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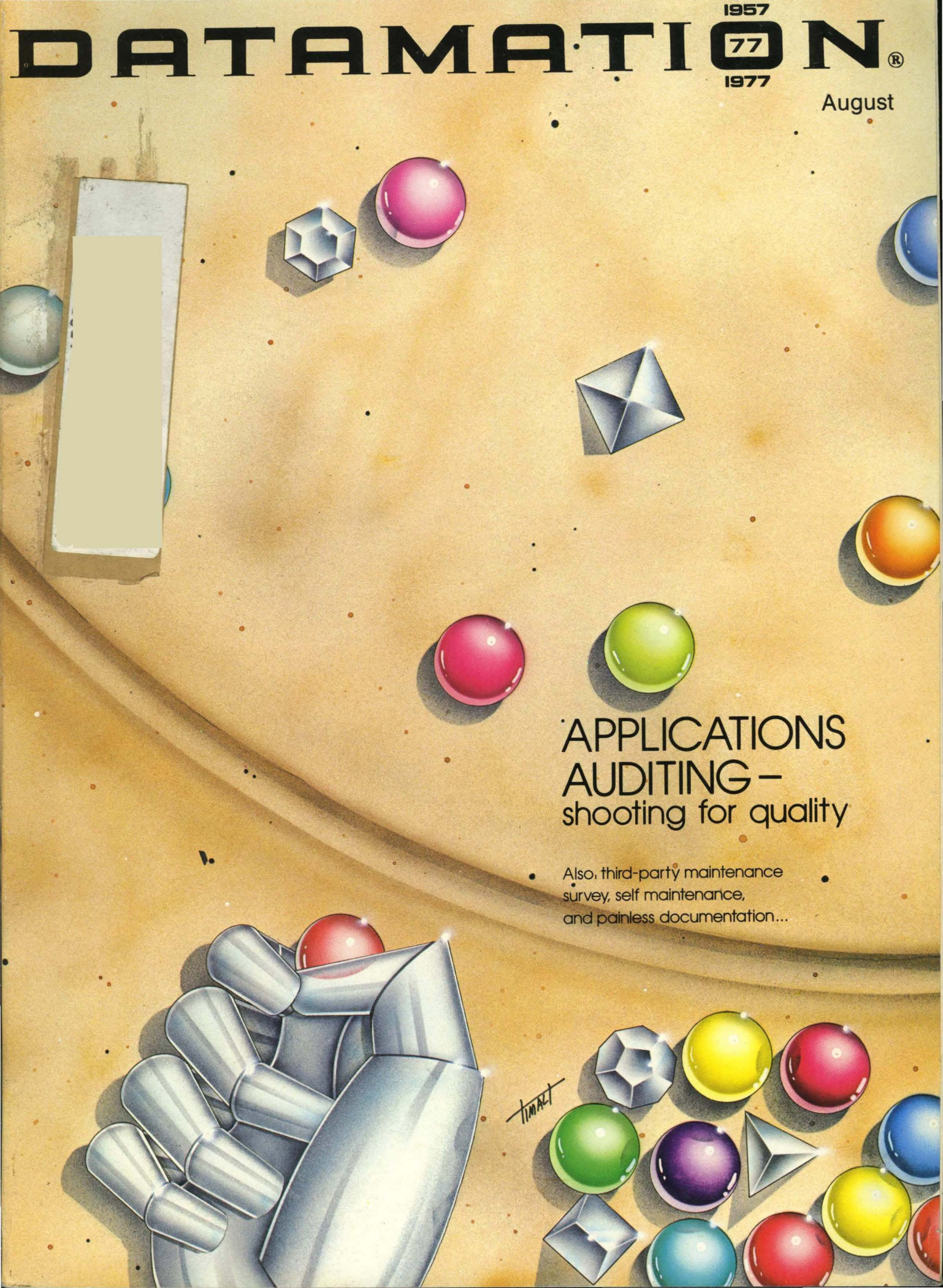

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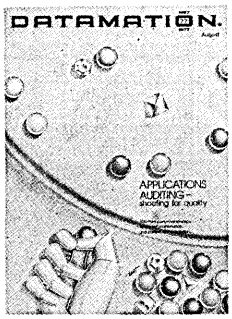


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About the Cover
It may not be as chancy as the old marble game, but with or without technology, auditing your application takes all the skills you can muster. Our design is by Tim Alt: Joan Lesser/Etcetera.

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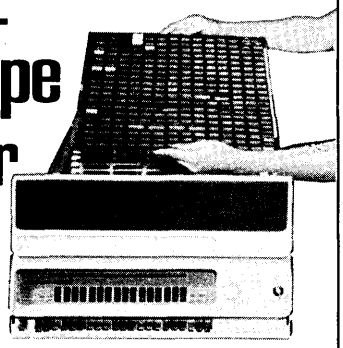
# NOVA and

DIGITAL EQUIPMENT CORPORATION

# PDP-11 minicomputers.



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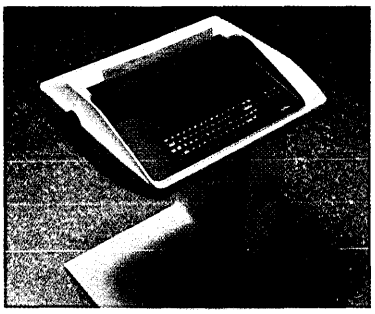
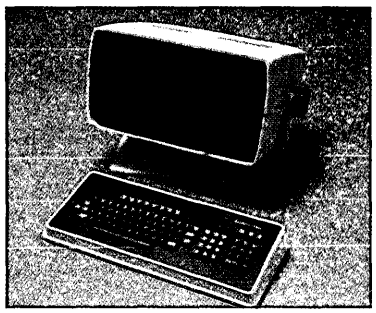

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# Looking Back in DATAMATION®

**On our 20th anniversary**

### July/August 1958

"Dp in Flight" might have been the theme of this issue, as two feature articles examined the use of data processing by the aviation industry. "Digital Computing at Saab" examined the use of computers in the manufacture of high-speed aircraft. Saab used an integrated automatic computing system from the earliest stages of aircraft manufacture, covering all the engineering phases, such as aerodynamics, thermodynamics, layout drawing, weights and structures, fitness for production, and other properties.

Trans Canada Airlines reported the operation of a Ferranti Transactor for reservations and for providing statistical data for future planning. The transactor allowed the system to accept a manual input, provided an answer more complex than a simple yes/no, and also was to be suitable for stock control, mail orders, freight services, and other general applications.

Japanese firms were showing an increased interest in computer installations. Remington Rand had delivered 28 Univacs, 22 120s, and 6 60s. IBM reported 10 orders for 650s, one for a 704 and one for a 705. A Bendix G-15D delivered to Japan National Railways in May already had brought about a 10% efficiency increase in the movement of commodities for the railroad.

### August 1967

Our theme was "Soviet Computers," and the theme article, "Soviet Computer Reliability," reviewed the state of dp in the USSR. The article reported the industry suffering from quality control problems and a lack of capable personnel.

"The BESM-6 Computer" described the newest and fastest Soviet computer, with a claimed speed of one million instructions/second, and major improvements in peripheral equipment. The system had two sets of peripherals in order to achieve reasonable reliability, commented Paul Armer in his guest editorial on the USA/USSR "computer gap."

We reported on the Assn. for Computing Machinery (ACM) on the occasion of its twentieth anniversary. In 1947 there were fewer than 300 members; in our 1967 article we reported close to 20,000. Today there are 35,000 ACM members. ✿

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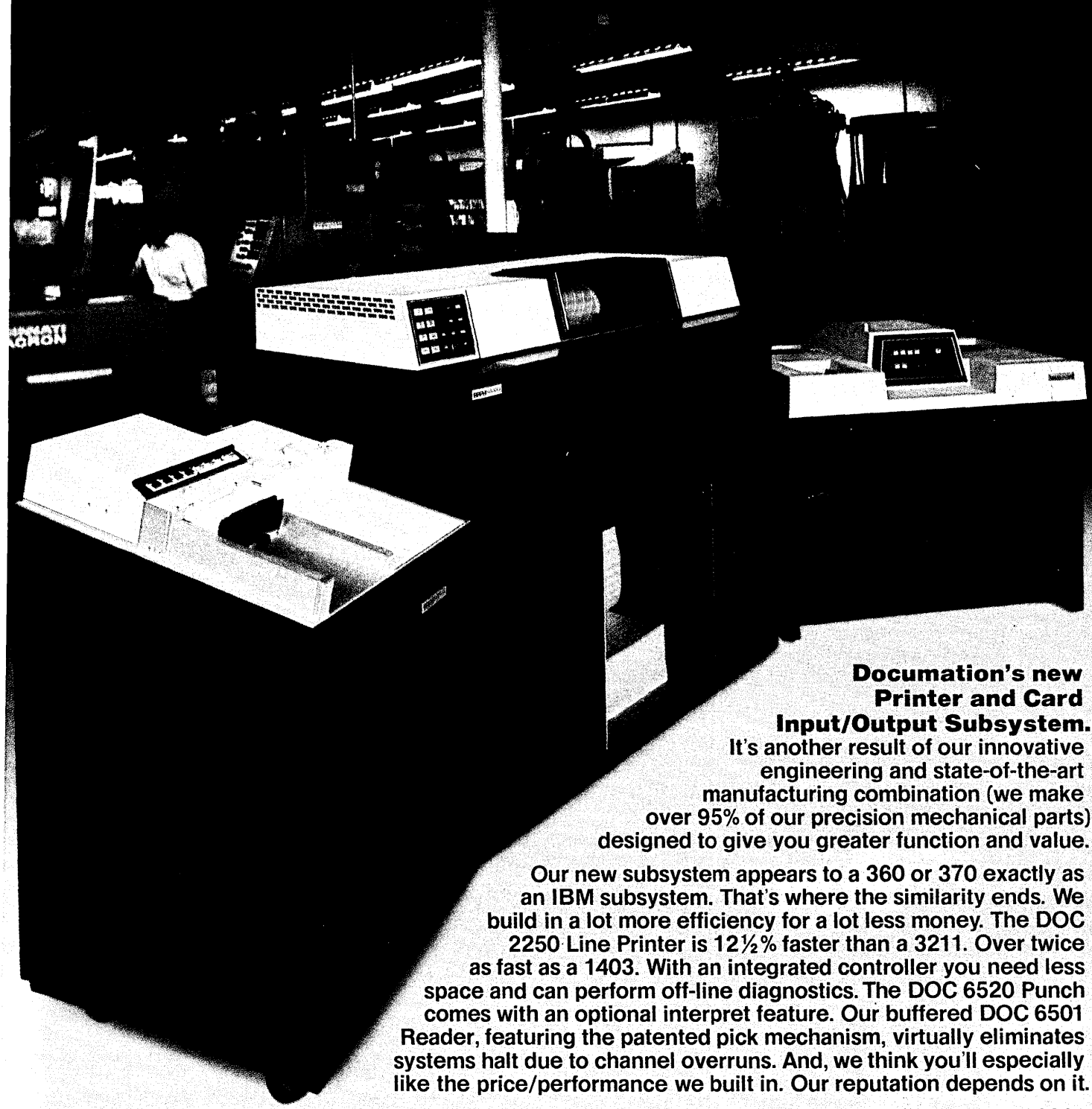

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# "Very impressive... Itel's Advanced System™ was installed and fully functional within three hours and fifteen minutes."

Kenneth Garrison, Vice President,
Information Systems Executive,
Pacific Mutual Life Insurance
Company, Newport Beach, California

"Itel's record installation time was outstanding, especially when ours was the very first Advanced System to be installed. And its performance has proven to be as impressive as its installation.

"With more than $1.7 billion in assests to manage, you can imagine the variety of complex tasks to which we put our EDP equipment. Of course, we knew we could expect performance from the system. Before replacing our IBM 370/155 with Itel's AS-5, we conducted extensive pre-installation tests to determine compatibility, reliability and error correction capabilities of the Advanced System. And all tasks were completed in equal or faster time compared to IBM's 370/158.

"Also contributing to our decision was the fact that the Advanced System would protect our investment in programming, documentation and personnel training. So, not only did we save on initial cost, but we're saving money in the long run, too.

"Choosing the AS-5 was a good move–we've been thoroughly pleased with the Advanced System and with Itel every step of the way. We sincerely feel that Itel deserves every accolade possible for the quality and reliability of their Advanced System, and the quality and professionalism of their people."

# "Incredibly enough, we made no software changes at all when we put the Itel Advanced System™ into production."

Dr. Clair G. Maple, Director of Computation Center, Iowa State University of Science and Technology, Ames, Iowa

"We're thoroughly pleased with the AS-5. Installation was completed with remarkable speed, and its performance has been outstanding. We're quite proud that Iowa State is the site of Itel's second Advanced System installation.

"We were initially receptive to the AS-5 because there seemed to be economic advantages involved. We saw the opportunity to replace the IBM 370/158 and to increase memory size, add secondary storage, upgrade our magnetic tape system and modify the CPU to a model III, all within a price range we could afford. And to be able to do all that without software modifications and without utilizing more space is positively remarkable.

"Here at the university, our Advanced System has between fifteen and twenty thousand users. It handles a wide range of activities – from course-related student programs to university-generated academic research. And its performance has been very impressive.

"In fact, we've been very favorably impressed in all areas of contact with Itel – from the outstanding performance of their products to the professional standards of their personnel and the excellence of the service they've given us."

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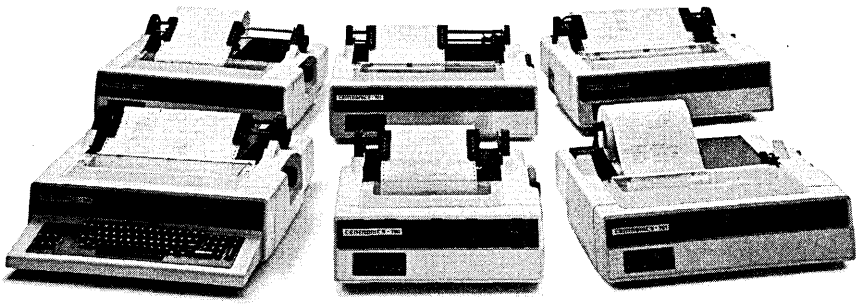
# It's that simple.



## The New Centronics 700 Series.

Now, the features that make our model 700 the best, lowest-priced serial printer are available in a *family of seven* models: uncomplicated modular construction; the reliability of fewer moving parts; high parts commonality; and low price. All of which means a lower cost of ownership.

The new 700 family covers a full range of serial printer requirements: 80- and 132-column format; 60 to 180 cps speed range; bi-directional and logic-seeking operations; and 110-300 baud KSR and RO teleprinters.

Like all Centronics printers, the 700 family is better because we back them with a wide choice of customizing options and accessories. More than 100 sales and service locations worldwide. Centronics' financial stability, and dependability proven by more than 80,000 printers installed.

Simplicity of design, full range capabilities, and better back-up make our 700 series printers simply better. Centronics Data Computer Corp., Hudson, N.H. 03051, Tel. (603) 883-0111. Or Centronics Offices in Canada and throughout the world.

**CENTRONICS® PRINTERS**
**Simply Better**

# letters

### Distributors debate depiction

Your article, "Is the Paper Products Case the Tip of the Iceberg?" (March, p. 148), detailing the Hartz Mountain case of commercial bribery hits close to where your readership lives. The careful and accurate documentation of such purchasing irregularities could have been an excellent service to those engaged in data processing management. Unfortunately, the author's defamatory handling of the subject misdirected your readers and did serious damage to the character of the business forms distributor. For example:

1. The business forms distributor, in general, for some reason which we cannot fathom, has been made to appear untrustworthy and dishonest. Your tasteless illustration captioned, "Distributor is told what the low bid is and comes in below it," portrays him with the horns and tail of Satan, and yet Tabulating Stock Forms, Inc., the company giving in to the requests for kickbacks from the data processing v.p. Corey is not a distributor at all, but rather a *direct selling manufacturer.* Were you aware of this fact?
2. Frank Knox, the only authority actually quoted by author McCartney, was contacted by this association to ascertain his impression of the article. You may be certain that Mr. Knox was not informed that he would be quoted. Second, Mr. Knox did not say, "If a fellow's susceptible to any kind of illegal dealings with *distributors,* this is a bad place for him to be—at least from the company's standpoint." Why should he? Frank Knox worked for years for one of the country's largest and most successful *distributor* organizations. Third, neither case of purchasing irregularities mentioned by Mr. Knox involved a distributor. Both incidents concerned salesmen from forms manufacturing plants, one of which had as a silent partner the assistant purchasing agent of the company being defrauded. Were you aware of this fact?
3. There are six unnamed authorities quoted, each maligning the distributor. Why? Who are they? You have allowed Moore Business Forms to be named in that article as an example of a supplier whose sales are from a list price and "no shenanigans." We respect Moore Business Forms and their policies, however, they surely use their ". . . own trucks for delivery . . . buy their paper directly from the mill . . ." and have a price list that is subject to flexibility in order to meet competition. These are not unusual practices in this industry . . . in other industries, yet author McCartney would have the reader believe that distributors who do the same are unscrupulous.

In order to instigate computer room fraud, according to one unnamed source, ". . . you have to go through a paper or forms distributor." We should be most interested to hear any supporting documentation of this kind of a charge. People in your own industry must find this statement incredible.

And we would like to know who felt the need to praise Moore Business Forms in print, and be so quick to point the finger at the distributor? The facts are that Moore, like the majority of all forms manufacturing companies, acts as a distributor for products they cannot produce on their own presses. This is a standard practice in the industry. Did author McCartney know this and conveniently omit the fact? Why would the term "distributor" be used 14 times in a negative context, and "manufacturer" not once?

White collar crime is not limited to theft, fraud, and bribery. Character assassination via irresponsible reporting can be much more costly to the ethical, honest distributor element in this industry than Corey's scheme was to Hartz Mountain Corp. It would have been a more professional decision to substitute supplier or vendor for "distributor" throughout the article and make the same points without defaming the marketing concept of the independent segment of the business forms industry. We believe you acted most unfairly by posing a constant subrosa question as to the integrity of business forms distributors to your readership.

MEREDITH R. SMITH, JR. CAE
*Executive vice-president*
*National Business Forms Assn.*
*Alexandria, Virginia*

Mr. McCartney responds: Mr. Smith's disagreement with us appears to be more semantic than substantive. We used the word "distributor" in its broadest generic sense, which includes manufacturers' representatives.

No doubt, most distributors are ethical and honest. The vast majority of dp managers and purchasing executives are undoubtedly ethical and honest as well. But that's not the point. What is at issue is the fact that kickbacks and purchasing irregularities exist. Nowhere does Mr. Smith dispute this. Instead, he self-servingly points the finger at suppliers and manufacturers, many of whom, as he himself points out, also function as distributors. Perhaps if Mr. Smith and the association that employs him spent more of their collective energies scrutinizing the activities of the business forms industry, and less time trying to whitewash its image, the few unscrupulous people in the business could be weeded out.

### Committee comments on Cobol

Mr. Beamish's Forum, "A Wish List for COBOL" (May, p. 294), brought up a number of valid and interesting points. Mr. Beamish and your readers may be interested in knowing that the CODASYL COBOL Committee (formerly the Programming Language Committee or PLC) has already dealt with several of his suggestions.

1. The topic of upper and lower array bounds has been discussed, but no conclusions were reached. There are currently no proposals on this subject on the committee's agenda. If anyone is sufficiently interested, I suggest that they submit a proposal.

2. A proposal is currently being processed which would allow values to be set in tables. It is necessarily somewhat limited, but it would accomplish what Mr. Beamish wants. There is significant opposition to this proposal, however, most of it from users. In the meantime, the INITIALIZE statement will set such values dynamically.

3. A recently passed proposal adds additional terminators to all of the "one legged" conditionals, as well as to the IF, and adds a CONTINUE statement. This will solve all of the problems mentioned in item 3. The method was somewhat different, but we felt that it was the best of a large number of alternatives. For example, the IF SIZE ERROR was not attempted because it is known that size error checking is usually very inefficient, and it would be difficult to determine to which statement it applied. The form is COMPUTE . . . ON SIZE ERROR . . . NOT ON SIZE ERROR . . . END-COMPUTE.

4. The CONSTANT SECTION and SIZE were dropped in 1967. ALTER and 77s have also been dropped. The GOTO has not been dropped and probably never will be. It is well known that none of the structured programming gurus can agree on whether it is evil or not.

5. A new statement called EVALUATE has been added to accomplish the same task as a PERFORM . . . DEPENDING ON. It is much more powerful and is relatively easy to use. It is decision table-oriented, so decision table fans are delighted. We compiler writers are sleeping soundly of late, since we are aware that implementation is not exceptionally difficult.

6. An in-line PERFORM has been added by extending the PERFORM and adding a terminator. It was felt that there was no reason to add a DO, which is not a very appropriate word anyhow. The changes are very simple and

# letters

easy for any COBOL programmer to use.

7. INSPECT REVERSED sounds like a good idea. Anyone who is interested should submit a proposal for such an animal.

8. A proposal for "esoteric functions" is now under consideration. It would also allow user-defined functions. The biggest problem is the vast number of reserved words which would have to be added in order to cover all possible functions. Attempts are being made to remove the reserved word requirement, but they have not met with success at this time.

9. A proposal to allow string substitution (shorthand as it were) was recently withdrawn. However, there is a great deal of interest in the topic, and several members have indicated that they will bring in new proposals. The envisioned facility allows the user to define his own forms. He could even use the COPY to bring a constant set in from the library. There is some opposition to this because almost every implementor has a text-editor of some sort which allows such substitution. Some committee members feel that the compiler should not have to perform tasks which are more suited to an editor.

10. The topic of program listings is rather taboo. Most committee members feel that the listings have nothing to do with COBOL and should not be mentioned at all in a standard or the Journal of Development. Personally, I feel that there should be a listing standard as well as a diagnostic standard (both compile and run time). However, this does not seem to be the view of most of the other members. Perhaps sufficient outside pressure could convince more people.

The COBOL Committee is always interested in the viewpoints and comments of the general public. Anyone is free to submit proposals and argue his/her case before the committee. Any correspondence directed toward the committee should be sent to: Chairman, COBOL Committee, CODASYL, P.O. Box 1808, Washington, D.C. 20043. A substantial dialogue between the committee and the public should help make the COBOL language a better tool for the future.

DONALD F. NELSON
*Palo Alto, California*

### Here comes the judge

I am going to nominate Edith Myers to the next vacancy on the Massachusetts Supreme Judicial Court. She is far more sensitive to contemporary legal issues involving the computer industry than the present bench. In her article, "Data Processing and Taxes" (May, p. 155), she reported that our court exempted hardware owned by a time-sharing corporation from personal property taxes under the exemption available to corporations engaged in manufacturing. Unfortunately, our court rejected that exemption, notwithstanding the fact that the definition of "manufacturing" does not appear in the statute and is left for the court to determine, and that the court has determined that corporations that generate electric power commercially are so engaged in manufacturing. They ruled that the statute, enacted during the Great Depression, was intended to grant that fundamental exemption only to "mills and factories."

Apparently the court simply could not appreciate the significance of the users of computer technology to contemporary society, and could not recognize that the granting of the exemption was as normal an act as it is with respect to more traditional business corporations. It seems to me that the court well could have been moved to act more favorably if corporations in the same circumstance as the one that brought the case joined in the action to indicate the general significance of the question. This ostrich-like attitude is all too common because many people think that by keeping quiet they will avoid the impact of various tax laws. Experience at present with the sales tax laws indicates the error of this approach.

ROY N. FREED
*Powers & Hall*
*Boston, Massachusetts*

### One more kind

Here is an 11th category of answer to Norman Grabowsky's excellently annotated programming problem ("What Kind of Programmer Are You?" March, p. 134). This answer might have been written by a programmer using FORTRAN 77, which is the proposed revision to the ANSI Standard. The example uses the new character data type and the new Block-IF statements (including the ELSE IF statement, which avoids messy nesting when it is not needed), as well as the list-directed I/O.

```
      INTEGER I
*       . . .
*CHANGE THE VALUE OF I.
*(VALUE OF I MUST BE 1 OR 2)
      IF (I.EQ 1) THEN
        I=2
      ELSE IF (I.EQ.2) THEN
        I=1
      ELSE
        PRINT *, 'ERROR—VALUE OF
          I WAS', I
        STOP 'VALUE OF I WAS NOT
          1 OR 2'
      ENDIF
```

BRUCE A. MARTIN
*Middle Island, New York*

### We stand corrected

As public relations counsel to Redactron Corp., we wish to point out an error in the April issue (p. 69). The comparison of equipment cites Redactron as having a printer with a speed of 45 characters per second. The printer in the Redactron word processing system actually has a speed of 55 characters per second.

MICHAEL SLATER
*Roslyn Willett Associates*
*New York, New York*

### Down by the river

We are delighted to note that our company has risen in rank from 25th in 1976 to 19th in DATAMATION's 1977 listing of "The Top 50 U.S. Companies in the DP Industry" (June, p. 64).

We must, however, express some concern about the paragraphs purporting to describe our company (p. 69).

First, our proper name is and always has been Management Assistance Inc.

Second, if the address provided is meant to be ours, please supply us with dredging equipment or direct us to the nearest underground tunnel. I'm afraid you have us located under the East River. Our address is 300 E. 44th St., New York, N.Y. 10017.

Third, in 1976, BASIC/FOUR business computer systems contributed 50% of total MAI revenues; peripherals and terminals contributed 20%; maintenance and related services contributed 30%.

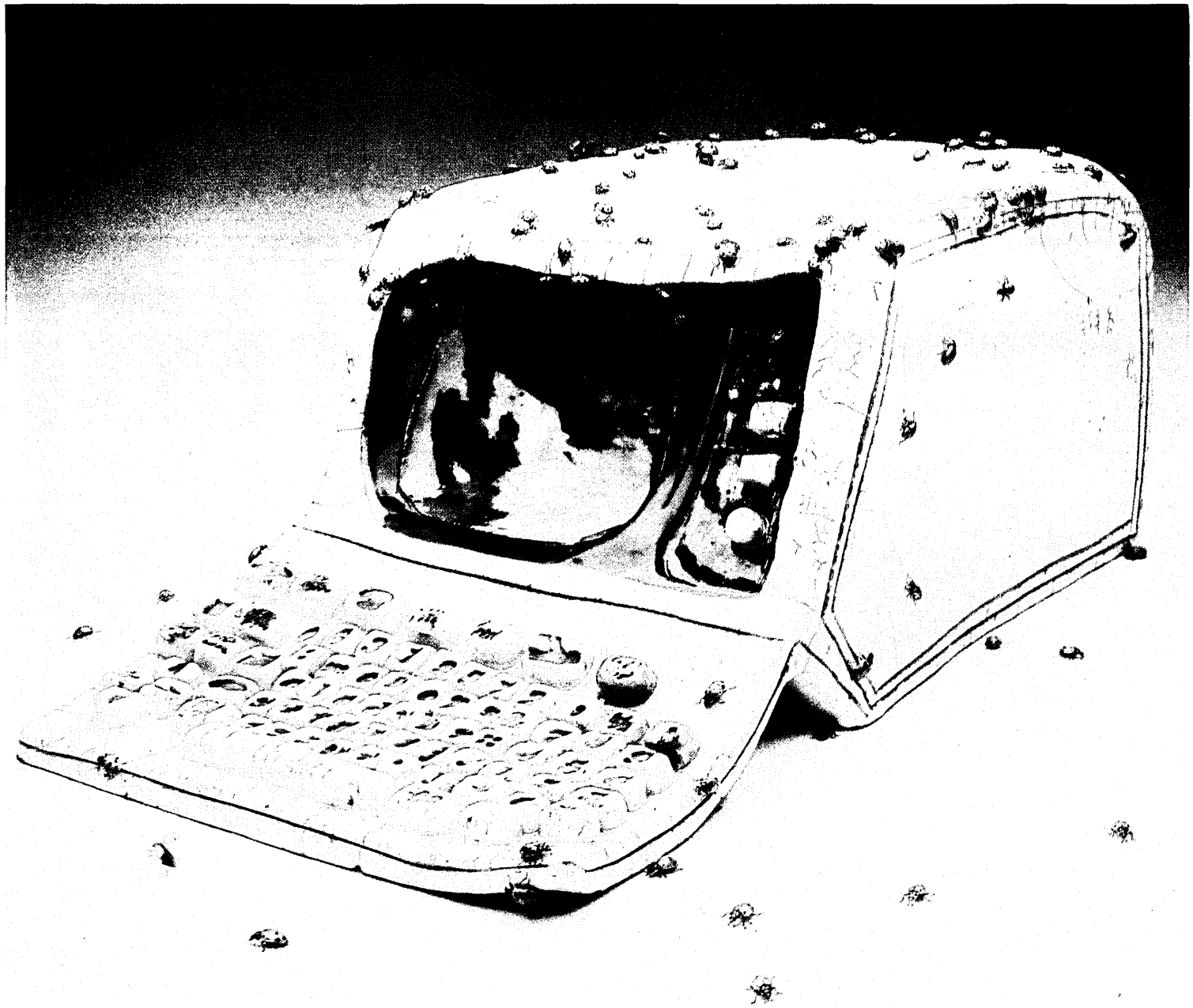
BRENDA J. UDOFF
*Director of Advertising*
*Management Assistance Inc.*
*New York, New York*

### Computer acquitted

I was surprised to see it stated that a computer killed the better part of the spaceship crew in "Forbidden Planet" (" 'Demon Seed': Computers in the Flesh," May, p. 47). In that picture, the crew was attacked by a monster created from subconscious thoughts fueled by the planet's giant power supply.

It was not a computer involved in the actual creation of the monster, but rather the subconscious mind of the professor. The confusion probably comes from the intelligent robot character, "Robbie the Robot."

ROBERT MERSHON
*Project Manager*
*ITT Financial Corporation*
*Chippewa Falls, Wisconsin* ❋



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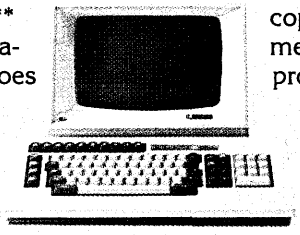

Let you make hard copy records to document intermittent problems.

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CIRCLE 81 ON READER CARD

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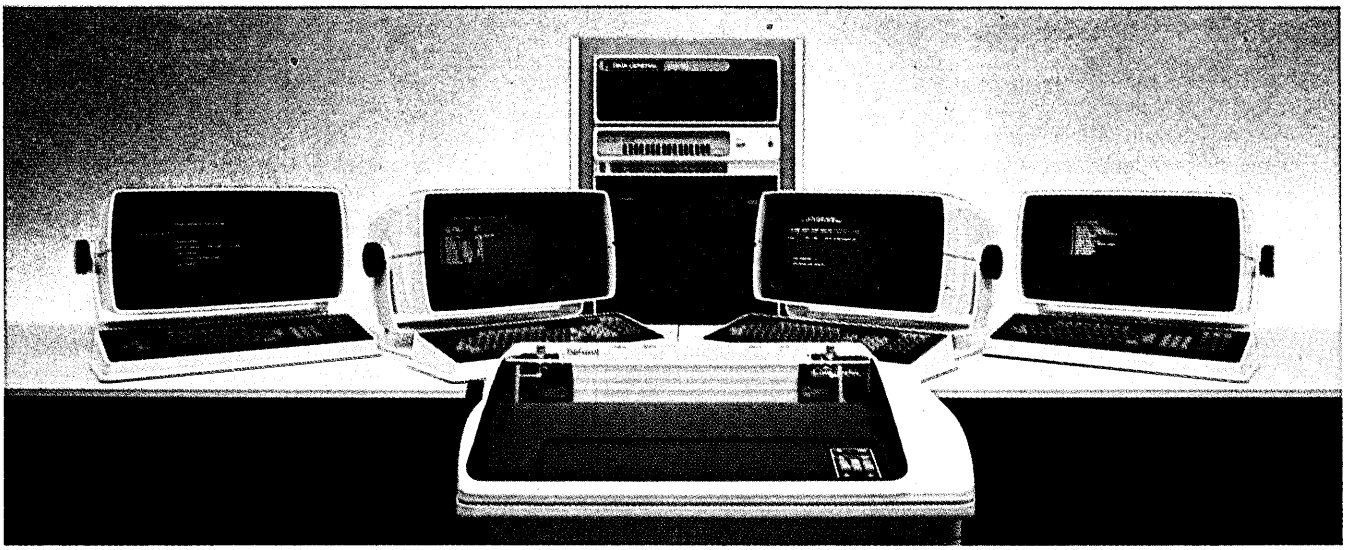

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# LOOK AHEAD

NEW YORK'S COSTLY BLACKOUT

Blackout price tag: A source close to the underwriting side of the insurance business estimates that claims filed as a result of dp-related damages--damaged disc drives, lost data, data that had to be reprocessed, added work shifts, work that had to be fielded out to service organizations--could easily run into the millions of dollars. And that doesn't take into account damages that users have not yet had time to fully assess, or business lost because systems were down, the source said. Wall Street alone was out a big bundle because of lost commissions resulting from missed trading time. (See related story on page 131.)

THE IBM 3033: ONE OF A SERIES

Some IBM competitors and leasing companies think IBM has other 3033-like processors up its long white sleeves, such as the 3032 and 3031. They think the announcement date is imminent. The 3032 machine, they say, is a four megabyte machine having roughly the same performance as a 370/158 AP with the same memory ration, but for 31% less ($1.6 million vs. $2.3 million for the 158). The 3031 processor, they say, shapes up as having the computing power of a 370/158-3 with 4MB of memory, though equipped with only 2MB which would help reduce the price by nearly half, a full 45% of the cost of the 158-3.

Compute power ratings for these models and others, based on the price of a 360/65 being equal to 1.0 show that the anticipated 3031 rates at 1.4, the 3032 at 2.4, the 370/168-3 is in a tie with the Amdahl 470V/5 at 4.4, the 168AP, the 3033, and the 470V/6 deadlocked at 7.5, and the Amdahl 470V/7 being the king of the hill at 9.8. A user who helped research the figures decided that, at least for their needs, a 1MB 360/65, currently available for about $350,000 was the best solution.

SIBLING RIVALRY

Pacific, Pioneer, and Orbit are not NASA projects, but code names for three new IBM products. At least two seem to be indicative of the love-hate relationship between the General Systems and Data Processing divisions. Orbit is rumored to be the replacement for DPD's 3790 communications system--a hastily conceived response to competition that suffers from inflexibility and use of aging technology. A developing competitor for the 3790 is the GSD's Series/1, but we hear the Series/1 will be used in Orbit, due out early next year without all the features of Series/1 because of the constraints of the Systems Network Architecture (SNA).

While use of SNA is corporate policy, we understand General Systems is fighting pressure to limit its mini to that standard since a major market in networks is IBM users who don't want to go the SNA route. An SDLC hardware adaptor has been developed for the mini, but the software hasn't been announced yet, presumably because of the argument over whether it will be tailored to SNA.

Pacific is an extension to the upper end of GSD's System/3--bigger and with more disc capacity than the 3/15. GSD already is encroaching on DPD's 370/115 and 125 territories. Pacific is expected to be announced by year end. Speculation has it Pioneer is the name for the anticipated System/36.

THE VENDOR BEWARE!

Caveat emptor is dead--at least in Australia where a new trade practices act went into effect July 1. And computer vendors have picked up their marbles and won't play anymore. Since early July, IBM, Burroughs, NCR, Univac, Digital Equipment, Data General, and others have been refusing to sign contracts or renewals on most of their products.

The act gives the buyer "all the cookies," and opens up the supplier to consequential damage suits that could "equal the medical malpractice situation in the U.S.," says one disgruntled source. Two major provisions say in effect that the vendor can't limit his liability for damage to the buyer's business by his products and that he's responsible for making sure the system does the application the user ordered. Although the act applies to products priced under $15,000, such as tape or disc media, these could be part of multi-million dollar contracts, and that worries the vendors.

Take IBM's contracts: a new version says that with the exception of patent claims and personal injury, it is not liable for more than $100,000 or a year's rent or lease fees for direct damage caused by its system. Its warranty says the system will work (not uninterrupted) and meet specs, but not that it will meet the customer's requirements. Current interpretations of the Aussie act say those clauses won't stand up in court; in fact, it's illegal to print anything about limitations.

One legal school of thought says that the exposure to suit under the act is uninsurable, so firms would have to raise prices to cover the risk or stop doing business in Australia. Another says the vendors are "overreacting" and trying a "power play," when they should be revising their contractual practices worldwide to take the responsibility for identifiable problems caused by their wares. Anyway, the Australian Parliament can't begin to resolve the issue since they're on vacation until mid-August. No signing on the dotted line until then--except for the ubiquitous Japanese: Fujitsu's Facom subsidiary, scrambling to extablish itself there, was doing business as usual.

EFT FOR CREDIT UNIONS

Ten Washington, D.C., area credit unions are easing their way into electronic funds transfer (EFT), at least on a pilot basis, following approval by the National Credit Union Administration of a shared Automated Teller Machine (ATM) system offered by Users Inc., Towson, Md., a data processing company owned by 250 credit unions. The one-year program began last month with the setting up of seven off-premise ATMs in drug stores in Maryland, Virginia, and the District of Columbia. Of the 10 credit unions whose participation has been approved by the NCUA, only one is not a Users Inc. client. Cardholders of clients will be able to access their accounts directly for each transaction. Those of non-clients will have batch resolution of their accounts. Cardholders will be able to access share, share draft, and line of credit accounts, make deposits, make transfers between accounts, and obtain account balances through the ATMs. Users project issuance of 35,000 cards. Participation of additional credit unions will require NCUA approval.

A SWITCH IN TIME FOR PCMS?

A tiny firm in Norwalk, Conn., called Data Switch Corp., may help the plug-compatible peripherals manufacturers cope with IBM's current trick of spreading the software around so PCM's can't figure it out for months. The company, headed by Richard Greene, makes a peripheral switch which is used to help allocation of resources.

IBM also makes such a switch, the 2914, but it's a sluggish, expensive RPQ device (nonstandard and with limited support) of which it has sold about 6,000. Any compatible peripheral can be linked with it. But later this year, we hear, the firm will announce a replacement with microcode that talks only to proprietary microcode in IBM control units. PCM's without the magic words can't horn in where that new switch is used. Data Switch's Greene says his advanced version will head IBM off at the pass. The solid state series, called CPS for computer peripheral switch, will handle eight cpu's and 24 peripherals (vs. four hosts and four peripherals with IBM's 2914, and four hosts and eight peripherals with a switch made by T-Bar Corp., which Greene left recently to form his own company).

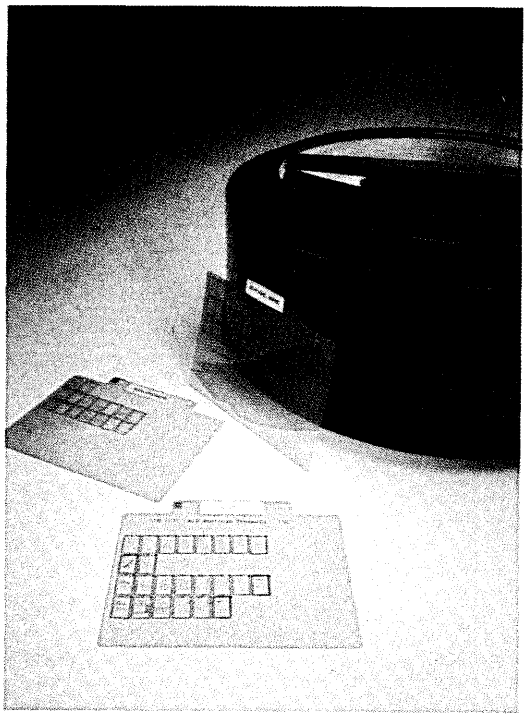
Greene says his company also is offering a system for energy saving, called CEECS (computer environment energy control system), which displays centrally those devices that are in use and the use meter of each device, and which allows central shutdown of peripherals. Another possible saving with CEECS: the proposed 20% investment tax credit for energy conservation devices.

OS 6 GETTING GOOD MARKS

IBM's Office System 6, a word processing system introduced last January, is apparently being well received in the marketplace. A big California dp and wp user, which just acquired one of the new IBM systems, is particularly impressed with its administrative records capabilities, which can be used for applications like the storage of telephone lists and mailing records. An enthusiastic New

(Continued on Page 146)

# A significant merger in information management:



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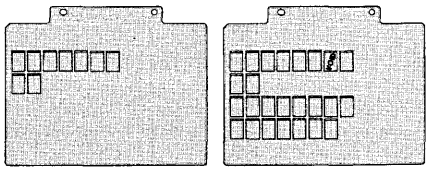

A single piece of 4" x 6" File Film accommodates 60 legal size or 98 letter-size documents. Images can be recorded or updated in just 8 seconds.

File Film has an add-on capability and can be updated. Prior recorded documents can be readily annotated for record control purposes.

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System 200 source file information can also be indexed by file number or file attributes and placed in your computer to speed search and retrieval of original documents recorded on File Film.

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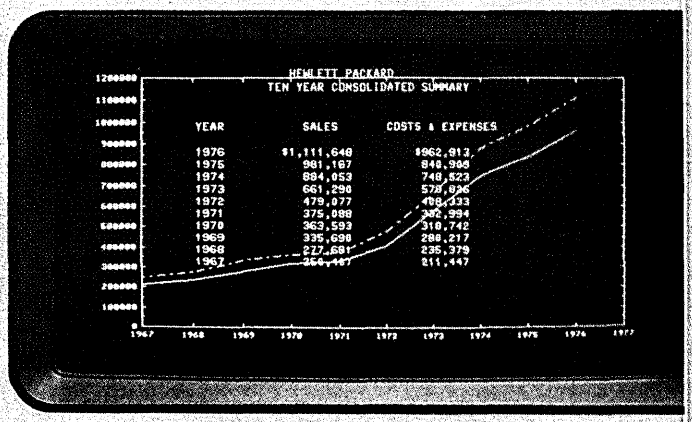
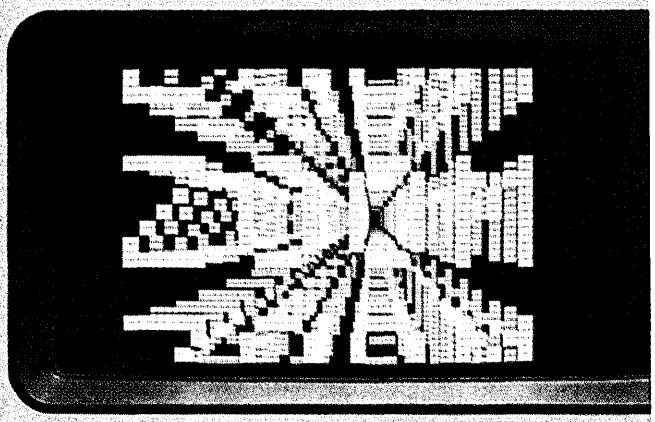
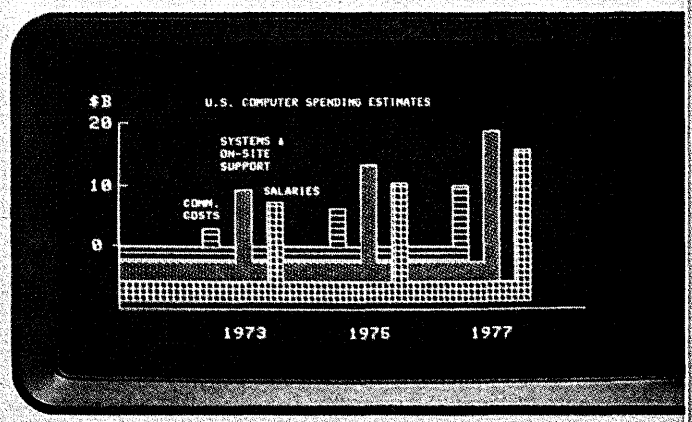
# Hewlett-Packard brings a bright new look to low-cost graphics.



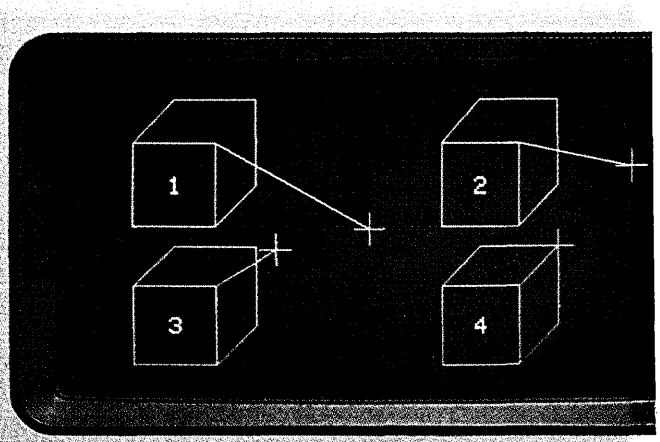

*Auto-Plot*



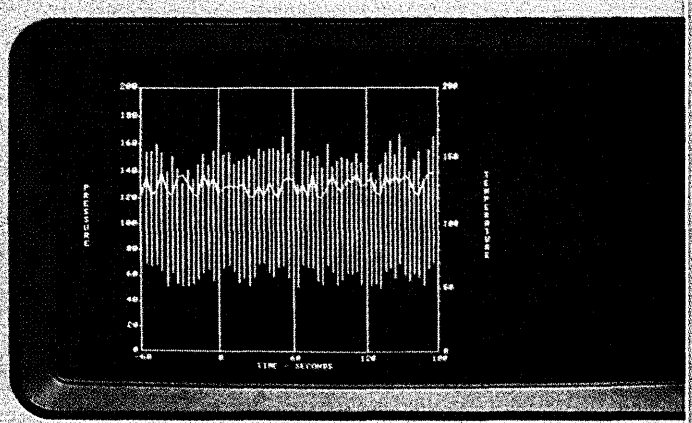
*Zoom*



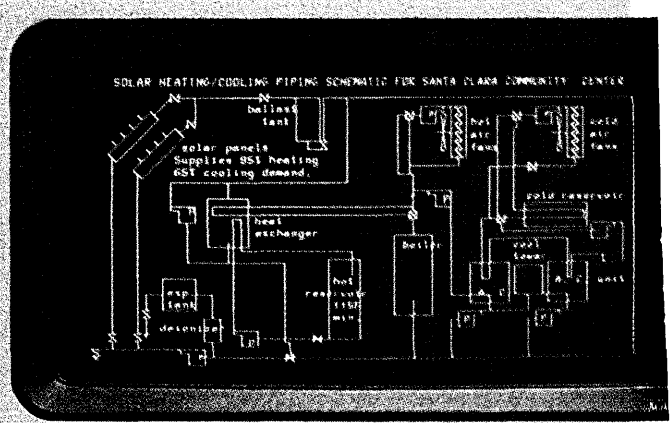

*Area shading*




*Rubber-band line*



*Typical application: scientific plotting*




*Typical application: process flow diagram*

# The new Hewlett-Packard Graphics Terminal uses a microprocessor and raster scan technology to combine high performance with low cost.

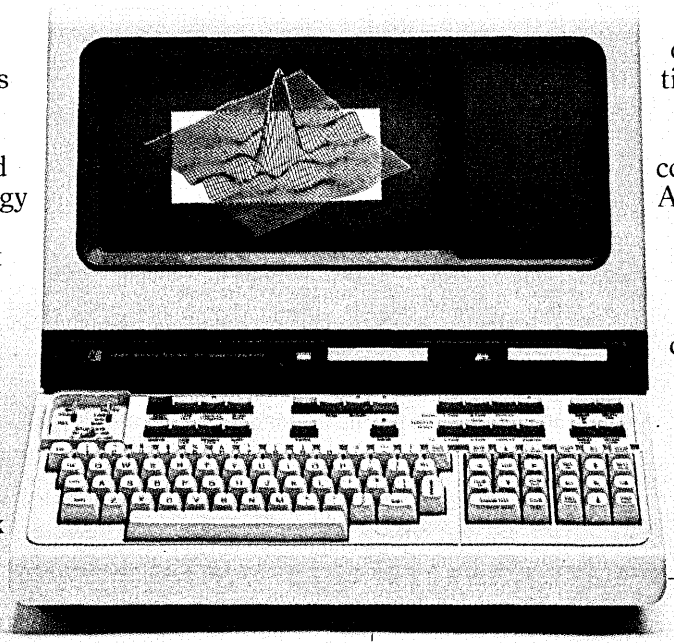
The HP 2648A introduces a whole range of bright ideas to graphics. There's so much power built into the terminal itself that you can perform everything from auto-plots to zoom without any CPU help at all.

**Auto-Plot.** You don't need to know programming or invest in costly software. Once you've entered your facts and figures from the alphanumeric keyboard, press a few keys and your tabular data is plotted instantly.

**Raster Scan.** No more pulling down the blind to make your plots visible. Our display is clear and easy to read even in bright light. And the raster scan technology permits selective erase, cutting down the time it takes to modify your picture also.

**Zoom and Pan.** This lets you magnify any area of the display up to 16 times. And you can pan in any direction for closeup investigation of complex designs, without having to reinitialize the data.

**Area Shading and Pattern Definition.** This makes it easy to distinguish areas with similar shapes, such as bar charts, mechanical parts and architectural drawings.



**Rubber-band Line.** You can draw trial sketches, such as architectural floor plans, with or without CPU connection. Think of the time and money you'll save by cutting down mistakes.

**Independent Display Memories.** Both alphanumeric and graphic data can be shown independently or at the same time. And you can carry on a dialogue with the CPU without disturbing the picture.

The HP 2648A also has all the advantages of our popular HP 2645A alphanumeric terminal. Specifically: mass-storage on 110K byte cartridges (you can store graphics as well as data); 'soft keys' to speed up repetitive jobs; one-button self-test; plug-in PC boards for easy maintenance; extensive data communication and off-line capabilities.

This bright new look in graphic terminals is designed for such applications as electrical, mechanical and architectural design. For process and control. For scientific plots. And for business planning. We'd like to give you a graphic demonstration of everything the HP 2648A can do. Send us the coupon and we'll set it up. Or contact the nearest Hewlett-Packard sales office listed in the White Pages. We're sure you'll get the picture.

HEWLETT hp PACKARD

Yes, I'd like to take a closer look at your low-cost HP 2648A Graphics Terminal.

☐ Contact me to arrange a demonstration. ☐ Send me complete information.

Name

Company Phone

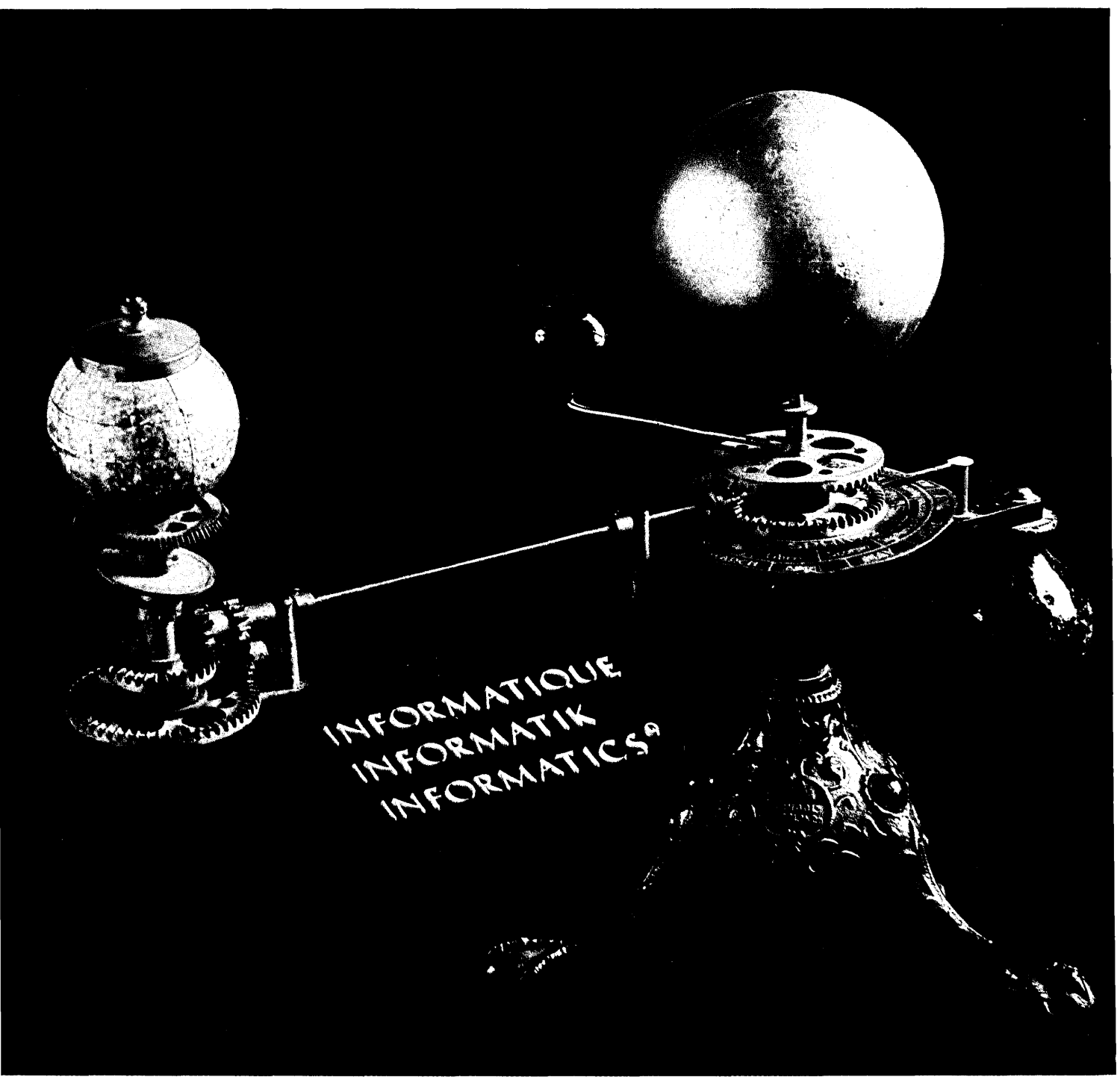
Address

City/State/Zip

Mail to: Ed Hayes, Marketing Manager, Hewlett-Packard Data Terminals Division, 19400 Homestead Road, Dept. 407, Cupertino CA 95014.

CIRCLE 19 ON READER CARD

42703HP14

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CIRCLE 40 ON READER CARD

# people

## The Best of Both Worlds

Ramon C. Barquin catches the visitor to IBM's World Trade offices in North Tarrytown, N.Y., in a judo hold, flips him over his shoulders and slams him to the floor.

Just kidding, folks. Ramon's a nice guy. He wouldn't do something like that. Not that he couldn't. The 34 year old Cuban-born Barquin has a second degree black belt in judo, a sport he's practiced since childhood. He's also fast on his feet mathematically, a talent that's enabled him to design and develop a computerized judo scoring and record keeping system which has been widely accepted now in competitions throughout the world.

Barquin's affinity for numbers and his love for judo converged in the early 1960s in Puerto Rico, where his family moved after Castro took over their homeland. An electrical engineering student at the Univ. of Puerto Rico at Mayaquez, Barquin began competing with a Univ. of P. R. team that would win the 1964 Eastern Intercollegiate Championship and later, competing internationally, he became subchampion in his 154-pound weight class for the Caribbean. But not yet a U.S. citizen, he was unable to represent Puerto Rico in the 1968 Pan American judo championships held in San Juan.

"It was very frustrating," he recalls. "But I still wanted to be involved in some way."

Involvement took the form of a computer program run on an IBM 360/30 at the firm's San Juan education center where Barquin was then employed as a systems engineer. "One of the reasons why computers started to make a lot of sense was that no statistics of the sport had ever really been kept," Barquin says. "I was starting from scratch and I'm not sure the committee running the championships really thought I could do anything. I was just some crazy guy with a computer."

The committee changed its tune, however, when it got a look at the computer printouts Barquin's system generated. They showed everything from each competitor's won and lost statistics, number of combats, and duration of combat, to the method by which victory was gained. In effect, Barquin had created the automated equivalent of baseball's box score and batting averages for a sport where scoring had previously been done manually with a tremendous variety in format. And the powers that be within the world of judo were impressed. Within the year, the system was adopted officially by the International Judo Federation, and would be utilized in the 1969 World Judo Championship in Mexico City.

Meanwhile, Barquin's career at IBM was taking a new direction. With an M.S. in mathematics from the Univ. of P. R. under his belt, he went to M.I.T., where he received a Ph.D. in computer science management and political science through the IBM Resident Study Program.

But in his spare time, he continued refining the system and applying it in competition around the world. The

RAMON C. BARQUIN
A second degree black belt

wife of I.J.F.'s director of refereeing, Evelyn Osaka, a programmer herself, wrote a real-time referee selection program to ensure neutrality, language compatability, and experience. Barquin incorporated the program into his system. "What it does, basically, is to resolve the problem of selecting teams of three judges from a pool of available officials for each match," he explains.

Still at M.I.T. in 1971, Barquin presented a report at the Fall Joint Computer Conference on the system in a special session on computer applications in sports. That year he also was I.J.F.'s director of statistics and became a member of its directing committee—a position he still holds today.

Utilized in both the 1972 and 1976 Olympics, the system has now been put on-line and runs real-time via TSO, IBM's time-sharing option. But Barquin, now program manager, external programs, for IBM World Trade, Americas/Far East Corp., has less and less time to devote to judo, though he still works out a couple of times a month and attends international competitions as an official whenever possible. Instead, as a specialist in technology transfer in emerging nations, particularly in Latin America, he monitors and studies activities in the transfer area at a number of organizations such as the U.N. and the Organization of American States (OAS). He also is the area chairman for the Eastern Hemisphere and Latin America for the IEEE Computer Society. Further, Barquin's still affiliated with M.I.T. as a Fellow of the Center for Information Systems Research at the Sloan School of Management.

Still, there's talk of a new project being started up at the Univ. of Hawaii's East-West Center. "It deals with some anthropological studies involving the martial arts and primitive fighting techniques, and they've asked me to advise them in developing an automated system for classifying, characterizing, and studying the profiles of the weapons," Barquin says.

"This would allow determining discrete features and morphological similarities between the specimens which permit comparison."

Barquin now lives in Mt. Kisco, N.Y., and has become an American citizen, though he still identifies strongly with Cuban culture. In fact, he's currently teaching his girlfriend, a native American, how to prepare Cuban food. Barquin, as his work with computers and judo indicates, knows how to combine the best of both worlds.

## His Honor The Mayor

The mayor of Moorestown, N.J., was a day late arriving at the 1977 National Computer Conference at which his company was exhibiting for the first time in several years.

The Moorestown City Council meets on Mondays and the mayor always presides. The NCC opened on Monday without the 45 year old president of Spectron Corp., James Palmer. But Spectron, a supplier of data communications equipment, was there with its booth.

Palmer takes his two executive positions equally seriously. "I like to work for and with people," he says. At Spectron, which he has taken from a three-man firm when he founded it in 1968, to a 275 employee company today, he has "tried to share our success with the employees. They participate in a monthly bonus plan based on previous month's shipments, and we have an Employee Stock Ownership

plan in which stock is contributed to employees by the company once each year and which is approved under ERISA (Employee Retirement Income Security Act). Eventually it will all be theirs."

As mayor of Moorestown, Palmer has instituted "Mayor's Night" held every third Thursday at different community centers and to which any interested citizen can come and share his feelings with his mayor. He also put in a separate telephone in his home, a "hot line" which citizens can call day or night, seven days a week.

Palmer has been active in community affairs in Moorestown, a town he calls "an oasis in a plastic desert," since he moved there in 1964. In 1970, he recalls, he was asked to serve on the town's Planning Board. "This is an official agency of municipal government," he explained. "It determines the town's growth pattern." He served on the board for two years and became its chairman.

In 1972, he said, "I was urged to run as a Republican candidate for a seat on the Township Council." He was elected then and reelected last fall. "In January (1977) the council itself elected me mayor." He explained that the mayor, in Moorestown, is part of the legislative branch and not the executive branch of government. What are his duties? "I preside over all council meetings, represent the township in county and state dealings, cut ribbons, kiss babies, provide the leadership required in the legislative branch, and act as the symbolic head of the community." He says he spends from 12 to 16 hours per week on mayoral duties.

And, he says, it doesn't detract from his work with his company which is headquartered in Moorestown. "It was the success I've had here and a desire to give back," he said, that made him want to get into community activities in the first place.

A native of Philadelphia, Palmer received a BSEE degree from the Moore School of Electrical Engineering, Univ. of Pennsylvania, in 1953. He also holds a Certificate in Municipal Planning received from Rutgers Univ. in 1971.

"I'd worked one summer with RCA while I was in college," he said, "so after graduation, I joined RCA in Camden." What he joined was RCA's then-embryonic and now nonexistent Electronic Data Processing Div. As a design engineer, he pioneered the use of transistors in computer peripheral equipment. "I designed," he said, "the first piece of all transistorized computer equipment ever delivered to a commercial customer." It was a card punch.

In 1955 and '56, Palmer served with the Army Signal Corps at Ft. Huachuca, Ariz. In '56, he rejoined RCA as a project engineer. It was then that he began to get involved with data communications which, he said, "was not yet recognized as a distinguishable discipline." In 1959 he was promoted to engineering supervisor and assigned responsibility for a product line of data communications terminal equipment. During this period, he said, he participated in the formulation of international standards for multiplexing undersea cables and supervised design programs in time division multiplexing and automatic error correction.

His next job with RCA was as manager, communications equipment engineering, and he was placed in charge of such programs as two large-scale message switching systems, a data collection system, and various data communication and computer peripheral equipment innovations.

In 1962, Palmer left RCA to participate in the founding of Data Communications Inc., in Moorestown. "We had a mixture of products related to data communications," he recalls, "including a mag tape buffer which, when connected to a communications line, would capture data and retransmit it at a different speed. DCI was ahead of its time; the market wasn't ready." Among its products was a commercial cryptographic device for data security, something few people worried about then.

DCI was sold, split up, and virtually disappeared in 1967. "I took the time division multiplexor product line," Palmer said, "and joined Computer Test Corp., a subsidiary of Computest which later was merged into its parent, Computest. He formed a data communications division for Computer Test.

"I soon found out I wasn't cut out for working for somebody else. I wanted to work for myself." In 1968 he left Computer Test to help found Spectron. In its early years, Spectron engaged primarily in development of specialized custom equipment for use in international communications. That equipment, Palmer said, purchased by foreign governments as well as domestic international carriers, "is still in service in all parts of the world."

Spectron's first end user product, the Universal Communications Monitor, was introduced in early 1970. An outgrowth of the earlier work in international communications monitoring equipment, the UCM became widely accepted as the standard for analysis of complex computer-communications system problems. Other end user products for switching and patching communications lines and equipment were introduced in subsequent years and the company today offers a broad line of devices and systems for monitoring, control, test, and management of data communications systems. Among its products is the Datascope, a second generation, improved version of the UCM, which, Palmer said, has "been very well received." He said Spectron currently is offering a wide variety of versions of the Datascope to fully programmable, interactive models.

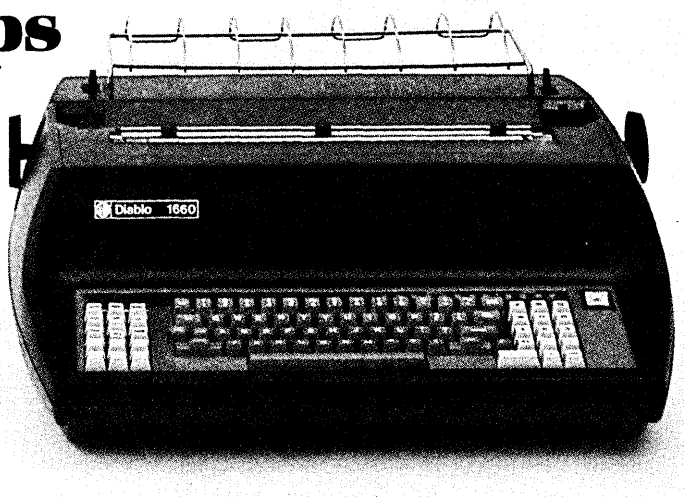
Palmer is as proud of his company as he is of his town. Of Spectron he says, "It is known as a leader in providing data communications technical control components and custom systems. The company offers customized turnkey systems, complete with training programs in the use of data communications test and control equipment."

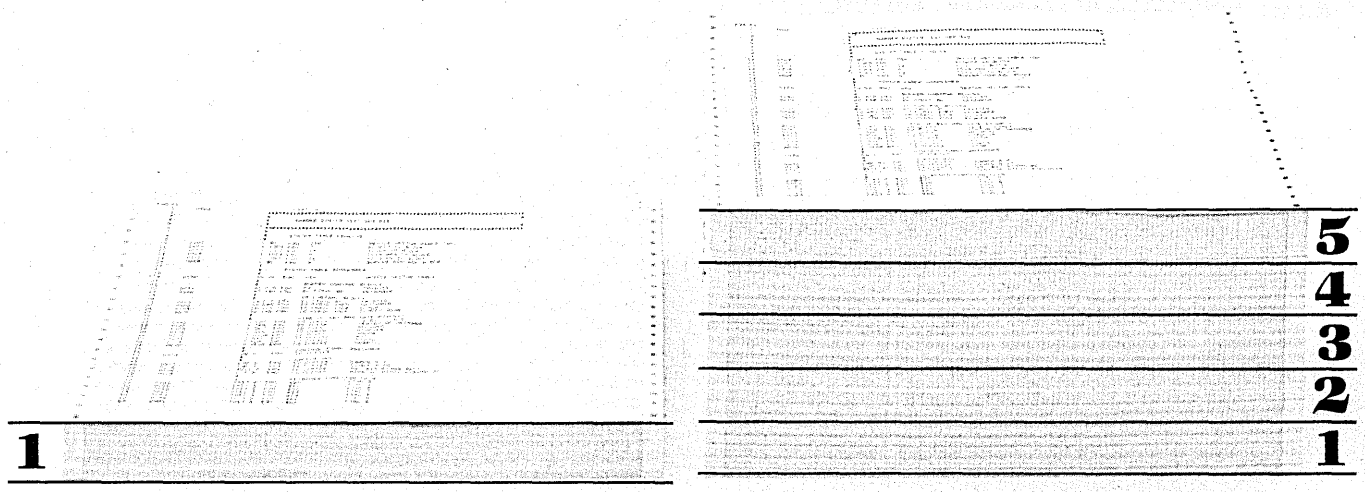
JAMES PALMER
Cuts ribbons and kisses babies

Of Moorestown, Palmer says, "It is my hometown just as surely as if I had been born here . . . it has the image of being an affluent community, but it isn't really that or just that. Its homes range from those someone unemployed could afford to $300,000. It's just that the lower income group is less mobile and transactions on their homes aren't recorded." He feels strongly about the "oasis" aspect of Moorestown, and one of the issues he's pursuing most strongly as mayor is "preservation of our farmland." Moorestown has a population of 16,000 and is characterized by Palmer as a "stable community . . . one with a tax rate lower than those of surrounding townships." He's committed to keeping it that way.

Besides his professional and civic duties, Palmer serves as an elder in the First Presbyterian Church of Moorestown. And, he sings in the church choir. ❋

# New from Diablo: 1200 Baud/200 cps Matrix Terminal.




## 4 to 5 times more productivity!

We're offering the most versatile 1200 Baud hardcopy terminal available. Our new Matrix Terminal prints 200 cps, has a 100% duty cycle 7 x 9 dot matrix head, that prints upper and lower case. We are microprocessor-controlled to provide incremental and "automatic" bidirectional printing, unique horizontal and vertical tabbing and extensive margin controls. We also offer program control multiple fonts, control code functions and versatile forms handling. We communicate in ASCII code, and are compatible with Bell 103A, 113A, 202 and 212 modems and other 110 to 1800 Baud asynchronous modems using the RS 232C interface, and we print an original and five or more legible copies of all 94 ASCII characters. A nice plus: our table-top terminal has the features and friendliness of an office typewriter. The rest comes from a demonstration! Call your Diablo representative or write Diablo Systems, Inc., 545 Oakmead Parkway, Sunnyvale, Ca. 94086, or Diablo Systems, S.A., Avenue de Fre, 263, 1180 Brussels, Belgium or Mitsui & Co., Ltd., 2-1 Ohtemachi 1-Chome, Chiyoda-ku, Tokyo.

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# calendar

## SEPTEMBER

**COMPCON 77, Sept. 6-9,** Washington, D.C. This will be the 15th IEEE computer society international conference. Devoted to the continuing theme of "Innovations and Change in Computer Design," this gathering provides a forum for the interchange of ideas among members of the computer community. Papers presented will cover areas such as microprocessors, distributed processing, software development and support, peripherals, system technology, real-time systems, component technology, memories, and applications. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, Md. 20901 (301) 439-7007.

**MUMPS Users' Group Meeting, Sept. 7-9,** Boston. This sixth annual gathering of MUMPS users will include a first day primer tutorial on getting started in Standard MUMPS; five technical sessions, including information panels on user experiences with Standard MUMPS; vendor forums on new hardware and systems; and visits to major MUMPS facilities. Fee: $50, members; $75, nonmembers. Contact: Richard Zapolin, The MITRE Corp., P.O. Box 208, Bedford, Mass. 01730. (617) 271-2534.

**On-Line Conference on Data Bases, Sept. 13-15,** London. Managers, designers, implementors, and users of data bases will meet and exchange views, ideas, and experiences, and extend their contact in this evolving field at this conference on experience and technology of data bases. The conference will cover three parallel themes. "User Experience with Data Bases" will provide an overview of data base techniques and an assessment of current experience with them. The other two themes, "Data Base Technology," and "Implementation and Operation," will provide insight into recent thinking and exposure to some of the key areas. Contact: On-Line Conferences Ltd., Cleveland Rd., Uxbridge, Middlesex, U. K.

**WESCON/77, Sept. 19-21,** San Francisco. Over 400 exhibitors will make this the largest Western Electronic Show and Convention since 1969. Thirty-two professional program sessions will cover such topics as: energy alternatives, program development for microprocessors, new advances in microprocessor peripheral circuits, designing with microprocessors, programmable pocket calculators, large scale computers, home computers, and transition to distributed processing. There also will be a presentation of the IEEE Region 6 Student Papers Competition, and a special exhibit of projects created by IEEE Region 6 students. Two sessions and a special exhibit have been planned for university-level engineering students. A panel session will discuss "Engineering Careers and the Problems After 40," and another session will discuss "Your Job Interview: The Million Dollar Decision." Fee: $9. Contact: WESCON, 999 N. Sepulveda Blvd., El Segundo, Calif. 90245 (213) 772-2965.

**ASIS 40th Meeting, Sept. 26-Oct. 1,** Chicago. "Information Management in the 1980s" will be the theme of this meeting which will look ahead to the next decade in the area of managing information. Topics addressed will include: technological implications, social impact, the role of the government and private sector, economic impact, privacy considerations, and freedom of information. The technical program of contributed paper sessions, special interest group programs, and technical sessions on the federal government's role will be supplemented by exhibits, special workshops, and counter program sessions. Fee in advance: $65, members; $95, nonmembers; at the conference: $85, members; $115, nonmembers. Contact: Skip McAfee, ASIS, 1155 16th St. N.W., Washington, D.C. 20036 (202) 659-3644.

**NMA/IMC Midyear Meeting, Sept. 27-29,** Washington, D.C. "Micrographics: A Partner in Emerging Technologies" is the theme for this combined meeting of the National Micrographics Assn. and the International Micrographics Congress. Twenty-one educational sessions will cover the state of the art of micrographics, new technological developments, new applications, and present and future partnerships of micrographics with other technologies and user groups. There also will be an equipment exposition.

One day before the official start of the meeting, four all-day concurrent seminars will be offered to those interested in learning the basics of micrographics or in expanding their knowledge in the field. Full registration for the meeting is $150. Contact: National Micrographics Assn., 8728 Colesville Rd., Silver Springs, Md. 20910 (301) 587-8444.

**Datacon '77, Sept. 28-30,** St. Louis. Cosponsored by the St. Louis chapters of the ASM and the DPMA, the conference will feature 32 seminars and over 50 exhibits. Those attending six of a series of eight courses designed for systems trainees, junior analysts, and newly assigned information systems personnel will receive a certificate of completion—Datacon '77 Basic Systems Course. Courses applicable to various levels of management will include: word processing, project management, minicomputer management, how to build an effective team, managerial procedures and contingency planning, and an update on privacy legislation. Courses for operations specialists and auditors, and systems and programming technicians also will be available. Fee: members, $70 for two days, $40 for one day; nonmembers, $80 for two days, $45 for one day. Contact: John Vaughan, ASM/DPMA, P.O. Box 1401, St. Louis, Mo. 63188.

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## CALL FOR PAPERS

The widespread influence of information systems calls for a set of generally accepted, widely applicable tools with which to specify the requirements of information systems, predict their effects, design them, control their development, analyze their behavior and integrate them into the user installation. The Second Conference of the European Cooperation in Informatics (ECI) is now soliciting papers to be presented at their conference in Venice, Italy, October 10-12, 1978. The conference will emphasize methodological approaches rather than technical descriptions. Suggested topics include: analysis of user needs; designing systems; development of systems; impact of new technology; evaluation, use, and maintenance; and forecasting and analyzing the impact on organization, education, work conditions, economics, and ergonomics. Intention to submit a paper must be declared by Sept. 15, 1977. Final papers must arrive no later than Jan. 15, 1978. Contact: Prof. Dr. P. Lockmann, Institut fur Informatik II, Universitat Karlsruhe, Postfach 6380, D-7500 Karlsruhe 1, Federal Republic of Germany. ❋

# Cross our Level 6 fox with our Level 66 lion and what do you get?

# A new breed of distributed systems that command a lot of respect.

Honeywell's Distributed Systems Environment integrates satellite minicomputers and general purpose systems, within an environment of cooperating software.

It lets a modern organization distribute appropriate data bases and application programs among remote locations. In short, it's a system that works the way a modern company works.

## First the lion.

Start with the upper end of Honeywell's Series 60 family, the large-scale Level 66 system. Here you have a powerful, large-scale multi-dimensional central processor. You have hardware and software features that simplify the management and utilization of your data. You have reliability with a minimum of human intervention.

The modular design of Level 66 systems lets you do what you want to do now and grow as your requirements grow. You can add resources where and when you need them most – input/output devices, processors, or memory – without having to swap out your system. And without reprogramming and retraining.

## A well-managed computer...

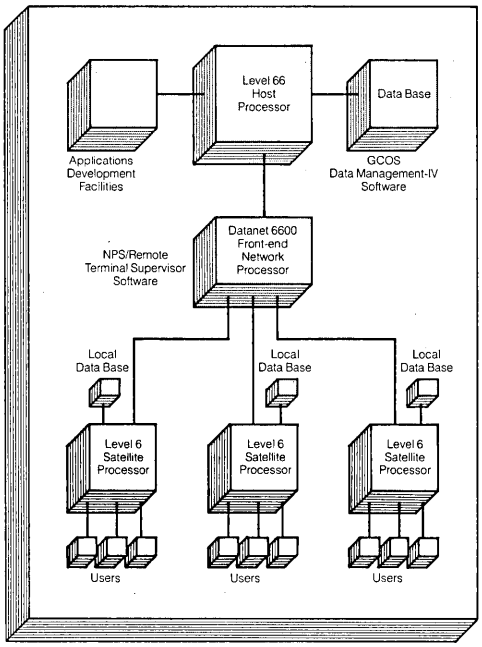
GCOS (General Comprehensive Operating Supervisor) is the executive software for all Level 66 systems. GCOS controls, schedules, and monitors all activities, and adjusts processing activity to changing demands. Processing modes include transaction processing, data base inquiry, time sharing, interactive job entry and execution, and batch processing. These modes are available at the central site, or remotely via Level 66 communication facilities – and they're available concurrently, using a common data base.

## leads to well-managed data.

Data Management-IV (DM-IV) is the Level 66 data base management system designed for high volume on-line transaction processing, and efficient, interactive remote query and reporting. It uses a common language for defining, managing, and directing data, and provides a standard user interface that is simple and logical. It allows a common file description to govern the structure of all data, but is independent of that structure.

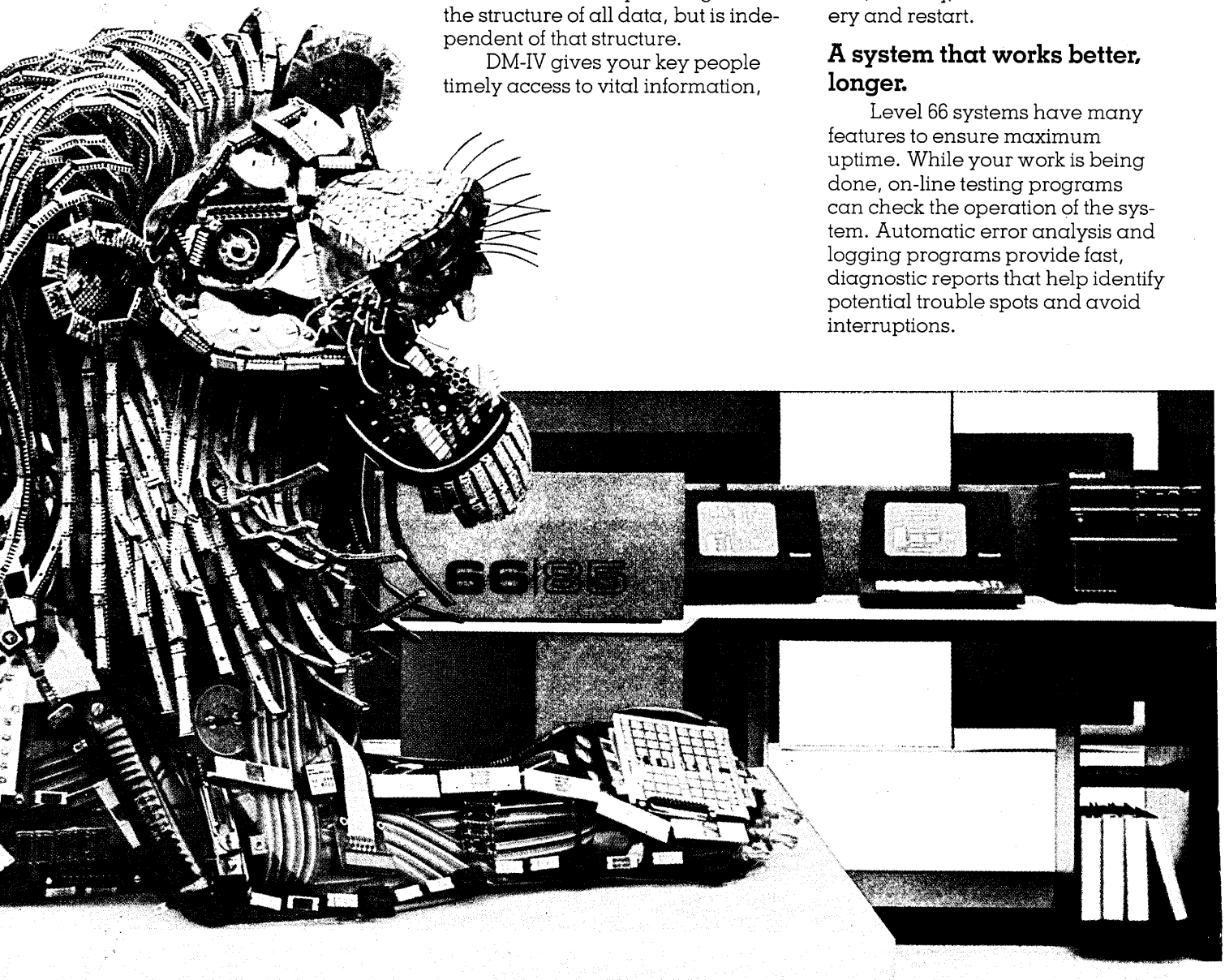
DM-IV gives your key people timely access to vital information, and provides data integrity protection, security, and automatic recovery and restart.

**Basic Elements of Distributed Systems Environment**




## A system that works better, longer.

Level 66 systems have many features to ensure maximum uptime. While your work is being done, on-line testing programs can check the operation of the system. Automatic error analysis and logging programs provide fast, diagnostic reports that help identify potential trouble spots and avoid interruptions.



Configurations with more than one of any module (two processors, for example) not only increase throughput, but provide built-in backup. Should one module go down, GCOS allows you to dynamically reconfigure the system to work around the inactive module and provide significant fail-soft protection.

## And now for the fox.

The fox, of course, is Honeywell's quick, versatile, and smarter-than-ever line of Level 6 minicomputers. Level 6 features an extremely flexible architecture and advanced modularity. It's a combination of large-scale integrated logic circuitry, firm-ware driven micro-processors, MOS memory, and etched-wire connections that achieves plug-in modularity with optimum configurability.

Coupled with its powerful and compact processing capability is a superior communications processor. Level 6 technology and packaging are used in the Honeywell DATANET 6670 Front-end Processor. Honeywell minicomputers are also being used as network processors and as intelligent terminals, doing everything from remote job entry to multiple work station data entry.

**Summary of Level 66 Characteristics**

| Model | Memory Size Range[b] | No. Processors | No. System Control Units (SCU)[c] | No. Input/Output Multiplexers (IOM) | No. Input/Output Multiplexer (IOM) Board Slots |
|---|---|---|---|---|---|
| 66/05 ICU[a]<br>66/07 ICU | 96K to 512K | 1 or 2 | 1 or 2 | 1 | 18 |
| 66/10 ICU<br>66/17 ICU | 96K to 512K | 1 or 2 | 1 or 2 | 1 or 2 | 18 |
| 66/10 FS[a]<br>66/17 FS | 96K to 1024K | 1 or 2 | 1 to 4 | 1 or 2 | 35 |
| 66/20 ICU<br>66/27 ICU | 128K to 512K | 1 or 2 | 1 or 2 | 1 or 2 | 18 |
| 66/20 FS<br>66/27 FS | 128K to 1024K | 1 or 2 | 1 to 4 | 1 or 2 | 35 |
| 66/40 ICU | 128K to 512K | 1 or 2 | 1 or 2 | 1 or 2 | 18 to 27 |
| 66/40 FS | 128K to 1024K | 1 or 2 | 1 to 4 | 1 or 2 | 35 to 54 |
| 66/60 ICU | 192K to 512K | 1 or 2 | 1 or 2 | 1 or 2 | 27 |
| 66/60 FS | 192K to 1024K | 1 to 4 | 1 to 4 | 1 to 4 | 35 to 54 |
| 66/80 ICU | 256K to 512K | 1 or 2 | 1 or 2 | 1 or 2 | 27 |
| 66/80 FS | 256K to 1024K | 1 to 4 | 1 to 4 | 1 to 4 | 35 to 54 |
| 66/85 | 512K to 2048K | 1 to 4 | 1 or 2 | 1 to 12 | Not applicable |

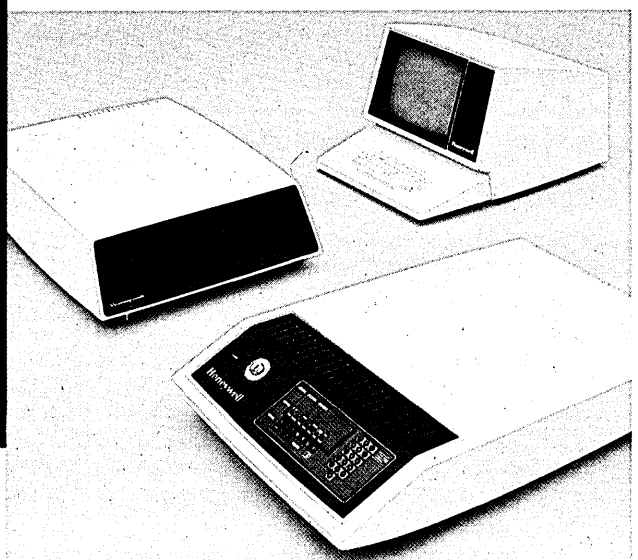
[a]Integrated Control Unit (ICU) contains the input/output multiplexer, system controller, mass storage processor, unit record processor and memory units in a single unit. Freestanding Systems (FS) house these units in separate cabinets.
[b]Sizes given in K words—K=1024.
[c]No. of SCUs *required*—one SCU can accommodate 512K words of memory. (Additional SCUs are optionally available.) An Integrated Control Unit (ICU) system can support a maximum of two SCUs; a Freestanding System (FS) can support a maximum of four SCUs.

## The software wherewithal.

Level 66 communications software includes the Network Processing Supervisor (NPS) and Remote Terminal Supervisor (GRTS) which simplify implementation of an information network and help optimize both response times and line costs. Messages from several terminal stations can be concentrated and forwarded to the host computer via a common communications line. And with NPS, transactions can be passed directly between stations.

Since NPS has its own access to stored information, the host system is free for other tasks and remote sites are insulated from host system operating conditions.

Level 6 offers a choice of rack-mountable, cabinet and tabletop models, and includes a full line of low-cost peripherals in both tabletop and rack-mounted versions. The cabinet version is shown at the left, the tabletop version with diskette and CRT below.



## GCOS 6/MDT(Multi-Dimensional Tasking) Software

**Executive Components**
- Executive/Monitor
- I/O Handling
- Communications Supervisor

**Program Development Tools**
- Execution and Operator Control Language Processors
- Text Editor
- Linker
- Cross-Reference Program
- Assembler
- Macro Preprocessor
- FORTRAN Compiler
- COBOL Compiler
- RPG Compiler

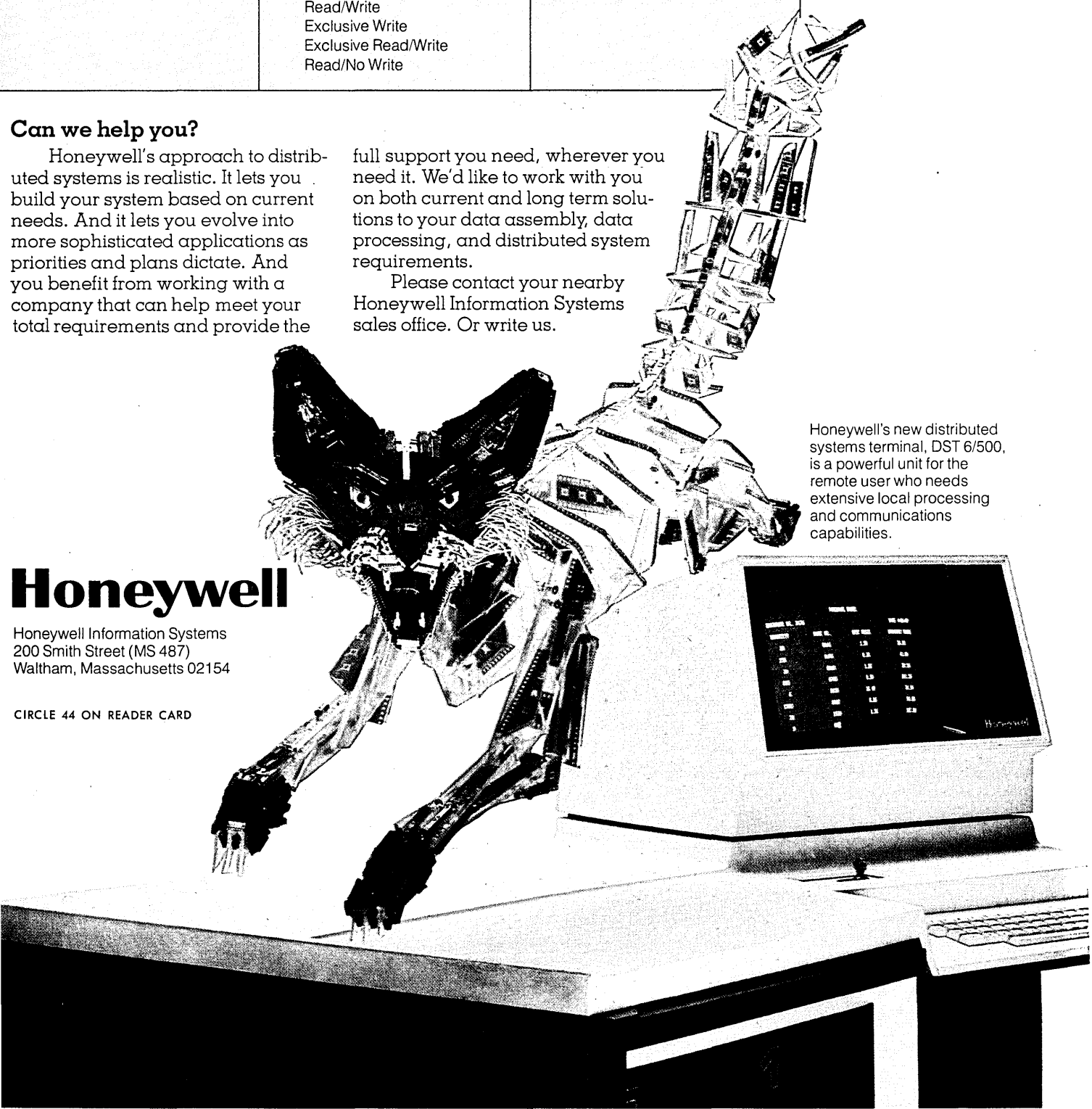
**File Management System**
- Files
  - Sequential on all media
  - Relative on mass storage
  - Relative with deletable records on mass storage
  - Variable sequential on magnetic tape and mass storage
  - Indexed files on mass storage (fixed and variable length)
- Access Methods
  - Sequential on all devices
  - Direct on mass storage
  - Indirect on mass storage
- Level of Access by Tasks
  - Read Only
  - Read/Write
  - Exclusive Write
  - Exclusive Read/Write
  - Read/No Write

**Utility Components**
- Volume Preparation
- File Support Utilities
- Copy
- Print
- File Dump
- List Names
- Import Partitioned Access Method
- Export Partitioned Access Method
- Compare
- Patch
- Debug
- Memory Dump Editor
- Disk Sort

## Can we help you?

Honeywell's approach to distributed systems is realistic. It lets you build your system based on current needs. And it lets you evolve into more sophisticated applications as priorities and plans dictate. And you benefit from working with a company that can help meet your total requirements and provide the full support you need, wherever you need it. We'd like to work with you on both current and long term solutions to your data assembly, data processing, and distributed system requirements.

Please contact your nearby Honeywell Information Systems sales office. Or write us.



Honeywell's new distributed systems terminal, DST 6/500, is a powerful unit for the remote user who needs extensive local processing and communications capabilities.

**Honeywell**

Honeywell Information Systems
200 Smith Street (MS 487)
Waltham, Massachusetts 02154

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# source data

SOURCE DATA provides information on books, courses, references, reports, periodicals, and vendor publications.

## books

### Logical Construction of Programs

by Jean D. Warnier
Van Nostrand Reinhold Company, 450 W. 33 St., New York, N.Y. 10001 (1977)
230 pp. $14.95

When was the last time you had to design software? If you had a problem, you may remember needing an effective, relatively straightforward design method but not having it. Several authors have attempted to rescue software designers from this dilemma. The methods they promulgate are directed at neutralizing the acid content of a software design problem and bringing quick relief to a designer's upset stomach. This book presents one such remedy. But, like other miracle cures, you only get what you pay for, and sometimes not even that.

This book is an "English" (not to be confused with American English) translation of a French manuscript. The management requests that linguists and information theorists not smirk! During the translation process some information was lost and the meaning of many phrases diluted or distorted. The translation is not necessarily an exact reflection of Mr. Warnier's intent or perception of his method. In fact, he has privately expressed some dissatisfaction with it. Hence, this review refers to the concepts as stated in the book. It is also interesting to note that there is a soft cover translation with the same title and author, but it is not identical to this book. The book being reviewed has a total of 11 chapters while the "English" translation has 10. This "new" chapter appears at the end of the book and is written in American English (e.g., organization vs. organisation elsewhere). More about organizational factors later.

The book describes a technique and rationale for designing software based on the premise that the structure of a program should reflect the structure of the program's data files. Intuitively, it sounds like a good idea, but can it be done? Mr. Warnier's book tells how.

The scenario is quite simple. Begin by graphically identifying the structure of the data. Next, this graphic depiction is used to define a modified form of flowchart. Detail is added to arrive at pseudo code which can later be converted to executable code. Sounds simple enough, but . . . there are a few minor problems. One is that not all data organizations are hierarchical. When this happens, the result is a poor quality program. Unfortunately, the book does not tell how to reorganize an imprudent data organization or how to compose a prudent one. Instead it introduces the concept of phase and uses it to subdivide a program, noting that a complex program may contain more than one phase. However, a method for identifying a phase is not provided.

Another problem is the implicit assumption that there is one input and one output file. When multiple files are used, a "guide" file (hierarchically superior to all others) is employed containing the element identifiers for all files. In the event a guide file is not present, the situation becomes complicated. These data file situations could be the final blow.

Warnier does not tell the reader the circumstances for using the method. In this regard, his presentation is similar to other formalized methods. However, the method is effective on small (single or few modules) design problems, and it may also be useful in detailing identified modules within a large system, but it is not a software system design method in the sense of Constantine, et. al.

The book is presented bottom-up, and gives the feeling that something is missing or left out. It consists of Part I, which has six chapters, and Part II, which has five. But it is not until chapter four of Part II that the reader discovers the missing element—an overview of how the concepts fit together. Unfortunately, by this point many readers will have lost interest and given up.

Presentation is not the sole cause of the lost feeling. Two others are the book's title and the audience definition. The title, "Logical Construction of Programs," does not reflect the content of the book, which describes a set of rules which use the structural relationships of the data. Strictly speaking, it does not address program construction (i.e. packaging, run environment, data element binding, and other issues), only program design. The issue of audience characterization, an important one for a technical work, is not addressed, although the book's introduction mentions the expertise the reader is expected to possess. A technical book should say up front who is going to get the most benefit from it.

If you subscribe to the view (as this reviewer does) that an effective software designer should be able to use several different design approaches, then this book would be a worthwhile addition to your library. Its contents represent a useful tool under the right circumstances. However, if you use the method described you will have to rely on your own ingenuity, since the book is not useful as a reference.

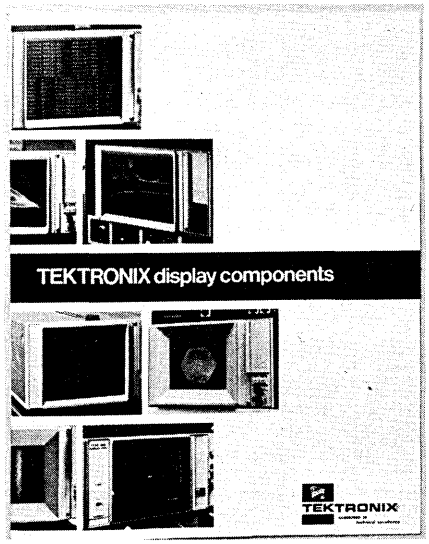
**—Lawrence J. Peters**

Mr. Peters is a software engineering consultant with Boeing Computer Services in Seattle. He holds degrees in physics and engineering, and has published several articles about software design.

## vendor literature

### Crt Selection Guide

Different applications for crt displays require different display characteristics, including resolution, storage or non-storage, stored writing speed, dot writing time, phosphor type, and need




for gray scale. This new brochure describes seven Tektronix crt displays and lists their specifications, and also includes selection considerations for display monitors. There also is information about hard copy units, cameras, and other accessories for enhancing the value of the display monitor.
TEKTRONIX, INC., Beaverton, Ore.
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*(Continued on page 33)*

To Os
To Os

# DOS to OS.
# We take you there the easy way.

The easy way is UCC-2 (DOS under OS). This software package allows you to run your DOS programs on your 360/370 OS or OS/VS system *without reprogramming.*

That eliminates the chaos, and much of the expense, of getting from DOS to OS. Whether you're planning a conversion, or having to live with both systems simultaneously, UCC-2 can make your shop more productive – and your job a lot easier. Over 500 installed systems prove the point.

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And, once you get to OS, take a look at what our other software packages can do for you:

A Tape Management System that insures against accidental loss or destruction of valuable data (UCC-1). Circle 94

A Disk Management System that you should look into before you buy another disk drive (UCC-3). Circle 95

A PDS Space Management System that eliminates the need for PDS compression (UCC-6). Circle 96

A Data Dictionary/Manager that really gets IMS under control (UCC-10). Circle 97

A Restart/Recovery Management System that makes restarting in a matter of seconds... a matter of fact (UCC-15). Circle 98

A General Ledger/Financial Control System that your Accounting Department has been dreaming of (UCC-FCS). Circle 99

Software packages like these. One more way...

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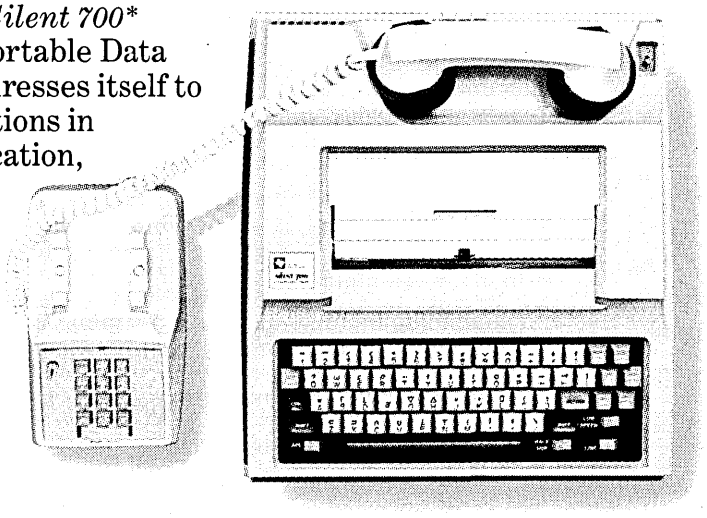
# Introducing a new set of characters.

## TI's Model 745 is now available with APL.

Now, the *Silent 700** Model 745 Portable Data Terminal addresses itself to your applications in science, education, business and finance. And other programs requiring APL.



And since we're in character with your needs, you'll be able to understand the other benefits that have made the 745 the most popular portable data terminal on the market.

TI's 745 offers you fast remote access to your central computer. With lightweight 13-lb. briefcase mobility.

The terminal itself interfaces by way of a built-in acoustic coupler or an auxiliary EIA port. With virtually silent printing at 30-character-per-second data transmission rates. And a rugged TI microprocessor-based design.

The 745 with APL features half or full duplex operating modes. Standard parity options. And ASCII/APL keyboard. With readable font, true underscore and real back-space key.

To find out more about TI's 745 with APL, or our desk-top Model 743 KSR with APL, simply fill out the coupon and mail today. Or call your nearest TI sales office.

The 745 translates into a better solution for your APL needs.

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INCORPORATED

Yes! I am interested in the 745 with APL.
☐ Please have your representative call me.
☐ Please send me more information. ☐ 745 APL ☐ 743 APL

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electronic data terminals

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Houston, Texas 77001

3-8-DM

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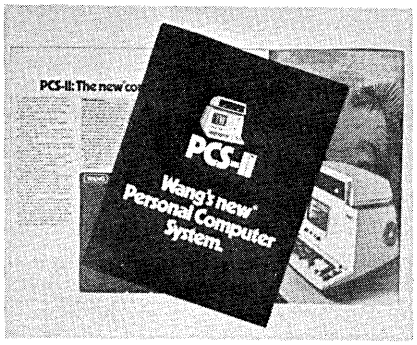
# TEXAS INSTRUMENTS.

# source data

*(Continued from page 29)*

### Personal Computer

A new desktop computing system described as having the retrieval power of a mainframe is the subject of this descriptive brochure. The PCS-II features random access storage on exclusive minidiskettes said to offer the fastest data access of any portable computer,




be compact, easy to operate, and provide instant access to computer power for businesspeople, managers, scientists, and engineers. Suggested applications include: reference and customer information storage; material location and performance; consolidation of information from different points; and forecasting of cash flow, or total sales. WANG LABORATORIES, INC., Lowell, Mass.
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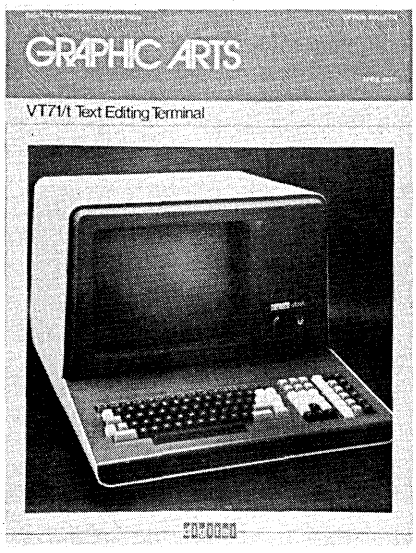
### Test Editing Terminal

The VT/71t is a microcomputer-controlled text editing terminal featured in a new pamphlet. The terminal contains an integral LSI-11 programmable microcomputer, and features large characters to ease reading. The unit can




store up to 31,000 characters internally. The pamphlet also describes the video display terminal's advanced editing functions and special capabilities such as smooth scrolling, restoration of deleted paragraphs, and up to 32 user-definable functions. DIGITAL EQUIPMENT CORP., Northboro, Mass.
FOR DATA CIRCLE 252 ON READER CARD

### Mass Storage System

A mass storage system with a capacity said to equal that of 150,000 average computer tapes is described in a brochure from this vendor. The SDC TBM II uses standard videotape on which data are recorded in a block format. Random access to any record is achieved by performing block address searches at tape speeds of 1000 ips. Features described in the brochure include capacity, cost, throughput, and architecture. There also is a comparison of the performance of the SDC TBM II with conventional tape storage for data base consolidation, file processing, and batch applications. SYSTEM DEVELOPMENT CORP., Santa Monica, Calif.
FOR DATA CIRCLE 255 ON READER CARD

### Microcomputer Products

Seven separate microcomputer families, peripheral support circuitry, single board computers, packaged microcomputer systems, and product development aids are listed in this eight-page, four color product line brochure. Also detailed is the support assistance available from the vendor, including documentation, training programs, a user's library, and software assistance. INTEL CORP., Santa Clara, Calif.
FOR DATA CIRCLE 254 ON READER CARD

### Time-sharing Systems

A new 20-page brochure describes this vendor's line of computational time-sharing systems, and explains how a single system can meet most time-sharing needs by combining mainframe performance and minicomputer adaptability. The most powerful system, the Prime 500, is said to support up to 63 users simultaneously. The systems can support programs up to 32MB long and can provide up to 8MB of main memory. They offer virtual address spaces of up to 512MB per user, and up to 2.4 billion bytes of on-line disc storage. The systems are built around totally upward/downward compatible central processors, and use the vendor's full line of time-sharing software. PRIME COMPUTER, INC., Framingham, Mass.
FOR DATA CIRCLE 253 ON READER CARD

### Forms for Minis

Forms designed for minicomputer use, including source documents, continuous forms, Moore Clean Print CPO forms, report forms, labeling systems, and government reporting forms, are described in this six-page brochure. The Total Concept Package is designed for use with System/32 and other small business computers. MOORE BUSINESS FORMS, INC., Niagara Falls, N.Y.
FOR DATA CIRCLE 259 ON READER CARD

### Project Planning

A new four-page bulletin explains the "Ezpert" alternative to the manual process of drafting a project network diagram to show planned work sequence among activities. "Developing Project Plans" begins with an example task list and proceeds in a step-by-step process to the completed logic network. There is also a graphic description of the seven steps involved in using the Prenet mode of the Ezpert project graphics system. SYSTONETICS, INC., Anaheim, Calif.
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### Image Processing

Vision One is a standalone image processing system said to be the most powerful system of its type available. A new six-page brochure describes the system, which includes a self-contained, general purpose programmable processor providing system control functions, computational ability, and access to the data base. Vision One is designed to interface with a wide variety of general purpose computers, including the most powerful minis, the IBM 370, and the CDC Cyber series. The brochure also describes the alphanumeric keyboard console, which contains a full typewriter keyboard plus up to 20 special function keys and a color crt monitor, and the software which provides the ability to read or write and display selected images and graphic overlays from the source data base. Other software features include computing of histograms, image size changes by extrapolation or interpolation, multiple image logical and arithmetic operations, and interactive video rate control of pseudo color and function processors. COMTAL CORP., Pasadena, Calif.
FOR DATA CIRCLE 257 ON READER CARD

### Digital Switch Patches

A new product sheet describes this vendor's digital switch patches used in data communications network control to permit manual or automatic selection of on-line or standby equipment. The two-color sheet details features and operating information of the patches, and includes photos of the unit in a range of in-use modes, and schematic and block diagrams. Features referenced include: a digital switch patch which assists in the rearrangement of interconnections between modems, multiplexors, terminals, and computers, plus a fall-back switch for switching modems or termi-

nals between on-line and standby equipment; fast patch with single plug insertion; and transfer or monitor of all 24 leads of an RS232 interface. SPECTRON CORP., Mt. Laurel, N.J.
FOR DATA CIRCLE 256 ON READER CARD

### Air Conditioning Brochures

Two new brochures are now available from this vendor. The Underspacemaker is an air conditioning system for computer rooms which uses the space created under the raised floor as an air supply plenum to pass the conditioned air into the room at conditions specified by the computer manufacturer. The system is in modular form, and can be expanded to meet increased demands on its potential. It also allows units to be installed in existing computer rooms where the computer is either being upgraded or replaced by a more powerful model, and where the existing air conditioning plant will not adjust to an increase in heat load and change in configuration.
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The Over 32 system is designed for small computer rooms, and can be equipped to perform the functions of dehumidification, humidification, and heating. The unit can be installed underneath a window or in any other desired position, and it is claimed to have an average energy saving of 30% over any standard window-type unit of comparable capacity. This system also may be expanded to meet the needs of a growing computer system. For Copy Circle 263 on Reader Card. HIROSS DENCO, Lockport, N.Y.

### Data Communications Products

A new catalog offers 16 pages of descriptions and illustrations of ICC/Milgo products, including modems, network diagnostic control systems, and terminals. Nine different modems, including a new microprocessor series of modems are described, as well as network diagnostic control systems which provide the user with centralized data communications network control. System accessories include transmission test sets, display panels, and patch panels. Terminal products described include the 40+ K1 Data Display Systems, the 40+ MPL Data Display System, and the System 400 Video Display terminal which offers full protocol and functional compatibility with the Honeywell VIP 7700 under "poll and select" protocol, the Univac Uniscope 100/200, and the IBM 3275 and 2265 terminals. INTERNATIONAL COMMUNICATIONS CORP., Miami, Fla.
FOR DATA CIRCLE 261 ON READER CARD

### HP 21 MX-based Systems

Nearly all the published data sheets about HP 21 MX-based computer systems are consolidated into this new 124-page booklet. The systems described are high performance small computers said to be ideal as building blocks for scientific measurement and control systems, disc-based systems, and as distributed network stations. Systems discussed include the E-, and M-Series computers, DISCOMPUTERS, and K-Series processor components. Also covered are memory systems, extenders, hardware and microprocessing accessories, and data communication, terminal, and instrumentation interfaces. HEWLETT-PACKARD CO., Palo Alto, Calif.
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### Managers' Brochure

This eight-page brochure, "A Manager's Introduction to Incoterm Intelligent Terminal Systems," is an introductory guide which presents the vendor's terminal product line in summary form. The brochure includes two charts, the first of which shows the relationship of the vendor's standard intelligent terminals in the stored program display product line. The second chart lists the basic hardware and software characteristics for each standard model, as well as available enhancements and upgrade potential. INCOTERM CORP., Wellesley Hills, Mass.
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### Keyboards Described

This 12-page brochure reviews this vendor's line of sealed solid state keyboards designed for applications in industrial, aerospace, marine, military, and other severe environments where contaminants, shock, and vibration are major factors. The Hall-effect keyboards are available in 16, 26, 63, and 75 key alphanumeric configurations, and are designed to operate at temperatures from −40 degrees to +75 degrees Centigrade. The brochure also describes individual sealed key plungers for those wishing to make their own keyboards. Mounting dimensions, product photographs, electrical data, and code and character assignments also are included. MICRO SWITCH, Division of Honeywell, Freeport, Ill.
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## reports & references

### Distributed Processing Report

Distributed processing will be the most dynamic growth segment of the data processing industry, and will grow to a worldwide market of $4.6 billion by 1981, according to a new research report now available from Creative Strategies, Inc. The study predicts dramatic growth in this industry, primarily in the simpler data entry applications rather than the distributed data base management systems. The report, based on a questionnaire mailed to 10,000 users and potential users, also found that distributed processing represents a major threat to time-sharing and computer service bureaus unless rapid adaptation is made; data base management dominated by large mainframe manufacturers presents significant entry barriers to smaller companies; and cost does not appear to be as critical a factor in distributed processing as in other markets—purchase decisions tend to be based on system performance. Price: $5,500. CREATIVE STRATEGIES, INC., 4340 Stevens Creek Blvd., Suite 275, San Jose, Calif. 95129.

### Computer Review

*Computer Review* is a 600-page book generated from a computerized data base. The main section of the book includes descriptions of central processor units, described one per page for easy look-up, with a 100 word description of the unit, and listings of system applications and features, characteristics of the central processor, and compatible peripherals. Systems software and software language availability, prices, and marketing data are also included.

Appendices describe each peripheral model referenced in the main section; describe operating systems; and give the name, address, and telephone number for each manufacturer. Price: $75 per year; includes updates every four months. GML CORP., 594 Marrett Rd., Lexington, Mass. 02173.

### Remote Batch Devices

Remote batch terminals have changed since the advent of the minicomputer and microprocessor. The *Guide to Remote Batch Terminals* highlights a number of minicomputer-based systems that have local processing capabilities, in addition to concentrating on equipment designed to perform the traditional remote batch processing functions. A Search Chart lists almost every hardwired and programmable device that can be considered a remote

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**Profit from our 32-bit experience.**

Scores of customers are taking advantage of our lead in 32-bit design right now, because we were there first . . . with the first mini with true 32-bit architecture. Hundreds of Interdata Megamini® computers have been working throughout the world since 1973.

Interdata's 8/32 computer processes data at one-half the speed of the IBM 370/158, for about one-tenth the cost. And the Model 7/32 offers even greater economies. With our Multiport Memory System, up to 14 processors can share a single memory bank, increasing throughput and processor-to-processor operation even further.

And, although they cost as little as the 16-bit DEC 11/70 or DG Eclipse, Interdata's Megaminis are the only low-priced computers with no constraint on program size. That's just one benefit of 32-bit architecture.

You also get 219 IBM-like standard instructions, and can create even more of your own with up to 512 words of Interdata Writable Control Store, raising throughput by a factor of five. And for still greater throughput, Interdata's exclusive Hardware Floating Point option improves the speed of scientific calculations ten times faster than software-bound minis.

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batch device, and there are 31 individual product reports analyzing specific devices or product lines. A tutorial article explains techniques used for remote batch processing and the various typical alternatives now available. The 189-page report is $24.95. AUERBACH PUBLISHERS INC., 6560 N. Park Dr., Pennsauken, N.J. 08109.

### Datamation Mini/Micro Survey

Five-thousand oems, systems houses, and end users responded to a survey by DATAMATION, and the results of that survey now are available in the 200-page report, *1977 DATAMATION Mini/Microcomputer Survey*. The survey was directed only to those with a known interest in mini and microcomputers; both foreign and domestic markets were examined.

The survey, which will be updated annually, looks at the current and future hardware and software needs of the users surveyed, and analyzes their spending plans for minis, micros, and miniperipherals for 1977 and beyond. There is an assessment of the IBM Series/1, and 32-bit machines by their users, and an analysis of prospective demand for the 32-bit systems.

End users will find the report allows them to compare their own experience with specific vendors to a national cross-section of other users.

There is a section on the respondents' minicomputer spending outlook for 1978 and longer term which will be of interest to industry and investment analysts, along with a report on the status of oem inventories, and one on the impact of minis on mainframes.

For market planners and sales executives, there is information on customer loyalty: what factors they consider important in choosing a vendor, and why they become unhappy with a vendor. Also included is a look by vendor and units at what software and peripherals are needed and planned by users. Price: for orders received before Oct. 15, 1977: $330, North America; $360, outside North America. For orders received after Oct. 15, $365, North America; $395, all others. D. Dwelley, DATAMATION MAGAZINE, 35 Mason St., Greenwich, Conn. 06830.

## periodicals

### Word Processing News

A monthly newsletter providing news commentary about important events and trends in word processing, the *Datapro Word Processing News* is designed to provide WP managers and office systems planners, specifiers, and designers with in-depth information on currently available systems. There is coverage on changing technology, new products, new concepts, and related industry developments. Subscription: $42/year.

Also new from Datapro is the information service, *Datapro Reports on Word Processing*. A free brochure includes summary information about the new reports and their comprehensive analyses and evaluations of word processing systems, products, and services. The brochure lists ten major categories of reports and gives a brief description of each one. The service itself includes looseleaf reports, monthly supplements, monthly newsletters, and a telephone inquiry service. Subscription: $290. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

## courses

### Microprocessor Education

A series of three courses over a period of four days cover everything from microprocessor project management to hands-on microcomputer programming. The first course, on project management, emphasizes high-risk, high-cost, and time-critical problems unique to microprocessors. Case studies illustrate the step-by-step methods presented. Key topics include: fundamental concepts; planning and specifying the project; how to select personnel; software development and how to verify the software works; testing and QA; servicing microprocessor-based products; and how to prepare for the future.

The second course, an introduction and survey, emphasizes factors affecting key design and development decisions including: processor selection, I/O and software design, software implementation steps, development and test equipment, and pitfalls to avoid when getting started.

The final course is a hands-on microcomputer programming workshop in which each participant receives a complete 8080 microcomputer for use throughout the course.

The courses will be offered in Atlanta, Aug. 16-19; and Anaheim, Calif., Sept. 13-16. The first two courses comprise the Management Series, for which the fee is $390. The second and third courses are the Engineering Design series, for which the fee is $495. The fee for all three courses is $595. INTEGRATED COMPUTER SYSTEMS, INC., 4445 Overland Ave., Culver City, Calif. 90230.

### Writing Skills for Dpers

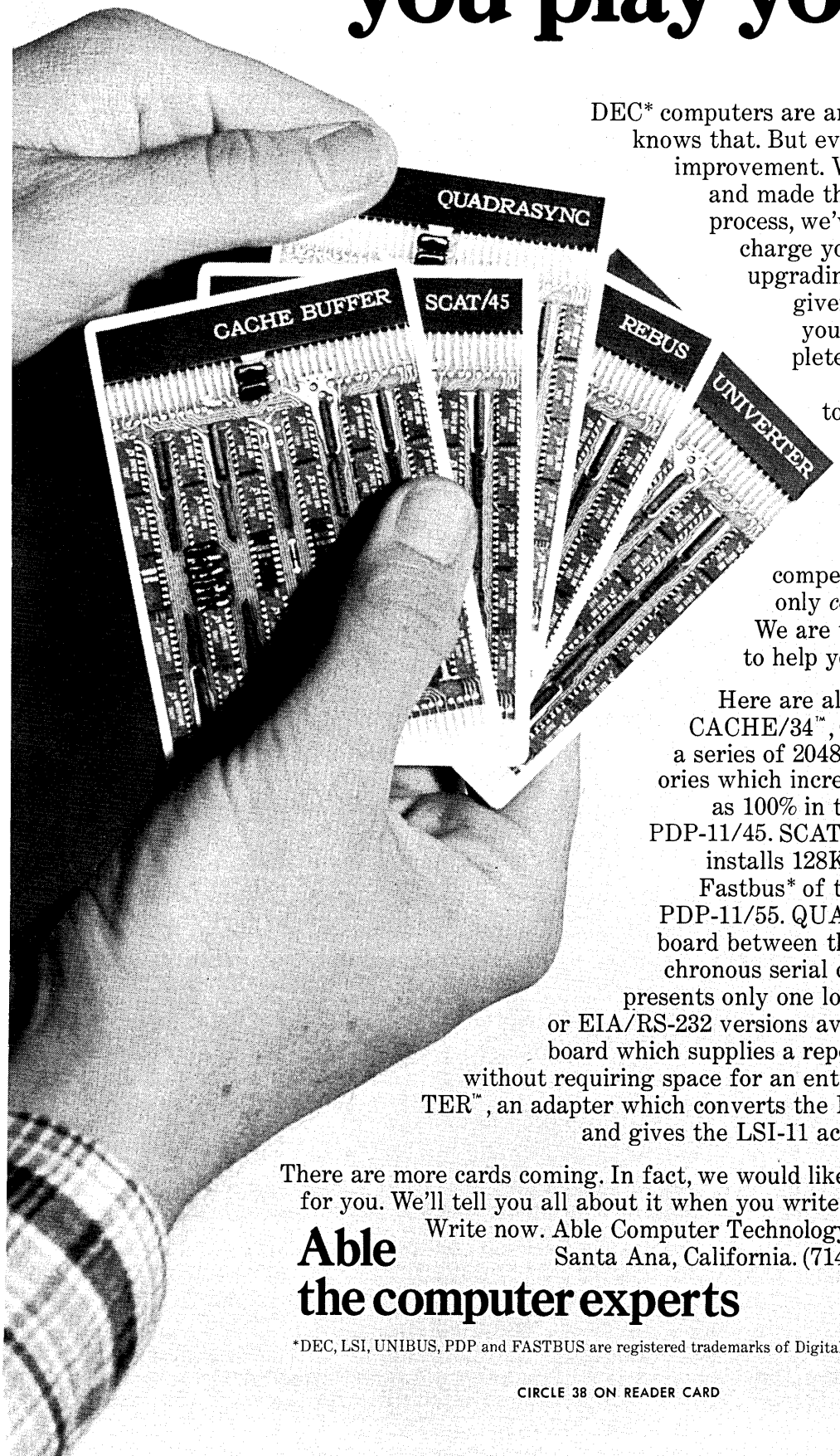
Improving the writing skills of dp specialists is the aim of this two-day course, "Writing Skills for the EDP Professional." Workshop participants learn writing skills in two phases. The first is the workshop itself, which begins with learning to focus on the reader, the media, and the structure of the report. The second day of the workshop focuses on the message and writing it efficiently. The second phase of the program, the individualized coaching program, is in effect for six months after the seminar, and is designed to encourage participants to submit copies of their written communications to the course director for editing or critique. The material is returned to the writer with suggestions for improvement. The course will be offered in Boston, Aug. 15-16; Washington, Aug. 17-18; Houston, Aug. 29-30; and Saddle Brook, N.J., Sept. 1-2. Fee: $395. Team discounts are available. AMERICAN INSTITUTE FOR PROFESSIONAL EDUCATION, Carnegie Bldg., Hillcrest Rd., Madison, N.J. 07940.

### Office Automation

The impact of office automation on personnel, systems, and organizations will be the subject of this three-day conference. "The Automated Office: Integrating Word Processing, Data Processing, and Administrative Systems" has been organized for executives and professionals concerned with current and future information systems in the clerical, administrative, and managerial office environments, and will provide an overview for the user or systems professional considering a first or subsequent office automation project.

Scheduled for San Francisco, Sept. 28-30, and Washington, D.C., Dec. 7-9, plenary sessions on the first day will survey the functions and systems of the automated office, including data processing, word processing, information communications, and file/record management. On the second day, there will be concurrent workshops examining such topics as: word processing technologies, electronic correspondence, and data processing systems for information and data storage and retrieval. Presentations on the third day will examine the integration of required diverse technologies and procedures into operational electronic office procedures. Fee: $295; teams, $195. AIIE SEMINARS, P.O. Box 3727, Santa Monica, Calif. 90403. ❋

# PDP-11 users, let the computer experts help you play your hand




DEC* computers are among the best ever. Everybody knows that. But even with DEC there is room for improvement. We took advantage of that fact and made the best ever even better. In the process, we've given you a chance to supercharge your present PDP-11* instead of upgrading to the next computer. We've given you more time and improved your cash flow with the most complete line of sophisticated computer enhancements on the market today. They are available off the shelf. They are priced competitively. They install in minutes. They provide immediate results. And, in every instance, they outperform the competition. They should. We are the only *computer* people in the business. We are the only people really qualified to help you play out your hand and win.

Here are all the cards in our present deck: CACHE/34™, CACHE/40™ and CACHE/45™, a series of 2048-byte single-board buffer memories which increase processing speeds as much as 100% in the PDP-11/34, PDP-11/40 and PDP-11/45. SCAT/45™, an add-in memory which installs 128K of high-speed memory on the Fastbus* of the PDP-11/45, PDP-11/50 and PDP-11/55. QUADRASYNC™, a quad interface board between the PDP-11 Unibus* and 4 asynchronous serial communication channels which presents only one load to the Unibus. Current loop or EIA/RS-232 versions available. REBUS™, a dual-width board which supplies a repeating function for the Unibus without requiring space for an entire system unit. And UNIVERTER™, an adapter which converts the LSI* bus to a Unibus structure and gives the LSI-11 access to a megabyte of memory.

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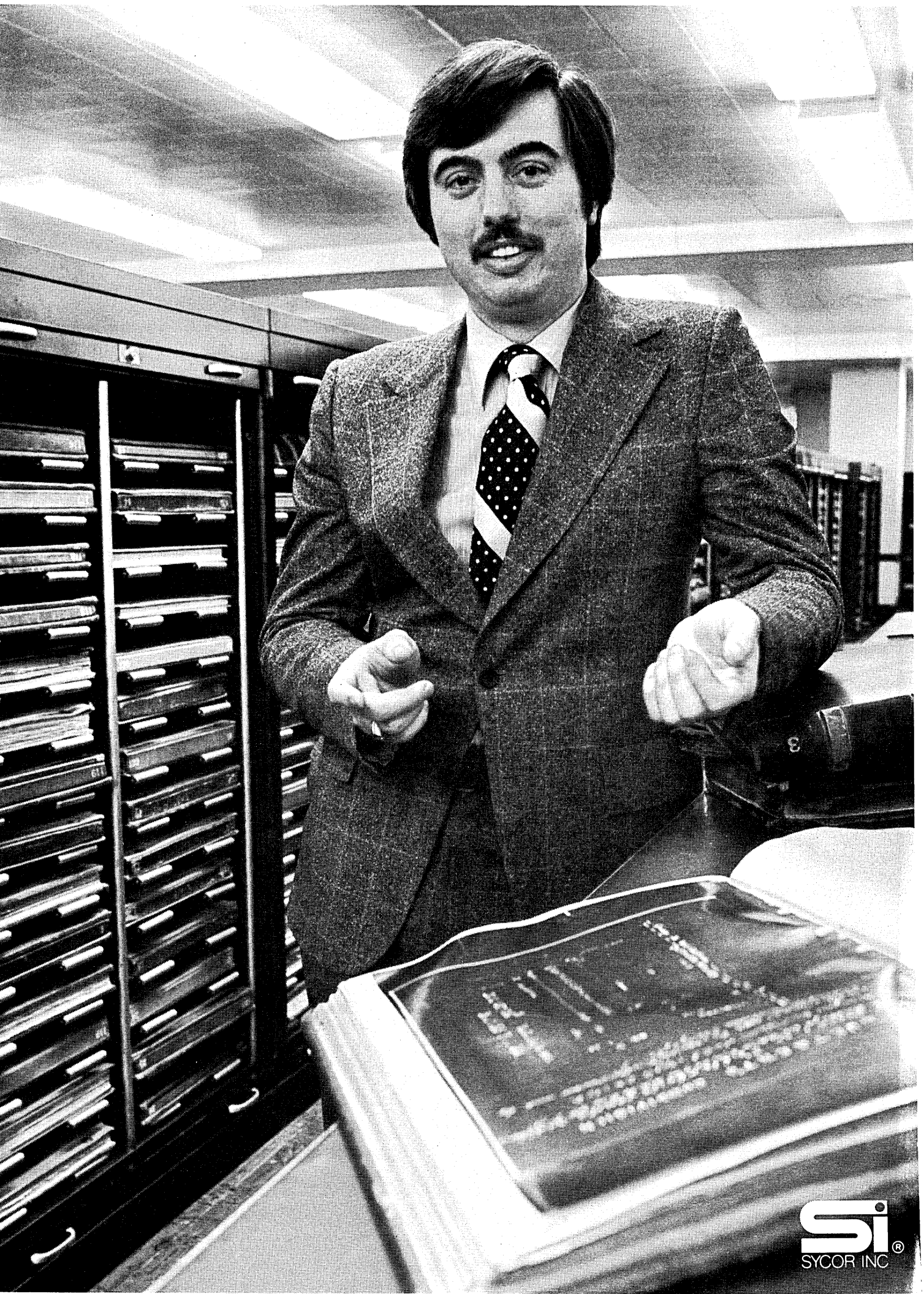
SYCOR INC

# "With Sycor 440 terminals, we increased productivity 43%."

*Jim Millington, Project Manager*
*Chicago Title Insurance Company*

Chicago Title Insurance Company, with more than 160 offices and 1600 agents, provides title insurance on real estate nationwide. This kind of insurance increases speed and efficiency in completing real estate transactions and protects against loss due to title defects. Chicago Title issues over 600,000 of these policies per year.

"Historically, title records have been kept by hand," Project Manager Jim Millington says, "but the volume of title actions in many densely populated areas demands speed and accuracy that hand-search simply can't deliver. That's why we developed OPTICOM—a computerized system for indexing the name and land records essential for providing title services—and made it available to our branch offices and agents.

### The Sycor 440 tackles the heavy-volume areas.

"OPTICOM—which includes the Sycor 440—is the most cost-efficient way we've found for handling heavy volumes of title actions." Millington explains.

"Information about a specific piece of property or about individuals is stored on the 440's 10mb disk. The data is entered on terminal display stations with eight special formats which cover each type of action concerning a piece of real property. The terminal controls formats and guides the operator, so data errors are almost completely eliminated.

### The Sycor 440 makes instant name searches.

"In addition to collecting, editing, verifying and sorting all our data," Millington notes, "the Sycor 440 also lets the Chicago Title branch or agent make name and property searches against up to 30,000 current records. Instantly.

"But the real payoff is that our users get more work done faster. Our studies show that they've been able to increase productivity 43%. And the Sycor 440 requires less-experienced people to achieve this productivity level.

### Sycor 440 reduces operating costs.

"Our increase in productivity and Sycor's attractive lease structure help us hold down operating costs," Millington reports. "And in addition to the daily capture of OPTICOM tasks, we also maintain our accounts receivable and customer name and address files by using data entry programs on the Sycor 440.

"The records created by OPTICOM and these data entry programs are transmitted daily to Chicago Title's CPU for processing. Reports generated and updates to the OPTICOM file are transmitted back to the local 440s overnight. We feel that this approach to distributed processing is the most economical way to provide our users with timely information. I'm really pleased with the 440's performance."

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The Sycor 440 is a clustered processing system. It is available with cassette or diskette interchange, up to 20mb of storage and eight video display terminals.

## Sycor puts computer power where the work is.

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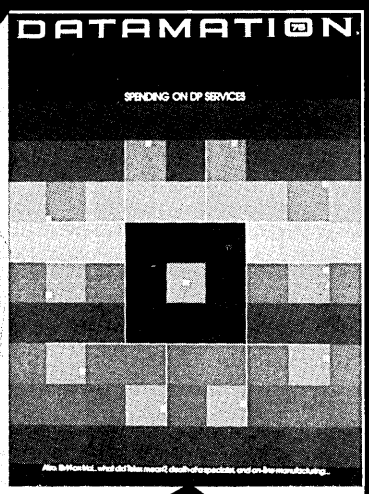


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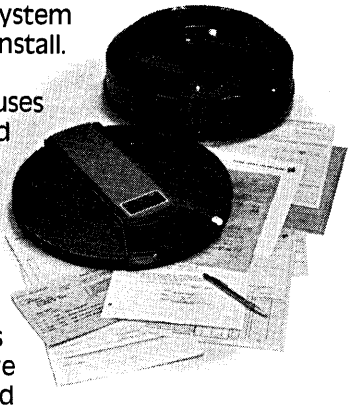

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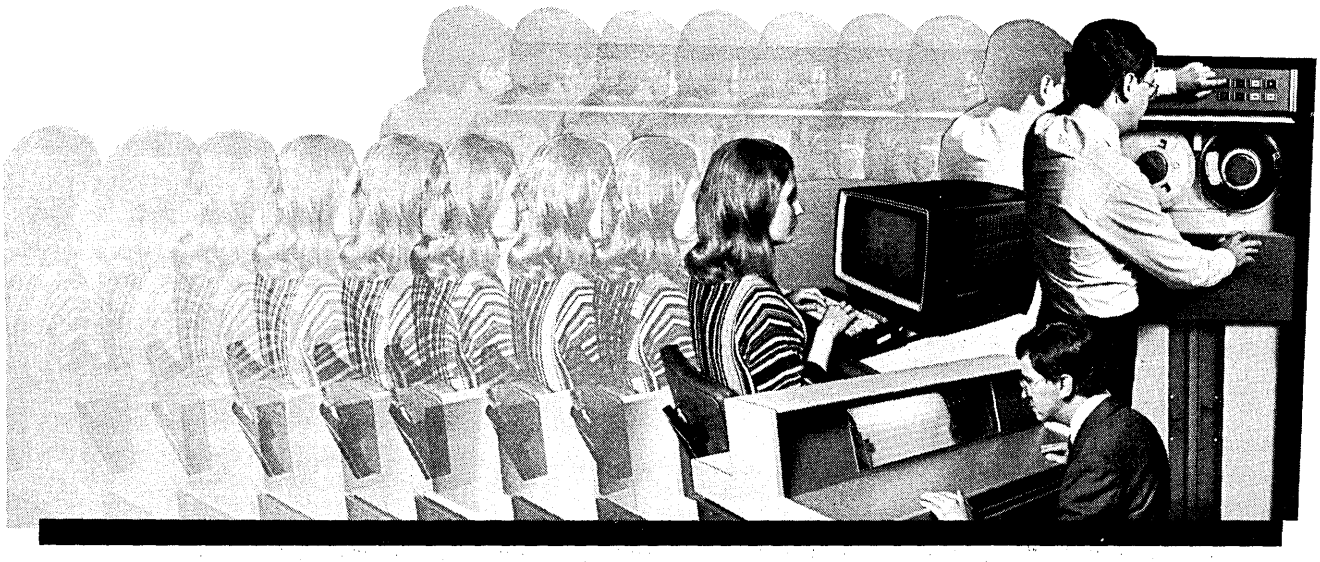

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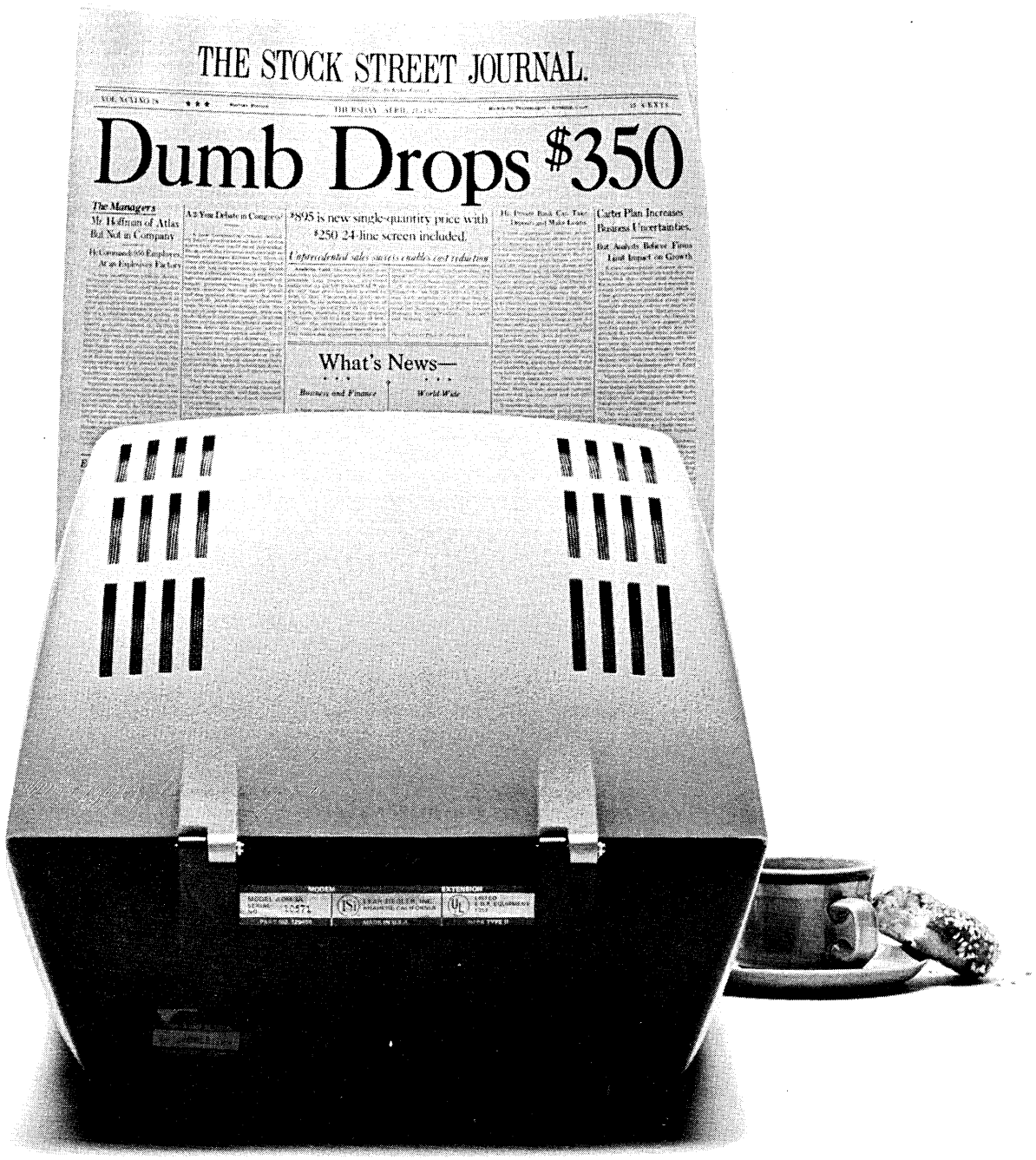


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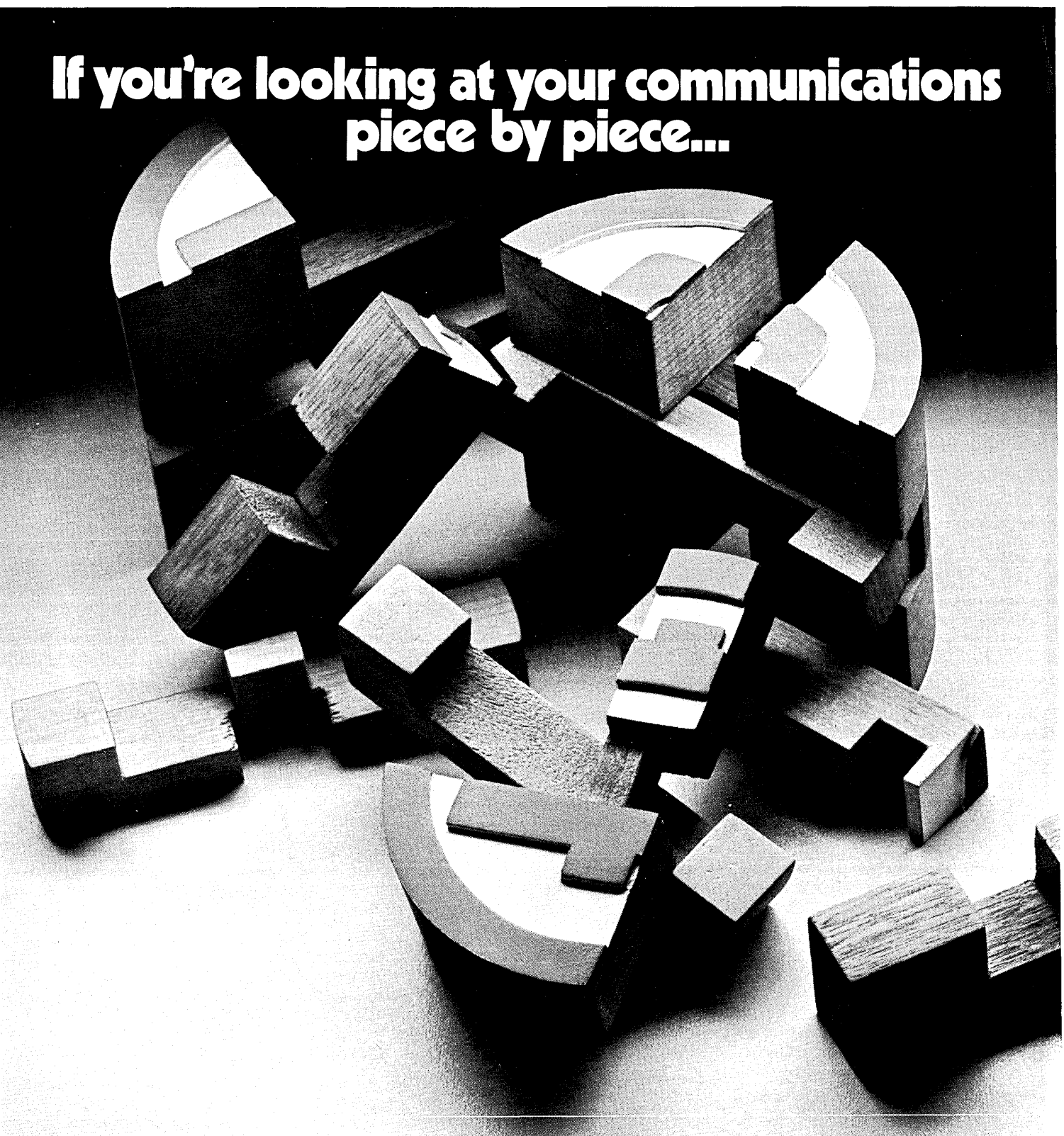

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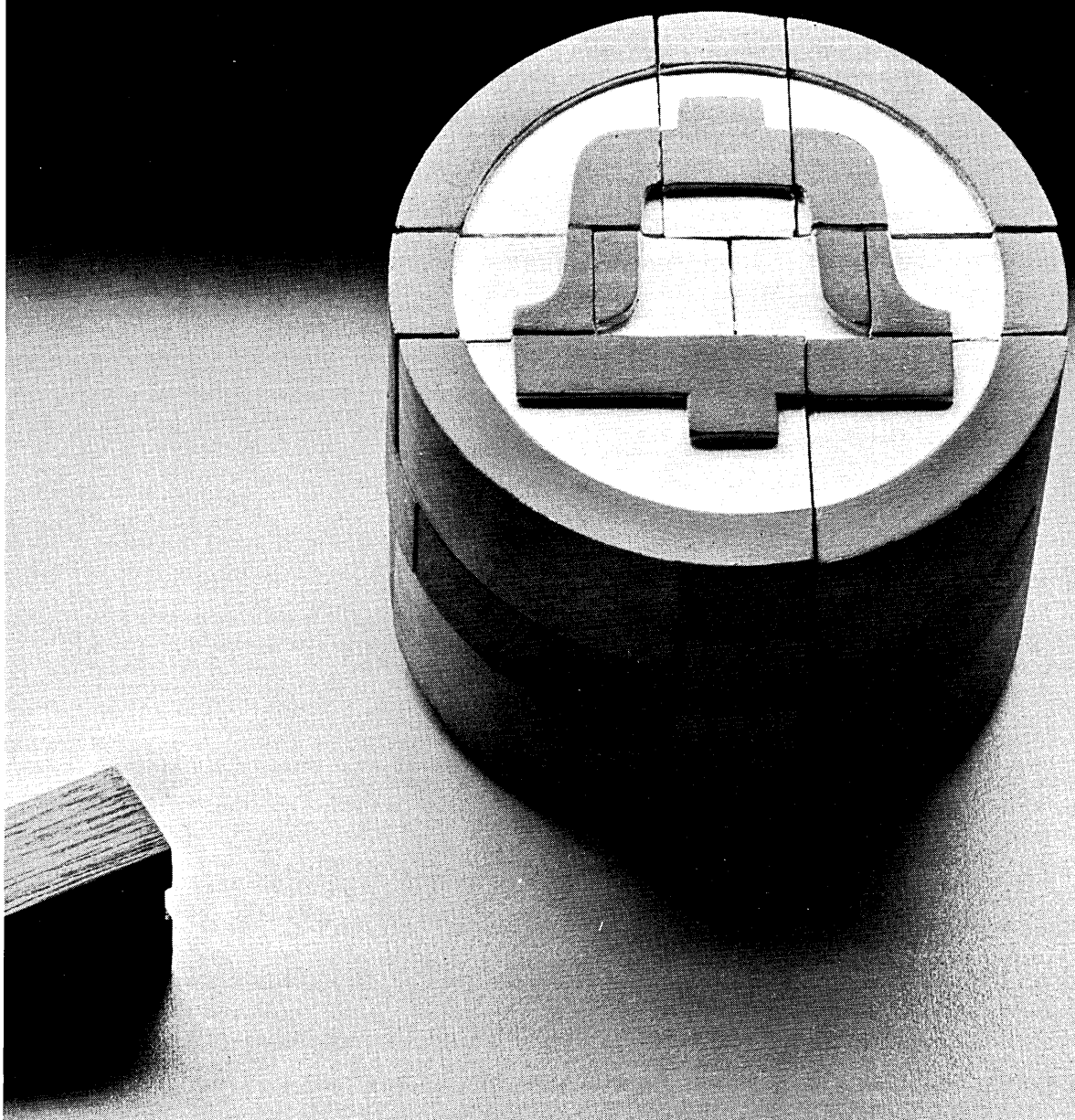


For we firmly believe that, in solving problems for companies like yours, the system is the solution. If you haven't talked systems with your local Bell Account Representative lately, you're missing something.

**The system is the solution.**

Bell System

# Designing for Auditability

by William E. Perry and Jerry FitzGerald

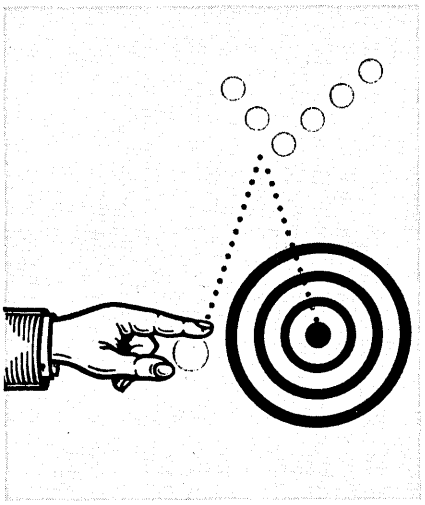
Audit controls must be built in, not added on. And that means the auditors must learn enough to participate in system design.

Changes in data processing technology have occurred concurrently with the expansion of both management's information needs and government requirements. Not only has the number of computer systems installed multiplied, but new capabilities and user applications have continually been developed and refined. These advances have had a number of implications for auditing and control procedures.

The growth in the use of data communications to connect processing facilities at many locations is one example of how new technology has complicated auditing and control. The number of data communications terminals installed was less than 250,000 in 1970, but by the end of 1975, the figure was almost a million. A further jump to three million terminals is expected by 1980, thus multiplying the number of locations subject to control and audit.

The potential for loss associated with the use of data processing is increasing not only with the increasing complexity and exposure, but also as procedures once performed manually are automated. Today, computer programs rather than human beings perform many of the checks and verifications necessary to ensure accuracy and completeness of data and records. This development has exposed information systems to the possibility of loss from several sources, including: errors or omissions in input, improper controls within the system, inadequate system design, fraud or theft, and failure to comply with legislated or other standards and procedures.

Another way in which the potential for loss is expanded is found in modernizing old systems. Although the number of errors made generally does not increase as a result of moving from a manual to a computer-based information system, the effects of any one error are potentially much greater. Moreover, tracing an error has been found to be considerably more difficult.



## Off to a bad start

Data processing managers and internal audit managers report that they expect intensifying top management concern about potential loss to result in greater emphasis on, and consequently more spending for, the development of audit and control tools and techniques. While increased expenditures for data processing controls will probably have only a limited impact, internal audit costs can be expected to increase sharply in the near future if internal auditors are to fulfill a significant role in the data processing environment.

Cost is not, however, the primary constraint on the development of an adequate dp audit capability. Rather, the development is constrained by the time required to recruit and train internal auditors so they can be effective in the data processing environment and participate constructively in the systems development process.

Top management, as well as the regulatory agencies and the general public, have tended to rely increasingly on the audit community (both internal and external auditors) to protect organizations against the hazards of inadequate control in dp systems. However, preliminary investigations reveal a dangerous gap: auditing and control procedures for dp systems have failed to keep pace with the introduction of new technology and new concepts in dp system design. Also, though techniques for dp auditing and control have been developed in some organizations, these have not been widely communicated or generally applied.

Although data processing systems and internal audit techniques both have been evolving, there has been little coordination between the two disciplines. From a standpoint of those managing the dp facility, the internal auditors' mandate and their scope of activities are not clear. On the other hand, internal auditors presently are faced with the task of investigating an environment in which most of them have only limited experience, knowledge, and tools. Compounding these conditions is the fact that top management in many organizations has not given adequate attention to the potential repercussions of inadequate dp audit and control practices.

Thus there is a need to increase management's awareness of changes in the data processing environment as they affect internal audit and controls governing data processing. This increased awareness, in turn, is required to place auditability and control of computer-based information systems in a proper perspective.

## Building in the controls

Some of the first things which must be developed are control guidelines based on cooperation among data processing, users, internal auditors, and external auditors. Firms which seem to have done the best work in this field have identified the following as some of the considerations that characterize effective internal control programs:

• Control objectives are defined during the system development process and are recognized as separate development requirements.

• Computer-based information systems, computer service center operations, and system development are considered within the context of the total management environment.

• Before new data processing technology or system design concepts are introduced, they are evaluated in terms of associated control requirements, capabilities, and procedures.

• Design review programs that cover planned controls are part of the information system development process.

• Control features are built into information systems, not added on.

• The operational responsibility for internal control resides with data processing users.

• Clear statements of responsibility define the relationships between users, the dp department, and the internal auditors.

• Users, internal auditors, and dp personnel work together to develop guidelines and standards for controls.

• Systems designers consider human factors affecting the reliability of computer-based information systems and data processing operations.

• Pre-installation testing is not compromised to achieve system development and installation schedules.

• Effective pre-installation evaluations are performed by internal auditors who also perform periodic post-installation verification of controls and of processing results such as records and reports.

### Looking at the life cycle

One of the real strengths of the recent study results from the research team collecting and organizing hundreds of controls that were found to be in actual use in various firms. One of the best sets found appears as the System Development Life Cycle.

The *System Development Life Cycle* technique is used to divide the system development process into a small number of distinct phases with formal management control points placed between and during each phase. The objectives in using the technique are twofold: to provide a more structured management scheme for controlling costs and schedules, and to ensure proper and responsive communications channels among users, dp auditors, hardware planning personnel, top management, and the data processing personnel responsible for developing the application systems.

The majority of companies interviewed which were using such a technique did so to ensure that major application systems were developed on schedule, within cost, and to the user's satisfaction.

The following representative example of how one large government organization has defined and uses the method serves as a basis for describing the general controls and techniques identified in use during the study. (However, other organizations define and use slightly different life cycle techniques, and such differences are discussed after the example.) The government organization defines the technique as follows:

• Project definition—That phase whose primary purpose is to define the user requirements and uses for the system.

• System analysis and design—That phase in which an overall description of the system is prepared.

• Detailed design and programming—That phase that focuses on the internal components of the system and the development of computer programs needed to form the system.

• System test—That phase in which the system is exercised to determine the correctness and completeness of implementation to the user requirements as manifest in the design documents.

• Conversion—That phase in which the tested system and operational procedures are initiated to move the system into full operational mode.

Other organizations include one or two additional phases broadly defined as:

• Operational—That phase concerned with ongoing operation, program changes, and *maintenance.*

• Post-implementation—That phase concerned with whether the system performs as intended by the user, with focus on methods to improve the development process.

Fig. 2 (p. 49) shows details of the five phases of the development cycle and the 15 control points used by that government organization. During the development of application systems, all requirements specified at each control point must be satisfied before that phase or the next phase can be continued.

Basically two types of control points are used: those affecting the quality of systems being developed from a computer processing point of view, and those used to interface to users and others outside the data processing department. System quality control takes place primarily at Points 1 and 4 through 13.

• Control Point 1—The dp auditor, user, and the project leader review the project organization, the arrangements with the user for communications, and the plans and work program for the design. This central point helps the project leader to establish a good working relationship with the user to ensure that the system reflects user requirements.

• Control Point 4—The user, dp auditor, and project leader review: the project organization resulting from the first phase; the communication links established between team members, users, and dp auditors; schedules and work plans; and other items germane to the specific project.

• Control Point 5—The dp auditor, user, project leader, and design analysts review the detailed design of output reports for completeness and clarity. The dp auditor attempts to ensure that sufficient design documentation exists to allow for a clear understanding by the test team and the dp audit staff.

• Control Point 6—The user, dp auditor, project leader, and design ana-

## About the Study

The conclusions reached in this article are based on a two-year research project which documented the state of the art—or at least the state of current practice—in dp auditing around the world. The project was conducted for The Institute of Internal Auditors by Stanford Research Institute, and was sponsored by IBM.

Called the Systems Auditability and Control project, the study was founded on the belief that practical audit and control techniques *have* been developed by many larger organizations. It was felt that there would be considerable value in providing a compendium of these proven methods to the auditing and dp communities.

The scope of SRI's research included visits to 45 organizations in Canada, the United States, Europe, and Japan, plus a questionnaire mailing to 1,500 more organizations in those areas. The organizations contacted were in industry and government, and most were large; the findings, however, are not based exclusively on larger organizations.

As a result of the research, three reports have been written: an Executive Report for top management, an Audit Practices Report for the dp auditor, and a Control Practices Report for the dp professional. Each is available for $12 prepaid ($30 for all three) through The Institute of Internal Auditors, 249 Maitland Ave., Altamonte Springs, FL 32701. ❋

lysts review the file requirement specifications and the input requirements associated with them. The user attempts to ensure that the file requirements do not implicitly or explicitly change the original system specifications.

• Control Point 7—The user, project leader, dp auditor, and other data processing personnel responsible for hardware planning review the equipment requirements.

• Control Point 8—The dp auditor, user, and project leader review the design from cost, data processing standards, and general management points of view. The project leader is interested in ensuring that all loose ends from the past two phases are in place before moving into the detailed design phase.

• Control Point 9—The dp auditor, project leader, user, and data processing personnel make a final review of plans, equipment, costs, project organization, and communications channels to ensure that all participants have agreed upon the status and direction of the project. The project leader is primarily concerned with assuring top management that sufficient systems analysis and design have taken place before the detailed design phase.

• Control Point 10—The dp auditor, user, and project leader review the documentation scheme and documents available describing the file systems, interface data handler programs, and program run documents for compliance to standards, completeness, accuracy, and clarity. The project leader is primarily concerned with ensuring that the project team is providing adequate documentation to meet data processing and user documentation standards.

• Control Point 11—The dp auditor, the project team members, testers, and user review the detailed system design to ensure that it follows from the general system design and still meets the user's requirements. In addition, the test plan is reviewed for completeness, timing, and cost. The conversion plan and associated paperwork are reviewed for reasonableness, completeness, and clarity. As this is the last checkpoint before the test phase, the project leader takes special care to ensure that the original design requirements are still intact or that a traceable trail exists that explains to top management and users why the system has changed.

• Control Point 12—The dp auditor, testers, user, and project leader review the test team organization to ensure that the proper people are present and that the project test plan is complete and consistent. The project leader is primarily concerned with assuring himself that the test plan will completely test the system and in particular will test the internal controls designed in the system.

• Control Point 13—The dp auditor, user, and testers develop test data, build master files, review test results, and monitor the test plan progress.

General management and other organizational interface controls occur primarily at Control Points 1, 2, 3, 4, 14, and 15, and Control Points 1 and 4 have already been described. The others are:

• Control Point 2—The user, dp auditor, and project leader review the analysis and planned cost for completeness and accuracy. In addition, the project control and communications plan is discussed and changed if necessary. The user plays a major role at this control point in assuring that proper analysis has taken place.

• Control Point 3—The user, dp auditor, and project leader review the conceptual design documentation for accuracy, completeness, and any changes that may have occurred. A revised cost-benefit plan is developed, and the dp auditor presents the findings to top management.

• Control Point 14—The user, dp auditor, computer operation personnel, and the project leader review the conversion plan for completeness of detail and personnel involved. Plans for communicating the production schedule to top management are discussed as well as other miscellaneous considerations germane to the specific project.

• Control Point 15—The user, dp auditor, and project leader review all problems not yet resolved, adequacy of documentation, and any incomplete activities identified. Final reports on the project status can then be written by the dp auditor.

Management at the government organization using the above approach said that they would like to include a post-implementation phase in their current cycle. They feel that after the application system has been used for a few months, problems can be identified by the users that will point out methods to improve the application system in question, as well as improve the entire life cycle review technique used.

Controls and techniques used in connection with the system development life cycle review by other companies interviewed include:

• daily reports to the managers of the functional areas during the critical stages of application system development.

• required sign-off by the internal audit department on all new applica-

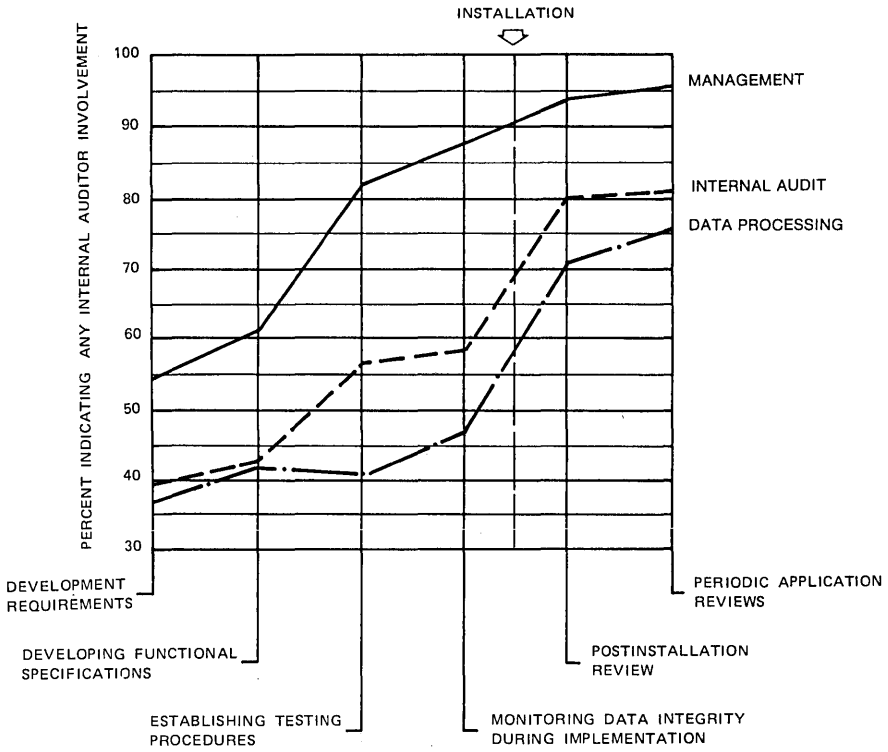



Fig. 1. Above are Stanford Research Institute's best estimates for what the present involvement of internal audit staff in dp system development and operation is perceived to be. The figures are based on a response of 283 sets of three questionnaires (one each for the chief executive officer, auditor, and dp manager).

Two conclusions can be readily drawn. First, internal auditors think they are more deeply involved than dp managers think auditors are, but less than management wants them to be. Second, the internal audit staff is probably little involved in early stages of system design in any case.

tion systems developed. (This control forces the internal auditors to become involved with the project team at an early stage.)

• post-implementation performance reviews conducted by the internal auditors and users to determine whether the operational system functions as expected and has been adequately documented from a user's point of view.

In summary, using some type of life cycle review does provide more management structure and an opportunity for users and dp auditors to participate in all stages of application system development. It does not ensure that users and edp auditors will do their respective jobs well or that project leaders will communicate as well as everyone would like.

The approach is a good application system development technique because it provides a means to develop more reliable and higher quality systems that can provide a high degree of data integrity. We see a definite trend to the use of some types of life cycle review in organizations that are heavily involved in application system development.

## Two years later

Based on the successful experience of leading organizations like the installation described above, we conclude that greater involvement of the internal audit functions in all phases of data processing is absolutely necessary and proper in today's increasingly complex data processing environment.

As management has become more dependent on data processing, data processing responsibilities have become more diffused throughout each organization. Previously, a department such as payroll or purchasing was responsible for its files and processing. That responsibility is now shared with a separate service facility, data processing, and frequently with other departments that use integrated systems as sources of information or as users. This brings about an upward shift in the lowest level of common responsibility or line management control. As a result, management increasingly looks to the internal audit staff as the logical group to evaluate and verify the effectiveness of internal controls across the entire organization.

But four things must occur before the internal staff can be effective:

1. Top management must ensure that the proper auditability mandate is established for the organization.

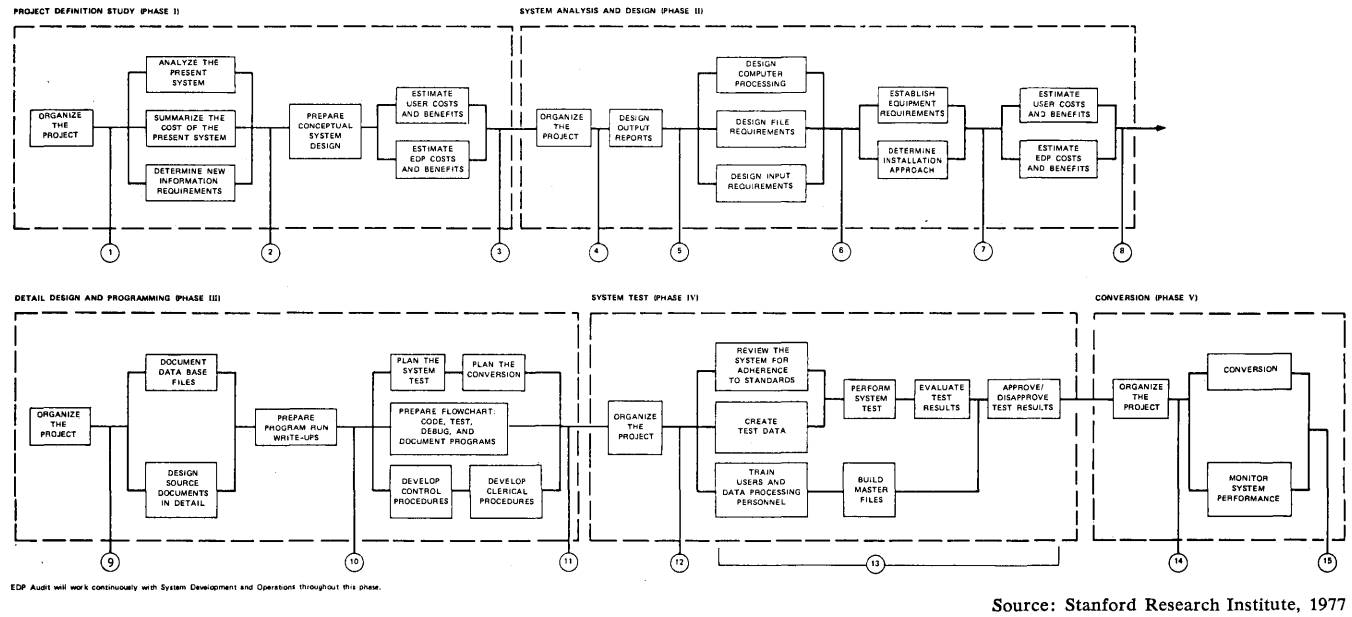
2. Data processing personnel must pay closer attention to building in adequate controls for computerized applications.

3. Internal auditors must be involved

**USE OF EDP TOOLS AND TECHNIQUES**

| EDP Audit Tool/Technique | Use in Auditing Development Systems and Modifications | Use in Auditing Production Systems |
|---|---|---|
| Generalized audit software | 12.5% | 32.6% |
| Manual tracing and mapping routines | 22.9 | 31.2 |
| Test data method (e.g., test-decking) | 27.1 | 26.6 |
| Parallel operation | 32.2 | 23.1 |
| Tagged transactions (flagging transactions in "live" operation for later review) | 12.0 | 20.9 |
| Snapshot (picture-taking of selected transactions through the flow of transactions) | 10.0 | 18.4 |
| Systems performance monitoring and analysis (e.g., SMF, SCERT) | 8.2 | 15.8 |
| Program source code comparison | 9.6 | 14.5 |
| Control flowcharting | 8.3 | 9.0 |
| Program object code comparison | 4.7 | 8.9 |
| Integrated test facility (mini- or dummy-company) | 4.2 | 5.0 |
| Modeling (simulation) | 9.5 | 7.6 |
| Automatic tracing and mapping routines (analysis of source language and logic to determine if any program segments are not being utilized) | 3.6 | 3.9 |
| Other | 6.5 | 10.5 |

Table 1. Stanford Research Institute's best estimates for the present use of tools and techniques in auditing are based on 221 questionnaire responses.




Source: Stanford Research Institute, 1977

Fig. 2. In one large government organization's dp system development cycle—here illustrated serially—there are 15 control points where the dp auditor can apply some leverage to the design and operation of the resulting product. Quality control points are primarily point 1 and points 4 through 13. Points 1, 2, 3, 4, 14, and 15 are user or management interfaces.

Other organizations often include two other phases in the life cycle: an "operational" phase concerned with ongoing use of the system, program changes, and maintenance; and a "post-implementation" phase concerned with user evaluation and focusing on ways to improve the development process.

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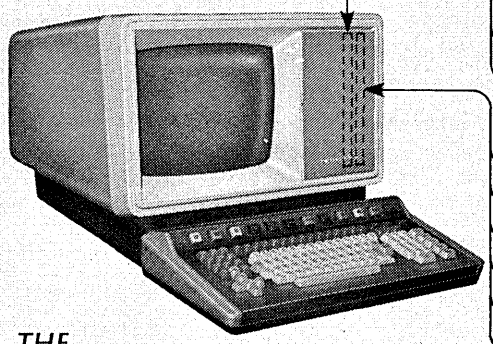

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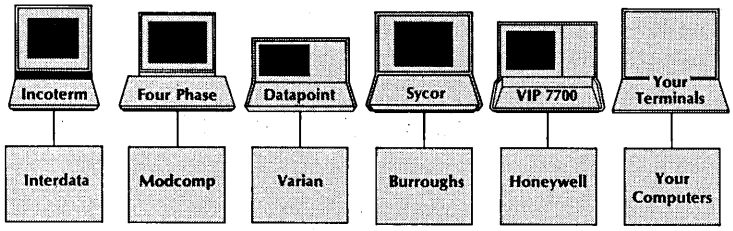


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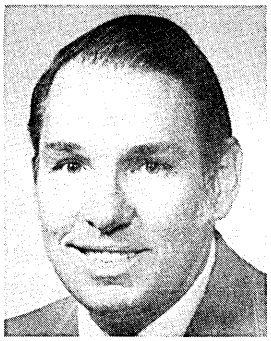
# AUDITABILITY

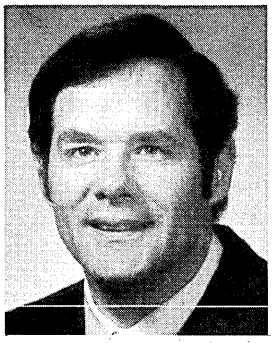
in the system design function and subsequent audits of computerized applications.

4. To make it all happen, the internal auditors must gain sufficient dp knowledge to meet their new responsibilities.

Should any one of the four be missing, auditability and control will remain elusive mirages, more shape than substance. ❋



Mr. Perry is the director of dp and research for The Institute of Internal Auditors, and staff liaison for the International EDP Auditing Committee and International Research Committee. Prior to joining the institute, he was the supervisor of corporate computer auditing for Eastman Kodak Co., having joined that firm in 1959 as a systems analyst. He also once held the positions of senior accountant with Arthur Young and Co., assistant comptroller with Ft. Richie, and junior accountant with Price Waterhouse and Co.



Dr. FitzGerald is the principal in Jerry FitzGerald and Associates, a management consulting firm located in Redwood City, California. Dp auditing is only one of the specialties of his firm. His prior position was as a senior management systems consultant at Stanford Research Institute, where he participated in the project mentioned in the text. His past experience includes positions as an aerospace programmer, a senior systems engineer for a computer manufacturer, a dp systems engineer at a medical center, and teacher of dp subjects.

# An Application Audit

by Bryan Wilkinson

## What to expect when someone says, "The auditor is waiting in your office."

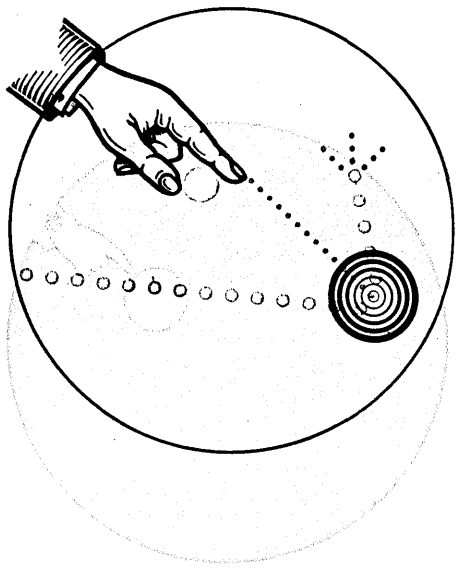
In an ideal world, every company would have a sufficient number of dp auditors so that these people could participate in the designing and continual monitoring of all dp applications at all computer sites. Unfortunately, few of us spend much time in such a world. Many data processing managers work in companies which do not have permanently assigned internal dp auditors, and so they have infrequent contact with the consultants, CPA firms, or other outside persons who come to scrutinize their shops. As a result, the managers don't know what to expect when they are told there will be an audit, or, worse, if the auditor shows up one morning.

A review of the life cycle of a dp audit may remove some of the mystery. And, as dp managers should have learned by now, mystery is not conducive to cooperation and acceptance. Here's a quick review of what an auditor will do.

The life cycle of an audit can be divided into phases, each with several work steps. Time or money constraints may eliminate some of the steps listed below:

A. Pre-audit phase
1. Select the installation to be audited.
2. Choose the application(s) to be reviewed in detail.
3. Set the date and duration of the audit.
4. Advise the installation of the audit.
5. Have installation personnel collect the requested work papers.

B. Audit phase: around-the-computer audit
1. Briefly review work papers.
2. Hold orientation session with key management personnel.
3. Cross-reference, index, and assemble work papers.
4. Complete the checklists (of questions to be asked).
   a. dp manager
   b. dp personnel
   c. user personnel
   d. others
5. Complete the work programs (validation steps).



During the first half of the audit, as many as 20 or 30 persons may be questioned.

C. Audit phase: through-the-computer audit
1. Determine questions to be answered.
2. Find out how to run the audit software on the installation computer.
3. Prepare and test the audit program.
4. Run the installation files against the audit program.
5. Analyze the results and explore discrepancies.

D. Audit wrap-up
1. Evaluate the findings.
2. Prepare a preliminary report.
3. Hold exit interviews.

E. Post-audit phase
1. Prepare and mail the final report.
2. Division (or company) management submits a reply.
3. Reply reviewed by dp auditor.
4. Prepare a request for further clarification if needed.
5. Division (or company) submits further clarification.
6. Follow-up review (or repeat audit, if necessary).

### Pre-audit phase

If a company has 50 computer installations, they can't be covered in a year with any degree of thoroughness unless the company also has a large dp audit staff. But large audit staffs are rare. So, a decision must be made. Which installations will be audited? If one or more of the following conditions is true of your shop, you should expect a dp audit or reaudit:

1. Yours is a large computer installation. This represents considerable investment in dollars and manpower.
2. Your installation has had significant changes in manpower, equipment, or systems since last audited.
3. Your division has automated applications which are used to control and manage a large dollar volume of assets, or applications which are used to make significant management decisions.
4. Your division has had significant deviations from plans or budgets or has had unusual changes in financial data.
5. You manage a company data center, or your installation services other divisions or outside companies. This creates special control problems.
6. Your method of operation may expose you to fraud or loss of control (such as using on-line terminals to record sales or to change asset values).

The "application to be audited" is a decision that is made more or less concurrently with the decision of whom to audit. Formal selection of the application using weighted factors would require information about all the applications in all the installations. There might be several thousand applications and a formal analysis would waste manpower. An informal approach serves the purpose.

Payroll is often the choice for a first audit. It controls assets. It is vulnerable to fraud. More importantly, it usually was the first system to be automated in any division. As a result, internal con-

trols may be nonexistent, the documentation may be incomplete and/or out of date, and the people who designed the system may no longer be with the division. As a result, payroll may be the least understood and least controlled application on the computer.

Financial systems are the normal candidates for audits. ("Financial" is defined to include inventory systems.) Systems which are given high priorities for audits are those which control significant assets, produce reports used by management, update important master files, have a large number of programs, and use considerable computer time during a month.

An audit by an internal dp audit team may take two or three weeks. Due only to the costs involved, it will probably be shorter if done by a CPA firm; that's not an ideal situation, but it's true. It may take longer if several applications are being audited or if unusual problems are encountered. This means that an internal dp audit team can handle 12 to 15 audits in a year.

Unless the auditor has reason to suspect embezzlement, you should expect to be notified about the audit one or two months before it is scheduled. The auditor should discuss the scope of the audit with you and request work papers which will be used in it. If this doesn't happen, both you and the auditor are going to have problems at audit time.

One of the important purposes of the pre-audit visit, if you haven't been audited before, is to let you know that the auditor doesn't have horns and a tail. It is essential to understand that the normal dp audit is not a "hatchet job." The auditor is concerned with controls, efficiency, safety, etc.; these are your concerns as well.

The preliminary visit also serves other purposes. If the auditor has not visited your facility, it gives him a chance to judge whether the time alloted for the audit will be adequate. Preliminary discussions about the application may result in the selection of a more appropriate one than he had chosen. The visit also serves to "break the ice" so that a minimum amount of orientation is required on the first day of the audit. Various mundane housekeeping requirements can be arranged, such as office space and the need for a telephone.

While the pre-audit meeting serves many purposes, the primary one is to discuss with you the work papers required and to set in motion the process of assembling them. Work papers are extremely important to the dp auditor. They orient him to your installation and the application to be audited. Work papers are also used to verify statements made by division personnel and observations made by the auditor. While they could be developed or assembled by the auditor, the initial collecting can be done more efficiently by your staff. The auditors will cross-check it against other documents and findings.

There are two types of work papers: those descriptive of the dp installation, and those descriptive of the application under study. The general areas covered by the *installation work papers* are:

1. Equipment: types, location, costs, and contracts.
2. Applications: number of programs per system, languages, cost if leased or purchased, primary users.
3. Systems software: description, costs, and contracts if purchased or leased.
4. Organization charts: data processing and the company.
5. Personnel practices: vacations, overtime, background checks, etc.
6. Standards manual: system development, documentation, operations, emergency procedures.
7. Logs and controls: maintained by dp and by the users.

One of the most important side benefits may be that the **user's** misunderstandings are cleared up.

8. Plans: new systems, major modifications, equipment, facility, personnel.
9. Fiscal processes: budgets, expenses, and charge-back procedures.
10. Project control: project authorization, project budgets, progress reports, post-installation reviews.

The *application work papers* include:

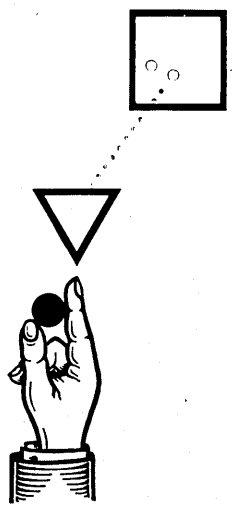
1. System documentation: narrative description, overall system flowchart, report examples, input form examples.
2. Program documentation: descriptions of each program, file layouts, edit rules, logic flowcharts if available, otherwise, access to program listings.
3. Operations documentation: computer run sheets, data entry instructions, data transmission procedures and controls, report distribution instructions.
4. User controls and procedures: user manuals, logs, batching, error correction procedures.
5. Data processing controls and procedures: control section logging and balancing procedures, tape librarian procedures and logs.

You will be asked to assemble some or all, of the types of work papers listed above and have them available on the first day of the audit. Failure to do this will, more often than not, prolong the audit.

### Audit phase (around-the-computer audit)

During the morning of the first day of the dp audit, the division general manager and the division's chief financial officer are given a preliminary schedule for the audit, are told again how it will be conducted, and are advised about the post-audit activities. (They would normally have been told about it for the first time during the preliminary visit.) This is important because they will be asked to sit in on the exit interview and to respond to the audit report. At this time, schedule adjustments are made so that the review of the findings (the exit interview) can be tied to the availability of these management people.

The working papers are briefly reviewed during the first day to see how complete they are. Missing or incomplete papers are normally a portent of troubles to come. At this point it is too early to tell if the papers are accurate and up-to-date or not. To determine this, the junior member of the audit team is set the task of indexing and cross-referencing the papers. Cross-referencing the application is most time-consuming—usually requiring one man-week, more if many problems are found.



The overall system flowchart is the heart of the cross-referencing effort. It is supposed to show all input, all output, all programs, and all files in the order of use. In turn, the working papers are supposed to include examples of all input and all output, file layouts, and program descriptions. Cross-referencing these documents points up miss-

ing and poorly maintained documentation. It is unusual *not* to find problems here. The operator run sheets normally show files and output for each program. These are also compared to the flowcharts and discrepancies are explored. Finally, the keypunch instructions are compared to the input documents. At the conclusion of this effort, the division will have one up-to-date, well-documented system, if only one.

To return to the first day's effort, the balance of the day is spent asking the dp manager questions from a checklist. During the first half of the audit as many as 20 or 30 people may be asked questions from the checklist. These people will include dp supervisors and workers, a cross-section of users, the controller, someone from the personnel department, and vendors.

Many of the questions can be answered "yes" or "no." A few will ask for descriptions of practices or policies. Checklists are available from CPA firms and the literature on dp auditing. (We initially assembled and used a list of 250 questions, but have reduced that to 165.) The checklist format provides a place to record the answers received. (The auditor also records *his* answer to each checklist question after completing the associated work program.)

It was found that the controller was using the system improperly; payments had **never** offset balances due.

A work program is a series of predefined steps which the auditor must go through to validate the answers received and to arrive at his own judgment about the checklist questions. These validation steps include such things as:

1. Asking different people the same question and comparing their answers.
2. Asking the same question in different ways and at different times.
3. Comparing checklist answers to work papers or the lack thereof. For example, the manager states that he has a written plan for developing new applications, but he is unable to furnish one upon request.
4. Comparing observations to the checklist. For example, the operations supervisor says that access to the computer is limited to authorized people, but the room is unattended and the door is unlocked.
5. Mini-studies. The auditor may develop rudimentary disaster plans or examine the invoices and the purchasing practices for dp supplies. (On several occasions, for example, I have analyzed run time to see if the computer is being used efficiently or to determine if a third shift is actually required.)

Because the checklist and the associated work program represent an organized, written, pre-planned approach to studying a data processing department, the auditor is able to get fairly deep insight into the operation of your data processing facility and your user relations in a relatively short time. In fact, one of the important side benefits of an audit is that misunderstandings on the user's part about the handling of his requests or questions can be aired and cleared up. For example, a department manager may blame data processing for delayed reports. The auditor may find that the delay was caused by clerks in the user's department not submitting input on schedule. When user management is advised of the true cause of the problem by a disinterested party, it is usually cleared up and both the user and the data processing department benefit.

### Audit phase (through-the-computer audit)

Some audit teams make use of audit software that lets them use the computer to sample or verify files and the performance of programs. There are 20 or more such packages available, most of which are meant for use by nonprogrammers, and they are worth using for auditors with one or two installations. Practically speaking, if an auditor has 50 sites to check in a single year, perhaps with several brands of cpu's, chances are he won't have the luxury of using such packages. In the first place, no one package will work at all locations. Second, operational practices and approaches to JCL will vary from place to place so these must be learned at each new location. Third, if a "through-the-computer" audit is added to an "around-the-computer" audit, the time required to perform an audit may double. This, of course, increases the cost and reduces the number of installations that can be audited during any given period.

The steps in the audit phase of a through-the-computer audit are as follows:

1. Determine the questions to be answered. This is the hard part.
2. Fill out the audit forms (which are provided by the audit software firm when such a package is being used). Have the forms keypunched.
3. Find out how to submit jobs to the facility and prepare the necessary JCL and job request forms.
4. Test the "program" produced by the forms and correct the errors. There always seem to be errors.
5. Run the files against the audit program.
6. Analyze the results.
7. Repeat the process to find answers to all the questions raised by the analysis.

Following are some examples of errors found by through-the-computer audits:

1. Two files of customer contracts were compared to determine if the names of the customers and the effective dates of the contracts were the same on both files. They should have been, but numerous differences were found.
2. An accounts receivable file was aged to find overdue accounts and to determine the amount of overdue dollars. It was found that the controller was using the system improperly and payments had *never* offset balances due.
3. A file of accounts payable was searched to see if the company had paid for the same item twice. It hadn't.
4. A file of vendor names and addresses was printed out and compared to a manually maintained file. Several differences were found.
5. The pay rates on the payroll file were printed and compared to manual payroll records. Differences were found.
6. The deduction calculations performed by a payroll system were redone using the audit software package. The results were compared automatically to the results of the payroll system. No differences were found.
7. Two files with a million records each were maintained by different systems. The records in each file had one important money field coming from different sources. The values for these money fields should have been the same in both files. Only three differences were found—which was almost unbelievable!
8. Sales forecasts in one file were compared to actual sales on another file on an item by item basis. Significant differences were found.

The above only suggests what can be obtained from audit software. Time and one's imagination are the limiting factors. In the examples chosen, you can see that audit software not only points out problems, it also can tell when things are under control and are functioning "as advertised."

### Audit wrap-up

When the auditor has finished his checklist, work program, work paper cross-referencing and review, and the use of his audit software, he then asks himself. "What does all this mean?" Actually, he's been sparring with that question all along, but now he can no longer delay his answer. He must begin to sift and weigh his findings so that he can prepare a preliminary report which sets forth his findings and recommended actions. This evaluation process and the preparation of the pre-

liminary report takes about one and one-half to two days.

Each company has its own approach to preparing reports. We have found the following format to work well:

1. A paragraph describing in broad terms the scope of the audit: who was audited, what application was covered, and techniques used.

2. A paragraph describing the state of data processing in the division: the type of computer or computers they have; outside services used or supplied; whether the computer is used extensively by manufacturing, marketing, etc., or primarily is a financial record keeper. This is done because company management cannot be expected to be familiar with 50 or more installations.

3. Strengths in the operation: what they are doing that is better than average.

4. Situations that need to be improved, together with recommendations.

The recommendations are more easily understood and corrective action is facilitated by grouping related points. We use the following groupings:

1. Project and change control procedures: how systems are initiated, how changes are controlled, the extent of testing, how documentation is maintained.

2. Operational and administrative controls: personnel practices followed with regard to hiring, training, and vacations; how budgets and costs are handled; how duties are separated; practices with regard to standards and documentation controls; what is logged and by whom.

3. Manual controls of applications: how input and output are handled, what the process for correcting input errors is, how changes to master files are controlled, what controls the users have to insure that the data are properly processed.

4. Programmed controls of applications: whether the input is edited completely, whether the files use header and trailer labels and if these labels have good control data in them, whether the system was designed to provide audit trails.

5. Control and protection of on-line systems: whether terminal access and use is controlled, whether the software prevents improper access to files and programs, and if hardware and software controls are adequate to ensure that the data are transmitted and received accurately.

6. Control when a service bureau or other outside facility is used: whether there is proper contractual protection, and if source documents are protected if sent outside, and the charges proper.

7. Safety, security, and back-up: whether reasonable precautions are taken to protect the facility and the personnel against fire, flood, or other natural disasters; whether the facility is secure against unauthorized trespass; the equipment, files, programs, documentations, and necessary preprinted forms backed-up off-site; whether emergency, back-up processing has been arranged; and if there are emergency procedures.

8. Asset protection: is negotiable paper secure; are supplies purchased and handled in a proper manner; are proprietary programs and confidential company data secure; is computer time used for personal projects; is adequate insurance carried.

9. Efficiency and effectiveness: is the computer operated efficiently; are cost savings techniques used; are relations with users satisfactory and is data processing perceived to be responsive to user needs; do the systems actually provide usable and useful data.

> If the auditor is doing his job, no one should be surprised in front of his boss.

Most of these are points which should also concern the data processing manager. Very few are strictly auditor-oriented. When weaknesses are found, you can expect the auditor to assign priorities to his corrective recommendations based on an evaluation of the cost to correct problems versus the expected benefits. He will probably not include low priority items in the report, maybe not even all the high priority ones. The reason for this is that if you are given a mass of problems to work on, your tendency may well be to throw up your hands and forget the whole thing.

The next wrap-up step should be a series of exit interviews—a "series" because if the auditor is doing his job no one should be surprised in front of his boss. The purpose of the audit should be to improve data processing operations and controls, not to crucify someone. The first exit interview should be with the dp manager, the next with the manager and his boss, and finally the division manager should be added to the group.

A primary purpose of the exit interview is to ensure that the findings are correct and that the recommendations are reasonable. If, during this interview, it develops that there was a misunderstanding, you should expect the auditor to change his report before proceeding further. However, be prepared to convince him of the error. Each exit interview takes from an hour to four or five, depending upon the questions raised by the division personnel.

### Post-audit

Sometime after the auditor leaves, you should expect a final audit report from headquarters. You will be asked to indicate what is being done about each deficiency and to supply a plan and schedule for the corrective action.

When your reply is received, it will be reviewed by the auditor responsible for the audit. If your plan of corrective action appears to be appropriate, no further correspondence takes place. In some cases, your plan may appear to be inappropriate. Deficiencies may not be covered in the plan or your proposed action may not supply a solution. In such cases, you should receive another letter explaining the deficiency further and outlining why the proposed actions do not appear to be adequate. You may be asked for further plans.

Six months to a year later, depending in part on the corrective plan, you may expect a follow-up to see if the corrective actions were taken. This may be a mini-review and a mini-audit, or, if it appears that little progress has been made, a full-scale reaudit. In the worst cases personnel changes may be made, perhaps even at your immediate level. At least forewarned is forearmed. ❁

Mr. Wilkinson is the manager of edp audit for Teledyne, Inc., a job to which he brings a mix of specialized skills (including being both a licensed industrial engineer and a licensed psychologist). He has spent 20 years in the dp field, starting with work on the SAGE computer.

Among other posts, he has been a management consultant, a developer of course curriculum on systems analysis for UCLA Extension School, a teacher, a president of the Los Angeles Chapter of the DPMA, and a chairman of the Southern California Chapter of the Institute of Management Sciences.

# Who Is the DP Auditor?

by Edward K. Yasaki, Sr. Associate Editor

The dp auditor is a rare individual whose special mix of skills can win him a good position. Someday he may be a manager, but for now he's a technician in search of tools.

Meet Paul N. Norris, manager of internal audit at Burlington Northern Inc., St. Paul, Minn. He's been a traveling auditor, has worked in dp operations, been a computer systems designer, programmer/analyst, and an internal auditor. Back in 1968 he became the first dp auditor of the Great Northern, that being the corporate name before the merger that produced the Burlington Northern. Today the company has close to 50 internal auditors, of whom six are in computer auditing. The latter function began when the president of Great Northern showed uncanny foresight and expressed the need for someone with both an auditing background and dp systems experience because of the growing impact of computers on the company.

There are not too many of this "new breed of cat," as Norris calls them. William E. Perry, director of research at the Institute of Internal Auditors, estimates the number of dp auditors in private industry at between 5,000 and 10,000, while Gerald E. Meyers of the EDP Auditors Assn. makes a conservative guess of about 3,000. But companies are falling over themselves in the scramble to find more. As Norris says, there's a large demand for, and a short supply of effective dp auditors.

### A different role

The green-eyeshade connotation of the "auditor" title sometimes turns people off on dp auditing too, but while the traditional auditor reports on past corporate events, saying "this is what happened," the dp auditor's job is to say that this or that *might* happen. They're two different roles.

With the complexity of some of today's systems—incorporating teleprocessing and data bases, involving and impacting a number of people—"It doesn't take much for some flaws to creep in and for the process to go haywire," says Paul Norris. "Sometimes people can't quite spot this. But a good dp audit review can shake a system down and find its flaws, its potential weaknesses, and come up with recommendations for the different people involved to put a fix in, to correct it before you suffer. So it's more future-oriented than other types of auditing."

Greg Grosh, who has been in auditing since 1970, also has 12 years of data processing behind him, including stints as a systems programmer and data base administrator. "As the eyes and ears of management," he says, "we are in many respects an internal consulting group, independent from dp." As the head of dp auditing at Wells Fargo Bank in San Francisco, he explains that when management is confronted with a major proposal, say for a mainframe change, management can turn to his group for a review of the proposal, and his group would look for alternatives or trade-offs overlooked by the original study group. Still, the main emphasis of dp auditing is on control or control systems.

Paul N. Norris
Burlington Northern
"Dp auditing is more future-oriented than other types."

Eleanor O. "Carol" Schaffer, v.p. and assistant auditor at Wells Fargo, was that firm's original dp auditor. She explains that the auditing staff's job is "to see that the company is protected against loss of all types. I emphasize *all.* It isn't strictly a fraud loss. It could be waste, inefficiency, ineffective systems that are the causes of loss of resources." So the group has a broad charter. Says Grosh: "We review systems in development, review all production systems, and do functional audits of operational areas—which are traditional-type auditing areas."

Thus the auditor's job is to provide an independent review of computer-related activities as a direct service to management. What with the formation of audit committees by the boards of directors of some publicly held companies, some internal audit groups report directly to that committee, achieving an independence and a prominence never before attained.

### An un-rosy past

There was a time not too long ago when the internal auditing job was given to someone new at the company. It often became a dead end job. But at larger firms, the position has been elevated and given more prestige. The top internal auditor at B. F. Goodrich was recently made a v.p. and member of the board. At J. C. Penney, the general auditor is a v.p. But it varies among companies. There are firms where the audit function is esteemed, where it interacts smoothly with dp management. At such companies, says Donn Parker of SRI International in Menlo Park, Calif., "you find that dp management is very self-confident and in a strong position."

But at the other extreme are companies where internal audit is staffed with rejects from the accounting department and where the dp organization is shaky. "And if they have dp au-

diting," Parker says, "the dp auditor is frustrated and winds up being, essentially, go-fer for the traditional auditors." They receive copies of this file or that, and they're sent to extract data from certain files within the computer.

At such firms, too, says Douglas A. Webb of newly formed EDP Audit Controls in Oakland, Calif., computer auditors "need to sell themselves to upper management as being an important function . . . they're unloved."

At Pacific Gas and Electric Co. in San Francisco, the manager of internal audit reports to the president and chief executive officer. "So we have pretty high visibility, as far as the company is concerned," says Roy C. Culbertson, supervising auditor. When he started auditing there, auditors reported to the controller, then to the v.p. of finance, then the senior v.p. of finance, then the vice-chairman of the board. "I think the higher your reporting relationship, the more effective you can be as an auditor," he says.

The Burlington Northern's Paul Norris agrees. "Independence is a key requirement if you want truly effective internal auditing," he says. "Because

Gerald E. Meyers
EDP Auditors Assn.
"An edp audit manager can make up to $35K."

often, during the course of development of major systems, you'll have many departments with needs and wants, including management services or systems and programming, and oftentimes some very severe communications blockages can occur during this rain dance we call systems design. And if the party that comes for an independent review is not independent, it's not going to help the rest of the groups get untied."

The auditing function began at PG&E along about 1967 when the firm sent four people to dp training school. Culbertson was the lone auditor among them, never having had any dp background until that time. He now has six dp auditors, all of them coming from the dp side. He feels IBM's System/360 was the primary motivating force behind the start of dp auditing at the utility company.

"Most companies weren't interested in dp auditing until then, at least with first and second generation equipment. With the 360 and all those wonderful things we were supposed to be able to do, management became concerned about how we were going to audit those particular applications when they became completely automated . . . It was a realization that dp was here to stay and eventually all systems were going to become computerized, so we'd (the auditors) better become involved."

### Proving its usefulness

But Culbertson also acknowledges that the Equity Funding incident (where data processing was used to perpetrate a multi-$million fraud) "probably triggered more interest in dp auditing than anything else that has come along in the past 10 years." He says that 60% of all major corporations in the U.S. may presently have dp auditors—but he stresses that this means 40% *don't* have them. Of those 60%, however, a high percentage established the functions only since 1970, so it's a fairly new discipline at most companies. "In this day and age, you'd think every company with a computer would have a dp audit function."

Roy C. Culbertson
Pacific Gas & Electric
"One must earn the right to audit, starting with one task and doing a good job."

Asked how he would start the dp auditing function if he were doing so today, Culbertson says, "Very slowly and very carefully." He says there's a lot of politics involved, that one can't just go to dp management and begin some form of auditing. One must earn the right to do so, starting with tasks he knows he can accomplish and doing a good job. Of the people on his staff, he says, "Each one has to earn his own way. If he doesn't, he really can't function for you effectively."

Five years ago, he continues, he would not have expected a request from dp management to perform an audit. "But we've been requested several times in the last two years to perform

## AUDITING AS

People in the dp auditing field, including any with a bit-fiddling capability, speak of the job as being an alternative career path for those in dp. They say that anyone who has risen through the ranks but no longer has much hope of becoming the top dp honcho at his organization might consider the management slots in other departments that are open to him or her by way of the dp auditing post. "It's a management training center, and it's used in that way in many corporations," says Eleanor O. Schaffer of Wells Fargo Bank. You learn much more about your company than you would sitting in the operations center.

"Dp auditing is so new that it doesn't have a track record as to where your auditors will go, as far as a career path is concerned," says Roy Culbertson of Pacific Gas and Electric Co. He says he's had only one auditor transfer out, and she returned to the dp department, not into programming or analysis but into a corporate systems planning group. Why do they come to auditing from dp? "I think it's a desire to do something beyond just data processing."

> ". . . approaching auditing from a viewpoint management hasn't seen before."

According to Gerald E. Meyers of the EDP Auditors Assn., the salary scale ranges between $25K and $35K for a dp audit manager (others place the upper limit at $40K), from $19K to $29K for a senior dp auditor, and from $17K to $24K for a junior dp auditor. These figures, however, can be expected to rise not only because of inflation but also as people with technical expertise in systems software and in teleprocessing and networking are lured into the world of auditing. Rare is the dp auditor today

audits of parts of the dp function. That to me says we've accomplished something."

So just what does a dp auditor do? At one level it can be compared with traditional auditing, where a snapshot look at financial records is taken, enabling the auditors to say what a company's finances looked like as of the last day of the year, for example. But Carol Schaffer says that in dp it's not a snapshot but rather a motion picture. At Wells Fargo they have on-going efforts in dp auditing that start on Jan. 1 and end on Dec. 31, being picked up again the following day.

In auditing during systems development, she adds, you're not saying that this did or didn't happen, as traditional auditors say in their report card to management, but that this *might* happen. "So you're approaching auditing from an entirely different viewpoint and one that management has not necessarily seen before." Wells Fargo's Grosh says that while auditors are out to stop fraud in dp, they work more to implement controls upstream to reduce errors at the output end. They work with dp to spot the causes of errors and to implement the kinds of controls that would have avoided those errors.

Paul Norris points out that dp auditing provides computer audit support to others on the internal audit staff and sometimes also to the external audit staff. It also provides a more effective audit capability, making it possible to use the computer to check on or review a company's manual systems.

Of course, it also answers management's requests for assistance when problems come up, for dp audit can bridge the gap that may exist between operating departments. He adds that dp auditors have a role to play in the privacy issue too, working with the personnel department in developing security measures, rather than waiting for the government to legislate them.

Greg Grosh
Wells Fargo Bank
"Dp auditing is a very good place to keep current in dp."

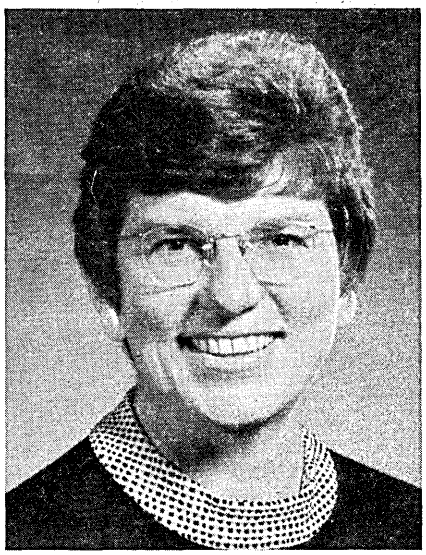
At the more detailed level, dp auditors at some companies have a chair at the system design table, sometimes with and sometimes without sign-off authority. They're there to check for design adequacy, for the adequacy of test procedures for controls approved in the design phase, and to get modifications in systems that might lack proper controls. The auditors also perform post-implementation audits, perhaps six months or two years later.

### Trade-offs and value judgments

Because each change in a system cannot be examined, auditors will periodically look instead at the change mechanism. Culbertson's staff, for example, will check to be sure that the computer department's control procedure for changes is working and to ascertain that all changes go through this control mechanism.

At Wells Fargo, too, they recognize the inability to review everything done by dp, so they look at a number of things to determine what it is that requires closer scrutiny. How frequently is a system being repaired, for example, and what problem reports are being generated? And why? Is it just because some analyst is not keeping up to date on JCL changes, or are there changes to the main line? Subjective factors must be considered: how do you feel about the people on the project? Have the systems analysts on the project shown a lot of savvy, brought to the project an interest in it and a good attitude?

Grosh: "In auditing we deal largely with something in which the potential is there but the kinetic may never show.



Eleanor O. "Carol" Schaffer
Wells Fargo Bank
"You learn much more about your company than you would in operations."

That is, there's a potential risk, a potential exposure, but the incidence rate could be excitingly low."

Schaffer: "But still you must look at the sensitivity of the system or the risk factors." For example, does the system affect the entire company or only one small portion? Is it information only or is it accounting and information? Is it information on which management decisions are made? So it's a trade-off.

Determination of software integrity,

## A DP CAREER

who has that type of knowledge, but his technical skills in computing provide him with a premium position within an internal auditing staff. "They are paid more than auditors in general," says William E. Perry of the Institute of Internal Auditors.

But Schaffer says it's more than the salary. The dp auditor also receives management attention and training, as well as a certain independence; you get an assignment and are pretty much free to do it your way. And you get to keep up with the state of the dp art.

"I think dp auditing is a very good place for me to keep current in dp," says Greg Grosh, who heads up this function at the Wells Fargo Bank. "From the position of dp auditing, I can stay current on virtually everything that's happening in data processing. I mean, I can look this year at telecommunications and at distributed processing, learning new protocols and picking up some new languages for this machine. I was very keen for many years on data bases and data base administration, so I got involved in that.

Dp auditing is so new it doesn't have a track record for career paths.

"So I have the opportunity to see, from above, all of these different things that are happening in dp, and sort of pick and choose what I want to look into—what I think is personally interesting to me but more importantly what I think is more interesting to the bank."

More information on the job, the people in it, and the things they do, is available from the Institute of Internal Auditors, 249 Maitland Ave., Altamonte Springs, FL 32701, as well as from the EDP Auditors Assn., 7024 Edgebrook Lane, Hanover Park, IL 60103. ✻

too, is part of this trade-off. Does a program do what it is supposed to do and nothing more? Is it worth the effort it would take to determine that? "Some dp auditors will get down to the nuts and bolts," observes Doug Webb of EDP Audit Controls. But, he adds, "there are not too many who can do that." Nor is there always an adequate payoff to justify such an examination.

Back in January of 1976, at a software auditing workshop, Bill Perry of the Institute of Internal Auditors observed that the auditing of software was being performed at a mere 100 computer installations. To date, he muses, he has seen nothing to indicate that that number has increased. Perry feels that the products of software vendors have been relatively free of security gaps. He thinks the fixes required are more in terms of controls. "Take, for example, the password feature in TSO," he says. "Many companies just ignore the use of that, and I'm sure if auditors were more involved they would insist on those features being used."

### But a lack of tools

Grosh believes you can look at source code for its information value, but you still must also test to see that the code does what it's supposed to be doing. "Having been a systems programmer, I can effectively hide anything in a piece of code that I want to." He says he knows people who do source code compares to see that one matches another. "I would never do that, even if I could look at all the source code, because I know that what's executing in that machine does not have to bear any relationship to what's happening in that source code."

> Technology is rapidly obsoleting existing control theories, and nothing is coming in their place.

The comment prompts Schaffer to remark that she has always wanted a facility that would translate object code to source code—sort of a reverse compiler.

She is not alone in lamenting the lack of adequate tools for her trade. The dp auditors interviewed for this article believe they understand batch systems adequately to do their jobs effectively. But they all agree that online systems incorporating teleprocessing and data bases pose a serious challenge to them. Now with distributed processing and all that that implies, they're in need of help. "That's probably the thing that's going to change the face of dp auditing—going from centralized to distributed processing," she says.

Adds Paul Norris: "The technology that's available and starting to be utilized by larger organizations—and it will spread down to smaller ones in the future—is moving so fast that the previous control theories relating to systems and data processing are being fast obsoleted, and nothing is coming in their place. If I had a key concern in terms of dp auditing of systems, and of dp in general, it's that somehow or other we have to bring the control theory—cost-effective controls—up to date and keep it in stride with technology."

He says there are a number of new concepts coming, but not nearly fast enough. "Obsolete control theories, when you try to apply them, sometimes are worse than no control at all because they give a false sense of security and really don't fulfill the original control objectives."

Norris sees bits and pieces of activity, such as those relating to data base security and teleprocessing and networking, but no overall integration of them that could result in good control theory. ❋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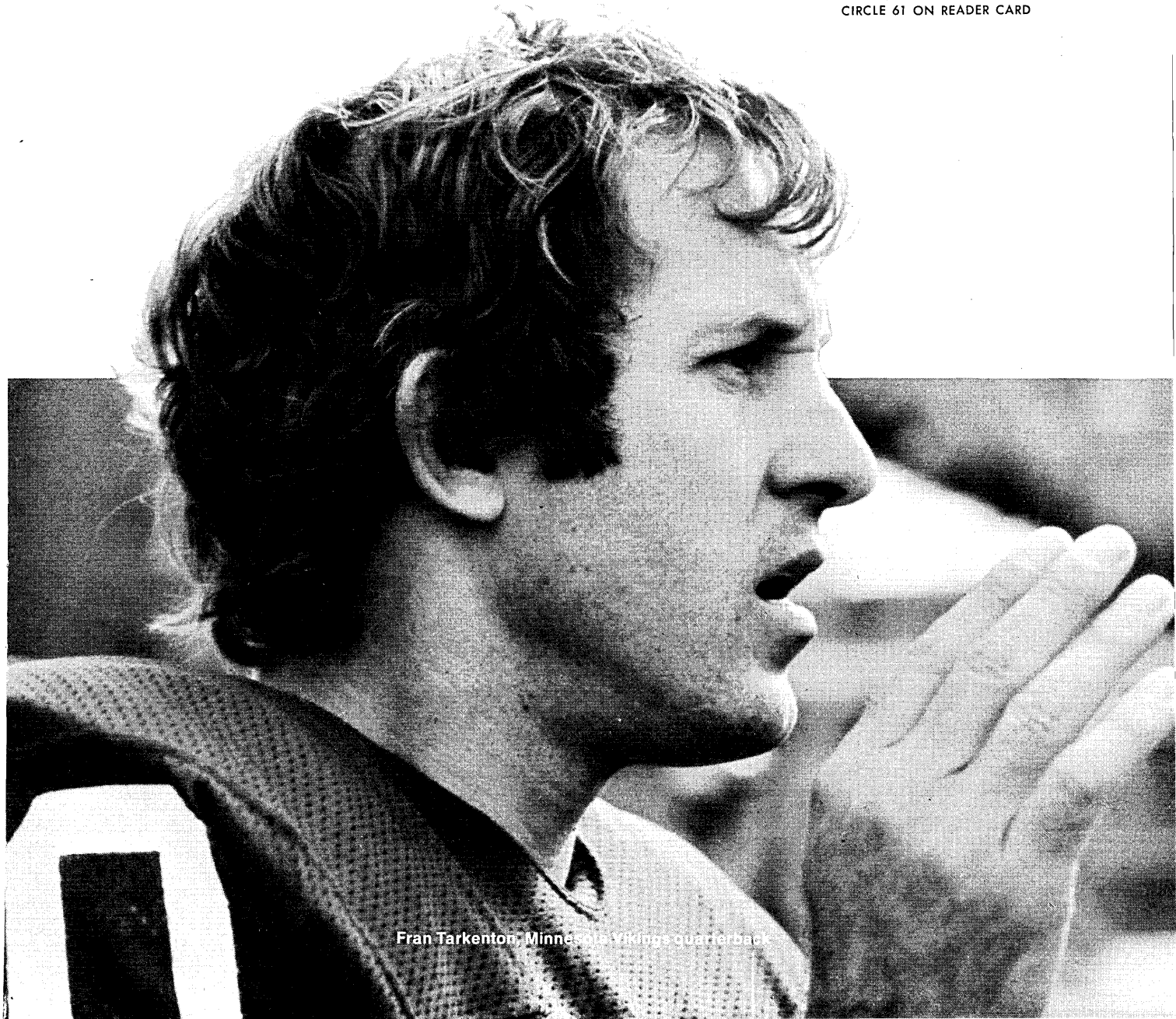

Fran Tarkenton, Minnesota Vikings quarterback

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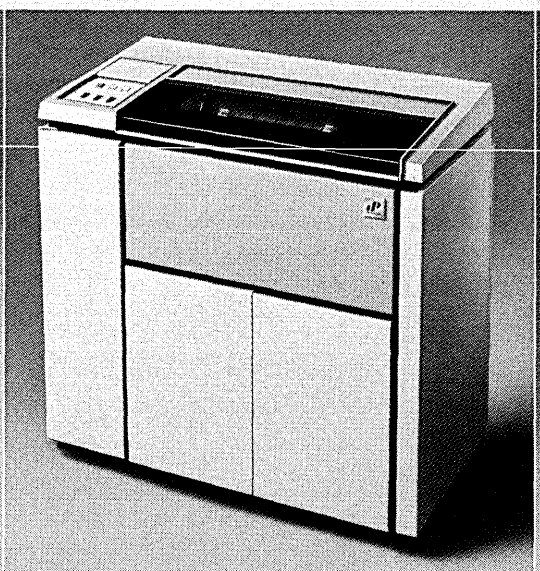
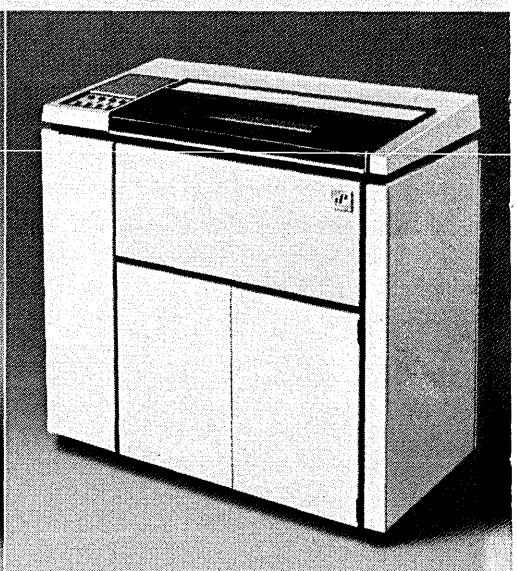


2470 LINE PRINTER—1250-2000 LPM



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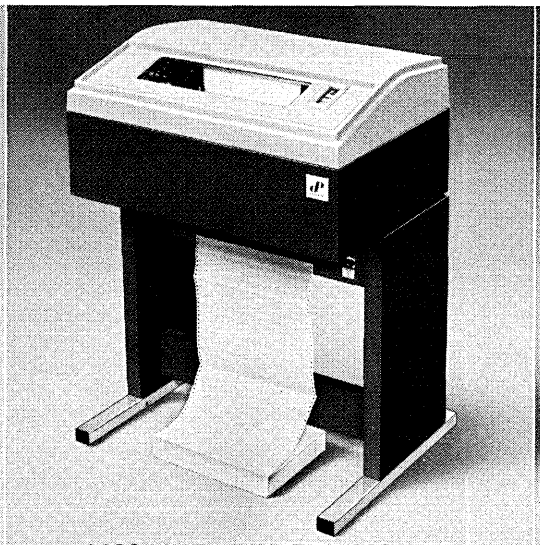
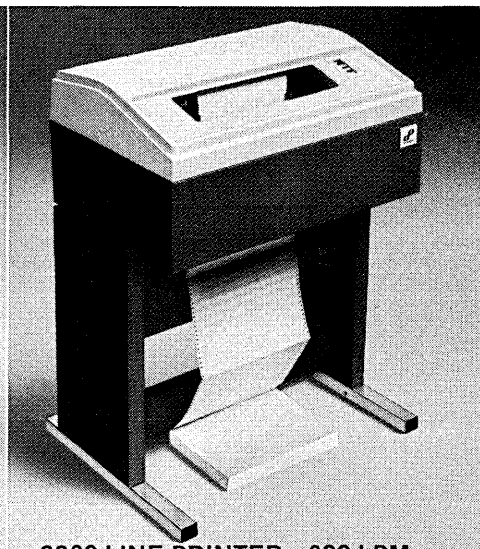
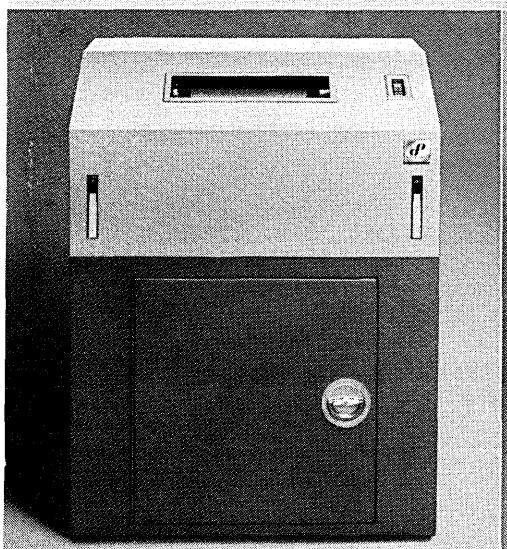


2230 LINE PRINTER—300 LPM



2260 LINE PRINTER—600 LPM



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# Making Documentation Painless

by Richard C. Fitzpatrick

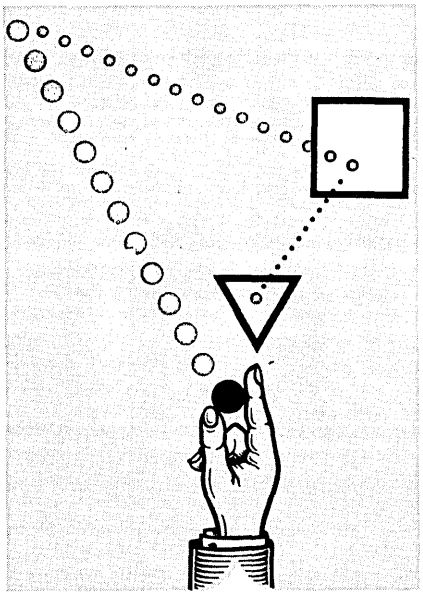
The way to get programmers and analysts to do it in spite of themselves is to provide them a cookbook example, have them use checklists where possible, and back them up with people who are better suited to the task.

Documentation can no longer be considered the poor relation of the computer system implementation effort. The arrival of dp auditors has axed documentation inefficiency, and those who would ignore this reality are Pollyannas. Complete and timely documentation of each production system within a data processing facility must now be considered a necessity if management is to protect the company's computerized assets, prevent disruption of orderly operations when the unexpected occurs, and satisfy the ever-increasing demands of auditors.

However, the success of a documentation program cannot be predicated simply on the amassing of voluminous materials. A successful documentation program requires establishing standards and enforcing procedures to provide initial high quality, and then providing for continuous maintenance and updating.

In 1972 the Information Systems and Services Department of American Mutual Liability Insurance Co. embarked on a documentation program, fully cognizant of the following, sometimes unfortunate, realities:

1. Systems analysts and programmers find no challenge in documenting systems once they are "on the air."
2. Without formal documentation standards, it is a good bet that no two people will use compatible documentation formats.
3. Documentation material that affects dp operations personnel should be reviewed by them before they are required to accept it.
4. Responsibility for scheduling, typing, editing, finalizing, publishing, distributing, and maintaining systems documentation would best be entrusted to a specially trained unit for whom the everyday problems of getting materials ready for publication are routine. This would permit technical people to properly devote their efforts to systems and programming work.



Given: the systems analysts and programmers find no challenge in documenting programs once they are on the air.

At American Mutual, the documentation program has really paid off. We now use a systematic, planned approach which can be adapted easily to almost any data processing organization. It was the result of research into various published works on the subject from which we chose those ideas and concepts we could effectively adopt. We also made inquiries and comparisons of successful documentation methods in other organizations, and fitted some of their proven techniques to our needs. And we decided to use various preprinted forms only where they would legitimately be more effective than straight narrative documentation.

To prevent the short-term demise of the documentation program and to save the product from dilution with the passage of time, we established three goals:

1. To provide a standardized approach to documenting all production systems.
2. To assemble a standards manual whose format and organization would be a model for all documentation packages to be developed by project teams.
3. To provide a simplified, yet comprehensive, method for creating and updating documentation.

### First, the specifications

Since new project documentation generally follows a request from either a user department or the system development department itself, a standard form authorizing the initial study and subsequent authorization to proceed should be mandatory. Purely from the standpoint of documentation, work will begin with the preparation of *functional specifications*. These should be mainly narrative and should cover such items as:

1. Background/brief history: a complete history of this system in-

cluding how the work currently is being processed.
2. Summary / objectives / scope: a brief but thorough description summarizing the objectives and defining the limits of the system.
3. Alternatives: a narrative of all alternatives including advantages and disadvantages of each and reasons for selecting the chosen approach.
4. Benefits/advantages/cost savings: a list of major benefits, etc., to be gained.
5. Conversion procedures: a procedural description for converting to the new system, if applicable.
6. Implementation plan: a step-by-step plan for installing and implementing the system, including personnel responsibilities.
7. Glossary: definitions of any unusual terminology or acronyms.
8. A detailed project plan: identification of the objectives in the system design and review phase.

Then, during the system design phase, *technical specifications* should be prepared. These should include the following items:

1. A systems narrative: including a detailed description of all necessary procedures and instructions.
2. A system flowchart: to reflect processing steps and relationships of inputs and outputs to the processing steps.
3. Document identity: including data concerning source, input, and output documents. Identification may be by title, form number, report name or number, etc.
4. Source document samples: including actual samples from originating departments.
5. Report samples: hand-drawn or typed facsimiles of proposed computer-produced documents.
6. Data layouts/item designs: these deal with record-level information and should include name, length, and type (alphanumeric, etc.) of each data element.
7. Input control procedures: these may be narrative and should explain all procedures for control of source documents, including accountability.

At the *operations level,* the following items should be considered necessary:

1. Report balancing instructions: the quantitative data to be balanced (dollars, hours, etc.), where to obtain the data, where to enter it, and how to handle out-of-balance conditions.
2. Report distribution: this should include a copy of each report plus a report specification sheet that contains report name, run day, type of paper, sheet volume, retention information, etc.
3. JCL lists: listings of the commands necessary to control the job.
4. Halt/console messages: this should reflect the halt code or message, its cause, and the suggested operator action.

### The master manual

In the typical dp installation, the documentation standards package should provide information covering: (1) user/management, (2) systems history and design, (3) programming, and (4) operations. Rather than create a separate manual for each, we created a single master manual which incorporated all the data pertinent to all of the sections. In addition, we prepared utility manuals which included only those items useful to user departments and computer operations.

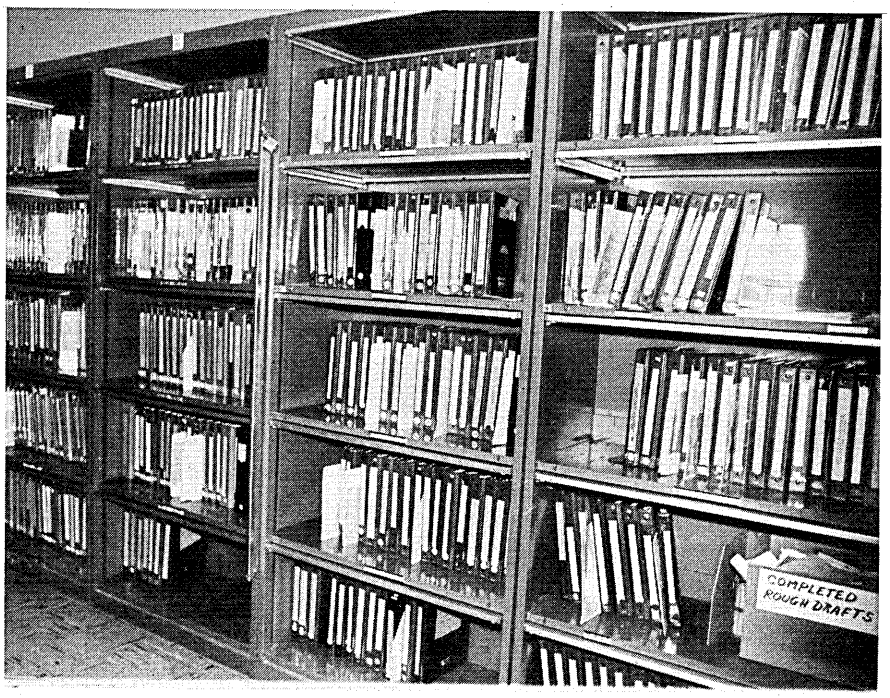
This is the point where the work *began* for the documentation unit. This group had to collect, develop, and modify all the items of information that were to become the nucleus of the standards package.

The next step was for the documentation manager to evaluate all items collected, combining similar ones, eliminating others, and deciding which ones could best be consolidated on preprinted forms (here knowledge of forms design was desirable). When the list of required items was reduced to a workable size, the next step was to decide the applicability of each item to the basic information areas (user/management, systems history and design, programming and operations) to aid us in distribution.

To be useful to systems personnel when they are assembling their documentation, the list of required items had to be formalized on some kind of preprinted worksheet. Fig. 1. shows one effective documentation control tool, the documentation checklist. It is suggested that a checklist be tailored to the individual needs of your organization, but there are some basic things it should accomplish:

**Unscheduled audits of manuals help to ensure compliance.**

1. It should identify all documentation requirements of a system.
2. It should serve as an index or table of contents for the systems package throughout all stages of development.
3. It should show what items are required before approval for the package can be sought.
4. The checklist should serve as a reminder of what is completed and what isn't, allowing the documenter to do other work and then return to the documenting, knowing where he is.
5. When an item applies to more than one area (systems, operations, etc.), the checklist should




Even the method of storing documentation should be kept simple using alpha ordering —with color-coded tabs for related products if the budget will stand it. Locked cases, sign-out procedures, and back-up microfilm all help ensure the right documentation will be there when required.

eliminate the possibility of duplication.

After all items on the checklist have been accounted for by the documenter, they are turned over to the documentation unit in rough draft form. It is advisable to include a cover sheet which can supply such information as: the submitter's name, phone extension, and whether there is a critical completion deadline.

Following review (for accuracy and completeness), finalization (forms typed, flowcharts drawn, and pages numbered and dated), printing (as a manual), and distribution to users and operations, it is suggested that the original manual and one back-up copy be stored alphabetically in the documentation library.

## Working with "live" systems

As an aid in documenting "live" systems, at American Mutual all systems and programming personnel receive a documentation standards manual which is organized as a model for future systems packages. Included in the standards manual are: documentation preparation requirements, review and finalization information, chargeout procedures, update submission procedures, country-wide distribution information, scheduling, interface (between two related systems) procedures, and checklist information.

The thing that makes the standards manual so effective is that it provides an actual "live" example of each item on the checklist. A programmer/analyst who follows the manual page-by-page should be able to effectively document or update a system with minimum assistance from his project manager.

Occasionally, when it's advisable to make a change to the standards manual, the new page(s) carrying the latest revision number should be distributed to all holders of the manual. To ensure accountability, standards manuals should be listed by each person's name and manual number on a master list maintained by the documentation unit.

As revisions and other changes take place in a system, the documentation unit can handle these in a manner similar to preparation of the original manuals, distributing updates to all holders of that manual. It is then the responsibility of the manual holder to insert the update in the proper location in his manual immediately upon receipt of the change. (Unscheduled audits of manuals help to ensure compliance.) The documentation unit sees to it that the library masters (originals) and back-up (working) copies are up to date.

**Keep all updates involving narrative information on some word processing medium.**

**DOCUMENTATION CHECK LIST** Item No. 2

SYSTEM/JOB TITLE

| DESCRIPTION | FORM # | | M/O | DATE APPLICABLE TO U | H | S | P | O | REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| **INTRODUCTORY SECTION** | | | | | | | | | |
| TITLE PAGE | 4597 | 1 | M | X | X | X | X | X | |
| CHECKLIST | 5332 | 2 | M | X | X | X | X | X | |
| OMITTED ITEM LIST | 0340 | 3 | M | | | X | | X | |
| **OVERVIEW SECTION** | | | | | | | | | |
| USER REQUEST | 4597 | 4 | M | X | X | | | | |
| MAJOR MEMOS/INTERVIEWS | NO FORM # | 5 | O | X | X | | | | *IF OVER ONE YEAR OLD |
| COST/SAVINGS INFO. | 3974 | 6 | O | | X | | | | *OR COMPARABLE FORM |
| SPECIFICATIONS (original) FROM USER | VARIOUS | 7 | M | X | X | | | | *INFO BEYOND USER REQUEST |
| SYSTEM SUMMARY/OBJECTIVES/SCOPE | 3974 | 8 | M | X | | X | | | |
| PROJECT COST ANAL (DEVELOP/OPERATING) | 3974 | 10 | M | | | X | | | *ACTUAL COSTS |
| ALTERNATIVES (WHY REJECTED) | 3974 | 11 | O | | X | | | | |
| PROJECT PLAN (TASKS & SCHEDULES) | 3974 | 12 | M | | X | | | | |
| TEST CRITERIA | 3974 | 20 | O | | | X | X | | |
| GLOSSARY OF TERMS | 3974 | 35 | O | X | | X | | | |
| **DESIGN SECTION** | | | | | | | | | |
| SYSTEM NARRATIVE, (W/HISTORY) | 3974 | 13 | M | X | X | X | | X | |
| SYSTEM RELATIONSHIPS | 4532 | 14 | O | X | | X | | X | |
| SYSTEM FLOWCHART | 4685 | 16 | M | X | | X | | | |
| USER INSTRUCTIONS/MGMT INFORMATION | 3974 | 19 | M | X | | | | X | *OR COMPARABLE FORM |
| INPUT FILE DESIGNS | 4535 | 21 | M | | | | X | | |
| OUTPUT FILE DESIGNS | 4535 | 22 | M | | | | X | | |
| TABLE ITEM DESIGNS (AMTABLES ONLY) | 4535 | 23 | O | | | | X | | |
| RUN NARRATIVE/PROGRAM DESCRIPTION | 3974 | 25 | M | | | | X | X | |
| PROGRAM LISTINGS | CP* | 26 | M | | | | X | | *KEPT IN SEPARATE FOLDER |
| DEVIANCE FROM STANDARDS | * | 27 | M | | | | X | X | *KEPT IN SEPARATE FOLDER |
| PROGRAM UPDATE REQUEST | 4891 | 29 | M | | | | X | | |
| PROGRAM CHANGE LOG | 4533 | 30 | M | | | | X | | |
| **DATA INPUT SECTION** | | | | | | | | | |
| INPUT VALIDITY TESTS | 3974 | 9 | M | X | | | X | | |
| SOURCE DOCUMENTS | VARIOUS | 17 | O | X | | X | | X | |
| DATA CARD LAYOUTS | 3974 | 44 | M | | | | | X | |
| KEYPUNCH/KEY DISC AND VERIF. | 5107 | 46 | M | | | | | X | |
| INPUT SPECIFICATIONS | 4615 | 48 | M | | | | | X | *USE FORM 4617 IF MORE APPROPRIATE |
| **OUTPUT SECTION** | | | | | | | | | |
| REPORT SAMPLES/LAYOUTS | 1851 | 18 | O | X | | | X | X | |
| USER OUTPUT REPORT CHARACTERISTICS | 4616 | 37 | M | | | | | X | |
| SAMPLE OUTPUT | CP* | 49 | M | X | | | | X | |
| **CONTROL SECTION** | | | | | | | | | |
| WORK FLOW SUMMARY | 4617 | 15 | O | X | | X | | X | *FORM 4615 OPTIONAL |
| EXTERNAL PARAMETERS | 3974 | 24 | M | | | | X | X | |
| JOB/CONSOLE MESSAGES | 4534 | 31 | M | | | | | X | |
| JOB FREQUENCY & HARDWARE REQUIREMENTS | 4531 | 32 | M | | | | | X | |
| EXTERNAL FILE LABELS | 3974 | 38 | M | | | | | X | |
| CONTROL/BALANCING INSTRUCTIONS | 3974 | 39 | M | | | | | X | |
| FILE RETENTION/RELEASE | 3974 | 41 | M | | | X | | X | |
| TIMING CONSIDERATIONS | 3974 | 42 | M | | | | | X | |
| DATA DECK SET-UP | 3974 | 43 | M | | | | | X | |
| WORKING PAPERS | VARIOUS | 45 | O | | | | | X | |
| **OPERATIONS SECTION** | | | | | | | | | |
| PROGRAM RUN CONTROLS | 3974 | 28 | M | | | | X | X | |
| OPERATOR SPECIAL INSTRUCTIONS | 3974 | 33 | O | | | | | X | |
| JCL LIST | 3974 | 34 | M | | | | | X | |
| RE-RUN/RESTART PROCEDURES | 3974 | 36 | M | | | | | X | |
| JOB I/O FLOW H8200 RUN REQUEST | 4836 | 40 | M | | | X | | X | |
| E.A.M. | 4685 | 47 | M | | | | | X | |
| DO'S & DON'TS OF SYSTEM | 3974 | 50 | M | | | | | X | |

KEY: M/O = MANDATORY/OPTIONAL U = USER H = HISTORY
S = SYSTEMS P = PROGRAMMING O = OPERATIONS
*CP = COMPUTER PRODUCED

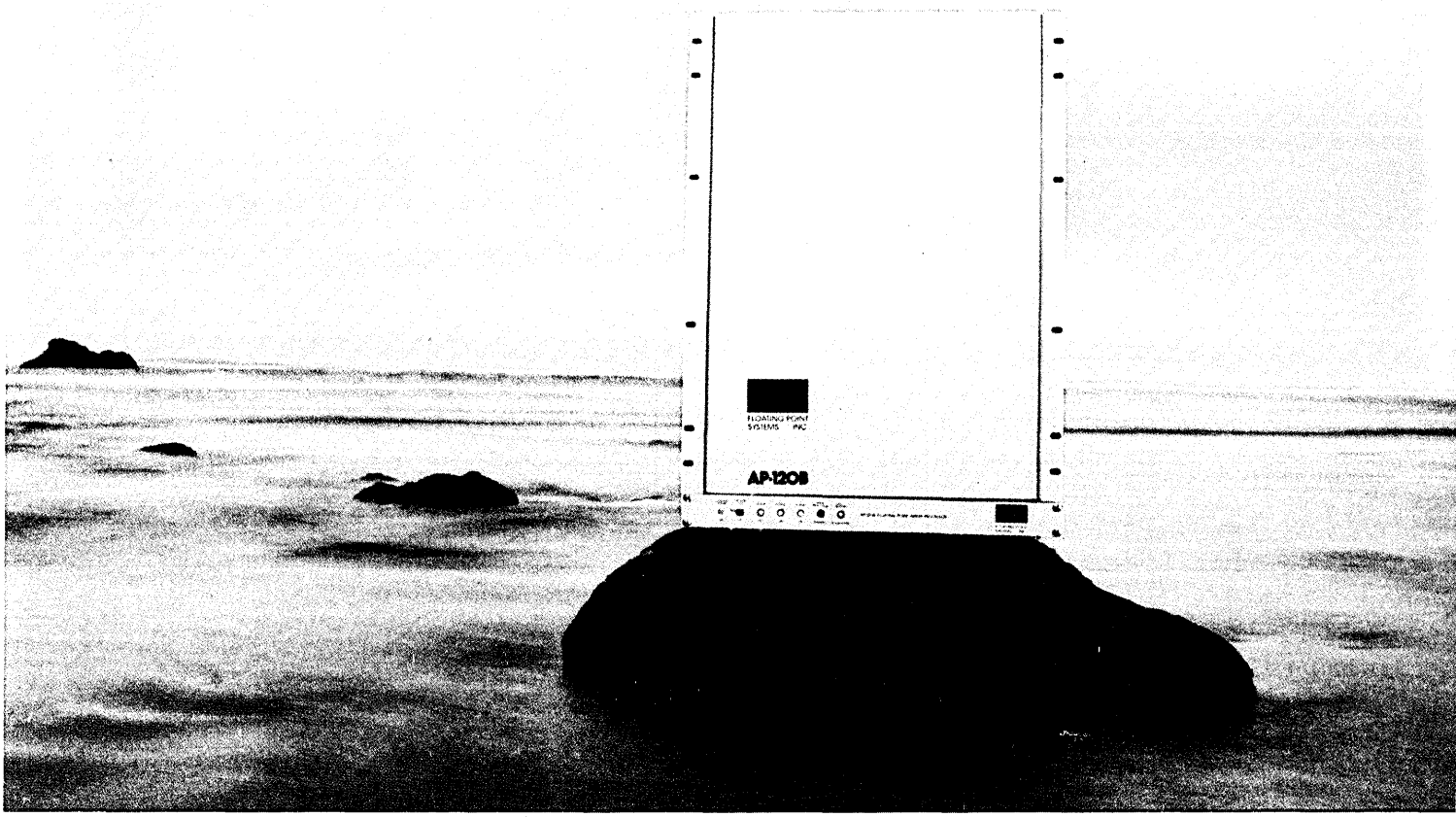
Fig. 1. Checklists simplify things. This one is for the programmer or analyst to use in assembling the documentation for a new system or for an update. Most of the elements called for on the list can be supplied on standard forms too, which keeps documentation consistent and makes its generation that much easier.

## Keeping it simple

The following are some effective procedures that may be used to enhance maintenance and development of production documentation.

1. Use a *simplified* storage medium for all systems manuals in the library, such as alphabetical filing. Consider ease of accessibility when deciding where to store the manuals.
2. Store material securely in three-ring binders or some other folder that allows for front and side identification tabs indicating the system name.
3. If the budget will stand it, use color-coded tabs for systems packages that fall in the same

# The age of array processing is here...




## and FLOATING POINT SYSTEMS is the array processor company.

- SIMULATION
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- GRAPHIC RESEARCH
- SPEECH PROCESSING
- METEOROLOGY
- SIGNAL PROCESSING
- VIBRATION ANALYSIS
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FLOATING POINT SYSTEMS' ARRAY PROCESSORS provide the high throughput required for computer systems used in scientific, engineering, and signal processing applications. They can increase the throughput of minicomputers up to **two hundred** times...of maxicomputers up to twenty times. Yet the AP-120B system is typically less than $50K.

While the conventional, scalar computers of today require the restructuring of algorithms to fit the computer, the architecture and instruction set of FPS Array Processors are specifically designed to accommodate algorithms in both scalar and vector form.

Floating Point Systems' Array Processors offer high reliability (more than 3600 hours MTBF) and compactness (only 26¼" high in a 19" rack). They are found in shipboard and mobile installations, as well as computer rooms throughout the world.

**FAST:** 167 nanosecond multiply/add...2.7 millisecond 1024 point FFT.

**EASY PROGRAMMING:** More than 150 routines callable from FORTRAN or the AP assembly language. Its symbolic cross-assembler and simulator/debugger helps you create new routines.

**COMPATIBLE:** Interfaced to all popular computers and their operating systems. A flexible format converter translates data to and from the host CPU. And a high speed DMA port is available to use with other peripherals.

**HIGH CAPACITY:** 8k to 1 megaword of 167 or 333 nanosecond 38-bit memories.

**PRECISION:** 38-bit floating-point arithmetic, normalized and convergently rounded, produces eight decimal digit accuracy, not just six.

**RELIABLE:** Goes where your CPU goes—computer room, lab, or in the field.

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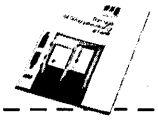
Discover how Floating Point Systems has brought THE AGE OF ARRAY PROCESSING.



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CIRCLE 52 ON READER CARD

SERIES 700
Distributed Processing Systems

# Easy-to-use software, built-in printer, large screen, more memory.

# Introducing the Model 770 Intelligent Terminal.

## From the company that makes technology affordable.

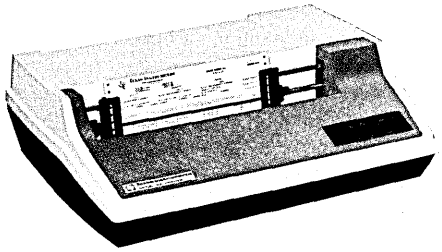
TEXAS INSTRUMENTS

The Model 770 Intelligent Terminal is a powerful system designed to meet your distributed processing needs. Better than sending your data to your host by mail or teletypewriter, better than entering it by keypunch or key-to-disc, the 770 provides the ideal, cost-effective solution for source data entry, data pre-processing and communications for your distributed processing applications.

**Reduces your communications costs.**
The Model 770 removes a substantial burden from your host computer and reduces your data communications costs. By pre-processing your data on the spot, errors are reduced, and speed and accuracy are increased. Additional communications savings can result by transmitting batched data at high speed during unattended operation when line rates are lower.

**Totally integrated package.**
The Model 770 terminal includes all the components of an entire system. It has features like dual mini-cartridge tapes, a 1920-character video display and up to 48K bytes of memory. And it's the first video display-based intelligent terminal on the market that offers a built-in 80-column printer.

For multi-copy and 132-column capability, TI's compact, microprocessor-based Model 810 impact printer is also available.



*Model 810 Impact Printer*

**Easy-to-use software, easy-to-learn language.**
Model 770 terminals are easy to program and operate with TPL 700, the flexible, powerful Terminal Programming Language. TPL 700 is a high-level business-oriented language that greatly simplifies forms generation and procedures for data entry and local processing. Programs can be developed interactively on the 770 without ever writing lines of code.

And, of course, TI offers total service and support, including flexible maintenance plans and a nationwide network of factory-trained customer service engineers. For your distributed processing needs, TI clearly has a better solution. For more information, mail back the coupon. Or call your nearest TI sales office or Terminal Systems Marketing, (713) 494-5115, ext. 3116.

Yes! I am interested in the Model 770 Intelligent Terminal. 1-8-DM
☐ Please send me more information.
☐ Please have your representative call me.

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Title _____
Company _____
Address _____
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Phone _____
My application is _____
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Houston, Texas 77001

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TEXAS INSTRUMENTS
INCORPORATED

major system category.

4. Keep all updates involving narrative information (especially those that have frequent updates) on some kind of word processing medium such as "mag cards" to facilitate updating.
5. Using the checklist, prominently display an item number in the upper right hand corner of each documentation page. The page(s) of each checklist item should be numbered independently (each item starts with its own Page 1) to facilitate updating as item changes take place. Also, to prevent confusion between prior pages and replacement pages, all pages should be date stamped (lower left hand corner) to indicate data of publication.
6. Keep supplies of preprinted forms readily available.

To ensure orderly and timely disposition of the documentation packages, it is advisable to establish a schedule for submission, review, and distribution. As new projects are initiated and updates to existing packages are received, add these to the unit's work schedule.

When management sets a completion date for a new project or a change in an existing one, documentation time should be built into that schedule. Documentation preparation should be ongoing, not left till the end. When the project manager announces completion of a system change, the documentation must be given to the documentation unit for review. Until this is done, the job should be considered incomplete. Copies of schedules should be supplied to operations, too, to ensure uniformity of workflow between the systems and the operations departments.

### Keeping it secure

Systems documentation should be maintained with reasonable safeguards. The recommended method is to have a hardcopy library under the care and control of the documentation unit staff. It should be their responsibility to update system packages as changes are submitted by departmental personnel. Access to systems manuals should be controlled through a sign-out procedure and should be restricted to those directly involved with the maintenance of the system.

At American Mutual, documentation manuals are locked up at the close of each business day. Manuals that have been charged out to departmental personnel need not be returned at day's end, but must be kept in desks. If someone needs a system manual after-hours or on weekends, he can contact the Building Security staff which has duplicate keys to all storage cabinets. But no originals of manuals leave the building without prior approval of the documentation manager.

As each new systems package is developed, the original and a working copy are placed in the documentation library. The original is closely guarded and the working copy is charged-out to personnel as needed.

Twice yearly, all production packages are microfilmed and the film is stored at a remote location. Between filmings, extra copies of all hardcopy updates are packaged monthly and stored on-site in a flame-retardant vault. Should a physical disaster occur, we can recreate all systems documentation in two steps: first, convert the most recent microfilm to hardcopy; second, combine the hardcopy (from microfilm) with the interim updates. And we're back in business. (Incidentally, the cost of microfilming and possible conversion to hardcopy is very reasonable.)

An operating guide for each production system should be maintained in the computer room. It should include all operations items indicated on the checklist (See Fig. 1). Responsibility for updating the operations manuals (as new information is generated by the documentation unit) should be the responsibility of the operations unit and someone should be delegated to carry out this task. (It is inadvisable to delegate the updating of manuals to computer operators.)

> It is inadvisable to delegate the updating of manuals to computer operators.

As with most computer rooms today, the one at American Mutual is kept locked at all times. Personnel who work there have keys, others who need to enter the area follow a rigid sign-in/sign-out procedure. Because of the degree of security exercised in operations, we are able to use an open-shelf filing system there.

To ensure the integrity of the information contained in the operations manuals, the documentation unit conducts unscheduled audits in which they check a particular system's operating guide against the original in the documentation unit. Any discrepancies in the operations manual must be explained and justified.

### Finding the people

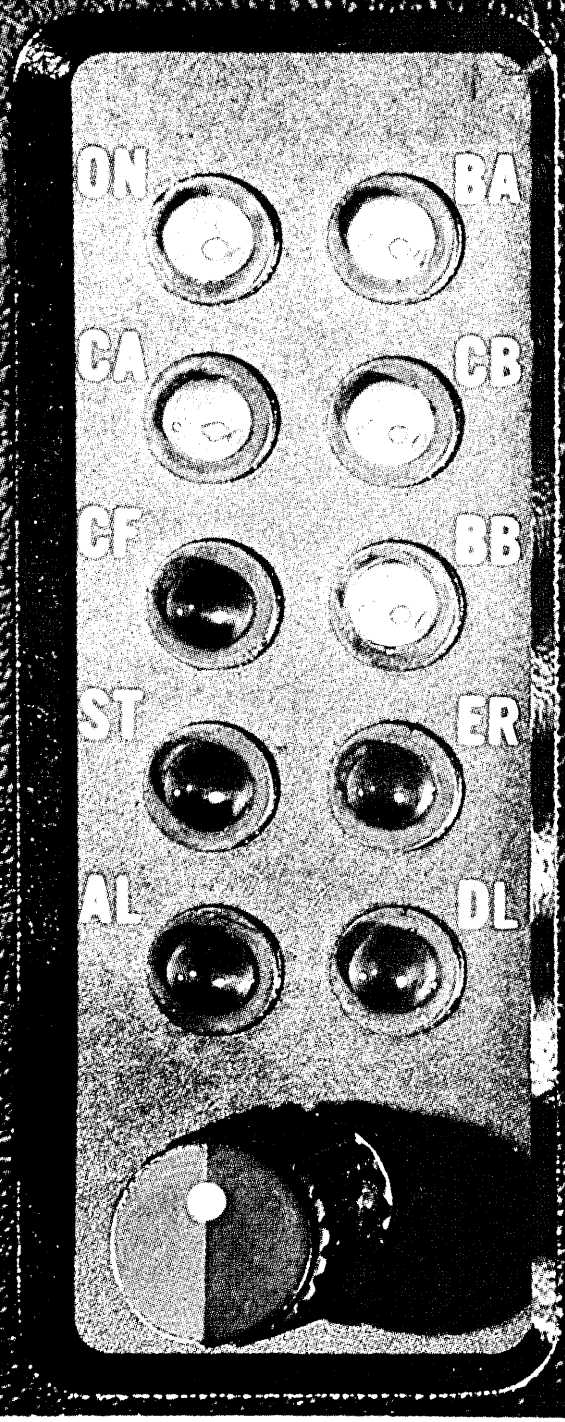
The documentation staff consists of a manager, a documentation assistant and sufficient typists/aides to handle the workload. In selecting personnel for this program, it makes sense to select as documentation manager a person with sound experience who has a reputation for thorough and complete documentation of any systems projects with which he or she has been involved. The technical expertise required by the documentation manager and/or his assistant will vary by organization. If you have a strong technical advisory staff that can be supportive in establishing technical standards in addition to the review of program listings to assure continued standards compliance, you can employ someone with administrative talents rather than a data processing technician. Skills in such areas as technical writing, forms design, record keeping, or communications should all be considered pluses in selecting the individual who is to be in charge of the documentation unit.

> As with programming, the workload doesn't taper off as systems go into production.

Bear in mind, too, that the documentation load doesn't taper off as new systems go into production. As each system becomes documented and the physical number of systems increases, the balance simply changes. The amount of update documentation (to maintain these systems) will begin to exceed the amount required for new production packages. If each project—new development or maintenance—is planned properly and documentation is required as an integral part of future systems, there will always be plenty for the documentation staff to do. And plenty that the documentation staff can do *for* you.

Mr. Fitzpatrick is the manager of documentation in the data processing department of American Mutual Liability Insurance Co., Wakefield, Mass. His 15 years of related experience encompass jobs as methods analyst, procedures writer, and systems analyst.

# Take a close look at the most cost-effective 4800-bps modem on the market.




## Take a close look at our 7208.

You'll see a modem that is fully Bell-208 compatible for both dial-up and private lines . . . a modem that gives you all of the fine features of the 208—plus a few extras you can't get from Bell.

An all-digital adaptive equalizer in the 7208 improves performance by preventing drifts and other analog errors.

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All of these features together with a surprisingly low purchase price make the 7208 the most cost-effective modem of its type on the market. If you want higher performance at lower cost, take a close look at the 7208. You'll like what you see.

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# Real-time problems? Systems has timely solutions.

Systems Engineering Laboratories has dedicated its 16 year corporate life to solving challenging real-time problems. The experience gained in solving these problems is what led us to pioneer the development of true 32-bit computer systems.

Look into the operating systems, the languages, the data base system, the real-time device handlers and terminal systems, and you will see that we build for the real-time environment. That's our business.

Choose from a well-bred family of computing systems: The SEL 32/35, the SEL 32/55, or the SEL 32/75. Unlike other so-called "32-bit minis" that are only bridge-the-gap systems developed from essentially 16-bit architecture, all SEL 32 systems are true 32-bit machines. This results in richer instruction sets, more precision in data representation and larger, directly-addressable memory. All are available with throughput rates in excess of 26 million bytes/second.

Systems computers fit the term "minicomputer" in price alone. If your application is performance-sensitive, we'll save you money. If you're budget-sensitive, we'll give you more performance for your dollar.

The SEL 32/35 can be configured from 64K bytes to 512K bytes of 900 nsec memory. Resembling its more powerful brothers, the SEL 32/35 is a complete package, including control processor with floating-point arithmetic, memory, chassis, power supplies and cabinet.

The SEL 32/55 is offered in a variety of both single and multiple CPU configurations, with from 32K bytes to 1 million bytes of 600 nsec memory.

The SEL 32/75, with up to 16 million bytes of main memory, has a concept so new, we had to coin a special term to describe one of its main features: Regional Processing Units. Working independently, these RPU's contain sufficient control and buffer storage areas to process an I/O region and transfer the resultant data directly to main memory. Computer system throughput is further enhanced by High-Speed Floating- Point Hardware and Writeable Control Storage.

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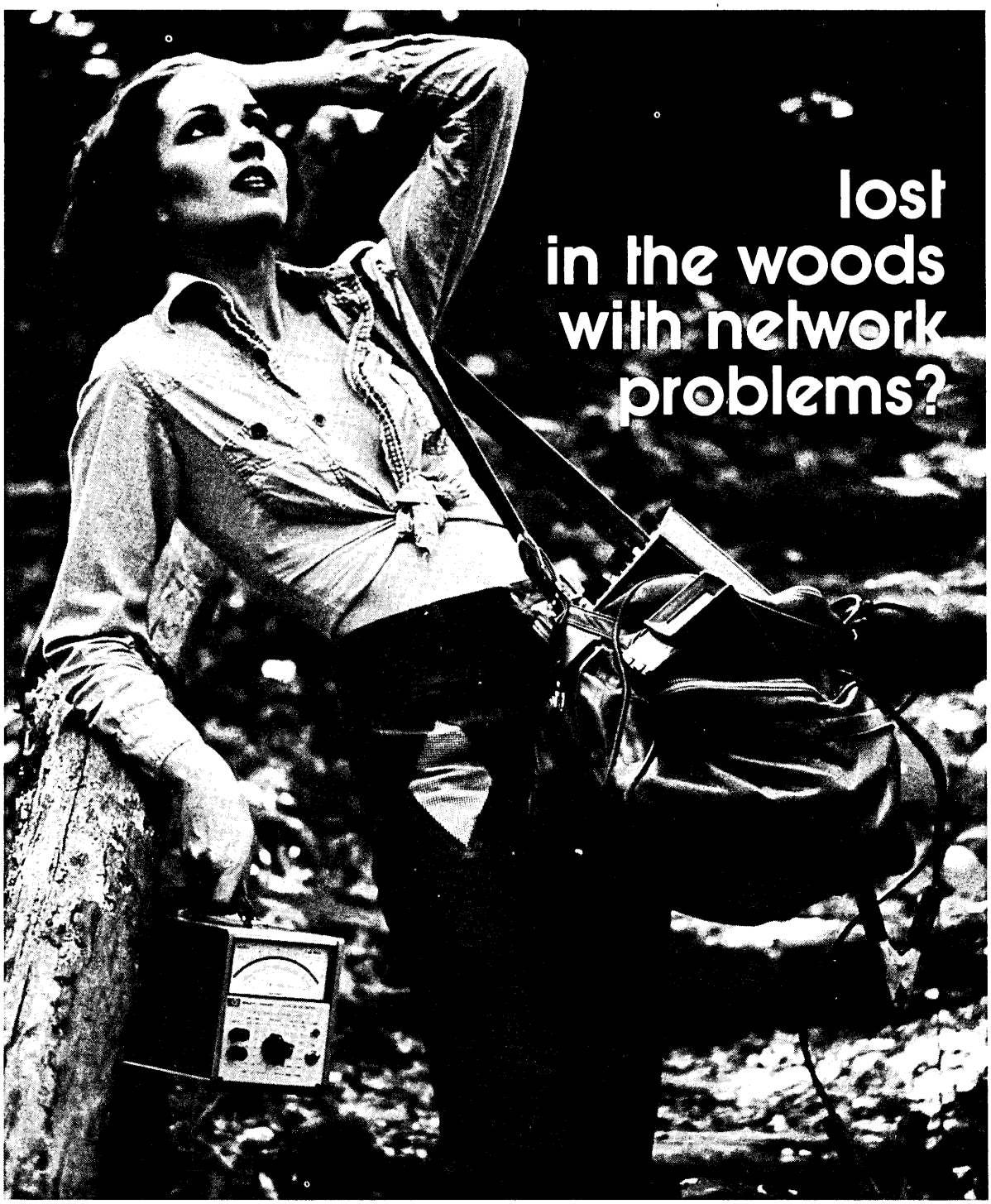


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Penril's new 4800 bps microprocessor-based modem, the 48 MICRO, has comprehensive diagnostics that DO NOT require operator assistance at the remote end. These features allow checking of segments of your communications system using test patterns from an external test pattern generator, a business machine, or the modem's built-in test pattern generator.

A master 48 MICRO shows status of interface signals between modem and data processing equipment and provides controls and indicators for locally controlled tests. The master modem also shows status of interface signals between a selected remote modem and remote data processing equipment with controls for remote modem test mode configuration and displays of the response of the remote modem.

With the Penril 48 MICRO in your data communications system, you won't have tiresome and perplexing trouble locating network problems!

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# Eulenspiegel Portraits

by Jackson Granholm

*As the history of digital computing devices grows toward initial maturity, its cast of characters and contributors expands accordingly.*

In the beginning few were called, but today many are chosen.

For now the number of those designing, building, selling, profiting from, programming, using, and suffering trauma as a result of computers equals the count of the hosts of Shishak, King of Egypt, before Jerusalem.

Clearly in such a mind-boggling number, there are some who serve unwillingly, who are present through mistakes of their draft board, who came seeking to avoid a greater horror. In brief, distasteful as it may seem, the data processing industry has, and has had, its appropriate share of misfits. It is to these lost souls that this recounting is dedicated, and for them it expresses concern and understanding.

* * * * * * * *

## JOE BFTSPLK

This gentleman got his name from the noted author, Mr. Al Capp, who correctly depicted him as perennially perambulating beneath a dark cloud.

Joe began his educational career as a major in physical education. In his sophomore year he suffered a separated knee cap while a member of the quoits team, and, sweating through a lingering recovery, changed his major to civil engineering, choosing a department with a momentary shortage of undergraduate candidates.

Joe obtained his degree in C.E., doing particularly well in courses in estimating and corporate billing, but being marginally low in transit placement and operation, and in slope calculation.

He was fortunate in being hired, upon graduation, by a progressive firm that made use of a capable, albeit rudimentary, drum computer in engineering calculation. By the time the senior partner discovered that it was indeed Joe's error of a trivial 53 square miles in a survey for which he was responsible which had brought on the lawsuit bankrupting the firm, Joe had inflated his resume to the point where he was already gone, and heading up software development for a manufacturer of computers.

Since Joe knew nothing about software, other than how to spell it correctly most of the time, he had to do a most vigorous song and dance in this particular management position. By the time top management found out, three years into the current major project, that software development was already more than two years behind schedule, Joe had become the vice president, development, of a software firm.

When the over-inflated stock of the software firm had fallen completely off the board and onto the floor with the rest of the waste paper, Joe had moved on to become the senior corporate honcho of computing with a leading supplier of important devices.

Joe is still in this respected position, and is much listened to because of his important-sounding vapid pronouncements. Some of his junior employees seem actually to believe that he is God, and they have formed a small church in the vicinity of the plant where his image, portrayed incorrectly under a silver cloud, is on continual display.

Joe seems to be at ease, but his close associates occasionally note that he is careful never to look up.

## DEAN DECISIVE

Dean was sent to a leading university through the Ph.D. level by doting parents. He went into the blossoming field of digital electronics with a high rank and much respect from day one.

In the shuffle of divisions, companies, mergers, acquisitions, etc. in which Dean was a participant, he was always at the vice presidential level. But after years of changes, and shuffings, and title changes, the incoming new corporate president of the year, Mr. J. Hardnose, wondered what it was that Dean actually did. Not finding an answer, he decreed that Dean was to be flung upon his tender buttocks into the parking lot.

Looking for a way to nail down ultimate security, which was really his lifelong search, Dean took a civil service job at a suitably adequate pay and fringe benefit arrangement, albeit much below his former exalted status.

Today Dean has a small office way in the back of a very large government facility. He spends much of every day wondering whether to have coffee now, or to wait a half hour.

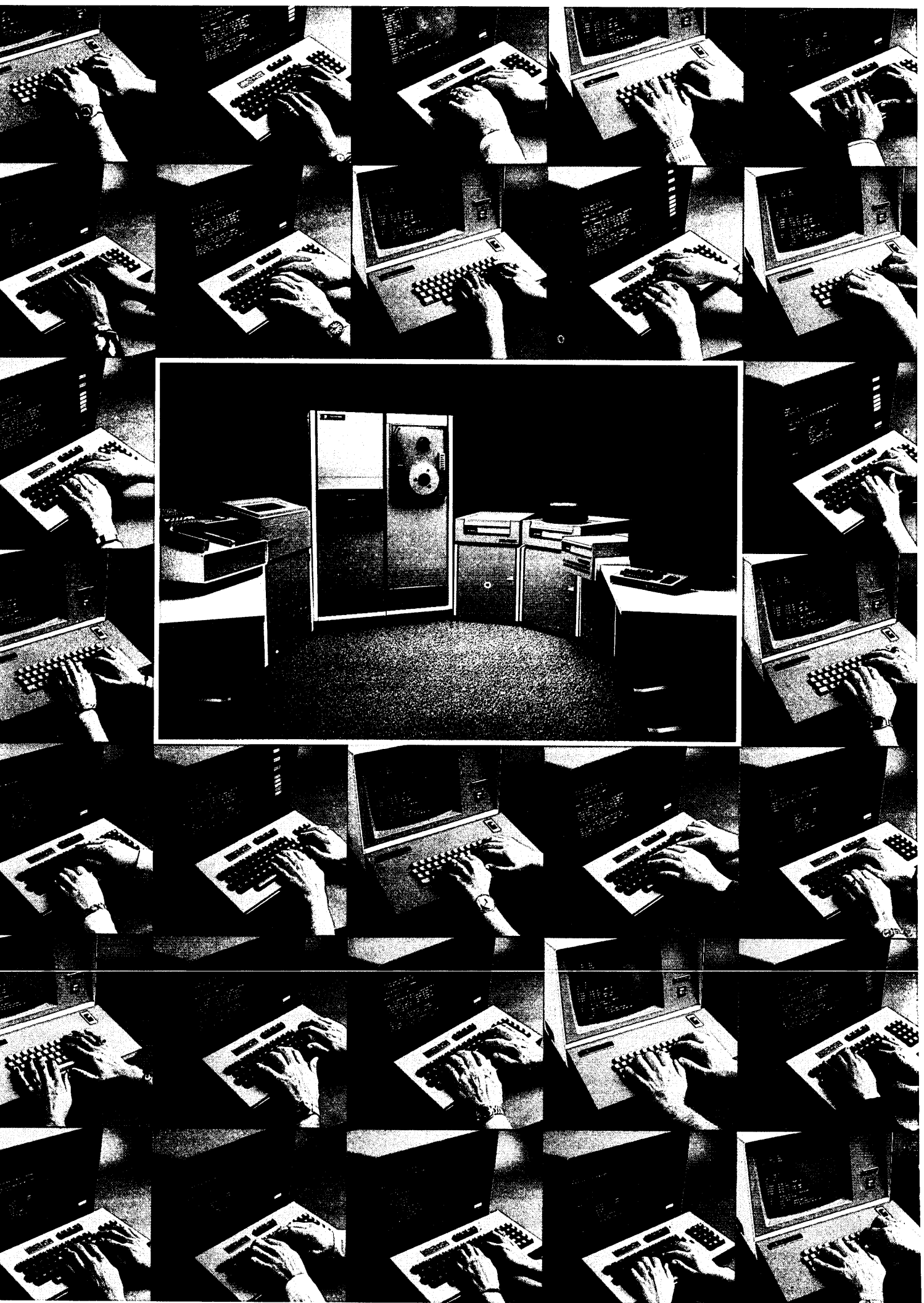
## FRED EAGER

Fred graduated with honors in mathematics from U. of Cal., Ukiah. He was promptly drafted into the U.S. federal Army wherein he went from Sergeant to Major in a remarkably few years.

Upon his return to the placid life of a civilian, Fred became a mathematician with the small electronic subsidiary of a large conglomerated corporation. He advanced rapidly to the post of marketing director, in which plush chair he sold numerous quasi-adequate computing devices to a willing world.

Fred left to found his own company which he soon dropped to found another, and yet another.

Fred has essentially zero patience



# All at once, it's Harris.

Harris now delivers the most cost/performance effective multi-use computer system in the industry.

Our new family of high performance systems—S115, S125 and S135—together with our powerful VULCAN Virtual Memory Operating System supports more than 50 terminals. Simultaneously.

This is a whole new line of medium-scale, multi-use systems with increased reliability and new state-of-the-art technology. You get greater I/O throughput. MOS memory with error correction. Powerful micro processor based CPU. Broad selection of highly reliable peripherals. And all operate with ANSI 74 COBOL, FORTRAN, RPG II, FORGO, SNOBOL, and extended BASIC.

The Harris S100 systems take on many different jobs all at the same time. Multi-stream batch processing. Multiple concurrent RJE's, both host and remote. Multiple interactive time sharing. Real-time processing. And this new generation of high performance computer systems from Harris delivers these all to you, *concurrently.*

If your need is distributed processing, time sharing, data base management, or any type of concurrent multi-use application, *benchmark our new computer system against any other system in the industry.*

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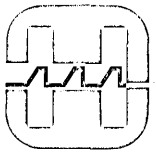
**All at once, it's Harris.**



HARRIS
COMMUNICATIONS AND INFORMATION HANDLING

with time or people. He is driven to corner the market in 15 minutes, never mind the cost. And his long trail of consummate crapouts is a monument, not only to himself, but to the skill and wisdom of professional investor/stockholders.

Today Fred sits in the park playing checkers daily with the other park inmates. He gives speeches, wonderful to hear, on how the world ought to be organized, and on how he could corner all the action in 15 minutes if there were just some way to get the idiots out of the line of fire.

## ALFRED ACADAEMIA

Alfred is one of those people who, while not overly brilliant, is apparently so learned as to be essentially incomprehensible.

Quite naturally he gravitated to the outer fringes of the software world. In his high-ranking managerships, he was in charge of producing for the customer (usually the U.S. federal government, D.O.D. Division) some of the largest and most content-free "studies" in all man's history.

Among his associates he became noted for leaving on long trips having forgotten his trousers, and for forgetting that he rented an automobile, either leaving it in various places to provoke endless "where is it?" queries from Hertz or giving it to his wife to drive, thinking he had bought it. He went on various crash diets, varying his weight rapidly between 350 and 150 pounds, avoirdupois.

Finally Alfred saw the light. Today he teaches obfuscation at Southeastern Idaho College of Agricultural and Fine Arts where his strange mental patterns are of no consequence, and where he is happy and loved by all.

## GUS GENIUS

Gus was the sole designer and guiding light of several of the very best early-day computers. In a great financial merging, the company which had been built primarily upon Gus' skill was made a part of a much larger company, and Gus was promoted up to the headshed as executive v.p. of technological pontificating.

In the new scheme of things, all was done by committee, but Gus was poor at committee work. He took to long, three-martini lunches which soon became seven-martini lunches, and breakfasts, brunches, and suppers. Gus got so far into the sauce that it typically took two young men accompanying him everywhere to keep him from bodily harm.

Gus was much sought after as a speaker, and, after a friendly assistant had carefully guided him to the podium, he underwent a remarkable metamorphosis, giving forth with some of the most wise and brilliant words ever heard about digital electronics. But as soon as he finished being on stage, he crawled immediately back in the bottle.

Gus dropped instantly dead of a massive heart attack while waiting to register in the lobby of the Jack Tar Hotel. Fortunately for the world, his conference fees had been prepaid.

## ETHELBERT EXPERT

Actually Ethelbert retired immediately after his university graduation. His first job was with a rapidly growing think-tank, and Ethelbert soon became in charge of arranging, scheduling, and attending conferences. At each of these he was certain to have in a prominent place on the program a most impressive paper on some topic of vital human concern, such as "The Social Responsibilities of the Bit Register."

Ethelbert was the ideal man to sit on advisory boards, to testify before Congress, and to write prefaces for books. He was much quoted by the secular and technical press, especially for his in-depth observations on such questions as "Why are People?"

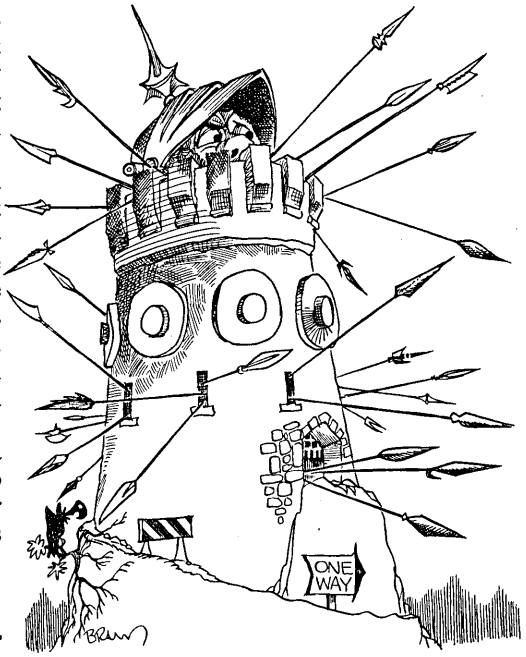
It is only fitting that Ethelbert should, today, head up the study efforts of a most prestigious research laboratory affiliated with a university of truly gigantic stature.

There, while his pronouncements are not as frequent as formerly, they are clearly more mature. Meanwhile, he continues work on his book, a magnum opus entitled "The IF Bit Through Man's History."

## BUSTER BACKROOM

Buster was born with a highly developed sense of proprietorship. He carried this with him into his various jobs as chief design engineer for a number of former companies.

Buster permitted only one expert in




the vicinity, and he was it. He became noted for the brief tenure of a long list of competent people who reported to him. And his view of the rest of the world as having zero Need To Know extended especially to company top management. With Buster on the job these people had a continual struggle trying to know what remarkable item was to be next in their product line, but it is a tribute to Buster's methods that they never found out.

Buster has moved on to the petroleum industry where he does fabulous and remarkable, albeit secret, things. He is well-remembered in electronics, however, as the true inventor of the black box. ✪

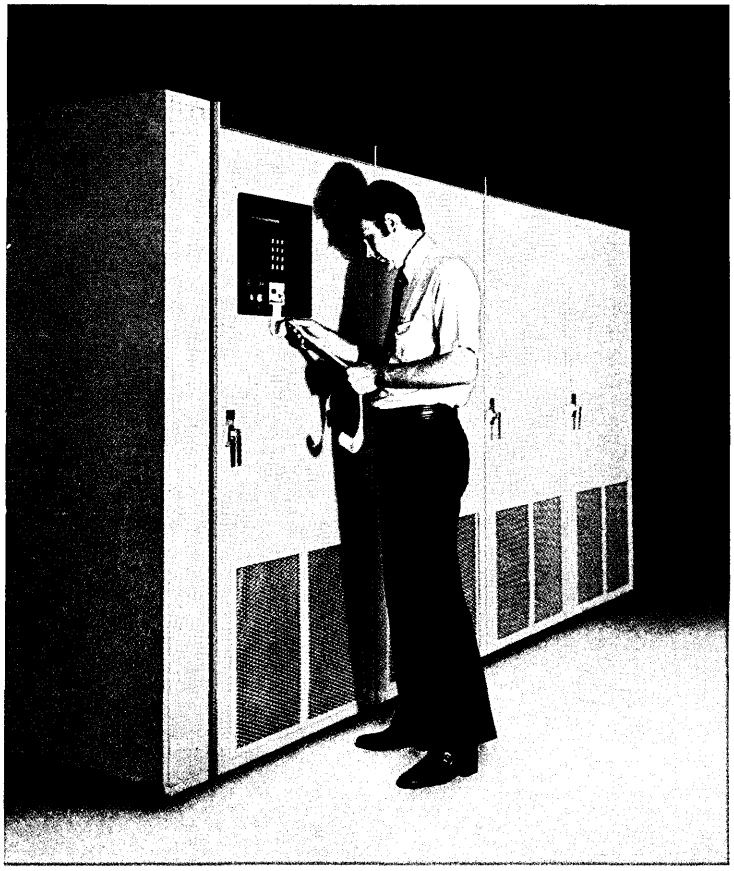
* * * * * * * * *

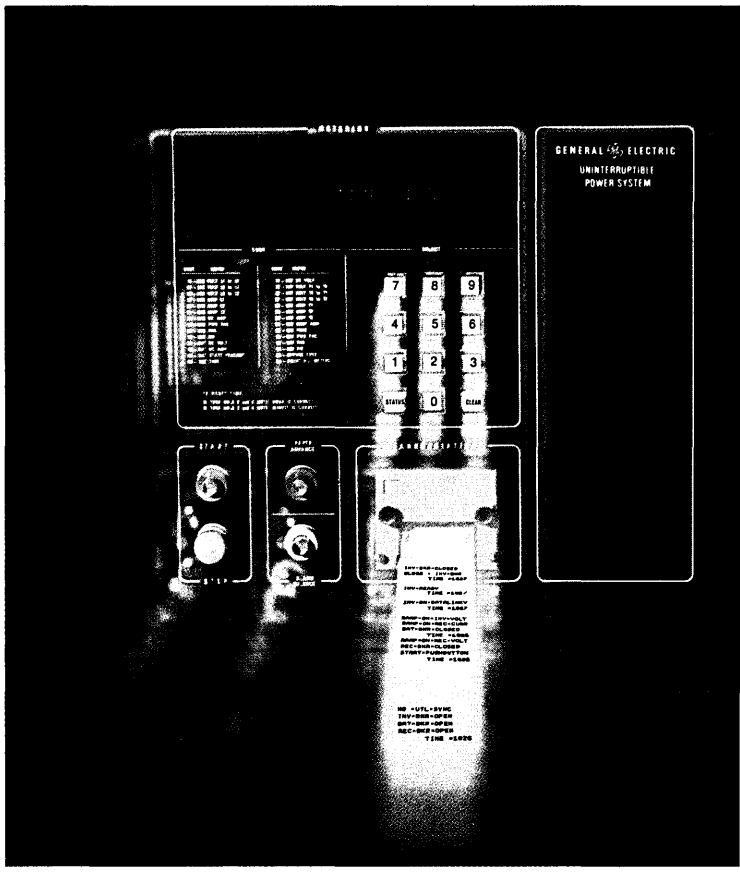
**Author's note** It has been my rare privilege to know many wonderful, fine, and fascinating people in the computing industry. But as man is usually beset by the need to live in his own, self-generated circumstance, we can, on occasion, find the square peg crammed into the round hole.

None of those so shamelessly depicted here are "real" in the sense of being particular individuals, past or present. But their characteristics have been, and possibly still are, known at various places and times.

# What makes General Electric's new UPS a breakthrough in reliability?

# Its brains.






The electronic brains of General Electric's sophisticated UPS (Uninterruptible Power System) provide computer operation centers with an improved level of protection against power problems.

These brains command the UPS to take input power disturbances in stride. And they go a step beyond to provide a continuous, regulated ac supply to the critical load.

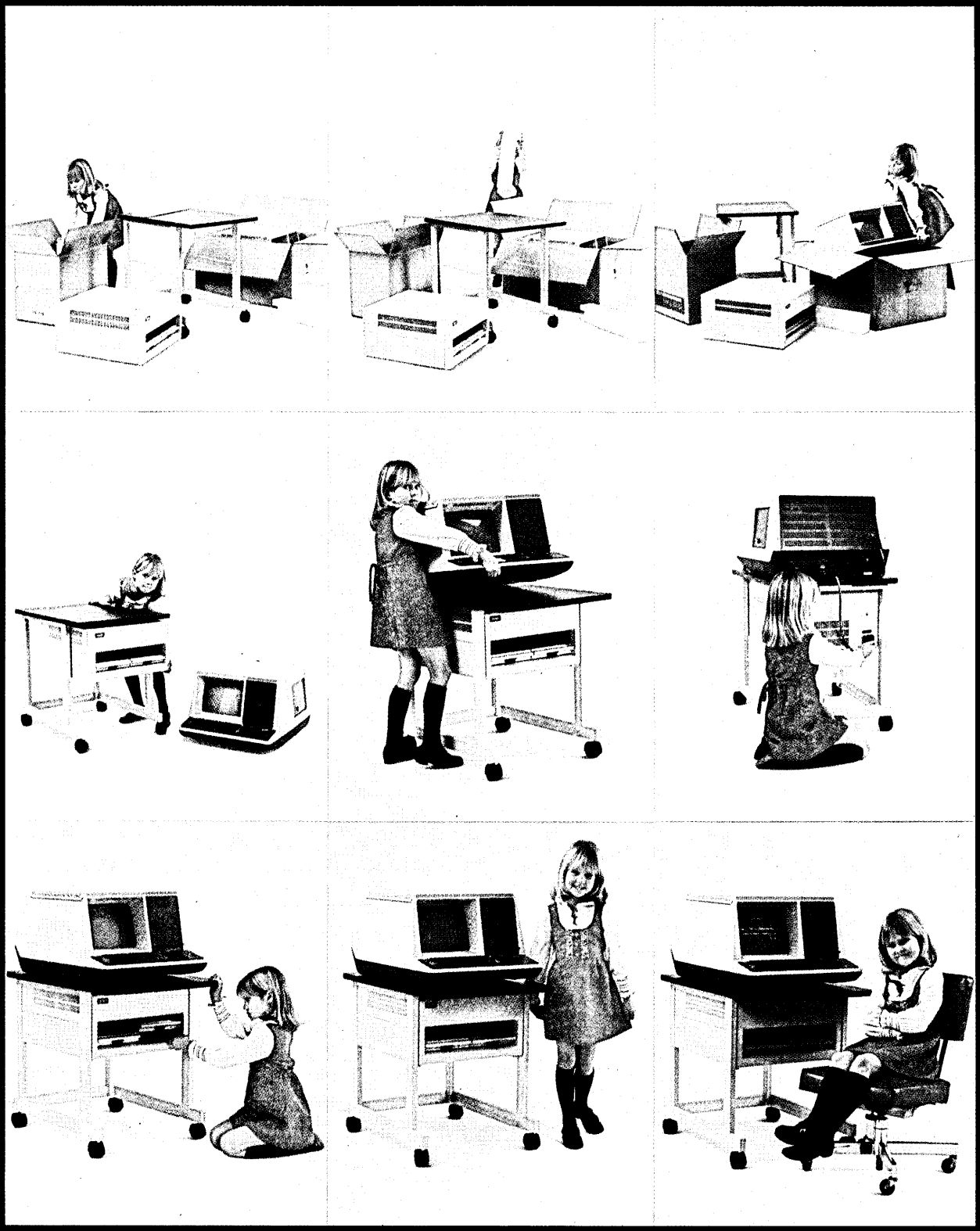
The exclusive GE Logicenter continually monitors and analyzes the system performance. Independent, redundant communication networks assure continuity of service. And hard copy printout (shown above) provides an automatic report on any changes in the system operation.

Reliability. The kind of extra value you get in more than 40,000 GE control products in 80 product lines. Ask your GE sales engineer, or write General Electric Company, General Purpose Control Department, P.O. Box 2913, Bloomington, Illinois 61701. 810-49

**There's more to GE control products than meets the eye**

GENERAL ELECTRIC

CIRCLE 2 ON READER CARD



# Digital introduces DECstation. A big computer system that's small enough for anyone.

Digital put an amazing LSI version of the PDP-8 inside a DECscope, added some ingenious interconnecting devices and created something new. The DECstation. A complete computer system big enough to do all kinds of work and small, simple and inexpensive enough to do it for almost anyone.

**DECstation. A complete computer system in disguise.** It looks like a terminal, but look again. The DECstation has a powerful general purpose computer, a video terminal, a dual diskette drive, and its own special operating system. What's more, you can hook up two different printers and a second dual diskette drive. Then put the whole thing in a mini-desk, and when you're done you'll have the smallest big computer you've ever seen.

**The Video Data Processor. It's the big reason the DECstation's so small.** The VT78 Video Data Processor is a computer wrapped in a terminal. Inside the familiar DECscope you'll find an LSI version of the PDP-8 with 16K words (32K characters) of MOS memory and built-in interfaces. Two serial asynchronous ports feature speeds from 50 baud to 19.2 kilobaud. A disk port interfaces with up to 4 diskette drives. A parallel I/O port for printers and custom interfacing provides data transfer rates up to 180 kilobits/sec. All standard.

**You can go from carton to computer in less than an hour.** If you can push a button, you can run a DECstation. Because one button is all it takes to start things up. The bootstrap and self-test routines are built in.

Put it together, plug it in, and immediately you can begin to run anything from the PDP-8 software library. Which means you start with one of the most comprehensive sets of software tools available in a small system. Including two proven operating systems: OS/78 for stand alone applications and RTS/8 for real-time. OS/78, an extension of OS/8, supports a number of languages, including FORTRAN IV and BASIC. So all you have to do is load the operating system and start programming your application.

Whatever that application, if you're looking for a sophisticated little system, at the right price, and a remarkable OEM tool, consider DECstation. $7995 each. $5436 OEM quantity 50.

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Phone_____ OEM_____ End-user_____

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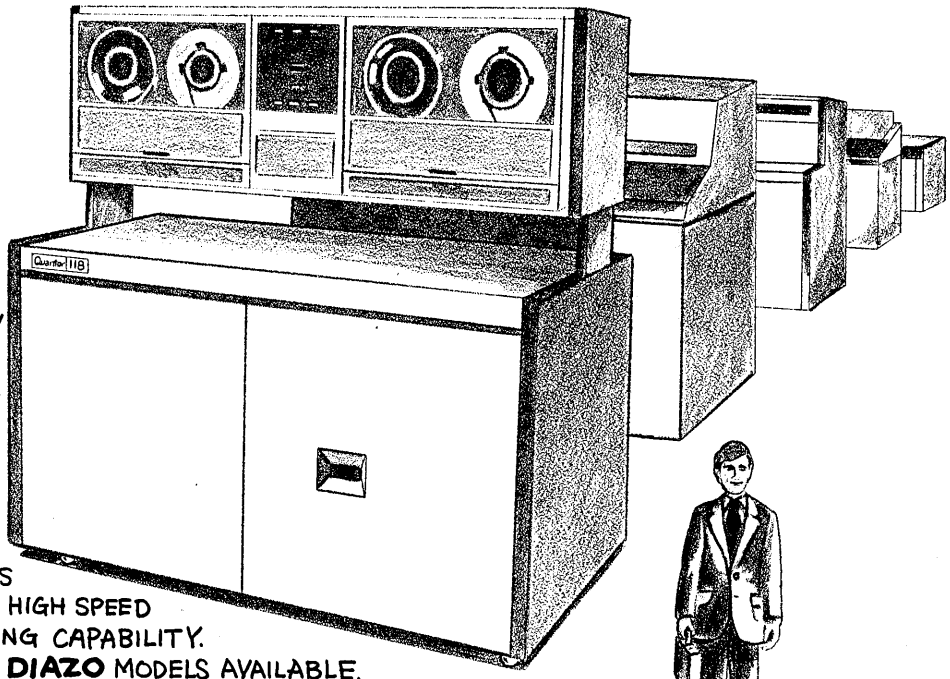


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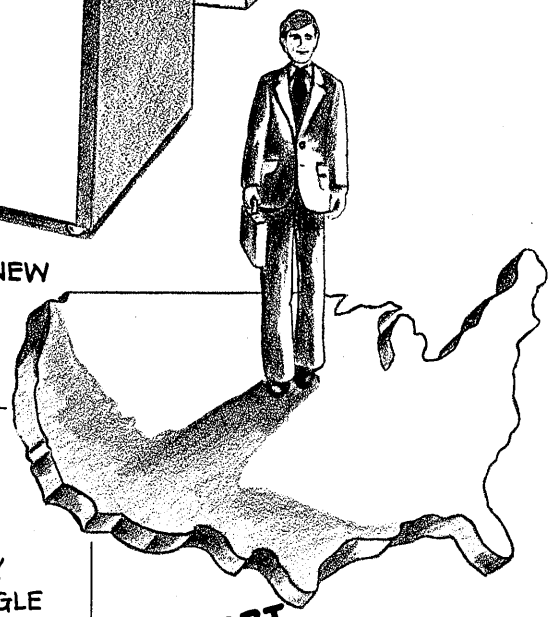

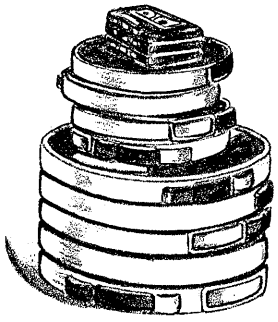

### SOFTWARE LIBRARY

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# STARAN can translate billions of bits into a 40% chance of rain.

A typical meteorological satellite system pours out a wealth of digital data to be translated into weather forecasts. Temperature, wind conditions, humidity, cloud cover, solar flare activity and other weather factors are all reported in the constant transmissions.

But the job of digesting the billions of bits of data for the computation of weather forecasts can give even powerful conventional computers indigestion. That's where Goodyear's STARAN® parallel associative processing can help.

Ordinary digital computers process only one or a few discrete points of data at a time. But the STARAN system combines content addressability with parallel array arithmetic to process hundreds, or even thousands, of data points at once.

This unique capability allows substantial improvements in throughput. And that's why the STARAN parallel associative processing computer is unmatched in its ability to solve problems that require matrix arithmetic operations or high-speed searches of many similar file records.

So before you invest a lot of money in a high data rate digital system, invest a little time. Look into STARAN. The more severe your requirements, the more money it may save you.

For complete information, just write to Wayne Brubaker, Goodyear Aerospace Corporation, Akron, Ohio 44315. Or call him at (216) 794-3631.

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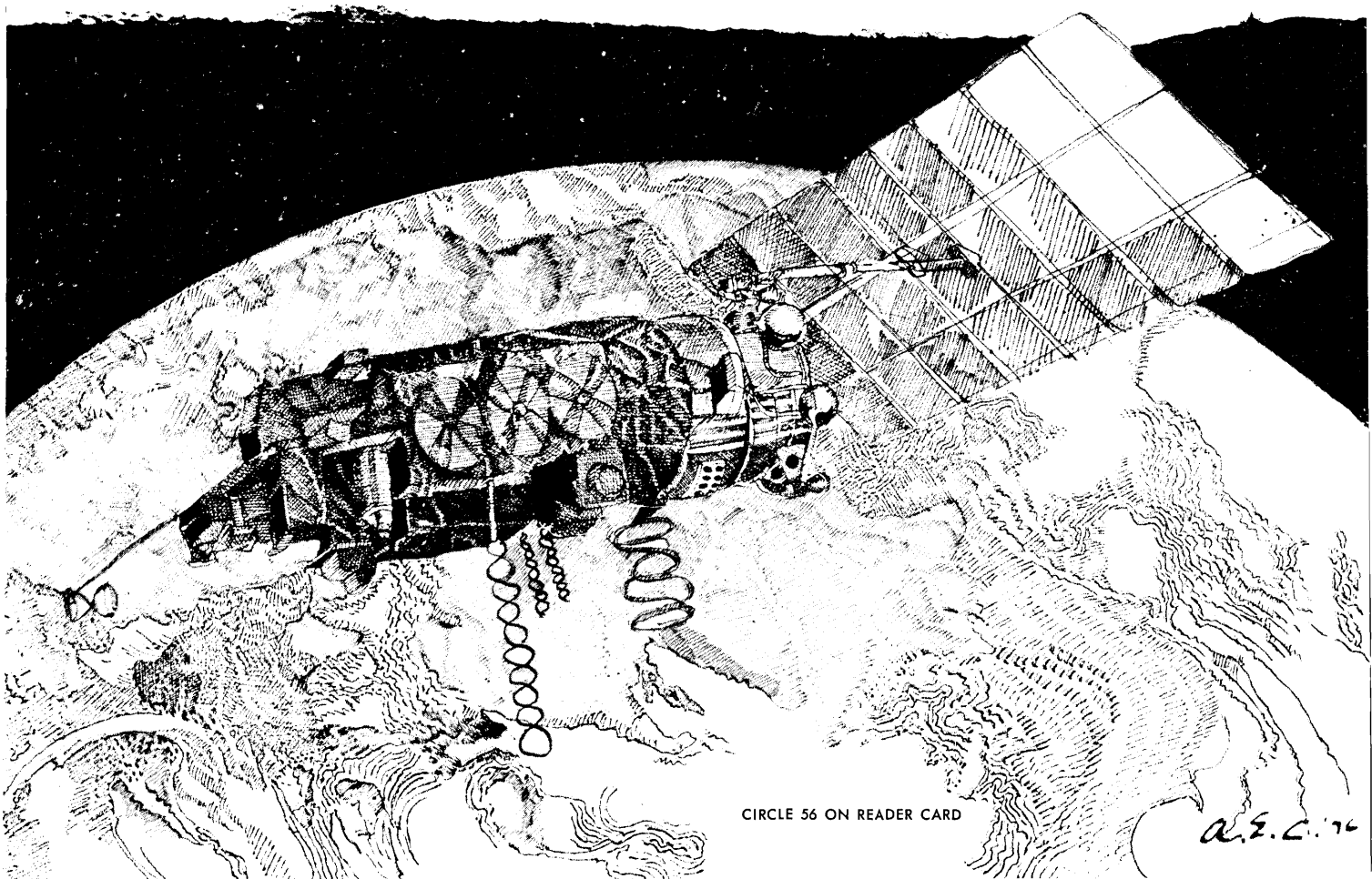
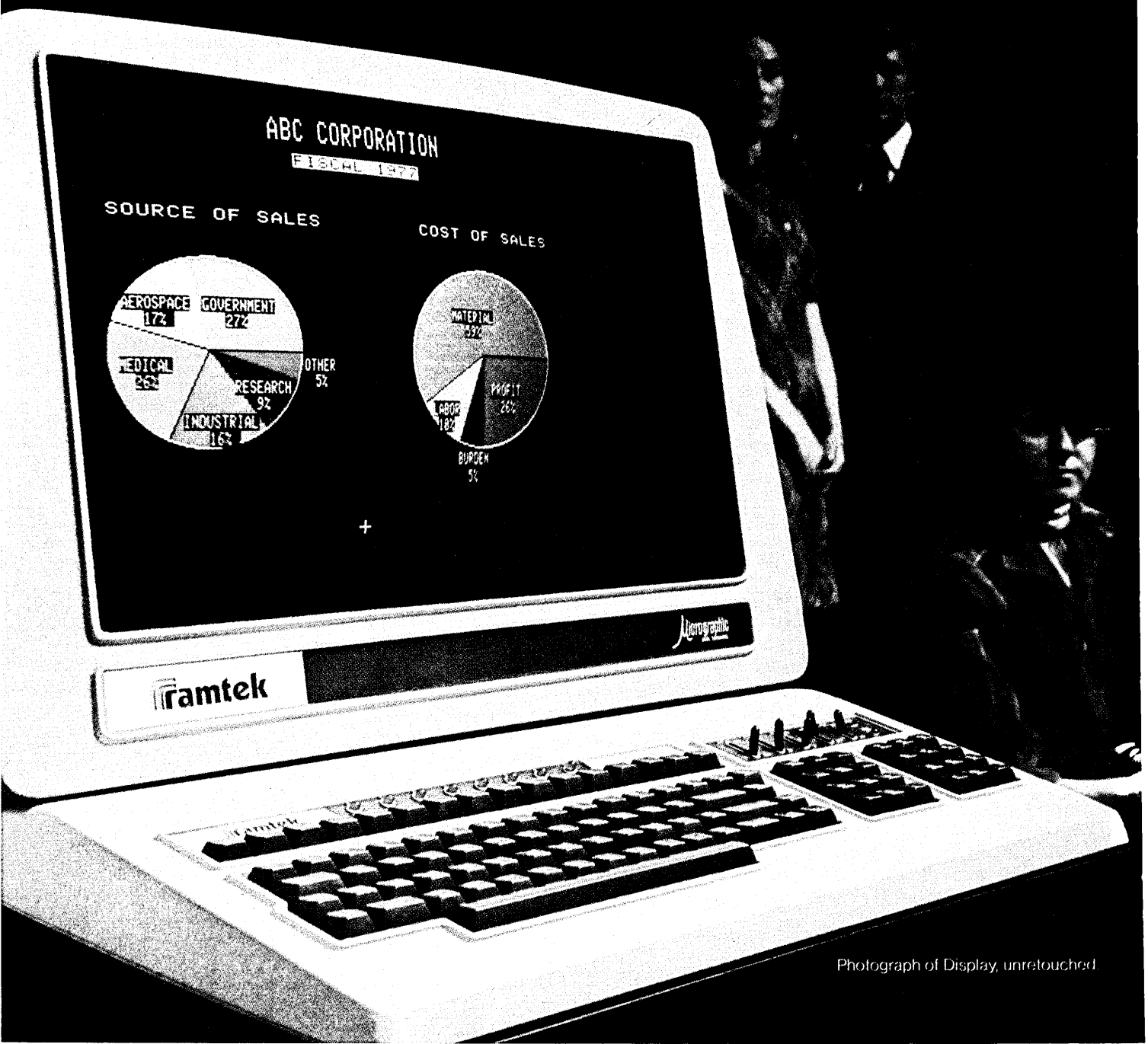


CIRCLE 56 ON READER CARD

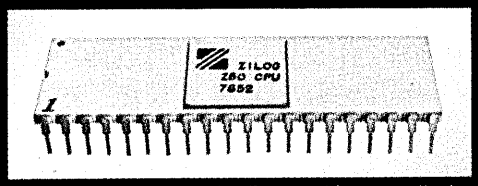
# Look what Ramtek has done to graphic terminals.




Photograph of Display, unretouched

# Now you can get quality resolution and a combination of true graphics and true alphanumerics at an affordable price.

Ramtek introduces the new Micrographic Terminal. No longer do you have to settle for poor resolution or give up color in economy priced display terminals. Ramtek gives you a high resolution flicker free display on a resolvable matrix of 512 elements by 256 lines. And you get a choice of black and white or any 8 of 64 colors as well as split or dual screen capability. The independent alphanumeric refresh offers you single character addressibility within a visible matrix of 25 rows of 80 characters that are crisp, sharp and well defined.




Ramtek's Micrographic Terminal is controlled by a powerful Zilog Z-80 with 28K bytes of PROM and 16K bytes of RAM

In addition you can program the Ramtek Micrographic Terminal and give it the dedicated capability and intelligence you need for your application. Ramtek's software gives you TTY compatibility and high level graphic functions commanded by ASCII text strings. You can choose from an extensive list of options such as floppy disc interface, additional serial I/O ports, alphanumeric overlays, user defined fonts, color selections and packaged software.

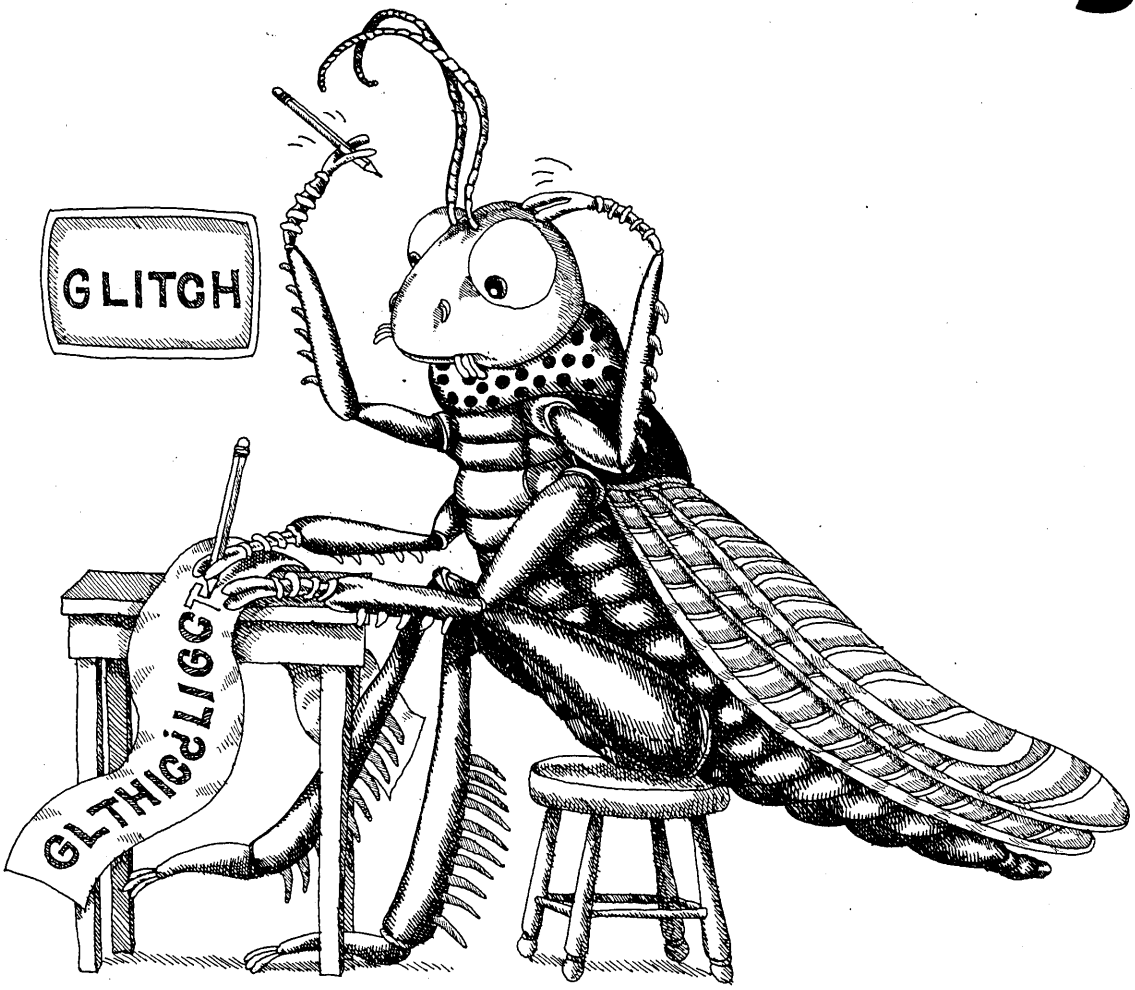
More good news: prices for a black and white basic system begin at just $4,700 and for color at only $5,400.

But to fully appreciate the contribution the Ramtek Micrographic Terminal can make to your application, you'll need to know more details. Just call or write Ramtek Corporation, 585 N. Mary Ave., Sunnyvale CA 94806. If you're really in a hurry call us at (408) 735-8400 and ask for Todd Martin.

**ramtek**

**Our Experience Shows**

# The Read/Write Error Bug.




## If the environment's not right, this bug won't let your computer read/write right.

An unstable environment results in the appearance of the Read/Write Error Bug. Sudden temperature changes, dirty air, static electricity, high or low humidity can nurture this costly pest. And, it's right at home in minicomputers as well as large scale systems.

EDPAC Process Cooling Systems are specifically engineered to achieve an exact, totally regulated environment that will prevent such occurrences. So you can rely on EDPAC to protect your computer like no regular air conditioning system can.

Before the Read/Write Error Bug plagues you with another costly error, contact EDPAC today! FREE BOOKLET. HOW TO GET THE BUGS OUT.

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# Do-It-Yourself Maintenance Management

by Jean Francois

## Indifferent treatment by the vendor led to an annual savings of $17,500.

In September 1964, the Ministry of State for Urban Affairs in Ottawa, Canada, got the green light to acquire a minicomputer system to be used in a service bureau mode for scientific work.

A contract was eventually awarded to a mini manufacturer, one of the top two or three in terms of market share, to provide a system with several oem peripherals and two processors. Specifically, the minis were connected to a dual-spindle 2314 type disc unit. For back-up purposes, a card reader, a line printer and some telecommunication equipment were made switchable from one processor to another. One cpu was to work in a foreground mode while the other with three magnetic tapes was working in a batch mode.

The contract included the hardware, at a cost of approximately $170,000, and maintenance, which was based on 10% of the hardware cost per year.

Soon after delivery, the system was accepted and the total amount of the contract was paid in full. Without realizing it, from that time on we were at the mercy of our supplier for the maintenance of the system. Our mistake had been to include the maintenance contract in the original deal. (We did so because the money was available and we were at the end of the fiscal year. That's the way things happen in government agencies.)

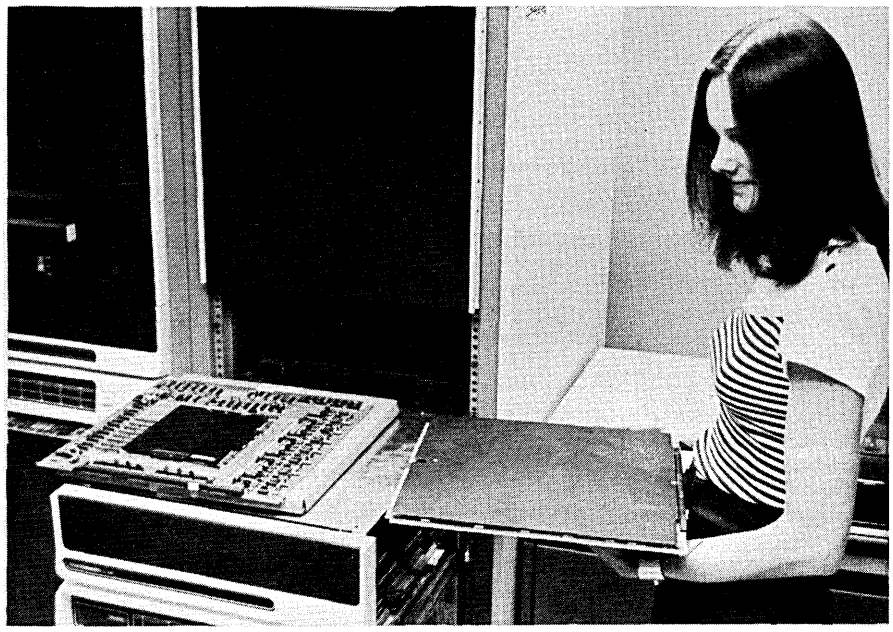
Our mistake had been to include the maintenance contract in the original deal.

During the first six months, the system was used to create new system software, modify existing system software, and on internal projects. The number of users was quite restricted and we could afford to divert our activities from the programming and debugging of computer programs when the system was not working satisfactorily. We learned during this time that the response time of the repairman of the company with which we were dealing was between a half to two working *days*.

From our point of view, we thought our maintenance contract was not being taken seriously: effective troubleshooting was not started before 10 a.m. and rarely extended beyond 3 p.m. In addition, if we were unfortunate enough to tell the field service representatives that a repair was not immediately required (such as one magnetic tape of the three giving parity errors), then things were *never* fixed.

Needless to say, we warned the local representatives several times that "things will have to change when we open the system to our users."

By the way, for those who believe this story is too bad to be true, at that time the distance between the computer and the office of the service man was approximately five miles. Later we both moved and that distance got



The author and one programmer/operator handle the maintenance management for the Ministry's dual-cpu mini configuration. Part of the preventive maintenance program they have instituted is the regular shipping of memory boards back to the vendor for readjusting and remargining.

# Can your computer system pass this test?

Recent independent studies show that the HP 1000 real-time computer system, with its new 21MX E-Series high-speed processor, ranks head and shoulders above other small computers. Test your favorite against Hewlett-Packard's price/performance leader:

| Feature | The HP 1000 | Your old favorite |
|---|---|---|
| CPU | 608K bytes memory capacity. Standard I/O rates of 2M bytes per second; burst rates up to 11.4M bytes per second. | |
| Micro-programming | Full software for developing and running 8.5K 24-bit words. 175 ns instruction execution time. | |
| Memory Speed | Cache speed 350 ns cycle time for all 608K bytes: just $2100* per 32K bytes. 595 ns cycle time: $1600 per 32K bytes (just 5¢ per byte!). | |
| Operating Systems | One upward-compatible family of Real-Time Executives: memory-based or disc-based RTE up to 608K bytes. BASIC, FORTRAN and Assembly languages. Pick what you need for today's job—expand when you're ready. | |
| Data Base Management | IMAGE, HP's complete DBM capability, plus QUERY language for easy access to related data, costs just $2500. | |
| Networking | Over 150 RTE networks installed and running. Modems or high-speed hardwired communications. Also RJE/1000 2780 emulator at 9600 baud. | |
| IEEE-488 Interface | HP-Interface Bus (HP-IB), HP's implementation of IEEE-488, allows simple link to instruments. Complete software including driver, formatters, message subroutines. | |
| Cost (Every HP 1000 includes 21MX E-Series CPU; CRT with dual mini-cartridges and soft keys; and RTE operating system.) | Model 20, 64K-byte memory-based system: $21,000. 500K-byte flexible discs optional. | |
| | Model 30, 64K-byte disc-based system, 15M-byte disc storage: $36,500. 5M- and 50M-byte discs available. | |
| | Model 80, 128K-byte data base management system with 15M-byte disc storage, IMAGE, mag tape, and line printer: $61,700. 50M-byte discs available. | |
| Delivery | 12 weeks ARO. | |

**All prices shown are U.S. Domestic List.*

I'd like to take a closer look at:
- ☐ HP 1000 system Model 20___, 30___, 80___, 21MX CPUs___.
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Mail to: Robert Puette, Hewlett-Packard, 11000 Wolfe Road, Dept. 406, Cupertino CA 95014.

Any more questions about the price/performance winner? Then call your nearest Hewlett-Packard office listed in the White Pages and ask an HP Computer Systems Representative. We'll be glad to arrange a demonstration of the HP 1000. Or send us the coupon and we'll get in touch with you. You'll find that our computers are even better in action than they are on paper.

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*Performance comes in three sizes:*
*the HP 1000 Models 20, 30, and 80.*

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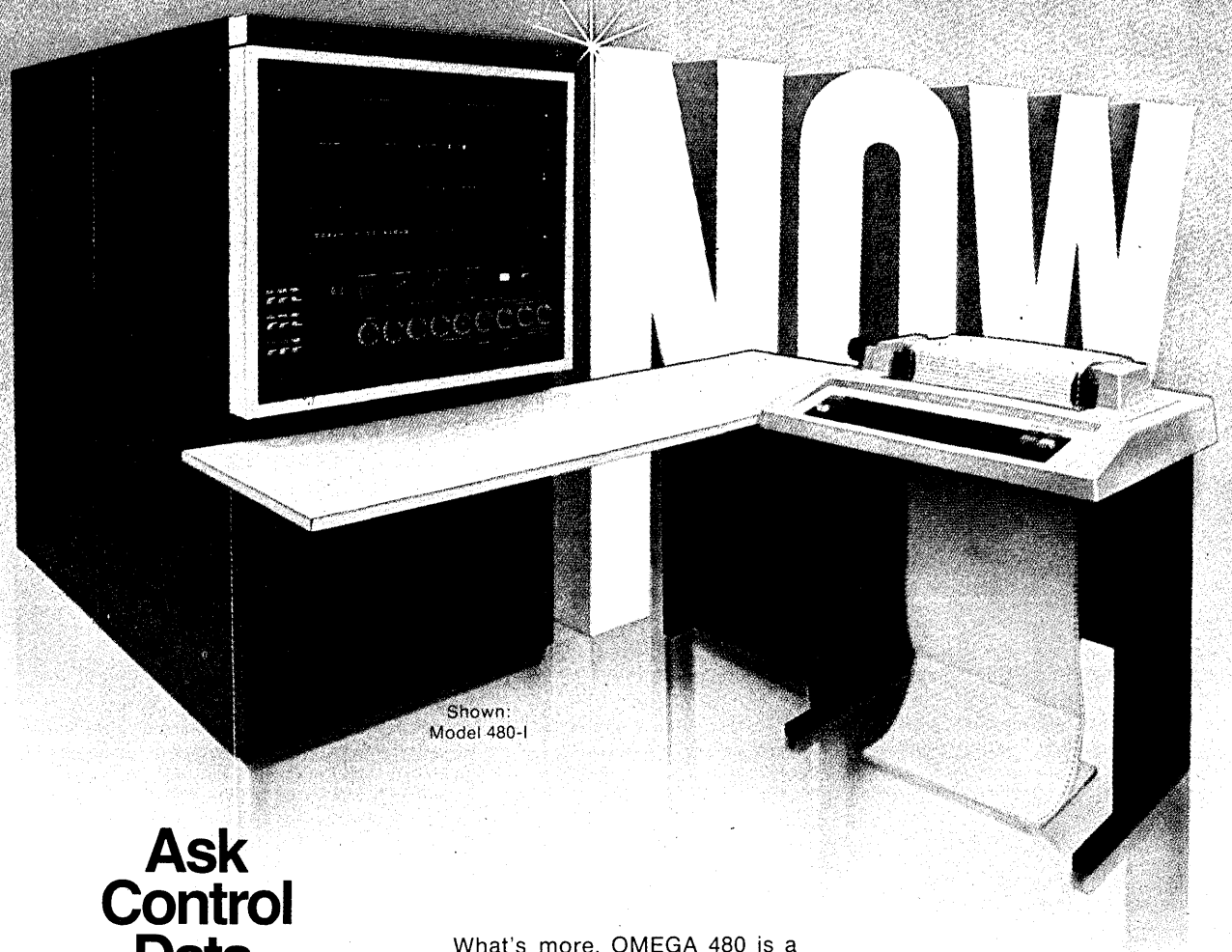
# Get the IBM 370-compatible alternative that's backed by systems know-how.

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Control Data introduces the OMEGA 480 System—**two compatible, price-conscious alternatives to IBM's 370-135/138 and 145/148.**

Our new OMEGA 480-I gives you half again as much throughput capacity as 370/138—yet costs about the same! And the OMEGA 480-II will exceed 370/148 performance while offering a purchase-price savings of $200,000!

What's more, OMEGA 480 is a space-saving one-half the size of the comparable 370! And, it's field-upgradable. That means you can get OMEGA 480-I now... upgrade it to 480-II capacity later!

Compatibility? OMEGA 480 supports without modification IBM Operating Systems, Program Products, and user programs.

Financing? Several options are available either through our competitively-priced Installment Sales Plan or a selection of 3- to 7-year leases.

But most important, you want service support. And you get it from Control Data! In our support organizations are more than 8,000 dedicated hardware and software specialists—including many with years of IBM system experience. Experience that comes from servicing more than 1,200 current IBM users, and maintaining such Control Data plug-compatible peripherals as Disk, Tape, Memory, Printer and Mass Storage Systems.

The OMEGA 480 Systems are available initially in: Boston, New York City, Philadelphia, Washington, Baltimore and Atlanta; Cleveland, Chicago, Detroit, Milwaukee, Minneapolis, Dallas and Houston; Denver, Portland, Los Angeles and San Francisco. For information phone your local Control Data Representative or write Thomas E. Phillips, Vice President, Peripheral Systems Marketing, Control Data Corp., P.O. Box 0, Minneapolis, MN 55440.

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CONTROL DATA CORPORATION

shortened to three miles. So travel time was never an excuse.

Our system was opened to the users six months after delivery. As it became more heavily loaded we found we could not guarantee anything better than an average of three consecutive working days of down time every three months. And we obviously could not afford to turn our programmers away from the machine for that long a period, nor can anyone else in a service bureau environment, governmental or otherwise.

We soon tried almost all means in our power to improve the efficiency of our maintenance contract, but no appreciable or lasting results were ever noticed.

Seeing that there was no way that we could change the spirit of the field service, our next step was to try to find an alternative.

The first thing which came to our mind was to ask that regular checks be made on the system. We discovered that no preventive maintenance whatsoever was included in our contract and that if we wanted it we had to pay extra for it—even though we were paying nearly $17,000 per year for "maintenance services!"

Talks with our vendor led to a proposal stipulating simply that each week a repairman would run some tests for a fixed monthly cost. Nothing in the proposal even mentioned which tests were to be run and for how long. Obviously this pass was discarded.

Our next step was to get involved ourselves.

### Getting involved

We had noticed that the first thing that the repairman did on coming to our site was to run reliability tests to see if any anomalies could be detected; we found that we could do this easily.

> The maintenance contract was not being taken seriously.

With no more background than that, we established a procedure whereby *we* would run overnight tests every week in the following rotation:

| | |
|---|---|
| memory | week 1 |
| cpu | week 2 |
| discs | week 3 |

The reason for choosing the above tests is that an undetected fault originating in the memory or the cpu or during the transfer of information to or from a disc has a good chance of becoming catastrophic for the system. This is the kind of fault we were after. Faults originating from the card reader, the line printer, magnetic tape units, etc. could be detected almost immediately anyway, so we decided to adopt the wait and see attitude for those parts of the system. At any rate, after several months of operation we saw that most of our problems were due to faulty memory boards, not from electromechanical components.

With our increased involvement in hardware maintenance, things were going a little bit better and the repairman from our original contracting firm was apparently pleased. (He should have been; we were doing his work for him.) However, we were not quite satisfied. Once we localized a fault in the system, the next step was to isolate the bad component or unit and if possible reconfigure the system in a degraded mode of operation. Then we could send the bad component for repair, wait until it came back, and reinsert it in the system. We thought that with this solution we could benefit from having a stock of repaired and adjusted parts, but were reluctant to jump all the way into doing our own work.

### Forcing our hand

Once we developed our "do it yourself" capabilities we were almost at the end of our original maintenance contract and not in a mood to extend it. Prices were up, too. We were told that our maintenance contract was originally set up at 1964 prices and in early 1966 an increase was seriously considered by the vendor.

We decided to go shopping around for suitable maintenance firms willing to trouble-shoot our equipment on an on-call basis. This solution promised to be much cheaper than the full parts and labor maintenance contract, and could be tried without risk; after all, we had nothing to lose with respect to response time and repair time. In the meanwhile, with part of the money saved by not paying for maintenance we decided to buy one or two extra memory boards and wait.

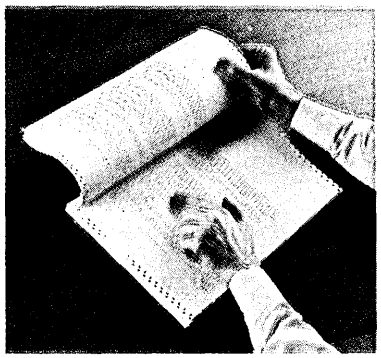
> Maintenance was $17,000 per year—preventive maintenance was extra.

However, our top management thought that the story sounded a little bit like a fable and they were heavily in favor of a maintenance contract negotiated with our original contractor.

Administratively, logically, and on paper, the full parts and labor maintenance contract *sounds* like stability, security, and relief. But should things go wrong, as was expected by the working level staff, a major accusation would have been brought up. We knew

# Series/1 contin

Series/1 is a family of small, powerful computers that offers experienced data processing users the opportunity to develop computer solutions closely tailored to their specific needs at a reasonable cost.

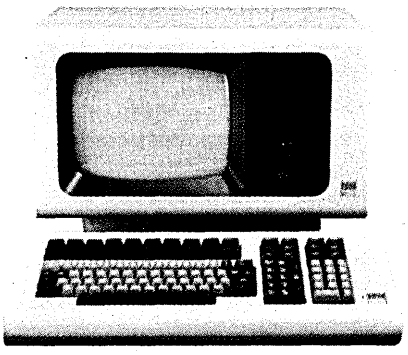


Series/1 can function in a distributed processing environment with an IBM host computer or as a stand-alone system. And because the system is modular, it can be assembled in an extensive array of configurations.

Now IBM introduces new Series/1 software and hardware that extends the range and flexibility of this extremely versatile family of computers.

## New Software

The IBM Series/1 Realtime Programming System is a new, full function, disk-based operating system that includes multi-programming and multi-tasking capability for commercial, event-driven and scientific applications in either batch or realtime modes.



In addition, a Program Preparation Subsystem allows you to use the system for background batch applications or application development while you're running realtime jobs.

The system supports two high level languages for faster, more productive application development.

PL/I is a powerful flexible language that can be used for commercial, event-driven or scientific applications. And it takes fewer steps to write programs in PL/I, so you can get your applications up and running faster.

FORTRAN IV is a widely-used, mathematically-oriented language that has been extended to make it easier to use in developing and running realtime applications on Series/1.

Other additions to the Series/1 software package include the Mathematical and Functional Subroutine Library and various Control Program Support extensions.

## New Hardware

Series/1 now includes a new custom display station that

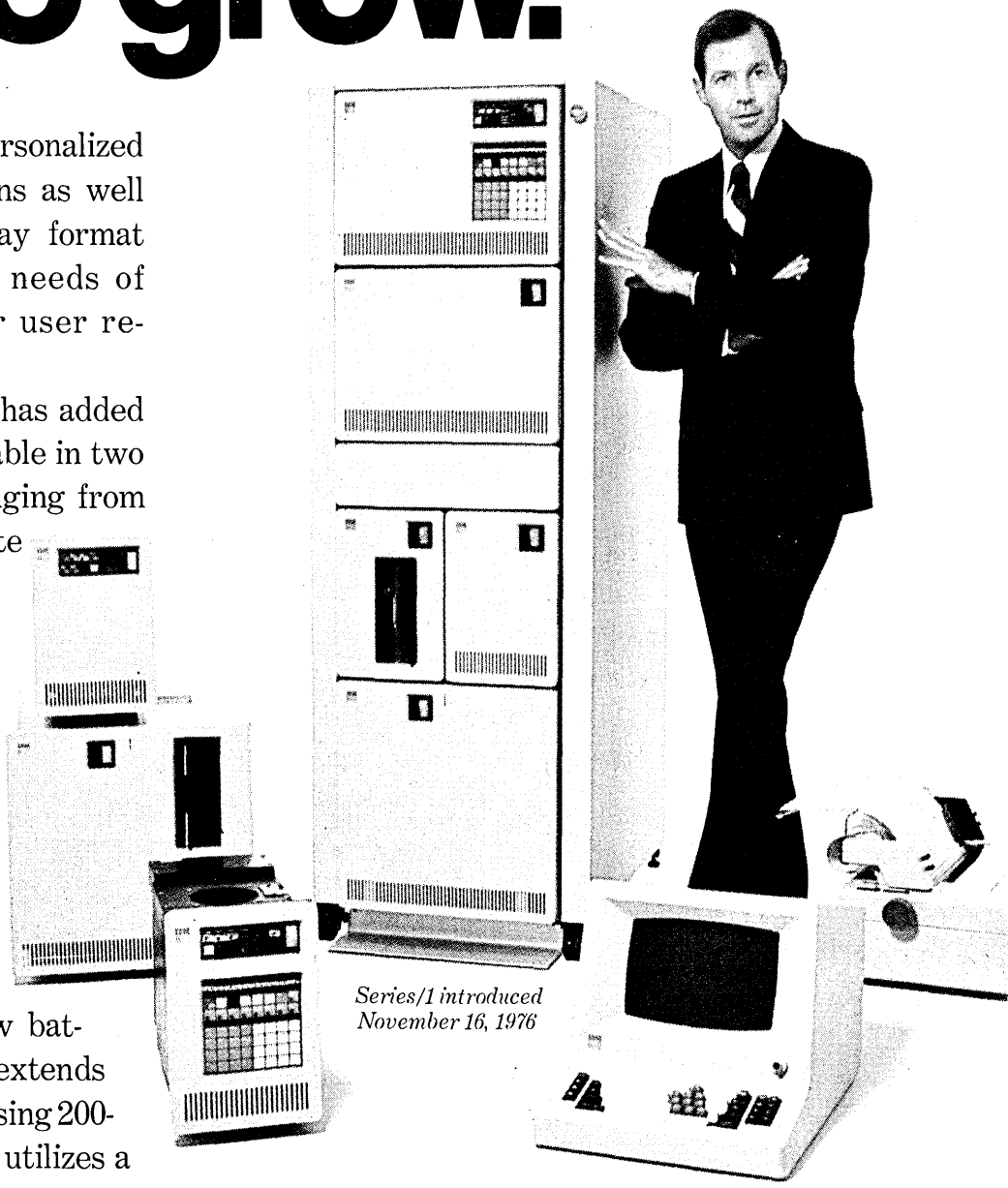
# ues to grow.

can be ordered with personalized key and display functions as well as a personalized display format designed to meet the needs of special applications or user requirements.

In addition, Series/1 has added a new line printer, available in two models, with speeds ranging from 80 to 414 lines per minute depending on the model and character set.

The system also features four new processor models utilizing 32K byte storage cards to provide lower cost memory and increase device attachment flexibility.

Finally, there's a new battery backup unit which extends coverage to processors using 200-235 volt power. This unit utilizes a common automobile battery (user supplied) to maintain data in memory, in case power is interrupted.



*Series/1 introduced November 16, 1976*

## How to find out more

Now that there's more to Series/1, there's more reason than ever to find out how this versatile, modular family of small computers can help you become more productive.

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what it would sound like: "This minicomputer system should have never been bought to be used as a data processing center for the Ministry." And this would have been the coup de grâce for the mini center.

For a while some negotiations were carried out to define a fool-proof contract which, among other things, would have given us total assurance—on paper—that the response time of the field serviceman and the mean time to repair were well within a working day.

Estimates for the cost of such a contract were well over $25,000, but a written proposal never reached our desk. Our impression was that our contractor would not enter into such a deal. Their idea, as we understood it, was to sell us their standard maintenance contract again with the assurance that things would get better "within the next six months."

It was nice to hear comforting words but how much credibility could we give them?

Fortunately or unfortunately, at the time that a decision should have been made, the Ministry was being reorganized and this gave us the time to prove that doing the management of the maintenance ourselves—finding the bad component and selecting the right maintenance firm for the right equipment—was a cheaper alternative than vendor service, and would lead to a higher availability of the mini system for our users.

If the hardware has a bug, it's certain to get worse.

Profiting from the fact that for a while things were unsettled in the Ministry, it was relatively easy to enter into selecting and requesting the services of maintenance firms and to switch from one to another for better service.

### Finding our way

So, suddenly we are maintenance men.

The cyclic tests run on memory, cpu, and discs make us somewhat confident that the system will be fairly reliable, but the worst can always happen, an undetected bug which turns out to be uninterpretable by our diagnostics. The time required to diagnose an intermittent fault is potentially very long, but it would be for the outside serviceman as well.

It has been our experience that the first indication of any kind of a fault is the progressive destruction of the system software residing on disc. So, as soon as we suspect something is going wrong, we recreate a system disc. Using a 2314-type unit, this takes less than 15 minutes, including restart.

The recreation of a user disc takes much longer, from one to two hours for a three-quarters full disc. However this procedure is rarely necessary since we separated the user disc files from the system disc after noticing that the user disc rarely gets clobbered. During prime time we have had to reconstruct up to several user files, however; this causes us to interrupt our batch processing for 15 to 45 minutes, depending on the situation.

Should a disc, or a processor, go down completely, we are still not completely stymied. We can load data onto the other disc and/or operate with a single processor. The possibility of the whole system going down at once is rather remote.

Admittedly, once in a great while we are faced with a problem we cannot trace to the hardware, operating system, software, or to the foreground/background method of operation. In these cases, if the problem does not disappear, it soon becomes apparent if the hardware is at fault. If the hardware has a bug, it's certain to get worse. That may not be much of a diagnostic method, but it works.

Availability has been 97% to 98%.

We soon learned how sensitive computer systems are to temperatures and to variations in temperature. A good way to prevent or postpone potential problems is simply to make sure that the ambient temperature of the computer room is constant and slightly cool. Regular checks should be made of the air circulation inside the racks in the area where there is a great deal of heat dissipation.

This sounds a good deal like "motherhood," but we noticed that the memories in our systems were becoming more and more sensitive with time. We first ran into problems when the temperature was obviously too high, then when it was only noticeably high, and later when it wasn't noticeable at all. The problem was traced to two small internal blowers in the cpu. Had we not found the fan problem, we most likely would have sent out some memory boards for repair, boards which may not have been as good as the others, but which certainly weren't in need of immediate repair.

Another diagnostic tool we have used is the test job. From time to time we run a few jobs which seem to exercise most of the software and hardware, then compare their output with


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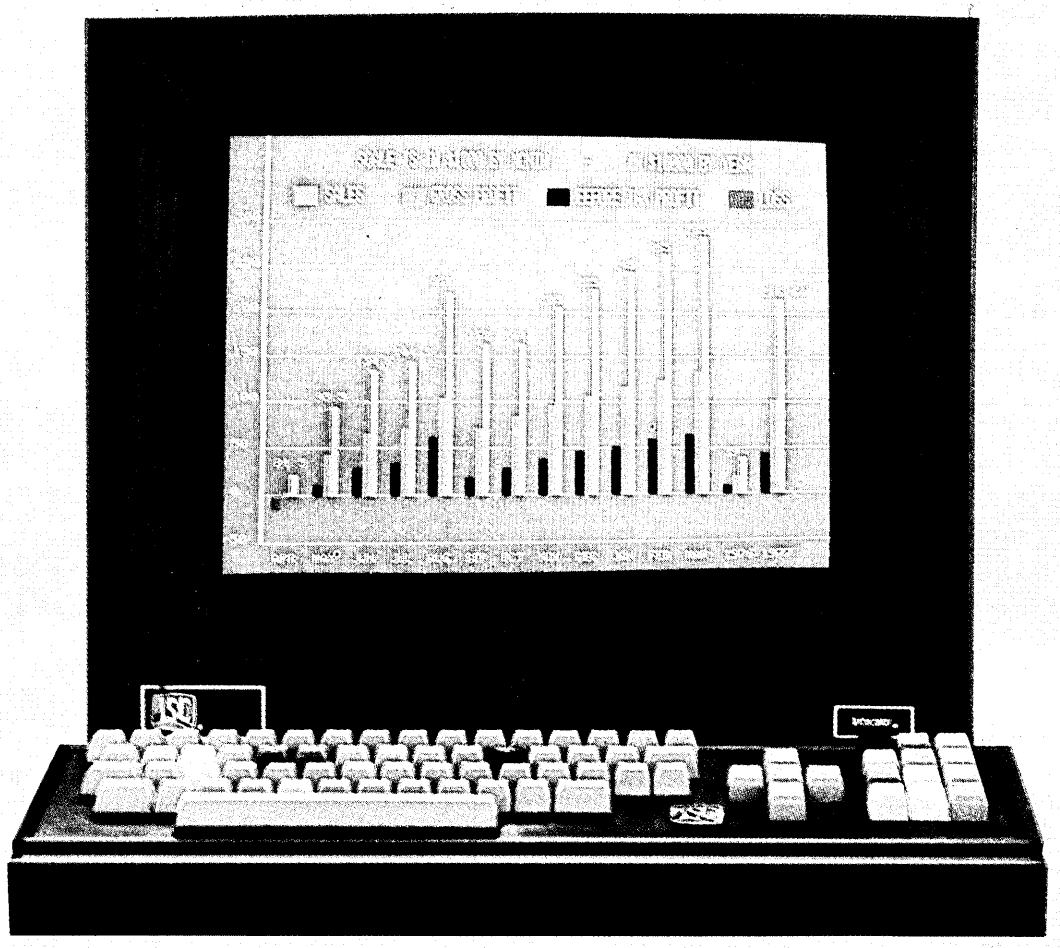

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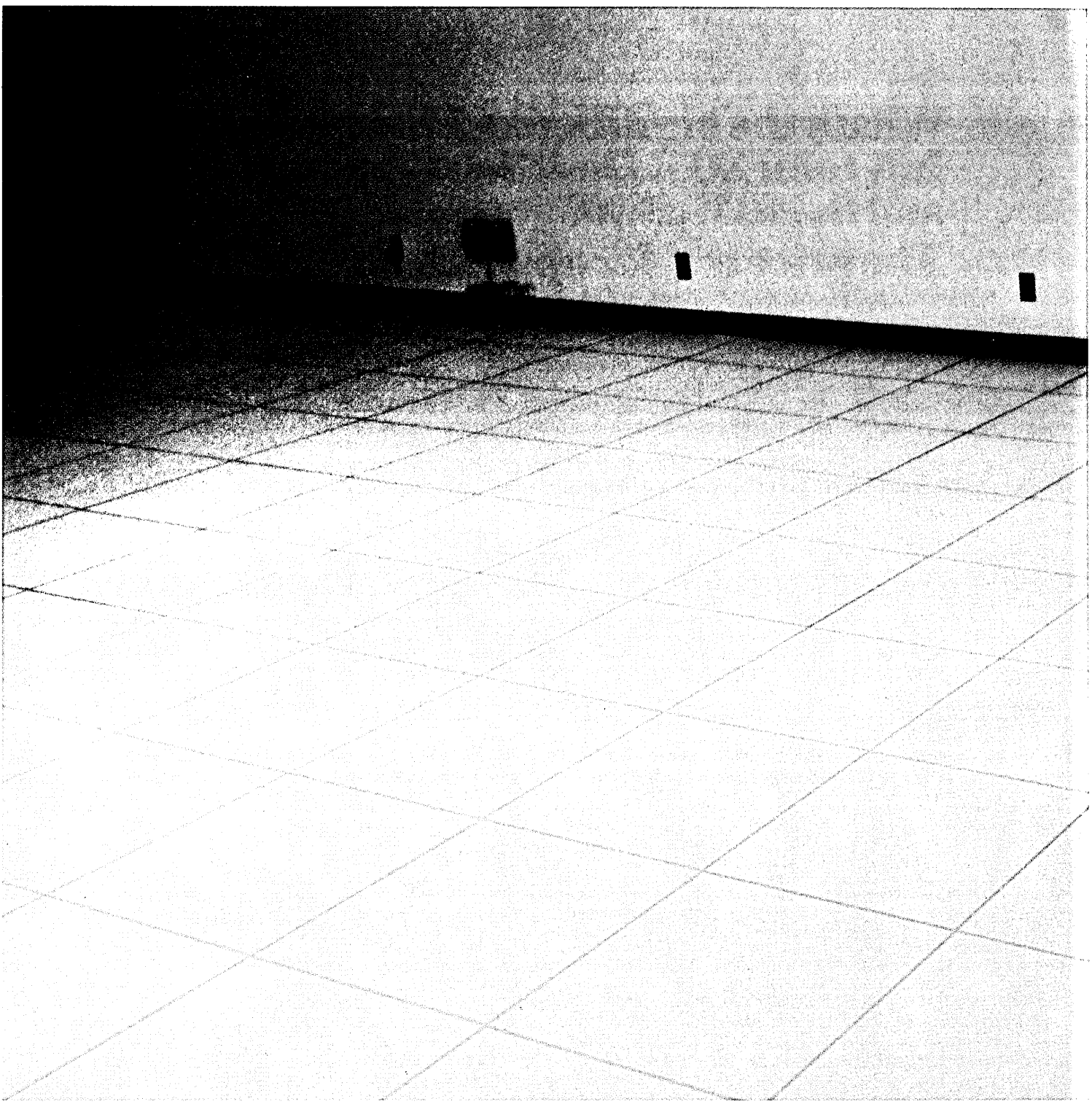

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known results. So far these runs have not found anything wrong, but they do reassure the users that problems being experienced are not due to faults in the system.

Finally, we do send suspect memory boards to the manufacturer to be readjusted and margined. The cost for this is on the order of $200 to $400 per board, depending on the repairs required, if any.

### Saving $17,500 per year

We have now been doing our own maintenance management for a year, the second year of our operation. The cost to maintain the system has not been over $2,500 (while a 9-to-5 parts and labor service contract would have run not less than $20,000). During that year we have used the on-call services of four maintenance firms in Ottawa. Our availability, measured as a percentage of prime shift time, has been 97% to 98%. Not bad for non-professional maintenance managers.

> The low price of minis has been to the detriment of the support provided.

Pessimists are quick to say we've been lucky. This may be partly true, as we've never had a head crash, for instance, or run into problems in the electronics of the printer. We think our "good luck" has been due to the fact that our equipment was well engineered to begin with, and that we have attempted to work around—even reprogram around—errors we could not fix immediately.

In our one year of operation, we have made practically no investment in maintenance; the exception being one extra memory board purchased for under $5,000, plus my time and that of a programmer/operator.

However, we have three potential areas of exposure: the single line printer, the single disc controller, and the dual cpu's (both are needed for our present mode of operation). For $70,000 we could back up all these pieces; for an additional $30,000 we could back up the discs too, making the configuration nearly completely redundant and giving us more processing power to boot. Since we're talking about minis, the cost of redundancy isn't all that high.

For several years now, prophets have been announcing that minis would soon take over a good share of the large computer market. That day has not yet come. One reason is that mini systems have low prices, and this is to the detriment of the support provided the users. That support has not been geared toward non-professionals who don't know how to fix their own problems. However, the minicomputer field is close to being a goldmine for persons who are willing to learn how to do some of their own maintenance, or are willing to find ways to live with some of their problems for short periods. And it isn't that hard to do. ❋

Mr. Francois is computer systems chief at the Ministry of State for Urban Affairs in Ottawa, Ontario, Canada. He has previously worked for the Ministry of Transport, for Quebec Hydro, Control Data, and at the ground station of Telecommunication by Satellite, in Pleumeur-Bodou, France.

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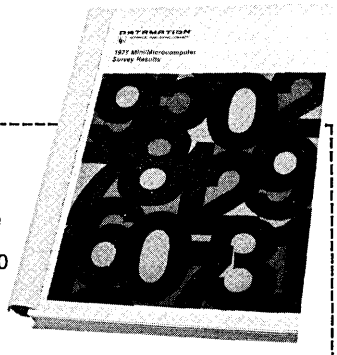

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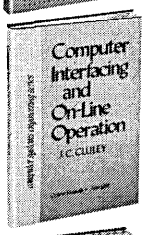

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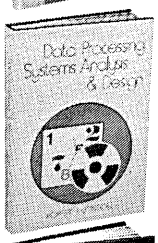

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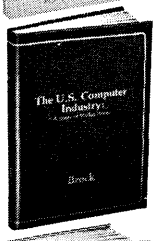

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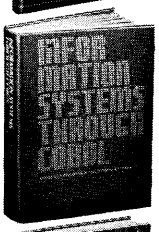

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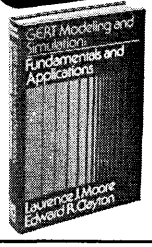

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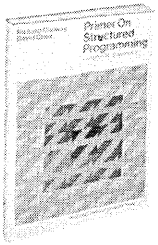

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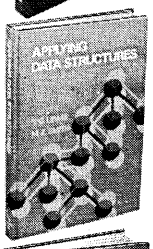

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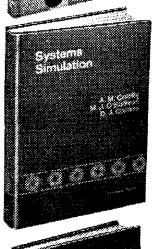

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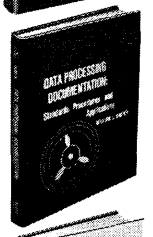

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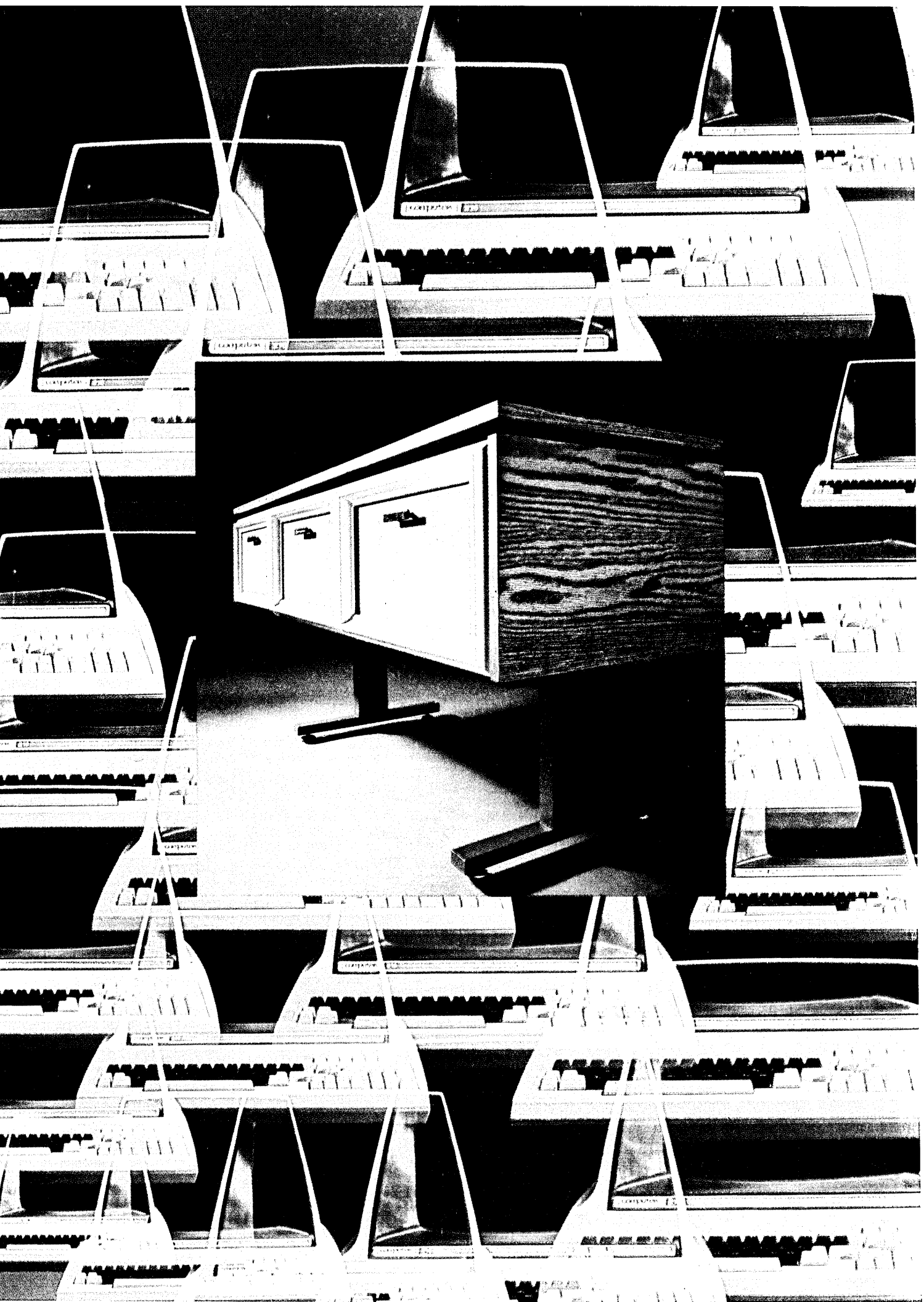

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CIRCLE 18 ON READER CARD

# A Survey of Hardware Maintenance Firms

by Michael Cashman, Technology Editor

There are alternate sources for maintenance services for almost anyone using name-brand equipment in or near a major city. Here are 45 of them.

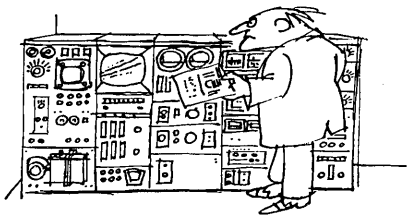
So you're unhappy with the maintenance being performed on your present equipment and are considering another source for your needs? Or you are responsible for maintenance of a small system your new company is selling, and you're wondering which vendors might be able to lift the maintenance responsibility from your shoulders?

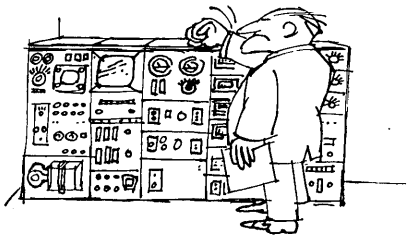
This survey is intended to help you in either case, for changing maintenance sources or arranging for them in the first place is not a step taken easily. To a great extent, the performance of your system bears a direct relationship to the quality of the maintenance performed on it.

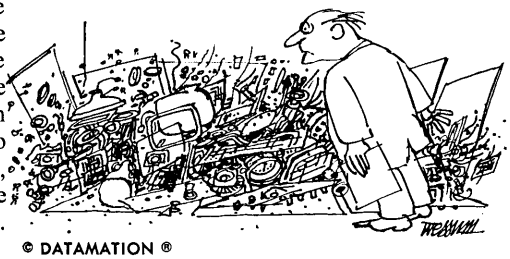
The survey is an attempt to list all major maintenance firms in the 50 largest cities in the U.S. (according to the 1970 census), excluding vendors that concentrate on unit record equipment service.

We have excluded associations, and have tried to "shop" for this list the same way you might: by calling some companies we thought might be in the business; talking to very cooperative people at companies we knew were in the business; and finally, in an effort to build as complete a survey as possible, spending several hours scanning the Yellow Pages of the 50 largest cities.

This last search helped us pull out a number of very small vendors we would have ordinarily missed, but







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wasn't totally satisfactory because a few directories (including Boston, Dallas, Houston, Tulsa, New York, San Antonio, and St. Louis) lumped all data processing references under a topic generally called "Data Processing Services, Supplies," and trying to separate the maintenance firms from everyone else was just too much walking for our fingers to do. Maintenance vendors in those cities would do themselves and their potential customers a favor by attempting to get the phone company responsible to break out the maintenance listings. It should be noted, too, that many companies claiming to be in most cities around the country don't show up in the Yellow Pages.

And, as in all surveys, a number of companies could not respond quickly enough for us to determine whether they were even in this industry, and those companies have been excluded. Given their non-responsiveness, one might not wish to deal with them anyway.

In all cases, *the vendors were contacted and interviewed directly by us.* Their representatives have provided the information contained in this feature, and are basically responsible for its accuracy.

The survey will primarily interest users who have purchased equipment,

especially those who have purchased equipment from a mix of manufacturers. This is where a great portion of independent maintenance is performed, and most maintenance vendors interviewed let it be known that they "love" mixed-vendor installations.

Users of rented or leased equipment should check with the company policies of their equipment supplier. In many cases the use of an alternative maintenance source will void the equipment warranties, but some users have been willing to risk this providing they could get adequate service on their equipment. That isn't always possible with many vendors, especially for some mainframes. Independent maintenance vendors were nearly unanimous in their praise of IBM for that firm's cooperation in supplying parts and information required to work on IBM systems. But specifically noted for lack of cooperation—not listed in any particular order—were Burroughs, Honeywell, and NCR.

Two listings are presented here. One is a city-by-city survey of the 50 largest cities, showing which vendors claim to have offices there. (We had to take them at their word except in instances where we could show that the vendor did not, in fact, have even a White Pages phone listing there!)

The vendor names listed under the city name then can be looked up in the services list for a profile of the company and what it claims it does or can do. You'll find firms in the listings ranging from multimillion dollar companies that do only maintenance, to electronics houses willing "to work on anything so long as we can get our hands on the schematics"—which in many cases, as already pointed out, they won't be able to do.

Some of the vendors perform maintenance at "your place," others have to do it at theirs—an important point to bear in mind when screening them. Also important to remember is that not all services listed are offered at every branch office, and not every last piece of equipment they work on was mentioned. Also, some offices are in towns we can't identify as suburbs of the 50 largest cities, so those locations have been listed under the vendor profile sketches, together with other cities which do not rank in the top 50.

A corollary to all this is that no service firm is listed unless that firm has at least one office in one of the top 50 cities. So we offer our apologies to the "Farmer's Tractor, Combine, and Computer Repair Services" of the world, many of which we realize are seriously in business although difficult to find.

And finally, in reading the information, remember that we printed what they told us. For example, some vendors may take "installations" to mean pieces of equipment. But by and large the numbers should place the vendors in perspective.

The third party maintenance business is a troubled one. It has never seen the popularity (read profitability) predicted for it earlier in the decade when it began to take hold, and many companies have given up trying to make money at it, including University Computing, Comain Corp., and others. Many of the numbers currently listed in the Yellow Pages lead to intercepted calls and "I don't show a current listing" epitaphs. And it seems that companies like Comma, which tried to go head-on against IBM in providing maintenance on IBM systems, might have succumbed had it not found a home under Control Data's wing. Other vendors like Sorbus and Ford Aerospace & Communications found refuge in doing much of their maintenance for other parts of their own corporate empires.

On the other hand, the future would seem to be brighter for the survivors than it was three years ago. The microprocessor/microcomputer boom hasn't escaped their attention, and they know that as these devices get into more and more critical applications, somebody is going to have to perform maintenance on them. And systems houses that are only interested in serving a specific locale, or vertical application, will undoubtedly use the independent maintenance companies until they can build up their own maintenance force. Perhaps the frustrations that led one vendor to state that it should have had its corporate head examined "before getting into this business" are easing. ❋

## SOME MAINTENANCE SOURCES IN THE 50 LARGEST U.S. CITIES

**Atlanta, GA**
- Comma
- Dynetics
- Formation
- General Electric IS&E
- ICE
- Information and Control Systems
- Integrated Automation
- Memorex
- Pertec
- Raytheon Service Co.
- RCA Data Services
- Sirvess
- Sorbus
- Syntonic Technology
- Telefile Computer Products

**Baltimore, MD**
- Comma
- General Electric IS&E
- ICE
- J.H. Leskin Associates
- Memorex
- Pertec
- Raytheon Service Co.
- RCA Data Services
- Sirvess
- Sorbus

**Birmingham, AL**
- Formation
- General Electric IS&E
- Integrated Automation
- Memorex
- Raytheon Service Co.
- RCA Data Services
- Sorbus
- Syntonic Technology

**Boston, MA**
- Comma
- General Electric IS&E
- ICE
- Memorex
- Pertec
- Raytheon Service Co.
- RCA Data Services
- Sirvess
- Sorbus
- Syntonic Technology
- Telefile Computer Products

**Buffalo, NY**
- General Electric IS&E
- ICE
- Memorex
- Raytheon Service Co.
- RCA Data Services
- Roger Computer Services
- Sorbus
- Syntonic Technology
- Telefile Computer Products

**Chicago, IL**
- Comma
- DP Service
- Ford Aerospace & Communications Corp.
- Formation
- General Electric IS&E
- International Computer Equipment
- Memorex
- Pertec
- Raytheon Service Co.
- RCA Data Services
- ServiTech
- Sirvess
- Sorbus
- Syntonic Technology
- Telefile Computer Products
- Tymshare Computer Maintenance

**Cincinnati, OH**
- General Electric IS&E
- ICE
- Memorex
- Pertec
- Raytheon Service Co.
- RCA Data Services
- Sorbus
- Syntonic Technology

**Cleveland, OH**
- CIG Computer Products
- Comma
- Formation
- General Electric IS&E
- Memorex
- Pertec
- Raytheon Service Co.
- RCA Data Services
- Sirvess

*(Continued on page 107)*

# HARDWARE MAINTENANCE FIRMS AND SERVICES

| Vendor | Action Electronics | Addco | Border Electronics | Business Products |
|---|---|---|---|---|
| Coverage offered | on-site or periodic | demand or temp. on-site | periodic or time & materials | on-site, time & materials, periodic |
| Monthly minimum charge? | none | based on amount of equipment | none | none |
| Additional services offered: | installation, relocation, consulting, interfacing, diagnostics | installations, relocations, site planning, diagnostics | installations, relocations, site planning, warehousing, refurbishment, diagnostics | installations and refurbishing |
| Contract is usually | vendor's | vendor's or negotiated | vendor's | vendor's |
| Agent for | Harris Corp. and Wavetek | Minicomputer Systems | Compco | — |
| Equipment serviced | Harris terminals, Wavetek equipment, DEC PDP-11. | DG Nova, Eclipse, DEC PDP-8 series, and peripherals; Lear Siegler ADM-1, 2, 3; Infoton and Beehive crt's. DECwriter and Teletype model 33 terminals. | Compco minis and associated terminals, Singer printers, ITT ASCIIscope, CIP 2000 computer, Cincinnati Milacron minis, Hewlett-Packard 2100, DEC PDP-11. | DEC PDP-11 and other minis & peripherals depending on parts availability, Philips. |

| Vendor | CIG Computer Products | Comma | Communications Engr. | Compunetics |
|---|---|---|---|---|
| Coverage offered | on-site | on-site, temp. on-site, time & materials, periodic | on-site, temp. on-site, time & materials | on-site or time & materials |
| Monthly minimum charge? | none | none | not usually | none |
| Additional services offered: | installation, relocation, site planning, diagnostics, warehousing, refurbishment | installation, relocation, site planning, mixed vendor diagnostics | installation and relocation | system design, refurbishing, site planning |
| Contract is usually | negotiated | vendor's | vendor's, or negotiated | negotiated |
| Agent for | — | — | Hazeltine | Beehive |
| Equipment serviced | Intel 370 memory, AMS 370 memory, IBM 370 (models 135, 145, 155, 158, 165, 168), Fabritek 360 memory, all Data Recall 360 memory, all IBM peripherals. | IBM 360 (models 22, 30, 50, 65, 67, 75), Sys/3, 1400 series, 7000 series, 370 (models 135, 145, 155, 158, 165, 168, 165 II, 155 II), & peripherals, except no RAMAC, no card reader/ punch for S/3, no 1419 check verifiers, no 1052 terminals. | Hazeltine, GE Terminet terminals; DG Nova, Interdata 16- and 32-bit minis; Wangco, Diablo, Ampex discs; Tally, Okidata printers; Mohawk data preparation equipment; Beehive terminals. | all Beehive terminals plus DG Nova minis. |

| Vendor | The Computer Room | Cptr. Hardware Maint. | Cptr. Hardware Support | Data Force Service |
|---|---|---|---|---|
| Coverage offered | on site, temp. on-site, periodic | on-site, temp. on-site, time & materials, periodic | time & materials or periodic | on-site, time & materials, periodic |
| Monthly minimum charge? | none | none | none | none |
| Additional services offered: | relocations, refurbishment, diagnostics | refurbishment, customizing, reconditioning 360/370 | installation, relocation, site planning, diagnostics, and consulting | installations, relocation, site planning, refurbishment, diagnostics |
| Contract is usually | vendor's | vendor's | vendor's | negotiated |
| Agent for | — | — | — | — |
| Equipment serviced | IBM 5100 and S/3, DEC PDP-8 and PDP-11, DG Nova, micros, Imsai, DEC printers, Research crt terminals, Centronics printers, Qume & Diablo printers, Lear Siegler ADM-2, ADM-3 crt's. | 360 (models 20, 22, 25, 30, 40, 50, 65) & peripherals; all 370 series and peripherals. | Univac 1108 & peripherals; DECsystem 10 & peripherals; H-P 2100 & peripherals; DECwriters and ADDS 580S/ 980S terminals; Lear Siegler ADM-1, ADM-2, ADM-3 crt's. | All DG Eclipse and Nova minis; DEC LA36, LA180, LA35 printers; Microdata Reality; Data 100 systems; Digital Computer Controls products; Keronix minis; Wangco discs; Printronics, Centronics, and Data Printer printers. |

| Vendor | DP Service | Data Systems | Datatek | DP Services |
|---|---|---|---|---|
| Coverage offered | time & materials | on-site, temp. on-site, on-call, time & materials | demand | on-site, time & materials, periodic |
| Monthly minimum charge? | depends on machine | — | — | depending on machine & location |
| Additional services offered: | warehousing and reconditioning | installations, relocations, site planning, consulting, depot work on Interdata pc boards | installations and consulting | refurbishing, warehousing, customizing |
| Contract is usually | vendor's | vendor's, customer's, or negotiated | vendor's | vendor's |
| Agent for | — | Vendor will not release data. | Vendor will not release data. | — |
| Equipment serviced | IBM unit record equipment, Tab Products, Tlon equipment, Graphics computers. | DEC PDP-11 and all associated peripherals. Interdata 6/16, 7/16, 8/16, and 7/32 models. Lear Siegler ADM models 1, 2, and 3. ADDS 520, 580, 920, 980 models. Hazeltine and DECwriter terminals. | Sweda 1200 series, ADDO-X adding machines, and some IBM peripherals. | Marshall discs, Mohawk equipment, Juki equipment, most IBM peripherals (except typewriters), and IBM 1401 cpu's. |

| Vendor | Dynetics | Engr. Service Systems | Ford Aerospace | Formation |
|---|---|---|---|---|
| Coverage offered | time & materials or periodic | on-site, time & materials, periodic | on-site, temp. on-site, time & materials, periodic | on-site, temp. on-site, time & materials, periodic |
| Monthly minimum charge? | none | none | depends on equipment mix | none |
| Additional services offered: | installations, relocations, site planning, refurbishing, diagnostics | refurbishing, warehousing, diagnostics, installations, relocations, site planning | installations, relocations, site planning, warehousing, refurbishment, diagnostics | installations, relocations, site planning, refurbishment, diagnostics |
| Contract is usually | vendor's, customer's, or negotiated | negotiated | customer's or negotiated | vendor's or negotiated |
| Agent for | Kybe, Access Corp., Meade Data Control | Anderson Jacobson | — | — |
| Equipment serviced | Wangco tape & disc formatters and drives; DG Nova; DEC PDP-8; Data Printer, Centronics, Data Products, Versatec printers; and most tape drives. | All DEC PDP-11, PDP-8, PDP-12; DECsystem 10 DS-310; DG Eclipse, Novas, Supernovas; Martin Wolfe systems; Interdata 16- and 32-bit equipment; Kennedy and Pertec tape drives; Diablo, Ampex, ISS, Memorex, Diva discs; Standard and Plessey memories; DECwriter terminals; Delta Data crt's; Teleray terminals; Selectrics; Teletype tty's; DECscopes; DEC graphic systems; NCR 399 accounting machines; NCR 657/658 tape drives; CalComp 2316-type drives; Burroughs L2000 and L3000 systems. | IBM 360, 370, 1400, 7000 series and peripherals; DEC PDP-11, PDP-8, PDP-16; General Automation, Westinghouse, DG Nova minis; Mohawk printers; Telex tape and disc drives; Ampex, CMI, EM&M memories; CalComp discs; Storage Technology tape drives. | DEC PDP-11/04 up to PDP-11/70, RCA Spectra, and associated peripherals. |

| Vendor | General Electric | Ice | Information & Control | Instrumentation Indus. |
|---|---|---|---|---|
| Coverage offered | on-site, temp. on-site, time & materials, periodic | on-site, temp. on-site, periodic | demand | periodic or temp. on-site |
| Monthly minimum charge? | none | none | none | none |
| Additional services offered: | installations, relocation, site planning, refurbishing, diagnostics | installations, relocation, site planning, warehousing, diagnostics, refurbishing | installations and site planning | none |
| Contract is usually | vendor's, customer's, or negotiated | vendor's | vendor's or negotiated | vendor's, customer's, or negotiated |
| Agent for | Metromation | — | — | Management Computer Systems |
| Equipment serviced | All DEC PDP-8, PDP-11, & associated peripherals; DG Nova same; Interdata; H-P 2100 series; Honeywell process line, including H-316; Four-Phase systems; Modcomp and Metromation minis. | DEC, H-P, DG, Interdata, Microdata, Computer Automation, Digital Computer Controls, Cincinnatti Milacron, Westinghouse minis and peripherals; Datapoint, ADDS, TI, terminals. | Texas Instrument and DG minicomputers and peripherals. | Zeta Research plotters; Kybe tape cleaners; Dataroyal line printers. |

| Vendor | Integrated Automation | Intl. Computer Equip. | J. H. Leskin Assoc. | Minnetek |
|---|---|---|---|---|
| Coverage offered | on-site, time & materials, periodic | time & materials or periodic | on-site, temp. on-site, periodic | time & materials |
| Monthly minimum charge? | none | none | none | none |
| Additional services offered: | installations, relocations, site planning, diagnostics, warehousing, refurbishment | installations or relocations | installations, relocations, site planning, warehousing, refurbishment | warehousing and site preparation |
| Contract is usually | negotiated | vendor's | vendor's | negotiated |
| Agent for | — | — | — | — |
| Equipment serviced | DEC PDP-11; Honeywell H-316, H-516 minis; CDC discs; Hazeltine crt's, and associated thermal printer and cassettes; Lockheed System III; Printec printer; Pertec disc; GE Terminets; no Teletype. | Lear Siegler, TI terminals. | DEC PDP-8, Centronics, Data Products, DEC printers; Data 100, Lockheed Sue computers, Pertec discs, Pertec key-to-tape gear, Pertec data transmission equipment, some Singer point-of-sale equipment, Flexowriters and data collection equipment, Kybe tape perforators. | IBM, H-P, Interdata, DG, and DEC systems; Versatec, Printronics printers; Entrex equipment. |

| Vendor | Memorex | PERC | Pertec | Raytheon Service |
|---|---|---|---|---|
| Coverage offered | on-site, on-call, temporary on-site, time & materials | time & materials or periodic | on-call | on-site, temp. on-site, time & materials, periodic |
| Monthly minimum charge? | depends on amount of equipment | none | — | none |
| Additional services offered: | installations, relocations, site planning, consulting, diagnostics, refurbishing, warehousing | installations, site planning, refurbishment, diagnostics | installations, relocations, site planning, consulting, and refurbishing | installations, relocations, site planning, refurbishment, board repair, training, diagnostics |
| Contract is usually | vendor's, customer's, or negotiated | vendor's | vendor's or negotiated | vendor's |
| Agent for | Vendor will not release data. | — | Numerous vendors (primarily vendor oriented) | Potter and Cambridge Memories |
| Equipment serviced | IBM 370 models 158, 168, and System/3. 370 peripherals and communications processors (3704, 3705), DEC PDP-11 and associated peripherals. | DEC PDP-8 and PDP-11; DG Nova and Eclipse; General Automation 100, 200, 300 systems; CDC 1600, 3200 and peripherals; CDC 3255 disc; Xerox (SDS) 910, 920, 930, 9300, 9313 systems and Sigma 1, 5, 9, 11 systems; IBM 632, IBM 6400; and Itel, DG, Diablo, Xerox, Century Data peripherals. | DEC PDP-8, PDP-11, Lockheed System/III, Digital Computer Controls Nova equivalents, and associated peripherals. Various other minicomputer systems, and equipment produced by Caldata, Wangco, Conrac, Motorola, Infoton, Ann Arbor Terminals, Documation, GDI, Diablo, Calcomp, Memorex, Burroughs, Centronics, Data Products, Control Data, Printronics, & Tally. | IBM 360 and 370 series; Honeywell 200 and H 2000 systems; Standard Memories, Cambridge Memories, Ampex memories. |

# SURVEY

| Vendor | RCA Data Services | Roger Cptr. Services | ServiTech | Sirvess |
|---|---|---|---|---|
| Coverage offered | on-site, temp. on-site, time & materials, periodic | time & materials or temp. on-site | on-site, temp, on-site, time & materials, periodic | time & materials or temp. on-site |
| Monthly minimum charge? | none | none | not usually | none |
| Additional services offered: | installations, relocations, site planning, diagnostics, warehousing, refurbishment | installations, relocations, site planning, refurbishing, diagnostics, special interfaces | installations, relocations, site planning, refurbishment, warehousing, diagnostics, board repair | installations, relocations, refurbishment, diagnostics |
| Contract is usually | negotiated | vendor's | vendor's or negotiated | vendor's (for minis); negotiated (for large-scale) |
| Agent for | Vendor will not release data. | — | 26 manufacturers | Vendor will not release data. |
| Equipment serviced | Concentrate on teleprinters through mini systems: Teletype models 33, 35, 28, 15, RO, KSR, ASR; Centronics all series; GE Terminet 30s; Extel teleprinter; some IBM crt's; Hazeltine terminals; Icto terminals; Diablo printer and disc; Honeywell H-516; DEC PDP-11. | Iomec 2000 discs, Printronics printers, Data Products line printers, Singer terminals, many out of production terminals, DEC PDP-8 and PDP-11. | DG Nova & Eclipse systems, peripherals, and DCC compatible equipment; General Automation, Computer Automation, Digital Computer Controls minis; Diablo discs, Ampex 980, CDC 9760, 9762, Wangco T & F series; Dataproducts 2230, 2260, 2550, and Data Printer Corp. printers; Diablo HyType II. Okidata, Odec, Tally 2000 series; Centronics 101, 102, 500, 300 series; Hazeltine 2000, 1000 ctr's; LSI ADM-1, ADM-2; most Terminal Equipment Corp. terminals; Beehive terminals, GE Terminet, Decwriters. | CDC 6000/Cyber series systems and peripherals; Univac 9200, 9300, 1004, 1005, 1050, 1107 systems; RCA Spectra systems and peripherals; Xerox Sigma 2, Sigma 5; SDS 900; IBM 1401 and peripherals; DECsystem 10 & 20 plus all current DEC equip. except PDP-15; all current DG, Interdata, Varian, some General Automation, some Computer Automation, some Digital Computer Controls. |

| Vendor | Sorbus | Staff Computer Tech. | Syntonic Technology | Telefile Computer |
|---|---|---|---|---|
| Coverage offered | time & materials, periodic, temp. on-site | on-site, temp. on-site, time & materials, periodic | on-site, temp. on-site, demand, periodic | on-site, time & materials, periodic |
| Monthly minimum charge? | none | none | none | none |
| Additional services offered: | installations, relocations, site planning, refurbishment, warehousing, diagnostics | site planning, consulting, special interfaces | Installations and relocations. | installations, relocations, site planning, refurbishment |
| Contract is usually | vendor's | vendor's or negotiated | vendor's or negotiated | vendor's |
| Agent for | — | Logical Machine Corp. | Hazeltine, Centronics, CDC | — |
| Equipment serviced | IBM equipment from keypunches to 370/155 and peripherals, 360 (models 20, 22, 25, 30, 40, 50, 65, 195) and peripherals, add-on memories; Diablo terminals, IBM System/3, DEC and DG minis, unit record equipment. | PDP-11, PDP-8, DEC system 10, PDP-12, Digital Computer Controls, DG Nova, Interdata, CDC. Anything if documentation is available. Do not do IBM or Burroughs. | All Teletype terminals; Beehive, Hazeltine, DEC, Lear Siegler terminals; CDC band printer, matrix printers, all Centronics, Data Products, Data Printers, DG, GE Terminet printers; DG Nova and Eclipse minis. | Xerox, all Sigmas and peripherals; GE 400 & 600 and peripherals; CDC 3200, 3300 new peripherals; front-end processors, and main memory; DEC PDP-11, DG, Lockheed MAC-16 minis. |

| Vendor | Tel-Tec Hawaii | Tel-Tex | Territorial Elect. | Tymshare |
|---|---|---|---|---|
| Coverage offered | on-site, temp. on-site time & materials, periodic | on-site, time & materials, periodic | on-site, temp. on-site, time & materials, periodic | on-site, temp. on-site, demand, tailored |
| Monthly minimum charge? | none | none | none | depends on area; generally no |
| Additional services offered: | telecommunications consultation and diagnostics | installations and relocations | installations, relocations, site planning, telecommunications planning, diagnostics | installations, relocations, site planning, power monitoring, software and hardware diagnostics |
| Contract is usually | vendor's | vendor's or negotiated | vendor's, customer's, or negotiated | negotiated |
| Agent for | Hazeltine | Harris Corp. and GE | Gould, Extel, Beehive | — |
| Equipment serviced | TRW financial systems, TT-100s, APU-401, APU-402; Hazeltine 2000; Concord point-of-sale gear, GE Terminet; Courier C-270 systems; Tab Products keypunch. | DEC writers, Diablo printers, Teletype teleprinter (models 32, 33, 38, 40, 43), Techtran cassettes, Texas Instruments Silent 700 series terminals. | all tty's, all Extel, all Diablo, Selectrics, CalComp tape drives, Century Data Systems discs, Mohawk key entry equipment, TEC terminals and cassettes, ICP and Trendata cassettes, ADDS Console 880 crt's, GE Terminets, Singer terminals, DG Nova 1221 mini, Codex and Milgo multiplexors. | Xerox 900 series, all Sigmas, and all terminals on these systems; PDP-10s, PDP-11s, PDP-8s; all Varian series; all Interdata series minis; IBM add-on peripherals (such as Ampex, ISS, Memorex, CalComp discs, Storage Technology drives, and Intel memories). |

| Vendor | Vardon & Associates |
|---|---|
| Coverage offered | periodic |
| Monthly minimum charge? | depends on equipment |
| Additional services offered: | none |
| Contract is usually | vendor's |
| Agent for | — |
| Equipment serviced | Lear Siegler, DEC, Teletype terminals; modems. |

(Continued from page 103)

Sorbus
Syntonic Technology

**Columbus, OH**
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Dallas, TX**
Comma
Communications Engineering Co.
General Electric IS&E
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Telefile Computer Products

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Ford Aerospace & Communications Corp.
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
ServiTech
Sirvess
Sorbus
Syntonic Technology

**El Paso, TX**
Border Electronics
General Electric IS&E
Memorex
RCA Data Services
Sorbus

**Fort Worth, TX**
Memorex
Pertec
Raytheon Service Co.
RCA Data Services

**Honolulu, HI**
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Tel-Tec Hawaii
Territorial Electronics

**Houston, TX**
Comma
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology
Telefile Computer Products
Tel-Tex
Tymshare Computer Maintenance
Vardon & Associates

**Indianapolis, IN**
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Jacksonville, FL**
Formation
General Electric IS&E
Integrated Automation
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus

**Kansas City, MO**
General Electric IS&E
ICE
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Long Beach, CA**
(possibly handled out of Los Angeles offices)
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus

**Los Angeles, CA**
CIG Computer Products
Comma
Data Force Service Co.
Engineering Service Systems
General Electric IS&E
International Computer Equipment
Memorex
PERC
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology
Telefile Computer Products
Tymshare Computer Maintenance
Vardon & Associates

**Louisville, KY**
Formation
General Electric IS&E
Memorex
Raytheon Service Co.
RCA Data Services
Sorbus

**Memphis, TN**
Action Electronics
Formation
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Miami, FL**
Computer Hardware Support
Formation
Integrated Automation
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Tymshare Computer Maintenance

**Milwaukee, WI**
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Minneapolis, MN**
CIG Computer Products
Comma
The Computer Room
Ford Aerospace Communications Corp.
General Electric IS&E
ICE
Memorex
Minnetek
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology
Telefile Computer Products

**Nashville, TN**
Formation
General Electric IS&E
Integrated Automation
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Newark, NJ**
Comma
Formation
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Telefile Computer Products

**New Orleans, LA**
Formation
General Electric IS&E
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Staff Computer Technology
Syntonic Technology

**New York, NY**
CIG Computer Products
Comma
General Electric IS&E
ICE
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology
Telefile Computer Products
Tymshare Computer Maintenance

**Norfolk, VA**
Compunetics
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus

**Oakland, CA**
DP Services
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus

**Oklahoma City, OK**
Formation
General Electric IS&E
Memorex
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Omaha, NB**
General Electric IS&E
Memorex
Raytheon Service Co.
RCA Data Services
Sorbus
Syntonic Technology

**Philadelphia, PA**
Comma
Computer Hardware Maintenance Co.
Ford Aerospace & Communications Corp.
General Electric IS&E
ICE
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology
Telefile Computer Products
Tymshare Computer Maintenance

**Phoenix, AZ**
Addco
Business Products Services
General Electric IS&E
Memorex
Pertec
RCA Data Services
Sorbus
Syntonic Technology

**Pittsburgh, PA**
CIG Computer Products
General Electric IS&E
Instrumentation Industries
Memorex
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology

**Portland, OR**
Comma
Datatek
General Electric IS&E
ICE
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology

**Rochester, NY**
General Electric IS&E
ICE
Memorex
Raytheon Service Co.
RCA Data Services
Roger Computer Services
Sorbus

**St. Louis, MO**
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology

**St. Paul, MN**
Comma
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus

**San Antonio, TX**
General Electric IS&E
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus

**San Diego, CA**
Computer Hardware Support
Datasystems
Engineering Service Systems
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus
Staff Computer Technology

**San Francisco, CA**
Comma
General Electric IS&E
ICE
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology

**San Jose, CA**
Comma
Computer Hardware Support
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sorbus

**Seattle, WA**
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology

**Tampa, FL**
Comma
General Electric IS&E
Integrated Automation
Memorex
Raytheon Service Co.
RCA Data Services
Sorbus

**Toledo, OH**
Memorex
Raytheon Service Co.
RCA Data Services
Sorbus

**Tulsa, OK**
General Electric IS&E
Memorex
Pertec
Raytheon Service Co.
Sorbus

**Washington, D.C.**
Comma
Ford Aerospace & Communications Corp.
Formation
General Electric IS&E
ICE
Memorex
Pertec
Raytheon Service Co.
RCA Data Services
Sirvess
Sorbus
Syntonic Technology
Tymshare Computer Maintenance ❁

# HARDWARE MAINTENANCE VENDOR INDEX

For more information about maintenance services, either contact the vendors listed below or circle the appropriate number on the reader service card bound into this issue.

**ACTION ELECTRONICS, INC.**
427 North Angelus
Memphis, TN 38112
(901) 272-3111
Est. 1975; 5 service employees
Sales $80K
Servicing 6 installations
Additional offices in Tupelo, MS.
FOR DATA CIRCLE 401 ON READER CARD

**ADDCO, INC.**
4542 W. Greenway Road
Glendale, AZ 85306
(602) 242-3195
Est. 1976; 2 service employees
Vendor will not release sales data.
Servicing 12 sites.
Additional offices in Baton Rouge, LA.
FOR DATA CIRCLE 440 ON READER CARD

**BORDER ELECTRONICS, INC.**
1704 E. Paisano
El Paso, TX 79923
(915) 532-2524
Est. 1974; 3 service employees
Vendor will not release data on sales or sites serviced.
FOR DATA CIRCLE 402 ON READER CARD

**BUSINESS PRODUCTS SERVICES, INC.**
1220 W. Alameda
Tempe, AZ 85282
(602) 968-7014
Est. 1972; 6 service employees
Vendor will not release sales data.
Servicing 70 installations
Additional offices in Tucson, AZ
(Services all Arizona.)
FOR DATA CIRCLE 403 ON READER CARD

**CIG COMPUTER PRODUCTS, INC.**
Subs. of CIG Computer Inc.
1305 Washington Blvd.
Stamford, CT 06904
(203) 359-2100
Est. 1971; 33 service employees
Vendor will not release sales data.
Servicing 800 installations
Additional offices in Charlotte, NC; Bridgeport, CT.
FOR DATA CIRCLE 404 ON READER CARD

**COMMA**
Subs. of Control Data Corp.
8100 34th Ave. South
Minneapolis, MN 55440
(612) 853-8100
Est. 1969; 300 service employees
Sales $13 million
Servicing several thousand installations
Additional offices in Charlotte, NC; Richmond, VA; Sacramento, CA.
FOR DATA CIRCLE 405 ON READER CARD

**COMMUNICATIONS ENGINEERING CO. (CECO)**
Subs. of Communications Industries, Inc.
P.O. Box 10186
Dallas, TX 75207
(214) 630-7500
Est. 1947; 100 service employees
Vendor will not release data on sales or sites serviced.
Additional offices in 23 cities in TX, NM, LA, OK.
FOR DATA CIRCLE 406 ON READER CARD

**COMPUNETICS**
Subs. of General Supply Ltd.
50 Cedar Lane
Newport News, VA 23601
(804) 595-5484
Est. 1975; 2 service employees
Vendor will not release data on sales or sites serviced.
FOR DATA CIRCLE 407 ON READER CARD

**COMPUTER HARDWARE MAINTENANCE CO.**
Subs. of CHC&S
370 Pheasant Run
Newtown, PA 18940
(215) 968-5900
Est. 1973; 15 service employees
Vendor will not release sales data.
Servicing 8 installations
FOR DATA CIRCLE 408 ON READER CARD

**COMPUTER HARDWARE SUPPORT, INC.**
P.O. Box 22234
San Diego, CA 92122
(714) 453-4688
Est. 1973; vendor will not release data on number of service employees.
Vendor will not release data on sales or sites serviced.
Additional office in Fullerton, CA.
FOR DATA CIRCLE 439 ON READER CARD

**THE COMPUTER ROOM, INC.**
3928 Beau d'Rue Drive
Eagan, MN 55112
(612) 452-2567
Est. 1975; 5 service employees
Vendor will not release sales data.
Servicing 50 installations
FOR DATA CIRCLE 409 ON READER CARD

# WHEN IT'S FINALLY ON THE SCREEN, YOU DESERVE FAST HARD COPY.

Gould's electrostatic printer/plotter is the fastest graphic hard copy peripheral available today for your Tektronix 4000 Series interactive graphic terminal. You get permanent graphics direct from the terminal in as little as 4 seconds, regardless of image complexity. In an on-line CPU configuration, you can plot at up to 3.25 paper in./sec. and print at up to 1600 lines per minute.

Yet Gould's hard copy still possesses exceptional resolution and extremely high contrast. Only Gould offers you both unmatched speed and unsurpassed image quality.

And Gould lets you select a 0° or 90° image orientation at will. In 90° mode, images are enlarged up to 72%. You are able to select 1024 or 2048 point sampling and high or low speed graphic operation, letting you optimize image size, resolution and speed.

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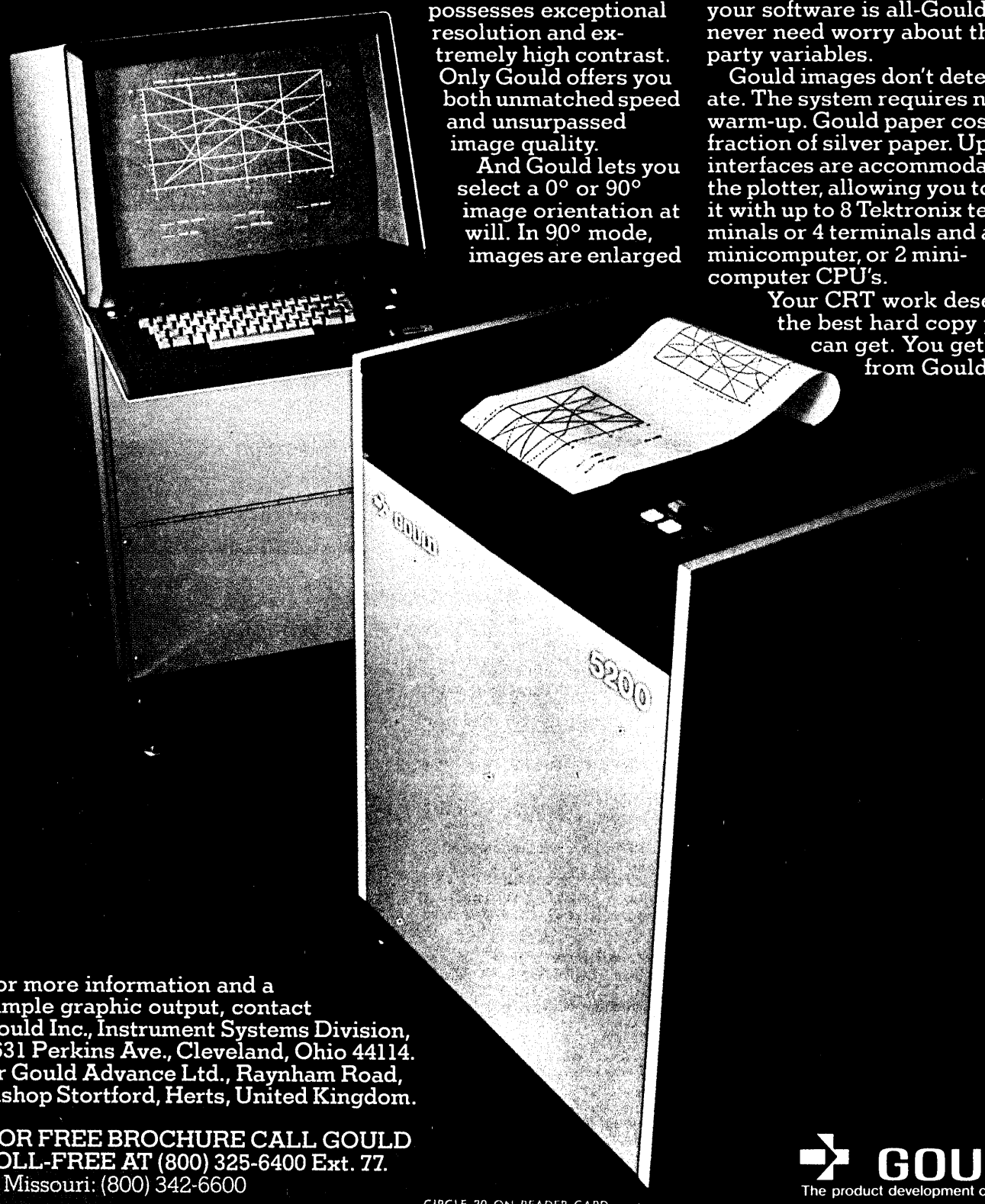
Your CRT work deserves the best hard copy you can get. You get it from Gould.




For more information and a sample graphic output, contact Gould Inc., Instrument Systems Division, 3631 Perkins Ave., Cleveland, Ohio 44114. Or Gould Advance Ltd., Raynham Road, Bishop Stortford, Herts, United Kingdom.

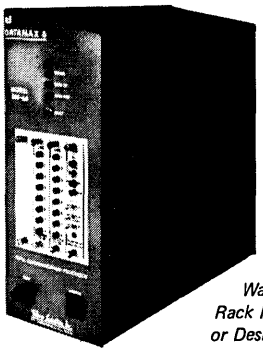
FOR FREE BROCHURE CALL GOULD TOLL-FREE AT (800) 325-6400 Ext. 77.
In Missouri: (800) 342-6600

GOULD
The product development company

CIRCLE 30 ON READER CARD

**datamax 6**

the first **UNIVERSAL DATA COMMUNICATION PROCESSOR**



*Wall, Rack Mount or Desk Top*

**APPLICATIONS**

- TDM
- TELEX SWITCH
- SELECTIVE CALLING
- SPEED CONVERTER
- CODE CONVERTER
- 32K BUFFER MEMORY
- POLLING
- TECH CONTROL
- MUX
- CONCENTRATOR
- ALARM SYSTEM
- INTELLIGENT TERMINAL

**BOARD COMPLIMENT**

- CPU WITH PORTS
- 1200 / 1800 / 2400 MODEM
- 4, 8, 16 K MEMORY CARDS
- 2, 8, 64 PORT BOARDS
- 2 CHANNEL FDM
- TTY UTILITY WITH EPROM PROGRAMMER
- 6800 SYSTEM ANALYZER
- VIDEO CRT CARD
- FLOPPY DISC

ti *Telcom Industries, Inc.*
TELEPHONE and DATA EQUIPMENT

5701 N.W. 31st Avenue
Fort Lauderdale, Florida 33309
(305) 971-2250

CIRCLE 53 ON READER CARD


# SURVEY

**DATA FORCE SERVICE CO.**
Subs. of Randal Data Systems, Inc.
2807 Oregon Ct. Bldg. F-6
Torrance, CA 90503
(213) 328-2950
Est. 1977; 8 service employees
No sales data available yet.
No number of sites data available.
FOR DATA CIRCLE 410 ON READER CARD

**DATATEK CO.**
604 N.E. 21st Street
Portland, OR 97232
(503) 228-1339
Est. 1976; 2 service employees
Vendor will not release sales data.
Servicing 36 customers (principally vendors)
FOR DATA CIRCLE 441 ON READER CARD

**DATASYSTEMS CORP.**
2333 Camino del Rio South #310
San Diego, CA 92108
(714) 291-0800
Est. 1977; 6 service employees
Sales: approx. $150K
Servicing 3 customers
FOR DATA CIRCLE 444 ON READER CARD

**DP SERVICE INC.**
5505 No. Menard
Chicago, IL 60630
(312) 774-2556
Est. 1967; 7 service employees
Sales $100K, 40% from service
Servicing 500 installations
FOR DATA CIRCLE 411 ON READER CARD

**DP SERVICES**
2966 Teagarden St.
San Leandro, CA 94566
(415) 351-0801
Est. 1974; 3 service employees
Sales to $125K, 99% from service
Servicing 91 installations
FOR DATA CIRCLE 412 ON READER CARD

**DYNETICS, INC.**
P.O. Box 1091
Decatur, GA 30031
(404) 289-7879
Est 1972; 3 service employees
Vendor will not release sales data.
Servicing 150 installations
FOR DATA CIRCLE 413 ON READER CARD

**ENGINEERING SERVICE SYSTEMS, INC.**
2196 Cable St.
San Diego, CA 92107
(714) 223-8193
Est. 1972; 16 service employees
Vendor will not release sales data
Servicing 25 installations
Additional offices in Augusta, GA.
FOR DATA CIRCLE 414 ON READER CARD

**FORD AEROSPACE & COMMUNICATIONS CORP. ENGINEERING SERVICES DIV.**
Subs. of Ford Motor Co.
3900 Welsh Road
Willow Grove, PA 19090
(215) 659-7700
Est. 1975; 80 service employees
Vendor will not release sales data.
Servicing 80 installations
Additional offices in Dearborn, MI; Martinsburg, WV; Austin, TX.
FOR DATA CIRCLE 415 ON READER CARD

**FORMATION, INC.**
823 East Gate Drive
Mt. Laurel, NJ 08057
(609) 234-5020
Est 1972; 150 service employees
Vendor will not release sales data.
Servicing 200 installations
Additional offices in Agana, Guam; Arlington, VA; Birmingham, MI; Bloomfield, NJ; Center Line, MI; Charlotte, NC; Columbia, SC; Dayton, OH; Decatur, GA; Docena, AL; Enid, OK; Ft. Lauderdale, FL; Jackson, MS; Jefferson City, MO; Kaneohe, HI; Lawton, OK; Macon, GA; Orlando, FL; Portsmouth, VA; Princeton, NJ; Rockville, MD; Shreveport, LA; Summit, NJ; Wippany NJ; and Winston-Salem, NC.
FOR DATA CIRCLE 416 ON READER CARD

**GENERAL ELECTRIC CO. INSTALLATION AND SERVICE ENGINEERING DIV.**
Section 950-17
Schenectady, NY 12345
(602) 264-1751
Est. 1967; 200 service employees
Vendor will not release data on sales or sites serviced.
FOR DATA CIRCLE 417 ON READER CARD

**ICE, INC.**
740 N. Church Road
Elmhurst, IL 60126
(312) 279-1960
Est. 1961; 60 service employees
Vendor will not release sales data.
Servicing 2,000 installations
Additional offices in Anaheim, CA; Hartford, CT; Peoria, IL; Augusta, GA; Atlantic City, NJ.
FOR DATA CIRCLE 418 ON READER CARD

**INFORMATION & CONTROL SYSTEMS, INC.**
P. O. Box 351
Roswell, GA 30077
(404) 971-5689
Est. 1973; 3 service employees
Vendor will not release sales data.
Servicing 5 sites
FOR DATA CIRCLE 442 ON READER CARD

**INSTRUMENTATION INDUSTRIES INC.**
215 Thomas Drive
Pittsburgh, PA 15236
(412) 884-5161
Est. 1967; 4 service employees
Vendor will not release sales data.
Servicing 17 installations
FOR DATA CIRCLE 419 ON READER CARD

**INTEGRATED AUTOMATION, INC.**
1745 Tully Circle N.E.
Atlanta, GA 30329
(404) 325-8100
Est. 1975; 22 service employees
Vendor will not release sales data.
Servicing 25 installations
Additional offices in Huntsville, AL; Charlotte, NC; Greensboro, NC; Orlando, FL.
FOR DATA CIRCLE 420 ON READER CARD

**INTERNATIONAL COMPUTER EQUIPMENT, INC.**
2030 Union St.
San Francisco, CA 94123
(415) 573-8616
Est. 1972; 16 service employees
Sales $500K, 9-10% from service
Servicing 6,000 pieces of equipment
Additional offices in Foster City, CA.
FOR DATA CIRCLE 421 ON READER CARD

# Zero RPM. The Disk that doesn't Spin.

Megastore goes where a disk drive used to go.

More to the point, Megastore keeps going long after a disk drive quits. Without motors, bearings, heads or platters, there's nothing to wear out, burn out or crash. No moving parts.

Megastore is the astonishing new fixed-head disk memory replacement from Ampex that uses reliable cores instead of rotating media. In the long run it saves a lot of money.

Megastore provides increased throughput, increased system availability, increased system uptime and reduced maintenance costs. A vastly better return on investment.

Unplug your disk and plug in Megastore. You'll get a half-million to four million bytes of capacity (in half-megabyte increments) that your existing software can't tell from the disk it was designed for. The only difference you'll see is a major improvement in throughput, because Megastore has a data access time that's anywhere from 1000 to 3000 times faster than the disk it replaces.

Megastore. Ready now as a software-transparent replacement for Novadisk (Megastore 1223) and DEC's RJSO3/RJSO4 Disk (Megastore 11). Also available as Megastore 4666 for users who wish to provide their own controller. Other versions on the way. Contact Ampex Memory Products Division, 200 North Nash Street, El Segundo, California 90245. Phone (213) 640-0150. Ask for Megastore. The disk that doesn't spin.

**AMPEX**

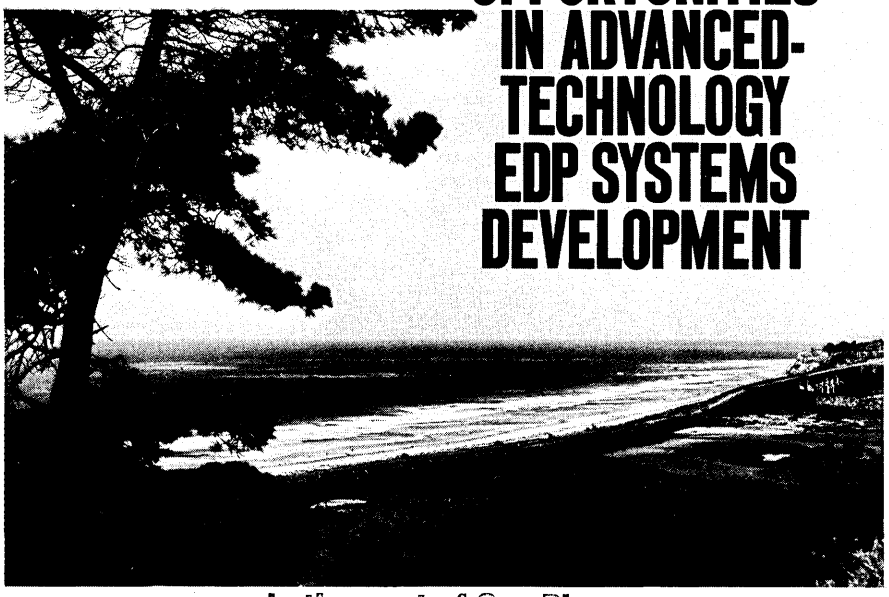
Novadisk is a trademark of Data General Corp.

**J.H. LESKIN ASSOCIATES, INC.**
2360 Avenue "A"
Bethlehem, PA 18017
(215) 865-3350
Est. 1974; 8 service employees
Vendor will not release sales data.
Servicing 150 installations
Additional offices in Valparaiso, IN.
FOR DATA CIRCLE 422 ON READER CARD

**MEMOREX CORP.**
San Tomas at Central Expressway
Santa Clara, CA 95052
(408) 987-1106
Est. 1974; 500 service employees
Vendor will not release sales data.
Vendor will not release customer data.
Offices in 84 cities.
FOR DATA CIRCLE 443 ON READER CARD

**MINNETEK**
1002 Riverwood Drive
Burnsville, MN 55332
(612) 890-2335
Est. 1973; 4 service employees
Vendor will not release sales data.
Servicing 300 installations
FOR DATA CIRCLE 423 ON READER CARD

**PERC**
15244 Magnolia Blvd.
Sherman Oaks, CA 91403
(213) 994-2338
Est. 1972; 5 service employees
Vendor will not release sales data.
Servicing 600 installations
FOR DATA CIRCLE 424 ON READER CARD

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Positions are available in the development of a very large distributive processing system, advancing the state-of-the-art technology utilizing the spectrum of EDP equipment—minis to large mainframe with assorted peripherals and terminal devices. Experience in telecommunications, networks, file processing or operating systems plus expertise in COBOL and assembly languages preferred.

**Communications Software Development**
These positions entail the system design and development of software for large communications networks. Experience in assembly languages, telecommunications and a minicomputer background; related BS degree preferred.

Please submit your resume including salary history to Thom W. Harris, Employment Specialist

NCR
Special Systems Division
4043 Sorrento Valley Blvd., San Diego, Calif. 92121 ☐ (714) 452-1020
An Equal Opportunity Employer M/F
CIRCLE 108 ON READER CARD


**PERTEC SERVICES DIV.**
Div. of Pertec Computer Corp.
12910 Culver Blvd.
Los Angeles, CA 90066
(213) 822-9914
Est. 1976; 350 service employees
Vendor will not release sales data.
Servicing 20 customers
Offices in 70 cities.
FOR DATA CIRCLE 445 ON READER CARD

**RAYTHEON SERVICE CO.**
Subs. of Raytheon Co.
2 Wayside Road
Burlington, MA 01803
(617) 272-9300
Est. 1970; 2,600 service employees
Vendor will not release sales data.
Servicing more than 2,000 installations.
FOR DATA CIRCLE 425 ON READER CARD

**RCA DATA SERVICES**
Subs. of RCA Corp.
Bldg. 204-2, Cherry Hill Offices,
Camden, NJ 08101
(609) 963-8000
Est. 1967; 600 service employees
Sales $30-40M, 20-30% from service
Vendor will not release number of sites serviced.
Offices in 180 cities.
FOR DATA CIRCLE 426 ON READER CARD

**ROGER COMPUTER SERVICES, INC.**
157 Kenwood Ave.
Rochester, NY 14611
(716) 235-4890
Est. 1973; 2 service employees
Vendor will not release sales data.
Servicing 25 installations
FOR DATA CIRCLE 427 ON READER CARD

**SERVITECH, INC.**
1409 Centre Circle Drive
Downers Grove, IL 60515
(312) 620-8750
Est. 1972; 17 service employees
Sales $500K, 95% from service
Servicing 410 installations
Additional office in Southfield, MI.
FOR DATA CIRCLE 428 ON READER CARD

**SIRVESS**
490 S. Riverview Drive
Totowa, NJ 07512
(201) 785-4950
Est. 1969; 100 employees
Vendor will not release sales data.
Servicing 500 installations
Additional offices in Boulder, CO; Salt Lake City, UT; Chattanooga, TN; Sacramento, CA
FOR DATA CIRCLE 429 ON READER CARD

**SORBUS**
Subs. of Management Assistance Inc.
150 Allendale Road
King of Prussia, PA 19406
(215) 265-6700
Est 1962; 1,300 service employees
Sales $37.5M, all from service
Servicing 67,000 pieces of equipment in 16,000 locations
Offices in 160 U.S. cities
FOR DATA CIRCLE 430 ON READER CARD

**STAFF COMPUTER TECHNOLOGY CORP.**
10457 Roselle St.
San Diego, CA 92121
(714) 453-0303
Est. 1969; vendor will not release data on

number of employees.
Vendor will not release data on sales or sites serviced.
FOR DATA CIRCLE 431 ON READER CARD

**SYNTONIC TECHNOLOGY, INC.**
Subs. of Control Data Corp.
7150 Airport Highway
Pennsauken, NJ 08109
(201) 574-1003
Est. 1964; 500 service employees
Vendor will not release data on sales.
Servicing 3,000 installations
Additional offices in Albuquerque, NM; Saginaw, MI; Orlando, FL; Raleigh, NC; Harrisburg, PA; North Haven, CT; Syracuse, NY; Charlotte, NC; Columbia, SC; Ft. Lauderdale, FL; and Spokane, WA.
FOR DATA CIRCLE 432 ON READER CARD

**TELEFILE COMPUTER PRODUCTS, INC.**
Subs. of Telefile Computer Corp.
17131 Daimler St.
Irvine, CA 92714
(714) 557-6660
Est. 1974; 75 service employees
Vendor will not release data on sales.
Servicing 75 installations
Additional offices in Tobyhanna, PA; New Cumberland, PA; Chambersberg, PA; Rockville, MD; Richmond, VA; Anniston, AL; Lexington, KY; Green Bay, WI; Texarkana, TX; Corpus Christi, TX; Salt Lake City, UT; Sacramento, CA; Sunnyvale, CA.
FOR DATA CIRCLE 433 ON READER CARD

**TEL-TEC HAWAII**
Subs. of Honofed Corp.
815 Alakea St.
Honolulu, HI 96813
(808) 546-5082
Est. 1972; 13 service employees
Vendor will not release data on sales or sites serviced.
FOR DATA CIRCLE 434 ON READER CARD

**TEL-TEX, INC.**
3203 Audley
Houston, TX 77098
(713) 526-8326
Est. 1969; 15 service employees
Sales $3.5M, 10% from service
Servicing 500 pieces of equipment
FOR DATA CIRCLE 435 ON READER CARD

**TERRITORIAL ELECTRONICS, INC.**
1221 Kapiolani Blvd. #240
Honolulu, HI 96814
(808) 536-4690
Est. 1948; 8 service employees
Vendor will not release sales data
Servicing 250 installations
FOR DATA CIRCLE 436 ON READER CARD

**TYMSHARE COMPUTER MAINTENANCE**
10231 Bubb Road
Cupertino, CA 95014
(408) 446-7000
Est. 1965; 100 service employees
Vendor will not release sales data
Servicing 40 sites
FOR DATA CIRCLE 437 ON READER CARD

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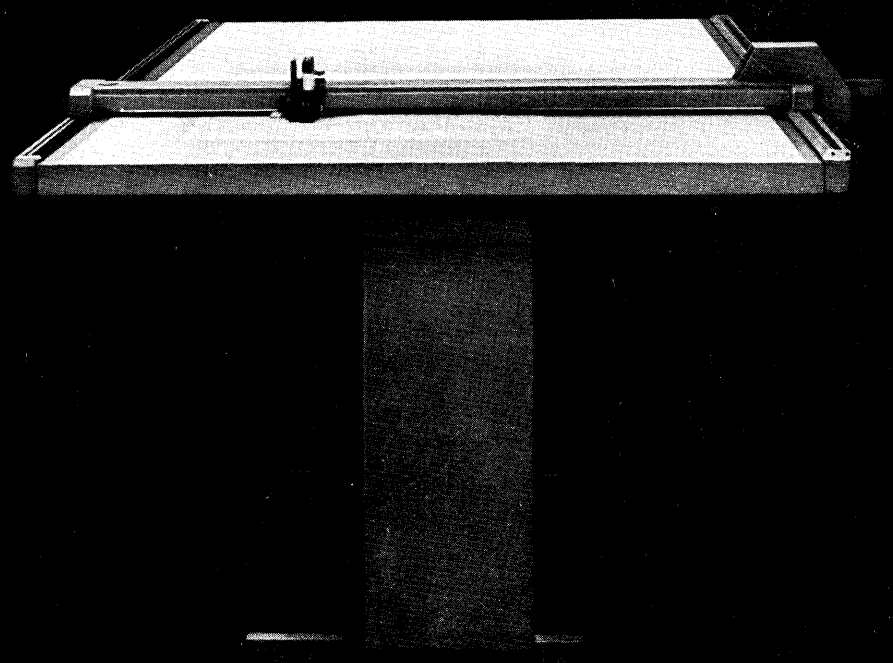

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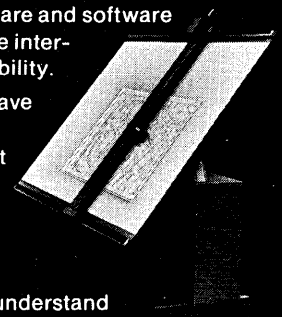

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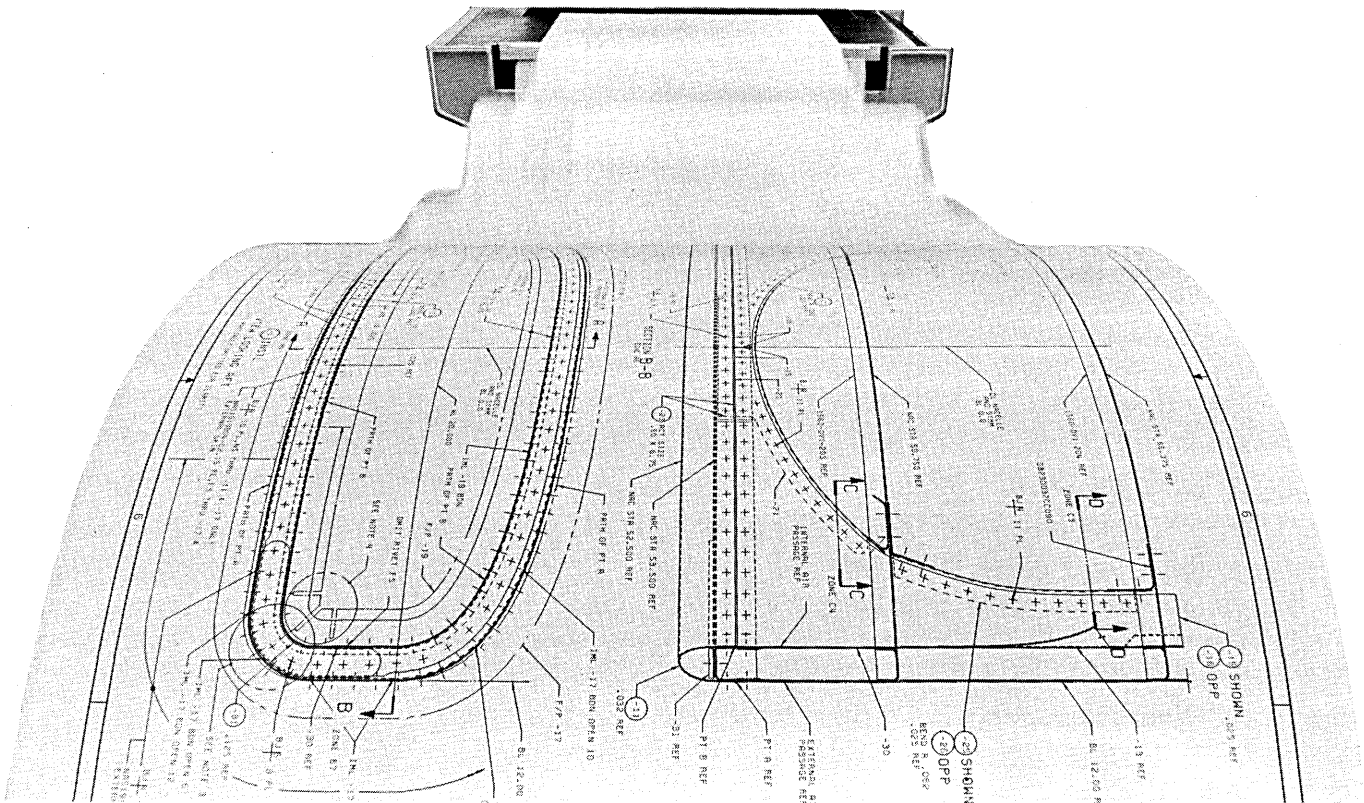

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**Plotting time**

| | **Versatec** Model 8136, operating off-line at half rated speed | **CalComp™** Model 1036 |
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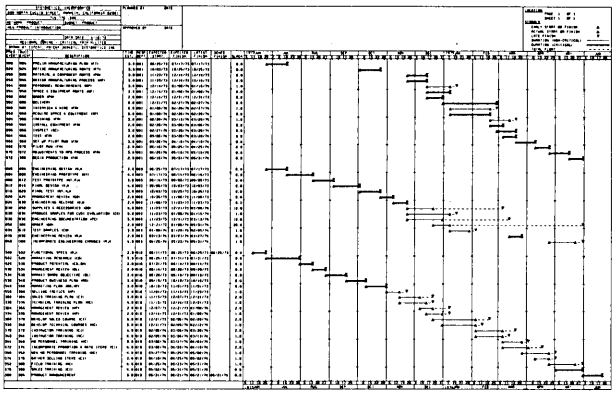
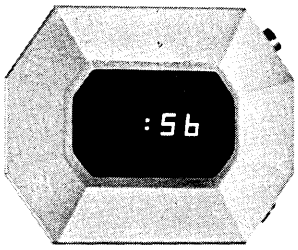
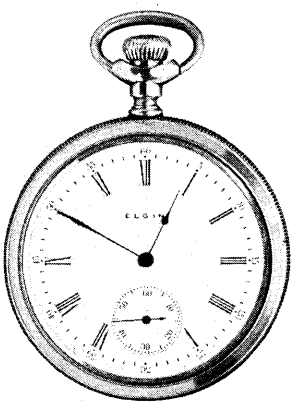
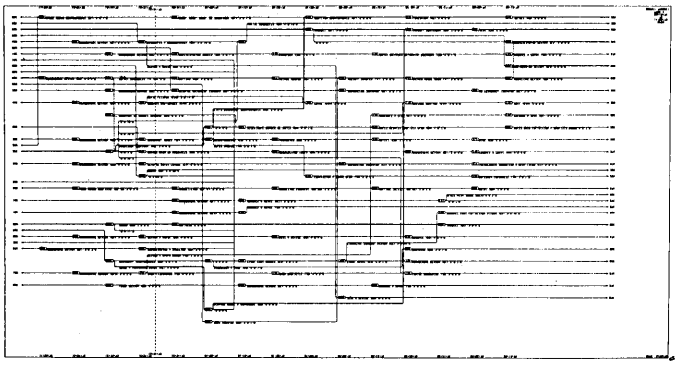
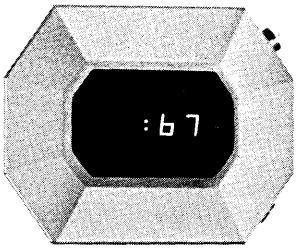
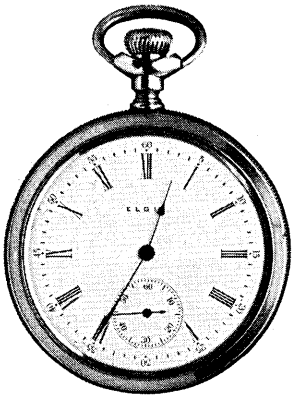
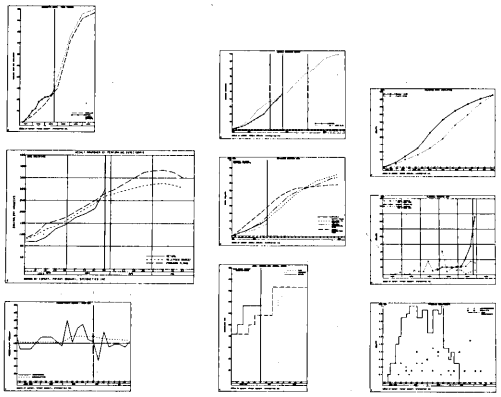
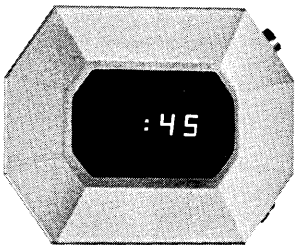
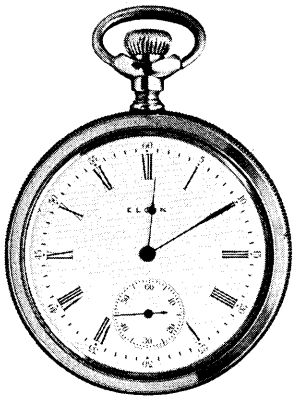
|  Plot size: 56" x 36" 33,000 vectors CPU & I/O time for sort & rasterization: 9 seconds |  **56 seconds** |  **50 minutes** |
|  Plot size: 67" x 36" 16,000 vectors CPU & I/O time for sort & rasterization: 8 seconds |  **67 seconds** |  **35 minutes** |
|  Plot size: 45" x 36" 15,000 vectors CPU & I/O time for sort & rasterization: 6 seconds |  **45 seconds** |  **10 minutes** |

**Tests were performed with IBM 360/65 computer,** OS/MVT operating system, EZPERT™ application software (Systonetics) and Versaplot™/Version 7 plotting software (Versatec). ™Trademarks: CalComp (California Computer Products), EZPERT (Systonetics), Versaplot (Versatec).

*Finance*

# Proposed Tax Revisions Could Cripple Innovation

## Computer industry critics worry over elimination of preferential treatment of capital gains and end of double taxation of earnings.

The Carter Administration appears to be moving towards implementation of a tax revision package that could severely jeopardize future growth and innovation within the computer industry.

So argue a number of prominent industry executives plus several industry trade associations which recently have mounted major lobbying efforts to modify possible tax changes before they're put into effect and make government officials aware of their potentially harmful impact.

Of specific concern is the President's strong endorsement of a future elimination of the preferential tax treatment of capital gains, a move that would shut off what sources of new capital remain to the dp and electronics industries, those who are apprehensive about the proposal believe.

Also worrisome is the possible elimination of double taxation on corporate earnings. This, in effect, could force high technology companies to distribute higher dividends to their investors at the expense of R&D, internal growth, and possibly their own payrolls, some concerned observers argue.

### The critics

The more vocal critics of the possible tax revisions include top executives at companies like Hewlett-Packard, Intel, Data General, and Mohawk Data; a group of venture capitalists involved in the computer business, and two industry organizations, WEMA (Western Electronic Manufacturers Assn.) and the Computer and Communications Industry Assn.

These critics fear that the Carter plan, though not yet official (its proposed components have been leaked repeatedly to the press, however) will hit technology companies particularly hard.

EDWIN E. VAN BRONKHORST
It would demotivate venture capitalists from looking at high technology firms

"It could put a number of companies out of business and force the survivors to raise their prices," asserts Dr. Robert N. Noyce, chairman and co-founder of Intel Corp.

"It would effectively demotivate anyone from putting venture capital in high technology industries," adds E.E. van Bronkhorst, v.p. and treasurer of Hewlett-Packard.

Because of earlier tax reforms and new pension laws prohibiting fund managers from investing in anything but established companies, money for startup situations or expansion is already extremely hard to come by, executives like Edson de Castro, president of Data General, claim. "I don't believe you could start up a Data General today, given the situation that exists now," de Castro says. De Castro and others fear that a further reduction of investment incentives as represented by possible tax revisions could stymie technical development here and open the door to greater foreign takeover of American firms or cause the U.S. to lose ground in the technology race.

### Capital starvation

Speaking of the investment incentive problem, especially as it relates to small, high technology companies that require extensive capital to get started, Edwin V.W. Zschau, chairman of System Industries, a Sunnyvale, Calif., based minicomputer peripheral manufacturer, says: "The situation has become so bad that many would-be companies don't get started and those that do either fail or grow slowly because of capital starvation.

"Recently," he adds, "several have obtained capital from foreign investors, often selling part of their technology in the process." Zschau, who heads up the WEMA task force on the capital problem, is himself currently negotiating to sell part of a System Industries subsidiary, Silonics, to Japanese interests.

The WEMA group as well as the National Venture Capital Assn., which is concerned with the same problem, point

out that in 1969 American investment markets raised more than $1 billion in new capital for small companies. By 1974 that figure had declined to $16 million.

They also stress new firms, especially those in high technology, make an invaluable contribution to the American economy because of the new jobs that open up. "They create jobs at a rate nearly 70 times greater than large, mature companies," Zschau says.

A recent M.I.T. study underscores the contribution new companies have made to the U.S. job market and economy. The study compared a group of what were termed "Innovative Companies" with a second group of "Young High Technology" firms. The innovative group, which included IBM, Xerox, and Texas Instruments, had an average sales growth of just over 13% and an average job growth of 4.3% from 1969 to 1974. For the same period the sales growth of the young high technology firms—a group that included Digital Equipment, Data General, National Semiconductor, and Compugraphic—was 42.5% and the job growth 40.7%.

### Hot bed of innovation

In arguing for more liberal investment incentives, the anti-tax revisionists point up that the dp and electronics industries contributed well over $13 billion to the U.S. balance of trade since the late 1960s. They further maintain that the smaller firms in these industries, the ones which would suffer most if the money faucets were turned all the way off, have been the hotbed of technical innovation.

"The major achievements in the semiconductor business didn't come out of the major companies," offers Reid W. Dennis, a managing partner with Institutional Venture Associates in Menlo Park, Calif., and chairman of Recognition Equipment Corp. "The same thing is true of the minicomputer and microcomputer industries. "Development and growth came through small companies and not the GE's and IBM's."

### For or against competition?

Ironically, the government is fostering a tax package that would enable the big companies to get bigger at a time when it's spending millions and trying to encourage competition in its antitrust case against IBM, these critics argue. "It (the tax package) is going to reduce the competition to IBM and force small companies to sell out to larger concerns at an earlier stage," Reid Dennis maintains.

And while the critics are all concerned about the potential effects of the package, there's some dispute as to which of its aspects is potentially the most harmful. Groups like WEMA are focusing exclusively on capital gains problems, while companies like Data General appear more concerned with the prospect of eliminating double taxation on corporate earnings. A Wall Street analyst who follows the company explains why.

"Data General, DEC, and a lot of other companies in this business don't pay a dividend," he notes. "The investor buys the stock for growth, not dividends. But if Carter removes the double tax on earnings, dividends could be tax-free. That means investors are going to be attracted to stocks with high dividends and away from securities like Data General and DEC."

The upshot? A firm like Data General would have to cut back on its expansion plans and distribute money earmarked for that purpose as dividends to its shareholders in order to remain competitive in the investment market. And this is not only true of Data General but any technological concern with a rapid expansion rate, a high R&D budget, and a low shareholder payout, the analyst asserts.

### Many don't know

Some executives are skeptical that the package will get through Congress. "I don't believe in virgins, unicorns, tax reform, or other mythical beasts," Lester M. Gottlieb, president of Data Dimensions, Inc., of Greenwich, Conn., observes. At the same time, other industry figures seem oblivious of its possible consequences.

"An awful lot of people have lost sight of the financial consequences of this," de Castro says.

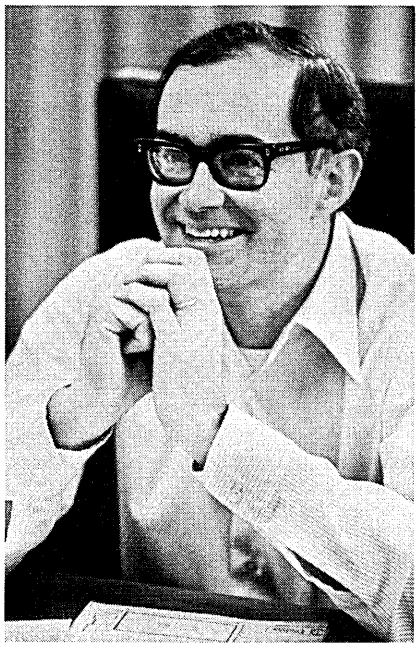
"They're so tied up in technology and their day-to-day problems, they may not realize the significance of the issue," adds Ralph H. O'Brien, chairman and president of Mohawk Data Sciences.

Still, the package isn't on the books yet. "There's still time for us to get our licks in and make this work for us rather than against us," a trade association executive notes. "This is an unusual opportunity if people will only seize it."

Perhaps even more significant than the tax bill itself, however, is the overriding question of the availability of capital. In a recent statement before the Congressional Subcommittee on Economic Growth and Stabilization of the Joint Economic Committee, A.G.W. Biddle, president of the CCIA noted capital requirements over the next five years for the minicomputer companies have been estimated at half a billion dollars. For central computer companies, excluding IBM, the figure is twice that, while the microcomputer industry needs approximately four hundred million.

Where the money is going to come from is anyone's guess, but Biddle proffers some specific suggestions to improve the investment climate. "We believe that a return to lower taxation of capital gains would provide a necessary incentive both for existing and new investors of capital," he said. "Also, dividends should be treated as a deductible expense, as is interest on borrowings, to make equity capital more competitive with debt equity. In addition, we are in favor of a graduated corporate income tax which would provide smaller businesses with higher retained earnings for the internal financing of current operations and future growth."

**—Laton McCartney**



EDSON DE CASTRO
Many have lost sight of the financial consequences

DR. ROBERT N. NOYCE
Could put companies out of business and force survivors to raise prices

*Government*

# Reorganization Hits DP

## Critics bothered by bureaucratic bosses running the show

The word in Washington is reorganization. Following President Carter's "bottom-up" approach to overhauling the Executive Branch, the President's zealous retinue of reorganizers have set out to cure the plethora of ills plaguing federal ADP management and policymaking. The proposed panacea is a sprawling study run under the auspices of what's come to be called the Federal Data Processing Reorganization Project.

Even before word of the plan was released officially in early June, Washington was buzzing with rumors that a major ADP revamp was in the works. And now that the game plan has been formally announced and the strategy flushed out, dpers both in and out of government have raised serious questions about the study's aims and methodology. They are also bothered by the bureaucratic bosses that are running the show.

Heading up the ADP rehabilitation effort are officials at the Office of Management and Budget, the top hand on the project being Wayne G. Granquist, associate director for administrative management. A former Connecticut banker and newcomer to the budget office, Granquist has appointed veteran OMBer Walter W. Haase to take direct charge of the study. Haase, as deputy associate director for OMB's Information Systems Div., was a likely choice for the job since he is reported to have brainstormed the original idea for the computer probe.

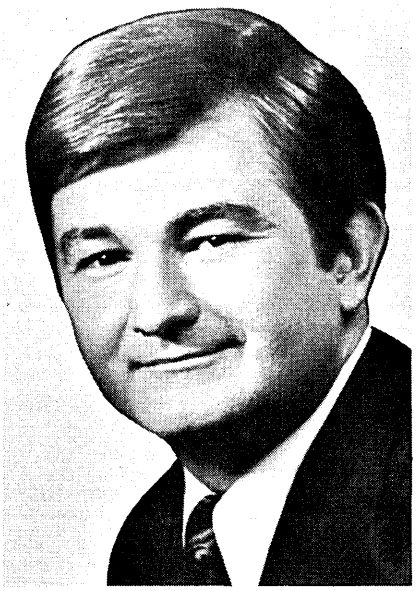
Selection of these top ADP policysetters to spearhead the reorganization investigation, however, has spawned a backlash of criticism. Says one outspoken federal dper: "You don't take the people who are the problem and put them in charge (of the study). There's not a single person who does not blame OMB for the chaos and mismanagement of information in government." The seemingly incestuous nature of the OMB approach also has worried other nonfederal computer specialists. Says one technologist: "OMB's leadership role in this study represents an absolutely clear conflict of interest."

### Credibility problems

"Having OMB at the helm," bluntly comments another federal dper, "could create serious credibility problems for the study because the very people in charge—the ADP officials inside OMB—are the very same people who've done very little over the years to help establish effective computer policies. So what makes you think they're going to do anything now?"

Pot shots also have been aimed at the way the budget office is handling the study. As originally configured, the study, according to the Dept. of Agriculture's assistant director of systems management Robert Head, is "overstructured and over bureaucratized." Head's remarks typify the feelings of most top agency dpers who are frustrated by the "all talk and no action" philosophy of federal ADP policymakers.

REP. JACK BROOKS
Has Brooks bill author's interest in computers waned?



REP. CHARLES ROSE
He'd pick up the ball and run should Brooks drop it

OMB, acutely aware of these gripes, believes it can turn the tables around with its new study. It's set up an elaborate task force mechanism, which will be monitored and coordinated by a seven to eight-member full-time project management group that includes three individuals from OMB, two agency representatives (Defense Dept. and the Energy Research and Development Administration), and several industry people. These private sector slots haven't been filled yet, and an OMB spokesman admits the office is "having a little trouble getting hold of people outside the federal government."

The OMBers also have started headhunting for task force volunteers, but these won't be set to operate before next month at the earliest. They will be made up of a 50–50 mix, half from government agencies and half from the private sector. And there's a checklist of 31 federal ADP issues which agencies and interested outsiders have been asked to comment on (see sidebar). The budget authority also sent out 130 solicitation letters to Congress, the agencies, and computer industry groups, and hopes by the end of the summer to have the issues all categorized into task areas which can be approved for study.

### Other hurdles

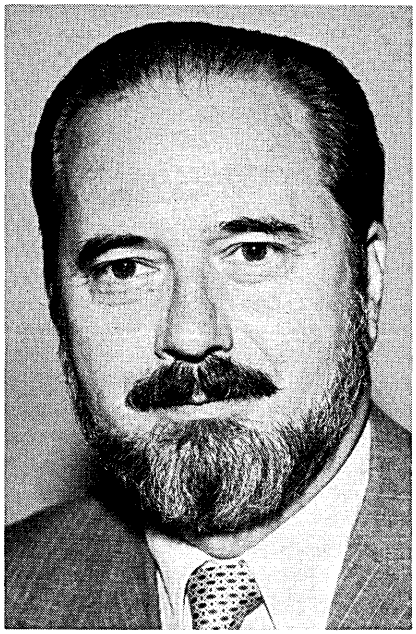
Originally kicked off on June 1, the project was targeted to take about one year. But since then several other reorganization schemes have had an impact, "throwing some pall of doubt over the scheduling dates," says one OMB source. As a result, the scope of the study, he notes, has been expanded "to cover more of telecommunications than was originally intended." Also, the recently announced reorganization plan in administrative services, partially aimed at the General Services Administration, will have an effect on the ADP probe, although it isn't clear yet exactly what that effect will be, he explains.

Whatever that effect is, OMB project planners are sure to ask the General Services Administration's new Automated Data and Telecommunications Service Commissioner Frank J. Carr for his input. Carr, who spent more than 20

years at Westinghouse, was involved 10 years ago in setting up the company's Univac computer center in Pittsburgh, which, according to one source, "was considered a very advanced real-time system in its day."

Carr, among other top government ADPers, is expected to play a key role in the OMB overhaul drive. His criticism, if indeed he has any, is expected to be muted since he's so new on the job.

Apparently the project team thinks they are planning the "perfect" study. Their goals, laudable to some, have nevertheless been sharply attacked for focusing too much attention on computers rather than on information systems to control, manage, and plan government operations. These objectives include: improving productivity in the delivery of governmental services through the application of computer technology; improving the acquisition, management, and use of these resources; and



FRANK J. CARR
The GSA's Commissioner for Automated Data and Telecommunications Services

eliminating duplication and overlap in agency jurisdictions dealing with computer issues.

### Four action areas

The project planners have set their sights on four specific action areas where they hope to come up with solutions. In the policy area, they want "to consolidate and simplify" the 17 different policy circulars currently sent out by the central ADP management agencies. But the "central theme" of the project, maintains one OMB official, will be in "strengthening ADP management" within the various agencies and departments.

Explaining this need for increased ADP managerial muscle, the OMBer says that lack of computer management might in the agencies is "a major gap in the existing process. We think there should be a particular individual within the agencies who has ADP management responsibilities . . . "

So, the project staff has decided to assign six or eight of the task forces to take a look at three to four agencies each and make recommendations on how to structure this ADP management capability.

It also will get down to specific reorganization proposals for the ADP policy setters—the National Bureau of Standards, GSA, and even OMB itself. Through this effort, the reorganizers hope to identify and resolve conflicting overlaps between all the various ADP authorities.

Lastly, the study team may make legislative proposals, such as an amendment to the landmark but faltering Brooks bill (named after its author, Rep. Jack Brooks—D.-Texas), which spells out the rules for government-wide coordination in the procurement and use of ADP systems. While one OMBer on the project admits legislative action is "a possibility," he adds that it's "probably unlikely."

One source close to the reorganization work being done at OMB argues that the Brooks bill "has really not worked well" and that the study group should not rule out amending it. But he also understands OMB's current reluctance to tamper with the bill. "They're (OMB) wary," he confides, "because they want to try and keep Brooks as a friend for as long as possible."

According to knowledgeable sources on Capitol Hill and at the agencies, though, Brooks' interest in computers has waned considerably since his intense involvement with ADP in the early '60s. As evidence of his disinterest, one source close to Brooks cites a conversation he had with the Texas Democrat a year ago in which Brooks unabashedly admitted he didn't care about ADP matters anymore. But the source also pragmatically points out, "If you were involved in reorganizing the entire federal government (as Brooks is) would you want to be bothered by the procurement of terminals?"

Rep. Charles Rose (D.—North Carolina), head of the House Policy Group on Information and Computers, who has been plugging computer usage by House members, says he "would also like to see more attention focused on government-wide computer policy questions." The chances are that if Brooks drops the ball in this area, Rose would be more than willing to pick it up and run with it, possibly creating a subcommittee on information.

### Very much in the picture

But Brooks is still very much in the picture, and as long as he is, the OMB ADP revampers will have to deal with him. And they'll also have to deal with anxious agency ADPers who are less than enthusiastic about the study. "The subject has been studied to death," protests Clagett Jones, chief of the Census Bureau's Systems Software Div. "Somewhere along the line," he asserts, "some-

## 'Everything but The Kitchen Sink'

The Office of Management and Budget's ADP rehabilitation team has put together a preliminary shopping list of federal computer issues which they have carefully noted is "not intended to be comprehensive." But as one more savvy federal dper has pointed out, "comprehensive or not, the 'grab bag' of issues includes everything but the kitchen sink." These issues getting the once-over from the OMB probers include the following:

- Dp planning process
- Requirements definition
- Economic analysis (dp justification)
- Evaluation of alternative sources of computer support
- Evaluation of alternative methods of procurement
- Evaluation of alternative methods of financing procurements
- Central agency vs. user agency responsibilities
- Central agency policies and regulations
- Convergence of dp and telecommunications
- Application life cycle vs. equipment life cycle planning and management
- Dp application program evaluation
- Integration of program and dp budgets
- Management audits of dp operation
- Processing of agency procurement requests
- Delegations of procurement authority to agencies
- Dp planning and budget information
- Interim upgrade policy
- Software conversion cost policy
- Software development and acquisition
- Goals and objectives of standards program
- Standards enforcement authority
- Computer resource management systems
- Dp work accounting systems
- Dp job classifications
- Certification of dp personnel
- Career development and training
- Computer security policy
- Full cost recovery policy
- Dp fund policy
- Functional performance specifications policy
- Software Exchange Program

*

body has to take some action." Echoing Jones, Norman Ream, first head of NBS' Center for Computer Science and Technology, says the "government computer problems that exist today were recognized and addressed back in the early '60s. And since then," he contends, "there's been a lot of money spent and nothing accomplished."

Calling the OMB study a "fishing expedition," Ream says that instead of setting up another study, the government "should establish a new department to define federal ADP objectives and pull them all together so they can be worked upon." Top Agriculture Dept. dper Head says, "The study is overstructured. If I were organizing it, I would have assembled a small group of experts, some from within government and some from outside, to take a much less intensive and much less structured look at the problems."

Responding to these comments, an OMB spokesman insists the agency is just trying to live up to the Presidential reorganization mandate for "maximum public participation." He adds, "It's a big project. I don't think we'll probably achieve everything we set out to, but I think we will achieve enough to make the study of benefit to the government."

**Focus still on equipment**

Others are less optimistic. Jon Turner, the director of advanced systems of Columbia Univ. computing center, spent three months as a consultant to the President's reorganization project for the Executive Branch. As a former insider on the reorganization scene, Turner has very definite opinions on the OMB project. The study's emphasis on ADP and ADP-oriented objectives, he contends, "perpetuates the current focus within government on ADP equipment instead of on the use to which that equipment is being put. A better approach," he suggests, "is not to study computers but to study administrative practices."

Turner also feels strongly about OMB's leadership role in the project. "It's clear," he asserts, "that the result of this study will be to put the stamp of reorganization on much of the existing government ADP mechanism. As a bureaucratic gambit, the proposal is a masterpiece. As an effort likely to achieve any of the President's reorganization goals, the proposed study is unlikely to succeed."

This bleak view obviously isn't shared by the OMB reorganization team. With the right help and cooperation from the computer community, they believe they can crank out a good study. Acknowledging past failures, one candid OMBer laments, "There are studies being done all the time in the federal government. Unfortunately we spend an awful lot for them and we don't get as much benefit from them as I think we could. I'm hopeful that this won't be a continuation of that pattern."

**—Linda Flato**

*Auditing*

# Edp Auditors: Explosive Growth

## Dp Auditing: Is It an Art Or a Science

Few professional organizations have experienced the exposive growth that the Edp Auditors Assn. has.

Formed in mid-1969 as the Edp Auditors of Los Angeles, the association had three chapters and 100 members when it held its first national conference in June 1973. The conference attracted an attendance of 225 which immediately swelled the membership, and by early 1974 there were 300 members.

Convening nationally for the fifth time in Houston this June, members heard past president and director, Bud Friedman of Coopers & Lybrand, Los Angeles, announce that the group now has 23 chapters and 2,000 members with eight new chapters in the formation stages which will bring in another 400 members.

Friedman was honored at the Houston conference with a plaque and a standing ovation for his work on behalf of the association over the past five years. The conference this year attracted some 600 members.

Friedman noted that three of the existing chapters are abroad: in Mexico City, Mexico; Sydney, Australia; and Toronto, Ontario, Canada. Today the association has two publications: a quarterly magazine, *The Edp Auditor*, and a newsletter, *The Edp Auditor Update*, which comes out every two weeks. It has spawned the Edp Auditors Foundation for Education and Research to develop and improve education and conduct related research to assist in the study of auditing. The Foundation, in turn, has formed the Edp Auditors Foundation Affiliates for computer manufacturers, software firms, computer service companies, CPA firms, and computer user organizations.

**Certification**

At the Houston conference, a proposal by the Institute for Certification of Computer Professionals that the Edp Auditors Assn. join ICCP and work with the certifying organization on certification examination for dp auditors was favorably received by the EDPAA's directors.

But the question, "What is a dp auditor?" is still being asked. Dr. Dennis Branstad, National Bureau of Standards, asked in a Houston session whether dp auditing is an art or a science. "An art," was the resounding answer. One attendee quipped, "Ask an edp auditor what time it is and he'll tell you how to build a clock."

Nick Campbell, director, edp audit, IBM, Corp., talked about the minimal education requirements for dp auditors at IBM. They (the dp auditors) "consist of both internal auditors who have been trained in data processing and data processing personnel who have been trained in auditing," he said. "An internal auditor who chooses a career path as an edp auditor should have two years' experience as an internal auditor and should take 6 to 12 weeks of formal classroom education in basic programmer training, and should work as an application programmer a minimum of six months. Data processing personnel, to be hired as dp auditors, should have two years on-the-job experience and be required to work a minimum of six months as internal auditors learning basic auditing routines and fundamentals."

Campbell said the dp auditors at IBM are not expected to maintain proficiency as programmers, but will be expected to "obtain continual, ongoing training in various aspects of data processing as required to meet the dp needs of the internal audit staff and to keep them up-to-date with the current state of the art in data processing." He said the ongoing education should include such topics as: data security, privacy, remote computing, programming standards, performance measurement, system design, large data base systems, audit software, and equipment utilization.

Campbell described the dp audit mission at IBM as "to conduct audits and reviews of data processing organizations, installations, and existing applications to ensure the adequate safeguarding of IBM assets, the effective utilization of data processing resources, and the adherence to management policies."

One of the dp auditor's duties at IBM, Campbell said, is "to ensure that separa-

tion of duties exist within the data processing organization, and that manual and system controls are adequate to deter fraud in computer-based applications."

He listed some others: "to ensure that adequate controls and procedures exist within both computer installations and applications to prevent unauthorized access to IBM proprietary data and employee data files; to ensure that adequate disaster protection and recovery programs exist within data processing installations; to ensure effective utilization of data processing resources including both manpower and equipment; to ensure that access to live data is controlled during a system development cycle; to develop audit software; and to develop and maintain a high level of edp technical knowledge and expertise on the audit staff."

Arnold Barnett, partner, Barnett Data Systems, Rockville, Md., talked of the dp auditor's role in computer performance improvement programs. Dp auditors, he said, "should team with data processing personnel to effect a performance improvement program."

Patrick T. McGuire, manager, corporate audit, The Pillsbury Co., Minneapolis, talked about auditing "distributive processing systems," noting that manual techniques play a bigger role than in auditing a centralized system. "One area to challenge," he said, "is to see to it that modular and orderly expansion capabilities are present in initial design that will cause minimal impact on those functions that already exist in the system."

He raised a political issue. "Before distributive processing is looked at with any serious implications, you must look at the various groups and how they interact and conflict with each other." He doubted that many honest answers would be forthcoming "but at least you can ask the questions."

### Maintain control

The most important result of a distributive computer network, McGuire said, "is the distribution of the function and decision-making process while maintaining centralized control, and this won't occur unless it begins to evolve way back in the planning stage and the impetus has to come from the user.

A former dp auditor for New York's Citibank in McGuire's audience complained of the difficulty of maintaining control in an environment where "minis were growing like mushrooms. We (the auditing staff) had to decide whether to increase staff or set priorities, covering the essential minis and letting the others wait."

He said he "didn't like the proliferation of minis at Citibank. The bank is going to lose control. Everyone's putting this on and that on. They're not communicating and they are duplicating."

McGuire advised fighting against "letting each user go his own way." He said a common technology base is essential in a distributive system.

In another session on "Security, Control, and Auditing in a Dispersed Data Processing Environment," John B. Wardlaw, manager, Seidman & Seidman, Houston, emphasized the importance of assuring that "local managers have a good idea what's going on in their systems," which, he said, is not always the case.

Wardlaw said any firm with 75 or more employees is a prospect for dispersed data processing and cited as one of its advantages "getting the responsibility for data right down where it belongs."

### The ideal time

He said conversions in a dispersed environment "are an ideal time to either start or stop fraud." He said auditors should assure that proper safeguards are taken during a conversion and should write programs to verify the results of the conversion.

Wardlaw observed that some local managers tend to treat their computer equipment as "just another office machine," located on a factory or warehouse floor. "It should be in an office that is dry and equipped with at least two fire extinguishers located on a wall where you can find them, not hidden under six boxes of paper." He advocated training personnel in firefighting at least once each year and said most fire departments will do this. "Test security measures," he told the dp auditors. "Be a bad guy and do it."

Bill Newcomer, president of Dylakor Software Systems, Inc., Los Angeles, told the Houston conference that he likes the idea of distributed processing because it "puts intelligence right where it's needed." He said his firm "opted for our first mini in 1975. We're back face to face with the device again ... back to something physical."

Newcomer, whose talk basically was on microprocessors, titled it " 'The Intelligent Tooth Brush' because I thought that was the ultimate in ridiculous applications of microprocessors. Turns out my lawyer has a client whose thinking along those lines."

He talked of other off-beat applications of microprocessors such as an intelligent fire hose with a safety device in its nozzle causing it to shut off if dropped; an intelligent sprinkler system which senses water content in a lawn and even a newspaper in a driveway; and an intelligent tombstone that plays hymns and waters flowers.

### The prerequisites

For the hobbyist considering building a microprocessor-based system piece-by-piece, he suggested as prerequisites: "a degree in electronics and computer science, programming experience, and a friend with unlimited test instruments willing to do unlimited favors for a frivolous project. If you don't have these things, I suggest you try a kit."

It was noted during Newcomer's session by NBS' Branstad that NBS' encryption algorithm has been implemented on a processor chip. In his own session, which was on encryption, Branstad said he believes it will be widely used for security in the next five to ten years "especially in the banking environment. It will be implemented in hardware, stuck down in the terminals. You (the edp auditors)," he said, "will be responsible in the future for making recommendations as to whether to use cryptography and as to whether or not it's being used properly and adequately." He said the state of Ohio now requires encryption of medical information sent from Ohio to the Contagious Disease Center in Atlanta. Cryptography is so good, he noted, that 72 quadrillion different keys are possible.

Wardlaw, in his session, wasn't so sure about hardware encryption. "It can be broken in a few minutes by a skilled cryptographer. I have not seen an effective hardware encryptor yet."

Robert Keith, manager, systems development and programming, Southwest Bancshares Inc., Houston, in a session on "Controls on EFT Systems," suggested cryptography as something to look into when developing security for an electronic funds transfer (EFT) system. He said financial institutions, in using EFT, are "doing nothing more than extending their services to you in an electronic environment. A great deal of the responsibility for input and output belongs to you." He said current paper-based controls "are not sufficient even though they're adequate." He suggested as things to look at in an EFT audit: the transaction initiation area, the physical terminal location, the concept of the plastic card and its issuance and control procedures, the customer identification process, common channels and lines, line monitors, and transaction processing in the switch.

Wayne Boucher of the National Commission on Electronic Funds Transfer (NCEFT) told the dp auditors that the commission, in one two-week period, received 6,000 letters of which only 11 favored EFT. Ten, he said, were uncertain, and the remainder "were desperately and utterly opposed." He said reasons for the opposition included fear of unemployment, of the ability to stop payment, of loss of control, of loss of proof of transaction, of increased costs, errors and thefts, of Big Brother, and something from the Book of Revelations. "EFT is just another sign that the end of the world is at hand." Boucher said the last fear was the only concern the commission had not addressed.

# There isn't a single single-that can touch Tandem in

To begin with, we're twice as good. With multiple processors. It's as simple as this. On-line means on-demand, and one processor won't do. Because any processor, even one of ours, can fail. And if that failure occurs during a peak period of transactions, you're out of business while it's down. And out of luck if you miss your re-start point or clobber your data base. And out of control if you lose or duplicate the transactions in process when the failure occurs.

**You need a NonStop™ System.**

Tandem has built the world's first multiple processor system, designed from scratch in both hardware and software, to provide non-stop processing—even during a failure—with no penalties in the speed, capacity, throughput or memory utilization of the system.

And it can grow without penalty. Starting with a basic two processor system, users can add processors, memory or terminals incrementally all the way to a fully expanded system of sixteen processors supporting 2048 data communications lines, with individual files of up to four billion bytes fully supported by a comprehensive data base management system. But the best part is that you never have to reprogram. Ever. Your Tandem NonStop System just gets bigger and better. At remarkably low cost.

**Why the big ones fail.**

The big mainframes are expensive to begin with. And even they can fail. Which can leave you high and dry in the on-line environment. But there are other difficulties with the big numbers, too. Of prime consideration in the on-line world, they offer very limited throughput for their price. And by the time you've hung a lot of communications lines on them, they suffer a derating which makes their performance even less attractive.

And whereas you may eventually need that kind of horsepower in your on-line system, chances are it's an expensive overkill at the outset. What you need is a system which will do the job efficiently on the way in, and grow as your needs grow, in modest price increments. It makes the big systems people wish they were more flexible.

**One mini just won't make it.**

Minis have made a name for themselves, justifiably. But in the world of on-line, where needs keep growing, the one mini system just can't cut it. With the architectural limitations inherent to a single mini system, growth can build system overhead so fast you'll grind to a halt before you know it.

**And strap-ups will kill you.**

The answer might seem to be to strap two processors together. One goes down, and the other takes over. Right? Wrong. It's not that simple. System software for a single processor system won't run on the strap-ups. And the fate of any transactions-in-process at the time of a failure is unknown. As is the state of any records being updated. And growth beyond the original system capacity is well nigh impossible.

What you really need is the one multiple processor system designed for multiple processor operation. Tandem's NonStop System.

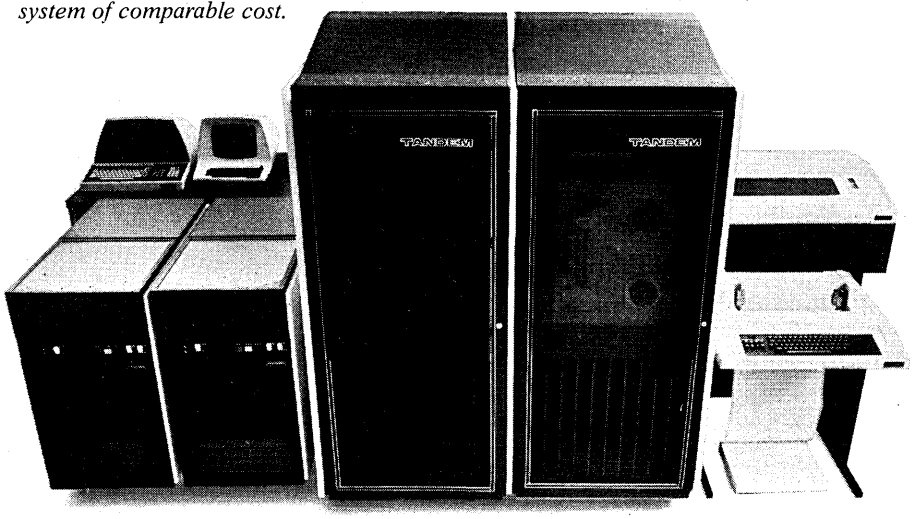
**The four major "on-line" considerations.**

When anyone is considering an on-line system, regardless of size, there are four primary points to consider. Throughput. Availability. Data Integrity. Transaction Protection. The system must be able to handle the job. It must be there when you need it. You must be sure of the integrity of your data base. And you must be sure you don't lose or duplicate a transaction. Even during a failure. No single processor system anywhere can provide that assurance. It takes a multiple processor system designed for the on-line environment, and Tandem is it.

**For better throughput, spread the files.**

We built the Tandem NonStop System with geographic independence of programs and files. They're handled automatically under Enscribe, our Data Base Record Manager. And instead of having one processor with one bottlenecking channel and a

*The Tandem 16 NonStop System is composed of multiple, independent processors with dual redundant communications paths. The unique interaction between Tandem hardware and software assures not only continuous operation, and the integrity of your data base, but also throughput unmatched by any other computing system of comparable cost.*



# processor system anywhere an "on line" environment.

fixed priority system, Tandem's NonStop System distributes the work and the files across multiple processors, multiple discs, and multiple channels. Enscribe controls the pattern and the flow for maximum efficiency. Because of simultaneous disc accesses, there's a dramatic improvement in response time. It's one of the performance benefits about a multiple processor system which you can't get on a single processor system.

**Ease of programming, by design.**

Historically, multiple processor systems have been a bear to program. Not with Tandem. Guardian, Tandem's operating system, lets you write your programs as usual. You can add more processors, or memory, or terminals as you need them. No need to rewrite programs. Ever.

And we make it easy to write the programs in the first place, with COBOL or with TAL, a powerful language designed for fast, flexible programming. The software development tools of this mini-based system rival those of far more expensive systems, and include NonStop operation, data communications, mirror volume capability, full file protection, screen formatting programs, and a host of housekeeping utilities.

**When you're thinking "on-line," think in Tandem.**

Which means think in multiples. Few, if any, "on-line" systems can be installed and forgotten. The number of transactions, the number of terminals on-line, or the number of applications programs to be run on the system keep growing. Most likely, all three will multiply.

Which is traumatic unless you've started with the one system on the market which can grow with you—even if the growth occurs during the initial configuration phase—without having to start all over again.

**NonStop growth and NonStop protection, too.**

Because the Tandem System was designed for NonStop operation in both hardware and software, it offers an extraordinary measure of protection against a failure in any processor, I/O channel, disc drive, or in the software. No other system offers this measure of assurance.

When a failure does occur in any segment of the system, its back-up counterpart completes the task, without a hitch. Since all programs are geographically independent, and the operating system both distributes and monitors all work-in-process, recovery from a failure is instantaneous. There is no restart; no backing up to a hopefully safe point. All indices are automatically entered and maintained in software. And the system monitors its own operations, performing all tasks in a distributed fashion across the multiple processors. Even when a CPU goes down, another CPU is immediately aware of the failure and picks up the task in process and completes it. No data and no transaction need ever be lost or duplicated. The integrity of the data base can be fully protected. It is truly unusual, but it's one reason why we say no single processor system anywhere can touch us in the "on-line" environment.

## NonStop software.

**Guardian: Operating System.**

NonStop operation.

Automatic re-entrant, recursive and shareable code.

Virtual memory system.

Geographic independence of programs and peripherals.

**Enscribe: Data Base Record Manager.**

Provides relative, entry-sequenced and key-sequenced files.

Each file may be up to four BILLION bytes.

Up to 255 alternate keys per file.

Optional mirror copy by disc volume.

**Envoy: Data Communications Manager.**

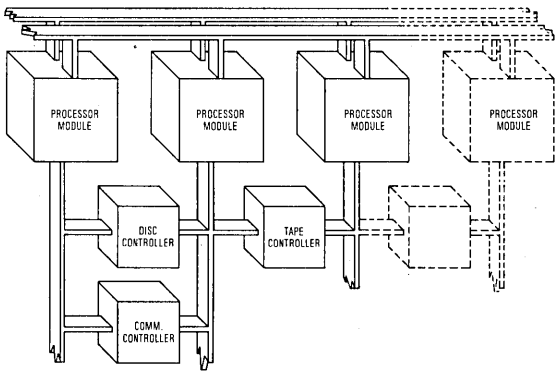
**Languages: COBOL, TAL.**

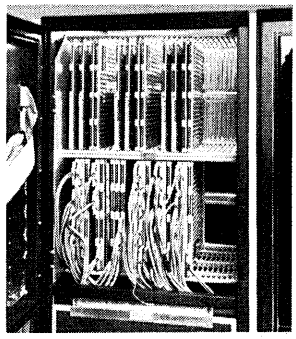
# TANDEM

Tandem Computers, Inc.,
20605 Valley Green Drive, Cupertino, California 95014 or Tandem Computers GmBH, Bernerstrasse 50, Frankfurt 56, West Germany.

**Toll Free 800-538-9360 or 408-255-4800 in California.**

*Photo and schematic show three processor modules with space for fourth module, interconnected to disc controllers, tape controllers and communications controllers.*



Newcomer foresaw a problem of another sort when he predicted that dp auditors of the future could have their own computer-in-a suitcase. "You'll walk into a site, plug into its machine, and do your own processing with a system you already know." The problem—getting through airports.

**—Edith Myers**

*Crime*

## A Crook By Any Other Name . . .

Col. David Winthrop was charming, believable, and seemed every inch the retired Air Force colonel he professed to be to the men who were to become his associates in DataSync, a Santa Maria, Calif., firm formed to market an educated terminal and a 16K RAM memory board, primarily to the hobbyist market.

The only unusual trait of Kenneth Allen was that the stories he told fellow employees at Cubic Data Systems, in San Diego, of the houses he owned seemed to vary as to their location in San Diego.

Neither man was exactly what he seemed to be. Neither was he who he said he was. The Federal Bureau of Investigation says Allen's real name is Henry Joseph Manning, III. The police department in Santa Maria says, as nearly as it can determine, Winthrop's real name is Norman Henry Hunt, Jr. Both men have used a long string of aliases.

Hunt showed up in Santa Maria last October as Col. Winthrop, just retired from the Air Force after 18 years in which he worked in digital electronics, and formed a company called Santa Maria Research to market what he said was a 16K RAM memory board to which he owned the rights. Police now say it not only wasn't a 16K board, but he didn't own it. It was a 4K memory board developed by SD Sales of Dallas.

Around Christmas of last year, Col. Winthrop met two of the four men who were to become fellow-principals with him in a successor firm to Santa Maria Research. He met David Faiman, a software expert who then worked for Polymorphic Corp., at a meeting of the Santa Barbara Computer Club, a hobbyist group. He met Ron Waffle, who then worked for California Computer Products, at the Santa Barbara Byte Shop where Ron was moonlighting as a technician. He told them of the memory board and how he wanted people to help him market his device. They told Ron Yager, who was running a camera store in Santa Maria, and Dennis Levinski, a field service rep for General Electric.

"The man was charming. You'd buy anything from him. We actually approached him," recalls Waffle ruefully. The four quit their jobs, invested what they could, and got DynaSync going with Col. Winthrop as chairman of the board and chief financial officer.

The firm began accepting prepaid orders. Waffle said Winthrop would pledge his house to get credit from suppliers. Winthrop claimed the house was worth $100,000 and that he had clear title to it, having paid for it in cash. It subsequently was learned he was renting.

What blew the whistle on Winthrop? A prospective customer, skeptical of the prices quoted in the company's ads (thought they were too low), called the

WANTED: Henry Joseph Manning, III, also known as Kenneth Allen and many other aliases, was born Nov. 8, 1937, in Colorado, weighs 200 pounds and is 6'1" tall, with brown hair and blue eyes.

Santa Maria police to check out the company. The police learned the firm did have a business license and was a California corporation. They next checked out the principals through driver's license records and vehicle registration. "The other four were fine," said a police spokesman. "They had driver's licenses and registered vehicles, but we found nothing for Winthrop." A closer check with the DMV, police said, turned up three strange applications for duplicate licenses under three different names. The duplicates were never granted because there were no originals on record and all three pictures were pictures of Col. Winthrop.

### Was awaiting trial

The good colonel was in jail in Santa Maria in mid-July awaiting trial on three felony charges of theft by false pretenses. Other jurisdictions were waiting their turn. The FBI wants him for bank fraud, and there are indictments out on him in Texas for a variety of allegedly fraudulent activities committed under a wide variety of names and on behalf of an almost equally wide variety of businesses the man formed. Santa Maria police said they know of 28 different aliases he's used and 15 different businesses he's started, many in the computer industry.

And the other four principals in DataSync are working hard to keep the firm going and honor its commitments. "This has set us back one and one-half to two months," said Waffle. They now have a design for a 16K RAM memory board that is their own, and they expect to deliver on all the prepaid orders.

### But Manning is free

While Hunt, alias Winthrop was in jail last month, Allen, alias Manning, was still at large.

Allen didn't make many waves at Cubic. Except for the discrepancies in the stories about his houses, the tall, Colorado-born programmer, who worked with the company for nearly 11 months, seemed well suited for the job, "not a super programmer, but we got our money's worth," says Paul Burns, v.p. and general manager of the service bureau which is owned by and does service mainly for Cubic Corp., a diversified San Diego company which also holds defense contracts.

When Allen suddenly left the company in May 1976, supposedly to visit his ailing father in Arkansas, leaving behind a wife and a trail of bad checks cashed at local banks, Cubic officials began to suspect that there was more to Allen's background than that of a competent COBOL programmer with experience on Honeywell equipment. His programming experience, it was learned later, was acquired in part at California's San Quentin Prison from which he'd escaped June 19, 1973, during the second year of a 10-year sentence for grand theft of $14,000.

FBI agents in Kansas City, Mo., where a warrant for his arrest was issued in March 1976, said their file on Manning fills two volumes. Among the data is a note of his employment in Houston in 1966-1968 by one of the Big 8 CPA firms, which the FBI won't name.

His Kansas City warrant is for allegedly giving false statements concerning his net worth in the summer of 1974 to

the Stadium Bank of Kansas City in applying for a loan of $3,500 under the name of David L. Robinson. And there were arrests and convictions in California and Sioux Falls, S.D. The agency still is looking for Manning and said he probably might apply for (and might already have) a job as a computer analyst or programmer.

### Security checks now

Cubic's Mr. Burns said the company was distressed that a more careful check of Manning's background wasn't made. "We needed a Honeywell programmer and once his knowledge of COBOL was affirmed, he was hired without a check." Burns, who said the company now requires applicants to apply for security clearances, is glad to talk of the incident because he hopes others will be more careful.

In his post with the company, Manning had access to a vault full of payroll and account checks. That was the first place Cubic looked when it learned the true story of Manning, but fortunately it hadn't been touched, Burns said.

Just as their names are hard to put down, ages of both men are not certain. Allen has given Nov. 8, 1937, Dec. 19, 1941, and April 16, 1942, as his birthdates at various times. Winthrop gave Santa Maria police 1938 as his birth year but the police, from other facts uncovered in his background, are inclined to think it was 1932.

### Schools for agents

Neither case relates to "computer crime"—rather to computer criminals—but the FBI now operates special hands-on schools for agents who will investigate computer crimes. "Computer crimes are rampant," says an agent in Kansas City, "but they're hard to prosecute." Few people understand really what's happened, he said, and prosecutors and juries don't have a sufficient grasp of the computer industry to convict suspects.

Last spring, FBI agent Glenn Rosenquist said many of the computer robbers who get caught with their hand in the hardware get off with probation and later set themselves up as "computer security consultants."

Rosenquist, who talked at a software user seminar sponsored by Insyte Datacom Corp. in Dallas, has supervised a number of computer fraud cases. He said a personal profile of the average white collar criminal was not possible, but the FBI does have a profile of the average computer criminal:

"They range in age from 18 to 30; are outwardly loyal to their company; have never been in trouble before; are bright and are challenged by the prospect of beating the system. And they fear detection more than they fear punishment."

He said his agency lumps computer crimes into five groups: *financial*, wherein funds transfers are made to the criminal's account; *property*, where bogus orders are placed for products that are later resold or fenced; *information theft*, unauthorized access such as the man who stole a three-million name list from the Encyclopedia Britannica; *theft of services*, which is the use of computer time for a person's own benefit; and *vandalism*, the intentional sabotage of company records.

Rosenquist, formerly of the FBI headquarters in Washington and now an assistant special agent in Dallas, is of the opinion that "perfect computer security is not attainable," and in his speech he called on management as well as the technicians to set up audit trails and other programs to ward off unauthorized computer access. He said it was highly important for management to continually attempt to penetrate their own systems and to have audit trails run on a regular basis by independent outside personnel.

*Mainframers*

## 'You Hit IBM on the Flanks or in a Very Narrow Product Area'

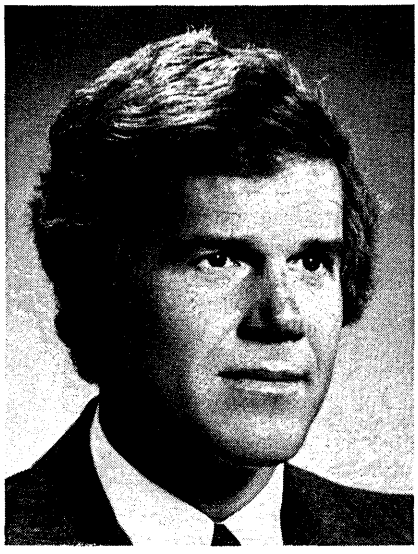
A new family is about to move into the block, and people already are worrying about what it will do to the neighborhood. Itel Corp., the leasing and financial services company in San Francisco, Calif., has been forced by news leaks to announce prematurely that it is about to begin marketing large-scale IBM-compatible computers manufactured in Japan by Hitachi Ltd.

The full and formal announcement by Itel is expected this fall, when the operating machine is installed at Itel's facility in Palo Alto, Calif. For now, company spokesmen say only that the first model will be three to five times more powerful than the AS/5-3, which reportedly has the power of a 370/158-3. Physically it will be half the size of a 168-3 in the one- to four-megabyte range, and consume half the power at the 4MB level. It is air-cooled, in contrast to the expensive water cooling required by the 168s and the newer 3033. And first customer shipment is expected in February 1978.

Itel, which sells packages of mainframes and peripherals in a variety of financial arrangements, rarely quotes prices, and will not disclose them at this time. But Richard A. Whitcomb, v.p. for systems marketing in the Computer Products Div., says the company must be competitive with the IBM 3033 and the Amdahl 470V/7 being developed with another Japanese firm, Fujitsu Ltd. "So it's not a one-machine program," says Whitcomb, but rather a family.

(A two-page ad, which appeared by mistake in *Computerworld* last month, said the new machine will cost "up to $1 million" less than a 168-3. Richard H. Lussier, president of Itel's Data Products Group, said none of the details mentioned in the ad are final and attributed its erroneous publication to a "communications problem" at the company's advertising agency.)

A family of medium to large-scale mainframes is being manufactured for Itel by National Semiconductor Corp., labeled the Advanced System. The



CHALLENGE TO IBM: John H. Clark, left, executive v.p. with Itel's Data Products Group, says company has determined Hitachi machines are compatible with IBM. Richard A. Whitcomb, v.p. for systems marketing, says it's not a one-machine program.

Itel/National AS/4 and AS/5 cover the 370 family from the 148 to the 158-3. And one can expect the new additions at the upper end of the series to bear the same appellation. How much above the 3033 they go will depend on market conditions—and what IBM does. "I don't think we're in the Cray machine market," Whitcomb quips, referring to the super-scale scientific computers produced by Cray Research. Installations of the AS/4 and 5 were expected to total 15 in mid-August, the shipment rate being about four or five during July and accelerating each month thereafter.

### Joint development

The people at Itel, for what some observers believe are political reasons, are quick to point out that the new computers from Japan are the result of a joint development project between Hitachi and Itel that began with discussions some four years ago.

Hitachi, the manufacturer, and Fujitsu, which is manufacturing parts of the Amdahl 470s, were the recipients of government subsidies to jointly develop a family of four computers, called the M Series. Fujitsu makes and sells the bottom and top of that family, the M-160 and M-190, the latter closely resembling the Amdahl 470V/6, while Hitachi does likewise with the 170 and 180 (see September 1976, p. 100).

Thus the point is made that Itel's new mainframes will not be from the M Series. "The machines that we'll be offering will be entirely different," says John H. Clark, executive v.p. of the Data Products Group. "These are machines that we wrote the specifications for and then were jointly developed with Hitachi." The distinction, he adds, is that the Hitachi mainframes were designed to run Hitachi software, while the new models were designed to use IBM software. "We've completed running all the IBM operating systems and job streams," he says, and have determined that there is 100% compatibility with IBM. Users will be offered all the OS, VS, SVS, and MVS operating systems.

### Foot in the door

All this is only a foot in the door for the Japanese. Hitachi's agreement with Itel represents the first all-out effort in the U.S. to market mainframes made entirely in Japan.

To be sure, Fujitsu has been manufacturing parts of the Amdahl mainframes, and Hitachi in the early 1970s conducted discussions with Telex Corp. about the latter marketing the Japanese concern's computers in the U.S. The Telex program was dropped. Going back even earlier, Fujitsu and a company called Automation Science Inc. went through the motions of selling a batch processing computer in the '60s, a venture that was short-lived. But the Itel arrangement has to be the first believable effort by the Japanese to crack the U.S. market for mainframes.

Anyone who has watched the costly withdrawal of RCA and General Electric, and Xerox and Memorex from the general purpose computer market, while all others except IBM struggle to achieve a viable position in it, might question the ability or desire of the Japanese to do so. Ability?

Leo Feltz of Input, a research firm in Menlo Park, Calif., observes that the Japanese have a record of establishing a niche for themselves in established markets already populated by dominant companies. Feltz, now with Memorex, cites the automobile market in the U.S. where a new vendor has to go up against the likes of General Motors, Ford, and Chrysler. The same can be said in motorcycles, shipbuilding, cameras, and radio/tv. In all of these markets, Japanese firms have not just established a foothold but are doing outstandingly well.

"What's to keep them from doing the same thing in the computer industry?" he asks. "We feel: nothing."

### Huge marketplace

Desire? Feltz notes that for Japan to survive it must export. The country is poor in natural resources but rich in human resources. It thus is attracted to the electronics business, which not only is a clean industry but also does not require a massive importation of steel, oil, or lumber. "Of course," he says, "the electronic industry over all, which the computer industry is a part of, will be the largest single industry in the world, from the revenue standpoint, within the next couple of years. So Japan must get into that marketplace."

Adds Input's Robert Colten, "There is absolutely nothing subtle or diabolical about this. It's out in the open for everyone to see. Anyone who cares to read (the Japanese) literature, their publications, can see it."

An Input study published in June entitled "Plug-Compatible Mainframes: The New Hardware Economics" states: "It is imperative that the Japanese achieve a 12% to 15% share of the total computer market if they intend to become a recognized force in the marketplace. The market share objective could be achieved in the early 1980s if the Japanese companies continue to implement their plan."

In the North American markets, that strategy is to affiliate with local companies. Fujitsu is doing so with Amdahl Corp. in the U.S. and with Consolidated Computer Inc. in Canada. Hitachi is now affiliated with Itel Corp. "They're picking out these relationships on a very well-planned basis," says Feltz.

### Different elsewhere

By contrast, according to the people at Input, the Japanese strategy in China, Eastern Europe, Africa, and South America is to sell directly and retain their own trademarks. In Western Europe, it will vary from country to country, but perhaps be a combination of the two approaches above. "Whenever possible," the study says, "Japanese companies are strongly motivated to sell all computer products with recognized Japanese labels to achieve product identity . . . "

Still, it might be questioned whether it isn't too late to begin marketing IBM-compatible mainframes and whether there are any more gaps in the 370 line. But Colten explains that there no longer is a gap strategy in going after IBM. Instead the strategy is to concentrate on a narrow segment and attack. Or as Feltz explains, "You hit IBM like the Viet Cong: on the flanks or in a very narrow product area."

Itel's Whitcomb says the plug-compatible mainframe vendors are still shooting for a "window," saying, "and we want to be there as early as we can. But the whole market is now so big—the 360s, 370s, and 3033s—that there's always somebody who wants to get a new piece of hardware to do something. And we're very pleased that the so-called window is much larger than people tend to believe it is."

### Amdahl's window

The veracity of this statement is illustrated by the success of Amdahl Corp. The Sunnyvale, Calif., company was late in completing development of its 470, which is compatible with the 370s and competitive with the 168. First delivery of the 470 occurred in May 1975, some 22 months after the initial installation of the 168. "They missed the window," observers said, intimating that Amdahl had missed its chance to sell enough machines to recoup its investment before the market, or window, for it closed.

But as of July 1, the company had installed 54 machines and was turning them out at the rate of five a month, up from four a month during the second quarter of this year. And additional capacity is planned. It's hardly what you'd expect of a company that supposedly had missed its window (see this issue's Benchmarks, p. 144).

The success of Amdahl Corp. and the subsequent entry of Itel/National and of Control Data IPL into this marketplace have caused IBM to respond with lowered prices on its large-scale mainframes and the introduction of the 3033.

The latter machine, of course, creates still another window to shoot for—and apparently it's an immensely large market.

IBM is said to have 3,000 orders for the 3033; at $4 million each that represents a value of $12 billion. Says Itel's Whitcomb: "That would be the largest product in the history of American industry." Adds John Clark, "If those 3,000 orders are real, why would IBM overreact to a competitor like Itel or Amdahl or CDC?" Even if a competitor acquired 5% or 10% of that market, it would be but a dent in a $12-billion coffer. As Whitcomb says, IBM's problem would be in manufacturing all those machines, and going after competitors won't change that. "Our exact sentiments," say the new kids on the block.

**—Edward K. Yasaki**

## NCR's William S. Anderson: Out to Defend What NCR Has

When Wall Street analysts worry out loud that NCR is making a mistake by extending its computer line upward, interpreting it as a possibly fatal broadside attack on the IBM colossus, William S. Anderson bridles. The NCR chairman of the board certainly is aware that analysts are growing fond of NCR because of its impressively improving profits picture. But the idea that their noises are more the clucking of protective parents than the bitter sting of a drama critic doesn't seem to mollify him.

"Wall Street is so sanguine," Anderson argued in a recent interview. "They can think of all the reasons why a company should or should not be doing something. If you believe that sometimes 'attack' is the best form of defense, then what I'm doing is right. I'm not out to attack IBM. I'm out to defend what NCR has. IBM is in every part of our business, except paper. So what should I do? Crawl into a hole and start making terminals only and pray IBM won't defeat me entirely in that area. Ridiculous."

Anderson, with 30 years of experience in head-to-head encounters with IBM, emphasized that, "I have to have the knowhow in my company to be able to stand up to IBM in our areas of concentration—retail, banking, and so on. To have that expertise, I have to have the full line of equipment. To *just* supply the peripherals to hang on to the communications system, to hang on to the front enders, to hang on to the mainframe is just asking for oblivion in the years to come . . . Anybody will be able to make terminals in the years to come, anybody. I want to provide a total system.

"There is no system that IBM can offer to a food store or a department store or a chain store that I can't do better. In banks, I feel equal or superior to IBM, depending on where I am and what application, and so on. In the manufacturing area, with the company we have ac-

WILLIAM S. ANDERSON, right, chairman of NCR Corp. with NCR president Charles E. Exley.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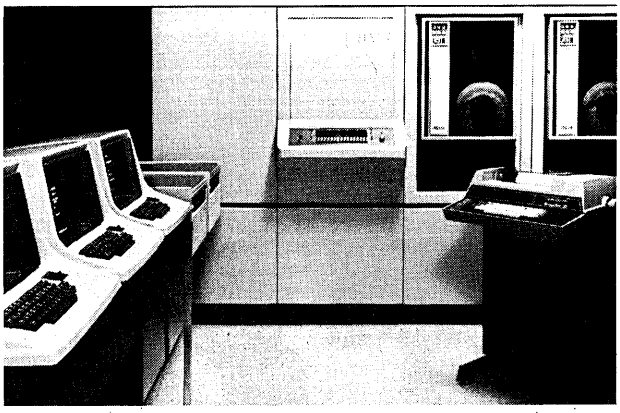

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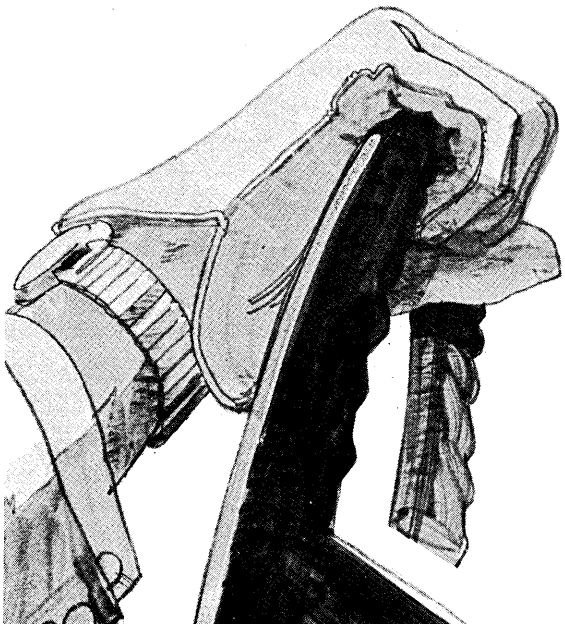

# Prime can help

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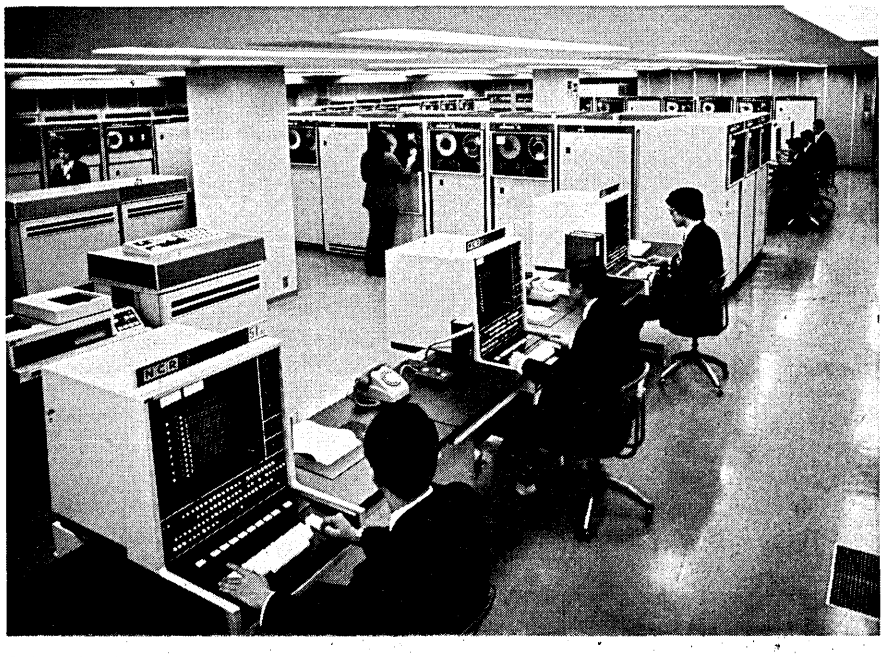

SUMITOMO BANK in Japan, with five Century 350 systems (about to be upgraded to Criterion systems) and 3,000 teller, crt, and teleprinter terminals, handles 250,000 transactions per hour.

quired, Data Pathing, there is no factory floor data collection system that IBM can produce that is better than mine . . . But in every one of those areas, I am meeting IBM head on in every deal."

Still, NCR has profited handsomely all over the world from lucrative contracts in which it surrounds an IBM central site with millions of dollars worth of terminals, minis, and communications equipment. Why, some persist in asking, shouldn't it leave the headaches of a large central utility to the likes of IBM.

### Not too proud to interface

Anderson noted that, "I'm not so proud that I won't interface whatever I've got to a system from IBM or Burroughs or CDC or anybody else. That is more than IBM is doing, but they don't have to do it.

I've never underestimated them since I joined the business—and that's 30 years ago." The NCR executive is clearly aware of the IBM strategy with its Systems Network Architecture, in which every element from terminal to computer is inextricably intertwined by software, microcode, and protocols that can be changed at will. If he is not underestimating NCR's need for a total system offering in the face of this strategy, he feels analysts and others are shortchanging NCR's proven capability in providing all elements of a massive network.

"Wall Street doesn't write about my huge real-time system in Japan, the Sumitomo Bank," he says. (Anderson ran NCR's Japan operation before being named president in 1972.) "Montgomery Ward's whole network architecture is being done by us—probably the most extensive business communications network that's being implemented in this country today. Wall Street doesn't write about that. Why not? Because they can't believe it."

Ward, which already has much of its network installed, ultimately will have 18,000 retail terminals, 3,000 crt's, and an assortment of minicomputers at 14 communications nodes around the country—all from NCR. (The network is linked to four sites with dual IBM 370/158s.) The Sumitomo Bank, with five Century 350 systems (about to be upgraded to Criterion systems) and 3,000 teller, crt, and teleprinter terminals, is already handling 250,000 transactions per hour. This is perhaps the biggest EFTS operation in the world.

Anderson, during the interview, seemed to mix "I" and "NCR." Perhaps it's a figure of speech, but in his five years at the helm, the two have become synonymous. Of course, the public thinks of the man and the company in tandem because Anderson is a highly accessible, outspoken executive—a model of British candor. But NCR's strongest push into the computer age has come under his direction.

For five years, NCR has been decentralizing manufacturing facilities, retraining people, and cutting back parts of the force, reorganizing, and developing more computer products than it has ever had to offer before. The company has been in total transition—from electro-mechanical to electronic manufacturing and from cash registers and accounting machines to computer-based systems. It has been traumatic in many ways, said Anderson.

### A damn foreigner

"In physical plant or in organization, it's easy. You just say, 'tear down this plant or build a new one, or remodel this plant for electronics.' You just take the organization chart and restructure it. But what do you do inside the heart and mind of every man? . . . It's like a language change. From speaking English, we're teaching him COBOL. All his life he's been very articulate, spoken English well, and now he finds he's a damn foreigner. This goes throughout the organization. The field engineer used to have pliers and a screwdriver in his tool chest. Now he carries a scope."

Many have gone because "they couldn't handle it, or weren't happy." Many, mostly in the plants, were simply "redundant." The NCR force has diminished to 67,000 from 103,000 in the last 5 years. The numbers in sales, R&D, programming, and support have not dwindled, said Anderson but the "caliber of people has changed." College degrees are required for the salesmen, along with some dp training or experience. "It's interesting. Today you can walk into a branch and find a lot of young people who have never touched an accounting machine and they certainly don't know what a cash register is." Yet Anderson, who started with NCR as an accounting machine salesman in 1946, recalls that "in the old days" the goal was to work up from selling cash registers to accounting machines. "This is our heritage."

### Replacing accounting machines

With the exception of a plant in Brazil, NCR doesn't make mechanical cash registers anymore, and it is about to announce an 8100 series of minicomputers this fall aimed at replacing the old Class 31 accounting machines (of which about 100,000 are installed) and the 399 and 499 (about 17,500 installations).

While it has been opening and closing plants around the world, NCR also has been reorganizing its manufacturing so that specific facilities have set charters for development and production. Charters for special and general purpose terminals are divided among plants in the U.S., Canada and Japan. Four U.S. facilities have primary responsibility for computer and communications systems, but NCR is giving more responsibility to its remaining facilities in Europe—in Dundee, Scotland, and Augsburg, Germany. (Three European assembly plants are being closed.) Dundee, which has been producing the Century series, is cutting over to the Criteri-

on line and will have a charter for some software development. Augsburg will be the second source for the new 8100 family and will be primary source on "one of the peripherals." It too will have a research and development charter.

These charters of responsibility for the foreign plants also should help NCR in dealing with the increasing nationalism and Europeanism that measures American firms by their contribution to local GNP, employment, and technological advancement.

### The internationalist

Anderson made it clear he's an internationalist, but that doesn't mean an accommodating diplomat. In numerous speeches, he has railed against the characterization of the multinational as "villain" and the increasing governmental, union, and other pressures put upon them worldwide. He is even more disturbed by the "recent trend away from the global economy concept—a concept which made possible the unprecedented expansion of international business since World War II. In its place we are seeing the emergence of nearsighted nationalism, economic blocs, and commodity cartels . . ."

The NCR's, IBM's and other multinationals have to live within most constraints abroad and cope with nationalistic support for local industry, but Anderson is most perturbed that American trade has its strongest adversary at home—the U.S. government.

In a speech last winter, Anderson jabbed Congress, which "readily concedes that export growth is an essential national goal. Has it therefore sought to stimulate exports? Quite the opposite. The so-called Tax Reform Act of 1976 actually weakened the few trade growth incentives previously offered American business."

Anderson is not enamoured of the Carter administration so far, either, since many facets of its planned tax package go even further than the 1976 act. He had disagreed with the 1976 provision that sought to cut back the tax deferments on overseas profits allocated to DISC's (Domestic International Sales Corporations). Now indications are that Carter wants to do away with DISC's altogether.

### Taxing overseas employees

There are several other reforms Anderson opposes, but one that upsets him most is the provision that would tax as income any company-paid expenses for Americans working overseas. He noted that, for example, an American living in Japan might have to pay $4,000 a month for housing that equals his home in the U.S. at $500 a month. If the company pays, he is taxed for $48,000 above his earnings. The same is true for education or travel home or other expenses.

While many U.S. multinationals say that the percentage of American employees working abroad is dwindling rapidly in favor of hiring nationals, this certainly does not help the new company just starting up abroad. Nor, said Anderson, is it wise to trim it too far back since the leading edge of technology is still in the U.S. But he is most concerned about the long-range effect.

"Fewer young American managers will be sent abroad to gain international experience. That means fewer internationalists in the future. I am one, and that worries me." The point is that corporations like NCR are placing increasing importance on the development of people who are able to operate effectively—both culturally and professionally—in an international environment, a long, demanding, and selective process.

NCR developed a chief executive that way.

**—Angeline Pantages**

*Security*

## Hard Day's Night

Leland H. Amaya, president of the Securities Industry Automation Corp., was at home in Darien, Conn., when it hit, knocking out power in New York City and engulfing millions in total darkness.

It was Wednesday night, July 13, about 9:30. Amaya had finished dinner and was watching television. The picture began to fuzz and then went out altogether. "What the hell's the matter?" Amaya said to himself. Lightning illuminated the sky in quick, brilliant sequences. And it was pouring. Amaya changed channels. Nothing. And then the calls started coming. Sam Alward, SIAC's senior v.p. of operations, was on the line. Alward lives in New York City. All he had to do was look out the window to confirm what Amaya already feared—a full-scale blackout was in effect.

Mention blackout to a computer person and he or she is likely to break out in a cold sweat. And Amaya had far more to loose that most people. Not only is SIAC's own system enormous, but it's the processing hub for dozens of other systems that interconnect with it. And all four SIAC computer sites had been up doing program testing and post-trade operations for the stock market—at least they had been until the blackout hit and the power went off.

### The impact

While Amaya was making up his mind what to do, the impact of the blackout was being felt sharply in the affected areas. The two national news services, United Press International, which is heavily automated, and the Associated Press, which is less so, were knocked out, putting the news flow, and information about the power outage, at a standstill. Citibank cut over to its two diesel powered generators downtown and continued processing without any major interruptions. Similarly, New York Telephone went to its backup battery systems, then moved over to its own diesel and gas turbine powered generators to keep its electronic switching systems in operation. The phone system functioned effectively throughout the emergency, as a result handling a record number of calls.

Other users were not so fortunate. Con Edison's three IBM 370/168s, a 158, and a 360/65 were out, but did not lose any data. Insurance giant Equitable Life, also an IBM user, had its system KO'd. Moreover, the two 30 HD communications links to the firm's backup system in Easton, Pa., were also out of commission. Fortunately there was no lasting damage to the system, however. Chemical Bank and Chase's computers would also go out, though an auxiliary power system enabled them to phase down slowly and thus escape damage or lost data. Even so, Chase's system would not be operational until late Friday night, more than 48 hours after the lights went off. And Equitable would come back at 4 p.m. Friday.

### No time for sleep

In Darien, Amaya had made an effort to grab some sleep before going into the city. But the effort was futile. He kept lying in bed imagining the consequences of what would happen if all the computers that kept Wall Street running were down. Probably no computer system in the country is more conspicuous when out of operation. Five minutes of downtime usually mean big headlines. Imagine what a major outage would produce? A little after 2 a.m., he made the decision to drive into New York. Sleep was out of the question.

Others were wide awake too. IBM had established a communications center to track computer sites in lower Manhattan that might be affected. Other centers also opened up around the city. The firm's office at 2 Penn Plaza, however, was shut tight and IBM customer engineers were unable to get into the building. Frustrated, they gathered in the lobby. Meanwhile, IBM users and users of other vendors' equipment who had UPS (Uninterruptible Power Supplies) were congratulating themselves on their foresight.

At the same time, Univac was flying service people in from neighboring areas, putting those who were not immediately needed up in darkened hotels on standby and bringing the others into affected sites. Some Westchester Univac users—as well as those of other ven-

dors—were having additional problems because of power burps, sudden surges of power that would come from down the lines, put a system on again, and then dissipate. The Univac people drew up a priority list of customers. National defense came first, then the hospitals, the securities industry where they had customers like SIAC, next communications, and finally the commercial users. Hundreds of calls were made by all the major cpu vendors to customers suggesting the course of action to take. An initial power surge when the electricity came back up could raise havoc if it hit a machine that was still operational. Users were told to turn their cpu's off. The mini vendors were slightly less harried. Many of the 4,000 DEC machines in the area were not in operation. Those that were powered down automatically, thereby avoiding serious damage.

### "Cat scanner" down

Same story with Data General's 140 users in the area. In fact, the firm received only a few more calls than usual. There was at least one emergency, though—at Eastside Radiology, a hospital using a "Cat Scanner," a computerized scanning system that in effect provides automated x-rays of the brain and body. It went down. EMI Medical, which supplies the system, and Data General, which provides the minis that drive it both rushed service people in and within a short time the scanner was working, operating under emergency power generated by the hospital.

By now Amaya was at SIAC's offices at 55 Water St. So were a number of other executives plus service people from Univac, Collins, and the firm's other vendors. One major computer room is on the 21st floor, a long walk in the dark. Amaya and the others went up to gauge the damage. The water cooling system on the floor above had gone off and water was pouring down on the computers. Further, an auxiliary power source located in the basement of another site was also flooded. "It's absolutely dead," Amaya said of the giant SIAC system.

### The long march

Luckily, SIAC has a reciprocal agreement with Merrill Lynch and Merrill's three IBM 370/168s and its 370/155 were operating on auxiliary power. It was absolutely essential to complete the post-trade processing, particularly options clearance and settlement. Amaya and the other SIAC employees present started a brigade over to Merrill, marching up and down seemingly endless flights of stairs to the Merrill data center carrying tapes, discs, and files throughout the night.

The following day, Thursday, the New York and American Exchanges were shut down. Amaya and his crew could assess the damage in daylight. Leaky air conditioning units had been a principle cause of harm, as they would prove to be at other sites around the city. SIAC employees and vendor service people employed hair blowers, water vacuums, and fans to dry things off, squeezing the last juice out of the UPS service batteries.

The real problem, however, was a power spike that preceded the blackout and went clear through the UPS buffer, registering an increase of over 10 volts on the computer side. This was *after* the system had filtered down the power. A big Honeywell user recorded a similar impact. Amaya theorized that one of the lightning bolts which had originally knocked Con Ed out of business had actually gotten into the electrical system, causing the tremendous power surge.

But there was little time for theorizing. Despite the one day respite, the SIAC crew had to have its processing capabilities operational by the beginning of the trading day Friday. The regional stock exchanges which hadn't shut down Thursday couldn't report their trades on the consolidated ticker unless SIAC was up. And options trading would be absolutely chaotic if SIAC's system was down another day. In various parts of the city power began to go on Thursday afternoon. Even so, service companies like Sorbus discovered that some of their customers, big users who had always had their systems operating 24 hours a day, now didn't know how to turn them on again. They simply had never had the systems off in the past, and consequently weren't familiar with the turning on procedure.

### Tight schedule

SIAC itself was situated in the last part of New York to gain power. It went on at 10:15 Thursday night. At least another hour and a half would elapse before the concern's computer sites could be thoroughly dried, cooled, and the machines put on. The crew, most of them, had been up for close to 40 hours now, but the work was paying off. Options trading processing had already been completed on the Merrill system, taken out to a bank in New Jersey, an area not affected by the blackout, and from there transmitted to Chicago where final settlement occurred. Now with SIAC's own system, the firm had less than 11 hours to complete its post-trading processing and be ready for the opening bell at 10 a.m. Friday—a deadline SIAC met with some luck, and what Amaya terms "a hell of a lot of hard work." It had been a hard day's night.

**—Laton McCartney**

*Communications*

## Computer Inquiry: Opinions From Bell, IBM, and the Justice Dept.

AT&T doesn't want its 1956 consent decree modified because this would automatically exclude computer-based information services from the offerings the company can market as a regulated communications carrier. Bell insists that many such services *are* communications, as that term is defined in the Communications Act of 1934, and thus must be offered only by suppliers who have received a license from the FCC.

The phone company is one of some 50 organizations filing comments this summer in the FCC's second Computer/Communications Inquiry. A basic purpose of this proceeding is to determine which services should be offered exclusively by regulated carriers and which by unregulated suppliers of on-line hardware/software. Rules splitting up the market between the two groups were adopted by the commission in 1971—essentially they consist of definitions differentiating between data processing and data communications—but the march of technology has led the FCC to take another look, and propose a new set of definitions.

Two other key respondents to the current inquiry were IBM and the Dept. of Justice:

IBM, insisting that the distinction between dp and datacom is fuzzy and getting more so, proposed deregulation of all communication carrier offerings, other than basic transmission service, together with modification of AT&T's consent decree so the phone company could compete in this new market environment.

The Justice Dept. contended that modifying the consent decree would be difficult, basically because there isn't a compelling need to do so—computerized information services have proliferated in recent years even though the decree has restricted AT&T's freedom to offer them. But the department's key point was that it isn't *necessary* to let AT&T into the on-line information ser-

vices marketplace; the commission can legitimately decide that dp services which include communication functions may be offered largely or exclusively by non-carriers. As the department put it:

### Call it as it is

"We believe the commission could adopt regulations in this area under which devices or services perceived by customers as 'data processing services' would be so classified, even if they included significant, indeed generous, 'communication' components. Such an approach would be especially sustainable insofar as it would, under existing law, minimize the potential that FCC economic regulation would intrude into the currently unregulated data processing field. A reviewing court might decline to approve commission regulations that both broadened the ambit of the term 'data processing' *and* sanctioned increased carrier involvement in the resulting unregulated field . . . However, there appears to be little likelihood that a court would upset commission regulations which (narrowed) the potential for economic regulation of non-carrier activities in what should by all measurements be a non-regulated field, data processing."

A little later, the department added that it would "endorse such an approach" if the commission adopts it. One result would be to put "many of the new 'value-added carriers' beyond the scope of FCC economic regulation. Such firms have few . . . of the traditional indicia justifying full-fledged common carrier regulation." Rather, they provide "services the marketplace perceives as data processing . . . even though (some of these services) resemble 'communications' offerings."

Another result, although it was unstated by the Justice Dept., would be to alter subtly the historic basis for communications regulation: FCC rules, instead of applying to suppliers of communication services and not applying to others, would be applicable on a selective basis to suppliers in both camps, as needed to maintain a desired level of competition.

### Incidental components

AT&T's argument was based on the 1934 Communications Act, which says that "wire communication" and "radio communication" include the "providing of 'instrumentalities, facilities, apparatus, and services' incidental to . . . transmission." The company's key point was that subsequent development of technology and user needs makes dp an incidental component of regulated communication. But the FCC hasn't fully recognized this relationship, AT&T contended, because its newly proposed definition of data processing allegedly bars regulated carriers from providing significant dp-based communication services.

The phone company wants the definition rewritten to, among other things, encompass only those operations which change the information content or meaning of input information. AT&T objects to the second part of the FCC's proposed definition, which says that dp can alternatively include processing "where the output information constitutes a programmed response to input information."

One reason for opposing the latter option is that "common carriers . . . have traditionally provided communication services which include capabilities for text editing, translation, and message retrieval." But another, possibly more significant reason for AT&T's opposition is that "in the future, it is expected that inter- and intraoffice communication services would ideally provide closer integration of voice, video, text, and data communication. For example, the telephone set could be combined with a terminal, perhaps with a cathode ray tube viewer, which would permit the storage and later display of a message . . . when the recipient is ready to receive it . . . As new electronic communication applications of this sort develop, the communication common carrier will be a vital option to which users can turn for new services."

While AT&T was trying to squeeze data processing into the tightest possible mold, IBM was doing likewise to "communications common carrier service."

### Limited to transmission

The computer giant wants the telephone giant's monopoly limited to transmission of message information that is delivered to the recipient in the same form as it was input by the sender, and without any difference in content.

Under this definition, IBM explained, the translation of information to make it intelligible to a cpu, or to a terminal, would not be a regulated common carrier service, nor could a tariffed service "take programmed actions on the basis of the content of the user's message . . . to produce a response or control the routing of a message." This latter restriction, if implemented, would reduce the appeal of systems like AT&T's Transaction Network Service (TNS). They could not decide automatically, based on the amount of the transaction, what credit authorization source—e.g. a "negative" file or general credit file—to access at the customer's central computer. Bell would have to offer TNS on a non-tariffed basis, as a data processing rather than a communications service, if it wanted to include this capability.

### Promote competition

The commission has ample power, said IBM, to redefine communications common carrier service along the lines described above, and to seek modification of the 1956 consent decree. Both actions would promote competition, the company said, and "to the extent that pro-competitive policies have been adopted by the commission with respect to interconnection, specialized common carriers, and domestic satellites, these policies have been uniformly sustained judicially."

However, the Justice Dept. argued that "it is not realistic" to assume the consent decree can be modified.

"The economic strength of a protected market should not be used to gain advantage in tenuously related competitive markets," the department pointed out. Justice also argued that although the communications industry has changed since 1956, AT&T hasn't—"Its dominance has not . . . become attenuated. . . " Thus, "It is still true . . . that the entry of an enterprise with the size and . . . power of AT&T into unregulated data processing might raise serious questions . . . of economic policy . . . We do not believe the record shows that regulatory bodies have been markedly successful in regulating or controlling the cross-dealings between AT&T and its present unregulated, separate subsidiaries, such as Western Electric. Could an equity court be assured that what has not worked particularly well in the past . . . will nonetheless work well in the future?"

Each respondent to the inquiry now gets a chance to attack the views expressed by the others, after which the commission will take a look at what everyone has said and decide whether the proposed rules should be adopted, changed, or completely rewritten. When this latter event will occur is anybody's guess. Don't hold your breath, however; it won't be soon.

**—P.H.**

## Bell Must Start Over Again on WATS Rates

Revised WATS rates—reducing charges for about 60% of the users and increasing them for the other 40%—were rejected by the Federal Communications Commission last month. AT&T, which had submitted 56 volumes of backup material containing 16,000 pages, was told in effect to start all over again.

However, one part of the filing was accepted: it extends WATS to Hawaii and Alaska.

The rejected portion of the tariff was "unlawful on its face," said the commission in a unanimous decision. AT&T allegedly failed to satisfy a number of requirements imposed by two previous FCC orders, issued last year. (AT&T Long Lines president Richard Hough categorically denied this charge in a statement

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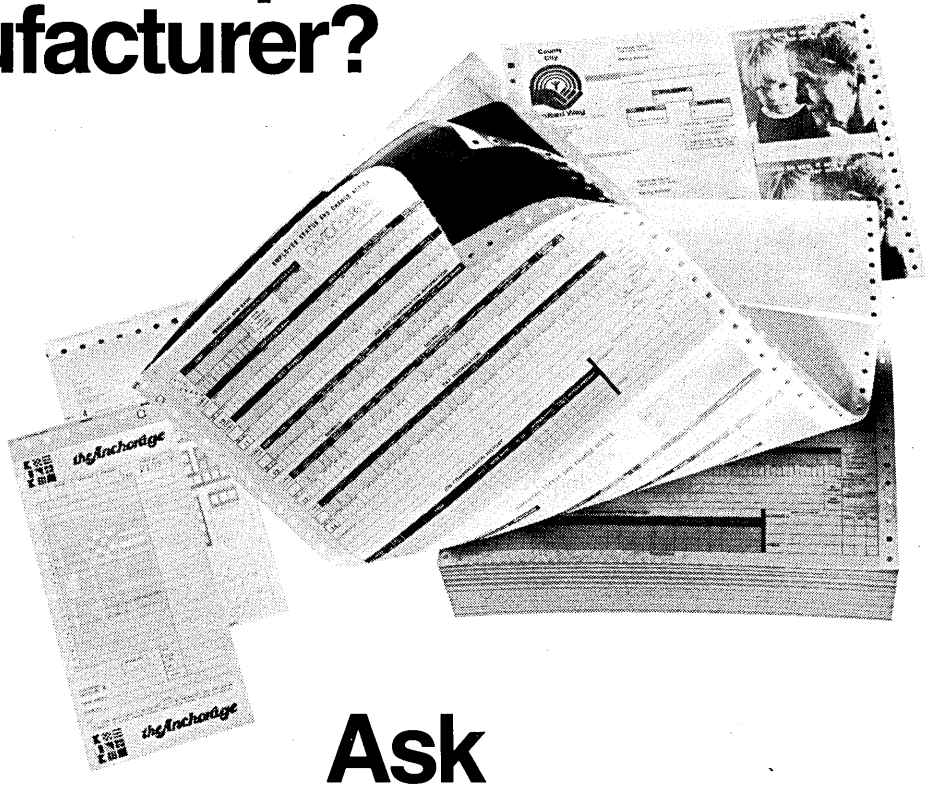


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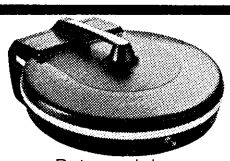
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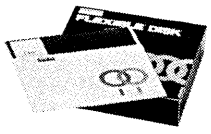
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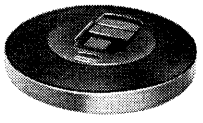
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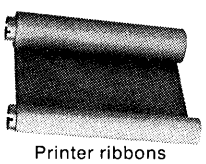
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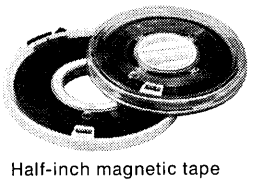
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# news in perspective

issued shortly after the WATS rejection was announced.)

One requirement, which grew out of a lengthy investigation of the WATS rate structure (Docket 19989) that ended in May 1976, called upon the phone company to submit detailed cost of service studies showing that WATS either is or isn't a bulk rate offering of dial-up long distance telephone service.

The phone company's basic position has been that such studies aren't necessary, and that WATS charges can be justified solely by maintaining "consistent" rate relationships with dial-up rates. The FCC argues this "alignment" approach is unacceptable because, among other things, it results in preferential rate treatment for long haul outward and inward WATS subscribers against short haul subscribers.

### Order to switch

Another bone of contention involves the method used by the phone company to allocate costs among its various services. Last October, the commission told AT&T to switch from long run incremental costing (LRIC) to fully distributed costing (FDC). The proposed WATS tariff was rejected last month partly because the supporting FDC cost data was "either out of date or trended forward without required new cost studies," as the FCC put it.

The commission's order requires AT&T to submit within 15 days a proposed schedule for filing "a fully justified and lawful WATS tariff." Also, an "accounting order" remains in effect. It forces the company to continue keeping track of WATS revenues by class of service (Measured Time; Full Business Day, etc.) so that rebates may be paid when the present tariff finally is replaced. Once new rates have been accepted by the commission, users eligible for rebates will pay reduced charges until the reductions equal their previous overpayments. The overpayments go back as far as March 1973.

Although WATS service between the 48 contiguous states and Alaska and Hawaii was authorized last month, it won't begin for a while. AT&T has asked for a 75-day delay to prepare detailed implementation plans with the participating carriers.

The phone company also was told in last month's order to file plans within 30 days for extending WATS to Puerto Rico and the U.S. Virgin Islands.

### Disagreement over revenue

Last April, AT&T, in a letter to the commission, reported that service to these points could not begin because of disagreement with the other carriers over how to split up the revenue. Thus, it isn't clear whether the 30-day deadline will be obeyed.

The rejected WATS tariff provided reductions in usage rates for 89% of all inward WATS customers, and 56% of all outward WATS customers, according to AT&T. The beneficiaries, generally, would have been customers using WATS circuits 91 to 150 hours per month. Those using WATS for longer periods would have paid higher rates. AT&T said the increases amounted to more than 10% for 8% of all inward and 7% of all outward WATS users. The FCC pointed out in last month's ruling that these increases would have ranged as high as 70%.

In addition, charges for extension stations, terminal installations, and moves, for access line conversion, and for suspension of outward WATS service were restructured and generally increased. Other major changes included: reduction of the present five WATS bands, covering the contiguous 48 states, to three bands; reduction of the present 18 rate steps to eight; combination of measured time (MT) and full business day (FBD) services, and separate rates for inward and outward WATS.

## Line Sharing Offer Extended Again

Telpak users won another temporary victory last month in their battle to continue leasing bulk private line channels at bargain basement rates. At the same time, rate decreases for many non-Telpak users were deferred.

Last March, AT&T announced that it was ending Telpak because of two earlier FCC orders: one declared the present tariff illegal and the other required the phone company—if it filed new bulk rates—to allow sharing of the circuits by virtually all private line users. Subsequently, after being inundated with protests from Telpak users, the commission rescinded its termination order, pending the outcome of a hearing. AT&T then announced it would continue Telpak, but only until June 21—the date on which sharing was supposed to begin. Shortly before the 21st, a federal appeals court in New York City deferred sharing one month, and AT&T extended Telpak accordingly. That set the stage for the latest act in the drama:

On the 21st of last month, the New York appeals court refused to defer the sharing order any longer. The phone company then announced that Telpak would cease at midnight. But immedi-

ately after this announcement, Telpak users won an injunction from a federal appeals court in Washington which forces the company to continue Telpak as presently offered -i.e. on an unshared basis. This injunction remains in effect until the court has reviewed the commission's decision declaring the existing Telpak tariff illegal, a process likely to take several weeks.

### Costs would soar

Under the Telpak arrangement, the telephone company leases lines at the rate of 60 or 240 lines to users who can use them or resell them. The lines are offered at huge discounts by the telephone company, which would like to have the unused lines for lease by itself.

Ending Telpak would increase costs several millions of dollars for present users of the service. The Department of Defense and the General Services Administration, which lease about 65% of all Telpak's circuits, have told the commission that the Feds will be forced to pay an additional $84 million per year in circuit charges. The news wire services estimate that their costs will increase 75% ($8.5 million per year), and ARINC—the airline communications cooperative—has predicted a 30%, $15 million annual increase. All of which helps explain why there were howls of protest when AT&T announced its intention to ax Telpak.

### Others must wait

Although Telpak users had won another reprieve, other private line users must wait awhile longer for rate decreases that probably would have gone into effect soon after Telpak's expiration. These reductions stem from an FCC decision last fall (Docket 18128) which ordered AT&T to file new rates for all of its private line services based on a "fully distributed cost" (FDC) method of allocating the related service expenses. The company, for years, has been using a scheme known as "long run incremental costing" (LRIC) which, allegedly, enabled Bell to cross-subsidize its competitive services with revenue earned from its monopoly services, and thereby gain an unfair pricing advantage over specialized carriers and independent terminal equipment makers. FDC is meant to eliminate this advantage.

Last March, the first of the FDC-based tariffs—covering individual voice grade private lines (Series 2,000-3,000)—was submitted to the FDC. It provided for reductions of up to 30% in the pre-existing Multi-Hyphen Schedule Private Line (MPL) rates charged for these circuits, i.e. more than 60, 100, or 200 miles, depending on the terminal cities involved. But there was a qualification: the new MPL tariff wouldn't take effect until Telpak was terminated. And, since Telpak has not yet been terminated, the savings promised by the new tariff remained no more than that.

### Enormous stakes

For AT&T, as well as the specialized carriers, the stakes in the Telpak battle are enormous. Because of the big discounts embedded in the present tariff, the specialized carriers have been forced to offer competitive bulk rates on which they make little or no money. In some cases—MCI is one example—the specialized carriers are heavily in debt, so a continuation of AT&T's bulk rate offering might push the phone company's competition over the brink.

For Bell, the economics are reversed. Telpak is a real money maker because of the company's real market share and greater diversity of services. "The key point to remember," explains an FCC source, "is that a Telpak "C" customer, who leases 60 circuits, can save money over the individual circuit rate, if he actually uses only 35 circuits; for Telpak "D" customers, the cross-over is about 120 circuits—i.e. half of the 240 circuits they actually lease. This means that the phone company now can collect twice, in effect, for 40% to 50% of its Telpak circuits: once from those customers who lease these facilities but don't actually use them, and again from the actual users. The latter group is large because Telpak circuits can be used alternatively for MTS, WATS, or as individual private lines. The FCC's sharing decision erases these benefits because it allows virtually all private line users to lease Telpak jointly. This will increase utilization significantly and drastically reduce the opportunity to collect from two customers simultaneously for the same circuit line."

*Marketing*

## DEC's Bill-Back Deal Explained

Recently revealed qualification rules for DEC's new and controversial "no-bill-back" contract for DEC terminal sales outline a market strategy which should effectively isolate two major segments of the data communications market for DEC's in-house sales force—even as their new 56% super discount for distributors who take 5,000-plus terminals concedes most of the open market sales to their largest resellers.

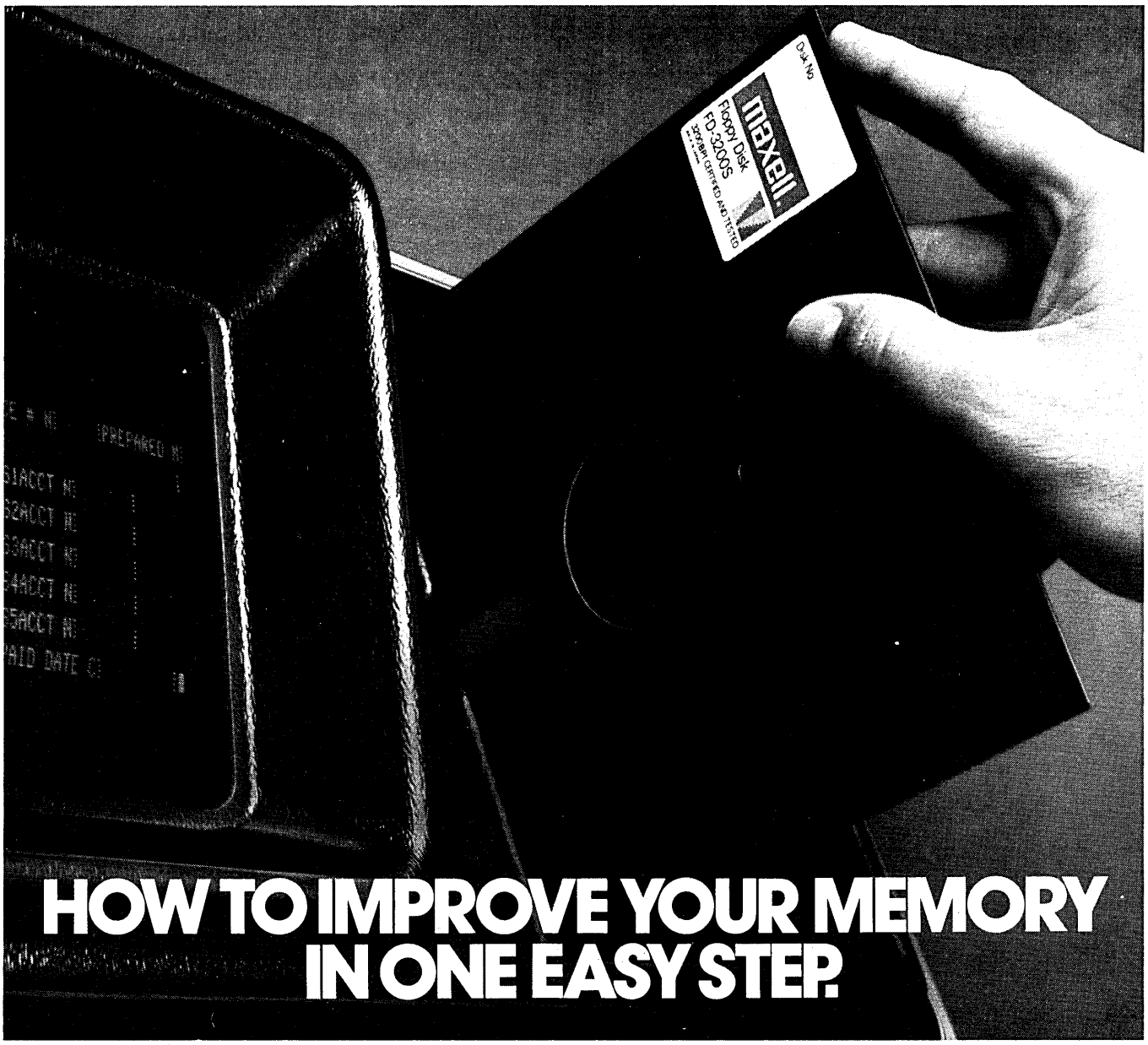
Both the "no-bill-back" contract and the 5,000-plus terminal purchase discount rate evolved from DEC's negotiations with AT&T last year, which culminated in the January contract in which AT&T signed for 5,000 DECwriters annually for three years. Now, in the light of background provided by DEC executives, it appears that DEC expects the Bell operating companies to purchase double the face-value volume of the contract, or 30,000 terminals over the three-year term. In fact, said DEC terminal product manager William Chalmers, the double-apparent-volume formula is the bottom line on "no-bill-back" contract.

The term "no-bill-back" refers to the elimination of a clause in the DEC component group's standard sales agreement whereby DEC holds the option of retroactively billing the purchaser at a higher price if the customer does not take the number of machines he was committed to purchase. DEC prices terminal products according to the purchase plans of large end users (or, as with oem's and resellers, expected sales goals), and then bills as the units are shipped to the purchaser; the bill-back clause is DEC's insurance policy.

WILLIAM CHALMERS
How DEC gave up its insurance policy

### For two kinds of customers

Although it is theoretically available to all purchasers, oem's and resellers as well as end users, the no-bill-back contract was developed specifically for two types of customer who have a history of large volume purchases, but are either incapable of committing themselves to a given volume because of decentralized purchasing, or are simply unable to risk retroactive billing (or re-

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troactive discounting) because their annual finance package is subject to government regulatory tariff review.

The first category, explains DECman Chalmers, includes numerous national and international firms with histories of constant terminal purchases in volume, but with no centralized buying, and policies that forbid any one department from committing other departments to buy.

The second category, which includes not only the Bell sisters and the independent telephone companies, but "hundreds, maybe thousands," of regulated businesses under the authority of local, state, national, and international rate-setting boards, have been legally and practically blocked from signing contracts that carried any risk of bill-backs that would change, even in a minor way, the financial package upon which they claimed tariffs. Consequently, they too were unable to claim DEC's volume discounts.

"So what we did," said Chalmers, "was to try to understand the tariffing problems and this other problem of decentralized corporations. We worked closely with our legal department and we came up with a plan: the no-bill-back contract.

The essense of the deal is a trade-off. The buyer accepts a discount set at approximately half the volume level they would commit for (if they *could* pledge company credit); and DEC, for its part, gives up its bill-back clause. Buyers pay more for an uncluttered contract.

AT&T, said Chalmers, was the first to sign a no-bill-back contract, but, since January, Digital has signed several others, "and they go from a large manufacturing company to an insurance-type company to a banking type company." In practice, he added, DEC has been very conservative in assigning the expected or potential volume figure for no-bill-back—the figure which is halved to get the actual discount level. When DEC gives up the bill-back, the buyer gives up the right to claim a higher discount on true volume, "but we do our homework on individual companies," said Chalmers, "and we believe we have almost no risk."

### "Public knowledge"

Chalmers claims the no-bill-back policy has been "public knowledge" since January, but in practice the existence of the new purchase policy seems to have been held in tight confidence—apparently for competitive advantage against other terminal manufacturers and DEC's own independent reseller network—until a DATAMATION item two months ago (June, p. 15) detailed the secret provisions of the AT&T contract. In April, for instance, Chalmers himself told executives at Carterfone Communications, one of DEC's largest leasing resellers, that DEC was then "considering" a new type of contract and "hinted that it might contain a no-bill-back type of clause," according to Carterfone marketing director Pat Houston. "It wasn't offered to me. He said it was a prospective arrangement, still up for internal committee review at DEC."

Chalmers, with the approval of AT&T, explained the nature and pricing of the previously confidential optional service clauses in the AT&T contract, describing the earlier report (on which AT&T at the time refused comment) as incomplete and misleading. Chalmers conceded that the Bell operating companies, which will purchase separately under the umbrella of the AT&T contract, can choose several options DEC's factory options integration; whole unit warranties; and small order/shipment alternatives—that had not and have not been made available to their normal resellers and other volume buyers. The options were offered at AT&T's insistence, he explained, in a competitive situation, "and while we gave them what they wanted, we expressed that we didn't want to do it in dollars."

### Pricing is high

The pricing for these extra service options, said Chalmers, is so high as to make them impractical for any buyer or reseller—and, in fact, the Bell companies themselves are not claiming these services. The surcharge-per-unit for DEC doing the terminal options-integration ($1000), handling small orders and shipments ($50), and accepting the whole unit back for warranty repair ($50) is high to begin with, he said, but becomes "wholly unrealistic" under the terms of the AT&T contract.

### The DEC plan

DEC has required that the purchasing Bell operating companies pay the surcharge on all terminals they *order* if they want any one of the optional services on any machine. (The DATAMATION story, which raised a furor among DEC's resellers, listed and priced the options, but did not explain that they were offered to the operating companies on an all-or-nothing basis.)

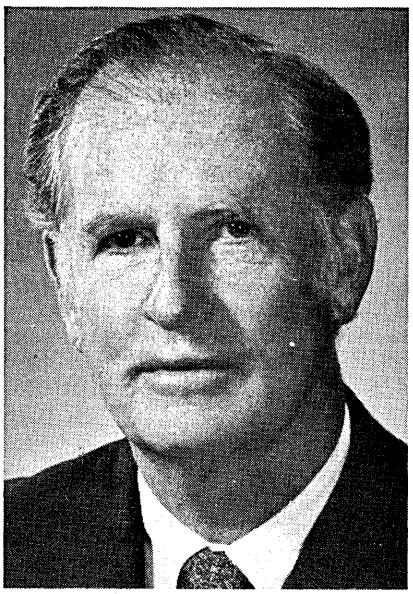
Because of the confidentiality clause in the contract, DEC previously had been unable to discuss or explain the widely rumored "extras" in the AT&T deal, said Chalmers. "Rumors are rumors and there has been very little I could do about them," he added forcefully, "but when the smoke clears, I can assure you that nothing was done by this company that was not morally and ethically correct . . . I'm an honest person. If you run the math out, you will quickly see that I have kept the faith and DEC has kept the faith (with the DEC resellers). There are no losses in that contract." **V.M.**

## James R. Bradburn

"He was one of two or three of the smartest students I had in eleven years of teaching at Cal Tech," said Philip S. Fogg of James R. Bradburn.

Bradburn, who died last month at his home in Mirror Lake, N. H., at the age of 66, was described by another associate from his early days in the computer industry, Bill Lonergan, now with Xerox Development Corp., as "a pioneering dp executive." Indeed he was one of the first, and Fogg had something to do with that.

"After he left Cal Tech, I persuaded him to go to Harvard Business School," Fogg said. Bradburn received an engineering degree from Cal Tech in 1931. He was graduated from Harvard Business School in 1933. Fogg's task at Cal Tech was to teach business subjects to engineers. He kept track of his prize pupil after he'd left school. "He was one of the finest young men I have ever known. After the war I persuaded him to join my company." That was Consolidated Electrodynamics, Pasadena, Calif., of which Fogg was president and which later was acquired by Bell & Howell.



KEITH MARTIN

JAMES R. BRADBURN

"He (Bradburn) was basically responsible for our investigation of computers. He started looking into computers in 1948," Fogg recalled.

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dated Electrodynamics, Bradburn held engineering positions with General Electric and Eastman Kodak, and served as a major in Army Ordnance.

Consolidated Electrodynamics spun off its computer operations, which was developing the Datatron computer, in 1953, as ElectroData Corp. Bradburn became president of ElectroData. "Bradburn recognized relatively early the value of concentrating on the commercial side of the computer market rather than on the scientific side," recalled John Alrich, who worked at ElectroData as an engineer and now is with Xerox Corp. "All State Insurance bought our first system."

Alrich also credits Bradburn with "bringing in (to ElectroData) one of the finest logic designers in the world, Dr. Ernst Selmer, now a professor of mathematics at the Univ. of Bergen, Norway."

**Burroughs acquisition**

ElectroData was acquired by Burroughs Corp. in 1956. "We put Burroughs in the computer business," said Fogg of the sale. In 1960, Burroughs underwent a corporate reorganization, ElectroData was folded into the overall corporate structure, and Bradburn moved to Detroit as corporate v.p. for manufacturing and engineering.

Ed McCollister, who was hired by Bradburn at ElectroData in 1954 and worked under him for five years, takes credit for Bradburn's next career move, to the RCA Computer Operation where he was v.p. and general manager from 1966 until early 1970.

"I was the key person in bringing him into RCA," said McCollister who was then marketing manager of that firm's computer organization. "I felt he could contribute to the success of the operation because of his excellent administrative abilities."

When Bradburn left RCA in 1970, the official line was he had "resigned because of pressing personal requirements." RCA insiders said at the time he was fired abruptly by Robert Sarnoff. Securities and Exchange Commission records indicate RCA agreed to pay Bradburn about $230,000 when he left.

**A consultant**

From 1970 until the time of his death, Bradburn operated as an independent computer industry consultant. At the time of his death he was involved in a consulting assignment for Systems Development Corp.

A native of Los Angeles, he operated his consulting business on both coasts. In addition to his Mirror Lake home, he maintained one in Santa Barbara, Calif. He was a member of the board of directors of Electronic Memories and Magnetics Corp.

A devout Christian Scientist, Bradburn also was an avid skiing enthusiast and outdoorsman. "Earlier this year," an associate recalled, "he had scaled the walls of the Yosemite Valley.

Bradburn is survived by his wife, King, a daughter, Mrs. John C. Schierholz, two sons, James H. and Kenneth, and eight grandchildren.

*Software Taxes*

## The Tax Fight Goes On . . . And On

For those fighting the big battle against imposition of sales taxes on computer software and services, particularly retroactive imposition, there's been good news and bad news and the waters are still muddy.

In New York, where the state has been auditing software and service com-


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panies based on rules adopted last Sept. 1, and occasionally levying retroactive assessments (May, p. 155), the state's Dept. of Taxation and Finance has said it will conduct an "informational hearing on the problems of the computer industry," on Aug. 23. The hearing will be held at the department's headquarters in Albany.

In a letter to interested parties, Thomas H. Lynch, Tax Commissioner, said the purpose of the hearing "will be to obtain information necessary to promulgate an industry regulation which will cover the application of the sales and use tax to various facets of the industry."

Robert Sherin, president of Nova Computing Services, Inc., Miami, who is fighting the New York assessments, was encouraged by the granting of a hearing. In a letter thanking Lynch and the commission for granting the hearing, Sherin requested "the opportunity at the hearing to know and to meet, with the weapons of rebuttal evidence, cross-examination, and argument, unfavorable evidence of adjudicative facts."

He said if his request isn't granted he will ask that the "Florida transcripts be read into the record." He was referring to transcripts of his successful legal battle in Florida to offset software sales taxes.

Sherin's firm and Informatics Inc., have filed petitions under New York State's Administrative Procedures Act protesting taxation on software sales. Informatics is seeking a revision of its "letter of determination," a state document indicating taxes are owed.

### No luck in Wisconsin

In Wisconsin, Mike Zeidler, an independent computer consultant, fought a clause in a state budget bill which would impose a 4% sales tax on software and dp related services, and lost. The budget bill, with the clause, was passed in late June and became effective Aug. 1.

Zeidler was alternately encouraged and discouraged during his fight. In early May, just after the bill, with the bothersome clause, was passed out of the Joint Finance Committee and on to the Senate, he wrote to the governor, members of the state Senate and members of the state Assembly congratulating them on their "win."

"This very day I have started to work to dismantle my business. It's all over. All that hard work. All that creative effort. All that hard effort," he wrote. "You won! You won big. I lost! I lost big."

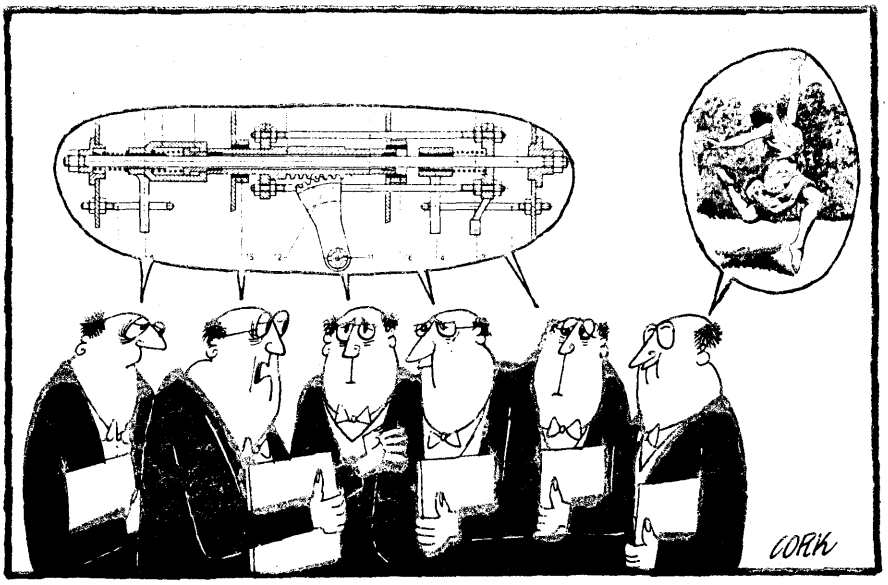
But, in early June Zeidler was more encouraged. The state Assembly on May 31 voted 80-19 to remove the 4% computer sales tax from the budget. "There appears to be more sympathy for the data processing industry in the state Assembly than there was in the state Senate," he said at the time.

But the lawmakers ultimately decided to include the tax "for reasons of consistency." State Rep. R. Michael Ferrall, assistant majority floor leader, said in a letter to Zeidler: "The sales tax law currently applies to some but not all sales of computer and dp services... This situation may lead to confusion as to what is and what is not taxed. This proposal would impose the sales tax more uniformly on dp services."

### The TI case

Another event seen as a setback in the fight against sales taxes was the overruling by a U. S. Court of Appeals in New Orleans of the Texas Instruments vs. U.S. case in which a lower court had ruled that TI could not claim investment tax credit for software because software is intangible. The earlier decision was a much used argument by those opposing sales taxes on software.

The Data Processing Management Assn., at a meeting in Florida in mid-





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CIRCLE 111 ON READER CARD

July, decided to get into the fight with funds. The move is the first by a user group. The Assn. of Data Processing Service Organizations (ADAPSO) has been in the fight since early last year. George R. Eggert, v.p., industry and government relations, will be spearheading DPMA efforts. Sherin will be working with him. "All my work is free," emphasized the Floridian.

Sherin sees the fight as "limited in scope . . . we shouldn't take on every state. I wouldn't want to take on California. The whole thing started there."

> "This very day I have started to work to dismantle my business. It's all over. All that hard work. All that creative effort."

But there are those in California who want to fight. "The fiscal problems of the states have, at least in part, been converted and transferred onto our industry," said Albert A. Eisenstat, v.p. and corporate counsel of Tymshare, Inc., Cupertino, Calif., at a recent meeting of the Computer Law Assn. in San Francisco to discuss taxation issues and problems.

"We are a ripe and ever-expanding industry," Eisenstat said, and various jurisdictions "are aggressively seeking ways to levy taxes on our industry's services to bolster sagging coffers."

To date, he said, state and local efforts often have been inconsistent or misdirected, and have been handled on an ad hoc, case by case basis. "Ultimately our industry will have to become more involved with legislative solutions" to these problems so that uniform ground rules and guide lines may be developed.

**—Edith Myers**

*Applications*

## Underwater Business

Back in 1958, a small group of divers in Lahaina, Maui, Hawaii, banded together under the name Maui Divers, practicing their skills for whatever income they could obtain.

Among the things they did then was finding underwater locales for Hollywood movie crews and providing technical help with the filming. During that time they discovered rich colonies of black coral in the Lahaina waters, 200 to 250 feet down. They brought some of it up and began fashioning crude jewelry that was an immediate success. But it was still small business. They hardly needed a computer.

In 1962, a young man named Cliff Slater joined the group. Over the years, ownership of the company changed hands and Slater became president. The company moved to Honolulu. Sophisticated jewelry manufacturing techniques were initiated. Maui Divers today is a multimillion-dollar a year business. Today they need and have a computer—an IBM System/3, Model 12, installed late last year.

Since the discovery of the black coral, Maui Divers has discovered supplies of gold and pink coral at greater depths, creating a need for another bit of modern technology—a specially engineered, two-man submarine, built for Maui Divers by General Dynamics Corp.

The sub makes more dives on a regular basis than all the rest of the world's civilian submarines put together. It harvests the coral using a hydraulic claw and clippers to snip the coral trees and store clippings in a wire basket in front of the vessel. Clippings are kept in the basket until the sub surfaces. The procedures, said Robert Taylor, v. p. of Maui Divers, have the endorsement of leading ecologists.

### Optimum use

When the sub surfaces, the clippings are carried from the pier to a production plant where the raw coral is sorted and inspected. When optimum use of each coral specimen has been determined, Maui Divers' technicians cut, polish, and mount the coral in a variety of rings, pendants, brooches, earrings, and special pieces.

"Our business has grown from 25% to 65% per year," said Taylor. "Having the resources to harvest our own gold and pink coral, and to buy large quantities of black coral from independent divers is just part of the story."

"Keeping close tabs on the manufacturing process, and doing the best possible job of processing orders and managing our inventories is the other part." That's where the computer comes in.

Maui Divers has been using some form of data processing since December 1965, when the firm signed up with a small service bureau. From December 1966 until May of 1969, its dp chores were handled by a Dura typewriter machine. Then, from May '69 until August '71, the job went to an IBM 403 accounting machine.

In August 1971 the company went back to a small service bureau and, as business swelled, went to a large service

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CIRCLE 54 ON READER CARD

bureau from November '72 until August 1973. That month Maui Divers acquired its first computer, an IBM S/3 Model 6. This was replaced by a Model 8 in August 1975 and by the current 12 last October.

### Cost justification

"We cost-justified each step in both applications development and computer acquisition," said Taylor. "We examined the alternatives of manual, service bureau, and our own computer processing options and, in addition, analyzed the financial benefits and the intangibles involved."

For fiscal year 1977, Maui Divers expects to spend $116,172 on data processing. Taylor said it would be very difficult to duplicate many of the firm's computerized systems. "However, assuming that all of the functions, including the invoicing, accounts receivable, sales analysis, inventory controls, purchasing, production scheduling, general ledger, and budget controls were to be done manually, a conservative estimate of the number of added people required would be in the range of 12 to 15. When you consider the office space, fringe benefits, calculators, and typewriters, and additional supervisory personnel, the cost is prohibitive."

In comparing costs of an in-house system against those of a service bureau, Taylor noted that one in-house programmer costs $1,000 per month while the same number of hours at a service bureau would cost about $4,200 per month. "In the past three years," he said, "we have done a considerable amount of system development and have, as a result, some very sophisticated systems. To develop the same with a service bureau would cost a great deal more."

Taylor did a monthly cost comparison, assuming service bureau programmers are twice as efficient but four times as costly as in-house programmers (he has a staff of five), and came up with $10,189 for the in-house computer against $13,350 for a service bureau.

"Each step in our manufacturing and distribution process is under computer control," Taylor said.

### Control for customers

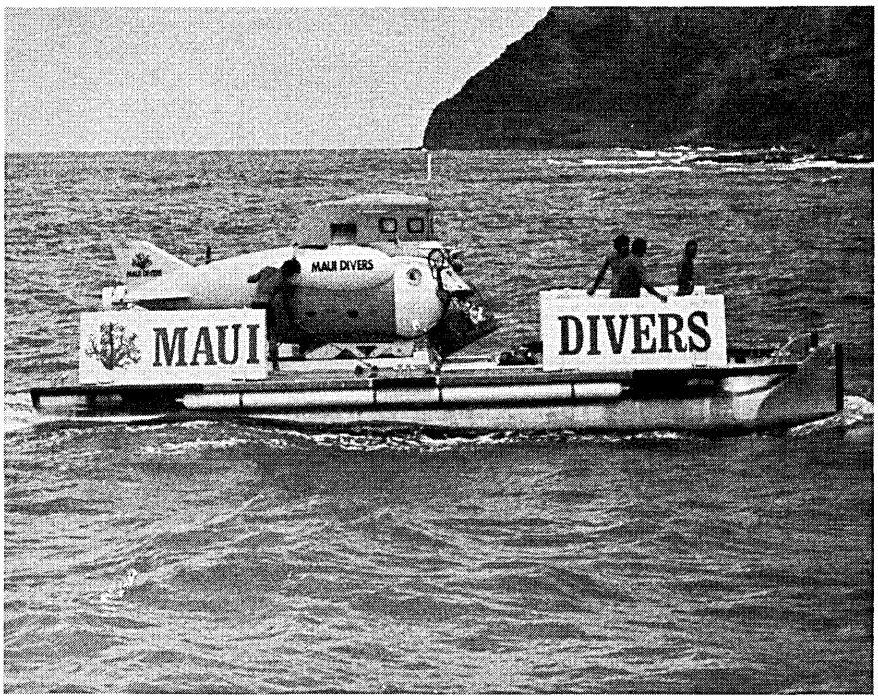
"In addition to maintaining constant control within our operations in Honolulu, we also provide inventory control for our customers, calculating a required inventory according to each customer's wishes so that each maintains a 98% in-stock condition on best selling items—an industry standard."

As a by-product of tight production and inventory control, Maui Diver's management can see at a glance daily which items are in high demand, peaking out, or in a decline.

"By using the management reports the computer spins off from its routine operations," Taylor noted, "we can stay one step ahead of the constant changes in taste of the jewelry buying public."

Maui Divers' integrated data processing applications tie production scheduling, invoicing, sales analysis, bill of materials processing, customer and company inventory analysis, purchasing, and accounting into a continuous process.

And, in the meantime, the company's minisub pilot, Bohdan Bartko, is setting a new world's record—the most dives in a civilian, commercial submarine—every time he goes to work. **—E. M.**

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## News in Perspective
# BENCHMARKS . . .

**Buy, Don't Lease: IBM** has spent considerable money training its salesmen to push purchases, not leases, to customers and it's paid off. Its net income in the second quarter of 1977 soared to an 11% increase over last year's same period, considerably better than the 5.3% rise in the first quarter, which many analysts called a disappointment. Its record income of $658.3 million in the second quarter was due to a "substantial" increase in outright purchases of computers, according to IBM chairman Frank T. Cary. **NCR** second quarter revenues rose 13% to $627.8 million from $556.3 million and its second quarter profit soared 86% to $34.4 million, compared with $18.5 million a year ago. **Control Data Corp.'s** computer industry revenue in the second quarter rose 10% from $335.1 to $369.8 million. Total earnings of Control Data soared 26% to $14.6 million. **Honeywell, Inc.,** claiming "substantial" improvement in its computer business—about 17% ahead of a year earlier—said they contributed to the company's 60% earnings increase of $27.2 million, from $17.1 million in the same quarter a year ago. Sales were up 17.5% to $705.2 million, from $600.6 million a year earlier. **Sperry Rand Corp.,** whose fiscal year ends next March 31, said it expects revenue from orders for its computers to rise about 15% over the previous year. Its Univac division last year had revenues of $1.44 billion out of Sperry's total revenues of $3.27 billion.

**IBM's Buy of IBM Cleared:** Directors of International Business Machines have authorized the corporation to purchase "from time to time" blocks of its own capital stock, "generally of 5,000 shares or more." Such blocks would be most likely to be offered by institutional investors. IBM said it would buy only through direct transactions with "principals who aren't brokers or dealers" and who offer the stock at no more than the current market price. Purchases were authorized up to the lesser of 2,500,00 shares or $700,000,000 gross purchase price. Last February IBM made a general offer to pay $280 each for as many as 5.5 million shares, then at a 3.6% interest. However, the bid drew a total of 2,567,564 shares, which cost IBM some $721 million including expenses.

**An Answer in Kind:** IBM's reaction to the success of Amdahl Corp. was to lower prices. It was answered in kind by the Sunnyvale, Calif., manufacturer, which instituted a 29% price reduction to its customers. Despite this the company posted record revenues of $45 million in its second quarter, during which all but one of the 13 systems recorded as sales were at the lower prices. Pretax income was $12.2 million, and that was 13% above the first quarter's income and 584% over the comparable 1976 period. In the first half of this year, Amdahl had revenues of $83 million, already 90% of what they had in all of last year, and the pretax income of $23 million is 96% of the 1976 total.

**Better Things Ahead:** Eugene R. White, president of Amdahl Corp., told security analysts that the big computer maker expects to increase shipments, improve product margins, and start on further production capacity expansion during the current half-year. He said the company "expects gross margins before operating costs in the third and fourth quarters to be somewhat greater than those in the first two quarters." Gross margin in the second quarter, White reported, was 45.4% compared with 44.3% in the first quarter. He attributed the second quarter improvement to volume efficiencies, reduced component cost, and the company's increased involvement in manufacturing.

**Longer Delivery Cycle:** Shipping dates for Honeywell's 66/85 announced early this year (March, p. 152) have slipped from third quarter '77 to sometime next year. The company, which didn't specify a month or a quarter, confirmed the fact that circuit packaging problems have caused the delay. A company spokesman said the production problems stem from the micropackaging of the Common Mode Logic (CML) chips used in the new machine, Honeywell's biggest yet. Honeywell claims yielded gate speeds for the CML chips of five to seven times faster than Transistor-Transistor Logic (TTL)) circuitry. The chips are produced by Honeywell at its Solid State Electronics Center in Colorado Springs and are second-sourced by Nippon Electric and Texas Instruments. The micropackaging of the chips is done in Phoenix. Details of the micropackaging problems were not disclosed.

**Revamped Reality:** In the wake of an announcement by Richard Pick, president of Richard Pick and Associates, Irvine, Calif., that he was marketing a more powerful version of Microdata's Reality small business computer system, Microdata said it will do substantially the same thing. Pick was chief designer of the Reality system and says he retains rights to the software. He was a consultant to Microdata until last December. Microdata said it has revamped Reality into a new series called Reality Royale with doubled memory capacity and faster throughput. Pick had said he was going after a market above that addressed by Reality for Reality II and Basic Reality. His firm is buying Microdata 1600 small computers on an oem basis and combining them with Ampex core memory, California Computer Products disc drives, and TEC crt's.

**Win Some, Lose Some:** Memorex Corp. completed one merger and lost out on another when merger talks between the Santa Clara, Calif., firm and Storage Technology Corp., Louisville, Colo., broke down. The completed merger was of Business Systems Technology, Inc., Santa Ana, Calif., into Memorex. BST makes storage equipment for small business systems. In an official announcement of the termination of the merger discussions between STC and Memorex, STC president Jesse Aweida said, "After giving careful consideration to all the terms and conditions, the board of directors of Storage Technology concluded that proceeding further with the merger discussions would not be in the best interests of Storage Technology and its shareholders." Under terms of the Memorex offer, STC would have been merged into Memorex on the basis of .725 shares of Memorex common stock for each share of Storage Technology Stock. There was some speculation that STC felt it was worth more than that, also that the merger was unpopular within STC and the company felt resignations might be the result of its consummation.

**Make the Punishment Fit the Crime:** Sen. Abe Ribicoff (D.-Conn.) and seven co-sponsors have introduced legislation which would make misuse of the computer systems of the federal government, financial institutions, and electronic funds transfer systems a crime, punishable by 15 years in prison, a $50,00 fine, or both. Sen. Ribicoff said the new legislation is necessary because the laws have not kept pace with rapidly changing computer technology. He said it would give federal prosecutors a weapon against four main categories of computer crime: introduction of fraudulent records or data into computer systems; unauthorized use of computer-related facilities; alteration or destruction of information on files; and stealing money, financial instruments, property, services, or valuable data, whether by electronic means or otherwise. "The simple fact is," said the senator, "that computer technology has created vulnerability to white collar crime. The bill is designed to provide criminal sanctions at all points where computer operations are targets for criminals." *

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RAYTHEON

# LOOK AHEAD

(Continued from Page 16)
York user touts features like the high speed (up to 92 characters per second) ink jet printer, diskette storage, and good price performance compared to other systems he's evaluated. Drawbacks? The small screen and lack of numerical processing capabilities are mentioned, but users still give the system high marks overall.

WESTERN UNION: ADDING SATELLITE MUSCLE

Western Union, generally considered an unlikely rival of the fledgling Satellite Business Systems, may end up giving IBM's satellite venture an unexpected dose of competition. As evidence of this, communications insiders point to the added satellite service muscle the carrier could build from a repeal of Section 222 of the Communications Act. Criticized for many years for being too restrictive on international record carriers (IRC), a repeal of the antiquated provision would open up more business to these carriers and would particularly benefit WU, which is vigorously pushing for full service use of its satellite.

The big guns in Congress heading up the repeal drive are Hawaii's Sen. Daniel Inouye and Alaska's Sen. Ted Stevens--both of whom have communications oversight responsibility and both of whom represent states which, under the law, are illogically considered to be international points. Counting on this congressional clout as well as FCC support of a repeal, WU also has its sights set on another strategy to expand its satellite service base. That strategy is aimed at bringing NASA back into the communications satellite fold. Once in business again, sources close to WU say the company would then inherit NASA's Advanced Technology Satellite customers.

IF THE LEFTISTS WIN IN FRANCE

What will happen to American multinationals in France if the leftists take over in the political elections next spring? Observers who watch the scene closely say there's a long list of companies that will be pushed out--either amicably or forceably, depending on French-American relations at the time. But IBM isn't thought to be on the list, and CII-Honeywell Bull won't be affected immediately because the government already has a piece of the action. The future of Honeywell's interest in the company, though, is up in the air. France already has toughened its stance with U.S. computer firms, exemplified by its refusal to allow Digital Equipment Corp. to build a plant there--to protect its own minicomputer industry plans--and its constant disapproval of marketing deals struck between U.S. and French firms.

A leftist takeover isn't the certainty today that it was a few months ago, according to these observers, because of party bickering and the supposed poor health of standard bearer Francois Mitterand. Two things are clear, though: France will enjoy a strike-free period until the spring elections; if the Left loses, all French industry, including data processing, will then suffer the most strike-bound era in history.

A LITTLE MORE ATTENTION

The disturbing idea that growing data protectionism around the world--via developing privacy legislation and conventions--will block the flow of data across borders is stirring a little more notice in U.S. government circles (June, p. 115). Industry finally may have a conduit for its opinions via the State Department and an Advisory Committee on Transnational Enterprises. State's task force on transborder data flow gave up on the idea of setting up a new advisory committee because of President Carter's tough edicts against them, and went to the transnational group with the problem. A subgroup, headed by Hugh Donahue of Control Data Corp., is being formed and should have its first meeting in September.

RUMORS AND RAW RANDOM DATA

Vendors are trying to figure out the costs of a tax proposal that would tax as income any company-paid expenses to an American employee working overseas. One vendor, feeling it would have to compensate the employees somehow for the added taxes, figured it would have spent $1 million last year, based on its sales of $300 million abroad...."Computer Embezzlement" was the intriguing headline for a classified ad in a recent Wall Street Journal, but Steve Perkins of San Francisco, who placed the ad, is not an embezzler. The former CPA said he's seen few systems in many years of auditing computer systems that are not vulnerable to embezzlement, and he wants to help companies detect and/or prevent it--all for $8 per hour.

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**Batch, but only batch.**
There's no denying the demand for on-line services. (Look how some of the remote computing services have prospered.)

So there's the problem of adding a timeshare capability. At low cost, so you can offer a low-cost service. But with the capability to grow with your business.

There's the problem of security for proprietary software and data. The problem of delegating control of system resources, without losing overall control. The problem of accounting for system use—especially use of added-value software. And the problem of knowing what is happening anywhere in the system, at any time.

Solving these problems could make you successful in timeshare as well as batch.

**Remote, but losing business.**
For remote computing services, keeping customers is often the biggest problem.

After a time, many customers begin to feel they're putting out too much money for your service. They check out your competitors. Or think about an in-house system.

Finding a way to extend your services downward in cost could turn your biggest problems into even better customers.

**Small, or just starting out.**
You may already have a small timesharing company. Or you're planning to start one. Your first problem is finding a computer you can afford. One that's also a real timesharing computer. With the management features the big timeshare computers offer.

Solving this problem could make your small company a big success.

**Problems solved here.**
These problems you're facing in your firm, timeshare or batch, large or small, can be solved with the computer made by us:

Basic Timesharing, Inc. We're the computer manufacturer with timeshare experience. We understand the unique problems of your business.

And that's what has helped us produce a computer so uniquely right for the timesharing business.

The BTI 4000 Interactive Timesharing System.

**A remote computer's computer.**
The BTI 4000 was built from the drawing board up for timesharing. To maximize operational capabilities. To minimize operating costs. To give you more.

You can start for just $35,950. For that you get a ready-to-go system with 10 megabytes of storage and 8 ports—just add terminals.

You also get BASIC-X, an unusually powerful extension of the BASIC user language, enhanced for business programming.

You get hierarchal account organization, allowing you to "sublet" portions of the system. Which lets you earn income without overhead, while still maintaining total control.

You get protection for your proprietary software that allows *you* to sell systems with your software on them—and still keep your software proprietary.

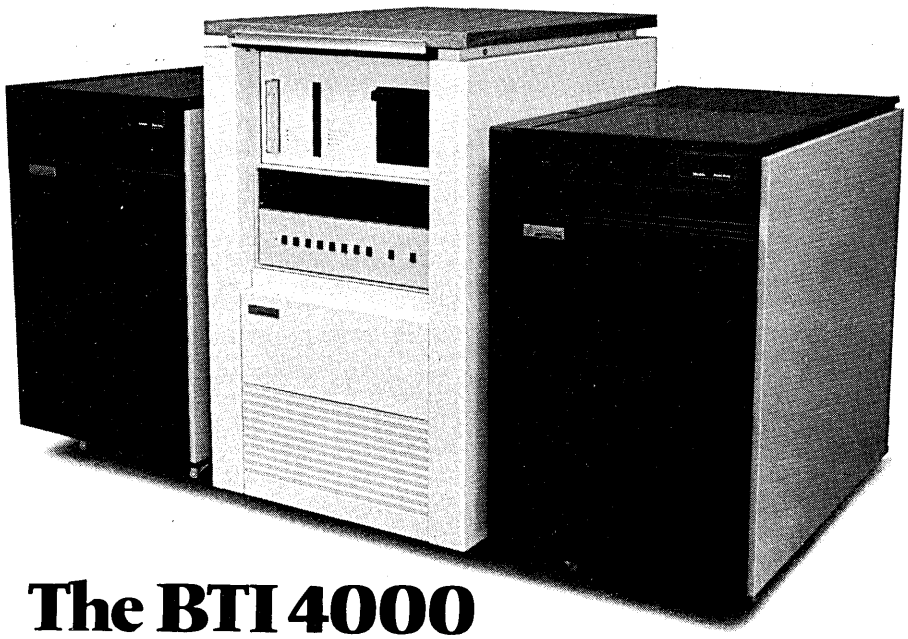
You get continuous system availability, because software housekeeping can be performed with users on-line.

You get room to grow, because the BTI 4000 is a modularly-expandable system. Add disk storage to 400 megabytes; expand user capacity to 32 ports; add peripherals like industry-compatible magnetic tape and a line printer.

And you get around-the-clock, on-line support for all your systems, no matter where they're installed.

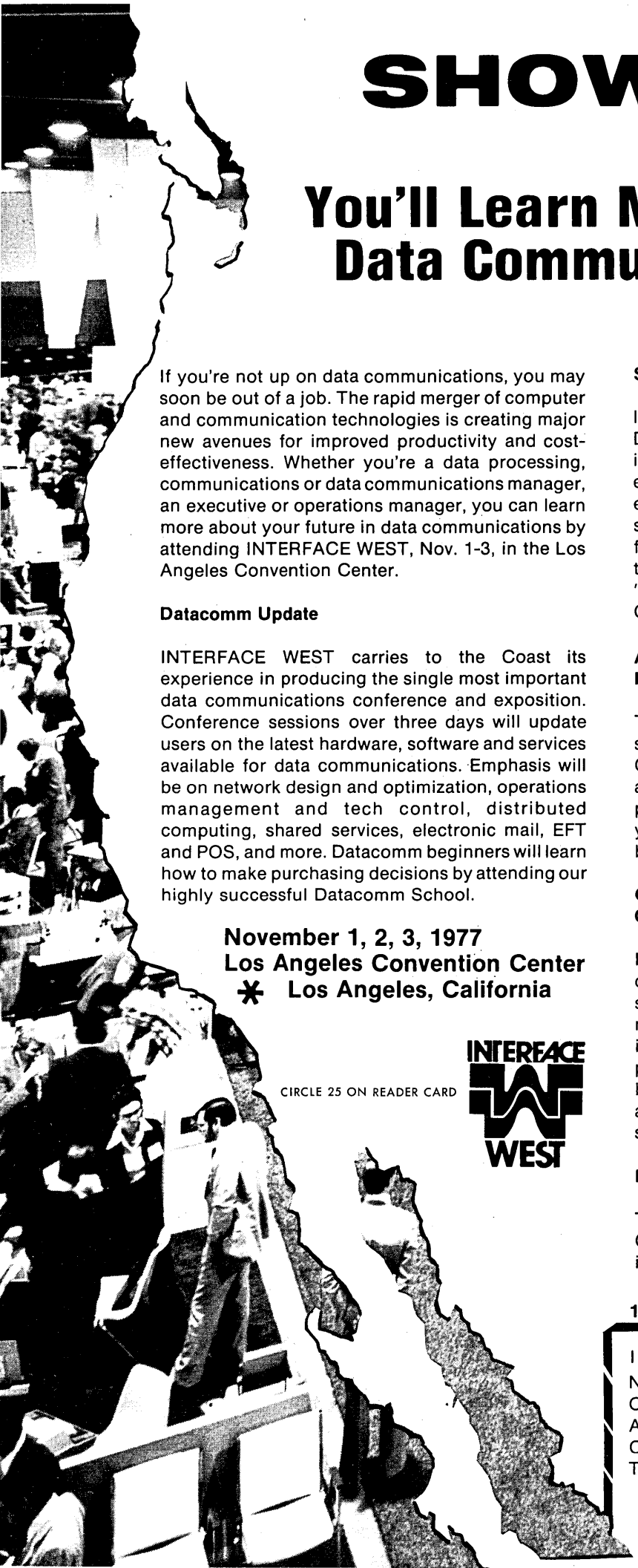
The BTI 4000. To help you get more timeshare business, and keep the business you have.

Get the complete details today.



## The BTI 4000 Means Business.

**Basic Timesharing Inc.**, Headquarters: 870 W. Maude Avenue, Sunnyvale, CA 94086. Sales Offices: East: Cherry Hill, NJ (609) 662-1122; Midwest: Minneapolis, MN (612) 854-1122, Chicago, IL (312) 298-1177; West: Sunnyvale, CA (408) 733-1122, Anaheim, CA (714) 533-7161



# SHOW UP*

## You'll Learn More About Data Communications

If you're not up on data communications, you may soon be out of a job. The rapid merger of computer and communication technologies is creating major new avenues for improved productivity and cost-effectiveness. Whether you're a data processing, communications or data communications manager, an executive or operations manager, you can learn more about your future in data communications by attending INTERFACE WEST, Nov. 1-3, in the Los Angeles Convention Center.

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INTERFACE WEST carries to the Coast its experience in producing the single most important data communications conference and exposition. Conference sessions over three days will update users on the latest hardware, software and services available for data communications. Emphasis will be on network design and optimization, operations management and tech control, distributed computing, shared services, electronic mail, EFT and POS, and more. Datacomm beginners will learn how to make purchasing decisions by attending our highly successful Datacomm School.

**November 1, 2, 3, 1977**
**Los Angeles Convention Center**
*** Los Angeles, California**

CIRCLE 25 ON READER CARD

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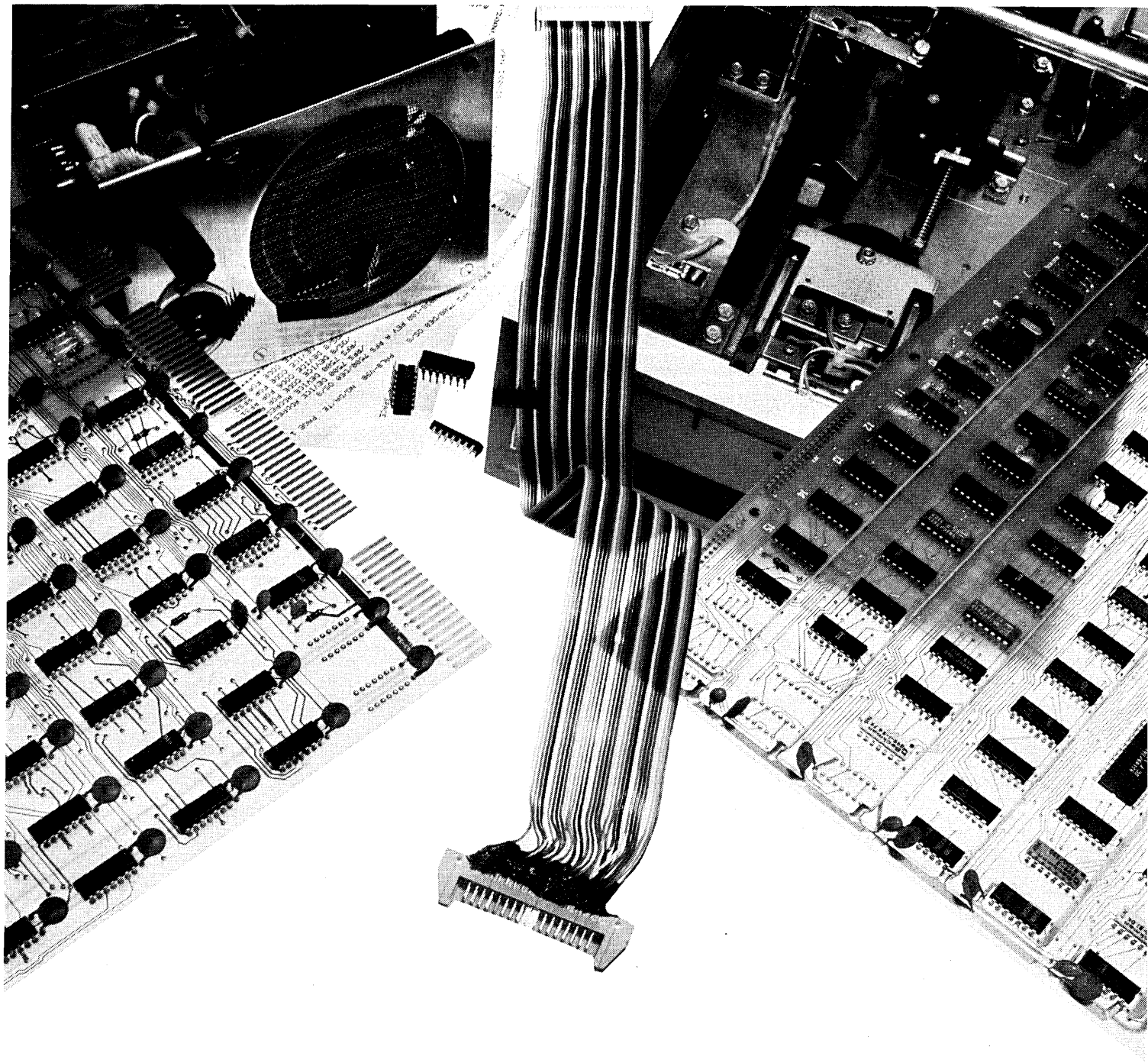
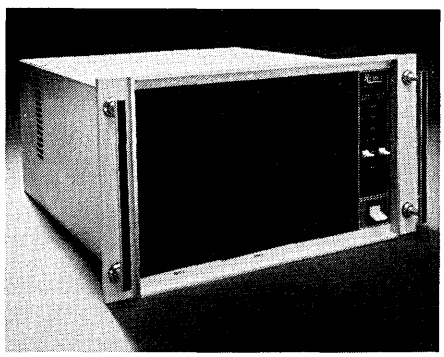


# DON'T GO TO PIECES. GO TO REMEX.

A cost/effective OEM flexible disk system can't be pieced together—hardware from one source, firmware from another, software from a third. Getting optimum performance at a low unit price requires design control to eliminate redundancy and volume production to reduce cost.

That's why Remex offers the RFS7500 Flexible Disk System—a complete system designed and built by Remex—including one to four Remex drives, a microprocessor based controller/formatter, software and interfaces for most major minicomputers plus power supply, cable and rack mountable chassis. The RFS7500:

☐ expands data capacity through implementation of IBM3740 format or a user selectable 1, 2, 4, 8, 16, 26 or 32 sector format. ☐ saves computer time by data block transfer of from one to 65K 2-byte words on a single command from the host. ☐ reduces core memory requirements due to automatic track and sector search and auto-initializing without software. ☐ simplifies operation and system integration by 8-command structure. ☐ saves space by housing interface card in the system chassis in some configurations. ☐ speeds access through 6 ms track to track speed plus unit select.



Ex-Cell-O Corporation

REMEX DIVISION

The Remex RFS7500 is a better system at lower cost than the OEM can build himself or buy from a minicomputer manufacturer or second level supplier. Don't go to pieces, go to Remex, 1733 E. Alton St., P.O. Box C19533, Irvine, CA 92713 (714) 557-6860.

CIRCLE 49 ON READER CARD

# hardware

## Off-line

Three firms are trying to make it easier for logic designers to get custom integrated circuits. The latest in the Master Logic Corp., Sunnyvale, Calif., family of semi-custom CMOS chips, the Master Logic 200 has a capacity of 200 gates of random logic, or about 50 counter stages. Prototyping takes eight weeks and costs $6,600. Production prices range from $7 to $17 depending on quantities and packaging requirements.

Interdesign, Inc., Sunnyvale, Calif., offers a 262-gate monochip. Developed in collaboration with Fairchild Semiconductor, the chip uses N-channel, silicon-gate, isoplanar technology. The vendor says the process is more efficient than $I^2L$. The tooling charge is a constant $2,800, and the first 50 prototypes take four weeks.

A few hundred miles south of Silicon Gulch, the Microelectronic Products Div. of Hughes Aircraft Co., Newport Beach, Calif., will manufacture custom LSI circuits. The new technology, called Schottky Cell Array Technology (SCAT) uses a custom interconnection process to configure LSI circuits from a library of standard MSI and SSI Schottky TTL cells. All cell designs are based on the industry-standard Schottky devices of the 54 LS series. The interconnection method used is a multilayer metallization process that uses two additional layers of thin film metallization; the desired logic function is implemented in a manner similar to the routing on a two-layer printed circuit board. Development of prototypes typically takes 10 to 12 weeks at a price of roughly $10,000.

Transistors provided a quantum jump in processing speeds and now, according to the Lead Industries Assn., Josephson Junctions promise a similar increase in performance. The superconducting devices, fabricated by IBM using a lead/indium/gold alloy, are said to operate 10 to 100 times faster than equivalent transistor-based circuits. An experimental device produced by IBM containing 50 Josephson circuits is said to perform multiplications in about 12 nanoseconds.

Oops...In our description of Artisan Electronics' Microcalculator (June, p. 209), the device's add time was given as 690 msec, nearly an order of magnitude slower than the device's true add time of 90 msec.

### Hobby Computers

As soon as the hobby computer market took off, we began hearing rumors that the large electronic kit retailers were just about to unveil hobby computers of their own. Now Heath has entered the market with two computers and a line of peripherals. Heath's two computers, the H8 and H11, are built around the 8080A microprocessor and DEC's LSI-11, respectively.

The H8 has an intelligent front panel with octal data entry and display, and a resident monitor with a built-in bootstrap for program loading. It has 1KB of ROM which contains the monitor program for front-panel control and load-dump operations. The cabinet is configured for 32KB of memory, with a total capacity of 64KB of addressable memory. The H8's bus is designed around a ten-slot mother board that uses 50-pin connectors. Convection cooled, the power supply can handle up to 32KB of memory and two I/O interfaces. The mail order price of $375 includes a fully wired and tested cpu and assembly and operations documentation, as well as all systems software in audio cassette form. Memory and I/O accessories include an 8KB board with 4K of static RAM ($140), a 4KB expansion chip-set ($95), a serial I/O interface board with 1200 baud audio cassette interface ($110), and a three port parallel interface ($150).

For users with more demanding applications, the H11 comes with a 16-bit LSI-11 cpu (fully wired and tested) and 4K 16-bit words of memory. Memory is expandable to 20K words. The unit has a built-in back-plane and power supply with switching regulators. A complete DEC system software package, which includes an editor, PAL-11 assembler, on-line debug package (ODT), I/O executive, BASIC, and FOCAL comes with the H11. The mail order price for the H11 is $1,295. Accessories include a 4K by 16 static RAM board ($275), serial interface ($95), and parallel interface ($95).

The company also markets a 12-inch crt ($530, kit), a paper tape reader/punch ($310, kit), and DEC's LA36 DECwriter II. HEATH CO., Benton Harbor, Mich.

### Distributed Processing

This vendor has topped its current line of distributed processing systems with the System IV/90, which offers faster cpu speeds, an expanded instruction set, and up to 192KB of memory. Supporting up to 32 video terminals, the IV/90 cpu operates at speeds from two to eight times faster than previous processors in this vendor's line. The IV/90 supports disc storage up to 270MB, printers with speeds from 30 cps to 1,800 lpm, both seven and nine-track mag tape, and card readers. Software developed for earlier models in the product line will run on the IV/90.

An intelligent communications controller, the model 8437, was introduced with the System IV/90. With its own processing unit and up to 16KB of memory, the 8437 supports both binary synchronous (BSC) and Synchronous Data Link Control (SDLC) network disciplines.

Monthly rental for a IV/90 with 12 1,920-character displays, a 192KB processor with decimal arithmetic, two 67.5MB disc drives, a 600 lpm printer, and the 8437 communication controller is $3,387 on a 42-month lease, including maintenance, software, systems engineering support, and systems education services.

A transaction-oriented software package, Vision provides system source data entry, on-line inquiry and retrieval, local data management, report and document generation, and batch communications. It runs on the vendor's IV/40, IV/50, IV/70 and IV/90 processors with 96KB of memory. Using IBM 3270 protocol, Vision communicates interactively with host mainframes. Information from local files and a central data base may be accessed for display, data validation, or direct record entry. This exchange of data may occur under operator control or automatically through format commands. Data also can be exchanged in batch mode with a host mainframe using IBM 2780/3780 protocol. Vision will be provided free of charge with the vendor's distributed processing systems beginning in September. FOURPHASE SYSTEMS, INC., Cupertino, Calif.
FOR DATA CIRCLE 286 ON READER CARD

### CCD Mass Memory

The CCDISC is a disc that doesn't rotate, according to its manufacturer. Using charge-coupled devices (CCD's) the unit has an average access time of 250usec. Capacities range from 128KB to 1,024KB in 128KB increments. Through daisy-chaining, capacities of up to 4MB can be achieved. The solid state memory is suitable for fast buffer,

# Some of the biggest mainframes use the smallest tape drives.

# Here's the number one reason.

## 1.

Over 2000 Wangco Mod 12 Tape Drives are in use today in mainframe applications around the world. The Mod 12, a low cost, 75 ips tape transport, measures only 24″ x 19″ x 19″.

What makes this compact tape transport the No. 1 choice for big computer jobs?

The Wangco Mod 12 with vacuum column design provides the super gentle tape handling required in high duty cycle operation. It has Autoload, a feature which permits control of rewind/unload by software as required in large systems.

Equally important, the Wangco Mod 12 is "ruggedized" to operate in mainframe data processing applications, even those requiring continuous operation up to 20 hours per day. Entirely enclosed in a steel chassis, the unit meets critical environmental and RFI specifications, reduces acoustic levels to NC55 and meets the stringent vibration and shock requirements of mainframe applications. The Mod 12 is UL and CSA approved.

In all applications, mainframe or mini, the Wangco Mod 12 will provide 75 ips forward and 200 ips rewind speed with no program restrictions. Data densities to 800 cpi NRZI and 1600 cpi PE are achieved individually or in switch selectable dual density.

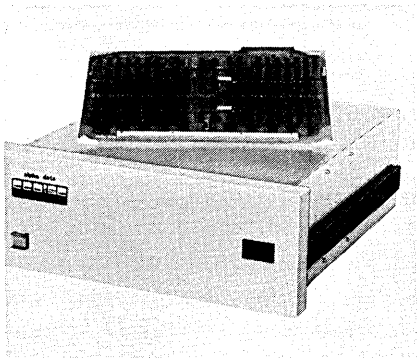
There are more good reasons to choose the Wangco Mod 12. Get full information from Wangco, Inc., 5404 Jandy Place, Los Angeles, CA 90066. (213) 390-8081. In Europe: P.O. Box 7754, Building 70, 1st floor, Schiphol-OOST, Netherlands. Phone: (020) 458269. TWX: 844-18822 WANGCO NL.

WANGCO

PERKIN ELMER DATA SYSTEMS

CIRCLE 39 ON READER CARD

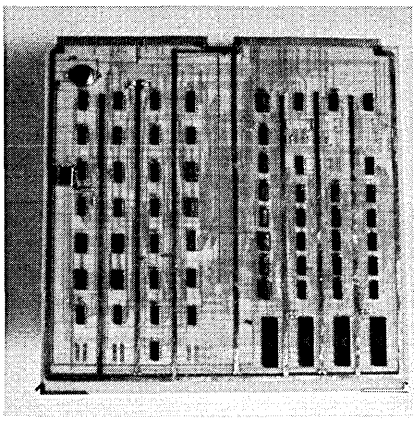
# hardware



paging, scratch pad, program swapping, time-sharing, and distributed processing applications. The unit interfaces to Data General computers and DEC's PDP-11. Interfaces for other computers, including DEC's LSI-11 and IBM's Series/1, are in the works. In quantities of 6 to 10, a 128KB CCDISC sells for $4,000; a full megabyte unit is $17,000. Since CCD's are volatile, the manufacturer offers an optional battery back-up capable of maintaining the integrity of a full megabyte for 30 minutes, for $150. Deliveries for Data General-compatible units are quoted at four weeks; PDP-11 compatible units take six weeks. ALPHA DATA INC., Chatsworth, Calif.
FOR DATA CIRCLE 295 ON READER CARD

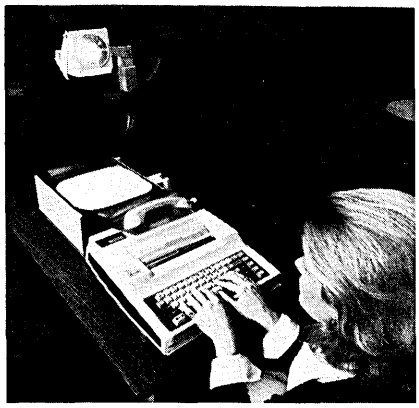
### Multiplexor

The AMS-4000 is a four port multiplexor capable of interfacing four RS-232-compatible devices to Data General Novas and Eclipses. The 15″ x 15″ board is said to work with most Data General emulators. Each port has its own address and selectable data rate from 110 bps to 9600 bps. In small quantities, the AMS-4000 sells for $600; a two port version goes for $500. APPLIED MANAGEMENT SYSTEMS, Whittier, Calif.
FOR DATA CIRCLE 292 ON READER CARD



### Thermal Film

To help firms making computer-assisted presentations, this company has developed a thermal image film that rapidly converts printout from non-impact terminals to visuals for overhead projection. The thin, light blue, infrared transparency film can be used in place of thermal paper in non-impact terminals. Instead of paper printout, it produces a transparency for immediate overhead projection; no processing, cutting, or framing is required. A carton of six 15-meter rolls sells for $150. 3M CO., VISUAL PRODUCTS DIV., St. Paul, Minn.
FOR DATA CIRCLE 300 ON READER CARD



### Color Graphics

A color desktop computer with graphics capabilities, a color graphics terminal, and software which supports English, Arabic, Farsi, and other character sets have joined this company's line of color terminal products.

The Intecolor 8031 is an 13-inch, eight-color desktop computer which carries a $5,495 price tag. It offers eight independent background and foreground colors and vector graphics. A standalone microcomputer system, the 8031 supports a high-level BASIC language. In its standard configuration the unit has 27KB of memory (expandable to 64KB). It also comes with front-mounted single disc and "floppy tape" drives. It can communicate at speeds of up to 9600 bps. The 13-inch screen displays 48 lines of 80 characters, and offers graphics resolution of 160 x 192-elements.

The Intecolor 8013 color graphics terminal, built around an Intel 8080 microprocessor, comes with RAM refresh memory, a separate keyboard, RS232C interface, graphics hardware and software, and a choice of 64 special characters. It displays 48 lines of 80 characters on its 13-inch screen. Space is provided for inserting a single "floppy tape" and mini disc drive combination for additional storage. The basic unit sells for $3,495.

This vendor also has developed a keyboard operating system for its existing Intecolor 8001 color terminal which allows English and numerals to be entered from left to right, while automatically switching to right-to-left input for Arabic, Farsi, and other languages used in the Middle East. Developed by the firm's Middle East Engineering staff, the software and terminal will be priced at under $5,000, according to the manufacturer. INTELLIGENT SYSTEMS CORP., Norcross, Ga.
FOR DATA CIRCLE 287 ON READER CARD

### Plotter

The 7221A Graphic Plotter can draw in four colors on its 11″ x 17″ bed. The microprocessor-based plotter has an RS232C interface and can accept data

# product spotlight

### Personal Computer

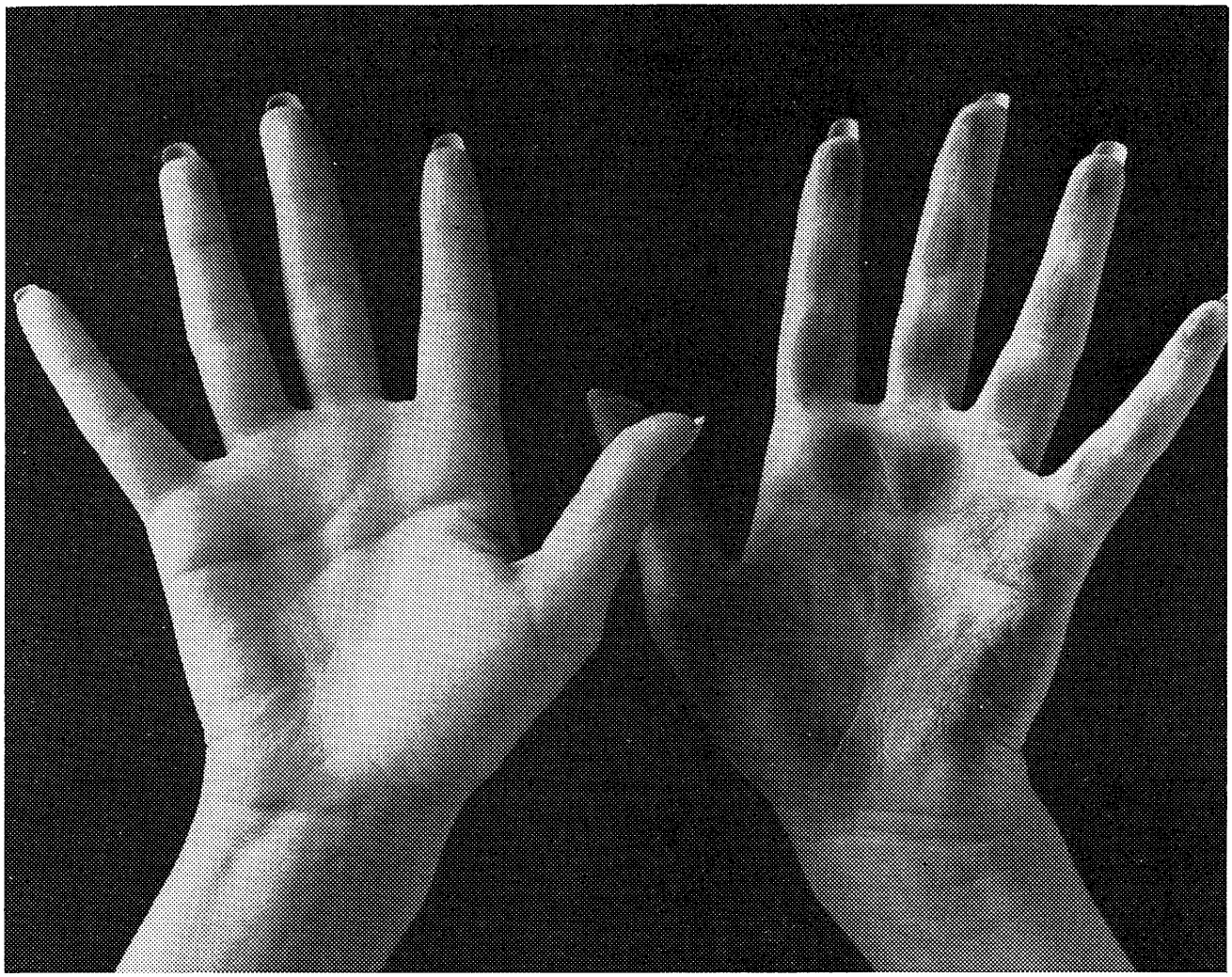
When home computers came on the market several years ago, they typically sold for $500 or $600 assembled, and that was just for the processor. Today there's the PET (Personal Electronic Transactor), a $595 home computer complete with keyboard and crt display, 4KB of user memory, cassette tape, and an operating system with BASIC interpreter. An 8KB PET sells for $795.

The nine-inch black and white crt displays 1,000 characters arranged as 25 lines of 40 characters. The character set consists of 64 standard ASCII characters and 64 graphic characters.

Fourteen KB of ROM contain system software. The BASIC interpreter, which handles strings, integers, and multiple dimension arrays, occupies 8KB. Supporting multiple languages and providing access to machine language, the operating system takes up another 4KB. The operating system also supports named files. The remaining 2KB of ROM contains a diagnostic routine and a machine language monitor.

User memory can be expanded up to 32KB. An additional cassette drive may be added through a built-in interface. A telephone interface system, an IEEE interface, and a floppy disc drive will be made available, according to the vendor. The IEEE-488 instrument interface allows multiple intelligent peripherals. A user-controllable eight-bit port is built-in to allow "do-it-yourself" attachments, such as music synthesizers, speakers, or a light controller. The vendor says it will fill orders within 90 days. COMMODORE INTERNATIONAL LTD., Palo Alto, Calif.
FOR DATA CIRCLE 285 ON READER CARD

# When it's printout forms you handle all day, there are only two ways to have them.



# Moore or less.

**Introducing Moore Clean Print® CPO. Convenient, clean, carbonless.**

Now you can make copies without making messes. Moore patented Clean Print forms provide the last word in total processing efficiency and overall economy.

**Clean.** With Clean Print, there's no carbon removal, no disposal. The printout image is clean, too, so you can forget smudges and hammer shadows. This new nonglare Moore paper is specially coated to enhance legibility.

**Convenient.** Thanks to the new body and smoothness of the Clean Print paper, you get the triple benefit of trouble-free feeding, refolding, and decollating. And excellent copies, right up to six parts.

**Economical.** Clean Print is 100% usable product; up to 21% of conventional three-part forms is carbon paper, and must be shipped, stored, removed, and disposed of. Somewhere.

Clean Print is ecologically and economically sound and is available off-the-shelf for immediate shipment.

**Compatible.** Clean Print carbonless paper has been tested successfully on just about every commercially available printer. We invite you to test it on yours.

**Clip this.** If you've had it with carbons, it's time you learned more about Clean Print. Just send us this and you will.

Moore Business Forms, Inc.
1001 Buffalo Avenue
Niagara Falls, N.Y. 14302
Attn: Product Information Department

☐ Please send me more information about Moore Clean Print.®
☐ Please have sales representative call.

Name _____
Address _____
City _____ State _____
Zip _____ Telephone _____

**Moore Business Forms, Inc.**

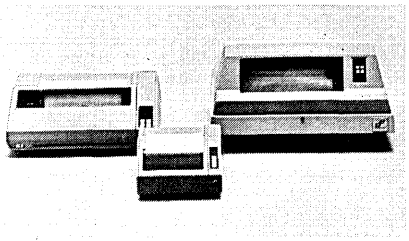
# hardware

at speeds ranging from 75 bps to 2400 bps. Some of the plotter's features include built-in buffer memory (1,150 byte), internal alphanumeric character generation, internal arc and circle generation, and user-defined dashed line patterns. Any sequence of plotter instructions may be stored as macros in the plotter's buffer. Up to 64 macros may be defined at one time. Provision is made for plugging in macros stored in PROM's, and the internal data buffer may be increased by an additional 2KB. The unit is also capable of digitizing. Base price for the 7221A is $4,600, the expanded buffer is an additional $225. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 299 ON READER CARD

### Printers

Three new families of printers from this vendor represent a downward thrust into new printer markets. The B-180 and B-300 line printers use a refined steel band font carrier to provide print speeds of 180 lpm and 300 lpm, respectively. In oem quantities of 200, they are priced at $3,000 and $3,300. The M-200 impact matrix head printer uses a dual column 14-wire head. It's rated at 200 lpm in a bidirectional mode, and it sells for $2,000 in oem quantities of 200. The T-80 thermal matrix printer has a non-impact single thermal dot matrix print head to offer a print speed of 80 cps. The printer's thermal technology was developed by Olivetti of Italy; this vendor has signed an exclusive oem agreement to manufacture the technology and market it worldwide in the T-80. The print head is operator-replaceable, so that after its print life of up to 20 million characters, it can be replaced by the user without a service call. Standard interfaces include both serial and RS232C. In oem quantities of 200 it's priced at under $1,000. Initial deliveries of the three families will be spread out over the next six to nine months. DATAPRODUCTS CORP., Woodland Hills, Calif.



FOR DATA CIRCLE 302 ON READER CARD

### Intelligent Terminals

With its eye on the data services, oem, and large end-user markets, this vendor has added the Microterm II and Microcomm intelligent workstations to its line of terminals. The Microterm II has a 12-inch crt capable of displaying 24 lines of 80 characters, an optional 2,200 cps non-impact printer, single or optionally dual mini diskettes, and two Z80 microprocessors. Applications software for the terminal may be written in an extended BASIC or Z80 assembly language. A typical configuration sells for approximately $5,000 in quantities of 100.

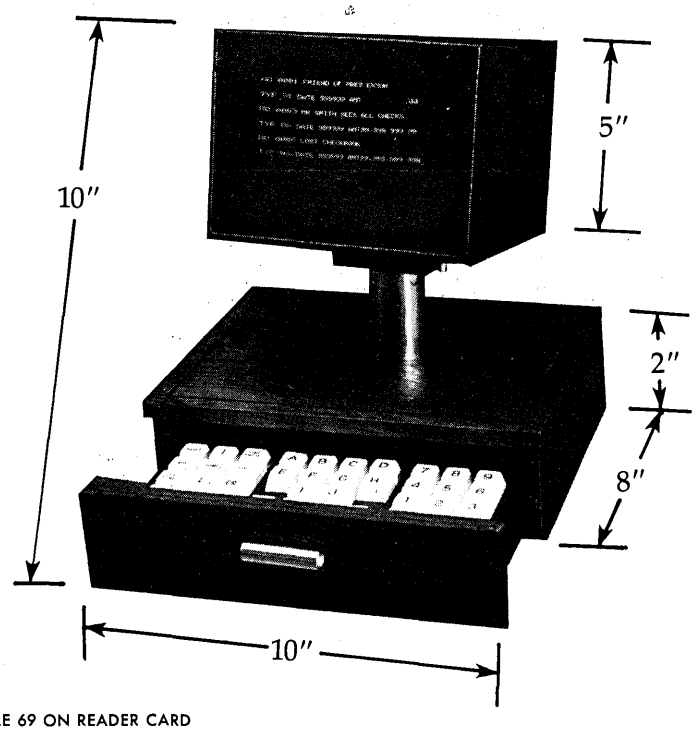

# Informer mini-terminals are small enough to fit your small business applications.

No wasted space with the INFORMER Executive Mini-CRT terminal. Imagine! Only 8" × 10"—the size of a piece of paper. A 5" display screen pedestal mounted on a walnut case, with the keyboard in a drawer.

Just right for the executive who needs to know "right now." Backlog info, receivables and payables data, sales reports and forecasts, ROI analyses, are just some of the answers available immediately.

You get 512 characters on 16 lines. And it's ASCII RS232 with any baud rate from 110-9600.

Price: $1275 Call 213/649-2030.




informer

8332 Osage Ave • Los Angeles, Ca 90045

CIRCLE 69 ON READER CARD

# Quick, which small computer has the fastest COBOL?

# Wrong.

It's the Data General commercial ECLIPSE. By a wide margin. And you can quickly verify that fact by asking any other company to run benchmarks against our ECLIPSE COBOL. Then watch their expression.

ECLIPSE COBOL works with our commercial instruction set. Giving you the fastest execution speed of any small computer. And it's the only COBOL on a small computer that meets the ANSI '74 standard at the highest level. Which, in plain English, means you'll get more throughput.

Since our ECLIPSE computer can converse fluently with big computers, conversion is both fast and easy. The way we extend COBOL makes us look bigger than other small computers, too. INFOS, our extensive data management facility, is one example. It makes manipulation of data bases easy. And our debugger is interactive. It uses simple commands like "Compute" and "Display". Which gets programs up and through faster.

When it comes down to who has the small computers with the fastest COBOL, our commercial ECLIPSE systems speak for themselves. And since we give you a computer that talks fast, our people don't have to give you a lot of fast talk.

# Write.

Mail to: Data General, Southboro, MA 01772
☐ Send me your manual, "Introduction to COBOL" and technical data sheets.
☐ Send me your brochure on the ECLIPSE computer systems with COBOL.
☐ Ask your sales representative to call.

NAME

TITLE

COMPANY

ADDRESS TEL.

CITY STATE ZIP

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DM8

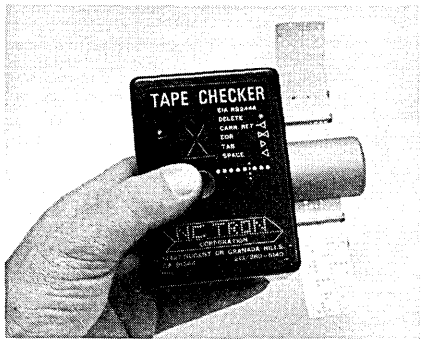
**Data General**
**It's smart business.**

Data General, Westboro, MA 01581, (617) 366-8911. Data General (Canada) Ltd., Ontario. Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361

# hardware

The Microcomm is an electronic store-process-forword communications system. In its basic configuration consisting of a 24 line by 80 character crt, mini diskette storage, floppy controller,

1KB of PROM, 16KB of RAM, parallel printer interface, RS232 interface, keyboard, and a pair of Z80 microprocessors, the unit sells for $8,500. Adding a 2,200 cps printer raises the price to $9,990. DIGI-LOG SYSTEMS, INC., Horsham, Pa.
FOR DATA CIRCLE 293 ON READER CARD




able batteries or 110VAC power, users draw a paper tape through the unit's reader while it displays each character. Users can locate errors on the tape, and, with an ancillary splicer/punch, make corrections. The Tape Checker can read either RS244A or RS358 ASCII/ISO code. A template supplied with the ACCUPUNCH allows the user to punch new data without referring to code tables. The Tape Checker sells for $325, the Accu-Punch is $80; purchased together, the pair sells for $350. NC TRON CORP., Granada Hills, Calif.
FOR DATA CIRCLE 297 ON READER CARD

### Paper Tape Decoder

The Tape Checker is a hand-held unit that can read and display the contents of paper tapes. Working on recharge-

### Multiprotocol Controller

The COM 5025 is a 40-pin monolithic integrated circuit that can replace as many as 330 integrated circuits in a universal synchronous receiver/transmitter multiprotocol communications controller. Operating at speeds of up to 2M bps, the 5025 can handle all major protocols, including bit-oriented types such as SDLC, HDLC, and ADCCP, and byte-oriented BISYNC and DDCMP. The manufacturer says that it is the first programmable chip controller approved for these protocols, and the only one that processes both SDLC and HDLC protocols. The 5025 is direct TTL-compatible, and contains selectable protocols and a tri-state I/O bus. Data lengths—from one to eight bits—are individually selectable for the receiver and transmitter. For bit-oriented protocols such as SDLC, the chip provides bit stuffing and stripping, automatic frame character detection and generation, and residue handling. For byte-oriented protocols the unit offers automatic detection and generation of SYNC characters, and options such as variable length data, variable SYNC characters (5, 6, 7, or 8 bits), and error checking (16 bit polynomial CRC or CCITT, as well as odd or even parity). The 5025 is compatible with specifications described in IBM General Information Bulletins GA27-3093 and GA27-3098, and IBM Systems Journal, Vol. 15, No. 1, 1976 (G321-0044), EIA standard RS334, CCITT Standard X.25 and ANSI X353 and XS34/589.

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CIRCLE 70 ON READER CARD

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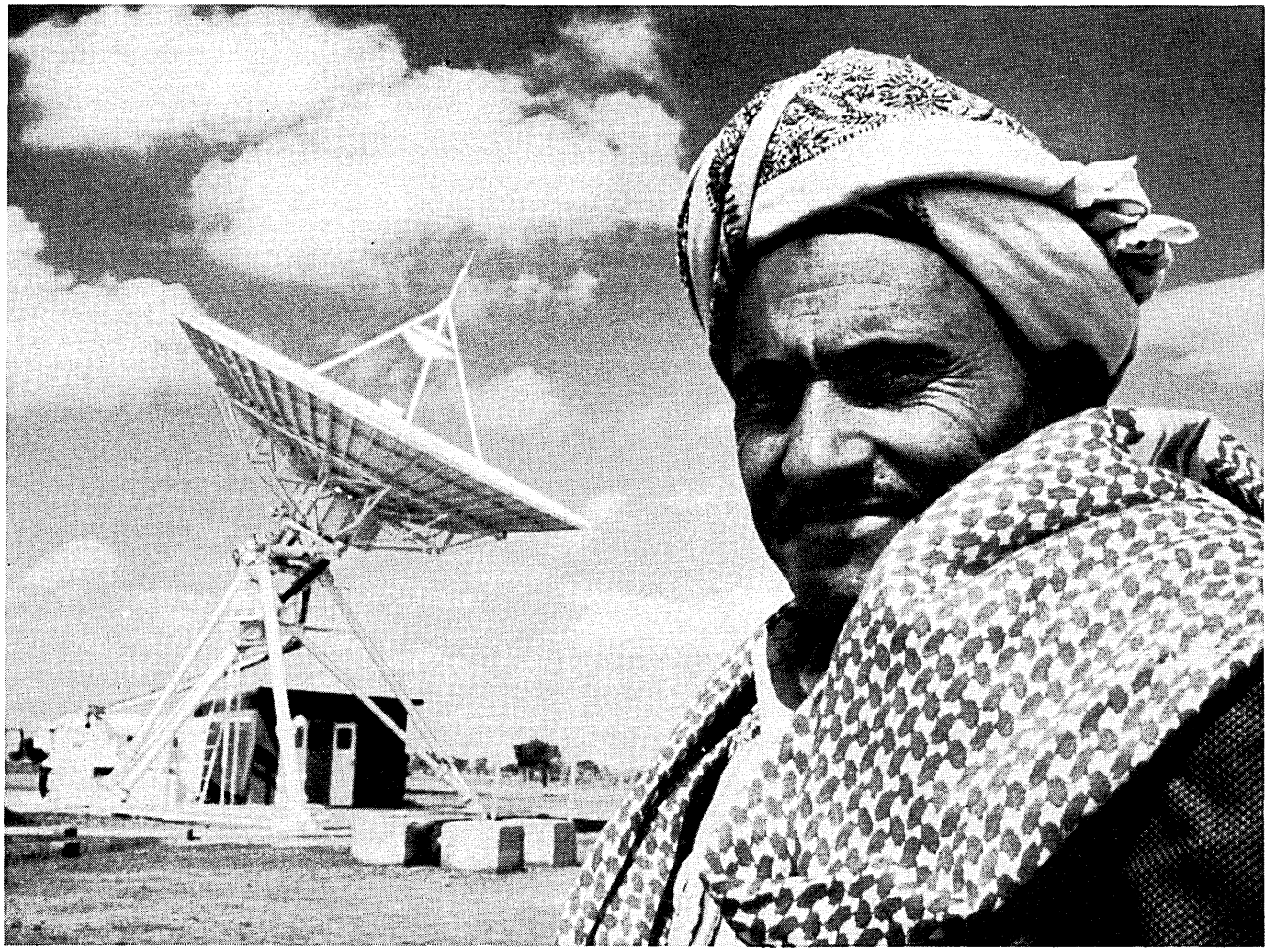

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# hardware

COM 5025s sell for $61.40 each in quantities of 500 to 999. STANDARD MICROSYSTEMS CORP., Hauppauge, N.Y.
FOR DATA CIRCLE 291 ON READER CARD

### Terminal
Totally plug-compatible with IBM's 3775, the Model 0752 standalone data entry terminal supports IBM's 3784, 3786, and 3788 printers. The 0752 offers features such as ocr wand, light pen, and both user and customer engineer diagnostics. The diagnostics can test the 0752 completely in local mode and also give network failure data when on-line. On a three-year lease, the 0752 goes for $98/month. Its purchase price is $3,950. TRIVEX, INC., Costa Mesa, Calif.
FOR DATA CIRCLE 288 ON READER CARD

### Add-on Memory
The Multimemory/148 add-on memory for IBM's 370/148 allows the user to double the 148's current maximum memory capacity. In its largest configuration, Multimemory provides 4,096KB of main memory. The Multimemory is a functionally equivalent, pin-compatible semiconductor memory using 4K NMOS static RAM devices. The system is priced at $75,000/MB. ELECTRONIC MEMORIES AND MAGNETICS CORP., Hawthorne, Calif.
FOR DATA CIRCLE 304 ON READER CARD

### Acoustic Coupler
The model 1200B is a 1200 baud acoustic coupler incorporating LSI technology. It's designed to operate with high-speed printers and baud rate-selectable crt's, allowing time-sharing and other remote computer access in a non-permanent environment. The 1200B sells for $975, with oem discounts available. OMNITEC DATA CORP., Phoenix, Ariz.
FOR DATA CIRCLE 290 ON READER CARD

### Microcomputer System
Combining hardware and software, this vendor has produced a multiuser microprocessor system. Basic system hardware consists of an 8080-based microcomputer with 32KB of memory, dual floppy disc system, and four I/O ports. A multiuser/multitask operating system is included.

The hardware includes a software programmable real-time clock. It also supports DMA data transfer. The soft-sectored, IBM 3740-compatible diskette drive uses a voice coil head positioning system, which has an average seek time of less than 50msec. The single card floppy controller accommodates up to two dual or four single drives.

Mute, the operating system, supports multiple terminals, allowing simultaneous software development by several users. Mute supports the vendor's BSAL-80 assembler (January, p. 186), linking loader, and text editor. The operating system software is said to resemble DEC's RSX-11 from a task queuing and scheduling viewpoint, and HP's MPE (for its 3000 series) with respect to the file system.

In quantities of 100, the basic system sells for less than $1,000. A single entry-level system will sell for about $8,200. MUPRO INC., Sunnyvale, Calif.
FOR DATA CIRCLE 301 ON READER CARD

### Terminal
The model 1100 audio-visual communication terminal accepts 10 cps from its Touch-Tone-like keyboard. The unit transmits Touch-Tones, and accepts audio output from most audio response computer systems or Frequency Shift Keyed (FSK) ASCII at 300 baud. The fully buffered unit can display 256 characters on its screen. When not in use as a terminal, the 1100 can function as a Touch-Tone telephone. Options include a telephone handset, magnetic card reader, Personal Identification Number (PIN) keypad, and a


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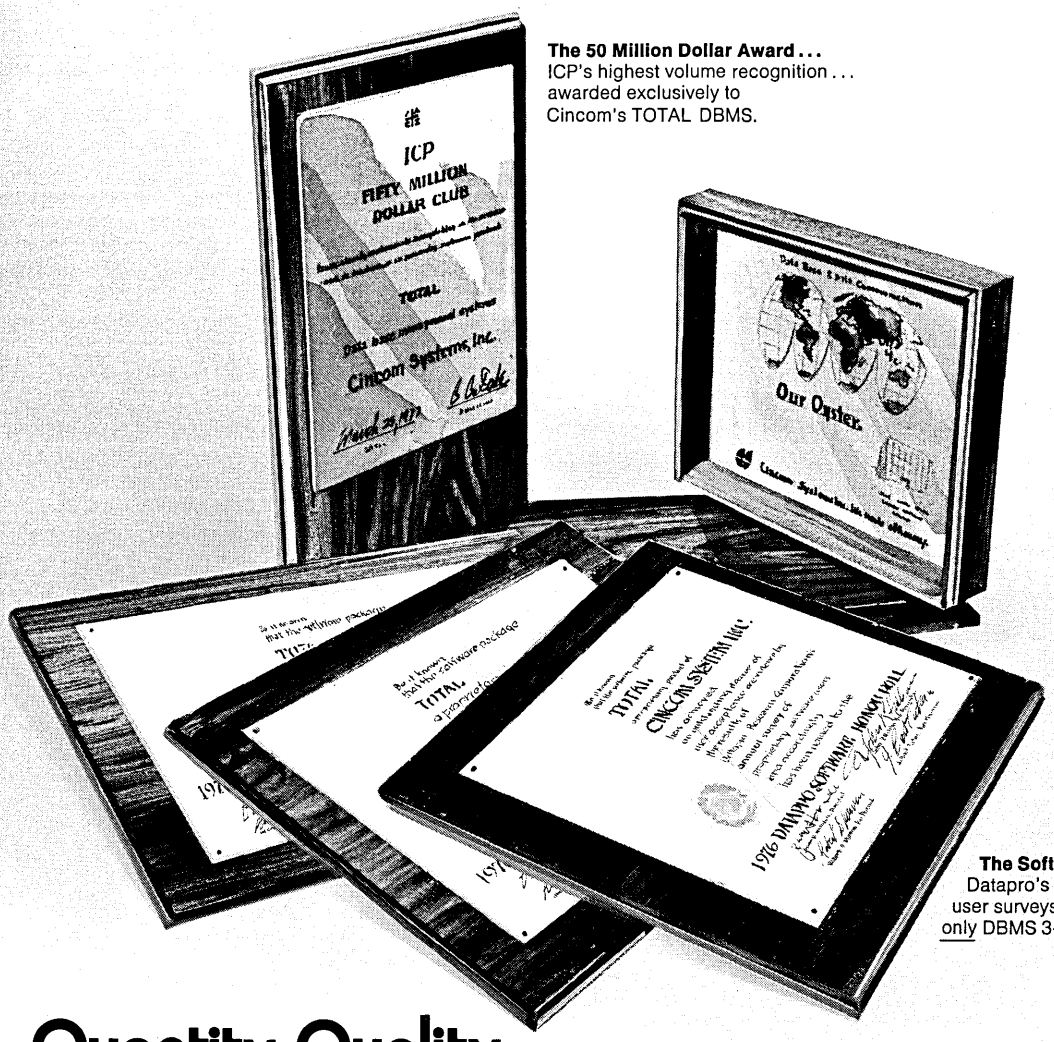


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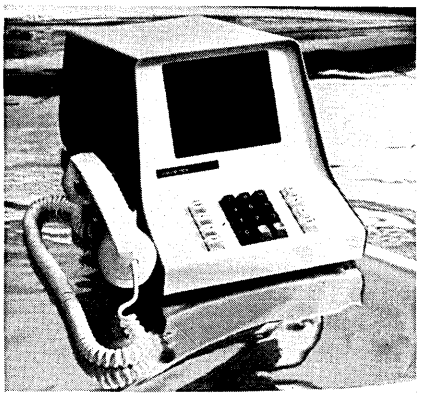
# hardware



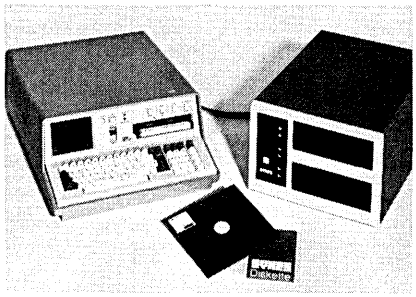
printer. Prices for the basic model 1100 start at $1,940 with a quoted delivery of 120 days. WAVETEK DATA COMMUNICATIONS, San Diego, Calif.
FOR DATA CIRCLE 289 ON READER CARD

### Megabyte Memory

Add this vendor's 21MX and 1000-series of minicomputers to the megabyte of memory club. Using 16K bit chips, the vendor can put a megabyte in a package 12 and one-quarter inches high. Central to the memory are 128KB memory boards and optional error correction boards. In a small memory error, correction may not be required; as memory size grows, users can add error correction. A 21MXE with a full megabyte and error correction sells for $59,800. With an optional memory extender, a total memory capacity of 1.8MB is possible. A 128KB memory module sells for $6,400, the fault-control memory controller is $600, and its associated check-bit boards sell for $2,750 (for blocks of memory up to 256KB) or $5,000 (for blocks of memory up to 512KB). HEWLETT-PACKARD CO., Palo Alto, Calif.
FOR DATA CIRCLE 298 ON READER CARD

### Floppy Disc

Plugging directly into the serial I/O port of IBM's 5100 desktop computer, the Comm-Stor/5100 file management disc storage system provides random access to any file on the diskette. The microprocessor-based unit reads and writes data in IBM 3740-compatible format. The system comes with a tape cartridge containing 10 BASIC key files and 14 APL functions. These routines may be integrated into applications programs. Data written by a BASIC program may be read by an APL program, and vice versa. A single drive system sells for less than $3,000, a dual drive system goes for under $4,000. SYKES DATATRONICS, INC., Rochester, N.Y.
FOR DATA CIRCLE 294 ON READER CARD



### Terminals and Controllers

IBM has a handful of new terminal products in its 3270-series, and a new 3790-series controller. The 3770-series has been consolidated, and pricing has changed on some existing products in all three series.

The 3274 control unit handles as many as 32 terminal devices and up to 16 previously available 3270 devices can be intermixed. The 3274 can remotely or locally link to 370 processors using binary synchronous communications (BSC), or synchronous data link control (SDLC), and to 360s using BSC. Purchase prices range from $13,190 to $18,770.

Controlling up to seven 3278 displays and 3287 printers, the 3276 control unit display station is offered in four screen capacities: 960, 1,920, 2,560, or 3,440 characters. It com-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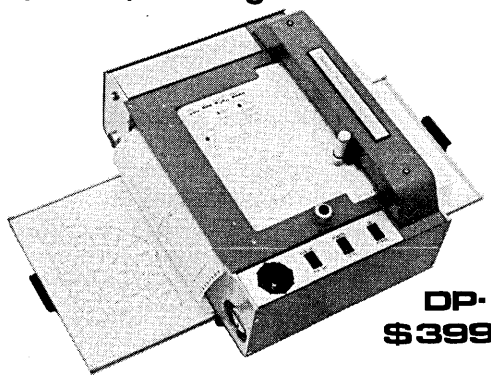

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municates with 370s using SDLC or BSC, and with 360s using BSC. Pricing ranges from $6,390 to $6,930.

The 3278 display station operates with either 3274 or 3276 control units, and offers the same screen capacities as the 3276. Its purchase prices range from $2,205 to $2,835.

The 3287 printer works with 3271, 3272, 3274, and 3276 control units. An 80 cps version sells for $5,680; a 120 cps version is $6,055.

The 3289 line printer attaches to the 3274 and offers speeds from 80 lpm to 400 lpm. Its price ranges from $11,110 to $16,560.

The new 3791 model 1C controller has 10MB of storage and is field upgradable to 20MB or 30MB. Maximum control storage has increased from 65,536 bytes to 196,608 bytes. The new controller sells for $22,100.

A remote data link adaptor for the 3791 controller now permits new 3270 display stations in the 1,920-character versions to be attached over communications lines. Up to five remote data link adaptors can be attached to a single 3791. The data link adaptor sells for $1,200.

The 3770 data communication system now comprises five basic units: the 3771 models 1, 2, and 3; the 3774 models P1 and P2; the 3775 model P1; and the remote job entry 3776 models 1 and 2, and 3777 models 1 and 2.

Rental and purchase prices for some of the 3270 series were reduced about 16%. A two-year lease is also offered. Lease, rental, and purchase prices were reduced 28% and 22% respectively for some members of the 3790 and 3770 lines. Maintenance prices on some of these products increased about 15%. Lease and rental arrangements are available for the new products, as is maintenance. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 306 ON READER CARD

### Daisywheel Printer

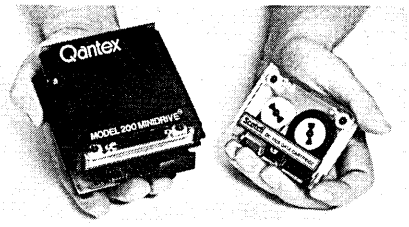
The Sprint Micro 5 family of daisywheel printers are aimed at oem's wanting to integrate them into computer systems. The byte input format of the printers allow direct connection to the computer's I/O channels. Previous daisywheel printers from the firm used a 13 bit input format. The printers operate at maximum print rates of 45 cps or 55 cps. Numerous options will allow oem's to tailor the printers to fit their applications. In quantities of 50 to 99 units, the 45 cps version sells for $1,675. An optional RS232C interface goes for $100. QUME CORP., Hayward, Calif.

FOR DATA CIRCLE 296 ON READER CARD

### Cartridge Tape Transport

The model 200 Minidrive is a tape transport for 3M's DC100A miniature data cartridge. It's available in one- and two-track versions, priced at $250 and $350, respectively, in single quantities. A complete recording capability, based on the single track transport and all necessary electronics, comes to about $485 in unit quantities. The vendor offers oem discounts. Deliveries are said to take about four weeks. NORTH ATLANTIC INDUSTRIES, INC., QANTEX DIV., Plainview, N.Y.

FOR DATA CIRCLE 305 ON READER CARD





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# software & services

## Updates

Companies soon will be able to report Form 1099 information to the IRS on disc or diskette media, reports the Computer Law and Tax Report. The IRS will accept media prepared on IBM Systems 3, 32, and 34, as well as media-compatible systems. The program will be under the direction of Max Stringer, magnetic tape coordinator for the IRS' Southwest region, centered in Austin, Texas. The program may be expanded to include other forms, such as the 941A. Stringer adds that the 941A may become an annual, rather than quarterly, report within a few years.

The FORTRAN Standards Committee, X3J3, has finished editorial clarification of the draft proposed FORTRAN Standard, and approved forwarding the proposal for further processing as an American National Standard to replace the current X3.9-1966 standard. The proposal also is being forwarded to the International Standards Organization as a contribution toward an international standard.

Telenet, the packet mode common carrier, has come up with a pair of microcomputer-based intelligent communications processors. The systems, called Telenet Processors, are designed to permit customer computers and terminals to simply "plug-in" to the public packet network. Micro-based Telenet Processors also will be incorporated into the network itself as packet switches and data concentrators.

In another communications application, Fairchild Camera and Instrument Corp. has awarded a contract valued at about $2 million to Computer Automation for as many as 18 SyFA minicomputer systems to link Fairchild facilities in Asia and Europe to its corporate headquarters in Mountain View, Calif. The network, hosted by an IBM 370/168, will bring together the functions of order processing, production control, and inventory control. When completed, the network will be hierarchical in design, with SyFA systems communicating with other large-scale computers in addition to the host.

TDX Telecommunications, Inc., of Houston, Texas, is offering Datapost, a facsimile-based alternative to Mailgrams. The service is priced from $.60 to $1.05 per message depending on volume.

### Management Game

Basically a performance evaluation and review technique (PERT) reporting system, GREMEX is a man-machine management simulation game of a research and development project. GREMEX is not a production job for product management. Projects may be studied from just after project plan development through the final construction phase. The user inputs, for each month, the amount of work performed on each activity and the computer does the bookkeeping to find the project's expected completion date. GREMEX assumes that all activities to be worked in a given month are indeed worked. The program predicts new durations and costs each month based on contractors' liabilities and the management actions taken by the players.

GREMEX may be used to train management personnel in the administration of research and development-type projects. It poses no "best way" to run a project, but emphasizes exposing players to many of the factors involved in decision-making when managing a project in a government research and development environment. Capable of operating with any research and development-type project with up to 15 subcontractors, GREMEX produces reports simulating monthly or quarterly updates of the project PERT network. Included with the program is a data deck for simulation of a fictitious spacecraft project (at this point we might note that GREMEX was developed at the NASA Goddard Space Flight Center). Instructions are included for substituting other projects.

The package is written in FORTRAN IV for execution on a 360 in batch mode. It requires about 350KB of central memory. The documentation sells for $48, the program for $810. COSMIC, Univ. of Georgia, Athens, Ga.
FOR DATA CIRCLE 278 ON READER CARD

### Series/1 Floating Point

This company has been doing quite a bit of software development for the recently announced IBM Series/1 minicomputer. Its latest product is a floating point emulator which will execute on both the 4953 and 4955 model processors. Programmers can code the standard floating point instruction set and the emulator will intercept the resulting class interrupt and execute the required instruction. It is said that the emulator uses some of the most time-efficient algorithms available in order to execute the instructions as quickly as possible. It requires roughly 3.5KB of memory. Licensed on a single cpu basis, the emulator has a one-time fee of $195. GRAHAM COMPUTER ENTERPRISES, INC., Birmingham, Ala.
FOR DATA CIRCLE 274 ON READER CARD

### Data Base Management

Seed is a CODASYL-type data base management system which sells for $7,500 (or $375 per month) in its basic configuration. Written in FORTRAN with assembly language routines for I/O, Seed is transportable. The vendor says that to install it on a "new" computer requires only a "little" work, primarily in rewriting the assembly language I/O routines. Seed is said to run on virtually any computer supporting FORTRAN, and the vendor anticipates that it will be particularly appealing to multicomputer and distributed processing users, and those thinking of changing computers. The package also has an optional interactive data base/data dictionary facility, DBLOOK, which permits any data base command to be issued directly in an interactive mode. Seed supports the languages defined by the CODASYL Data Base Task Group including both FORTRAN and COBOL Data Manipulation Languages. INTERNATIONAL DATA BASE SYSTEMS, INC., Philadelphia, Pa.
FOR DATA CIRCLE 271 ON READER CARD

### Financial Analysis

A computerized screening system, XSCAN allows investment analysts, financial researchers, and corporate planners to analyze a wide selection of data on more than 3,500 companies and 42,000 securities. The conversational system lets a nonprogrammer screen and manipulate data from a number of data bases, including COMPUSTAT and Value Line. XSCAN locates, screens, and sorts information according to any specified criteria. It can perform statistical analyses and regressions. Results can be displayed in customized formats, scatter plots, and histograms. Results also may be stored for later use. A typical session, involving screening about 1,000 companies for possible merger or acquisition, limiting the field to 10 or 20 candidate companies, and then performing a detailed analysis on the candidates ran up charges of about $50 on the vendor's time-sharing network. INTERACTIVE DATA CORP., DYNAMICS ASSOCIATES DIV., Cambridge, Mass.
FOR DATA CIRCLE 284 ON READER CARD

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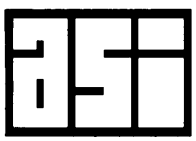

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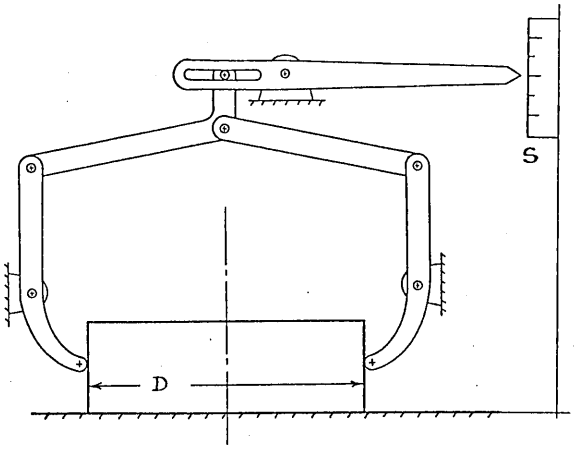


### Mechanical Modeling

DCS automatically makes mathematical models of almost any two-dimensional mechanism or assembly of parts. Available on this vendor's time-sharing service, DCS provides a simple method for defining mechanisms, relieving the user of the necessity of doing any arithmetic or trigonometry with the dimensions of the parts. Mechanisms are defined by overlaying a coordinate grid and specifying the coordinates of significant features, such as part interconnections. In this figure, the calipers are designed to measure the dimension D of an object placed between them. The linkage magnifies variations, and the measurement is read from the scale S. Questions that might be asked of this model include: how sensitive is it to changes in D? How should the scale S be calibrated? When a reference object is measured, how much tolerance should be allowed for variations in part dimensions? To run this problem, DCS ran up charges of about $5. FIRST DATA CORP., Waltham, Mass.

FOR DATA CIRCLE 272 ON READER CARD

### Cobol Development Aid

TSOBOL helps programmers develop COBOL programs by prompting the user for information about the architecture of his intended program, and by using this information to generate COBOL source programs. The package is intended to run on an IBM 360 or 370 in an OS/VS TSO environment. At the end of the terminal session, the programmer will have a diagnostic-free COBOL program, essentially generated by entering user requirements, to which user-specific logic statements may be added.

The package supports sequential, indexed sequential, key-sequenced VSAM, entry-sequenced VSAM, print and imbedded COBOL SORT files, generating all required COBOL I/O statements. An optional report layout generator allows the programmer to transfer report layouts directly onto the TSO screen. Other options include interfaces to IMS, CICS, and Total.

The package provides consistency and standardization to program structures. All programs generated by TSOBOL have sections numbered and organized in the same manner. Common code essentially will be the same. Additionally, the vendor says TSOBOL eliminates errors introduced during keypunching, missing code, and misspelled data names.

The basic TSOBOL package is sold with a permanent license fee of $13,500, and an annual maintenance and enhancement fee of $500. Additional options are priced at $2,000 each. SIGMATICS CORP., Irvine, Calif.

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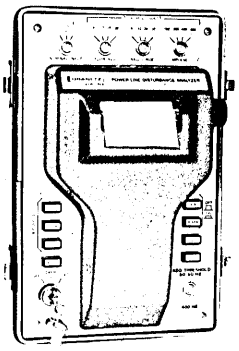

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### HASP RJE

HASP/32 is a software package that lets users of this vendor's 32-bit computers use their computers as HASP workstations. Both remote job entry and standalone processing are possible when HASP/32 executes as a user task under the vendor's OS/32 MT operating system in conjunction with ITAM, the vendor's telecommunications access method. A user may submit batch jobs to a host IBM processor using HASP/32, and the results are returned to his site for local storage or output.

The software supports up to seven card readers and eight printing devices, a control console, and dial-up or leased line communications at speeds of up to 19.2K bps. Multileaving up to seven jobs in each direction over a single communications line allows concurrent operation of the card readers and printers. The software package sells for $1,740 on seven or nine-track magnetic tape, $1,930 on a 2.5MB disc, and $1,970 on a 10MB disc, including installation and documentation. INTERDATA, INC., Oceanport, N.J.

FOR DATA CIRCLE 279 ON READER CARD

### SMF Reporting

This user-developed package, built around Easytrieve, organizes an SMF variable block data base into the more easily handled fixed block format. It provides a total package for SMF reporting. The system consists of five main line programs which produce a reformatted SMF data base, and two programs to generate daily and periodic reports, including file management information. It deals strictly with records typed 4, 5, 6, and 20 and can be adapted to users' specialized report headings and various accounting needs. The Easytrieve/SMF Reporting System is available to Easytrieve users at no charge through the company's System Exchange program. PANSOPHIC SYSTEMS INC., Oak Brook, Ill.

FOR DATA CIRCLE 277 ON READER CARD

### Zero-Base Budgeting

Developed in cooperation with several high-level federal agencies, this vendor's Zero-Base Budgeting system closely conforms to the Office of Management and Budget's instructions as issued in OMB Bulletin 77-9. By automatically generating detailed budget reports for each decision package, consolidating them, and producing financial summaries for all units in the organization, it is said the system virtually eliminates the paperwork crunch caused by zero-base budgeting.

The package provides summarized ranking and funding reports at all agency levels. "Cross-walk" reporting and analysis may be performed. The system can accommodate requirements unique to individual agencies and private industrial organizations. Ranking and financial summary reports are generated both before and after funding cutoffs are applied, but after funding only those decision packages funded are listed and summed together; unfunded packages are reported separately. All information, including ranking and funding cutoff data, is stored in an integrated DBMS-10 network structured data base. Each unit manager's view of the data base is limited to the data for which he is directly responsible.

Charges for using the system on the vendor's remote access computer system are the standard rates for computer resource usage. One typical job, consisting of 64 decision packages, loading the data base, generating reports, applying funding cutoffs, and generating final reports cost roughly $130. RAPIDATA, INC., Fairfield, N.J.

FOR DATA CIRCLE 276 ON READER CARD

### Micro Operating System

Fast Multi-tasking Operating System, FAMOS, is a multitasking real-time operating system for 8080 or Z80-based microcomputer systems. It is said that 24KB of RAM and dual diskette drives will support two users; additional memory may be needed for more users. The software also requires a

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$300 special interrupt board (an S-100 bus-compatible board currently is available).

Central to the system is a "Super Selector" (ss) program which provides control over all tasks. There are seven ss commands, one of which is a function command for more than 30 system functions and utility programs. These functions include editing, status reports, and file utilities. FAMOS also includes a BASIC compiler which generates reentrant code.

Users may initiate several tasks from their terminals. The number of tasks FAMOS can support is limited only by available memory. The system dynamically allocates memory as needed, so there are no partitions. Disc storage is also dynamically allocated, eliminating the need to repack discs. The vendor says this efficiency allows 20 or 30 terminals to concurrently access the system. FAMOS has a one-time license fee of $1,750 per copy. MVT MICROCOMPUTER SYSTEMS, INC., Canoga Park, Calif.

FOR DATA CIRCLE 275 ON READER CARD

### Diskette Copy Utility

For use with all Data General Nova, Eclipse, and MicroNova diskette systems (6030 family), Floppy/Copy does a complete sector-for-sector absolute copy of a diskette. Its vendor cites three advantages over existing Data General-supplied system software: there is no need to initialize the target diskette, only proper formatting is required; diagnostic and software release diskettes may be backed up (the COPY commands in DOSINIT/DKINIT and DOS/RDOS won't touch these); and absolute (non-DOS/RDOS) diskettes can be copied. Floppy/Copy is also said to be faster and easier to use than other currently available copy routines. The one-time permanent license fee is $100 for the Nova/Eclipse version or the MicroNova version, or $170 for both. THE TOOLSMITH ORGANIZATION, LTD., Schaumburg, Ill.

FOR DATA CIRCLE 270 ON READER CARD

### PL/1 Monitor

PRT7/VII is a software tool that allows application programmers to time and analyze PL/1 programs and DL/1 calls. The package measures and prints the time in microseconds for every individual flow path executed by the program, and also times DL/1 calls and reports detailed results on the outcome of each call. Percentage of program execution time and minimum and maximum elapsed times are also reported, allowing the programmer to identify bottlenecks in his programs. The vendor emphasizes that PRT7 is *not* a sampling technique, but is rather a direct measurement of every microsecond used by the program. The package is said to use original techniques, including inspection of System/370 "system control blocks." Use of the package requires no recompilations, additional job steps, temporary work files, or special JCL. To control activity, the flow path monitor is included with the program to be monitored at loading or linkage editing time. PRT7 will work on any 370 with the IBM optimizing PL/1 compiler under any operating system. The PRT7/PL/1 monitor is priced at $7,500 and the DL/1 monitor is $4,500. Packaged together, the two monitors sell for $11,000. Prices include installation, documentation, and training. PRT7 was developed by the Swiss firm of HIS Consultants. PITRONIM INC., Brookline, Mass.

FOR DATA CIRCLE 281 ON READER CARD

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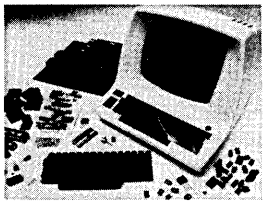

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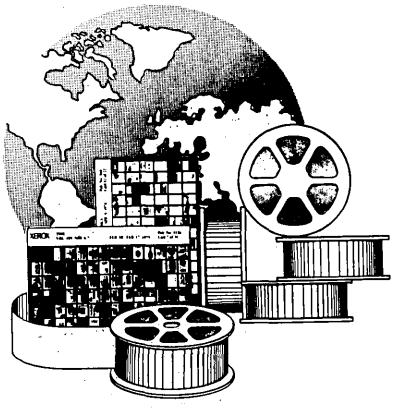

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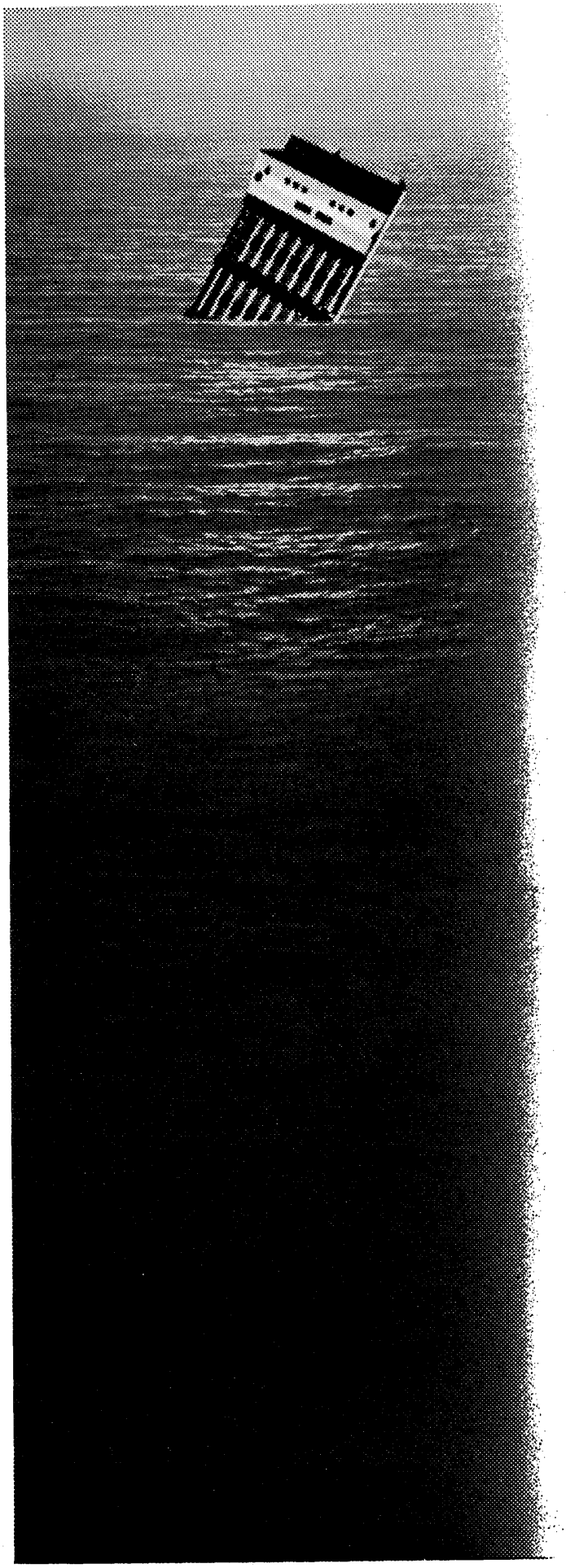

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# the forum

## Should Software be Copyrighted or Patented?

We've been wrestling with the question of whether software should be copyrighted or patented for some years, and the issues seem far from being resolved. A few cases, however, have occurred which provide a background for answering the questions of software protection, at least for some kinds of programs. For instance, if a program is defined as a set of operating instructions to be used by the computer in solving problems, as the Copyright Office has chosen to define one, then a copyright affords little protection; the courts have viewed these instructions as part of mathematical science, and hence not copyrightable.

The copyright only excludes others from unauthorized copying of documentation anyway, and even this protection is limited by the "fair use" doctrine. Fair use allows libraries and others to make limited numbers of copies for intellectual use. Based on a number of court decisions, this practice allows scholars and others to make copies for individual and private use; it evolved from photocopying being just an advanced way of taking notes. The line between infringement and fair use is subject to interpretation and is a matter of purpose and degree, the purpose dealing with the profit involved and the degree with the number of copies in relation to the market.

There are those who would attempt to apply the concept of fair use to patent protection. This can only come from a basic misunderstanding of copyrights and patents.

A patent excludes others from making, using, or selling an invention. It makes no difference if a profit is involved or only a few copies are made. It is only with respect to the size of the damages claimed that these factors are pertinent.

A patent can be issued for software provided that the software can be regarded as an invention that is novel and has not been shown in the prior art. This is demonstrated by Martin Goetz' patent (No. 3,380,029) for a "Sorting System." (Mr. Goetz' patent was the first ever issued for software, and not very many others have since been granted.)

The expense and time involved in preparing and receiving a patent allowance is considerable compared to that involved for a copyright, further complicating the question of which way to go for software protection. Copyright application requires a $6 fee with a two page registration form and the printing of the copyright notice on the material. The copyright is allowable even without registration, but registration with the Copyright Office facilitates the dating of the notice in any later infringement proceedings.

Patent grants, on the other hand, take about two years. For most software, which is constantly updated and improved, this may be much too long a delay to give any protection. Also, about one-third of patent applications are rejected; the software involved must represent a real breakthrough before this type of protection will be granted it.

It is obvious that our present copyright and patent legislation does not consider the requirements or the rapid revolution in data processing. Those with a stake in this area are urged to write their congressmen, expressing their concern and their views on copyright and patent revision.

Mr. Hordeski is the president of Siltran Digital, a digital transducer manufacturing firm located in Silverado, Calif. He is also the holder of a patent on digital encoding.

—Mike Hordeski

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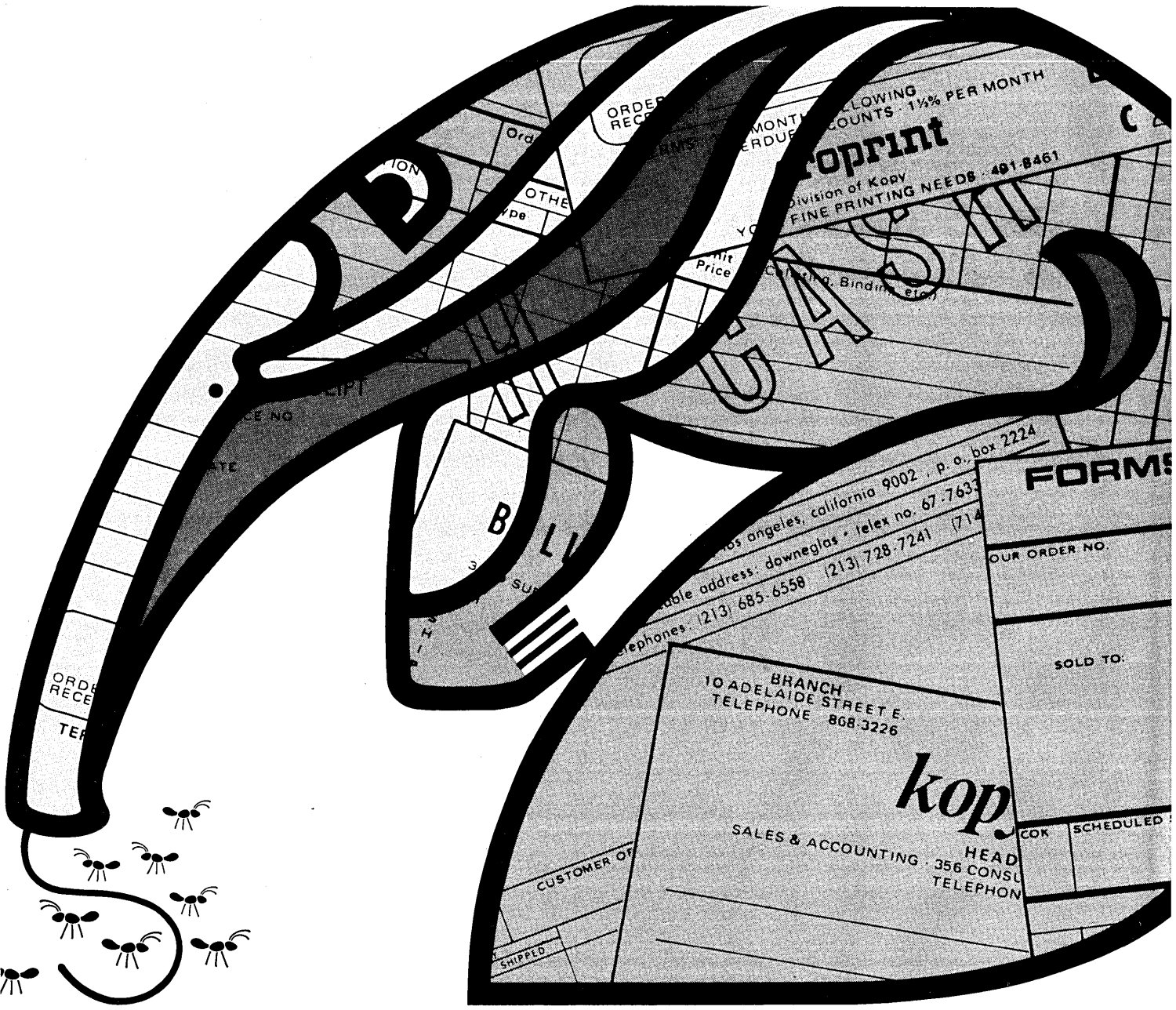


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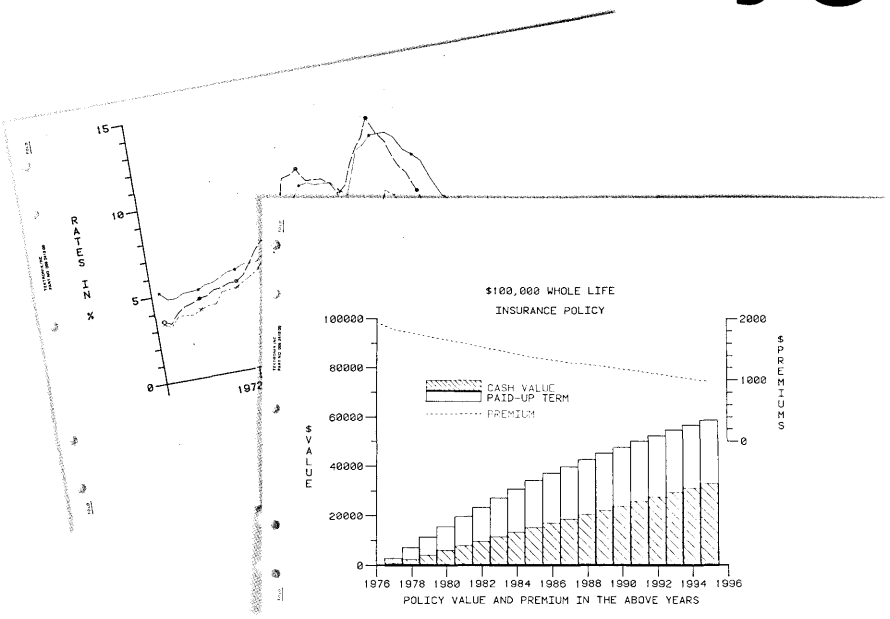


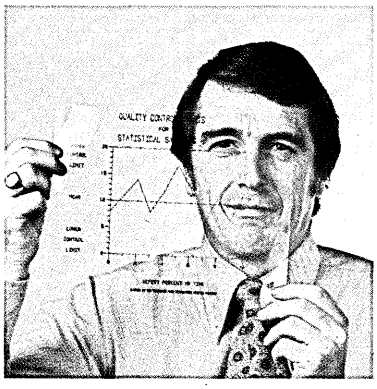

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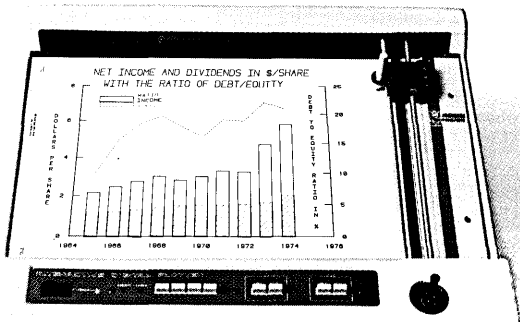


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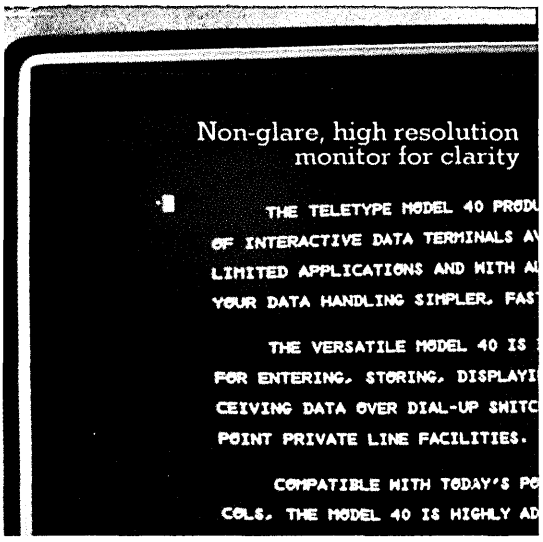


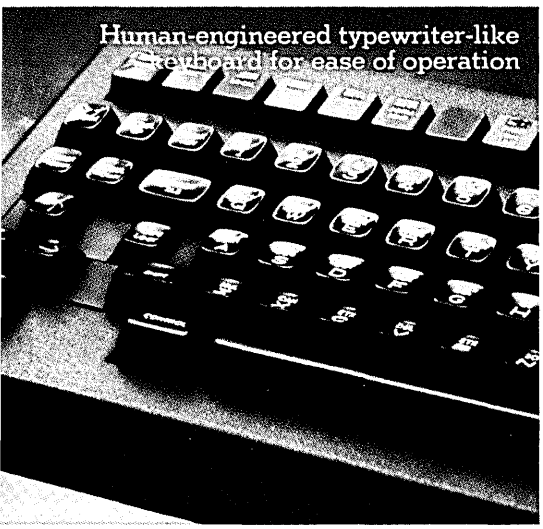

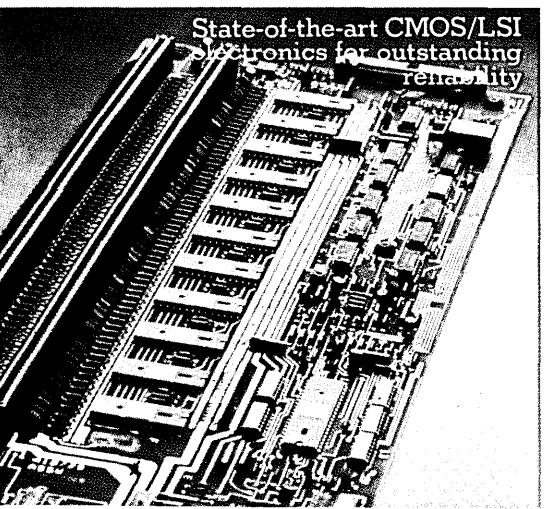


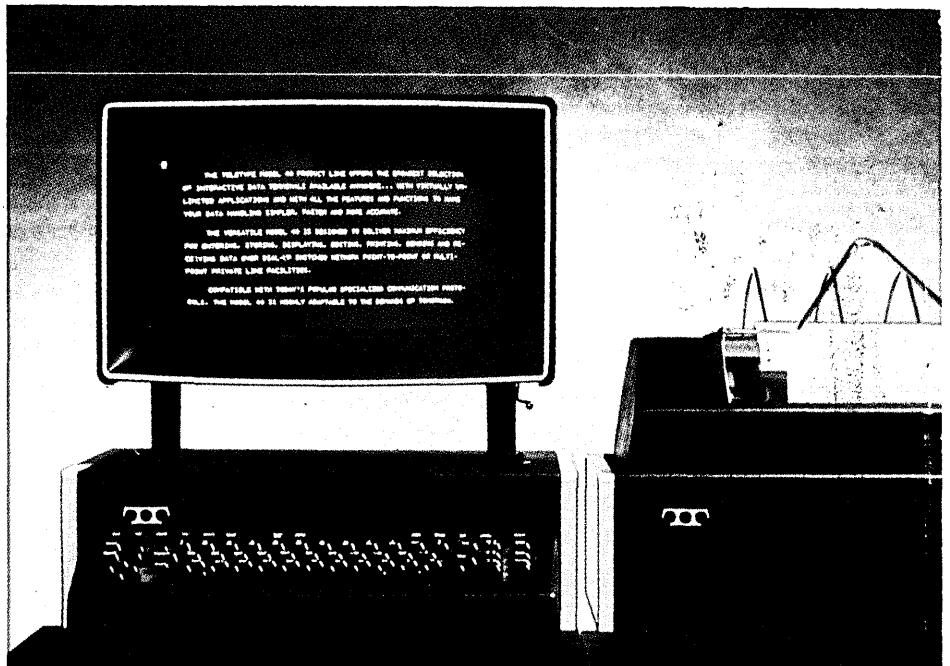

# THE MODEL 40 IS SO GOOD, NOTHING EVEN COMES CLOSE. AND WE CAN PROVE IT, COMPONENT BY COMPONENT.

We're convinced the Teletype® model 40 product line matches—if not exceeds—any data terminal system on the market today. Because on a cost/performance basis, nothing even comes close.

The 40 printer, using a unique design, is incredibly dependable. And its CMOS/LSI drive electronics are so advanced and compact, they fit inside the printer itself on a single circuit card.

Our keyboard is anything but ordinary, too. Naturally, all controls are grouped according to function. But more importantly, the entire unit is human engineered to provide the most in throughput. Not only do the keys impart a typewriter feel, they're also contoured to the shape of the operators' fingers.

We admit we could have cut corners when we designed and built our display tube. But good enough wouldn't have been good enough. So we used a glare reducing screen. Even the display type is specially designed for legibility, with a flicker-free refresh rate of 60 times/second. Character separation and clarity are insured by a large 7 x 9 dot matrix. And the whole unit tilts through 20° for the best viewing angle.

As good as the individual components are, added together they put the model 40 product line in a class by itself. For more information, write or call: Teletype, 5555 Touhy Ave., Skokie, IL 60076. Phone 312/982-2000.

TELETYPE

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CIRCLE 3 ON READER CARD