i.e., debugging—of Type I software);

Data Processing Division (markets dp equipment, programs applications or Type II programs, provides free and for-fee customer education, and maintains and distributes the entire program library via the program information department.)

Not within this group are the Advanced Systems Development Division, whose research on new markets often results in product designs transferred to SDD; the Federal Systems Division, a profit-making organization geared for "advanced systems" contracts, including special programming, for government and industry; the Research Division, whose research domain extends beyond computers to other technologies.

Other related operations in the form of subsidiaries are IBM World Trade Corp. (which grossed over $2 billion last year), Service Bureau Corp., and Science Research Associates, Inc., which "develops and publishes a full range of modern learning and guidance materials and intelligence, aptitude and achievement tests for schools, government, and industry. The latter is one of the largest publishing houses in the country."

cost allocations

For the most part, our concern is with the Data Processing Group. As a single profit center, it has been able to balance the cost trade-offs of each division to achieve overall profitability.

The picture of how IBM breaks down costs of its revenue dollar is an elusive one, open to interpretation. The input from the field says it looks something like this:

New (product cost (including direct labor and materials) overhead and indirect cost, manufacturing and engineering, noncapitalized test equipment, etc.) ..... .10

Product cost apportionment (including field transfer of equipment, development costs of products that did not make estimated sales forecasts, some costs from ASDD, IBM Research, etc.) ..... .06

Maintenance ..... .15

Profit before taxes ..... .30

Other apportionments (marketing, including .10 for systems engineering, .19; personal property tax, .05; overhead, .06 ..... .30

Direct development costs (software, .05; SDD cost, .04) ..... .09

The actual price set on a piece of equipment is based on market considerations, taking a series of low, medium, and high forecasts of sales and settling on one. (IBM so underestimated the sales of many 360's that the underestimated cost of certain items like software was offset, we're told.)

Taking the percentage of the revenue dollar applied to any one item and diminishing the user's rental price by that amount would be inaccurate. In other words, you can't simply remove 5% for software, 10% for systems engineering, 15% for maintenance, and 1-2% for education—if those services are separately priced. For one thing, not all IBM users will purchase all the services—isn't that what this whole mess is about?—so IBM would be forecasting fewer sales and spreading the cost over a narrower base.

Also, putting software costs, for example, at a mere 5% is misleading. For one thing, it is the average and is spread across the entire data processing line, including peripherals, terminals, etc. There are also software expenses to be found in systems engineering, in products which have failed and whose costs are allocated in the product apportionment, etc. Software must also account for a percentage of profits, of overhead, and so on. In its suit, Applied Data Research says that standard and custom software, systems engineering, etc. (lumped under software expenses) amount to 35-50% of the system price.

In fact, if you take each service or product and apply the same rules of cost allocation as applied to hardware (30% profit, for one thing) you end up with many different pricing possibilities.

But the IBM cost structure is subject to change. For example, IBM's costing philosophy has been eroded, by the

change in the cost of certain elements. Total product cost reportedly has significantly diminished in the last 10 years while marketing cost has increased, mostly due to systems engineering support costs.

Below are some opinions from users and the various suppliers of equipment and services about the possible separation of pricing for the four major candidates: software, systems engineering support, education, and maintenance. You'll find few pat answers. In all it is well to remember that IBM must balance the trade-offs among the services, that it will resist creating a greater "bodyshop" problem than it has, and that it must price competitively.

Software. IBM is said to have 3000-4000 systems programmers developing Type I software (compilers, operating systems, sort/merge and utility routines, text editors, etc.). On the other hand, IBM is said by another source to have 2300 programmers and 400 systems analysts at Federal Systems Division and 1700 programmers at Systems Development Division and an undetermined number at ASDD, World Trade, and IBM Research—all of whom contribute somehow to the Type I library. (That's just to show you how confusing it can get; IBM will not supply such figures to the public.) In any case, the bill for Type I 360 software for '68 is estimated by non-IBM sources to be $100 million, and to be $150 million in '69.

About 400-500 applications programmers, many of them ex-systems engineers, are said to be working on Type II software in the Data Processing Division, and their current annual bill is put at $15-16 million.

IBM also gives away programs in classes called Type III, which are IBM contributed but not maintained, and Type IV, user contributed, not maintained. These are not part of the standard product line and their costs are not allocated to it. (The lines between the classes blur somewhat, and you'll find packages like the CALL/360: BASIC offering not classified at all.)

The last IBM annual report we can find with figures on the number of programs in its library is 1965, when it listed 2500 programs . . . and that was early in 360 software development.

Nearly all IBM customers use the systems software but "applications programs from IBM are for selling, not installing," said one ex-IBMer. "IBM was dragged into offering applications programs by aggressive marketing people, but now the momentum in computer use in many industries is so high that IBM would not lose customers by not having Type II for them. If there is a convenient way out of this service, or at least to reduce its cost, IBM would be happy to use it."

type two first

Therefore, the consensus is that IBM will first separately price Type II. IBM does not have a centralized organization for its application program effort. It is fractionalized—in the branches, regions, etc. And IBM may be looking for ways to control this group and direct it toward new markets where applications are vital if a computer sale is to be made. Too, directing its skills at fewer, specific areas could also mean better programs. Possible result: inevitable sales to the "underdeveloped" markets; partial abandonment of software in established computer markets to the software firms, who will do their darnedest to step up production of programs for 360 computers, also benefitting IBM; and general benefits to the software houses, who will find a slightly bigger market to attack, and to service bureaus which can buy the "improved" IBM packages for markets considered lucrative by the superb IBM market researchers.

But Type II really isn't such a big market, we're told.

If the Justice Dept. and the private antitrust plaintiffs were not in the picture, one could fathom that IBM would do any or all of the following:

1. Price all *future* applications packages;
2. Price all future Type I packages that supplement or provide an alternative to current basic systems software (such as CALL/360: BASIC, OS alternatives, etc.);
3. Continue all rental contracts with the current library available for free to them, but perhaps pricing any major revisions of these programs which extend "beyond a reasonable period of time;"
4. Offer software and systems engineers in a package, perhaps under a minimum formula of x number of dollars for software for x number of SE's;
5. Charge the user a one-time rate for software no matter how many installations he may have that use that software.

These are some of the possibilities. But with the problem of antitrust, IBM could be forced to put a price on each discernible "labeled" software product and the manuals involved (which already have a price tag on them to noncustomers), provide no personnel except those allowable under warranty (warranties are not provided with IBM software now), charge the user full rate for each package used at each installation, separately price systems engineering support, and perhaps even provide a rebate to the user for paying for unused software in the past. (We expect that the courts would have to demand the last.)

type one too?

In other words, it is said that IBM will ultimately have to price Type I software. To those who say that "You can't run the hardware without operating systems, compilers, etc." the counterargument of software firms (Applied Data Research, Programmatics, and others) is, "We're not asking IBM not to develop this software, just not to give it away." ADR says that IBM has 99% of the Type I market for IBM equipment because it gives it away.

A lawyer with edp credentials supports this view. "Software is software in the eyes of the law. How would the industry like it if the courts had to judge the difference between these arbitrary classes, or between one function they perform and another? Asking for such distinctions, when even within IBM the line is not always clear between its 'types' of programs, is asking for regulation."

[It's time to throw in a rumor. IBM is said to be preparing a new operating system, NSS, for the New Systems to be announced within the next year (360 compatibles called the 360/35,/45). And NSS is said to have a price tag on it. Presumably the present operating system will still be usable on the New Systems, but NSS will be a "vast improvement" under which current compilers will operate.]

Thus the industry can conceivably look forward to complete separation of software, although it will not all come at once. The four classes as now set down may disappear, with no Type III equivalent, and perhaps Type IV (user programs) kept in the libraries as a service to the user and only tape duplication and distribution charged. As an afterthought, it is suggested that if IBM wishes not to support all the Type III programs now in its library, it may variously: sell the program at a low price without a warranty and with no modifications or maintenance, or it could perhaps license software houses, and service bureaus for a fee, to maintain and market the package, collecting a royalty, or perhaps sell it to them outright.

Regardless, the user is warned that any package he buys from anyone should come with a warranty and a carefully drawn-up contract, especially if Systems Engineering help is separately priced. (We recommend DATAMATION's October, 1968 issue on software packages and "The Economics of the Software Market," by Dr. M. Conway, for contractual, pricing, and other considerations.)

Systems engineers (SE). This is a people problem. (There are about 10,000 SE's in the field, in assistance centers and branch offices.) The reason IBM's cost of marketing has about doubled in the last 10 years is because of the SE, who has cost IBM 10¢ of the 19¢ for marketing in

the revenue dollar. The SE is a sales tool, but he costs "too much" money.

What does an SE do? Mel Conway notes, "Almost exclusively, support is help provided to a user in designing and programming his particular application and in making sense of the software he gets." IBM says his function is to provide "guidance and counseling;" he is not the user's contract programmer, systems analyst, etc. SE's come in various classifications ranging from trainee not long out of college to senior, with experience in systems design, analysis, and programming. The user variously tells you he may, depending on his level:

—provide assistance in training in-house personnel or give guidance in defining training programs;
—do research on how to solve technical problems;
—provide a reference on what other users are doing to prevent "re-invention" of a program already developed;
—help design a new system;
—"constantly" make suggestions for new hardware needed;
—"take off for days to go to classes or get involved in some sales pitch for another installation;"
—"work on projects that will benefit IBM, not necessarily the problem areas;"
—do programming tasks rather than trouble-shooting.

The mix of SE's an installation may get varies, and that's why the functions vary, and he is there of course to serve IBM . . . that's indirect selling. One group at one large installation contained "two full-time programmers and systems designers, two part-timers going to classes, and one engaged in selling MIS to the user and doing MIS systems design work."

se pricing problems

Thus, in determining separate pricing you would have many problems of classification, dollar value, and function. IBM software does not come with a warranty; updates and revisions and SE support are provided as part of the system. If both software and SE's were separately priced, you might end up with any of several combinations. It would be up to the user to demand contracts which spelled out performance specifications of the software and the length of help that he would get to make the software meet those specs. One user suggests that the "debugging" and updating functions—as opposed to systems design or other consulting work—could reasonably be included in the software package.

As a matter of fact, Robert V. Head lists among his rules for buying: "If a company is paying more than $2000 or $3000, it should expect a reasonable amount of initial on-site support. The nature and extent should be clearly understood." Training and assurance of error-free operation for a reasonable period of time are also important elements.

But with or without "reasonable" help to get a single package or several going, the user has the problem of getting his whole system on the air. This is where systems help is needed and can be accomplished in several different forms.

First, let's look at several premises. The SE above all provides account control. The trade-off between his cost and this control is such that IBM would rather pay SE costs than lose control. But legally, opinion is that IBM must separate SE's to be responsive to antitrust action. Second, the smaller user traditionally requires more help than many large users, primarily because of experience of the user. (Note: a $60-80K 7090 averaged about 12 man-months of SE time to install, while a $15-20K 1401 required 30 man-months.) IBM wants the small user market, because these users grow to the most lucrative medium-scale system. Therefore, it cannot afford to set a price based on actual cost of SE help to these users; it would be far too high. Fourth (but not as important), if forced to separate, IBM would like to diminish the cost of its SE support.

some alternatives

Within this context, let's see what interviewees said might be done:

1. If IBM does not split out Type I software, it could split the SE force into two, one for Type I and one for Type II. The SE's involved in systems programming would be bundled into the hardware price, keeping the latter high and resisting the exposure of extremely low product cost—a danger to the competitor. This would also save the small user. IBM does not now have any set regulations for dispatching SE help. The branch manager has the budget flexibility and the authority to provide more or fewer SE's—depending on the problem, the importance of the users, and/or how loud he screams (the "oil the machinery where it squeaks most" method). If there were any legal arguments on this free-wheeling dispatching, IBM would set up a complicated formula—complicated of necessity—which apportioned the SE time according to the complexity and/or size of the system.

Type II SE's, dealing with a smaller base of customers, could be priced on a per diem or hourly basis, or be provided in a fixed monthly price package which would not commit itself to any time estimates, which IBM is loathe to do.

2. Or, IBM could put all SE's on a per diem or per hour basis. But here, there could not be any single price because of the levels of experience represented. If IBM charged against actual cost, it could price itself out of the market. The only gauge we have is that independents are said to charge anywhere from $10-40 an hour, and Federal Systems Division, which has a lower profit requirement, charges about $25/hour. Thus, IBM, if it remains competitive—and its price based on current overhead would have to be high—would be putting itself in competition with the independents. Many users claim (we're not surprised) that "superior SE help could be obtained outside."

3. Or, IBM could put a price on a certain number of SE's per system, as indicated above (1), but involving *all* SE help.

what might happen

IBM will probably put more emphasis on the following: use of the technical assistance centers around the country, possibly on a per hour basis, sometimes eliminating the more costly on-site SE for help in systems problems; use of hard-wired programming functions in the cpu, and (equally important) in special-purpose terminals to diminish the problems and responsibilities of the SE as well as the necessity of marketing and pricing some software.

If IBM did the latter, it would probably make the special functions highly reliant upon the software it develops; hence, the user would be stimulated into buying the software and the SE's. It could also develop applications packages for the small user a la the NCR approach—don't diddle with them, just slap 'em and run—which presumably is being done with the upcoming IBM 3.7 system, again diminishing SE requirements.

Education. Free customer education is said to have cost IBM $60-70 million last year. IBM does have some courses for a fee, such as a $1600 systems analysis course, but fewer than 1,000 students enrolled for such courses last year. Hence, with such costs and little return in cash, a battle has gone on within IBM for years about whether to charge the customer for all the free training and "orientation" he received.

IBM has several levels of education. There is the executive orientation course, lasting under a week, and numerous

more technical courses aimed at data processing management and at systems analysts, programmers, and operators.

The likely candidates for separation initially are those professional training courses for edp managers, programmers, etc. The executive courses, which are labeled the most brilliant "soft-sell" in the industry, might be the last to go because they are marketing tools aimed at enamouring the executive with the qualities of IBM.

Separate or not, users indicated that they would take advantage of many IBM courses. The company is considered to have one of the best, and the biggest, computer universities in the world. In fact IBM might wipe out many of the programming schools for the public if it attacked that marketplace. But here is IBM's "double-edged sword" to use in argument with the Justice Dept. IBM is not likely to want to extend far beyond customer or prospect education because to date it is a costly "bodyshop" business. If Justice says that its services must be offered to all comers, IBM can argue, if it wants, that many programming schools would not survive (not such a bad idea, say many).

As for courses like those offered by Brandon Applied Systems, University Computing, Computer Sciences, etc., said one executive of an edp education firm, "The demand for edp education is so great already that there would be little impact in separate pricing in edp management and operating levels." The separation of executive course prices could mean a slightly larger market for the competition, if they can educate the executive to the fact that IBM courses are slightly biased and not likely to teach him about such things as the economics of shopping around for the best equipment and price.

One market IBM could move into effectively is the non-data processing operating level management—the man who's responsible for turning out the company's widgets. Consulting firms see this as a great untapped educational market and an important one.

An education market IBM will surely not enter is courses to teach the user how to cope with separate pricing and selection of services from many vendors.

If IBM does not enter the public arena in education, therefore, few can see a great deal of impact other than cash for the IBM coffers. One systems engineer we spoke to indicated the fear, however, that if the user ends up paying more for a total package from IBM one of the "luxury" services he may eliminate or diminish will be education, to his detriment.

Looking down the road, the only other observation is that while education is currently that "bodyshop" business, IBM could expand its efforts and trim its personnel through the use of computer-assisted instruction. It already has such a program for its field engineers, who are partially trained and updated via terminals.

Maintenance. From a pricing standpoint, this would appear to be the easiest service to break out. (IBM already has a price tag on all maintenance for purchased machines and for rental equipment beyond the free basis nine-hour five-day week included in the rent. The user can enter into maintenance agreements for 9, 12, 16, 20 and 24 hours a day for five or seven days a week. Or he can obtain maintenance on a time and materials basis, paying for the field engineer by the hour and for parts. (One big user complains that the only one who charges as much as psychiatrists and plumbers is IBM maintenance.) IBM also has a 90-day warranty on all equipment.

As a matter of fact, the General Services Administration has almost guaranteed that maintenance will cut out; it has called for separate pricing on all rental edp equipment for the fiscal 1970 pricing schedules. Additionally, it has even asked for a discount wherever there are numerous units at the same location, although IBM has traditionally balked at discounts. GSA is also investigating the cost of maintenance to determine how much it pays for "low" reliability.

While it is conceivable that IBM's pricing method for maintenance will remain the same and that the charge to renters will be within a few dollars of that to purchasers, this does not preclude some changes. Most likely is a maintenance increase across the board, something IBM tried to do some months ago on purchased equipment only (subsequently rescinded). IBM does not make a profit on maintenance now for various reasons; increased reliability on some units costs more than the FE effort to make up for the failures of "less reliable" equipment, for one thing.

If IBM did raise its maintenance prices, its competitors would welcome it, since many charge more than IBM currently does on numerous units. It could also create a market for the independent maintenance firm, thus far excluded from almost all of the IBM equipment on rent (which accounts for 85% of IBM installations). Many users claim they would not defect from IBM on maintenance costs. Others are more cautious, saying they would stay with IBM at least "initially."

The report by the Boston Computer Group, Inc., on "Maintenance of ADP Equipment" completed in January for the General Services Administration, says that current industry manpower is about 30,000 men for the existing data processing and punched card equipment vendors. IBM must have at least 5,000 data processing Field Engineers (maintenance men).

waiting to move in

But the BCG report tells GSA that there are "several large and more stable organizations strongly desirous of getting into the maintenance business and can be developed as an alternative (to the equipment vendor)."

We already count Management Assistance, Inc., and the RCA service company among the few large active independents (RCA's field engineering for its own dp systems is separate from the service company). RCA has already captured a contract to maintain the 1500-1800 terminals for American Airlines that were developed by IBM's Federal Systems Division, and it is reported to be proposing maintenance of IBM computer systems at at least two installations. MAI is building up a stable of peripheral equipment which it markets and maintains (Memorex drives, Potter tape drives, a data inscriber). Depending upon what other peripherals are in the MAI plans, a user could obtain a 360 with MAI peripherals—and if a single vendor's peripherals account for the larger proportion of the system dollar, it "would be a short step to maintain the cpu," said one interviewee.

There may also be some opportunities for the small local maintenance firm, particularly in the small batch system market. We're told many entrepreneurs among IBM FE's are ready to resign to form such firms if separation occurs. Leasing companies are also in there fighting, setting up to maintain much of the equipment they have on lease. And although the peripheral companies association that was started last year is considered a good candidate to cooperate on a nationwide maintenance activity for all member equipment, we are told that the association is at least two years away from such a project.

the forceful approach

One IBM-watcher interjected a thought that almost all others we talked to rejected, but it's still worth mentioning: Should IBM separate maintenance, it might be coerced by the sophisticated user with a mixed-vendor installation to maintain the entire system for a fee. If IBM refuses, he suggested, this user might go to someone willing to provide

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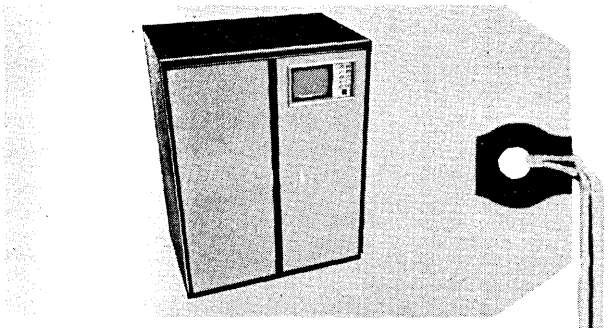

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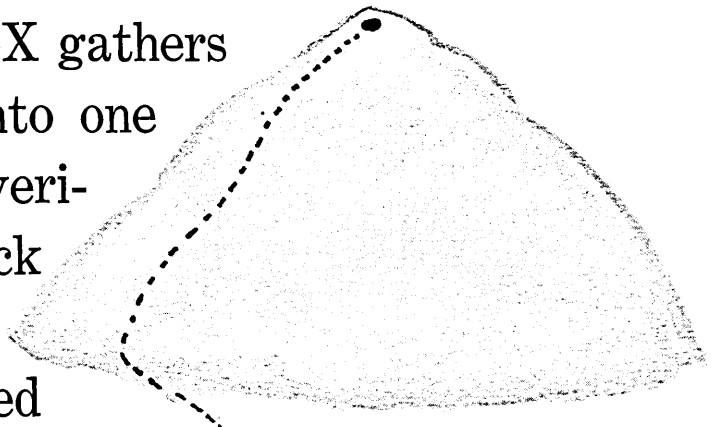

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such service if such a firm exists. In either case IBM is rendered vulnerable in the peripheral area. This source says that currently peripherals account for 55% of the hardware dollar in a system and will in the upcoming systems account for ⅔. Competition for IBM in the perpheral market is gathering strength, offering compatibility with IBM systems and better prices.

The counterargument to this suggestion besides IBM's unwillingness to do so, may be the other vendor's unwillingness to have IBM do it . . . although IBM has offered systems maintenance management contracts in which it diagnoses a system problem, contacts and notifies the non-IBM supplier if his equipment is at fault, makes monthly reports, recommends diagnostics, etc.

A few years ago, at one 15-vendor installation (second generation equipment) IBM made such a proposal but the other vendors resisted such management and would not provide training to IBM FE's. But the mere threat of such a move caused each vendor to keep the downtime of his part of the installation at a minimum, and the user ended up with a highly efficient operation.

Regardless of that one success, however, too many vendors at an installation can be a problem. If the user does consider the single, independent service company as a solution, he will have to be much more knowledgeable about maintenance and the problems he will face in selecting such a third party. Few computer users have ever paid much attention because service came with rental. Consider the following excerpt from the BCG report:

engineering changes

"The problem of engineering change would not be a major concern to the maintenance were it not of such high occurrence. As observed, it seems particularly high in the case of the System/360. Several installations visited report an excess of 300 hours of engineering changes still backlogged at the installation . . . the prevalence of such a high level of engineering change suggests that the equipment is partially being debugged and built in the field (at obviously high expense to the manufacturer). The fact does remain that the installation of such changes reduces equipment availability to either the rental or purchase user, and in the case of the maintenance agreement apparently is performed at the expense of preventive maintenance time—which the user is paying for."

The single problem of engineering changes suggest that there would be problems for the non-vendor service man. How can he keep up with them? Is IBM obligated to provide him with the documentation to do so. On rental equipment it would seem to be to IBM's advantage to keep its equipment up to date. Too, this also suggests that the 90-day warranty provided on equipment is extremely short for such expensive equipment. In other words, it is felt that IBM would have to provide a warranty that is more reasonable, including all engineering changes that must be made to meet *carefully drawn up* specifications of performance.

Even if engineering changes are made as part of the hardware contract, any service man must be aware of them. Here are some further problems for the third-party firm: the field engineer must be trained and BCG says that it costs $7,500-$12,000 to recruit, train, and place a technician; the firm must obtain documentation, another cost item; parts must be maintained in inventory, readily accessible; some means must be found to repair some parts to keep costs down; and in order to keep his inventory down to a reasonable minimum, he must have historical records on the units he maintains so that he can tell what parts have the highest frequency of failure and store accordingly.

The BCG report says that parts are 10-20% of the total maintenance costs. The third-party firm would have to pay the manufacturer's markup of several hundred per cent on these parts, and often he would have to buy a whole assembly just to replace a faulty element in it. If he knows his business, he has a list of non-IBM manufacturers who can supply certain parts that are not unique to the IBM system and therefore made not only by IBM. IBM, of course, has parts centers all around the country: support centers in eight metropolitan areas, distribution centers in New York, Dallas, Los Angeles, and Atlanta, and a few major depots, one in Mechanicsburg, Pa.

Since IBM does not rebuild parts or offer a trade-in, if third-party service firms do become a factor in the industry, there may be a place too for the local repair shop that specializes in repairing items like power supplies, mechanical assemblies on peripherals, etc.

how to shop

Thus, if you're looking for a good independent service firm for IBM equipment it's the one that ideally has IBM-trained FE's, well kept historical records, carefully selected items to maintain, location near parts centers, excellent knowledge of parts manufacturers, and maybe even a repair shop on-site or nearby—among other things. (But if you get into equipment that uses new techniques like Large Scale Integration, you're probably better off using the vendor's service, since the independent service firm may be discouraged by the spare parts investment.)

One last consideration that speaks against defecting from IBM on maintenance: if the service firm contracted for does not perform well, IBM will take on the contract again. But the equipment must meet IBM specifications and if it does not, IBM will bring it up to spec if possible . . . but at a price. On the other hand, it will be to IBM's advantage to make sure its rental equipment is kept up to spec, so it may issue well-documented standards and may even provide limited training to the user's non-IBM service man.

There's bound to be some kind of a market for the independents just because there will be a price tag on maintenance, and because of the mixed-vendor installations.

The federal government may be a good customer at some installations. At least, the BCG report indicated it was interested in a definite alternative to vendor or in-house,maintenance.

But the user is warned to sharpen his knowledge on how to select and contract for such services.

many paths

As we've already indicated IBM will probably use or consider using several different techniques to offset or complement the effects of any separate pricing policies. As noted earlier, there is computer-assisted instruction for its education courses to cut down on the personnel problem, the integration of software functions into hardware (cpu and special purpose terminals) to alleviate the SE and software marketing problem, model easy-to-run applications packages for small systems. Use of LSI circuitry, whether IBM cares or not, may discourage independent service companies because of the extremely high cost of parts replacement.

But, in addition, IBM is also utilizing a higher purchase-rental ratio on its newer equipment, which thwarts the purchase of computers—and hence the leasing industry. But it can increase cash flow through the sale of services and software, previously paid for monthly in hardware. This also helps the other mainframe makers who follow suit.

If the current squeeze on IBM's peripheral market (how do you squeeze an elephant?) is compounded by forcing IBM to maintain mixed equipment installations or by third-party services firms able to do so, IBM is bound to make several moves to protect this market, from cutting prices . . .

to integration of the control unit into the central processing unit. The latter is another one of those rumors. IBM is reportedly considering integrating the control units, scattering the CU logic to take more efficient advantage of the nanosecond cpu logic. Such a move would require that the foreign peripherals attached to it be "totally" compatible with IBM peripherals. Further, the CU integration may cut the price of these "boxes," offsetting the higher costs of IBM peripherals. Some users may not stand for this lack of flexibility in attaching foreign units, but small and medium scale users wanting to stay with a single vendor may welcome the economic tradeoff.

In any case, you can see there are many avenues open to IBM. With Vincent Learson and others like him at the helm of IBM management, it's not likely that the company's profits will suffer, even if eventually its share of the product and service markets is diminished.

the end result?

The interviewees guessed that IBMs' initial announcements will involve unbundling of professional training courses, Type II software, maintenance, and systems engineers. Type I may be forced out, perhaps in bits and pieces, later, as may the executive orientation courses. Those initially separated services will mean the basic rental price will decrease by 10-12%, we're told, while the total package will mean a 10-15% (or even 20%) increase . . . depending on who you talk to.

Everyone expects most of the users to maintain the IBM security blanket, subscribing to most IBM services, no matter what the price. Said one software executive (and this would apply to other services), "Separate pricing won't make a bit of difference until independent software houses come up with products and maintenance that are superior to IBM. There isn't any independent that can handle what IBM does. However, the industry is maturing and, in three years or so, things may take shape and there will be real competition. Quality and economics will be the key factors in determining which firms will survive."

effect on competition

Does separate pricing mean merely that there will be 2,000 instead of 1000 new software firms, 50 instead of 10 new maintenance firms, because the industry has been so bullish in its growth already? We were told: "Any time you put a price tag on a product or service, especially when it involves most of a market that has never been available to non-IBM firms, you must end up with a market for competitors that is at least a few percentage points bigger than it was. And a few percentage points to IBM may mean the doubling and tripling of someone else's business."

One executive of a computer manufacturing firm confidently predicted that IBM's share of the market would decline to 50% during the 1970's. And this would happen not only because of separate pricing, but also because there is strong competition developing in terminals (to account for 20-30% of the market by the 70's, it's guessed), in peripherals, in communications-oriented systems, and in many special markets, like process control.

(We asked Richard Brandon what he thought would happen in the long run, and, after allowing for some unstartling growth in competition, quoted Lord Keynes, "In the long run, we are all dead.")

It remains for the computer manufacturers to outwit IBM, as always. Burroughs has already shot up some trial balloons, by separating software on small new systems, like the TC-700. Scientific Data Systems already separately prices its COBOL and a linear programming package. Univac has never included maintenance in its rental price, but as to further separate pricing has stated that it did not consider it feasible. Honeywell has already set up a software company under its service center operation, apparently in preparation for the new policies. Control Data has its institute for education, including maintenance training. RCA has a unique option that most don't have: it can have its users buy IBM applications programs—if IBM makes them generally available—to run under the Spectra computers with only minor modification, we're told.

The more scientifically oriented firms, like SDS and CDC, will probably not go too heavily into the software area to compete, because the needs have never been as great as for business data processing, and the "people problem" is fierce. We may see some of these manufacturers making more licensing agreements with service firms in any of the above areas, in an effort to provide total packages. We may see some manufacturers continue to bundle their services and hardware to see what kind of a competitive edge they can gain. And some may follow IBM's lead, but configure their prices and services differently.

Manufacturers like Control Data are trying very hard to develop their OEM markets to drive up the volume of production and bring manufacturing costs down—in an effort to compete more strongly should IBM "expose" its relatively low product cost in future prices.

follow the leader

Generally, the marketing ability of IBM competition must be improved immensely to compete with IBM's high-incentive force. Management in some instances would do well to copy the IBM style, which on some levels, such as branch management, provides great flexibility and stimulus.

And, the industry must surely get over its case of what Parkinson calls "Injelititis," induced inferiority, to IBM. We refer them to a book called *Management and Machiavelli,* for finer points on how to wage corporate warfare.

And ah, the user. He will pay. But he will also have a choice if he knows what to do with it. The first thing he will have to do is set a time limit on all the salesmen that he will surely be seeing. They'll be hawking: a software package at 10% less than IBM, consulting services at $10/hour less, maintenance "equal to" IBM's price but "better in quality and mixed equipment coverage," peripherals and mainframe manufacturers with their own set of products and services claims, facilities management companies that would like to run the user's installation, etc. In other words, management will be forced to consider the economics of systems, even if it stays with IBM. He'll also need a lawyer to draw up the contracts.

Facilities management looms large, in the opinion of those we spoke to, as a possible "boom" area. Users now secure with IBM may become confused by the prices thrown at them and abdicate in favor of "letting someone else do my computing just as someone else services my car." Good facilities management houses presumably will know how to mix equipment and software, we're told.

But just as a final salvo at those who may think IBM does not have a contingency fund for that too, we bring forth Federal Systems Division, which has about 12,000 people, a manufacturing facility (Electronic Systems Center, which can make everything from 4-Pi military computers to special purpose terminals for American Airlines), a large stable of programmers and systems analysts, and about half a billion dollars in annual revenues. It has been doing systems management for the government for some time and has a growing group of about 200-300 doing similar projects for industry. It's run by a crack businessman, B. O. Evans.

On the other hand, Applied Data Research has complained about FSD in its suit too. . . .

If this treatise has done little more than confuse the issue, the issue does not need our help. One bright marketing manager, in considering all these arguments, did provide us with one sure-fire solution: IBM and the Justice Department should merge. ■

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SEMICONDUCTOR MEMORIES: EVOLUTION OR REVOLUTION?

by Robert F. Graham

The answer to the question in our title rests with the computer manufacturer.

Using today's standard machine organization, presently available semiconductor memories allow him higher speed. Semiconductor memories now in development will permit lower cost equipment of an evolutionary nature. However, if the machine designer takes a new look at the cost-performance trade-offs available through semiconductor memories and reorganizes his machine to take advantage of these new trade-offs, there is a revolution in the making.

the evolution

Let us look first at the evolutionary situation we see today:

Fig. 1 (p. 100) shows an approximation of the prices we can expect versus access time for the presently available memory technologies. In order to obtain maximum accuracy, a third dimension of *memory size* should be included; however, for our purposes these parameters will suffice, since price tends to dictate the extent of utilization.

In Fig. 1 memory technologies are compared using access time as a parameter. Such a comparison may be less than fair to semiconductor memories, for full cycle time for cores and/or other destructive-readout technologies is about three times the access time; for semiconductor memories, access time and full cycle time are really equal.

It can be seen that semiconductor memories will give more performance per dollar than any of the technologies shown. With the exception of the slow mass stores such as drums and discs, semiconductor memories can even give more storage per dollar. For the purpose of this article, we will not attempt comparison with slow mass stores because it is doubtful that semiconductor memories will be able to compete on a cost/bit basis. Usually such memories also require additional characteristics that would be difficult to obtain with present semiconductor technology.

If you have seen the prices semiconductor manufacturers

Mr. Graham is director of marketing for Intel Corp. He has held marketing positions with Fairchild Semiconductor and ITT Semiconductor and most recently was deputy general manager of ITT. He has a BS in electrical engineering from UCLA.

are now charging, you must feel that the author is dreaming with respect to the semiconductor prices shown in Fig. 1.

This points up the need for a fourth axis on our chart of Fig. 1, and that is volume. (Very competitive prices are being quoted even today, but as you know volume is a real requirement.) A typical price-volume relationship for a long (approximately 1,000 bits) register would be as shown in Fig. 2, where the price drops quickly from 5¢ per bit to well under 1¢ per bit. In order to place this volume requirement in proper perspective, we must consider further the origin of the costs of a complete memory in the competing technologies.

Even in large thin film and core memories, 30-50% of the cost is in the peripheral equipment. Under 100K bits, the peripheral costs become prohibitively high. In semiconductor memories, peripheral costs are less than 10% of the memory cost and tend to remain less than 10% regardless of size.

It has already been determined in practice that even at modest volumes semiconductor memories can compete in the scratch pad and buffer areas. A pleasant surprise awaits the user who considers the use of semiconductor memories in large volume mainframe designs.

The modest volume user can also utilize leverage in getting competitive prices by buying reasonably standard configurations where his volume can be added to that of other users.

A Key Point: The cost of a thin film or core memory depends primarily on its size. The cost of a semiconductor memory depends on the total number of packages purchased by the user whether they are used in one large memory or many small ones.

The Pitfalls: To indicate there are no problems associated with this new technology would be an assault on your sensibilities. There are problems. Only now is the semiconductor industry learning to control processes to the extent which will allow usable yields of large and complex circuits. Fig. 3 indicates the progress made over the past years in the number of components per 100 square mils.

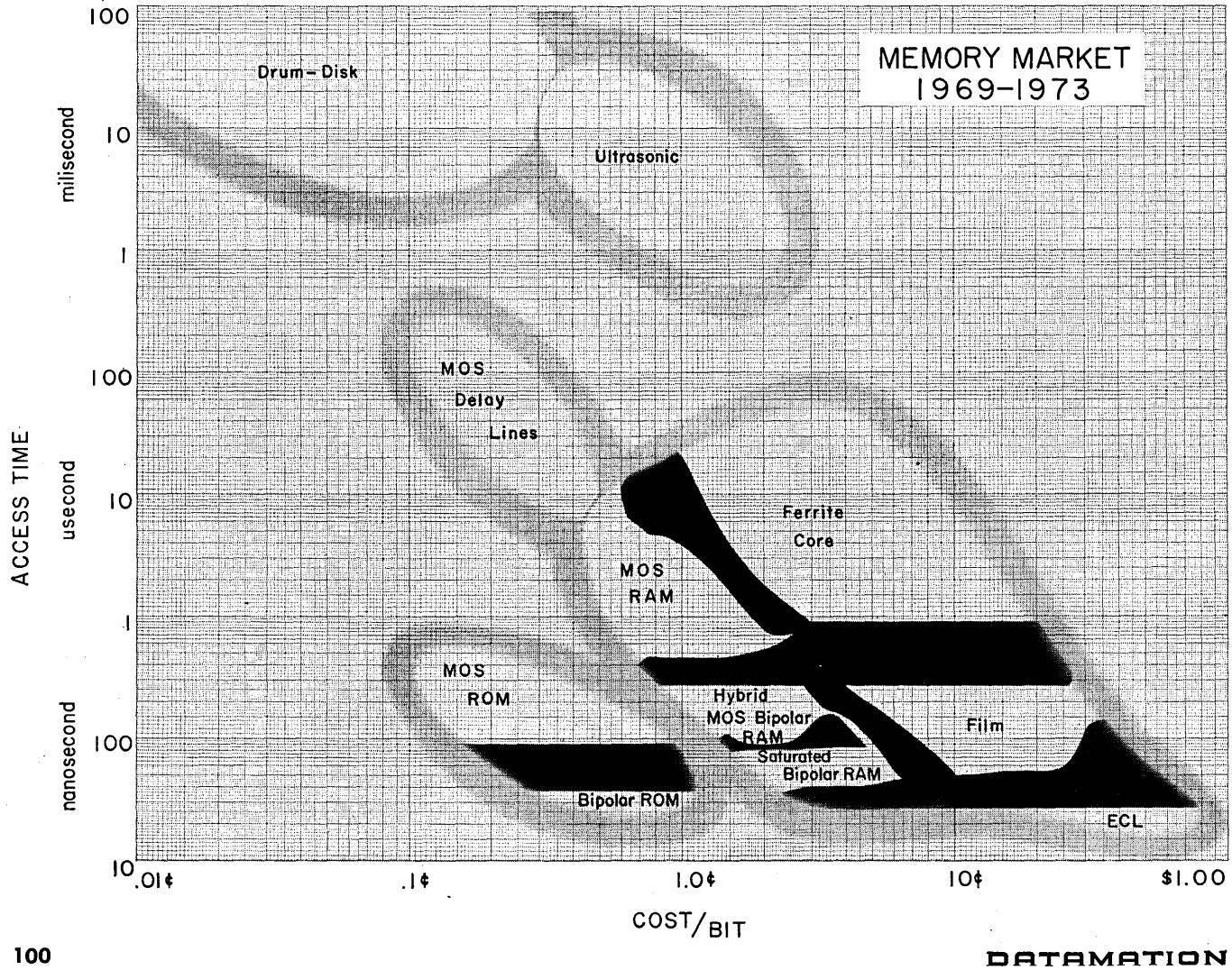
Fig. 4 (p. 103) indicates what has been done in increasing the size die and silicon wafer which can be utilized. In order to properly carry fabrication and assembly processes to a satisfactory yield on large arrays, semiconductor manufacturers will be required to make substantial investments in modern facilities and equipment. In each case, improvement required to meet project prices is noted.

In order to compete broadly for memory business the semiconductor manufacturer cannot limit himself to bipolar or MOS technologies since he will require not only sophisticated efforts in both, but in addition, the ability to combine the technologies in a single package.

a word about the technologies

The bipolar technology is similar to the one used in computers today and has speed as the prime advantage. It uses more area (a factor of 3) on the silicon and costs more to

Fig. 1. Approximation of prices versus access time for presently available memory technologies.



process (a factor of 2); but because of its low thresholds, low impedances and high transport factors, it cannot be equaled in speed by the MOS (Metal Oxide Silicon) device.

A full description of these two technologies is beyond the scope of this article, but the February, 1968, DATAMATION article, "Large-Scale Integration: A Status Report," by Don Farina, is a place to start.

With the above process controls, equipment and facilities, the design and production of scratch pad and buffer memories are well in hand. To realize semiconductor mainframe memory, new techniques must be moved into the production environment including:

1. Beam lead or use of raised contact flip chips.
2. Assembly of many chips into one package.
3. Multi-layer interconnections—both on the chip and within the package.
4. New packaging concepts.
5. New testing concepts.

Item 1 (beam lead or raised contact) has developed a great deal of emotion among semiconductor manufacturers, primarily because either one would be satisfactory and neither one has been shown to be low cost as yet. One of these techniques will be required if we are to build multichip hybrids with many contacts per chip. A comparison of the structures can be seen in Fig. 5 (p. 104).

Both structures are normally flipped over and mounted face down on the "mother board." The beam lead approach has the advantage of a very flexible lead which can be easily deformed to make a good contact to the ceramic or other substrate which acts as its mother board. Forming the beam leads is done at the wafer stage, which makes it a batch process and, therefore, hopefully a low cost process.

On the minus side, beam leads require larger chip-to-chip spacing on the silicon wafer and, therefore, waste a very expensive commodity: silicon area. They are also difficult to handle and automatically align when in the chip state, and contacts can only be placed at the periphery of the chip. There is, in addition, some question as to the consistency of the thermal dissipation on devices attached in this manner.

The raised contact approach manages to overcome the disadvantages of the beam lead technique quite nicely, but in the process manages to generate some of its own disadvantages. Since the contacts are under the chip in the form of bumps when it is mounted, we must be able to assure that sufficient deformation takes place at all bumps to assure good connections. An additional consideration in raised contact devices is that they are rigidly attached to the mother board and, therefore, the contacts must absorb shock and vibration levels which are higher than the beam lead devices where the flexible beams absorb some of the shock.

The raised contact with its area advantage and greater handling ease would appear to have an edge conceptually, but since either technique can be made to work, it remains to be seen which will be most economical in production.

The above technologies are within our grasp and will handle all read-write memory applications up to mass store. They will also handle read-only memories (ROM's) of the long turnaround or highly repetitive types such as character-generators, tables, etc. Nevertheless, to satisfy the majority of ROM requirements effectively, new technologies must be developed that will allow the user to set the information into the memory at the computer site rather than require the semiconductor manufacturer to perform this operation. While many ROM approaches are being investigated, none appear to be close to transfer to production.

At first glance, the problems in competing broadly in the memory area appear formidable, but (except fast turnaround ROM) required technologies have been developed and many are presently being applied to cost reduction programs for all types of semiconductor devices in production today. Semiconductor companies who have the ability to bring dynamic, technology-oriented pressure to bear on the production problems will be the first in line with a complete solution. If the user can find such companies and can bring equivalent pressures to bear in his own organization, he will find little cause for worry.

the revolution

The evolutionary development of semiconductor memories is assured. The market is extremely large and the cost-performance advantage is great. An even greater advantage which semiconductor memories bring to the user is the opportunity to re-examine the relationship between hardware,

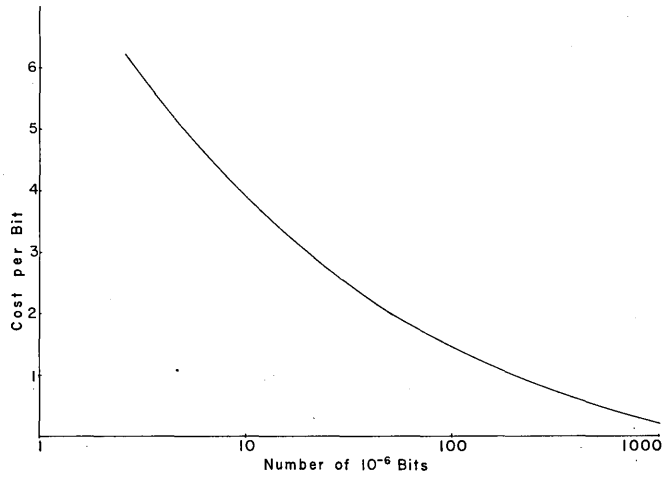
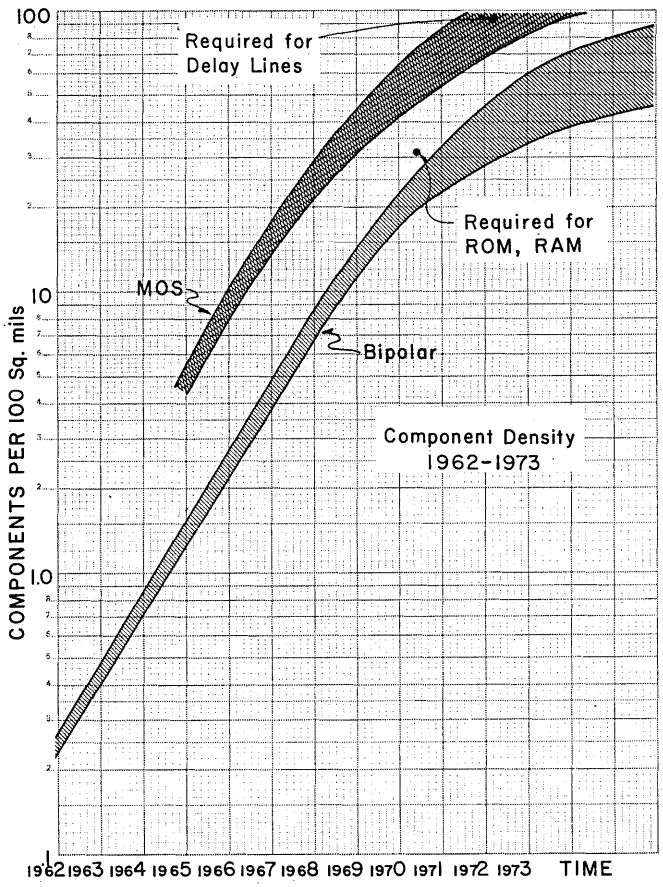
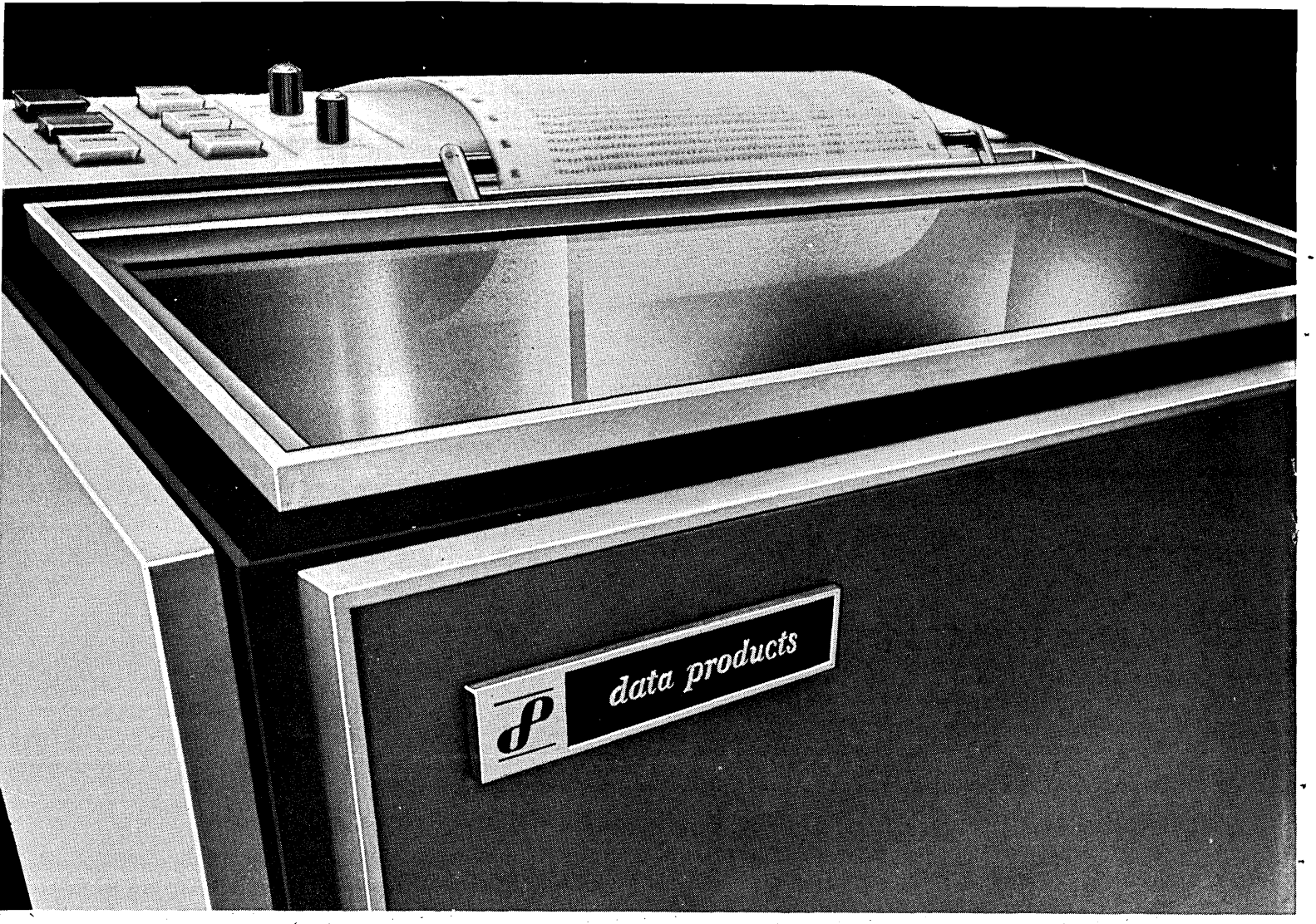


Fig. 2. Typical price learning curve—long shift register.

Fig. 3. Progress made over the past years in the number of components per 100 square mils.





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As a manufacturer of semiconductors, rather than computers, we can only make observations based on what appears to be useful. The manufacturer of computers must decide on the degree of usefulness, and he is really the one to develop the proper techniques for maximum effective utilization.

Access Time = Cycle Time: Non-destructive readout (NDRO) and the fact that address decode on semiconductor memories is a major portion of the cycle time means the read-write cycle is only 10-15% longer than the read-only time. A semiconductor memory with access time of 250 nsec can be interrogated three to four times faster than a core or film memory of equal access time. Writing into the same cell to change the data will cost only an additional 20-30 nesec. To access a cell and write only is faster than the access read-only cycle.

The non-destructive readout characteristic of semiconductor memory is a free characteristic and may simplify the peripheral circuitry now used for intermediate data storage. Although some of the competing technologies can provide NDRO, it cannot be done without sacrificing cost or some performance characteristics.

Logic Capability: Both bipolar and MOS technologies allow logic levels which are compatible with the other semiconductors in the computer. Because of the significance of the cost of peripheral electronics, the configuration of the core or film memory is to a large extent determined by the attempt to minimize this cost. By including address decoding on the semiconductor memory chip, most of the peripheral electronics cost is eliminated, and a given chip can be used to build a very wide variety of memory structures.

If each semiconductor memory element uses static logic circuits, a memory may be built with a minimum of additional registers, possibly not even requiring a storage buffer register. If outputs can be "or-tied" and an enable input is provided on each memory element, large memories can be assembled from the elements with a minimum of additional hardware. Fig. 6 (p. 104) illustrates the ease of adding elements to increase the number of bits per word, while the number of words may be increased by decoding additional address bits, and applying the decoded outputs to enable inputs of several such assemblies.

Sequential Address: In certain memory applications, access to addresses may be in nearly consecutive sequence. Advantage may be taken of the highly parallel access available in a large semiconductor memory to effectively reduce the access time of the memory. For example, in a 4096-word memory *realized* with 256-bit semiconductor chips, 16 words may access in parallel. By arranging the memory so each such set of 16 words has consecutively numbered addresses, the average access time per word may be significantly reduced. Such parallel access might be utilized by providing 16 words of very fast access read-write storage to store the parallel-accessed words, then rewrite the contents of the fast-store into the large store (necessary only if writing has taken place) before going on to the next group of 16 words.

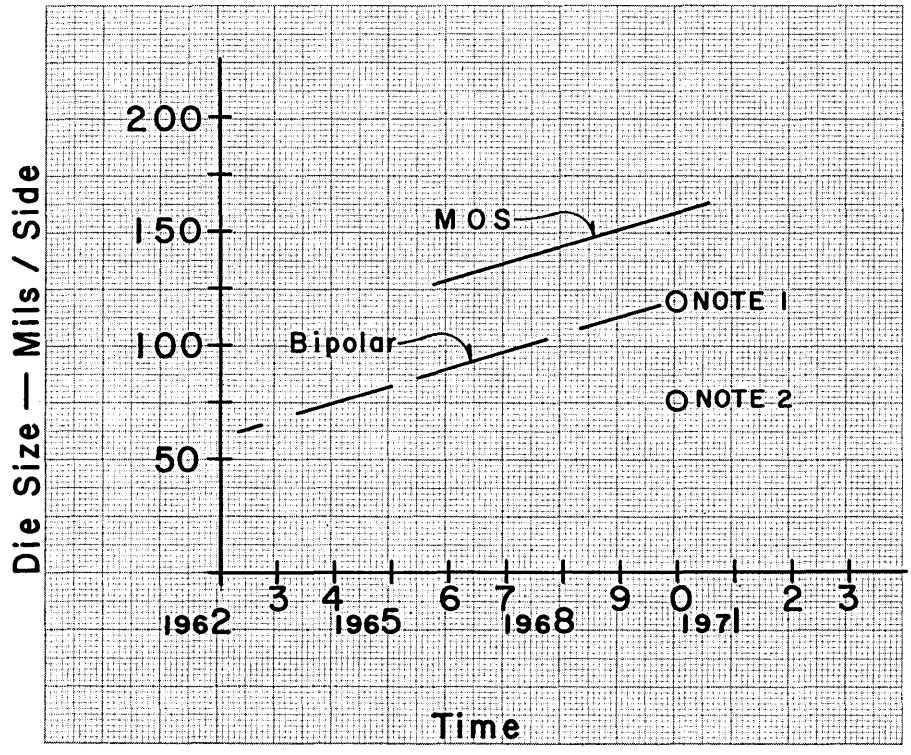
Such organization might be used to provide higher data rates than are now available with serial memories (delay lines—shift registers) and yet have much shorter access times than serial memories have.

cost

Semiconductor memory costs are a function of how many total bits are used, not how large each memory section is. For all practical purposes, it will cost no more to use many local memories placed throughout the computer than to try to use one large central memory. This should give the designer much greater flexibility and permit more parallel operation. Buffers for queuing of data through slower parts of the computer become more economical. In general, very significant restructuring of the computer becomes possible when memory function can be distributed.

Power Restrictions: Most semiconductor memory cells can hold information at much lower power levels than are required to transfer information at high speeds. The speed-

Fig. 4. Die and wafer size.



WAFER DIA. (INCHES)	IN PRODUCTION (YEAR)
3/4	1958
1 1/4	1962
1 1/2	1964
2.0	1967

NOTE 1
Complexity required for cost competitive Bipolar and MOS RAM.

NOTE 2
Complexity required for cost competitive MOS Delay lines.

power product can be reduced by significant factors by using clocked power supplies to enable the bit addressed. This technique can even be applied to bipolar memories. Large bipolar mainframe memories should be feasible, using practical amounts of power while providing extremely even high speeds.

10 usec Memory: Referring to Fig. 1 again, there is a noticeable lack of memory capability between the slow (millisecond to many seconds) mass memory and the faster (one usec) mainframe memory. Circulating MOS registers organized to give access to any bit position within 10 usec and at a cost in the area of .5¢/bit are well within our grasp.

This would provide high speed bulk memory capability for systems involving large amounts of data and as a storage for subroutine programs and compilers. In addition, highly parallel transfers from semiconductor bulk memory of this type and semiconductor mainframe memory should reduce overhead in time-shared systems, and in large linked programs.

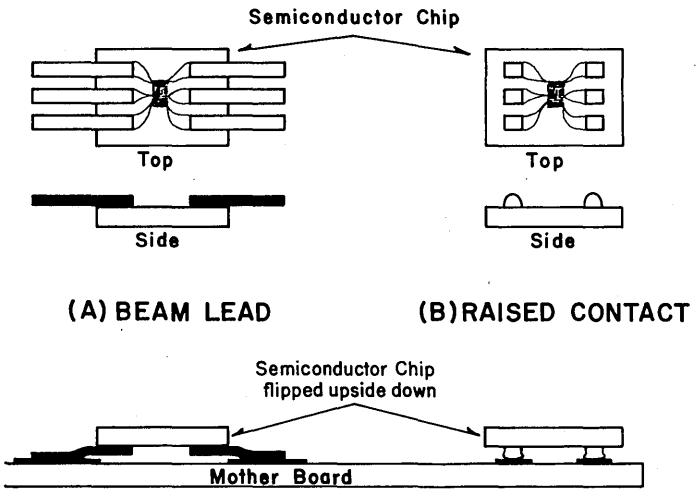
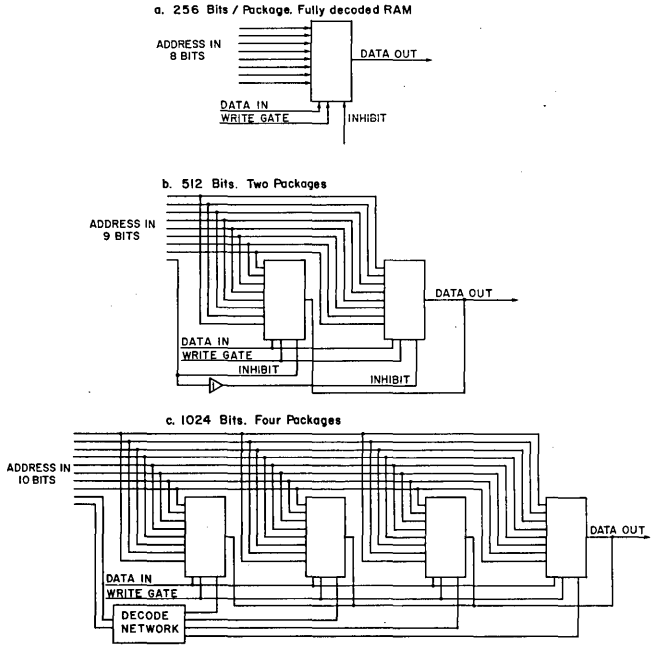


Fig. 5. Comparison of beam lead and raised contact chip structures.

Fig. 6. Adding elements.



Serial Registers: Many computer data transfers are most easily done serially. The lowest cost semiconductor memories can be built utilizing recirculating registers. These registers will be able to operate at speeds of about 100 usec with bit rates of 5 to 10 Mc and should cost about .2¢/bit.

Content Addressable Memories: As the semiconductor manufacturer learns to produce more and more components on a single silicon chip, reasonably sized content-addressable memories may become feasible. Memories of this type, available on a large scale, should permit significant changes in the machine language of the computer, and possibly provide simplification in the design of such software as operating systems and compilers.

Random Access Memory Developments: Well back in the laboratory considerable work is being done to develop semiconductor technologies for producing random access memory systems at only three to four times the cost of serial registers, but for the foreseeable future these must be considered in the "blue sky" category. With all of the other technology still to be utilized, these new technologies are not required for our evolution to take place.

Pitfalls: The pitfalls we may encounter before proceeding into the "revolutionary" phase of computer development are the same as those in the "evolutionary" phase, but the timetables are extended because they require in addition to the new components, completely new approaches by the computer manufacturer. The required technologies will surely be transferred to production status before new systems can be developed to the point where they need large volumes of components.

conclusions

The performance shown in Fig. 1 for semiconductor memories can be demonstrated today. The prices shown are either already being quoted today or are being forecasted for the near future. If history repeats itself, the forecasted prices are high. The semiconductor industry has a habit of overestimating their projected costs.

The computer manufacturer has the ability to control the speed with which the "evolution" gives way to the "revolution."

At the present time, semiconductor hardware (including both memory and logic) is only about 10% of the cost of a computer. By making greater use of the increased flexibility, very low cost, and high performance of semiconductor memories in the design of new computer systems, the designer will:

1. Greatly improve the performance of the computer, while reducing the cost.
2. Provide simpler interfaces to I/O equipment via increased use of small buffer memories. I/O software should also be simplified.
3. Utilize distributed memories to permit more efficient use of computer hardware, and to provide additional machine operations in an effort to simplify software design.
4. Provide much greater capability for rapid exchange of data and programs between mainframe and intermediate storage, so that lower cost time-shared systems are possible.

Many computer and memory systems houses are already moving into the evolutionary period, as are most semiconductor companies. The large revolutionary gains will come as the computer manufacturer begins to have confidence in his ability to utilize semiconductor memory and as the large, broad-line semiconductor companies join the emerging semiconductor memory specialists to encourage *full utilization* of this new approach. ■

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MICHIGAN'S LAW ENFORCEMENT INFORMATION NETWORK

by John R. Plants

The law enforcement community of Michigan realized in late 1965 that the existing methods of operating files of wanted persons and property was becoming unwieldy and inefficient. The increasing rate of crime and the ever larger population put such pressure on manual file systems that they could not function adequately. It was not uncommon for an individual to be stopped by one police jurisdiction and released although he was wanted on criminal warrants by one, or more, neighboring agencies. Since there was no central wanted file, an arresting department had to know precisely where to check to learn if a person was wanted.

Although the Michigan State Police maintained the central identification record file for the state and the most complete wanted vehicle file, the processes for getting into these files, both for inquiry and updating, was often too cumbersome except in the more serious cases. For this reason, the records were fragmented and quite provincial in nature.

Another problem, although not as serious as the wanted records, was in police communications. The lack of a statewide Teletype system placed a heavy burden on the radio networks, and as a result they were often overloaded with rather trivial, but necessary, traffic. A system covering the southeast part of the state was operating but was an old slow manual switched network that was no longer compatible with the modern needs of the police. A modern system of computer switched terminals was necessary to reduce radio traffic and conserve its potential for more important functions.

The solution to these problems was the establishment of the Michigan Law Enforcement Information Network, commonly referred to as LEIN. This system is essentially 145 terminals based in nearly every major police department in the state as well as in some other governmental agencies and tied to a central computer based information file. The network is guided by an advisory board consisting of representatives of sheriff's departments, local police agencies, state police and the Michigan Attorney General, Secretary of State and Corrections Departments.

outside help

The Michigan State Police correctly decided early in the project that they did not internally possess the expertise for designing and implementing the system. The selection of a technical staff was the first step in the process. We were fortunate in obtaining the services of Mr. David R. Fergason who became, and still is, our chief of data processing. We also recognized that although many people were talking about the type of system we wanted to build, none was really operational in early 1966. We asked for proposals from consulting firms to assist us in the study and design of the network and selected the Systems Science Corp. for this purpose.

The equipment selection was based on the needs of the system design and was made by a selection committee composed of the major computer users in state government, the Michigan Management Services Div. and the Michigan State Police. The vendor selection and system design was not completed until late August, 1966, and we expected to go on the air in April, 1967. While we did not make that deadline, we were in operation by July, 1967, and have been continually since.

The system has three major files: wanted persons, wanted vehicles, and revoked or suspended drivers. The latter file is one which is normally maintained by the Michigan Department of State but is being temporarily provided by LEIN until their automation is completed. The files are extensively cross-indexed.

flexible

The name index uses an expanded Soundex principle, i.e., vowel stripping, elimination of duplicate consonants, etc. This is done to cause all "sound-alike" names to be concentrated in one of 999 subfiles. Upon inquiry, the name

Capt. Plants is commanding officer of the Michigan Dept. of State Police's Executive Div., which exercises supervision over the data processing, planning and research, management improvement and capitol detail sections, and has directed the Michigan Law Enforcement Information Network since its inception. He has a BA in public administration from Michigan State Univ.

is similarly stripped and points to one of the subfiles which is completely searched. An inquiry may produce several possible responses, and it is the responsibility of the inquiring officer to determine if he has an actual "hit." Since all responses are weighted according to identifiers, the greater the quantity and quality of inquiry information, the better the chances of a unique hit. An inquiry by an absolute number, such as drivers license number, social security number or system identification number will produce an absolute hit if the person is in the file and has corresponding information recorded.

A hit, or positive response, is based upon a system of point values assigned to various identifiers. We assign a base of 48 points to the search as a programming technique. If it becomes necessary to alter the threshold at which we consider a response to be positive, we need only alter the base figure and do not need to extensively alter the search program. While many other systems require identical information for a positive response, we think the flexibility of the LEIN technique is readily apparent.

One of the most desirable features of the LEIN is that any file additions, modifications and deletions can be made from the remote terminals. All transactions are first captured in paper tape in an off-line mode. We use model ASR 28 Teletypes, and the paper tape serves as an inexpensive local buffering device. When a message is ready to transmit, a key depression creates an interrupt at the computer which then polls each station on the line. We refer to this technique as a hybrid since it contains the good features of both a polled system and of a contention system.

Prior to the hybrid system we used a polling technique which polled each station several times each minute. This required the mainframe of the computer to generate several million polls each day, 90% of which served no real useful purpose since the terminals had no traffic to send. The hybrid method has significantly reduced this polling load.

We maintain tight line and terminal security and only a station that inserts a record can modify or delete it. We maintain this security through a combination of checking the line number, terminal hardware and typed identifiers. Under normal operating programs it is not possible for any station to counterfeit its identity and perform untraceable functions.

Many information systems use a batch method of file maintenance and this is undoubtedly the simplest to operate. This is not something with which police can live since early entry into the file enhances the opportunity to apprehend the wanted person. We have cases where persons entered into the file from one remote location were apprehended by another jurisdiction minutes later on a routine traffic check. While fast entries are important, fast cancellations are more so. Citizens who have satisfied traffic warrants or have had their driving status restored expect immediate removal of all wanted notations. This requirement alone justifies the time and money necessary to establish an on-line updating system.

Typically, an inquiry originates with a police officer on the street who radios his request to a base station that has a LEIN terminal. The terminal operator inserts the request into the system and an answer is returned, usually within 10 seconds. The answer is then transmitted to the officer by radio. We are presently working with some manufacturers of police radio equipment to provide the ability to make inquiries directly from the patrol car into the computer files and return, bypassing the desk officer, or terminal operator, completely. The availability of small mobile teleprinters makes the route from the computer to the car much simpler than from the patrol car in, and it is this phase which needs extensive development. Equipment of this type is necessary if police information systems are ever to realize their full potential because it does little good to have a computer-based network capable of returning information in a few seconds if a terminal operator, overloaded with other work, takes 15 minutes to get the inquiry on its way to the files.

LEIN also provides a complete store and forward message switching capability to the terminal users. Each terminal may send point-to-point messages to any or all terminals on the network. A message destined for a terminal that is busy or inoperative is stored in the computer until the condition no longer exists and is then sent. For the convenience of the users the state is divided into eight broadcast areas which range in size from a dozen to 87 terminals. A single input message can automatically be sent to all stations on a broadcast net without further concern of the terminal operator. This capability is also allowed on file updates. A stolen car message, for example, entered by the Detroit Police Department can be broadcast to 87 terminals with the same message that updated the vehicle file.

All messages are time and date stamped and given computer-assigned identification numbers which indicate the total number of system messages, the total number to each individual terminal, the station number, and the originating station. Message recall for a 24-hour period is also provided. One indicator of the effectiveness of the message switching/broadcasting feature is the drastic reduction in radio traffic through the Michigan State Police Operations Office. This facility is the central police radio broadcasting operation in the state, and since the inception of the LEIN its radio traffic has been reduced by over 60%.

The LEIN is presently connected to the National Crime Information Center (NCIC) operated by the Federal Bureau of Investigation in Washington, D.C. NCIC has been in operation since January, 1967, and serves as the national depository for computer-based records on wanted persons and property. Our link to NCIC provides each of the LEIN terminals with an automatic entry to these records. All felony wanted entries to the LEIN are programmatically reformated and sent to the NCIC for entry into the NCIC files, as are all stolen and wanted vehicles and inquiries that meet NCIC criteria. LEIN does not as yet have a stolen article file; therefore we provide a message switching function so that each of our terminals can enter information on stolen guns and other property directly into the NCIC. We presently interface with NCIC on two 150 baud lines, but we anticipate upgrading into a 2400 baud line by July, 1969.

The LEIN, through the message switching function, provides our users with entry to the Michigan Department of State (DS) which maintains the state's files concerning drivers and motor vehicles. Searches of these records have been made manually in the past and have not been fast enough to meet the needs of the law enforcement community. The Department of State has been engaged in automating their huge files for two years and are currently able to offer remote terminal searches for a large portion of their files. The necessary software has been developed to link the files with the LEIN terminals. We have installed a 2400 baud line to the Department of State, and our terminal users are able to access information in the DS files and have their information checked in the LEIN files and the NCIC files with the same entry.

The Detroit Police Department has established an internal network, and we expect to connect with their system as soon as ordered equipment is delivered. Our experience in the LEIN-NCIC link will assist us with the Detroit Police Department link since both NCIC and Detroit Police have IBM/360 systems.

The communications portion of LEIN consists of 145 terminals in 120 jurisdictions. The Detroit Police Department, for example, has nine terminals, as does the Michigan State Police Headquarters. These terminals are tied to the computer center through 74 lines of 75 baud capacity. We selected the ASR 28 terminals for several reasons but the primary one was cost. We make extensive use of the state

Telpak network, and it would have increased our already considerable line costs by three times if we had selected 150 baud ASR 35 or some other ASCII terminal. We feel that our 100-wpm ASR 28 terminals give us the necessary speed and buffering we need, as well as reasonable line costs. In addition we have the two 150 baud lines to NCIC and the 2400 baud line to the Department of State mentioned earlier.

the files

The central computer equipment consists of a Burroughs B-5500 with two processors and eight memory modules which provide 262K characters of core storage. In addition we have three I/O channels, an 800-cpm reader, a 700-lpm printer, four tape drives with 72 KC transfer rate at 556 bpi and the necessary data transmission equipment to handle the lines coming into the center.

We presently have 160 million characters of disc storage which should be sufficient to handle 450,000 records of wanted persons as well as 20,000 records of wanted vehicles along with their related indices. Our present files have 20 mil/sec access time but we intend to substitute the 40 mil/sec files when they become available. The system has two disc controllers which allow simultaneous access to two separate files.

The content of the file is dynamic, and any file inventory must indicate at which instant the count was taken. As an example, at 9:30 a.m. May 1, 1968, the file consisted of:

Stolen vehicles	9,566
Stolen plates	1,624
Wanted vehicles	565
Repossessed vehicles	0
Total vehicle file	11,755
Traffic warrants	31,053
Misdemeanor warrants	6,388
Felony warrants	6,602
Felony no-warrant	23
Miscellaneous	4,052
Driver file	69,866
Total name file	117,984

The files are constantly being purged to remove dead records and those of questionable integrity. Because of the dynamic file allocation of the system, we never find it necessary to re-organize our files and have never done so since the file has been in operation. This feature is especially significant to us since our network often handles over 1,000 file updates daily, and any system which required daily or weekly file re-organization would be extremely difficult to live with.

A typical breakdown on these messages for a particular day is as follows:

Error messages*	510
Hot car sheets	1,000
Enter, cancels, updates	7,000
Queries	11,000
Point-to-point	14,000
Recalls	59
NCIC sent	2,350
NCIC received	2,350
Total	38,269

*The large number of error messages is due to garbage on the transmission lines which the system interprets as bad messages.

During our feasibility study in 1966 we determined that all the police agencies in the state handled approximately 8,500 transactions per day including all radio, Teletype and telephone traffic. We decided that we could plan realistically on at least 17,000 messages under the new system, but we also knew the LEIN could handle more. We presently handle between 35,000 and 40,000 messages daily and have gone as high as 45,000 daily.

The average length of a message received is approximately 228 characters and the average length of a message sent is approximately 123 characters. These figures are indicative only and vary from day to day. The typical load thru the computer, exclusive of any background processing approaches 70 characters per second, 24 hours per day.

costs and financing

The cost of the system from its inception in 1966 through the fiscal year ending June 30, 1969, totals $2.7 million. This includes $75,000 for the study and design portion; $344,000 for the first year of implementation; $1,000,000 for the first full year of operation; and $1,250,000 for the present fiscal year. The Michigan Legislature has provided all the funds for this operation with the exception of a small amount provided under a grant by the Department of Transportation. In addition, the NCIC has, through a grant under the Law Enforcement Assistance Act, provided the funds for the LEIN-NCIC link. The $1,250,000 for the present fiscal year is allocated in approximately equal amounts for personnel, communications lines and terminals and central computer equipment.

One of the features that makes LEIN unique is that the Michigan Legislature has provided funds for local terminals and with the exceptions noted above, the entire costs of LEIN are supported by the state. Our state has a long history of assisting local units of government and this is another instance of such support for local law enforcement agencies.

Another of the major functions of our central computing facility is the processing of background programs. We continually process our batch programs while the communications network is operating. We have some very large background programs in the fields of traffic accident analysis, crime analysis and related areas. In addition to the Master Control Program, or operating system, we have all, or portions, of the data communications handler, the File Manipulation Routine (FMR) and the Check, or inquiry, program in core and running simultaneously. In addition there is frequently a user program updating the files, and often there is also a background program running. This gives us six programs running in the mix at one time. We are programmed to stop a background process if the demands of the data communications network become more than normal.

I have attempted to give the reader a thumbnail sketch of the Michigan LEIN. Space does not permit a full recitation of all the problems and features of the system; as in all data communications systems these vary from hour to hour. One vital fact we learned from our experience with LEIN is that much of the experience obtained through batch processing can be discarded when one starts into large data communications systems.

Many of the tried and true techniques do not hold when confronted by problems of line handling and on-line updating. We have even found that techniques that suffice for a dozen terminals are inadequate for a system of a hundred terminals. To truly understand the problems connected with modern data communications systems, they must be either studied in depth or they must be lived through implementation.

The Michigan LEIN has just scratched the surface of service to police agencies. There are many applications to be implemented and there are many applications to be conceived. And while the problems connected with police computer systems are tremendous, the rewards can be infinitely greater. ■

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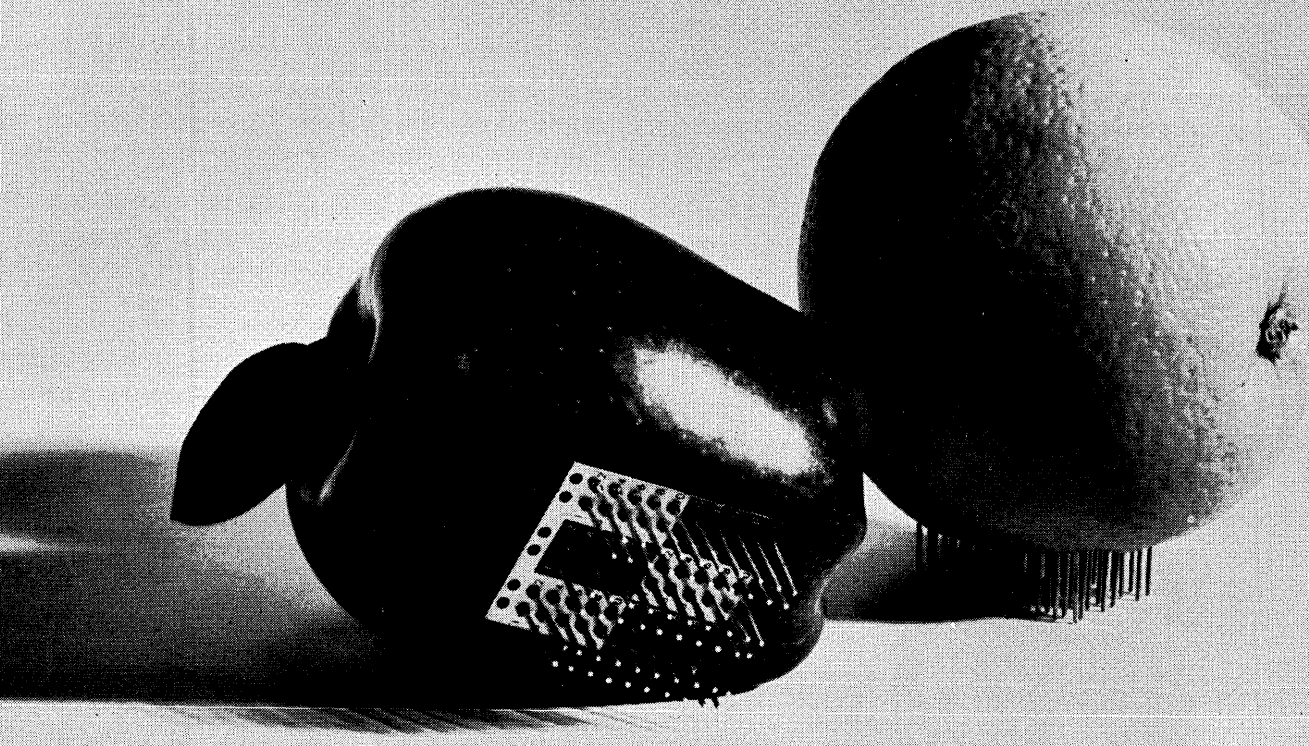
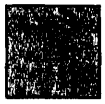


SOFTWARE PROTECTION

many questions, few answers



Drawing upon a panel of patent attorneys, economists, software marketers, and others concerned with the immediate and pragmatic questions of protecting software now, a two day forum on March 3-4, 1969 in Chicago brought together representatives of hardware suppliers, software suppliers, users, and their attorneys. A survey of the attendees listed 15% connected with computer and communication suppliers; 21% with software and/or operations research responsibility; 26% were house counsel, from legal firms, or CPA's; 11% represented financial or insurance interests; 28% were identified as computer users.

Sponsored by Growth/Change Seminars, a subsidiary of Leasco, the workshop covered the traditional areas of patents, trademarks, copyrights, trade secrets, and contracts as they may relate to computer programs. Almost in surprise one member of the audience pointed out that this was the first workshop that had presented divergent views upon the desirability of gaining patent protection for programs.

Among the dilemmas posed by the speakers and discussed but not resolved were:

1) Absent a patent, could a software package be depreciated for tax purposes? Would investors put risk capital into a situation where formal legal protection is lacking? Is there a shortage of risk and venture capital at present?
2) Even if software is not itself patentable, does it anticipate or infringe valid hardware patents? Is the Patent Office logical when it refuses a patent on software per se, but issues a process patent if the application is couched in hardware terms and notes a software alternative?
3) If no new patent or copyright legislation is likely, should a system of compulsory licensing and mandatory deposit of all software be set up?
4) If a program is protected by a patent or copyright, then antitrust considerations regarding marketing are more crucial. Thus, the government need no longer prove economic significance—a patent or a copyright is presumed to be restrictive. Hence, such protected programs could no longer be "tied" together and marketed only as a package, i.e., the likelihood of suit by the government and its success when restrictions are present is enhanced by these formal protections.

no quantum jump

It would indeed be gratifying if one could conclude a workshop such as this with the feeling that certainty has been achieved, final answers given, and a quantum jump in knowledge imparted. But, to quote the philosopher, it "just ain't so." Therefore, what could be distilled from these two days?

First, and perhaps most basic, is the thought that the use of the term "program" is a misnomer except in the crudest sense. Apart from the trivial, one speaker listed three categories which warranted some form of legal protection:

1) *Systems software*—operating systems, report generators, and the like;
2) *Applications software*—this may range from the mundane to the significant, from canned payroll to airline reservations; and
3) *Utility software*—that which performs a general function, is problem- and machine-independent, does indeed represent new technology, and perhaps is most "patentable."

Another speaker developed the scheme that programs generally pass through three stages:

1) the *idea*—which may be expressed in the basic equation, logic, or system;
2) the *technique*—the expression of the idea in generalized, problem-oriented form, free of language and machine limitations; and
3) the *expression*—or translation of the technique into flow charts, detailed algorithms, etc., so that the

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technique can be put into a computer, with a minimum of human intervention.

These three levels seem useful in drawing analogies from present legal policies. Thus, casually the expression would seem to be related to copyright; the technique to patent; and the idea to a law of nature, which is not protectible under patent and copyright.

The legal techniques available at present seemed to be those of formal protection: *patent, trademark,* and *copyright;* and those of common law: *contract, trade secrets,* and *unfair competition.*

Many problems appear when these legal techniques are applied to software, particularly if used in combination.

copyright questioned

Thus, to obtain a copyright, one merely places the "author's" name, year, and a copyright logo; and *publishes* the program. Publication was further defined as making the work *available to the public.* The question was raised whether one could protect a program as a trade secret if it bore a copyright legend. Another problem was that if a program bore a copyright notice then it could not be sold only as part of a package, i.e., the antitrust laws would presume an illegal tying arrangement if the product is protected by copyright or patent.

On the other hand, if reliance were entirely upon trade secret and contract, once disclosure is made, no protection remains with the program.

One speaker pointed out that traditional trade secret techniques were inapplicable in his marketing situations—prospective clients were not about to buy a program without knowing what was in it. He also noted that clients, particularly large ones, were not about to agree to nondisclosure arrangements.

Several of the speakers pointed out that pricing of packages and programs was crucial—that the person marketing the program should price it low enough to discourage theft or unauthorized use.

One question addressed to those opposing extension of patent and copyright protection was whether these protections had impeded the development of hardware. In partial rejoinder, it was noted that the ENIAC patent, the basic digital computer patent, was not issued until 1964. Parenthetically, it was additionally noted that Honeywell has charged in a lawsuit that the ENIAC patent has been utilized by Univac and IBM to Honeywell's detriment.

If one may summarize, it is abundantly clear that there are no clearcut legal methods of assuring full protection to the program originator. Each traditional method has its advantages and disadvantages. There are risks in disclosing, and there are risks in concealing. No one should conclude either that there is no protection at all or that some form of absolute protection can be had. The types of protections chosen should be tailored to fit the needs of the particular situation:

1) Will they prevent or discourage successful theft, except at exorbitant cost?
2) Will they provide evidence to punish theft after the fact?
3) Will they prevent meaningful imitation or duplication?
4) Are the protections easily obtainable or hard to achieve?
5) What is to be protected—the idea, the technique, or the expression?
6) Does the particular package need outside protection or is it self-protective due to its dynamic nature?
7) Why is protection sought—to influence outside investment, to aid marketing, or to demonstrate technical competence?

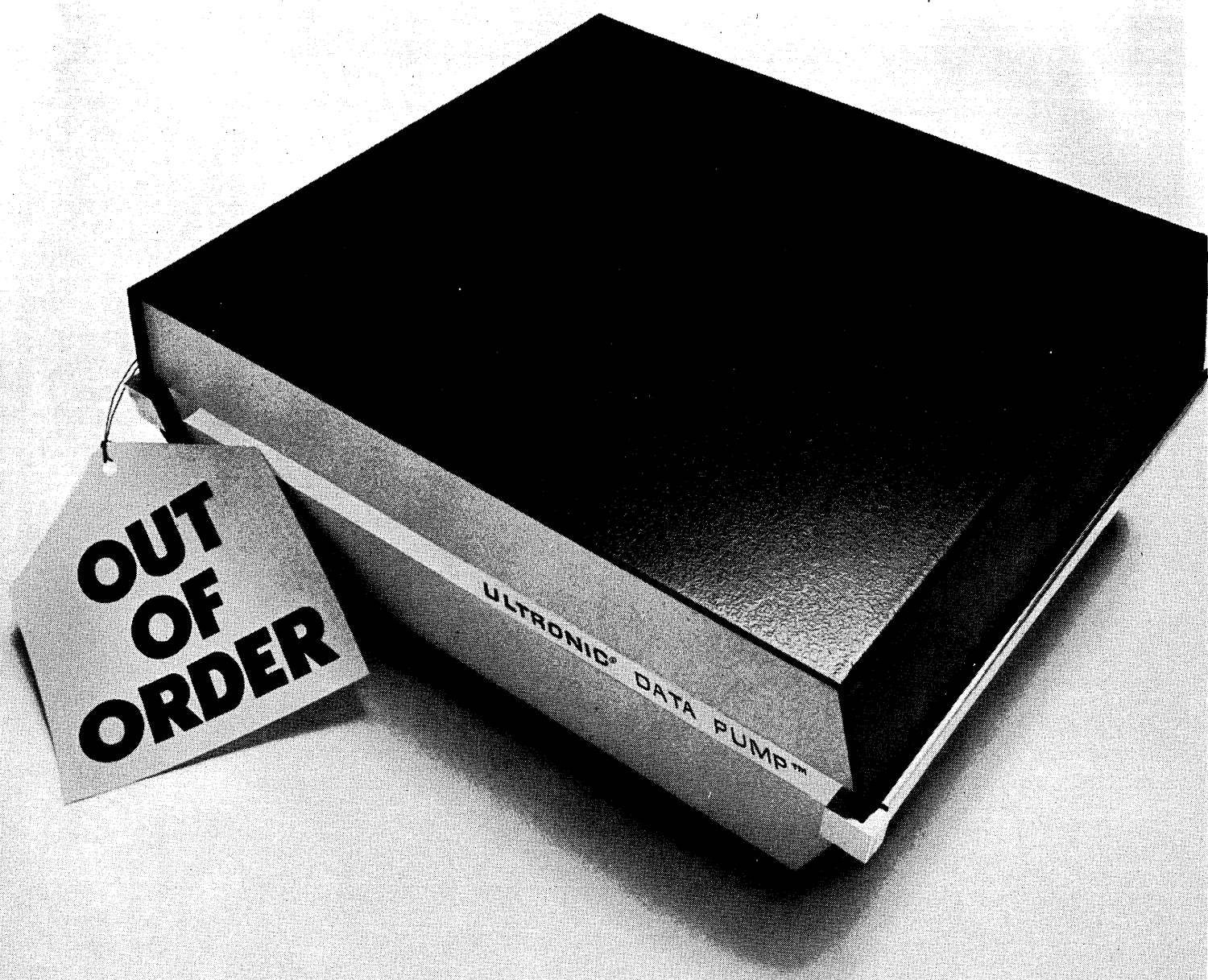
wonderland rules

While the present legal scheme resembles Alice's game of croquet with the Red Queen: the wickets, balls, and rules are all in motion, change, and flux; it still is better than no game at all.

The speakers included: Richard C. Jones, President of Applied Data Research; Herbert R. Koller of Leasco Systems and Research Corporation; Ray M. Harris, formerly with NASA; Paul G. Zurkowski, formerly counsel with the House Judiciary Subcommittee concerned with patent and copyright legislation; Harold Eis, Vice President of EDP Associates; Donald I. Baker, Chief Evaluation Section of the Antitrust Division, U.S. Department of Justice; Co-Chairman Michael A. Duggan, Assistant Professor of Economics, University of New Hampshire, and Chairman of the ACM's Committee on Patents, Trademarks and Copyrights; Kenneth E. Karger, Head of the Legal Department, Honeywell Electronic Data Processing Division; and Dr. Edwin Mansfield, Professor of Economics at the Wharton School of the University of Pennsylvania.

A limited number of copies of the proceedings are still available from Growth/Change Seminars, 4833 Rugby Avenue, Bethesda, Maryland 20014, Attn: Mr. Ray V. McDonald, Co-Chairman.

MICHAEL A. DUGGAN
Co-Chairman—Seminar



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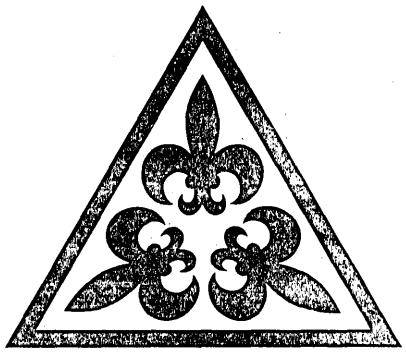


DPMA 1969 DATA PROCESSING CONFERENCE AND BUSINESS EXPOSITION

largest ever

If you attended the SJCC in Boston last month and are now on your way to Montreal for the June 16-19 (18th annual and largest in history) Data Processing Management Association conclave, the first thing you may notice upon arrival at the exhibits is that DPMA has less than half the number of exhibitors, although the conventions are about the same size. (DPMA expects over 4,000 conferees and 20-25,000 exhibit visitors vs. 5,000 and 20-25,000 of the same for SJCC.) That is, if you are so inclined you actually have a chance to get to all the exhibits that interest you within the allotted time and still attend some sessions. Or it may mean it will just be more crowded.

And if you're really perceptive, you will notice that 40% of the exhibitors were also at SJCC and that the 60% who were not consist mainly of data processing forms and supplies firms, plus some new (and old) companies who couldn't get booth space at SJCC, some Canadian firms, and Burroughs.

seminars

Thursday morning's open selection seminars (9-11:30) are on topics of general interest. One of them, "Social Implications of Computers," will be chaired by *Computerworld's* Alan Taylor, who promises *action* and not just more discussion. Panelists include an attorney (Robert Bigelow), a businessman (William Home), and a "radical student who has also been a successful businessman" (Joseph Hanlon). The panel will attempt, with the audience, to determine the computer professional's responsibility and to formulate a course of action for carrying out that responsibility.

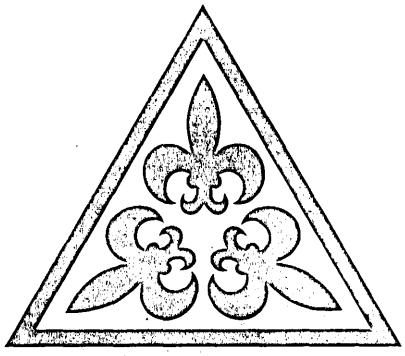
Another seminar, "In-Service Education and Staff Training in EDP," will discuss methods of establishing in-house programs for the training of professional staff members on new and additional edp concepts. "Information Storage and Retrieval" is a state-of-the-art review of data management systems and technology. As more local governments are becoming involved in the application of data processing to their operations, the "Centralized vs. Decentralized Data Processing in Municipal Government" seminar was included in the program to examine the advantages and disadvantages of each approach.

DPMA formed a committee just over a year ago to study private edp schools and make recommendations for improvements which could be offered to these schools as guidelines, so we may learn of their progress and findings at "Private Data Processing Schools—An Appraisal." The "Risk Protection" seminar, a result of recent unrest at various universities, will discuss the methods of minimizing the possibilities of destruction of critical equipment and files. How to expedite two unpleasant but necessary tasks will be discussed at the "Documentation and Debugging" seminar.

"Effective Use of Executive Time" will deal with the application of effective techniques for personal time management. The standards efforts of various countries will be compared and reasons for any significant differences will be examined at the seminar on "The Role of Standards in Data Processing." Applications of time-sharing will be discussed at a seminar of that very name. And finally, "The Computer Utility for Tomorrow's Business" will define computer utility and how it differs from a service bureau and discuss the future of the computer utility in the business community.

Meanwhile, your wife will be touring the Laurentian Mountains and the 36 most historic sites in Montreal, attending fashion shows, having leisurely luncheons, and going to beauty preparation/cosmetics and wig styling /hair dressing seminars. She will meet you at the Thursday evening convention banquet which will conclude all official program activity.

So, for your spare time, DPMA has gotten up a long list of seminars, tours, and special activities varied enough to suit your mood. On the lighter side, it seems that the "Paris of North America" boasts a *brewery* that boasts a *computer,* and you can take a tour to see it. Other tours include visits to Chemcell Ltd., whose GE 625 is said



DPMA 1969 DATA PROCESSING CONFERENCE AND BUSINESS EXPOSITION

to be the largest computer of its type in Canada; Canadian Aviation Electronic, where you can see the computer-controlled manufacture of components; Montreal and Canadian Stock Exchange, the world's most computerized stock exchange; Eastern Air Lines, which is hooked up to "the most sophisticated electronic reservation system in the transportation industry," located in Miami, Fla.; and Air Canada facilities. All tours will be held on Monday, June 16.

One tour is included for "full program" registrants, as are three luncheons, one banquet, the full seminar program, and the *Proceedings*. For those who did not pre-register by mail, on-site registration will be at the headquarters hotel, the Queen Elizabeth, from 9 a.m. to 9 p.m. Sunday, Monday, and Tuesday.

The exhibits open 1 p.m. Monday in the East Hall of Place Bonaventure, but the sessions do not begin until Tuesday afternoon. This gives you Tuesday morning to go to the exhibits or to recover from the first day's activities.

short courses

The sessions are again set up on a "short course" concept. The program is structured into 10 separate seminar series. If you register to attend a whole series, say Installation Management, you automatically go to each of three seminars—one Tuesday afternoon (Feasibility Studies) and two on Wednesday (The Conversion Problem and Scheduling Techniques for DP Operations). And that's your short course in installation management. Then you sign up for one of the 11 "simultaneous seminars" to be held Thursday morning. Or, you can attend individual seminars within several series if you like. Or, you can go back to the brewery.

Besides *Installation Management*, there are nine other short courses (each consisting of three seminars):

Trends in Systems Analysis Techniques
- Principles of Systems Analysis and Design
- Modular Method of Structuring MIS
- The Systems-Management Relationship

Control Considerations in Systems Operation
- Matters of Error Detection and Correction
- EDP Systems Audits
- EDP Systems Controls

Computer Management
- Managing the Third Generation Computer
- Time-Sharing for Management
- EDP Equipment Selection

Real Time
- Real Time Management Information System
- Data Communications
- Problems in Real Time Systems

Software
- The Future of High-Level Programming Languages
- Systems Software
- How to Evaluate and Select Software Packages

Project Management
- Present Status of Formal Project Control Techniques
- Data Processing Project Selection
- EDP for the Smaller Company

Personnel Management
- Personnel Recruitment and Selection
- Personnel Training
- Responsibilities of the DP Supervisor Today and Tomorrow

Information: Management, Storage, Input and Retrieval
- The Paper World of Computer Forms
- Trends in OCR Techniques and Equipment
- Microfilm Information Retrieval Systems

New Programming Applications
- Linear Programming
- Techniques in Programming Languages
- Programming for Time-Sharing Systems

All seminars will be held from 9-11:30 a.m. on Tuesday and from 9-11:30 and 2-4:30 on Wednesday.

At 7 p.m. Wednesday evening—a time chosen to enable participation by all interested conferees—a special seminar will focus on the Certificate in Data Processing Program initiated by DPMA in 1961 as an industrywide effort to evaluate and recognize knowledge and proficiency in data processing. Panelists will include members of the Certification Council. The association has added a category (data processing and general management skills) to the 1970 test and is also broadening the other four areas, so you may want to go and get your two or more cents worth in. ■

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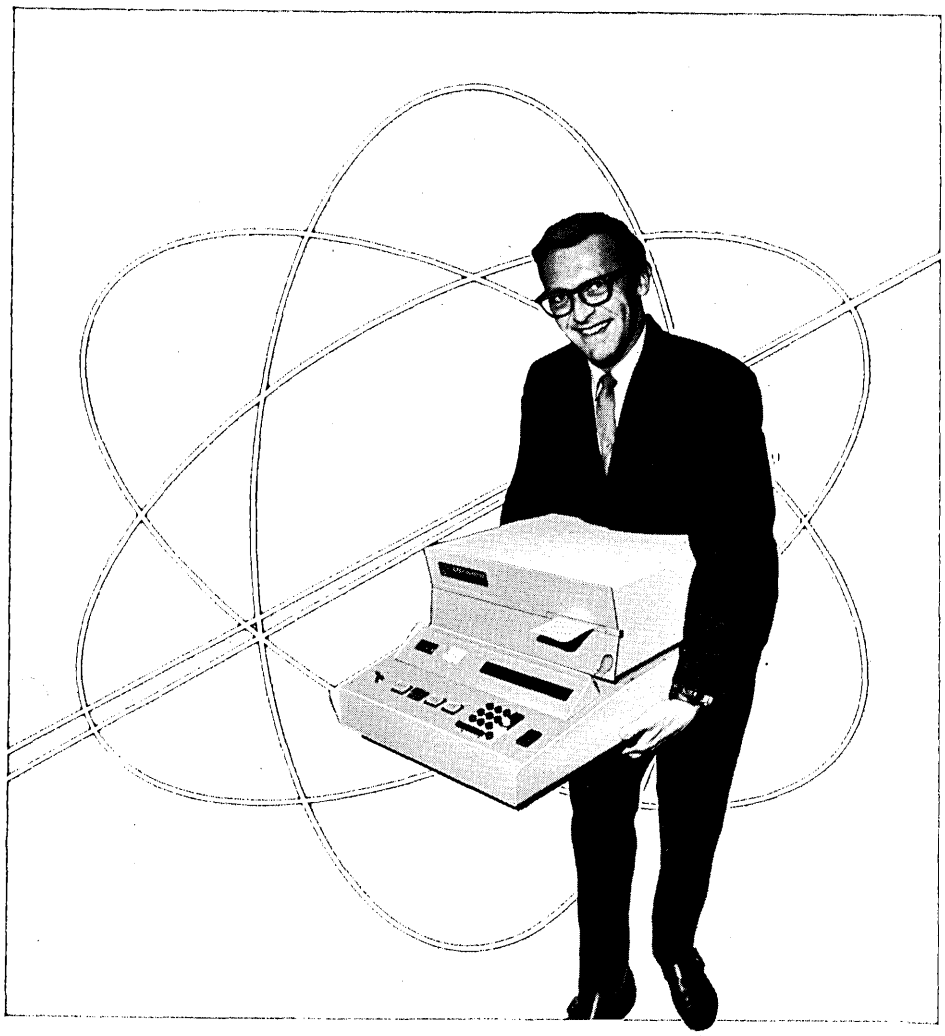

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news scene

an interpretive review of recent important developments in information processing

IBM's "VIGOROUS" DEFENSE SPREADS THIN, AS ADR FILES # FOUR

The legal "bombing" of IBM, like the student siege of the universities, has become a commonplace event. Last April, Applied Data Research, Inc., filed the fourth in what seems to be a "continuing" series of antitrust suits against the industry's patron and omnipotent nemesis. As in the case of two other such suits, it was filed in the Southern District Court of New York, which is bound to become the major pool of information on this industry.

Each of the suits have become progressively narrower in scope and more specific in allegations. Control Data's complaints, too numerous to reiterate here, ran across every segment of the industry, alleging wrongdoing in marketing, educational discounts, announcements of hardware and software, bundling of services, etc. Data Processing Financial & General, the leasing industry representative, concentrated mostly on the total bundling issue and sales practices. Applied Data Research, software firm, also concerned itself with the issue of a single-price for all services and products, but concentrated on the nitty-gritty of software and software services.

ADR does not wield the financial power of CDC and DPF&G, nor the government-endowed sword of the Justice Department, but the $4.2 million firm tries to make up for it through lung power. In the person of Richard Jones, president, ADR in the last two years has waged a campaign across the country—at the Patent Office and from the podium—in favor of proprietary software packages, separate software and hardware pricing, and software patents. In the latter case, ADR claims the first software patent; it was an event that caused havoc within the Patent Office, which issued it but has not been willing before or since to rule that software is patentable.

Thus, with all this, it seems a fitting climax to ADR's campaigning that it should file suit against IBM, which it feels has been the roadblock to success in all the areas mentioned.

Violation of the Sherman and Clayton antitrust laws, of the Consent Decree of 1956, and of the unfair competition laws are the formal allegations made here. But as one reads along, the case for software patents is also being waged in the suit, the hand of patent attorney Morton Jacobs showing up strongly throughout. This will be discussed later.

they left a ring

Antitrust violations revolve, as said, around the bundling of services and products under a single price. Also alleged in this category are:

A "bathtub conspiracy" (between entities of a single corporation) between IBM and subsidiary Service Bureau Corp. to divide up the portions of the market for data processing services to the detriment of competitors;

Patent misuse, in which IBM has "threatened and is threatening to enforce its present and future patents" involving hardware and software against the software companies;

Fraud against the U.S. Patent Office, by applying for patents based on software but disguised as hardware;

Misrepresentation of software delivery dates and premature announcement of software packages to thwart competition; and others.

IBM is also said to be in contempt of the 1956 Consent Decree for its tying-in practices and for its development of time-sharing services and subsequent transferral of this operation to Service Bureau Corp.

Unfair competition claims involve alleged misrepresentation of the IBM/360 FLOWCHART package capabilities to the detriment of ADR's competitive AUTOFLOW package. (ADR says IBM said FLOWCHART was automatic, when it actually required that a systems engineer manually set down the symbols.)

ADR claims damage to itself for other specific products:

When ADR announced plans for or began marketing the PDQ (program descriptor query) package, a time-sharing package for the 360, and AUTOFLOW packages for the 1400 and 360 series, it claims IBM countered with competitive products, some being prematurely announced. Thus ADR terminated plans to market PDQ, may face the same with its time-sharing package, dropped the 1400 series AUTOFLOW, and was limited to 3% of the IBM market for 360 AUTOFLOW.

Alleged damages suffered by ADR include: $97.5 million in the IBM software package market; $32.5 million in non-IBM markets (because of other manufacturers following the single-price policy); $10 million in custom services and software market; $10 million in the data processing services market; $150 million lost to ADR because IBM retarded the economic and technological growth of the market; $689K for IBM software and services ADR has paid in its use of IBM equipment.

Besides finding IBM guilty of all the charges and ordering damage payments, ADR asks that the courts force IBM to rebate to all purchasers and lessees the fair sum represented by the bundled software; and IBM put over $3.57 billion in a Special Rebate Fund for customers to pay off sums due to violation of the Consent Decree.

IBM is also to divest itself of software activities (which in the courts could mean the formation of a separate subsidiary), and until it does divest itself, IBM is to be asked to separately price all software and services. Further announcements of software are not to be made until 60 days before delivery.

Further, the time-sharing activity is to be removed from SBC and put up for sale. And finally IBM's patents are to be declared unenforceable.

software on its feet

Now that one has an idea of what ADR alleges, ranging from the general to the specific, the way it builds its case can be examined. Generally, it's done with figures, definitions, and oration on the true status of the software industry.

The markets that IBM has "attempted and conspired with others to monpolize and has monopolized and

is monopolizing" include computer software packages, customer software and services, data processing services, and computer hardware. Mentioned in a line are maintenance and education markets, but this is not further developed.

Since the late 1950's, says ADR, it has become clear that the concept of software as "know-how to make the computer hardware operative" has "no technological or economic justification," and that software "stands on its own feet as a basic and major, and perhaps principal, component of the computer industry." IBM has sought to perpetuate the erroneous "know-how" concept of software, and "has contrived to hide the share of its revenue properly attributable to software as against hardware". It is alleged that the software share of IBM revenue approximates between 35 and 50% of its total revenue derived from its pricing of sales, service, and rentals of IBM hardware. The software market for IBM hardware "thus foreclosed to ADR and to all others for the single year 1968" is approximately between $1.95 billion and $2.79 billion; for 1959-68 it is about $9.6-13.75 billion.

ADR provides these percentages on the general software market and submarkets. IBM has: 75% of the hardware market and at least that much of the total software market (packages and custom software and services); and with SBC, has more than 50% (accounting for $1 billion in gross revenues in 1968) of the custom software and services market. As relates to IBM equipment alone, IBM accounts for 99% of the generally available systems software and applications packages used.

define your terms

Now coming to definitions, the "know-how" concept that IBM is said to have perpetuated relates to definitions in the Consent Decree on tying practices and to definitions in patent law. ADR defines computer software as a "computer-program device used as a control attachment and machine extension for the hardware . . ."

The Consent Decree says that "IBM is hereby enjoined and restrained from conditioning the sale or lease of any standard tabulating or electronic data processing machine upon the purchase or lease of any other standard tabulating or data processing machine." It defines "electronic data processing machine" as a "machine or device and attachments thereof used primarily in or with an electronic data processing system." Now, one can see why ADR wants its software definition accepted. (This also relates to the allegations concerning IBM's time-sharing services, now transferred to SBC, since it was not specifically stated in the Consent Decree but could be interpreted that time-sharing is a service bureau activity, and therefore should not have been developed within IBM but within SBC.)

Extending ADR's software definition into the patenting argument, one can also see where it would impact the current arguments against patenting software. Software, if considered an edp "machine" or "device," begins to imply patentability. This is a confusing issue, but ADR claims that IBM was and is "attempting to develop a state of confusion as to the technological character of software and has advocated the view in the U.S. Patent Office and among software innovators that computer systems achieved with software are not patentable subject matter." It has done this, ADR says, despite having attained patents "based on software and disguised as hardware" a "fraud" on the Patent Office.

Finally, a conspiracy charge that ADR levies involves the provision of custom software and services by both IBM and SBC. While IBM's Data Processing Group does supply some of these services to its customers, primarily via what is done on the job by the systems engineer, our conversations with ADR indicate that the activities of the Federal Systems Division within IBM proper will be singled out during the suit discussions. Although FSD does not sell computer time, it does have the charter of providing custom hardware, software, and systems management under contract, and thus duplicates or conflicts with (whichever way you want to look at it) SBC activities. And ADR even feels that FSD activity could also be interpreted in violation of the Consent Decree, although the specific allegation is conspiracy in violation of antitrust laws.

age of consent

Again, we are in a position of reiterating some of what has been said about past suits. The plaintiffs have a right to ask for IBM information to prove the allegations of their suits regarding IBM's share of the market and market practices. This information will probably go into a common "pot" to be used by all the plaintiffs. All we can conclude is that, even if some data is not officially made public and the plaintiffs lose, more will be known about IBM than ever before.

Again, if the Justice Department arrives at a Consent Decree with IBM, the private plaintiffs will not be able to use its case in proving their allegations; if Justice goes to trial and wins, the rest will be assured of some victory. Everyone we know is betting on a Consent Decree.

ADR's claims of Consent Decree violation are not considered to have much chance by legal experts. The Justice Department, which did not note such violations in its suit, is traditionally the instrument by which a violator can be held in contempt. And IBM's time-sharing transferral to SBC is considered in that case to have satisfied any objections Justice may have had.

Separate pricing of software and services is something IBM is expected to do, although it is expected to drag its feet on systems software. At writing, there is a rumor that by the beginning of June IBM will announce the separation of programming activity into a separate department, with an eye toward determining the cost structure of this segment, and thus, the pricing policy.

Most users consider ADR's demand that IBM not announce software until 60 days before delivery is ridiculous. Users need, we are told, all the information they can piece together from preliminary announcements, nondisclosure discussions held by IBM with the user groups, and even the rumor mill to help them determine how to plan for any conversions. "Can you imagine what would have happened if IBM had announced USASCOBOL 60 days ahead, instead of a year ahead of delivery?" asked one user. "There are millions of dollars of conversion effort involved here, and unless we do it right, we're in trouble."

IBM promises to "vigorously" defend itself against the ADR suit, as it has with all the others. That vigor is being spread thin, and may be spread even thinner, as other companies in other specific submarkets hint at taking some action because they do not feel the Justice Department or a Consent Decree or separate pricing will pay heed to their complaints. IBM is perhaps seeing itself as the object of massive "guerrilla warfare," aimed at keeping the giant so busy in task force studies on all these issues that its normal operation of business is somehow suffering.

appealing footnote

As a footnote to all these proceedings, it is apropos to also report that Service Bureau Corp. is now appealing a ruling in Minnesota that it misrepresented the capabilities of an inventory control system it installed in 1963. Three subsidiaries of F. B. Clements Co. of Minnesota have charged that SBC advised that it would be necessary to automate their account-

ing if inventory control information was to be obtained; that "management by exception" reports promised turned out to be too bulky and erroneous; that the capabilities of the Flexowriter, which SBC does not make, were misrepresented; and that a written proposal had contained further erroneous claims. The judgment was for $480,811. SBC is appealing on grounds that sound like, "if the customer puts garbage in, he'll get garbage out," a fact beyond the control of the system.

Even if this seems like one added legal problem for the IBM domain, supporters of the giant can take heart that unlike antitrust suits, IBM is not the only one to have its troubles with irate users.

—ANGELINE PANTAGES

AN INVENTION BORN LATE ONE SUNDAY ENTERS FIELD AS PLOTTERS THICKEN

Last Sept. 15 Burt Cohn and Bruce Sawyer started "walking Wilshire Boulevard" looking for money for a new company.

The two had been brought together by Growth Technology, an L.A. venture capital house, which specializes as technology-management marriage brokers.

Sawyer, a veteran engineer-inventor—and a partner and co-founder of California Computer Products—brought to the marriage a piece of paper, Patent #3,376,578, for a two-axis linear motor. He says he invented it late one Sunday. Cohn brought eight years' experience as vp and general manager of the Magne-Head and Systematics divisions of General Instrument Corp.

By Oct. 12, the two new partners had their money—seven digits' worth—and in January, Xynetics, Inc., was born. On Feb. 1, the company's three employees moved into a handsome new 22,000 sq.-ft. building in the San Fernando Valley.

By the end of April, Xynetics had 14 employees and a working prototype of the basic element of their first product, a computer-controlled automatic drafting machine.

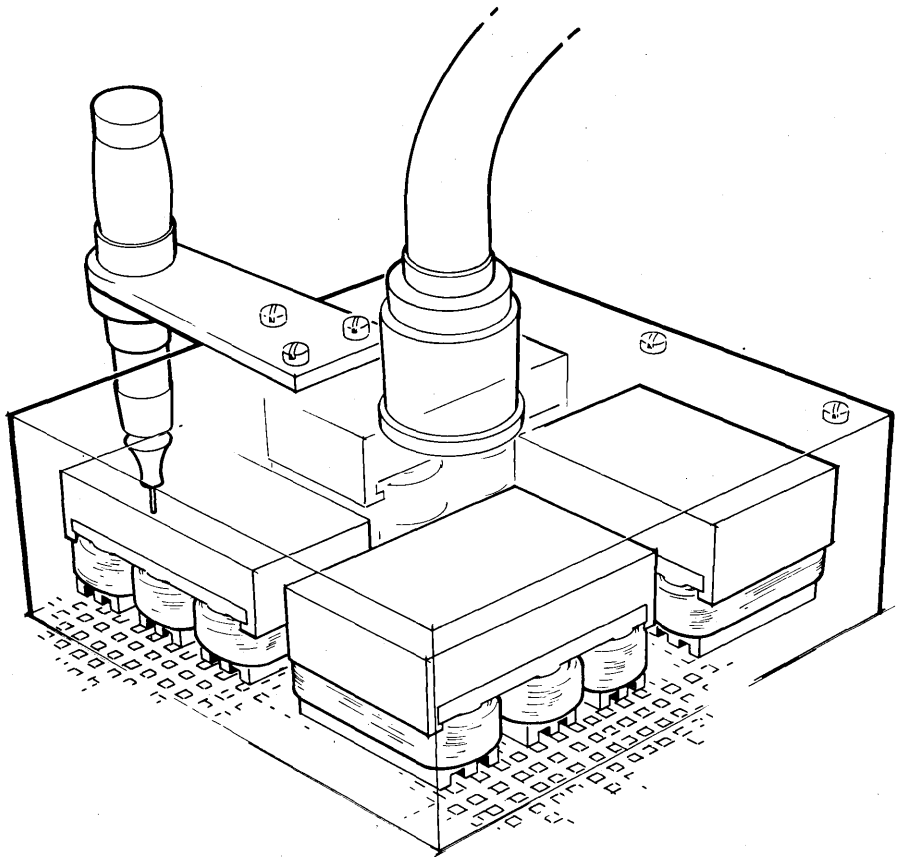


Fig. 1 Schematic shows head containing four sets of magnetic drivers (but only one pen) riding on metal "waffle iron" bed of plotter. Umbilical cord at top carries air which provides the head's cushion.

the technology base

The conventional way most plotters move a point across a plane is a two-member slide mechanism, with a bridge controlling movement along one axis, and a beam on the bridge controlling movement along the other. Or paper is attached to a drum, which controls one-axis movement, while an arm containing a pen controls the other.

Sawyer's technique is different. He uses a metal bed which has been cross-scored to form small equidistant islands of equal size and height. (Sawyer's analogy: a waffle iron.) The scorings are then filled with epoxy. Above this surface rests a head containing five air bearing outlets and four sets of magnetic drivers, (they look like small rows of railway ties), two each for x- and y- motion (see Fig. 1).

Three drivers serve as the basis for selection of movement. One driver's set of poles is always aligned with the

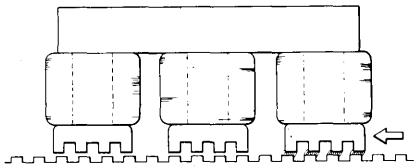


Fig. 2 Arrow indicates pulsing the driver on the right forces it to line up with the ridges below, creating movement to the left.

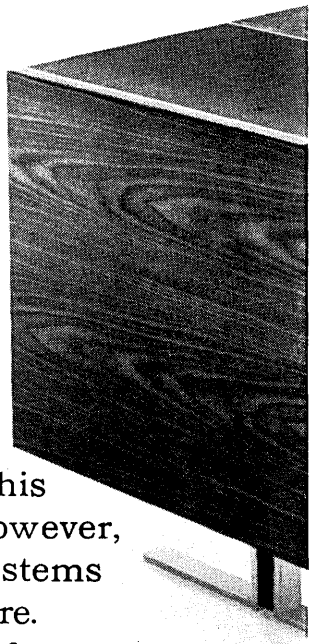
ridges of the metal base. By pulsing one of the remaining two unaligned drivers frequently, the head moves swiftly on its one-mil cushion of air across the smooth bed of the device (see Fig. 2).

more than plotters

Cohn is quick to point out that Sawyer's technique has implications far broader than the company's first product. "The metal bed might be the floor of a warehouse," he says, "across which you could move tractors." A similar principle is being used in Japan, he adds, to drive a train.

Sensibly starting on a less ambitious product, Xynetics' first product will be a 5′ x 8′ drafting machine, controlled by a Mac 16 computer. The bed will be constructed in 30″ x 30″ modules, chemically milled. The head, which will mount two pens, will be 4″ x 4″ and weigh one pound. The one-usec core of the Mac 16 will enable them to pulse the head often enough to achieve speeds of 40 inches per second, about 10 times as fast as most currently available plotters, with one-mil resolution. Sawyer is already working on a device which will offer finer

The Killjoy.



We have here the Cal Systems Computer, which looks a lot like a desk. Sorry, but it's going to take some of the fun out of the computer business.

It's too easy.

It won't let you design a bunch of new forms or experiment with new tape punchers and card sorters. Since it speaks English, you won't have to speak some special language. And there's no chance of building an isolated, air-conditioned, acoustical room for it. Operating our computer lets you practice only one skill — typing. And programming it is ridiculously simple. You put a tape cassette in a slot.

Once you overcome this initial lack of challenge, however, you'll find that the Cal Systems Computer is far from a bore.

We built it to be easy for amateurs, so it's apple pie for pros. But we also built it to do a professional job, and somewhat to our surprise, the pros are the ones who are buying it. To use as a departmental computer. Or a data terminal, to handle communications with the computer center.

It seems the pros are intrigued by the fact that it can accept literally an infinite number of programs because they're all stored outside the computer, in cassettes. And that the tape data density is up to 132 bytes per inch, with a cassette capacity up to 400 feet. And that the computer can accept over 400

Our computer. It doesn't even look like fun. No whirling reels, no flashing lights.

commands, and has a memory capacity of up to 16K. And that internal speeds run, for example, 21.60 μsec between I/O and memory, so that as far as the operator is concerned everything happens instantaneously.

There is one other little no-challenge we should tell you about. You won't get the thrill of selling management on a major capital outlay for the Cal Systems Computer. Because it doesn't take one. But why not find out more about it anyway? Write California Office Systems Corporation, One Maritime Plaza, San Francisco, California 94111.

The Cal Systems Computer.

resolutions.

The big board was chosen after a market survey of customers' wants, which also led them to design it so that it can be moved through a standard doorway, instead of knocking out windows or walls.

Cohn says there are about 300 large-scale drafting machines in the field now, but market intelligence indicates that number will double every 18 months.

software plans

Sawyer says the units can be produced fairly inexpensively, but Xynetics will build in some bells and whistles, now extra-cost options on competitors' gear, to come in around $100K. They're doing their own software, under an ex-CDC-er named Don Ritter, and plan to offer such niceties as the ability to directly accept x-y coordinates (now an option on most plotters), plus storing a complete symbol font in Mac's memory, so the user won't have to write his own instructions telling the beast how to draw each individual symbol. And they're thinking about offering iterative programs . . . such as window drawings for architects.

They figure Mac's memory, expandable to 65K, should allow them room for lots of software. Input will include keyboard, mag and paper tape; output will be to Teletype or mag tape. Specs on the first product should be firmed up by summer. The unit will probably make its bow at the FJCC at Las Vegas in November.

Cohn, who calls himself a "hands-off" manager, has a bachelor of science degree from CCNY and an MBA from NYU. Sawyer, who has held high-level engineering posts at such companies as Litton, Lockheed, Hughes and North American, says he doesn't want to be a president.

It could be a model marriage.

RBF

SRI REPORT ON FCC COMPUTER INQUIRY SUPPORTS FREE ENTRY, SOME CONTROL

Any responsible company that wants to sell data communication services should be free to do so, but some control is necessary to promote interconnection and prevent "cream-skimming."

This is one basic conclusion of the long-awaited Stanford Research Institute report on last year's FCC computer inquiry; the seven-volume study, released last month, also blessed Western Union's plan to bail itself out of a dying business—public message telegraph service—by getting into another—commercial dp service. SRI thought it might be an "interesting experiment" to let GT&E get into commercial dp also. But Stanford's analysts said the other existing carriers shouldn't become commercial data processors because it would be difficult to control them if they attempted to grab all the business.

Many dp industry groups, in their responses to last year's inquiry, cited a crying need for the carriers to provide a greater variety of specialized data communication services. The report downgrades this complaint by saying that the shortage won't create serious problems in the next few years. This is because SRI feels the carriers have the necessary financial capability to meet the demand. "Generally speaking," adds the report, "we believe there is good evidence that the major carriers are interested in responding to data customers and their needs."

SRI agreed that more data-oriented services are needed in the long run but advised FCC, before it acted on this problem, to define the need more precisely in terms of what users are willing to pay and what the suppliers are likely to offer. One volume of the report presents a tentative forecast of the growth of teleprocessing relative to other types of communication. It predicts that data traffic will comprise 10-50% of the total load on the telephone network by 1979, versus less than 1% today. The number of high-speed data sets in use during this period will grow at an annual rate of 30%, while slow-speed data sets will increase at a rate of 70%/year. Data set prices will be reduced 50-75% as a result of increased sales, greater competition among suppliers, and introduction of LSI circuitry. Meanwhile, long-haul, bulk data transmission costs will decrease an average of 40%.

don't push

FCC issued a notice, simultaneously with release of the report, inviting outside comment on the subjects covered and on the quality of SRI's analysis. The comments are due June 24th. The notice also reported that AT&T "will shortly" introduce a one-minute initial period rate for switched system voice and data messages, offering the user "substantial savings." The new schedule will be available on a trial basis in a limited number of locations.

This projected rate reduction was one of several actions cited by the FCC notice as evidence that last year's inquiry has produced greater willingness on the part of the telephone company to respond to the dp community's needs. There was a clear implication that the commission will follow SRI's advice and not try to push Ma Bell into any further concessions, at least for the present.

FCC also plans, apparently, to follow SRI's recommendation regarding information privacy. The recommendation, basically, is to gather more information regarding "those aspects of the problem unique to teleprocessing and telecommunications," and let Congress carry the rest of the load.

But the FCC notice *did* promise more substantive action on the major issues raised by the inqury. "We will shortly initiate an appropriate proceeding . . . as to what requirements shall be imposed upon carriers with respect to data services, and whether computer services which involve data communications should be subject to regulation whether engaged in by carriers or others, and the specific form of any such regulation."

SRI's views concerning dp services provided by common carriers follow pretty closely those expressed recently by a Presidential Task Force on Communications Policy (see May, p. 121). But Stanford added a new dimension to the discussion when it suggested that GT&E should be allowed to get into the business.

"Since GT&E has more resources to commit than Western Union, there is perhaps more potential danger of predatory pricing . . . However, if there are, in fact, economies resulting from an integrated communications-data processing offering, this might be an interesting opportunity to see them demonstrated in practice."

squawk boxes

Existing commercial dp suppliers are likely to squawk about the GT&E proposal, but they may be mollified somewhat by SRI's suggestion that FCC review Western Union's tariff arrangements with AT&T. This was advanced as one way of curbing any monopolistic proclivities Western Union (and, by implication, GT&E) might have as a commercial data processor. Actually, though, much more is at stake.

The established carriers have argued for a long time that their agree-

ments with each other are outside FCC's regulatory authority. Under this philosophy, the carrier, alone, decides whether it wants to interconnect with another carrier. New firms that want to become communication common carriers face a big hurdle as a result; they must persuade their competitors to be cooperative or else be content to offer sharply circumscribed services.

Microwave Communication, Inc. and University Computing, among others, are planning to build microwave systems that promise greatly improved service at greatly reduced costs to data processors. MCI has applied to FCC for a common carrier license, and UCC can logically be expected to do likewise, soon. If and when the licenses are granted, each firm will probably try to negotiate an interconnection agreement with Ma Bell. If FCC believes that such agreements are outside its authority, the telephone company will probably refuse to negotiate with UCC and/or MCI. The effect will be to restrict, if not eliminate, the competitive threat posed by outsiders who try to get into the existing common carrier club. But if the commission accepts SRI's advice and affirms the government's right to review intercarrier agreements, Ma Bell will be far less likely to slam the door, and the number of outsiders trying to join the club will almost certainly increase.

This would be one way of increasing the number of firms supplying data communication services. The SRI report devotes a good deal of space to another approach, which consists essentially of interpreting the rules so that those who don't belong to the club can offer teleprocessing services without joining, i.e., without becoming common carriers.

Until now, the argument about whether common carriers, alone, should supply communication services has revolved largely around the question of whether message-switching and other services related to the transmission of data come within the jurisdiction of the Federal Communications Act of 1934.

The carriers, in their responses to the inquiry, said the services *are* covered by the Act. If FCC agrees, data communications, like other types, must be regulated, and must be obtained from a relatively small group of government-licensed suppliers.

BEMA and other dp industry respondents insisted that most data communication services lie outside the authority of the Act. This interpretation, if accepted, would permit the services to be offered by noncommon carriers, without regulation.

SRI agreed with BEMA, basically, but for reasons unrelated to the scope of the communications act. ". . . The potential benefits of free entry into the entire teleprocessing area appear to be substantial," says the report. "In other words, it is not just a hypothetical benefit in this case, but a highly probable event . . . The potential for a wide range of communications services that are neither telephone nor telegraph is very large and the technology that could make these services widely available is rapidly coming into the cost range of interest."

costs for free

But the report admits that costs are associated with a free entry policy. One such cost would be imposed on the established carriers, and would be due to "cream-skimming"—i.e., the appropriation by a UCC or MCI of the most lucrative market for a particular teleprocessing service. Another cost would be imposed on users, and would stem from the inability to interconnect, through their terminals, with users tied to other systems.

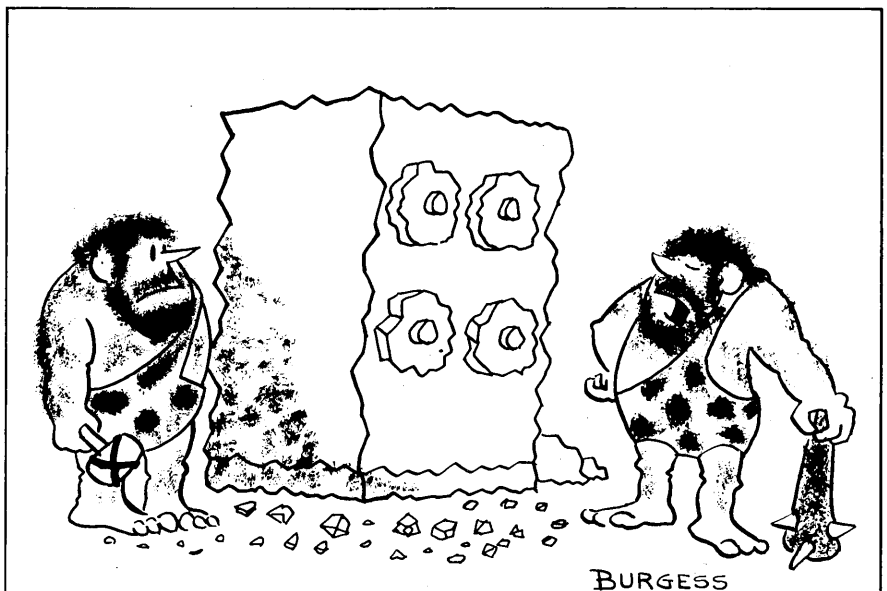
The solution, SRI suggested, is to consider each class of data communication service individually and determine whether it is likely to generate interconnection and/or cream-skimming costs. The report discusses four kinds of service to illustrate this process. Message switching systems comprise the first class. SRI concludes that some—like airline reservation systems and Telex-TWX—require a high degree of interconnection, while others, such as stock quotation services, do not.

The other types of data communication services discussed are private lines, long-haul services, and specialized data transmission networks. "Each of these . . . raises the issue of cream-skimming in one form or another."

But even where the cost is high, SRI doesn't necessarily advocate restricting the number of suppliers or imposing dictatorial government control. Where cream-skimming seems to be a substantial threat, it calls for "a careful analysis of the extent of this cost . . . to assess the net benefit or cost of allowing noncarriers to provide these services." And where interconnection seems to be necessary, "it appears that the commission could make an important contribution by encouraging the establishment of technical standards which would allow the interconnection of systems designed by different equipment manufacturers. Providers of teleprocessing services in such a market would be able to compete both in price and in auxiliary features, but all would have to meet the same standards of signaling, message format, and technical performance."

How these standards would be established was not spelled out in the report, and that is apt to present a problem. If the commission took on the job, its action would be subject to the endless lawyers' battles that are a permanent part of proceedings before the FCC. If the standards were established voluntarily, the carriers, dp suppliers, and users would first have to want to get together. But, judging by the hassle over foreign attachments, this desire doesn't exist.

—PHIL HIRSCH



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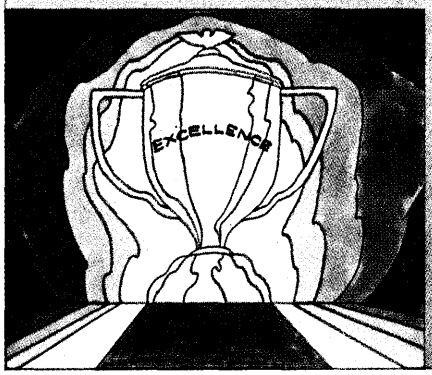

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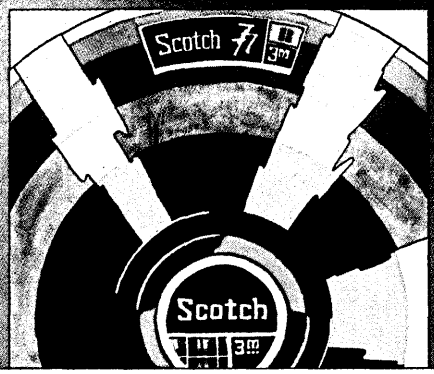

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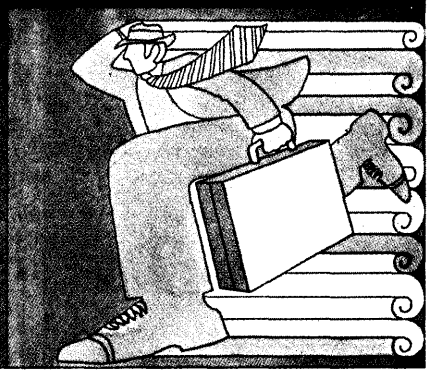

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news briefs

DUNLAP GOES CAMPING AND DIGITEK REORGANIZES

Jim Dunlap, newly *ex*-president of Digitek Corp., the software firm in Marina del Rey, Calif., was once quoted as saying the richest man in the world in the year 2000 would be an ex-programmer. At the time he said it, he was trying awfully hard to be that man.

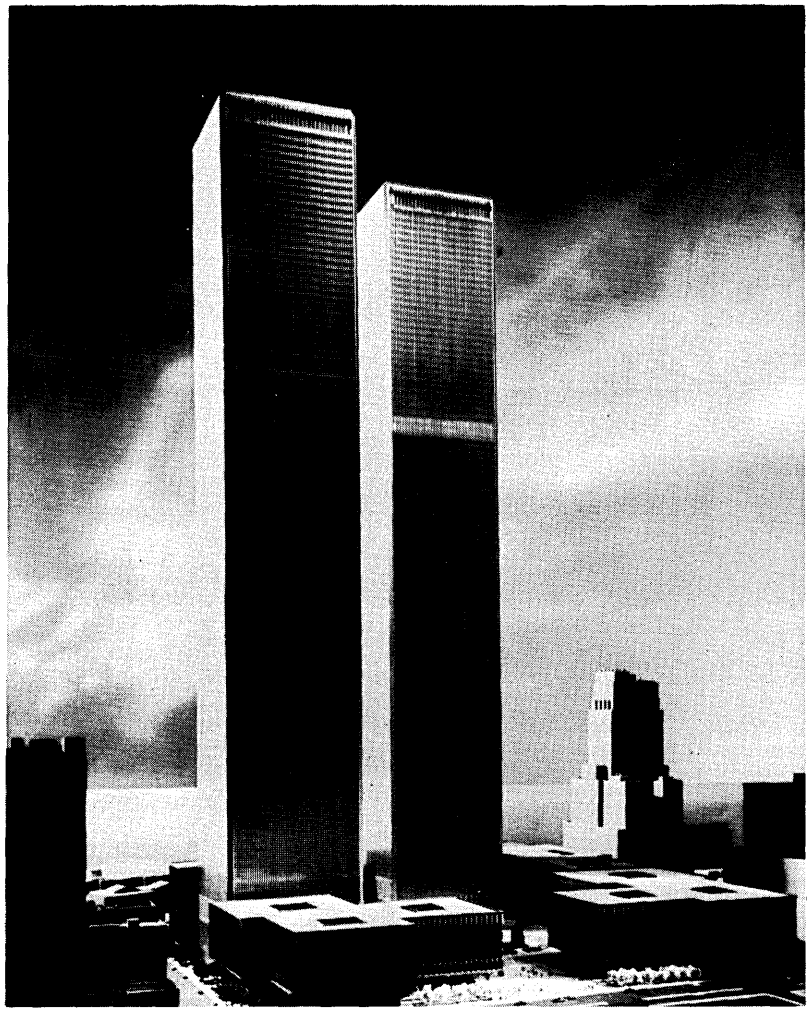
His attempt at a success story began at Hughes Aircraft Co., a Southern California firm widely used as a training ground. At HAC he labored as a computer designer/mathematician/-programmer. He started out one day with Don Ryan, head of scientific programming there, and a mutual friend, Don Peckham, with plans to make it big, in the manner of Fletcher Jones of Computer Sciences Corp., on an estimated $17K shoestring.

The triad was a capable team to whom the inner workings of compilers had been revealed. No one, however, had opened to them the mysteries of management. Feeling that it could not be all that difficult—especially when you are only three people—they started out for Oz.

Their very first contract started them off on the wrong foot. The neophyte firm found itself bidding against big opposition before they had had any time for on-the-job training in running a business. Max Palevsky of Scientific Data Systems wanted a one-pass FORTRAN II compiler for SDS's very own very first machine. Digitek, still gun-shy from losing some early bids, came in with a price for the package that it thought no one could beat. Digitek was right, no one else would try to build it at that price. CSC, the next-lowest bidder, reportedly came in with a price three times Digitek's. This was not to be the last time the company ran into real trouble from underpricing its merchandise.

Somehow the company hung together on the strength of its underpriced products and willingness to work. In the earliest days, on-lookers were astounded when Dunlap, one week out of heart surgery, was back on the console doing on-line debugging. The company began to grow fast, very fast, more than doubling its sales and earnings in each of its first five years ('61-'66). And Dunlap began thinking, or at least acting, like he was well on his way to fulfilling his own prophecy. His firm, with real assets of something less than $700K, moved into plush $100K/yr. office space, and he staffed his own office with rented paintings.

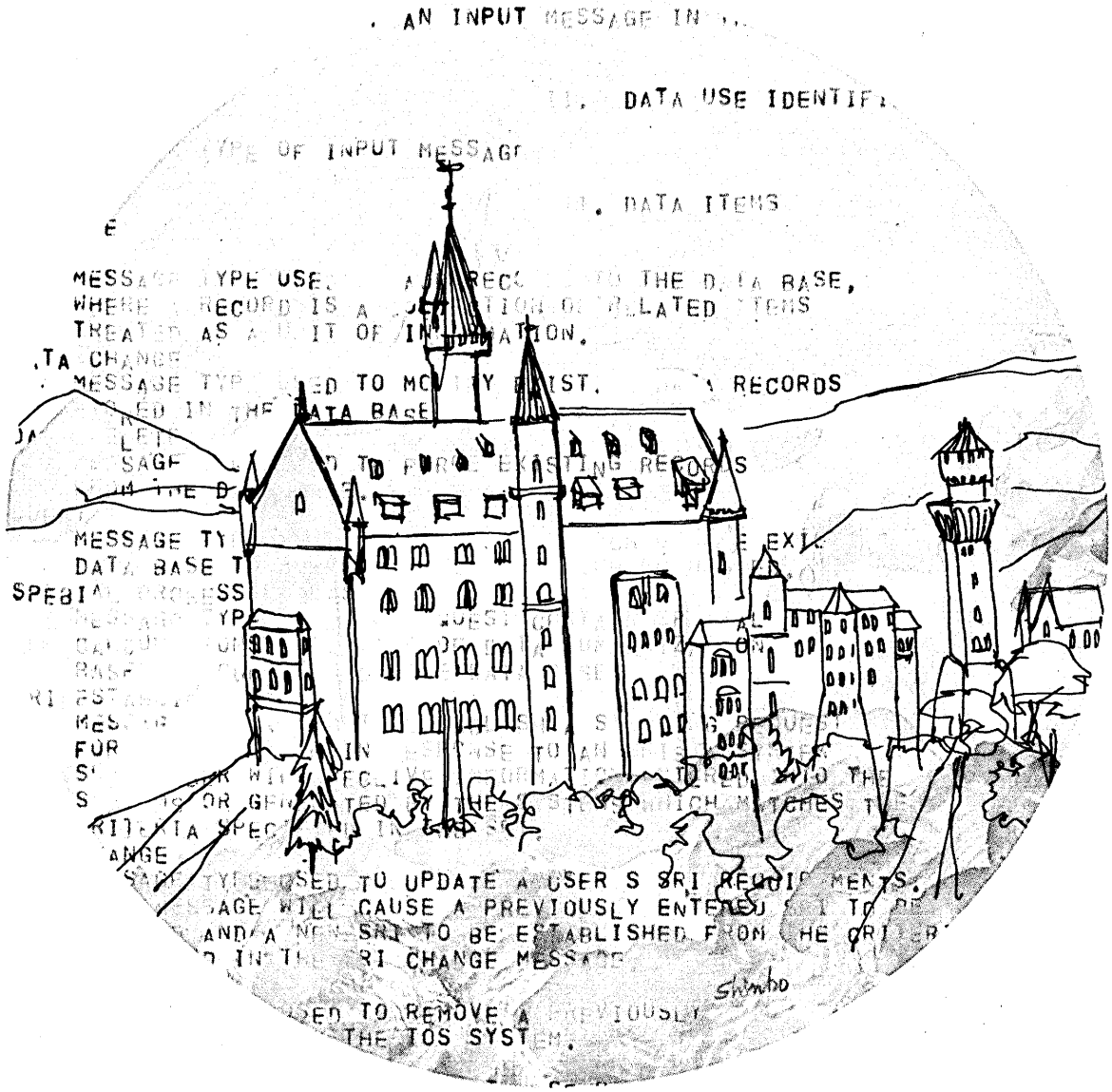
By the end of the fourth year, business had been coming in faster than Digitek could staff up to handle it. Three other firms were acquired, Measurement Analysis Corp., Applied Resources Corp., and Distribution Control Corp. (which was to become Digitek Time-Sharing). Somewhere along the way the lack of management savvy caught up with them. Lessons sometimes come hard in the dp world, and are generally expensive. Underpricing mistakes and overrun fixed price contracts for third generation systems (they were not the only ones to be hurt in this game) cost the young company lots, and things looked really bad in Fiscal '67 when the firm lost more than $710K on sales of less than $520K. Down, but not out, they moved to the low-rent district and began fighting their way back to solvency. Somehow they made it, moved back into respectable but not flashy



HONEYWELL AUTOMATES 10 MILLION SQ. FT. KING KONG WOULD HAVE LOVED IT HERE

Honeywell has got itself a $7 million chunk of the $1 billion building automation market projected for 1980. The Commercial Div. is designing the largest automated control system ever for the $600 million World Trade Center to be completed in 1973 on Manhattan's lower west side. The computer-controlled system will handle the day-to-day operations of the five-

(Continued on page 134)



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news briefs guide . . .

surroundings, priced their products higher, and made a profit. The roughest part seemed over.

With the company back in the black, the timing for Jim's next move was surprising, but then Dunlap has never been known for his orthodoxy. He bought a camper, took a few moments to write up a resignation, and headed off for the Rocky Mountains. People that know him say he just got tired of the game. Paul Toeppen, chairman of the board and chief executive officer, was handed a somewhat unwieldy miniconglomerate with a hole where the president used to be.

Things may never be the same around Digitek—for one thing, an insider says that morale is definitely up. Jim has not been replaced, but some meaningful shuffling has been done. Digitek's most profitable division, the compiler-writing force, is running under Don Ryan, sr. vp and last surviving founder, and Dave McFarland, also a vp. Applications Resources Corp. has been absorbed by Measurement Analysis Corp., with Dr. Julius Bendat, who had been simply a corporate vp after MAC was acquired, in as president there. Lee Wiegart remains as president of the third corporate arm, Digitek Time-Sharing. The net effect of the organizational changes will be to free the compiler group to concentrate on bread and butter lines.

No telling where Jim and his camper will turn up.

HONEYWELL, AUERBACH FORM "COMPUTERIZED CATERING"

Honeywell Inc. and Auerbach Corp. have formed an independent computer service company that will develop advanced information systems for specific industries and businesses. The firm, called Honeywell-Auerbach Computer Services, Inc., is 60% owned by Honeywell, and 40% by Auerbach. It is an "autonomous" enterprise that will, nevertheless, be able to draw on the resources of both parents for advise and guidance as well as capital, although it is not bound to purchase hardware or services from Honeywell or Auerbach.

President of H-A is Francis A. Rowe, formerly general manager of Univac's Information Services Div. He stated that the firm is planning to "build a dedicated computer service that will be accepted and adopted by the data processing user simply because it can handle his computer needs better than he can handle them himself. This, after all, is not much different from calling in a catering service to operate the company dining room." H-A defined "dedicated" as meaning service to specific industries, markets, or applications, in contrast to service bureaus that handle batch processing needs of all types of customers.

The firm's first venture will be a comprehensive line of Automated Industry Management Services for selected financial industry applications, such as brokerage back-office services. The first service, for savings & loan associations, is presently under development and is expected to be announced in the fall, and ready to run next year. Rowe noted that only about 4% of the 6,200 savings & loan associations in the U.S. have "automated" their operations.

Services will be supported by H-A supplied terminals, communication networks, computers, software, and facilities. The firm will be based in Philadelphia, and is temporarily headquartered at the Auerbach Corp. offices there.

FCC ADVISED BY CCB THAT TELPAK REGS DISCRIMINATE

FCC has been advised by its Common Carrier Bureau that Telpak sharing regulations "constitute an unlawful discrimination and preference" contrary to the Federal Communications Act of 1934.

The recommendation is important because if the commission agrees with it, all private line customers may be allowed to pool their communications requirements and obtain Telpak discounts. The potential savings are substantial.

According to an example cited in the Common Carrier Bureau's recommendation, those qualifed to share Telpak C pay about 1/3 as much per voice grade channel as those who must lease equivalent private lines individually. For Telpak D service, the savings are even greater.

The Common Carrier Bureau suggested that the present Telpak restriction, which allows sharing only among government agencies, and regulated entities in the same business (e.g., airlines, railroads, pipeline companies), be eliminated. The Bureau shied away from opening the door further, but it discussed two other possible modifications of the tariff.

Elimination of all sharing was one possibility. The bureau concluded that this "would be a step backward in that it would inhibit, rather than promote, the efficient and economic use of available communications services by the public."

The second alternative was to allow unrestricted sharing by all existing private line users, even among those in different lines of business.

"No constructive... purpose would appear to be served by a tariff restriction requiring that only customers in a common line of business may share," said the Bureau. "Certainly, from the standpoint of customers seeking the most economic alternative to satisfy their communications needs, two or more customers should be free to combine their requirements if, by doing so, they can mutually derive economic benefits. Clearly, if there are to be any restrictions on such customer sharing, the carriers must make a strong showing that such restrictions are warranted . . . We are aware of the argument advanced by AT&T that un-

limited sharing will mean the eventual demise of Telpak discounts . . . whether or not this will be the fate of Telpak rates as a consequence of unlimited sharing cannot be definitely assessed on this record . . . however, the fact that removal of . . . sharing . . . may lead to increased rates for the favored users provides insufficient basis in law or reason for retention of that discrimination."

In the next act of this drama, AT&T and Western Union, which offer Telpak, will file objections to the Bureau's recommendation. Oral arguments undoubtedly will follow. After that, hopefully, the FCC will decide whether to accept, modify, or reject the bureau's advice. A final decision seems likely before the end of this year.

Honeywell . . .

acre, six-building complex, as well as schedule maintenance functions on a time or usage basis.

Some 5,000 DataCenters are in operation worldwide (first one installed was in the White House in 1953). The first computer-controlled system was installed almost ten years ago in the Tennessee Gas Transmission Co.'s 33-story headquarters in Houston. The first closed-loop system (tying a DataCenter to an on-line computer to analyze incoming data, then make instantaneous corrections in remote mechanical equipment) is nearing completion in Dallas' Main Place complex. This particular system will save about $200K annually, according to Honeywell: $50K in power savings and $150K from lower heating, cooling and manpower costs.

Two DataCenters will be used in the Trade Center project. As the job progresses, a conventional center will start up major air-handling systems. When the complex is completed, the large DataCenter and its computer will take over.

The computer is a DDP-516 process control machine with a 16K(16-bit)-word random-access core memory that carries the master programs for operating the Trade Center, as well as critical contact statuses, high and low limits for critical variables, and program priorities. A 196K-word disc memory, expandable to 786K, backs up the core memory. The 300 cps reader handles any additions or changes to the various computer programs and can also load master programs into the core and disc memories for diagnostic purposes, restore a memory track if needed, exercise the memories, and put new programs into memory. A high-speed punch can record data on magnetic tape at 110 cps. This tape can be fed into an off-line computer for programming or detailed analysis. Key information for an entire day's operations at the Trade Center—figuring 500 values taken every 30 minutes for 24 hours—can be punched onto one tape.

Both analog and digital information is processed. Analog includes temperature, humidity, pressures, flow differentials, and power used. Digital inputs are from alarms, status indicators (on/off), meter totals. An interface controller acts as a buffer between the computer and the DataCenter control console and also translates analog signals from the remote sensors and controllers into digital data. It includes a master programmer and a real-time clock for automatically starting and stopping equipment on a pre-set basis.

The DataCenter will control more than 200 separate mechanical systems, monitor more than 6,500 individual check points, and scan hundreds of variables. Even an "army of dedicated engineers" would find it impossible to cope with the avalanche of information pouring in every second, says Honeywell. The system does nothing that a building engineer couldn't do "if he had 7,000 assistants scattered throughout the Trade Center complex continually reporting critical values and operating critical controls."

The computer is designed for almost unlimited expansion, both in remote sensing points and in programs and peripheral equipment, so it will be able to take on additional tasks without requiring a substantial investment in new hardware. The system will be backed up by a conventional DataCenter (one without a computer) so that continued manual and automatic operation of the buildings will be provided even if the computer is down. This should be of great comfort to those working on the 110th floors.

Wonder what the market for automated clean-up would be. ■

IBM ANNUAL MEETING FEATURES GOOD CHEER

IBM held its annual stockholders' meeting in Santa Monica, Calif., April 28, creating a traffic jam that was advantageous to a group of unappetizing but nimble lady pickets who stuffed handouts into the windows of the creeping cars advising passengers that the company was subverting our children by sponsoring sex education in the schools.

The note of good humor and solidarity that predominated was set early as a member of the audience asked the featured speaker to identify himself and the speaker said he was Thomas J. Watson, Jr. This pleasant exchange was followed by a motion from the floor that "because of the harassment of the company" lately the shareholders present should give the management a standing vote of confidence, which they did rousingly.

Business on the agenda was dispatched swiftly, with massive majorities in favor of changes in the retirement plan and the stock option plan, keeping Price-Waterhouse as company auditor, and electing all 16 directors favored by the present management. Mr. Watson then gave a short talk, noting once again that the large proportion of outright sales had caused a bulge in earnings ($205.9 million for the quarter) that would detract from long-range income. He said that the latest figures showed purchases now heading down compared to rentals. He then commented on the pending lawsuits, saying that the claims of monopoly were refuted by the fact that there are now some 70 companies making systems and another 4000 in computer-related activities. He also said that fast-changing market conditions demanded new forms of support services and that the company's reaction to these needs would be described in July.

A movie, intended for new employees, was shown—an unusually good one of its kind that included some footage from an IBM meeting in the 1930's featuring Thomas J. Watson, Sr., and a group of tuxedoed IBMers singing some of the famous company songs.

The stockholders then settled back for the question and answer period, which turned out to be a long one. Here are a few highlights:

One questioner asked about a recent suit where an IBM customer was awarded a judgment against the company because his computer application didn't work out and his business was affected adversely. Mr. Watson said that IBM was appealing the case and that he considered this judgment to have serious implications. It's the first time the company has been or-

dered to pay damages in this kind of situation and, while IBM was willing to take a machine back in certain cases, this one seemed analogous to a customer buying a chain saw, misusing it and hurting himself, and then suing the people who sold it to him.

Another member of the audience asked about the future market for turnkey services, such as those supplied by Electronic Data Systems. The answer was that there seemed to be some demand for this and that IBM was in this business through the Federal Systems Division.

A question was raised about IBM losing its middle management as young men in a hurry left to start their own businesses. Watson said that this was happening, especially in the last five years, but that the company still had only about half the attrition rate of other companies of its size. He added that they are doing everything they can think of to avoid it—cash awards for good ideas, stock plans, accelerated pay increases, and changes in organization. But any suggestions are welcome.

Will the World Trade Corp. someday be bigger than the U.S. operations?

"That's what my father told me and I always believed him."

The last question of the day was on the great sex problem being promoted by the pickets outside the building. (From the tenor of the question, one of the picketers must also have been a shareholder—a sort of internal conflict of interest.) Mr. Watson said that it was true that Science Research Associates prepared curriculum materials on this "interesting subject," as they did on other subjects approved by school boards, but he thought the contents were rather bland. It was also true that IBM had once hired a man to give a lecture to high school teachers on the same subject but, considering the newspaper stories (being circulated by the pickets with added comments on the reprints such as *DANGEROUS ITEM)* they probably wouldn't do so any more.

HOUSE TRIES TO PUT ITSELF IN ORDER

Legislation to computerize Congress took a big step forward last month when a House Government Operations subcommittee approved HR 10791; this bill, sponsored by Representatives Jack Brooks of Texas and William Moorhead of Pennsylvania, directs the Comptroller General to set up a budgetary information retrieval system for both Houses of Congress. It would be made compatible with another system, now being developed by the Budget Bureau, so that data could be interchanged between them. HR 10791 empowers the Comptroller General to establish data standards for other legislation-oriented dp systems used by Congress. He is also given control over the acquisition and use of non-legislative dpe operated by Congressional agencies—e.g., bookkeeping systems.

HR 10791 was on the verge of being approved by the full House GovOps Committee as we went to press. It would then go to the House Rules Committee, where a second measure—drafted by Rep. Moorhead —is already pending. This bill, HR 7012, assigns responsibility for computerizing Congress to a legislative data processing center. The center would report to a new joint congressional committee on legislative data processing. A 12-member advisory board, representing various Congressional agencies and including four dp industry members, would help direct the center's operations.

Moorhead favors 7012 over 10791, although he is supporting both measures. If the Rules Committee prefers the latter measure, Moorhead told us, he "will not be unhappy." But the Congressman indicated that he will continue plugging for his own bill.

Offered two choices, the Rules Committee is likely to refuse either of them.

Some members of the Rules Committee are closely associated with a long-dormant bill to reorganize Congress; they will probably favor delaying the two computerization proposals in the belief that this will increase the reorganization measure's chances. That bill covers, among other things, the use of computers to supply information on the status of pending legislation, summaries of related bills previously enacted, and budgetary data. Many legislators in both houses would like to use such a system. But not all of them are especially eager to reorganize Congress.

An obvious strategy for proponents of reorganization is to keep their measure intact and push computerization-reorganization through the House in a single package.

Even if a computerization bill is quickly approved by Rules and passed by the full House, it must be blessed by the Senate before being implemented. Although several key Senators ardently support reorganization, no individual member has gone out of his way to push computerization.

The House may establish a computerized information retrieval system on its own which the Senate could join later on. The Clerk of the House, Pat Jennings, currently is using an NCR Century 100 to do bookkeeping chores, and has asked the House Administration Committee for authority to add capabilities—notably a data base and terminals which would report the status of pending legislation. Committee Chairman Joe Waggoner of Louisiana has directed Jennings to sit down with the Comptroller General, Library of Congress representatives, and members of the Administration Committee staff, to work out a detailed implementation plan. That meeting was imminent as we went to press.

PENNEY'S SAYS GE SYSTEM IS A RETAILER'S DREAM COME TRUE

General Electric may have grabbed the inside track with retailers from NCR. Last month, seven years of research effort (and the spending of more R&D dollars than were budgeted) culminated in the signing of a $10 million contract with J. C. Penney Co. for extension of the TRADAR (TRAnsaction DAta Recorder) computerized retail information system to some 50 Los Angeles area Penney stores. Approximately 1500 point-of-sale terminals will be linked to twin GE 420's at Penney's Buena Park, Calif., data processing center.

The system was developed cooperatively by GE, Penney's and the Dennison Manufacturing Co. GE spokesmen gladly concede that this is just as much Penney's system; that GE couldn't have built this successful a system without Penney's help. The two companies worked so closely together during the field testing and evaluation period that "you couldn't tell a GE engineer from a Penney employee." Dennison's MERITAG Data Systems Div. developed a three-part system consisting of magnetically encoded merchandising tickets, ticket coder, and ticket reader for use with TRADAR.

The contract was signed after an exhaustive trial run at Penney's Glendale, Calif., store, where 15 terminals are now in operation (there will be 22 or 23 altogether). The first one was installed in November, 1967, and was an "instant success," according to store manager Ray English. Within the first week, every sales associate (clerk) in the section could operate the terminal successfully, so Penney's installed more terminals for the Christmas rush. Since then, the terminals have handled more than half a million transactions. The system has been in operation 99.97% of the time. (The second 420 is a parallel back-up system that polls the other computer every two seconds. If one system develops trouble, the other cpu automatically takes over.)

Penney's needed the system for

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*Rack-mountable version. Table top and pedestal models also available.

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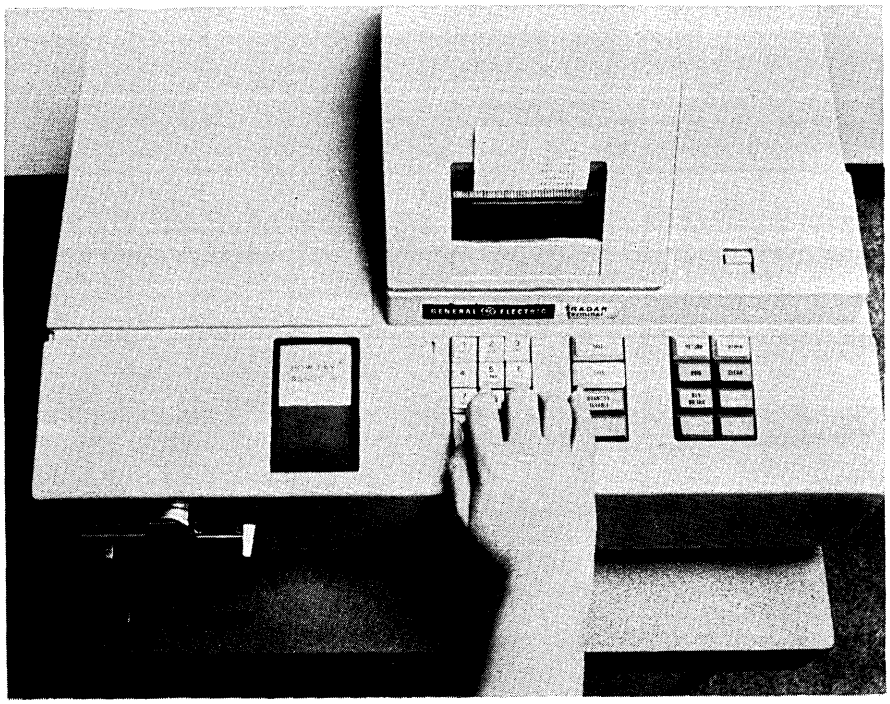
CIRCLE 58 ON READER CARD

two main reasons: Buyers are both more selective and more impatient—a retail store must have the right merchandising data at the right time. Secondly, buyers are turning more and more to credit card transactions, and a store needs a simple way to control the credit function. The three main questions Penney's needed answered were: Will the system work well in the store? Will the sales associates accept it? Will the customers like the system? The immediate answers were yes on all counts.

The TRADAR system has two main objectives: to speed up customer transactions and to capture at point of sale merchandising, accounting, credit and other essential data about a store's operation. It not only replaces the cash register, but most or all of the store's dp equipment as well.

TRADAR has three main equipment subsystems: the data center system (computers and peripheral equipment at the Buena Park facility); the media system (the magnetically encoded merchandise tag and plastic credit card and the machines to produce them); and the store system (point-of-sale terminals, Teletype adapters, scanners and data sets—connected to the data center system). Here's how it works:



Merchandise tags are coded and verified (manually, by punched card, or under computer control) at Penney's distribution facility, attached to the merchandise, and sent to the retail outlets. The ticket is the basic source document and contains—both in man- and machine-readable form—the merchandise number, category, department, vendor, color, size, and price.

The key element in the TRADAR system is the point-of-sale terminal (pictured) which is connected to and controlled by the computer. It has the ability to read the special magnetically encoded merchandise tickets and charge cards. A visual display panel guides the sales clerk step-by-step through every transaction. The terminal performs most of the operations done manually in stores today—verifies credit, computes tax and change, produces sales slips, automatically subtotals and totals. The only writing done is when a charge customer signs his name to the store receipt. A multiple extension feature for quantities of identical items requires only one entry by the sales associate. For house sales, the terminal computes the discount and subtracts it from the total. It also records the number of the associate making the purchase.

The data is not recorded on magnetic tape until it is complete and error free. The information is immediately available for accounting, inventory, or merchandising purposes. No keypunching or scanning is required.

In a one-item cash transaction, the terminal and the cash register methods take about the same amount of time, but the store has immediate access to much more information with the computerized system. The big time differences come in credit and other more complicated transactions. The automatic credit checking function eliminates the need for phone calls; and lost or fradulent credit cards are discovered immediately, even when the amount of the transaction is not over the floor limit.

Customers are not embarrassed or inconvenienced by long waits. And at the end of the day, there are no discrepancies between the amount of registered cash transactions and the actual amount of cash in the drawer.

Although Penney's does not know yet what the ultimate effect on profits will be with the system, they do expect that it will pay for itself. However, GE says that a primary objective of TRADAR is to improve the net profit of retail stores and that retail consultants have indicated a net profit improvement of from 0.5 to 2.0 percentage points is achievable with proper use. (The average retail net profit for department stores in the U.S. with a $50 million or more sales volume was 2.81% in 1967, according to the National Retail Merchants Assn.)

Penney's expects to procede nationwide, although some individual stores may not be automated. The retailer is already implementing the use of the MERITAG merchandise tickets in all stores. Dennison's MERITAG system is based on a building-block approach. The tickets can be used as part of an automated system or in a free-standing batch system. They can be read by a reader that serves as an alternate data collection device (instead of the TRADAR terminal). The reader provides the means to batch process ticket data directly on-line to a computer or off-line to magnetic tape. So a store need not go on-line immediately, or ever. A service bureau can be retained to process the tape, and the store will receive the same merchandising and accounting information that an on-line user will (somewhat later, of course). Dennison is adding this system to its product line. It is new, but analogous to existing MERITAG data systems.

Just from experience in the Glendale store, Penney's has found that TRADAR has improved customer service and sales associate productivity, reduced stock-counting effort, improved merchandising inventory turnover, reduced credit losses, reduced cash-till shortages and overages, improved store operation. Further, sales associate training time has been greatly reduced; most employees learn to use the terminal in an hour.

GE will market TRADAR information systems commercially and is also seriously looking into offering the system on a time-shared basis. Although the concept has wide potential ap-

plication, GE is not at this time considering designing a system for supermarket-type chain store use. GE claims that there is not another completely on-line retail information system available; and their nearest competitor, presumably NCR, is about a year behind. It will probably be difficult for them to close the gap.

WHEN GOOD FRIENDS GET TOGETHER

Applied Data Research, Inc., Princeton, N.J. (See News Scene, p. 121), has acquired Programmatics, Inc., Los Angeles, for an undisclosed amount of ADR stock. All particulars have not been completed, but Dave Ferguson, Programmatics president, will be an ADR vp and will probably function as manager of ADR's western region. Programmatics' Washington D.C. office will merge into ADR's office there, and ADR's Los Angeles office will move into Programmatics, which will become the Programmatics Div. of ADR.

ADR was formed 10 years ago by Richard C. Jones, and last year had net earnings after taxes of $528K on sales of $4.2 million. Its proprietary documentation software package, AUTOFLOW, accounted for 40% of its income, and is currently in use at some 450 installations. The firm has a 360/50 in its Princeton office for development of proprietary software, and employs 200 in its domestic and overseas offices.

Ferguson formed Programmatics in 1963 after leaving CSC, and the company is now doing business in "the high six figures," employing 35 people. ADR will market Programmatics' products, such as its PI SORT 360 systems disc sort package, and although Programmatics will continue to do contract programming, Ferguson expects this to be less and less important in the future. "Separate pricing of systems software is inevitable," he said, "regardless of what the Justice Dept. does."

With the acquisition of Programmatics, ADR now has the support of Ferguson's software Patent No. 3422404 for an "Apparatus and Method for Decoding Operation Codes in Digital Computers" to go with its software Patent No. 3380029, a software sorting system invented by Martin Goetz, an ADR vp. Thus far, these are the only patents awarded to software houses.

Aside from such industry-oriented assets, the new combine can also boast about $45K in image assets, which include a Ferrari (Ferguson), a Lamborghini (Jones), and a Maserati (Frank Welsh, Programmatics vp). Jones and Ferguson are longtime friends and the new association should proceed smoothly. As Ferguson says, "We think a lot alike."

That's patently obvious.

SOURCE DATA IN, TYPESET DATA OUT: MDS AND PHOTON

The proposed merger of Photon, Inc., Wilmington, Mass., and Mohawk Data Sciences Corp., Herkimer, N.Y., puts together the major phototypesetting manufacturer with the Key-to-Tape King. For MDS, it's another in the series of moves to create the "broadest line of auxiliary data processing equipment and marketing support services offered by any independent manufacturer in our industry." For Photon, it means a leg up in the phototypesetting field, whose technology is rapidly melding with that of the computer industry.

Just as beneficial, both firms are in the black, with the combined proforma revenues in calendar 1968 (actually Jan. 69 for MDS) ringing up at about $87 million, $5.9 million in earnings.

While a date for the meeting of stockholders to approve the action is not set, both firms seem confident of success. The two have emphasized that the "agreement in principle" is for merger, not acquisition, and that rather than "consolidation" there will be "compatible utilization of facilities." It has not yet been decided which will be the surviving company; a new company may be formed. The new or "continuing company" will trade its stock for MDS and Photon shares.

A look at the two companies may indicate the kind of house that's being built. Since its inception late in 1964, MDS has grown from a one-stop shop in Herkimer into a company with "upwards of 4,000 employees," including 350 maintenance men; 84 U.S. and about 50 overseas offices; 14 manufacturing sites; and 2,000 customer accounts—all important statistics for the smaller Photon. In the last two years, MDS has acquired Anelex, Soroban, Ohr-Traonics, and H. M. Storme, thus expanding its product line to include paper tape readers and punches, printers, magnetic tape units, communications equipment, retail tag readers and punches, and printer ribbons. It also has an agreement to market Colorado Instruments' source data acquisition equipment under the MDS label. Many of these products, in addition to being sold as stand-alone units, have been combined with the successful Data Recorder (key-to-tape unit) into various system configurations, numbering "over 40 models." MDS says it has over 20,000 Data Recorder systems in now.

Its 1968 revenues, ending July 31, were $53.6 million, earnings—$3.1 million. The first six-months report for '69 showed $35.7 million gross, $1.5 million net.

Photon makes a range of phototypesetting equipment for text and graphic production of newspapers, books, and periodicals (713 Textmaster series, Zip series, 200 Admaster and Tapemaster series, 500 Displaymaster series). It also makes System G, for production of engineering and other drawings with alphanumeric copy. These systems are variously driven by keyboard, paper tape, or magnetic tape units, none of which Photon makes—indicating one fit of MDS capability and Photon need. Photon also offers but does not make Keycomp keyboards for preparation of the 713 unit tapes.

The New England firm currently has about 60% of the phototypesetting market, which totalled $33.8 million in 1968. (Photon grossed about $20 million, netted $1.8 million in '68). But competition is growing, particularly since IBM has announced a crt-phototypesetting unit priced at about half the price of those currently available. Photon is working on a competitive model, its U.K distributor Crosfield, Ltd., developing the crt portion. But it suffers from a lack of service force and an inability to handle rentals. The merger with Mohawk will solve both problems, we're told. MDS' 350 field engineers will be trained to service the Photon units.

Photon has seven sales offices and 33 salesmen. This force will be enlarged and deployed to locations near the 84 MDS sales offices. MDS says that the larger firms are becoming increasingly attracted to phototypesetting for in-house publication activity, and many of them are among MDS' 2000 customer accounts. As an MDS salesman unearths possible Photon prospects among these, he will call in his Photon counterpart. And of course, MDS 50 overseas offices will be valuable to Photon, which does not have any international offices. (It has a distributor in England, Crosfield, Ltd.)

In addition to the product, marketing, and maintenance benefits, there is a manufacturing complement. MDS has a metal-cutting plant with 15 numerically controlled machine tools, and Photon has a plant for casting and sheet-metal fabrication.

The combination of the two firms also drives up the dollars spent on equipment from outside suppliers. For example, both firms use $5-6 million a year in controllers. Keyboards are another high volume item. The new company may go into the manufacture of such items if the economics are right.

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MDS has also had a long-standing interest in entering the optical character recognition field, and has already announced a mark-sense unit. Photon's optics experience may come into play here. Nonimpact printing is another market for both firm's talents.

Other areas MDS is studying include processor-oriented keyboard entry (a la Realtronics and Computer Machinery Corp.), touchtone phone terminals with voice response from central computer, complex data terminals with remote processing ability, and indeed, the "full spectrum of peripheral equipment now available on today's computer systems."

SCC STOCK FALLS OFF AND THE FIRM REORGANIZES

Spectators in the investment arena have recently been turning thumbs down on the stock of Dallas-based Scientific Control Corp. after last year's brief but ardent courtship. Opening at $7.50 on Jan. 1, '68, the stock (OTC) rose to $20 the first day and looked at $60 before it was through climbing. Apparently it is through climbing for awhile, coming to rest in the around-$30 bracket, which still represents a big price/earnings ratio. Investors are not all that unsophisticated—although they still buy anything that says "Computer" in the title—and the disenchantment reflects the market's opinion of SCC's earnings and sales.

Since earnings and sales, in turn, directly reflect the efficiency of the marketing department, as well as the machine-builders, it is not too surprising that a new PR firm has been hired and the vp of marketing, Norm Young, has left the company. Although not necessarily a related fact, that particular position often looks like a good target area in times of crisis. Shortly after Young left, SCC issued a news release regarding "strengthening its operating management to keep pace with growth." Among the changes mentioned by Patrick S. Martin, chairman of the board, were three executive promotions: Lyle J. Ratner, former vp of manufacturing, has been named executive vp and chief operating officer to assist John B. Baird, president and founder; Jesse D. Gilbert, former assistant to Ratner, has been raised to Ratner's old position; and Bennie Short has been appointed asst. vp of materials. A change not mentioned was the replacement of Young by Bill Leeds.

These men now preside over a 660-man company engaged in building the 24-bit 660 computer, the large 6700 computer, communications terminals (the DCT-132 and DCT-32), and the 4700—a product they were prodded into developing for the very fast-growing 16-bit computer market by Young.

Norm Young, on the other hand, may have been going, anyway, and just inadvertently seemed the scapegoat. He has already established his own firm, Remcom, for the manufacture of remote communications gear. Products from the infant firm are not expected for six months or so.

SEVEN YEARS OF R&D BRING AMPEX ITS LARGEST ORDER

As a supplement to its planned regional justice system for which IBM 360/40 and /50 computers are now being installed, the Los Angeles County Sheriff's Department has signed a contract with Ampex for a $5.6 million Videofile system to automate and speed the handling of the department's 18 million law enforcement records. With the Videofile system, information does not have to be converted to digital form as when it is entered into a computer; and many of the records used by the Sheriff do not lend themselves to digital form—fingerprints, mug shots, signatures, handwritten notes.

The computer-controlled (by a modified SEL 810A worth $109K of the contract) record-keeping system known as ORACLE (Optimum Record Automation for Court and Law Enforcement) is the first application of the Videofile concept to law enforcement.

The ORACLE program, developed cooperatively by Ampex and the Sheriff's Dept., will be implemented next year. It will consist of 14 remote facilities linked by microwave to the central filing section at the Hall of Justice. Material for file may be entered in original form from all outstations. A retrieved document may be displayed on a crt at the remote location, or a whole series of documents can be scanned. Hard copy output is available from the central printer. Fingerprints are shown on a split screen for matching, and even sound-alike names can be retrieved for matching. There are several levels of file protection, with the computer as the central control unit, and security tapes are maintained. As many as 246 simultaneous inquiries on the same paper can be handled in seconds using a buffer section as traffic monitor. A document is never out of file. The information storage and retrieval system is an internally developed indexing and searching scheme.

It is estimated that 20-25 people will be able to man the central file section (around the clock, seven days a week), compared to 200 now, and that annual department savings in record-keeping costs will be about $1.5 million. File space needed will be reduced to less than 10% of the present 40,000 square feet. Document capacity of the system is unlimited.

Ampex spent $8 million in R&D, and much more for the whole system. Videofile was introduced a year ago; this is the company's 11th order. It is the largest single order in Ampex' history.

Since 1963, the Sheriff's Dept. has been in the process of developing an information system to serve all justice agencies in the area. Finally, it seems that they're getting somewhere. So, if you have misdoings to hide, don't get hauled into an L.A. County Sheriff's station . . . your record may show up before your lawyer does.

ARIES SHOWS SIGNS OF RAMMING AHEAD

Automation Technology Inc., a dp-oriented holding company, has bought a 53% interest in Aries Corp. President George Danehower is out, and so is Bill Miller, who had been in charge of developing and marketing proprietary software; Richard Daly, who was board chairman, is now an Aries director. Danehower has been replaced by Chris A. Clark II, head of ATI. Miller's operation was merged with Autotech Systems Corp., another ATI subsidiary.

Aries lost $1.25 million last year, on sales of approximately $4.5 million. A knowledgeable source says the proprietary group's cost of sales were way out of line and accounted for much of this loss. Aries' basic mistake, he adds, was to use its own sales force. Under the new setup, the company's proprietary products—Autodiagrammer and Prompt are the major ones—will be marketed through licensees. None has been signed up yet, but Clark says he's looking; likely candidates are sales reps for terminal manufacturers, and firms specializing in software marketing.

Another weakness of the old Aries organization may have been overly decentralized management. This is indicated by Clark's decision to create a new position, executive vp for field operations. He has appointed Bill Ratcliff, president of Autotech Systems, to this spot. The new organization includes one other executive vp, Ron York, who heads up federal operations. He had similar responsibilities before, as a vice president.

ATI acquired a controlling interest in Aries by purchasing $200K shares of common stock at $5.50 per share.

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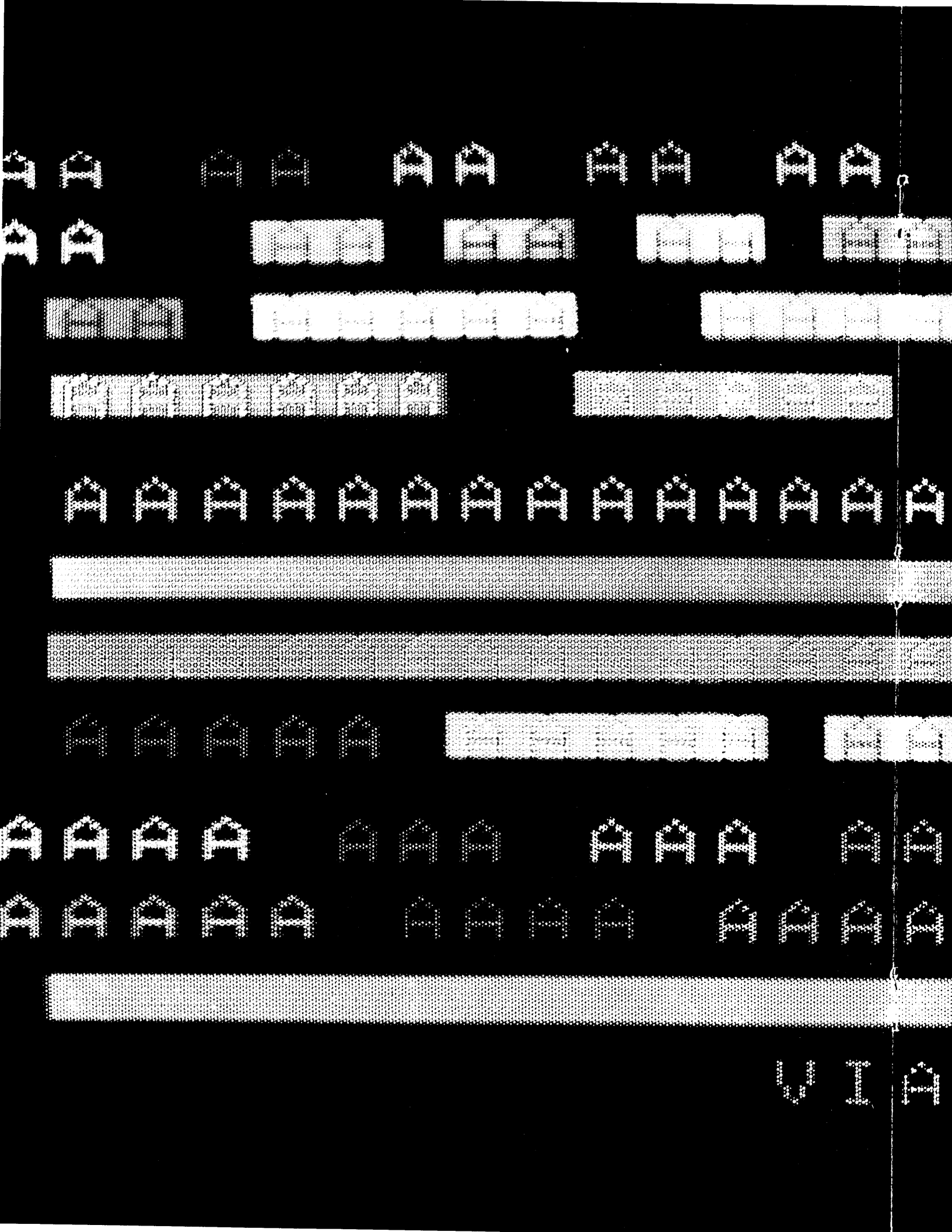

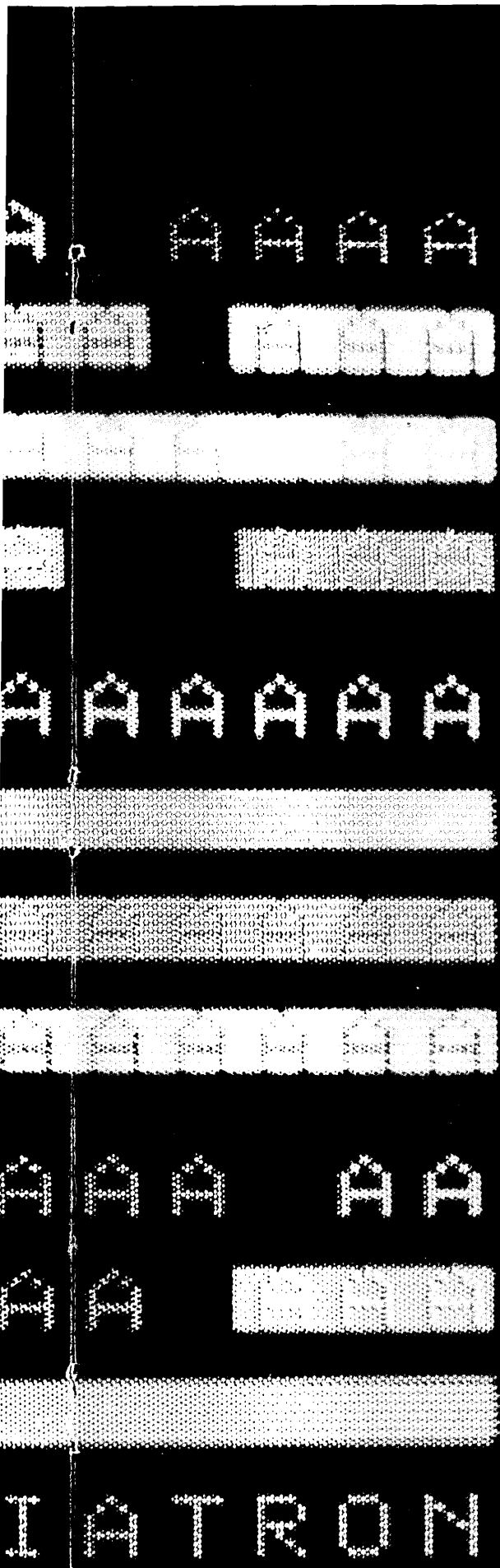

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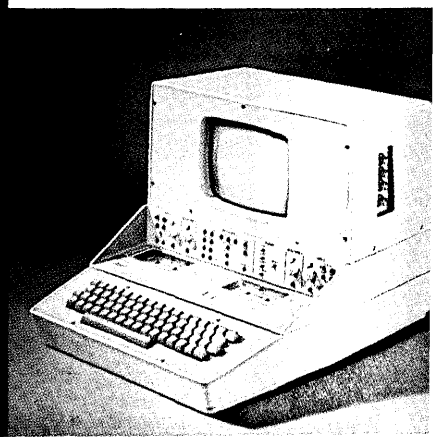

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Some of the financing came from a group of investors headed by H. L. Federman, New York City.

Clark told us that the new operation, although centralized, still permits "a great deal of local autonomy." Department heads and branch managers continue to operate on profit-center basis and control their own day-to-day operations. "Only the legal, financial, and other policy-making responsibilities have been centralized," Clark added. "Basically, we set the permissable limits and then manage by exception."

Aries, under Danehower, was one of the top ten publicly-owned software houses in the U.S. Now, with the addition of Autotech Systems, the combined operation is "probably fourth largest on the basis of their total '68 sales (about $6 million)."

Before founding ATI, Clark was manager of plans and programs in Washington for Computer Sciences Corp., generally regarded as the current number one. Before that, he worked for Planning Research Corp., generally regarded as number two.

He expects to show a profit for the first six months of this fiscal year, which is quite a feat considering the size of last year's loss, and the fact that the new team took over only last April. But ATI's past history suggests that such a reversal is more than possible. Three years ago, Clark and a group of associates founded what is now ATI on a $13K shoestring. The company's business then was programming and system consulting. First year sales were $686K. ATI now has four subsidiaries (Autotech de Latin America, Tax Corp. of America, Computer Professions Corp., and Aries), and expects to gross around $10 million this year. Aries sales for the six months ending June 30, '69 should be "around $3 million," says Clark—i.e., about the same amount Aries and Autotech Systems grossed during the same period last year. He expects volume during the next six months to be "significantly higher." About 70c out of every Aries sales dollar comes from the federal government; Clark believes this ratio will remain more or less constant for some time.

He has begun an "aggressive" marketing effort designed to increase the company's contract sales, which include programming, facilities management, and systems analysis. New branches are "possible" in Dallas and L.A., supplementing those already located in Washington, New York City, Minneapolis, Chicago, Philadelphia, and San Francisco. "We are also aggressively seeking to acquire other companies that can add to Aries' capabilities, like operations research, systems analysis and research outfits."

IBMERS SEEK EVEN GREENER PASTURES

Among other rubs that currently plague IBM is the continuing loss of key members of its middle management, a widely known and almost inevitable development resulting, perhaps, from the very magnitude and complexity of the colossus. While the rate of attrition overall seems to be the same, IBM is distressed that it's losing people at and above the district and branch manager level, an unusual situation for the loyalty-inspiring firm. A case in point: Ling-Temco-Vought, Inc., and its new firm, Computer Technology, Inc., recently enticed away Jack Von Gillern, special assistant to F. G. Rogers, pres. of IBM's data processing div.

And Computer Technology, itself, is a case in point. Formed in mid-1968 by LTV, it is headed up by G. W. "Bill" Woerner, former vp and midwestern regional manager for IBM's Data Processing Div. CTI has since filed to go public, to finance its expansion in facilities management.

A more recent example representing defection from the IBM ranks is the formation of Data Dimensions, Inc., in Stamford, Conn., by Less Gottlieb and Jerome Paul. Gottlieb, president of the new firm, was manager of business analysis for the Systems Development Div. of IBM, and previously the manager of marketing for the Information Marketing Dept., now transferred to Service Bureau Corp. Paul, exec. vp, was director of information and data processing systems for IBM's SDD. Data Dimension, Inc., whose six principals are all ex-IBMers, will go after a variety of markets, including time-sharing, systems management, contract programming and consulting services, personnel services, leasing, and publications.

Alfred Norelli, former Union Carbide technical services manager and IBM account rep, will direct the systems management effort, and Robert Kenagy, former IBM marketing manager in the printing and publishing industry, will be DDI's director of printing, publishing and marketing services. Time-sharing and remote batch processing will be offered on a 360/50 in the New York area, emphasizing text-editing, signifying the firm's initial emphasis on the printing and publishing field.

Completing the ex-IBM roster are Ed Van Gombos, former manager of Administrative Information Systems with SDD, who will be the director of technical development, and Stanley Clousman, who worked with IBM user groups for seven years, and who will be director of personnel services.

IBM also is losing upper echelon salesmen, who have become disaffected for various reasons, including IBM's stringent adherence to its somewhat complicated point system, which awards a salesman points for the installation of equipment but subtracts those points (which stand for money) on a declining scale if and when a purchase is cancelled. There is much pressure on the salesmen to obtain long-range commitments to keep systems in. The paperwork requirements have also become too demanding. Some branch marketing execs claim they spend 90% of their time filling out reports, instead of making calls with salesmen and training them.

But there are other reasons for the departure of both execs and salesman, and these are apparent. A common feeling among those who have gone elsewhere is that IBM is now so large that advancement is slow; that even though beginning financial arrangements are fair, it takes a long time to move into desired administration posts. This can become galling to those who stay with IBM and watch the proliferation of young millionaires on the outside who start their own companies. The lure of these young companies with their stock options and instant executive titles is another factor in IBM defections, which tend to mushroom because when seniors leave, they also take juniors along with them. An ex-IBMer will nearly always hire an ex-IBMer.

Additional reasons have been advanced by various sources. "IBM salesmen are bored with the 'blue suit' pressures and the completely structured situation . . . a certain amount of time in a particular job or locale and no deviations before one moves up." "There's the lure of being a larger frog in a smaller corporate puddle." "White Plains and Armonk, where a period of time must be spent, just don't have a great deal of appeal."

One observer who heads a professional placement service agreed with most of the above reasons and preferred even another: The antitrust suits have unsettled the salesman because company presidents now might not be reluctant to keep an IBMer cooling his heels in an outer office.

He also added, "IBM's name on one's resume is probably worth more than it is on his business card."

RAND TO TAKE STOCK OF STOCK OPERATIONS

Rand Corp. will continue its investi-

gations of the problems of the Wall Street paper overload under a $1.1 million contract underwritten by both the big exchanges, even though the arrangement has come under criticism from Rep. Charles Gubser, of Calif., for its apparent deviation from the Rand regimen.

In recent remarks in the House of Representatives, Gubser objected to Rand's participation in a project that was not government-oriented, maintaining that Rand was subsidized by the Department of Defense and, particularly, the Air Force, and thus should not be allowed to compete against private firms for the Wall St. job. He said it amounted to subsidy of Wall St. by the DOD, and that even though Rand is a nonprofit organization and does not bid on contracts, it obviously does negotiate, which constitutes competition. His remarks were related to House consideration of certain tax exemptions of nonprofit organizations.

A Rand spokesman stated that the firm is, indeed, nonprofit, investing all its profits in further research on matters concerning "the public welfare and national security." He said that around 58% of Rand's work is for the Air Force (diminishing each year), but that Rand has no formal ties with any federal agency, and has done work for many local, state, and federal entities. Rand's preliminary study of the Wall St. paperjam satisfied Rand that it was in the public interest to alleviate the problem, which could constitute a stricture on the nation's economy. Rand further made the point that it is involved in many noncivic enterprises, including biomedical research with the UCLA Medical School and the Anderson Medical Center in Houston.

It still is active in civic business, however. After a long association with New York City and its attendant dilemmas, Rand recently announced the formation of the New York City Rand Institute, with its own board of directors, which will work with Mayor Lindsay and the local government to provide solutions to the problems that currently plague Fun City.

EUROPEANS URGED TO MERGE

The merging of West European companies in the computer and other industries, with no regard to national boundaries, will do more to "bring sound competition within a free enterprise world and pave the way toward a true European economic community" than signing treaties, said Andre Chargueraud, president of Diebold Europe S.A. in a recent speech on the European data processing market.

Europe, said Chargueraud, has committed over $500 million to the computer industry. Germany and Great Britain have poured money into existing computer companies like ICT and English Electric, and Siemens and AEG/Telefunken, he said. Holland and France have supported the entry of large electric and electronic firms into the computer field, like Philips, CSF and CFTH. But they are not an immediate threat to U.S. manufacturers, and even 5-10 years hence they will not be unless they get together. "Each national market is too small to support its own computer manufacturer, and the multiplication of an export marketing network is not a satisfactory solution." Many discussions have taken place, he said, but nothing has happened.

Charguraud covered quickly a gamut of topics on the industry in Europe: total size, data transmission, small computers, time-sharing, and leasing. There were about 14,000 computers in operation in Europe in July 1968, with an estimated value of $4 billion—about 20% of those in the U.S. 1978 forecasts indicate 80,000 computers will be installed in Europe, meaning a faster growth rate than in the U.S.

But the gap between Europe and the U.S. in data transmission will increase in the next five years, since communications networks are state-owned in Europe and the "response to market demands is slow and service below standard." Plans are ambitious, however. France expects to have 25-30,000 lines in 1975 (although the best-laid plans often go awry in state-owned nets). The French National Railway is installing 1600 terminals (500 in now) linked to four interconnected Univac 1108's via 32 switching computers. The General Post Office National Data Processing Service in the U.K. should have a few thousand terminals in post offices by 1972/73. Great Britain also hopes to have 15% of its communications load in data transmission this year.

The communications lag will not slow down time-sharing use in Europe, the speaker said, primarily because it is scientifically oriented and does not require a large volume of data transmission. It is only two years behind the U.S. in this area, he claimed. About 30 t-s centers are now in operation, GE accounting for 12 of them. "Over 60 centers are being implemented," and the increasing entry of independent U.S. and European service bureaus into this market will account for 50% of the installations within one year.

"It is in the field of small scientific computers where the most spectacular price-performance/sophistication ratios took place in the last two years," said Chargueraud, ticking off eight countries that contributed 20-25 new small computers in this time. The small business computer lags behind, however, because of the difficulty of producing input/output gear, and high reliability at a low price, and of providing marketing support and rentals. "This market should be watched: spectacular and new announcements will come, as will obsolecence to existing systems."

Third-party leasing has been slowed by "fear of obsolescence and not enough attention to the concept of return on investment," he noted, but American leasing firms with non-full-payout contracts are entering Europe with a "dynamic marketing approach."

Finally, going back to the original comments made on the need for mergers to develop European computer power, Charguraud noted that 90% of all computers have been designed and developed in the U.S. or by their European subsidiaries, a situation that is only likely to be hurt slightly by nationalistic policies, unless strong mergers do come about.

IBM OPTS FOR ELECTRONIC PLASMA DISPLAY PANEL

IBM has entered into an option agreement for a nonexclusive license for the use and sale of an electronic plasma display panel with memory. The panel was developed at the Coordinated Science Laboratory of the Univ. of Illinois and may be used for computer display readout or in other electronic systems.

The plasma display panel is a three-layer glass sandwich. Its center layer has lines and rows of gas discharge cells with thin-film gold electrodes, which appear transparent on its exterior surfaces. These are in register with the cells. A voltage applied to a cell causes it to discharge and changes it to plasma, which emits light. Each cell has inherent memory. A selected array of lighted cells thus produces an image. The panel is computer addressable with no digital-to-analog conversion. The glass may be either transparent or translucent. Prototypes of the panel, which is still in the research & development stage, have measured up to about 11 x 11 inches.

University Patents, Inc., Chicago, is the exclusive licensing representative. The firm is a marketing organization that has title to inventions emanating from the Univ. of Illinois. The panel

was invented by Professors Donald L. Bitzer and H. Gene Slottow, and Dr. Robert Willson, a former graduate student at the Univ. The basic research was sponsored by the Joint Services Electronics Program of the Dept. of Defense and the Advance Research Projects Agency of the Dept. of Defense. Will SDS picket IBM?

PUNCH CARDS STILL PACK A WALLOP

CalComp, Anaheim, Calif., graphics firm, will shortly market a new peripheral product called the Punchmaster, a device that attaches to an IBM card punch or verifier and provides buffer and memory that enable an operator to keypunch and verify at normal typing speeds without waiting for the machine to perform its automatic functions. The buffer stores up to 31 keystrokes, allowing the operator to continue typing while the punch or verifier is processing the previous card. The program memory handles up to 22 different card formats at one time, which can simplify batch control, because all cards for a batch can be in a single deck in document sequence, and data common to each card is keyed only once for each document.

The company is betting that the punch card is far from dying, and a representative stated that he's sure it's "included in IBM's next five-year plan." The firm claims that a pilot installation indicates better than 60% increase in production in 90 days and a two-to-one reduction in errors.

The Punchmaster is intended for keypunch installations that wish to speed up their operations without basic changes in their systems and procedures, and with an economical outlay. The device is lease-priced at $95 a month, with optional display at $10, left zero fill attachment at $10, and left zero fill and accumulator at $35. January, 1970, is the target for first delivery, with an earlier possibility.

CIRCLE 598 ON READER CARD

SOMETHING MUST BE IN A NAME

In a recent memorandum to ACM regional representatives and chapter chairmen, George Samson, chairman of the Public Relations Committee of the ACM, outlined his proposal to change the name of the organization to the ACP (Association for Computing Professionals). He stated that it would be a "significant milestone in advancing our Association's 'people image'," and that ACM "is a name more appropriate to an amalgamation of computer manufacturers, rather than the people who are responsible for making their existence profitable in the first place." He further stated that the word change would give "emphasis and correct meaning to what we are. It will give impetus to our 'people centered, responsible professionals' public relations program while deemphasizing machinery—the tools of our profession."

Samson was replied to in a letter by Lynn Stoller, member at large of the ACM, who objected to the proposal on the grounds that it "would increase public apprehension as well as increase our own self-deception." He felt that "as a member of the ACM I can ethically attest to having a greater than layman's level of technical knowledge about computing machinery. As a member of a company . . . I cannot usefully subscribe to being a computing professional. What policy matters could be stated by the profession that would be contrary to my allegiance to my company? If there are none, then what is the value of the name change? If there are, then I suggest members would have to sign a loyalty oath to the ACP in order to assure the public that the change in name was not the perpetration of a fraud." Stoller further suggested that the members of the ACM increase their own awareness of the humanities, stating that "the public would be more impressed with knowledge that we were attending seminars conducted by leading humanists, than they are by our attempt to increase their technical knowledge of computing."

Both the memorandum from Samson and the letter from Stoller were read in their entirety to the membership present at a meeting of the L.A. chapter of the ACM. There was a discussion and a straw vote. Four were in favor of the change, 23 opposed it, and 16 abstained. No amateurs lost their standing.

COMRESS STOCK SALE TO FINANCE NEW SOFTWARE

Comress, the well-known simulator supplier, plans to offer a new medical application software package with some of the proceeds from a $15 million stock sale scheduled for this month or next. The shares will be offered at an estimated $15 apiece.

The new medical package is to be offered through a wholly owned subsidiary named Commed, Inc., and reportedly encompasses conventional bookkeeping applications plus "some others," which were not described further. But the package apparently will require real-time conversation between user and computer.

Two other new proprietary packages will be financed with proceeds from the upcoming stock sale. One, called "Dynamost," is designed to schedule multiprogrammed computers dynamically. The other, "Datanetics," is an on-line operational control system.

Part of the remaining proceeds will be invested in further refinement and marketing of "Comchart," a flowcharting program developed in 1966. A "substantial" portion of the stock sale proceeds are earmarked for new subsidiaries and new outside ventures. The latter, according to the prospectus, will include formation of new companies and purchase of "substantial" minority interest in existing firms.

About $282K of the stock sale money will go into a new headquarters that Comress plans to occupy next month. It's located in Rockville, Md., just outside Washington, and about 20 miles from the company's present location.

Roughly two-thirds of the shares to be sold will be supplied by present stockholders. The largest individual contributors will be Chairman Don Herman, who is offering 183,330; President Fred Ihrer has put up 177,530 shares, and Treasurer Lee Johnson, 62,110.

After the stock sale, the public would own 14% of the outstanding shares. The prospectus shows the company now has 6.6 million common shares outstanding with a book value of 23 cents/share.

The stock will be marketed through G. H. Walker & Co., New York City.

COMPUTER RESPONSE CORP. GETS ANSWERS FROM AN 1108

"Exec VIII is coming along very rapidly; we're satisfied with the way it's handling our workload."

So says 1108 user Bob Wiggins, an ex-IBMer who now presides over Computer Response Corp., headquartered in Washington. CRC is a service center which specializes in scientific data processing. It offers a variety of related services ranging from dp training to facilities management.

When interviewed early in May, Wiggins had been using Release 23.25 of Exec VIII on an operational basis for about a week. During the preceding three weeks, several CRC technicians had spent a substantial part of their time debugging, testing, and modifying 23.25. Wiggins regards this investment as "not unusual for a sophisticated OS." CRC's workload consists of a mixture of high speed (75 lpm.) and low-speed (10-15 char/sec.) data, handled in batch mode, on a time-sliced basis, from an unspecified number of remote terminals.

news briefs

CRC was incorporated a year ago, and has been actively seeking business since last Fall. Within the next few months, it will issue 300K shares of stock, at an estimated price of $7 apiece, with which it hopes to raise about $2 million for further expansion. A second data center, supplementing the 1108 system at headquarters, is a major element in the expansion. It will be opened "within the next eight months." The location was not disclosed, but it probably will be equipped with a 360/50. CRC has just started a training school in Rosslyn, Va., a Washington DC suburb, where courses are offered in FORTRAN, COBOL, and assembly language, using a Univac 9200 linked to the 1108. PL/I will be added later, possibly after the second dp center goes operational. Four more training schools are planned, but Wiggins declined to say when or where. CRC has five field sales offices in operation, and additional outlets are planned this year. Those open at the moment are located in Boston, New York, Philadelphia, Pittsburgh, and Atlanta.

According to CRC's prospectus, it plans ultimately to service 100 low-speed and 15 high-speed terminals simultaneously with the 1108 now located in Washington. Some augmentation will be required, though, because the present configuration can accomodate a maximum of only 64 lines. The system includes a 131K word core, seven drums, 8 tape drives, and two CTMCs. The drums include five Mod 432s, a 1782, and a Fastrand.

CRC's facilities management business consists at the moment of one customer, a manufacturing concern signed on in April. The work is done on the customer's equipment, largely with his personnel. CRC expects that the bulk of its future facilities management business will come from smaller companies. The work will be done on CRC equipment, linked to the customer by remote terminal. "We're designing software with special appeal for this market," said Wiggins. The first such effort consists of modifying IBM's bill of materials processor. CRC also hopes to sell machine time to software houses, and to software developers employed by companies in other businesses.

Wiggins, before co-founding CRC, had a long career with IBM which culminated in his appointment as manager of its time-sharing facility in Cleveland. The other co-founders were Henry H. Greer and George Pressly. Both are executive vps at CRC. Greer was marketing manager under Wiggins at Cleveland, and Pressly was operations manager. Other CRC officers are vp Leon Somerall, who came from Johnson Bronze Co., New Castle, Pa., where he was operations vp, and Harry Leizear, previously assistant treasurer for CEIR.

NEW FIRM SIGNS SYSTEMS PACKAGE CONTRACT WITH CCI

Computer Communications, Inc., Inglewood, Calif., and INTELECOM, INC., a newly formed New York firm engaged in the marketing and operation of on-line, time-shared computer communications systems and services, have announced a contract whereby CCI will be systems designer, developer, supplier and manager of INTELECOM's product. This equipment will utilize CCI's CC-30 communications station and related CCI peripheral devices. The initial phase of the program, with a value estimated at $500K exclusive of hardware, will conclude with the first operational version of the system within a year.

Members of the board of directors of INTELECOM include Robert N. Kisch, a founder of CDC, Robert F. White, president of Shedd-Brown, Inc., and Dr. Robert E. Fagen, president of CCI. The firm intends to operate on a nationwide basis with individual subscribers and organizations with multiple locations, and ultimately on an overseas franchise basis. White, president of Shedd-Brown, Inc., and Dr. Robert E. Fagen, president of CCI. The firm intends to operate on a nationwide basis with individual subscribers and organizations with multiple locations, and ultimately on an overseas franchise basis.

EQUIPMENT LESSOR OFFERS VARIETY OF MAKES

Time-Sharing Terminals, Inc., reputedly the first teletypewriter lessor to offer different makes of equipment, is installing them at the rate of 150 per month (more than 500 are already in). The company was formed last November.

Last month, TST offered 350K shares of stock at $10 per share, which were gobbled up. Five branch offices have been opened, and seven more are scheduled in the next few months. Among TST's major customers is a nationwide restaurant chain. Another is the new Honeywell time-sharing service. TST will supply the first 1000 TTYs ordered by the latter's customers. It has similar contracts with U. S. Time Sharing and Com-Share.

The company had an eight-man maintenance crew when this article was written, early in May. By the end of this summer, TST expects to have 40. Some are being hired directly out of the armed forces. Others come from larger firms in the maintenance business. "They like the opportunity for quick advancement which we offer here." explains president Jack Young.

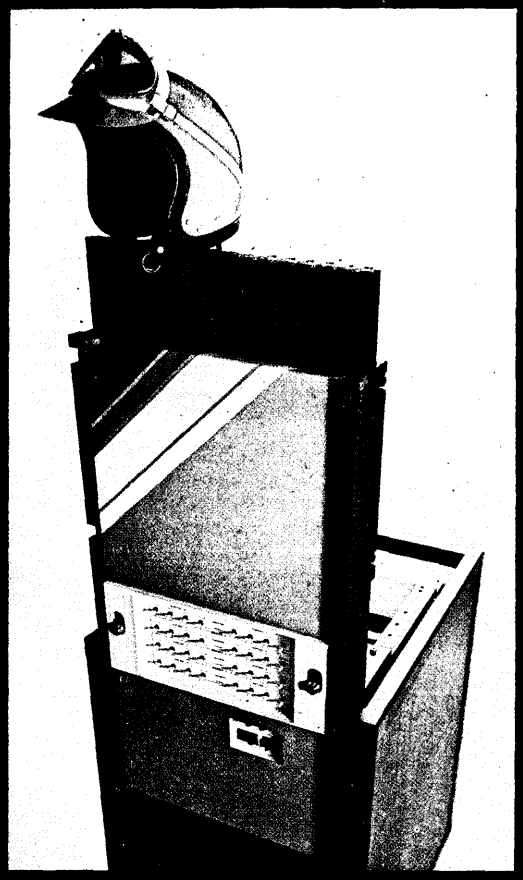
Young, 39, is ex-president of Consultec, a software subsidiary of NUS Corp. Among the directors are Dan Honig, president of Qatron Corp.; Bud Shuster, president of Datel, and Porter Stone, president of U. S. Time Sharing. TST's marketing vp is Jim Gillece, 33, an ex-RCA information systems sales manager, who came to his present job directly from Time-Sharing Corp., Hanover, N. H. Secretary-treasurer (and a director) is Garrett Sanderson, Jr., formerly Litton's eastern regional director, and more recently, executive vp of Stackig and Sanderson, Washington advertising-pr firm (he remains in that job). U. S. Time Sharing, Qatron, and Datel each own about 10% of TST; about half the outstanding stock is owned by the public.

TST is headquartered at the moment in Bethesda, Md., but plans shortly to move into larger quarters in nearby Gaithersburg. The surprising thing about the company's rather phenomenal growth is that it isn't offering a unique product. TST leases acoustically coupled Teletype Mod 33 TTYs, a Datel-modifed IBM 2741 Selectric, and soon will be offering GE's new TermiNet 300. Couplers are supplied by GE and Omnitec. Each of the terminals could be acquired from the original manufacturer, so why does the user come to TST?

One reason, explains Jack Young, is that "We offer the user a choice of equipment he can't get from any individual manufacturer, plus a more objective analysis of his needs. Also, because we specialize, we're often aware of improved equipment before anyone else. This was the case with the TermiNet. Several months ago, we went down to Waynesboro, Va., where they're manufactured, and made a detailed analysis. This was a long time before any TermiNet publicity appeared."

Another reason for TST's appeal is quicker delivery, added Young. "We can supply a terminal two to three days after the user signs an order. The manufacturer usually takes several weeks; this delay is expensive, particularly for the operator of the commercial time-sharing system."

Several expansions in TST's product line are likely during the next year. "We're looking at a new Olivetti terminal," says Young, "and at Teletype's new inktronic machine. We're developing a paper-tape reader-punch for use with the Selectric, which will be



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The new exciting entry is the CPC head-per-track disc system providing from 25 million to 200 million bits in a compact chassis to fit your 19-inch rack.

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There's more to tell. Like a worst-case-failure recovery time of only minutes. Or the ability to service up to 3 controllers. Or system expandability to billions of bits.

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SRI DENIES STANFORD HAS RIGHT TO SELL SRI

A 12-man committee of Stanford Univ. students, faculty and administration members voted nine to three recently to sell the Stanford Research Institute, reportedly because of SRI's involvement (10% of its $65 million in revenues last year) in the Vietnam War. It placed a $45 million market value on the Institute, 90% of whose work requires the use of computers (a CDC 3200 and 6400 are installed at its computation center), and advocated selling SRI to SRI.

As far as the Institute is concerned, however, there isn't going to be any sale, for the compelling reason that Stanford, according to SRI, doesn't own it. A spokesman for SRI said that it's a nonprofit organization and that no private institution or individual has the right to sell it, although he granted that legal ownership will be a difficult question to settle. He said that the majority of the SRI staff resents the precipitous action of the committee, and that the Institute will continue to function as in the past. The Institute seemed especially annoyed that the value placed on it represented the intangibles of its own skills, and thus, if it bought itself, it would be paying for something it already possessed.

The relationship between the University and the Institute is tenuous, at best. Time charges to the Institute by the University's computation center have dropped to less than ½ of 1% of the center's monthly revenue. At press time, it was reported that the University would sever formal ties with the Institute.

NAME OF THE PRODUCT IS NOW THE NAME OF THE FIRM

Peter P. Harris, pres., recently announced a change of the name of his firm from Applied Data Systems, Inc., to Adpac .Computing Languages Corp., which happens also to be the name of the company's chief product. Adpac is a general purpose computer language that operates with IBM 360 machines for business applications under TOS, DOS and OS, and will be available for other manufacturers' machines later this year.

Never reticent about his favorite subject, Adpac and its ultimate domination of the world, Harris also announced a year-long $750K marketing, training and distribution program to expand into eight additional regional markets, bringing the total to 19 major cities where Adpac sales and service are available.

Among various claims that Harris makes for his creation is that it doubles programming output and programmers learn twice as fast as with any other language; that it is the first language ever developed by a nonhardware company and will eventually replace all other computer languages; that Adpac programs take 50-75% less machine time to compile and debug; and that any program can be written two to three times faster in Adpac than in any other language.

It would seem that Harris is aware of the imminence of separate pricing.

NEW FIRM OFFERS ON-LINE STOCK DATA TO ANALYSTS

New firms building special systems for specific applications out of the small general purpose computers and other available devices are becoming a common occurrence. One such example is the first product from LV Computer Systems, Inc., New York: a total hardware/software package dedicated to the needs of the security trader and analyst in the investment community.

Called the LV-3000, a basic $3300/month system consists of a modified PDP-12 with an 8K memory and crt display, six Linc tape drives, two 32K-word DECdisc units, a repertoire of on-line and off-line software packages, and a data base on the "2400 or 2500" securities traded on the New York and American Stock Exchanges. Options include "special programs" ordered by the user and remote crt/keyboard terminals (manufacturer yet undetermined). The 3000 is said to handle up to 16 such terminals located within the same building and linked via a control unit.

The 3000 will be linked to tickers at both exchanges to receive data on each day's transactions (bond ticker input will be available in January 1970). The analyst will have on-line and off-line programs available in three categories: stock selection, portfolio evaluation, and information storage and retrieval. Under stock selection, during the day the analyst can receive information on events such as stock data collections, block trading detection, new high-low occurences, opening gap information, etc. Off-line, the system will do historical updates, block trading summaries, daily high-low summaries, etc. For portfolio analysists, on-line data available will include price display, stock position, buying power; off-line programs will summarize the above and other information.

In addition, LV offers an optional capability that it considers "revolutionary": daily and weekly bar-chart displays that will show charts on a stock going back six months and three years, respectively. That is, the high-low-close data on the daily chart will show six months of activity, while the weekly chart will show the same information for each week going back three years.

Also optional will be historical data tapes (daily or weekly) that contain number of shares outstanding, four years of quarterly earnings, and dividends, moving average, and other data. Transaction tapes of a days activity will also be available to the user, particularly useful if the network or the 3000 goes down during the day. LV says that the $3300/month will include a maintenance contract with Digital Equipment Corp. RPG is also being developed for the system.

SOFTCORE UNDEREMPLOYED LEARN SOFTWARE LORE

Computer Dynamics Institute, an Englewood Cliffs, N.J., programming school, began training some twenty "underemployed" individuals of Puerto Rican or Cuban ancestry last month. The students, all of whom are employed during the day, will undergo six months of evening classes toward a certificate in programming. They were selected from among eighty "ghetto" residents recommended by the North Hudson Community Action Group, of whom 25% passed the programming aptitude test. The school noted that this percentage was about as good as that for most applicants. In fact, the program differs from the regular CDI curriculum primarily in that aid is being given to the students.

Tuition is being subsidized or eliminated through aid from CDI and from sponsoring companies. Notably, Continental Can Co. and Volkswagen of America have made definite commitments, with the latter agreeing to pay full tuition and promise employment to two black students. CDI intends to profit from the endeavor through its placement service, Datamatics Management Services, which it expects will get the business of most graduates during later job-hopping. Plans call for expansion to include black students through cooperation with the North Bergen Urban League, and the addition of more sponsors. Robert Bocchino, president of CDI, noted that "no vocational field today is more wide open to our disadvantaged youth than computer programming."

SOPHISTICATED NEW ARCHITECTURE FOR TIME SHARING.

SCC's 6700 was designed especially for time sharing. It is the product of years of research by a team of hardware and software experts.

Four peripheral processors perform all communications, batch I/O, memory swapping and executive functions.

The system is supported by Conversational Basic, Fortran Symbolic, Cobol with conversational editing and a comprehensive user accounting system.

Features

125 nanosecond fast memory
1 usec main core
5 million word drum memories — 2.25 million words per second
168 million word disk memories — 275 K words per second
256 simultaneous remote keyboard printers plus remote batch
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CIRCLE 63 ON READER CARD

news briefs

MIT SCIENTISTS SEEK ARPA FUNDS FOR T-S FACILITY

A group of behavioral scientists from the Massachusetts Institute of Technology have submitted a proposal for support to the Behavioral Sciences Division of the Department of Defense's ARPA (Advanced Research Projects Agency) for the establishment and operation of a time-sharing system of computer analysis and modeling relating to the behavioral sciences. The project would be unclassified and would be engaged in by researchers at M.I.T. and other universities using a computer system called CTSS (Compatible Time-Sharing System), developed by M.I.T., that runs on an IBM 7094.

Under the Cambridge Project (so named because it will be centered in Cambridge) proposal, the behavioral scientists would be funded to make a gradual takeover of the CTSS system over a five-year period, augmenting and maintaining the facilities. The project would enable scientists currently conducting separate studies to use a common computer facility, sharing common public data files that will contain no classified data or private information on identifiable individuals.

Principals among the more than 50 behavioral scientists in the Cambridge area who participated in the proposal are M.I.T.'s Dr. J. C. R. Licklider and Dr. Ithiel de Sola Pool.

ALL 50 STATES' STATUTES STORED

Aspen Systems Corp., Pittsburgh, has established what it claims is the largest body of full-text information ever stored in a computer: the entire statutes of all fifty states, comprising about 200 million words. Called System 50, the information is provided as a service, enabling rapid searches of statutes, with relevant laws provided as computer printout, printed pages set by computerized photocomposition, or magnetic tape. New statutes are continually added in an effort to keep the data base current. Searches are performed for all states, any given state(s), or for certain geographical regions.

Cost ranges from $250 for a computer printout of a search of the statutes of Rhode Island, to $7000 for a book of phototypeset pages from a search of all fifty states. Hardware used consists of a 360/40 with 256K core plus a 2314 disc. Photocomposition is performed at the firm's St. Paul subsidiary, Aspen Computype, Inc., using a second 360/40 to drive an RCA Videocomp.

A major advantage of the system is that it reads all statutes without regard to indexes or cross-references, unlike manual searching. When information is needed on a given subject, input consisting of words or phrases identifying the subject is used, permitting the computer to scan all statutes word by word, and print out all relevant material. When the system was used by legal researchers in Ohio who had manually sought for eight years to find all statutory references to "Justice of the Peace," the computer search uncovered seventeen relevant sections that had eluded manual search. Users of the service are expected to be found in many organizations, including Federal agencies, national corporations, trade associations, foundations, and insurance companies, as well as the states themselves.

COLLINS ESCAPES EDS CLUTCHES

Electronic Data Systems Corp.'s bid for control of Collins Radio Co. (May '69, p. 140) was withdrawn May 1st, after a struggle that nearly sent Collins to the altar with Honeywell in an effort to avoid takeover by EDS. Collins and Honeywell had issued a joint statement on April 8th declaring that they were holding discussions toward a merger, but the talks collapsed less than two weeks later, with no announced explanation. There was speculation, however, that fear of the Justice Dept. dimmed enthusiasm for the marriage. Following termination of the talks, EDS victory appeared certain, although EDS was still awaiting SEC approval of its tender offer to exchange 1.5 shares of EDS stock, valued at about $65, for each share of Collins. The Honeywell offer, had it taken place, would have given 56/100 of a Honeywell share, worth about $70.

But only ten days after Collins appeared to be left helpless by its break with Honeywell, EDS abruptly withdrew its offer, which had never actually been made to the public, as SEC approval of the registration statement had not yet been forthcoming. EDS allegedly gave up the ghost because large institutional holders of Collins stock were leery of trading their shares, selling at less than twelve times earnings, for the soaring EDS stock, which sells at about 300 times earnings, had only been publicly traded for six months, and is about 90% owned by EDS directors. These investors were apparently holding out for a better offer from EDS, which the firm was not prepared to make. According to *The Wall Street Journal,* the Chase Manhattan Bank, with 450,000 Collins shares, making it the largest single holder, and other institutional investors "consolidated their opposition, dooming the tender offer."

EDS' official explanation for the withdrawal was that the company had learned of a revolving credit agreement of $75 million which Collins had floated in April, containing a clause providing that a change in control of Collins could be grounds for default on the loan, thus endangering the interests of both EDS and Collins stockholders had the takeover been effected.

GIGO, LIKE FOR REAL

A Dallas computer service firm that shall go unnamed recently pulled a noteworthy switch on the old Garbage In, Garbage Out nostrum. The firm was under contract to neighboring Tarrant county (Ft. Worth) to maintain lists of voters on mag tape and prepare voter certificates via computer from voter registration applications. Company employees somehow managed to deliver two boxes of fresh voter registration applications, sent from Ft. Worth, to the Dallas city dump before they had been punched. When the errant shipment was noted, officials of the firm hastened to the dump where in hurried honeycombing they managed to retrieve about half the missent applications. Too little, and too late. Tarrant county has awarded the contract to prepare 1970 voter application rolls to Commercial Computer Services, Inc., of Ft. Worth. "I would prefer to deal with a Tarrant county firm," said Tarrant county Assessor-Collector Reed Stewart. "This company has assured me that there will be a greater number of safeguards."

TORONTO U. GETS GRANTS TO STUDY COMPUTER USE

The Univ. of Toronto has been awarded grants totalling $1,230K to study and develop better ways of using computers. The awards by the National Research Council will be spread over a four-year period, during which time the Univ. will endeavor to eliminate weaknesses in the Canadian computer industry that have developed because "not nearly enough effort is being put into the study and development of more efficient and more effective means of using" computers. The ultimate goal is to see that the results of investigations of the design and operating characteristics of computer systems are used to improve information processing in Canadian

business and government, as well as universities. Toward these ends, the Univ. is now forming a Computer Systems Research Group, which will have an academic staff of 12 and 40 graduate students, plus 20 additional academic, technical, and administrative personnel, who will work with an IBM 360/44.

The Group will have five major objectives: (1) To develop new problem-oriented languages in areas such as process control, medical data processing, computer-aided graphics, real-time data processing, and non-numeric computation. (2) To develop software of a degree of reliability commensurate with that now attained in hardware, with emphasis in the areas of scheduling algorithms, resource allocation, system recovery, measurement of efficiency, etc. (3) To study human factor engineering of hardware and software that, until now, has been designed primarily on the basis of technological considerations, requiring users to conform to an "unnatural" environment. (4) To determine the most effective design of specialized hardware for graphic displays, analog-to-digital conversion, etc. (5) To ensure that the newly developed languages and systems programs are made available to Canadian computer users in all types of organizations, with emphasis on the implementation of "useful and practical" systems.

DPMA PUBLISHES GUIDELINES FOR PRIVATE EDP SCHOOLS

The Data Processing Management Assn.'s Private Data Processing School Standards Committee (see July, '68, p. 114) has issued a report offering guidelines for these schools. The 48-page manual defines criteria for ultimate performance objectives in four major areas of operation within private dp schools where serious problems have been commonly observed: management, director and instructors, instruction and course implementation, and placement methods.

The first section, dealing with management, recruitment and selection, includes a definition of management, a list of basic responsibilities of all data processing schools, a discussion of recruitment practices and policies, and suggested procedures for selection of qualified students. The second section provides a definition of the duties, responsibilities and qualification of the director of education and the instructors.

The third section, covering instruction and course implementation, concerns itself with defining training objectives of a private edp school in terms of performance ability in keypunch, punch card equipment, computer programming and computer operation. Also included in this section are definitions of the role of equipment on the school premises, minimum project requirements for students in punch card and programming curriculum, and criteria for student proficiency and progress measurement in the various curricula. The final section discusses the role of the placement function, its supporting activities, and student understanding of the placement service.

"Guidelines for the Operation of Private Data Processing Educational Institutions" is positive in approach and does not attempt to point out malpractices in private edp schools. Rather, it is intended as a means of self-evaluation and as an impetus for the schools to develop quality programs. The report is available for $1.50 from DPMA, 505 Busse Hwy., Park Ridge, Ill. 60068.

FORD HELPS YOU HIT THE SKIDS

Ford is offering a $197 device to stop braking skids as an option on the Thunderbird and Mark III. The Sure-Track (short for Sure-Track Anti-Lock Brake System) controls the braking action of the rear wheels whether the car is going at maximum speeds (over 100 mph) or as slow as five mph. When the driver slams on the brakes the computer directed safety device takes over.

The system consists of three parts: two electromagnetic sensors in the rear axle shaft are wire-connected to the control module (computer) mounted under the glove compartment, and the vacuum powered actuator houses in the engine compartment and deriving power from the engine intake manifold.

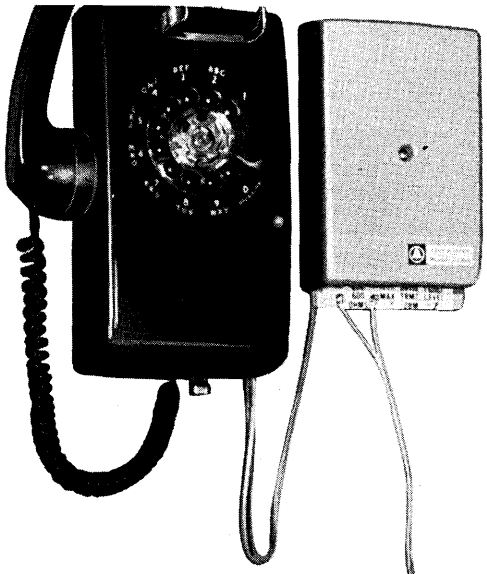
The sensors sense the speed of rear wheels and transmit the information to the computer. From the rear wheel velocity the computer determines the optimum braking cycle and signals the actuator. The actuator has valves that regulate the pressure of brake fluid delivered to the rear wheels. If more brake fluid pressure is applied than is desirable, the valves will release enough pressure to keep the brakes from locking the wheels. This causes the brakes to pump themselves faster than the driver's ability to pump them, sometimes as fast as four cycles per second.

The computer, about the size of a paperback book, is enclosed in a plastic casing. It has 160 solid state discrete electronic components (transistors, diodes, capacitors and resistors) mounted on a printed circuit board which is padded with a rubber-like compound.

The system is self-adapting to changes in road surface friction sensing conditions, from dry concrete to wet or icy glaze.

new companies, mergers, acquisitions . . .

Ex-superintendent of Chicago schools Benjamin C. Willis and his staff at Benjamin C. Willis Educational Services (see Nov., '68, p. 178) have become **Compumatics Educational Services,** a subsidiary of Compumatics, Inc., a Chicago software firm. . . . A joint venture to provide the petroleum industry with computer automation of oilfield production operations throughout the world has been formed by Baker Oil Tools, Los Angeles, and Space Craft, Huntsville, Ala. The new company, **Baker Automation Systems, Inc.** (BASIC), will be headquartered in Houston. Baker owns majority interest in BASIC, which will be headed by J. Ray Pace, formerly director of product marketing for the Baker Div. of Baker Oil Tools. . . . **Ennis Brandon Computer Services, Inc.,** is holding preliminary talks expected to lead to the acquisition of **Meyer Higgins Computer Systems, Inc.,** St. Louis, by Ennis Brandon. Meyer Higgins sells package accounting systems. . . . **The CSI Corp.** has been founded in Los Angeles to form and acquire companies in technology and service areas requiring systems management capabilities. President Sanford C. Sigoloff is the former president of Xerox Corp.'s Electro-Optical Systems division. Vp's David T. Traitel and Donald J. Taffi also come from Electro-Optical Systems. . . . **Lex Computer Systems, Inc.,** a new software and services firm headquartered in Redwood City, Calif., will be headed by Alfred Julian, chairman of the board, and Kenneth E. Knight, president. The company will offer packaged programs, several already developed and tested, for handling fiscal, record-keeping and planning activities for customers in the legal profession and for general business. Lex plans to offer other services, including seminars on computer applications and cost-effective computer utilization. Marketing offices are already established in San Francisco, New York and Los Angeles. Chicago, Boston, Cleveland, Washington, Philadelphia, Miami, Atlanta, and Dallas-Ft. Worth offices are planned to open within a year. . . . **Automated Investment Sciences,** Washington, D.C., will offer a computerized stock market advisory service that features



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DATA COMMUNICATIONS SYSTEMS,
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news briefs

individually tailored investment recommendations. . . . **Computer Complex, Inc.** (formerly Com-Share Southern), has agreed to acquire Data Communications Services of Tampa. The Florida time-sharing firm will be added to Computer Complex' network. . . . Major shareholders of a new Cleveland computerized typesetting firm, **Hierographics,** are principals of The Perlmuter Printing Co. Central Data Systems, Cleveland, owns 20% interest and will provide the new company with computer and dp services. Hierographics will use the $400,000 Haris-Intertype "Fototronic CRT" typesetter, a computer-driven electronic page generator capable of setting a five-column telephone book page in ten seconds. . . . **Data Products Corp.** is planning to acquire **Intrex, Inc.,** a privately held company which specializes in precision numerically controlled machining for the peripheral equipment industry. . . . **ComputerPix Corp.,** a new NYC company, has been licensed by Comfax Communications Corp. to make, use and sell a system which will allow computer-stored information on any subject to be pulled from or by a computer and translated into printed or photographic form for transmission in a facsimile mode which is many times faster than the state of the art. . . . **EDP Technology** has acquired **Education Computer Corp.,** Strafford, Pa.-headquartered firm engaged in the development, production, and marketing of educational materials and services. ECC and EDP will cooperate to bring the "latest computer technology and educational techniques to bear on our nation's vocational education and industrial training needs." Shares of EDP Technology, which until this transaction was a private company, will be traded in the over-the-counter market in place of Education Computer Corp. . . . **Creative Computers Corp.** has been established in Chicago to offer time-sharing (using APL) and related services based on APL, including consulting, design of dp systems, and the development, publication and distribution of integrated user text and software packages. . . . The formation of **Computec, Inc.,** in Washington, D. C., has been announced by David E. Stone, president, the founder and former exec vp of Vertex Corp., an operations research firm. Computec's objectives are to build an international operation dealing in computer-related services and equipment and ultimately leading to the company's ability to perform any function dealing with or using computers and data processing technology. . . . **Interstate Business Services Inc.,** Mansfield, Ohio, is another new firm with a big order to fill. A subsidiary of the Lumbermen's Mutual Insurance Co., Interstate plans to offer systems consulting, mailing list services, microform services, edp education, computer programming, dp services, and equipment leasing. Gaylord V. Wingate, president, was formerly director of systems for the McGraw Hill Information Systems Co. . . . **Florida Software Services, Inc.,** Orlando, will offer systems analysis and design, program development, computer center management, and consulting services on a nationwide basis. . . . **Astrosystems, Inc.,** New Hyde Park, N.Y., manufacturer of precision computer interface and automatic test equipment, has agreed to acquire **Dimensional Systems, Inc.,** Waltham, Mass., designers of computer-based systems for control of various manufacturing processes. . . . **Randolph Data Services'** acquisition of **National Data Processing Corp.** is said to make Randolph one of the largest organizations in the country processing automobile and truck dealer requirements. Both companies are headquartered in Cincinnati. . . . **Computer Aid Companies, Inc.,** Dallas, has purchased **Addressors Unlimited, Inc.,** to complement Computer Aid's abilities in market research and public opinion surveys. . . . **Pioneer Data Systems, Inc.,** has been established in Des Moines, Iowa, as a wholly owned subsidiary of Pioneer Hi-Bred Corn Co. The new firm will offer software packages to both agriculture and business. . . . The first product of **Four-Phase Systems, Inc.,** Palo Alto, will be a data terminal using MOS/LSI technology to provide built-in computation. . . . **Unimed Computer Corp.,** Rochester, N.Y., will specialize in dp services to medical, educational, and business groups. . . . Western Reserve Holding Corp., Clearwater, Fla., has formed **Computer Assistance Corp.** as a subsidiary to offer computer management and programming services on a time-shared basis. . . . **Viatron Computer Systems Corp.** has acquired all the outstanding shares of **Photics Research Corp.** Photics makes photographic masks for manufacturers of IC's and MOS circuitry and also develops photo information storage systems. Viatron will advance $100K to Photics to increase its mass manufacturing capability. . . . Dr. Jonh J. Szalay, co-founder and former president of Industrial Corp. of America, a Los Angeles holding company, is now president and chairman of **American Computer Technology, Inc.,** a new company planning to produce computer, digital test and control systems and to assist electronic manufacturers with computer aided design. . . . **United Data Centers** has acquired **Simtab,** a Syracuse dp center, now the 14th link in United's network. . . . **Seaco Computer-Display Inc.,** a new company planning to develop and manufacture electronic systems, including a computer-controlled display system for use as an artwork generator, is now in operation in Garland, Tex. . . . Directors of **SSI Computer Corp.** and **Statistics for Management Data Processing Corp.** have approved an agreement to merge the two companies into a new firm called **Itel Corp.,** which will be headquartered in San Francisco. Itel will be a broadly based service company specializing in data processing services. . . . **Computer Time-Sharing Corp.,** Palo Alto, has reached agreement in principle to acquire **Kenlabs** of Berkeley, and **KLS Co.** of San Leandro, Calif., as part of the company's long-range plan to build a complete data processing capability. CTC also announced that a final contract had been signed for the acquisition of **Systems Analysis, Inc.,** Los Altos, which will operate as the Engineering Systems Div. of the parent company.

• The Tacticom data input system, designed and manufactured by the Houston-based Industrial Products Div. of Texas Instruments Inc., will be marketed by Honeywell's EDP Div. under a nonexclusive agreement that extends into mid-1972. No dollar value or unit quantity was revealed. Although Tacticom is designed for manufacturing operations, performing such tasks as gathering and reporting of industrial management information at its source, and solving production management and control problems, Honeywell envisions its use in other businesses and industries, such as distributors and hospitals. The systems will be built to Honeywell specifications and marketed under the Honeywell name. TI, however, will also continue to offer Tacticom directly to users through its own marketing program.

• Ampex has received a $400K contract for installation of its first PYRAMID random access audio/visual information retrieval system as the third part of a scheduled three-phase computer-controlled instructional resource center at Oak Park and River Forest (Ill.) High School. Completion of this phase will permit students to select from up to 3,000 still television pictures, either independently or in synchronization with any of the

school's present 224 audio channels, for viewing on a TV monitor with an average waiting time of no more than one second. The first phase of the project was the installation of a random access audio information retrieval system, and phase two extended the audio and added conventional video to the system. The PYRAMID design permits modular expansion of high-speed audio and video duplication systems from a small, single cassette duplication terminal to a full-capacity system that can serve hundreds of students in classrooms and carrels. All control logic for the system is handled by an SEL 810A computer, which provides the capability for testing as well as instruction.

• Leasco Data Processing Equipment Corp. has announced its entry into the peripherals market by agreeing to purchase and nationally market over $60 million worth of specially designed peripherals from Control Data Corp. and Texas Instruments Inc. The two contracts were signed by LDPE's wholly-owned subsidiary, Leasco Computer, Inc. CDC will manufacture and maintain disc drives compatible with System/360, while TI will produce and maintain a line of magnetic tape transports. First deliveries will take place within two to four months.

• Plans for an international network of independent but affiliated timesharing companies operating nationwide and in Canada have been announced as a joint venture of P.J. Industries, Ltd., a Canadian holding company, and EDP Central, Portland, Ore., developers of the REACT timesharing system. REACT, a proprietary conversational subset of PL/I, is the primary language of the system. The companies will operate in the U.S. as REACT Network Associates and in Canada as REACT Timesharing Ltd. Services will be provided in the Vancouver market immediately, using leased time on EDP Central's IBM 360/50. Both locations have 360/65's on order.

• One of the limited number of IBM 360/91's has been installed at Oak Ridge National Laboratory. Selected because of its similarities to the laboratory's 360/75, initial purchase price for the cpu and peripherals was nearly $6 million. The new computer will be used in such research areas as desalination studies, the design of components for space reactors, and the development of breeder nuclear reactors. The new Oak Ridge electron linear accelerator will depend on the /91 for data acquisition and analysis.

• Datacap Systems, Newport Beach, Calif., a division of Datacap International, Salt Lake City, has signed an exclusive contract with Redcor Corp. to market the Decade 70 computer for commercial applications (the machine will be called the Datacap 100). The firm has several software packages to implement the equipment, including general ledger, payroll, accounts receivable, and a program called MARS (Management Analysis Reporting System), which is "really an RPG for the Decade computer." Datacap will receive 30 computers on the contract, which is estimated at $500K. Other divisions of Datacap International are Datacap Computing, which oversees operations, and Graphcomp Sciences, which makes automated drafting tables for interfacing with computers. International's goal is to get into timesharing with PDP 10's and 13's; it currently operates a PDP 9 in Salt Lake City and Newport Beach.

• Tom Steel, of SDC, has been appointed chairman of the IFIP TC2 (Technical Committee 2) on Programming Languages, effective in the Fall. Already a member of the Committee, he succeeds Heinz Zemanek, of Austria, who becomes a vp of IFIP. Steel, a staunch advocate of standardization of PL/I, is also chairman of the USASI subcommittee on Common Programming Languages, X3.4.

• Computer Machinery Corp., Los Angeles, has made the first installation of its KeyProcessing System at Blue Cross of Southern California. The system is designed to replace both punch card and key-to-tape units, and is controlled by a PDP-8L, which can handle as many as 32 individual keystations, all entering or verifying data simultaneously on different jobs. Blue Cross uses the system to input and store data on Medicare patients.

• A transcontinental network of timesharing computer centers will be operated by Intranet Industries from headquarters in Los Angeles. The first facility is due to open at El Segundo, Calif. in July, and will use not only its own software, but its own configuration of large-scale equipment. T-S systems will be based on the Univac 1108 computer, with Memorex and Datametrics components.

• National Data Communications, a Dallas firm that recently went public, is preparing to reach out for the growing hospital data processing market through an ambitious software package named REACH and a computing center in Dallas equipped with two Honeywell 2200 systems (to be expanded upwards). The proposed service will utilize Raytheon crt terminals and Honeywell 516s on site in the hospitals and connect to the Dallas center for master file maintenance and for processing tasks that can't be handled locally. Currently under field test in a Beaumont, Texas hospital, the system is to be offered nationally when debugged. A novel feature of the service is that on-site computer personnel in the hospitals will be NDC employees, not the hospital's; as many as five a site will be assigned to operations, systems engineering and general programming and maintenance tasks.

• A new service from System Interaction Corp., New York, publishers of "Software Packages: An Encyclopedic Guide," is called Machine Assisted Vendor Information Network, or M.A.V.I.N. The service aids users in locating and preselecting software contractors to meet their specific needs. The user selects qualifications for contractors and ranks them in order of importance, then M.A.V.I.N. selects those most closely matching his requirements, based on information contained in a continuously updated data base. Major selection parameters include: geographic coverage, development and language strength, mainframe and peripheral experience, and commercial and scientific areas of specialization. The user receives profile sheets covering all contractors matching his requirements. M.A.V.I.N. service will begin within the next quarter.

• The Telex Corp. and Information Storage Systems, Inc., have entered into an agreement giving Telex marketing rights to end-user customers in the U.S., Canada, and Mexico for disc drives manufactured by ISS. The contract covers 2,400 of the units which sell for about $20,000 each. The disc pack drives complement Telex line of computer tape drives and will be marketed through the company's existing sales and service organization.

• The Air Force has selected General Electric to furnish and install updated dp equipment at its headquarters data services center in Wash., D.C. It invited 11 computer firms to bid on the contract, but only three responded.

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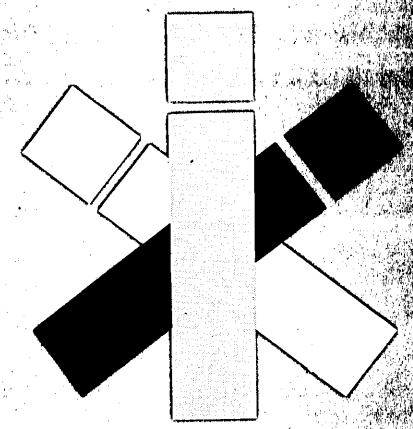

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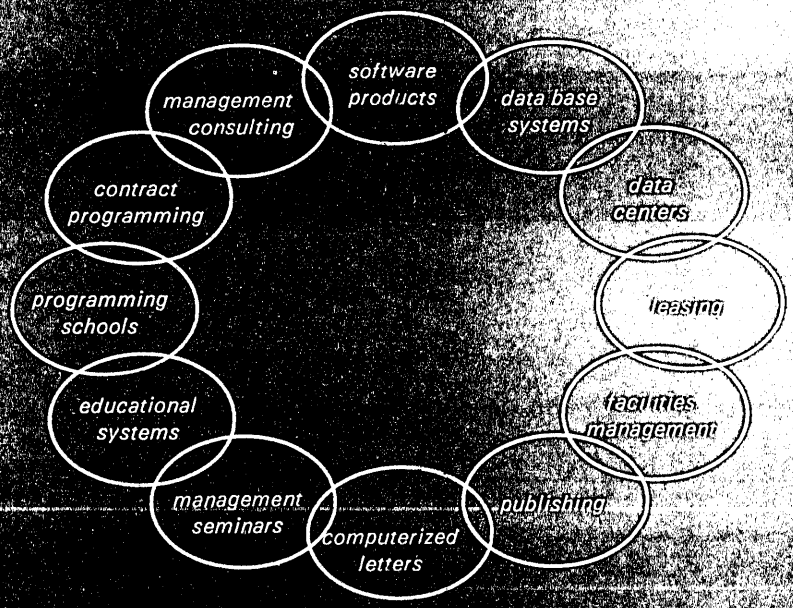

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The leased equipment will come in two sections: less in September-October, 1969 ($933K for fiscal 1970), and more next July ($2,317K for fiscal 1971). Besides providing dp for the Air Force, the center also supplies support information to the Secretary of Defense. The new equipment eventually will replace eight second-generation systems presently in use.

• Brunel University, near London, is planning a second international symposium on computer graphics after the success of its first, which last year attracted 450 delegates from 18 countries. Prof. M. L. V. Pitteway, program director, is particularly keen on getting "a lot of new American speakers" for the second symposium, scheduled for April, 1970. Those interested can reach Prof. Pitteway care of the university's Computer Science Department, Uxbridge, Middlesex, England.

• Business & Computer Devices, Inc., Plainview, N.Y., has received a contract "in excess of $10 million" to manufacture their Models 2425 and 2427 magnetic tape systems exclusively for Data Processing Financial & General Corp.'s distribution to the end-user market. The units are directly interchangeable with IBM 2420 tape transports and will be available to users at "substantially" reduced rentals. The BCD tape units operate with IBM cartridges, providing automatic loading at speeds up to 200 ips and a data transfer rate of 320K bytes per second. The system utilizes a single capstan servo with a tape path said to ensure that the oxide side of the tape touches only the read-write head and tape cleaner in data transfer operations. High speed rewind is performed at an average speed of approximately 500 ips.

• Sperry Rand's Univac Div. will open a new Research and Advanced Development Center in London this summer, equipped initially with two UNIVAC 494 systems. The efforts of the Center will be directed toward the development of advanced programming systems for large-scale edp installations, including Univac's own, with emphasis on increasing the real-time and time-sharing capabilities of Univac equipment.

• Amsterdam has ordered a 1904A computer from International Computers, Ltd., to help administer the city and its 850,000 people. The large-scale model, first to be sold on the Continent, will handle population records and data on employment, welfare, real estate management and building programs. ICL is offering its local government experience along with the computer—it has taken more than 100 orders for its 1900 series from local government in the U.K. alone. Other cities in The Netherlands (Rotterdam, The Hague) will benefit from the installation, which will work cooperatively with them. The shared programs will be written in COBOL and FORTRAN. The machine has a 64K central processor, 1600 card-per-minute reader, card punch, paper tape reader, fast line printer, graph plotter, teletypewriter, data transmission terminal, three exchangeable disc stores, and 40 and 80 K/chs magnetic tape units.

• The Blue Cross Association, Chicago, which acts as a clearing-house of information and communication between 75 Blue Cross and 73 affiliated Blue Shield plans, has begun installing a $2.5 million Honeywell system consisting of two 2200's and two 516's. The system should be ready for checkout before the end of the year. The new system will enable the centers to send and receive claim questions and answers from the various plans and handle administrative dp. Terminal equipment in BC and BS offices across the country will include paper tape, teleprinters and mag tape, connected on-line to line adapters at headquarters.

• Central Information Processing Corp., Baltimore-based subsidiary of Commercial Credit Co., began offering remote and on-site batch processing service to the business community this month, using a CDC 3300. Software packages include payroll, general ledger, accounts receivable, cash flow, depreciation, forecasting, and scheduling, aimed at small and medium size firms. Service will be expanded to include offices with CDC 3300 or 3500 mainframes in Washington, Philadelphia, and Atlanta by the end of the summer.

shortlines . . .

. . . Radio Corporation of America shareholders voted to change the firm's name to RCA Corporation, and all foreign subsidiaries will be known simply as RCA, regardless of the country in which they are located. . . . William H. Heflin, show director of the Western Electronic Show and Convention (WESCON) in San Francisco, Aug. 19-22, predicted that the exhibit space in the five halls of the Cow Palace will be completely contracted for, with 1180 booths and 625 exhibitor organizations. . . . The 3300-member Menswear Retailers of America has contracted with NCR for an exclusive group edp program, utilizing an NCR data processing center nearest a member store for the processing of register tapes and other retail input. . . . University Computing Company's Data Link Div. has opened a new Data Preparation Center in Dallas for the conversion of business file data to computer-readable media. . . . Honeywell has borrowed 60 million Swiss francs (about $13.7 million) to finance operations of subsidiaries and affiliates outside the U.S. An underwriting of 15-year bonds of Honeywell Overseas Finance Co. was offered to the public in 1000- and 5000-franc denomination bonds bearing a 5-3/4% coupon. . . . Honeywell also has opened the fourth of seven H-1648 equipped time-sharing centers scheduled to be established this year by its Information Services Div. The latest center is in Cleveland, with New York, Los Angeles, and San Francisco next on the schedule. Facilities were previously opened in Minneapolis, Chicago, and Boston. . . . Intermac Corp., a Rochester, N.Y., systems analysis and programming firm, will begin offering APL time-sharing and remote job entry services from a new 360/50-equipped t-s center August 1st.

call for papers . . .

7th Annual Meeting, Engineering Science in Biomedicine, St. Louis, Mo., Nov. 3-5. The three main subject areas of this conference are computers in biomedical research, artificial internal organs, and biological fluid flow. Papers on theoretical or experimental research in any of these fields, or in related areas of biological, computer, engineering or medical science are solicited. Three copies of 500-word summaries and 150-word abstracts should be sent by July 15 to Prof. E. Y. Rodin, Dept. of Applied Mathematics & Computer Science, Box 1176, Washington Univ., St. Louis, Mo. 63130.

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To save you a boatload of dimes by concentrating dozens of remote terminals over a single high speed line. We'll even put it in a remote phone booth, if that's where you'd like it. It's got the kind of reliability that will permit thousands of hours of unattended operation . . . and features that make it completely self-operating such as — automatic line control, automatic dial-up, error checking and message processing.

FIRMWARE makes the difference

A unique approach — we have achieved an advancement in the state of art by packing strategic functions in read-only-memory. What you get is phenomenal 400 nanosecond processing speed and non-destructible programs. What it means is a capacity for more lines . . . a capability of more message processing.

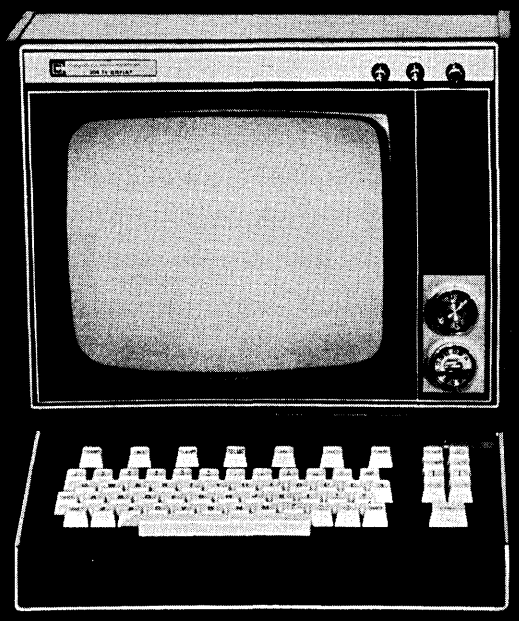
There is a whole family of communications processors built around this idea. And they're operational NOW in applications which range from remote concentration to "front end" preprocessing for machines like the IBM 360, Burroughs 5500 and Univac 1108.

Call Vic Spencer collect at 201-229-4040 if you'd like more information, or write.

INTERDATA

2 Crescent Place, Oceanport, N.J. 07757

STRONG SILENT TYPE



Fully Teletype Compatible Without Software Changes

It's about time . . . time-sharing, that is. Now users of time-sharing systems can update their terminals to the new generation of remote display stations while continuing to use existing software. The portable, modular CC-33 Teletype Compatible Display Station incorporates a CRT (which can be any standard television set or monitor depending on specific viewing requirements), a keyboard functionally designed to resemble a conventional electric typewriter (but without the noise), and a control unit with a full duplex serial interface for 110-baud Teletype transmission (if your system can accommodate faster speeds we can provide a 110- 600- and 1200-baud switchable capability).

No matter how you share time, whether it's your own system or someone else's, all you need to get a "window" on your programs is a CC-33, a power outlet, and a data set or telephone coupler. It's that simple. The CC-33 has shared time with a host of computers and their associated Teletype-oriented software, including the SDS 940, Call/360, GE 265, B-5500, Univac 1108, Q-32, Data Net 30, PDP-10, DDP 516, and others.

For all these reasons — Teletype compatibility, silent operation, capability of higher transmission speeds, availability of optional I/O devices for more flexible modes of operation — the CC-33 is another excellent reason why ability in computer communications means **Computer Communications.**

Computer Communications, Inc.
701 W. Manchester Blvd.
Inglewood, California 90301
Telephone (213) 674-5300

CIRCLE 119 ON READER CARD

Computers read Keytape input up to 10 times faster.

Here it is, 1969. We have third-generation computers that'll process 500,000 characters of data per second. Incredible.

And what do we feed these super-speed computers?

Punched cards. Which the computers process at the *first*-generation rate of 800 characters per second.

Super-speed data preparation.

Isn't there something ridiculous about this? Isn't it about time data preparation made it into the third generation, too?

Well, it has.

Keyboard to magnetic tape.

The Honeywell Keytape unit functions very much like a keypunch. Except for one big difference: It records data directly on magnetic tape instead of on punched cards.

Keytape units increase data preparation productivity by an average of 35%. And with your input data on tape, you can feed your computer up to 1,000% faster.

Plus.

You can store more data on one standard Keytape reel than in 20 boxes of punched cards. And, of course, you can use tape over and over again.

The Keytape operation is quiet, and the units are easy to learn and to use. So you end up with happier operators and less turnover.

On top of that, you even end up spending less money.

So if you've got a tape computer to feed, stop feeding it holes. Feed it tape. The Keytape way

See us at the DPMA Show, or write to Honeywell Communications and Data Products Division, Wellesley Hills, Mass. 02181.

The Other Computer Company: Honeywell

system spotlight

information for this series is invited applications submitted must be installed and operational

direct digital control

GLASSMAKING CONTROL SYSTEM

Ford Motor Company, Dearborn, Mich.

Shortly after World War I, Henry Ford introduced a second kind of moving assembly line—for glassmaking. At that time, in 1919, Ford's glass production lines in Highland Park, Mich., turned out about 730 tons of usable glass annually. Today new processes used at the company's plants in Dearborn and Nashville turn out over 400,000 tons annually, enough to make Ford America's third-largest glass manufacturer.

computer and peripherals

IBM 1800 processor with 32K of core memory, 4-usec cycle time
Three IBM 2310 single-disc storage units
Plus three typewriter consoles, printer, mag tape units, and card reader, sensing units and a/d conversion gear

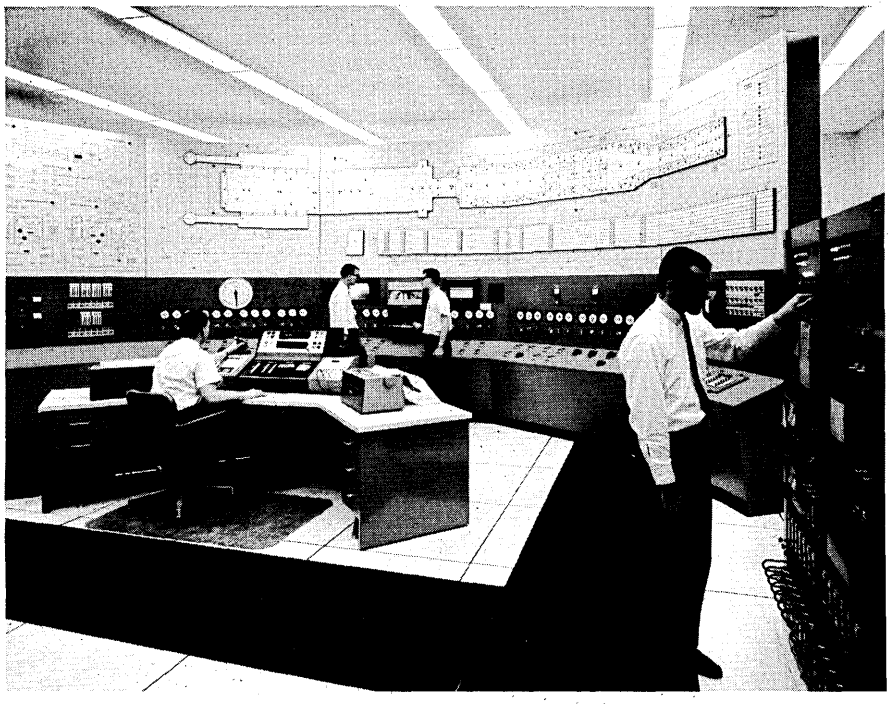
application

Ford's automotive glass, whether for windshields, backlites, or sidelites, for their models or for competitors' models, is all originally produced in a continuous ⅛th-inch thick sheet, 100 inches wide, by a computer-controlled float glass process. The company's Dearborn glassmaking line turns out over 8¼ miles of automotive glass every 24 hours.

The "float" glass process, originated in England, takes its name from a step in the operation where molten glass is floated on a bath of molten tin. First, 300-400 tons per day of the raw materials, including feldspar, rouge, charcoal, cullet, soda ash, salt cake, dolomite, limestone, and sand, are heated in a natural gas furnace to a temperature of 2,900°F. The glass is homogenized—just like milk—by being cooled to 2,000°F, and is then poured onto the 175-foot bath of liquid tin. As the glass travels over the tin, its temperature is gradually lowered to 1,200°F. From the tin bath the glass goes into a 350-foot annealing (tempering) oven where a gradual reduction in temperature to 250°F equalizes its internal stresses and prevents blemishes. When the glass rolls out onto the end of the line to be cut into sheets, it drops to room temperature. At this point the glass is finished. Grinding and polishing operations are not required since the glass has already taken on the perfect flatness of the molten tin.

The controlling IBM 1800 handles approximately 500 analog signals and 200 digital signals 30 times per second. It uses 80 closed control loops to maintain the correct conditions in the melting furnace, the tin bath (and its nitrogen atmosphere system), and the

Gauges display some of the 700 parameters monitored by the IBM 1800 system in the production of 8¼ miles of glass each day.



annealing oven (called a lehr). The signals originate at some 700 sensing devices located in the furnace, lehr, and other key points, and monitor variables such as temperature, level of molten glass, liquid and gas flow. The 1800 compares each signal with a range table, correcting through one of the 80 control loops or printing alerts for the operators when one variable goes out of bounds. With direct digital control of the process, critical temperatures in the 2,000°F range can be controlled to within one degree and pressures in the furnace can be held constant within 2/1000ths inch.

Five closed-circuit tv cameras enable the operators to also visually monitor the entire process.

software

The Ford software is based on a 16K ddc package delivered with the machine by IBM. Included in its core-resident supervisor are routines for processing multilevel interrupts, for interval timer control, for servicing the 80 control loops, and for producing error alerts.

A polling routine compares a clock cycle to a scan time and initiates each instrument poll. I/O conversion routines convert between analog and digital signal values, putting measured parameters into the correct engineering units where necessary. A filter routine is called in to massage signals from flow meters, thermocouples, transducers and other noise-sensitive instruments. The standard ddc package provides handles for these routines and allows for adding algorithms for adaptive tuning, etc.

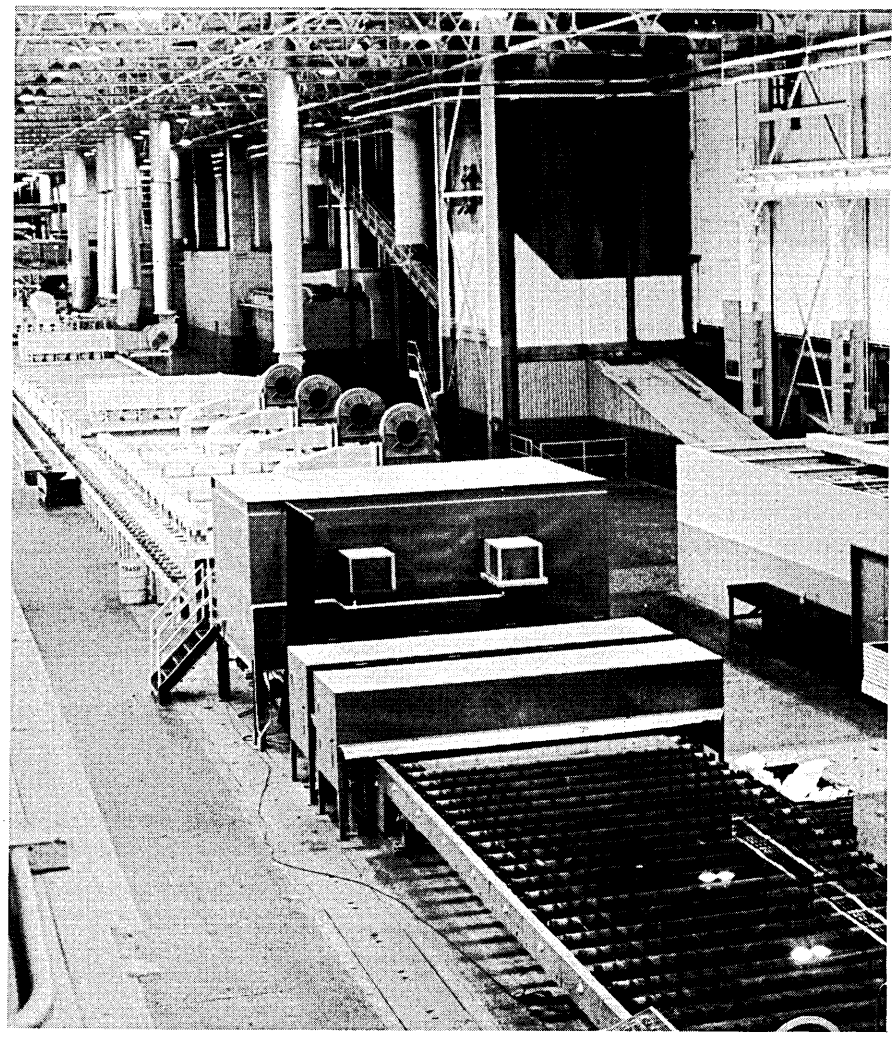
Operators can assume manual control of valves or cause present values to be printed on one of the three typewriters by manipulating sense switches. This, too, is made possible by the built-in priority scheme.

Some diagnostic routines were supplied by IBM for checking out the a/d hardware, for making temperature compensations in I/O signals, and for printing operator alerts for parameters not included in the 80 loops. Utility routines provide access to core for changes and for snapshot dumps.

Record sizes may vary between 6-32 words (of 48 bits) depending upon the complexity of the function to be monitored and upon such things as the need for input signal filtering. On the other hand, all routines are in assembly language, permitting some variable definitions to be made at the character level and allowing for bit manipulations where needed.

The 1800 was originally dedicated to the control function operation, but the release of IBM's TSX Time-Sharing Monitor allowed Ford to convert to a time-sharing mode of operation wherein unused cpu time is accessible for performing tests and for general commercial and scientific processing for the glass division. For instance, quality control inspection reports and production control recaps are now done under the TSX monitor while the process control functions are handled as background processing. A FORTRAN compiler has been implemented for noncontrol programming. ■

Glass enters Ford's float lines from the melting furnace (not shown) at 2,900°F, passes over a 1,200°F nitrogen-atmosphere tin bath (rear), through an annealing oven (just behind the inspection booth), and onto the rollers in the foreground to be cut.



The first person to call Foxboro collect at 617-543-8750 gets immediate delivery on this PDP-8 compatible disk system *(others may have to wait 30 days)*

Come to think of it, 30 days isn't bad when you consider it will take you up to one year to get other systems with far less capability.

Here's what you get:

- **A fast 8.3 msec average access time — twice the speed of other PDP-8 compatible bulk storage.**
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new products

british crts

The two models of TDM crt terminals are differentiated by the manner in which they produce their characters. The TDM 1000 uses a 625-line tv raster to produce characters which are 14 bits by 20 tv lines. The standard 1000 unit can display 1000 characters on its 12-inch (diagonal measurement) face, but options can raise this to 2,048 characters. The 1000 can display a

regular tv scene with characters overlaid on the subject. The TDM 2000 uses a sub-raster method of character generation. In this system, each character is 15 bits by 11 lines. Either 32 rows of 64 or 26 rows of 80 characters can be shown.

The TDM 1000's picture is refreshed at a rate of 25 times per second and character writing speed is 50 KC. Both units can be obtained with ASCII coding provisions. Both use solid state keyboards with 67 keys (including 14 function keys) and have provisions for hard copy printout and paper tape peripherals. Data rates are 1,200 baud (asynchronous) and 2,400 baud (synchronous). Prices start at $6,000 in quantities. FERRANTI LTD., Plainview, N.Y. For information:

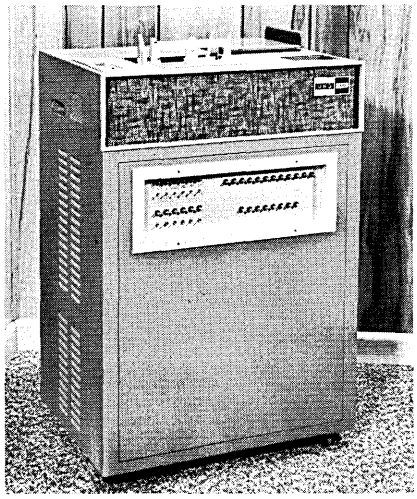
CIRCLE 500 ON READER CARD

card transmitter

The two models of the CRU (Card Reader Unit) Transmission Terminals read punched data at a rate of 100 words/min and transmit in ASCII or EBCDIC. Both feature a high speed skip cycle, which is controlled through special card punches detected or through a built-in programming disc, for ejecting cards at 140 cps (which the vendor's arithmetic presents as 1,400 words/min). The model designations denote their application. The CRU-TTY-FS, as might be expected, is built for connecting to one or more Teletype terminals; models 28, 33, 35, and 37 terminals can be used. The CRU-DS5-S is built for connecting to a type 5 dataset. Options for the readers include automatic carriage return and line feed generation, parity transmission, and variable code conversions (any punched code to any output code).

A third product, a paper tape punch, is called the CTU-1200-FS and connects to one of the readers for punching BCD or ASCII coded tape at 20 cps. As this indicates, the readers can be configured for higher than 10 cps transmission rates, if desired.

The CRU-TTY-FS8 (for eight-level code transmission) sells for $3,600 and



leases for $148/mo.; the CRU-TTY-FS5-S goes for $3,750 and $160/mo. and transmits 5-level code. The dataset version is marked at the same price as the FS5 unit. No price was released for the punch. DEMEX, INC., Kansas City, Mo. For information:

CIRCLE 501 ON READER CARD

teller terminal

Several manufacturers have entered their champions for consideration in the banking terminal competition. Many were hoping for a nod from the reviewing stand when the joint committee of representatives of the U.S. Savings and Loan League and the National Assoc. of Mutual Savings Banks met in late May to judge the results of their Sept. '67 release of terminal specifications for their industry. Originally, specifications were released to Burroughs, IBM, NCR, RCA, and Bunker-Ramo, but others, including Olivetti and even Omnitek are engaged in the pursuit of providing teller gear that will make the judges happy. IBM is running their model 2980, Bunker-Ramo has entered their series 1000 units (which were introduced pre-Sept. '67 and which we were chided for not mentioning once so there they are).

Burroughs' entry is the TC 700, an evolutionary development from TC 500 and L 2000 (Product of the Month, April) which might best be described as an exercise in packaging since it contains the same innards, very nearly, as the L2000 in vertical, rather than desk-mounted, cabinetry. The TC 700 has an alphanumeric keyboard, a 10-key numeric keyboard, program select keys, a variety of operational status indicators, and a carriage built for

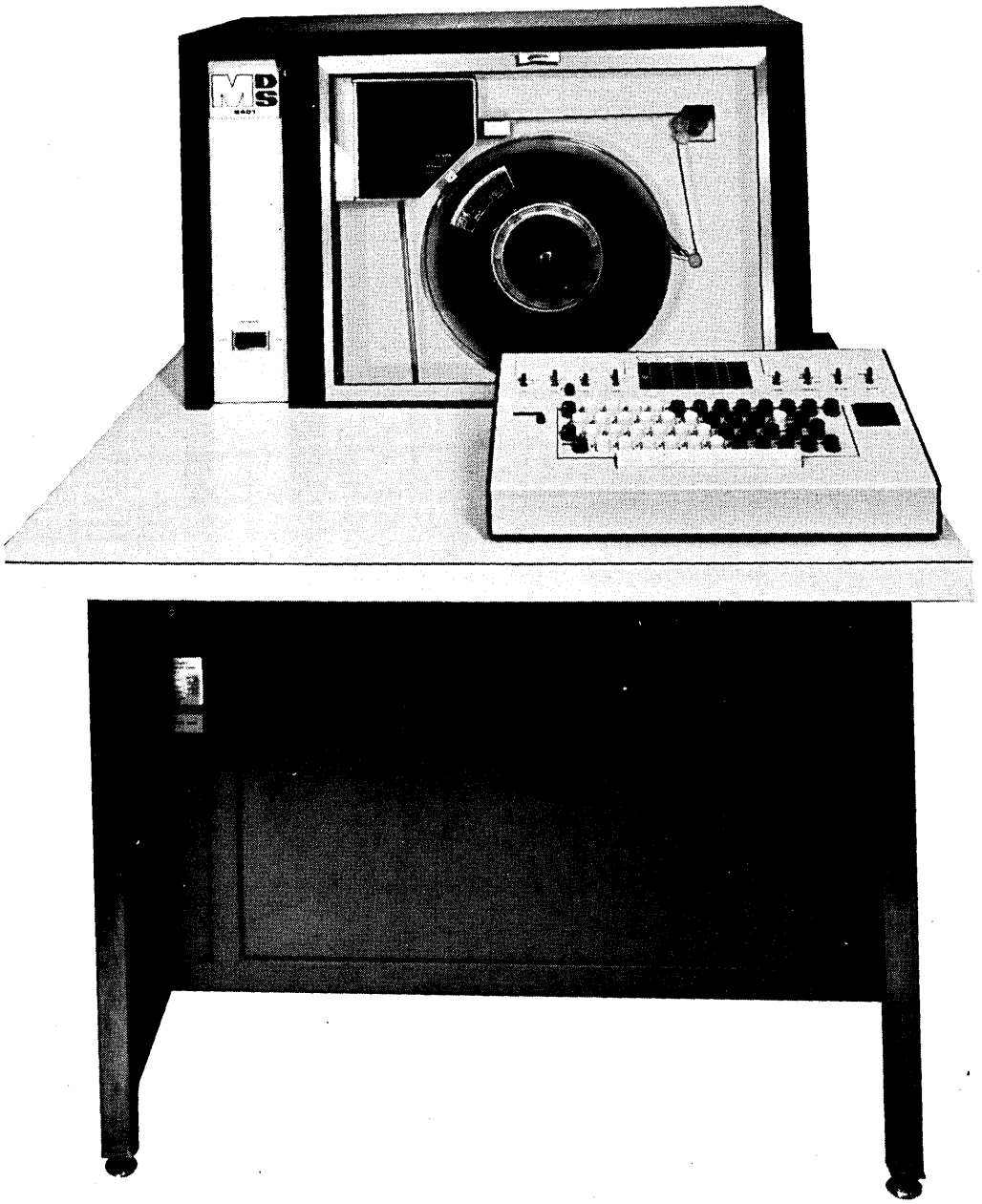
accepting passbooks and ledger records. The unit uses a 64-bit word, which can contain four instructions, 15 digits plus sign, or eight alpha characters. Storage is provided by a 40-track 1K disc and two 256-word buffers. Half of the disc is dedicated to the customer application programs, in this case financial packages, and the other half contains Burroughs' version of firmware, the expansions of the macro instructions used by the applications programs or accepted through the keyboard. The TC 700 terminals, in turn, can be connected to Burroughs B 300 or 500 computers. Application areas include credit unions, finance concerns, and reservations systems as well as banking institutions. The TC 700 almost overpowers the banking requirements, and purchase prices range from $8,840–$13,400, well above the $5K-$7K specs. BURROUGHS CORP., Detroit, Mich. For information:

CIRCLE 502 ON READER CARD

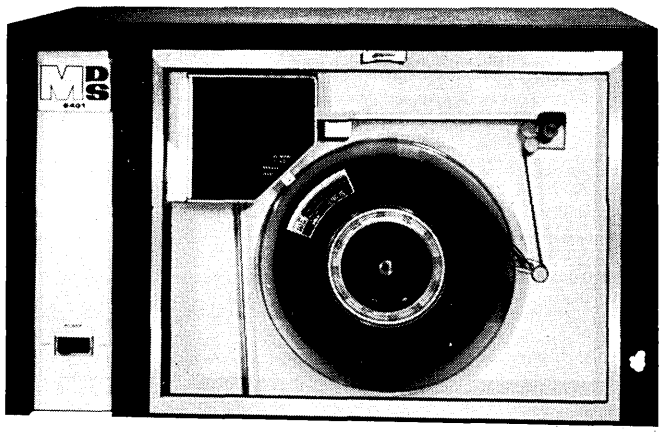
octal or hex calculator

Core dump analysis and program debugging can be made much easier by having the appropriate calculator. De-

If you have 25 of these...



you have 24 too many of these.



What happens when 25 girls at 25 Mohawks (or 25 Honeywell Keytapes or 25 of any other key-to-tape units) have keyed 25 batches of data?

Somebody gathers up the 25 tapes from the 25 tape units and puts them through an expensive merging procedure to collect all the data from the 25 tapes onto one tape for computer input.

And back at the tape units there are 25 other tapes to be mounted and threaded before the 25 girls can go back to work.

(Well, it's better than keypunching!)

Now CMC offers you computer-controlled keyboard input with the CMC KeyProcessing™ System

KeyProcessing ends all that tape handling. Those 25 girls at 25 keystations key their data directly onto a single magnetic disk, for automatic transfer onto a single tape.

It works like this: Individual keystations (up to 32 in a system) are simple keyboard-and-display units, controlled by a special computer that contains programs provided by CMC as part of each system.

As data is entered through each keystation, it is processed by the computer, held on that keystation's portion of the disk, verified and then transferred automatically from that one disk onto one tape. Done.

One other thing. A 25-keyboard CMC KeyProcessing System costs a lot less than 25 Mohawks or Keytapes.

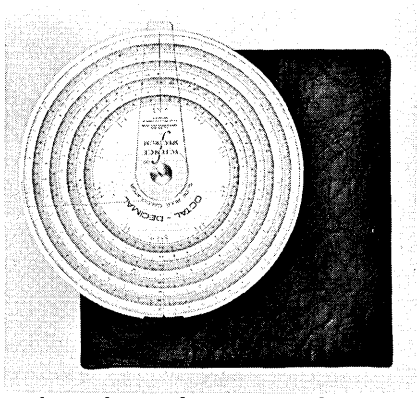
KeyProcessing makes your data preparation as modern as your data processing. For more information, please call or write:

CMC

COMPUTER MACHINERY CORPORATION
2000 Stoner Avenue, Los Angeles, California 90025
(213) Granite 7-1585

New York San Francisco

pending upon the brand of machinery used, a programmer can choose between the octal/decimal and hexadecimal/decimal converters offered by this vendor. Using the 8-inch circular slide rules, normal arithmetic operations (additions, subtractions, multiplications, divisions, squares and square roots, logs, exponentiation, etc.) can be performed as well as straightforward number base conversions. The arithmetic can be performed in computer-base (octal or hex) numbers to three or four figure (decimal equivalent) accuracy. On the octal rule, numbers can be handled in normalized (octal powers of 2) or unnormalized (to the base 8) form simultaneously. On both rules, colored



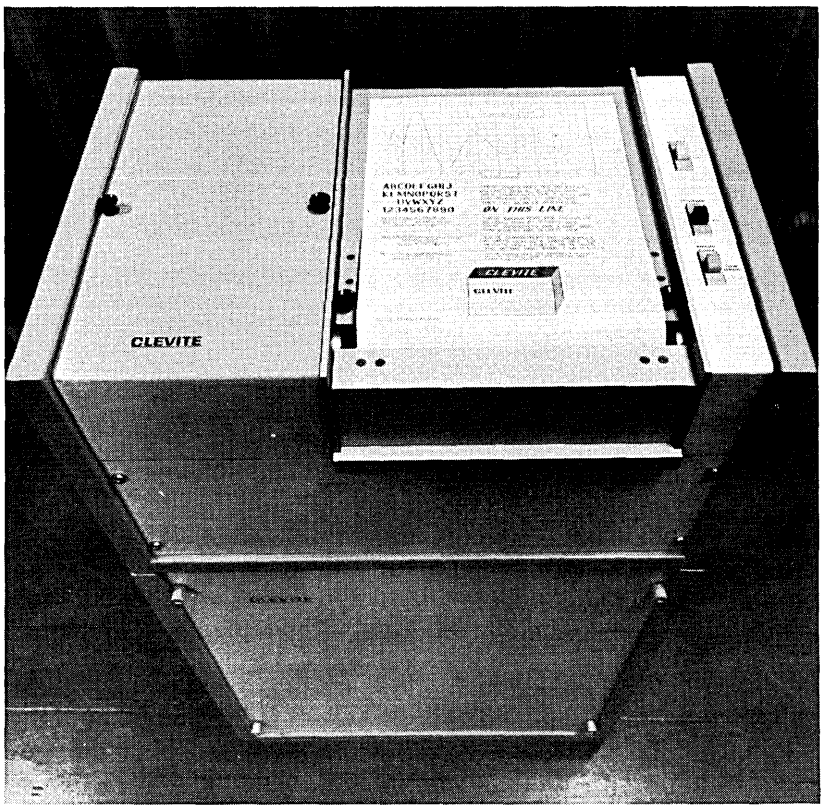
tracks make reading easier; this is especially important on the conversion side, which has more than 175 inches of conversion scale. The price of each rule is $8.50 and quantity discounts are available. SCIENCE SPECTRUM, INC., Santa Barbara, Calif. For information:

CIRCLE 503 ON READER CARD

calculator plotting

Another chessman has been played in the desk-top war between the manufacturers of calculators and the manufacturers of computers. The calculator makers have added cpu's, printers, and card readers to their lines to make their products function more like computer terminals. The computer terminals, on the other hand, were originally built to give their users the access and convenience afforded by a desk calculator. Hewlett-Packard, which has sort of a split personality in this conflict since it manufactures both computers and calculators, just fired another shot with the introduction of the 9125A X-Y Recorder. The device plugs into the back of the HP 9100A Calculator to provide a plotting capability to the calculator user. Not particularly fast, the unit plots at a rate of one point per .9 sec. However, the

PRODUCT OF THE MONTH



printer/plotter

"A highly attractive market," commented this vendor, "with peripheral computer equipment expected to grow five times in dollar volume in the next seven years compared to 1968. Industry figures predict shipment of approximately 23,000 digital computer systems in 1969, growing to 26,000 shipped in 1970." That *is* a highly attractive market, and the Model 4800 printer is aimed right at the heart of it. The 4800 is an electrographic writer, which means that it uses electrically charged paper to produce an image, not light-sensitive or pressure sensitive paper. Generally such a printing mechanism is slow, but the 4800 takes its name from its lines per minute rating, and 4800 lpm is not slow by any normal measure.

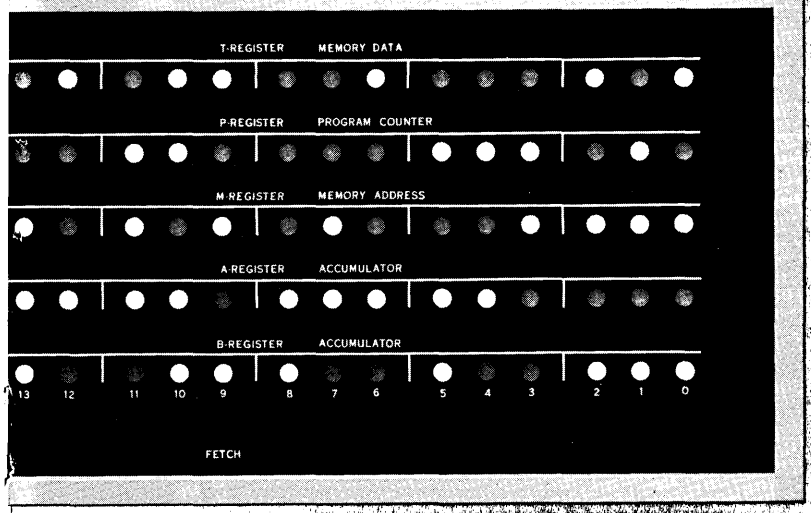
The printer works by selectively activating 600 stylii across the width of the 8½ × 11-inch page. This number of selectable dots allows for printing about 10 characters per inch for a total of 80 lines of 86 characters in 5 × 7 dot matrix form. The dots, of course, can display graphics as well as, or perhaps better than, alphanumerics. A typical display page is delivered dry in less than one second. The paper is supplied in 8½-inch by 300-foot rolls, costs less than 5¢ per page, and can be marked with ball point or pencil unlike some papers used by copiers.

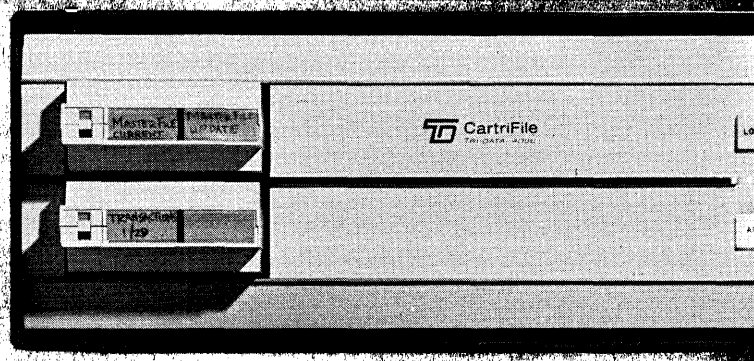
Inputs to the 4800 may be serial or parallel digital data from mag tape, for instance, or on-line from a cpu, or from a raster-type crt refresh memory. Electronics are IC modules, and many of the 35 cards included are duplicates, so that downtime is minimized. No special cooling or ventilation facilities are required.

The 4800 is several times faster, in the right line lengths (such as for compilations), than an 1100 lpm printer, and allows for using multiple type fonts, and good graphics (several times better than line printers due to the small spot size). It is hard to see this device replacing line printers, however, since it has several disadvantages for a straightforward listing application, including a $5 per hundred page paper cost and that 300 foot paper roll (which would have to be changed every five minutes at maximum print rate if my arithmetic is correct). On the other hand, it is hard to envision a large-scale or medium-scale installation that could not use one when its basic tentative list price is given as $15,000. CLEVITE CORP., Cleveland, Ohio. For information:

CIRCLE 504 ON READER CARD

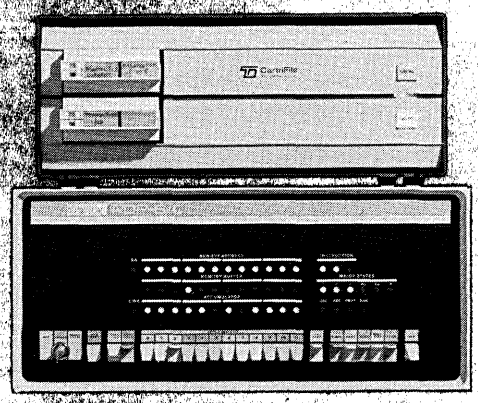
data-processing system... with CartriFile





These CartriFile magnetic-tape system features make the difference.

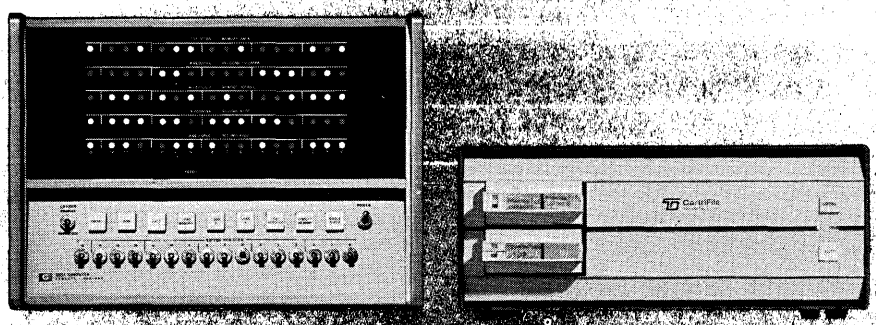
- 4 mag tape transports & controller
- cartridge-loaded
- high transfer rates
- error detection & correction
- simultaneous reading & writing



CartriFile
for PDP-8, 8/S, 8/L, 8/I

with positive-logic interface . . $5,700
with negative-logic interface . $6,000
(not including cables)

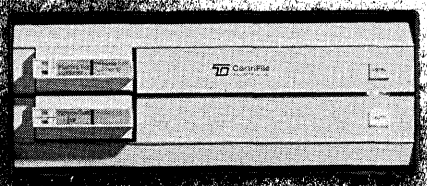
CIRCLE 40 ON READER CARD



CartriFile
for H-P 2114/2115/2116

with interface and cables $6,400

CIRCLE 41 ON READER CARD



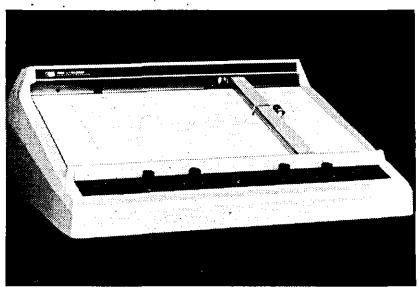
CartriFile ready to use with your interface for other computers and data collection systems. $6,400

CIRCLE 42 ON READER CARD

TD

Mountain View, California

plotter can draw straight, dashed, or dot-dash lines between points at a rate near 30 inches/min. Plotting accuracy is within 0.03 inch on the 10 × 15-inch coordinates. Straight lines can be plotted at any angle, rather than in



tiny stair-step increments. The recorder controls allow for placing the origin at any point on the paper, and recording sensitivity can be adjusted for different scale factors. Programs are entered into the calculator-plotter configuration through the keyboard of the 9100 or through its magnetic strip card reader. The price of the X-Y Recorder option is given as $2,475. HEWLETT-PACKARD CO., Palo Alto, Calif. For information:

CIRCLE 505 ON READER CARD

bigger 360/65 core

If you have outgrown your multiprocessor IBM 360/65 configuration, IBM has good news for you. Core sizes for that system have been doubled. Storage was previously available in sizes from 512K-1,024K; the new options extend the range from 1,280K-2,048K bytes (or 2,097,152 bytes). Monthly rentals for the new storage systems range from $10,680—$41,520; purchase prices go from $454,050-$1,757,400. First deliveries are scheduled for the fourth quarter of this year. IBM, White Plains, N.Y. For information:

CIRCLE 506 ON READER CARD

pdp graphics system

The KV Graphics System is now available as an option for PDP-8 computers. The system includes a cursor which is controlled by a joy stick, a direct-view storage tube which eliminates drift and flicker, and a controller that provides point plotting, linear vectors, circular vectors, and arc vectors. Information density is approximately 4,000 characters, at 72 characters per each of 54 lines, and 30,000 discrete resolvable points or vectors may be generated. Included is EDGRIN software, providing a variable font symbol generator, a general purpose text editor, and a general purpose expandable graphics package. The graphics package provides origin shifting and scaling (zooming), rotation light buttons for program interaction, provides subroutine definition capability and programmed loop execution for automatic generation of preselected dash/dot sequences. Input to the system is entered by a Teletype or joy stick. The display controller is an analog stroke vector generator that provides programmed selection and control of the storage tube display. The KV controller also will accept analog input signals and provides digital conversion to enter the signals into the computer. Price is $6,500 for those already having a PDP-8, or about $17,000 for a complete system including a PDP-8/L computer. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 507 ON READER CARD

mini time-sharing

A poor man's time-sharing system called MC 232 is the ambitious first product of one year old, five-man Mini-Comp, Inc. The system simultaneously handles up to 32 terminals, and provides capabilities simulating those of an adding machine, a desk calculator, or a programmable

time-sharing calculator through use of the firm's terse language, MINITOK, and ASR 33 Teletypes. The cpu has 16K core which can be doubled to 32K and operates in fixed and floating point modes with 12-place accuracy. The 232 will be marketed to users in the areas of engineering, science, education, manufacturing, and industry. The company is currently developing a library of software packages to meet these needs. FORTRAN and BASIC will also be offered. Price is about $45,000 for a system with eight ASR 33's. Delivery requires 90 days ARO. MINICOMP, Inc., Natick, Mass. For information:

CIRCLE 508 ON READER CARD

accounting machine

The accounting machine market is a highly competitive one. Manufacturers like Victor Comptometer (which markets a series of equipment from Nixdorf in Germany), Burroughs (which just introduced the L2000, April New Products), and Litton vie to give the customer wider capabilities and more powerful processors at lower costs. At present they are all adding more and more peripherals and obscuring the distinctions between accounting machines and computers.

The new champion from the Litton stables is no exception. Called the EBS/1231, the system includes a processor, an I/O console, a keyboard, and a printer. The I/O unit contains a

50 cps edge-punched card and perforated tape reader and a similarly-rated punch. The printer is rated at 35 cps and comes with an 18-inch carriage and gadgetry for handling multiple forms simultaneously.

The processor has 694 registers—128 program registers, 64 data registers, two arithmetic registers, and 500 accumulators. Each program register can contain four instructions; variable data registers and accumulators hold 10 decimal digits plus sign. Arithmetic processing is serial binary and the average instruction processing time, including access, is .025 sec.

Litton has determined, as has its competition, that the most powerful way to use a small machine is with a built-in firmware program, so that is how the system is delivered. Also delivered with the EBS/1231, is a bill for $17,400. LITTON INDUSTRIES, Carlstadt, N.J. For information:

CIRCLE 509 ON READER CARD

credit card terminal

TACK 30 is a credit card verification terminal with a numeric keyboard which enables a customer to present his credit card for immediate verification by a clerk who inserts the card into the terminal, then keys in the amount of the transaction and transmits to the computer, which then authorizes or rejects the credit. If authorized, a printer prints a validation number and the amount on a sales slip, and produces a journal tape for the store's permanent record. The keyboard has nine rows of ten keys each, and accepts Dial-A-Phone cards or punched credit cards as input; an improved version which will read standard embossed cards is expected to be developed within the next month. Output can be in ASCII, EBCDIC, or other codes, and the terminals can be used with virtually any computer

new products...

which has a time-sharing capability, with the size of the computer depending on the number of accounts being serviced. An optional multiplexor permits up to twenty terminals to use a single telephone line. The terminals may also be used with magnetic tape cassettes or paper tape units for batch processing of inventory control information. Price is about $1,500 per terminal in quantity, and around $3,000 for the multiplexor. Delivery requires eight weeks ARO. DECITRON COMMUNICATION SYSTEMS, INC., Brooklyn, N.Y. For information:

CIRCLE 510 ON READER CARD

multi-purpose terminal

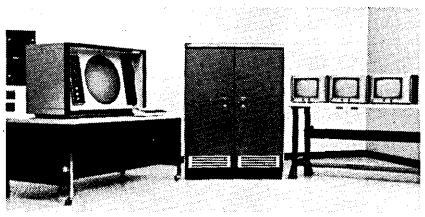
The Electronic Data and Information Terminal is the first product of a three-month old, three-man firm, and it's said to be able to do just about anything—or everything—depending on what configuration you order. EDIT is a keyboard terminal which can be equipped with up to 192 or more keys, and also accepts input from punched credit cards, or other small cards, such as employee i.d.'s. Output is in parallel and/or serial form in ASCII, EBCDIC, or other codes. EDIT is compatible with Bell System data sets or independent modems meeting EIA standards, and can be interfaced with magnetic or paper tape storage units or acoustically coupled to telephones. A printer may be attached to provide hard copy. And, for portable use, a battery powered model is available. The terminal is being marketed to end users as well as OEM's. The firm hopes to make a dent in the market by underselling competitors; cost of manufacture is claimed to be low because of design improvements. At writing, the name of the manufacturer had not been revealed. Prices are expected to start at around $300, depending on quantity and configuration. N.L.P. ELECTRONICS CORP., Commack, N.Y. For information:

CIRCLE 511 ON READER CARD

graphic display

The ADDS/900 Advanced Data Display System features mixed mode and time-shared operation of one or more displays, high speed function generation, editing devices, and a small integral computer. The system is composed of four basic elements: a display processor, a display generator, data entry devices, and display indicators. These permit modular expansion. The display processor, with a 1.8-usec cycle,

permits conversion of raw or preprocessed sensor data to display format, and updates the visual display for real-time applications. It has a 16-bit binary word processor, and a 4K word memory, expandable to 32K, or 20K with a dual port core. Also provided is display software including an interrupt processor, assembler, mathematics, I/O library, diagnostics, and an ASA FORTRAN subset. The processor is



contained in a standard 19-inch cabinet.

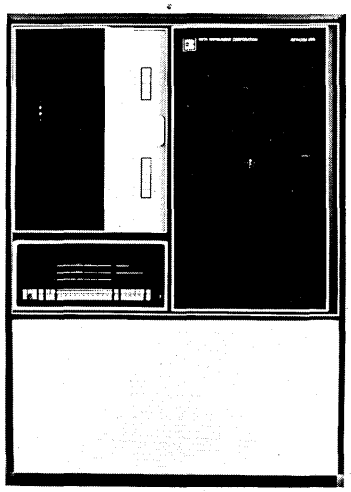
The ADDS/900 display generator transforms analog and digital inputs into analog voltages to drive the display indicators. It generates character, symbol, and line vector information with a dynamic writing speed range of 64 to 1 in multiple steps under control of the display processor. Character generation time is about 2.4 usec and vector generation time is 40 usec for full screen on axis. The display generator includes the display controller, vector/position generator, 22-stroke cursive character generator with four slanted or straight character sizes, 90-degree rotated characters, and eight brightness levels with a blink feature. Coordinate conversion, allowing 360-degree rotation and translation of display data, and TV sweep generation are available. The generator is housed in a standard 19-inch cabinet.

The ADDS/900 system can operate with such data entry devices as the Photopen, trackball, joystick, function and alphanumeric keyboards, and teletypewriters. The system will drive such display indicators as an 8-inch medium speed cockpit display, 13-inch displays for high speed writing, 20-inch display consoles, and 21-inch desk top displays. A typical system costs $100,000 and delivery requires seven months ARO. SANDERS ASSOCIATES, INC., Nashua, N.H. For information:

CIRCLE 512 ON READER CARD

output microfilm recorder

The Beta COM 600 computer output microfilm recorder converts computer generated data from magnetic tape to microfilm. The system prints alphanumerics at a rate of 12,000 lpm and includes a forms projector which superimposes computer generated data with fixed images such as business forms. A graphics capability allows plotting of data in the form of graphs, charts, and drawings. The basic system includes a tape drive, a 4K 12-bit word general purpose minicomputer, and a crt film recorder. The system accepts most print tape formats without the necessity of reformatting, provides a 128-character set, upper and lower cases, proportional spacing, offers programmable horizontal and vertical tabbing and skipping, and can include an optional on-line capability. Tasks to which COM is suited include printing

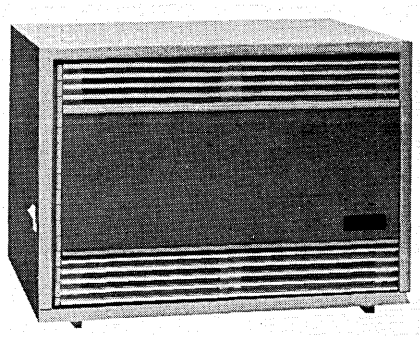


invoices, customer account records, sales histories, parts catalogs, business graphs, data plotting, management reports, etc. Price is $125,000. BETA INSTRUMENT CORP., Newton Upper Falls, Mass. For information:

CIRCLE 513 ON READER CARD

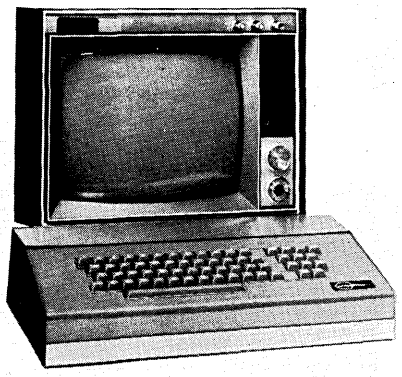
four-crt network

These crt and keyboard stations use very stock looking 14-inch tv's for the display portion of the system, but can also be ordered with 9-inch or 12-inch standard or projection television screens. Color sets are not listed even



as an option. Each standard screen is capable of displaying 192 characters (48 per line times four lines). The characters are generated in a 9 × 11 dot matrix and can be any of 64 symbols. Eight-level ASCII code is used by the terminals (seven bits plus parity) for 63 data signals, 19 external control and 11 internal control signals. An interface to 202D phone lines is standard, but the sets can work up to 4,800 baud.

A single controller supplies the power for one to four sets at once. The standard lease price is quoted as "$130 per operator station" or $14,000 purchase, but this assumes the full four-crt



system. Prices for a two-station configuration of the TK 340 are $11,100 and $400/mo.

Options include the ability to overlay the screens with one of 256 stored grids or formats, or with a continuous video signal (VIM). Random access to the stored overlays is rated at .2 sec, and the option is priced at under $100/mo. Polled operation is standard, but another option allows for contention operation. COMPUTER TERMINALS, INC., Minneapolis, Minn. For information:

CIRCLE 514 ON READER CARD

document microfilming

A picture is worth a million bits of archival mag tape storage and is a whole lot cheaper, too, when it is a 1/32 reduction on microfilm. That is the reasonable-sounding premise behind the development of the Scannermate, a document filming and retrieving system which adapts mag tape recording techniques to microfilming. Scannermate is designed to work as a slave to a document sorter on-line to a cpu to produce a permanent record of transaction documents such as checks or vouchers. The system is composed of three main components plus some storage furniture and carts. The first piece of gear is the camera system, which sits in-line with a customer's document reading system, accepting paper inputs from a belt and vacuum drive to record up to 40 documents per second onto one track of a 16 mm film cartridge. Using film cartridges with 1,000 feet of film each, the camera can record up to 155,000 images on two tracks of each cartridge at speeds compatible with the fastest available document readers. The second component in the system is the film processor, which accepts the film cartridge and develops the film images.

(Continued p. 177)

The third piece of gear is the Copytriever, a device built around a film transport and a Digital Equipment Corp. PDP-8 which scans the film to look for the serial number of a document to be retrieved and produces hard copy output. An entire tape can be scanned on the Copytriever in less than a minute; copies are produced at a rate in excess of 100 per hour. The search is carried out using a bar code and serial number added by the camera, which can be equipped with up to 16 Nixie-type tubes for adding batch numbers, file numbers, or data information to the filmed records. The Copytriever uses the built-in PDP-8 to do its searching and for storing the serial numbers of documents to be pulled. (It would seem that a sophisticated user could program the computer to do sorts of the requests and other tasks, too.)

Using the Scannermate system, the manufacturer claims, a customer can store records at a cost of 20¢/thousand and retrieve them for about 20¢ each. This is a very low figure compared to manual or semiautomatic records keeping procedures, much lower (by a factor of four?) than storing information on mag tape and much more useful for storing customer-related information. It will cost the user something in the neighborhood of $100,000 to get to that low storage figure per document TERMINAL DATA CORP., Los Angeles, Calif. For information:

CIRCLE 515 ON READER CARD

teaching aid

IBM offers a course to acquaint managers with the values of computer processing which begins by making the "students" program in machine language and works up into compilers. This vendor goes one step further in claiming that before a potential programmer can appreciate what his coding will do he must learn something about digital logic circuitry. The product involved is the Electronic Circuit Construction Aid Model ICB I. With it, and a handful of IC's, the students are taught to construct their own NAND and NOR gates, to verify truth tables and to implement Boolean expressions. Experiments introduce flip-flops as storage elements and shift register elements. With this background they presumably go on to learning programming languages (unless they are driven into learning the fine art of selling brushes or something instead). In addition to giving programming students a frame of reference, the teaching aid can be used in elementary instruction for computer engineers. The ICB I is priced at $195. BERKELEY ELECTRONICS RESEARCH, Berkeley, Calif. For information:

CIRCLE 516 ON READER CARD

pdp-8 process control

INDAC-8 is an industrial process control system which uses the PDP-8 computer and includes compiler-level, real-time software, designed for use by engineers who have FORTRAN programming experience. A real-time monitor is also provided. Applications for INDAC-8 are expected to be found in the chemical, manufacturing, metals, utility, aerospace, and research industries. Tasks to which it might be assigned include logging, alarming, basic set-point control, and quality testing.

The basic configuration offers a PDP-8, -8/I, or 8/L with core memory of 4K 12-bit words, a Teletype, a 32K-word disc storage unit, and a real-time clock, at a cost of under $20,000. Such a system would be useful for program development. A minimum system for actual control applications includes the basic requirements, plus a 32-channel analog-to-digital converter, at a price of under $25,000. A "typical" system, however, includes the basic re-

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quirements plus an additional 4K words of core, an additional Teletype, a 200-channel, low level a/d converter, an additional 32K words of disc storage, and 50 contact inputs, for about $45,000. More elaborate systems may be constructed using company-developed peripherals and options such as crt's or magnetic tape units. INDAC-8 software is available to present users of PDP-8 systems for a service charge; a DEC spokesman emphasized that the firm is not actually separately pricing software. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 517 ON READER CARD

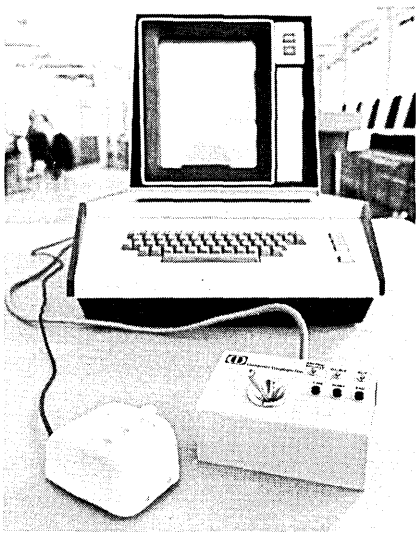
disc drive controller

A control unit for disc drives compatible with IBM's 2311 is being offered to computer manufacturers which has a price tag of less than $10,000 in quantities of five or more. Called the DO68, the unit is claimed to be completely compatible with IBM gear; disc packs which have been created on an IBM 2311 drive can be read on a drive controlled by the DO68, and vice versa. (The 2311 drives use the six-high disc packs, if you get them confused, too.) Up to eight disc drives can be controlled by a single DO68. The unit is in competition with IBM's 2841 storage control unit, apparently, but the 2841 can control drums and/or data cell drives, too. The DO68 makes use of software and direct-access capability in the computer with which the disc drive is used to eliminate control unit buffers and much of the control unit logic. Installation and operating software is included in the purchase price. BCD COMPUTING CORP., Deer Park, N.Y. For information:

CIRCLE 518 ON READER CARD

mouse and joystick

Two new graphic input devices are the Mouse and the Joystick, designed for use with the developer's ARDS or similar crt display systems. The Mouse is a two-dimensional controller for positioning a cursor on the screen. Moving the Mouse about on any flat surface causes the cursor to follow in an identical manner. Three buttons are mounted on top of the Mouse, allowing the user to transmit the cursor position or its vector value to the computer. The Joystick is an alternate graphic input positioning device. Like the Mouse, it provides analog voltage to control the cursor. The same three push-button controls for generating

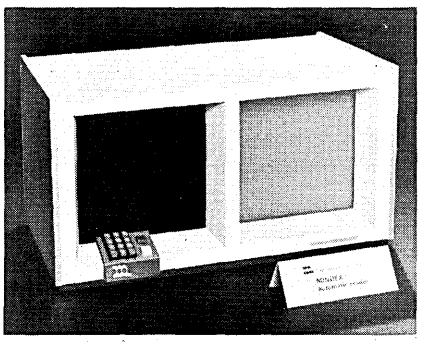


graphic input messages are provided on the Joystick housing. In addition, switches are provided for selecting solid line input, dotted line input, and returning cursor control to the computer. COMPUTER DISPLAYS INC., Waltham, Mass. For information:

CIRCLE 519 ON READER CARD

ultrafilm system

"Ultrafilm" is a storage medium like microfilm, only more so. For instance, the manufacturer of the systems that make and use the film claims a reduction range of better than 150-250X and gives the following comparisons: one six-inch strip of ultrafilm recorded at a 210X reduction will contain the same amount of information as 60 feet



of standard 16mm microfilm, or 2,000 8½ x 11 pages, or one full 2,400 foot reel of mag tape recorded with 500 character blocks using .75-inch interrecord gaps, or 33 COSATI microfiche, or two IBM 1316 disc packs recorded at 75% of their 7,250,000-character capacity.

To read the film, once recorded, the manufacturer markets the MINDEX/350 Automatic Reader. The 350 is called automatic because, once the film strip is inserted in the reader, any page image can be accessed randomly in an average of 3 sec through the built-on 10-key keyboard. Sequential access times are less than 1.0 sec. Ten ultrastrips are stored internally at one time in the MINDEX/370 Reader; six times as many may be stored optionally. Both use a 12 x 12 inch screen to display the filmed images, and can also have an optional 12 x 12 crt with a computer interface for comparing filmed records with storage and for changing filmed records. An electrostatic printer (10 sec print time) is listed as an option, as are custom keyboards and numeric position readout for giving the digital address of a record to be accessed.

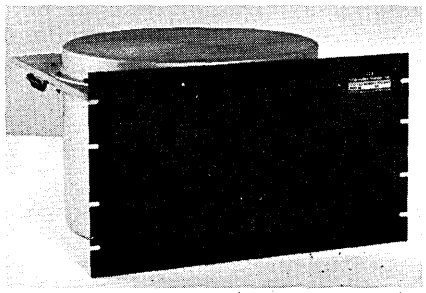
Of course, it takes more than a reader to use the medium. A "primary camera" is included for bringing the images down to as much as a 35X reduction; it is capable of producing 200-400 records per hour (records of 8½ x 11 images). A "final camera" is included for further reducing the images on the 35 mm film; it produces .5 masters per hour (which does not sound like much until it is translated to its 1,000 page equivalent). A continuous film processor and a contact printer make up the rest of the system; each is rated at producing 1,200 ultrastrips per hour.

In the final figuring, it costs $1,790 for each M350, the ultrafilm reader with a single-strip capacity (2K records), $2,385 for each M370 reader (with 20K records stored internally), and $3,635 for each M370 with a 120K storage capacity. The film processors and cameras are leased—complete with a full-time on-line systems engineer—for $10,000/mo. MICROFORM DATA SYSTEMS, INC., Palo Alto, Calif. For information:

CIRCLE 520 ON READER CARD

2-megabit disc

Two million bits of storage are packed at a density of 1,000 bpi on 64 tracks of the model 7064 Disc File Memory System. Access time for the resultant memory is 16.5 msec, and the cost is listed at less than $\frac{3}{10}¢$ per bit. Heads are fixed and aligned one per track;



each track's storage runs to 37,360 (a strange number). A non-contact principle, based on moving the disc to the head, is used for starting and stopping so that impact dents should not be a problem. The 7064's transfer rate is given as 1.2MC, and options include two- and four-bit parallel transmission.

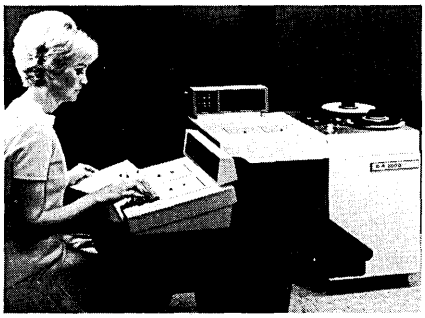
The dimensions of the unit are 19 x 17 x 10½ inches, and the price is $5,168. INFORMATION STORAGE, INC., Detroit, Mich. For information:

CIRCLE 521 ON READER CARD

key-to-cassette

It seems strange that, in attacking the same key-to-tape problem, the many, many manufacturers of this equipment do not develop solutions that are more nearly similar. In producing an automobile, even Volkswagen of Germany and Cadillac achieve products that are alike in many respects. Key-to-tape units all seem different. The CA 4000 keyboard recorder/verifier, for instance, uses two mag tape cartridges for original data entry *or* for verification. While entering new data, one of the cartridges contains program information (up to four programs) regarding fields to leave blank, information to be duped into each record, etc., and the other becomes the computer input file. When verifying, the first cartridge contains the original data tape and the second contains the verified data. (The verifier operator does not have the advantage of the program tape.)

While keying original data a backlighted display identifies, by the intersection of two light bars, the last character keyed, in alpha. When verifying, the same lights indicate the last character read on the input (original)



tape. Errors can be corrected by either operator by hitting the backspace or erase keys and rekeying the correct information. The tape is not actually moved or erased, but an identifying character is added for later decoding.

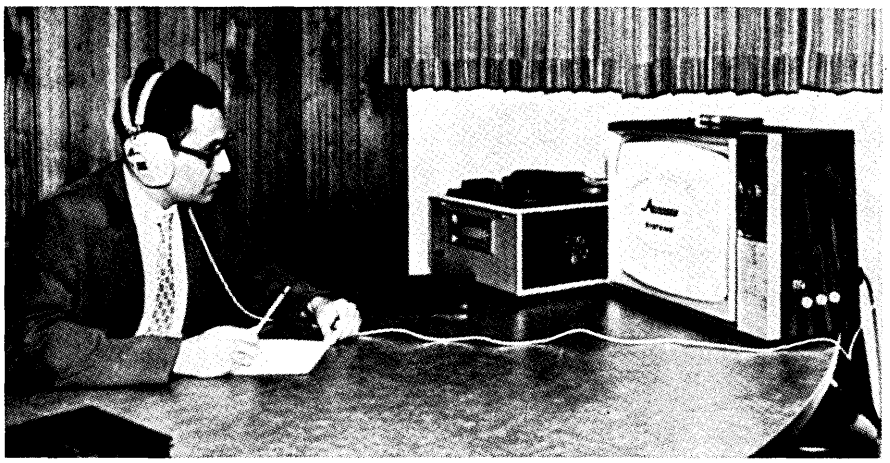
Additional panel indicators display status messages such as ready, tape error, parity error (ASCII code is used), operator error, etc. Each mag tape cartridge contains a pre-recorded timing track along its 300-foot length of computer grade tape. If the track cannot be read, no character can be entered. Correction procedure when this occurs calls for forward spacing the tape and leaving another identifying mark.

If the customer is really sure about the input, or if, as in the case of subscription data, verification is not necessary, a model 2000 recorder is offered which has only one cassette drive and does not have the display panel which shows the last character entered. The less complicated unit does have the status lights for error conditions and alerts, and errors sensed by the operator, or suspected, can be noted on the tape by the same procedure—typing "backspace" or "erase."

A third unit, the model 6000 Converter, is used to pool the data from the cassettes onto ½-inch mag tape. Each full cassette of 40,000 characters can be written onto the ½-inch tape in about three minutes. The resulting computer-compatible tape can be read on *either* a 7- or 9-track drive. The secret is that the information is recorded onto only the middle tracks of the ½-inch tape in an octal code which must be deciphered and formatted by a software package on the host computer. The computer is also given the responsibility of noting correction characters and deleting bad characters and records.

The 2000, 4000, and 6000 all use odd recording techniques. In no case is a read after write performed. Instead, redundancy comes into play to achieve reliability. The 2000 and 4000 direct

New videotaped courses in data processing solve 7 major training problems



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entry units actually write each character on tape three times (so it takes 120,000 characters to achieve the 40,000 character per cassette figure). These three characters are compared during the conversion process and the result is written twice on the ½-inch tape. These, finally, are compared on the host computer and one good character is retrieved.

Several attractive features are included in the products. First, the cassettes, as mentioned, contain computer grade tape. Second, the cassette drives are reel-to-reel mechanisms developed for digital recording, not converted audio gear. Third, there is no record length restriction even though the data is formatted into 64-character blocks during pooling.

The price for the 4000 is listed at $3,425 ($70-80/mo.), for the 2000 at $1,925 ($40-$50/mo.), and for the pooler at $9,850 (with various lease-per-use charges to make it easier for the little guy). The software for the host computer, 6K bytes of restricted (and therefore compatible) COBOL, comes at no extra charge; no timing figures for it have yet been compiled but the speed "should" be around 3,300 char./sec. COMPUTER ACCESS SYSTEMS, Phoenix, Ariz. For information:

CIRCLE 522 ON READER CARD

real paper products

An expanded line of Moore paper products includes Perforator Tape in eight different colors with special printing or directionalized top arrows on the edge of the tape in bold color for threading correctness. Zero Defects Oiled Perforator Tape is designed for unusually severe demands and contains an "additive" (*not* STP), said to eliminate static at all speeds. Printout rolls for teleprinters and accounting machine rolls are also available in a variety of colors. MOORE BUSINESS FORMS, INC., Niagara Falls, N.Y. For information:

CIRCLE 523 ON READER CARD

crt/paper tape systems

The Sanders 5700 Display/Tape System features a crt terminal which displays an exact replica of a source document and provides visual verification of all typed data before it is punched on tape. Source document formats, generated from a pre-punched tape, appear on the screen and can be filled-in by an operator, tabbing from field to field

until the record is complete. The system includes an internal memory which holds all data until verified, and permits transmission to the paper punch by depressing a single button. Insertions, deletions, and typeovers are performed via the keyboard.

Two models are available. The first, designated the Model 5708 Basic Paper Tape System, provides for simultaneous inputs from up to three crt terminals, each having a dedicated paper tape reader for data output to the display screen or memory. Each crt terminal may also output stored data to a single tape punch shared among all displays. Priority is established by queuing. Tape read and punch rates are 45 and 180 cps, respectively, and an 8 channel ASCII plus strobe format is used. The second model, called the 5709 Advanced System, combines all basic features of the 5708 plus multiple-punch switching and integral code conversion in an identical package size. Output may be manually switched at each crt terminal to any one of three punches, using either 8 channel ASCII or 5 channel Baudot tapes. Both 8 channel and 5 channel readers and punches can be intermixed in any combination for simultaneous operation. Model 5709 Systems may be configured with up to 12 crt terminals, each located up to 1000 cable feet from the 5709 control unit. Output punches can be as far as 50 cable feet. A typical 5708 with one control unit and three 1,024-character memory crt terminals sells for $21,900 and rents for $855/mo. Delivery requires 90 days ARO. SANDERS ASSOCIATES, INC., Nashua, N.H. For information:

CIRCLE 524 ON READER CARD

crt terminal system

First product of year-old Computer Consoles Inc. is the Model 520 Display/Keyboard and the Model 724 Control Unit which, together with an optional printer, local storage magnetic tape unit, and standard magnetic tape, may be used as either an independent information handling unit or as a data terminal system connected either locally or remotely to a computer. The 520 Display has a 14-inch crt with 11.25 x 5.75 inch screen. Twelve lines of 80 characters provide 960 characters per display. The detachable 520 Keyboard contains 26 alphabetic, 10 numeric, and 23 punctuation and special function keys. A single or continuous advance multidirectional cursor control provides operator guidance during the inserting, shift-

family of computers

COMPUTER AUTOMATION ANNOUNCES FAMILY OF COMPATIBLE COMPUTERS

Computer Automation has announced a family of four compatible computers including its two current models. All four machines are termed Programmed Digital Controllers but are in fact full-fledged binary, parallel, control computers. The company has placed heavy emphasis on reliability, ease of programming and memory efficiency. Reliability is stressed since the computers are designed for on-line systems where down time can be extremely costly.

Since programming cost is sometimes greater than the hardware purchase price, the company has designed the machines for the programmer. Powerful, meaningful and flexible instruction sets reduce the programmer's task to a minimum.

Core memory efficiency is meaningful since about half the mainframe cost is memory. All four machines are organized to make maximum use of core. Comparisons against other mini-computers have shown the Controllers require as little as half the memory for the identical task. Of the four machines, two are sixteen-bit units and two are eight-bit units. All units use identical peripheral adapters interchangeably. Software compatibility exists between the two eight-bit units and between the two sixteen-bit units. Mainframe prices (4K core) start at $6,600 and go to $13,000. Deliveries range from off-the-shelf to 120 days.

ing, or deleting of characters, lines, or the entire display.

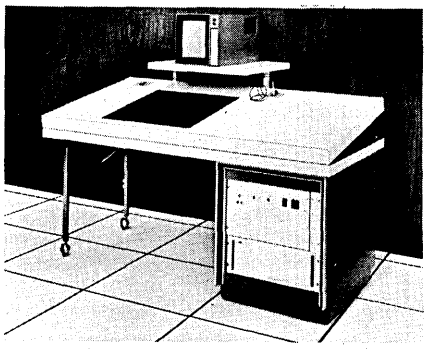
When the system functions as an input unit, verification of keyboard data entry is performed by entering data a second time; this data is au-

tomatically compared with the first and verified. For browsing magnetic tape and handling long forms, a scroll up/down feature is used. In addition to visual indications of operation, audible keyboard sounds include variable volume key stroke sound and end of line warning tone, with volume control. The Model 724 Control Unit contains a 960 character buffer core storage and logic for keyboard or data processing facility instructions, and an additional 240 character buffer for the printer. For data communication, a 202C Data Set or equivalent may be used. Transmission rate is 1,200 baud. Code is 7-level ASCII. The optional paper printer operates at 15 cps with format control performed by the display. The local storage CCI 520 Digital Tape Unit with a reel capacity of 280,000 characters has a read/write rate of 1,600 cps with rewind speed of 40 inches per second. The system is intended for use with 360/30 or larger cpu's, but may be interfaced with equivalent non-IBM mainframes. Price for a basic system including just the keyboard and crt is $10,090 plus maintenance, or $252/mo. rental including maintenance. Delivery requires four to six months. COMPUTER CONSOLES INC., East Rochester, N.Y. For information:

CIRCLE 525 ON READER CARD

on-line/off-line digitizer

Computer art, like computer-created music, may never come into vogue, but if it does the counterfeiters will have a field day with the Grafacon 2020. An operator with a pen-like stylus can trace a drawing over the 20 x 20-inch drawing surface and transmit coordinate data to a computer or to a peripheral interface at a rate of 4,500 points/second, and speed is important when you are trying to turn out several "originals" overnight. The 2020 uses a built-in 1024 x 1024 matrix that provides resolutions of 50 lines/



inch. The device's output register contains 10 bits of X data and 10 of Y, and also three control bits, including a data-ready bit, an "old value" bit (which is used in detecting when *not* to send data so that garbage is not transmitted when the pen is laid down or moved accidentally), and a pen-up/pen-down indicator.

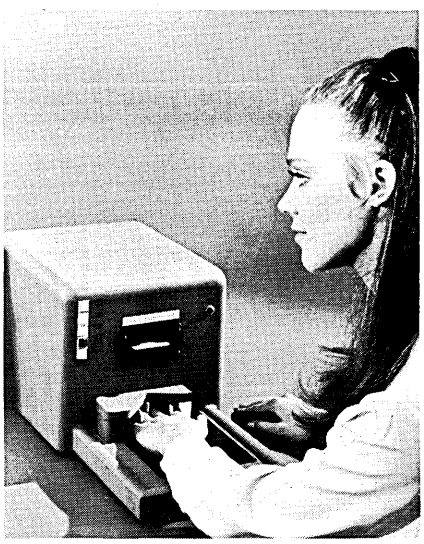
In addition to sketching, the 2020 can be used to compose or edit text

(no keyboard is provided, but a portion of the tablet can be dedicated to sensing impulses for translation to characters or symbols), and to control data entry and processing. Options include a tilt-top table feature (add $1,000) and a Tektronix model 611 storage crt (add $9,900 including interfacing). The base price for the system before options is $12,500. Its manufacturers claim that there is no competitive model marketed since others (such as Calma's unit) are not interactive. BOLT BERANEK AND NEWMAN INC., Santa Ana, Calif. For information:

CIRCLE 526 ON READER CARD

personal i.d. unit

The Identimat 2000 may be the answer to positive personal identification, provided you've got at least one reasonably intact hand. It's a box containing some electronics which the developers won't talk about because their patents are only applied for. An individual seeking to verify his identity merely inserts a card into the Identimat, then places his hand in a second slot, and—presto!—his identity is established in a fraction of a second. The card used is the size of a standard credit card and may employ punched holes, magnetic marks, or characters for optical recognition. No internal



memory is used; identification is established by comparison of information on the card and recognition of "hand geometry." An individual is issued a card through operation of the Identimat in a "punch mode": a blank card and a hand are inserted, and the card is punched in approximately seven seconds. "Four characteristics" of the hand are measured, resulting in "99% effectiveness" in establishing a unique identity. The Identimat may be used as a stand-alone unit, as an off-line recording system using magnetic tape, as an on-line terminal, or for "point of sale" applications, such as cash registers and vending machines.

The device is currently being field tested at the Institute of Living, Hartford, Conn., in conjunction with the TravCom hospital information system. The Identimat is interfaced with terminals so that a user must establish his identity before accessing information, and a record is made of the identity of the user. Another Identimat is being tested in a Michigan hospital which uses the unit to control the lock on a narcotics supply, preventing unauthorized entrance. Price of a single, stand-alone Identimat is currently about $4,000, but this is expected to be reduced to about $1,000 eventually. Delivery time is three to four months. Prices are higher for units requiring interfaces, which will be supplied as part of the system. IDENTIMATION CORP., Northvale, N.J. For information:

CIRCLE 527 ON READER CARD

new software

360 telecommunications

Sales on rocket engines are down right now, so Aerojet-General has begun to market some of the software tools developed for its own use. One of these is TELCOM 1, a 360 communications system which provides remote services using any combination of IBM-supported terminal devices. TELCOM 1 provides remote inquiry to stored data files, data distribution between terminals and the central computer, desk calculating and message exchange between terminals. A common interface automatically compensates for differences in terminals; and the terminals can be tested on-line if desired. Other features include the ability to terminate remote services without the loss of in-process data, automatic polling for multi-terminal drops on a single line, automatically recorded terminal traffic statistics, and a broadcast mode for message transmission. Data banks are accessed through a directory when the proper terminal numbers and/or passwords are given. A check of security requirements for the data is automatic.

TELCOM 1 is designed for operation with OS/360 MFT, MFT II, or MVT. A single partition is used under MFT. Core residence requirements call for 65K bytes. Maximum efficiency is claimed through the use of reentrant programming, unique data management techniques and controlled buffer pools. Written in Assembly Language, the system requires direct access storage devices, a card reader, and IBM 2740, 1050, and/or 2260 terminals. The price is $37,500 installed, but component packages are available separately. AEROJET-GENERAL CORP., Sacramento, Calif. For information:

CIRCLE 533 ON READER CARD

fund accounting

C/CFAS, a Common and Collective Fund Accounting System for banks, is available in several PL/I and COBOL versions for 65K 360's under DOS or OS. The software performs maintenance of participant ledgers, fund assets, income accrual, and units transfer and valuation, in addition to providing an accumulation of tax cost and tax cost adjustment data. It permits a multiple number of funds to be processed using only two files, removes the need to manually maintain participant ledgers, and prepares schedules of capital transactions for the Internal Revenue Service. The package sells for $14,000, complete with documentation and one man-month of technical support, permitting modification of the system for use with the individual bank's coding structure. WELLINGTON SYSTEMS INC., New York, N.Y. For information:

CIRCLE 534 ON READER CARD

bug-killer

Once a programmer has finished designing and coding a program, it is difficult for him to become completely objective long enough to test out all possible cases and data conditions that the program may encounter. Often it is intelligent to have a second programmer, or the user, begin testing the program case by case. Testing of any kind is time-consuming and subjective, and it is no surprise to have a "fully-checked-out" program hang up unexpectedly one night after many months of smooth operation because no one had checked what would happen if one of the parameters went to zero. In some instances the program is so well trusted that machine maintenance is called for rather than a programmer.

FILEMAKE is designed to help in checking out a "finished" program by generating a file of data cases as complete as is desired. Since the program is given the unstimulating task of generating the data, there is less likelihood of one case not being tried. The input to FILEMAKE would include a definition of input variables and a range of values for each; the file generator figures out the permutations.

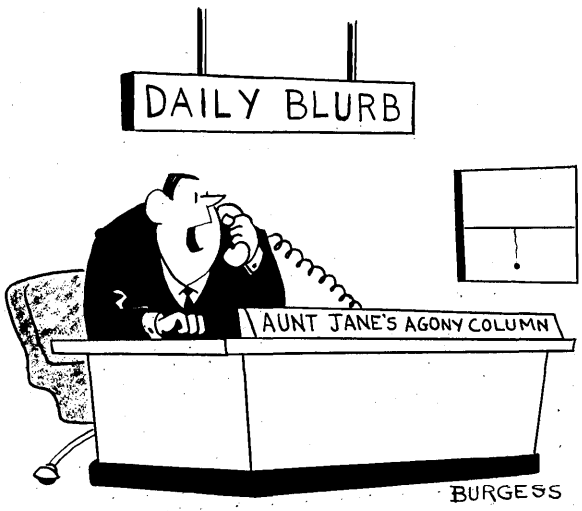
Compatible with FORTRAN, COBOL, PL/I, or Assembly Language under DOS/OS (releases 14 and above), the program requires 24K bytes of storage on a model 30 or larger 360. Its $1,250 price includes installation and one year's maintenance. SYNERGISTIC SOFTWARE SYSTEMS, INC., Houston, Texas. For information:

CIRCLE 535 ON READER CARD

schematic drafting

After giving this software package a description of an electronic circuit, a user can request five kinds of output, two printouts and three plots. The printouts consist of a parts listing and a parts count report. The graphics consist of a schematic diagram, a logic diagram (for digital logic circuits), and an interconnection schematic, and are produced on CalComp plotters or CalComp command language-compatible gear.

The program uses a specialized in-



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A hardware-oriented "basic" system, they refer to special software and jury-rigged systems.	The NCP uses a software approach to provide a "total" system that is ready for turnkey installation.
Takes the load off your central processor, and can increase its available capacity by 25% to 50%.	NCP does the same thing, and can increase the computer's capacity by up to 90%.
Can interface with most remote terminals.	NCP will handle virtually all terminals . . . at no extra charge to the user.
Can handle 64 "all speed" channels and can be expanded up to 2048 low speed lines.	So can the NCP, but it can handle up to 4096 low speed lines if required . . . *and we provide the software to back it up.*
Is available now, ready to install with all *basic* software.	NCP is deliverable in 90-120 days. It is a total system including *all* hardware and *all* software so the user doesn't have to write programs to make it work. Just plug it in and go.
Storage—not stated in advertising nor shown in photos.	NCP provides disc storage in increments of 6 million bits (included with the system).
Provides line service at speeds from 2,000 bits per second to 230,400 bits per second.	NCP starts at 110 bits per second and goes up to 230,400 bits per second . . . or even faster should the user need it.

CIRCLE 88 ON READER CARD

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new software...

put language, which is much like APT or PAL, to enter the circuit geometry. The vendor claims that users find this language even simpler than the other two. The programs for deciphering the input language and producing the plot and print commands are written in FORTRAN IV and require about 20K of core for residence. Capabilities include changing scales, but clipping or sectoring (limiting the amount of a large picture which is to be shown in a particular drawing) must be done by editing the input. Using a larger machine, such as the Univac 1108 or GE 635, a "C" size schematic containing 70-90 components can be generated (written onto tape) in about 40 seconds, reportedly.

The package can be purchased for $30,000 or leased at $800/mo. with 50% of the rental going toward an eventual purchase, if desired. A 90-day contract is required. Plotting services are also being provided to Los Angeles firms using the suppliers system. TECHNICAL OPERATIONS, INC., Los Angeles. For information:

CIRCLE 536 ON READER CARD

message switching

Communications Administrative Message Program services the store-and-forward requirements of a multi-station Teletype network. The package operates on a 360/30 or larger system with minimum 32K memory with disc. It is also available in adaptations for Spectra 70/35 and other similar size computers. CAMP maintains control of the network and performs various checks to prevent message loss or duplication. Complete header analysis is provided, including error message generation when an invalid header is received. Various supervisory controls and statistical data analysis capabilities are also provided. The system permits spooling operations to be performed simultaneously with message switching. Prices start at $30,000. FAIM INFORMATION SERVICES INC., New York, N.Y. For information:

CIRCLE 537 ON READER CARD

file management system

This 25-man division of Republic Corp., which describes itself as an applications programming house, offers an assembly language data management system called FAST 1. The product is actually one package, not a series of versions for different machines, but is made available in a variety of

assembly languages. The vendor has created what amounts to an assembler translator (assembler assembler?) which it uses to convert its software system, written in English-like statements, to the assembly language of the customer's computer. The basic version of FAST 1 has so far been implemented on a Honeywell 200, Burroughs 2500, and several 360 models.

FAST 1 provides facilities for creating and maintaining data banks, modifying and updating them, and extracting data from them for analysis or for reporting. Sort routines and report generators can be included in the offering, along with handles for incorporating the UCLA Bio-Med statistics routines or the customer's own analysis programs. The "utility" portion of FAST 1 is priced at $4,000; a full-blown version could run as much as $10,000. The utility package requires a 32K byte machine; the version which incorporates the UCLA programs—available without charge from the university—requires a 128K byte configuration. SYSCOM, Manhattan Beach, Calif. For information:

CIRCLE 538 ON READER CARD

typewriter plotting

Students are gaining a reputation for being rough on just about everything. Perhaps that is why this vendor chose to have its program package and self-teaching routines tested by undergraduates at the Computing Center of the University of San Francisco. Apparently the package withstood the testing, because it is now being marketed to IBM 1130 users who would like a typewriter plotting capability. Called the TPLOT System, the FORTRAN-callable package includes about 6,500 words of assembled code, 3,000 words of which are core resident.

A special typewriter element is included in the purchase price. The "golf-ball" contains enough variably-positioned X's, dots and grid line elements to produce a plot accurate in both the horizontal and vertical components to 1/30-inch. With . these plotting elements and a two-color ribbon, several parameters can be differentiated on the same axes. The 7½ × 10-inch plots are produced at full typewriter speed (about 15 cps for typing, but faster overall due to the tabs) for a randomly-ordered data set of up to 1,000 values. The ability to plot randomly-oriented data rapidly is expected to make the product look good to statisticians. Purchase price for TPLOT, including documentation and self-training programs, is less than $1,000. TPLOT CORP., San Rafael, Calif. For information:

CIRCLE 539 ON READER CARD

installment loan

FILS, the First National City Bank of Boston Installment Loan System, provides a complete installment loan accounting service for a bank and its correspondents. It requires a 360/30 with 65K core and minimum of four tapes or discs, and is written in COBOL. The system provides up-to-date payoff amounts for each loan, up to 99 different loan type classifications, indirect loan reporting, management statistics, and automatic closure of small balances. To accommodate the desires of correspondent banks, the program incorporates several accrual methods, various check-digit calculation procedures, option codes for the selection of reports, and flexibility of scheduling late notices and late charge assessments. The primary report, called the Consumer Credit Reference Listing, contains the current balances, payoff amount, and other pertinent information for each account. Every week this reference listing (or trial balance) lists every loan. In addition, a cumulative listing reflecting those accounts which have had activity during the week is provided daily. A complete set of additional reports is also available, including such items as auditors' notices and loan index cards. A total of fourteen standard and fourteen optional reports are produced. The program was developed by the First National Bank of Boston for its own use, and is being marketed by CULLINANE CORP., Boston, Mass. For information:

CIRCLE 540 ON READER CARD

circuit analysis/plotting

Non-linear DC and non-linear transient circuit analyses can be performed with NET-1, producing plotted as well as printed output. The program is an outgrowth of the NET-1 Network Analysis and SOP (Solution Output Processor) programs developed originally by Los Alamos Scientific Laboratory, but contains many alterations, including modification of the DC convergence procedure, the addition of automatic tape error recovery, and the removal of restrictions on transistor beta variation with current. The program uses double-precision arithmetic and can handle resistors, capacitors, inductors, mutual inductances, transistors, diodes, DC sources, signal sources, and combinations of these

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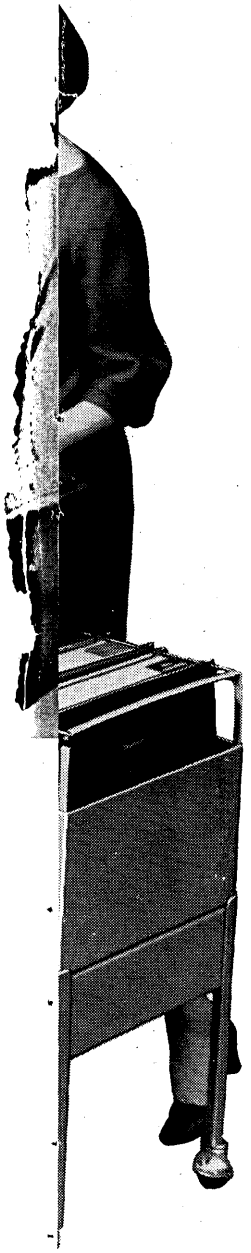

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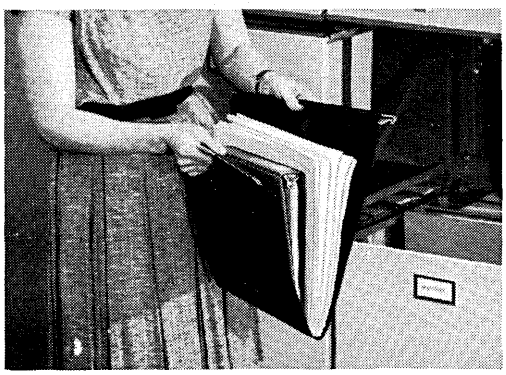

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new software...

elements. NET-1 operates on the IBM 7094, 360/65 or /67 with 7094 emulation, and on the Standard Computer Corp. IC6000. Output plots are compatible with the Stromberg-DataGraphiX 4020.

An object tape of the program, a test case, a semiconductor library tape, users manuals, loader cards and pre-punched subdecks will run the customer $2,300. These materials will be maintained for one year. Flowcharts and annotated symbolic tapes are available as options for $200 and $700, respectively. NET-1 contains about 39,000 lines of FAP coding. DESIGN AUTOMATION, INC., Lexington, Mass. For information:

CIRCLE 541 ON READER CARD

payroll

MASCHECK is designed to operate on a 360 model 25 or larger to process payroll for multi-plant, multi-state companies. Federal, state, and local taxes are calculated; standard deductions and labor distributions are considered. Installation of the 32K COBOL package and documentation are included in the "under $10,000" price tag. MASTECH COMPUTER SYSTEMS, INC., Chicago, Ill. For information:

CIRCLE 542 ON READER CARD

automatic documentor

The name "AUTODOC" has been used before for documentation programs (by IBM in some form?) but this program offering is only distantly related to older packages. In its present form, AUTODOC processes COBOL source decks to generate: a logic chart, a detailed flowchart, a special reference list, procedure reference list, data reference list, error list, source program list, report layout (a dummy report), record layout, and a cover page. Written in about 8,000 COBOL statements, AUTODOC is segmented to operate on a 32K IBM 360 running under DOS. Versions are available for most computers. Input decks can be stacked and the program run under a partitioned mode, if desired. If all options were excercised, the program would process about 250 statements per minute on a 360/40 under DOS.

A second version of the program will be available shortly for processing FORTRAN decks; plans also include versions for BAL, PL/I, and EASY-CODER. A three-year lease is offered for $4,800, a price which includes a management

orientation session, a training program (for operators and programmers), and maintenance ("emergency" maintenance for accommodating new user needs, and "normal" maintenance for system updates). COMPUTER TIME-SHARING CORP., Palo Alto, Calif. For information:

CIRCLE 543 ON READER CARD

accounts payable

The Delta Accounts Payable System is being marketed to commercial service bureaus, and consists of 22 programs and sorts written in COBOL, designed for operation on a 360/30 or larger, either in disc or tape configuration. The system accommodates the accounting needs of many different businesses, and automatically calculates due dates, discount amounts, and net amounts for each invoice, based on prompt payment terms offered by individual vendors. The package also features data entry at one point only, automatic reconciliation of bank statements, multiple-division or multiple company processing, and a uniform set of 12 reports, using the same format and heading. Cost is $15,000. DELTA DATA SYSTEMS INC., College Park, Md. For information:

CIRCLE 544 ON READER CARD

debugging

The first of three related software packages is called XBUG. It is a console debugging utility program that enables users to debug 360 assembly language programs on-line. The package runs on any DOS configuration. By typing in commands at execution time, the user can create breakpoints, interrogate registers and core locations, change register and memory contents and alter program flow. XBUG interrupts cancel routines to transfer control back to the user on program checks. Price is $1,000, with duplicate programs at a reduced rate. Next comes COREX, a correction package for 360 DOS, which is linked via the COREX Macro called at the beginning of the problem program. At run time, COREX takes any number of correction cards from the job stream and makes the changes to the core image. Hopefully, COREX can enable users to substantially reduce machine time when doing assemblies and compiles. At $100, it might be worth a try. And finally we have SUPER; a call to the SUPER package allows a user program to enter supervisor state and make alterations to the supervisor. The package runs on 360 DOS, too, of course. It is useful on storage protected systems where the user is prohibited from storing in lower core, adding new supervisory calls, etc. Cost is $250. MANDATE SYSTEMS INC., New York, N.Y. For information:

CIRCLE 545 ON READER CARD

contractor's systems

General trades contractors can access three related programs through a specialized service bureau installation in Milwaukee. Services are provided over dial-up lines to customers as far as California, and New York users can dial-up on toll-free lines. The three programs involved, COLOR, CONTROL, and ESTIMAT, are resident on a Burrough's 5500, on which they use about 19K. As the names imply ESTIMAT is designed to help in bidding jobs and CONTROL is used in production control and cost evaluation. COLOR is used for production planning. COLOR and CONTROL can be used by any contractor without modification, but ESTIMAT must be tailored to reflect each user's construction costs.

Processing is performed in a remote batch mode from user inputs and user files. Key outputs are returned via tty, and the bulk of the printout is done on a line printer overnight and returned by mail. One pre-tailored ESTIMAT package, for painting contractors, can perform the estimating processing for a $150,000 job for about $10 of cpu time. Customers pay $100/mo. for access to the programs, 18¢/sec for cpu time, and $15/hour for connect time. Terminal costs and line charges are the responsibility of the user. Training seminars are provided. CONSTRUCTION COMPUTER CONTROL CORP., Milwaukee, Wis. For information:

CIRCLE 546 ON READER CARD

360 report generator

FORMAT I is a one-pass data retrieval and report generator consisting of four programs written in COBOL Level F and one in 360 Assembly Language (called in for efficiency during data movement). Particularly adaptable to processing large data files of character-oriented information, such as personnel, inventory, and population files, the programs can be tailored to a user application. To use FORMAT I, first the

data elements, and their location and size within records, are defined. The desired reports are described (the vendor claims that the most complex report can be defined within two hours) by listing sort fields, excluded records, page format instructions, tallies, etc. The defined reports are requested by calling out their report number.

The package requires an IBM 360/40 operating under OS with 128K bytes of core, three tape or disc units, a card reader and printer. Any number of data files may be defined as sources, and up to 20 data elements may be displayed in the reports. With the Level O program five data elements may be used in sorting, or to specify the range for record inclusion or exclusion. Five reports may be specified in a single run; and up to 20 literal equivalences may be used. All of these limits can be exceeded by going to another level of the package program. Level O sells for $9,000 installed; Level I, with extended capabilities, goes for $12,750. AEROJET-GENERAL CORP., Sacramento, Calif. For information:

CIRCLE 547 ON READER CARD

program policeman

Compumeter generates daily reports indicating type and name of each program run, number of times run, and length of time used per program. The system lists and summarizes each operator's productivity, and ascertains time required to debug a specific program. All that's required is entering a standard call card as part of the program. Printed weekly, monthly, and annual summaries show how the computer is being used or misused. Compumeter can be run on any IBM 360, DOS or OS. Prices are Model Number multiplied by 100, i.e., 360/25, $2,500, 360/30, $3,000, etc. Installation is accomplished in a day by one of the developer's analysts on site. Separate maintenance contracts are available. It's the first product of COMPUTYNE, INC., Deer Park, N.Y. For information:

CIRCLE 548 ON READER CARD

subscription fulfillment

Two subscription fulfillment packages are aimed at BPA and ABC magazines, respectively. The BPA package is intended to reduce costs by eliminating manual handling of new orders, renewals, classifications, address changes, etc. It also provides statisti-

cal analysis of readership. Price is $4,000. The second package, for ABC publications, includes five programs, handling such tasks as label printing, notice printing, file maintenance, credit subscriptions, multiple copies, etc. Price is $6,000. Both packages run on IBM 1401 or 360 cpu's with minimum 12K core, four tape drives, card reader, punch, and printer. COMPUTEROLOGY INC., New York, N.Y. For information:

CIRCLE 549 ON READER CARD

precompiler

DETRAN is a decision table translator which utilizes limited entry decision tables. It is a hardware-independent precompiler that produces COBOL programs and is adaptable for other languages. The package uncovers and resolves incomplete logic, eliminates redundant interrogations, and generates programs having the fewest steps necessary to arrive at a decision. DETRAN requires as little as 32K core and is said to produce programs requiring "substantially less" coding than other decision table translators. Price is $15,000 for single installations, with reduction for multiple use. INFORMATION INDUSTRIES INC., Wayne, Pa. For information.

CIRCLE 550 ON READER CARD

purchasing system

Purchasing Action and Control System is an information system with report generating capabilities, designed to facilitate planning, control, and action. Daily and weekly purchase order reports generated by the PACS system can be used by buyers to keep abreast of the status of all open orders. The system can also be used to produce open material commitment reports, material order status inquiry reports, and material performance reports. PACS is designed for use on 360/30 or larger computers with minimum 16K core, and can be adapted to similar non-IBM machines. It is sold as a "customized" system rather than a rigid "package." It is also sufficiently modular so that component parts may be purchased rather than a total system. Price for the system ranges from $20,000 to $30,000 plus implementation. COMPUTER USAGE CO., INC., Greenwich, Conn. For information:

CIRCLE 551 ON READER CARD

business forecasting

A conversational time-sharing software system called the "Instant Series" of Computer Software for Time Sharing Systems is designed for use in forecasting and comparison analysis in the financial and business communities. The system provides forecasting of profit and loss statements, forecasting of manpower and resource allocation, budget preparation, comparison of two forecasts or of a forecast and actual historical data, and projection and compilation of the results of trend analysis. It will be marketed both to users of t-s services and to commercial t-s installations. Users are expected to include bankers, finance officers, marketing managers, brokers, budget directors, etc., each of whom need only have access to a teletypewriter terminal.

Price is $4,000 plus a $200 annual maintenance fee after the first year for the full system. Modules may be purchased separately as follows: Data Generator Module, which produces a forecast file from a user-defined data base, $1,500; Forecast Display Module, which prints a listing of the forecasted data base, including subtotals, totals, summaries, etc., $1,500; Comparison Analysis Module, which calculates and prints either percentage or

new software...

percentage and integer differences between forecast and actual, two actuals, or two forecasts, $1,500; Update Module, which simplifies update of data files, either actual or forecast, $1,000. LEVER DATA PROCESSING SERVICES, INC., New York, N.Y. For information:

CIRCLE 552 ON READER CARD

information raps

Retrieval Analysis and Presentation System is an information retrieval software package which combines high level retrieval and reporting capabilities with a mathematical calculation capability. The package contains two special-purpose compilers which transform RAPS language statements into retrieval programs, sort parameters, and output programs. The output program is compiled from RAPS language into FORTRAN source code, thus allowing any special logic that is not standard in the basic package to be included in the output program being compiled. A second feature is a facility which allows the user to expand his own system to serve his special needs. For example, he may create his own special display function, such as a bar chart presentation, and then make it available at any time by using a simple "call" statement. RAPS will run on any 360/30 or larger with minimum 32K core. Price is $12,000. LEASCO SYSTEMS & RESEARCH CORP., Bethesda, Md. For information:

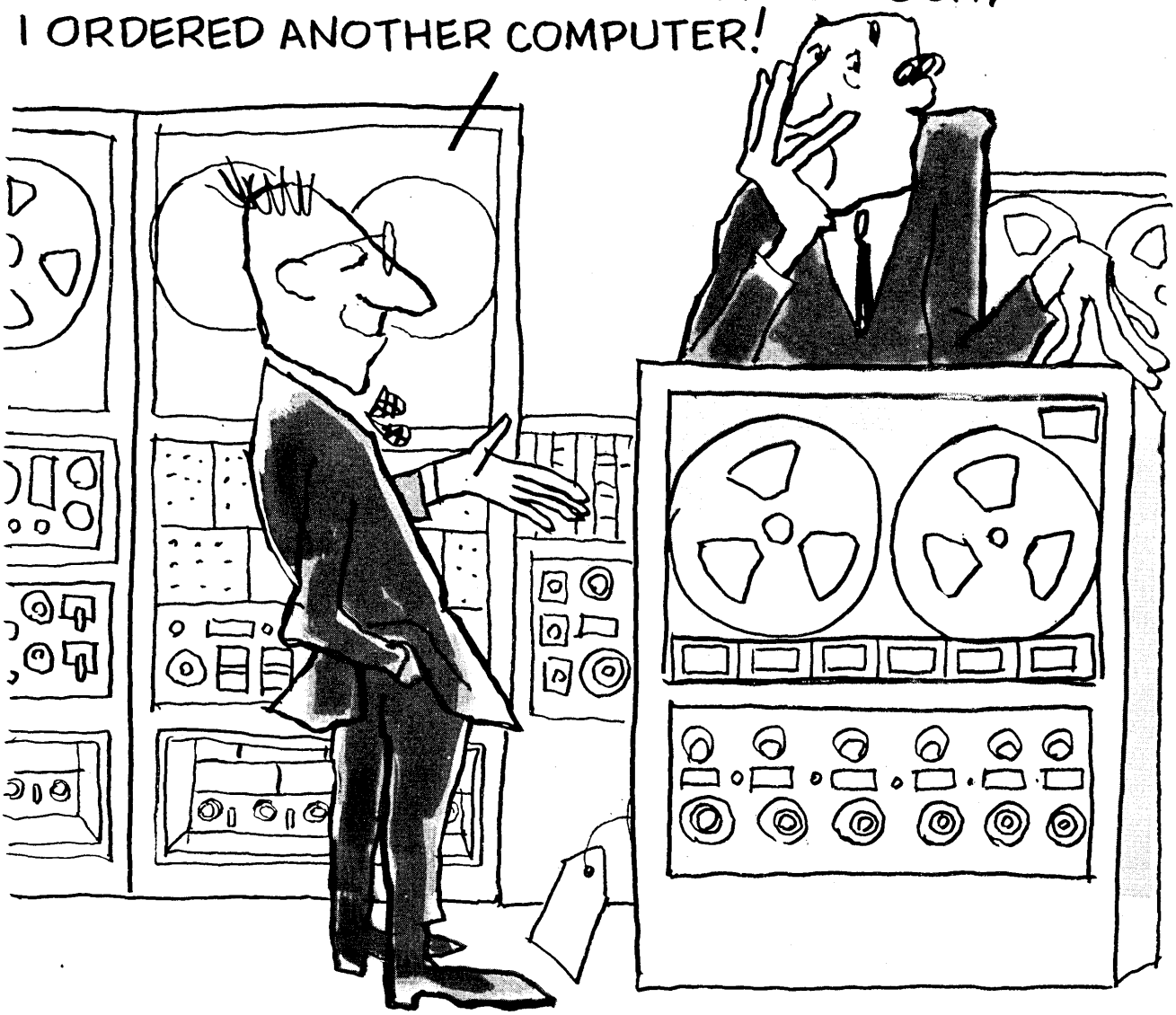
CIRCLE 553 ON READER CARD

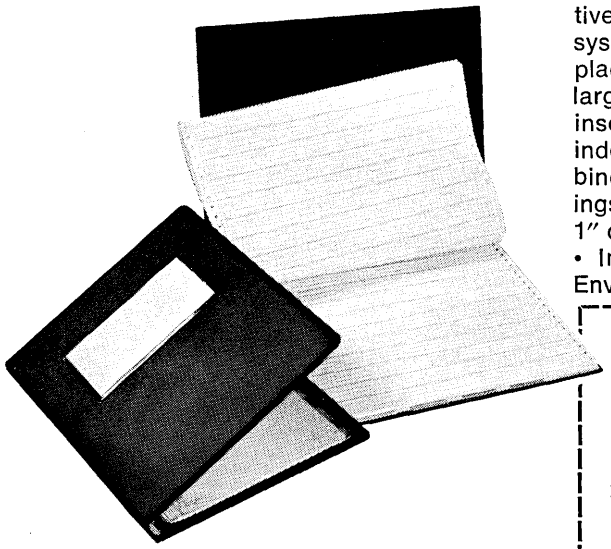
action accounting

The Action Accounting package, written in COBOL, provides monthly trial balances, balance sheets, operating profit and loss statements, and complete general ledgers. It was developed by the First National State Bank of New Jersey with assistance from S. Bosworth & Associates management consultants, who are now offering the software for sale or franchise. First customer is Bankers Trust Co., New York, which is now offering Action Accounting as a service. The program can be compiled on any 360/30 or larger with 32K memory, on a GE 400 with 8K words, or similar mainframes. With a high-speed printer and four tape drives, more than 50 accounts per hour can be processed. Non-exclusive selling price is $5,000. Exclusive franchises are negotiable. S. BOSWORTH & ASSOCIATES, Plainview, N.Y. For information:

CIRCLE 554 ON READER CARD

GOLLY GEE, BOSS - I LIKED THE NATIONAL SYSTEMS DOCUMENTATION KIT SO MUCH, I ORDERED ANOTHER COMPUTER!





The new National Systems Documentation Kit is specifically designed to protect and house computer printouts, system narratives and flow charts. The Kit lends itself to an orderly approach of system documentation requirements. Narratives and flow charts are placed within the three ring binder. The binder has a 1" capacity and large labels for identification. Insertable indexes and 17 preprinted inserts are furnished for both listings and documentation. A vinyl indexed envelope holds control cards, notes and tapes in the ring binder. The accompanying Natlon™ Data Binder holds all listings. The Kit consists of the following: Data Binder (black Natlon) • 1" capacity black 3 ring Binder • Index set for Ring Binder—5 tabs • Index set for listings—6 tabs • Control Card Documentation Envelope.

NATIONAL

NATIONAL BLANK BOOK COMPANY, INC.
Holyoke, Massachusetts 01040
A Subsidiary of Dennison Manufacturing Company

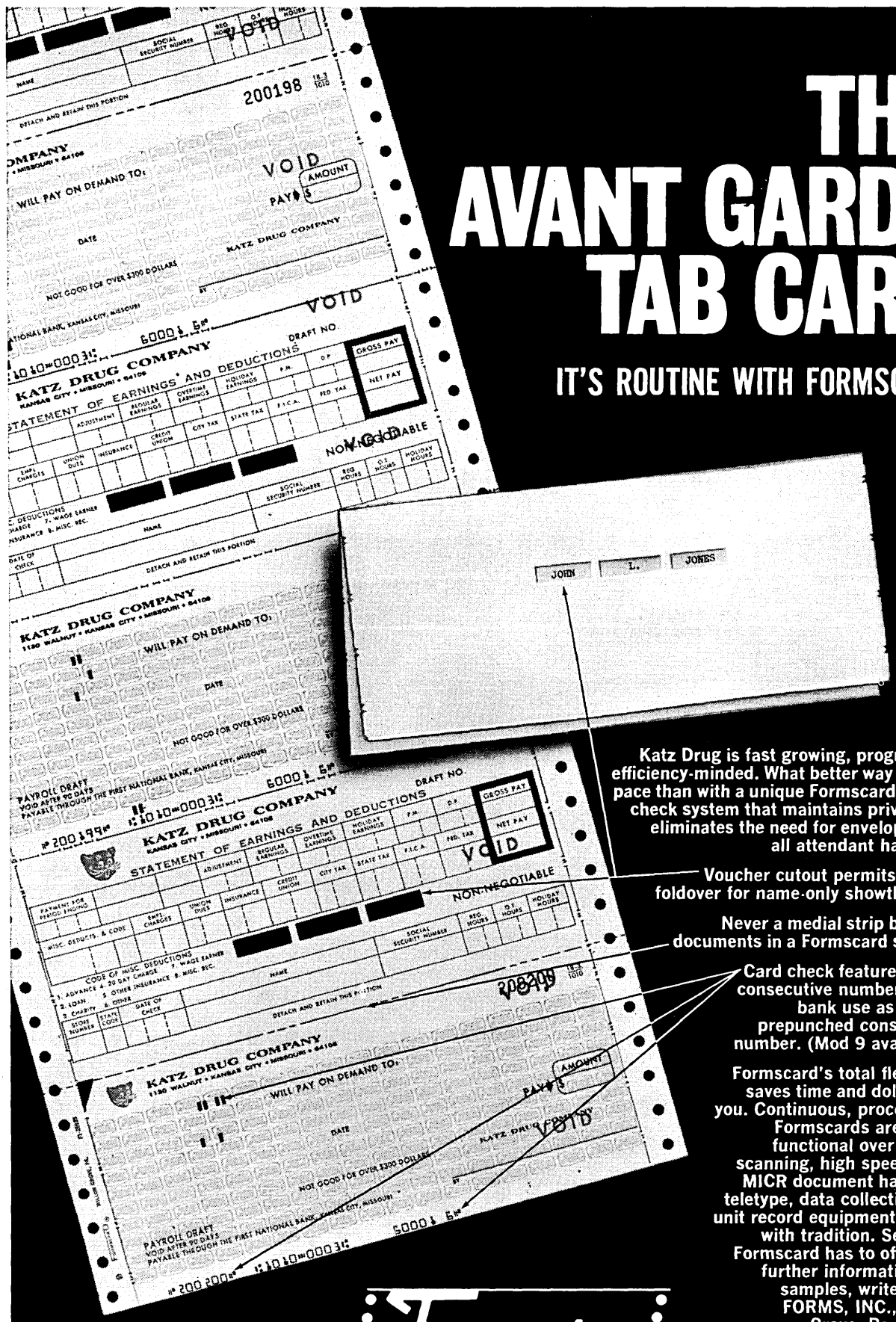
Please tell me more about your Systems Documentation Kit.

Name_____ Title_____

Firm_____

Street_____

City_____ State_____ Zip_____



THE AVANT GARDE TAB CARD

IT'S ROUTINE WITH FORMSCARD®

Katz Drug is fast growing, progressive, efficiency-minded. What better way to keep pace than with a unique Formscard payroll check system that maintains privacy yet eliminates the need for envelopes and all attendant handling.

Voucher cutout permits simple foldover for name-only showthrough.

Never a medial strip between documents in a Formscard system.

Card check features MICR consecutive numbering for bank use as well as prepunched consecutive number. (Mod 9 available.)

Formscard's total flexibility saves time and dollars for you. Continuous, processable Formscards are multi-functional over optical scanning, high speed EDP, MICR document handling, teletype, data collection and unit record equipment. Break with tradition. See what Formscard has to offer. For further information and samples, write or call FORMS, INC., Willow Grove, Pa. 19090 (215) OL 9-4000.

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new literature

1968 DATAMATION INDEX: Eight-page subject index to DATAMATION Vol. 14, 1968, includes references to material in feature articles, conference reports and particulars, Editor's Readout, The Forum, Books, News Scene, and System Spotlight. F. D. THOMPSON PUBLICATIONS, INC., Pasadena, Calif. For copy:

CIRCLE 560 ON READER CARD

TECHNOLOGY FORECAST: 187-page report uses SEER (System for Event Evaluation and Review), a technique that incorporates the consensus of particular experts, to produce a technological forecast of what is expected to occur in the information processing industry in the next 15 years. AD-681 752. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

MYSTIFIED BY MEMORIES? This six-page brochure, written for those who do not have first-hand knowledge about core memories and memory systems, concentrates on what happens in the memory system rather than precisely how it happens. Available operating modes and their variations are examined in detail. Also described are the binary notation, principles of data storage, data retrieval, restoring data, data inputs and outputs, and address selection. Four diagrams illustrate basic memory functions, memory system timing, 3-D plane with sense and inhibit winding, a memory radius array, and two forms of the "black box" and its interfaces. FERROXCUBE CORP., Englewood, Colo. For copy:

CIRCLE 561 ON READER CARD

BASIC MANUAL: "Basic Ideas" is a training book for the conversational BASIC language designed to allow the student to "interact" both with the computer and the manual, using it as a self-teaching guide or a classroom text. Each page is a lesson printed on heavy stock paper held in a loose-leaf binder and can be removed from the book for use at a time-sharing terminal. The individual lessons consist of a problem, a flow chart of the problem, and the correct answer. The student is expected to write the program in BASIC to arrive at the solution. Cost: $5.95 per copy; quantity discounts available. INTERNATIONAL TIMESHARING CORP., P.O. Box 8418, St. Paul, Minn. 55113.

T-S LANGUAGE: Reference manual describes XTRAN, an independent time-sharing language that incorporates the best features of both FORTRAN II and FORTRAN IV. Among the features of the language are: temporary internal files for information formerly stored on disc; one command dispatcher for rapid execution of all functions in one subsystem; random access files; stand alone programs, created in XTRAN but run under the EXECUTIVE; TAP interface, to enable the customer to link assembly language subroutines with XTRAN while remaining under the XTRAN operating system; command files to simplify the loading process; program overlay (chaining), to allow creation of programs of virtually unlimited length through program segmentation; and debugging capabilities. XTRAN can be either fully interactive or run in an almost batch-like mode. COM-SHARE, Ann Arbor, Mich. For copy:

CIRCLE 562 ON READER CARD

CRITICAL PATH FILM: A 28-minute 16mm black and white film, "Critical Path in Use," describes Critical Path Analysis as a management and PERT as a scheduling technique. The sound film, produced by the British Productivity Council, traces a project from initial planning. It is distributed with a discussion leader's guide containing an outline of the film, points for group discussion, and an annotated bibliography. Cost: $160; rental, $27.50 per week. ROUNDTABLE FILMS, INC., 321 S. Beverly Dr., Beverly Hills, Calif. 90212.

DATA SETS: Four-page bulletin describes the Transidata T103A series of solid state modems that transmit and

new literature ...

receive asynchronous serial digital data at up to 300 bps, full duplex, over two-wire facilities. The series includes the T103A1 for use on TWX-CE service and the T103A2 for use over the direct distance dialing network. The data sets are compatible with Western Electric 103A series data sets, 804B or 567PB data auxiliary sets, and 801A and 801C automatic call units. SANGAMO ELECTRIC CO., Springfield, Ill. For copy:

CIRCLE 563 ON READER CARD

STANDARD COBOL: "USA Standard COBOL, X3.23—1968" is the result of a 10-year COBOL development and standardization effort by representatives from computer manufacturers and user organizations. The standard is described in terms of a nucleus and seven functional processing modules, with both a low and high level standard defined. Based upon machine size and/or application requirement, a choice may be made from the defined structure of the standard COBOL: Manufacturers may select a level appropriate for their equipment, and users may request a COBOL level sufficient for their applications. Because each level of the standard is upwards compatible, programs may be transferred to different computers more easily and the recognition of incompatibility made more apparent than in pre-standard times. Cost: $6.50, USASI, 10 E. 40th St., New York, N.Y. 10016.

DATAFORM SAMPLES: Free kit contains samples of all the dataforms developed by the company. Perfect register of lines down through pad insures exact carbon duplication of data. Price schedules and ordering information is included. ADDISON-WESLEY PUBLISHING CO., Reading, Mass. For copy:

CIRCLE 564 ON READER CARD

IC CALCULATOR: Eight-page brochure describes the model 700 third-generation programmable calculator. This self-contained desk-top electronic calculator, constructed with integrated circuits on snap-in replaceable printed circuit modules, contains six system elements: sealed Microswitch keyboard, dual-register Nixie-type display, arithmetic unit, 8192-bit core assembly, 40K-bit read-only memory, cassette tape transport. The unit will add or subtract in about 300 usec, multiply in 3 msec (divide in 3.5), find a log in 15 msec, calculate e^x in 35 msec, perform trig functions in 250 msec. WANG LABORATORIES, Tewksbury, Mass. For copy:

CIRCLE 565 ON READER CARD

ACCOUNTING SYSTEM: Six-page brochure describes EBS/1230 electronic business system which provides complete accounts receivable and cash receipts accounting procedures with simultaneous general ledger distribution. The system prepares original business documents, updates account ledgers and develops and prints out hundreds of different totals as an automatic by-product of original entry procedures. AUTOMATED BUSINESS SYSTEMS DIV. OF LITTON INDUSTRIES, Carlstadt, N.J. For copy:

CIRCLE 566 ON READER CARD

HYBRID MICROCIRCUITS: 24-page brochure describes the use of hybrid microcircuits for lightweight and compact packaging designs. The reference guide shows how hybrid technology can achieve design functions not possible through monolithic integrated circuitry. A step-by-step explanation of hybrid manufacture is given, together with a description of the company's testing and quality assurance programs. The brochure features a hybrid design guide, which outlines layout procedures for the creation of special custom products. Also listed are the company's 16 standard off-the-shelf hybrid products with electrical specifications, logic diagrams and packaging information. FAIRCHILD SEMICONDUCTOR, Mountain View, Calif. For copy:

CIRCLE 567 ON READER CARD

PAYROLL SYSTEM: Eight-page brochure describes the "Monitor" system of computing payroll utilizing modular programming. The system is designed to accommodate any type of computer hardware. Because the system is highly modular, new payroll requirements can easily and inexpensively be added as needed. COMPUTER PLANNING CORP., Torrance, Calif. For copy:

CIRCLE 568 ON READER CARD

DATA SAFE: Eight-page brochure describes a safe that will store magnetic tapes, disc packs, sensitive cartridges, microfiche, and other edp media to protect them against fire, heat, and moisture. The maximum allowable

heat limit of 150°F is designated by the Underwriters Laboratories. A sealed inner repository "floats" within the outer safe on a bed of insulating foam so that it never touches the exterior walls. A pressure locking mechanism seals the insulated inner doors from heat and moisture. The outer wall is protected by a heavy wall of Monolite insulation, a material that leaves no space for heat to penetrate. The safe is available with a selection of locking features and comes in 40-inch counter height and 61-inch full size styles. DIEBOLD INC., Canton, Ohio. For copy:

CIRCLE 569 ON READER CARD

TELETYPEWRITER TERMINALS: One eight-page brochure describes how teletypewriter terminals provide General Electric's appliance scientists and technicians direct access to a time-sharing computer. The system makes possible immediate determination of idea and design feasibility. A second eight-page brochure tells how a network of terminals links a National Food Stores division supermarkets to a warehouse to enable next-day shipment or orders, billing, and reordering of stock; tightened inventory; and up-to-the-minute transmission of price changes. TELETYPE CORP., Skokie, Ill. For copy:

CIRCLE 570 ON READER CARD

LOGIC HANDBOOK: 416-page paperback is the fifth edition of the company's guide to its complete line of logic modules, associated hardware, and application information. The book offers an introduction to and general characteristics of the M Series, K Series and A Series positive logic modules, with descriptions of power supplies, hardware and accessories and a discussion on how to use these items. A brief description of the company's computer line is also included. DIGITAL EQUIPMENT CORP., Maynard, Mass. For copy:

CIRCLE 571 ON READER CARD

DATA ACQUISITION: Six-page brochure describes the series DG 2000 DATA GAIN automatic data acquisition terminal system that consists of a master data collection station and one or more remote terminals. Both master and remote terminals are assembled from a basic unit and selected functional circuit cards and peripheral units. The system can automatically answer the phone, report data and hang up, completely unattended. Teletype and other communications systems may also be used. Data acquired either automatically or by manual entry is transmitted over the telephone from remote stations to a master data collection terminal using standard ASCII code. A master may automatically poll each remote periodically to obtain desired data from the unattended station with one phone call, or a call may be made by a remote station when data is ready. Keypunching is avoided, and data from remote locations is immediately available for computer processing or manual evaluation. APPLIED PERIPHERAL SYSTEMS INC., Houston, Tex. For copy:

CIRCLE 572 ON READER CARD

FORTRAN PROGRAMMING: 18-page report describes techniques that can be used by FORTRAN programmers to minimize storage requirements for programs requiring large amounts of memory. PB-182 504. Cost: $3; microfiche, $.65. CLEARINGHOUSE, U.S DEPT. OF COMMERCE, Springfield, Va. 22151.

DP BIBLIOGRAPHY: Ten-page bulletin lists books, pamphlets and articles on various aspects and applications of data processing received in 1968 at the Detroit Municipal Reference Library. The items listed are of interest to personnel working in governmental data processing. MUNICIPAL REFERENCE LIBRARY, Detroit, Mich. For copy:

CIRCLE 573 ON READER CARD

SIGNALING STANDARD: This standard provides a group of specific signaling rates for synchronous serial or parallel binary data transmission. The rates exist on the received data and transmitted data circuits at the interface between data terminal equipment and data communications equipment which operate over nominal 4kHz voice bandwidth channels. Order RS-269-A. Cost: $1. ELECTRONIC INDUSTRIES ASSN., 2001 Eye St., N.W., Washington, D.C. 20006.

DISPLAY SYSTEM: Eight-page brochure describes the IDIOM interactive display system and describes how the system can facilitate real-time two-way communication between computers and individuals without special edp training. Operation of the system is explained, together with illustrated typical applications and a detailed de-

Keyboard to tape

One look will tell you this Potter keyed data recorder is designed for operator efficiency

The Potter KDR transfers source data directly from keyboard to 7 or 9 channel computer tape. It's designed to help your operator produce more. There's more desk-top space. All controls are on the keyboard unit including a straight numeric column indicator that doesn't require any code conversion. There's no need for tiresome eye scanning from keyboard to back panel.

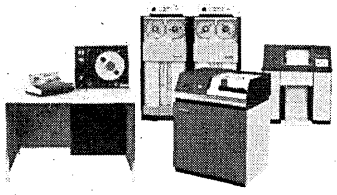
In contrast to conventional key punch equipment, the KDR permits higher keying speeds, delivers magnetic tape ready for immediate computer input, assures faster computer reading time, generates less noise, occupies less space, requires less maintenance.

KDR advantages over other data-entry devices are: faster duplication, skip and release functions... easier character error correction... memory display without data destruction... automatic advance to beginning-of-tape. Dual programs and other "extras" are standard features of every KDR.

Potter peripherals are operating in hundreds of data processing centers providing maximum reliability for minimum cost. Potter service centers staffed by highly trained, fully equipped personnel are in principal cities.

Potter Instrument Company, Inc., East Bethpage Road, Plainview, NewYork 11803 (516) 694-9000 TWX: 510- 224-6485. Call or write for details.

POTTER INSTRUMENT CO., INC.®



STRETCH YOUR EDP DOLLAR. PLUG IN A POTTER PERIPHERAL.

DIRECT READING COLUMN POSITION INDICATOR. NO DECODING NECESSARY.

KEYBOARD UNIT SLOPED FOR EASE OF READING, MINIMUM HAND FATIGUE.

EASILY MOVABLE KEYBOARD UNIT.

PLENTY OF DESK-TOP SPACE.

CIRCLE 104 ON READER CARD

new literature ...

scription of how IDIOM simplifies the job of programming the display. INFORMATION DISPLAYS, INC., Mt. Kisco, N.Y. For copy:

CIRCLE 574 ON READER CARD

TAB SET BAR CODING METHOD: A method of bar coding tab card sets is said to eliminate mismatches, incorrect sequence, and missing numbers. Absolute fidelity between Arabic and bar code numbering is assured since both are printed from a single printing bar. Another method, clear through numbering, guarantees numbering on parts of the tab card set is the same as the original. A tab card set consists of an 80-column card and up to three paper forms. The set is read by an optical code reader. Samples of the tab card sets with bar code numbering will be sent. MOORE BUSINESS FORMS, INC., Niagara Falls, N.Y. For copy:

CIRCLE 575 ON READER CARD

MODEMS: Four-page brochure describes four standard commercial and industrial data sets operating at speeds up to 4800 bps. The modems are available in a variety of data rates, configurations, and modulation techniques. Optional modules, PC cards, and strap options further expand the model lines. The data sets can be utilized on either private or dial networks. RIXON ELECTRONICS, INC., Silver Spring, Md. For copy:

CIRCLE 576 ON READER CARD

OPERATIONAL CONTROL SYSTEM: 22-page manual illustrates an automatic user-oriented production control system which combines the traditional areas of production and inventory planning and control into a total operational control system. The system can be adapted to punch card, tape or disc systems, using any computer configuration. It is an open loop system, designed to provide information for and to support the decisions of operating supervision. EMSCO ENGINEERING AND MANAGEMENT SCIENCES CORP., Woodland Hills, Calif. For copy:

CIRCLE 577 ON READER CARD

INQUIRY SYSTEM: Reference manual describes a conversational statistical system for the B5500. The system has the following features: conversational or batch mode of operation; free-format statistical language; initial offering of

15 analysis programs; input files from cards, tape, disc or remote terminal; output reports directed to terminal or printer; data may be weighted and may contain missing data codes; disc library for language definition storage; filtering and transformations may be performed prior to any analysis; additional analyses may be added by users by supplying ALGOL procedures. The B6500/B7500 version will be released next year. BURROUGHS CORP., Detroit, Mich. For copy:

CIRCLE 578 ON READER CARD

SYSTEMS SEMINARS: Brochure describes seminars to be held in various cities from Aug., 1969, through May, 1970. Course titles include "Fast Start in Systems Analysis," "Systems Theory Forum," "EDP Systems Workshop," "Systems Documentation Workshop," "Systems Leadership Laboratory," and "Internal Systems Training." SYSTEMATION, INC., Colorado Springs, Colo. For copy:

CIRCLE 579 ON READER CARD

SIGNAL AVERAGING: 13-page application note describes the LRS method, using high-resolution digital techniques, for nanosecond pulse signal averaging. The technique is used for performing analytical measurements upon repetitive waveforms whose parameters are obscured by noise. A typical signal averaging system is illustrated in block diagram form, showing how discriminator, digitizer, scaler, control unit, and processor interface modules are organized into a simple system to be read out into computer, line printer, or other readout device. Detailed technical data on the individual modules is also presented. LeCROY RESEARCH SYSTEMS CORP., West Nyack, N.Y. For copy:

CIRCLE 580 ON READER CARD

HOSPITAL SYSTEM: Eight-page brochure describes the INFORM system that provides automated processing of patient accounting, payroll, personnel, Medicare cost allocations, property ledgers, preventive maintenance scheduling, accounts payable and general ledger responsibility accounting, either as a total integrated information system, or by selectively utilizing any combination of the systems available. COMPUTER TIME SHARING CORP., Palo Alto, Calif. For copy:

CIRCLE 581 ON READER CARD

R&D INDEX: Annual index lists all reports announced in U.S. Government Research & Development Reports during 1968. Each entry gives subject field/group; a code denoting the journal containing an abstract of the report; and the price of reports available from the Clearinghouse. The six sections composing the index are: Section 1, Personal Author; Section 2, Corporate Author; Section 3, Contract Number; Section 4, Accession Number; Section 5, Subject A-M; Section 6, Subject N-Z. Order USGRDR. Cost: $3 per section. CLEARINGHOUSE, U.S. DEPT. OF COMMERCE, Springfield, Va. 22151.

PROCESS CONTROL SYSTEM: 16-page booklet describes process control systems for small, intermediate or complex processes. Applications discussed include control systems in metal processing, the paper industry and other process industries, and control of a peak load power system that solves complex generating and dispatching problems. The booklet also tells how computer systems have reduced plant start-up costs and provided better and less costly quality control through automatic testing. Systems engineering and consulting services are described. HAGAN/COMPUTER SYSTEMS DIV., WESTINGHOUSE ELECTRIC CORP., Pittsburgh, Pa. For copy:

CIRCLE 582 ON READER CARD

Amelia Auricle's Computer Dating Bureau

Miss Auricle helps a conservative chap swing with a good thing.

"Really. Some people are *awfully* stuffy. Like the positively *crusty*, grey-haired gentleman who came to me last month.

"Had his mind made up to date a 360/25. 'Very sensible,' he thought. 'Solid family. Oh my, yes.'

"Well, he was so square I almost let him go his own way, but I'd never forgive myself. So I told him, *live* a little, date a Spectra 70/35.

"'What? Me?' he blinked. Really. I'd never *seen* such a closed mind.

"I said, 'Have some tea, and listen to me. Spectra 70/35 is from one of the first families of our country, so ease your mind on that score. But, more important, you'd get out of your rut. You don't want a stodgy old 360/25. You and a Spectra could do so much more together.'

"I mean, really, two-and-a-half times as many add full words a second, three I/O channels instead of one, sixteen disc drives to a 360/25's meagre four, six-level multi-programming instead of three, and a modern DOS that's *out of sight.*

"'But,' he said pompously, 'I really don't know if I want to invest in all that.'

"I said, 'Nonsense. Processor costs are exactly the same. Look. Life is short and time is fleeting, and you really must make the most of it.'

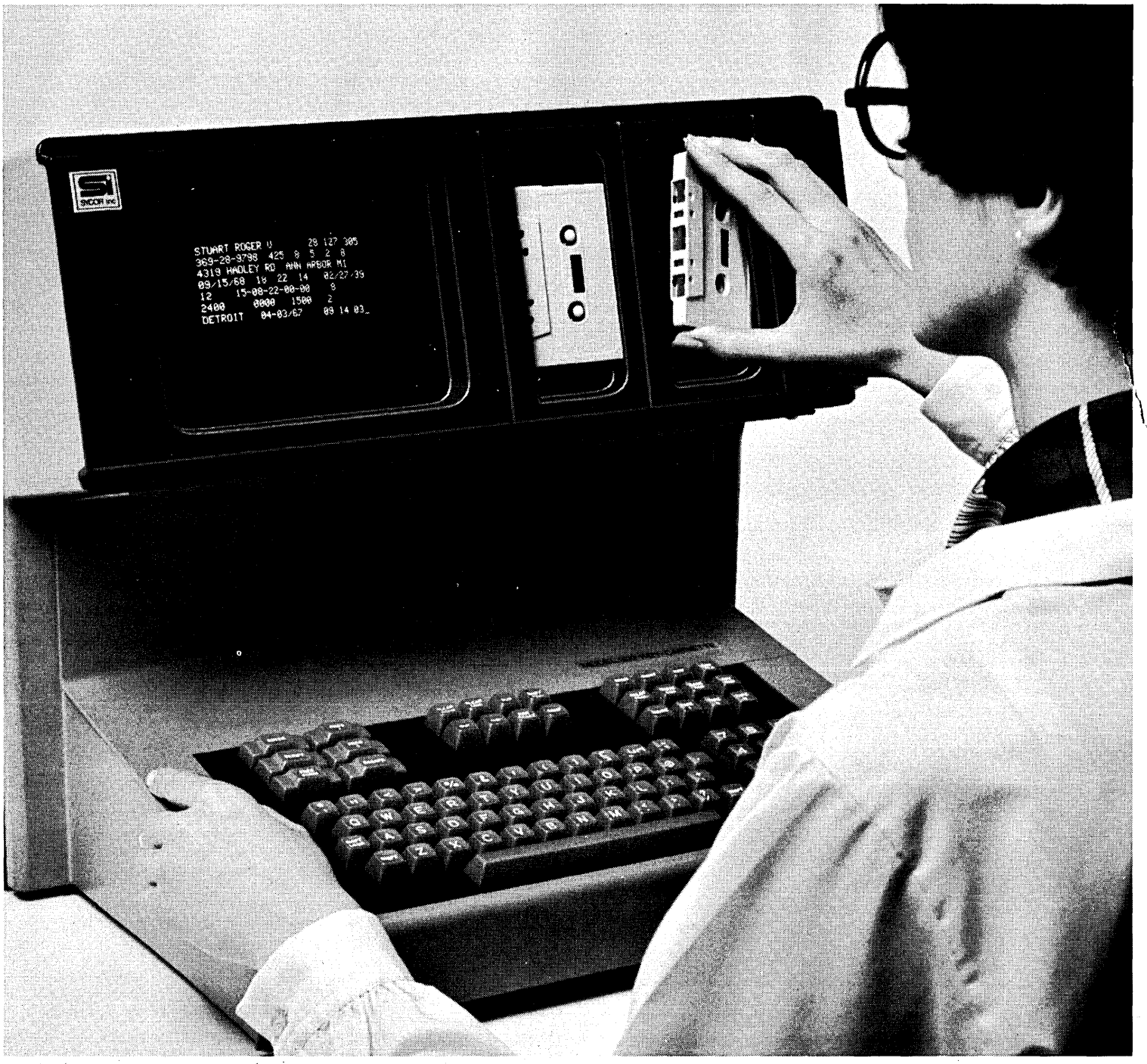
"Well, he agreed, grudgingly, to try. I crossed my fingers and hoped he was up to it.

"And do you know, I saw him yesterday. He's slimmed down to fighting weight, and he's positively dashing. The old rogue."

For a date with a 70/35, or more facts, write RCA Information Systems, Cherry Hill, N. J. 08034. Or call 609-424-2385. Maybe Amelia herself will answer.

RCA
Information Systems

CIRCLE 108 ON READER CARD



The medium is the message

. . . and that medium is the magnetic tape cassette. It is here to stay as the logical successor to paper tape and punched cards for intermediate storage in source data recording. With the inherent advantages of magnetic tape for file storage, plus the further advantages of its compact size, the cassette promises to become the new standard for intra- and inter-organization information exchange.

Making good use of this new medium, our design team came up with the Key-Cassette™ System to record, display, verify, search and edit business data at its source. Now its availability has given management some rethinking to do. Get the message?

SYCOR inc

(look for us at DPMA, booth 614-16-18)

117 NORTH FIRST STREET, ANN ARBOR, MICHIGAN

CIRCLE 109 ON READER CARD

These men believe in the importance of excellent higher education.

They know it can't be maintained without increasing business support.

Many large corporations and small businesses are contributing generously to colleges and universities. The men who head these businesses are urging others to join them—with larger investments—or by starting a company aid-to-education program.

Business needs college talent in increasing quantity. But rocketing costs are causing a financial crisis for colleges and universities that could impede educational progress.

If your business has not recently evaluated the self-interest importance of investing in higher education, it should do so now.

Tuition, on the average, covers but ⅓ the cost of a college education. More help from more businesses is needed to contribute importantly to the other ⅔.

Give to the college of your choice.

Special to management—a new booklet of particular interest if your company has not yet established an aid-to-education program. Write for: "How to Aid Education," Box 36, Times Square Station, New York, N. Y. 10036.

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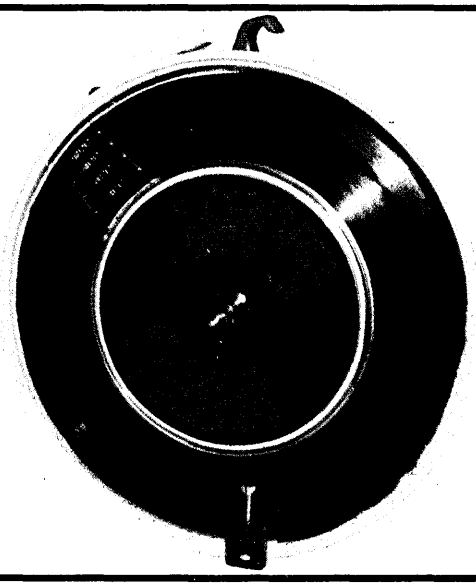
And THIS is DATA LOCK

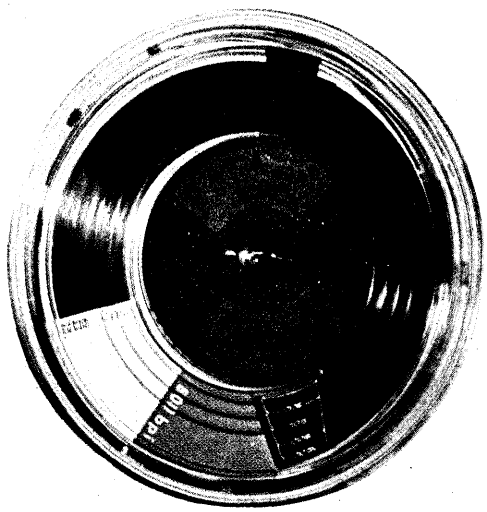
When all else has been said and done

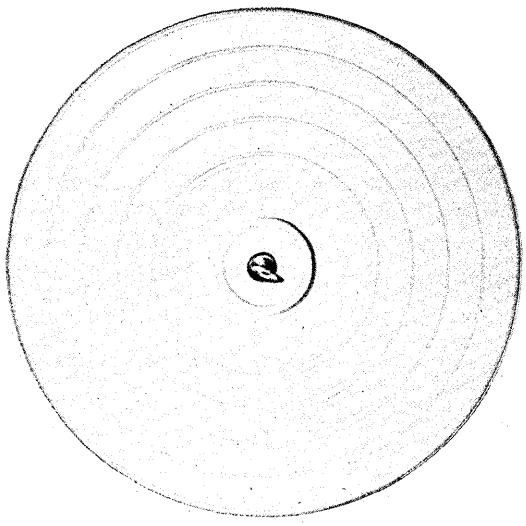


After our three month scenic (ad) tour, we believe it's time for product identification. Not only product identification but presentation of a **DATA LOCK** design that's been greatly improved during the tour. Six chambers instead of the original four. Also six tumblers instead of the original five. More than 46,000 chamber-tumbler combinations; 200,000 on a five-region (international) basis with distribution of keys computer-controlled to assure you of the individuality of your lock. Color co-ordinated in yellow, green, blue, and red for fast visual identification.

The applications of **DATA LOCK** are many: Payroll, customer files, profit and loss, general ledger, master files, and so on. Its rationale is explicit: designed to keep your files honest when you're not there to watch them—Also, to protect them from inadvertent use as scratch tapes by inexperienced or night personnel.

The operation of the **DATA LOCK** is as simple as its internal design is intricate. The **DATA LOCK** for wrap-arounds consists of two parts; an upper and a lower which are joined together over the tape's mounting hub. A key is then inserted, driving a lock from the upper portion into a recess in the lower. The reel is





then secured. **DATA LOCK CANISTERS** (1200′ and 2400′) and **DATA LOCK DISK PACK BASES** are shipped ready for use. Simply insert and turn the key; then remove from the lock. One **important** note: **THERE IS ABSOLUTELY NO STORAGE OR RACK SPACE SACRIFICED BY THE USE OF DATA LOCKS ON ANY REELS.** For more information; circle reader card, call or write.

DATA LOCK DIVISION

DYNANAMICS, INC.

2745 Bernice Rd., Lansing, Ill. 60438
(312) 474-5100)

"Insert **security** into your vital files."

books

***Information Retrieval Systems: Characteristics, Testing, and Evaluation*, by F. W. Lancaster, Foreword by Sol Herner. John Wiley & Sons, Inc., New York. 1968, 222 pages, $9.**

Testing and evaluation are a responsibility of any management producing a product for consumers. For many years, traditional information retrieval systems (libraries) carried on without much thought as to whether or not they were delivering a quality product in an efficient manner. In recent years, with the advent of specialized information centers, increasing costs, and a proliferation of publications, considerable concern has arisen on the part of information system managers as to whether or not their operation was efficient and produced high-quality service.

Primarily written for students of librarianship and information science, this book provides brief but clear treatments of the historical background, the conceptual mathematical bases, and examples of the application of most viable, and widely applicable, procedural features of information retrieval systems. The descriptive emphasis in approximately half the book is on human-performed indexing and searching of information files. The last half is devoted to system evaluation using methods and concepts from the series of experiments at Cranfield (England) and the MEDLARS evaluation projects at the National Library of Medicine with which Lancaster has been associated.

Lancaster usefully distinguishes between the operational and economic efficiency of a system. The former centers around search accuracy considerations and is not taken up with cost. The latter considers search accuracy as well as other benefit and effectiveness criteria together with cost data in the light of trade-off analysis.

In his foreword, Sol Herner characterizes the book as being free from unexplained and unnecessary jargon. Unfortunately, there seems to be some tendency to use jargon in instances where it is not always necessary. Even though it is adequately explained in most instances, this can still be irritating to students. Herner points out what are, essentially, the primary failings in the book. These are: there is too much emphasis, perhaps, on human processes with a corresponding denigration of the possibilities of technology; too great a tendency to hold an excessively positive or negative attitude in regard to certain processes; and, perhaps most important, too great an emphasis on retrospective searches for "all records on subject X," which, as any reference librarian knows, rarely occur, in real life, when one is dealing with knowledgeable adults.

In the first chapter the various activities included in "information retrieval" are identified and defined. Two lengthy chapters follow covering subject indexing theory and practice in a very thorough, accurate fashion. The discussion includes the historical development of indexing from Melville Dewey to the present. Lancaster writes well, and these chapters alone make the book worth reading. Next come a series of rather short chapters on search files, selective dissemination, performance criteria (for IR systems), and factors which affect the performance of any IR system. These chapters are all too short to cover their respective topics, but what there is of them is good.

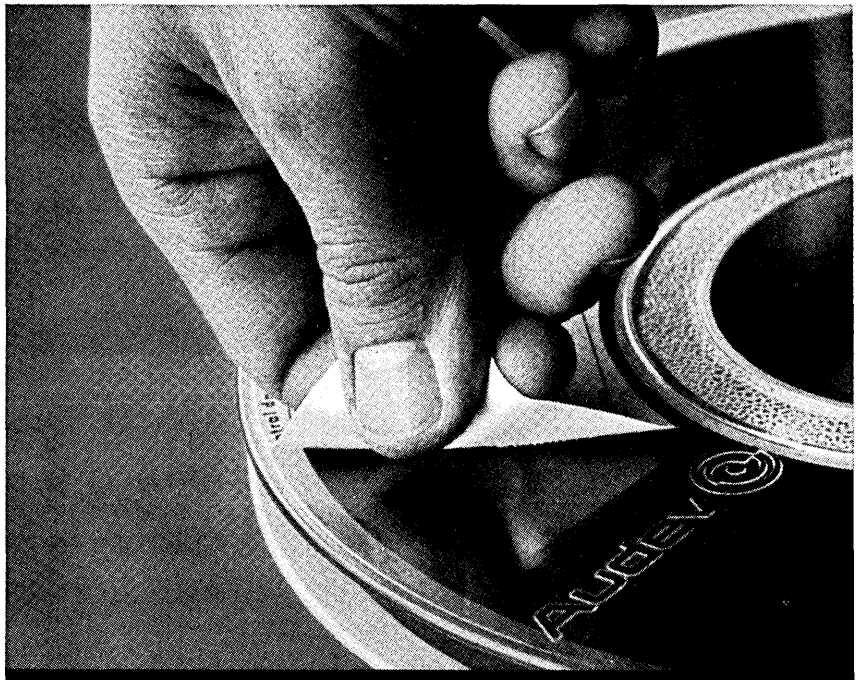
Chapter 8, on index languages, corresponds to chapters 2 and 3 in terms of length and importance. Too many people in IR work overlook the importance of indexing languages. This chapter should be required reading for all workers in the field.

Chapter 9 discusses the not inconsiderable work that has been accomplished in the past 20 odd years in developing completely mechanized systems that do not demand human agents to assign subject terms. It also contains the best bibliography in the book, albeit slightly out of date.

The remainder of the book (seven chapters) discusses many aspects of testing and evaluating IR systems, which has been the major interest of Lancaster for some years. The discussion is thorough and well written, but still there are areas of more recent activity that are not covered, nor does Lancaster admit that not all workers in the field accept completely his evaluation criteria. Still, this is one of the best discussions of evaluation that is currently available.

There are a few quibbles which one might levy against the book, some, I would judge, the fault of the publisher. For example, on page 106, Reichenbach's book "Elements of Symbolic Logic" is cited and the date 1947 is mentioned in the text. The citation itself, appearing at the end of the chapter, gives the publication date as 1946. The correct date is 1947. In stumbling on mistakes of this sort, one always wonders how many more there are that have not been uncovered. Other petty failings are: the table of contents

The lethal label.



With proper handling, computer tapes can be "scratched" and reused almost indefinitely. However, careless removal of previous labels can crush reel flanges against tape edge, and kill a good tape.

Moral: Hold flanges away from tape when removing labels.

Antidote for tape problems: Audev. Whether you use our series 61 or premium K-68, you're in good company. These are the tapes used by the top U.S. companies.

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does not give the chapter numbers, but in the foreword the chapters are discussed in terms of numbers only. Citations to the literature are, for the most part, all of pre-1966 vintage, except for a few of Lancaster's own papers or papers that discuss MEDLARS. No citations at all are given to some of the papers that have attacked the Cranfield experiment in one way or another. It would seem only fair, in a book of this sort, to point out that there have been criticisms of the methods developed at Cranfield for evaluation of retrieval. There are no literature references at all in seven of the chapters, while many other chapters have only one citation or only a few. Chapter V, "The Current Awareness Function," has only one reference to a paper on selective dissemination of information, and that is the original article by H. P. Luhn, published in 1949. Moreover, the chapter is only 4½ pages long, which scarcely seems adequate to discuss this very important topic of current awareness, which will probably become even more important as time goes on.

There are a few misleading elements in the discussion of some topics. For example, on page 8, in discussing the alphabetical subject catalog, Lancaster says: "The classified approach is provided for by building into the authority list and the search file a hierarchy achieved by means of cross-references. For example, under the generic term 'welding,' one may find an instruction to *see also* terms for various species of welding, such as 'arc welding,' 'butt welding,' etc., . . . The searcher interested in every type of welding is thus provided with an overview of all the headings he must consult in order to carry out a comprehensive search for documents in the subject field." It is immediately apparent, of course, that this is a unidirectional hierarchy downward from "welding" to subordinate terms, but not upward to superordinate terms. Since the alphabetical subject catalog lacks the superordinate feature, it cannot be said that there is truly a hierarchy provided by the cross-references.

In several places, in discussing the subject of recall, the statement is made that recall figures by themselves are meaningless. On page 123, for example, it is stated that "The only perfect recall ratio is one obtained on the basis of the requestor examining and assessing the entire document collection." If the retrieval method is by author rather than subject, it is quite possible to have perfect recall without examining the entire document collection. Lancaster persistently fails to remind the reader that he is talking only about subject indexing and not some other form of indexing.

It would be extremely useful to have had a complete list of citations at the end of the book. As it is, with citations spread throughout the book, it is difficult to go back and find a particular citation once you have left the particular chapter in which it appeared.

The index itself leaves a few things to be desired. It is only 3½ pages out of a total page count of 222, and it is obviously inconsistent. For example, under the entry term "Cost" there is only one entry "Cost for Retrieved Citation;" however, on page 114, the cost of automatic indexing is discussed in terms of cost per document indexed. This would seem to be just as relevant an entry as cost for retrieved citation. Under "Unit Costs" there is a considerable discussion of the cost of a retrospective search. Why these various considerations of cost are not all entered under the term "Cost" is certainly not clear. For $9 the publishers could have done somewhat better by us all. It is especially regrettable, in a series of books on information sciences, that the publisher does not see fit to spend a little more money on the index.

In sum, this is an interesting and worthwhile book. It is unfortunate that much of the material is old and that the references do not include more recent materials. For example, there is no mention of the very extensive articles on evaluation of information systems and services which have appeared in the *Annual Review of Information Sciences and Technology* each year since its inception in 1966 (covering the year 1965). But Lancaster's book is worthy of study by anyone seriously interested in information storage and retrieval systems either as a user or as a producer.

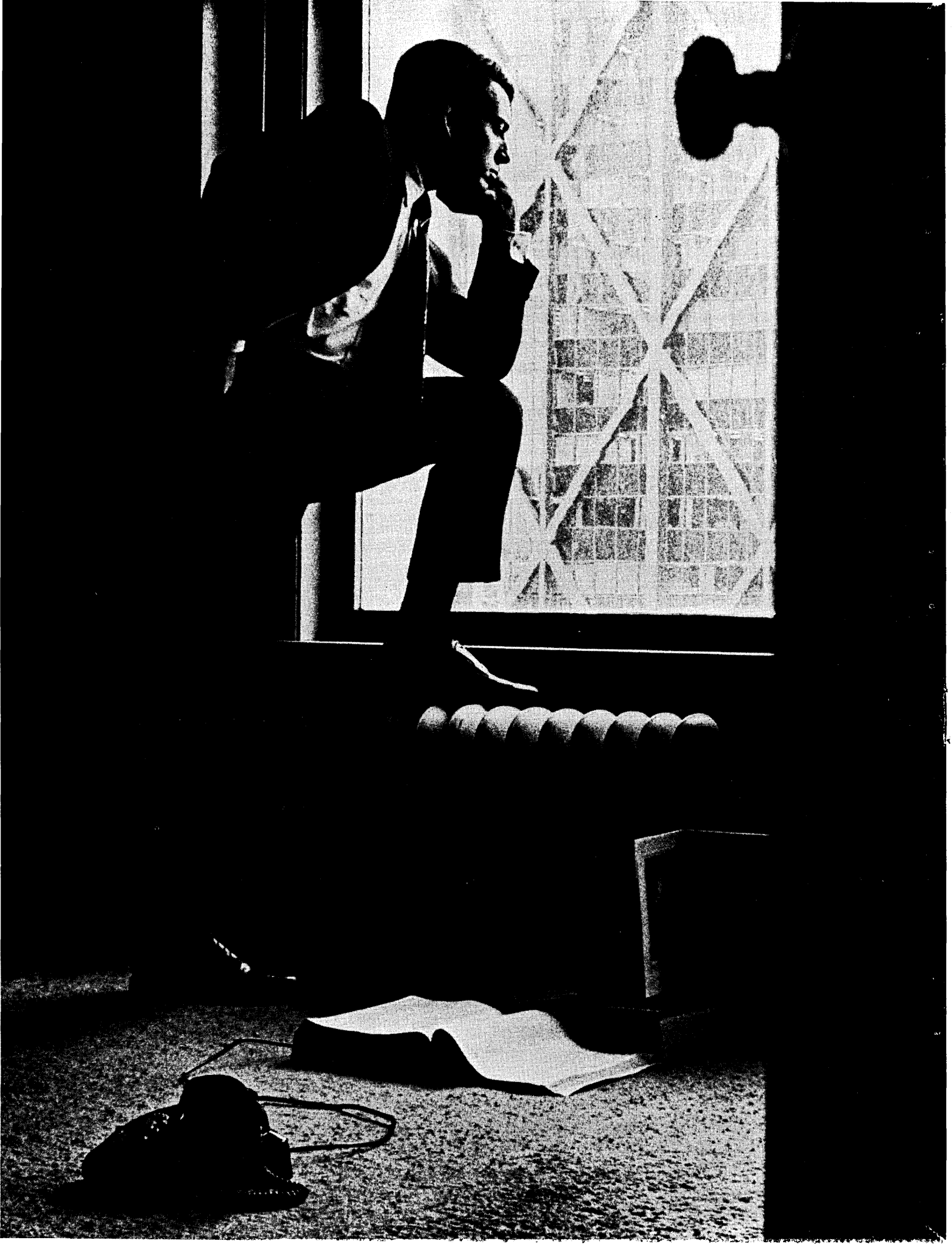
—DONALD V. BLACK

book briefs

(For further information on the books listed here, please write directly to the publisher mentioned.)

Computer Sorting, by Ivan Flores. Prentice Hall Inc., Englewood Cliffs, N.J. 1969. 237 pp. $12.95.

The book is said to be the first to adequately cover the subject of sorting with its applications to commercial problems, compiler and assembler design, scientific problems, operating systems, and list processing. Detailed attention is given to all popular sorting



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DIGITAL COMPUTERS

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22914

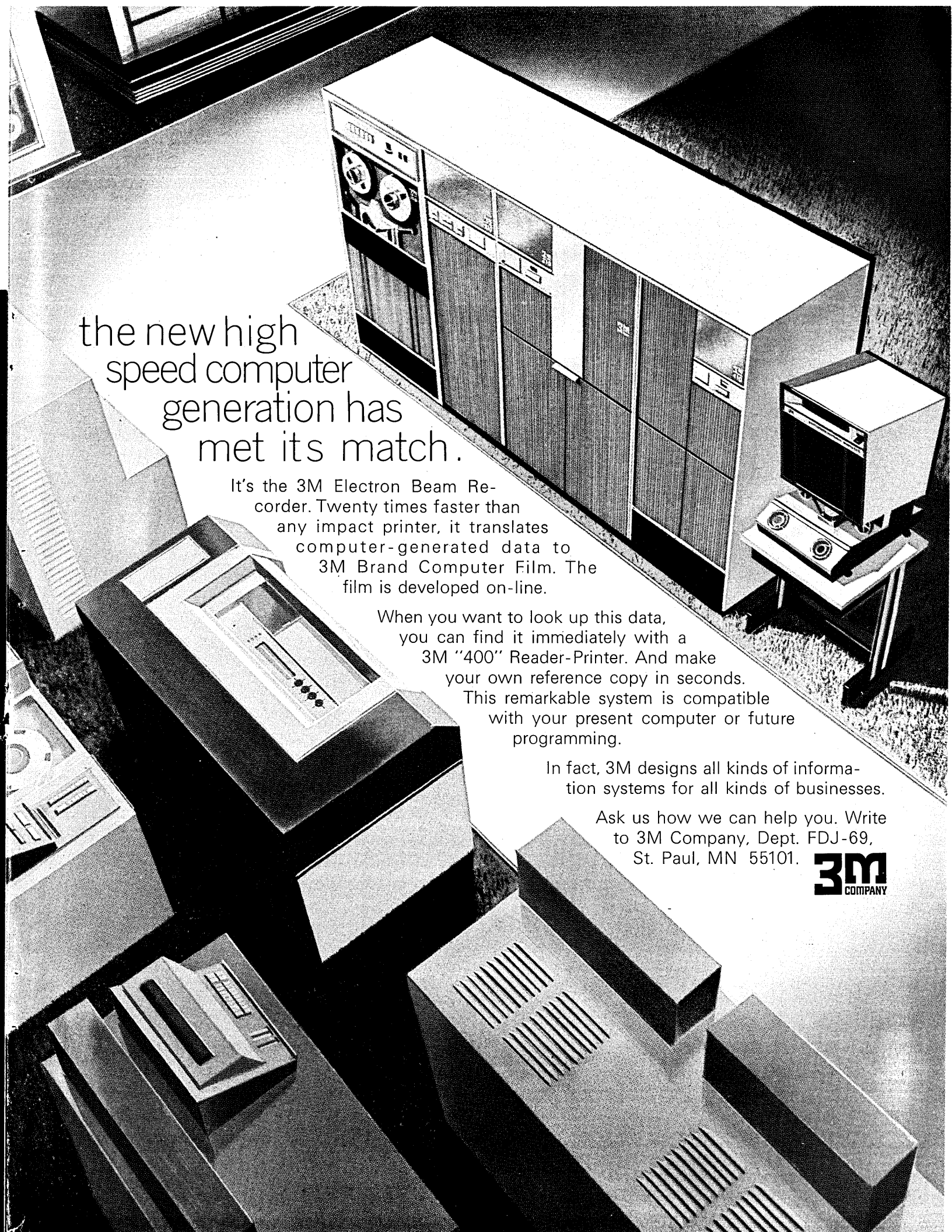
techniques, including those confined to internal memory, those using magnetic tapes, and those with disc or drum auxiliary memories. Prerequisites include a basic knowledge of programming and some facility with symbol manipulation, although specific mathematical knowledge is not required.

***Sources of Federal Support for Higher Education: Experimental Systems for a National Information Network*, by Rowan A. Wakefield, Walter F. Dunne, and Frederick Kirch. The Research Foundation of State Univ. of New York, Communication Service Corp., 1333 Connecticut Ave., N.W., Washington, D.C. 1968. 121 pp. $5.50; paperback, $3.50.**

This book contains the final report on a study for the State Univ. of New York's Research Foundation. It establishes that information on a wide range of federal activities, including programs of grants, contracts, and other forms of financial assistance to universities, will be stored and retrieved in machine-readable form in federal computer systems and that paralleling the growth of these federal management information systems will be the development of university networks ultimately evolving into a national educational network. Therefore, much of the information on federal programs needed by colleges will eventually be put directly into university information networks either in the form of magnetic tapes purchased or leased from the government or by linking information systems directly together. The report concludes with the design of three experimental pilot projects that will lay the groundwork for the day when information transmission between Washington and the universities will be automatic as part of a larger national and international network of knowledge.

***Introduction to PL/I Programming*, by R. Clay Sprowls. Harper & Row, 49 E. 33rd St., New York, N.Y. 1969. 179 pp. $4.95, paperback.**

This book presents a subset of PL/I that will illustrate its use in programming commercial, scientific, textual, and symbolic applications. Presentation is geared to those with no prior programming experience and those familiar with other languages. PL/I was selected not only to teach coding and programming techniques, but also to illustrate fundamental ideas such as data representation, data structure, program structure, parametrization of procedures, and recursion. ■


the new high speed computer generation has met its match.
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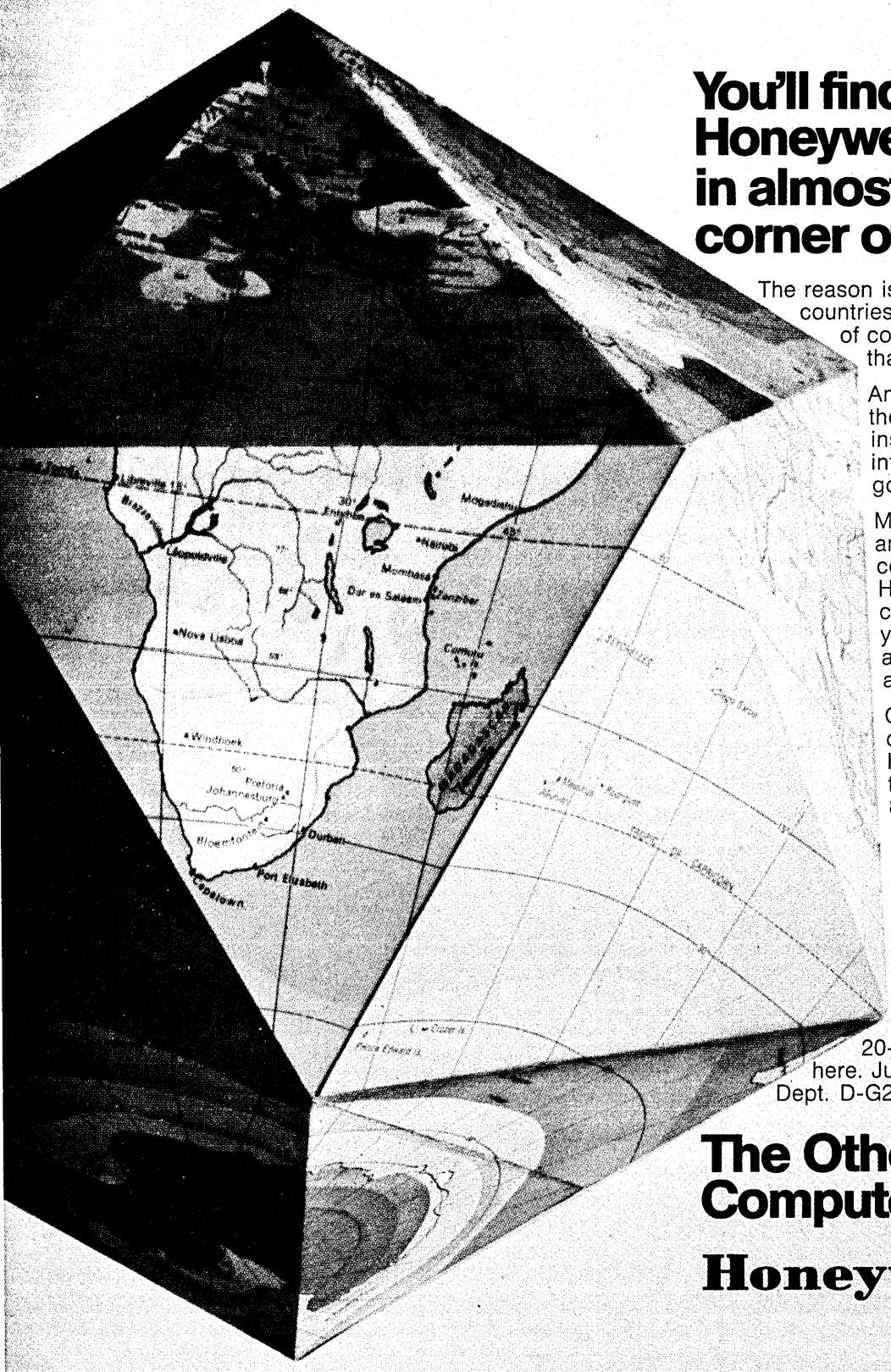

You'll find Honeywell computers in almost every corner of the globe.

The reason is that 39 branches in 11 different countries overseas specialize in sale and service of computers to provide the same backup that you'd expect in the United States.

And if you're the man who makes the decisions about computer installations in your company's international facilities, that's good to know.

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world report

DE GAULLE'S DEPARTURE TRIGGERS COOPERATION

De Gaulle's political corpse was scarcely cold before proponents of Anglo-French cooperation in computer development were wooing each other. In so doing, they revived the three-year-old scheme for a jointly designed and built superscale machine in the government-funded areas of long-range weather forecasting, nuclear research, economic modeling and strategic work. Estimates of a $300 million market for these areas alone is said to be conservative.

Revival of the big machine project came from a computer working party of the European Economic Community. The chairman is M. J. Allegre, who is also current head of France's Plan Calcul, the five-year plan to build up the indigenous French industry. The Plan is already riding out some stormy weather that has brought management changes to the CII (the central manufacturing group of a regrouped industry) following slippage on delivery dates of the product line. Since the first idea to move to a jointly designed and constructed big system, the European industry has been through its merger throes, which bring some name changes to the potential partnership list.

Important among these is the giant Philips concern, which is just launching its 360-compatible series onto the market. Germany's Siemens and Britain's ICL are old participants in the idea. Telefunken has joined in talks from Germany, together with Olivetti from Italy. Since selling out its share of the joint company once owned with GE, the Italian concern has concentrated on building itself into the biggest maker of peripherals in Europe, with emphasis on keyboard and display data-communication terminals. Because of the number of firms involved, it seems unlikely that the idea could come to fruition before 1980. And so far nobody has worked out how to divide the cake on a who-does-what basis.

LEASCO DEAL WITH METRA MIGHT BE MISDEAL

The willingness to cooperate atmosphere is at variance with an atmosphere charged with tension over recent months. One of the sufferers has been Leasco. Almost on the eve of De Gaulle's referendum, Leasco decided to pull out of a deal with Metra International, the big Paris-based consultancy and software house. On Feb. 1, they signed an agreement in which Leasco took a 20% stake in the French parent company. The arrangement needed ratification by the government to go ahead. Ten weeks after drawing up the agreement there was no sign that this approval was forthcoming. Sources close to the planners at Plan Calcul maintain that Leasco and Metra would not get the go-ahead unless there was a clause in the document to restrict the American corporation's holding to one-fifth.

Apart from being Europe's biggest consultancy and software shop, Metra has an important role to play in the development of the Plan. It also has

(Continued on page 223)


"I knew someday there'd be a computer firm that could handle everything, but Computer Response Corporation was formed at least two years ahead of my most optimistic projection.
"I produce specific, proprietary software—mostly for technical and scientific clients. Started my own company about five years ago. There's eleven people on my staff right now, and we're about to add one more. Until CRC came along, placing our work was a real problem, because there was no single company that could handle everything we do. We were forced to be content with a sort of hit-or-miss patchwork—one company for one thing, another for another.
IT'S ABOUT TIME!
"No more of that, now that CRC is on the scene. Their Univac 1108 configuration is just about as complete as it gets—it'll do everything my clients require, faster and more economically than they've ever had it. And, your in-house terminal can be a TTY 33, TTY 35, Univac 9000 series, Univac 1004, DCT 2000, IBM 1130—in fact, almost anything from a memo pad to another Univac 1108. Computer Response Corporation is a 'spoiler,' and speed isn't the only way they do it, either.
"CRC's management is totally committed to a policy of customer service that goes beyond anything I've ever seen. Their reps all have substantial experience in EDP—and they get constant additional training. There isn't one of them that wastes a client's time no matter how often he calls. These are shirt-sleeves, hard-working, deeply involved guys.
"I've been hoping a computer outfit like CRC would come along. It's about time!"
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important government business in economic planning and strategic areas. In backing out of the deal, Leasco claimed that the development of the joint company would have involved projects in which government cooperation would have been necessary. On the going form, this did not look promising for the future. However, Metra has need of a cash injection to boost the consultancy systems side, which has been profit-flagging of late. Talks are in hand with other groups prepared to cooperate. Interestingly, listed among them is the giant Dutch Philips again. Recruitment campaigns by Philips have left no doubt about the firm's need to develop its software skills.

UNIVAC TO ESTABLISH R&D CENTRE IN LONDON

Univac has been quietly marching through the big real-time and MIS market in Europe. With its eyes on ready 1106 and 1108 business, the firm has opted to plough $7 to $12 million into an R&D Centre based in London. With bank and discount rate changes, some big institutional customers allegedly paid off installations early to put Univac UK into a healthy profit for the year, a fact that lent impetus to formation of a European system R&D support group that has been on the drawing board for some time.

PRC BUYS A PIECE OF LOGICA, BRITISH SOFTWARE PIE

In the latest Anglo-American hookup a new boy, Logica, has made an arrangement with Planning Research Corp. which gives PRC a 40% foothold. Logica was formally brought to life by two ex-Scientific Control Systems, Ltd., men, Philip Hughes and Len Taylor. With OR and modeling backgrounds, these two have pitched for the burgeoning demand of software men to design and implement data base systems for the medium-sized commercial and industrial houses.

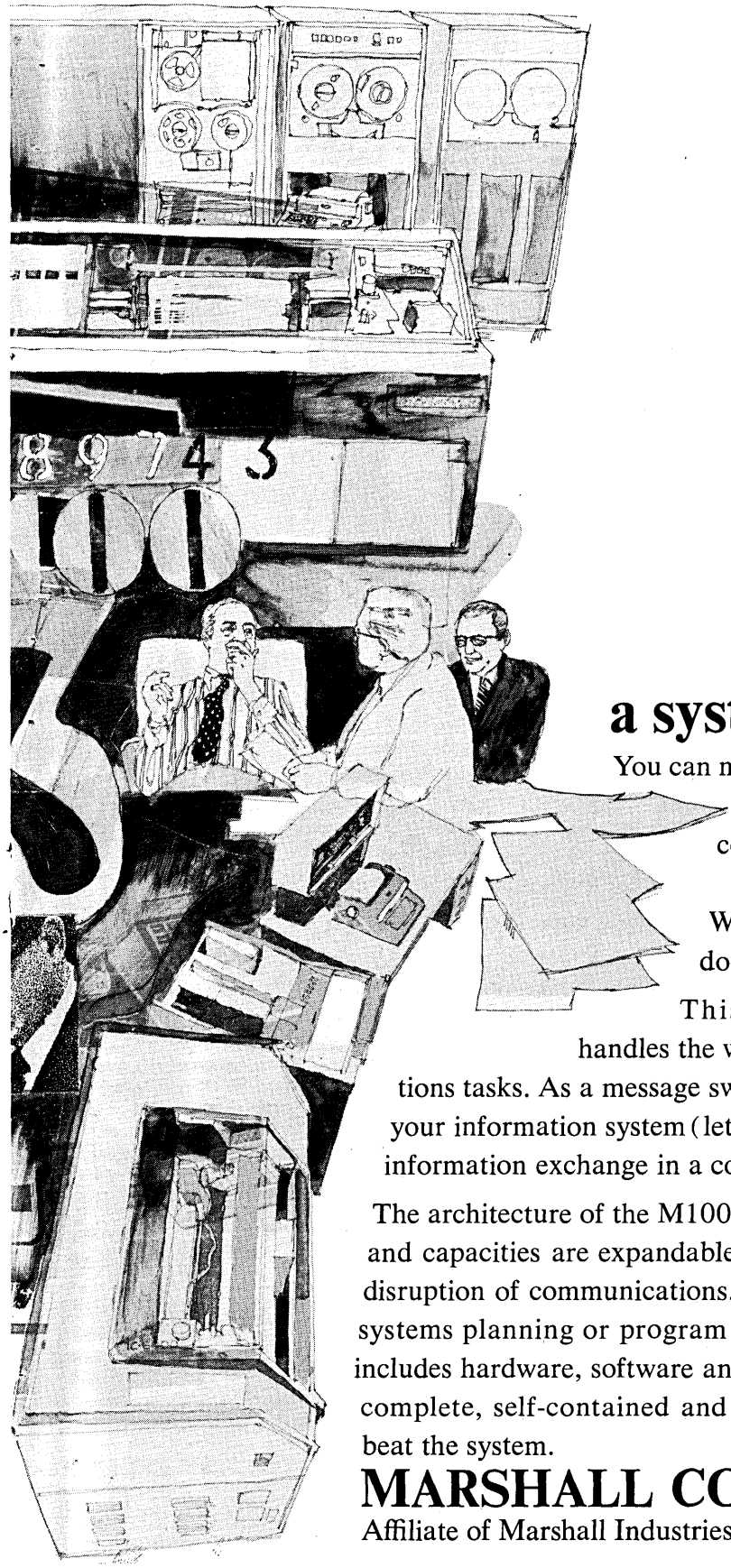
BITS AND PIECES

At a time when IBM reviews all its new territorial advances against the interpretation that may be put on such developments by antitrust inquirers, one of the French labs let a cat out of the bag in talking about a new electronic telephone exchange concept for both speech and data. After demonstrating the hardware to a selected few, story has it that communications wires between NY and the Continent were hot. From the same lab comes a new ruggedised disc store devised for an unsuccessful French Navy contract, but to be turned to advantage for the process control business...The Shell Company of Australia, Ltd., has leased nearly A$2 million worth of IBM equipment from Data Systems Management Corp., Ltd., which is owned by Bankers Trust, of N.Y., and Leasco. Managing director J. B. Dier stated that D.S.M.C. is the only computer leasing company in Australia...IBM Australia, Ltd., will set up a non-profit institute in Canberra next year equipped with a 360/67 to provide facilities for R&D at no charge in advanced dp projects by the government, industry, medicine and education.

The on-line dilemma:

The M1000 Systems: on-line or on order for Credit Data Corporation, Delta Air Lines,

resolved.



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key-to-disc

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accepts the output from 60 or more key stations simultaneously

Time-shared input cuts data preparation costs 50%.

Now you can cut your computer input costs in half. This new innovation in data preparation techniques gives you two money-saving advantages over conventional keypunch or one-keyboard/one-magnetic-tape-per-operator systems: (1) the LC-720 employs a computer time-shared input; (2) it is the only system available that provides data output directly on IBM/360-compatible magnetic disc.

By time-sharing the data from 60 or more keyboard operators simultaneously, significant savings in data station costs of as much as 50% can be achieved. Costs drop to as low as $4300 per data station for a typical 60 station system. For large data preparation installations, the time-shared input is the only economical way to go.

Data entered into the LC-720 is processed by a small digital computer and stored on an IBM/360-compatible magnetic disc that provides the advantages of bulk storage and high speed random access of data. The problems associated with punched card handling or the mounting, pooling, merging and unmounting of magnetic tape reels are eliminated. All data is conveniently and economically stored in an IBM 1316 disc pack for direct high speed input to your modern data processing system. Naturally, an IBM/360-compatible magnetic tape is also provided with the system as standard equipment.

The LC-720 KeyDisc System also offers for the first time, data verification requiring one input pass only through the system, in addition to the normal technique of verification requiring two different operators. Record size is infinitely variable by each operator from 1 to 120 characters long and the system stores a large library of 30 or more different format control programs, all available simultaneously to any and all operators.

LC-720 KeyDisc System

Bring your own data for a demonstration

Logic Corporation invites you to see an operating demonstration of the LC-720 KeyDisc System at the company's premises. Bring your own original data and Logic will provide a reel of magnetic tape of the output of your data from the LC-720 for later printout at your own computer facility.

To arrange for a demonstration, contact Gary Tischler, Director of Marketing (201) 334-3713

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washington report

PRODUCT EXPORT CONTROLS: RELAX AND ENJOY

Representatives of IBM, CDC, Hewlett-Packard, ITT, and EIA strongly supported Bill S-1940 to relax U.S. export controls in testimony before the Senate banking committee last month. Drafted by Sen. Ed Muskie, the bill would allow U.S. firms to sell communist nations any products not on a restricted list, which would be limited primarily to those having significant military applicability. Now, virtually any U.S. products must be licensed for shipment to the communist bloc.

CDC's witness, Hugh Donaghue, illustrated the delay and difficulty in getting a license when he reported that last year CDC had a chance to manufacture 3300's in Rumania under a plan that would have generated "several million dollars" in business, but the Commerce Dept. sat on the application so long the Rumanians lost interest and wound up with Plan Calcul.

One argument for relaxing export controls is that eastern Europe is already getting computers from other countries. Great Britain, said Donaghue, has sold 87 to the eastern bloc, two of which went to mainland China, with two more, an ICL 1903 and 1905, on order. Israel's Golem II computer, with capacity equivalent to the CDC 7600, will be available next year, he said.

Witnesses emphasized that relaxing controls on export to Europe could noticeably improve our balance of payments. CDC's sales were $1.3 million to eastern Europe last year, Donaghue said. Thomas Christiansen of Hewlett-Packard reported his firm's sales to the communist bloc totalled "less than $700K in '68," should be about $1 million this year, and -- if the Muskie bill passes -- could increase three to fourfold within the following two to three years.

CONGRESS, PRIVACY AND HERE COMES MR. JORDAN

Congressmen who blame credit bureaus for not keeping their records confidential are putting the cart before the horse, according to Harry Jordan, head of Credit Data Corp., who testified last month before a Senate banking subcommittee. He said that the federal government permits noncredit-granting government agencies to obtain credit data from credit files, and asked the subcommittee to justify its criticism of the industry for supplying such information. He indicated that the government is among the chief privacy violators, and stated that he would like to see Congress enact legislation that would prohibit noncredit-granting governmental agencies from access to credit files unless national security is involved.

The subcommittee is considering S-823, a bill that would impose several restraints on the kinds of information that can be collected by credit firms, limit use of the data, and require a firm to explain credit refusal to an applicant.

Jordan also thought S-823's provisions concerning disclosure of unfavorable credit evaluations ought to be changed. As now written, the bill requires a credit-granting agency to inform a borrower whenever it obtains adverse data about him; if the credit is subsequently denied or cancelled, the agency must explain why. Jordan argued that the latter notification, alone, is adequate.

Jordan reported that this month, with conversion of Credit Data's Detroit files, the company's data base will be completely computerized.

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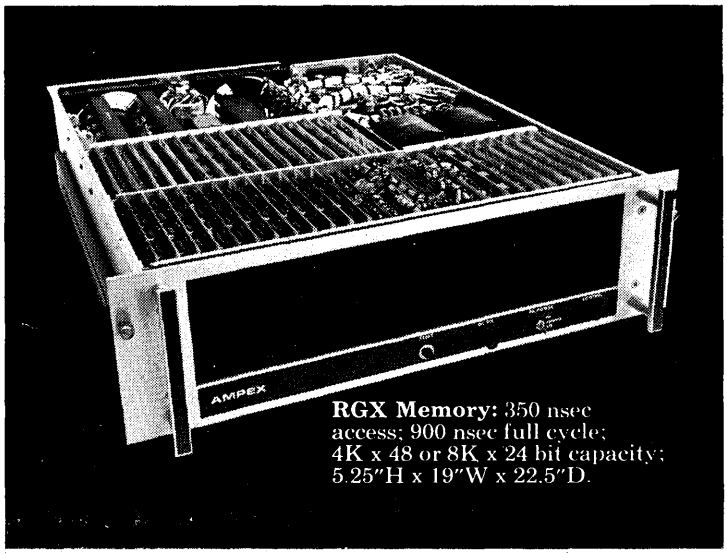
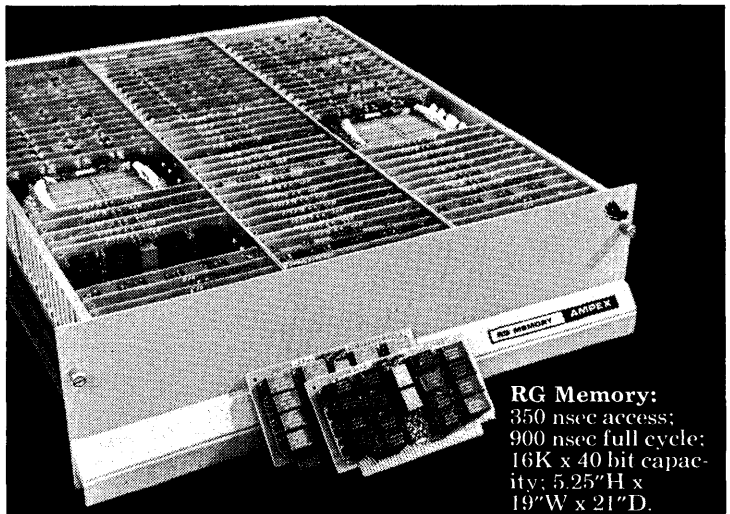
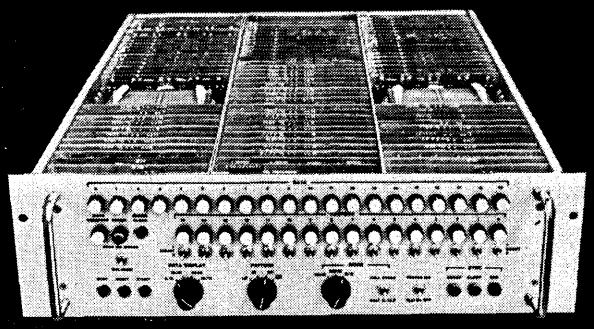


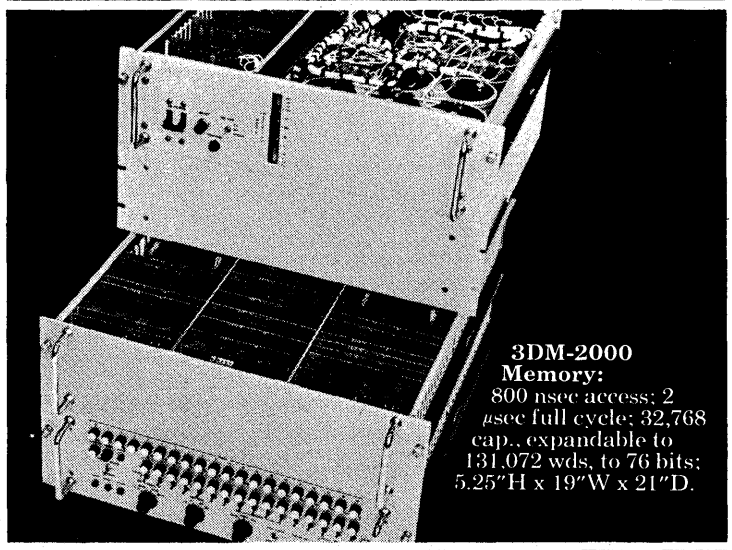
RGX Memory: 350 nsec access; 900 nsec full cycle; 4K x 48 or 8K x 24 bit capacity; 5.25″H x 19″W x 22.5″D.



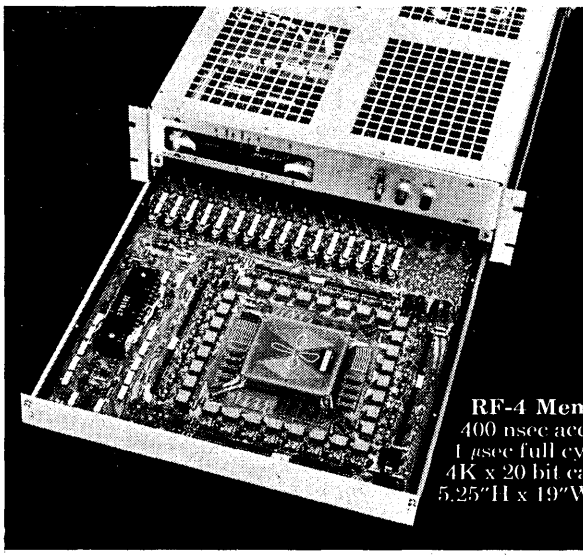
RG Memory: 350 nsec access; 900 nsec full cycle; 16K x 40 bit capacity; 5.25″H x 19″W x 21″D.

3DM-650 Memory: 275 nsec; 650 nsec full cycle; 16K x 40 bit capacity; 5.25″H x 19″W x 21″D.

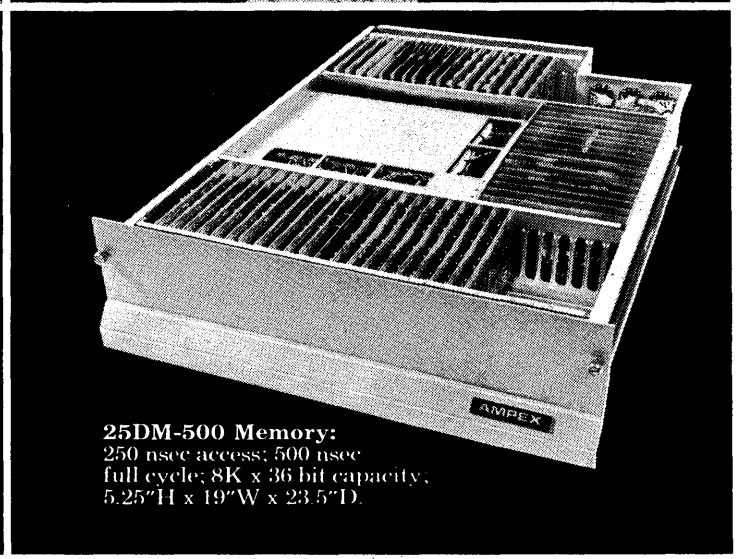




3DM-2000 Memory: 800 nsec access; 2 μsec full cycle; 32,768 cap., expandable to 131,072 wds, to 76 bits; 5.25″H x 19″W x 21″D.



RF-4 Memory: 400 nsec access; 1 μsec full cycle; 4K x 20 bit capacity; 5.25″H x 19″W x 21″D.



25DM-500 Memory: 250 nsec access; 500 nsec full cycle; 8K x 36 bit capacity; 5.25″H x 19″W x 23.5″D.

matchables

Unmatchable Performance and Versatility—Ampex offers off-the-shelf memories with the widest range of cents-per-bit-per-nanosecond choices. From character buffer through central memory to extended core memory, there is an Ampex standard product to satisfy your needs.

Unmatchable Reliability—Ampex memory systems are subjected to a consistently high level of quality control from raw core materials through final systems checkout. Core compositions, stack design parameters, and systems worst-case circuit design characteristics are all arrived at through computer-aided analysis. Ampex memories are manufactured in accordance with quality standards based on years of experience with thousands of memories. This complete capability has enabled Ampex to utilize the more reliable 3D memory organization in a 650-nanosecond memory.

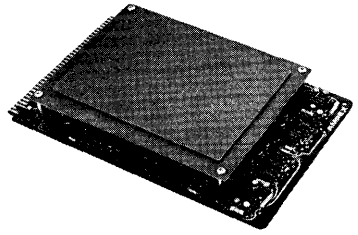
Unmatchable Packaging—Ampex memory packaging represents the optimum combination of bit density and maintainability. Five-million-bit Ampex memories fit in as little as 27 inches of standard 19-inch rack space with every printed circuit card module instantly available.

Unmatchable Experience—Since 1954 Ampex has delivered thousands of memories, incorporating a complete range of cycle times and capacities, to an ever-growing list of clients.

For full details about Ampex memories, stacks, arrays and cores circle the reader card number. Or write: Ampex Corporation, Computer Products Division, 9937 W. Jefferson Blvd., Culver City, Ca. 90230.

AMPEX

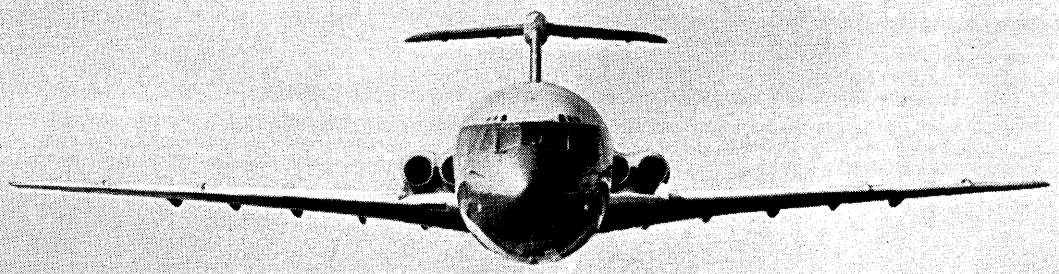
NEW CONCEPT IN LOW-COST CHARACTER BUFFER MEMORIES!



The Ampex 3DM-3000 – a 1.5 μsec buffer cycle time, 3.0 μsec full cycle time memory with unprecedented capacity for its size and cost.

CIRCLE 118 ON READER CARD

It takes a fast printer to keep up with BOAC's 100 million dollar computer system.

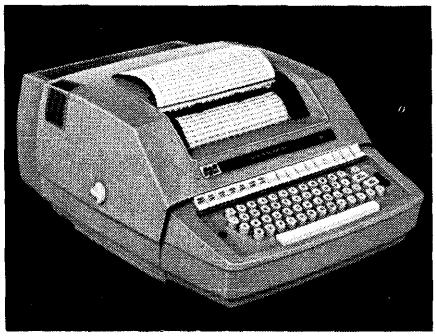


Kleinschmidt.

The amazing Kleinschmidt 311™ Teleprinter is part of BOAC's 100 million dollar computer system called Boadicea. This system puts all the BOAC offices in the United States right next door to the home office in London.

For example, if the BOAC office in Miami needs a passenger list for any BOAC flight, Kleinschmidt gets the answer from London in seconds. At 400 words a minute.

The Kleinschmidt 311 Teleprinter gives BOAC the ultimate in speed and reliability. Furthermore, the 311 Teleprinter can accept parallel information on demand at an average speed of 40 characters a second, which eliminates the formatting problems of serial printers.



What Kleinschmidt is doing for BOAC it can do for any business that requires quick reception of the printed word. If you would like to learn more, please write Kleinschmidt Division of SCM Corporation, Deerfield, Ill. 60015. Or call us at 312-945-1000.

SCM®

CIRCLE 145 ON READER CARD

megabucks) bootleg parallel processor project at Federal Systems Div. lacks the authority of corporate approval.

Meanwhile, in Menlo Park, a number cruncher project allegedly dear to T. J. Watson Jr.'s heart has reportedly had its problems changing to 360-compatible after an early try at the non-compatible route, with accompanying personnel changes. It's still headed up by key 360 architect Gene Amdahl. Rumors are that an attempt to scuttle the project is really an effort to get more dough for the project, originally budgeted for a reported $450 million.

Besides ego satisfaction ("If CDC can build a supercomputer, so can we"), the big beast is supposed to test out new technology. But standard-line I/O devices are said to be killing it.

CANADIAN SUNRISE; INVASION FROM NORTH

Consolidated Computer Industries, Canadian company which is marketing a modified Hewlett-Packard 2116B time-sharing system, is set to invade the U.S. with a data preparation unit called Key-Edit, unveiled at the DPMA in Montreal this month.

The unit moves data from keyboard to a high speed drum, then, on the operator's command, to tape. It will include a minicomputer, offer "extra" features at a "competitive" price.

CCI, incorporated last July, plans to raise some $10 million soon by going public (Toronto Exchange), will expand marketing operations, headed in the U.S. by George Athanus, in High Point, N.C. Headquarters of the 40-man company are in Toronto. President is Mers Kutt, a Canadian edp veteran formerly with IBM, Honeywell and Queens Univ.

OEM PRINTERS SNEAK PREVIEWED AT SJCC

Boston's infant Data Printer Corp. will soon unveil a line of impact printers for the oem market. The F-80 and F-132 (column width) boast 600 lpm, are designed for mass production, maximum reliability. Over 10 patents are pending on design and manufacturing techniques.

Aimed at use with minicomputers and as remote terminals (including Teletype replacement), the compact printers will offer a mechanism price of about $3500 for 100-unit orders, said to be some $500 less than competitive printers.

The 18-man firm is hiring assembly workers for its 17.5K-sq.-ft. plant, plans to produce 100 printers a month beginning in September.

IBM OUT AS UC IRVINE SHUFFLES COMPUTER FACILITIES

About July 1, the University of California at Irvine will send back its 360/50 with some 15 terminals (down from 40 earlier) and replace the single system with a Sigma 7 and a PDP-10.

At the same time the UC campus is restructuring its computer facilities and management. Instead of one center, now headed by Robert Gordon, there will be two--the PDP-10 for batch work and the Sigma 7 for interactive operations. Heads of the two centers, not yet chosen, will report to the holder of a new job title--assistant chancellor for computing. The department of information and computer sciences, which handles student instruction, will remain a

(Continued on page 233)

Moore New Ideas for Data Processing

Route selling—40% faster, 50% cheaper

Route salesmen could load up faster and do their bookkeeping with less effort by combining a Moore idea with computer capability. Idea is to preprint product names, codes, and prices—including last-minute new-product additions. All salesman has to do is enter quantities. Avoids errors due to bad handwriting. Makes sure new products get a push. Faster. Cheaper. More efficient. Ask about "route selling."

Stretchable records that cut costs

When you can stretch an information system to provide extra copies only on an if needed and when needed basis, you can eliminate some of your paper cost. Moore has such systems—with built-in duplicator masters to turn out whole or partial copies as needed. You cut forms inventory and you avoid stuffing needless paper into files. Ask about "stretchable records."

Computerized labeling

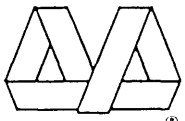
If you've been preparing labels by hand to identify bulky products not easily identified, Moore has a good idea for you. Computers are capable of generating king-size numbers that can be read easily from several feet away. Not only numbers but words and symbols. Printed on continuous adhesive label stock, these labels can be generated as a by-product of other printouts. Ask about "labeling."

Faster, cheaper way to report college grades

It used to be the responsibility of each instructor to send out final grades. When you've got 20,000 students, each carrying five subjects, that's 100,000 different notifications. A lot of time, work, expense. Moore has a way to tap your ADP equipment for this job. Student grade reporting comes as a by-product. No envelopes. No stuffing. No metered postage. Grades get out faster. University records are completed faster. Time and money are saved. Ask about "college grades."

Only the tried and true

When you ask Moore for ideas, you get only those that have stood the test of use. And there are more than 2400 Moore men out gathering, swapping, improving on, and creating new ideas to meet the changing needs of business. One Moore idea may be what you need.



MOORE® BUSINESS FORMS, INC.

Over 675 offices and plants, 2407 salesmen in North America

separate function; students may be assigned projects on either of the machines.

Impetus for the changes came, apparently, from physical science faculty members who wanted direct access to their own computer. And, about the same time, IBM chose not to renew their agreement with Irvine for joint development of operating systems to support instructional use of the 50.

INDUSTRY SUBSCRIBES PALTRY KING FUND

Tired of waiting for sluggish AFIPS to decide if it wants to administer the Computer Industry Martin Luther King Fund, Howard Bromberg, fund originator, has forwarded it to Rev. Ralph Abernathy of the Southern Christian Leadersip Conference. The conference is sponsoring the new People's International Univ. in Atlanta, and the money--now a staggering $1300--will be used to assist students in the school's programming and keypunching courses.

RUMORS AND RAW RANDOM DATA

Looks like sluggish sledding for the Brooks-Moorhead bill to computerize Congress, passed by the House GovOps committee last month. A Rules subcommittee, headed by Calif.'s B.F. Sisk, considers the bill a proposal to reorganize Congress. Such proposals call for "several months" of study...New computer rumors: CDC will announce "within nine months" a new machine which, contrary to rumor, will not incorporate modified 6400 or 7600 cpu's...GE is expected to announce additions to the 600 series by year-end, including a model bigger then the 635... And Univac, so long promising the 9500, will unveil a 9000-series-compatible 9600 in July. Look too for an 1110, said to be compatible with the 1108, but "different in structure.'' ...A federal gov't ruling requiring testing of every automobile tire represents a bonanza for makers of small computers, used at quality assurance test stands. One tire maker has ordered 100 mini's...Look for Bell & Howell sub Consolidated Electrodynamics to be another entry in the key-to-tape recorder race. ...ADAPSO's new time-sharing section has added new dimensions to the FCC computer/communications inquiry. The group recently recommended that the commission take some responsibility for intrastate as well as interstate service, to achieve greater uniformity. It also lodged the first official protest concerning 50% rate increases imposed in several states on telephone network-linked users. ...Now that the Codasyl programming language committee has approved the teleprocessing proposal for COBOL, IBM will begin implementing it into its USASCOBOL, even before USASI ayes it...The Computer Peripheral Manufacturers Ass'n. met at the SJCC to consider a plan on organizational structure and a draft charter prepared by a committee headed by Dick Caveney. After numerous attempts (seemingly motivated by provincial self-interest) to shoot it down, it was decided to send it out as prepared for charter members, including computer manufacturers, to accept or reject on a take it or leave it basis. ...Rapid rise dept.: Max Palevsky, who joined Xerox May 15, was named head of the executive committee May 15.

Is cutting your IBM 360 sort time in half worth $200 a month?

The name is PISORT and Programmatics could do it because Programmatics is in the software business. Strictly. PISORT is an amazingly simple piece of plug-in software that's fully compatible with IBM's DOS sort program. Programmatics guarantees that PISORT will not only cut your sort time in half; it will cut your disk space in half at the same time. PISORT includes all the features of DSORT and utilizes the same JCL and sort control cards. What you have to have, of course, is an IBM 360 with 65K or more operating on DOS. Which doesn't mean that all you OS people should defenestrate yourselves. We're working on our OS PISORT now. Lease, license and lots more good information is available on request. By now, you've probably rationalized that your IBM Sort is free. Which is true. But you've got to admit that it's only half fast.

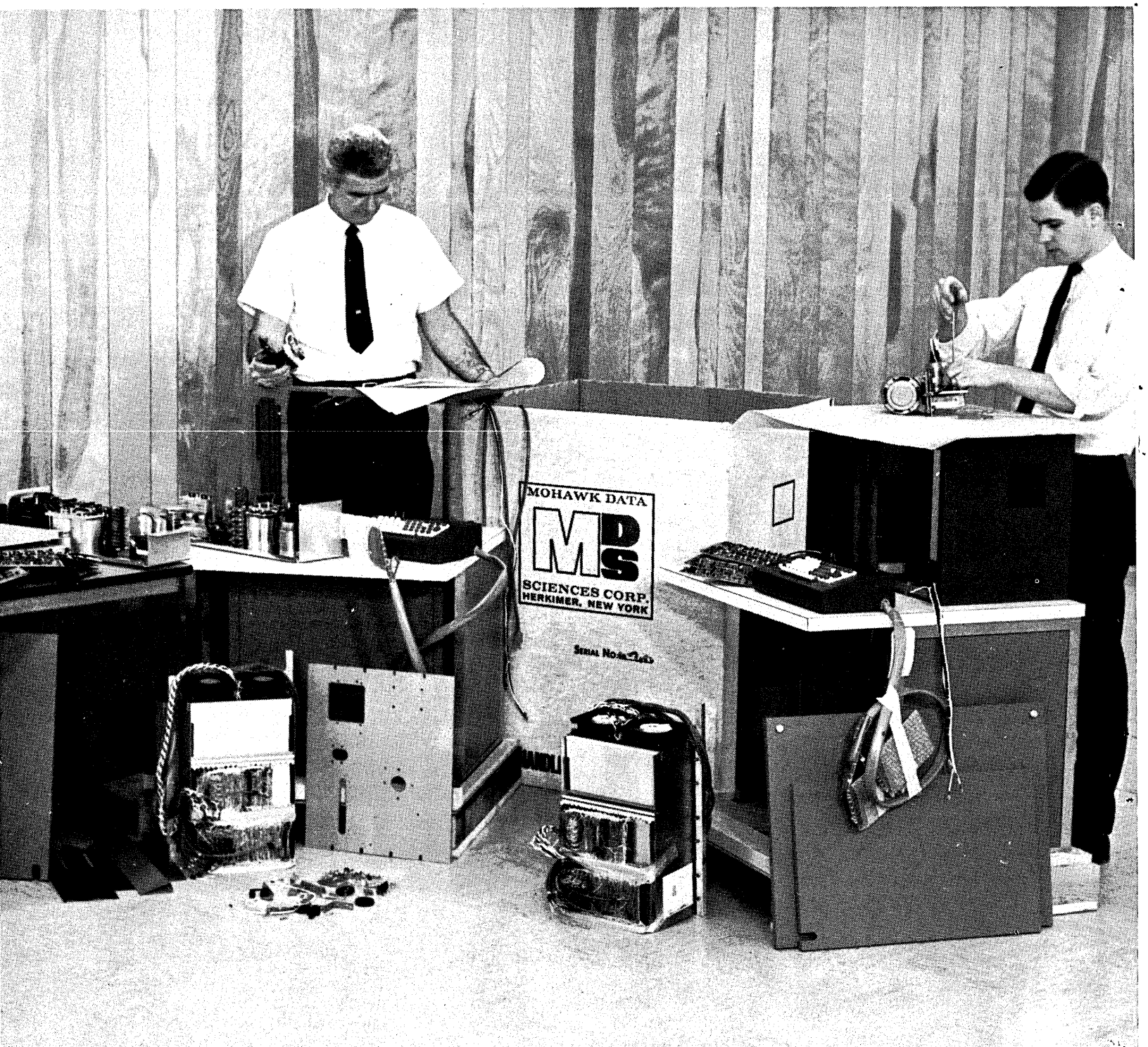
PI PROGRAMMATICS
11661 San Vicente Blvd., Los Angeles, Calif. 90049
11401 North Shore Drive, Reston, Virginia 22070

people

Jack A. Strong, balding computer pioneer, sailor and bon vivant, has dropped plans to form his own firm (see Jan., p. 185) and has joined Mauchly-Wood as vp, marketing and administration. An early member of CSC, he was most recently exec vp of Digitek. . . . International Telephone and Telegraph Corp. has announced the consolidation of its data systems, equipment and services operations on

a worldwide basis under the direction of **Martin E. Karp.** . . . **Dr. Harold Goldberg,** most recently a vp and director of LTV Electrosystems, Inc., has joined Riker-Maxson Corp. as executive vp and director to supervise the operations of some 30 of the company's operating facilities. . . . **Robert Howe,** chairman of the board of Applied Dynamics, is now also chief executive officer. Former president **William Wood** resigned to become a Singer vp. . . . **Paul Anderson** is the new manager, computer applications, at Ford's engineering staff. He had been manager of dp at the company's Rawsonville plant. Anderson takes the position vacated by **Chuck Missler,** who left to form Cyphernetics Corp. (see April, p. 194). . . . **Henry J. McCarthy,** marketing vp for Ticket Reservation Systems, has been appointed president of TRS subsidiary Ticket Controls, Inc., which will develop lottery and on/off-track betting systems. He will remain a vp of the parent company. . . . **Kenneth F. Julin** has been elected president of Subscription Television, Inc. He will concentrate on broadening the company's base of activities in electronics, communications and computer-related fields. Julin has been president of Leach Corp., an STV subsidiary, and is succeeded there by **Robert L. Jannen,** former Leach exec vp. . . . **William J. Weisz** will succeed **Elmer H. Wavering** as president of Motorola, Inc., in September of 1970 and as chief operating officer in May, 1972. . . . **Dr. Herbert Freeman** of New York Univ. has been named chairman of the U.S. Committee for IFIP Congress '71, to be held in Ljubljana, Yugoslavia. . . . **Julius Blank,** one of the eight founders of Fairchild Semiconductor, has joined Ness Industries, Inc., Palo Alto, as senior venture manager. . . . Univac has established a third systems programming location. Heading up the new group is **Edward A. Watkins** as manager of Salt Lake City Software Development. He had been project manager of systems programming at the Roseville, Minn., software development facility. The new operation will augment other systems programming work and prepare software packages to be supplied on a worldwide basis to Univac users. . . . **N. Richard Miller,** former staff vp, business planning and economic analysis, for RCA's Information Systems Div., has been appointed division vp and gm of the company's Graphic Systems Div. . . . **Linden G. Criddle** has joined Tally Corp. as exec vp. He had been vp of United Control Corp. and general manager of its Data Div. in South El Monte, Calif. . . . **George Glaser,** McKinsey & Co. associate in San Francisco, will move to the company's Dusseldorf, Germany, office in the same capacity. . . . REDCOR president **Emil Borgers** has been elected to the board of Applications Software Inc., Torrance, Calif. . . . **Dr. Peter Wegner,** Associate Professor of Computer Science at Cornell Univ., has been re-elected chairman of the ACM Special Interest Group on Programming Languages (SIGPLAN). . . . **Garlan Morse** has been promoted to the newly created position of exec vp for Sylvania Electric Products Inc., with responsibility for corporate direction of the company's six operating groups: lighting products, entertainment products, electronic systems, information systems, metals and chemicals, and electronic components. . . . **William E. Reidy** has been promoted to the position of corporate director of systems and procedures for Kraftco Corp., one of the nation's leading producers of processed, packaged foods. He will be responsible for direction and coordination of all data processing in the corporation. . . . **Richard S. Moore,** former director of the spare parts department of the Boeing Co.'s Commercial Aircraft Div., will join Butler Data Systems, Hawthorne, Calif., on July 1 as president and chief executive officer. He will succeed **James M. Bird,** who will remain in the company as an advisor in marketing and in acquisition and diversification matters. . . . **Robert**

If we thought your EDP needs stop with "hardware", we could deliver Data-Recorders on a do-it-yourself basis



When MDS took the "punched card" bull by the horns, and introduced the Mohawk Data-Recorder in the Spring of 1965, we knew we had our work cut out for us.

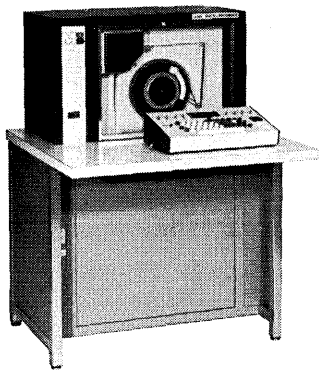
We felt a little like the first automobile builders, who faced the prediction "it will never replace the horse and buggy."

Like the automobile, the Data-Recorder won acceptance, and paved the way for numerous competitive keyboard-to-tape devices.

We already knew that, despite the appeal of the Data-Recorder's potential, you would expect considerably more than a mere hunk of new hardware. From this insight came several critical MDS decisions which have contributed greatly to the successful use of Data-Recorders.

WE DECIDED . . .

. . . that the unique versatility of the Data-Recorder warrants extra effort on our part to help you develop the data formats that let you take maximum advantage of the MDS keyboard-to-magnetic tape method. With the Data-Recorder, you're not fenced in by punched card limitations.



CIRCLE 123 ON READER CARD

. . . it is necessary to spend ample time with you . . . to become familiar with your EDP problems and applications before we can intelligently determine how Data-Recorders can best be of service to you.

. . . that when you install Data-Recorders, MDS should be on hand to help you get the feel of this new equipment. We keep an MDS man on the job until you're ready to go on your own.

. . . that MDS should back you up with a strong, well-trained Customer Engineer organization. Today, should the necessity arise, every Data-Recorder user can have service help in short order . . . from 70 offices in the U. S., and others throughout the world.

. . . that because an operator is efficient on the card punch, it doesn't mean you should automatically turn her loose on the Data-Recorder. So we developed the now-famous MDS "Programmed Instruction" Series that gets the operator off on the right foot, trains her to get the most out of *all* Data-Recorder models. Many Data-Recorder operators now come from *typist pools.*

These are significant "pluses" that come with the Mohawk Data-Recorder hardware (the original units that made it possible for you to transcribe data from source documents direct to computer-compatible magnetic tape).

If you're still tied to punched cards for input preparation . . . and want to break the bottleneck . . . this is just a gentle reminder that Mohawk Data-Recorders offer you *both* proven hardware advantages, and a broad range of "pluses" you can't afford to overlook.

Want more facts about Mohawk Data-Recorders?

Phone or write.

MOHAWK MDS®
DATA SCIENCES CORP.

P. O. Box 630 • Palisade St., • Herkimer, N.Y. 13350 • Tel.: 315/866-6800

OFFICES IN MAJOR MARKET AREAS AROUND THE WORLD

MOHAWK DATA-RECORDER MODELS: 1101 . . . 1102 MTP (Multi-Tape Pooler) . . . 1103 LDC (Long Distance Communications) . . . 1104 AMC (Adding Machine Control) . . . 1105 PTR (Paper Tape Reader) . . . 1106 PCR (Punched Card Reader) . . . 1109 DPC (Data Preparation Card Reader) . . . 1112 DPA (Data Preparation Adding Machine) . . . 1115 DPT (Data Preparation Tape Reader) . . . 1118 DLP (Data List Printer) . . . 1122/902 (7/9 Channel Converter) . . . 1181 TWK (Input/Output Typewriter) . . . 1183 DPP (Data Preparation Printer). All 1100 Series Models record data on 7-channel magnetic tape at 200 BPI. The following 6400 Series Models (9-channel, 800 BPI) also are available: 6401 . . . 6402 . . . 6403 . . . 6404 . . . 6405 . . . 6406 . . . 6409 . . . 6412 . . . 6415.

people . . .

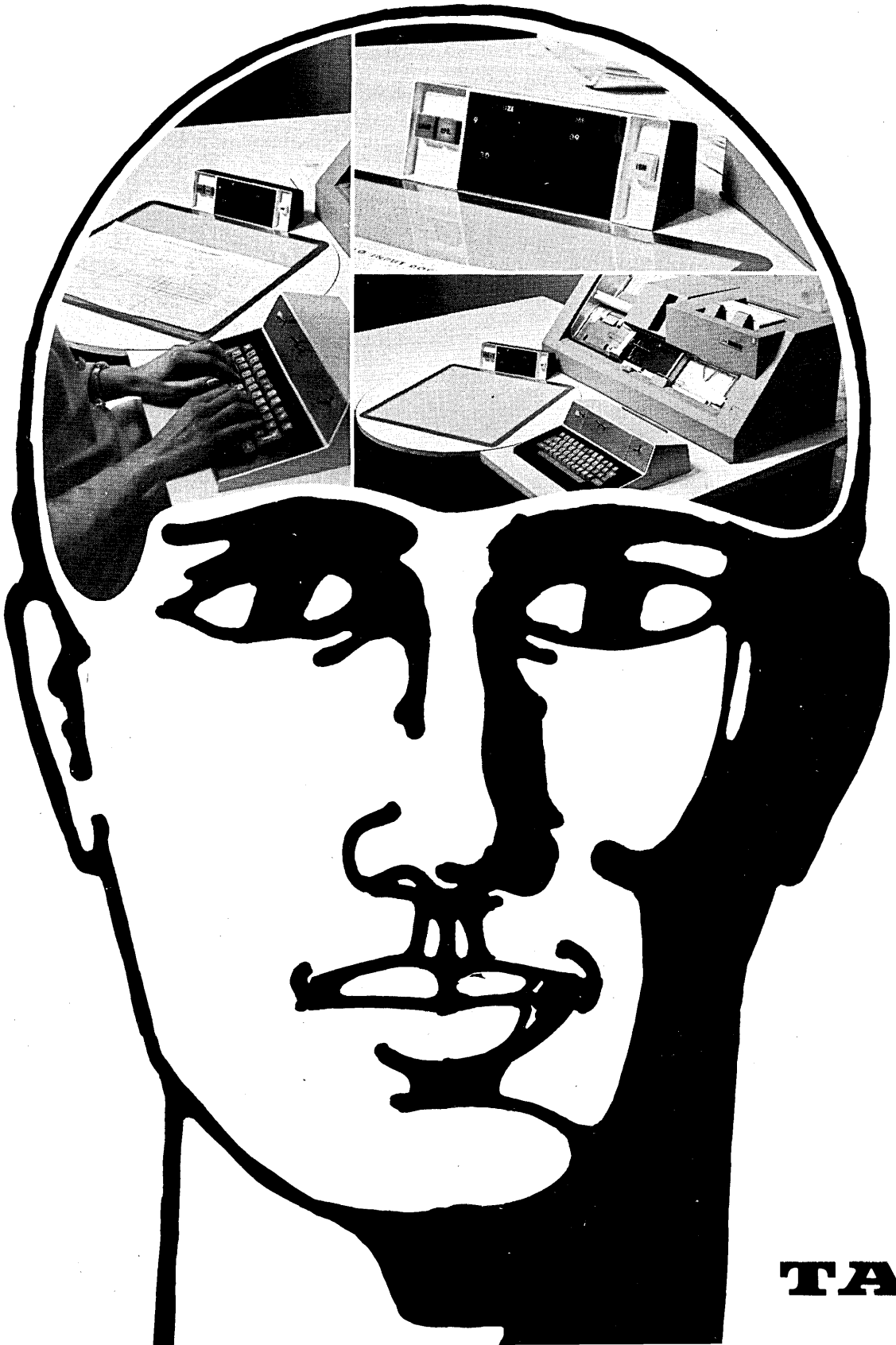
R. Everett has been elected president and chief executive officer of The MITRE Corp. He was also named to the board of trustees and member of the board's executive committee. Everett has been with MITRE since it was founded in 1958. . . . Creative Computer Services, Inc., New York City, has announced the appointment of **Gerald O. Koop** as president and **John F. Phillips,** executive vp. They were formerly president and vice president, respectively, of Data Concepts, Inc., a subsidiary of United Data Centers. . . . **Anton J. Pros,** former vp and treasurer of the Midwest Stock Exchange Service Corp., has been named president and chief executive officer of Mid-America Computer Corp., a Chicago-based computer service organization. . . . Cambridge Computer Corp. has formed a new subsidiary, Cambridge Computer of New York, to provide a complete dp facilities management service for select major industries. **John Kehoe, Jr.,** has been named president and **Frank Triolo** exec vp. Both come from IBM. . . . **Jack N. Veale,** formerly exec vp, Systems Sciences Div., of Technical Operations Corp., has been appointed exec vp and elected a director of Optical Scanning Corp. Before joining Technical Operations, Veale was with Sperry Rand for 27 years in various executive positions, including vp-marketing of the Univac Div. . . . Delta Data Systems Corp. (formerly Computer Technology Inc.) has announced the appointment of **R. Barry Borden** as president. Previously, he was a founding officer of DENCO-DATA Engineering Co., manufacturers rep firm in the computer and computer peripheral equipment field. . . . **Bob Bemer,** manager of Systems and Software Engineering Integration at GE Phoenix, has been appointed Program Chairman of the 1970 ACM Conference and Exposition. . . . **Robert M. Whittington** has been appointed to the new post of director of management information services for Libbey-Owens-Ford Co. Formerly coordinator of corporate data processing and plant offices, he will be responsible for the direction, development and operation of the corporate-wide financial and production information systems involving the company's data centers for computer and data processing. . . . **William P. Dingsdale** has been elected president of Western Magnetics, Inc., Glendale, Calif.-based producer of magnetic tape heads. . . . **T. J. Watson, Jr.,** has been nominated as Citizen Regent of the Board of Regents of the Smithsonian Institution. . . . **Dr. Milton**

KEY PUNCH WITH A MEMORY

New Tab Datafinder 400 brings key punching into phase with today's computers. Datafinder 400 attaches to any IBM key punch or verifier. A 14,000 to 28,000 bit delay line memory provides for programmed control of automatic punching and constant data for increased document throughput and accuracy. Datafinder trains operators to punch any document in minutes with exclusive and automatic, constantly lighted instructions.

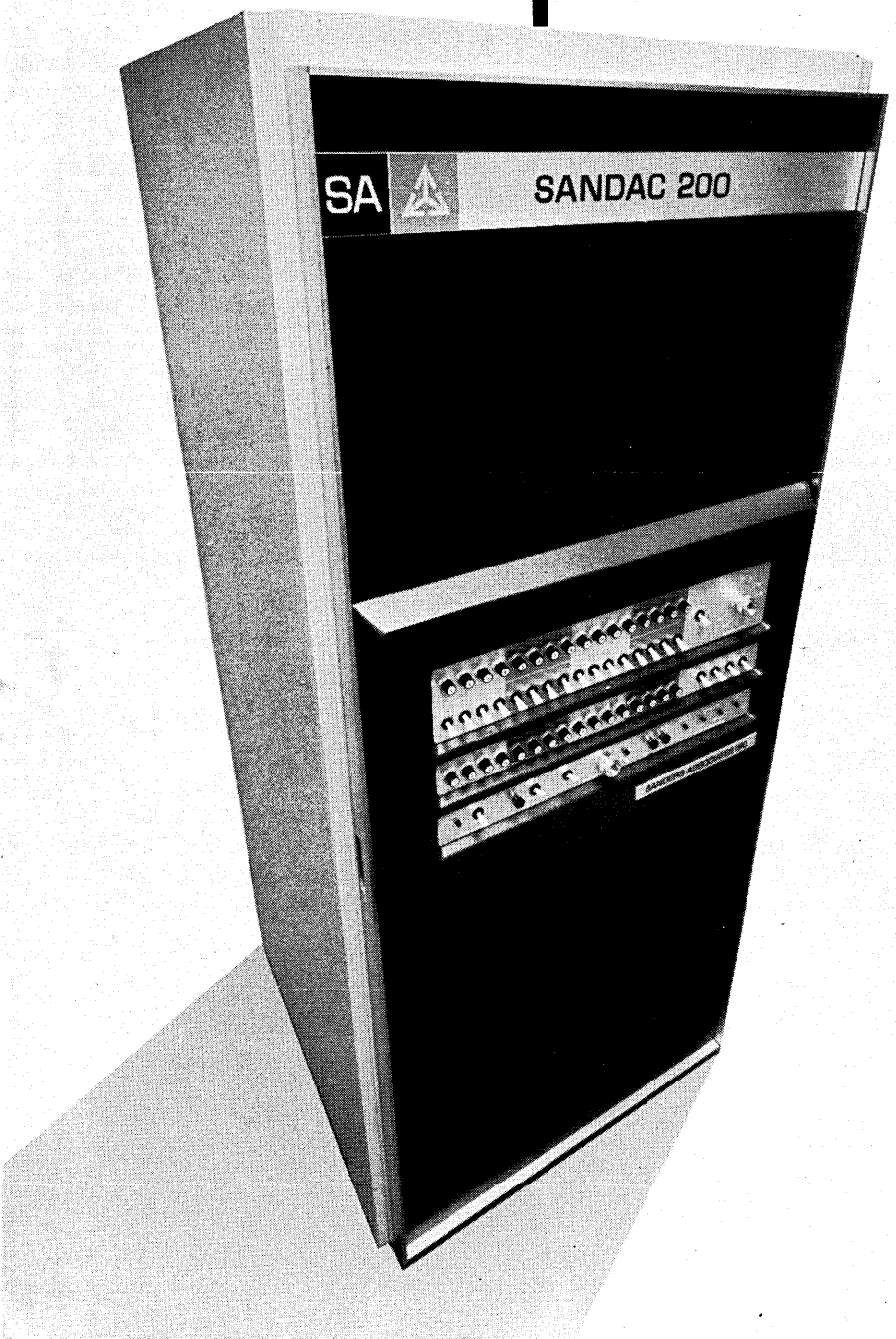
Datafinder 400 can provide card punch capacity up to 31 programs, further increasing throughput and accuracy. With the back-up of Datafinder-equipped Tab Data Input Centers, you can rely on Tab for accelerating accurate input, helping you achieve greater utilization of your computer. For information on Datafinder and Tab Data Input Centers, write Tab Products Company, 633 Battery Street, San Francisco, California 94111.

CIRCLE 125 ON READER CARD



TAB

This computer doesn't compute.



It communicates.

Is your EDP system in real time? Or going into it? Don't bug the main frame by using core space for a communications job it wasn't designed to do.

The Sanders SANDAC* 200 is a Programmable Communications Processor. That's exactly what it was designed to be.

A SANDAC 200 lets you start with what you need now. You can add I/O channels as required. Up to 256, all simultaneously active. And you can multi-drop terminals on each channel if desired.

Interface a remarkable variety of peripherals. Low speed or high speed. You tell us and we'll make them fit. There's a choice of single bit, serial or parallel character, and parallel word buffers.

Expand from 4K to 65K (131,072 bytes) of directly addressable core memory. With memory parity and protection bit for each location.

Software includes diagnostics, assemblers, debugging and utility routines. A real-time supervisor offers dynamic core allocation.

Put a SANDAC 200 in front of your EDP system, a System/360 or any other. You'll be able to do more computing with a smaller computer. And you'll end up with a more efficient data communications system.

For information, contact Marketing Manager, Data Communications Systems Group, Sanders Associates, Inc., Daniel Webster Highway South, Nashua, New Hampshire 03060. Or telephone (603) 885-4554.

SA SANDERS ASSOCIATES, INC.

*TM Sanders Associates, Inc.

CIRCLE 126 ON READER CARD

people...

E. Mohr has been elected president and chief executive officer and **Malcolm A. MacIntyre** chairman of the board of The Bunker-Ramo Corp. MacIntyre has been a director of Bunker-Ramo since formation of the original company in 1964. Dr. Mohr has served as chairman of the board for the past year (see Sept. '68, p. 79). . . . **Paul Taylor,** formerly with the Vertol Div. of the Boeing Co., has been appointed exec vp of Information Industries, Inc., Wayne, Pa. . . . **Edwin M. Bederson** has been elected president of Strategic Datacenters, Inc., subsidiary of Strategic Systems, Inc. He had been vp for marketing services of the parent company. . . . **E. W. Housh,** former director of information and data processing systems for IBM World Trade Corp., has been elected president of Cybernetics International Corp. . . . **Leonard R. Dimmick** has been promoted from assistant manager to manager of corporate data processing for Bethlehem Steel Corp. He replaces **James H. Woodhouse,** who retired after 32 years with the corporation. . . . **Peter Davis,** most recently head of Laurentide Leasing Co., has been appointed president of DPI Systems, Inc., the wholly owned leasing subsidiary of Data Pathing Inc. . . . **Howard S. Landsman** is the new president and chief executive officer of Data Transformation, Inc., computer-oriented printing company. He had been exec vp of the parent company, Computer Management Consultants, Inc., Skokie, Ill., and will continue as CMC vp of sales. . . . The board of directors of University Computing Co. has elected **Charles J. Wyly, Jr.,** as president of the company. **Sam Wyly,** founder and former president of UCC, has been elected chairman of the board. . . . **B. Joseph Vincent,** chairman of USASI's Committee on Optical Character Recognition, has joined Recognition Equipment Inc. as assistant general sales manager. He had been senior staff consultant to URS Systems Corp. . . . Data Disc, Palo Alto, has established a Manufacturing Div. which will mass-produce the products for the already existing company divisions. The new division will be headed by **John Shortal,** most recently with Litton Industries. . . . Principals of Com-Pete, the Com-Share spin-off (see May, p. 245), are: **James Morelock,** formerly with Navy systems engineering specialists Veda, Inc., president; petroleum specialists **Arvid Callen** and **John Spitler,** exec vp and vp-marketing, respectively; and **Ralph Rheingans,** vp of technical operations, formerly with Com-Share programming. ■

datamart

NOTICE — This marks the final appearance of the Datamart. Those seeking alternative methods of advertising in Datamation are urged to contact the nearest Datamation sales office (See p. 4).

Address all replies to box number advertisements as follows:

Box .....
DATAMATION
F. D. Thompson Publications, Inc.
35 Mason Street
Greenwich, Conn. 06830
Classified Advertising

EQUIPMENT FOR SALE PURCHASE OR LEASE

SALE: 024—$600; 026—$2000; 056—$600; 077—$900; 082—$1000; 083—$4000; 084—$7500; 402—$1100; 403—$1500; 407—$4700; 514—$1400; 602—$900. Panels 50% off. ADP CO., 105 Hinricher, Willow Springs, Ill. 312-839-5164.

IBM MACHINES
For Sale
Call or write us for any of your DP machine requirements. All of our machines are subject to IBM M/A.
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P.O. Box 29763, Atlanta, Ga. 30329
(404) 451-1895

FOR SALE

32K CONTROL DATA 3300
COMPLETE COMPUTER SYSTEM

Manufacturer's Maintenance

Also Extensive Software
For Petroleum Exploration
Data Processing

Box 6-1

FOR SALE—All in excellent operating condition—almost new. Three (3) Magnetic Tape Certifiers:
1 Cybetronics CS-1
1 Cybetronics CS-2
1 General Kinetics Model 97

For information on these certifiers please contact:
Magnetic Media Corp. 616 Fayette Ave.
Mamaroneck, N.Y.
212-792-1919 or 914-698-8660

WANTED

Existing software system for convalescent home. Patient billing, Medicare, etc. Will purchase or lease. Write: Box #6-2

FOR SALE: Burroughs 11 total typing sensimatic style F1303P with A542P card punch control unit. Card-punch not included. Cost new $10,000 in 1965. Contact: S. P. Fawcett, c/o National Graphics Corp., 386 S. 4th St., Columbus, Ohio, 43216.

TIME-SHARING PORTABLE TERMINALS
Modified TELETYPE
Model 33 KSR & ASR
(Friction and Sprocket Feed)
AND
Acoustic Data Sets

MULTIPLEXERS
Remote, all 103A data and control functions

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SERVICES

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HELP WANTED NON-PROFIT INSTITUTIONS

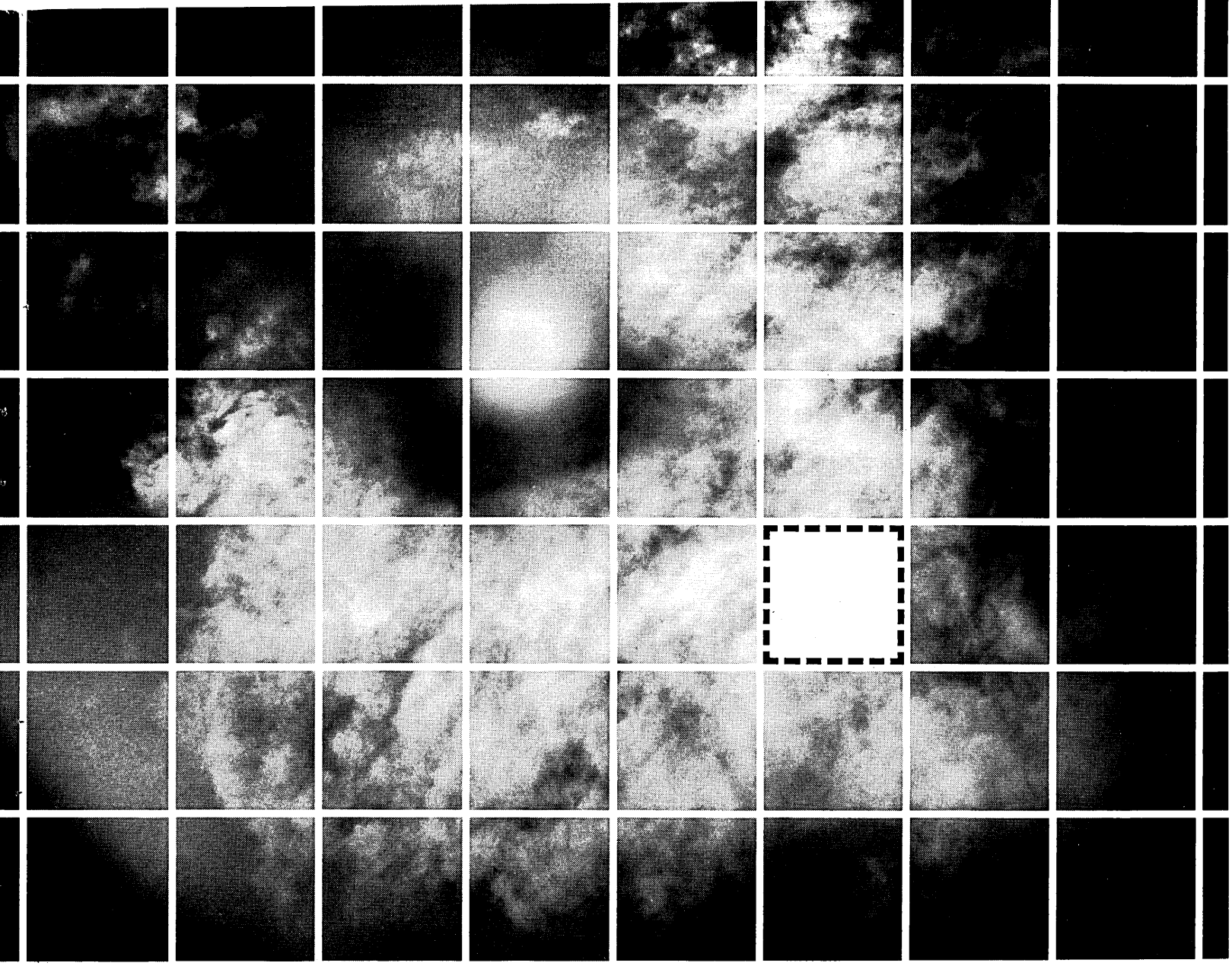
POSITIONS AVAILABLE—MONTANA STATE UNIVERSITY, Bozeman, Montana. Systems Analyst—Programmers. IN—Computing Center, Business Office, Registrar's Office. **CONTACT**—John C. Miller, Director, Computing Center, Montana State University, Bozeman, Montana 59715.

SYSTEMS PROGRAMMERS
The Columbia University Computer Center has openings for systems programmers on several levels, including the supervisory. We have a 360 Model 91 and a Model 75, operating under LASP/MVT. This system is to be developed in a variety of ways, including implementation of low- and high-speed terminal facilities. The environment is challenging. Send resume to Jessica Hellwig, Computer Center, Columbia University, New York, N.Y. 10027.

Director, Bureau of Systems Analysis, Data Processing and Telecommunications. $15,147-19,219. Commonwealth of Massachusetts. Top position in newly-established bureau responsible for state policy, planning and direction of data processing, systems analysis, including communications systems, management studies and program development. Write: Commissioner of Administration, Room 312, State House, Boston, Massachusetts 02133.

recruitment advertisers' index

For the convenience of those readers interested in professional opportunities, we have gathered in the following pages the advertisements of these industry firms and professional placement agencies:



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– Or other Space and Range Projects, Spaceborne Programs, or Advanced Technology for Space Operations, military and civilian.

The most experienced company in the world of computer software has become the most versatile in the universe of satellite control, range systems, and information processing. That's us. SDC.

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Join us in space. In time you'll be way ahead.

System Development Corporation

SDC

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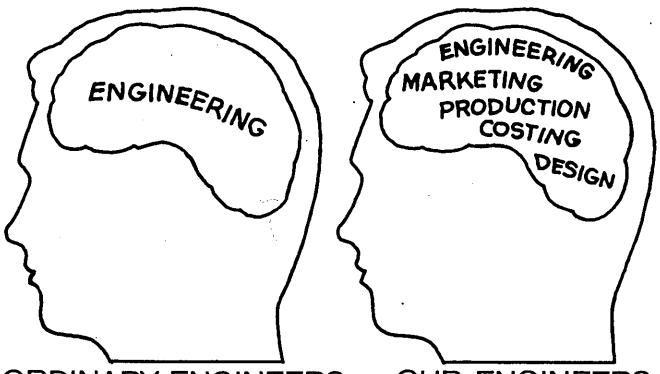
Ordinary engineers have their place. Elsewhere.



ORDINARY ENGINEERS OUR ENGINEERS

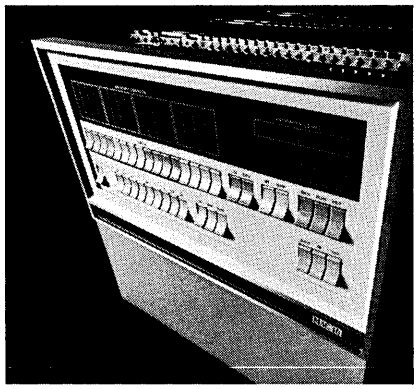
Ordinary engineers are the guys who sit in somebody's bullpen and slave away on a tiny part of some immense project. Doing the same kind of thing. Over and over, without ever really knowing what their contribution amounts to.

We go about things a little differently. And we think that's the reason we've become a leader in computer memories.

Our technique is to let engineers get involved in as many different activities as they can handle. Technical proposals, design, development, costing, production, marketing, planning—you name it, our engineers get involved in it. And the involvement leads to commitment. It's worked out beautifully.

As a result we have a busy and extremely interested engineering staff. And the finest line of memory systems and stacks and interconnect circuitry on the market.

It should surprise no one to learn that we're growing at a healthy clip. Just recently, we introduced our new digital Multi-Application Computer —MAC 16 —and that's going to accelerate our growth.



So, we need more engineers. Good minds. Good technical backgrounds. And the desire to get involved.

We pay well. And, because of our continuing growth, we offer rapid advancement.

If you're interested in us and you've got an M.E. or E.E. and E.D.P. hardware or software experience, let's get together.

Write to me—E. A. Gage—at 6201 E. Randolph Street, Los Angeles, California 90022. Better still, call collect. (213) 722-6810. Naturally, we're an equal opportunity employer.

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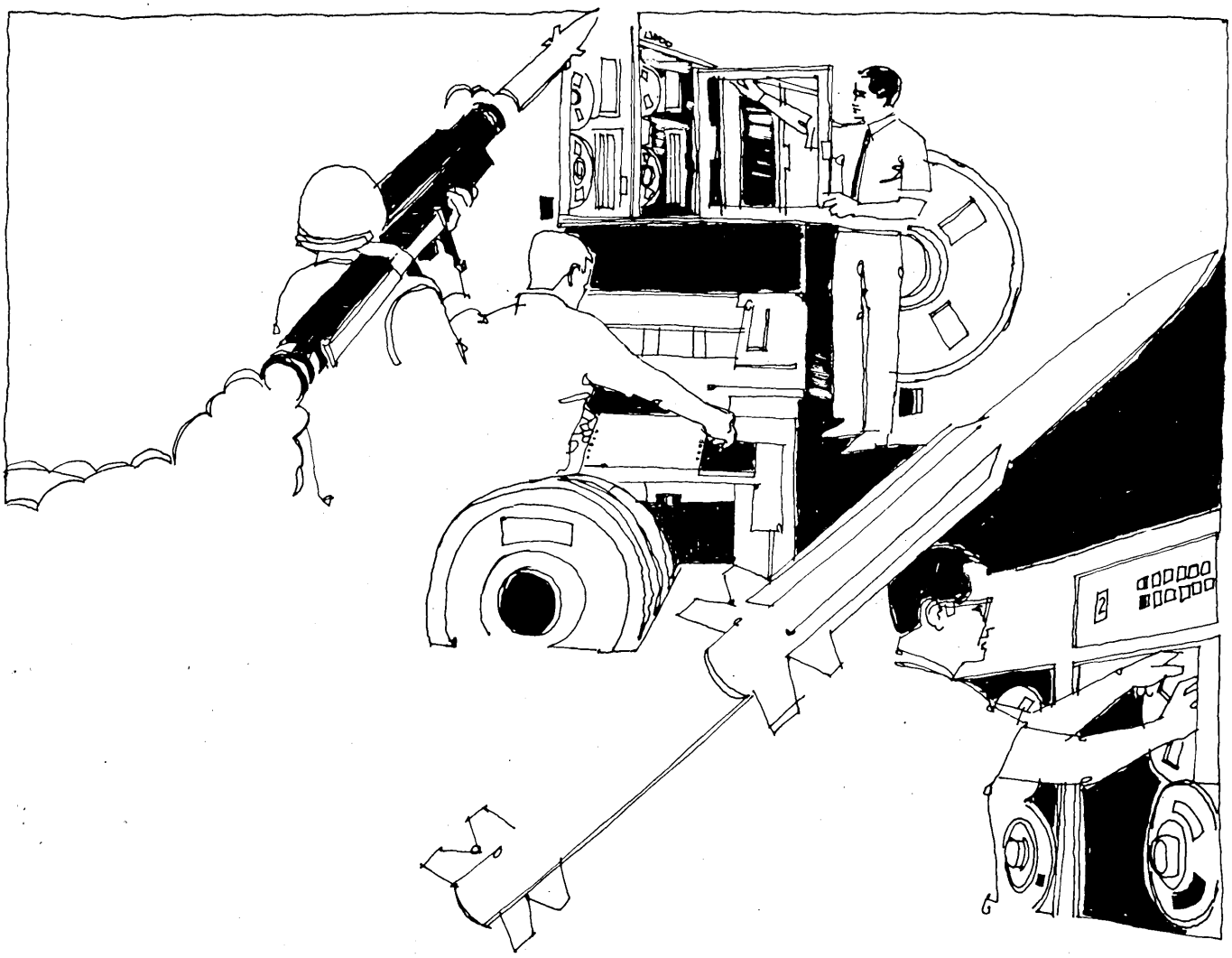
LEC Data Products Division • A Division of Lockheed Aircraft Corporation



The Leader Must Lead

And to maintain our position as the nation's leading manfacturer of tactical guided missiles and weapons systems, we must constantly search for creative men and women capable of sustaining and advancing our record of achievement.

If you are looking for a better career and can meet our qualifications for achievement. —Make the move today!

Immediate openings now exist for:

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Two years minimum programming experience preferably on large-scale computers, with knowledge of COBOL, AUTOCODER, or 360/BAL programming languages. Experience in application areas such as Quality Assurance, Production Control, Finance, Personnel, and Engineering Data Systems is essential for the qualified applicant.

ANALYST - PROGRAMMERS

Minimum three years of actual program experience designing computer systems for large-scale computers. Experience in design and implementation of large-scale computer systems in areas such as Quality Assurance, Production Control, Financial, Personnel, and Engineering Data Systems is essential.

SYSTEMS ANALYST - MANAGEMENT PRACTICES

Minimum two years experience or four years in related business experience, preferably in manufacturing concern. We are seeking several aggressive, self-motivated individuals who can assume the complete responsibility for development of division-wide administrative systems. Experience in the areas of Production Control, Quality Assurance, Engineering Documentation, or Industrial Engineering is desired.

All applicants must be able to communicate well, orally and in writing, with all levels of management. College degree preferred.

To arrange a confidential interview, please send resume, including salary history to:

Mr. O. R. Warren
P. O. Box 2507-W
Pomona, California 91766
or phone Mr. Warren collect at
(714) 629-5111, Ext. 3288

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Positions offer unique opportunity to work with a small group involved in state-of-the-art development, design, coding, and check-out of the software required to examine mission data in a real time mode from a sensory satellite system. Requires three to five years experience with FORTRAN IV programming. Assembly language experience would be desirable.

COMPUTER SYSTEMS SPECIALIST

We have an extremely important position in our data processing and analysis laboratory for a specialist in software programming. His mission will be to implement the retrieval and analysis of satellite data in a real time mode. The individual selected must be capable of a high degree of innovation creativity in the development of digital computer programs to determine mission performance and related phenomenological data.

SYSTEMS ENGINEERS

System Test Engineers to prepare test plans and conduct analyses of test results relating to an on-line data processing system. The positions will require the development of system verification requirements and planning of tests to satisfy these requirements for the hardware, software and personnel subsystem. The persons selected will be expected to establish and coordinate the complete test plan for a multi-purpose on-line processing and display system, direct the analysis of test results, and conceive and propose efficient means of verifying software performance. BSEE required, MSEE desirable, with six years experience, three years experience in data processing.

Submit resume, including salary requirement to:

D. L. Rowe, Employment Manager
P.O. Box 303-A
Azusa, Calif. 91702

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If you have a B.S., M.S. or Ph.D. and you are experienced or interested in any of the following, contact us immediately for free career counseling and an objective analysis of your position in today's market.

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- Information Retrieval
- Command & Control
- Aerospace Applications
- Real Time/On Line
- Systems Simulation
- Software Development
- Communications

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- Digital Communications
- Systems Integration
- Soft Ware Analysis
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Salaries range from $8,200 to $25,000.
Our client companies assume all fees.

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Mr. Martin E. Sheridan
Area Code 703) 524-7660

SHERIDAN ASSOCIATES INC.
1901 North Fort Myer Drive
Suite 614
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(Just over the Potomac from Washington, D.C.)

Personnel Consultants to the Computer Industry

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Invitation to 2 Engineers for Marketing Consulting Firm

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You'll evaluate existing and forthcoming digital systems and components, foresee needs, trends, and markets, and translate your findings into terms understandable to business and financial executives. Calls for 5-15 years of experience.

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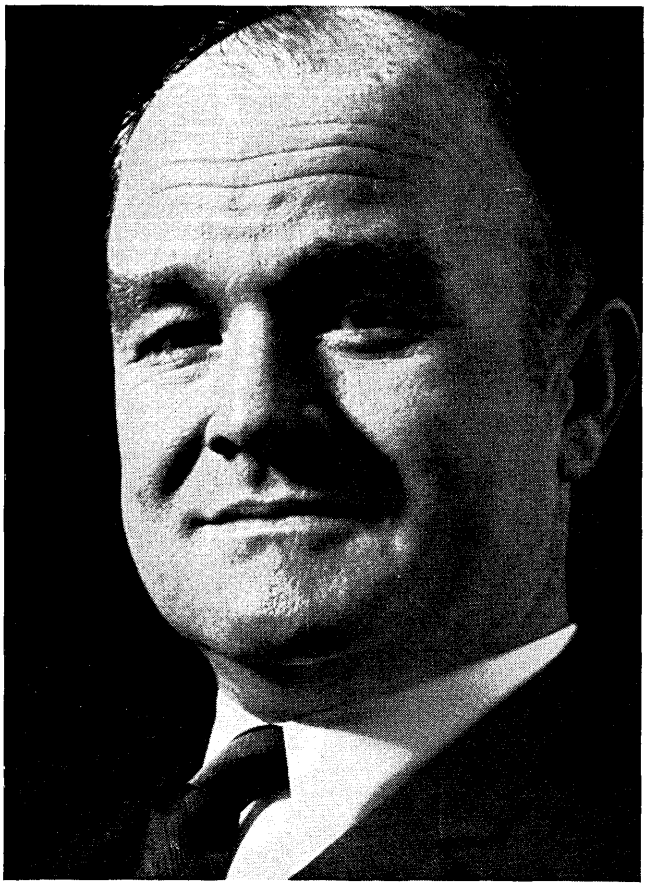
You will have an intimate knowledge of input and output devices, including terminals and memories. Position requires the ability to forecast technological & market trends. At least 5 years of engineering/marketing experience.

Consulting with Quantum Science Corporation offers you more variety, more stimulation, and a lot more room to advance rapidly. Quantum, because of the number of advanced degree men on our staff, holds a unique position among national technically-oriented consulting and information services, with major companies and financial institutions as clients. Profit-sharing and bonus in addition to appropriate salary. In the East please call Mr. H. Bailey at 212-986-4410 or send resume and salary history in confidence to Quantum Science Corporation, 245 Park Avenue, New York, N.Y. 10017. In the West please call Dr. M. Disman at 415-327-8400 or send resume and salary history in confidence to Quantum Science Corporation, 851 Welch Rd., Palo Alto, Calif. 94304.

Quantum Science Corporation

CIRCLE 303 ON READER CARD

I'm a headhunter.



Make something out of it.

More money, for instance.

Or make the jump from big old company to growing new one. Or make the move that will get you a stock option or more security or better climate.

If you're a winner, I can get you your deal.

The way I see it, being a headhunter means I work hard to help other hard-working guys get the biggest and best jobs they can handle.

If you want that kind of help, send me your resume. Or give me a call.

If you don't, then maybe you'd better stick with the job you're stuck with. Lots of luck.

—Don Zimmerlin

When you ask Resource Computer Corporation to find you a better job, you deal with a knowledgeable executive who has line management experience in the computer field.

Like Don Zimmerlin, vice president in charge of our East Coast operations. He used to be director of market planning at Control Data and has been in computers since 1954.

Or—in Los Angeles—Sam D'Angelo. He joined us after 15 years in sales and sales management with IBM. VP George Caras, from IBM by way of Scientific Data Systems. And RCC's president, Chuck Cole, who was at SDS as vice president, sales, and before that at IBM and Control Data.

We know where the action is. We're in the business of matching individuals to individual jobs. And we speak your language. Let's talk. Call or come in or write.

Till we get you a better job, you won't owe us a cent. Afterward, you still won't. Your grateful new employer will pay our fee, as well as your new higher salary.

Mr. George Caras
RESOURCE COMPUTER CORP.
1901 Avenue of the Stars
Los Angeles, Calif. 90067
Phone (213) 277-4717

Mr. Donald J. Zimmerlin
RESOURCE COMPUTER CORP.
1875 Connecticut Ave. NW
Washington, D.C. 20009
Phone (202) 483-1200

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This is an ideal time to consider a career change, and you should be looking at the opportunities immediately available. Let's open the door to a confidential discussion of your professional goals and our clients needs. All expenses and fees are paid by client companies. Send resume in complete confidence with salary history and location preference to:

S. K. STEWART & ASSOCIATES
The Herald Bldg.
P.O. Box 40247 Cincinnati, Ohio 45240

CIRCLE 312 ON READER CARD

Systemation Consultants, Inc.

Houston - New York

San Francisco

New software development department with company having established a reputation for sophisticated systems seeks professional with five or more years experience in operating systems design on large computer systems. Extensive design experience at the exec, monitor or master control panel level. Experience should be in a multiprogramming, multiprocessors environment. This operating system under design has extended core storage. Prefer advanced degree in Computer Science. Starting salary to $20,000.

Hardware Systems Engineers

Growing medium sized subsidiary extending computer technology into new high speed material handling, control, medical, and potent consumer-oriented applications seeks BS/MSEE's with experience in at least two of the following areas: digital logic/circuit design, large electronic/electromechanical control systems, A/D and D/A converters, data acquisition systems, DDC or Supervisory control systems, etc. Ground floor opportunities in both design and application engineering with this company whose parent corporation is glamour stock. Starting salaries to $17,000 range — Southwest.

Systems Planning

Rapidly expanding Houston subsidiary of major manufacturing company seeks professional to assume integrated systems responsibilities including planning, design, and implimentation. Must be capable of interfacing with several growing operating departments concerning their requirements for systems and procedures, short interval scheduling, training, etc. Outstanding opportunity to develop new computer applications—occasional travel and no programming involved. Starting base salary to $15,000 range.

NO FEE

The above positions are only a small sampling of the exceptional hardware and software opportunities within the activities of systems management, systems design/programming, process control, scientific/commercial applications, etc. as well as marketing, Operations Research, and other associated activities of our client companies in various domestic and international locations—both jr. and sr. positions available. Your current employer will not be contacted without your permission. Send resume in confidence or request our resume form. A call to our Houston Director—J. L. Gresham, BChE, MBA—for further information is also invited.

Post Oak Tower
Houston, Texas 77027 622-1370

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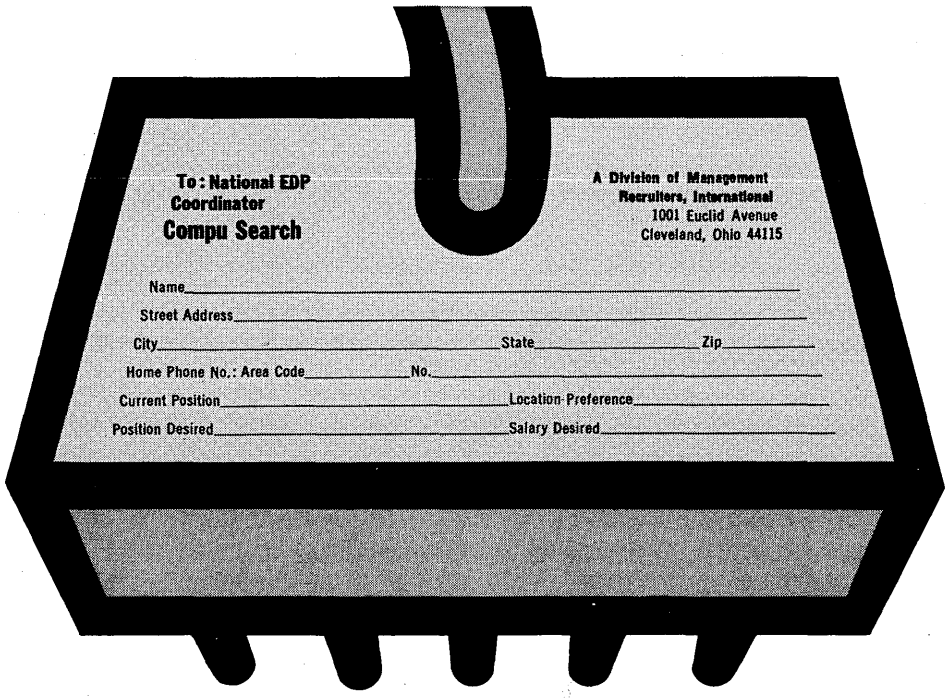

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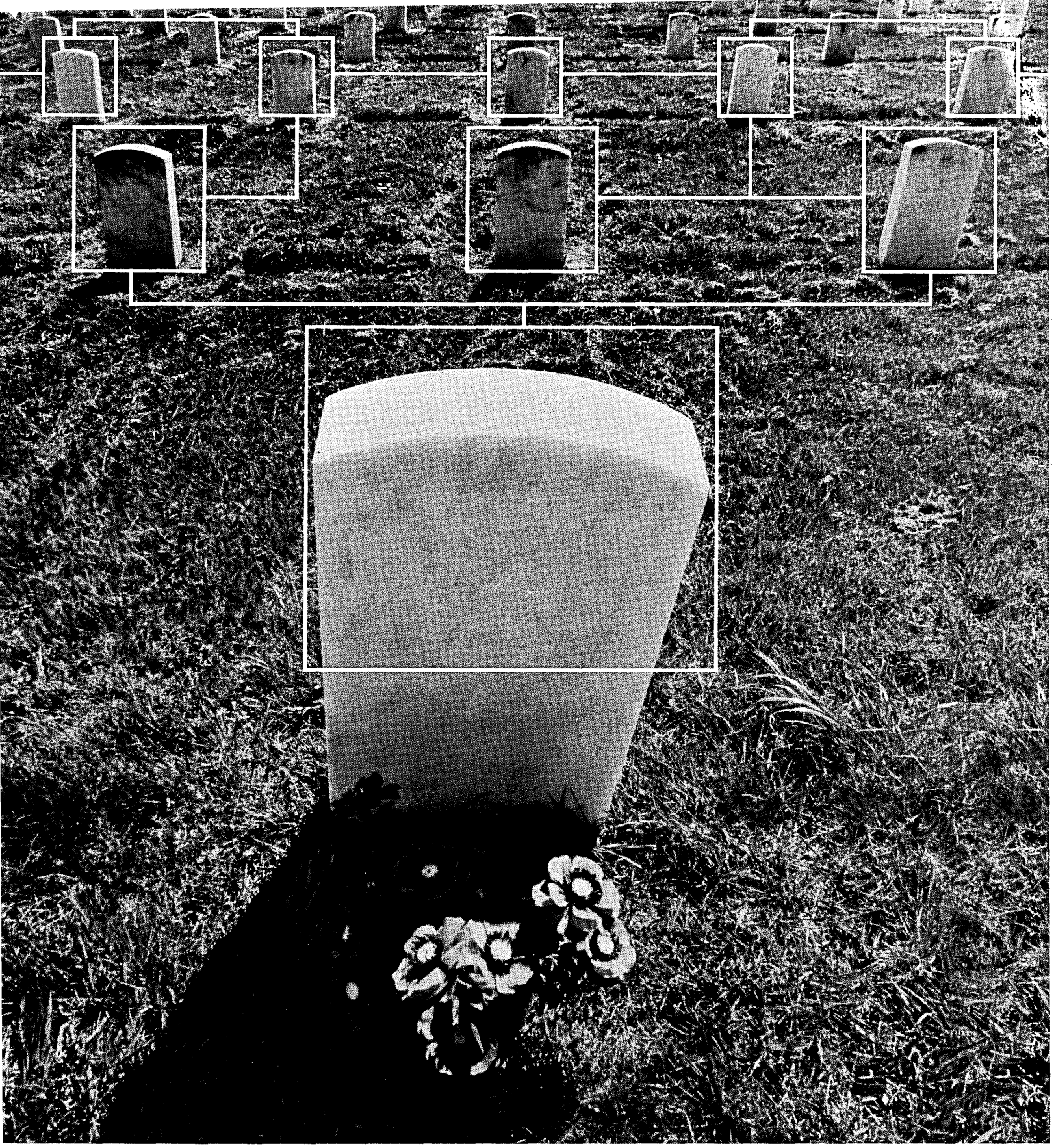

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All demand fail-safe technology – the finest electronics and systems available.

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LTV Electrosystems has the scientific and engineering talent, fast-reaction capacity and the production facilities (15 nationwide) to build the sophisticated, new-generation systems our customers need to extend their senses and capabilities into every environment.

Why don't you join us?

See the opposite page for a listing of current professional opportunities at LTV Electrosystems.

LTV ELECTROSYSTEMS, INC.

P.O. BOX 6030, DALLAS, TEXAS 75222

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CIRCLE 315 ON READER CARD

sort of transaction goes on all the time: it is the basis of existence of most computer user's groups. Software is also peculiar from a legal point of view, in that it can be stolen without depriving the original owner of anything tangible, whether of wealth, material possessions, or capability. Like a picture of a 1970 automobile, it may have a value far beyond its material worth, and it should be legally protected in some way. But patentable? That's another question.

There are many things that, in the light of computer technology, are unclear about patent law. Obviously the intent of patent law, as originally developed, is not entirely applicable to a technology whose essential components overlap the bounds of "process" as understood by patent lawyers of thirty years ago. And I am certainly no lawyer by any stretch of the imagination. But I hope the fallacies of today will not become the legal arguments of tomorrow.

LYNN D. YARBROUGH
Arcon Corporation
Wakefield, Massachusetts

acrobreves

Sir:

In response to Mr. Vladimir Pravikoff's letter appearing in April, I would like to state that Computer Guidance Corporation has compiled, and will have available for distribution, a list of acronyms and abbreviations of all data processing terms that we have been exposed to in our 10 years.

Anyone desiring this list can obtain one by writing to: Mr. J. P. Tutunjian, Computer Guidance Corporation, 777 Third Avenue, New York, New York 10017.

J. P. TUTUNJIAN
New York, New York

gimme a glitch

Sir:

The "Willya Ifya syndrome" is a standard problem an Original Equipment Manufacturer in the electronics field has to live with. The prospective customer, through the salesman, says, "Will you add this special logic glitch for me? If you make it a zlump instead of a zampf, then I'll buy it."

The OEM then has to decide:

1. How definite is the prospective account's ultimatum;
2. Is it worth the product planning and engineering time and expense to cost out the ultimatum;
3. How doth it profit the manufacturer to contrive the unique glitch?

These three questions must be gone through with almost every field request precipitated by what, in many cases, are casual questions asked by the prospective account. The problem the home office has is that it is very difficult to determine: "Did the salesman make a realistically solid attempt to sell standard off-the-shelf hardware?" "Did the prospective account make a realistic systems study of his requirements before he demanded his special glitch?"

Salesmen are not systems analysts, they are salesmen. Many prospective accounts do inadequate systems studies. This inadequacy forces an OEM to waste time processing a certain number of field requests that represent superficial systems planning. The question the OEM has to answer is, "How much systems review and backup should an OEM give its salesmen and its prospective accounts before it accepts special requests or even standard orders?" To put it another way, "How does an OEM increase the net profit on each order it processes?"

Processing the statistics required to give an honest answer to this question would be an exhausting job. Perhaps big enough to turn over to the Ford Foundation. But unless an OEM answers this question correctly, his net profits will continue to be in close contact with the zero line.

HERBERT REICHLIN
Nashua, New Hampshire

cobol fumble

Sir:

The New Products section of your April issue carried a software story (pp. 247) about the recently introduced STATPAC (statistics package) for our PDP-9 computer. The story erroneously stated that the package is written in COBOL. STATPAC is, in fact, written in FORTRAN.

MARK NIEBERG
Manager, Public Relations
Digital Equipment Corp.
Maynard, Massachusetts

DATAMATION welcomes correspondence about the computer industry and its effects on society, as well as comments on the contents of this publication. Letters should be typed, double-spaced, and brief. Only those reaching the editors by the 1st can be considered for the next month's issue. We reserve the right to edit or select excerpts from letters submitted to us.

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2. **DEGREED MILITARY PERSONNEL** with any computer background
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- Computerized Process Control
- Management Information Systems
- Systems Planning/Development
- Business Systems, Programming
- Applied Mathematics
- Scientific Computation
- Logic/Digital/Circuit Design
- Software/Applications Packages

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Joseph Albert or phone 505/982-4436
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- DISPLAYS/PERIPHERALS
- SYSTEMS INTEGRATION/TEST
- MICROELECTRONICS

Software

to PROGRAMMERS ANALYSTS
- LANGUAGE DEVELOPMENT
- COMPILERS/ASSEMBLERS
- SYSTEMS DESIGN/ANALYSIS
- SCIENTIFIC PROGRAMMING
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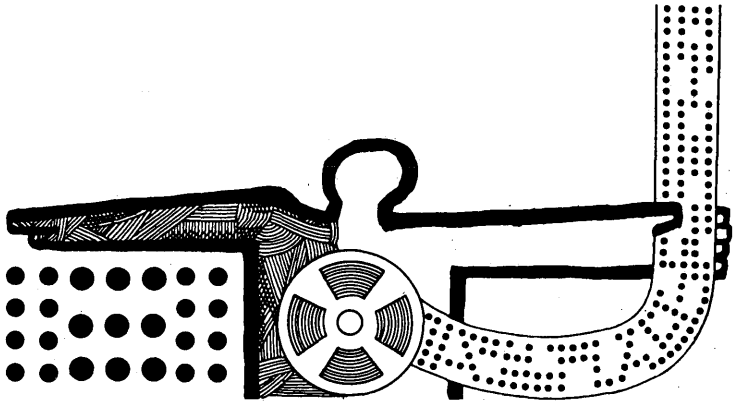

PROGRAMMERS
SYSTEMS AND BUSINESS

Systems programming is in three areas of application: 1) Develop on-line systems for hospital data management. Must have IBM 360/DOS and assembly language background; 2) Perform test data programming on advanced aerospace projects. Must have CDC 6000 experience; 3) Coordinate between programming and manufacturing organizations. Must have A.P.T. systems experience. BS in math or engineering is required for all above positions. Business programming: Develop COBOL programs for hospital business offices. Must have degree and two years' experience.

For further information please write J. N. Love, Professional Placement Manager, P.O. Box 504, Sunnyvale, California 94088. An equal opportunity employer.

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MISSILES & SPACE COMPANY
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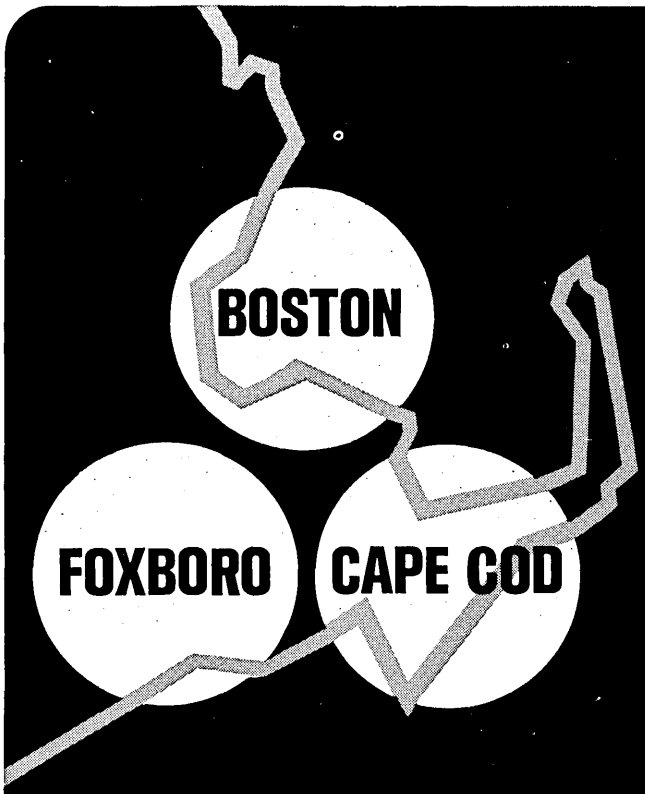

PROGRAMMERS AND SOFTWARE SYSTEMS DESIGNERS

GET THE BEST OF 3 WORLDS.

Foxboro offers you responsibility, diversity and hands-on programming experience with the team of professionals who are setting the pace in computer controlled process systems development.

The complexity, size and world-wide diversity of existing projects and experimental programs now underway are greater than at any other time in our 60-year history. Foxboro sales and facilities have tripled in the past ten years. Our 1968 sales topped $120 million, and our employees number over 7,000.

And we're in Foxborough, Massachusetts. Which means you'll be in the midst of some of the most pleasant, uncrowded New England countryside you could want, yet only a half-hour from Boston, Cambridge or Cape Cod.

We invite you to explore the career positions now available in the fastest growing area of computer application, particularly if your experience and interests relate to the following openings.

APPLICATIONS PROGRAMMERS

Several new positions exist requiring varying levels of experience. Creative application programmers are sought who are capable of taking complete responsibility for bringing process control systems software from their introductory stages of design through to full real time simulation testing and installation. Experience is required in one or more of the following areas: Real Time Executive and/or Real Time Input-Output, Time Sharing, Batch Control, DDC, Setpoint Control and Multilevel Programming.

SOFTWARE SYSTEMS DESIGN

Senior Programmers are sought to work in a creative environment, developing a new generation of digital technology. Development programs encompass advanced Real Time Systems, Computer-based CRT Display Systems and Man-Machine Communications. A degree is required, with a minimum of 3 years' programming experience in leading development efforts in operating systems, languages and communication, and control software development. Successful candidates will be responsible for all phases of program designing, coding, checkout and documentation.

Interested individuals should forward a resume or a detailed letter to Mr. Tom Bryant or call him collect at (617) 543-8750, The Foxboro Company, Professional Placement Office, Neponset Avenue, Dept. D6 , Foxboro, Mass. 02035. Foxboro is an equal opportunity employer.

FOXBORO®

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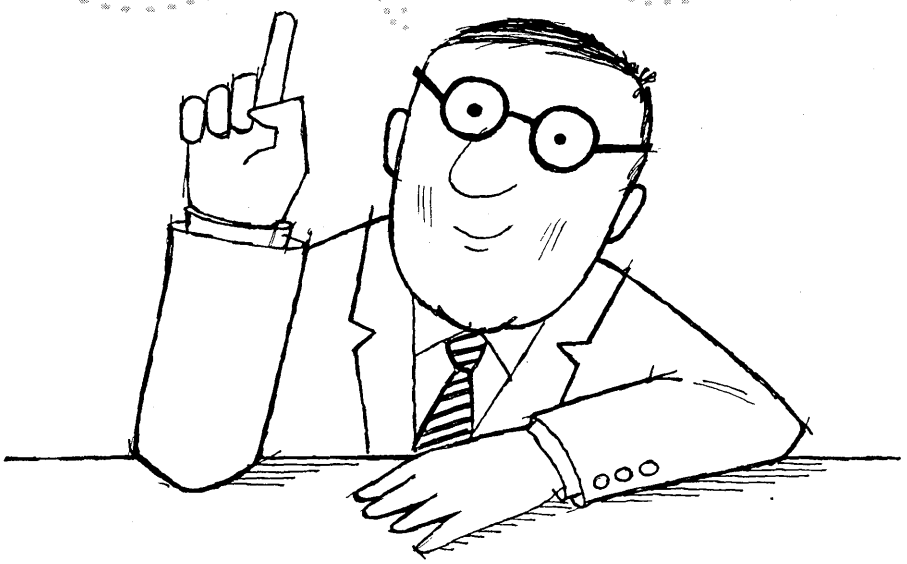

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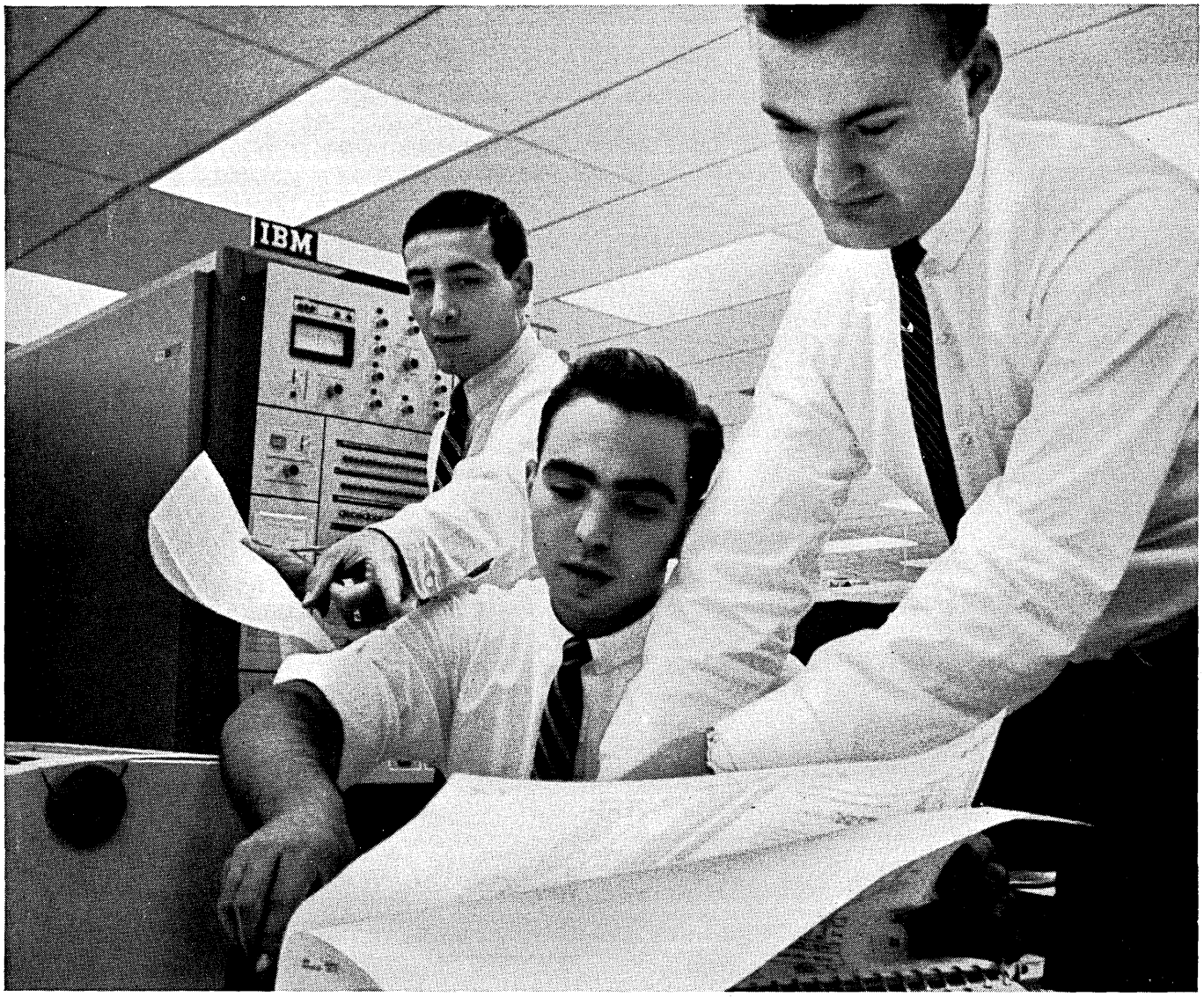

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the forum

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

WHAT ARE IBM'S CORPORATE OBJECTIVES?

Much has been said, pro and con, on the question of separate hardware/software pricing, what it would do for (or to) computer users and how it would affect IBM. Mr. Brandon, in his recent DATAMATION guest editorial (April 1969) stated that "for the sake of the industry" he is unalterably opposed to breaking up IBM or drastically changing its corporate objectives. Pray tell me, what are its corporate objectives? Are they to develop compatible DOS and OS/360 operating systems, or fast efficient sorts and compilers, or a GIS system, or a simple Job Control Language, or over 100 different manuals with addendum after addendum, or to minimize the core requirements for its operating system, or to guarantee its software or to produce the most efficient hardware in the industry, or the most efficient third generation software, or, perhaps only to sell computers and let everything else fall where it may.

Pity the poor third generation user as noted in a recent N.Y. Times advertisement (April 13). "Wanted—OS 360 Specialists—In the land of the blind, the one-eyed man is king." Sounds kind of desperate, doesn't he?

The computer industry is at the crossroads. It now has the opportunity to change the status quo. The question is whether the user ever had it so good . . . or bad. I doubt that IBM will voluntarily relinquish its monopoly in systems software. And what is systems software anyway except those programs that a computer manufacturer chooses to implement? And what's not systems software? Well, it's those programs that the manufacturer was not pressured into implementing. That's how software is built by manufacturers . . . just enough to get by and who really cares how good it is . . . unless it may sell more computers.

I am associated with one of those small software houses that has prospered. ADR has developed software for sale, that does sell. But you must admit it is difficult to compete against free software. So until IBM markets all its software separately; until IBM is forced to sell its software solely on its merit in a free and competitive market; until then software companies will not be able to market improved software that they are technically qualified to develop . . . and until then I sympathize with all those managers in data processing departments who spend half their waking hours explaining why their computer applications take twice as long to implement and run twice as long as estimated. The status quo is safe and changes create uncertainty. But let there be no mistake, today's software is substandard. I care about that. Do you?

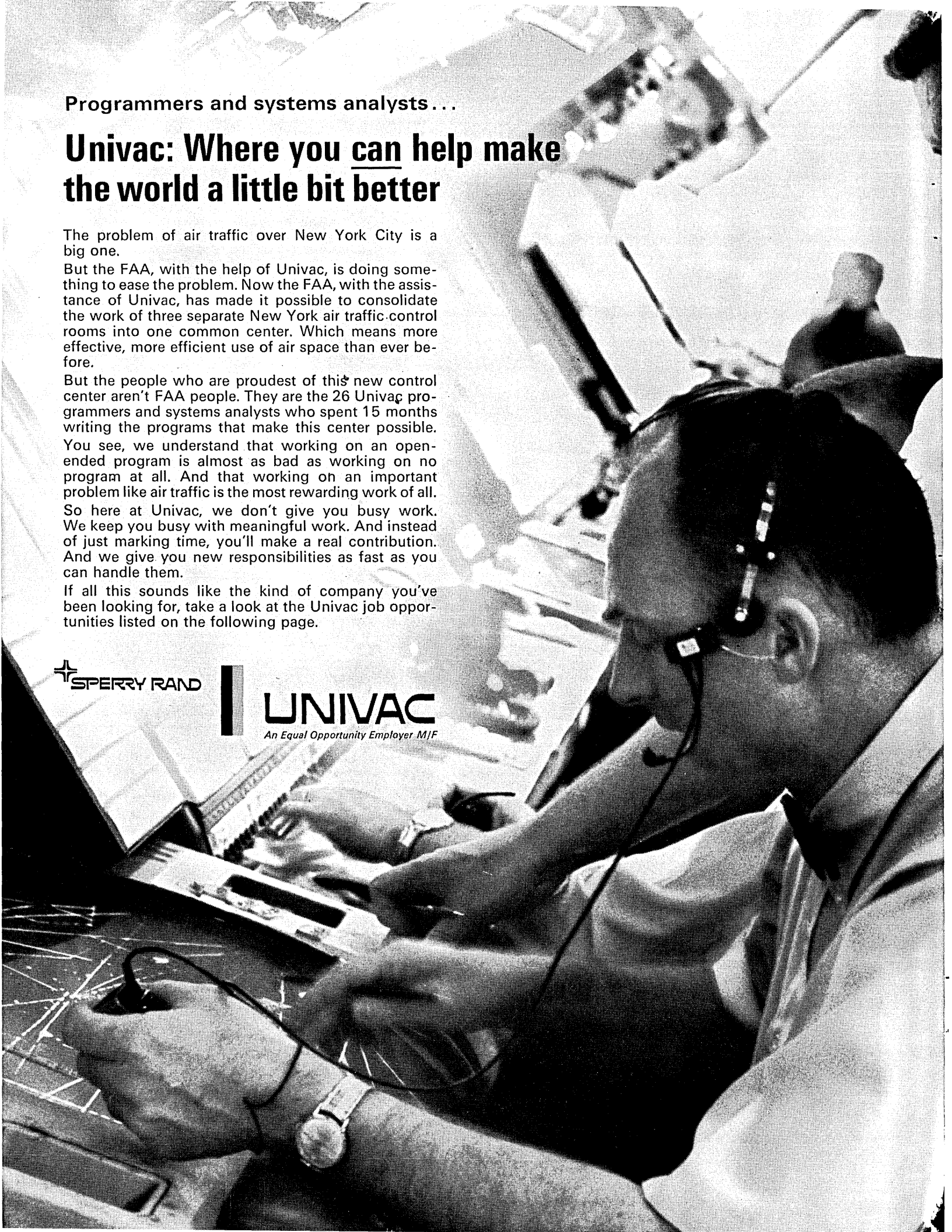
—MARTIN A. GOETZ

THE BIGGEST SOFTWARE COMPANY

King Solomon obviously never intended to chop the child in half. All he wanted to do was correct a situation in the simplest fashion and with the least amount of pain.

I put forth, therefore, that breaking up Gargantua lacks wisdom and could be extremely painful. And even if we ignore the fact that splitting up IBM is only somewhat less complicated than splitting the atom, we are still faced with the real issue: what benefits do we derive?

I doubt very much whether IBM will be shattered into a vast array of independent, inefficient corporations. The obvious and most likely answer would be a division between hardware and software operations. Spinning off the IBM Systems Development Division could provide one of the solutions, but what does that accomplish that is



Programmers and systems analysts...

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But the people who are proudest of this new control center aren't FAA people. They are the 26 Univac programmers and systems analysts who spent 15 months writing the programs that make this center possible.

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not accomplished by a rigid regulation governing the separate pricing of hardware and software?

But the hue and the cry is echoing throughout the land. We all want to see a little IBM blood flow. And so be it. What we have to remember, however, is the fact that the whole purpose of antitrust legislation is the protection of the consumer, not the punishment of the company. As such, the Justice Dept. would require SDD to operate profitably. Although the department cannot wave a magic wand of profitability, it can prevent a company, in most cases, from intentionally operating at a loss. This then would provide us with some insurance that competition with SDD would be somewhat equitable.

Eventually.

But I repeat . . . what does the split-up accomplish that separate pricing doesn't? Some argue that separate pricing will favor IBM whether SDD is spun off or not. Since IBM can amortize their software development costs over more customers, the unit price should be less than that of their competitors. Furthermore, since there are more IBM computers in the field, independent software firms will undoubtedly produce more packages for this market. This, in turn, will provide the IBM customer with more software and better software.

I can't deny that IBM would have a clear-cut advantage, but it would be a temporary, short-lived one. For instance, IBM would probably, initially, amortize their software over all of their hardware customers, even though this is highly unreasonable. But all IBM customers do not want all of IBM's software. Therefore, PL/I, as an example, should be amortized over a small percentage of IBM customers. As the independents' share of the market becomes larger, the prices for their software will drop, while IBM's prices will rise due to a receding market. It's not simple supply and demand. It is also a question of the quality of the supply and the realism of the demand.

In order for the independent software firms to capture mass markets, they will need to produce "plug compatible" software, i.e., programs which are externally identical to the de facto-standard it replaces (IBM software). This will be the order of the day until they have proved their capability in the marketplace and until they master the art of mass distribution and merchandising. It should be noted that being plug compatible causes a loss of efficiency, although this is a small price to pay when considering the marketing aspects of software packages.

To take an example which is not too technical, in maintaining plug compatibility in PI SORT (a Programmatics replacement for IBM's DSORT), a certain amount of efficiency was lost which could have been gained by not being compatible. In sorting on random access devices, it is desirable to write physical blocks of a certain length and to read back blocks of a different length which is not known at the time the blocks are written. The IBM System/360 hardware has the capability of doing this, but the software does not. This problem does not arise in tape sorting and, alas, virtually all manufacturers' disc sorts use thinly disguised tape sorting techniques.

IBM software is the easily identifiable market to attack. However, packages will certainly be developed for other manufacturers as well. There are both technical and economic reasons for this. First of all, once a program has been produced for a particular computer, much of the work involved in producing the same program for a different computer has been done. The design, most of the documentation, the reference manuals, and even some of the marketing groundwork is done. It can then be produced for a new computer at a fraction of the cost of the original program. Although there may be a smaller market over which to amortize the costs, there are fewer costs to amortize. Secondarily, since the software market for IBM computers will become extremely competitive, forward thinking software firms will focus attention on the less competitive markets represented by other computers. There exists a kind of basic self-

regulating situation in this regard.

Therefore, I don't see any true advantage to the consumer in spinning off SDD. But in any event, I see no reason for concern on the part of the software industry. IBM has never demonstrated its ability to produce quality or even adequate software. The reason the SDD product survives is merely because most users don't realize how really bad it is since there is no broad basis for comparison. As a separate corporate entity, out there in the hard, cruel, motherless business world, SDD could not exist for long.

Maybe, then, throwing SDD to the wolves isn't such a bad idea after all.

—DAVID E. FERGUSON

LONG-TERM IMPACT ON THE INDUSTRY OF THE IBM COURT CASES

To a large extent, IBM created the computer industry. Starting from a position of disadvantage, IBM has assumed the dominant position in the computer market. It had the financial, research, educational, manufacturing, field engineering and marketing resources to accomplish this feat.

It is particularly interesting and pertinent to note that IBM was able to accomplish this while operating under a *Justice Dept. Consent Decree.*

Several companies, and the Justice Dept., have brought suits against IBM. The cumulative effect of these lawsuits is to focus a great deal of attention on the computer industry, and raise the basic question of whether or not this industry has a truly competitive market.

One basic test to determine competitive opportunity in a market is to analyze the ability of new companies entering the market to grow and prosper. This test assumes that if newly formed companies, with limited management and financial resources, can grow and prosper the market is openly competitive and substantial opportunity exists.

The proliferation of new companies in our industry certainly indicates that there is much opportunity in the market as it is structured now. In fact, there is so much opportunity that poorly conceived and managed companies

can easily obtain financing. This—not IBM—is, in my opinion, the great threat to the computer industry's future.

Even if IBM wanted to completely control and dominate this market, and was free to do so, it could not, because IBM does not have the human resources to grow rapidly enough to take advantage of all existing market opportunities.

Our industry is in the process of maturing. This dynamic industry is rapidly becoming a basic industry to the world. Historically, basic industries have tended to become regulated industries in the United States.

Unfortunately, lawsuits, antitrust regulations and consent decrees, whose purpose is to regulate markets, have historically damaged the market. Dismantling the strong factors in the market, in an effort to protect the weak and inefficient, will lead to additional regulation. If the pending lawsuits and antitrust actions are carried out, this new basic industry will be damaged. Regulation and antitrust action are not necessary in the computer industry for the simple reason that the market's appetite for computers and services is larger than the combined capacity of all the companies in existence to supply these services.

At a time when the market for products and services is so dynamic, and financial resources are so easily obtained, thoughtful managers should be carefully building their companies to stand the test of time. *This is a time for building.* We should address ourselves to the construction work of building our companies—not to the destructive work of dismantling IBM.

The leaders of the emerging companies should be developing products, services and human resources that can compete head on with IBM and *win.* The best way to reduce IBM's market dominance is by being more innovative at creating and marketing products and services—not through court action.

Independently and corporately, we have had opportunities in this new industry that outstripped our boldest dreams. It would be a sorry finish for history to record that in the 1970's a new basic industry with a free market destroyed that free market by thoughtless actions of a few companies within the industry.

As a new industry, we have the opportunity, through enlightened leadership, good business practices and fair competition, to build a great basic industry, free of regulations, other than the laws of the market place. Surely, we should be wise enough to take advantage of what has been learned in business history. These lawsuits are not in the long-term best interests of the companies filing them or of their stockholders. The current threat, of course, is regulation which will certainly have the effect of slowing down technological advances and creativity in an industry which has shown enormous capacity for both.

The objective of some of these lawsuits is to force IBM to separate its products and services into several categories including hardware, compilers and other supporting software, systems engineering support, education, and field engineering services. Somehow, the organizations bringing these lawsuits feel that this will make the market place more competitive.

Let's look at what will really happen. Dismantling IBM into multiple companies will increase IBM's dominance and control over the market and drastically reduce manufacturing competition. The shrewdest corporate strategy IBM could employ would be to voluntarily separate its services prior to court action. The net effect of this strategy would be to eliminate pending legal action and dramatically increase IBM's dominance and profitability in the computer market. Let's consider what would happen.

Hardware—No other company in the computer business can compete with IBM in mass producing hardware on a price/performance basis. Its manufacturing facilities make it the General Motors of the computer business. The economies of scale in manufacturing will prevail to IBM's advantage. Users desiring hardware will be able to buy at the lowest cost from IBM. IBM will be able to manufacture hardware and sell it at a price, including an attractive profit to IBM, that may well be lower than the manufacturing cost of IBM's competitors. This is competition of the old-fashioned, bare-knuckle type that our industry has not been accustomed to.

Dissenters may contend: "IBM wouldn't do that." I contend that IBM will be put under heavy pressure, by the federal government and the various federal procurement agencies, to do just that. These prices, publicly available, will make the market. Such a situation will inevitably lead to more whimpering in the market place. The hardware manufacturers, now involved in bringing court action against IBM, will find themselves longing for "the good old days."

Another interesting asset, working in IBM's favor, is its huge customer base and marketing ability. Historically, IBM has been able to rent its products at a premium *price* above the market. After being dismantled, IBM would be able to rent its products at a premium profit and, at the same time, deliver its products at the lowest price on the market. Dismantling IBM will

the forum...

allow IBM to change the other areas of its business—some of them marginal profit areas in the past—into significant profit centers.

Field Engineering—IBM has been conditioning the market for years to accept very high field engineering rates by gradually raising hourly rates for a field engineer, without regard to his capability, salary or proficiency. After dismantling, IBM will be able to charge its entire customer base for field engineering services at these rates. Its customers will have no practical alternative except to pay these fees.

Education—IBM has established policies for charging for portions of its education, another service formerly included in its rental price. Examine the charges carefully on IBM's educational programs and, again, you will find substantial profit margins. After dismantling, IBM would charge for all education at similar rates.

Systems Engineering—The IBM systems engineer now available on a consulting basis as part of the rental agreement will become available on an hourly basis at profit margins of some three to four times his salary cost.

The profits derived from field engineering, education and systems engineering are insignificant to IBM compared to the profit derived from the manufacture of hardware. I have discussed each of them to point out that in every single case IBM's market position is enhanced, not weakened.

Dismantling IBM will cause so many problems that the next step will be industry regulation. This can be gracefully brought about by the end of the 70's because of the dependency of our industry on communication facilities. Twenty years from now, under such circumstances, the computer industry will become just another public utility.

The only certain result I can see from this pending court action is eventual federal regulation. If it occurs, we have only ourselves to blame, and our great mistake was that instead of building we tried to destroy. The basic issue to every thoughtful member of this industry is—are these court actions constructive or destructive? Are they building a stronger market place or weakening the market? Weak companies continually seek a regulatory umbrella that will allow them to remain in existence. The strong companies in the computer business share the conviction that it is unnecessary to go to court to beat IBM. We can beat them in the market place today.

—H. Ross Perot

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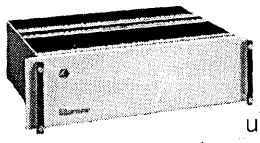

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