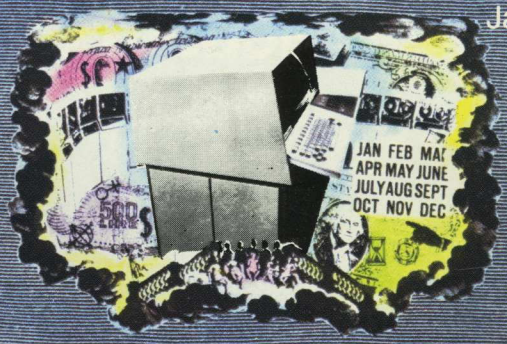
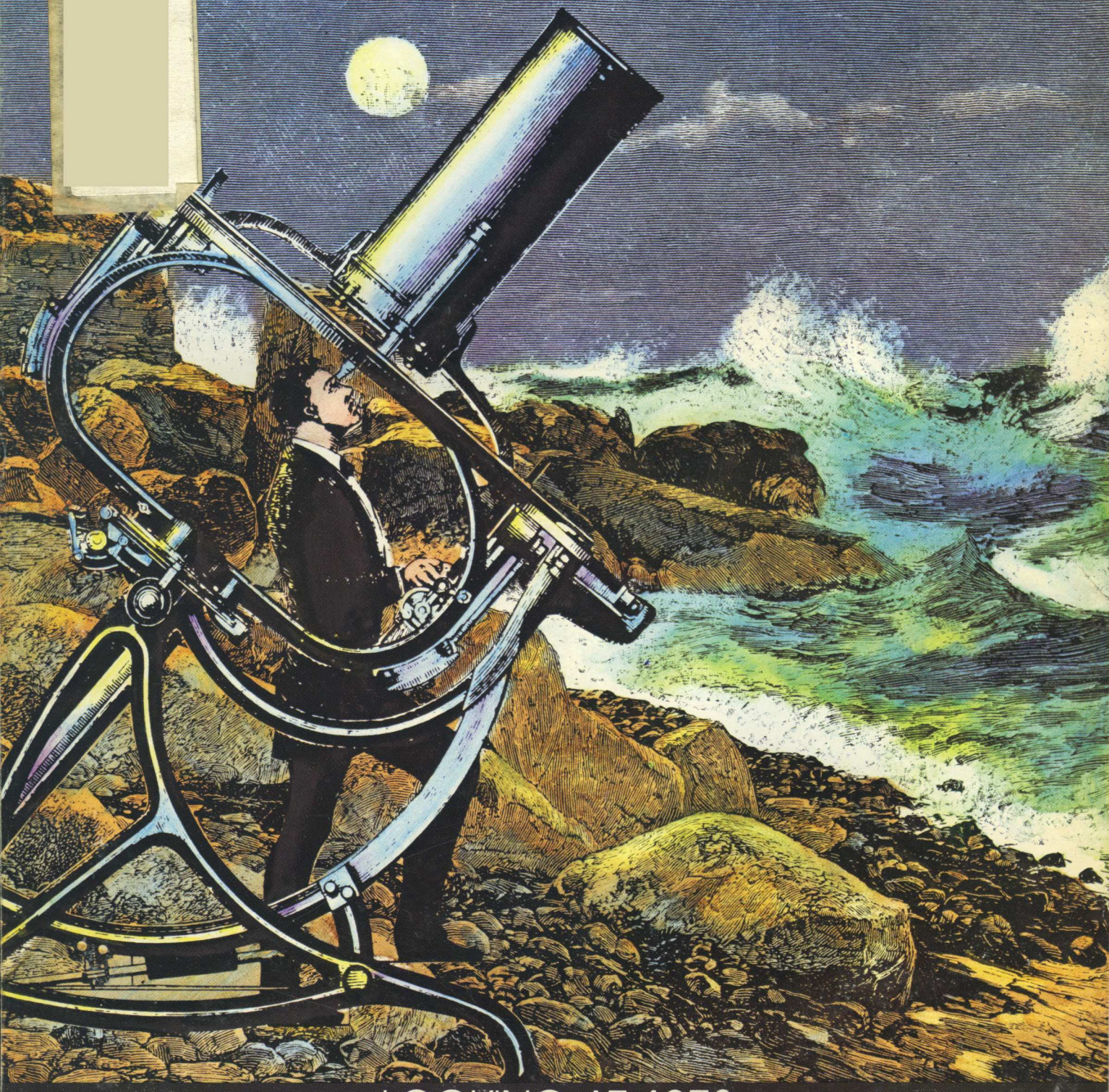
DATAMATION 78®

January
3.00
USA





LOOKING AT 1978

Also: 1978 dp budgets, Norris on East-West trade, memory technologies, and Japan Inc. . .

Models 9100/9300 Vacuum Column Tape Transports. We didn't have to make them this good.

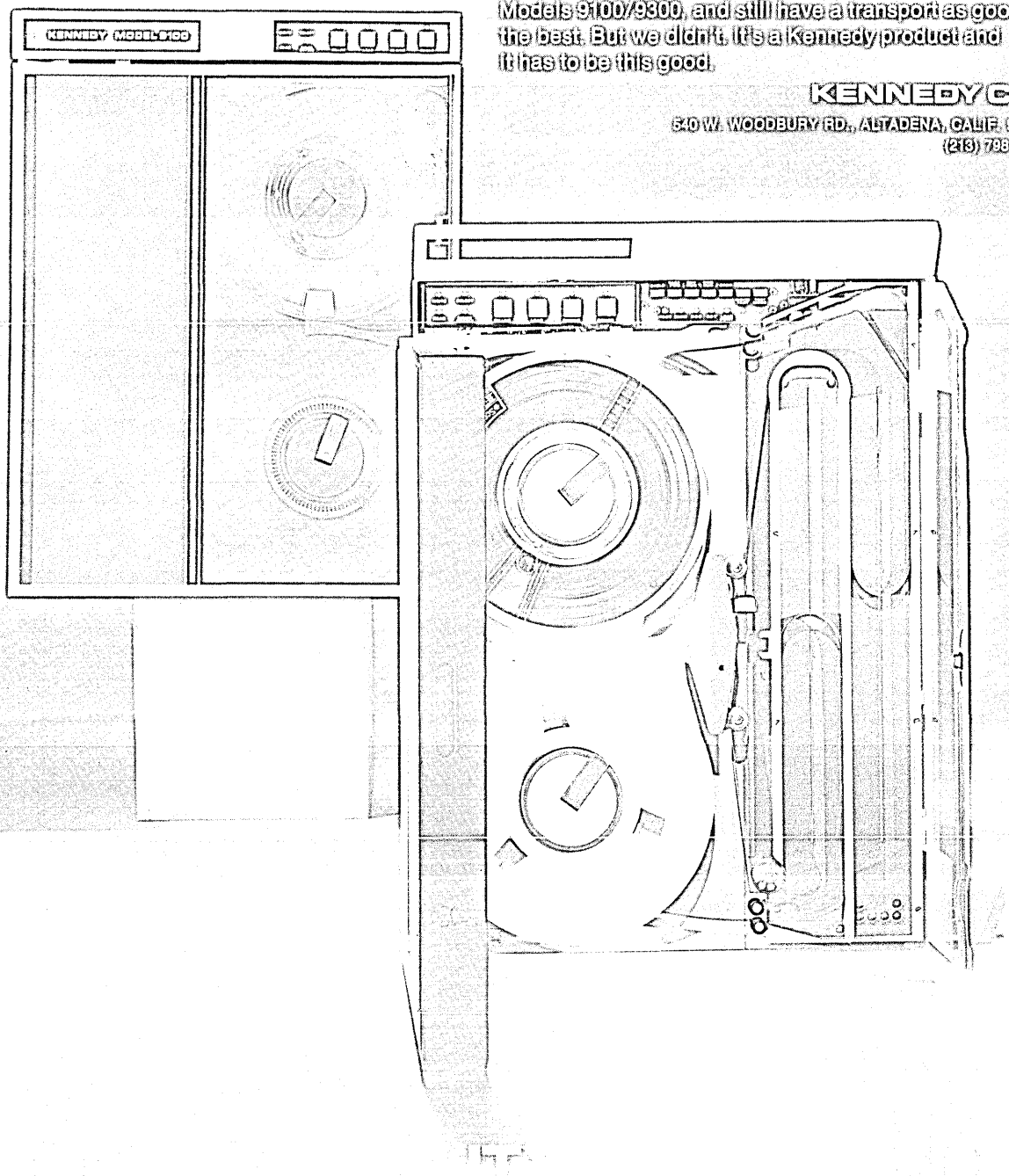
Kennedy vacuum column digital tape transports have been the standard of the industry from their introduction. Some companies would have stopped and relaxed. We didn't. We added features such as our capacitive tape-location detector, for improved tape life, air bearings and tribaloy coated read-after-write heads to reduce tape wear and improve data integrity, and we've achieved the lowest noise level in the industry.

Performance is just as impressive, with tape speeds to 125 ips (75 ips on Model 9100) and operating features such as crystal controlled timing, read threshold scanning, read-after-write shortened skew gate, front-accessible test panel, quick-release hubs and simplified tape loading.

Data densities are 200/556 cpi or 556/800 on our 7-track unit and 800 cpi, 1600 cpi or 800/1600 cpi on the 9-track transport. The format is NRZI/PE.

We could have eliminated some of the features of Models 9100/9300, and still have a transport as good as the best. But we didn't. It's a Kennedy product and it has to be this good.

KENNEDY CO.
540 W. WOODBURY RD., ALTADENA, CALIF. 91001
(213) 798-0953



CIRCLE 1 ON READER CARD

With XL40 Distributed Processing, your people will be doing business...

...while your competition's doing paperwork.

[illegible] fast [illegible] need it most [illegible] sorting through yesterday's [illegible]

Faster, more accurate information management.

Accuracy and speed increase [illegible] and costs decrease [illegible] when information is managed by the people who know it best. That's why the XL40 distributes data processing power to source departments.

Staff personnel [illegible] not computer [illegible] [illegible] all the source data they need [illegible] right in the same room.

Concurrent—no waiting in line.

[illegible] XL40 [illegible] [illegible] up-to-the-minute information.

Ready for business.

The XL40 was designed for simplicity and reliability. Getting the system up and running is fast and easy. The XL40's professional education program will train operators [illegible]

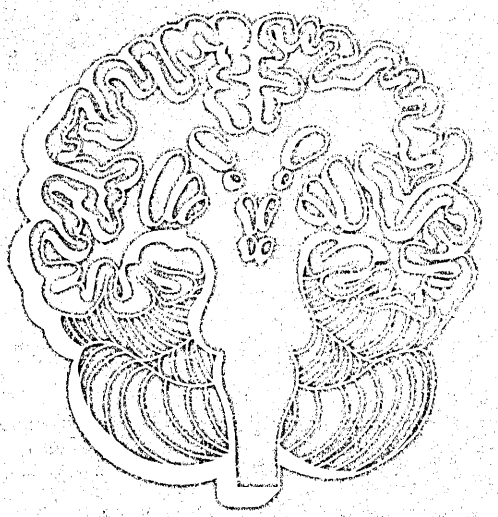
Built and backed by Pertec Computer Corporation.

The XL40 is manufactured, marketed [illegible] PCC, the world's [illegible] computer peripherals, distributed processing and data entry systems.

[illegible] for more information on the XL40 [illegible] brochure that explains the system in detail. Or we'll be happy to arrange a demonstration.

PERTEC COMPUTER CORPORATION
CMC Division
[illegible] Boulevard, P.O. Box 92300
Los Angeles, California 90009
(213) 822-9914 TWX (910) 343-6451

Our closest competitor



The brain is the original software system. It's been around as long as man.

It's where computer software has been headed, but will never get to.

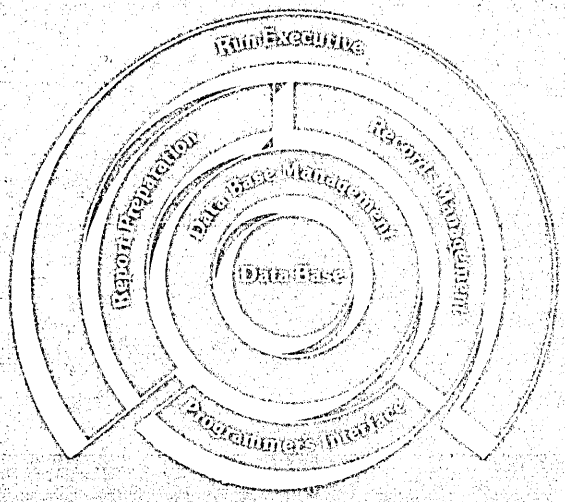
The brain is usually the most foolproof way to turn data into information.

It validates input. Stores facts. Applies them to an infinite number of decisions. Withholds information, if necessary. Enters new data without reprogramming, and gets it out as quickly as it goes in.

Above all, it has already achieved the ultimate goal of other software systems—the brain's problem statement is its program.

However, the brain does have drawbacks. It can't handle enough data and it's too slow.

An imitation called RAMIS II®



RAMIS II is a software system that offers many of the brain's capabilities without its limitations.

Like the brain, it's a DBMS. The only DBMS besides the brain that lets you specify what you want in English without having to specify how this information is to be obtained.

And like the brain, RAMIS II lets you access information even if you don't know how and where the data is stored. RAMIS II knows and that's enough.

This means that if you're a DP professional, you can design whole systems in one-fifth the normal time. And if you're a manager, you can access corporate data bases, ask those "what-ifs" as needs arise, without putting undue pressure on the DP staff.

Add information today and get it back today for both routine operations and decision support. RAMIS II tells you what you need to know. Now.

Send for a RAMIS II factbook. Write Mathematica Products Group, Research Park, PO. Box 2392, Princeton, New Jersey 08540, or call 609-799-2600 or 800-257-9426.

MATHEMATICA

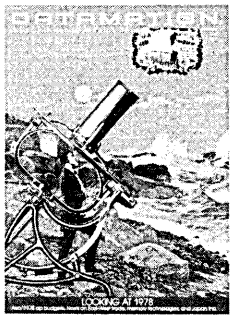
The brains behind RAMIS II

CIRCLE 24 ON READER CARD

DATAMATION®

VOLUME 24 NUMBER 1 This issue 134,718 copies JANUARY 1978

FEATURES



NEWS IN PERSPECTIVE

DEPARTMENTS

About the cover

Once again we join the seers, prophets, and other horizon-gazers seeking to separate the visions from the probabilities for the year ahead. Our design is by Barbara Benson.

DATAMATION

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ForeWord is a shared logic system that uses a Four-Phase computer with up to 16 video display stations and 16 printers to help your staff prepare letter-perfect correspondence in a fraction of the time once required. Either in a central location. Or in individual offices. Or both with the same system.

Ideal for manuals and proposals

ForeWord can also be used for direct composition, editing, and final typing of the large documents that once tied up your staff for days. Paragraphs can be retrieved from local storage and updated, chapters reorganized...all at computer speed. And all while other operators are performing their independent tasks.

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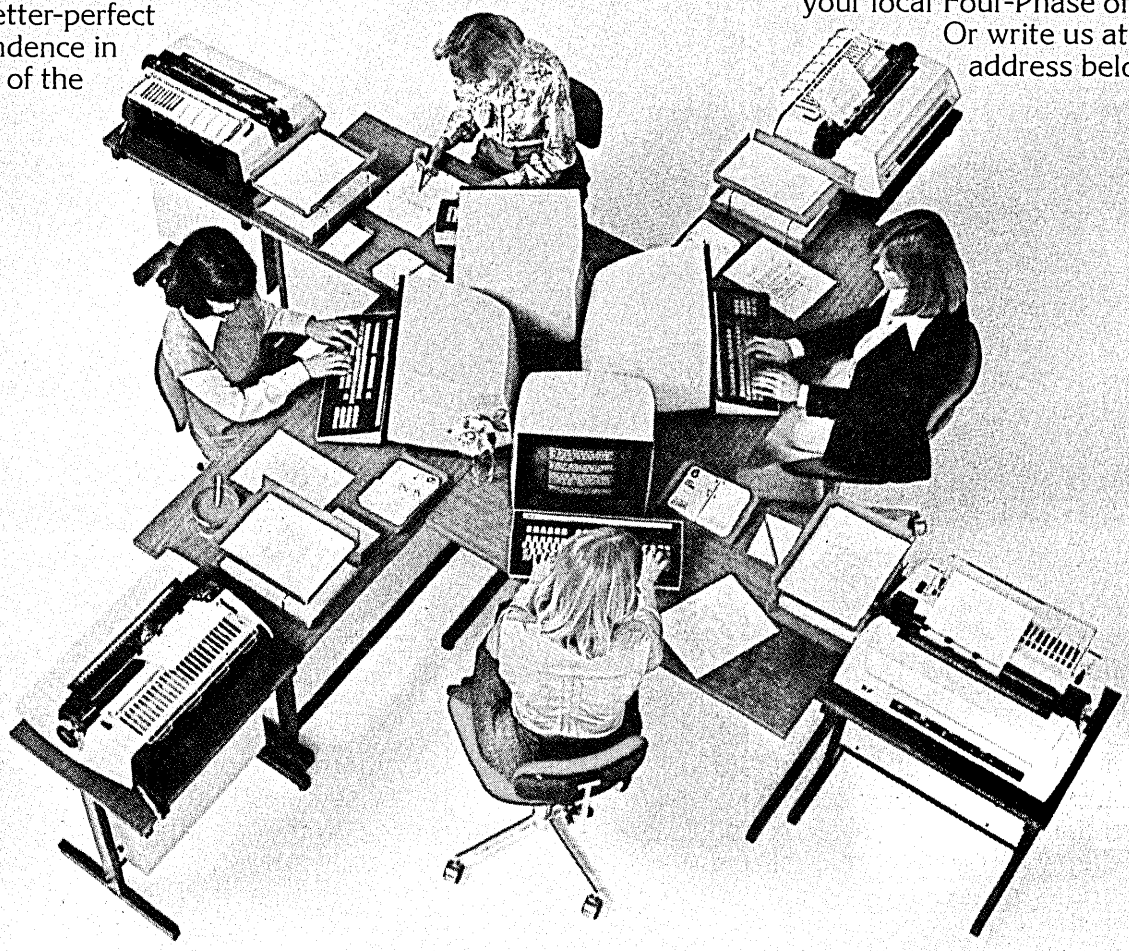

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CIRCLE 42 ON READER CARD

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PRONTO. The biggest booster

Nice system, your 3270's and 370.

But PRONTO, the Sperry Univac distributed data processing system, boosts its cost efficiency by taking care of all your remote computer needs. And freeing your 370 host to do the work it does best.

PRONTO is a software package that runs on a V77 minicomputer, equipped with peripherals such as line printers, video terminals, and disks.

PRONTO boosts the computer power at your remote branches by migrating computer services to meet their individual needs. Without changing host hardware and software.

When you add PRONTO to your current 3270 network, you suddenly find yourself able to concurrently perform local tasks you never could before.

Local and remote on-line processing. Local and remote batch processing. You can create new remote data bases. Not just for

your 3270 network ever had.

simplistic tasks, but for complex data base management services.

PRONTO speaks your mainframe's language. Whether it be COBOL or FORTRAN. And the system can even accommodate RPG-II.

1000 host computers already use TOTAL,® our data base management system.

With PRONTO, you won't use as much costly mainframe time or as many dedicated communications lines.

You get all this. Plus all the service and support of Sperry Univac around the world.

And it's those things that will turn a lot of 3270/370 users into Sperry Univac boosters.

Write to us at Sperry Univac Mini-Computer Operations, 2722 Michelson Drive, Irvine, California 92713. Or call (714) 833-2400.

SPERRY UNIVAC

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CIRCLE 33 ON READER CARD

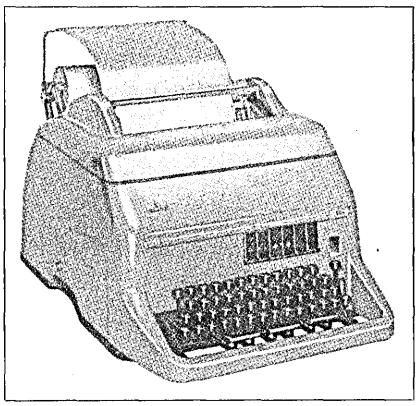
Looking Back in DATAMATION®

January/February 1959

A preview of the Western Joint Computer Conference in San Francisco, in this issue, shows they had a "blue-sky" session that included papers on experiments in information retrieval, symbolic language translation, and communications across language barriers. There were two sessions on information retrieval and machine translation at this meeting, chaired by Robert R. Johnson of GE and Richard W. Melville of SRI.

In those days, the "Joints" were sponsored by the Institute of Radio Engineers, the American Institute of Electrical Engineers, and the Assn. for Computing Machinery. The first two were to become the IEEE.

Among those on the program were the late Ascher Opler of Computer Usage Co., Charlie Bourne of SRI, Howard Bromberg of RCA, Lou Fein of Palo Alto, Calif., the late George Forsythe of Stanford, the late Howard



Aiken of Harvard, Dick Tanaka, Jack Sherman, and Norm Ream of Lockheed, Harry Huskey of the Univ. of California, and Bill Luebbert of Fort Monmouth, N.J.

We also reported on two new transistorized mainframes. The Honeywell 800 from the Datamatic Div. of Minneapolis-Honeywell featured parallel processing of up to eight jobs. The RCA 501, too, reportedly had "a 'time-sharing' system which enables (the) unit to do several operations simultaneously."

January 1968

A detailed study of the growth of computing power in the U.S. showed that improvements in power continued from 1950 through 1962 and that it "possibly slightly accelerated from 1963 through 1966 with the introduction of third generation computers."

Give us 3 minutes

and we'll show you how to cure your 2501 headache

We're that sure of our new 6501 Buffered Card Reader. Call us and we'll tell you more about how:

- The buffered DOC 6501 can be installed on ANY position on the channel and puts an end to channel OVERRUNS.
- The buffered DOC 6501 gently handles and increases the life of repetitively read card decks.
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- The buffered 6501 can be purchased or leased NOW.

If you aren't convinced in three minutes, we'll send you some buffered aspirin. With an unbuffered 2501 you'll probably need it.

Call John Sterling at (800) 327-6424 or (305) 724-1111.

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Or call, Atlanta, GA (404) 955-0309; Boston, MA (617) 890-2650; Chicago, IL (312) 782-0551; Dallas, TX (214) 661-9902; Detroit, MI (313) 353-8181; Greenwich, CT (203) 869-4123; Hartford, CT(203) 278-2010; Houston, TX (713) 780-1432; Los Angeles, CA (714) 752-8782; Miami, FL (305) 592-9655; New York, NY (212) 695-4195; Oakbrook, IL (312) 920-0551; Philadelphia, PA(215) 574-0950; San Francisco, CA (415) 574-4060; Washington, DC (703) 356-2050. **International Offices:** London — Staines 61124; Paris 686 8207; Toronto (416) 622-8720; Germany 06 11/728 128; Spain 416 87 60.

CIRCLE 146 ON READER CARD

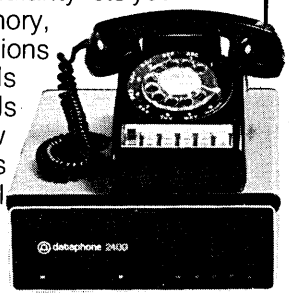
WANG'S PCS-II

THE END OF THE LINE FOR INTELLIGENT TERMINALS.

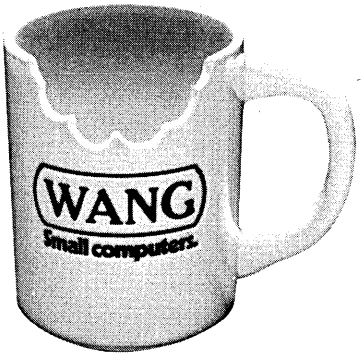
Wang's PCS-II. The small business computer that makes intelligent terminals obsolete. And introduces a whole new world of Distributed Data Processing.

Endowed with commercial BASIC and exclusive Wang minidiskette storage, the PCS-II delivers direct access data processing capabilities no ordinary terminal can. And with Wang's programmerless "EASYFORM" forms building and data-entry language, the PCS-II is a hands-on winner in any data-entry or forms-processing environment.

Wang modularity lets you expand memory, communications or peripherals as your needs grow. Or new technologies as they develop. Directly at the operator site.



The PCS-II even gives you a price tag no intelligent terminal can match—just $6,200. With 50K memory, dual minidiskette drives and bisynchronous 2780/3780 communications it's still only $9,200.



Hungry for more intelligence? Call your local Wang office or mail this coupon to PCS-II Product Sales, Dept. DDP, Wang Laboratories, Inc., One Industrial Ave., Lowell, Massachusetts 01851.

Wang Laboratories, Inc., One Industrial Ave., Lowell, MA 01851
I'm hungry. Send me information on Wang's PCS-II.

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Title _____ Phone _____

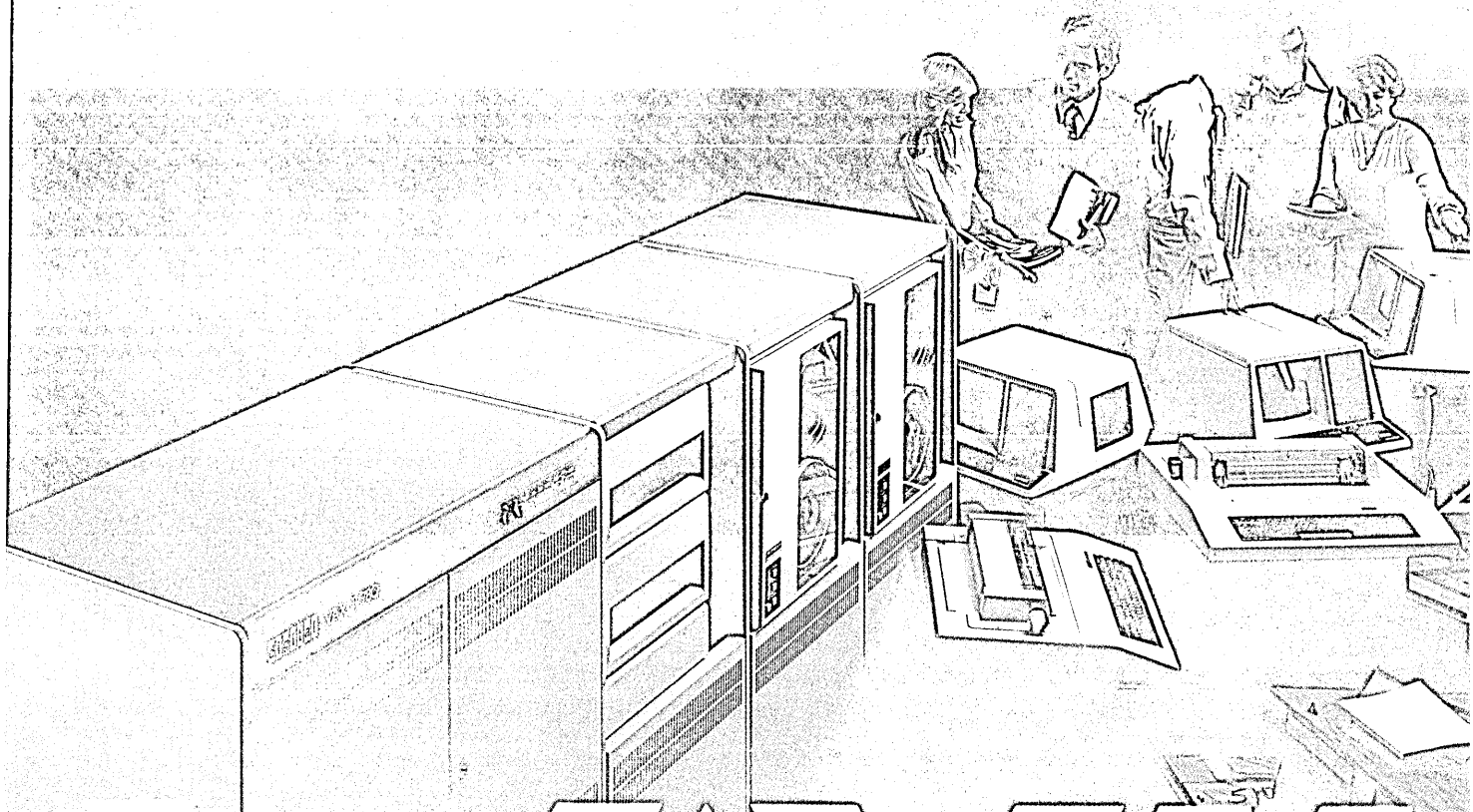
Company _____

Address _____

City _____ State _____ Zip

DP72/D18,

Digital introduces



VAX 11 780

Interactive VAX-11/780: A new computer system with exceptional performance...

VAX-11/780™ is a new, virtual memory, multi-user, multi-language, multi-programming, interactive computer system with extensive batch and real time response capabilities.

It is the product of many man-years of effort layered on top of more experience and more success with interactive computers than that of any other company in the world.

Digital believes the VAX-11/780 is a landmark computer system. It believes the VAX-11/780 is the beginning – of new definitions, new standards, new expectations.

Take performance. Throughput. Quantity and quality of useful work.

VAX-11/780 will take essentially *any* size program. It has a 32-bit word length, 2 million bytes of physical memory, and more than 4 *billion* bytes of virtual addressing space.

It will operate on that program quickly. Its big cache memory yields an effective cycle time of 290 nanoseconds. With its optional floating point accelerator, it performs double precision floating point 64-bit addition in 1.4 microseconds.

It will move the data with exceptional speed. Its synchronous backplane interconnect, which is its main control and data path, has a bandwidth of 13.3 megabytes per second. And it checks for parity and errors on each 200 nanosecond cycle for data integrity.

And it even makes the programming efficient. Its new, powerful instruction set is a model of efficient code generation. A FORTRAN DO loop, for example, is one instruction. Calls to subroutines, and returns to the main programs combine up to 15 operations into just one instruction. And for time-critical applications, one instruction will store and another will restore the contents of all general-purpose registers simultaneously.

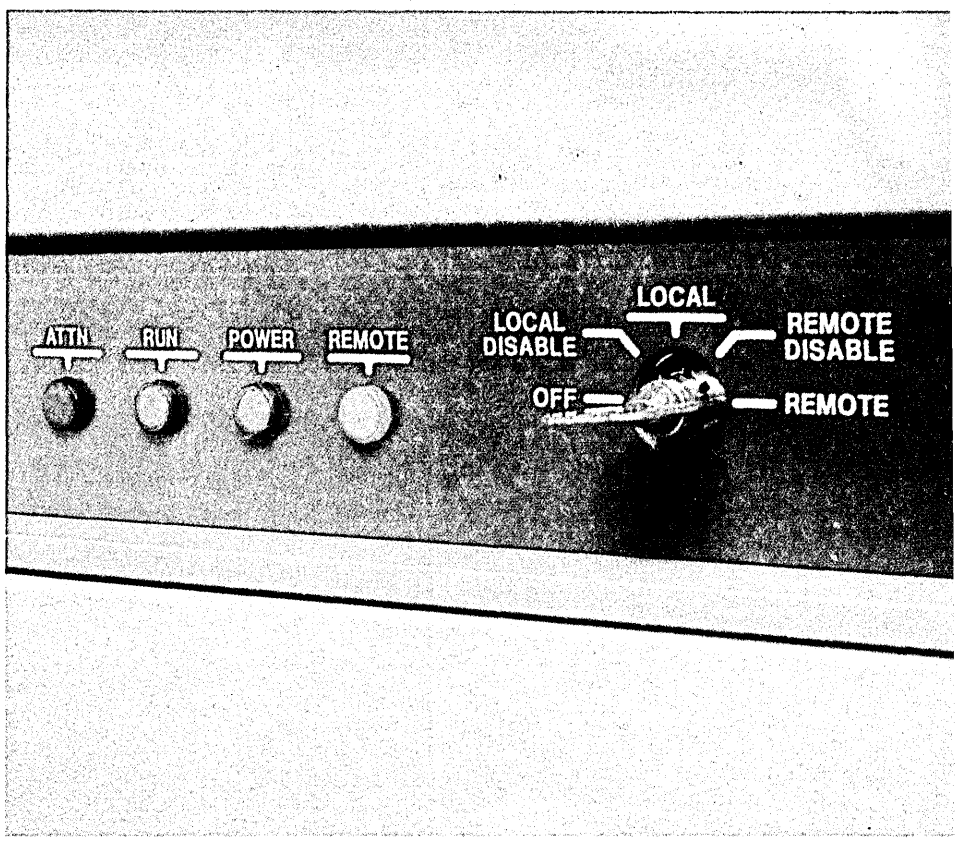
digital
VAX11
780

...unmatched reliability, availability, maintainability...

By design, the interactive VAX-11/780 is the most reliable, available, and maintainable computer system of its general class that has ever been built. It is another standard against which others must be measured.

Reliability, availability, and maintainability features are found in the hardware architecture, the software architecture, the individual component and board designs, and in the cabinetry – all supported by new and improved diagnostic aids.

Objective: keep the system running. If it fails, find the fault quickly, fix it, get the machine up and running again. Protect that data.



Four hierarchical access modes protect the system information. A diagnostic console contains an LSI-11 microcomputer. Automatic consistency and error checking detect abnormal instruction uses or illegal arithmetic conditions. Integral fault detection and maintenance features detect errors on memory, on disks, keep a history of recent bus activity, detect hung machine conditions, and allow automatic restart recovery.

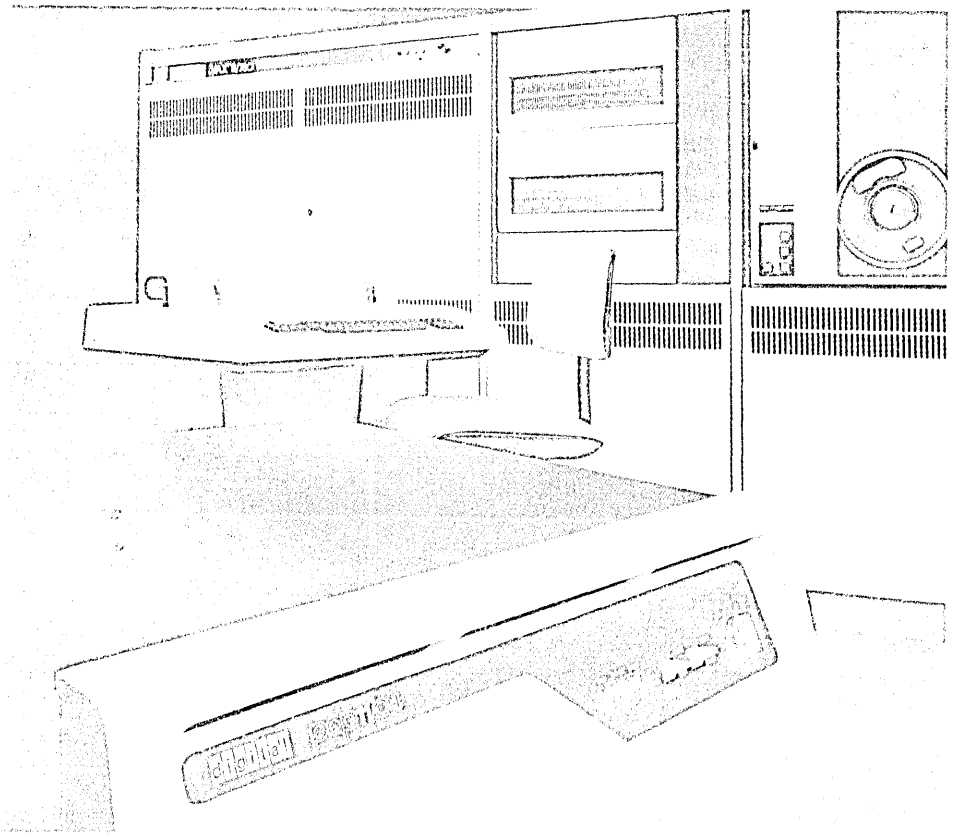
Parity checking for the integrity of the data is performed on the synchronous backplane interconnect, the MASSBUS and UNIBUS adaptors, memory cache, address translation buffer, microcode, and writable diagnostic control store. There are fault tolerance features. There are remote diagnosis capabilities. There are system verification test packages. There are functional and fault isolation diagnostics.

There are operating system consistency checks, redundant recording of critical information, uniform exception handling, on-line error logging, unattended automatic restart capabilities.

There are power loss, temperature and air flow sensors, cabling located away from the modules, a modular power supply with malfunction indicators...

digital
VAX11
780

...compatible with 50,000 PDP-11s already installed.



The VAX-11/780 is an all new 32-bit, virtual memory computer system with 242 basic instructions and a single all-purpose operating system.

DCL is the command language used on the PDP-11 with IAS and RT-11 operating systems. MCR is the command language used with RSX-11M and RSX-11D. Both DCL and MCR command languages are implemented on the VAX-11/780. The on-disk structure is the same one used by RSX-11M and IAS. The file access methods are the same as for RSX-11D, IAS, and RSX-11M.

Both VAX-11/780 and the PDP-11 implement the same FORTRAN IV, PL/I, BASIC-PLUS-2, and COBOL languages, with the FORTRAN converting native 32 bit code on the

Major Features of the VAX-11/780 system

CPU 32-bit word length • Can directly address 4 billion bytes of virtual memory • User program can be up to 32 million bytes • Powerful instruction set includes integral floating point and context switching instructions • Instruction set supports 9 fundamental addressing modes with single instructions simulating entire high level language constructs • 8K byte write-through memory cache results in effective 290 nsec memory access time • Supports state-of-the-art paging memory management with 4 hierarchical protection modes each with read-write access control • 16 32-bit general-purpose registers • 32 interrupt priority levels, 16 for hardware and 16 for software • 2 standard clocks, programmable real-time and time-of-year with battery backup for automatic system restart operations • 12K bytes of writable diagnostic control store.

The Console Subsystem Intelligent microcomputer LSI-11 with 16K bytes of read-write memory and 8K bytes of ROM, floppy disk, and terminal • Optional port for remote diagnostics • Fast diagnosis, both remote and local, simplified bootstrapping, improved distribution of software updates.

Main Memory Subsystem ECC MOS memory built using 4K MOS RAM chips • Memory controller includes request buffer, increasing system throughput, eliminating most need for interleaving • Minimum memory configuration 128K bytes—maximum up to 1 million bytes per controller, two controllers allowed per system, for total of 2 million bytes physical memory.

Input/Output Subsystems Synchronous Backplane Interconnect (SBI) is main control and data transfer path. SBI capable of aggregate throughput rate of 13.3 million bytes per second • Error and parity checking every cycle for data integrity • SBI protocol uses 30 bits for address, allows both 32-bit plus parity and 64-bit plus parity data transfers • UNIBUS connected to SBI permits interfacing of general-purpose peripherals and user devices • Buffered UNIBUS adapter pathway between UNIBUS and SBI has throughput of 1.5 million bytes per second • MASSBUS connects to SBI via buffered adapter, permits interfacing high performance mass storage peripherals with parity checking • MASSBUS adapter throughput rate is 2 million bytes per second • Four MASSBUS adapters permitted per system.

Software System Designed for many applications including scientific, time-critical, computational, data processing, batch, general-purpose timesharing • Process-oriented paging for execution of programs larger than physical memory, transparently to the programmer • Memory management facilities controlled by user—can lock pages into working set, never to be paged out, or lock into physical memory, never to be swapped out • Sharing and protection at page level (512 bytes) • Four hierarchical access modes • Interprocess communication through files, shared address space, or mailboxes • System management facilities • DIGITAL command language and MCR command language provided • File and record management facility includes sequential and relative file organization, sequential and random record access • Supports Files-11 on disk structure level 2 • Program development capability includes an editor, language processors, symbolic debugger • Support provided for FORTRAN IV-PLUS/VAX and MACRO/VAX in native 32-bit mode, COBOL-11 (V3) and BASIC-PLUS-2 (V1) in compatibility mode • Scheduler is priority-ordered, round-robin/time-slicing, event driven • 32 levels of software process priority for fast scheduling • Networking capabilities are supported through DECnet for process-to-process, file access and transfer, and down-line loading • Batch facilities include job control, multi-stream, spooled input and output, operator control, conditional command branching and accounting • Command procedures are supported by command languages.

PDP-11 Compatibility Provides system-wide compatibility supporting execution of the PDP-11 instruction set (with exception of privileged and floating point instructions) in compatibility mode • Applications Migration Executive allows RSX-11M/S non-privileged tasks to run with minimal or no modification • Host Development Package allows creation and testing of RSX-11M tasks • Same data format • Same source-level programs • High level languages • Files-11 on disk structure, level 1 • RMS file access methods including ISAM • DIGITAL Command Language and the RSX-11 MCR command language.

Reliability, Availability, Maintainability Remote diagnostics by means of integrated diagnostic console permits diagnostics, examination of memory locations from remote terminal • Automatic on-line error logging • Automatic restart capabilities after power failure or fatal software error • Users continue to use system with failed hardware components • Consistency and error checking detects abnormal instruction uses or illegal arithmetic conditions • Improved packaging and cabinetry increase hardware reliability and ease of maintenance • On-line diagnostics available and run under operating system.

digital

VAX 11 780

Digital Equipment Corporation
146 Main St., Maynard, MA 01754
Attention: Communication Services NR-2/2

I want to know more about Digital's VAX-11/780:

☐ send me your colorful, new VAX-11/780 brochure.

☐ send me your detailed System Summary.

☐ please have a Digital sales representative call me.

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Company_____

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Presenting lunch hour programming.

Programming on other computers can eat up a lot of valuable time. But on Data General commercial ECLIPSE systems you can develop workable screen formats in as little time as an hour. So instead of having to wait for a break in your computer's schedule, you could do a small data entry program on your lunch break. And wrap up entire applications in days rather than months.

A Data General commercial ECLIPSE data processing system can do it because it's a real-time data management system. It uses Idea, our interactive data entry/access software for online screen formatting. Idea also has an online multiterminal monitor and powerful English-like language resulting in faster screen-related programming. Plus applications developed under Idea can automatically access and maintain files built by a highly sophisticated data management system, our INFOS software.

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CIRCLE 48 ON READER CARD

LOOK AHEAD

NEXT: A 16K CHIP MEMORY FROM IBM?

Rumors now are circulating that IBM will: (1) move to a 16K chip memory technology this year; and (2) initiate a price cut on the 303X line as a result. If true, the 16K move might prove an upgrade to the H line, the so-called next generation of IBM machines. Moreover, the 16K memories, less costly to manufacture, would provide the computer giant with a legitimate reason for slashing prices, an important consideration in light of the on-going antitrust suit. Skeptics, however, view the rumors as a possible plant--geared to keeping customers from switching over to the competition. If IBM does switch to 16K memories, the move won't come for several years at least, they say.

A SUPER ECLIPSE FROM DATA GENERAL

Data General plans to announce a super Eclipse this month which will have one million bytes of main memory and will be competitive with the Hewlett-Packard 3000, Digital Equipment Corp.'s VAX-11/780 and System 20, and with IBM's 370/138 and 148. The company plans to tout the processor's extremely high throughput rate and the fact that it's software compatible with the rest of the Eclipse line. DG also intends to announce availability of PL/1, the programming language, for its Eclipse line just before the mid-January annual meeting.

BURROUGHS STILL OPTS FOR BDLC

Look for Burroughs to implement its communications protocol, BDLC, on some products to be announced in the second quarter of this year. So far, the company's only use of the line discipline is between a pair of switches in Amsterdam and Brussels on the international banking network, S.W.I.F.T. Basically, these are subsets of BDLC and the company plans some changes and enhancements.

The company made the comment in denying a report in this column in December that it was abandoning BDLC in favor of supporting ADCCP, which both ANSI and the federal government are expected to adopt as a standard. It says it is tracking ADCCP as well as the International Standards Organization's HDLC and will remain compatible with them.

IBM UNDER FIRE--INDIA, NIGERIA, BRAZIL

Everyone knows multinationals are under fire around the world, and no one knows it better than IBM. It already has pulled out of India because it would not give up 100% ownership in its subsidiary there. It compromised in Indonesia (IBM retains ownership of its own operation but will use a local trading agent for yet-undisclosed functions). And now Nigeria is pushing IBM, along with a long list of multinationals, to give up a big piece of its subsidiary there. Rumor has it that IBM tried to get the Carter Administration to get IBM off Nigeria's split-list but Nigeria turned thumbs down. What will happen is a big question since IBM provides almost all Nigerian computers.

IBM also has lost out in its bid to the Brazilian government to become part of a new national minicomputer effort (16 firms bid, three local companies won out). IBM can't say yet what this means for its small business systems there. It makes System 32's in Brazil but so far it only has been allowed to export them, not sell them domestically.

INTEGRATING MARKING STANDARDS

Guidelines to help manufacturers who sell goods through both department stores and grocery stores to comply with marking standards for both are expected early this Spring. Technical advisory committees of the National Retail Merchants Assn. (NRMA) and the Universal Product Code (UPC) Food Products Council launched a joint effort in late November to develop a method for integrating NRMA's OCR-A standard of marking and the grocery industry's UPC, a bar code. The two committees are holding separate meetings early this month and a joint meeting toward the end of the month. J. J. Miller, NRMA's Director of Universal Vendor Marking, said activities to date "have been encouraging" and that guidelines probably "will be publishable" by early Spring. Grocery stores use scanning to read the UPC. Wands are used by department stores to read OCR-A.

LOOK AHEAD

GAO CRITICAL OF NBS STANDARDS ACTIVITY

A General Accounting Office draft report, sent out for comment last month, is rumored to be critical of the National Bureau of Standards' lethargic track record in ADP standards development. Due out in the next few months, the report focuses on the bureau's Institute for Computer Science and Technology and its efforts in the federal information processing standards (FIPS) program. GAO has been working on a computer standards study for 18 months.

It reportedly zeroes in on several dismal case studies which pinpoint the institute's lack of progress in specific adp standard areas. The criticism is said to be particularly aimed at former director Ruth Davis who, one source claims, "got word of what the GAO was up to and decided to clear out" for a job at the Defense Dept.

DEC HEDGES ON DISTRIBUTOR

Digital Equipment Corp.'s Business Products group has no viable plans to convert its OEMs to licensed distributors, the company claims. Reports to that effect circulated in at least one trade weekly recently when a DEC paper regarding a proposed commercial distributor program became public. DEC says the paper, which spelled out ways in which Digital would assist OEMs/distributors and vice versa, was strictly a tool used to discuss what a hypothetical distribution program should be. The discussion took place at at Tarpon Springs, Fla., sales meeting last October. "If this document was for real, it would have been labeled 'company confidential' ", a DEC spokesman asserted. "There may come a time when such a distributor program could become a reality, but right now it's still up in the air."

CODING SHEETS AS A TAX DODGE?

"The antiquated and now costly process of coding sheets is used for the sole and express purpose of avoiding sales and use taxes," says California's Sales Tax Action Group (STAG). It told this to the state's Board of Equalization in successfully requesting a public hearing on Rule 1502 covering "Automatic Data Processing Services and Equipment" (p.201). STAG said a section of 1502 "imposes sales and use tax on the transfer of custom programs written to the special order of a customer except when such programs are transferred on coding sheets. With the advent and widespread use of sophisticated programming and data entry equipment," the tax group said, "programs are now keyed directly into a computer by the programmer as a part of the development process or as the ultimate end product." Thus, the use of coding sheets as a tax dodge. This and other problems with 1502 were to be discussed at a full STAG membership meeting at 6:30 p.m. Jan. 11 at the Sheraton Inn, Burlingame, Calif. as part of preparation for the February hearing with the Board of Equalization.

AF TO ISSUE $400 MILLION COMPUTER PROCUREMENT

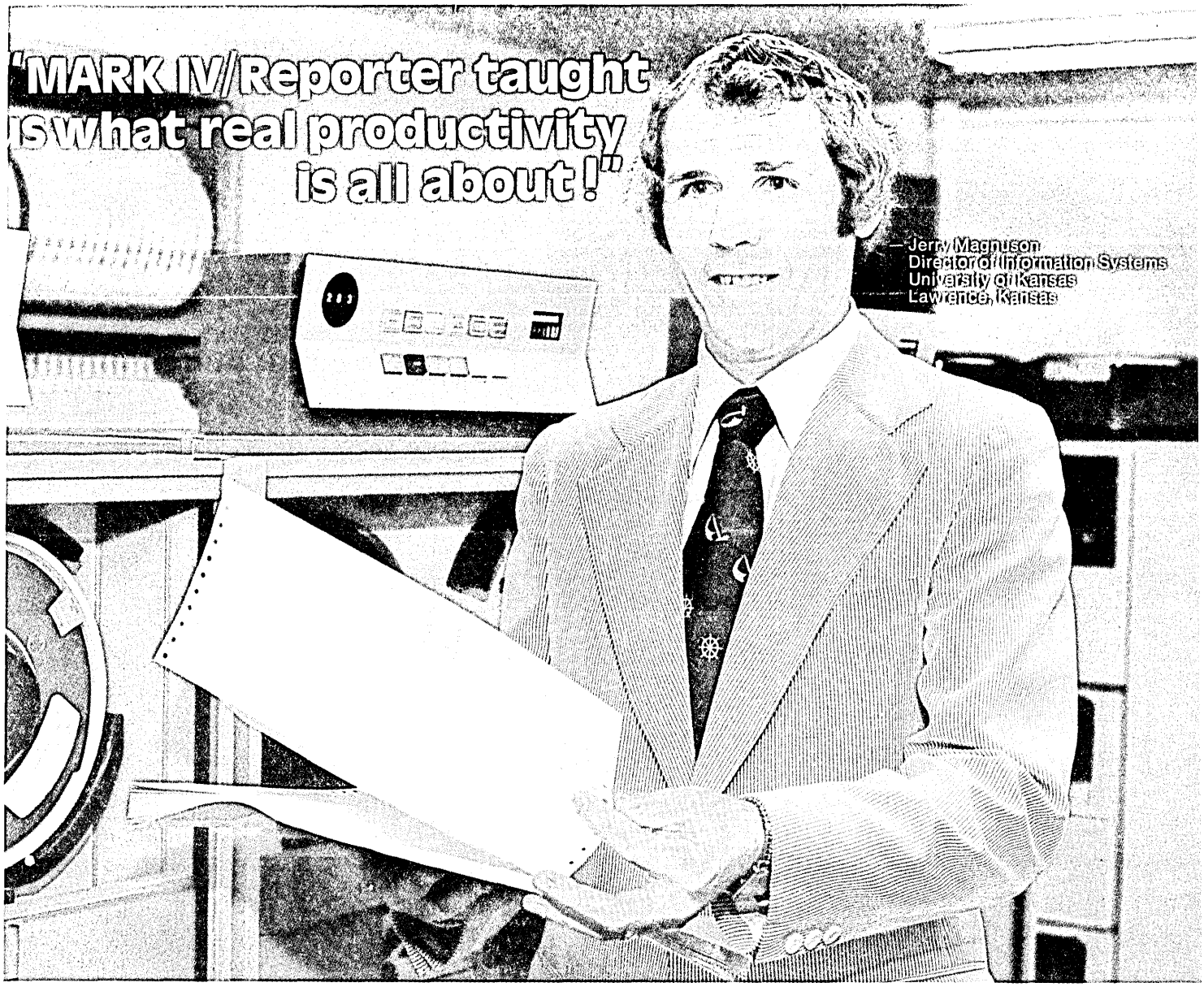
The Air Force, saddled with mainframes purchased back in the '60s, is preparing to launch a major program to replace all of its base level and major air command computers. Sources close to the program say an order as high as $400 million could result (before the customary vendor discounts which could slice up to 60% off the price tag).

By June, the Air Force expects to announce a general request for information to get a feel for potential bidders. A request for proposals (RFP) then would be issued, and final installation of the selected mainframes would begin in 1981 and run through 1984. To be replaced are two current base level-machines--the Univac 1050 which is used for supply and inventory and the Burroughs 3500 which handles such Air Force base administrative functions as payroll. Also to be replaced are the Honeywell 800s purchased in 1964 for the AF's major air command outposts.

ENERGY CONSERVATION AND THE COMPUTER ROOM

What does running a computer installation do to the electric bill? The U.S. Dept. of Energy will commission a study to find out, and computer makers everywhere had better keep close tabs on the results. The study will look at the KWH usage of dp equipment by system, machine, and manufacturer; the energy it takes to keep

(Continued on page 208)



"We purchased a General Ledger accounting system from a major vendor. After investigating, we found that we were going to have to drastically change the Cobol programs in order to generate all the required reports.

"Rather than this, we concluded that it would be far better to start from scratch and use MARK IV/Reporter for the 75 to 100 daily, weekly, monthly and year-end accounting reports that we produce. We made the right decision. If we had tried to modify the Cobol report writer that came with the system, it would have taken us at least two months longer to complete the project.

"MARK IV/Reporter was installed on our 370/145 within a few hours. The four people who attended a basic MARK IV/Reporter class were using it comfortably within a week. We also have a competent Cobol programmer who took the MARK IV® manuals home and read them over a weekend. He started using MARK IV/Reporter the next Monday morning.

"It runs very efficiently and it's helped increase the productivity of our systems and programming staff. With the confidence we've gained in MARK IV/Reporter we can commit to new projects now that would have been impossible before. We'll be using it for 50% of our new work, which includes a new student records information system. MARK IV/Reporter will be a key part of this new system. "As for Informatics Support, our staff here is very impressed; their people have been extremely competent and the systems engineering support has been excellent."

WHAT IS MARK IV/REPORTER? MARK IV/Reporter is an information processing system which handles all reporting requirements for existing file and/or data base systems. Although extremely flexible and powerful, the system allows non-programmers to produce error-free reports in a fraction of the time required with conventional programming methods. MARK IV/Reporter can be installed and implemented in the U.S. and Canada for as little as $306.00 a month. MARK IV/Reporter is upward-compatible to MARK IV whose 1,300 installations worldwide make it one of the most successful software products of all time.

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The acquisition of Mark IV was made possible by a grant of the University of Kansas Endowment Association. Mr. Magnuson oversees administrative DP activities for the Lawrence campus. The views expressed are those of Director Jerry Magnuson and not necessarily those of the University of Kansas.

CIRCLE 17 ON READER CARD

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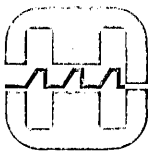

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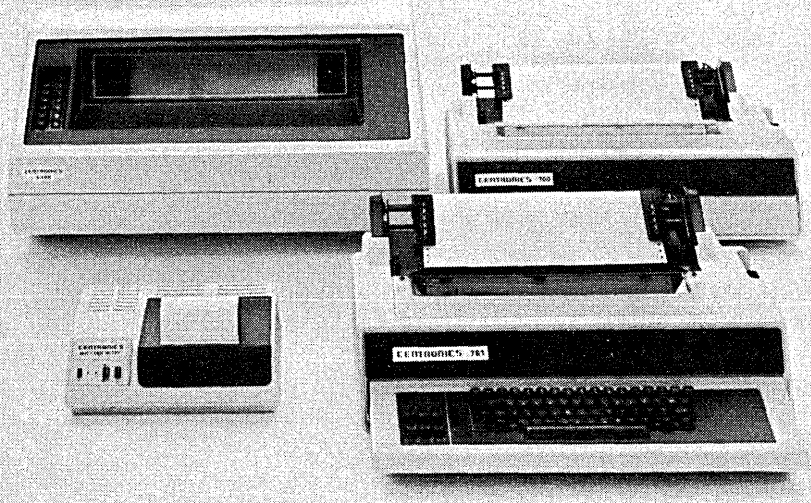

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Tax topics

Your October editorial ("Capital Gains —Who Loses," p. 59) urging the retention of the preferential treatment for capital gains in the tax laws presents a rather narrow view of a broad, deep, and crucially important subject. As a first-order approximation, you are correct; tax incentives to invest rather than consume are essential to the renewal and advancement of the technological base of our economy. The present capital gains preferences, however, are not very effective in obtaining the kind of investment required.

By treating all capital gains alike, the present law provides no greater incentive for investment in new plants or in research and development than it does for long-term speculation on changes in the interest rate using safe government debt instruments or for other strictly financial games. Instead of deploring a movement to repeal such incentives, we should be using the movement to bargain for more effective laws. Three desirable reforms come to mind immediately.

First, while taxing capital gains at full normal rates, the proceeds from the sale of assets should be indexed by the GNP deflator before inclusion in income. Thus there would be no tax on the portion of the gain attributable to socially created inflation. Incentives to invest would be preserved while gimmicky tax-avoidance schemes would not be encouraged.

Second, realization of gains would be deferred on that portion of the proceeds of a sale of assets that was reinvested in new securities to the extent that the new security was not merely a refinancing vehicle. Without foregoing the principle of equal treatment for income and capital gains, this provision would focus investment on wealth creation and away from transfers of already-existing wealth.

Third, the present restrictions on writing off capital losses should be removed. In the absence of a preferential tax rate, there is no reason, if there ever was, for inhibiting the cutting of losses and reinvesting the full proceeds as quickly as possible. To the extent that the present laws place extra burdens on losers, they favor safe, unimaginative investment over venturesome risk-taking.

Furthermore, given laws that more specifically encourage risk-taking, it is by no means clear that the elimination of double taxation of dividends will enhance the economic power of the big, dividend-paying corporations. Double taxation coupled with the preferential capital gains rate have been keystones in their argument for retention of earnings. Investors have had an incentive to let management finance company expansion internally, away from the open capital market. With that incentive gone, investors may well demand higher payouts of profits in the form of dividends. If they can procure such payouts, at least some of the investors are likely to put some of the proceeds into more venturesome situations than would the management of the dividend-payer.

By preferring all kinds of capital gains indiscriminately, the present law creates powerful incentives to structure business arrangements artificially for tax advantage rather than economic value. The law does too much generally and not enough specifically for those kinds of investments society should be encouraging. The first step out of this mess is to eliminate the distinction between ordinary income and real capital gains income. Only then will it be possible to devise tax incentives that will encourage innovative investment.

SANDER RUBIN
Berkeley, California

What to do

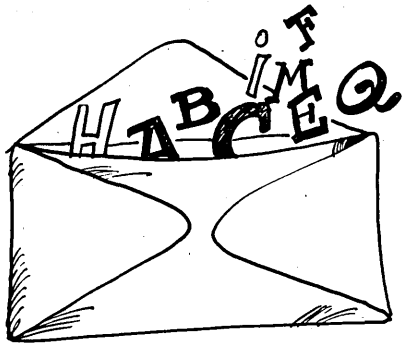
The data communications tutorial by George M. Dick ("The Communications Channel: It's Broken—Now What," October 1977, p. 113) did a very good job of presenting a large amount of information. Some basic, although important, topics which were omitted concern testing at the terminal-modem interface, and use of the data communication error logs as an alert to a problem of degradation before the communication channel goes down.

Very often we must include the DTE (data terminal equipment which can be the communications controller of a computer or an ordinary terminal) as a suspect in the diagnosis of a data communications failure. It is relatively easy to monitor the common EIA RS2323C interface between the DTE and the modem with a specialized test box. The better EIA test and breakout boxes have small lamps which allow the user to see the state of any of the control circuits, and to view the data circuits a built-in pulse stretcher provides a flickering light for data at any rate—a steady mark or space is proof of the absence of data.

Additional tests and substitutions can be made using this tester, and with a cost of well under $1,000, it is much more easily affordable than the digital and analog measurement sets discussed by Mr. Dick. The low cost and straightforward use makes it possible for the user to own and apply such a test set and to help isolate data communication problems.

Most modern data communication involves a computer at at least one end of the channel and incorporates error detection with retransmission requested when an error is detected. The data communications software (in the computer, front end processor, etc) often maintains a log of the number of retransmissions required. This gives an indication of the block error rate and, since it shows the overall effectiveness of the system operation, it can be used for evaluation and tuning.

In the current context, if the retransmission rate is inspected periodically, it can indicate a gradual degradation before the error rate becomes so high that the communication



channel becomes unusable. This is the time to arrange for backup and for the thorough testing described by Mr. Dick—preferably to be done during slack times or when you've transferred to your backup facililities.

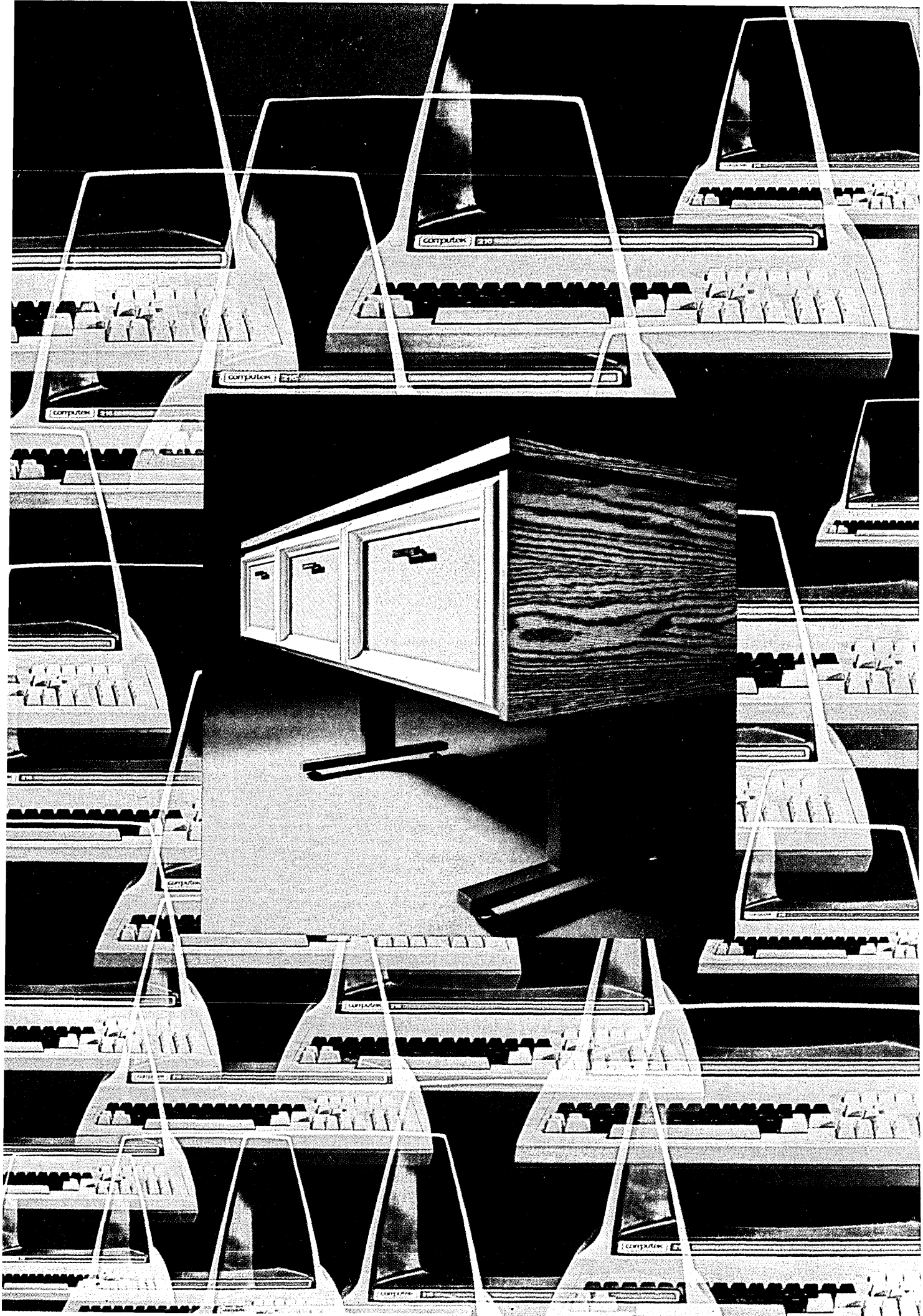
HENRY E. SCHAFFER
Professor of Genetics
North Carolina State University
Raleigh, North Carolina

Mr. Dick responds: Mr. Schaffer is discussing what can be done by an end user before getting involved in the testing I described. His suggestions, of course, are only a beginning, as there is much else than can be done with the hardware most users already have available. Unfortunately, most persons don't realize what is possible. For example, I've always wondered why the EIA Signal Quality lead is rarely considered as a channel performance monitor. One thing, however, must always be remembered: trouble-shooting is an inexact science, and a method that works well for one individual may be totally useless (or meaningless) for another.

Room for some more

I challenge the comment in the "Rumors and Raw Random Data" section of your October 1977 issue (p. 176) which alleges that the size of the BC/7 operating system "is so big there's hardly any memory or disc space left for the user." This is a distortion of the facts.

The Sperry Univac BC/7 Interactive Operating System was developed with ease of use as one of the primary design objectives. It communicates with the operator through the video display,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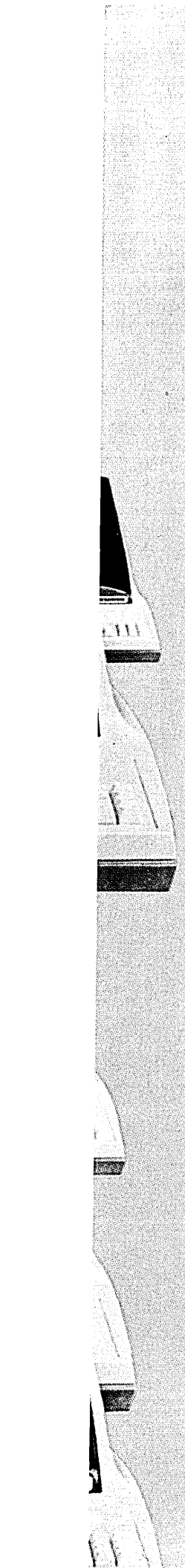

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CIRCLE 18 ON READER CARD

letters

employing various conversational techniques, and features short, simple, and easily understood English language statements, enabling uninitiated personnel to quickly become BC/7 operators. The BC/7 oerating system will range in size fom .5MB to 1.5MB, depending on customer requirements.

The operating system used with a diskette-based system can reside in one diskette drive. As many as six diskette drives can be interfaced to the system.

The disc operating system requires approximately 1MB of disc storage. Disc configuration ranges from 5MB to 40MB. While in use, the BC/7 operating system utilizes 16K of memory, providing a minimum of 32K for user program.

MARTIN R. DURBEC
Director, Business Systems Marketing
Sperry Univac
Blue Bell, Pennsylvania

Tools for the trade

I was pleased to see that the apparent end product of the design process featured on your November 1977 cover was structured pseudo-code. A designer's or programmer's most important tool is his language. It affects not only the way he codes, but the way he does and and can think about a problem. Training in a language that does not make structured coding seem natural can interfere with the ability to create well-designed programs.

Designers are recognizing this and are looking for tools (including structured, design, pseudo-code, etc.) that are independent of the final implementation language (typically COBOL or FORTRAN). It is generally felt that the actual coding can be carried out in any language without doing damage to the design. Under ideal, or even "good," conditions this is probably so. Under pressure, however, our design language rapidly approaches our implementation language. ("There isn't time to rework the design—just make the fix quickly.")

Program coders need tools (particularly good languages) just as badly as designers do. We probably need to seriously reconsider our commitment to COBOL or FORTRAN (Pascal, e.g., has become a serious contender). Another temporary alternative is to provide programmers with an improved COBOL or FORTRAN through the use of a precompiler, and make it possible for them to write with the proper control structures of structured programming without the laborious and error-prone hand translation required to do this in COBOL or FORTRAN. When the actual program code can exactly parallel the designer's pseudo-code we have eliminated the design/implementation language clash.

MARTHA J. CICHELLI
Software Consulting Service
Allentown, Pennsylvania

A most important asset

I read with great interest your article pertaining to the terminal distributors around the country ("Terminal Distributors: "Our Most Important Asset," September 1977, p. 159). While I must admit that much of it was accurate, I quite frankly question the reliability and/or objectivity of your sources.

I take exception to Mr. Chalmer's (of DEC) thoughts that dealers (or as he calls us "resellers") are a necessary evil that he "must learn to live with. . ." The nature of this business is such that end users of this equipment usually require a higher level of service than a giant corporation can render. The dollars involved in a terminal transaction just don't justify the effort that would be necessary to change these attitudes.

Several of the major manufacturers seem to gravitate toward one particular dealer who gives the outward appearance of being a highly professional organization with considerable marketing clout. The result usually is some form of special contractual arrangement between the two. A lesson soon is learned that this particular dealer "kills the golden goose" by advertising exceptionally low prices. All other dealers must meet the price, no one moves any more equipment, and all earn lower profits. One increases profits by lowering price only if all competitors maintain a higher price and are willing to settle for lower volume. The result of such pricing is that the manufacturer is barraged by complaints from the other dealers that profits are too thin, and it doesn't pay to carry that manufacturer's products. Many smaller dealers are forced to drop such products because of their inability to sell at a price that allows a reasonable profit considering the price that the smaller dealer must pay, allowing for his potential volume, overhead, and financing problems. In many cases the price the market will bear is actually below the price the smaller dealer must pay. Many small dealers gravitate toward other larger dealers as a source of equipment, thus the practice of "tiering."

As for Wall Street, we do make something: a reliable, fast source for a broad range of products and custom-tailored services.

WILLIAM F. TILLEY
National Computer Communications Company
Wellesley Hills, Massachusetts

Number, please

There has been considerable controversy in the field of data processing since the advent of the Privacy Act of 1974, directed toward the question of which personal identifiers to use in place of the Social Security Account Number (SSN) to uniquely access computerized data files.

Full name and birth date used together provide less than 100% accuracy, and the key deteriorates with a name change. Full name, birth date, and current address should provide 100% accuracy, but the address portion of the key deteriorates rapidly. There are many other combinations of personal data that might be considered, but I can think of none that do not deteriorate as time passes. The SSN, on the other hand, has the dual advantage of uniqueness and nondeterioration.

Much harm can occur if the identifiers used are not unique, resulting from the mismatching of records. A person could get tagged, for example, with the bad credit rating (or excellent rating) of another person who happens to have the same, or very similar, personal identifiers. Also, a person's record can become inaccessible if the personal identifiers used to store that data have changed. If record-keeping is done by SSN, the likelihood of errors is bound to be greatly decreased.

Any data processing person of reasonable ability should be able to match 90% of two data files based on personal identifiers other than the SSN and, therefore, can still misuse the data in the combined files. The problem of privacy is not one of what personal identifiers are used, but whether data is protected from unauthorized disclosure and misuse. The privacy benefits to the few whose records cannot be matched when data is misused seem to me to be far outweighed by the penalties to those whose data is mismatched in legitimate use of the data, and to those whose records cannot be retrieved because the keys do not provide uniqueness or have changed value.

The obligation of record-keepers to maintain the security and privacy of data is the heart of the matter and should be the focal point of our efforts and the object of any additional legislation. Restriction of the use of the SSN as a personal identifier is not the answer to the privacy problem.

WILLIAM D.B. FELCH, CDP
Coordinator of Administrative Computing Services
Western Wisconsin Technical Institute
La Crosse, Wisconsin

This subject also is discussed by Robert L. Patrick in his review of "Accessing Individual Records from Personal Data Files using Non-Unique Identifiers" on p. 41 of the October 1977 issue.

Hewlett-Packard

Computer Advances

Vol.3 No.1 January 1978

Distributed Processing: An idea that works

Some consider distributed processing a revolution. Others view it as the next phase in the evolution of dispersing data. Whatever the position, the trend is clear. We are entering an era where data bases and time critical processing are moving to the source of the data.

If you have a task to do, isn't the most logical approach to put the resources where the job is? This is the concept of distributed processing. Move the processing logically closer to the source and user of the data . . . parallel your existing organization with your computing power. With this approach, small computers can respond to local needs, and the mainframe can do what it does best—repetitive, batch oriented processing.

Distributed processing makes sense, because problems in the real world are interrelated, not isolated by department nor restricted to a central location. What happens on your manufacturing floor does, after all, affect your financial accounting.

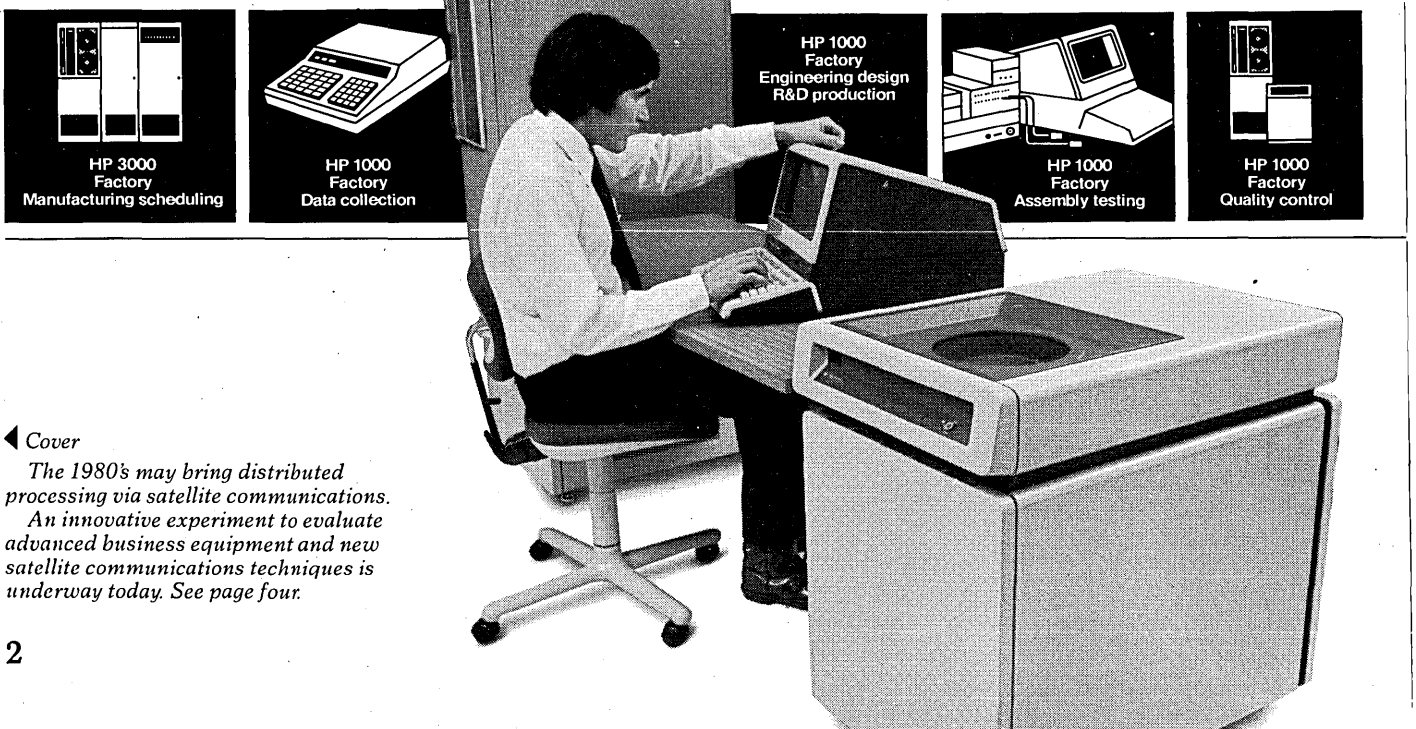
Networks offer advantages beyond this kind of responsiveness to the user—dependability, for instance. If one computer system of the network is down, the organization can continue to function. You can even handle that system failure by routing around it.

Hewlett-Packard was one of the first computer manufacturers to market products for distributed computer networks. In fact, several hundred of our worldwide customers are already using distributed networks.

Today, we have further committed ourselves and future computer products to networks with "HP-DSN"—Hewlett-Packard's Distributed Systems Network. This is a sophisticated plan for interconnecting various computer systems. We are building a line of products with a wide range of processing power, communication speeds, and capabilities. Our goal is to map our computing products onto customers' organizations and network needs.

Since not everyone in your organization is a computer specialist, a primary goal of HP-DSN is that it be useful to operating managers and professionals. The high-level network capabilities are accessed with simple, English-like commands. So the user can concentrate on the solution of a problem and not on the internal workings of the network system.

This ease of use is achieved, in part, by a layered architectural



◀ *Cover*

The 1980's may bring distributed processing via satellite communications. An innovative experiment to evaluate advanced business equipment and new satellite communications techniques is underway today. *See page four.*

design of both hardware and software. Only the top layer, which provides high-level system services, is visible to network users. The other layers, which provide network communication services, and necessary electrical interfaces, are handled automatically by HP-DSN hardware and software and are transparent to the user.

Flexibility is another advantage of the layered approach. Each functionally independent layer can accommodate new technologies without affecting the rest of the layers. For example, HP plans to interface to packet switching networks using CC1TT x.25 compatible protocols. As developments like this occur, they will be implemented in the appropriate layers with no disruption to user programs that communicate across the network.

HP-DSN assumes intelligence at each node. Every member of the network stands by itself and performs a specific processing task—be it an HP 3000 for batch and terminal-oriented data processing, an HP 1000 for real-time applications in the lab or on the factory floor, or an HP 2026 for data entry and communication. Yet, for many applications, the resources of all other members of the network are readily available through that node.

Full implementation of a distributed information network for a company will likely be an on-going process. Networks map onto existing organizational structures which, of course, flow and change. HP-DSN is a strategy that accommodates these changes by redefining, when necessary, the use of the equipment.

Hewlett-Packard is committed to a partnership with its customers to provide the on-going products, consulting, support, and service needed as their distributed processing demands evolve and grow.

DS/1000-The latest link

HP is not new to networking. We have been delivering reliable networks—200, in fact—for the last half decade. HP started with small star networks with fixed command relationships, and moved toward more capable star networks with flexible command relationships.

Now, with DS/1000, we have a truly generalized nodal network which supports a variety of configurations—stars, strings, rings, and combinations.

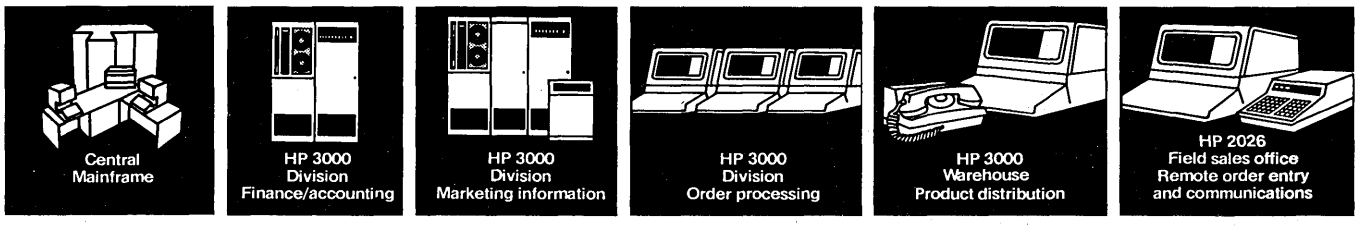
DS/1000 is a set of hardware, software, and firmware which supports HP 1000 and HP 21MX systems as network nodes which communicate not only with each other, but also with a directly-connected HP 3000 Series II computer.

Users can strategically disperse computing power where it's really needed while readily sharing data and application programs. With DS/1000, a remote HP 1000 can be just across the room, hardwired up to 10,000 feet, or across a continent—as far away as data communications facilities reach. All this happens with no significant increase in complexity for the applications programmer. The network information flow is handled entirely by DS/1000.

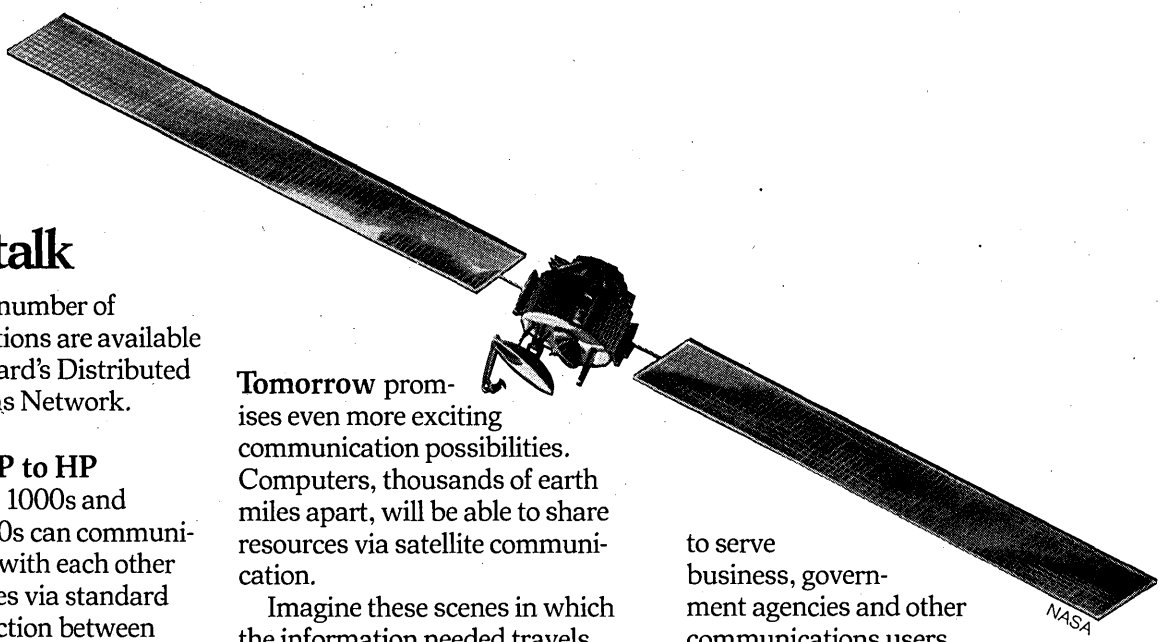
Both disc-based, RTE-III HP 1000s, and memory-based, RTE-M HP 1000s may be mixed freely in a single DS/1000 network. The same set of network program requests and operator commands are available on upward-compatible RTE-III and RTE-M. To use DS/1000, then, the user does not need to learn more than one operating system.

With a powerful remote command processing capability, users at terminals on one HP 1000 node can access any other HP 1000 in the

Continued on page 8

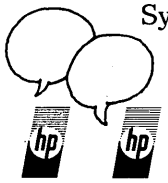


Distributed Processing: Systems that work together

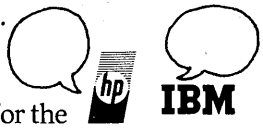


Talk, talk, talk

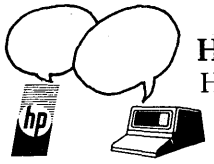
Today, an infinite number of network configurations are available with Hewlett-Packard's Distributed Systems Network.



HP to HP
HP 1000s and 3000s can communicate with each other and with themselves via standard cabling. The connection between HP 1000s, between HP 3000s, and between HP 2026s can also be synchronous modems. The HP 2026 can communicate with HP 3000s with synchronous modems. Plus, the HP-IB interface* simplifies system connections to single or clustered instruments, calculators, or terminals.



HP to IBM
RJE/1000, for the HP 1000 and HP 21MX, emulates an IBM 2780 remote batch terminal to many IBM 360 and 370 systems. Communication between the HP 3000 and IBM hosts is provided by a 2780/3780 Workstation Emulator.



HP to Terminals
HP networks support local terminals via a standard cable; remote connections are provided by full duplex modems, and also by half duplex modems for the HP 3000. These connections can also accommodate special purpose terminals such as calculators, data entry devices, and badge readers.

Tomorrow promises even more exciting communication possibilities. Computers, thousands of earth miles apart, will be able to share resources via satellite communication.

Imagine these scenes in which the information needed travels nearly 50,000 miles, to and from a satellite, in only a few seconds:

Personnel at an Eastern site instantaneously view a financial graph stored on disc at a Western site.

Two people, at two different host sites, call for a contract stored on disc at one of their sites. They simultaneously view and discuss its provisions.

A high speed file transfer from a remote computer system backs up and restores a lost data base on the local system.

These transactions are being tested and evaluated today by Project Prelude—an innovative business communications experiment which adds high-speed satellite communications capability to business equipment. The overall coordinator of the project is Satellite Business Systems (SBS), a partnership formed by wholly-owned subsidiaries of COMSAT, IBM, and Aetna Life and Casualty. SBS has been authorized by the FCC to establish a domestic satellite system to serve business, government agencies and other communications users.

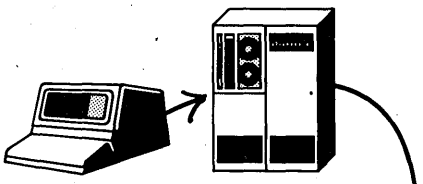
Three companies are hosting this series of experiments: Rockwell International Corp., Texaco Inc. and Montgomery Ward & Co., Inc. The HP 3000, with DS/3000, was selected by Prelude as the computer system to be used in the project. It is one of the few computers available today with vendor supplied network communication software.

In addition to the data processing experiment, other tests feature the use of television in a two-site business conference, and the rapid transfer and broadcast of documents using facsimile equipment. Again, HP 3000 computers and DS/3000, the network services software, are being used to demonstrate the data processing aspects of each experiment. Network data base management, and network information transmission, storage and retrieval are done interactively between two HP 3000s.

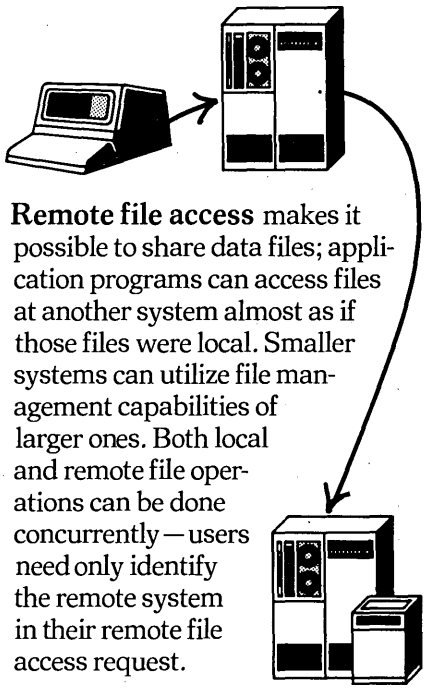
*HP-IB is Hewlett-Packard's implementation of IEEE Standard 488-1975—"Digital Interface for Programmable Instrumentation."

Remote possibilities

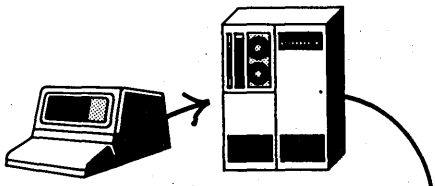
Four high-level capabilities of HP-DSN dramatically increase resources available to HP 1000 and HP 3000 users. They can execute local system commands remotely, have access to data files residing on remote systems, communicate between programs, and share expensive peripherals. These capabilities lever the effectiveness of any programmer on any system in the HP Distributed Systems Network.



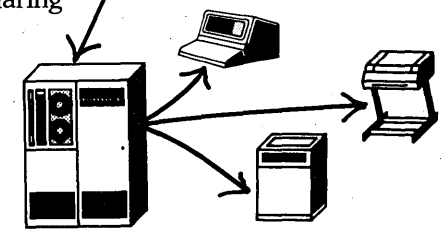
Remote command processing enables users to execute local commands remotely via the network interface, thus accessing the full processing power of a remote system. HP-DSN users have access to operating system commands, programming languages, and application programs on systems in other locations. They can also access special network-oriented commands to create files remotely or to copy files between systems.

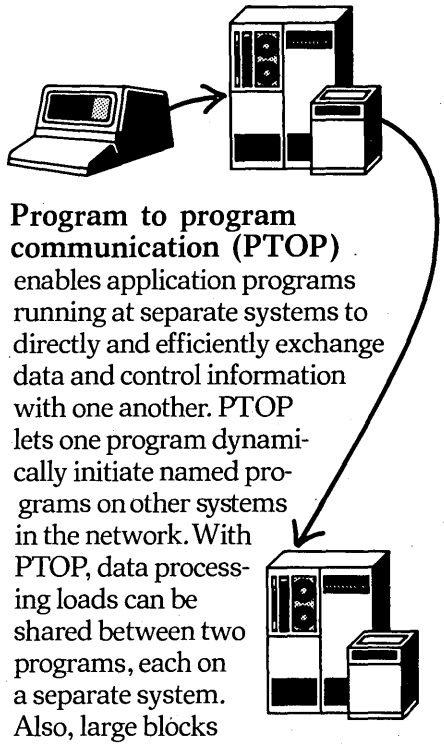


Remote file access makes it possible to share data files; application programs can access files at another system almost as if those files were local. Smaller systems can utilize file management capabilities of larger ones. Both local and remote file operations can be done concurrently—users need only identify the remote system in their remote file access request.



Resource sharing means that peripherals on remote systems can be used by others via network interconnections. This includes I/O devices such as printers and plotters, which can be accessed with the same read/write statements used for local devices. Resource sharing maximizes use of expensive peripherals and makes the power of a single, large system available to smaller, dedicated systems.





Program to program communication (PTOP) enables application programs running at separate systems to directly and efficiently exchange data and control information with one another. PTOP lets one program dynamically initiate named programs on other systems in the network. With PTOP, data processing loads can be shared between two programs, each on a separate system. Also, large blocks of data can be transferred between systems with a simple call sequence in the application program. Programmers, for example, can pre-process data before transmitting it to a remote program.

Distributed Processing: It's working for our customers

"The only way a computer system will become a true success is for it to be totally integrated into the operations of the user area."

Patrick Daniel
Automated Systems Superintendent
Hudson's Bay Oil & Gas Co. Lmtd.

"It seems to me it is always more logical to provide a facility where it's needed rather than centralizing it. Before, due to costs, this wasn't feasible. The economics have definitely changed."
Patrick Daniel—HBOG

"It's really very basic... we split up the information handling function to reflect the way the organization operates."
C. Guruprasad—Supply & Services, Canada

"We saw some real advantages to the user having essentially his own machine. He can run and schedule it according to his own needs, and not fit into a complex, large system schedule where his priority may not always be what he'd like it to be."
Gary Specker—General Mills, Inc.

"Our concept is to push more and more of what is useful to the user, back towards the user. By distributing the data bases closer to the action, users can manipulate the information at their own timings and frequencies."
C. Guruprasad—Supply & Services, Canada

"This makes the computer responsive to the manager, rather than the manager responsive to the computer."
Al Viste—Boeing Co.

"It used to be that you had to have highly experienced computer experts wherever you had a computer. That's no longer so."
Gary Specker—General Mills, Inc.

"One of the reasons I picked the HP system is because it is "docile" —it's teachable, and can be managed by non-EDP professionals."
Al Viste, Boeing Co.

"People tend to accept computers more when they are located within their own grasp. It's a lot like the hand held calculators. In previous years you had a few calculators located centrally. Now just about every engineer, scientist, or accountant has one sitting on his or her desk."
Patrick Daniel—HBOG

"I'm not one who believes you can plan the whole thing out for five years and then implement a piece at a time. But you can set a direction and control the evolutionary development."
Gary Specker—General Mills, Inc.

"The beauty of a distributed system is that you don't have to tackle the entire, huge complex job all at once. You can break it up into manageable bits."
Patrick Daniel, HBOG

"There are ways to do the job today that weren't there even two or three years ago. You have to ask yourself: Is there a better way to do this than just increasing the size of the large central computer?"
Gary Specker—General Mills, Inc.

"You select your equipment according to the job. You wouldn't send a semi-truck out to pick up 100 pounds in an alley. A general purpose mainframe is trying to satisfy all problems. To make a great big semi work like a pickup, you have to spend a lot of time programming it."
Al Viste—Boeing Co.

"You really don't need a computer that's any larger than the largest job you have to do."
Gary Specker—General Mills, Inc.

"The dynamics of a living organization tend to cut across simplistic organizational boundaries. Organizations don't operate in a centralized, monolithic fashion. Data processing must be able to change in order to represent the reality of the operation. Otherwise, you can't survive."
C. Guruprasad—Supply & Services, Canada

"A distributed system gives us the flexibility to change as business needs change."

Gary Specker—Director of Systems & Data Processing, General Mills, Inc.

"If we are wholly dependent on the mainframe for the more dynamic parts of the system, it takes us a long time to make changes and to respond to changing management requirements." *Al Viste—Boeing Co.*

"We chose a distributed network, rather than a large central batch machine, to have a completely fail safe system. If any one element failed, another part could take over."
Alain Faveau, CAMIF Co., France

"When you're tied centrally and your machine's down, everybody's down."

Dennis Eickhoff— Vice President, Systems & Data Processing, Nationwide Financial Services Corp.

"EDP capacity of the corporation is less vulnerable with the distributed arrangement... multiple boxes allow for a higher degree of backup."
Gary Specker—General Mills, Inc.

"With HP's DSN software, the user merely declares himself a remote user and he can access the data in any of the other network nodes—that is, as long as he's legally authorized to get access. You get the feeling you're working on a large mainframe because you're able to easily switch from one machine to another. The fact that you're switching is transparent."
C. Guruprasad—Supply & Services, Canada

"With DS/3000, any one of our four HP 3000s can communicate with any other in the network."

Alain Faveau, EDP Manager, CAMIF Co., France

"I don't have to worry about protocol; I depend upon HP's DS/3000 software to talk to IBM, and to talk to other 3000s."
Al Viste, Boeing Co.

"What we saw in HP was a company with a very clearly defined growth pattern for their computer systems and distributed processing networks. The kinds of things we were wanting to do with the computer were exactly the kinds of things HP was selling their computers to do."
Gary Specker—General Mills, Inc.

"Any company looking into distributed processing should very strongly consider the vendor's commitment to the concept."
Patrick Daniel—HBOG

"I played it conservative in selecting a vendor. HP is moving ahead in the technology and they have a reputation for not playing on futures... you know, like giving me a bunch of promises that may or may not come true."
Al Viste—Boeing Co.

"It's important to realize distributed processing is a two-way street. You should determine whether the vendor is going in the direction you want to go."
C. Guruprasad—Director, Corporate Systems Branch, Supply & Services, Canada

"We're not leaving the IBM fold since we still use it as the central system."

Al Viste—Finance Systems Manager, Boeing Co.

"If you're going to enter a fairly new area such as distributed processing, you should have vendors who you have some faith in that they'll be around in say three years."
Dennis Eickhoff— Nationwide Financial Services Corp.

"The more you satisfy people, the more they demand. I think, customers will continue to expect HP to provide more and more of the systems, and software necessary for distributed processing."
C. Guruprasad—Supply & Services Canada

People are really talking about Hewlett-Packard's Distributed Processing.

Isn't it time you talked to us about it?

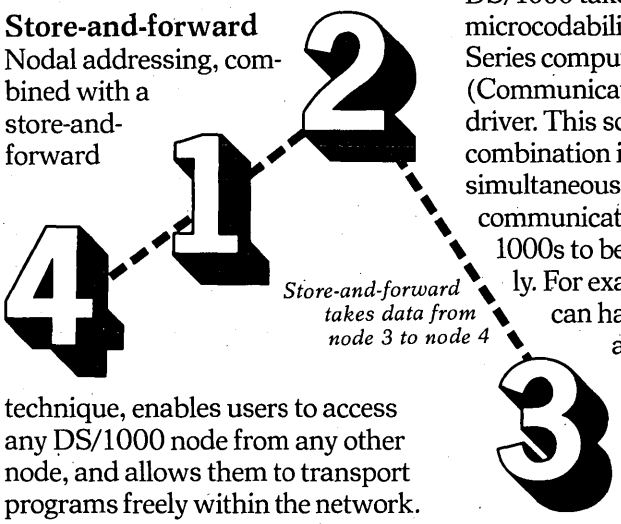
DS/1000-
The latest link (continued)

network, local or remote. These users can easily utilize files, programs, and peripherals on other nodes, even when they are unattended. Individual HP 1000 nodes can be connected in any manner that suits the material flow of a plant or geography of a region—a star arrangement surrounding a central node, a ring, a string, or any combination of these. Nodes are connected with either a single four-wire cable or by full-duplex modems.

DS/1000 is particularly well-suited for instrumentation, computation, and operations management tasks in functional areas such as manufacturing, R&D, quality control, and distribution. Moreover, DS/1000 to DS/3000 communication facilitates the integration of these tasks with commercial data processing functions available on the HP 3000 Series II, such as production scheduling, order processing, and accounting.

Store-and-forward

Nodal addressing, combined with a store-and-forward technique, enables users to access any DS/1000 node from any other node, and allows them to transport programs freely within the network.



Store-and-forward takes data from node 3 to node 4

A user at a node in New York, for example, can write to a line printer at a node in Boston. If the user later transports the program from New York to a node in Atlanta, the same line printer in Boston would be accessed, without change to the user's program.

The application programmer need only identify the node where the printer is located, and DS/1000 forwards the information from node-to-node until it reaches that address. The DS/1000 software only needs an organizational chart of the network, the "Network Description Table," to define the inter-connections between the nodes. That's forward.

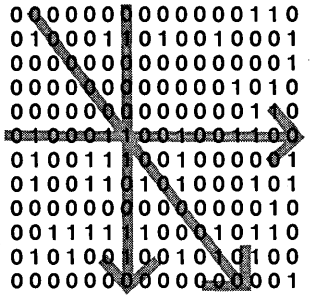
"Store" indicates that the data stops briefly at each node. This store-and-forward routing is completely handled by the DS/1000 software, relieving the programmer of the need to write communications.

Microcoded Driver

DS/1000 takes advantage of the microcodability of the HP 21MX Series computers in its CAM/1000 (Communications Access Method) driver. This software/firmware combination is fast enough to allow simultaneous requests on multiple communications lines between HP 1000s to be serviced concurrently. For example, a DS/1000 node can handle four concurrently active 9600 baud lines, or two active hard-wired lines with a combined effective throughput of up to 20K-bytes/second.

Tri-Directional Error Check

To ensure data transmission integrity, DS/1000 incorporates a powerful error checking method. Data blocks, when received, are checked simultaneously for vertical, longitudinal, and diagonal parity. This block error checking scheme can be done while maintaining high-speed communications because it is implemented in microcode.



An initial DS connection between HP 1000's is $6200; subsequent connections are $3700. A DS/1000 node can connect with a DS/3000 system for $1250.* **For more information on Hewlett-Packard's Distributed Systems Networks, return the attached reply card.**

*Domestic U.S. prices only

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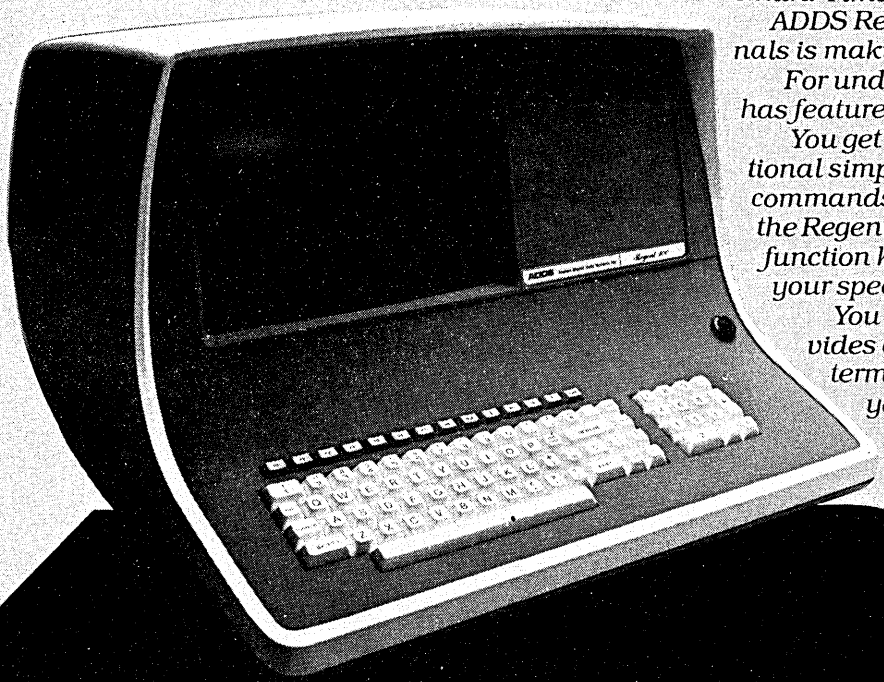

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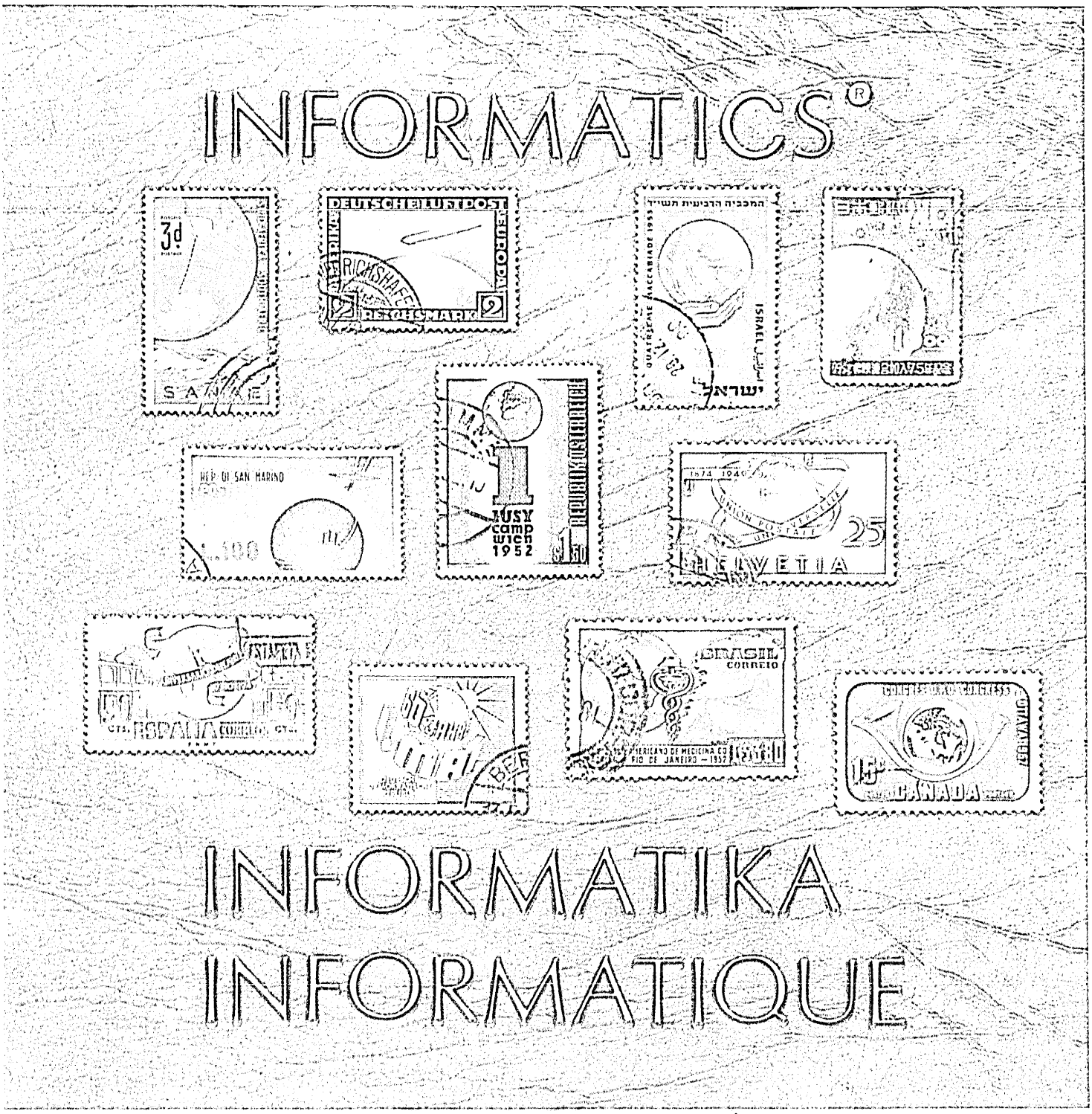

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people

The Year of the Lawyer

In 1970 people were saying that would be the computer industry's year of the lawyer. Could they have foreseen the plethora of legal issues which would be facing the industry in 1978, they probably would have withheld that label for seven years.

Susan Nycum, an attorney with the San Francisco law firm Chickering & Gregory, specializing in computer-related law, and chairman of the Assn. for Computing Machinery's (ACM) standing committee on legal affairs, was asked by the ACM to look into "what's going on in Washington concerning the computer industry." The initial result of her investigation was a stack of paper almost four inches high. She said there are 328 bills before the Senate and the House of concern to the industry. And that's just the federal level.

At the head of a list of issues she put communications, including the Bell bill (the controversial AT&T-backed Consumer Communications Reform Act which some see as dead while others are not so sure) and a need to rewrite the Communications Act of 1934 to accommodate telecommunications.

She mentioned privacy of information systems, predicting that numerous federal bills on this subject will come up for hearings this spring and that many will come head-to-head with the Freedom of Information Act. She said the privacy issue directly interacts with another big area of legal concern within the industry, electronic funds transfer (EFT). Here, she said, "we also have the whole notion of antitrust, competition, branch banking laws, and required sharing of terminals.

Also mentioned as key issues were software taxes and the question of the tangibility of software and the problems of protection of proprietary interest in software.

Nycum, in her capacity as chairman of ACM's standing committee on legal affairs, carried the opinions of members of her committee to Chicago to lay them out for the software subcommittee of the National Commission on New Technological Uses of Copyrighted Works (CONTU) which was holding hearings on a report it had issued essentially recommending copyright protection of software (September 1977, p. 252). Declining to state her own opinion, she said her committee took "no solid poosition. A plurality (of the committee) thought it (copyright) was a good idea. A number of members disagreed and some didn't have a position. The hearings raised as many questions as they answered."

She said problems with the proprietary aspects of software are the most common among her clients, whom she described as ranging from "very large, sophisticated computer users, multinationals, down to a couple of people just getting started. Professors, you name it. . ." A second big concern of her clients, she said, is taxes.

While today her practice is exclusively in computer law, Nycum started out as a lawyer who "didn't even know computers existed." She worked for a family firm. "In those days, as a woman," she recalled, "you were restricted to the kinds of law that are not very exciting such as real estate and probate."

She got into computer law in 1965

SUSAN NYCUM
a plethora of issues

when she went to the Univ. of Pittsburgh to work on a project involving computerizing state statute data bases. While there she developed what probably was the first litigation support system. The university's project team was spun off to form Aspen Systems Corp. The company went public and, Nycum said, "the emphasis was on selling, not on creating."

Her first impression of the IBM 1401 at the university had been, "It's a big piece of equipment that blinks at you." While still there she began to hear talk from a friend at Carnegie-Mellon Univ. of "something called a PDP and a company called DEC. I realized there was something more out there than what we had."

When the emphasis shifted at Aspen, she went to Carnegie-Mellon as manager of User Services and Operations at the university's Computer Center. In 1969, she moved west to become director of the Stanford Campus Computer Facility. From there she moved back into law, accepting a position at the Stanford Law School in an IBM-sponsored program which let "you do whatever you wanted. I looked into the possibility of a artificial intelligence approach to litigation."

She got into something else while at the law school. It was there she met Donn Parker of Stanford Research Institute who was just beginning to look into computer-related crime.

"I was ready," Nycum said. "I'd just had an incident. Someone tapped the campus computer facility's computers and was caught. All they could get him on was making an obscene or harassing phone call." She worked with Donn Parker on the National Science Foundation-funded report on computer abuse which she said had as one direct result the introduction by Sen. Abraham Ribicoff of the Computer Systems Protection Act of 1977.

Susan joined her present firm in 1975 and is adroit in allocating her time between her practice, her work with ACM, and work as vice-chairman of the Science and Technology section of the American Bar Assn. "I pretend I'm working two shifts." She says she averages one speech a week in any given year although "they tend to bunch up."

Born and raised in Pittsburgh, she is a graduate of Ohio Wesleyan Univ. and Duquesne Univ. Law School. She is coauthor with Robert P. Bigelow of *Your Computer and the Law*.

When not lecturing, counseling, researching, traveling, and writing on the issues of computers and law, Susan Nycum enjoys her home in Portola Valley. She admits to being "a very bad tennis player," but she says her husband, Jim, also a lawyer, is good and she plays at a tennis club where "the pros are understanding." Another hobby is "pets in varying numbers." She's very happy that last year her 18-year old daughter, named as she was for her grandmother, pledged a sorority, Kappa Alpha Theta, that both her grandmother and great-grandmother belonged to in the 1800s. "And she has my grandmother's pin." The younger Susan is a freshman at the Univ. of California, Berkeley.

For Sycor's 10th birthday in distributed processing, a system that makes your wish come true!

Creating the first intelligent terminal ten years ago gave us the edge in distributed data processing today. We're celebrating that lead by introducing the Sycor 445—the ultimate distributed data processing system. It gives you power, versatility, security, proven software, communications capability and Sycor's traditional reliability and ease of use.

"A Gift" of Power

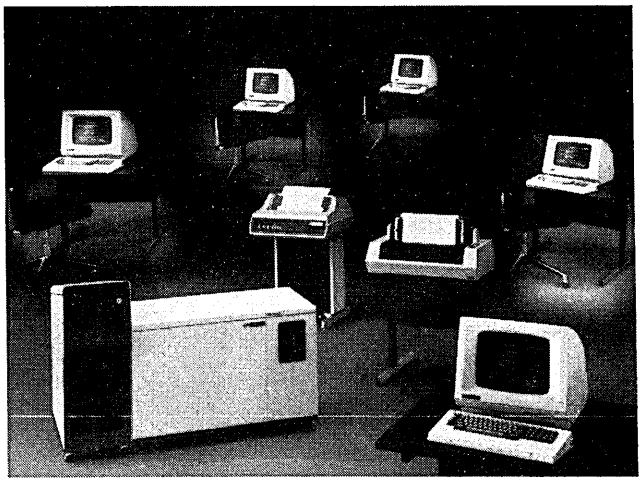
Jobs get done fast with the Sycor 445. The system presents up to 256K of memory, 70Mb of disk storage, eight video data stations and a combination of line and bidirectional matrix printers. The 445 meets all of your processing needs.

SYCORLINK—"One to Grow On"

Our exclusive SYCORLINK lets you connect several 445 systems and permits disk file and peripheral access of one system by another. Any operator can automatically access any file in your growing SYCORLINK network. So start with a basic 445 configuration and add processing capability with SYCORLINK as your business grows.

"A Package" of Proven, Reliable Software.

Start working right away with Sycor's proven 400 Series software. The new 445 is ready with COBOL for both data entry and concurrent processing. BASIC is available for business and financial applications. And TAL, Sycor's proven Terminal Application Language, makes data entry easy. A full range of file management capabilities and utility programs makes your 445 productive immediately.



Communications with Sycor Is "A Piece of Cake."

Our communications expertise gives you the edge in networking, no matter where you buy your mainframe. IBM, Burroughs, CDC and others. We talk to them, and we have for some time.

Of course, Sycor systems also talk to each other and your smaller offices can have remote

data stations that share the power and resources of the 445. Best of all, the 445 provides IBM 3270 emulation so you can blend on-line communications with distributed batch operations.

Security for Peace of Mind and "Many Happy Returns."

Relax! The Sycor 445 gives you security in many ways. Every system includes a cartridge tape drive that can back up a disk file by recording up to 10Mb of data in a matter of minutes. Program controls let you lock out special keyboard functions and password-protect their use to authorized persons.

Sycor's Guardian feature protects against power failures. In the event of an outage, it saves memory by storing it on the disk. Then the data is automatically restored when power returns. You can also get an optional lock on each keyboard to lock out all activity on the data station.

Let Our Experience "Make Your Wish Come True."

You can benefit from our experience. We didn't just jump into distributed processing. We started it a decade ago. We've designed our systems so your present employees can easily handle day-to-day operations. If they should need help, our experienced service people are ready. We've learned to make it easy for you.

"Join the Party." Call Sycor Toll-Free 800-521-2838.

Enjoy powerful hardware, proven software and peace of mind. A nice way to get ahead in distributed data processing. Find out how nice by calling Tony Fazio, VP, Sales. Or write: Sycor, Inc., 100 Phoenix Drive, Ann Arbor, Michigan 48104.

Better yet, contact a nearby sales office. We're in the Yellow Pages under "Data Processing Equipment."

Sycor puts computer power where the work is.

SYCOR

people

There's A Lot to be Done

Obsolete is something Robert V. Head will never be. Having spent 20 years in the systems field with the likes of IBM and Univac, the top Agriculture Dept. dper is more than qualified to speak out on computer problems. And he does speak out regularly and rationally on the plethora of ills plaguing the

Photo by Jack Howard

ROBERT V. HEAD
"A year in a tiger cage"

biggest user of them all, the federal government.

Uncle Sam's biggest stumbling block to effective computer usage today, he asserts, is "our inability to get rid of obsolescent systems." This situation, he speculates, may be exacerbated by procurement difficulties coupled with the heavy agency investment in application programs. But the people behind these antiquated dp setups may also be a factor. "Maybe it's not just obsolete hardware." Head quips, "but maybe it's obsolete people as well."

Before joining the government six "long" years ago as a USDA consultant, 48 year old Head worked as an information systems consultant. His specialty has always been large scale system projects, dating back to his early work with IBM on the Sabre system. His "affinity for large systems," he explains, led him to the federal government. Currently, and for the last two years, Head has been assistant director of the Office of Automated Data Systems.

Discouraged by the slow progress the feds have made in implementing innovative computer technology, Head harkens back to the '50s when "the federal government was one of the most innovative organizations in dp." Today, he laments, "not only aren't we doing anything very innovative . . . but we're just struggling to keep up." One possible solution to this technology lag, he maintains, is to bring in "a whole new set of people to take a fresh look."

Another thing that would help, system specialist Head contends, is better long-range planning by the individual agencies. But realistically he admits that trying to integrate agency program requirements with system development in the dynamic bureaucratic environment is tough. Unlike the corporate world's top-down planning approach, the government must follow a bottom-up type planning process. Unfortunately, many agency dp policymakers haven't followed through on developing long-range strategies. Head has championed this cause at Agriculture and feels the central ADP management agencies should require five-year plans which would give Congress an "early warning system" on agency ADP moves.

No such early warning arrangement was in place when the ill-fated and infamous FEDNET fiasco got underway several years ago. The original FEDNET project, headed up by Head and designed solely for USDA use, was configured around a system of large-scale, time-shared computer sites linked by a packet switched communications network. But GSA got in on the deal and the protests began to mount, centered mainly on the privacy issue.

Also protesting vocally to the GSA tie-in was Head himself. As a result, Head "spent a year in a tiger cage, was demoted a grade, and spent a substantial amount of money in legal fees trying to recover." And he did recover from his demotion and from a Siberia-like transfer assignment in which he was given "basically nothing to do." The final arbiter, the Office of Management and Budget, finally cancelled FEDNET in May 1974. Head went back to his old job at his original salary, and the hapless Ag dpers who had supported the project were pushed out the door.

Vindication? Yes, "but despite the FEDNET experience," he declares. "I don't see myself as a crusader or whistle blower. I see myself as a person who's trying to introduce a more rational and disciplined approach to some of (the government's dp) problems." But whether he'll stay at USDA and work on these problems is uncertain. What is certain is that he feels a commitment to government. "I think this is where some of the major problems are, not just in terms of the magnitude of the systems, but in terms of public service—trying to use systems in the public interest. There's a lot that could be done. So I'd like to stick around."

In New Posts

SAMUEL J. MOSS, director of American Express Co.'s worldwide communications and related computer systems, was elected senior vice president of the company. . . JOHN B. MC KINNEY was appointed general manager and executive vice president of ITT World Communications, Inc. . . . ROY L. PHELAN, vice president, corporate research and development for NCR Corp., was elected chairman of the board for the Computer and Business Equipment Manufacturers Assn. (CBEMA) . . . JOHN A. HILL, formerly vice president of sales, was elected president of Megadata Corp., Bohemiz, N.Y. . . . RICHARD K. GERLACK was named vice president, engineering, at Randal Data Systems, Inc., Torrance, Calif. . . . JOHN B. DONNER was appointed to the newly created position of vice president, program implementation and systems integration, for GTE Information Systems Inc. . . . Eastern States Bankcard Assn. promoted DONALD B. CARNEGIE to manager, major systems research and development. . . NEAL A. L. GOLDSTEIN was named manager, advanced cash management services, by National Data Corp., Atlanta. . . C. DUDLEY WARNER joined Boole & Babbage, Inc., Sunnyvale, Calif., in the newly created position of vice president of hardware engineering. . . RANDOLPH A. MARKS, president of Computer Task Group, Inc., Buffalo, N.Y., was elected president of the National Basic/Four Dealers Assn. . . . BRUCE T. COLEMAN, president of Boole & Babbage, Inc., was reelected president of the Software Industry Assn. (SIA) and elected to the board of directors of the Assn. of Data Processing Service Organizations (ADAPSO) . . . JAMES M. CRETSOS, head of the Scientific Information Systems Dept. at Merrell-National Laboratories, Cincinnati, was elected president elect of the American Society for Information Science (ASIS) . . . ROBERT G. BARTIZAL was promoted to the new position of executive vice president of the printer and memory business of Dataproducts Corp., Woodland Hills, Calif. . . . JOSEPH A. FORNATARO was elected a corporate vice president of California Computer Products, Inc. . . . D. F. MANZER was appointed vice president for product planning and programs and F. R. PRIEST, vice president for manufacturing at Honeywell Information Systems' Large Information Systems Div., Phoenix. ❋

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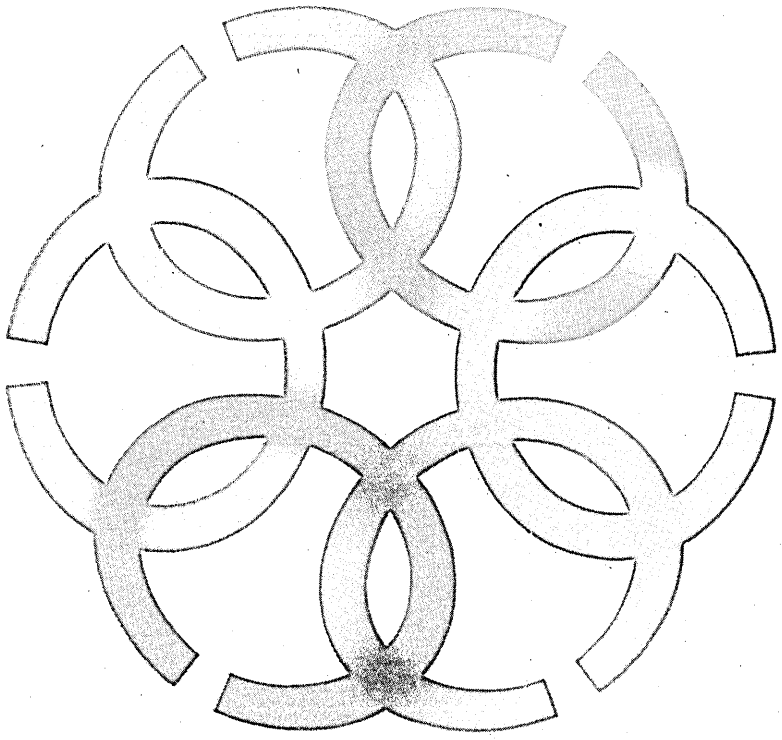
A large-scale computer system.

Functionally dispersed data processing.

A common, integrated data base.

Unlimited growth without economic penalty.



The ARC™ System

from Datapoint.

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Imagination
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Imagine. A large-scale computer system that would solve all of the problems that system planners have complained about in conventional computer architecture. That would work and grow without interruption, without extensive operator re-training, and without endless new model upgrades. A system that will adapt itself to your budget, and not the other way around.

The Attached Resource Computer™ System is Datapoint Corporation's solution to the inherent problems of conventional computer system architecture. It will eliminate the headaches which until now have seemed inevitable. Like updating several data bases, costly programming changes, and complete system failure. Not to mention the huge expenditures involved in hardware upgrades.

The ARC™ System is an *attached processing* system — based upon the idea of functionally dispersed processing resources, located in a company's offices, stockrooms, transaction counters, and warehouses. Operating independently, and yet as parts of a whole.

Because ARC allows all of these task-oriented processing stations access to the common data base, in as large (or small) a capacity as each company's needs dictate.

A unique modular architecture

How can ARC combine the effective throughput of a large traditional computer with the flexibility and convenience of a small computer?

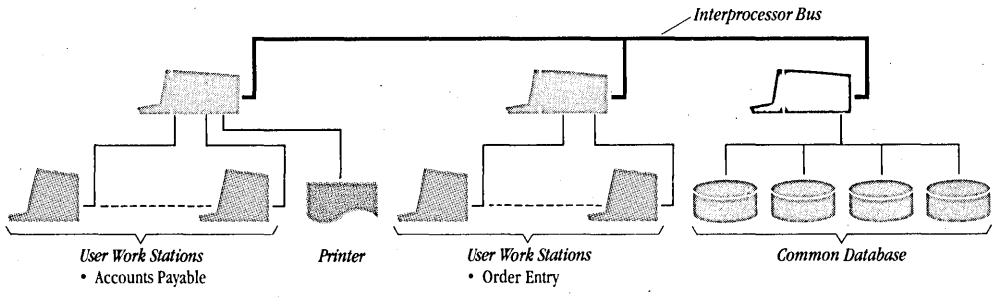
Because it takes the two basic functions of any conventional computer — applications program execution and data file management — and distributes them among two or more specialized computers: the applications processor and the file processor.

By attaching these two types of functionally specialized processors to an ARC System, each company can select just the right amount of processing power and on-line data storage that it needs. Without over-buying to stave off some future requirements. Or over-burdening an existing, insufficient computer.

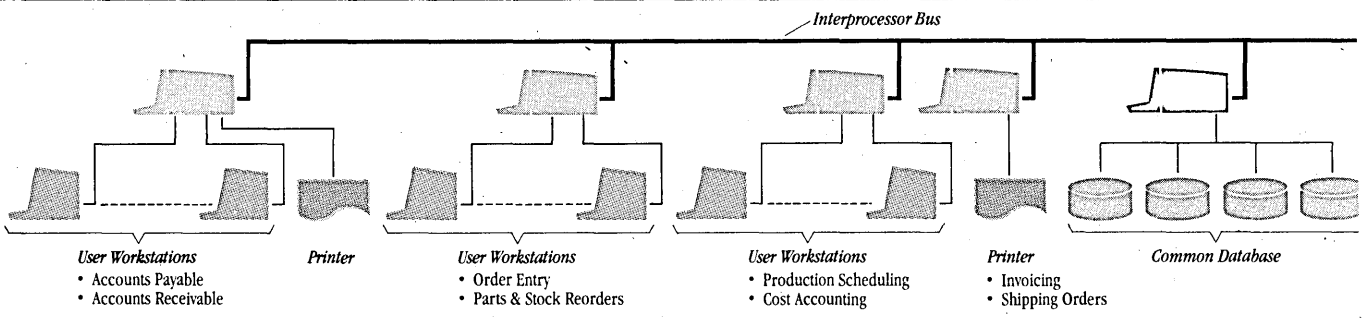
Unlimited growth without economic penalty

If more processing muscle becomes necessary as time passes, just add another Datapoint applications processor. Right where the work gets done. And if data

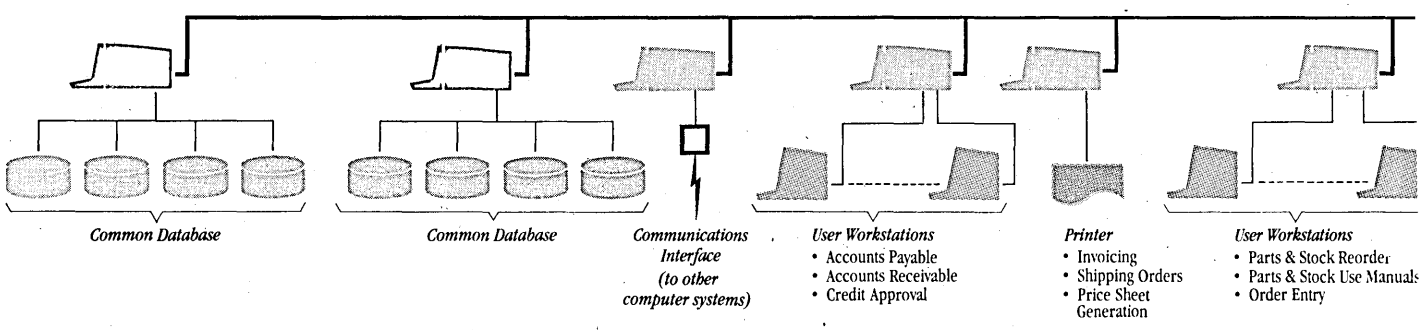
A small ARC system.



A medium ARC system.



A large ARC system.



handling capacity (or speed) needs to be boosted, additional file processors will each provide up to 200 megabytes more disk storage. While preserving the commonality of the data base. And at predictable, economical costs.

Every ARC system comes equipped with user-definable security software that allows each company to restrict access to the data base in several ways.

But the best news is that there is no central processing unit to get bogged down. No single component that will drag the whole system under if it fails. With the Attached Resource Computer, adding (or removing) any attached component requires no system downtime, no re-programming, and no re-training.

Functionally dispersed resources

The ARC System uses an electronic pathway called the Interprocessor Bus to communicate requests and data from one attached resource to another. This communication takes place at such high speeds that applications processors can get the data they need faster than if it were on their local disks. Even though the source of the data may be in another department.

Any number of applications and file processors may be connected to the Interprocessor Bus and located in the offices where they're needed. Each applications processor can have the printers, card readers, magnetic tape, or local disk storage that a traditional computer would have. And each applications processor can be dedicated to its own function, using any of the software in Datapoint's extensive library:

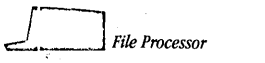
- DATASHARE® for multi-user, on-line transaction processing;
- COBOL for industry-standard batch processing;
- DATABUS®, RPG, SCRIBE®, and BASIC for other business needs;
- Telecommunications to other computer systems with Datapoint's networking software.

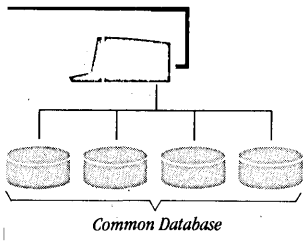
In fact, ARC even enables an existing IBM 360/370 mainframe to come on-line as an applications processor, using Datapoint's Direct Channel Interface Option.

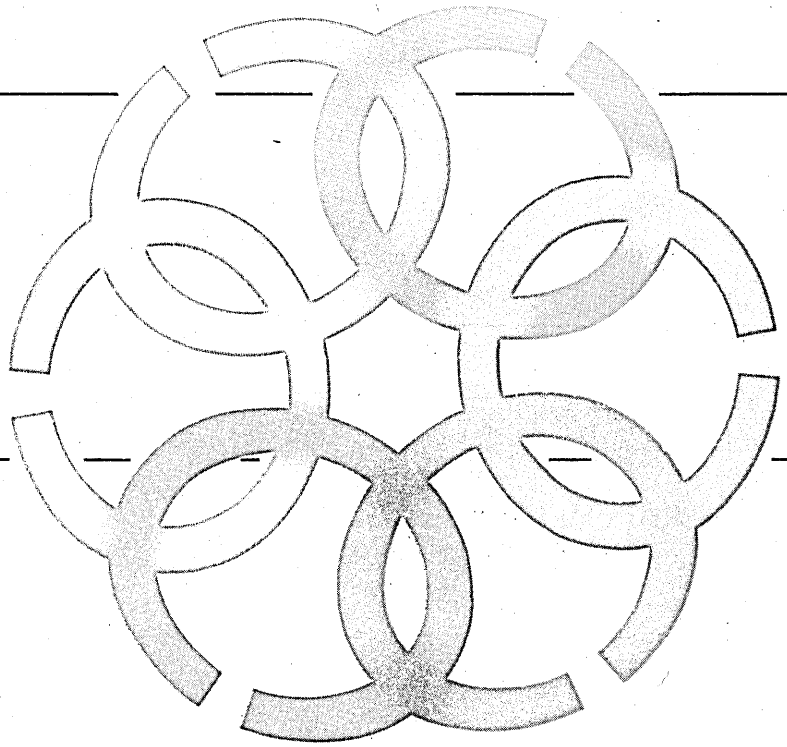
ARC supports all of the functionally dispersed tasks to be carried out at the same time — all on the common data base of the file processors.

Use your imagination.

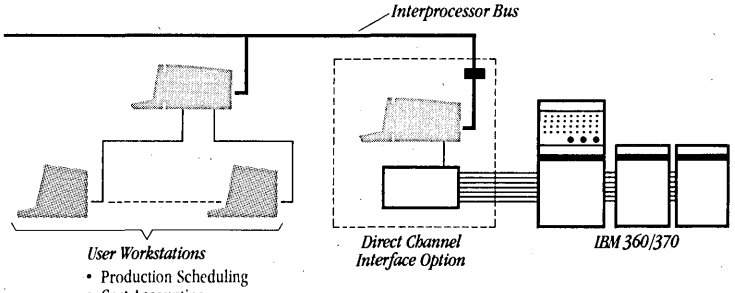
Take a look at some typical ARC Systems. And just imagine how they could be put to work for you.







The ARC™ System



ARC™ system components

Datapoint provides you with all the building blocks necessary to construct an Attached Resource Computer™ System to meet your needs.

Processors

6600 Advanced Business Processor, 120K user memory, supports all Datapoint peripherals and up to 24 user workstations.

5500 Advanced Business Processor, 48K user memory, supports all Datapoint peripherals and up to 16 user workstations.

6000 Series Attached Processors, 60K or 120K user memory, supports all Datapoint peripherals and 16 or 24 user workstations.

3800 Series Attached Processors, 60K and 120K user memory, for single-user data processing, data entry, and telecommunications.

1170 Dispersed Processor, 48K user memory, supports Datapoint peripherals and up to 4 user workstations.

1150 Dispersed Processor, 24K user memory, supports all Datapoint peripherals.

Peripherals

Disks:

25MB Mass Storage Disk drive, up to 200MB per processor as a local or common database

20MB Cartridge Disk drive, up to 160MB per processor as a local or common database

5MB Cartridge Disk drive, up to 40MB per processor as a local database

Printers:

30 cps Servo printer
80 or 160 cps Freedom Printer
120 LPM printer
240 LPM printer
300/600 LPM printer

Magnetic Tape Drives:

7 and 9 track

556, 800, and 1600 bpi recording densities

Software:

COBOL: industry standard business programming language

BASIC: general purpose business programming language

RPG: report-oriented business programming language

DATABUS/DATASHARE®: Datapoint's high-level business programming language for single or mulitple users

DATAFORM/MULTIFORM®: Datapoint's two-level data entry and checking language

DOS: powerful operating system with comprehensive utilities

SCRIBE®: Datapoint's powerful yet easy-to-use text processing language

DATAPOLL®: Datapoint's automatic polling and data communications program

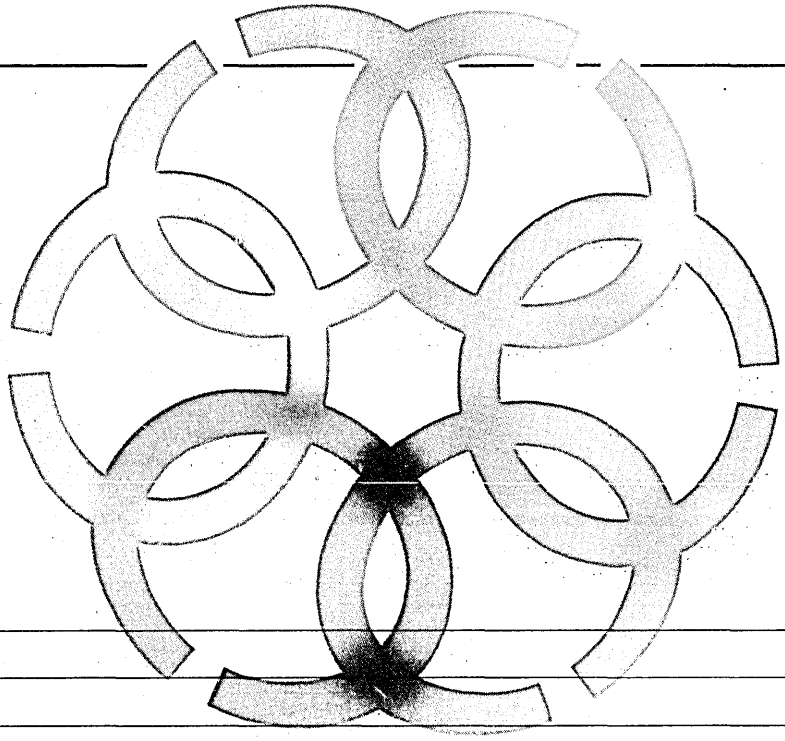
Communications: IBM, Honeywell, Burroughs, Univac, and other disciplines

Use your imagination.

Mail this coupon today and find out more about the most important development in data processing since the minicomputer: the Attached Resource Computer. From Datapoint.

DATAPOINT CORPORATION

The leader in dispersed data processing™



Datapoint Corporation
Attn. Marketing Communications
9725 Datapoint Drive
San Antonio, TX 78284

Tell me more about the ARC System!

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Title _____

Company _____

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Your continuous-forms handling. There are two ways to handle it.

Moore or less.

The Moore 3600 Series Forms Processor. A new generation of forms-handling equipment.

It greatly increases the speed and efficiency of your "after-writing" continuous forms-handling functions.

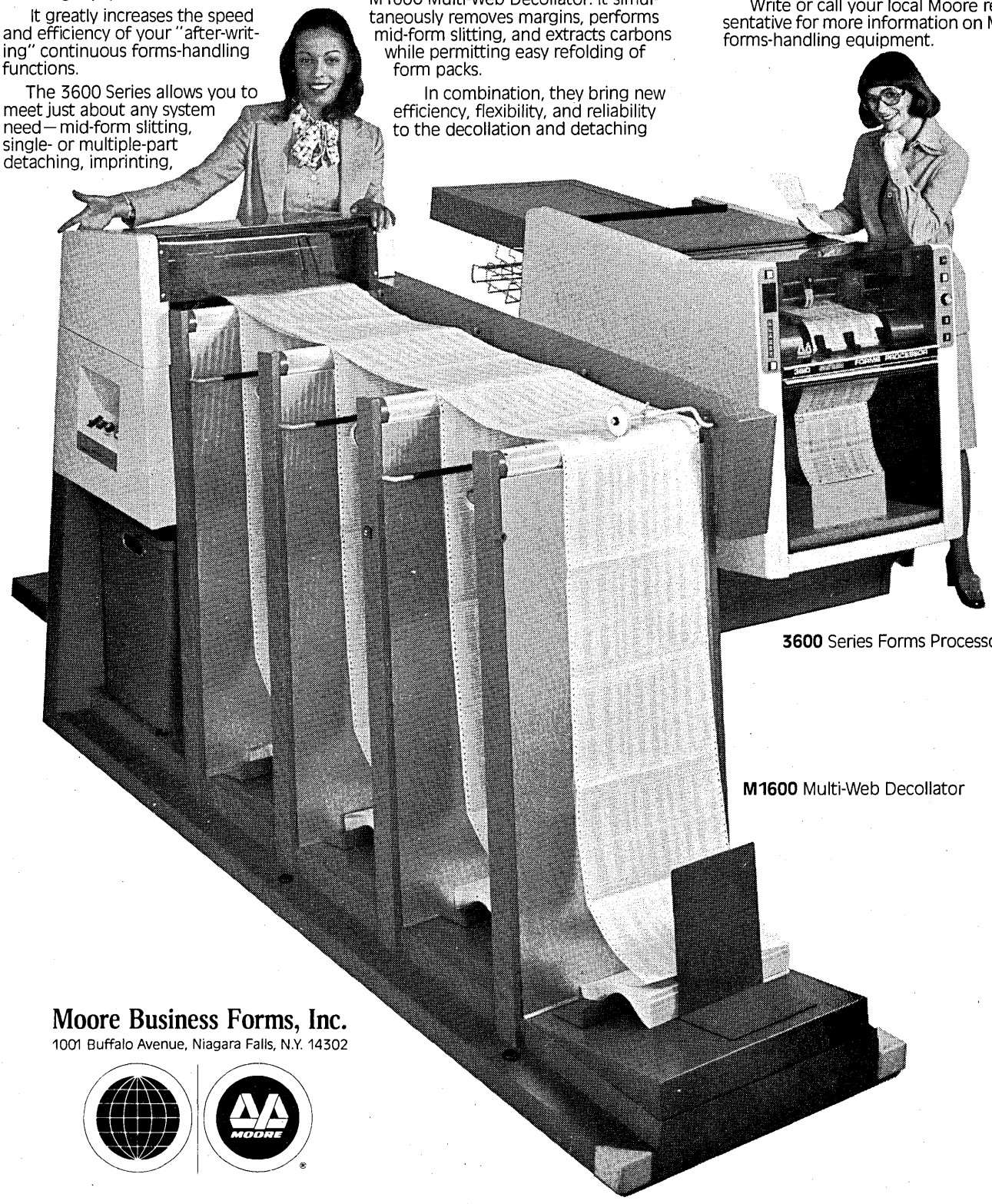
The 3600 Series allows you to meet just about any system need—mid-form slitting, single- or multiple-part detaching, imprinting, high-capacity stacking, folding, and more.

Team the 3600 Series with our M1600 Multi-Web Decollator. It simultaneously removes margins, performs mid-form slitting, and extracts carbons while permitting easy refolding of form packs.

In combination, they bring new efficiency, flexibility, and reliability to the decollation and detaching of multiple-part continuous forms.

Don't settle for less.

Write or call your local Moore representative for more information on Moore forms-handling equipment.



3600 Series Forms Processor

M1600 Multi-Web Decollator

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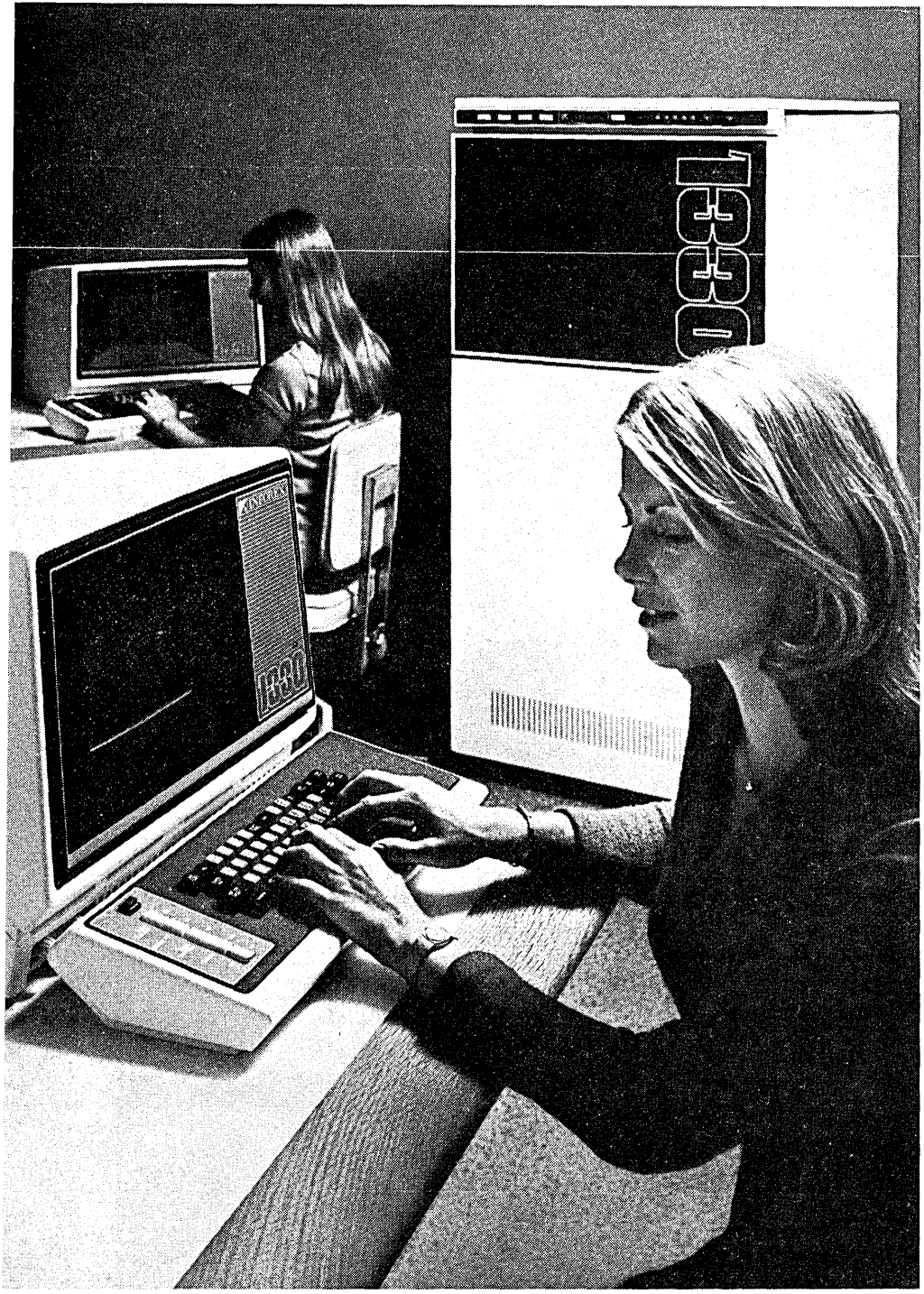


With the 1330, you can consolidate remote job entry and batch data entry applications without compromising either function. The system features expandable disc storage (up to four—10 Mb. drives) foreground and background editing and bisync communications.

INFOREX: THE SIMPLEST SOLUTION TO ALL YOUR DATA ENTRY PROBLEMS.

The simplest and best solution to all your data entry problems is right here: the Inforex data entry family.

Simplest because we design them for ease of use and speed of throughput.

Best because we've been a leader in the innovation and development of key-to-disc data entry products and capabilities right from the start.

Which is why our family's got it all. From the basic keypunch replacement 1300 IKE System to the tremendously powerful maxi-editing System 3300.

So whatever your needs—modest, middling, or immense—the growing Inforex data entry family will meet them.

You don't have to settle for a compromise system. You don't have to sweat out an unsatisfactory price/performance choice. All you have to do is choose the system that's best for you.

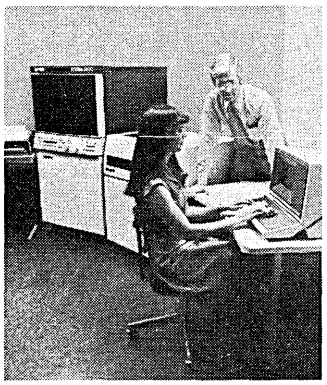
And that's where an Inforex Support Team comes in. They'll help you select just what you need. They'll provide expert installation. And they'll give you the benefit of their years of experience in other installations.

But even after all that, you won't be left high and dry. Whenever and wherever you need help, an Inforex Support Team will be available with the support you need.

The Inforex data entry family. You shouldn't settle for anything less.

Inforex 1300 and 1301 offer highly cost effective data entry capability for smaller installations (4 to 8 keystations) or remote locations where you can take advantage of our communications capabilities.

The 1303 provides medium range data entry capacity, with about triple the disc capacity of the 1301. It supports up to 16 keystations and the addition of edits, table look-ups, range checks and cross-footing. The 1303 also offers communications capabilities such as *spooling, HASP* and *RJE.*



The Inforex 3300 is a powerful pre-processing system that allows you to edit data at the point of entry, enabling you to offload your mainframe. Its sophisticated editing capabilities can also handle many of those applications which you haven't had time to put on your present mainframe.

I would like more information on the following:
☐ Key-to-disc data entry ☐ Distributed processing
☐ Computerized records management
☐ I would like to talk with an Inforex Sales Representative

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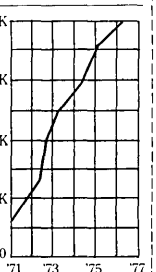

More keystations in more countries than any other company in the world.

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Offices in major cities throughout the United States, Canada and Europe. Distributors worldwide.

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1978 SHOWS AND CONFERENCES

JANUARY

NRMA Annual Conference, Jan. 14-17, *New York City. Contact: Mary Ellen McGroary, NRMA, 100 W. 31st St., New York, N.Y. 10001 (212)244-8780.*

Computer '78, Jan. 16-20, *London. Contact: George Kemp, U.S. Dept. of Commerce, Room 4217, Washington, D.C. 20230 (202)377-3459.*

U.S./Southeast Asia Telecommunications Conference, Jan. 19-21, *Singapore. Contact: Electronic Industries Assn., 2001 Eye St. N.W., Washington, D.C. 20006 (202)457-4990.*

International Word Processing Conference, Jan. 31-Feb. 2, *New Orleans, La. Contact: IWP Assn., Attn: Lorraine Lear, AMS Bldg., Maryland Rd., Willow Grove, Pa. 19090 (215) 657-3220.*

FEBRUARY

Computers and Peripheral Equipment Exhibit, Feb. 6-10, *Tokyo, Japan. Contact: U.S. Dept. of Commerce, Domestic and International Business Administration, Washington, D.C. 20230 (202)377-4379.*

Telecommunications Workshop, Feb. 12-15, *Houston, Texas. Contact: Connie Williams, Operations and Automation Div., American Bankers Assn., 1120 Connecticut Ave. N.W., Washington, D.C. 20036.*

Computer Network Protocols, Feb. 13-15, *Liege, Belgium. Contact: A. Danthine, Univ. of Liege, Ave. des Tilleuls, 49, B-4000, Liege, Belgium.*

Learning Technology Conference and Exposition, Feb. 13-17, *Orlando, Fla. Contact: Society for Applied Learning Technology, 41 Culpeper St., Warrenton, Va. 22186 (703) 347-0055.*

ACM Computer Science Conference, Feb. 21-23, *Detroit. Contact: Seymour Wolfson, Computer Science Section, Wayne State Univ., Detroit, Mich. 48202 (313)577-2477.*

Datacomm '78, Feb. 21-23, *Washington, D.C. Contact: Ed Bride, The Conference Co., 60 Austin St., Newton, Mass. 02160 (617)964-4550.*

Edp Audit Conference, Feb. 26-March 2, *San Francisco. Contact: Bank Administration Institute, P.O. Box 500, Park Ridge, Ill. 60068 (312)693-7300.*

Compcon Spring '78, Feb. 28-March 2, *San Francisco. Contact: Compcon '78, P.O. Box 639, Silver Spring, Md. 20901 (301)439-7007.*

MARCH

2nd West Coast Computer Faire, March 3-5, *San Jose, Calif. Contact: The Computer Faire, P.O. Box 1579, Palo Alto, Calif. 94302 (415)851-7664.*

Interface '78, March 6-9, *Las Vegas. Contact: Datacomm Interface Inc., 160 Speen St., Framingham, Mass. 01701 (617)879-4502.*

Federal ADP Users Group Conference on Zero Base Budgeting, March 13-14, *Washington, D.C. Contact: U.S. Professional Development Institute, 719 N. Belgrade Rd., Silver Spring, Md. 20902 (301)649-1177.*

Federal Office Equipment Exposition, March 14-15, *Washington, D.C. Contact: National Trade Productions, Inc., 9301 Annapolis Rd. #104, Lanham, Md. 20801 (301)459-1815.*

3rd International Conference and Exhibition on Computers in Engineering and Building Design, March 14-16, *Sussex, England. Contact: Beverley Rushbrook, CAD '78, IPC Science and Technology, 32 High St., Guildford, Surrey, GU1, 3EW, England.*

Printemps Informatique, March 14-17, *Paris. Contact: Peter Ryan, U.S. Dept. of Commerce, Domestic and International Business Administration, Washington, D.C. 20230 (202)377-2849.*

calendar

11th Annual Simulation Symposium, March 15-17, *Tampa, Fla. Contact: Annual Simulation Symposium, P.O. Box 22621, Tampa, Fla. 34622.*

Oregon Report on Computing, March 20-22, *Portland, Ore. Contact: T.G. Lewis, Computer Science Dept., Oregon State Univ., Corvallis, Ore. 97311 (503)754-3273.*

APRIL

8th Annual Symposium on Automatic Imagery and Pattern Recognition, April 3-4, *Gaithersberg, Md. Contact: Electronic Industries Assn., 2001 Eye St. N.W., Washington, D.C. 20006 (202)457-4981.*

5th Annual Symposium on Computer Architecture, April 3-5, *Palo Alto, Calif. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, Md. 20901 (301)439-7007.*

Communications '78, April 4-7, *Birmingham, England. Contact: Tony Davies Communications, c/o P.D. Bishop, 8 Coningsley Rd., South Croydon, Surrey, CR2 6QP, England.*

8th Conference on Computer Audit, Control, and Security, April 10-13, *New York City. Contact: Institute of Internal Auditors, 249 Maitland Ave., Altamonte Springs, Fla. 32701 (305)830-7600.*

ADAPSO 49th Annual Management Conference, April 12-14, *Phoenix. Contact: ADAPSO, 210 Summit Ave., Montvale, N.J. 07645 (201)391-0930.*

Workshop on Pattern Recognition and Artificial Intelligence, April 12-14, *Princeton, N.J. Contact: Prof. Y.T. Chien, Dept. of Computer Science, Univ. of Connecticut, Storrs, Conn. 06268*

National Information Conference and Exposition, April 17-19, *Washington, D.C. Contact: Information Industry Assn., 4720 Montgomery Lane #904, Bethesda, Md. 20014 (301)654-4150.*

Mini/Microcomputer Conference and Exposition, April 18-20, *Philadelphia. Contact: Bob Rankin, Mini/Micro '78, 5528 La Palma Ave., Anaheim, Calif. 92807. (714)528-2400.*

Hannover Fair, April 19-27, *Hannover Messe, W. Germany. Contact: Helga Meixner, Schenkers International Forwarders, 1 World Trade Center #1867, New York, N.Y. 10048 (212)432-3000.*

Percomp '78, April 28-30, *Long Beach, Calif. Contact: Percomp '78, 1833 E. 17th St., Santa Ana, Calif. 92701 (714) 973-0880.*

MAY

Micrographics '78, May 9-12, *Boston. Contact: National Micrographics Assn., 8728 Colesville Rd., Silver Spring, Md. 20910 (301)587-8444.*

Eurocomp '78, May 9-12, *London. Contact: On- Line Conferences, Cleveland Rd., Uxbridge UB8 2DD, England.*

Edp '78, May 9-15, *Milan, Italy. Contact: Tommy Thomas, U.S. Dept. of Commerce, Washington, D.C. 20230 (202) 377-4508.*

International Conference on Software Engineering, May 10-12, *Atlanta. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, Md. 20901 (301)439-7007.*

Assn. for Educational Data Systems Conference, May 15-19, *Atlanta. Contact: Dr. James E. Eisele, Office of Computing Activities, Univ. of Georgia, Athens, Ga. 30602.*

7th ASIS Mid-Year Meeting, May 22-24, *Houston. Contact: ASIS Headquarters, 1155 16th St. N.W., Washington, D.C. 20036 (202) 659-3644.*

JUNE

Isratech '78, June 4-8, *Jerusalem, Israel. Contact: Government of Israel Investment Authority, 641 Lexington Ave., New York, N.Y. 10022 (212)486-8538.*

National Computer Conference (NCC), June 5-8, *Anaheim, Calif. Contact: AFIPS, 210 Summit Ave., Montvale, N.J. 07645 (201)391-9810.*

4th Annual Symposium and Exhibition: MIMI '78, June 12-15, *Zurich, Switzerland. Contact: Secretariat, MIMI '78, Interconvention, c/o Swissair Postfach, 8058 Zurich, Switzerland.*

Computers in Banking, June 13-15, *Zurich, Switzerland. Contact: Secretariat, Computers in Banking, Interconvention, c/o Swissair Postfach, CH-8058 Zurich, Switzerland.*

Design Automation Conference, June 19-21, *Las Vegas. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, Md. 20901 (301)439-7007.*

FTC-8, June 21-23, *Toulouse, France. Contact: Jean Claude Rault, DIB-Thomson CSF, 33 rue de Vouille, 75015 Paris, France.*

Syntopicon VI, June 21-23, *Washington, D.C. Contact: IWP Assn., Attn: Lorraine Lear, AMS Bldg., Maryland Rd., Willow Grove, Pa. 19090 (215)657-3220.*

JULY

Summer Computer Simulation Conference, July 24-26, *Newport Beach, Calif. Contact: 1978 Summer Computer Simulation Conference, P.O. Box 2228, La Jolla, Calif. 92038.*

AUGUST

ACM Sigmini Symposium on Small Systems, Aug. 2-3, *New York City. Contact: ACM, 1133 Ave. of the Americas, New York, N.Y. 10036 (212)265-6300.*

Jerusalem Conference on Information Technology, Aug. 6-9, *Jerusalem, Israel. Contact: Anthony Ralston, SUNY-Buffalo, 4226 Ridge Lea Rd., Amherst, N.Y. 14226.*

Conference on Computer Graphics and Interactive Techniques, Aug. 23-25, *Atlanta. Contact: ACM, 1133 Ave. of the Americas, New York, N.Y. 10036 (212)265-6300*

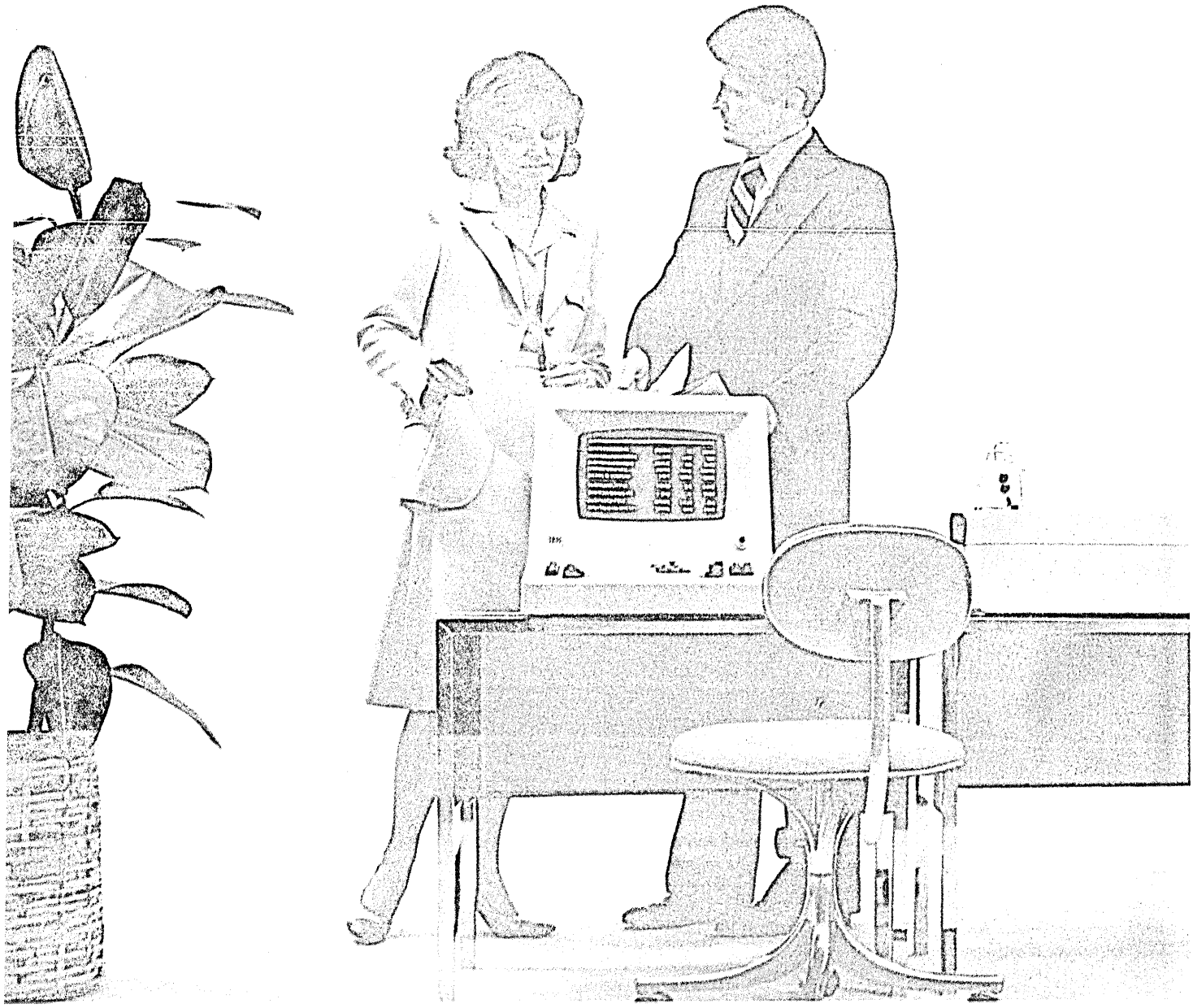
Compstat 1978: Symposium on Computational Statistics, Aug. 21-25, *Leiden, The Netherlands. Contact: Centraal Reken Instituut, Univ. of Leiden, Wassenaarseweg 80, Leiden, The Netherlands.*

8th Australian Computer Conference, Aug. 28-Sept. 1, *Canberra City, Australia. Contact: Australian Computer Society, Box 448, Canberra City A.C.T. 2601, Australia.*

SEPTEMBER

Southeast Asia Regional Computer Conference, Sept. 4-8, *Manila, Philippines. Contact: Philippine Computer Society, MCC P.O. Box 950, Makati Commercial Center, Metro Manila, Philippines.*

(Continued on page 162)



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Series/1 is a family of small, powerful, general-purpose computers that puts the emphasis on productivity.

Series/1 offers a choice of two processors in a variety of storage sizes, plus a full range of I/O units, high-speed disk storage, dual-sided diskette capability, both digital and analog sensor I/O, line and matrix printers and a choice of standard or customized display stations. And well-documented user attachment features make it possible to directly attach non-IBM equipment you may already have.

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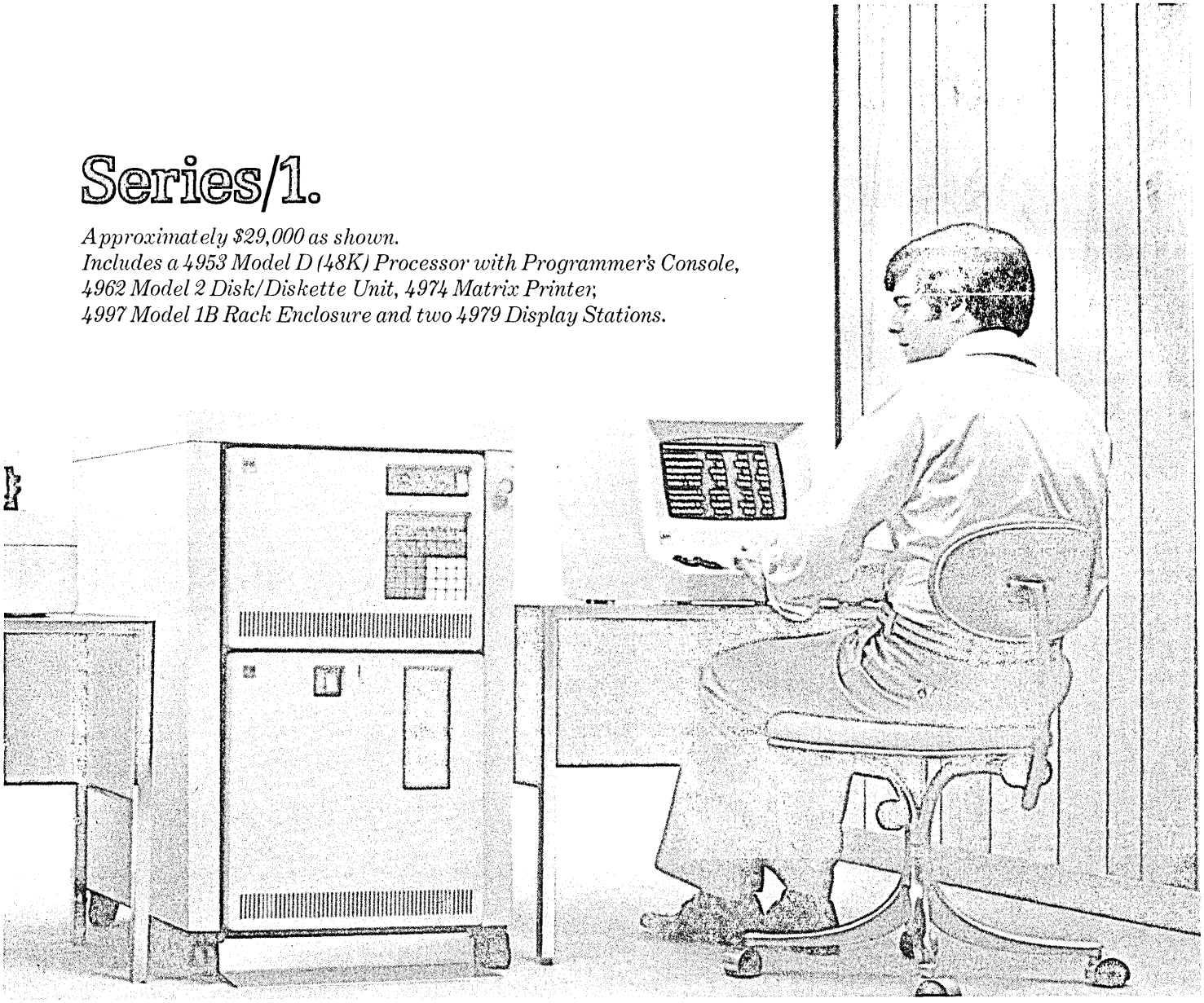

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168 on the 4953.

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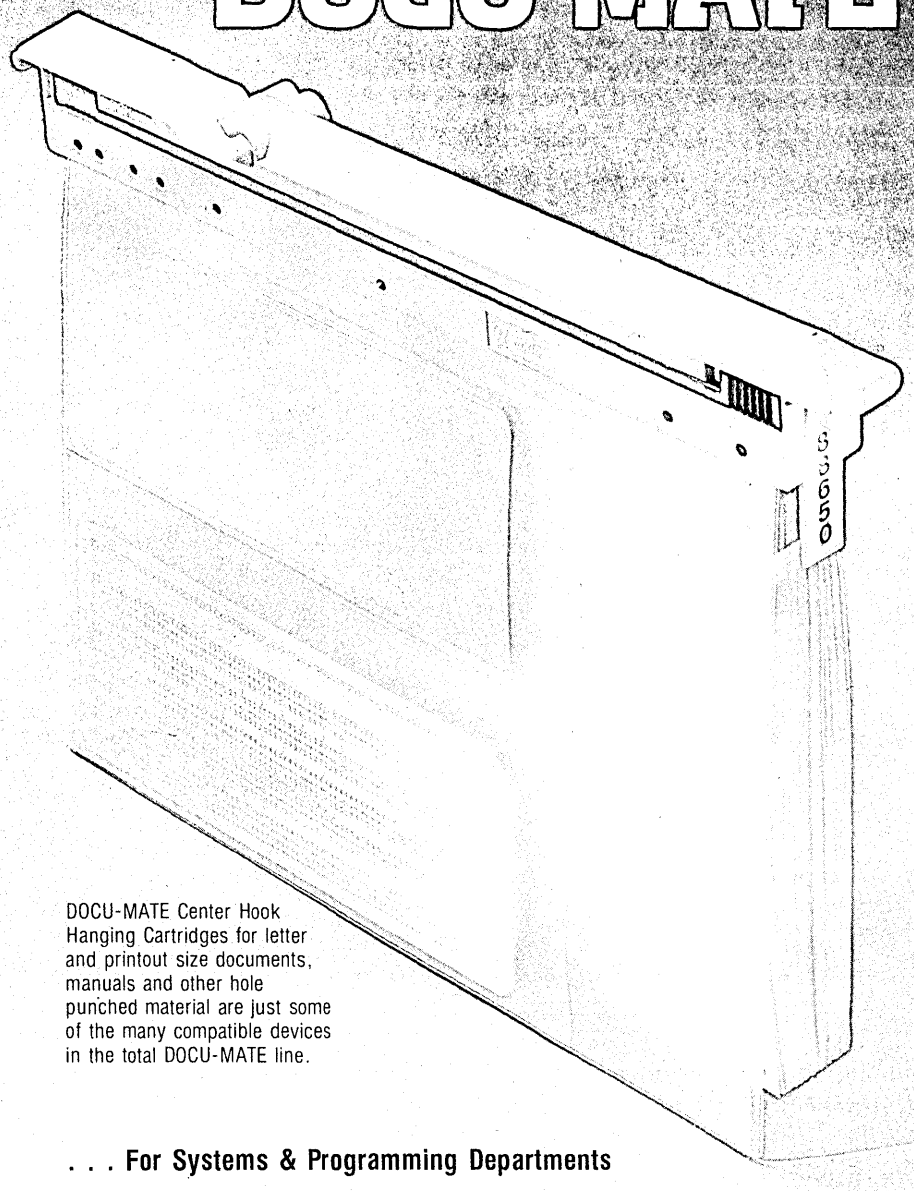

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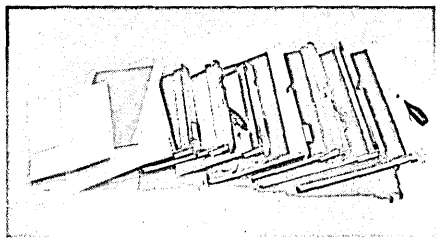

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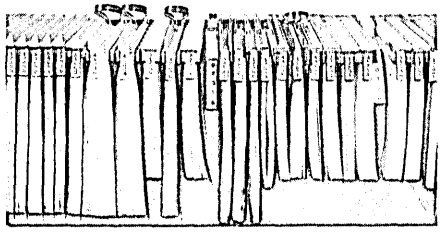

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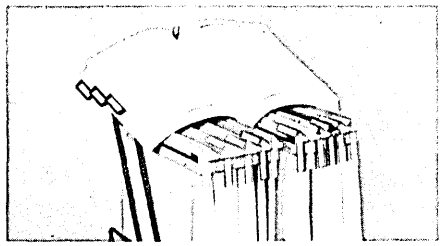

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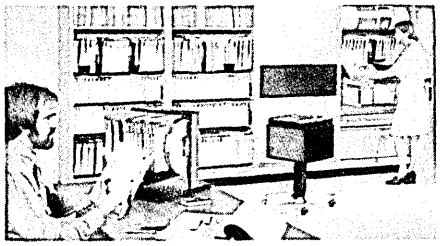

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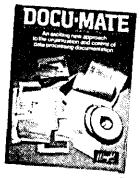

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books

Structured Systems Analysis: Tools and Techniques

by Chris Gane and Trish Sarson
Improved System Technologies Inc.
888 Seventh Ave., New York, N.Y. 10019 (1977)
373 pp. $30.00

This book is aimed at filling the gap that exists between "fuzzy" notions about needs and a software design. It accomplishes this in the context of the software problem environment by presenting several analysis tools and techniques. In this respect, the title of the book is well chosen; it is a collection of tools and techniques. These have not been selected at random, but rather for their complementary characteristics. They represent a set of matched tools which help "structure" systems analysis.

The book's audience is identified in the preface, but the identification is broad and excludes few. Even customers would find this book of value if for no other reason than to help maintain good communications. Generally, though, technical people who perform the analysis and requirements definition would benefit the most.

The thrust of the book seems to be that since analysis is a discovery-oriented investigative process, it is not easily systematized. Those who have analyzed even a simple system would agree. A loosely defined procedure is described to guide the analysis. Its use reduces the possibility that some important factor will be overlooked.

The systems analyst is often faced with the problem of comprehending verbal statements and written narratives describing some problem. His job is to clearly communicate this unstructured "stuff" to the customer and software designers. The value of this book lies in its portrayal of tools to "structure" (there is that word again) problems. Although the book describes the use of each, its basis, and gives examples of its application, it goes one step further by aiding the analyst in deciding which tool(s) would be appropriate in a given situation. It includes a valuable guide to the suitability of a tool to a specific problem. This type of guidance is a must for any book of this sort where a number of different tools and techniques are presented.

Those who are familiar with the more formal, mathematics-oriented systems engineering approaches to problem modeling and definition will be disappointed. The book is oriented toward "how" and "what" rather than why (theory). Its organization reflects this in that it first discusses why we need tools, describes the use of several tools, then shows how they fit together and how an analysis can be evolved into a design.

The learning process is aided by the inclusion of exercises at the end of each chapter, but solutions are not provided—for several reasons. One is that solutions to analysis problems often require a good deal of space. Another is that the nature of analysis is such that several different solutions to the same problem could all be correct. This is quite different from high school algebra, but the nature of the problem(s) also is different. In algebra problems there is one, and only one, correct answer. In analysis problems, there is a class of solutions which are correct, with some more attractive than others according to constraints, objectives, etc.

Those using the Structured Design method to design software will find this book explains the data flow diagram notation in a way that complements other works. Specifically, it addresses the nitty-gritty details of handling awkward notational problems and the issue of making the transition to a structured design.

Finally, software design methods published in recent years tend to assume the problem being addressed has been defined, but considers the definition process outside its scope. This book provides the analyst with the basics he needs to fashion a rational problem statement and eventually a design. It is easy to read and understand, more directed at the practitioner (analyst) than those idly curious about analysis. Analysis is often viewed as an art. This book provides palette, brush, and lessons. Its price may be high, but good tools are hard to come by.

—Lawrence 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.

BOOK BRIEFS . . .

Strategic Planning for MIS
by Ephraim R. McLean and John V. Soden
John Wiley & Sons, 1977
489 pp. $22.50

This book grew out of a working conference at UCLA in the spring of 1974. Chaired by the editors of the book, the conference was geared for MIS practitioners, managers, and corporate executives, with a focus on long-range strategic MIS planning.

The 100-page introduction is in four chapters, the first detailing present literature on MIS planning and defining a framework for use in considering MIS strategic planning terms and tasks.

Chapter two, "Comprehensive Managerial Planning" by George Steiner, includes such considerations as "translating strategic plans into current decisions" and the value of formal planning versus "intuitive anticipatory" planning.

Chapter three summarizes the results of the conference survey and discussion, covering such topics as planning objectives, end products, approaches, guidelines, and pitfalls.

The fourth chapter provides implementation and evaluation suggestions especially for top management.

The balance of the book consists of the papers presented at the conference grouped by economy sectors—private, regulated (or quasi-private), and public. Organizations represented are as diverse as Kaiser Permanente, Hughes, the Los Angeles Unified School District, and the Board of Governors of the Federal Reserve System.

Many charts and diagrams clarifying the organization of MIS positions, planning cycles, and budgets are included in the text.

Appendices include the planning documents from IBM, Mobil Oil, the U.S. Army Materiel Command, and Xerox Corp. Information Systems, as well as the complete text of the conference survey questionnaire.

Computers and the Unions
by Clive Jenkins and Barrie Sherman
Longman Group Ltd, 14 W. 44th St., New York, N.Y. 10036 (1977)
129 pp. $11.00

Totally unrelieved by illustration, this 129-page book is aimed at an audience with little or no knowledge of computers. The emphasis is on the computer as a social tool; how computing has influenced and is influencing the union job market; union practices; the creation, content, satisfaction, and security of jobs; promotion prospects, and the setting of salary levels.

Sample chapter headings are: "In-

(Continued on p. 66)

source data

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troducing Computers and Unions," "Computers, People, and Jobs," "Unions Meet the Computer," and "Bargaining Digitally."

Without knowing the similarities between trade unions in Britain and the U.S. it is hard to evaluate the usefulness of this book. It should be of most help to readers who want an overview of the computing industry in the context of union negotiation, as the text is prose rather than reference.

reports & references

Data Dictionary Systems

Two recent publications on the subject of data element dictionary/directory systems now are available from the National Bureau of Standards.

Technical Profile of Seven Data Element Dictionary/Directory Systems presents a state of the art assessment of this tool, and describes the system in terms of its characteristics. Seven commercially available DED/D's that meet the following criteria are identified: the main function of the software package is to control and maintain the definitions and descriptions of the data element; the functions of defining, describing, and controlling the data elements must be an integral part of the DED/D (it is not a cross-referencing or report generating tool); documentation for the package is available. The seven systems chosen are: Data Catalogue, Data Dictionary, Data Dictionary/Directory with CMIS Data Element Glossary, Datamanager, DB/DC Data Dictionary System, Lexicon, and UCC-Ten Data Dictionary/Manager.

A glossary of terms and a comprehensive bibliography are included. Price: $1.05. Refer to stock number 003-003-01725.

The second report, *A Survey of Eleven Government-Developed Data Element Dictionary/Directory Systems,* presents the current state of the art of government-developed data element dictionary/directory (DED/D) systems—software tools used for managing and controlling information and data. The 11 systems are described first by a side-by-side features presentation, and then by a narrative systems description of each system, highlighting special capabilities and experiences with each.

The purpose of the report is to help potential users evaluate requirements for a DED/D, and to acquaint readers with a sampling of recent systems and the associated features. The systems highlighted are: ADISDED, ASCSDBD, DARCOM DED/SYSCAD, DEMS, DLCS, DMB/DED, FPCRIS, LOGDRMS, STADES, USDADBD, and VADD. Price: $2.50. Refer to stock number 003-003-01817-1. Both reports are available from the SUPERINTENDENT OF DOCUMENTS, U.S. Government Printing Office, Washington, D.C. 20402.

Conference Analyzer 77

Several national conferences, including Datacomm 77 in Washington, D.C., Interface 77 in Atlanta, the OCR Users' Conference in Washington, D.C., the First Annual Data Entry Management Conference in New York, and Intelcomm 77 in Atlanta, focused on data entry and data communications. This report analyzes those five conferences in terms of the content of the seminars and interviews with attendees and vendors. Datacomm 77 is compared with Interface 77, as reflecting the attitudes of U.S. data communications users and vendors. The OCR Users' Conference emphasized the applications orientation of ocr. Intelcomm stressed the need for cooperation among all nations in the field of international data communications, and the First Annual Data Entry Management Conference highlighted the theme of "people—the most important data entry resource." The conference analysis is available for $25. MANAGEMENT INFORMATION CORP., 140 Barclay Center, Cherry Hill, N.J. 08034.

Auditext

This 200-page audit preparation handbook has been compiled for users with or without their own internal auditing staff. *Auditext* covers 16 major areas of audit problems including: security, privacy, facility protection, personnel procedures, software design, risk management, and computer room operating procedures. The handbook includes over 500 questions that an auditor might ask, and is applicable to both small single computer installations and large multilocation configurations, the vendor says. Cost: $47 (Calif. residents add $2.82 sales tax). ACCRA CORP., 16000 Ventura Blvd., Suite 230, Encino, Calif. 91436.

EFT Commission Report Summary

The final report of the National Commission on Electronic Funds Transfer has been summarized in this eight-page brochure from the Payments System Planning Div. of the American Bankers Assn. (ABA). The commission's 389-page report is entitled *EFT in the United States, Policy Recommendations and the Public Interest.* The ABA summary describes the four major areas covered by that document: consumers and EFT, including privacy, establishing and operating an account, theft, error, and malfunctions; providers' issues; technology; and the government role in monetary policy and government operation. The summary also covers the principles of the commission's conclusions and recommendations, and dissenting statements which were included in the original report. The summary is free. AMERICAN BANKERS ASSN., Attn: Frank Curran, Payments System Planning Div., 1120 Connecticut Ave N.W., Washington, D.C. 20036.

Word Processing Guide

This vendor's *Guide to Word Processing* comprises 300 pages of selection information designed to assist managers in the selection of a word processing system. The buyer's guide presents comparison charts of competing office copiers, dictation equipment, and word processing-related ocr equipment. Additional charts compare the performance and characteristics of competing systems. Individual product reports include a system description, system design, competitive positioning, user case histories, and price data. Price: $59. AUERBACH PUBLISHERS INC., 6560 N. Park Dr., Pennsauken, N.J. 08109.

courses

Minis and Distributed Processing

"Minicomputers and Distributed Processing," a three-day course, will focus on the uses, economics, programming, and implementation of minicomputers. Specific topics for the seminar include minicomputer architecture, peripheral equipment, minicomputer software, microprocessors, distributed processing, communications support for distributed networks, application-oriented systems, and mini-based business systems and word processing. The program also will analyze the planning and installation of minicomputers on a standalone or decentralized basis. Presented by the Univ. of Chicago Center for Continuing Education, the course will be offered Jan. 23-25 in Atlanta; Feb. 22-24 in Los Angeles; March 13-15 in New York; April 17-19 in Chicago; May 15-17 in Toronto; and June 21-23 in San Francisco. Price: $435/person plus $60/company registration fee. NEW YORK MANAGEMENT CENTER, 260 Lexington Ave., New York, N.Y. 10017.

(Continued on p. 70)

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It's non-stop.

Where others fail. It's simple. You must have a non-stop system to have non-stop COBOL. And only Tandem has it. A unique multiple processor on-line system which ensures protection of the data base, and that no transactions are lost or duplicated, even if a processor, I/O channel, disk controller or disk should fail. Best of all, the system keeps running.

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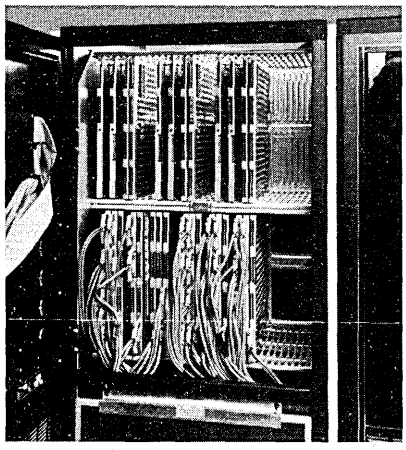
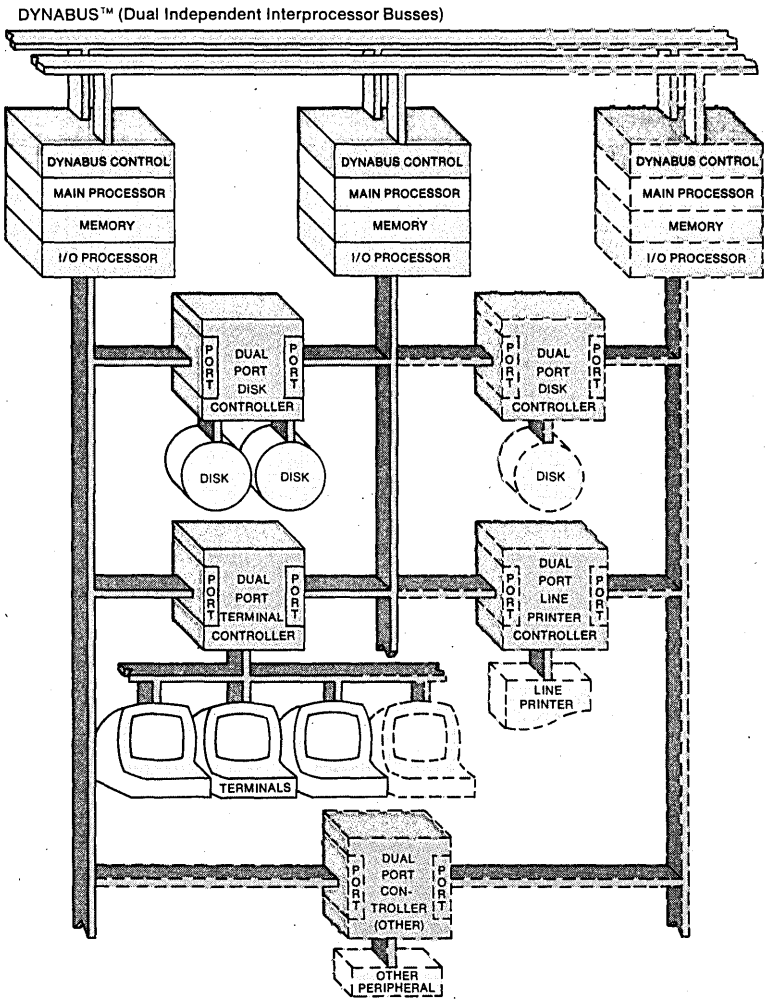


Four BILLION bytes per file. With no limit on the total data base size. Key sequenced, entry sequenced or relative file structures. With up to 255 alternate keys per file. And optional mirror copy by disk volume. It's incredible storage and tremendous flexibility in a mini-based system. And of course, it's non-stop.

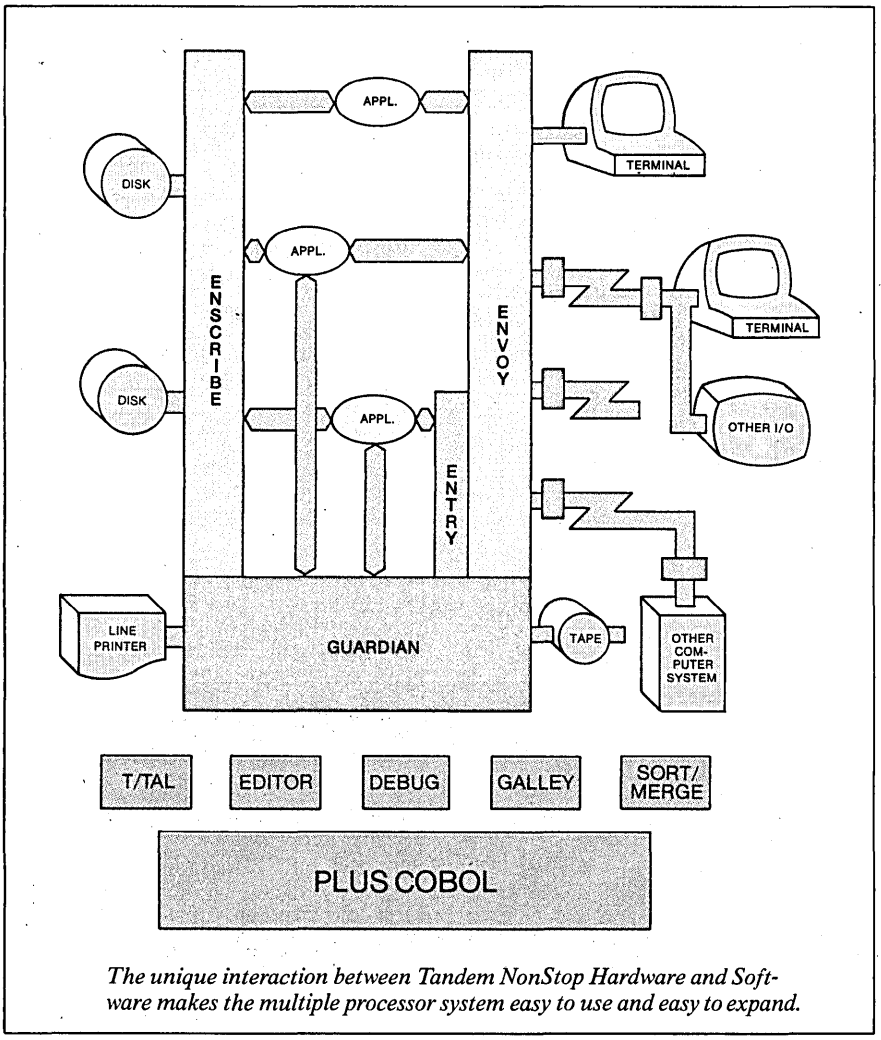


The Tandem NonStop System is composed of up to 16 multiple, independent processors with dual communications paths between all system modules. The result is not only continuous operation, but throughput unmatched by any other system of comparable cost.

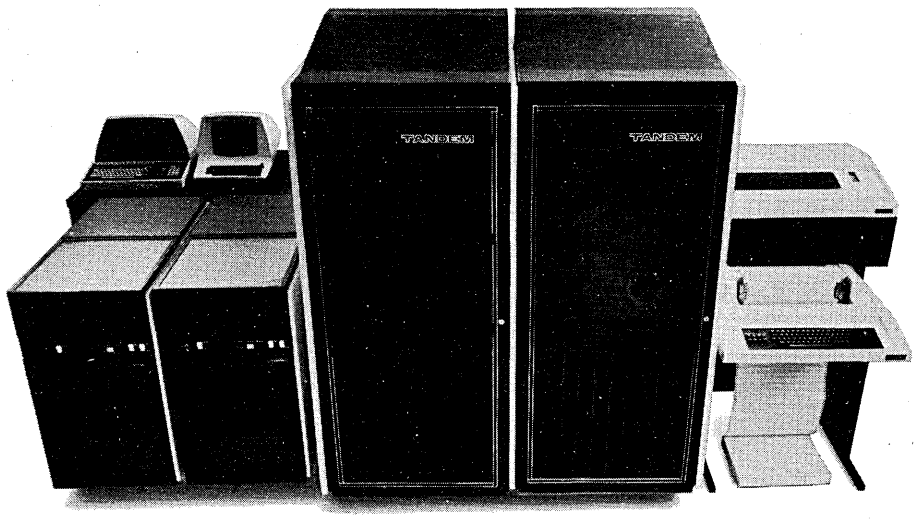
Sharing a common data base. Three new verbs, LOCKFILE, UNLOCKFILE, and UNLOCKRECORD have been introduced to the Tandem COBOL I/O facility to permit the use of corresponding system file and record locking routines, and allow separate processes to share a common data base. READ and REWRITE verbs have been extended to allow specification of LOCK or UNLOCK operation. OPEN syntax has been extended to specify the file access, EXCLUSIVE, SHARED, or PROTECTED, and to permit the SYNCDEPTH for files opened in the OUTPUT, I/O or EXTEND mode.

With STARTBACKUP and CHECKPOINT. These are logical extensions of Tandem COBOL which implement the NonStop™ features of Guardian Multiple Processor Operating System. STARTBACKUP is called once at the

standard about our COBOL.



The unique interaction between Tandem NonStop Hardware and Software makes the multiple processor system easy to use and easy to expand.



beginning of the program to set the NonStop mode. From then on, CHECKPOINT controls passing information to the backup process at critical points. CHECKPOINTS occur automatically at any OPEN or CLOSE after the backup is established. These two simple instructions eliminate the downtime, restart, and revalidation which plague any user without the Tandem NonStop capability.

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TANDEM

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(Continued from page 66)

Security/Privacy Workshop

Using the "case study approach to computer abuse," this three-day workshop will focus on the major problem areas of computer security and privacy. Responsibility, risk analysis, operation security, internal computer security, computer auditing, disaster recovery planning, and system monitoring and surveillance will be among the areas discussed. In addition, the workshop will include an overview and discussion of the Federal Privacy Protection Study Commission Report and a special presentation on distributed systems and communications security. The topics are said to have particular value to those persons involved in auditing, computer operations, systems analysis and programming, and internal security. Price: $425; $375 if paid 30 days in advance. Group discounts are available. The workshop will be held Jan. 24-26, Feb. 14-16, March 14-16, and May 16-18 in Phoenix, Ariz. HONEYWELL INFORMATION SYSTEMS, Computer Security and Privacy, P.O. Box 6000, MS K-95, Phoenix, Ariz. 85005.

Edp Planning

This seminar is said to be designed to provide a set of tools and techniques for the evaluation of user requests, formulation of a master system plan, and avoidance of costly decisions on replacements or extension of computer systems beyond their economic shelf-life. Specific topics discussed at the three-day workshop will include developments in the dp planning process, how to evaluate the current system status, identifying key strategic dp planning issues, future system design considerations, architecture of tomorrow's hardware/software facilities, managing the change in organizations, and implementation issues. Case studies examined are said to be derived from real-world situations in governments and businesses. The seminar will be offered Feb. 21-23 in Ottawa, Canada. Price: $470, members; $495, nonmembers. The PROFESSIONAL DEVELOPMENT INSTITUTE PDI LTD., P.O. Box 1181, Station B, Ottawa, Ontario, K1P 5R2 Canada.

Zero Base Budgeting

Designed to be of most benefit to systems analysts, planners, budget analysts, dp managers, administrative managers, and consultants, this course also will help other managers having budgeting responsibility. No computer expertise is required. The seminar will address the zero-base budgeting process with an emphasis on implementation, and feature a discussion of software application packages that can be used to support a zero-base budgeting system.

Day one of the two-day course will focus on scope objectives and assumptions of ZBB, components of a system, management of the ZBB process, and the use of computers in zero-base budgeting. The second day will introduce available software packages, including RAPIDATA, CDC, CSC (INFONT), and TYMSHARE. Also covered will be planning for ZBB implementation and winning acceptance of ZBB within the organization. The seminar will be offered Jan. 30-31 in Phoenix, Feb. 27-28 in Boston, March 30-31 in San Francisco, and April 17-18 in Arlington, Va. Price: $335. INSTITUTE FOR PROFESSIONAL EDUCATION, 1901 N. Ft. Myer Dr., Arlington, Va. 22209.

periodicals

Satellite Communications

A new magazine, *Satellite Communications*, is described as a "clearing house" for ideas and applications for equipment manufacturers and users of communications services. Editorial coverage will be divided into news, features, and departments, and each issue will include features on new applications and explanations of uses for existing technology. Proposed articles include: a profile of the U.S. domestic satellite carriers, shopping list for the prospective satellite user, current developments in Intelsat, implications of satellite technologies for privacy considerations, issues involved in transnational communications transfer, and update: teleconferencing for business purposes via satellite. Price $10/year (charter subscription). SATELLITE COMMUNICATIONS, 1900 W. Yale, Englewood, Colo. 80110.

vendor literature

32-Bit Computer

This vendor's first 32-bit computer system, the VAX-11/780, is described in a new four-color, 24-page brochure. The booklet covers the new machine's operating strengths, compatibility with the vendor's PDP-11 line, software features including the virtual memory operating system, and peripheral options. DIGITAL EQUIPMENT CORP., Northboro, Mass.

FOR COPY CIRCLE 305 ON READER CARD

Microcomputer Reliability

Reliability of the TMS 1000-series of one-chip microcomputers is the topic of this 64-page report covering 21 million hours of testing. Both the test procedures and results are discussed. Formulas are given for calculating failure rates and expected system reliability. The report, illustrated with both photographs and graphs, also describes the vendor's quality assurance and reliability program. TEXAS INSTRUMENTS INC., Houston, Texas.

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PDP-11 Memory

Six two-page data sheets describe this vendor's PDP-11 compatible memories. Add-in (planar) and add-on (modular) memories ranging from 12K words to 4MB are described. Design features, specifications, addressing, and operating data are discussed in the spec sheets. MONOLITHIC SYSTEMS CORP., Englewood, Colo.

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Minicomputer

The Eclipse S/130 is the subject of a 16-page brochure. Both hardware and software are discussed, including the topics of computation abilities, languages, operating systems, programming aids, peripherals, and typical system configurations. DATA GENERAL CORP., Westboro, Mass.

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Engineering Handbook

The 1977-1978 Engineering Product Handbook contains information on the most significant products from this

(Continued on p. 74)

Verbatim™

The whole message is quality.

You want to record your message verbatim—word for word—whether it's bits, bytes or "Dear Folks" translated into word processor language.

Our objective in manufacturing recording media for the electronics industry—digital tape cassettes, floppy disks, mag cards, computer cartridges—is to give you the finest, the best, the most dependable, the most cost-effective.

That means rugged, long-lived, abrasion-resistant recording media with superior magnetic qualities. If we made tires, they'd be steel-belted radials.

We delivered our first digital grade certified tape cassettes back in the beginning, 1969. We made the first commercial 3740-compatible floppy disks that didn't bear IBM's name. And the first Flippy® reversible flexible disks with *anyone's* name on them. The first mini data cassette is ours. And we've got the newest miniature flexible disk, the MD 525.

Now, **Verbatim** media. It's a new formulation of ferric oxides, an advanced macromolecular binder system to adhere it to the tough polyester film, and a process control system that demands over 200 separate quality checks before the material is cut, packaged, and certified to be 100% error-free.

The final quality check? "Make it pretty!" Our production people tell us that magnetic recording media is one of the rare instances in manufacturing where aesthetic appearance translates directly into final product quality. It has to look beautiful to work beautifully.

We have the formulas, the machines, the technology to make high quality recording media. But it takes the best people in the industry to deliver Verbatim disks, cards, cartridges and cassettes. You'll find them here. Write or call for our new monograph, "Data and Word Storage Media." Phone (408) 245-4400. TWX 910-339-9381. 323 Soquel Way, Sunnyvale, CA 94086.

Information Terminals Corp.®

CIRCLE 80 ON READER CARD

Meet two new systems that double the power range of NCR's 8000 series.

The NCR V-8580 and V-8590.

With these two new systems at the upper end of NCR's versatile 8000 series, every computer user now has access to twice as much NCR computer power. With an NCR system, he can upgrade smoothly through the entire power range without obsoleting his software design as his requirements grow. Because NCR's migration path extends from family to family, from generation to generation, from the entry level I-8100 all the way up to these powerful new computer systems.

The new systems bring latest state-of-the-art hardware and software technologies to bear on larger-volume processing problems. The user gets super-efficient performance at a price that fully reflects today's breakthroughs. In a smaller package. With a full complement of peripherals and terminals to meet his specific requirements.

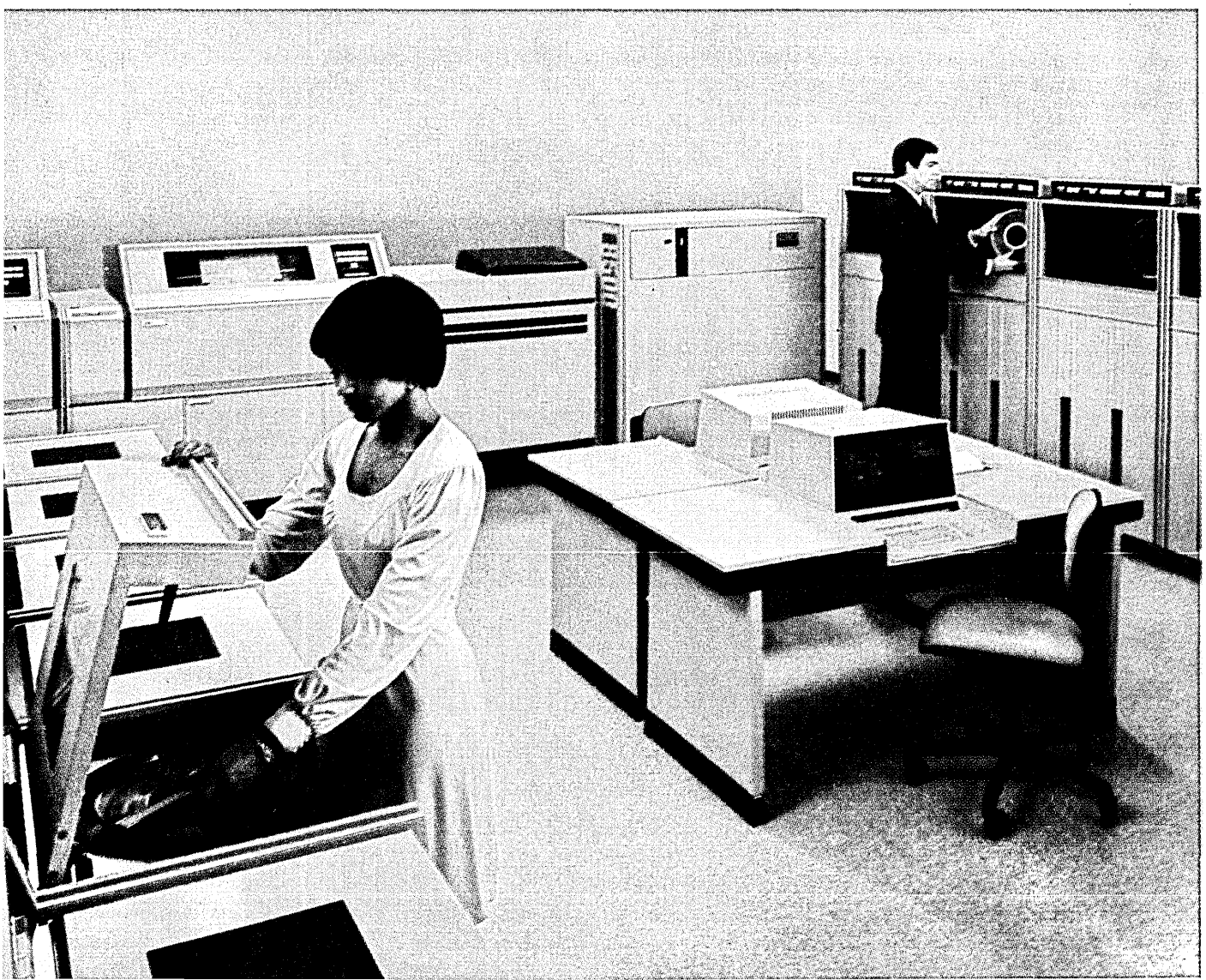
Both systems offer VRX (Virtual Resource Executive), NCR's most sophisticated operating system software, to take full advantage of the hardware's architecture. VRX provides virtual memory operation, online program development, and the ability to function as multiple virtual machines.

Languages available with the two systems include COBOL 74, NEAT VS, FORTRAN, RPG and others.

THE FIRST POWER STEP

The V-8580 is the power step preceding the V-8590, assuring smooth transition up to the highest power level. The V-8580 is ideally suited for large online and multiprogramming applications that take full advantage of the system's virtual memory.

It has distributed intelligence. The central processing unit is supported by up to seven additional processors which independently handle diagnostics, control, input/output and communications functions.



It uses multilevel pipeline processing. As each program instruction is executed, the next three instructions are simultaneously advanced toward execution to provide greater efficiency.

The V-8580 has a very high speed main processor with a cycle time of 56 nanoseconds. And its memory is substantial. Up to four megabytes in one-megabyte increments.

DOUBLE THE POWER RANGE

The V-8590 is a twin-engine system with twice the power of any earlier NCR system. It has two main processors at the center of its distributed intelligence system operating on the same transfer bus. The processors share the same workload under the efficient control of VRX, aided also by the subordinate processors.

Both 56-nanosecond processors have equal access to memory and all other system resources. Both have multilevel pipeline processing capability. The shared memory ranges from two to six megabytes in one-megabyte increments.

The V-8590 functions in a multiprocessing mode, dynamically allocating system resources as needed. This shared-workload concept improves system thru-put and productivity.

Several of these new systems can be linked together as communicating processors in a network built around NCR's Distributed Network Architecture.

Also introduced to complement the V-8590 are two new high-performance peripherals, the 6370 tape unit and the 6540 data storage subsystem. The 6370 tape unit has dual mode capabilities—it can function in either the Phase Encoded (PE) mode at 1600 bpi or the Group Coded Recording (GCR) mode at 6250 bpi density. The 6540 has a capacity of 540 megabytes. The transfer rate of both disk and tape is an extremely fast 1.2 megabytes per second.

For a personal introduction to the V-8580 and V-8590, call your local NCR representative. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

NCR

Complete Computer Systems

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source data

(Continued from page 70)

vendor's line of A/D converters, D/A converters, computer analog I/O peripherals, data acquisition systems, sample-holds, power supplies, digital panel meters, and data logging instruments. Directed to system and circuit design engineers, the 288-page handbook is intended to help the reader select and apply the product that best fits his needs. To simplify the selection process, the booklet contains tabular selection guides which categorize the vendor's line of data conversion devices by performance. Complete spec sheets are provided for key products, and a 13-page application section covers "Principles of Data Acquisition and Conversion." DATEL SYSTEMS, INC., Canton, Mass.
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Small System

Two booklets describe this vendor's 2026 "dedicated system for source data entry and data communications." A 12-page overview describes the system and discusses the vendor's internal use of an international network using the 2026. The booklet also lists peripherals and user support programs. A companion 40-page price/configuration guide covers base system equipment, options, accessories, site planning, and warranty provisions. Twenty-four pages of the booklet are devoted to product and peripheral specifications. Support services including manuals, consultants, and maintenance also are discussed. HEWLETT-PACKARD CO., Palo Alto, Calif.
FOR COPY CIRCLE 302 ON READER CARD

Microcomputer Boards

Microcomputer boards, printed circuit boards, and off-the-shelf designer breadboards are described in a six-page, two-color brochure. Products described include a 32KB static memory board for hobbyists and small business use, an S-100 compatible general purpose board, and a wire-wrap breadboard. The firm's technical capabilities also are discussed. ARTEC ELECTRONICS, INC., San Carlos, Calif.
FOR COPY CIRCLE 301 ON READER CARD

IEEE 488 Revealed

"An Example of an M6800-based GPIB interface" provides a comprehensive description of the General Purpose Instrument Bus (also known as GPIB or IEEE 488-1975). An attempt to educate the industry on how to apply the IEEE 488 interface (developed by Hewlett-Packard), the pamphlet includes a five-page description of an actual product (3M-type tape drive) development project. Most of the booklet consists of listings of the assembly language routines used to communicate over the bus, while the last page of the booklet is a fold-out GPIB interface hardware diagram. TEKTRONIX, INC., Beaverton, Ore.
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Data Labels

An eight-page, four-color brochure covers this vendor's line of pressure sensitive labels for use in dp installations. Other paper products, such as personalized memo pads and NCR-carbonless forms for requesting data information, also are listed. Pricing information and a toll-free phone number for placing orders are included. APPLE LABEL, Div. of Applebaum Tag & Label Corp., Long Island City, N.Y.
FOR COPY CIRCLE 298 ON READER CARD

Minicomputer Accessories

Minicomputer accessories, ranging from magnetic tapes and discs to books and tool kits, are described in this vendor's 16-page mailorder catalog. The catalog includes product specifications, pricing, and an order form. MISCO, Holmdel, N.J.
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Wire Line Modem

This vendor's model 263A wire line modem is described in a four-page brochure. Specific features including self-diagnostics, timing and control,

Don't let static kiss your computer's memory good-bye!

Set up islands of protection with 3M Velostat Brand electrically conductive floor mats!

Static on personnel, discharged into a terminal, can upset the logic of your terminal, mini, or CPU . . . can send erroneous data . . . permanently damage circuits causing costly downtime and repair. No equipment is 100% immune. Some computer equipment makers report that as little as 200 volts of static can cause serious problems!

VELOSTAT Mats create positive paths to ground . . . drain static away from terminal operators . . . keep them static free. Simply place the mat where the operator must step on it to reach the keyboard, and the VELOSTAT Mats provide passive protection in such key areas as these:

- Around Data Entry, POS and Bank Terminals
- At Minicomputer and Word Processing Stations
- As a floor runner in Computer Room Entrances
- In front of Computer Printers and Disc Drives

TO: Static Control Systems
Dept. BZF-18
3M Company, St. Paul, MN 55101

3M COMPANY

YES, I'm interested in keeping static away from my terminal with VELOSTAT conductive floor mats.

☐ Please have a 3M Static Analyst call.

☐ Send more information.

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Title_____

Company_____

Area Code_____ Phone_____

Address_____

City_____ State_____ Zip_____

source data

and protection and compensations are discussed. Illustrations show various methods of installation; tables provide interfacing information. GTE LENKURT INC., San Carlos, Calif.
FOR COPY CIRCLE 295 ON READER CARD

Computer Cartography
An illustrated, six-page brochure describes the vendor's study, "Computer Cartography: Worldwide Technology and Markets." The brochure gives background on the field and the objectives of the study. Short biographies of the authors are included, along with comments from reviewers. The study's outline and an order form are provided. INTERNATIONAL TECHNOLOGY MARKETING, Newton, Mass.
FOR COPY CIRCLE 293 ON READER CARD

Training Courses
A 10-page catalog lists this publisher's training courses for the small-to-medium sized business computer user. The audio cassette/workbook courses described include those covering programming languages, such as COBOL and RPG II, computer concepts for managers, developing user-oriented computer systems, and implementing an internal control system. INFO 3, Woodland Hills, Calif.
FOR COPY CIRCLE 292 ON READER CARD

Keyboard
An eight-page, two-color catalog describes this vendor's "PRO" keyboard for personal computer, hobbyist, and oem use. Customizing instructions are included. Dimensions and interfacing data also is provided, as is a schematic of the keyboard. CHERRY ELECTRICAL PRODUCTS CORP., Waukegan, Ill.
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Acoustic Couplers
This vendor of acoustic couplers and modems has prepared a catalog to familiarize readers with the logistics and mechanics of either taking a first step into time-sharing or upgrading to a sophisticated system such as one for message communications. OMNITEC CORP., Phoenix, Ariz.
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Disc Cleaning
A four-page brochure describes the proper method for cleaning disc cartridges. Written by the president of a firm supplying disc maintenance supplies, the brochure notes that instruction sheets accompanying new disc packs "urge good housekeeping methods, but seldom do they recommend on-site cleaning." The author goes on to say that in actuality, cleaning a cartridge at a user site is "no more risky than handling and mounting." THE TEXWIPE CO., Hillsdale, N.J.
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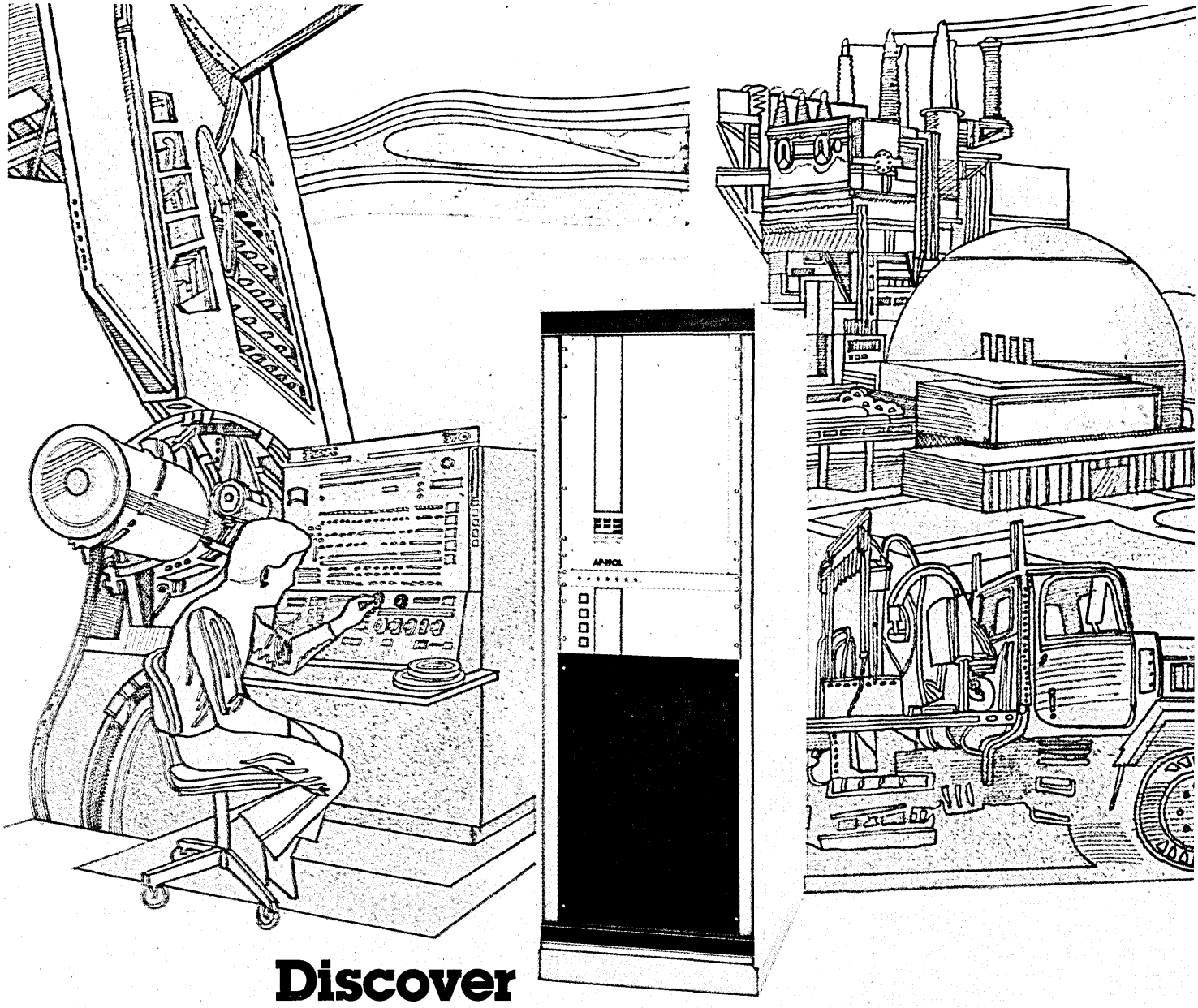
Wholesalers' Help
"Profit-Making and Problem-Solving for Hardware and Electrical Wholesalers" discusses how wholesalers can benefit by having this vendor install a turnkey computer system. The eight-page brochure discusses problems wholesalers have encountered with computers (and the reasons behind those problems), and then goes on to explain the vendor's step-by-step method of installing turnkey systems. The illustrated brochure also includes a question and answer section covering computer fundamentals of importance to those in the wholesaling business. SYSTEMS OPTIMUS, Laguna Hills, Calif.
FOR COPY CIRCLE 296 ON READER CARD ❋

We attributed the photo of DEC's "Beginner's Guide to Small Business Computers" on p. 48 of our November issue to the wrong company. It should have been inserted under the heading "Small Business Computers" on the same page. The guide is offered by DIGITAL EQUIPMENT CORP., Northboro, Massachusetts.



Discover FPS Innovations for your Scientific Processing Systems.

The key to unequalled systems solutions for scientific processing is available from FPS for users of large computers such as **IBM 360/370** and **Univac 1100 Series.**

FPS offers users of large computers the technical innovations, applications development, and systems support in Array Processors that have created a worldwide reputation for this emerging company.

Hundreds of FPS Array Processors are in use today. We invite you to investigate the company, the product line, that has had such impact on technology.

You can share in the benefits of FPS involvement in **nuclear core phenomena, vibrational** and **structural** analysis, **weather** modeling, **hydrodynamic** modeling, **power** flow simulations, and more.

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- FORTRAN level user interface to the array processor
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- Hardware interfaces to the CPU via an I/O channel

APPLICATION SOFTWARE

- Scientific algorithms
- 200-function general-purpose Math Library
- Higher level program to link several algorithms together

Less than $97k buys you a fully operational AP-190L Array Processor System interfaced to your large computer system.

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☐ I have an immediate need. Please have a technical consultant contact me.
☐ Please send me an FPS Array Processor brochure.
Name_____ Title _____
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My Computer System is _____ My application is _____

DATAMATION 1/78

The pioneer of small business computers now makes small business computers.

Actually, Basic/Four Corporation has been making its own central processing units since August, 1976. We now make our own terminals, too.

We wanted tighter rein on manufacturing and testing, choice of the latest components, total control of quality, production and delivery. So we could offer even more reliable, better products.

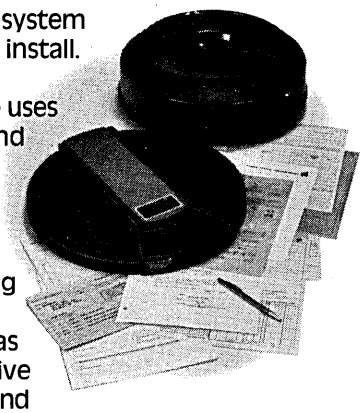
Now we do.

The Basic/Four® CPU's new semiconductor memory means 40% faster cycle time, down from 1 microsecond to 600 nanoseconds. New models make expansion even easier, accommodating one to 16 terminals. There are other improvements, too, with more to come.

And the Basic/Four systems we make have been running, bug-free. Just like before–only better. The best small business computers available.

All-around simplicity

We also made sure our system would be the easiest to install. And operate.



The software uses BUSINESS BASIC. And we have applications modules that are preplanned and packaged, including such eminently usable programs as CBS (Comprehensive Business System) and EASY, an exception analysis system. Plus a multitude of specialty packages. For hospitals, insurance, travel agencies, bond brokers, banking, the apparel industry, trucking, publishing–literally dozens, and more on the way.

Full time commitment

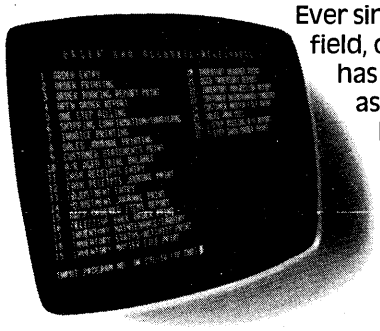
Our specialty is small business computers; it engages our full attention, dedication and effort. And, of course, as the pioneer, we've been at it longer. Long enough to have established through SORBUS INC., our sister MAI company, a national network of support and service, 24-hours a day, if needed.

All this leadtime and concentration keeps us ahead.

And now we make our own. So we *know* we're offering the best.

If you'd like to know more, call or write: Basic/Four Corporation, 18552 MacArthur Blvd., Irvine, CA 92714

Look to the pioneer



Ever since we pioneered the field, our operating system has been acknowledged as the best of any small business computer. It had to be–because our systems were always interactive, even when others were batch.

Nowadays, everyone in the field is talking "transaction processing"–following our lead, some six years later!

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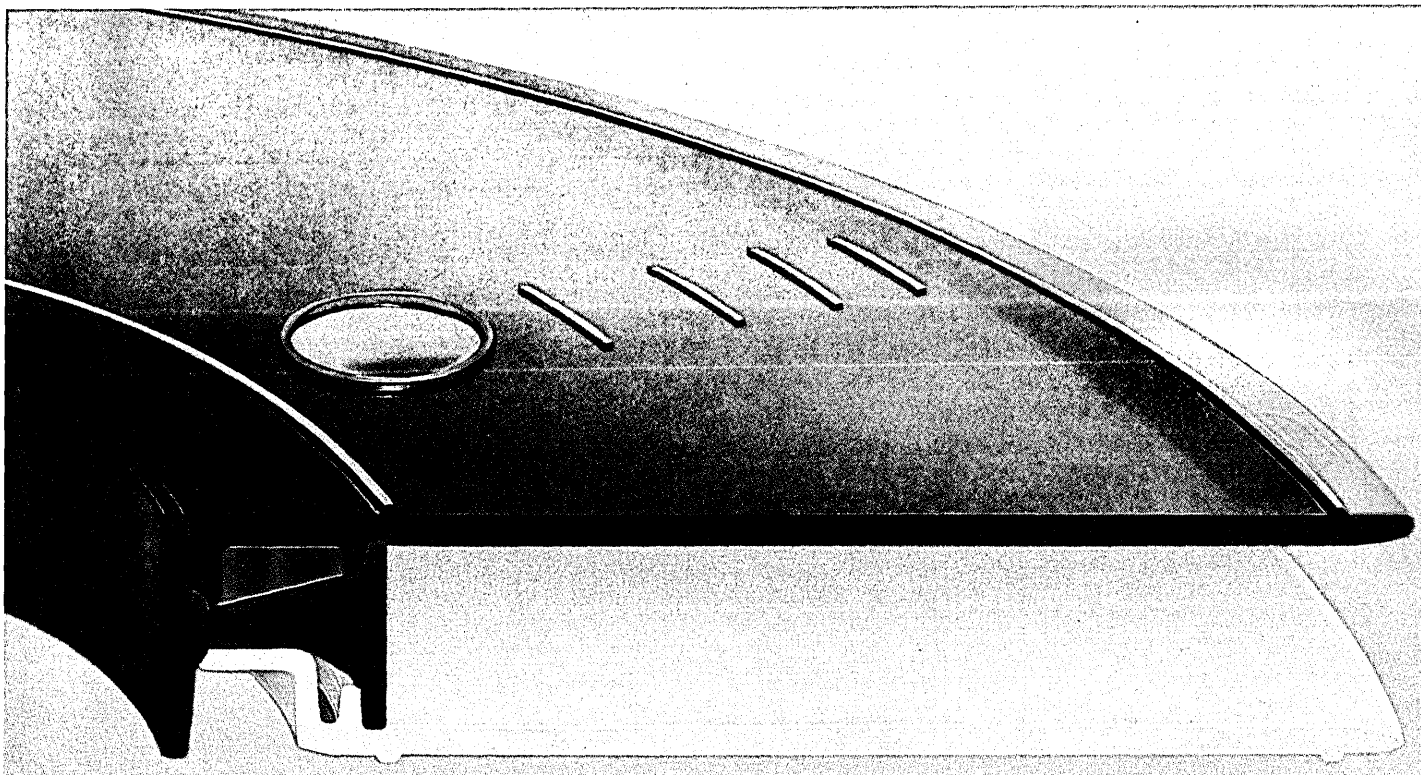
Albuquerque · Atlanta · Baltimore/Washington · Birmingham · Boston · Buffalo · Chattanooga · Chicago · Cincinnati · Clark, N.J. · Cleveland · Dallas · Denver · Detroit · Fresno · Grand Rapids · Hartford · Houston · Indianapolis · Kansas City · Las Vegas · Los Angeles · Lubbock · Madison · Memphis · Miami · Milwaukee · Minneapolis/St. Paul · Nashville · New Orleans · New York · Orange County, CA · Philadelphia · Phoenix/Tucson · Pittsburgh · Portland · Richmond · Sacramento · Salt Lake City · San Antonio · San Diego · San Francisco · Seattle/Tacoma · St. Louis · Syracuse
Basic/Four Systems are also marketed in more than 30 foreign countries.



Introducing the reel shape for things to come.

Memorex SuperReel.™ A new approach to computer tape reels. The approach that's right for tape drives here now, and for the new generations to come.

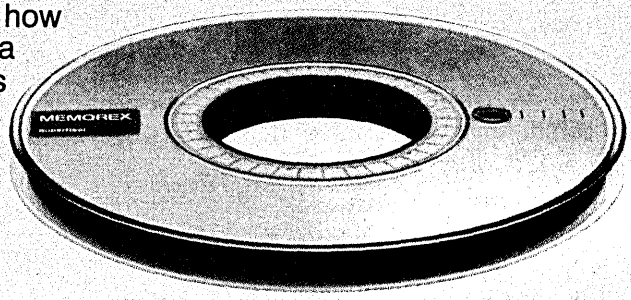
SuperReel gives you a uniquely-shaped I-Beam hub, making it 90% stronger than conventional reels, giving SuperReel the strength to withstand the higher tensions of both your current and future drives. SuperReel also has a specially-shaped tape wind surface, to prevent edge damage during rewinds. And all SuperReel components are ultrasonically welded—no glues or solvents—for improved strength, product uniformity, and lasting performance.

SuperReel is the only reel specifically designed to meet the demands of advanced drive technology. The one reel that surpasses all published specifications for high-performance drives. The one reel that performed reliably in stringent testing conditions at 15 ounces of tension and speeds up to 220 ips. The one reel with no flange expansion or contraction under stress conditions. The one reel balanced to prevent hub-to-drive fit problems.

Memorex SuperReel. A better reel, to give you better results. Better winding. Positive autoload functioning. More accurate data transfer. Greater reliability. On the drives you're using now, and the new generations of drives to come.

Memorex SuperReel. The new shape that'll put your data processing in great shape.

Ask your Memorex representative to explain how SuperReel can dramatically reduce your data processing costs. Locations in principal cities worldwide. Or contact us at 1200 Memorex Drive, MS-0064, Santa Clara, CA 95052. Phone 408-987-1043.



MEMOREXCELLENCE

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When you make your next investment in terminals...

Get something to show for it.

The new Tektronix 4020 Series may be your first long-term terminal investment. It's a series of refresh terminals designed to fit your needs today... and your growth picture tomorrow.

For example: The 4025 terminal expands from smart alphanumerics...to forms ruling...all the way to graphics. You start with basics like expandable memory. Familiar typewriter keyboard with complete, easy editing. Scrolling. Easy-on-the-eyes green display with variable brightness.

Now or later, add forms ruling. You can construct separate on-screen workspace and monitor areas that scroll independently. You can recall complex forms with a single key.

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Information Display Group
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The Netherlands

OEM information available

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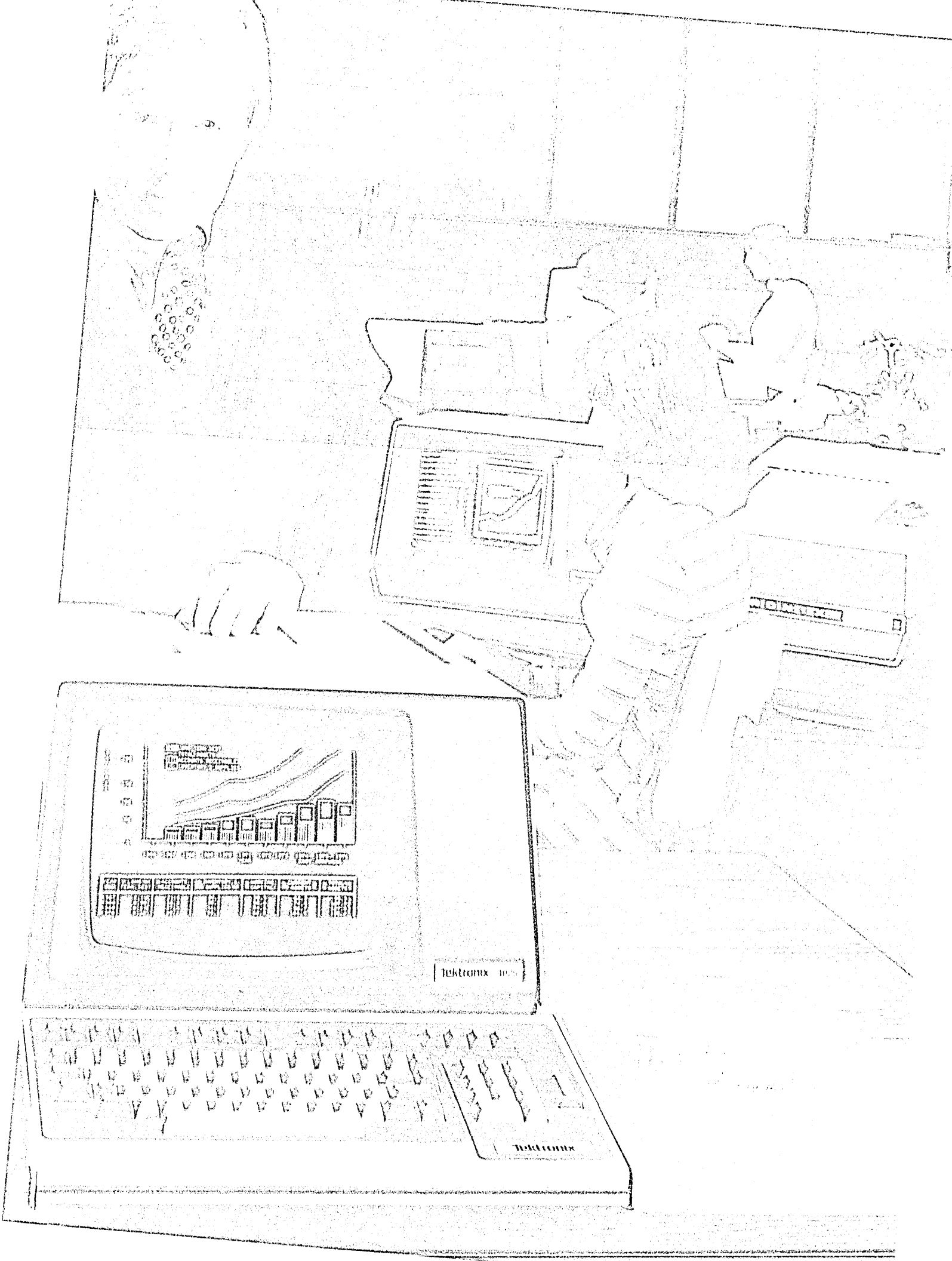
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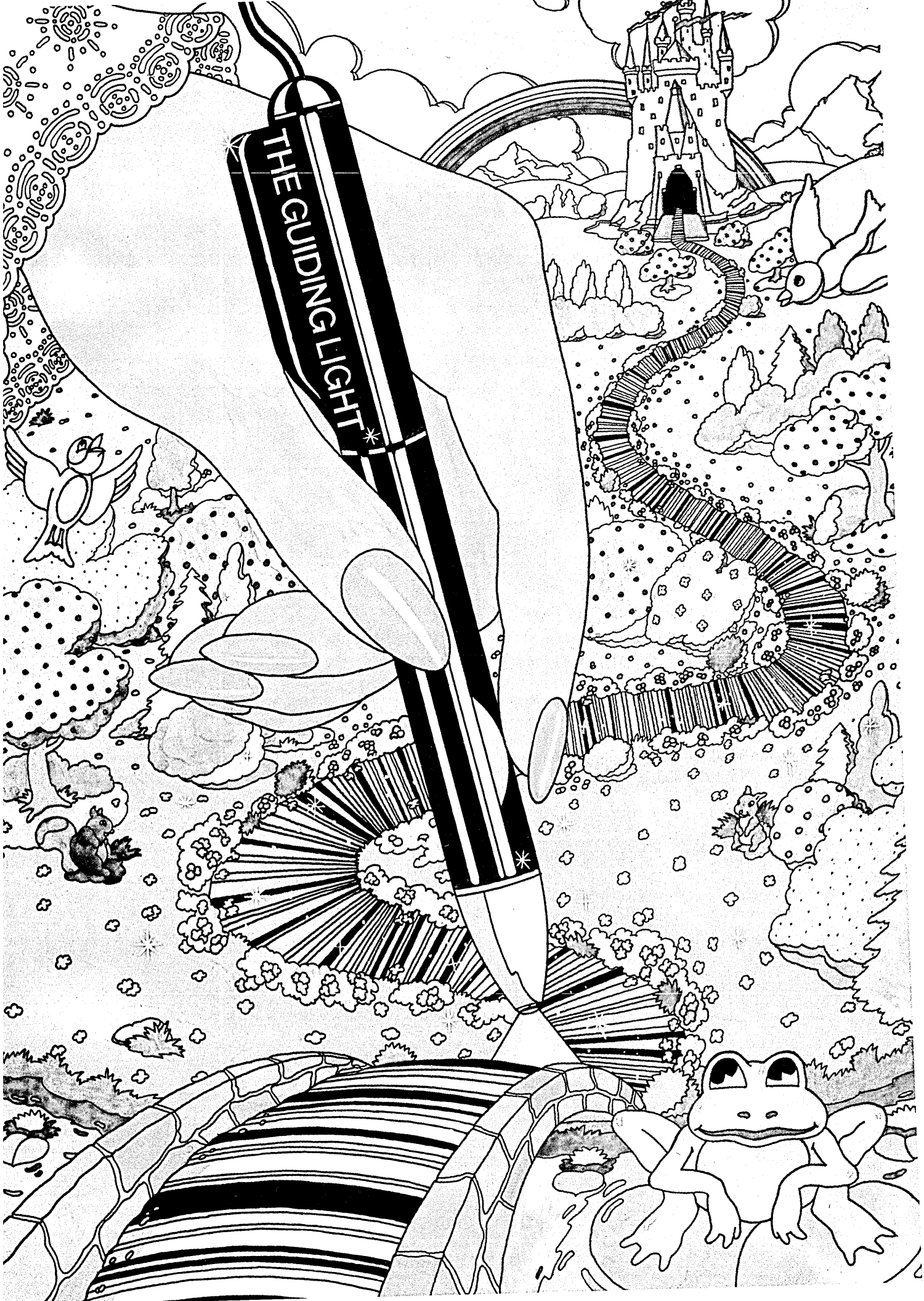
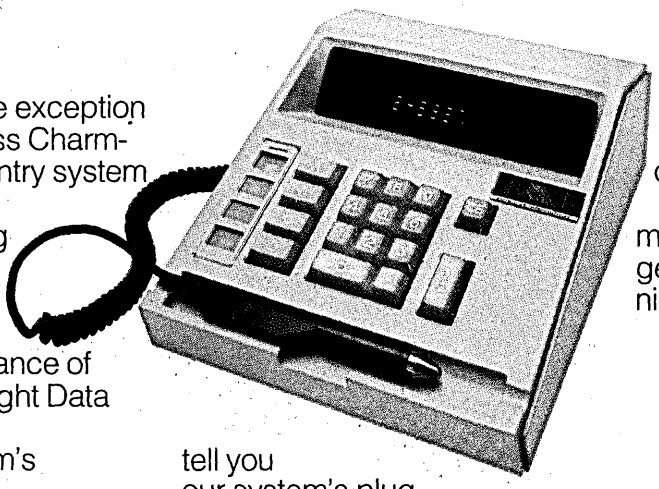

THE GUIDING LIGHT

And then, with a wave of her magic wand, the wicked evils of keypunching disappeared forever.



With the possible exception of Prince or Princess Charming, a better data entry system has been the most frequently recurring dream since key punching came on the scene.

With the appearance of the new Guiding Light Data Entry System by Ames, the dream's come true.

You can hardly call it work, yet waving a wand across bar codes is more efficient than

work ever was. Data just gets picked up and swept off to the computer, leaving no room for error. And it's ten times faster than keypunching.

Happier day still when we tell you our system's plug compatible with most computers. The Guiding Light can read most code formats, including, AMES CODE, CODABAR™, UPC versions A, E, and Extended Distribution Code. It also traces out-of-file records, controls quality, production and inventory, posts charges, verifies credit, communicates two-ways, and boasts four function keys and sixteen different tones.

And if you think all that's compatibility, wait till you see what happens when keypunching turns into wandwaving. Then anybody can enter data directly into the computer.

Oh all right, it's not a coachman and six horses. But it'll get you home before midnight, pumpkin.

Ames Information Systems
12 Park Street, Somerville, Mass. 02143
(617) 776-1142

Please send me information on Ames Guiding Light System.

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Firm _____

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5 good reasons why IDMS should be your database system

People usually buy IDMS because it is a versatile Codasyl-based system that has extreme power and efficiency yet requires little overhead.

But the reasons they are so overwhelmingly satisfied with the system are because Cullinane Corporation cares about the users. For example, on-site support (if you really need us we'll hop a plane and be on site fast), genuine ease of use and installation plus outstanding documentation and first class training, and expert review of database design. These are the reasons our users feel they made an excellent decision. As a result they have helped their organizations immensely and in many cases themselves, too.

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CIRCLE 46 ON READER CARD

Editor's Readout

John L. Kirkley, Editor

Our 1978 Wish List

About this time last year we published our 1977 wish list, a collection of computer industry vexations that we hoped would be rectified by the time 1978 rolled around. Alas, none of our wishes came true.

The IBM antitrust trial still slogs along. Although we're a little closer to an I/O channel interface standard we still don't have one. And for a time we thought the Bell bill had actually died, but, like the Andromeda strain, it has mutated and returned to plague us in yet another form.

Not a particularly good year for wishes, 1977; but for the computer industry, it was great. Both users and vendors benefited: price/performance ratios plummeted, shipment volumes and revenues were up, and word processing, personal computing, and distributed processing began to take off.

And what about 1978? In this issue seer Ted Withington goes into his annual prognosticative trance and predicts good news for the users, a touch of profit squeezing for the vendors, and overall continued growth and progress.

So, buoyed by Withington's predictions, and undaunted by last year's batting record, we're updating our wish list and trying again.

This is the year we'd like to see certain confusions cleared away. Heading the list is the computers and communications controversy. We need some rules—rules that are derived from a coherent national policy addressing the control and dissemination of information. We need to define what a common carrier can and cannot do, a definition that allows AT&T to compete in the unregulated data communications marketplace through arm's-length subsidiaries and at the same time provide transmission capabilities on a regulated basis. And we need to settle the interconnect furor in favor of stimulating competition, and sweep aside obstructive ploys like the primary instrument concept.

Who should make these rules? It must be Congress, muddled as it is, not commission bureaucrats, political committees, or powerful lobbyists.

In a more cynical vein, a friend of ours suggested that we might wish for the greatest boon our government could grant our industry: an extended period of benign neglect. Well, at least we can hope that proposed legislation will be drafted with an eye toward helping, not hindering, industry as it goes about its business both here and abroad.

The courts need to clear up another muddle. In IBM vs. Telex, IBM was branded a monopoly by the lower court and exonorated by the circuit court; in IBM vs. Greyhound the exact opposite happened. Now that's confusing.

While we're on the subject of IBM, it's probably too much to hope that the gray giant will be a bit more candid about its plans for the 303X line. For example, can we expect multiprocessors, attached processors . . . and what's the planned life of the system? Such candor not only would be startling, it would help users do some confident long range planning. They have too often been burned by a sudden technological leap or an unexpected price/performance slash.

A modicum of candor would also help at the booming low end of our industry where the minis and micros are finding a host of new applications. Too often potential first-time users are subjected to a sales pitch worthy only of a carnival barker. Shabby sales tactics have no place in our industry.

We'd like to see an actual, honest-to-goodness, distributed data base up and running so we can all learn how its done, how its synchronized and managed.

We wish for software that's easier to use, for truly fast access secondary storage, for workable measures of programmer productivity, and for a good definition of distributed processing (or *any* definition of distributed processing).

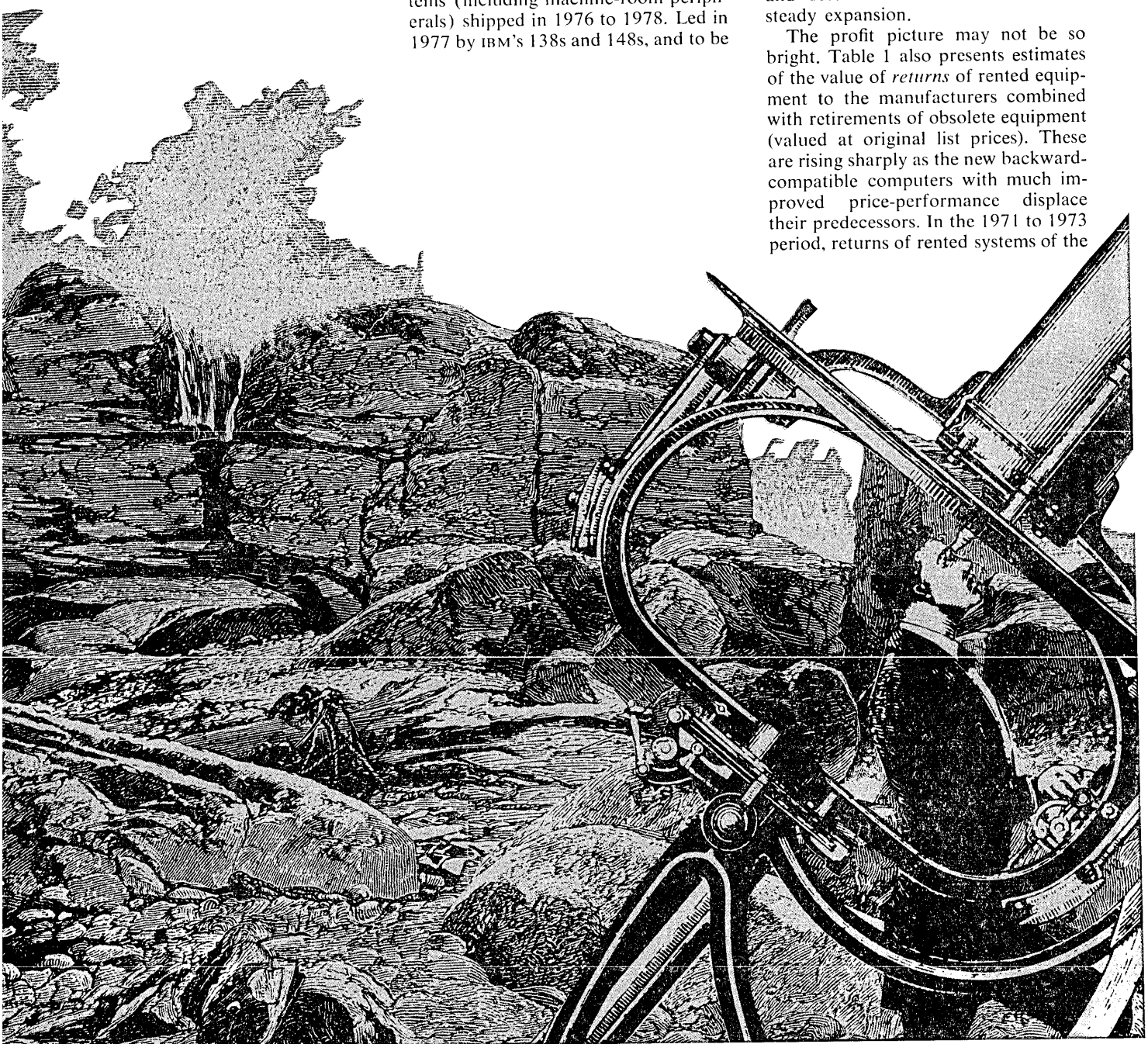
There's more, lots more. But space demands that we stop here and simply end our list with the wish that all of our readers everywhere have a happy and prosperous new year. ❋

The DP Industry

Shipments will be up. Profits may not. Good news for software houses, systems dealers, and some service firms. And in the courts, only confusion.

1977 WAS A GREAT YEAR; WILL 1978 TOP IT? It seems certain at least that shipment volumes and revenues will be higher in about every dp product category, particularly late-model computers. Table 1 presents estimates of the value of general purpose computer systems (including machine-room peripherals) shipped in 1976 to 1978. Led in 1977 by IBM's 138s and 148s, and to be led in 1978 by the 303Xs, the value of shipments is increasing impressively. Most of IBM's main competitors will also be shipping late models in increased volumes. Plug-compatible equipment, minicomputers, and terminals should also all be up, and services and software should continue their steady expansion.

The profit picture may not be so bright. Table 1 also presents estimates of the value of *returns* of rented equipment to the manufacturers combined with retirements of obsolete equipment (valued at original list prices). These are rising sharply as the new backward-compatible computers with much improved price-performance displace their predecessors. In the 1971 to 1973 period, returns of rented systems of the



Outlook for 1978

by Frederic G. Withington, Contributing Editor

360 generation offset about two-thirds of the value of new shipments. Much less of the installed base is on rent now so the return wave will be smaller, but it may rise to offset half the value of new shipments (particularly considering the value of customer-owned third generation machines that will be put to final rest by the irresistible new models).

Therefore, the net addition to the value of the installed base should actually *decrease* over the three years (Table 1). Revenues from new equipment purchases are not affected by any decrease in the rate of net additions, but rental and service revenues (still critical for the largest suppliers) are directly affected, as is the potential for future peripheral equipment additions.

The general wave of price reductions announced in 1977 will have a more direct effect on profits. Goaded by the plug-compatible mainframe vendors, IBM established a new price-performance standard for large computers with its price cuts and 303X models. (IBM may not be through: the 138 and 148 have not been significantly cut, and the effective price of 303X memory suggests room for future cuts. If the PCM mainframers continue their inroads, the price reductions may continue.)

The PCM mainframers have had to respond. The competitive system suppliers (Burroughs, Honeywell, Univac, NCR, Control Data) also have had to respond, though their customer bases are protected by software lock-ins that give them time and room to maneuver.

Not content with establishing a new price-performance standard in computer systems, IBM has also reduced prices on its main lines of terminals, with corresponding competitive effects.

In the minicomputer world the situation is similar, with Digital Equipment reducing prices for the heart of its product line and challenging competitors to respond.

Spokesmen for many of the manufacturers have observed that manufacturing costs have been declining

Value of General Purpose Computer Systems Shipped to U.S. Customers by U.S. Vendors ($ billions)

	1976	1977	1978
Value at list purchase price	$7.7	$8.5	$9 - $10
Returns and Retirements	$1.8	$2.6	$4.5 - $5.5
Net Addition to Installed Base	$5.9	$5.8	$4.5 - $5.5

Table 1.

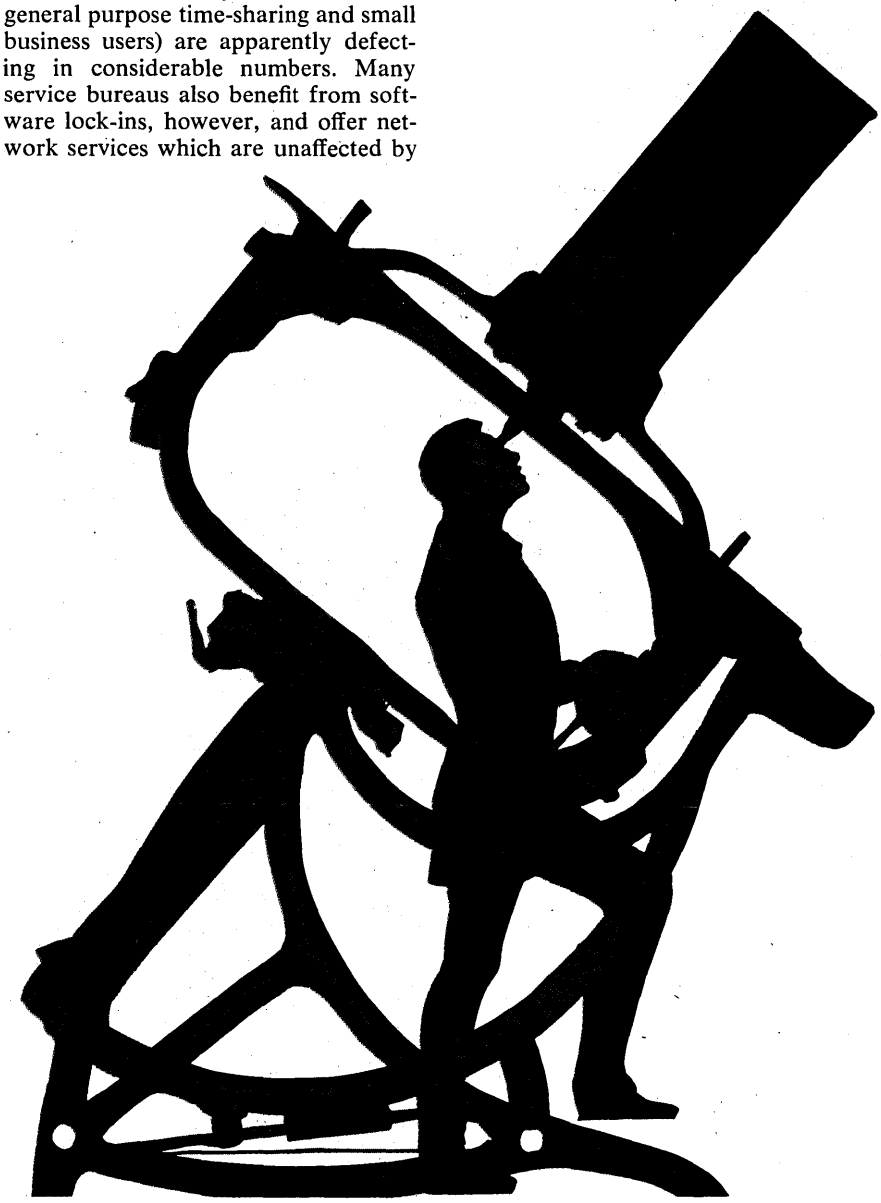
sharply, offsetting the effects of the price cuts. Manufacturing costs are indeed down, but they account for no more than one-fifth to one-third of the products' total costs. The remainder (marketing, software development, customer support, overhead) are primarily people costs, and these have been rising because of inflation and also because the industry's expansion has increased the demand for experienced people. In compensation, most companies have been moving further toward unbundling of software and services, and have been raising prices in such unbundled areas as contract maintenance. Therefore, the user's bottom line cost will rarely reflect the entire improvement in hardware price-performance.

Service bureaus should feel the same pressure, but to a lesser degree. Their customers are being offered very attractive in-house systems at all price levels, and those most easily reached (such as general purpose time-sharing and small business users) are apparently defecting in considerable numbers. Many service bureaus also benefit from software lock-ins, however, and offer network services which are unaffected by improved equipment price-performance. And of course the service bureaus will themselves eventually benefit from the virtues of the new equipment.

It's an ill wind that blows no one some good, and in this instance software houses and system houses may benefit a great deal. Their market improves as the system manufacturers unbundle. Also, the new, more attractive equipment is causing the overall market to expand in three main areas: new small users, new applications in existing user organizations, and conversions of old applications. In all three areas the visible software cost to the user tends to be high, and users are perhaps more willing than ever before to consider credible packages as substitutes for in-house programming.

These remarks apply primarily to the United States and Canada. They also apply in varying degrees in other parts of the world, but national and regional situations affect the picture greatly. In general, user organizations in most foreign countries are not blessed with the financial means to acquire new products as quickly as those in the U.S., and many are more conservative. Also, foreign exchange and import constraints are often severe. As a result, shipments of the new products may be expected to grow more slowly abroad. This may mean that foreign profits of U.S. companies will not face the same pressures, but I wouldn't bet on it. Local inflation rates, fluctuating currencies, and nationalistic economic policies will all take their toll.

Unquestionably bright, however, is the competitive picture of the U.S. dp industry relative to foreign companies. The U.S. lead in software is continuing (even growing), and the new price-performance levels will be harder for most foreign companies to match than for most U.S. companies. The Japanese group of companies may prove an exception because of Japan's impressive national effort to overtake the U.S. in semiconductor technology, but 1978 will probably be too soon to know for sure.



Industry trends

Developments in IBM's 303X line will be the most important industry events in 1978. The timing and quantity of shipments, the actual power and reliability of the machines, and new announcements within the product line will dominate the news. My crystal ball says multiprocessors for the 303Xs are likely to be announced in 1978, and some kind of memory enhancement. A standalone front-end processor is also possible. A file or back-end processor, sure to come some day, may be later.

Plug-compatible mainframe activity will accelerate in 1978. The existing vendors (Amdahl, Itel, and Control Data) will be able to benefit from IBM's long delivery times for a while yet, and they can be expected to make more counter-countermoves on the price-performance front. Probably other plug-compatible mainframe offerings will appear, too.

IBM's late-model computers are not the only potential target: other manufacturers' lines may be attacked, and large installed bases of obsolete equipment present attractive opportunities. Telefile has stated an intent to offer successor computers for the Xerox Sigma line. The IBM 360s, Honeywell 2000s, and GE 400s are other examples of potential targets. Plug-compatible mainframe competition may prove particularly attractive to Japanese firms with excellent electronics capability but without large customer bases or superior software; Fujitsu and Hitachi are already well into plug-compatible activities.

All this is not to say that plug-compatible mainframe competitors neces-

sarily have an unclouded future. The system manufacturers call the tunes to which they must dance, and in the end may run them off the dance floor. In any case, the effects of increasing customer software lock-ins will bring permanent structural changes to the industry of which plug-compatible mainframes are only one example.

We will hear more about Satellite Business Systems in 1978. We may or may not learn about its initial installations within IBM, but we will probably learn some of the results of Project Prelude (a series of trials of exotic services, including teleconferencing and wideband computer and facsimile links, being conducted with three large users: Montgomery Ward's, Rockwell International, and Texaco). The pattern of SBS offerings will soon become clearer, as will the likelihood of IBM offering SBS-related products.

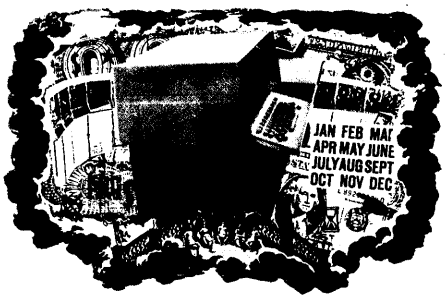
The trend to digital processing of text, images, and voices will also be evident in the continued evolution of word processing systems. The standalone systems are not likely to change much in 1978; but the slow evolution of the market toward a second generation of more interactive and intelligent devices will continue. More novelty is likely to appear in experiments with communicating word processors used for interoffice mail; interest in this area is increasing. A substantial push to the market is likely to be provided by manufacturers of large computer systems including IBM and Honeywell with MULTICS. They see no reason why interoffice mail can't be handled by existing terminal networks connected to a central large computer; the equipment and systems programs are already in place in many user shops. Perhaps in 1978 computer networks and word processors will begin to meet for the first time in a significant way.

There is no lack of long-range opportunity.

Important support to the image and text trend will be provided by the rapid evolution of nonimpact printers. Novel products appeared in 1977 as predicted (the Xerox 9700 and the Applicon color plotter); many more will be coming. The market will be limited only by customers' willingness to design applications and write software; some manufacturers would give a lot to know what you users are eventually going to do with nonimpact printers!

And industry litigation

1978 will be a vintage year for litigation. The Justice Dept. should complete presenting its case against IBM (it may have done so by the time this appears). IBM may then move for dismissal and the court will respond; the documents should be interesting. Then IBM will *start* presenting its defense (assuming the trial continues).



Interesting activities will also take place in the Greyhound case and those involving the so-called "West Coast litigants": Hudson General, Transamerica, Memorex, and Forro Precision. All these are within the jurisdiction of the Ninth Circuit Court of Appeals, which recently reversed a lower court's dismissal of the Greyhound case against IBM. The Appeals Court went unusually far in its opinion, implying that a jury would have found IBM guilty even though no defense had been presented. (One of the judges dissented from this implication.)

The situation is exactly the reverse of the Telex case which covered almost the identical subjects. In that case the trial judge found against IBM and the Appeals Court (Second Circuit) reversed *him*. Is anyone besides me confused? At any rate, the West Coast plaintiffs must be greatly encouraged and will be pressing their cases vigorously in 1978, while IBM may be more nearly ready to consider settlements.

Other interesting trends in 1978 will be the continued evolution of personal and hobby computing, and probably a resurgence of micrographics in novel forms to support increased text processing. Though these will continue to form relatively small parts of the industry, they will merit special attention because of their possible implications for larger markets.

Applications

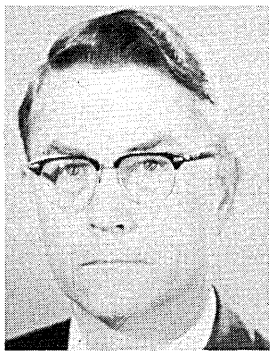
Across the board growth in applications of all sorts is likely for 1978, but a few do seem to stand out.

The manufacturing industry, for one, has for many years been the largest single consumer of computers, but most of its dollars have gone into support applications (such as inventory control, order entry, finance) rather than into applications directly involving the manufacturing process. Recently, however, control applications have been growing sharply, with online microprocessors and minicomputers proliferating in manufacturing plants of all kinds. At the same time the use of interactive graphics in engineering design has been increasing, and the support applications have been evolving in the direction of data bases and networks.

The possibility of tying all these together seems reasonable to increasing numbers of users. In response, vendors of many kinds of data processing products are concentrating increasingly on the manufacturing industry. During the next few years the preeminent market position of the manufacturing industry is likely to increase as the full potential of manufacturing applications is finally realized.

At the same time other markets continue to expand. The retail and banking industries are not being revolutionized overnight as some early forecasters of electronic funds transfer predicted, but growth of in-store computers and remote bank terminals is nevertheless rapid. The regulatory climate seems to be increasingly favorable to growth. Revolution may in fact take place, though over a long time.

Most other application areas will also be growing at a reasonably healthy rate in 1978. The improved price-performance levels that will squeeze some vendors are good news to users, who are responding with unprecedented volumes of orders (and returning a large quantity of older equipment, further squeezing some vendors). But there is no reason to weep for the dp industry. As long as the nearly universal adoption of network and data base systems continues at its slow but colossal pace, and as long as new applications and media (voice, text, and image) continue to appear, there is no lack of long-range profit opportunity. ❋



Mr. Withington has directed Arthur D. Little, Inc.'s computer industry analysis activities for 14 years, while serving as a consultant to more than 100 organizations. He has been one of Datamation's contributing editors for eight years, and is currently a visiting professor at the Harvard Business School.

Among his publications are four books, the latest of which appears this month: "The Environment for Systems Programs," part of the IBM-sponsored Systems Programming Series published by Addison-Wesley.

1978 DP Budgets

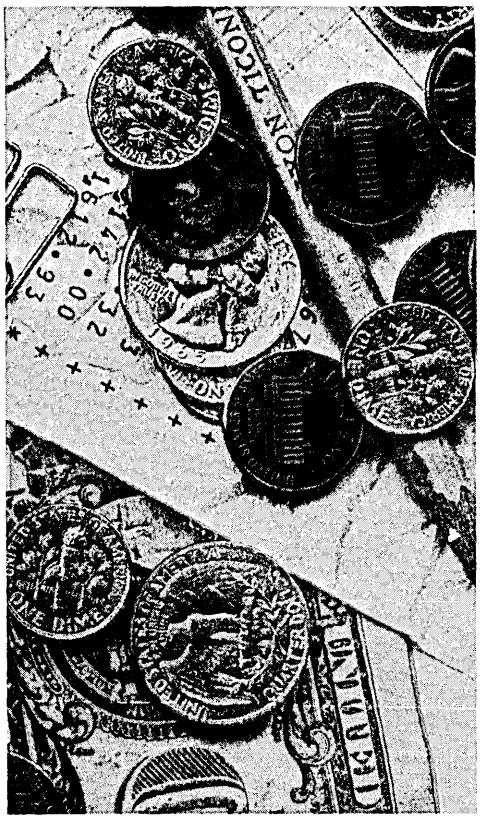
by Michael Cashman, Associate Editor

Lots of money flowing for everything except time-sharing and paper. We'd infer that time-sharing and paper are dying, but everyone knows that nothing ever completely dies in this industry.

If there's a big bad recession lurking out there in 1978, somebody better get to the dp budget authors fast. A survey of hundreds of dp installations across the country shows that dp chiefs are getting the go-ahead to bring in lots of additional hardware during the coming year, hardware to support new applications and to ease the growing pains of applications already in place. The *median* increase in hardware spending over 1977 among our respondents was in the neighborhood of 15%. The money seems to be flowing, no doubt caused by pent-up demand for applications shelved during the earlier (read shakier) years of the '70s.

There seems to be more money now for things like uninterruptible power systems—something considered a low priority item until recently. Fully three times as many shops will install UPS systems in the coming year as did in 1977, and several companies are spending money on this item in both fiscal years. Additionally, eight times as many companies plan to spend more money on training during fiscal '78 than fiscal '77. Most of the rest will spend at least as much as they did in 1977.

One place where fewer dollars will be shared, however, is in outside time-sharing services. There is unmistakable evidence that companies are busy *right now* budgeting money for additional in-house equipment to get away from the outside time-sharing service umbilical.



The number of companies allocating more money for conference attendance and travel outnumbered others by two to one. And even more surprising, those companies planning to spend more money in this area show an average increase of a whopping 55%! Clearly, most users think that traveling around and finding out what others are doing is well worth the effort—and the expense—and apparently upper management has been convinced of it as well.

Many companies are placing money in the conversion/consultant coffers, too, indicating that an upgrade or conversion is in the works for the coming year. This certainly makes sense: the attractive price/performance curves recently announced by most manufacturers make switching to newer machines with vastly increased memory sizes (and possibly more reliable technology) irresistible.

Possibly the greatest increase is in personnel costs. The personnel cost is always a large component of the total dp budget and a 10% adjustment here (not that uncommon) can sway budget percentages wildly. Yes, it looks like there's a movement underway to keep the dp departments ahead of the subsiding inflation rate—at least for now.

A surprising number of users seemed to pencil in a straight 5% to 8% greater allowance for media (excluding magnetic media). We're not sure just what that means. That might be just about the anticipated media price increase for the coming year over the past one, but if that's so, it doesn't sound like more paper will be used in the shop this year—which seems like heresy to suggest. Maybe users are finally breaking the ties that bind them to paper usage as they move into terminal/distributed processing.

Oddly enough, word processing wasn't mentioned in as many questionnaires as it was last year. We know

that particular movement isn't subsiding: this may just be a case of budget determinations moving this money out of the dp budget and more into administrative budgets.

Mustn't forget terminals and communications gear. Yes, again: lots of dollars. Everybody knows distributed processing is catching on, and it shows up in the budget.

Many things show up in this year's budget data. Not apparent, on the other hand, is how the budget data showed up.

Generating non-random numbers

Frequently, one dp manager will share budget data with another, but this is difficult for them both since neither knows if the other is counting the same line items, amortizing purchased hardware in the same manner, etc. DATAMATION is fortunate to be able to skip some of those "apples and oranges" problems, however. The dp budget data used here is gathered in the same form from installations across the country through the agency of our Computer Executive User Panel, a group of several hundred data processing managers who have agreed to help in such fact-finding operations.

That isn't to say that the job of comparing budgets becomes easy. The managers are asked to spend a good deal of time translating their budgets into our form. We, in turn, spend a good deal of time compiling the figures. Stray, unexplained values cause some forms to be put aside. So does missing data. Data for shops going through massive conversions is also excluded from the number crunching. Every reasonable precaution is taken to ensure that the resulting information represents stable sites which process data as a service for the firms which contain them. Sites on-line to larger computer installations are not included, nor are service bureaus, nor installations where the bulk of the work is purchased through service bureaus.

And once the batch of data has been reduced to those budgets for stable, conventional shops, then the real work begins. The easy way to do it would be to add up all the dollar figures for "data entry," for example, and divide by the number of forms present. We don't do it that way. The hard way to do it would be to figure each budget line item as a percentage of total spending, then average the percentages. That's the tack we take.

The reason for doing it the hard way is to keep the largest spenders in a batch from overpowering the smaller

1978 SPENDING FOR HARDWARE & MAINTENANCE *(Installation sizes determined by yearly spending on dp hardware & maintenance)*

	to $25K/year (9 sites)	to $100K/year (29 sites)	to $250K/year (26 sites)	to $500K/year (9 sites)	to $1M/year (9 sites)	Over $1M/year (8 sites)
PERSONNEL EXPENSES						
Salaries & fringe benefits	61.8%	52.6%	46.3%	47.6%	46.4%	44.2%
Training	1.0%	0.4%	0.8%	1.0%	0.4%	0.7%
Conferences & travel	0.6%	0.6%	0.5%	0.3%	0.8%	0.4%
Other personnel expenses	0.3%	0.1%	0.1%	0.1%	0.5%	—
HARDWARE & MAINTENANCE	21.6%	32.9%	41.2%	37.9%	39.5%	37.7%
SUPPLIES & ACCESSORIES						
Supplies (forms, cards, etc.)	10.4%	7.0%	4.9%	5.1%	4.1%	5.3%
Magnetic media	0.1%	0.5%	0.4%	0.4%	0.6%	0.2%
Furniture & accessories	0.2%	0.1%	0.2%	1.5%	0.1%	0.2%
Physical security systems	—	—	—	—	—	—
UPS and power generators	—	0.1%	—	0.3%	—	0.4%
COMMUNICATIONS LINES						
Data	0.1%	1.7%	1.0%	0.8%	2.7%	6.0%
Voice (if in same budget)	0.2%	0.1%	0.2%	0.6%	0.2%	0.3%
PACKAGED SOFTWARE						
From mainframe vendor	0.3%	1.2%	0.9%	1.3%	0.9%	0.8%
From independent	1.9%	0.9%	0.9%	1.2%	0.6%	1.2%
OUTSIDE SERVICES						
Time-sharing	—	0.3%	0.2%	0.4%	0.2%	0.1%
Batch processing	0.7%	—	0.2%	—	—	—
Remote batch	—	—	—	0.6%	—	0.1%
Microfilm processing	0.3%	0.1%	0.3%	0.4%	0.2%	0.2%
Off-site data entry	—	—	0.1%	0.1%	1.3%	0.1%
Facilities Management	—	—	—	—	—	0.1%
Consultants	0.1%	0.4%	1.1%	0.1%	0.9%	0.1%
Contract programming	0.1%	0.5%	0.4%	0.2%	0.2%	1.8%
Temporary on-site help	0.3%	0.1%	0.3%	0.1%	—	—
MISCELLANEOUS	—	0.4%	—	—	0.4%	0.1%
TOTAL	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

1978 DP BUDGETS BY INSTALLATION SIZE *(Installation sizes determined by yearly spending on dp hardware & maintenance)*

	to $25K/year	to $100K/year (16 sites)	to $250K/year (12 sites)	to $500K/year (6 sites)	to $1M/year (8 sites)	Over $1M/year (6 sites)
CENTRAL SITE						
Data entry		5.9%	6.0%	6.4%	3.4%	1.6%
Computers & memory		46.6%	45.0%	41.6%	47.4%	54.0%
Peripherals		37.8%	30.3%	34.7%	30.0%	21.7%
Communications gear	*hardware*	4.0%	5.0%	2.3%	7.6%	2.3%
Central site terminals	*budget*	2.8%	5.1%	3.7%	2.4%	6.9%
Computer Output Microfilm	*generally*	—	0.5%	0.5%	0.7%	1.0%
Microfilm readers, etc.	*not detailed*	—	0.1%	0.1%	—	—
Auxiliary equipment		1.0%	1.1%	1.3%	1.0%	0.3%
Word Processing		—	0.8%	—	—	0.8%
Other central site hardware		—	0.4%	0.2%	0.5%	0.1%
REMOTE SITES						
Data entry		0.4%	3.9%	0.2%	1.8%	—
Computers & memory		1.5%	0.6%	6.9%	2.5%	0.5%
Peripherals		—	0.6%	—	1.3%	—
Communications gear		—	0.1%	2.1%	0.1%	0.1%
Remote site terminals		—	0.5%	—	1.3%	10.7%
TOTAL		100.0%	100.0%	100.0%	100.0%	100.0%

Preparing a Budget

Due to space considerations, DATAMATION publishes budgets in a compressed form, without showing the thinking that went into them. Here is a list of a few of those things that should be considered when preparing a dp budget.

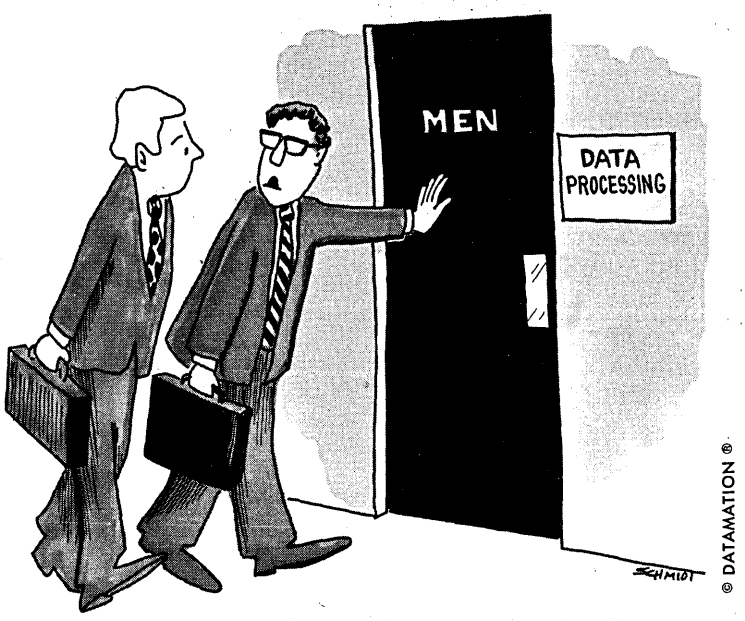
1. A budget is a statement of expected costs necessary to meet a projected workload. No budget should be prepared without a succinct statement of the projected workload and any other assumptions on which the budget is based. If you are anticipating the completion of a contract, a new piece of work, the end of a depreciation period on a piece of purchased equipment, midyear salary adjustments, or whatever, the first couple of pages of your budget should state all this clearly. Write these down before the budget is prepared and then staple them to the budget when it is forwarded to senior management for approval.

2. If you are a senior manager and required to review and approve a dp budget, check the assumptions *before* you look at the numbers. If you sneak a peak at the final total, you'll be less objective in evaluating each assumption and in determining that the list of assumptions is exhaustive.

3. Over the years many computer department managements have tended to collect dissimilar activities under a single budget heading. Some computer shops still lump development and production personnel under a single title, "programmer." The trend is definitely away from such groupings and a serious attempt should be made to budget production and maintenance, development, preliminary systems analysis, and education and training as separate line items. Further, a summary of the hardware budget should prorate your equipment pool into a similar series of budget categories.

The annual preparation and submission of a budget is an opportunity to educate management and lay the groundwork for meaningful discussions leading to the establishment of management policy. If you hide your contributions to SHARE in the programming budget and lump all the travel items together, you fail to exploit that educational opportunity.

4. When actually preparing the budget spread sheet, show any rates or percentages explicitly down in the budget detail. If you assume the cost of paper is going up another 10% or that your wage adjustments will be 4% at the beginning of the year and another 4% at midyear, explicitly show these percentages on your budget worksheet. Then if you wish to make a different set of assumptions and rework your budget, or if you wish to compare "actual" versus "estimated" when discussing a budget overrun, the percentages will be available for all to see and interpret.



"It's a very new installation operating on a very small budget . . ."

5. Unless you are the federal government, your annual purchases of equipment probably don't average out. So you need to give some consideration to the replacement of depreciated equipment. Some controllers like to see depreciation shown explicitly, whereas others prefer a cash budget. Ideally there would be a cash charge exactly equivalent to the depreciation and the controller would invest this money so there would be enough set aside in the depreciation account to replace equipment when it became obsolete.

If you are on a cash budget, also beware of setting rates for services based on the actual cash outlay because your rates will get so low that you will never be able to afford to retire a piece of obsolete equipment. If you're not careful, you'll soon be running a museum.

6. If you bought a piece of equipment from a vendor that expired, or if your vendor is healthy but has discontinued your product line, you'd better start talking to your management about the costs of conversion. You should establish some programming standards that ease the cost of conversion to a viable vendor or another product line and put some conversion dollars in your budget *now*—so you can start to convert before you are forced to by lack of parts, service, or some catastrophe. Even if the controller doesn't approve your request for conversion dollars the first year you ask for them, at least you will have opened the matter for discussion.

7. Budget time provides a good opportunity to discuss insurance coverage with your controller. Most big companies have a blanket insurance policy that covers office equipment. There are options that cover the costs of moving equipment or processing outside in the case of a catastrophe, and that insure your storage media. Since controllers are not usually skilled in data processing, and since data processing managers are not usually skilled in insurance, the budget provides an opportunity for you to review your insurance coverage and explain to your controller the risks that should be covered.

8. Some firms have found it desirable to prepare an annual report to accompany next year's budget. The annual report would highlight the accomplishments of the current year, provide some statistics on volume, and summarize in one concise form the machine and people resources covered by the budget. The first annual report is a chore to prepare. Subsequent annual reports are a breeze since you have 12 months to collect the proper data. A senior executive seeing a report on the current year, accompanied by a budget for the forthcoming year, is delighted because it gives him an opportunity to meaningfully discuss what was done with last year's money and why you deserve more for next year.

—Robert L. Patrick

ones. Now the figures presented are as valid for representing the installations at the low end of the ranges as for those at the high end. It's more work, but it's worth it.

In the end, the figures must be read with the same degree of care applied in compiling them. It is definitely not true that an average of 5.0% spending for some item represents a range from 4.0% to 6.0%; more likely the true range is from zero to 10%. Yes, we could supply the mean deviations from the averages, but these are meaningless for small samples too. Our goal is not to satisfy the statisticians, but to learn what a typical budget looks like for each machine size category.

The results of our labors appear in the tables. Notice especially that the groupings are decided by total yearly expenditure for hardware and maintenance—not monthly hardware expenditures, not total yearly budget. Those spending under $25,000/year on hardware are likely to be minicomputer sites. The next category, up to $100,000/year, most often has a maxi-minicomputer—or whatever they are now called—but may have an IBM System/3 or another small business computer. The "up to $250K/year" category generally is large enough for an IBM 370/138, sometimes for a multiple System/3 shop.

By the time one reaches the next category, up to $500K/year, he is in the big time. Since the average hardware percentage for that class of shop is listed as just under 38%, simple arithmetic tells us that an installation could be spending well over $1.3 million and still fit nicely. Computers found here include the IBM 360/50, Univac 1100/20, and HIS 64/20.

Then, although a single IBM 370/158 can more than fill the bill for the "up to $1M year" classification, it is equally likely that multiple smaller machines will be found in dp departments spending that much money.

The top is represented simply as the "over $1M/year" slot. Some of the sites supplying us data spend several times that amount on hardware, as much as ten times that figure for their total budgets.

Finally, in using the data, remember that the bigger sample sizes provide more reliable measures than the smaller ones, and that none of the numbers are firm enough to bet your shop (or job) on. They definitely are, though, a reasonable *benchmark* to judge any budget against. If a site's expenditures are way out of synch with these, there may be very valid reasons for the differences—but the manager ought to know what those reasons are. ❋

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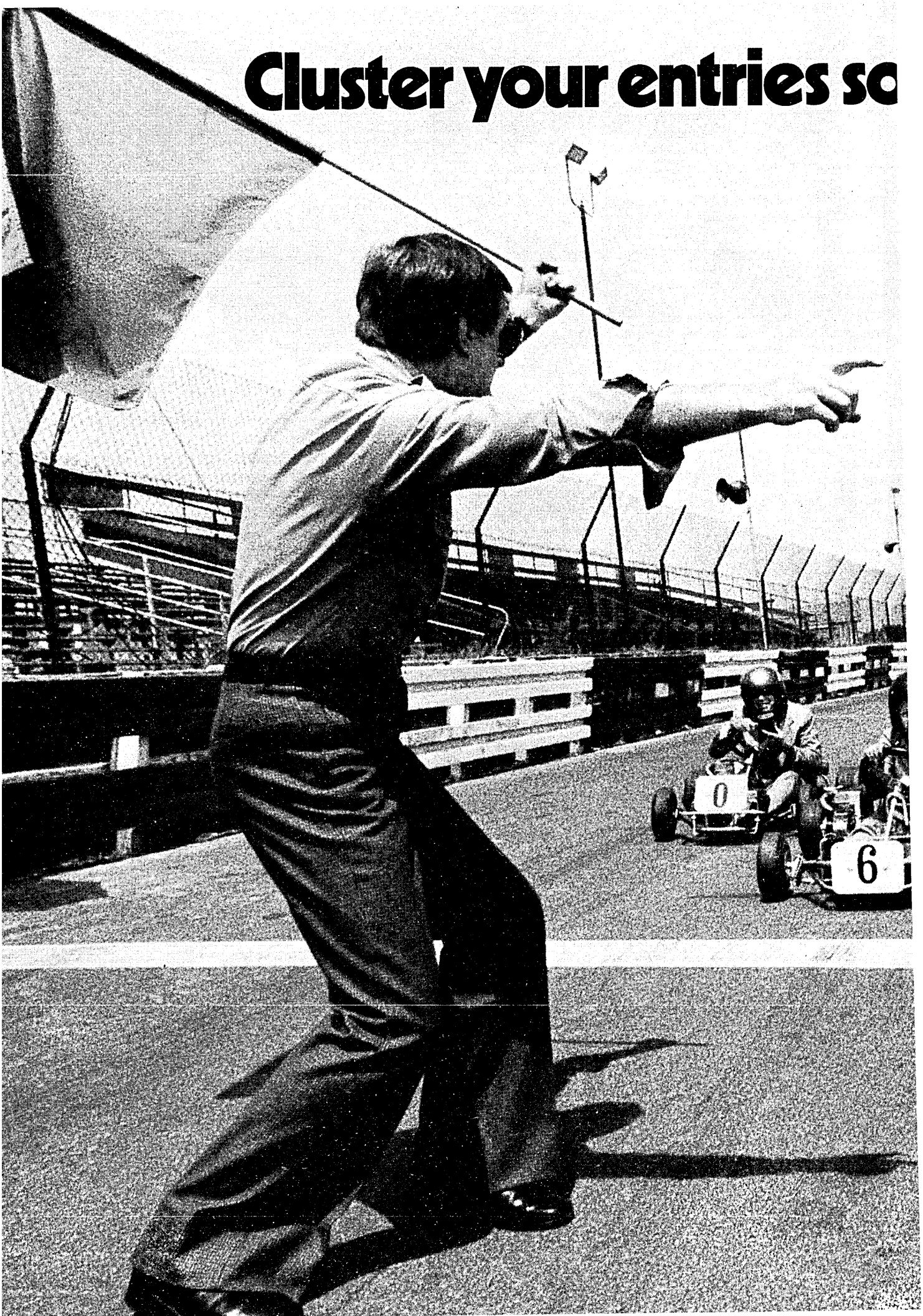

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High Technology Trade with the Communists

by William C. Norris

With the right kind of cooperation between government and industry, the U.S. can benefit greatly from East-West trade and still control the risks.

The gut issue in high technology trade with the Communists is jobs versus military risk. In today's atmosphere, however, attention is focused almost entirely on military risk with little or no apparent consideration given to the new jobs that can flow from increased trade.

Yet the nation's number one problem is unemployment. Not only are more jobs needed, but almost as important, more *skilled* jobs. The unemployment problem will become even more critical as in the next 10 years another 20,000,000 new jobs will be required. This will be the largest increase in any decade in our history; 13,000,000 were created in the last 10 years, for instance.

The main thrust of controls is to shoot down applications, not to make them acceptable.

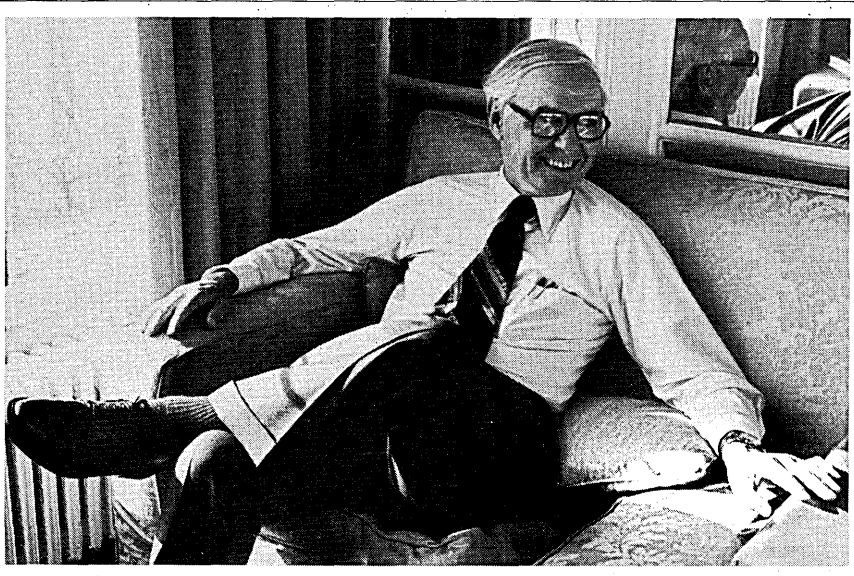
When more jobs are so badly needed, particularly by the minority young, why the apparent indifference to increasing high technology trade with the Communists?

Export controls

One reason is that there are serious deficiencies in the administration of U.S. export controls. High on the list of deficiencies is the lack of means for adequate consideration of factors other than military risk. An actual experience that occurred in a 1976 meeting to review an export case with Dept. of Defense officials will best make this point. During the meeting it was emphasized that jobs should be considered as well as military risk. The chairman of the meeting, a high defense official, tersely responded: "Our responsibility is national security and defense and if you think we are going to give any consideration in our deliberations of defense about jobs, I can tell you that we *ain't*! That is someone else's responsibility!" When asked whose responsibility, he didn't answer.

Another serious deficiency in the administration of export controls is the lack of positive initiative. The main thrust is to shoot down applications as opposed to working with industry to devise ways of making them acceptable. This is in contrast to European and Japanese government procedures that assist industry in every reasonable way.

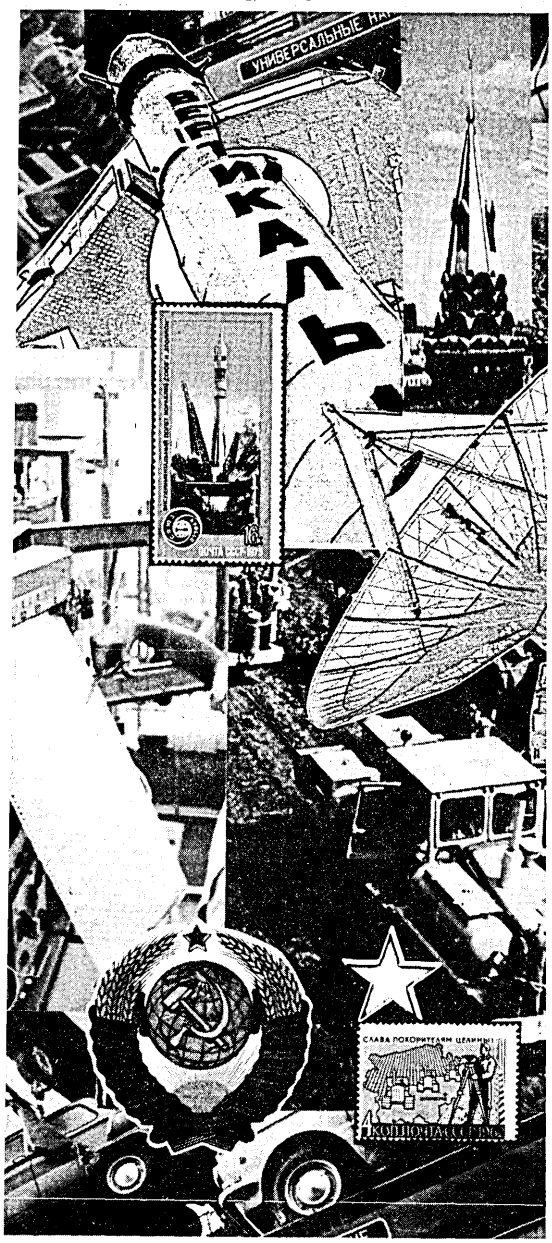
A third weakness is in the methods used to establish guidelines. One cri-



William C. Norris, founder, chairman and chief executive officer of Control Data Corp., in recent years has become known as a vocal innovator and activist on several public issues: East-West trade, the role of technology in solving major social problems, corporate social responsibility, and unemployment. Especially as it foredooms the future of urban minority youth, Mr. Norris regards unemployment as the most serious dilemma that society must deal with over the next decade.

terion is the demonstrated Communist capability. In other words, if the Communists already have it, the U.S. can attempt to sell them the equivalent—whereas to be successful, U.S. industry should be offering what is *not* available. Current policy, therefore, locks U.S. firms into a losing marketing strategy.

Product export guidelines are also



based largely on U.S. intelligence assessments of Communist technology. From first-hand observations of technology in a number of areas, we at Control Data can say that these assessments are in many cases inaccurate, incomplete, and outdated. Further, industry—which is often more realistic in its assessments—has been denied direct participation in establishing guidelines. Compounding the problem of insufficient information, there is also the tendency to restrict what isn't understood.

Obviously these methods produce unnecessarily conservative guidelines which cause the loss of significant export business and, in turn, jobs.

In addition to unnecessary conservatism in guidelines, control procedures are haphazard, cumbersome, time-consuming, and subject to political moods. They are expensive both for industry and government.

Distaste for Communism

Obfuscating the administration of export controls, and, even more important, the formulation of appropriate export control legislation, is the influence of those who are in opposition to virtually any form or degree of East/West trade. There are enough of these persons in government, business, media, and elsewhere to generate inappropriate legislative controls and sidetrack many important positive actions. These people do not understand the technical aspects and are not interested in them. Instead, they often employ scare tactics with arguments based more on emotion than on reason. Frequently they make their case by citing Lenin's prophecy that Western businessmen will sell the Communists the rope with which to hang the West. Or that for a few bucks U.S. business is willing to expose the country to serious risk. And computers are called "electronic brains" to connote a sinister potential.

The influence of these people has been enhanced disproportionately by the media's greater coverage of some of their bizarre positions. One example is that of my company's application for an export license to deliver a 10 year old 7600 computer to the Soviet Union's Hydrometeorological Center. An avalanche of adverse publicity built up while the application was in process. It was triggered by a highly misleading Jack Anderson column that had a $13 million electronic brain turned against us to track U.S. missiles, planes, and submarines, as well as to decode sensitive U.S. intelligence transmissions. Facts were supplied to Anderson both before and after his article appeared: a single 7600 could not be turned against us in a meaningful way to accomplish what he said. We asked that a correction be made. Response zero. Anderson's article also set off speeches in Congress and reprints in the *Congressional Record*.

This kind of emotion preempts thoughtful policy formulation, which would not only take into account the adversary position of the Communist and U.S. societies, but also seek benefits to be derived by the U.S. In other words, it is totally negative.

A more basic reason for the indifference to increasing Communist trade is the lack of perception of the role of technology in the economic process by most of our political leaders and in turn by the general public. More specifically, it is not widely understood that new jobs are derived from the application of technology. Instead, many people associate technology more with productivity improvement, which to them means loss of jobs. Frequently another reaction from just the use of the word "technology" is that people turn off with the attitude that technology is for the longhairs—don't bother me. And, more recently, technology has been thought of by some as a synonym for pollution and dehumanization.

Indifference of business

Another important underlying reason for the lack of impetus in high technology trade is the indifference of business toward unemployment and other major societal problems. For too long business has been preoccupied doing the things that are most profitable and leaving the solutions to most of society's major problems as the responsibility of government. Meanwhile, these problems are growing to disastrous proportions.

> "Technology" has been thought of as a synonym for pollution and dehumanization.

For example, one of the most serious societal problems, closely related to unemployment, is the development of more abundant and less costly sources of energy. Our economy is utterly dependent on cheap and readily available gas and oil for energy. Within 20 to 30 years, world production of these will begin to fall off. Considering that 15 to 20 years are required to get meaningful results from the average new development, there is precious little time available to avoid disaster.

There are many other major societal problems crying for more attention. These include energy conservation, environmental protection, less costly food production, water conservation, revitalization of inner cities, better education, and better health care.

Solutions to this array of major societal problems will in the long run provide millions of jobs which must be viewed as a part of a systematic route to solving the unemployment problem. But timely solutions require massive technological resources, far beyond what the United States or any other single country can marshal. For this reason, and because the problems are global in nature, the answer is cooperation with other countries, including the Soviet Union.

Technological cooperation

The potential for technological cooperation with the Soviet Union is very great. Though efforts thus far have been limited, significant results have been achieved from several U.S./Soviet cooperative research projects. Two important projects in the field of energy are in magneto-hydrodynamics and fusion energy.

Magnetohydrodynamics, which is more often referred to as "MHD," is a process to improve the efficiency of electricity generation. Efficiency increases are expected initially to be in the 20% to 40% range, ultimately reaching more than 50%.

The joint U.S./Soviet MHD R&D program is based on the complementary nature of developments in the two countries. One immediate result was the saving of more than $150 million to the U.S. through the joint use of a Soviet test facility. In addition, the development of MHD is progressing faster and with less risk of technical failure than if the two countries had worked independently.

> Solutions to societal problems require resources beyond what any single country can marshal.

The joint fusion project started in 1974 is based on a breakthrough by Soviet scientists. The information and technology exchange that has been accomplished thus far has been very useful to the U.S. laboratories engaged in fusion work.

In addition to this project in fusion, there is a joint conceptual research and study program being carried out under an agreement signed last July by the Electric Power Research Institute and a Soviet institute.

Beyond the energy field there is great potential for advancing scientific computing which has virtually plateaued in the U.S. due to lack of R&D funds.

In the U.S.S.R., a gap persists between the creation of knowledge, in the form of theory and mathematics, and the application and refinement of that knowledge through computer modeling, data reduction, and intensive calculation. The gap is partly traditional—Soviet research has been theoretical and somewhat isolated from industry and practical application —but, in many cases, it is unavoidable —the U.S.S.R. does not have access to hardware of sufficient power to perform the necessary calculations.

With this background and manpower already available in the U.S.S.R., there could be a resurgence of scientific computing advances through a cooperative U.S./U.S.S.R. effort that would include making larger computers available for Soviet use under appropriate conditions.

These three examples provide a glimpse of the tip of the Soviet iceberg of technology that could be of enormous potential benefit to the U.S. through cooperative efforts. The iceberg has resulted from the Soviet Union having more scientists and engineers at work than any other country. A recent Rand Corp. report cites a steady growth in Soviet attention to basic and applied research, and shows that in 1965, U.S. scientific and technical personnel stood at 498,000, compared to between 599,000 and 682,000 for the Soviets. "No subsequent events have occurred," according to the Rand report, "that would indicate a degradation in the favorable numbers position of the Soviet Union." In 1975, the U.S.S.R. graduated 260,000 engineers and scientists—five times the number graduating that year from U.S. schools.

The broader aspect of the need for more technological cooperation between the U.S. and the Soviet Union is the growing complementary nature of technical efforts in the two countries. Government studies show that in the last 10 years spending for R&D in the U.S. has *de*creased. Whereas the U.S. once did about 50% of the R&D in the world, it is now doing only about 20%. Also, expenditures for R&D have slipped to 2% of Gross National Product from more than 3% in 1965. In the Soviet Union it is 3%. The greatest part of the decrease in U.S. spending is in research aimed at finding new products as opposed to more emphasis in quick payoff development. On the other hand, the Soviet Union is emphasizing research, so there is opportunity for the U.S., through cooperation, to close a serious gap in its program.

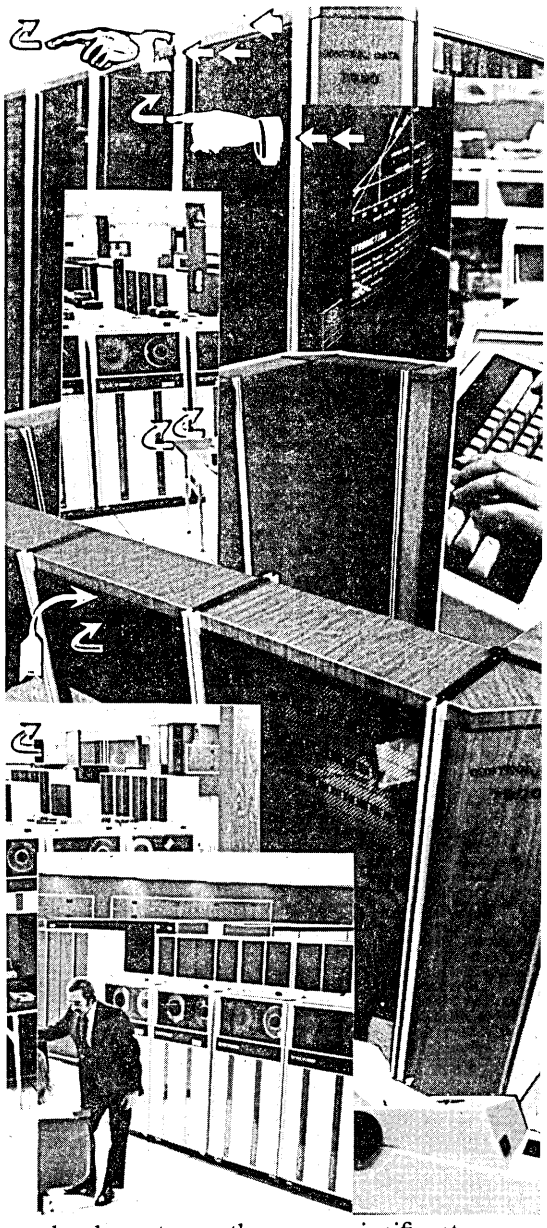
But for a number of reasons the potential of this vast storehouse of Soviet technology is not widely perceived in the United States.

First, most of it is not industrially proven technology. Second, because of Soviet ineffectiveness in moving technology from the laboratory to industry, the quality of the research itself is deemed to be inferior. One reason for the ineffectiveness is a lack of incentive in the Communist system for scientists to sell their research results. Compounding this misperception in the U.S. are the widespread "not invented here" and anti-Communist attitudes that cause any excuse for downgrading Soviet technology to be seized upon and amplified.

Therefore the problems of tapping this vast potential aren't going to be solved until there is a fundamental change in U.S. business objectives that includes a much greater initiative in addressing our major societal problems. Soviet technology isn't particularly needed—nor is it suitable—for doing the things we already do well: manufacturing more cars, more television sets, or more snowmobiles. But it is needed in helping to find alternate sources of energy and timely solutions to other serious problems.

High technology products

Even though technological cooperation offers great benefits to the U.S. in the long term, there are significant benefits to be derived from the sale of high technology products to the Communist Bloc as well.



With more positive initiatives, including moderate relaxation in export control guidelines and close cooperation between business and government, high technology exports to these countries would grow to several $billions per year and create hundreds of thousands of U.S. jobs.

In fact, in the computer industry

alone, it is estimated that the sales of larger computers and peripherals for U.S. companies could in 10 years build to an annual level representing 150,000 jobs.

This is not wishful thinking. Indeed, similar increases have occurred in the past when export controls were relaxed. Let me cite just one of many examples. From the end of World War II through most of the 1960s, the U.S. government prohibited the export of Caterpillar earth-moving equipment to the U.S.S.R. and Eastern Europe. In the latter part of the '60s, export controls over tractors to these countries were relaxed. Immediately thereafter, sales of Caterpillar tractors and other earth-moving equipment to those countries skyrocketed, thereby creating thousands of jobs for Americans.

The message to relax export controls is made more urgent by taking into account that expansion of our work force in the future will occur in smaller increments—because of progress in automation. For example, total employment today in our highly automated semiconductor industry is only 100,000. For the coal mining industry it is about 200,000. But coal mining employment 25 years ago was 400,000. Both industries illustrate that new automated production facilities require ever-decreasing numbers of employees.

In addition to creating jobs, Communist trade would benefit the U.S. balance of payments. High technology products, plus agricultural products, account for the bulk of U.S. exports today. Therefore, it is particularly important at this time, with trade deficits mounting, to exert every reasonable effort to increase exports.

High technology exports can also produce other benefits. I will cite two examples, both involving computers.

If the Soviet Union had access to more powerful computers for oil discovery and recovery, oil production could be increased within that country. Production of easy-to-recover oil is slowing and more efficient processes for recovery from known reservoirs are needed, as well as in discovering and recovering oil in new areas.

One of the major differences between pessimistic and optimistic estimates of world petroleum supplies is Soviet production. Hence, Soviet production is important to the United States. Lack of adequate internal production could turn the Soviet Union into a major competitor for oil in world markets.

The second example is the potential for stimulating progress in many of the 47 joint projects that have been established under the U.S./U.S.S.R. cooperative agreement signed in 1972 and extended for five years in 1977. These projects include basic and applied research problems in earthquake prediction, arctic and subarctic ecological systems, influence of environmental change on climate, large scale ocean/atmosphere interaction, and pollution. Contributions to progress on such far-reaching world problems by the Soviet Union are hindered by lack of adequate large scale computing resources.

Hence it would be in U.S. interests to make larger computers available under appropriate conditions for oil exploration and recovery and for the joint U.S./U.S.S.R. projects.

So much for the benefits from exports. What about the risks? There are two categories: commercial and military.

Commercial risks

Export of technology is really the only area where there are significant commercial risk issues. Clearly there is risk that the sale of current technology abroad could create competition back here at home if the resulting products are imported into the U.S. An example is Japanese products that are based on U.S. know-how and now sold in the U.S. But with technology exchange, that is a two-edged sword.

> With serious and rational efforts by business and government, the risks can be managed.

Other countries with serious unemployment problems are striving to maximize local manufacture. Couple that with the fact that there is virtually no technology today that is exclusive to the U.S. and we readily conclude that if we don't help those countries meet their know-how needs, other countries will. Then we lose three ways. We lose the value of the know-how, we suffer product competition in world markets, and we don't get know-how in return that could be the basis for greater competitive thrust for U.S. industry in those same world markets.

Military risks

The main points in assessing military risk include the following:

1. The Soviet military is well-endowed and has first call on Communist supplies of everything needed.
2. The Soviet Union military, like that of the United States, avoids dependency on foreign supplies and suppliers.
3. Classified U.S. military technology is under complete control.

Military risk assessment, then, boils down to those few industrial technologies where there is significant potential military benefit and where the U.S. has a monopoly. The only practical approach is to make a determination based primarily on what the U.S. gets in return. If we get a significant technology in return, then we have profited more than the other country, because we are much more effective in transforming know-how into products and in marketing them.

There is also risk in *not* furnishing the desired technology and products. Without doubt, U.S. export controls have forced the acceleration of the development of the Communists' computer industry, thus causing economic and military capability to be created at earlier dates and outside of our control.

So the best answer for the United States is cooperation, either through direct exchange of technology, or indirectly through joint projects or jointly owned companies.

Through joint activities it is possible to share permanently in local markets and have an adequate degree of control. Frequently in joint projects or jointly owned companies, it is practicable—even desirable—to retain some of the product component production in the United States. The joint activity can carry on related research and development and this technology can flow back to the United States.

It should also be noted again that joint activities have the advantage that the U.S. partner has a considerable degree of control and, of course, knowledge of what is going on.

For high technology products the U.S. *should* continue to require the maintenance of reasonable visibility to help assure that Soviet usage is limited to agreed-upon purposes. This has been proved feasible in the case of computers, and no diversions have occurred.

Technological balance achieved by cooperation is the answer—not technological protectionism as embodied in the recent Dept. of Defense interim policy on the transfer of technology. That reactionary dictum calls on the Dept. of Commerce to formulate procedures to control critical technology to all destinations, and could even affect a company's relationship with its own subsidiaries abroad, including those in friendly countries.

Ultimately, technology is our greatest national resource and as such merits the most thoughtful response possible by both business and government, particularly in these times of growing military and economic competition in the world. Consequently, a policy should not be established in the narrow confines of military strategy risks to

the U.S. It should be clear, consistent, and based on an analysis of the total risks versus the total benefits to be gained for the U.S. on a worldwide basis.

Summary

There are many other problems in high technology trade with the Communists that are important, but I am convinced that there are reasonably straightforward solutions to all of them when viewed in the context of the benefits to the U.S. in increasing high technology trade.

A national policy is needed that fosters the export of virtually any industrial product or technology under appropriate conditions. The thrust must be expansion and not constriction. The burden of administration is primarily the determination of minimum appropriate conditions.

For products, appropriate conditions are that they will be used for industrial purposes with reasonable visibility on usage during the life of the product. Only those products or services embodying the most highly advanced technology would be scrutinized.

For technology, the major criterion is an appropriate balance between each other country and the U.S. Certainly between the U.S. and the Soviet Union it should be equal. Most technology transfers would occur under a blanket agreement negotiated between governments. Once the blanket agreement is in place, then U.S. companies proceed to establish projects in the traditional manner.

The normal approach for the export of current industrial technologies would be that of receiving technology of equivalent value in return for that exported, or the establishment of joint projects or joint companies where a substantial amount of commercial control and visibility is maintained.

It should also be noted that there are countries that may not be concerned about technology trade balances but prefer to make cash sales of technology to us. This would be very advantageous to the U.S. and should be encouraged.

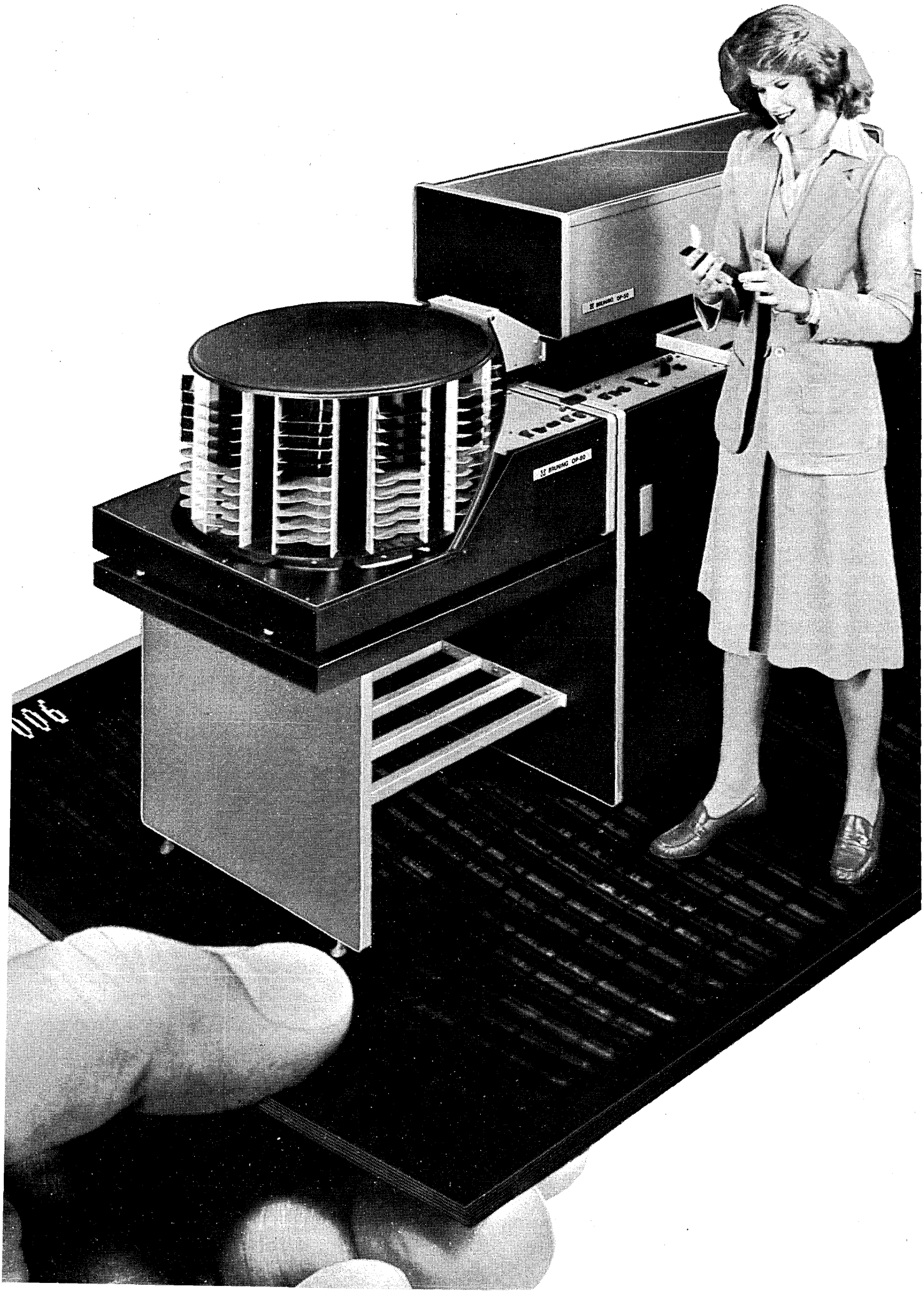
For technology, as with products, only the most highly advanced know-how would be subject to government control.

Dept. of Defense and other government officials emphasize that the greatest U.S. defense asset is a strong industrial base. This should be a guiding principle in assessing military risk. By keeping the number of export cases coming under government control to a minimum, the necessary review of risks and benefits to the nation can be made by a high-level commission, one whose members have unbiased interests and broad perspectives so that all factors are properly weighed in considering technology policies. This is not achievable in a review involving only representatives of the departments of the executive branch of the government.

It is clear that as long as this nation has a healthy economy, it will never fall to Communism, either from within or from abroad. But economic disorder, with widespread unemployment and consequent disillusionment with our economic system, would be an entirely different and threatening setting.

If the U.S. had all of the resources to satisfy its economic needs, solve its social problems, and otherwise control its destiny in this shrinking world, the case for doing business with the Communists would not be compelling. But that is not the way things are. For the first time in many generations this country does not have all the resources to provide timely solutions to its major problems. Consequently solving them may prove much more challenging than containing military aggression.

Finally then, it seems to me that with serious and rational efforts by business and government working together great benefits can be realized from expanded high technology trade with the Communists, and with manageable risk. ❋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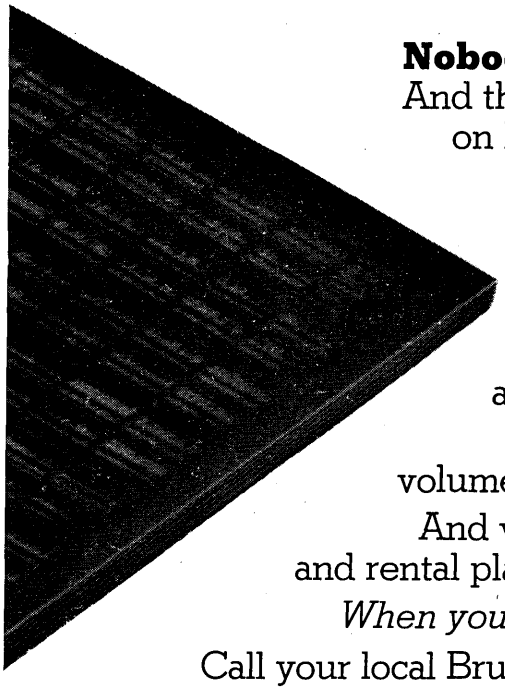

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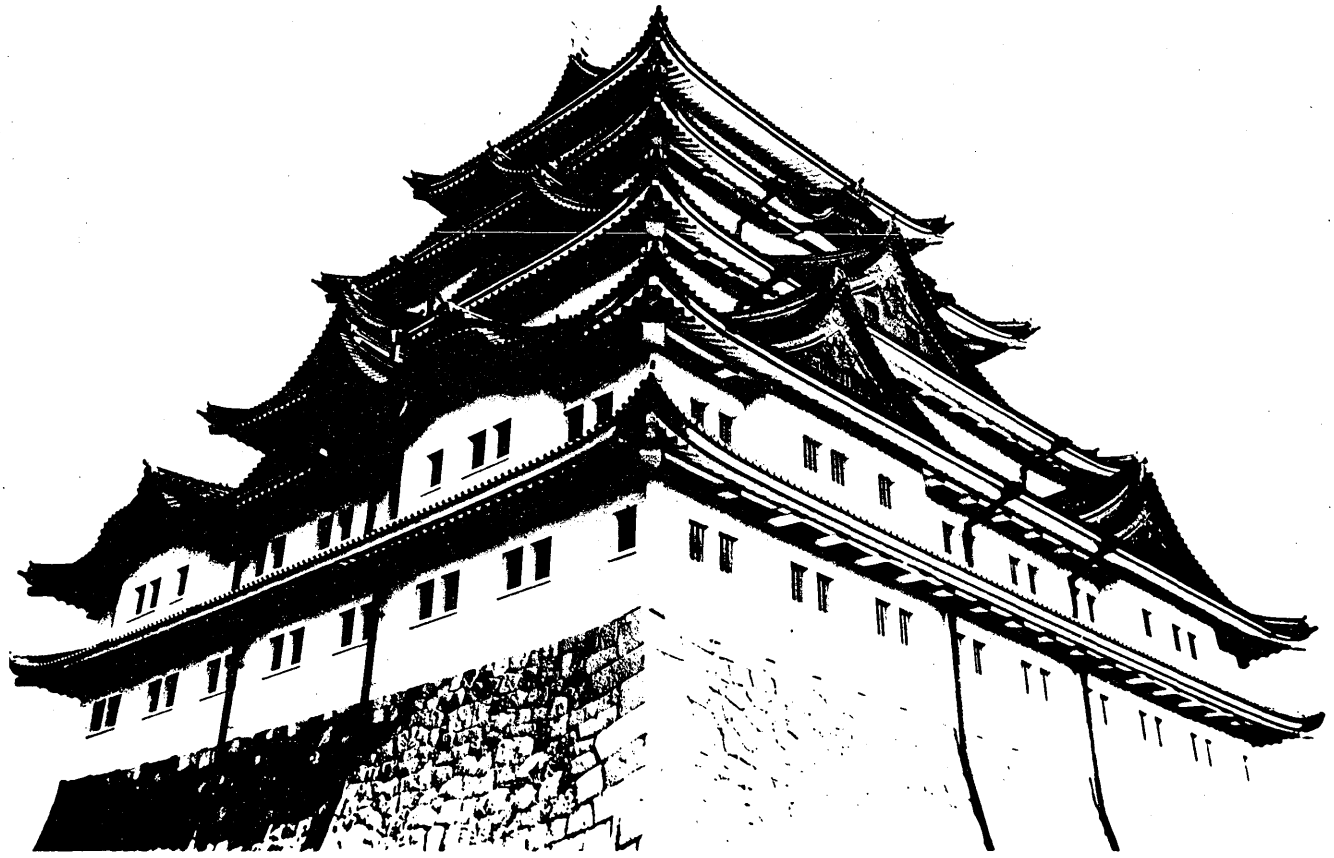


Castle Nagoya/photo by Norio Hasegawa

Is There A Japan, Inc?

by Edward K. Yasaki, Far East Editor

Can Japanese combines crack foreign computer markets? Will their government partners finance their excursion to the U.S. in 1978?

Does the Japanese computer industry, known for its high technology, wrapped in anticompetitive combines, and strongly supported by its government, represent an imminent threat to the U.S. computer industry and to U.S. computer vendors? Is there really a "Japan, Inc." looming over our western horizon, ready to do battle with IBM *and the rest of the world? Not according to the Japanese there isn't. Not yet.*

A funny thing happened to them on their way to the U.S. marketplace with their homegrown computers, they say. Their chief rival, IBM, went around cutting prices on its big-ticket items, making life difficult for the competition. What's significant is that this lucky break for computer users occurred *before* the Japanese could arrive with any low-priced alternatives.

But the Japanese are coming. And you can take that to the bank. Just don't hold your breath.

"Our computer market is saturating, so we want to export," says Dr. Kohei Amo, general manager of the Medium and Large-Scale Computer Div. of Toshiba (Tokyo Shibaura Electric). But Amo, who has a doctorate in electrical engineering from Stanford Univ. that he got under a Fulbright scholarship, knows the Japanese mainframers have a tough sell in the American market. He's not alone. Hitachi's executive managing director, Katsushige Mita, thinks it will be 10 years or more before the Japanese are active in international markets. He adds that they're still trying to figure out how to handle domestic sales.

"They still have a long way to go," agrees Martin L. Zapf, president of Burroughs in Japan. Noting that it's an entirely different game from trying to sell calculators or tv sets, he says the problem is software. "And there the Japanese manufacturers are still lacking in competitiveness. Perhaps they can catch up, I don't know."

Interviews with executives of Japanese mainframe companies indicate a decided interest in international markets and a recognition that software is, indeed, the major problem. Of course Hitachi got around this by selling its new mainframe through San Francisco-based Itel Corp. With this move, Hitachi also avoided the problem of marketing and all the support activity that must go along with it. And marketing, says Fujitsu's Takuma Yamamoto, is seen as the most difficult problem for his company too as it eyes foreign markets.

Financing and marketing problems

Nor do the Japanese take lightly the matter of financing an expanded marketing effort. Hitachi's Mita cites the example of General Electric, which he says had the engineering capability but not the financial muscle to continue in the mainframe business. As GE formerly did, Hitachi relies on computer revenues for only a small portion of its sales, and Mita thinks it will be necessary for them to generate the money internally in order to finance their sales.

In contrast, Fujitsu would prefer to find a partner abroad which would be

able to help with the financing and marketing, perhaps with software development as well.

To reduce the burden of financing rental machines in the domestic market, the Japanese vendors had earlier formed JECC, the Japan Electronic Computer Co. An attempt was made to get JECC, or an organization like it, to finance rentals for exports. But that idea apparently has been scrapped. So that leaves the government, right? Wrong.

According to Teruaki Mizunoue, deputy general manager of the Machinery and Information Industries Bureau at the powerful Ministry of International Trade and Industry (MITI), the nation must emphasize *imports*, not exports. And so the government is not considering any financial support for the industry's export effort.

To date, Japanese mainframe makers have derived little revenue from international markets. Fujitsu's Yamamoto says computer exports are no more than 5% of total Japanese computer production, and most of that is accounted for by shipments of IBM Japan. His own company, which makes portions of the Amdahl Corp. mainframe, is the leader among Japanese mainframers.

Fujitsu derived slightly more than 10% of its computer-related revenues from exports in its latest fiscal year. No other mainframer exceeded 5%. Fujitsu's total sales came to $1.184 billion, of which computer-related products accounted for $865 million. Of exports totaling $135 million in that period, $97 million were for computers, or slightly more than 10%. That's a total of 401 mainframes and minicomputers, including shipments to Amdahl. Europe took 150 of them, Asia and Australia an additional 117, North America 88, South and Central America 46. According to a separate source, the goal is to generate from 20% to 30% of dp sales from exports during fiscal 1980, at which time total dp sales are reportedly targeted at more than double these of 1976.

But Yamamoto, who is the corporate managing director and general manager of Computer Systems at Fujitsu, says, "We have no definite plans for the future," and no strategy regarding exports. He gives the impression, however, that he is none too happy with the way things are going with the firm's marketing efforts abroad, and that things are being held in abeyance until a reevaluation is completed.

Hitachi's Mita was equally noncommittal. The company had only recently shipped its first mainframe to Itel Corp. Such oem sales, he said, are easier than end user sales, but they produce relatively smaller profits. He prefers a balance between the two, noting that a reliance on strictly oem sales can keep a manufacturer too distant from the user and too isolated from his needs.

He says he sees the U.S. and Communist countries as attractive markets.

> The Japanese export no more than 5% of their computer production—and most of that is from IBM Japan.

Hitachi has had an order for three large-scale systems from the People's Republic of China, valued at some $10 million. But it's the type of sale that the U.S. government has veto power over. Mita says there's a need to change the U.S. attitude toward sales to such countries. "They're too nervous" about such things, he adds.

A third industry powerhouse is Nippon Electric, which is very strong in communications and derives only about a fourth of its revenues from computers. In the current fiscal year, about 4% of dp sales will come from exports, according to Dr. Yoshiteru Ishii, general manager, Edp Planning Office. And in five years that will rise gradually to about 10%, most of that in oem sales. "From Nippon Electric's standpoint," he says, "I don't think it's an easy matter to export computers."

Small systems first

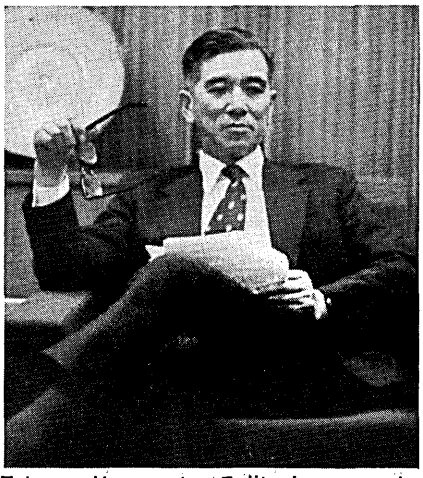
The company is most active in small business systems, pursuing this market in Thailand and Singapore, but looking to expand to Hong Kong and Taiwan. It established NEC Singapore last April, a subsidiary that appoints and services sales agents in each country, agents who must provide applications programs and perform the maintenance.

NEC, which has small office systems with a communications capability that sell for $30K to $150K, hopes to begin selling them in the U.S. in 1978. Dr. Ishii says they are trying to find sales reps here, either a systems house or a software company. Through its recently established subsidiary, NEC Information Systems Inc., Lexington, Mass., the firm is also selling peripherals and terminals to oem's.

A major customer has been Honeywell, with whom NEC has long had technical tie-ups. Honeywell Australia has been selling the small business machine, the System/100, and more than 1,000 NEC disc drives have been shipped from there to other Honeywell subsidiaries in France, Italy, and the U.K., in addition to HIS.

That still leaves large systems sales, an activity that Ishii admits could more easily be initiated in Asia than in the U.S. "But still a problem is money for rentals and for systems support," he sighs. He says they haven't considered

The author interviewed Mr. T. Mizunoue, deputy director of MITI's Machinery and Information Industries Bureau (center) and Mr. K. Ito, division chief of MITI's Electronic Policy Div. (right). From them he learned of the country's export dilemma: hoping to sell its computer technology abroad, the nation is suddenly faced with emphasizing imports, not exports.



Takuma Yamamoto, Fujitsu's corporate managing director and general manager of Computer Systems, says that computer exports represent no more than 5% of Japan's computer production.

finding a joint venture partner in the States to sell NEC mainframes, adding that he doesn't foresee such an alliance in the next few years.

Toshiba is beginning its international forays with the installation of a medium-scale Acos 600 series machine at a government ministry in Iraq, hoping to add one or two more in that country before expanding its marketing efforts to neighboring nations. The company's Dr. Amo notes that it takes a lot of hardware and software support with each installation, and so they must use their resources intelligently. He said they also want to talk to Honeywell Bull in France, regarding sales to them on an oem basis. Systems sales to Southeast Asian nations, he added, also look attractive.

In the U.S., however, they will start

IMPORT, PROCESS, EXPORT

Before the Japanese mainframe manufacturers were able to establish a presence in the U.S. market, they began hearing the beginnings of what they perceive to be anti-Japanese sentiments in the U.S. Fujitsu's Takuma Yamamoto is especially critical of IBM board chairman Frank Cary's comments about competition from Japan, as well as claims by others that the Japanese semiconductor industry is about to drive the American producers from their home market. These, he says, are off the mark.

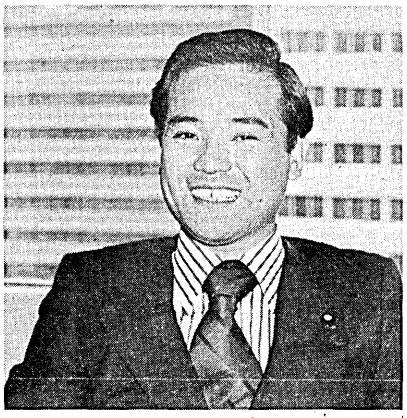
The Japanese are sensitive to criticism from Washington, following the experiences of others with exports of textiles, steel, tv sets, and the like. Of late, however, Japan is not only seeing more of its export markets being closed off, but also losing business to competitors from other nations.

Once the world leader in shipbuilding, it is seeing this business taken away by companies in Yugoslavia, Formosa, and South Korea, where wages are lower and where know-how is almost on a par with Japan. A recent report states that Japanese shipbuilders were operating at only 68% of their 1974 levels and are losing out in bidding for new contracts.

Thus a nation unable to rest on its laurels must find other ways to keep its labor force fruitfully employed. The Japanese are hopeful that its prowess in computer technologies is one that cannot readily be replicated by developing nations.

This predicament was perhaps best expressed by Hiroshi Kumagai, a member of the Japanese parliament (the Diet). The 37 year-old Senator, tracing the last 100 years of his country's history, points out that Japan has depended for its livelihood on trade—importing raw materials, processing them, and exporting products. But, he notes, many developing countries are catching up with them. And so Japan must find products that require sophistication in the processing phase.

Kumagai, the first deputy chief of the Information Processing Promotion Div. of the Ministry for International Trade and Industry, is the only senator with a background in the computer industry. He also spent a year in graduate studies at the Harvard Law School. Kumagai speaks of the musical instruments industry, part of his constituency, and the many years over which it has developed its capabilities, saying that it's a type of "knowledge" industry. He says people tell him it would take 50 years for developing countries to catch up with Japanese technologies in this field.



A member of the Japanese Diet and first deputy chief of the Information Processing Promotion Div. of MITI, Hiroshi Kumagai points out that Japan has spent the last 100 years importing raw materials and exporting finished products. Now, his country must find products that require sophisticated processing. But in the long run, he says, it may not be possible to support the computer industry in competition with IBM.

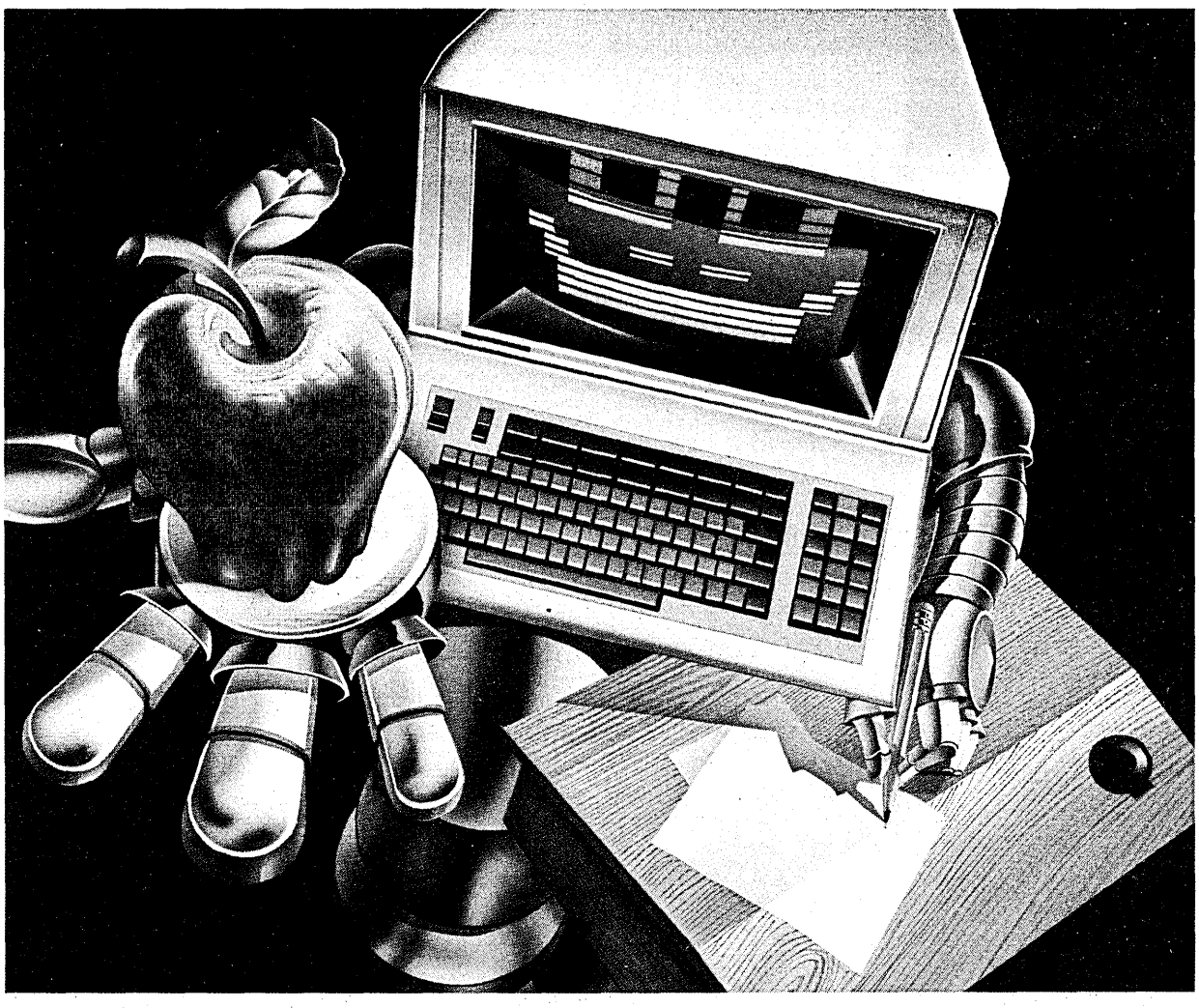
But he also places a premium on systems activities for the nation's survival. Not simple activities like textiles, he says, but rather those that require a melding of industrial groups. He cites as examples the exportation of industrial factories, as Japan is already doing to Southeast Asia and Russia, and modern musical instruments that incorporate electronics.

Even when he was at MITI, Kumagai continues, it was their view that the computer hardware or software industries could not be viable as independent entities, but rather should be combined with other industries. And so an effort was made to link them with the medical field to develop a medical information system, a project that continues to receive government funding today. But in the long run, the senator says, it may not be possible to support the computer industry in competition with IBM.

Still, the Japanese currently see no alternative. The government is committed to the computer industry (they call it the information industry) as one of the mainstays for its future economic well-being. There's a feeling that the industry, coddled and sort of insulated from foreign competition, must get out and do battle with the big boys if it is ever to achieve some kind of world standing. And besides, they say, the domestic market for computers is nearing saturation. And so they must look to, and enter, markets abroad.

Toward this end the government has begun to do what the U.S. Commerce and State Departments have been doing for years: studying foreign markets for computers. In November 1976 it established the nonprofit, government-supported Center of the International Cooperative for Computerization (CICC). And last year CICC sent 13 people abroad, to South America, East Europe, the Middle East and Africa, to Australia and Southeast Asia, in the first fact-finding mission. A member of one such group, Katamitsu Kono, went to Iran, Iraq, Kuwait, Saudi Arabia, Egypt, Turkey, Kenya, and South Africa. He says the Mideast people have been exposed to Japanese goods, are aware of the economic progress made by Japan and of her level of technological expertise, and may be receptive to accepting and using Japanese computers. Kenya has a stable government and is an important market, Kono adds, noting that the English are also studying that market. He found the South African market split about evenly by IBM and England's ICL.

But CICC is also interested in holding seminars to train people in computer basics, including applications. Last fall in Tokyo the first such seminar was scheduled, but there were also plans to send Japanese abroad to conduct classes in Southeast Asian and Middle East countries next. ❋



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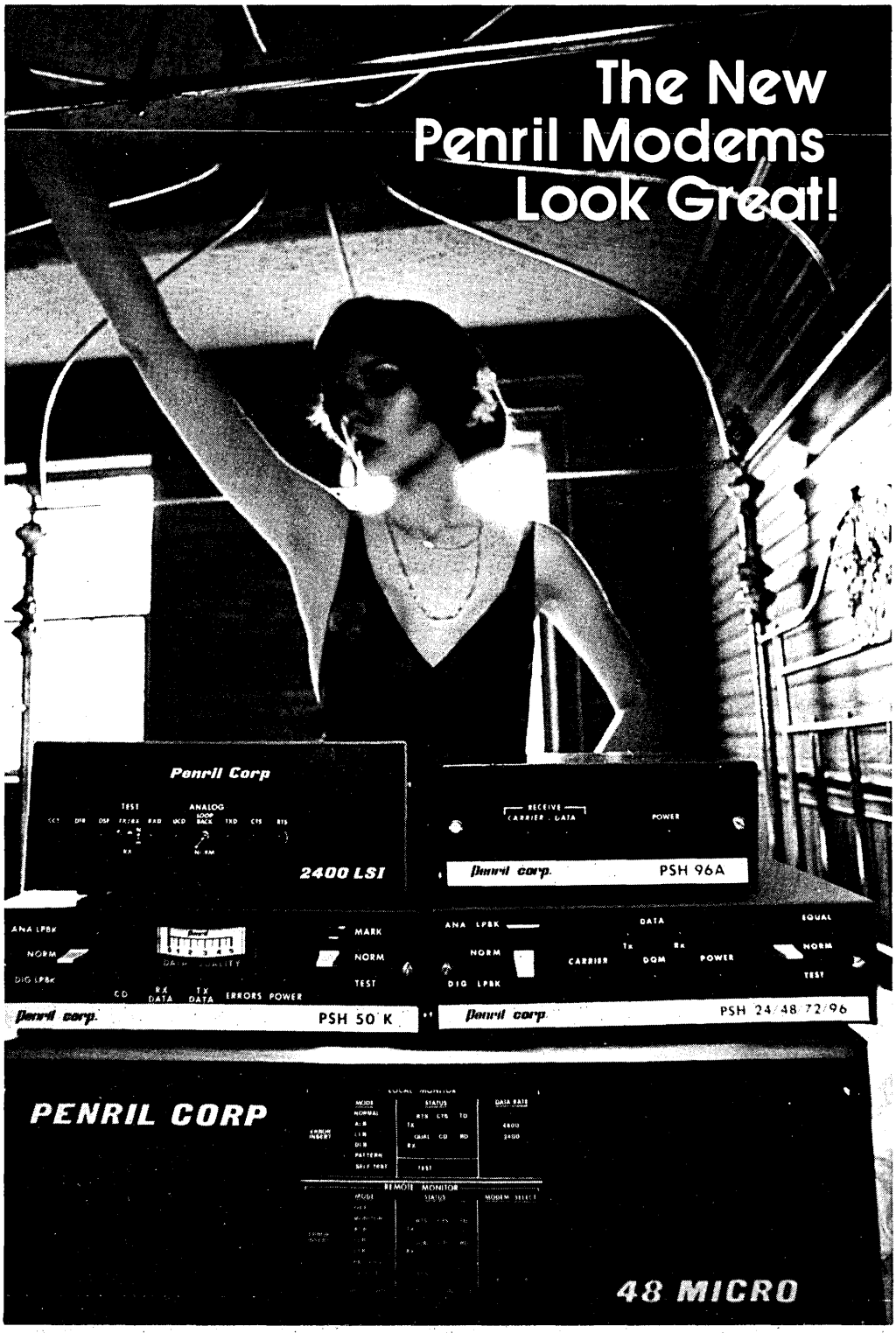

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with small business systems and minicomputers. "But we feel minicomputers will face much tougher competition in the U.S. than office computers."

Toshiba gets only about 6% of its corporate revenues from computer sales, and less than 3% of that from international sales. But between 1980 and 1985, Amo says, it is hoped that some 30% of the so-called Information Systems Group's revenues will originate abroad.

The company that appears on the one hand to have had the most experience in foreign markets can also be seen on the other to be starting anew. Mitsubishi Electric Corp. began marketing small business systems in Eu-

Mitsubishi, too, is looking for a U.S. sales arrangement for 1978.

rope in 1970 through an affiliate trading company, Mitsubishi Corp.—an unhappy effort that resulted in some 400 installations but the suspension of sales. According to Hideo Ohta, general manager of the Computer Div., sales in Europe will resume in time, but this time using the divison's own sales staff.

Since its product introduction in 1968, the firm has installed 6,400 office systems in a domestic market where the Japanese themselves have only a 60% share. The other 40% is held by such foreign vendors as Burroughs, NCR, IBM, and Nixdorf. Ohta says Mitsubishi has about 18% of the local market, about 30% if one excludes the foreigners.

But this year he hopes to begin a sales effort in the U.S., preferably with a joint venture partner. The firm might start with the Melcom 80, priced at from $20K to $100K, can have up to 192KB of main memory and 200MB of disc. It can run seven programs in parallel and support more than 30 crt's says Ohta. There's a DBMS, in addition to applications programs and utility routines.

While all this leaves no doubt but that the Japanese are seeking and developing export markets for their computer products, it also shows that more American users will be exposed to Japanese small systems before many are exposed to the likes of a Japanese medium or large-scale machine. And it is increasingly likely that sales and after-sales services will be provided by Americans.

But as Martin Zapf of Burroughs in Tokyo says, Japan, Inc. *will* become an important factor in international markets. Just not right away. ✲

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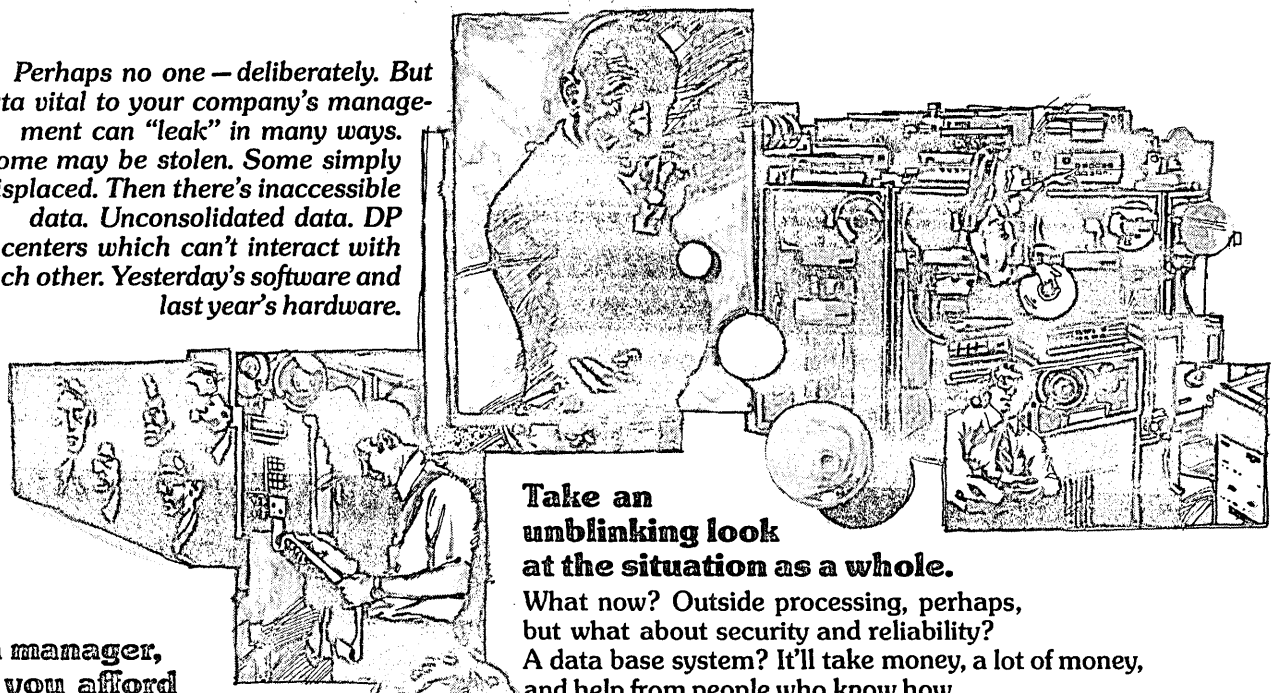

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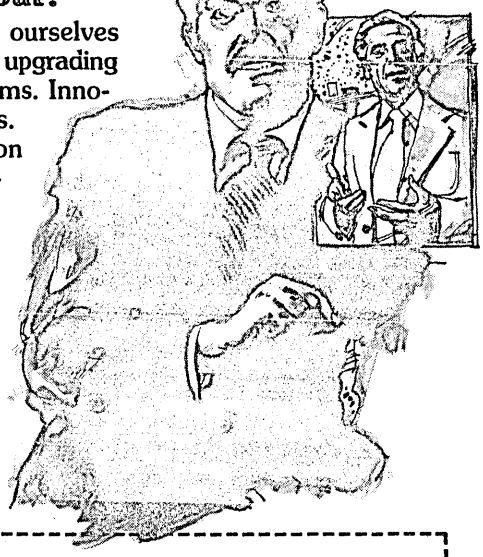

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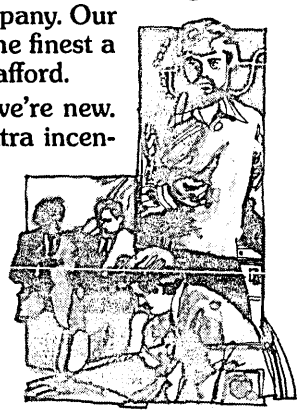

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CIRCLE 40 ON READER CARD

An Overview of Memory Technologies

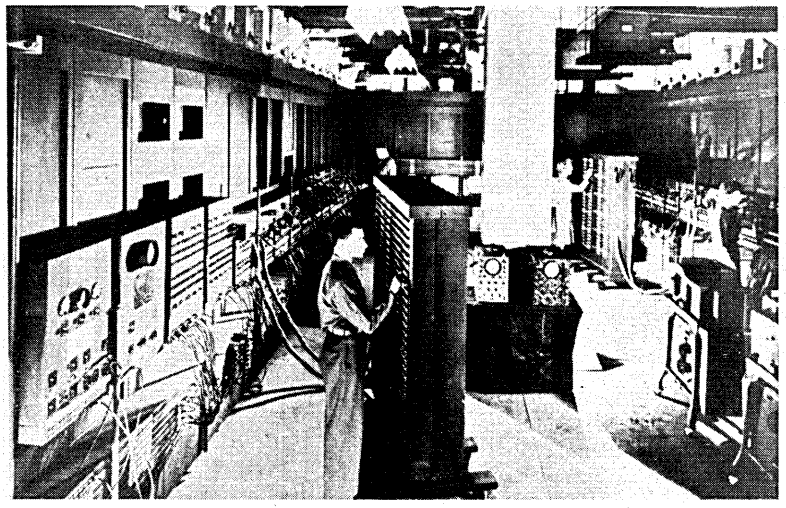
by Douglas J. Theis

The developers of the first pre-computers could not find a single form of memory which would be both fast enough and inexpensive enough to fill all their needs. Thirty years have passed. Will we finally find one in 1978?

We faced a dilemma in building a machine to follow the ENIAC. The dilemma was that we didn't know how to spend money for the different types of memory involved. And we had been thinking of memory in terms of some one form of memory for programming and another form for the digits involved in the fast part of the calculations and another form for the digits which weren't needed quite so often, such as in function tables, and another form of memory for incidental constants that were needed now and then in the machine.

We realized after building the ENIAC and, in fact, while building it before we finished, that all these things were the same. That a number that told you where to put a plug in was no different; that somebody looking at it written down on a sheet of paper couldn't tell any difference between it and a number in the problem moving along somewhere.

And we realized that what we needed is just one form of memory that is fast enough and cheap enough to do everything. Now, to this day, of course, we have never found that one form of memory.



Electronic Numerical Integrator And Computer

So then we involved another thought, which is the idea of having, say, at least two or three types of memory. Say, for example, a fast memory and a slow memory on magnetic tape or wire or punched cards or something. Of course we had three types of memory—three or four types of memory—in the first ENIAC even in a coarse sense. We had cards, relays, and electronics. But in a finer sense we had about six or seven types of memory. We had the resistance function tables and the flip-flops and so on.

And we began to realize that any machine was going to be made up of a hierarchy of memories. (The word "hierarchy" was suggested by von Neumann by the way, but the concept was one we suggested to him.) I realized that the hierarchy of memory that we were going to have was simply going to mean that you had a very fast memory which was pretty expensive, a slower one which was less expensive per bit, and a slower one which was less expensive yet per bit, and so on.

Still, if possible, trying to find one memory that would do all these things. That is, we still hope for a day when we will find one form of memory cheap enough to be both fast and plentiful too, but we may never find such a thing.

J. Presper Eckert, Philadelphia, 1975

Dr. Eckert's remarks are quoted from an interview taken as part of an oral history of computing, compiled by Dr. Christopher Evans with the support of the Science Museum, London, and the National Physical Laboratory, Teddington, England.

J. Presper Eckert was, with John W. Mauchly, the developer of the ENIAC, a huge vacuum tube machine which was either the first computer or the world's most significant pre-computer, depending on your definition of the

terms. In his comments above, Eckert was describing the breakthrough his group made in understanding the memory problem. In his mind, this understanding was their second great advance (the first being the decision to make ENIAC as an electronic device).

The ENIAC was completed in 1946. It was nearly 30 years later that Eckert commented on the continuing search for that one type of memory which would serve all of a computer's storage requirements.

Memories have come a long way since the days of the ENIAC project, so far that the fastest forms are finding a natural limit in the speed of light. And still no single form of memory has been found to do all of a computer's jobs. Still there are fast, expensive internal memories for calculations and slower, less expensive ones for peripheral storage. And still there is a gap between them in terms of speed and cost.

In the meantime, computer developers and users have struggled to compensate for the difference in speed between internal and peripheral storage. Multiprogramming and virtual storage concepts, among others, have been invented solely to make up for the speed disparity.

So it is that computer users and designers alike are sensitive to new memory technologies and watch their development with keen interest. For them this update on the state of the art of memory development is intended. And that is why what follows is not a survey of all the memory products available, but an overview of the new developments which recently have been translated to working products.

Memory technologies which **could** fill the gap are either brand new or not even available.

Products which have not yet been delivered to users are not included. Nor are products such as core memory, which exist in some state of arrested development. Nor are, for reasons of space and effort primarily, read-only types or other variants. And still there are a sufficient number of exciting developments on both sides of the read/write memory "gap" to fill many times this many pages.

For this presentation, we can consider that there are four categories of memory. Moving out from the heart of the system, they are:

Internal memory
- MOS random access memories
- Bipolar random access memories

Gap-filler memory
- Charge-coupled devices
- Magnetic bubble devices
- Electron beam accessed memories
- Head-per-track discs

Secondary memory
- "Winchester" discs
- Magnetic tape units

Mass storage systems
- Automatic tape library systems
- Video-recorded mag tape memory

Internal memory

To date, MOS RAM (random access memory based on metal-oxide-semiconductor technology) dominates the mainframe memory market. Charge-coupled devices (CCD's), electron beam accessed memories (EBAM's), and magnetic domain bubble memory devices (BMD's) are competing to be the memory "gap" filler. Magnetic tape and disc continue their dominant roles as secondary memory. And the trillion-bit memory systems have had only limited success.

MOS and bipolar RAMs

Intel introduced the first 1K RAM memory back in 1971. This was followed in 1973 by the 4K RAM chip. Now the 4K chip is available from nearly every major integrated circuit (IC) manufacturer in the business. The market for them has become fiercely competitive, with some devices selling for as little as $4 each in very large quantities. Last year, 16K MOS RAM's became available too, at the same price of 0.1¢ per bit. At those prices,

The new memories are not likely to be readied for the current computer generation.

there seems little likelihood that core memories will live much longer, at least in conventional computer memories.

RAM's are organized in matrixes of words x bits. For instance, 4K RAM's are offered either as 4K words by one bit or 1K x 4 bits. The total number of bits is the same, but the parts are not interchangeable. All of the available 16K RAM chips have been organized as 16K x 1, however, so that computer manufacturers can stack chips in parallel groups depending on their

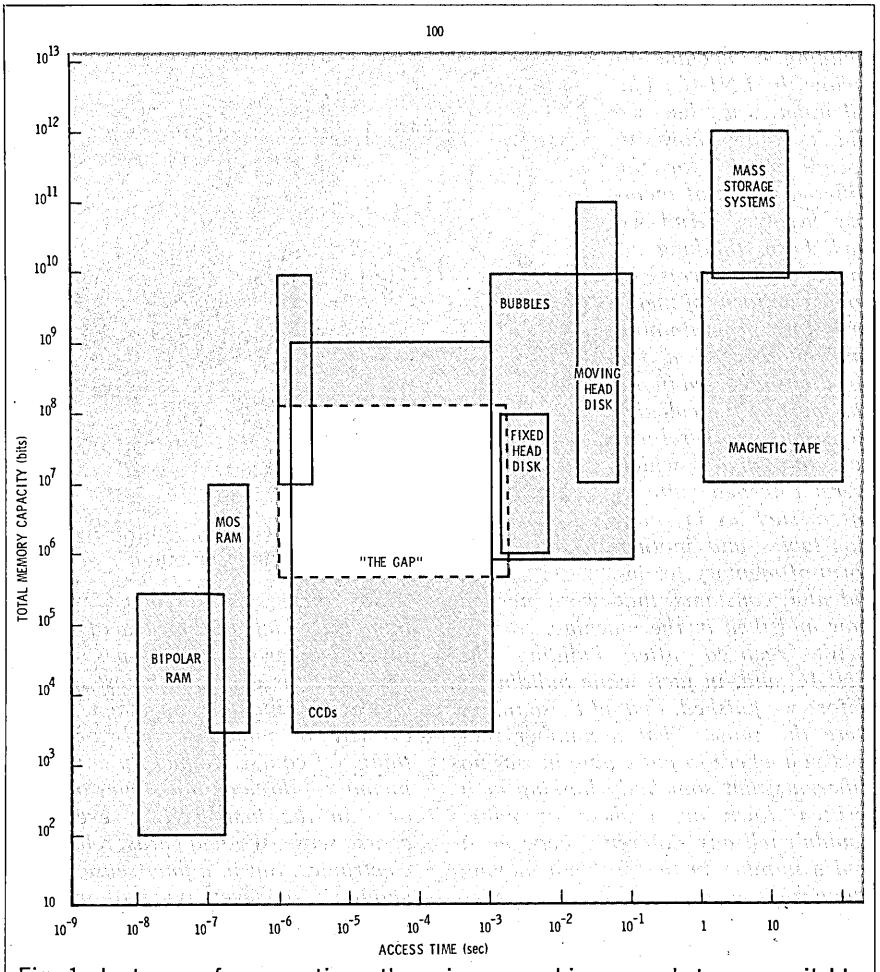


Fig. 1. In terms of access time, there is a very big space between available technologies for main memory and those available for secondary storage. Charge-coupled devices conceivably could fill the gap, but they too have their drawbacks.

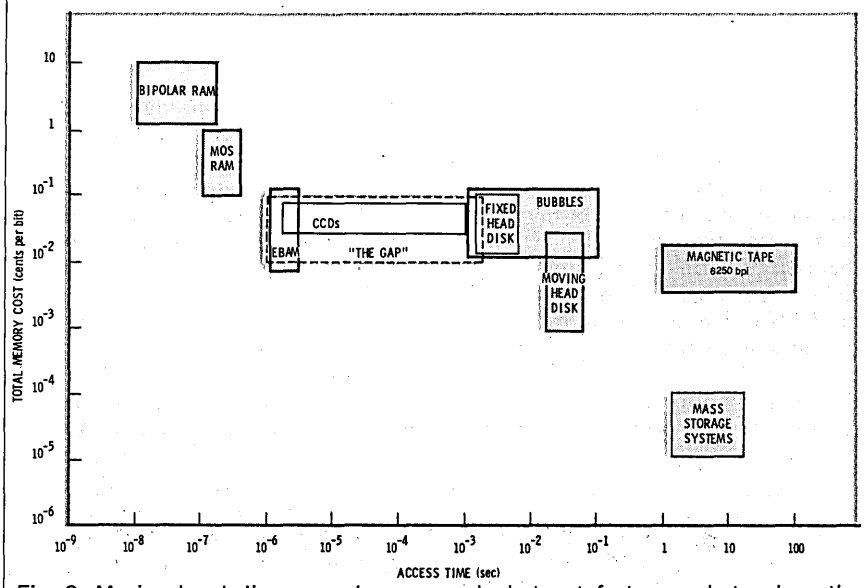


Fig. 2. Moving head discs are cheap enough, but not fast enough to close the gap; CCDs are almost fast enough but not cheap enough. So the gap will exist for some time yet.

"Price Per Bit"

The dp industry always uses "cost per bit" or "price per bit" numbers in comparing solid-state memory devices such as RAM's, CCD's, and Bubbles. DATAMATION is generally careful to use "cost" in referring to how much it costs the manufacturer to build something, and "price" in referring to how much the manufacturer asks for its product.

But there are several levels of confusion beyond that because manufacturers state their charges, or prices, in several ways. One common way to state price is based on the price for the raw chip device when purchased in quantities of hundreds or thousands of units. In those terms, the oem price per bit is the price of the chip divided by its bit capacity.

Another common method is to state the price of a "system" including the printed circuit boards, connectors, and power supplies. This is an end user price. In those terms, the price per bit is figured as price of the whole system divided by its bit capacity.

Finding a factor to multiple chip or device price by to attain end user system price is difficult because pricing depends on the complexity of the system, the performance, the pack constraints, environmental factors and others. Due to these, the multipliers can vary from 1.5 to 10.

One rule of thumb seems to work, though. That quadrupling the *chip* density usually halves the *system* price per bit. For example, one manufacturer now offers a 1MB Memory built up of 16K RAM's (and including chassis and power supply) for $27,000. That's the end price (yours and mine). The 16K RAM parts cost the system builder about $32 each in quantity, which is a raw oem cost of 0.2¢ per bit to him. Dividing the end user price by the capacity, we find the end user "system" price to be 0.3¢ per bit.

The same megabyte capacity based on CCD devices is available from another maunfacturer for about $13,500. The 64K CCD parts cost approximately $65 each in large quantities. Therefore the raw cost per bit to the computer manufacturer is 0.1¢ per bit and the end user system price is 0.15¢ per bit.

Three things are important to the end user, end user prices cannot be easily determined from device or chip prices the computer manufacturers pay. Second, higher densities *should* lead to lower end user prices. And third, the manufacturer's costs on those memories used as illustrations above are expected to fall to less than half their present amounts by the end of 1978 as volumes become large, and *some* of that drop should be reflected in prices we pay. ✻

word sizes. (See Table 1.)

There are two basic types of RAM's, static and dynamic. The differences are significant. Dynamic RAM's are those which require their contents to be refreshed periodically. They require supplementary circuits to provide the refreshing and to assure that conflicts don't occur between the refreshing and the normal read/write operations. Even with those extra circuits, however, dynamic RAM's require fewer on-chip components per bit than do static RAM's which don't require refreshing.

The fact that they require fewer components makes it possible to achieve higher densities with dynamic RAM's than are possible with static RAM's. And the higher densities lead to lower costs per bit. The production techniques for the two kinds of chips are identical. Therefore, the cost per unit quickly becomes the cost for mass producing one chip. Since the chips cost about the same amount to build whether they store 4K or 16K, higher densities lead to lower costs per bit.

Static RAM's are easier to design with, however, and compete well in applications where less memory is to be provided since their higher cost then becomes less important. They are often chosen for minicomputer memory, or especially for micros.

Because they require more components per chip, making high bit densities more difficult to achieve, the introduction of static RAM's of any given density follows that of dynamic versions. While several dynamic 16K RAM's are currently available, for instance, industry sources are not even giving firm near-term projections for when the static versions might be available.

CCDs of any given capacity have preceded RAMs in the marketplace.

Even when static RAM's get to 16K capacities, they may not have caught up with the dynamic ones. The target is moving. For example, Mostek has built an improved access time version of its own 16K dynamic device. The new product was produced through a technique called "scaling," whereby the size of the masks or patterns for making the chip is photographically reduced to yield a smaller, and hence faster device.

Mostek cut the size of its 16K chip from 27,700 to 22,000 square mils. (Mils are thousandths of an inch. It would take about 40 of the new chips to cover up a regular postage stamp.) By reducing the size about 20%, the firm improved the speed by about the same amount. Also interestingly, the

new 16K chip is smaller than the 4K chip the company offered back in 1973. That's how fast the field is moving.

Hewlett-Packard was one of the first manufacturers to make use of the new 16K Mostek dynamic RAM. H-P crams 1MB of memory into a 12½ x 19 x 23-inch box using them. (Just as impressive as the memory's tiny size is its fault control mechanism, which is claimed to automatically correct all single-bit errors and report all double or triple-bit ones. And because RAM memories are usually set up to have each bit of a word on a different chip, the computer will operate even if one chip from each 16K block is pulled off its board!)

By late 1979 or 1980, the industry is expected to have 64K dynamic MOS RAM's ready. Intermediate steps will probably be skipped since the "rule of four" postulated by Intel's president Gordon Moore has proved valid: the cost of developing a new device generation can be justified only by a factor of four increase in capacity or performance.

There may be some exceptions to this, however, including one from IBM. The company is said to have made some 32K RAM's for the 3033.

There is another trade-off to be made with semiconductor random access memories too, in addition to the choice between static and dynamic types. The trade-off is between MOS and bipolar circuitry. Bipolar devices are faster, but have not yet achieved the densities (and hence the lower costs) of MOS. The highest density bipolar RAM to date is Fairchild's 4K bit unit. There is talk that the manufacturer will soon offer a 16K replacement. That might put bipolar on a par with MOS, but probably only for a short time. (See Table 2 if the choices are getting confusing.)

All of the RAM technologies will soon be up against the limits of present fabrication techniques, which are based on photolithography. Presently, large size patterns for the circuits are made. These are photoreduced to the size of the chip and used for patterns to control the placement of materials on the silicon wafers. This technique allows for circuit components as small as four microns (millionths of a meter) in size.

To go beyond the 64K RAM requires a two-fold technology improvement, namely: (1) better means such as electron beam imaging to achieve smaller component dimensions, and (2) a method such as dry processing to selectively remove excess materials. Consid-

Pushing for Higher Yields

Memory manufacturers are continually pressured to produce faster, more reliable products at lower and lower prices. The pressures drive them to the very edge of the state of the art in their respective technologies. Out there on the brink, things don't work right every time, and the number of products which must be thrown away becomes a significant factor in the cost of doing business. So it is that the vendors try every technique they can invent which promises to increase the yield of good parts economically. This leads to some unusual product capacities, some pricing aberrations, and some clever error-correcting techniques.

The number of products which must be thrown away becomes a significant factor in the cost of doing business

Look at the Intel 8K RAM chip, for example. Our understanding of the semiconductor chip technology and of the price of developing new products tells us that next logical step up from the 4K RAM is 16K RAM. So how does an 8K product come to be? In this case it is a result of building 16K RAM's. Some of the 16K bit capacity chips have a good half and a bad half. Instead of throwing the whole thing away, Intel disables the faulty half and sells the result as an 8K device.

For another example, consider the Texas Instruments bubble memory. It comes with a "guaranteed" capacity of 92,304 bits. "Guaranteed" in this case means that at least 144 of the product's 157 loops will operate. PROM addressing is used to bypass the bad loops.

Similar things happen with charge-coupled devices. Honeywell made a CCD part where changes in interconnections allow for reconfiguring around bad cells

Another CCD maker runs a kind of "seconds" sale. It offers to supply a perfectly operating IBM memory on a board for $4,000—using its imperfect parts but adding extra bits and circuitry to compensate—while the price for the parts alone, if perfect, is over $8,000.

Such things don't happen only to chip-size memory products, either. Floppy discs need not have both sides working, even though the magnetic oxide is coated on both sides. Manufacturers starting out to build "flippy" discs (with two recording sides) will end up with some floppies to sell.

Even on large discs used in disc packs, not every side comes out perfect, but there are two discs in every pack which are recorded only on one side—the top one in the stack and the bottom one. And so it goes.

Then too, some discs (or tapes, for that matter) can't hack the high recording densities they are built for, but will work well at lower densities. The BASF 3340-compatible data module comes off the same production line as the higher density 3350-compatible modules do.

The IBM 3340 itself has a feature called "defect skipping." It is simply a means to skip over bad tracks which are caught at the factory. Yes, it takes one more revolution of the disc to recognize and skip over a bad track, but that's not an intolerable price to pay when the rest of the disc surface is good.

Some escape, but . . .

Other techniques are used for detecting and correcting errors too, which provides still another means for upping the yields, whether they are yields of chips, discs, tapes, or whatever. An example is the Hewlett-Packard IBM RAM-based memory for minicomputers. Its fault control system will correct single-bit errors, so H-P's designers made certain that each chip contained only one bit of any word. That leads to the memory being able to operate with failing chips, and the system has light emitting diodes on each memory board to pinpoint the bad chips.

Group-Coded Recording does something similar for 6,250 bpi magnetic tapes, and the list goes on from there.

In the end, the user benefits in several ways. First, prices are lower for the good products since the number of unsalable devices per batch is reduced. Second, some intermediate products are made available which otherwise might not be built, like the 8K RAM's. Third, many of the error detection and correction techniques invented to make memory products salable also benefit the user once applied in his environment. It's a good deal all around. ❋

Typical 16Kbit MOS (NMOS) Dynamic RAMs

Manufacturer & Part Number	Intel 2116-2	Mostek MD4116-2	TI TMS 4071
Organization (words x bits)	16K x 1	16K x 1	16K x 1
Access Time	125-200nsec	100-150nsec	165-250nsec
Read/Write Time	375nsec	375nsec	400nsec
Density (bits/in^2)	4.8×10^5	5.9×10^5	5.0×10^5
Operate Power/ Standby Power	425/25mw	562/20mw	600/10mw
Approximate Oem Price (1,000s)	$32	$30	$35
Oem Price/bit	0.20¢/bit	0.19¢/bit	0.22¢/bit

Table 1. These products illustrate typical characteristics of 16Kbit RAMs. All are NMOS, use similar power supplies, and come in dual in-line 16-pin packages for mounting on printed circuit boards. Since they are dynamic devices, their contents must be periodically refreshed. This makes them "unavailable" to system or user programs roughly 1% of the time. The percentage of time they are unavailable is not much of a problem, but avoiding conflicts between data access and data refreshing does add to the design complexity.

erable research is now under way to use x-ray and electron beam techniques instead of visible light for submicron features since these have shorter wavelengths.

Gap-Filler memory

The "memory gap" noted by Eckert and others so long ago is recognized as a dilemma to the dp system user. The wide gulf between fast, expensive main memory devices and slow, relatively inexpensive secondary memory is illustrated in Figs. 1 and 2. Memory products which would attempt to fill the gap must fit in these performance and cost ranges:

The "Memory Gap"

Access time	1usec - 30msec
Capacity	10^6 - 10^8 bits
Price per bit	0.1¢ - 0.01¢

The memory gap for access time is bounded on one side by a 1usec typical mainframe memory cycle time and on the other by the 30msec typical disc drive access time. Capacity is bounded by a reasonable mainframe memory capacity of something like 128KB and by the smaller end of disc capacity, say 10MB. The price is then determined by these existing technologies, that is, 0.1¢ per bit for RAM's and 0.01¢ per bit for small discs.

Unfortunately, the *proven* memory technologies exist outside of the gap and those memory technologies which *could* fill the gap are either brand new (CCD and BMD) or not yet available (EBAM). And while the newer items are being proven or brought to market, the existing ones are continuing to improve in performance and price, squeezing the size of the gap. It's unlikely, however, that the proven technologies will spread far enough to completely close the gap, at least not in the near future.

On the slow access, low cost, high capacity side of the gap, there is especially tough competition for the newcomers from existing head-per-track discs. Any new competitor must be at least as good as these discs in terms of reliability, error rates, and maintenance costs. Another frequently overlooked consideration is that any new subsystem must be fully developed in terms of hardware, software, interfacing, and fitting existing environments before users will buy and install it.

As a result of these facts, these new memory technologies will most likely be used for special applications and for future computer systems. They are not likely to be readied for the current computer generation.

Charge-coupled devices

Charge-coupled devices have been around for a while—both Intel and Fairchild have been delivering 16Kbit versions since 1975—but their sales volumes have been minimal. There are some applications where they have been very successful, however. One is in the Comtal, Inc., Model 8000S image display where the refresh memory using 16K CCD's has cost half as much to deliver (including engineering) as it did using 4K RAM's in early 1976.

CCD's, because of their lower circuit component requirements, can potentially achieve higher densities than can the RAM's with which they usually compete. (Also in a CCD about 30% of the chip area goes to overhead circuitry; in a RAM, more than 50% does.) Because the higher densities are easier to achieve, CCD's of any given capacity have preceded RAM's in the marketplace. RAM's, in fact, are fabricated with the same silicon processing technology; and can borrow the techniques developed for CCD's preceding them. But RAM's do catch up.

Charge-coupled devices are inherently slower than RAMs.

When 16K RAM's were announced, interest in the 16K CCD's sank. Then in 1977, 64K CCD's were introduced and

Typical 4Kbit RAMs

Semiconductor Type	Bipolar				MOS			
Manufacturer & Part Number	Fairchild F10470 ECL	Fairchild 93481 I^{2}L	Signetics 82S400 ST^{2}L	Fairchild 93470 T^{2}L	Harris 6514 CMOS	Intel 2147 HMOS	Mostek 4027-2 NMOS	AMI 4017 VMOS
Type	static	dynamic	static	static	static	static	dynamic	static
Organization (words x bits)	4K x 1	4K x 1	4K x 1	4K x 1	1K x 4	4K x 1	4K x 1	4K x 1
Access Time	30nsec	120nsec	70nsec	50nsec	170nsec	70nsec	150nsec	55nsec
Operate Power	1 watt	450mw	600mw	900mw	30mw	500mw	462mw	500mw
Approximate Oem Price (100s)	$35	$24	$24	$33	$30	$38	$14	$25
Oem Price/bit	0.85¢/bit	0.59¢/bit	1.09¢/bit	0.79¢/bit	0.73¢/bit	0.92¢/bit	0.33¢/bit	0.61¢/bit

Table 2. A wide variety of technologies are used in building 4K RAMs. This helps in comparing the technologies in terms of power requirements, access times, and prices. MOS RAMs are usually found in main memories, bipolars in cache memories and high speed buffers. Note that dynamic and static forms exist for both MOS and bipolar.

3270/3790 Users:
Why wait for 3274s or 3276s? Raytheon's PTS/1200, the highly does much more. And you can ge

Waiting for the next new product advance can often make a lot of sense. Unless there is an immediately available alternative that has far more capabilities and can produce far greater cost savings and productivity benefits.

Raytheon's PTS/1200 system is such a product. It is a fully-programmable distributed processing system that uses an easy-to-use English-language compiler, has a main memory capacity of up to 128K bytes, handles up to 32 operator displays—*plus* dozens of additional downline displays in a multipoint network control mode—and can have a large peripheral equipment complement and local data base as well.

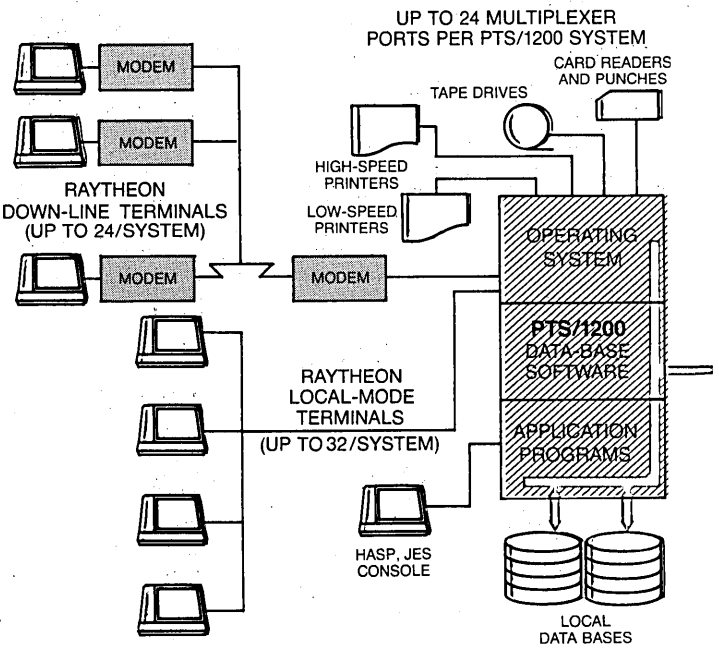
And the PTS/1200 operates in a fully compatible mode with IBM 3270 operator display devices. It not only emulates every 3270 function, but it performs total batch processing and spooling functions as well—simultaneously—and with no degradation in response times in either interactive or batch mode.

If you are waiting for the next 3270-type product to come on the market, wait no longer. For the PTS/1200 is far more powerful, cost efficient and adaptable—in a 3270 environment—than any product you can find today. And you can take delivery in just 30 days.

Look at what else the PTS/1200 can do for you:

- ✓ Operate in full 3270-compatible mode
- ✓ Control up to 32 operator displays
- ✓ Perform local batch processing concurrently with 3270 interactive processing
- ✓ Attach up to 24 peripheral devices
- ✓ Attach a large local data base
- ✓ Perform all 3270-type data entry tasks
- ✓ Perform all 3270-type inquiry/response tasks
- ✓ Operate as a HASP/JES workstation at the same time it is performing 3270 emulation
- ✓ Perform multiprogramming functions
- ✓ Control, in addition, a multipoint network of up to 24 terminals in 3270 mode.

Consider these five benefits, and you'll look a lot harder at the PTS/1200:



1 No Change To Host Processor

The PTS/1200 installs immediately within your existing network with no change required in your host CPU, in the 370X front-end, in your existing applications software, or in your Emulation Program. It goes to work under 3270 bisynch protocol the day you install it.

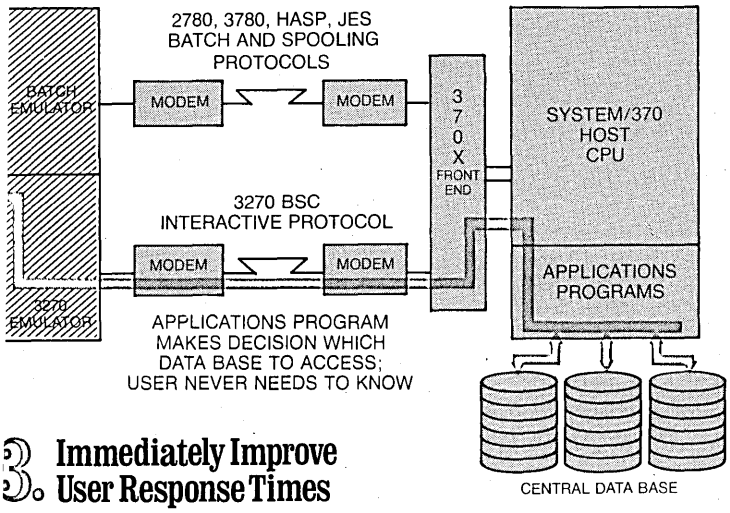
2 Cut Mainframe Overhead

The enormous power of the PTS/1200 permits you to develop and store local formats and perform advanced data editing prior to transmission to the host CPU. This one feature alone can reduce your mainframe overhead by 30 per cent or more. The PTS/1200, in addition, runs its own multipoint network of up to 24 Raytheon terminals in 3270 mode—saving even more CPU time.

ntelligent terminal system, t in just 30 days.

4. Reduce Communications Line Loading

With the PTS/1200, you perform a high percentage of the data entry and inquiry functions of a 3270 locally. In many cases, that can eliminate up to 90 per cent of the wasted communications overheads involved in polling, ACKing and NACKing, and in retransmitting. Your system becomes much more efficient in its use of communications lines.



3. Immediately Improve User Response Times

The busy times that often degrade each operator's response time from the host CPU disappear when you install a PTS/1200. Instead of operator waits of 20 or even 30 seconds when the network is busy, with the PTS/1200 the response is instantaneous for every operator, with every transaction. Multiply the number of operator stations by the number of messages by the average degradation delay and you get some feel for the productivity advantages that the PTS/1200's local format and data base storage features offer you.

☐ Tell me more about the PTS/1200. I am currently planning to develop _____ 3270-type links, with about _____ terminals, using Model _____ mainframe equipment.

☐ I need immediate delivery of _____ 3270 emulation terminals. Tell me how fast I can get them. We'll talk about PTS/1200 features later.

Name: _____

Title: _____

Company: _____

Street: _____

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State: _____ ZIP: _____

☐ I'm also interested in:
____ PTS-100 intelligent terminals
____ Raytheon's packet network systems
____ Your New OEM/Dealer Support program

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made available in sample quantities. (See Table 3.). So they are ahead for awhile.

CCD's sometimes lose to RAM's on the basis of speed. Charge-coupled devices are inherently slower because their internal structure consists of serial delay lines (shift registers). Data circulates continuously through the devices.

One of the key performance factors to understand about CCD's is that they are a combination of random access and serial access devices. It is possible to randomly access a block of data on a CCD, but then the block must be read out serially. (Often this is called block-oriented random access, and that is where the odd acronym BORAM comes from.)

The shift-register nature of the devices causes manufacturers to organize them in complicated ways in attempts to compensate for their slower access times. On the other hand, they do have fast shift rates and can transfer data serially at speeds around 5M bps. By paralleling the chips to construct wider paths, it is possible to move 2KB blocks of data in as little as 500usec. This is a respectable rate at which to feed a cpu. Some CCD systems are significantly faster. Fairchild offers an 8MB memory, for example, which has a transfer rate of 8MB—the whole thing can be flushed out in a second.

In addition to the three suppliers shown in Table 3, at least three computer manufacturers have produced CCD's in sample quantities. IBM is seriously investigating one for its memory paging unit; the objective would be to significantly reduce the overhead needed to support virtual storage paging. Honeywell has a 92Kbit CCD. Hewlett-Packard has made 64Kbit CCD parts to build a solid state replacement for a head-per-track disc; the product would exhibit the same performance as discs at projected price of 0.05¢ to 0.1¢ per bit.

Magnetic bubble devices

Bubble memory devices actually have become available only in the last year or two. Thus, evaluation and user acceptance have just begun, but there are high hopes for them.

Bubbles are different from semiconductor memories in that they are *magnetic* devices, where the absence or presence of a magnetic domain is the basis for a binary one or zero.

A magnetic "bubble" is in reality a cylindrical magnetic domain with a polarization opposite that of the magnetic film in which it is contained. These cylinders appear under a microscope as small circles—hence the name—with diameters measuring 2 to 20 microns (again, millionths of a meter). The size of a bubble is determined by the material characteristics and by the thickness of the magnetic film.

Bubbles are moved or circulated by establishing a magnetic field through a separate conductor mounted adjacent to the bubble chip. Still, a large portion of the bubble chip itself also must be given over to circuitry for generating, detecting, and annihilating the bubbles.

The first devices to be delivered with bubble memories were point-of-sale terminals built by Rockwell International. The firm's terminals contained eight 100Kbit chips on a small printed circuit card. Now Rockwell also will sell bubble memory subsystems built to user specifications, but refrains from selling the parts separately.

The other supplier of BMD devices is Texas Instruments. TI will sell the components individually (part number TBM 0103, with a guaranteed usable capacity of 92,304 bits) but also includes them in its latest terminal, the Model 765. The memory and its associated electronics contribute three pounds to the portable's total weight of 17 lbs, and are used in conjunction with TI's TMS 9900 microcomputer to provide 20,000 bytes of local storage (expandable to 80,000 bytes).

Table 4 shows the characteristics of these two current products. Both have been built for special applications, and that seems to be the consensus of how bubble devices will be evolving in the marketplace. Bubble memories are particularly well-suited to such applications because of their physical advantages (low power requirements and light weight) and speed advantage over electromechanical devices such as cassettes and floppies. Like their electromechanical counterparts, bubble devices also are nonvolatile—they retain their contents when the power goes off—and nondestructive in their readout operation.

> Rockwell has successfully tested a 1MB bubble chip in its labs.

BMD's can operate in an endless serial loop fashion or in an organization with bit-serial minor loops feeding major loop registers; in this respect they are similar to CCD's. Current typical data shift rates are 100 Kbps to 300K bps; and by paralleling or multiplexing, eight chips can transfer 1KB in less than 10msec.

In 1979, both Rockwell and TI plan to offer a 256K bit chip with a projected device price of 0.01¢ to 0.02¢ per bit, and both products will be organized into the major-minor loop arrangements for improved access times. By 1980, 1Mbit chips are projected (Rockwell has successfully operated one in its labs) with transfer rates of 1M bps. These would provide an order of magnitude faster transfer rates and would be better able to challenge head-per-track discs than can current bubble memories.

Electron beam accessed memories

There are presently no commercially available electron beam accessed memories; they have been made to work only in laboratory environments. This might suggest that the devices are brand new to the world, but that isn't the case at all. Some of the very first things called computers were equipped with cathode ray tube memories called "Williams Tubes" in honor of their inventor, Sir Frederic Williams. The crt devices were used on the early computers produced at Manchester Univ. In England and on Princeton's IAS—both of which appeared shortly after World War II, and on other early machines.

In the meantime, other technologies have taken precedence. Core memories, for instance, were seen as a great advance over the tubes.

Since their "demise," EBAM's have seen a great deal of improvement, if only in the labs. Access times for modern versions are typically 100usec (although it takes twice that long to switch over reading to writing or vice versa) and transfer rates are typically 10M bps (which is readily compatible with host computer channel rates).

Data is written onto a MOS storage chip (target) by means of an electron beam—either using a single tube or a configuration of parallel tubes where each holds one bit of a data word. The MOS target inside the tube stores the data as a positive charge in its silicon dioxide plane. Readout is accomplished by using a lower energy electron beam to interrogate each memory cell; the read beam causes a high or low current to flow off the target depending on whether a "1" or "0" was stored in that cell.

The tube memories are generally used in a block-oriented random access fashion, as CCD's and bubbles are. They are nonvolatile, but have a semidestructive read operation, that is, the contents must be rewritten after several reads.

Multiple tubes could be ganged together to achieve a highly effective system in terms of cost and performance. The resulting memory would still have a fast access time (on the order of 10 to 20usec), but the cost per bit would drop substantially over that of single tubes. However, the implications of

paralleling and multiplexing data onto and off the multiple tubes remains to be solved in terms of data base management techniques for the host cpu. Problems also remain with tube wear, alignment, and maintenance.

Two companies are actively pursuing the development of EBAM. General Electric is being federally funded to develop the electron tube, a matrix lens, a deflection system, and an MOS (that's right, an MOS) target as the storage medium. GE has brought the size for a single addressable spot on the target down to the one or two micron range, which yields a device capacity in the neighborhood of 32M to 100M bits.

The other company is Microbit Corp., which is being financed by a consortium including Control Data and Amdahl Corp. Microbit is using a storage tube directly derived from the old Williams tube.

For all its apparent age, EBAM technology remains immature. Its investigators feel they can wring 100 times more capacity from it. This may not happen very soon, but it's interesting to know that when it does happen the government and some big computer companies will be right on it. Their interest also ensures that the technology has a good chance of seeing that further development.

Head-per-track discs

The fastest growing markets for head-per-track discs are in message storing and in recording data formats for larger capacity discs. In both of these applications, fast access and nonvolatility is of prime importance. These two account for approximately 30% of the head-per-track disc sales in 1977; the other 70% is spread among minicomputer storage and use in ruggedized or special-purpose applications. Ten years ago, the process control industry was the largest single user; today that industry remains a big user, but not as big as it was.

Typical 64Kbit CCDs

Manufacturer & Part Number	Fairchild CCD 464	TI TMS 3064 JL	Intel 2464
Organization (loops x bits)	16 x 4K	16 x 4K	256 x 256 x 1
Access Time	500usec (½ x 4K @ 4MHz)	820usec (4K @ 5MHz)	256usec (256 bits @ 1MHz)
Bit Transfer Rate	1-5MHz	1-5MHz	250KHz-2.5MHz
Density (bits/in²)	1.68 x 10^6	1.52 x 10^6	not available
Operate Power/ Standby Power	400/70mw	260/50mw	400/60mw
Approximate Oem Price (samples)	$65	$65	not available
Oem Price/bit	0.1¢/bit	0.1¢/bit	not available

Table 3. Charge-coupled devices presently available vary in a number of significant ways, including in their operating modes, number of off-chip clocks required, and other technical factors. Although they do not require "refreshing" as such, their contents are continually circulated and will be lost if the standby power is lost.

Products with Bubble Memory

Manufacturer & Model	Rockwell POS/8 Terminal	TI Model 765 Terminal
Organization	Endless loop	Major-minor loop
Average Access Time	0.5sec	4msec
Transfer Rate	100KB	50KB
Total Capacity	819,200 bits	160,000 bits
Capacity/Chip	102,400 bits	92,304 bits
Bubble Size	4 microns	5 microns
Operate Power	30 watts per system	0.5 watts per chip
End User Price	$8,000	$1,995
End User System Price per bit	0.97¢/bit	1.2¢/bit (includes micro)
Oem Device Price per bit	not offered	0.2¢/bit

Table 4. In both products, the bubble memory is used for local storage; and in both cases the memory adds only a few pounds to the weight of the terminal. Like CCDs, the bubble devices continually recirculate their contents, but they are more useful than CCDs for products such as those above since they don't lose their contents when the power is off.

Head-per-track discs have fast access times for electromechanical gear, primarily because no time is spent in moving the read head over the track, but also because the discs can be spun faster in these subsystems. Typical units have access times of 8.5 to 17msec, and store between 4MB and 32MB of data.

They can be pushed much faster, however. For example, the IBM 2305, which was introduced in the mid-'60s, cut its average access time down to about 2.5msec by spinning the disc at 6,000 rpm. That unit has since been dropped and most head-per-track discs with IBM labels now appear as optional features in the 3350—where the fixed-head part provides 0.5MB to 1.0MB for data formats for the moving-head part.

The trend away from operator removable packs will continue.

Table 6 presents typical units from four manufacturers.

Through the years fixed-head discs have benefited from the recording density and track density improvements made for moving-head discs. To those advantages they have added their own, such as sealed cases, to bring reliability levels up as high as 8,800 hours (about a full year) between failures.

Secondary Memory

"Winchester" discs

Many improvements in disc memories have been made in the 1970s. This brief treatment allows us to update only the major trends, obviously not all the new developments. And of the major trends, two are most significant: the "Winchester" developments of the data module (where the read/write heads are made integral to the disc pack), and of the large fixed disc pack drives with capacities of 300MB or more. (Tables 5 and 7 compare units of each kind.)

Functionally, discs have always had the advantage of immediate playback, immediate reuse, and long-term storage. An equally important quality is reliability, and thus the trend has been away from operator removable packs as capacity has increased. Controlled environments—controlled in the fixed-head disc sense of "sealed"—always lead to fewer problems, and that's the direction we are heading. In turn, controlled environments argue against operator removability.

IBM's "data module" with integral heads, media, and spindle was a big step in this direction. Others have gone even further. Memorex sells a similar unit called the Data Mark Module which differs from IBM's in having the rotation mechanism and actuator coil

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in the pack as well.

We may see a good deal more of this, as the higher densities seem to demand it, and the higher densities are coming along quickly.

The IBM 3330 announcement in 1970 ushered the user into the era of the 100MB disc pack drive, but its supremacy was short-lived. Now the IBM 3350 and others like it provide 300MB of random access storage in a pack not all that much bigger than a breadbox. (Somewhere along the way the breadbox seems to have disappeared too; are they still made?)

Improved performance features have been every bit as significant as the improved capacities. Rotational position sensing has freed the disc controller and channel for other functions during seek time and during part of the rotational delay time. The ability to queue channel command sequences (which appeared as part of the block multiplexing capability) also allows for more efficient operation, although it's as much a channel feature as a disc subsystem feature. New automatic error detection, correction, and recovery abilities built into disc controllers are of great benefit as well.

Part of the benefits have been in storage costs too, as any increase in density implies. For example, the IBM 3350 controller can handle 16 on-line dual-spindle drives for a total capacity of 10 billion bytes at a price of 0.001¢ per bit. This price betters that of on-line 6250 bpi tape storage, and the random access capability comes "free" in the comparison. Further improvements in recording density are expected to take the disc to 10^7 or 10^8 bits per square inch by 1980.

(For more specific information on this aspect of secondary memory, see "Comparing Disc Technologies" in this issue.)

Magnetic tape units

Half-inch tape has been the industry standard since it was first commercially used in 1953. At that time it may have been metallic foil tape, rather than mylar, but it worked much the same. Performance and capacity improved by several orders of magnitude over the years. Then came the single-capstan drive to improve startup speeds and reliability. Now users are also accustomed to vacuum column drives with such nice features as automatic hub engagement, cartridge loading, and automatic threading.

The newest capability shows up in the 6,250 bpi tape drives introduced in 1974. At that recording density (6,250 bits per inch per track times nine tracks), a 2,400-foot reel could theoretically hold approximately 1 billion bits. The per-bit price for the media is 10^{-6} cents or 0.000001 cents/bit. On-line storage costs, including the controller and drives, raise that to between 0.001 and 0.003 cents/bit. 6,250 bpi drives are expensive.

A new "Group-Coded Record" code is used for recording, where every eighth byte is given over to error checking.In conjunction with the one parity bit for every 8-bit character, this allows for detecting and correcting all single-track errors (they don't even have to be single-bit errors). GCR offers *(Tables 6, 7 and 8, p. 124; text continues p. 129.)*

Typical "Data Module" Disc Systems

Manufacturer & Model	IBM 3340	Memorex 601 (OEM)
Spindle Capacity	69.9MB	75MB
Maximum System	559.1MB	600MB
Access Time	25msec	32msec
Transfer Rate	885KB	885KB
Number of Surfaces	12 sides	6 sides
Number of Tracks	696 tracks	700 tracks
Bytes/Track	8,368 bytes	17,900 bytes
Optional Head per Track	502KB	500KB or 1MB
End User Price per Drive	$25,200 (2-spindles)	$10,000 (1-spindle)
End User Controller Price	$39,420	$11,750
Maximum Drives	4 dual-spindle	8 single-spindle
End User System Price per bit (Maximum System)	0.0034¢/bit	0.0018¢/bit

Table 5. Memorex includes the rotation mechanism and arm actuator coil in its "module." In other respects the two units are similar, except for the fact that IBM puts two spindles in one drive box and Memorex thus requires twice the number of boxes. Also important to the comparison is that the IBM unit is built to interface an IBM 370 while the Memorex device is shown with an interface for a DEC PDP-11.

Typical Head Per Track Discs

Manufacturer & Model	Alpha Data 80-512	Amcomp 8530/256	DDC 8408-8	DDC 9113-H-16	DDC 750-256
Capacity	76.8M bits	76.8M bits	76.8M bits	153.6M bits	38.4M bits
Access Time	8.5msec	8.3msec	8.5msec	17msec	8.5msec
Transfer Rate	8Mbps	9.0Mbps	8.8Mbps	4.4Mbps	9.0Mbps
Number of Surfaces	4 sides	4 sides	8 sides	16 sides	2 sides
Tracks/Surface	128	128 tracks	64	64	128 tracks
Bits/Track	150K bits	150K bits	150K bits	150K bits	150K bits
Density	6,200bpi	7.5Kbpi	5,000bpi	5,000bpi	6,000bpi
Track Density	57tpi	55tpi	40tpi	40tpi	66tpi
End User Price (no controller)	$18,725	$21,260	$26,200	$64,000	$13,125
Controller Interface	$2,500	$4,850	$2,500	$2,500	$3,950
End User System Price per bit	0.03¢/bit	0.03¢/bit	0.04¢/bit	0.04¢/bit	0.045¢/bit

Table 6. Head per track discs are coming under increased competitive pressure from moving-head discs, charge-coupled devices, and bubble memories; but there are applications where they do very well in that competition. The units above employ approximately 12-inch discs coated with Nickel-Cobalt, and represent only a few ways the devices can be configured.

Typical Large Disc Systems

Manufacturer & Model	Control Data 819-1	Control Data 33801 A2	IBM 3350 A-2	STC 8350-A2	STC 8800	Telex 6316-2
Spindle Capacity	413M chars	400MB	317MB	317MB	200MB	317.5MB
Maximum System	4.8B bits	12.8B bytes	10.1B bytes	10.1B bytes	6.4B bytes	5.1B bytes
Access Time	58.3msec	33.4msec	33.4msec	33.4msec	38.4msec	33.4msec
Transfer Rate	38.7Mbps	1.2MB	1.2MB	1.2MB	806KB	1.2MB
Number of Surfaces	40 sides	19 sides	30 sides	30 sides	114 sides	19 sides
Number of Tracks	404 tracks	808 tracks	555 tracks	555 tracks	552 tracks	885 tracks
Bytes/Track	25,600 chars	13,030 bytes	19,069 bytes	19,069 bytes	13,030 bytes	19,069 bytes
Maximum Bytes Without Arm Movement	6.8M chars	2.5MB	572,070 bytes	572,070 bytes	1.5MB	362,311 bytes
End User Price Per Drive	$63,000 1-spindle	$47,100 2-spindles	$62,500 2-spindles	$61,250 2-spindles	$55,440 4-spindles	$16,000 1-spindle
End User Price Controller	$190,000	$54,250	$103,400	$86,720	$70,540	$38,000
Maximum Drives	2 drives (2 spindles)	16 drives (32 spindles)	16 drives (32 spindles)	16 drives (32 spindles)	8 drives (32 spindles)	16 drives (16 spindles)
End User System Price per bit (Maximum System)	0.0066¢/bit	0.0007¢/bit	0.0014¢/bit	0.0011¢/bit	0.0010¢/bit	0.0007¢/bit

Table 7. These are typical of drives with over 300MB per spindle. All shown here are fixed or sealed module drives, except for the Telex unit which uses a 12-disc pack. (Note that although maximum configuration systems are used for comparing prices on a per bit basis, it may not be at all realistic to configure a working system that way.)

Other units available are the Ampex 9300, CalComp Trident T-300 disc pack drives, and the fixed disc Memorex 3650.

Typical 6250bpi Magnetic Tape Units

Manufacturer & Model	Control Data 679-5	Control Data 679-6	Control Data 679-7	IBM 3420-4	IBM 3420-6	IBM 3420-8	STC 3670	Telex 6420-44	Telex 6420-66
Tape Speed	100ips	150ips	200ips	75ips	125ips	200ips	200ips	75ips	125ips
Transfer Rate	625KB	937KB	1250KB	470KB	780KB	1250KB	1250KB	470KB	780KB
End User Price Per Drive	$25,500	$28,800	$30,600	$21,960	$25,650	$28,440	$30,120	$13,000	$14,000
End User Price Controller	$42,300	$42,300	$42,300	$39,420	$39,420	$39,420	$38,635	$18,000	$18,000
Maximum Drives	8 drives	8 drives	8 drives	8 drives	8 drives	8 drives	8 drives	8 drives	8 drives
End User System Price per bit (Maximum System)	0.003¢/bit	0.003¢/bit	0.004¢/bit	0.003¢/bit	0.003¢/bit	0.003¢/bit	0.003¢/bit	0.002¢/bit	0.002¢/bit

Table 8. Most of the features of these drives are identical, including: 6250 bpi GCR recording, 9-tracks, automatic loading and threading, 0.3 inch interblock gap (compared to 0.6 inch on older drives), and 125MB useful capacity per 2,400 foot reel (assuming 4,000 byte records).

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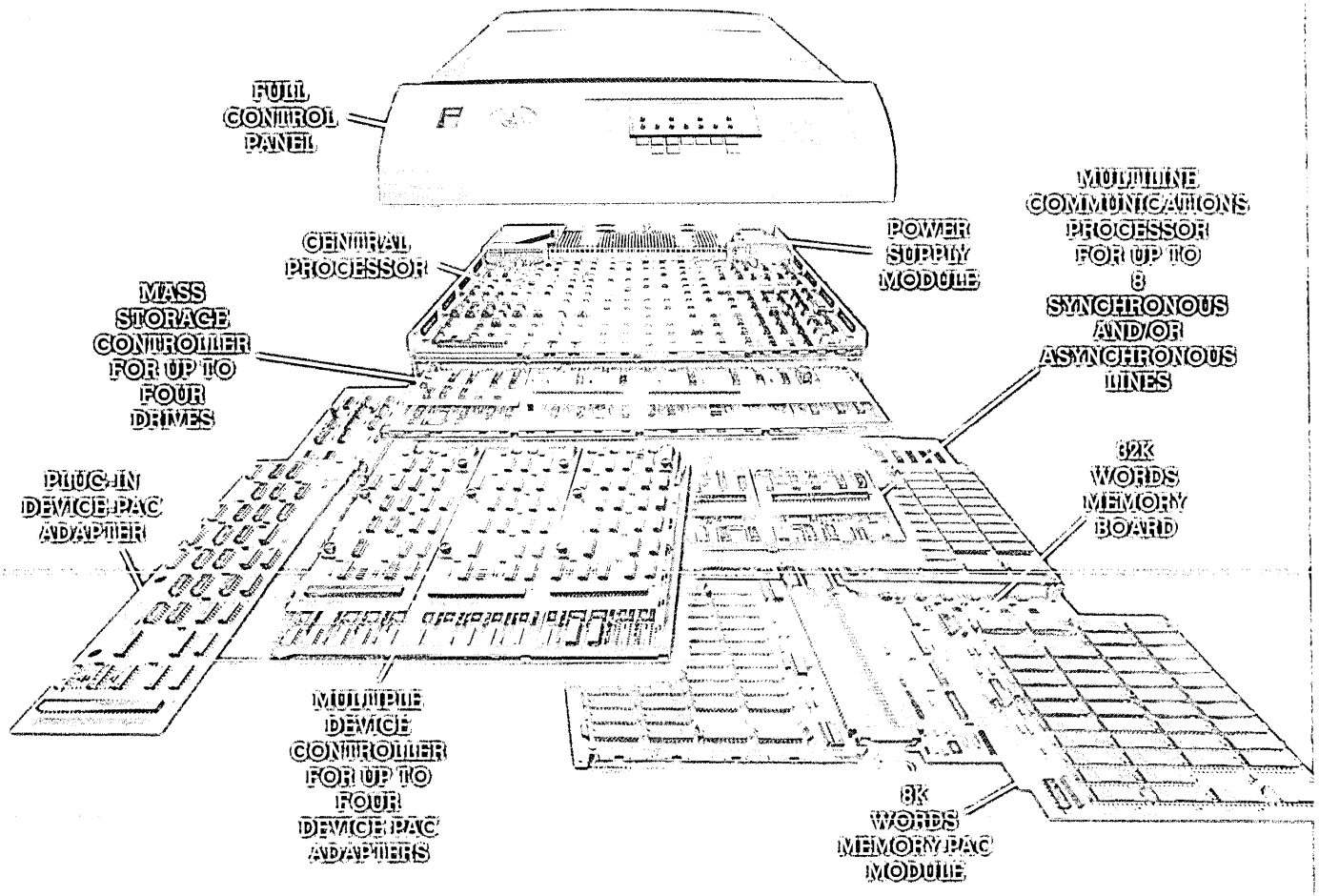

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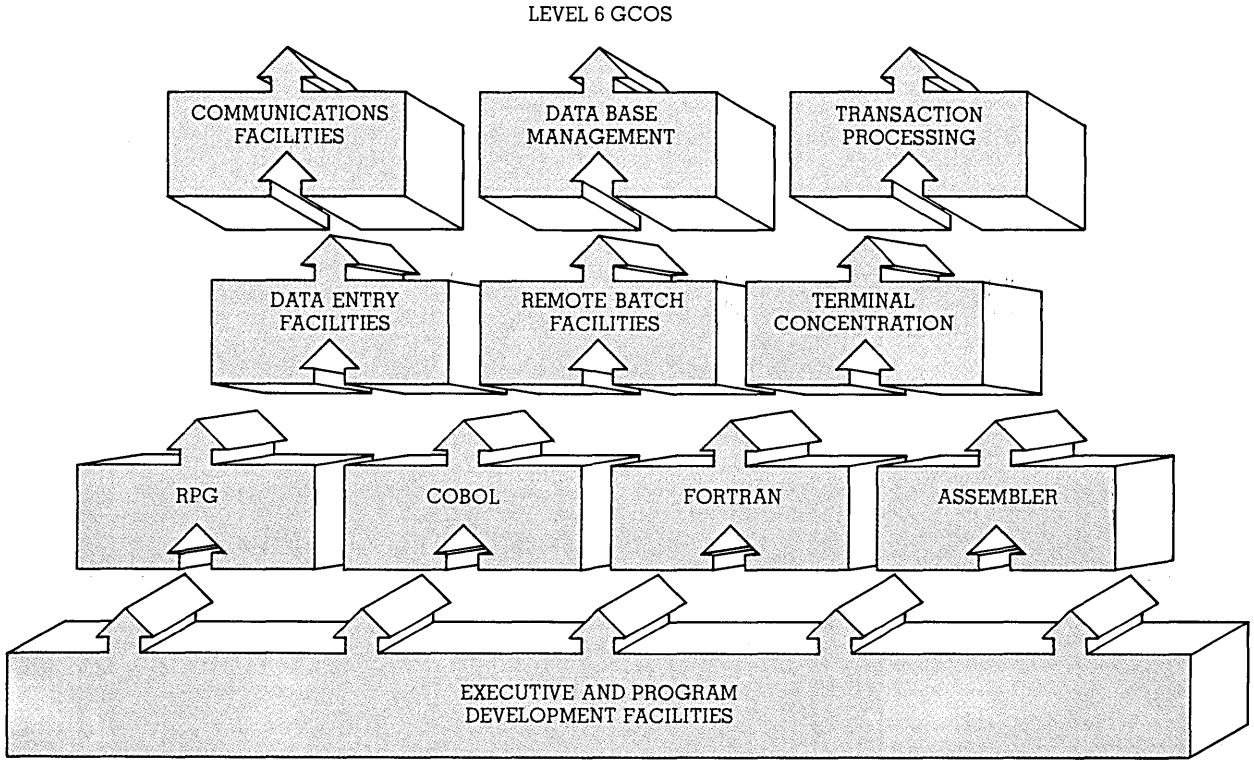

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inherently greater reliability, but it also requires a good deal more complex circuitry.

This doesn't mean that the older NRZI phase-encoded recording will immediately die, however. Since so many tapes are already recorded with that, the GCR/phase-encoded combination drives—rather than straight GCR drives—will have a steady growth over what's left of the 1970s.

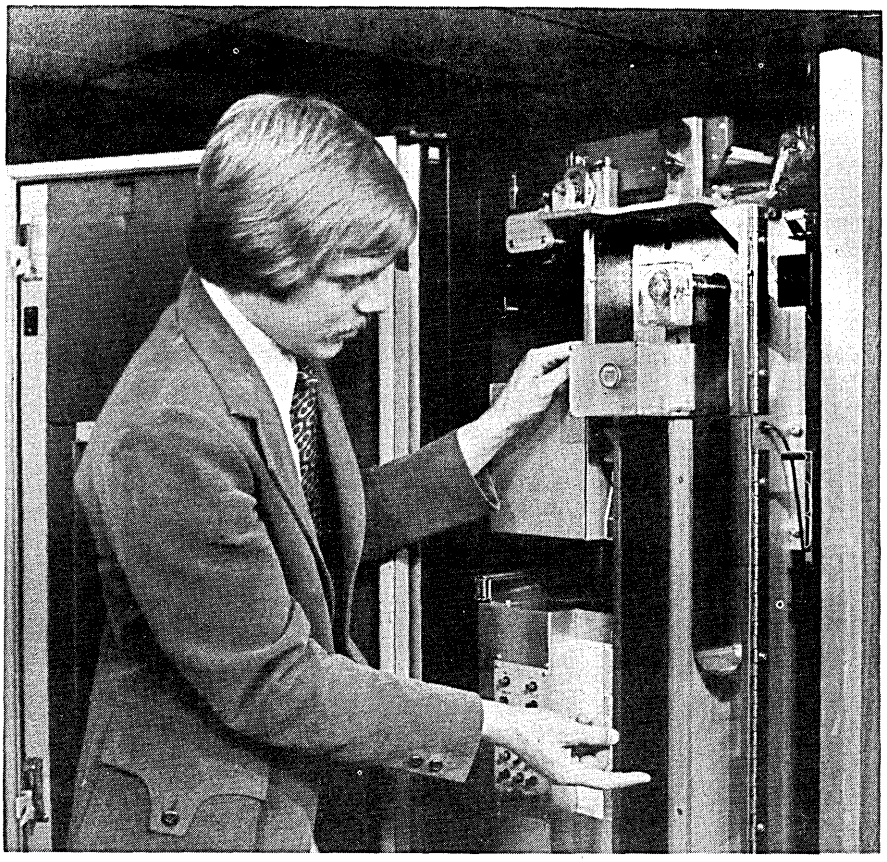
Mass Storage Systems

Delivered mass storage systems are few and far between. We have surveyed the four latest kinds delivered but have not included others that were built and installed in the 1950s or 1960s. (See Table 10 for some of those units *not* included in this article.)

Magnetic tape storage costs approximately 0.000001 cents per bit, off-line.

In different ways, these units combine the inexpensive cost of tape as a storage medium with the operating advantages of semi-random on-line access. Table 9 compares the characteristics of the CalComp 7110, the CDC 38500, IBM 3850, and Systems Development Corp./Ampex TBM.

The main objective in the IBM and CDC short tape cartridge systems is to improve access time; that is, the shorter the tape, (770 inches versus 2,400 feet) the better the access time. Operationally, the IBM and CDC cartridge tape systems and the CalComp tape library have experienced from 100 to a peak of 300 cartridge or tape loads per hour. The more obvious use of these first three (which are sometimes called automated tape libraries) is to eliminate manual tape mounting operations.



Both the IBM 3850 and Control Data 38500 mass memory systems are basically tape libraries. Although each has mechanisms for storing and retrieving cartridges, within the cartridges there is 3-inch wide magnetic tape. As shown in the CDC photo above, the tape is removed from the cartridges and then read or written in a conventional manner.

The CalComp 7110 is a fully automated on-line tape library for standard half-inch magnetic tapes. Under computer control the 7110 equipment automatically brings the tapes from storage, mounts them on tape drives, dismounts them when the job is completed, and returns them to storage. The 7110 can store up to 7,000 standard tapes or 8,000 thin line reels in a lockable self-contained library that can service up to 32 tape drives and which can interface up to four cpu's. The

Mass Storage Systems

Manufacturer & Model	CalComp 7110	Control Data 38500	IBM 3850	SDC/Ampex TBM
Maximum Capacity	8×10^{12}bits	2.4×10^{11}bits	3.8×10^{12}bits	2.9×10^{12}bits
Media	½-inch tape	tape cartridge	tape cartridge	videotape
Number of Media Units	8,000 tapes	2,000 cartridges	9,500 cartridges	one per drive
Capacity/Unit	10^9bits/tape	8MB/cartridge	50MB/cartridge	45×10^9bits/tape
Media Size	½" x 2400'	2.7" x 150"	3" x 770"	2" x 3800'
Access Time	10sec	7sec	15sec	15sec
Transfer Rate	1.2MB	806KB-983KB	806KB	700KB
Typical Throughput	150 reels/hour	200 files/hour	100 files/hour	150 files/hour
Maximum Drives	32 drives	1 drive	2 drives	32 drives
Typical End User System Price	$929,360	$626,200	$496,050	$1,154,000
Capacity of System Priced	6.1×10^{12}bits (32 drives)	2.4×10^{11}bits (1 drive)	2.8×10^{11}bits (2 drives)	1.8×10^{11}bits (4 drives)
End User Price per bit	0.00002¢/bit	0.00026¢/bit	0.00017¢/bit	0.00064¢/bit

Table 9. Far more kinds of mass storage systems have been announced than have been delivered. Far more have probably been delivered than have worked effectively, too. Note that the cost of the media becomes important in these products, since there may be so many units of media involved.

product has the lowest price per bit of the three systems and can interface with almost any brand of computer system, although the software supplied is strictly for IBM machines. That software provides data base management below the specific tape number to the data set.

The IBM 3850 mass storage system uses a new storage component called a data cartridge. Housed in a honeycomb storage compartment, these 2 x 4 inch plastic cartridges can each hold up to 50MB of information on 770 inches of approximately three-inch wide magnetic tape. Whenever information from a cartridge is needed by the computer, a mechanical mechanism selects the desired cartridge and transports it to one of up to eight reading stations. There the data is read out and transferred to the staging disc drives. (These discs must be dedicated to the task.) The IBM's 3850 cartridge cannot be manually loaded and, therefore, there are two tape selection mechanisms for better operational availability. The CDC 38500 and CalComp 7110 *can* be manually loaded.

The CDC 38500 uses similar cylindrical data cartridges which can each hold up to 8MB of data on 150 inches of 2.7-inch tape. The unit has a faster access time and a faster data transfer rate than the IBM 3850 because CDC's longitudinal recording requires less data correction redundancy than IBM's helical recording. CDC has the option of using either a staging disc or reading directly from the read station to the cpu, and thus can mix staging data files and others on one disc.

The Systems Development Corp./Ampex TBM (Terabit Memory) takes advantage of videotape recording technology and Ampex' expertise in this field. In development since 1966, the first system was installed in 1972. The TBM is very similar to the magnetic tape systems discussed earlier, except that it is written onto and read from magnetic videotape achieving much higher densities. For example, the floor space required for the Terabit is 112 square feet versus the 2100 square feet which would be required for 220 Model 1 IBM 3330s with the equivalent bit capacity.

TBM records digital data on two-inch wide tape, 3,800 feet long. Data is encoded with frequency modulation of a 6.25MHz carrier and recorded on magnetic tracks which are transverse to the longitudinal tape movement by transducers mounted on a rotating drum. During read/write operations, the longitudinal tape speed is 5.17ips and during search mode, the speed is

Other Mass Memory Technologies

Memory System/Technology	Reason for Exclusion
Ampex Magneto Optic Tape	Being pursued in research lab.
Ampex Hologram	Being pursued in research lab.
Cambridge Memories Domain Tip Devices—DOT	Not being actively pursued.
Digital Recording Corp. Optical System for Video Storage	Read/write system development needed, also further development on photographic medium.
Electronic Systems and Technology Corp. (Formerly EPSCO, before that CBS Labs.) Electron Beam, Silicon Dioxide Drum	Not actively funded.
Grumman Mass Tape	Disbanded effort. One internal unit built. No replacement product.
Harris HR/MR Model 2 (Human Readable/Machine Readable)	Holographic recording on film; not erasable. One installation.
Holofile Industries Ltd.	Access system not developed.
IBM 1360 Film Photostore IBM 2321 Magnetic Data Cell	No longer in production and maintenance service discontinued.
3M Laser Beam Recorder	Microfiche with no digital readout.
Phillips Video Tape/Disc	Read-Only Memory.
Precision Instruments Corp. (Unicon 690 and Model 190)	Laser/optical recording on film strip; not erasable. One of each delivered.

Table 10

Memory Products Vendor Index

For more information about the products mentioned in this feature, contact the vendors listed below or circle the appropriate number on the reader service card bound into this issue.

Alpha Data Inc.
20750 Marilla Street
Chatsworth, CA 91311
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Amcomp
(Subs. of Datapoint Corp.)
686 W. Maude Avenue
Sunnyvale, CA 94086
CIRCLE 321 ON READER CARD

American Microsystems, Inc.
3800 Homestead Road
Santa Clara, CA 95051
CIRCLE 322 ON READER CARD

BASF Systems
(Div. of BASF Wyandotte Corp.)
Crosby Drive
Bedford, MA 01730
CIRCLE 323 ON READER CARD

California Computer Products, Inc. (CalComp)
2411 W. La Palma Avenue
Anaheim, CA 92801
CIRCLE 324 ON READER CARD

Control Data Corp.
Box "O"
Minneapolis, MN 55440
CIRCLE 325 ON READER CARD

Digital Development Corp. (DDC)
8615 Balboa Avenue
San Diego, CA 92123
CIRCLE 326 ON READER CARD

Fairchild Camera & Instrument Corp.
464 Ellis Street
Mountain View, CA 94042
CIRCLE 327 ON READER CARD

Harris Semiconductor Inc.
Div. of Harris Corp.
Box 883
Melbourne, FL 32901
CIRCLE 328 ON READER CARD

IBM Corp.
Data Processing Div.
1133 Westchester Avenue
White Plains, NY 10604
CIRCLE 329 ON READER CARD

Intel Corp.
3065 Bowers Avenue
Santa Clara, CA 95051
CIRCLE 330 ON READER CARD

Memorex Corp.
OEM Division
San Tomas at Central Expressway
Santa Clara, CA 95052
CIRCLE 331 ON READER CARD

Mostek Corp.
1215 W. Crosby Road
Carrollton, TX 75006
CIRCLE 332 ON READER CARD

Rockwell International
Bubble Memory Marketing
3370 Miraloma Avenue
Anaheim, CA 92803
CIRCLE 333 ON READER CARD

SDC/Ampex Corp.
1020 Kifer Road
Sunnyvale, CA 94086
CIRCLE 334 ON READER CARD

Signetics Corp.
811 E. Argues Avenue
Sunnyvale, CA 94086
CIRCLE 335 ON READER CARD

Storage Technology Corp. (STC)
2270 S. 88th Street
Louisville, CO 80027
CIRCLE 336 ON READER CARD

Telex Computer Products Inc.
6422 E. 41st Street
Tulsa, OK 74135
CIRCLE 337 ON READER CARD

Texas Instruments Inc.
Box 5012
Dallas, TX 75222
CIRCLE 338 ON READER CARD

1,000ips. The unit has a minimum capacity of 9×10^{10} bits and a maximum capacity of 2.94×10^{12} bits. Its output also can be staged onto discs.

As may have been suspected, the number of installations of each device tells its own story. While over 100 IBM 3850s have been installed, only four of the similar CDC 38500s have. Perhaps

Over 100 IBM 3850s have been installed, versus only four for the CDC 38500.

for different reasons, CalComp has placed over 30 of its tape libraries in the field, compared to four of the more exotic SDC/Ampex Terabits.

Conclusions

There continues to be a great deal of activity in memory development. New limits to available technologies appear in rapid succession as designers clear one hurdle after another. Just when one technology seems to have reached its final maturation, it changes. Technologies once presumed dead suddenly show new life. One technology will achieve a technical breakthrough only to find that its target has moved.

Still the search for "that one form of memory, both fast and inexpensive" goes on like a pursuit for a new Holy Grail. Like that earlier pursuit, the search is not without its rewards. Each year we can pack more data into less space and at lower cost. Each year applications become feasible that once were prohibited by constraints of price or speed or size. In the end the benefits outweigh the efforts invested to attain them, and that makes it all worthwhile. ❋

Mr. Theis is the manager of the computer applications section at Aerospace Corp., where his responsibilities include hardware and software evaluation, especially for real-time systems. He has been a senior associate for Hobbs Associates, a senior engineer with North American on the Apollo project, and a frequent contributor to Datamation.

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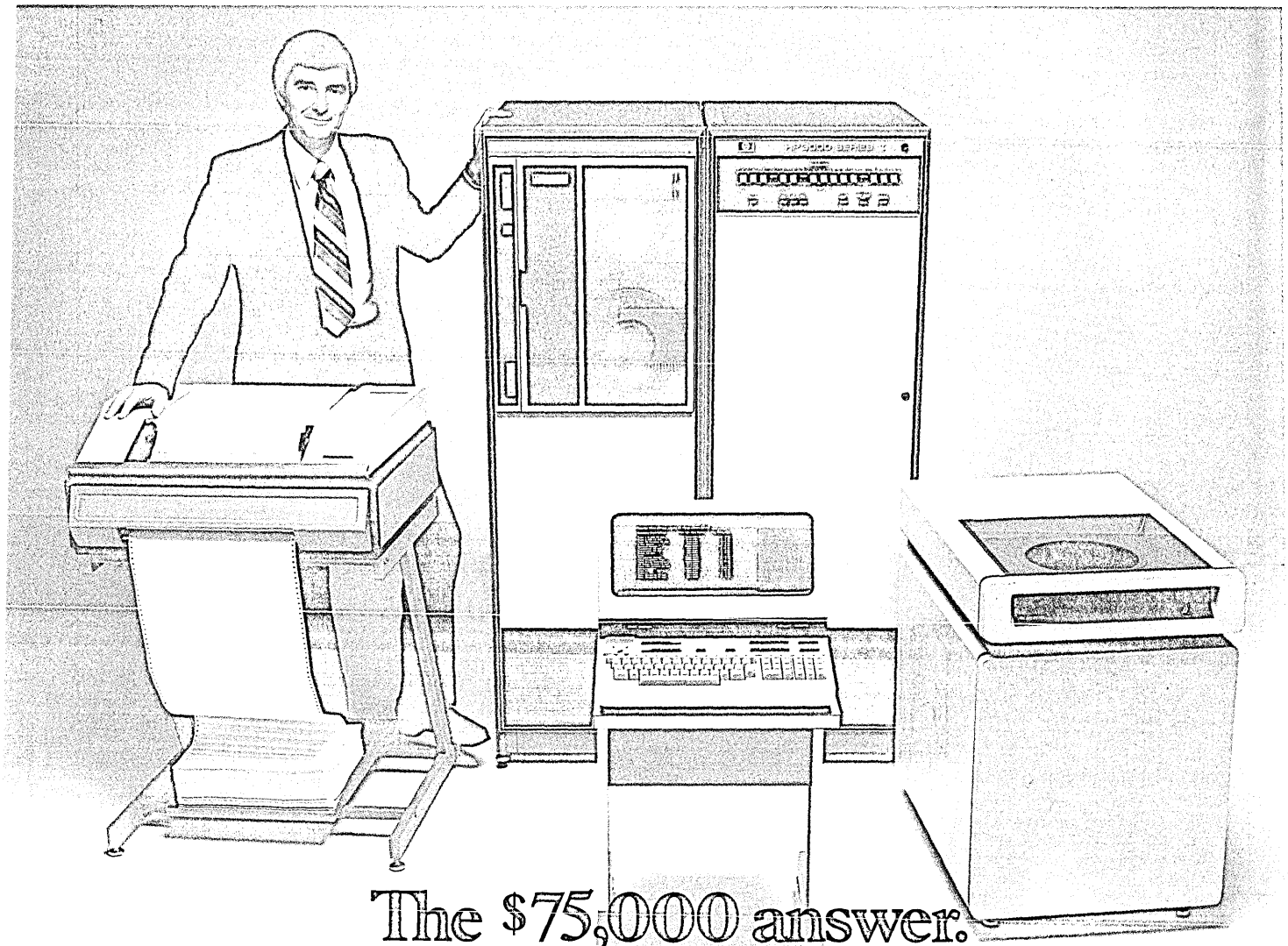

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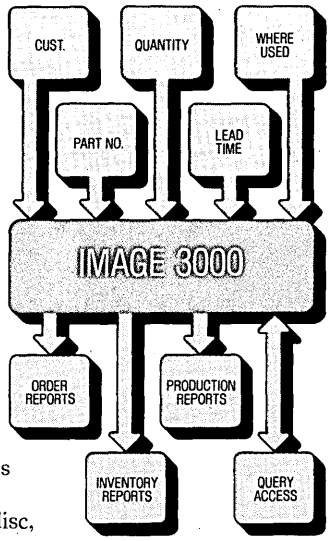
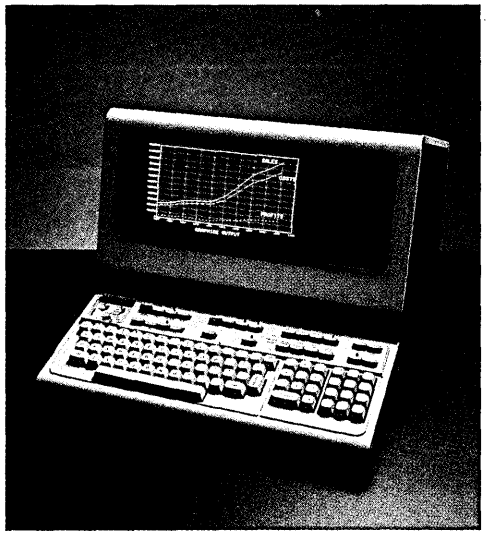
*U.S. domestic price for HP 3000 Series I. Optional equipment at additional cost.

by batch alone.

1.



2.



Two major features put the HP 3000 in a class by itself. The first is our state-of-the-art operating system, a Multiprogramming Executive that can manage a vast workload extremely fast. When we clocked one second of MPE activity, it handled 2,280,000 micro instructions in the central processor, 14 file accesses, seven input swaps and five output swaps.

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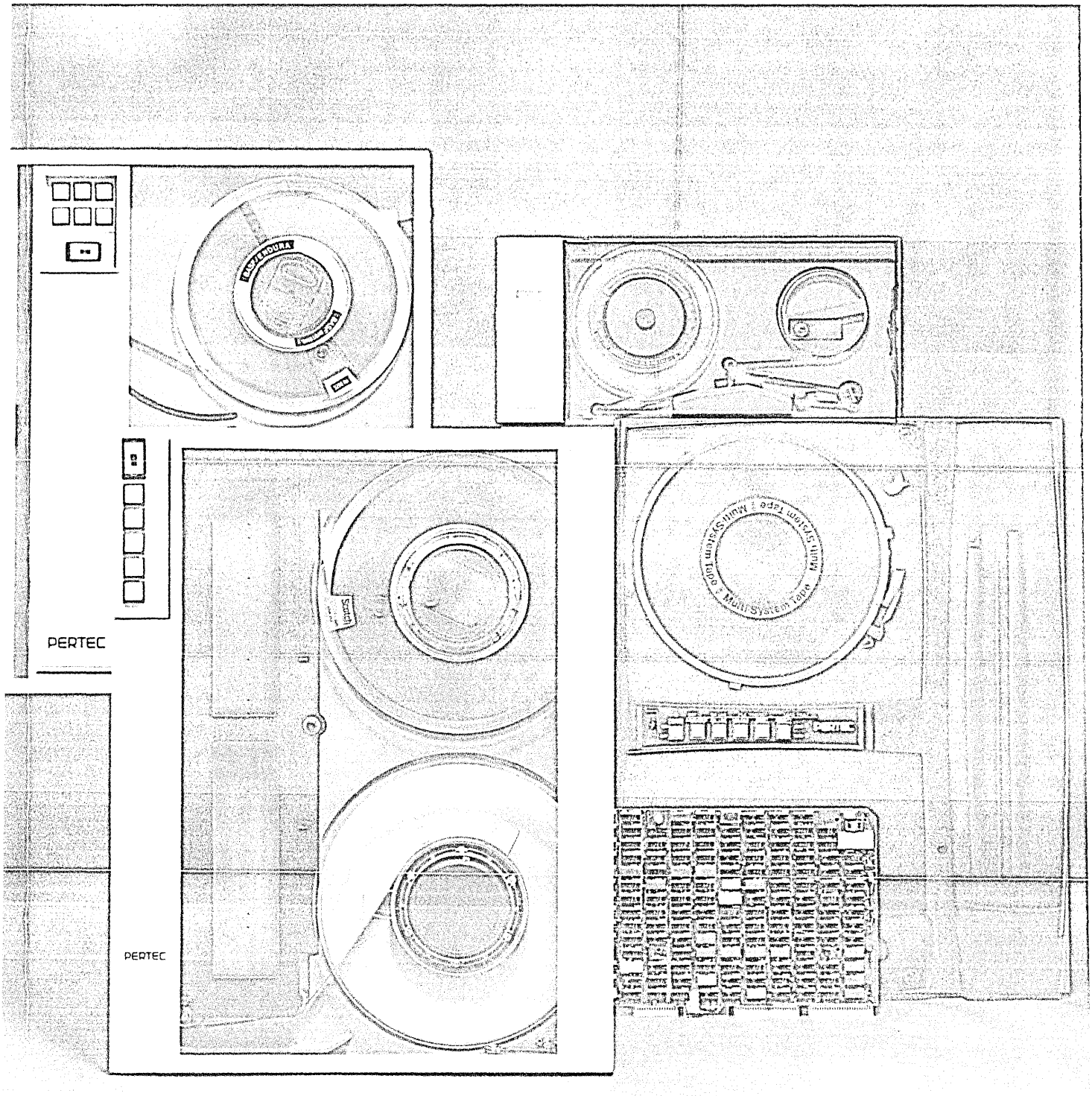

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CIRCLE 20 ON READER CARD

Comparing Disc Technologies

by Rick Brechtlein

The Winchester succeeded the 3330 which succeeded the 2314. Each generation brought major improvements, but still it can be tough to choose between them.

In the beginning—a decade ago—there was *the* disc, a dramatic improvement over the magnetic drum and tape.

Today, after step-function advances in performance, reliability, and capacity, at least *three* separate disc technologies have evolved. Every system designer and dp manager is now faced with a series of difficult choices and decisions. Which technology is best for a particular application? How will this decision affect the future capabilities of the system? What industry trends will influence next year's decisions?

The situation is complicated by the fact that there are dozens of disc equipment sources, all with varying degrees of systems responsibility. There are manufacturers which specialize in disc drives, others in disc media, and others in disc controllers. There are computer manufacturers which make their own disc drives and controllers, and disc companies which make computers.

The confusion is compounded by similar sounding model numbers, and terminology that means different things depending on the source. "Plug-compatibility" blurs the distinctiveness of each company's offerings. But through the fog, the three main levels of technical advancement can still be discerned.

We can label the three major technologies with identifying tags, based on their IBM origins:

- "2314" technology became the industry standard in the mid-1960s.
- "3330" technology arrived at the turn of the decade, and represented major advances in both performance and potential capacity.
- "Winchester" technology, introduced in the early 1970s, took the next logical steps forward—and one step backwards.

The IBM numbers refer to specific disc drives, with set numbers of platters and heads, etc. Here the numbers are used instead to identify the recording technology, including the type of head and positioning mechanism, bit densities, track densities, and such, but not specific drives. It's possible, for instance, to use "3330" technology on a single-platter disc cartridge, even though IBM did not promote it that way. The point is that in ten years or so we have made three major advances in these technologies.

The computer industry has long been accustomed to this rapid advancement and obsolescence. Processor hardware has progressed through successive "generations," starting with discrete components and advancing through IC's, MSI's and LSI's. Each generation has obsoleted and substantially replaced the preceding state of the art equipment.

It would seem that the older 2314 technology would be more appropriate for a vintage computer than a Winchester. Often the reverse is true.

Disc drives have not followed this pattern. Instead, both old and new technologies are flourishing simultaneously. At Telefile Computer Products, for example, we use all three types of discs, for reasons that often seem contradictory. (We don't build the discs, but we do buy them for upgrading existing computer installations.) While it would seem logical that the older 2314 technology would be most appropriate for enhancing a vintage computer and Winchester discs for a more recent processor, often as not, the reverse is true. Each technology has its advantages and disadvantages. The application, not the age of the processor, is the determining factor.

Extension of main memory

A similar old-and-new situation exists with add-on memories. Again, our firm finds itself supplying both core and semiconductor memories as enhancement products. Both technologies have their place, depending on the application.

The similarity between discs and memories is more than coincidence. Disc systems are, in effect, a special type of add-on memory. Like memory modules, they can directly affect the performance, throughput, and reliability of a computer installation. Printers, terminals, and tape readers can crash without disabling the computer, but the failure of a disc can be a disaster.

Most operating systems, for example, now depend on discs for mass storage. In fact, at least a portion of the operating system itself is normally disc resident. The same is true of application-program overlays, assemblers, compilers, and all frequently referenced tables and data files. When the disc is down, the computer is down.

This critical memory extension role accounts for the rapid evolution of disc technology. In fact, the principal design objectives have been identical to those affecting the main memory itself: increased capacity, faster access time, absolute reliability, and of course, lower cost.

All these must be achieved, however, with a device that has an inherent

weakness. Discs have all but replaced magnetic tape transports as system mass storage mechanisms, except when the processing of sequential data makes tape an economical alternative. Yet, like its predecessor, the disc is electromechanical.

An ideal mass storage medium would be all-electronic. Charge-coupled devices and bubble memories are on the horizon, but for now, the disc remains as the *single* electromechanical element at the operating heart of a computer system.

Capacity, performance, price

The coexistence of three disc technologies can best be explained in terms of capacity, performance and price—with electromechanical reliability as the limiting factor in all three areas.

Except for the floppy disc, which can be viewed as primarily a low-capacity derivative of 2314 technology, all three types of discs start with a common base—a 14-inch diameter aluminum platter coated with iron oxide. Another common denominator is the fact that the costs of many of the most expensive elements in a disc system (the motor, head actuator, and control electronics) are relatively independent of storage capacity. The number of bytes of storage can be doubled and tripled with only an insignificant effect on the cost of these fixed elements.

The result, as shown in Fig. 1, is a steep reduction in the cost per million bytes (MB) as the capacity of each disc spindle increases. Similar "economies of size" apply in other types of computer hardware, such as main memories and data communication equipment, but rarely with such impact.

The incentive, then, has been to add capacity by every conceivable means. The trends have been toward more bits per track, more tracks per disc surface, and more surfaces per disc spindle.

Every increase in packing density has had an immediate payoff in terms of the cost per megabyte. But each packing-density advance also increases the chances of error in the form of lost bits or crosstalk between tracks. Reliability remains the ultimate restraint on mechanical and electronic ingenuity.

Increased throughput

Cost effectiveness has also been enhanced by reducing the access time and increasing the data flow. The economic payoff in this case has not been in reduced storage costs, but in increased throughput and efficiency of the total computer system.

Again, we are reminded that disc is, in truth, an extension of memory. In the past, most cpu's have been memory-bound, limited in their performance by both the size and the speed of their memory modules. Today, in too many cases, the cpu is disc-I/O bound, and every increase in disc throughput will help to break this bottleneck.

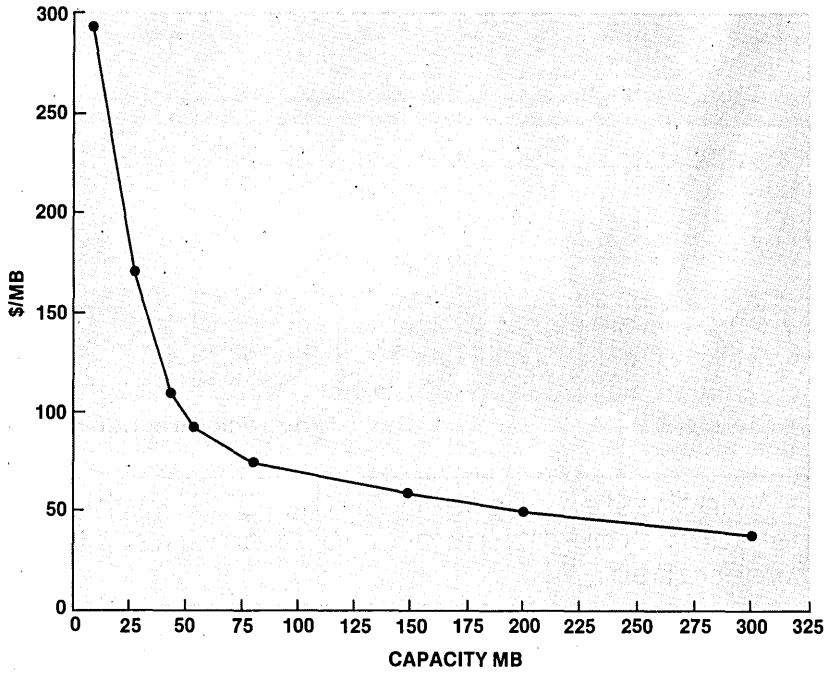


Fig. 1. The costs of many of the most expensive elements in a disc subsystem (the motor, head actuator, and control electronics) are largely independent of the storage capacity of the disc platters. Also, the disc platters themselves are much alike regardless of their capacity. As a result, higher capacity units are generally more cost effective. (These are current single-unit oem drive prices.)

Higher packing densities add to throughput in a direct fashion. With more bits per inch, more data passes under the read/write head per unit of time. With more closely spaced tracks, the track-to-track access time is reduced. With more disc surfaces per spindle, the computer can access more

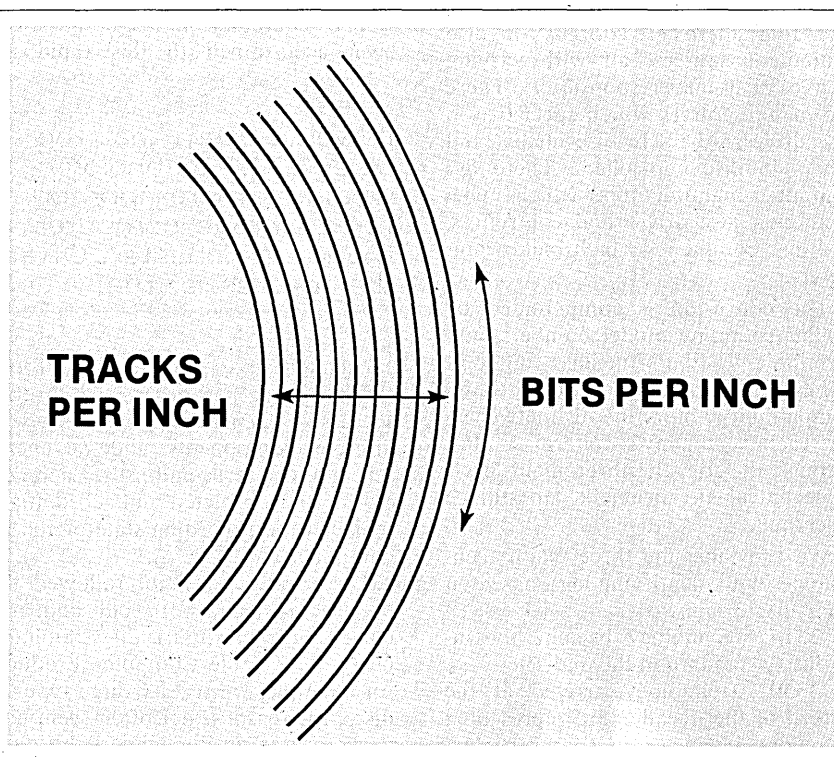


Fig. 2. Magnetic flux spreads out with distance. So the closer the head can fly to the surface, the greater the linear packing density (bpi) will be and the higher the number of tracks per inch (tpi).

data without moving the read/write heads.

The throughput of the disc system also can be improved by increasing the rotational speed of the spindle, up to a point. The aerodynamic characteristics of the flying head put certain constraints on the rotational speed, limiting the progress that can be made in this area.

And more

Other, more mundane considerations also have influenced the evolution of disc systems. With the introduction of small, compact microcomputers and minicomputers, there has been a demand for small, compact disc drives —with replaceable media to compensate for limited storage capacity.

Advantages also could be gained by simplifying the controller interface, and by increasing operator convenience through the use of front-loading cartridges, rather than top-loading cartridges or disc packs.

Each year has witnessed incremental advances in disc-system design. But the major, step-function changes have come as a constellation of new characteristics. In a single abrupt shift, nearly every aspect of the system has been upgraded toward higher capacity and throughput.

Table 1 summarizes the differences separating the three basic disc technologies. Each technology was pioneered by IBM, and each has become, in its turn, an industry "standard." Refinements by other manufacturers have been modifications on a basic theme.

Central to each advance has been a significant increase in the packing density. Moreover, the key to this increase has been, in each case, a reduction in the "flying height" of the read/write head.

Magnetic flux spreads with distance. Thus, any separation between the read/write head and the magnetic surface will increase the area occupied by an information "bit." This limits, in turn, the number of bits that can be defined along an inch of track (Fig. 2) and increases the minimum spacing between tracks.

The ideal would be a direct contact between head and surface—as in the case of magnetic tape. This is impossible, however, with a rigid aluminum disc. The surface is traveling at rates that can exceed 100 miles per hour. Any direct contact would quickly destroy the storage medium. Instead, the head is given an aerodynamic shape that allows it to "fly" on the rotating film of air that adheres to the disc surface. Proper spacing is maintained by applying a "load" on the head assembly.

Fig. 3 indicates the progress made in reducing the flying height. An improved aerodynamic design in 3330 drives allows the distance to be cut in half compared to that of the 2314. Winchester technology, using a lightweight head and a minimal load, has reduced the distance by half again.

The flying heights shown are current typical values for each technology. Manufacturers continue to make refinements in all three technologies, however, lowering the head height and narrowing the track width.

Typical Comparisons

	2314	3330	"Winchester"
Capacity Factors	1MB-100MB/spindle 1,000-4,000bpi 200 tracks/inch 400 tracks/side	25MB-300MB/spindle 4,000-6,000bpi 400 tracks/inch 800 tracks/side	25MB-300+MB/spindle 6,000+bpi 400+tracks/inch 800+ tracks/side
Performance Factors	156KB-624KB/sec 12msec track-track 1500rpm/2400rpm	806KB-1,209KB/sec 6msec track-track 3600rpm	1,209+KB/sec 6msec track-track 3600rpm
Media	non-oriented magnetic no head contact	non-oriented magnetic no head contact	oriented magnetic head contact okay
Head	load: 350gm mass: 3.25gm flying height: 100 microinches	load: 350gm mass: 5gm flying height: 45 microinches	load: 10gm mass: 0.25gm flying height: 20 microinches
Positioning	hydraulic actuator mechanical track hold	voice coil actuator electronic track hold	voice coil/rotary actuator electronic track hold
Reliability Factors	discretes, plastic/ceramic ICs fixed or removable packs or cartridges	plastic/ceramic ICs fixed or removable packs or cartridges	ceramic ICs fixed or removable sealed modules
Maintainability	heads aligned by user heads replaceable 1 hour/month maint MTBF: 1200 hours MTTR: 1.5 hours	heads aligned by user heads replaceable 0.5 hour/month maint MTBF: 2500 hours MTTR: 1 hour	no head alignment by user head/disc assembly replaceable no preventive maint MTBF: 5000 hours MTTR: under 1 hour

Table 1. There are great variations in how each technology is implemented, but the major differences between them are still clear. One of the big jumps in going from 2314 technology to 3330 was in the arm positioning technique; this led to tighter packing of tracks, faster disc spinning, and (indirectly) to higher packing densities. Another big change was in the flying height of the head.

The change to the Winchester technology was more obvious physically, in that sealed modules containing the discs and heads were introduced. Not as obvious but also important was the further reduction of the flying height.

Out of the tunnel

But Fig. 3 also indicates the hazards to be overcome. From the earliest days of disc technology, cleanroom conditions have been required within the drive enclosure. A single smoke particle can damage the disc and destroy data. Moreover, with each reduction in the flying height, the contamination problem becomes more severe, requiring more stringent control over the disc environment.

Fig. 4 (p. 144) shows a range of 2314 track widths—and the further advances made by 3330 and Winchester innovations. Included in these innovations has been the elimination of the 2314 "tunnel erase" tandem head that trims down the width of each track, guaran-

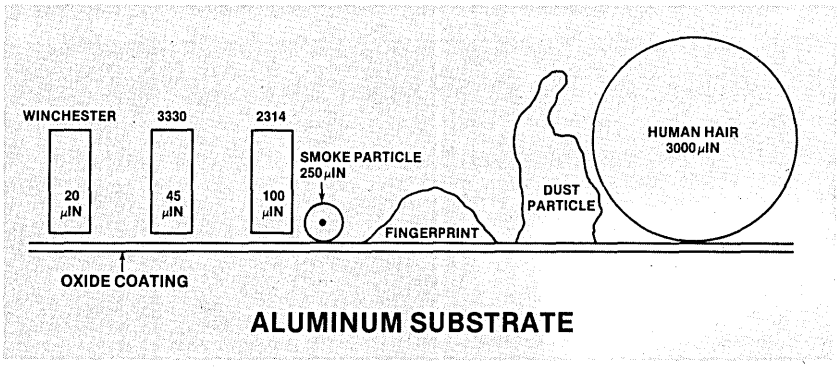
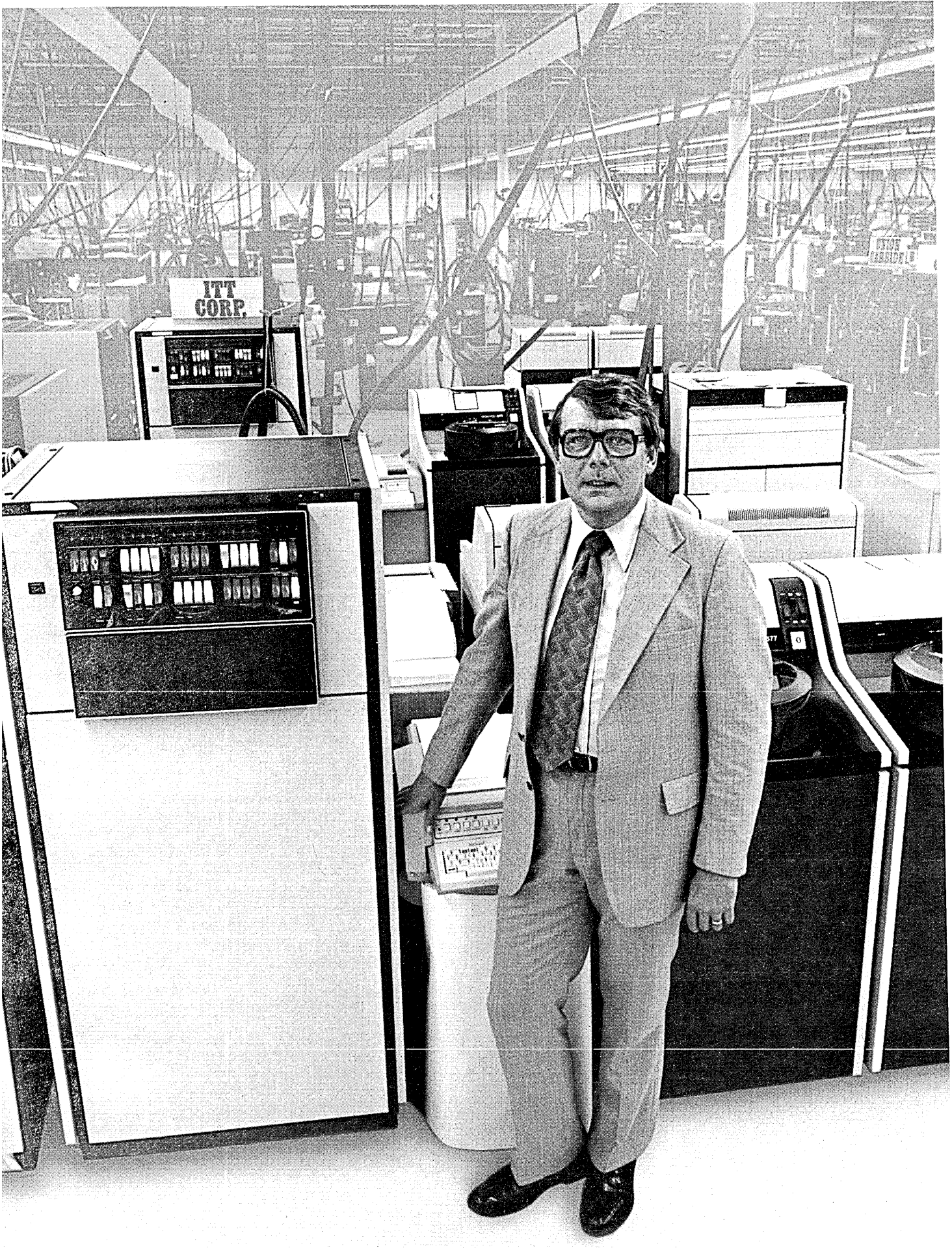


Fig. 3. The reason for controlling the disc environment, and for sealing the packs, becomes apparent when we realize that a smoke particle roughly 250 millionths of an inch in diameter simply won't fit between the read/write head and the disc surface. To a flying head, a fingerprint looks like a mountain. In comparison to these obstacles, the major differences in the flying heights of the three kinds of heads does not show up in this scale.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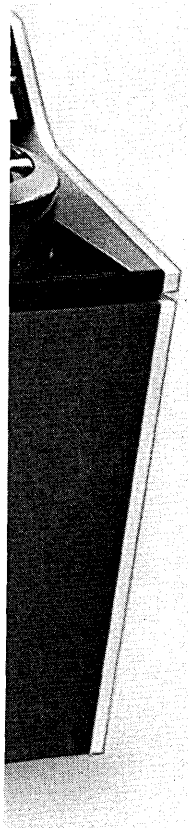

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teeing an adequate separation between them. Analog circuits within the disc drive have been simplified by this change, with a corresponding increase in reliability.

The extremely narrow Winchester track has been achieved by a combination of factors. The Winchester head weighs only a quarter gram, and flies within 20 microinches (millionths of an inch) of the surface. The iron oxide particles on the disc surface have also been magnetically oriented so that both the track and the bits along the track are more precisely defined.

Another innovation—which probably best characterizes the new technology—is a lubricated surface that allows the lightweight head to rest *on* the disc during start and stop operations. By comparison, both the 2314 and 3330 technologies require that the disc be at "flying speed" before the head is loaded. In theory, at least, the in-contact start/stop capability of Winchester drives has also eliminated the "head crash" problems encountered with the earlier technologies.

As the spacing between tracks has decreased, additional demands have been made on the accuracy of the track positioning mechanism. The relatively broad spacing of a 2314 disc allows a mechanical/optical positioning mechanism to be used. The close spacing of 3330 and Winchester tracks has led to the development of electronic sensing mechanisms. The source of the controlling information for head positioning has also been moved from the disc drive to the disc pack itself.

In similar fashion, the hydraulic head actuator used in early 2314 technology drives gave way to the voice-coil positioner which is the standard today. Winchester technology has carried this a step further and uses a rotary actuator—still based on the voice-coil principle—that requires 40% less power, generates less heat, and offers significant advantages in terms of size, service life and reliability.

The linear spacing between bits has also been reduced. Bit-per-inch values now range from 1,000 bpi for a lower-performance 2314 drive to 6,000+ bpi for the newest Winchester drives.

Linear packing density can be further enhanced by changes in the coding technique. As shown in Fig. 5, the code used in the 3330 and Winchester drives has eliminated the clock-pulse transitions required by 2314 technology. This has enabled the designers to condense the linear length of the record, further increasing the bpi value.

With improved definition between bits and changes in the aerodynamic head design, the disc can be rotated at faster speeds, reducing the latency period. Higher packing densities, combined with faster rotation, result in step-function increases in the transfer rate between the disc and the host computer. Transfer rates now range from 156KB to over 1MB per second.

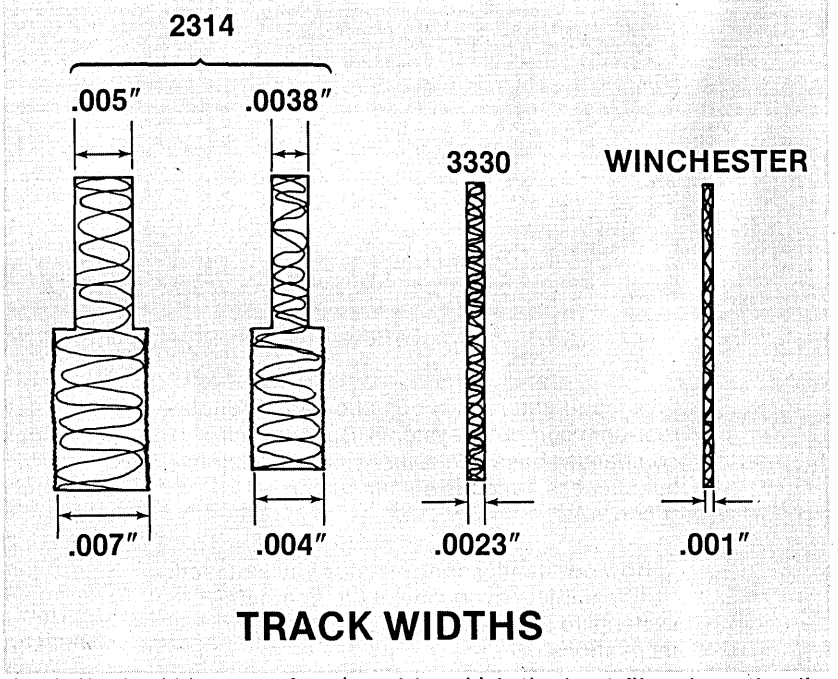

Fig. 4. Track widths are a function of how high the head flies above the disc. Even after the tracks written by a 2314 head had been trimmed by the "tunnel erase" tandem head, they were still large in comparison to the track width of the 3330. The Winchester head, flying less than half as high as that of the 3330, can put down a track even less than half as wide—tiny in comparison to the 2314's.

Track-to-track access times—normally "lost" to the system—have been reduced by closer spacing between tracks, faster-acting actuators, and in the case of Winchester drives, by splitting the recording surface into inner and outer bands and providing a separate head for each half. Again, by minimizing the time taken to reposition the read/write head to a given track, significant increases in system throughput have been achieved.

Controller interface

If disc drives are viewed, for the moment, as peripheral devices—as opposed to extensions of main memory—they must be classified as "dumb." They do little more than to rotate the

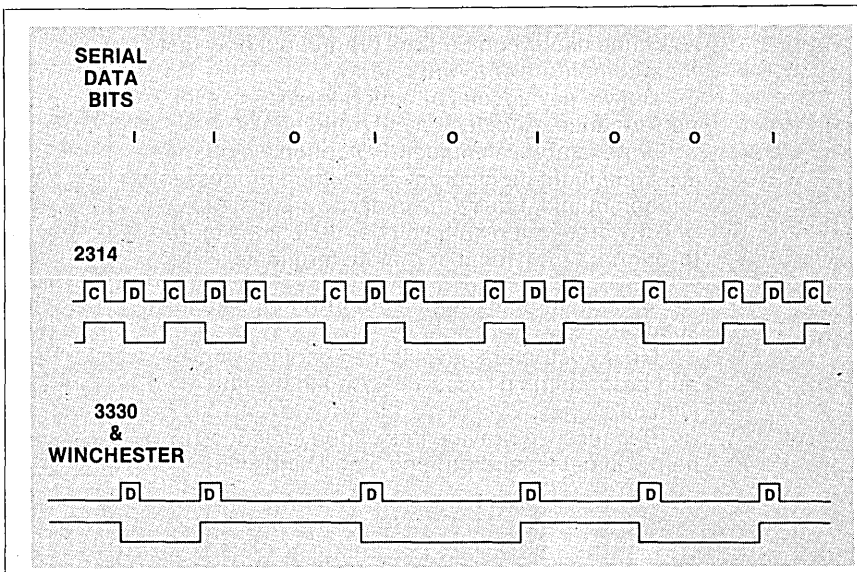

Fig. 5. Electronics played a role in achieving higher densities, too. Where the 2314 head had to record and read back clock bits (the "C's") with its data bits ("D's"), the two later technologies don't need them.

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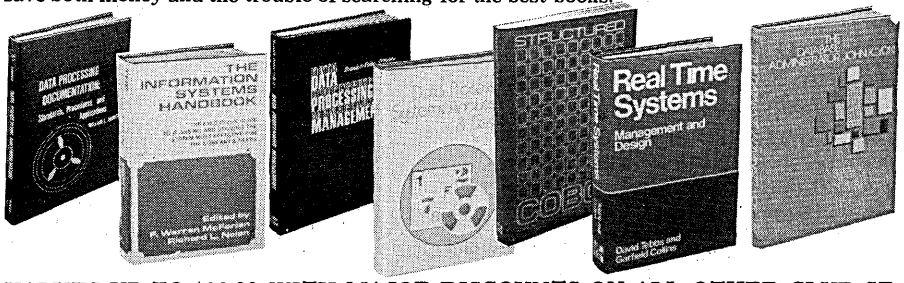

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disc media, move heads back and forth, and generate magnetic fields.

In contrast, disc controllers are among the most "intelligent" of peripheral interfaces. They determine the coding technique, establish sectors, sense the position of the disc surfaces and heads, correct errors on the fly, and supervise communications with the host computer.

Because they are so sophisticated, and expensive, controllers are normally designed as the central element in a disc subsystem that can include several disc drives. The first disc (and its controller) is sometimes referred to as the "master." Additional discs are called "slaves." But these terms are arbitrary; the controller remains as the master element.

The transition from one disc technology to another has witnessed a different kind of progress in terms of controller design. The early introduction of 2314 technology resulted in a confusing variety of proprietary disc drive controller interfaces in the non-IBM marketplace. Plug-compatible options were required to fit one manufacturer's discs to another's controller or computer.

The faults in this approach were recognized by the time the 3330 technology arrived. IBM's 3330 interface was accepted as the standard for larger capacity drives; suppliers of smaller discs elected to follow a simplified "storage module" protocol established by Control Data, the first company to offer 3330 technology to non-IBM users (primarily in the rapidly expanding minicomputer market).

This same interface has now been extended to smaller capacity drives using Winchester technology. True plug-compatibility therefore exists between controllers and disc drives based on both 3330 and Winchester technologies.

A word of caution is required however. There is a limit to the "transparency" of the disc system in terms of operating-system software. If, for example, a disc with a higher packing density is added to the system, the number of sectors on each track or the number of tracks per surface will generally be different. This information must be communicated to the operating system, or valuable disc space can be wasted.

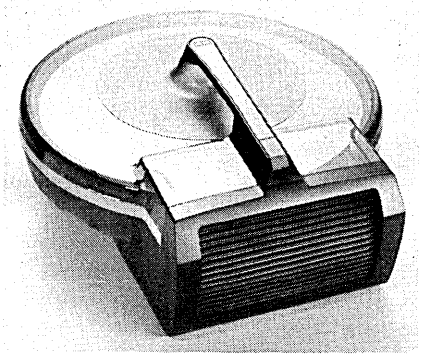
Removability trade-off

The ability to remove and replace disc media has proved to be a valuable asset, especially in a multiple-user environment. Disc cartridges offer almost as much convenience as reels of tape. And floppy discs carry this to the limit, with a single (or dual) surface and a size that can be easily stored or dropped in the mail.

Disc drive manufacturers looking for a distinctive edge, have taken full advantage of this flexibility. Some, including Diablo, Pertec, and Wangco, have created combination units with both fixed and removable media. Another variation is the dual-purpose drive, like IBM's 3350, with a fixed-head-per-track surface for extremely fast access and a multiple-platter moving-head spindle for bulk storage.

Most micros and minis can get by with a 2314 technology disc, most midis with 3330.

Some of this flexibility has been lost in the move toward higher capacities and performance. The higher packing density has reduced the margin for error and increased the need for environmental control. Until recently, for example, the convenience of disc cartridges has been restricted to 2314 technology drives. But CDC has announced a cartridge drive using 3330 technology, and others will very likely soon follow.



Taking a lesson from fixed-head disc technology, where the disc and its heads are often in a sealed case, the "Winchester" concept puts the disc pack and heads in a sealed "data module." The IBM 3340-type module is removable, as illustrated by the BASF unit above, but the trend seems to be away from that.

Moreover, Winchester "removability" involves replacing the entire disc assembly—including the heads and positioning mechanisms—contained in a rather expensive, hermetically sealed package. Thus the Winchester technology, despite its other advantages, represents a step backwards in terms of convenience and flexibility.

Choosing a technology

Keeping these variables in mind, certain rules can be established for choosing the optimum technology for a given application.

Returning to Table 1, with its detailed comparison of the three technologies, we can state that the most important feature is capacity. Pushed to its limit, 2314 technology restricts the total storage on a single spindle to approximately 100MB. The newer 3330 technology expands this potential, but again reaches a limit at about 300MB. The ultimate capacity of Winchester drives is a speculative guess.

There is, in theory, no lower limit on any of the three technologies. But as a practical matter, the complexities of the 3330 Winchester techniques, plus the availability of smaller drives using a simpler technology, act as restraints on their minimum capacities. A high-capacity Winchester drive is highly competitive in terms of dollars per MB. The same mechanism with only a few MB of storage would be prohibitively expensive.

The first rule, then, is to pick the technology that will provide the required long term storage capacity on the lowest number of spindles. It is technically feasible, for reasons of reliability or avoiding seek conflicts, to build a 200MB capacity with four 2314 discs, each providing 50MB of storage. A more cost-effective route, however, may be to invest in a single 200MB drive using 3330 or Winchester technology, even if that means a part of the capacity remains unused for a period.

By the same token it would be wasteful to overshoot the mark. The low cost per megabyte of the larger, advanced technology drives in the 300+MB range may be attractive, but the potential savings will never be realized if the total storage requirements of the system never exceed 25MB.

This may sound strange, but remember that 300MB units may be *less* expensive than 100MB disc drives. Going to 100MB/spindle in 2314 technology, the user is looking at a massive, six-foot high box originally constructed as a plug-compatible replacement for IBM gear. The 300MB device, on the other hand, could be a 3330-type cartridge drive *intended* for use on a mini.

Fortunately, most of the other performance parameters are closely related to capacity for most applications. If very high capacities are needed, there generally is heavy traffic between the disc system and the host computer, and full advantage can be taken of the high transfer rates offered by the 3330 and Winchester technologies. If the storage requirement is small, it is usually safe to assume that the disc transactions will be limited, and the user can live with the lower transfer rate inherent in 2314-type discs.

But there are exceptions, and other considerations. In a dynamic real-time environment, for example, a high transfer rate may be a technical re-

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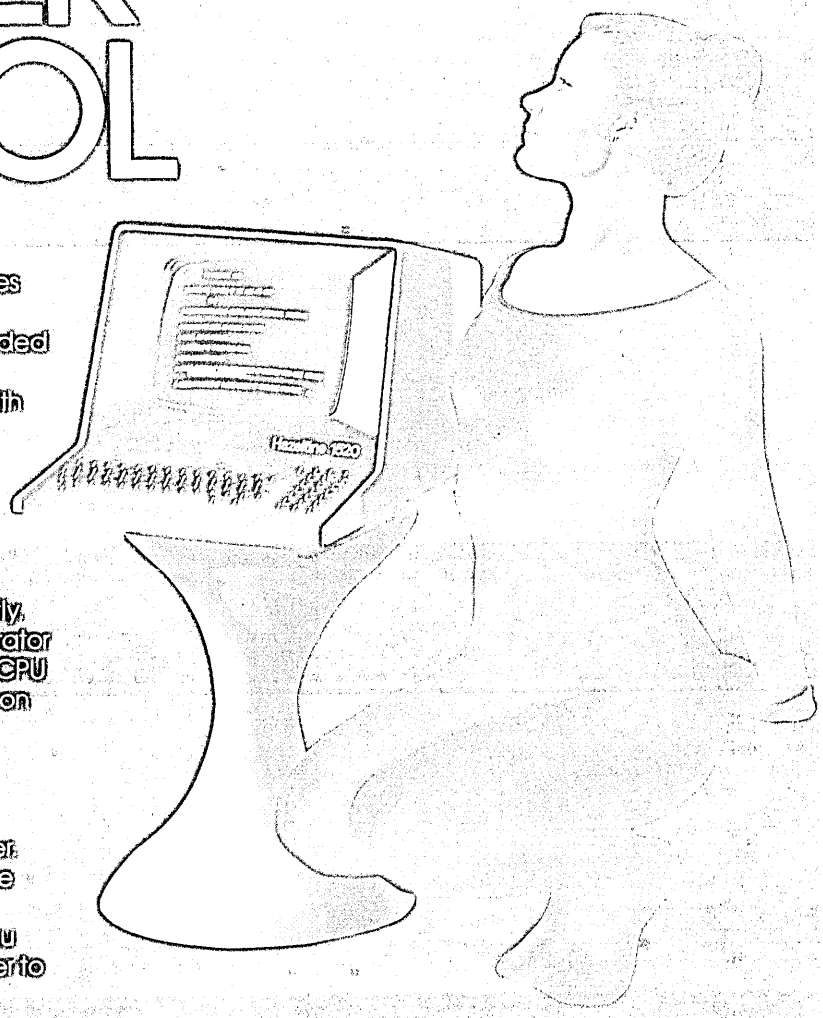

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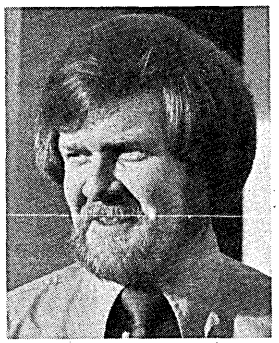
quirement and is worth the cost, even if the smallest available disc exceeds the actual storage requirements. There will also be cases, especially in service bureaus and other multiple-user environments, where the advantages of removable cartridges and packs will dictate the use of 2314 and 3330 drives—despite a total capacity that would make the installation an ideal candidate for Winchester drives.

Taking these exceptions into account, we can state that if the user's long-term requirements are likely to remain under the 50MB mark, and high transfer rates are not essential, 2314 technology discs will suffice. Most microprocessor and small minicomputer applications will probably fall in this category.

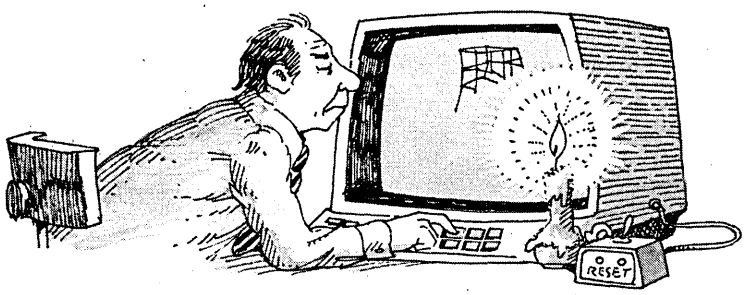
So-called midicomputers and small-to-medium sized business systems will generally require larger capacities and increased performance. The newer 3330 technology offers immediate advantages for these users, and at least a few should consider the potential of Winchester drives.

Moving to the top of the scale, to larger mainframes, Winchester drives become the standard for both new and enhanced installations, with 3330 drives providing a degree of removability.

All three disc technologies are now tested and proven, and each has its place. The challenge is to consider all of the options and to select the type of disc technology that will provide the most cost-effective and useful storage for the application, considering both today's requirements and foreseeable future demands.



Mr. Brechtlein is the product manager for minicomputer peripherals at Telefile Computer Products in Irvine, Calif. His 17 years in the electronics and dp industries included nearly eight years at CalComp, where he last was product marketing manager for minicomputer memory systems, and stays at North American as a systems engineer, and at Varian Data Machines as a test engineer.



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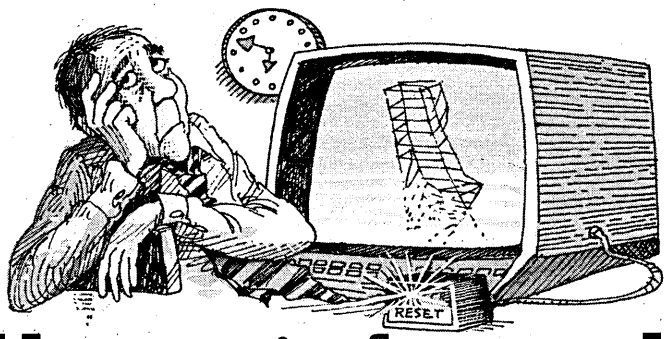

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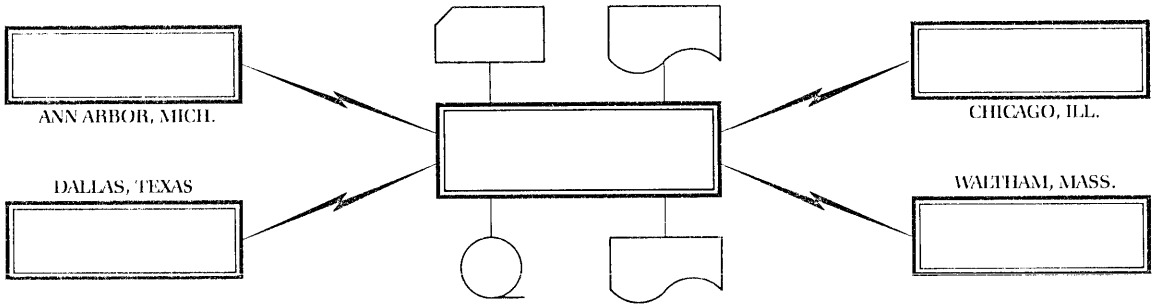

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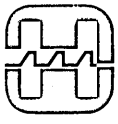

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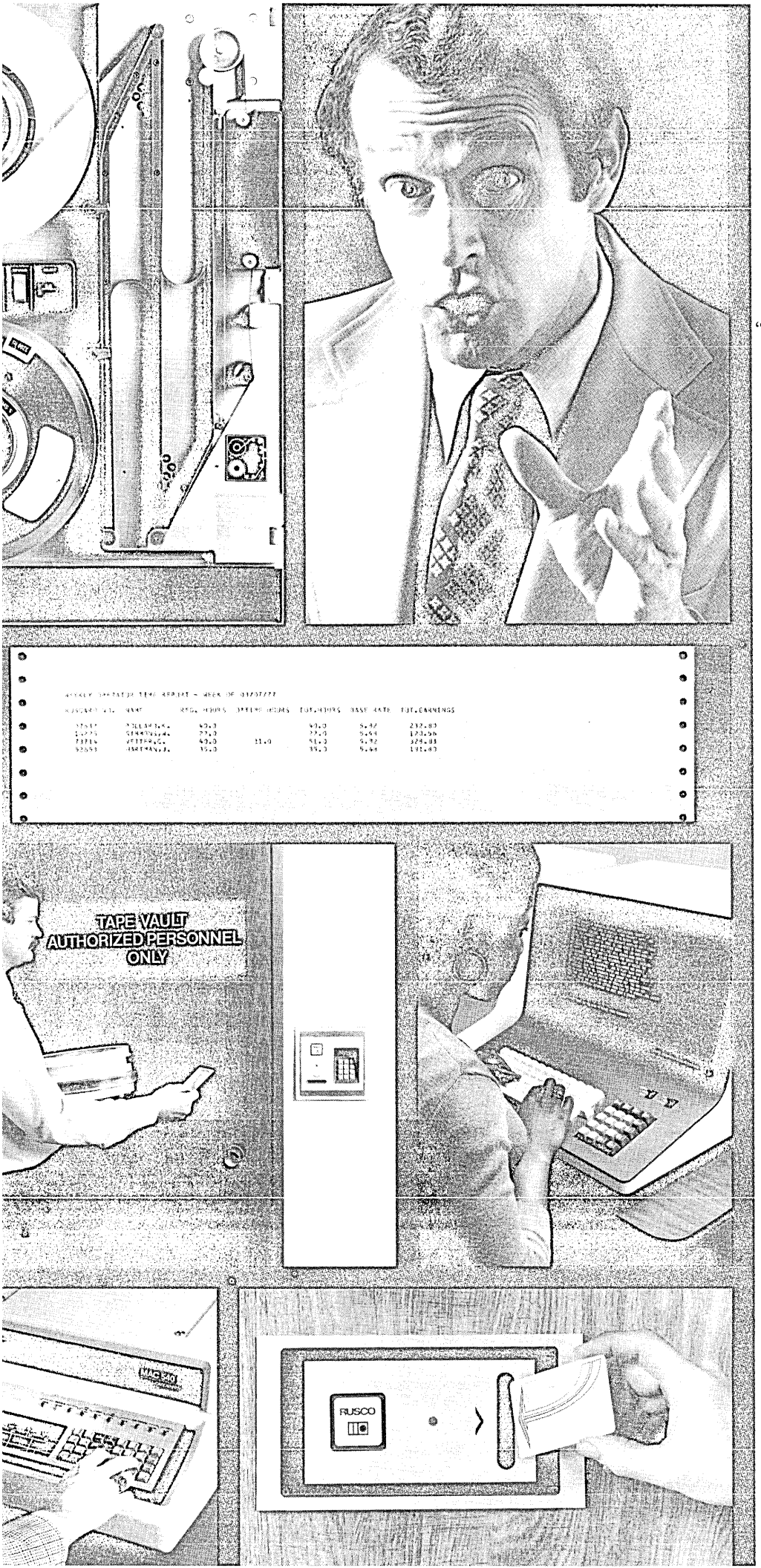

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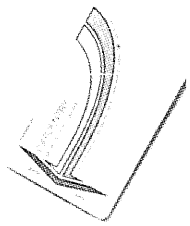

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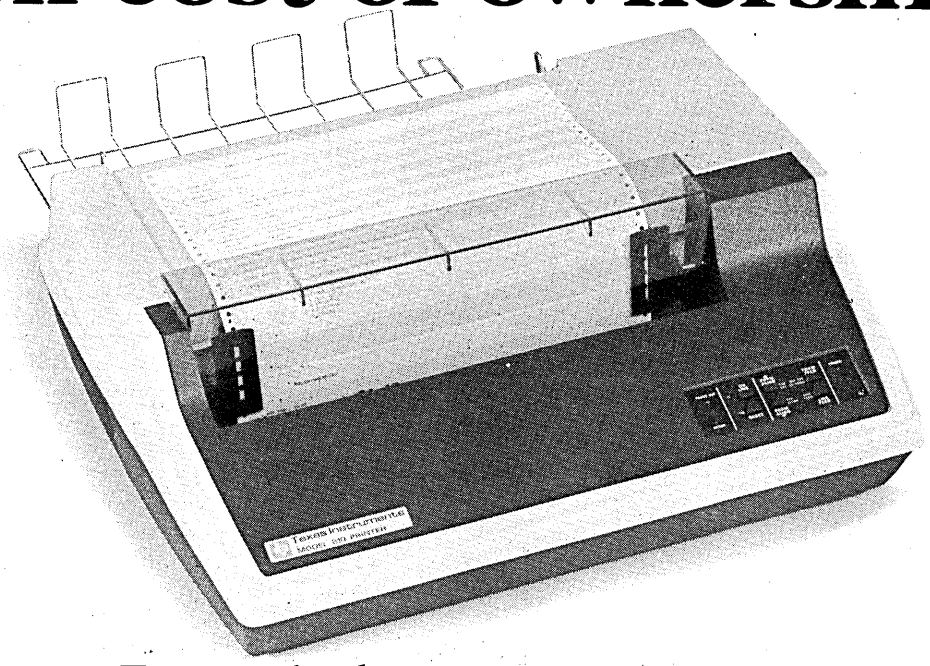

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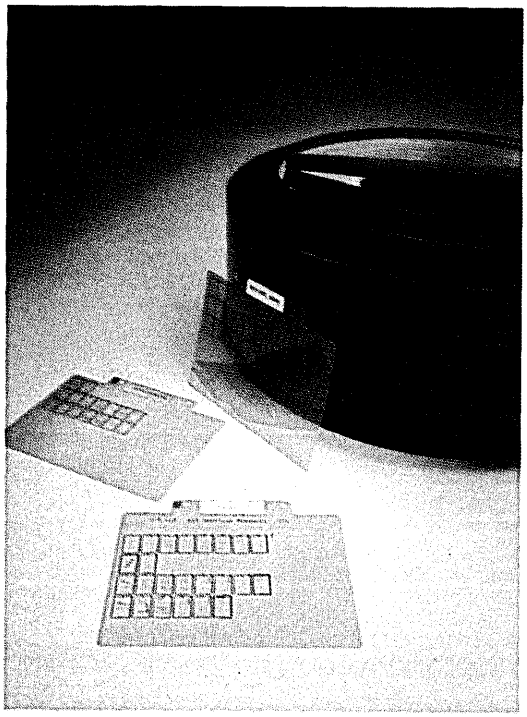

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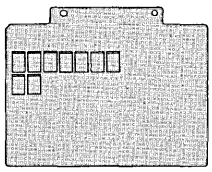
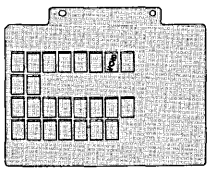


A single piece of 4" x 6" File Film accommodates 60 legal size or 98 letter-size documents. Images can be recorded or updated in just 8 seconds.



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

By freeing your electronic system from mass information storage, System 200 enables you to make the most efficient use of your computer — for *computing* and for storing and retrieving abstract and summary data.

Computer indexing speeds access to off-line data.

Used in parallel with your computer, System 200 supplies complete, off-line data in answer to in-depth inquiries plus rapid, on-line access to routine information.

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.

In a totally automated information system, it will be feasible to search, retrieve and deliver any System 200 File Film or set of files out of hundreds of thousands.

With or without a computer, System 200 has the answers.

As an integral component in your data processing system or as a stand-alone micrographic record processing system that provides total file control and integrity, System 200 offers a variety of solutions to your information management problems.

Send for a fully illustrated brochure and special supplement on the use of System 200 with computer systems. A.B. Dick/Scott, South Hadley, MA 01075. Telephone (413) 538-7550. A.B. Dick/Scott is a joint enterprise of A.B. Dick Company and Scott Graphics, Inc., a subsidiary of Scott Paper Company.

A.B.DICK/SCOTT

Previewing 1978's Telecommunications Problems

The enormity and rapid pace of international telecommunications developments were well illustrated by the mind-boggling Intelcom '77 exposition held in Atlanta in October. The Horizon House production enmeshed itself in every aspect of international data communications, CATV, satellites, mobile radio, and telephone networks.

Some 3,000 persons attended, and 250 exhibitors. At the end of their five days there, it was easy to understand why the United States is finding it difficult to reorganize its telecommunications policy and law-making. It is a complicated problem technologically, economically, and politically, but Joseph Coates of the Office of Technology Assessment, among others, emphasized how important it is that we tackle it.

Coates lambasted the obsolescence of the current government framework for controlling telecommunications, and called for intensive study and public discussion "about what one does with a major new sector of the economy." Drawing a parallel with the computer industry, he noted the handling of the eight-year-old IBM antitrust case. He said, ". . . there is no matter of law, justice, or equity which takes eight years to solve. Whatever is being solved by that arthritic process in the courtroom can't be a search for justice or equity. It must be something else."

There is another reason to look hard at the future for telecommunications, he added. The public has been told of all kinds of potential benefits the technology holds for education, health care delivery, municipal services, and for expanding the diversity and quality of our lives. "And where are they? They are in some sense thwarted by the present order of things."

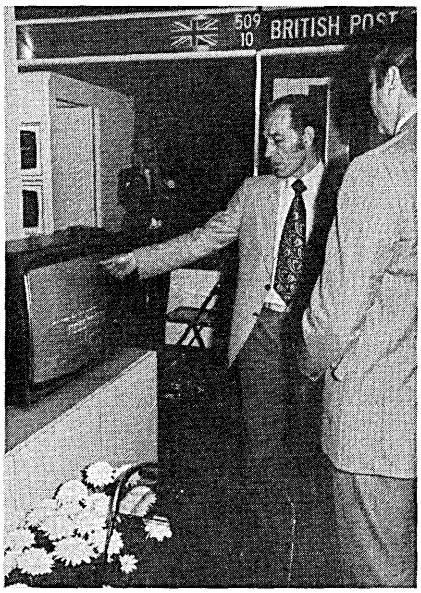
Balancing public and private interests

From the data communications standpoint, the "something else," the "present order of things," seems to involve the confusion of government bodies attempting to balance public interests against the revenue interests of foreign and domestic communications suppliers.

For example, many sessions highlighted the battle between international record carriers, AT&T, the value-added networks, and foreign postal, telecommunications, and telegraph authorities (the PTT's). The users called for a free flow of voice and data traffic down international lines, easy interconnection from country to country, and a variety of public and private line services to suit their volumes.

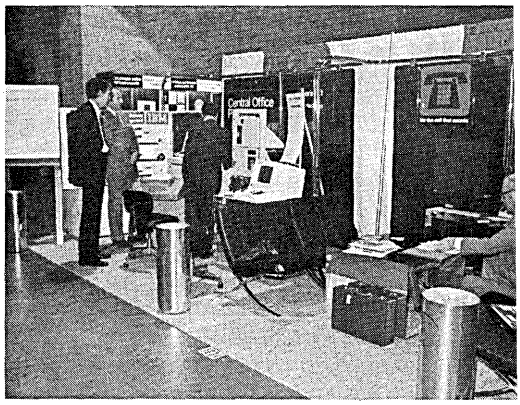
> "Whatever is being solved by that arthritic process in the courtroom can't be a search for justice or equity."

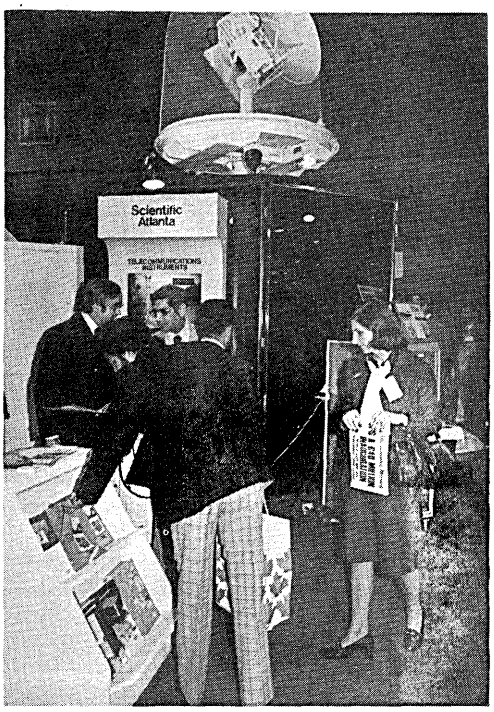
Then there's the vendor side. Tymnet and Telenet spokesmen, now that their companies have been given FCC permission to try to interconnect with foreign networks, called for foreign governments to allow them to do so. AT&T would like the same for its international dataphone service. The international carriers want equal competition with the value-added and domestic carriers. Also, of course, the foreign PTT's want to get the most out of both their old and new services—guarding against rapid replacement of telex services while shoving users toward their new public nets.

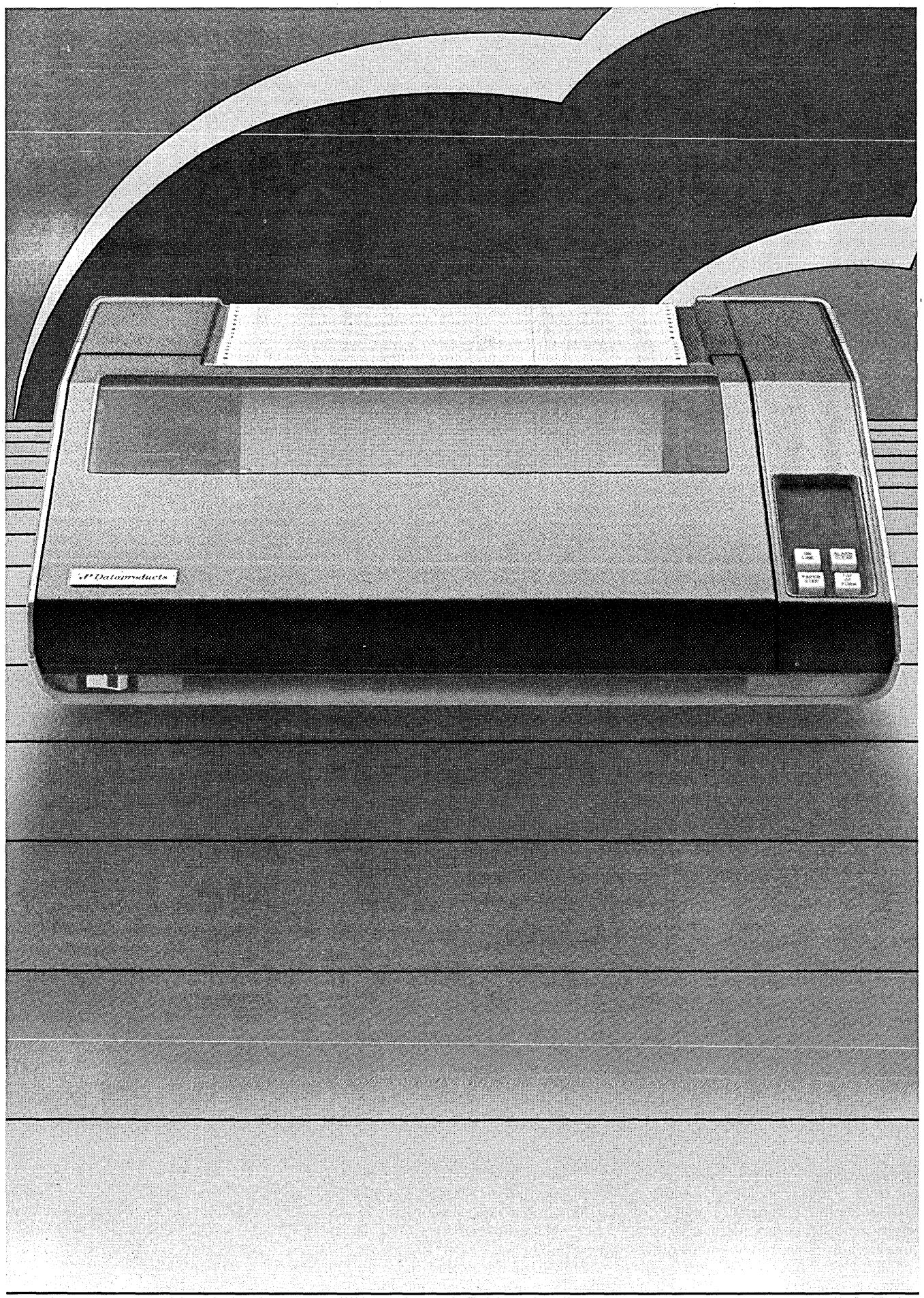


How hard a problem will juggling all that be for the U.S.? One indication was that a number of sessions were devoted to just that subject. The most telling was probably the one covering the suggested realm of responsibility for the new Assistant Secretary of Commerce for Communications and Information. Henry Geller, former FCC counsel, has been nominated for the position. It turns out that if he gets the job, he will *not* have all the power he needs to solve the problems—problems encompassing almost every aspect that the conference did—but he *will* have all the problems anyway. Mr. Geller will need help.

Discussions on developing networks and services filled the attendee's menu. Bernard Durteste, a SESA manager in-



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Finally, we gave this New Era printer an average speed of 200-LPM (for 80 columns) and made it interface-compatible with all Dataproducts printers.

The M-200 table-top and pedestal models should require no more than two service calls a year and are designed to eliminate scheduled preventative maintenance.

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PROBLEMS

volved in developing France's Transpac packet switching network, pointed out a number of issues that will affect the U.S. data communications users both domestically and internationally. Transpac, due to go live in 1978, is the first in a series of public networks being developed in Europe that ultimately may eliminate the availability of private leased lines.

Quoting a French PTT manager, Durteste noted that "for a long time, tariffs for Transpac will not increase, but for leased lines they are going to increase." This would push users to Transpac and its volume-sensitive tariffs. Once the private lines are gone, will tariffs go up? Durteste felt the PTT would keep charges down, and by establishing Transpac as a private company, provide economies to high volume users.

In many Intelcom sessions, the issue of private versus public networks was raised. As mentioned, the Europeans are pushing for a volume-sensitive tariff for public nets and private lines, one way or another. International, U.S., and Canadian carriers are not averse to this kind of pricing either. But Wayne Hart of Teleglobe Canada asserted: "The conventional private line is likely to remain" because of the economies achieved by its high volume users. (Many of those users, however, are not convinced their lines will always be available.)

And X.25

Another hot topic these days is the X.25 packet protocol being adopted internationally. Because of Transpac, the French have been able to force the likes of IBM and their own manufacturers to support the protocol. That may work in France, but perhaps not everywhere else.

Durteste thinks that the pan-European packet network, Euronet, will initially have a difficult time getting users to connect up. This is because some countries, including West Germany, are not developing packet nets. Hence, not all vendors must support the protocol.

The U.S. government, however, is moving toward adoption of its own version of X.25, so U.S. vendors which want government contracts will have to support it.

Durteste noted that the cost of X.25 to the user will depend on this vendor compliance. If the vendor modifies its software, there is only a one-time cost involved, and that may be amortized over many users. If the vendor won't, he said, the user will have to shell out $3,000 to $6,000 per terminal for the conversion.

Fiber optics and satellites

Fiber optics in communications and computers was the subject of many papers and exhibits. The Japanese were there in force with "show and tell" presentations. In one paper, a Hitachi spokesman talked about that firm's own research in the technology, which also was demonstrated in an experimental video transmission system in the exhibit hall. Another paper, by Dr. M. Kawahata of the Visual Information System Development Assn. in Tokyo, described the $15 million Hi-ovis experiment using fiber optics for two-way CATV in Higashi Ikoma New Town. The computer-based system is to provide audio-visual information to homes and businesses via an elaborate, expensive (several thousand dollars) home terminal system: tv, keyboard, camera, microphone, and terminal controller. Field service using it is scheduled to begin in 1978.

Also in the exhibit hall, one could see not only Viewdata and Japanese fiber optic systems, but numerous mini-

Japan's fiber optics net is expected to see action this year.

antenna dishes propped on top of exhibits, with placards proclaiming satellite systems installed in Africa, the Middle East, and South America.

Rockwell International's Collins group was there with digital switching and other communications equipment. This company, which has installed computer-based communications systems for many of the world's leading airlines and banks, has recently completed the first all-digital communications system for the Dutch Air Force. (We hear the Pentagon is green with envy.) And Rockwell is now installing the first digital switching systems to handle all bank communications, eliminating a multitude of incompatible terminals and systems.

Harris Corp. showed the "other side" of the house, with a laser facsimile transmission system, satellite communications system, and mobile radio equipment. There were computer-based diagnostic systems for communications lines, computer-based PABX systems, intelligent time-division multiplexors, smart terminals, and modems big and small. Italcable, ITT, Western Union International, and RCA Globecom demonstrated their services.

And, as we said at the outset, the conference itself—with its maddening barrage of parallel sessions spread among too few people—illustrated why the U.S. government is confused about its telecommunications policy, national and international. It also showed once again how difficult it is to define either the computer industry or the communications industry. Not a computer show, really, Intelcom demonstrated a slice of telecommunications in which the computer is just one of many tools.

—Angeline Pantages and Lynn Ridlehuber

The Outlook for Viewdata

One of the most exciting PTT developments for the public is the U.K.'s Viewdata service, which was demonstrated and discussed at Intelcom. Now in experimental stages, this service seeks to link home and office with data bases developed by private industry and maintained by the British Post Office (BPO).

The data is to include everything from recipes and lists of local restaurants to news and publications abstracts, from formatted messages ("Won't be home for dinner") to home-buying and income tax calculations. Small businesses will be able to subscribe to a closed user group service, allotting them memory space to keep financial records and other information.

The BPO is setting up a U.S. marketing arm for Viewdata technology.

The terminal for it all is an adapted tv, with keypad or keyboard, that ultimately could come down to a per unit price of $500 to $600.

The BPO is setting up a marketing arm to sell the know-how and software from Viewdata in the U.S., if not the terminal. More than likely the agent will be a services or communications company. The BPO has already sold the system to the German Bundespost, and two more PTT's are negotiating for it.

We mentioned to a Viewdata demonstrator that the U.S. Public Broadcasting System was in the process of installing a Collins-supplied satellite system with more than 150 ground stations. His eyes lit up at the thought of a ready-made education-oriented network. He didn't mention whether IBM had talked to the BPO, but that could happen. In other sessions, Satellite Business Systems people *were* talking about future computer/communications services for the home—and IBM can get back into the services business in 1979, after all. ❋

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Somebody asked us why Versatec outsells all other electrostatic printers and plotters combined. We're glad they asked.

We discovered seventeen exclusive features that made Versatec easier to use, more efficient, more adaptable to your output requirements.

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2. Dual contrast adjustment. ("Dark" control potentiometer and exclusive concentrate pump.)
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4. Writing head adjustable while running. (You see the result immediately.)
5. Output basket collates and keeps paper off the floor. (Standard for all fanfold machines.)
6. Space-saving design. (Eleven-inch models require less than half the space of competitive units.)
7. Portable. (Ours weighs 20-50% less than theirs, and casters are standard.)
8. Select from three different type fonts on high-resolution machines.
9. Serial and parallel interfaces for all 8½, 11 and 20-inch models.
10. True simultaneous printing and plotting with hardware generated characters on the same scan line without losing plot speed.
11. Variable line spacing. (Example: Our 900A is set at 84 lines per page, but you can adjust line count from one line to 95 lines.)
12. Exclusive wide models: 24, 36, 42 and 72-inch paper widths. (We've been shipping wide models for over two years. Another exclusive from Versatec.)
13. Choice of three resolutions: 100, 160 or 200 dots per inch. (Competition offers two.)
14. Differential drive. (Eliminates paper tracking problems of competitive solid drive roller that can skew and tear paper.)
15. Wider environmental specification. (Operation at 32°-105° F and relative humidity of 10-95%.)
16. Lower spare parts cost. (Competitive components can cost more than eight times that of Versatec equivalents.)
17. Sealed paper compartment. (Keeps paper "fresh." Maintains quality output.)

Features aren't enough. We also supply better plotting software integrated for more popular computers, interfaces for more display terminals, the biggest service organization devoted exclusively to electrostatic printer/plotters.

But believe it or not, we've only scratched the surface. So check the readers' service number for your 24-page full color brochure. It's filled with output ideas, application data and samples.

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computer and operating system

calendar

(Continued from page 51)

Compcon Fall, Sept. 5-8. *Washington, D.C. Contact: Compcon Fall '78, P.O. Box 639, Silver Spring, Md. 20901 (301) 439-7007.*

Intelcom, Sept. 11-16. *Beirut, Lebanon. Contact: Horizon House International, 610 Washington St., Dedham, Mass. 02026 (617) 326-8220.*

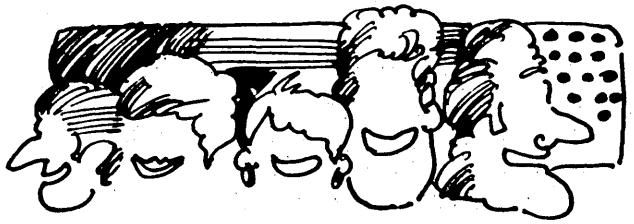
54th National BAI Convention, Sept. 17-20, *New York City. Contact: Bank Administration Institute, P.O. Box 500, Park Ridge, Ill. 60068 (312)693-7300.*

10th Annual SMIS Conference, Sept. 17-21, *Washington, D.C. Contact: C.O. Smith, U.S. General Accounting Office, 441 G St. N.W., Washington, D.C. 20548 (202)275-6572.*

SICOB, Sept. 20-29, *Paris. Contact: Pierre Wagner, French Trade Office, 1350 Ave. of the Americas, New York, N.Y. 10019 (212)582-4960.*

Conference on Interactive Techniques in Computer-Aided Design, Sept. 21-23, *Bologna, Italy. Contact: Giorgio Valle, Universita di Bologna, Facolta di Ingegneria, Instituto di Electronica, Viale Risorgimento 2, 40136 Bologna, Italy.*

4th International Conference on Computer Communication, Sept. 26-29, *Kyoto, Japan. Contact: ICCC-78, c/o International Affairs Bureau, Nippon Telegraph and Telephone, 1-6 Uchisaiwai-cho, 1-Chome, Chiyodaku, Tokyo 100, Japan.*



OCTOBER

NRMA Edp and Datacommunications Conference, Oct. 14-18, *Washington, D.C. Contact: Laurence Abzug, NRMA, 100 W. 31st St., New York, N.Y. 10001 (212) 244-8780.*

Info '78, Oct. 16-19, *Chicago. Contact: Lin Williams, Clapp and Poliak, 245 Park Ave., New York, N.Y. 10017 (212) 661-8410.*

Federal Micrographics Expo, Oct. 24-25, *Washington, D.C. Contact: Robert Harer, National Trade Productions, 9301 Annapolis Rd. #104, Lanham, Md. 20801 (301)459-1815.*

Fall Symposium—IWP Assn., Oct. 24-26, *St. Louis, Mo. Contact: IWP Assn., Attn: Lorraine Lear, AMS Bldg., Maryland Rd., Willow Grove, Pa. 19090 (215)657-3220.*

3rd West Coast Computer Faire, Oct. 27-29, *Los Angeles. Contact: The Computer Faire, P.O. Box 1579, Palo Alto, Calif. 94302 (415)851-7664.*

18th Annual ADAPSO Meeting, Oct. 30-Nov 2, *Southampton, Bermuda. Contact: ADAPSO, 210 Summit Ave., Montvale, N.J. 07645 (201)391-0930.*

NOVEMBER

Interface West, Nov. 13-15, *Los Angeles. Contact: Datacomm Interface Inc., 160 Speen St., Framingham, Mass. 01701 (617)879-4502.*

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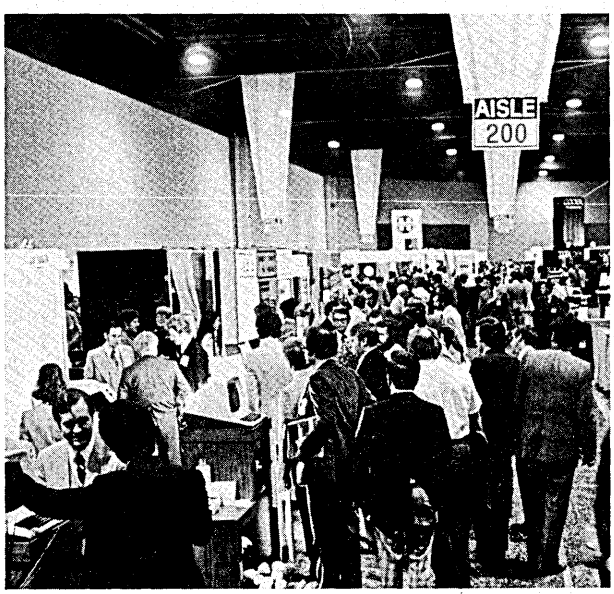

If productivity in data processing and communicating is important to you...

- you're in operations, general or financial management, data processing, data communications, systems design or engineering, or network development...
- you're a novice, an advanced or sophisticated computer/communications practitioner, serving business, industry, government or the public...
- you're interested in a terminal, a minicomputer, a distributed processing system, or anything in between...

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Never before in the five-year history of the Data Communications INTERFACE show has such a comprehensive program of tutorial and applications information been offered -- covering not only basic products, services and hardware uses, but emerging concepts, new technologies and future projections as well.

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No topic of importance will be overlooked. Minis and micros...Distributed data processing... Multiplexers...Concentrators...Front-end processors...Terminals...Modems...Packet switching...Electronic mail...Electronic funds transfer...Satellite transmission...Software... and other subjects will be covered. All at a level that everyone can come to grips with.

Timely Answers...

For the Beginner

Attendees at the Datacomm School will study all areas of concern in data communications -- with emphasis on fundamentals for management decision-making rather than on technical details. Two days in the school will lay a foundation on which to expand your knowledge in a variety of more advanced sessions that will fully round out your learning experience.

For the More Experienced

If you have a working knowledge of computers and data communications, INTERFACE '78 offers a variety of tutorial and state-of-the-art workshop sessions. Subjects will span all pertinent planning, implementation and management functions that you will encounter in the development, use and expansion of a computer communications network.

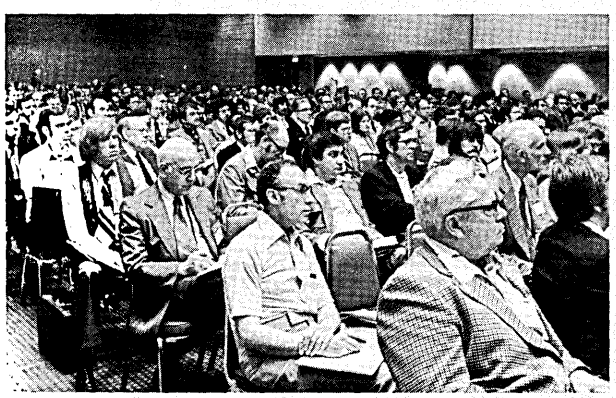
For the Highly Experienced

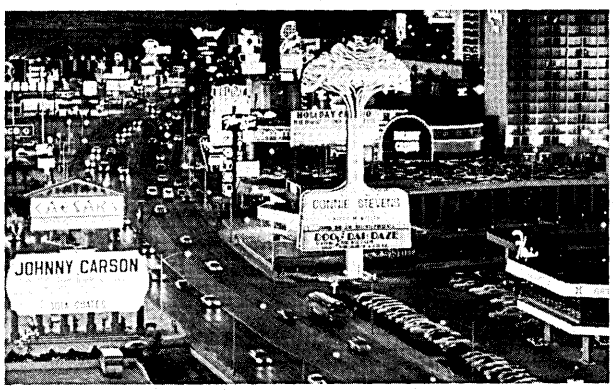
If you are actively involved in the design or implementation of computer communications networks. INTERFACE '78 offers a full schedule of comprehensive working sessions that cover product advances and changing directions in the application of a wide variety of data communications tools and methods, including distributed processing.

For Everyone

INTERFACE '78 offers applications sessions that you can select according to your own business or operational needs. Each session will be guided by speakers chosen for their demonstrated achievements and knowledge in individual application areas.

And, from there, you can carry your learning forward through the largest assembly of product demonstrations ever on our exhibit floor.





A Spouses Program, too

Don't leave your spouse at home. INTERFACE '78 has organized a three-day, fun-filled program of sightseeing, luncheons...and some surprises, too...that will delight your spouse during those hours when you are busy with your conference activities.

Highlights of the three-day program include gaming demonstrations where you will learn to understand "the games people play" in Las Vegas. And for women who want to walk and look like a show girl there will be a uniquely entertaining "behind the scenes" presentation by a Las Vegas show girl.

See the town -- the new as well as the old. Part of the tour will include many of the top gambling casinos. The Las Vegas Convention Center where INTERFACE '78 is in progress. The University of Nevada. The beautiful enclosed Boulevard Shopping Center. And more.

Then it will be off to Old Nevada, away from the neon glitter of Las Vegas to see an authenic reproduction of a western mining town complete with shoot-'em-up cowboys, gravel streets, and quaint little stores.

No trip to Vegas would be complete, of course, without seeing the grandeur of the state of Nevada. One of the sights will include a stop at majestic Hoover Dam, one of the seven man-made wonders of the world, where a guided tour has been planned. Enjoy a boat ride on beautiful Lake Mead, the largest man-made body of water in the western hemisphere.

You can register your spouse for this exciting program on the registration form. Or we can send you a separate Spouses Tour Registration Form, including further tour information.

But act immediately. Space is limited.

70 Ways to Answer Your Questions

This year's 70-plus conference sessions will take a fresh look at what's occuring in data communications...and why it is happening. New conference sections will cover Distributed Computing, Software Strategies, Timesharing Services and other subjects. And a series of debates and related conference sessions -- all focusing on privacy -- will be offered.

The Debates

A new round of debates for INTERFACE '78 will focus on critical issues such as the worldwide crisis in datacomm privacy, Bell's right to compete in the Information Age, and whether data communications users are making any progress against the legal and policy-making processes.

The Datacomm School

Educating the novice in data communications fundamentals, lots of new ideas and approaches are woven into a program stressing the basics for datacomm decision making.

- Fundamentals of Data Communications
- Interfacing and Transmission
- Communications Processing and Software
- Terminals and Terminal Systems
- Introduction to Distributed Computing Networks

Privacy: A Worldwide Datacomm Conflict

These sessions delve deeply into the problems and opportunities of worldwide data flow so increasingly important to all datacomm users.

- Data for War or Peace in the Information Age
- What IRCs and PT&Ts Have in Mind for the User
- Privacy Solutions through Systems Design

Hardware Highlights

An efficient means of updating attendees on ever-advancing datacomm technology is offered through these seven sessions emphasizing major datacomm product areas.

- Front Ends and Remote Communications Processors
- Data Switching Systems
- Modems and Multiplexers
- Display Terminals
- Teleprinters
- Graphics Terminals
- Remote Batch Job and Data Entry Terminals

Software Strategies

How to optimize software architectures as well as network operating system elements, both local and remote, are addressed in five comprehensive sessions.

- Network Operating Systems
- Datacomm/Database Software Architectures
- Programming Language Efficiency for Datacomm
- Software Schemes to Optimize Data Flow
- Evaluating Datacomm Software Packages

Distributed Computing Workshops

A world of intelligence is distributed in these four important sessions explaining where we are and where we're going as well as what techniques and products will get us there.

- Distributed Computing Progress Report
- Vendor-Designed Network Architectures
- Distributed Data Processing Systems
- Turnkey Applications for the Remote User

Getting Into Packet Services

Packet switching is upon us, and progressive users can discover the ways to benefit in these start-up sessions.

- Principles of Packet Switching
- Planning for Packet Service Use
- User Strategies for Optimizing Packet Services

Time-Shared Services and Systems

Informative sessions on shared services, both general purpose and dedicated, plus in-house systems, are sure to whet the appetite of data communications users bent on cost savings.

- Time Sharing: Complement to the Datacomm User
- Choosing Resources for Dedicated Applications
- Evaluating In-House Time-Sharing Systems

Net Workshops

Seven comprehensive sessions will inform attendees of the strategies and techniques for optimum network performance and network control.

- Planning for Net Performance
- Simulating Alternatives
- Design Optimization
- Measuring Net Productivity
- Implementing Network Control
- Hardware/Software Control Tools
- Real-Time "Tech" Control

The Services Scene

More and better alternatives in transmission service from Bell and independent carriers present much food for attendee thought and action.

- More and More from Bell
- Expanding Independent Services
- New Ways of Sharing Services
- International Alternatives

Datacomm: The Administrative Tool

Where and how datacomm is changing administrative operations are the subjects of five sessions offering tangible evidence of the office of the future.

- The Office Datacomm Will Integrate
- Word Processing Systems Design and Application
- Facsimile Systems and Services
- Telecommunications Tools for the Office
- Electronic Mail

Applications Progress Sessions

Data communications has developed to where a thorough update on systems approaches in these core applications areas should deliver the greatest return to attendees from any operating environment.

- EFT/POS
- Inventory Control
- Reservations
- Production Control
- Order Entry
- Information Retrieval

Datacomm Management

Encompassing key approaches for planning on datacomm performance, attendees are offered four management-oriented sessions to improve their return on invested resources.

- Datacomm Economics for Executives
- Hiring, Training and Motivating Personnel
- Contracting and Negotiating Successfully
- Managing Network Security

Micro Technology for Datacomm

These sessions will give datacomm users an awareness of new, cost-effective micro computing tools so important to improve the efficiency of a network.

- Introduction to Microprocessors for Datacomm Planners
- Distributed Microcomputers Offer New Alternatives
- Micro Intelligence in Terminals
- Micro to Maxi Memory Peripherals in Store for Datacomm

Technology Forum for the Future

INTERFACE '78 offers a series of six sessions to probe the hot areas for maximum systems return on technology, while emphasizing those issues of imminent importance to the user.

- Microcomputer Design for Datacomm Applications
- Message Format Optimization
- Queueing Theory
- Developing Transmission Concepts
- Satellite Communications Progress
- Packet Switching Software

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Current Exhibitor Listing

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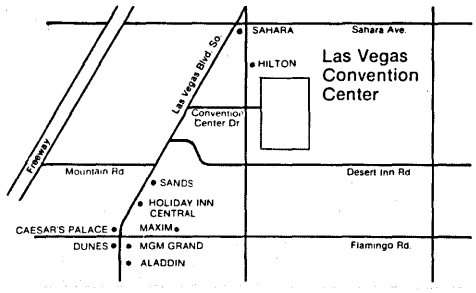

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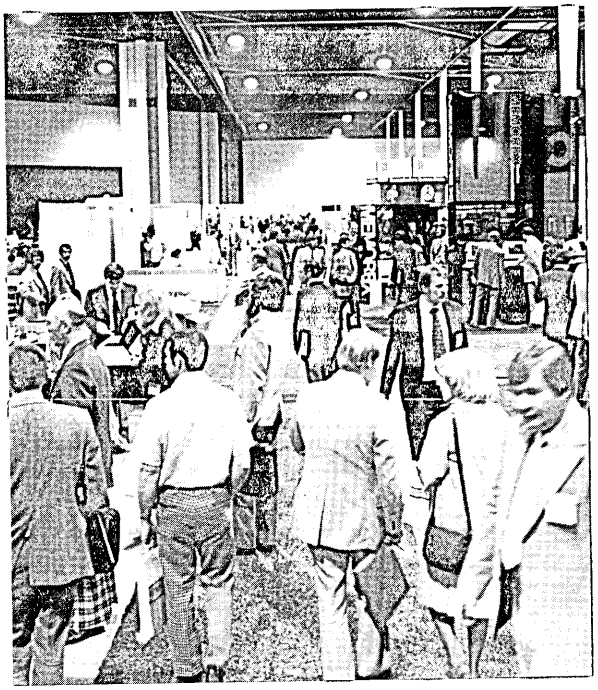

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Combating the "90% Complete" Syndrome

by Frank S. Ingrassia

At its home base, this technique has been rated ahead of structured code, automated test tools, and design inspections. And it's easy to implement.

One of the most common problems encountered in software management is the lack of visibility into the progress being made by each individual on a project. Consider the "percent complete" estimates given by programmers. They are notoriously bad. I have had cases of a programmer, whose job took twelve full-time weeks to complete, reporting "90% complete" by the end of the fifth week.

If you are a manager receiving such estimates, you may have the feeling of having sent the programmer into a deep, dark tunnel into which you have no visibility. From time to time you might hear "I'm 90% through" or "I'm 98% through," but it's often a long time before the programmer emerges. In the meantime, you find yourself spending a lot of time juggling assignments and commitments based on the assumption that the estimates are near the mark.

Especially if you are one of several managers on a large project, continually negotiating schedules and costs based on such estimates, you may begin to see how easily such projects get out of control—even if you have such helps as structured programming working for you.

One way you can combat this "90% complete" syndrome is to establish mini-milestones for each programmer's progress. Even with this plan, though, you can run into problems if the milestones aren't easily and objectively verifiable. For example, take the milestone "Test Plan Available." A programmer claiming to have passed this mark could mean anything between the following two extremes:

"Here's a copy of my test plan. It has been reviewed and approved by the test group, and distributed to the appropriate people."

or

"I talked to Sam last week and he said he had an old test plan for a similar routine that will probably fit our needs."

If you're not sure which of these cases is described by the achievement of the "Test Plan Available" milestone, you're not much better off than you were with the percent-complete estimate. Thus, you need something better: a way of coupling the milestones, the artifacts they represent, their schedule, and an objective scheme for verifying they have been completed.

> . . . the feeling that the programmer has gone into a deep, dark tunnel . . .

At TRW this need is being met by a management tool called a Unit Development Folder, or UDF. Over the last few years, UDF's have been successfully used to enhance management visibility on several software projects ranging in size from one person to over 300 persons. In a recent survey of 67 programmers and managers on a large project, the UDF was rated as the most effective unit-level technique employed on the project—ahead of such other effective techniques as structured code, automated test tools, and inspections.

The UDF is, simply, a particular form of development notebook: a three-ring binder containing a cover sheet and several predefined common sections. This notebook has proven useful in collecting and organizing components of software products as they are produced. In essence, however, the UDF is much more than that; it is a means of imposing a management philosophy and a development methodology on an activity that often appears chaotic.

The UDF provides a uniform and visible collection point for all documentation and code associated with each unit (a "unit" consists of a routine or group of related routines, typically comprising about 50 to 300 source statements). Unit boundaries are established by considering size, functional modularity, and testability —those factors that affect manageability and comprehension.

The organization and content of a UDF can be adapted to reflect local conditions or individual project requirements. All sections may be assigned to one performer, or different sections can be assigned to different specialists. The various sections contained may also be expanded, contracted, or even resequenced to better suit specific situations. The important considerations in its structuring are:

- The number of sections should not be so large as to be confusing or unmanageable.
- Each section should contribute to the visibility and management of the development process.
- The content and format of each section must be adequately and unambiguously defined.
- The subdivisions should be sufficiently flexible to apply to a variety of software types.

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- The individual sections should be chronologically ordered as nearly as possible.

Elements of the UDF

Here are the elements of the UDF, as illustrated in Fig. 1:

1. Requirements

This section identifies the baseline requirements specified for the software project and enumerates those requirements which are addressed by this specific software unit. Any assumptions, ambiguities, deferrals, or conflicts concerning the requirements and their impact on the design and development of the unit should be stated here.

2. Design Description

The format and content of this section, containing the current design description for each of the routines included in the UDF, should conform to established documentation standards and be suitable for being directly included in the appropriate detailed design specification. Throughout the development process this section represents the current working version of the design and, therefore, must be maintained and annotated as changes in the initial design occur.

When the initial detailed design is completed and ready to be coded, a design walk-through is held with one or more interested and knowledgeable coworkers. The completion of Section 2 is predicated on the successful completion of the design walk-through. Upon completion of testing, the final versions of these sections with marked-up corrections are simply collected from all the UDF's and sent to be typed. This comprises the major portion of the final design specification.

3. Functional capabilities list

A Functional Capabilities List (FCL) details testable functions performed by the software unit, that is, it describes what things a particular unit does, preferably in sequential order. Generated from the requirements and detailed design prior to development of the unit test plan, the Functional Capabilities Lists provide the basis for planned and controlled unit-level testing (a means for determining and organizing a set of cases which will test all requirements and functional capabilities and all branches and transfers).

The lists also provide a consistent approach to testing which can be reviewed, audited, and understood by an outsider. When mapped to the test cases, they provide the rationale for each test. And the FCL encourages another look at the design at a level where "what if" questions can become apparent.

4. Unit code.

This section contains the current source code listings for each routine. It is considered complete when, after the first error-free compilation or assembly, the code is ready for unit-level testing.

5. Unit test plan

This is a description of the overall testing approach for the unit and a

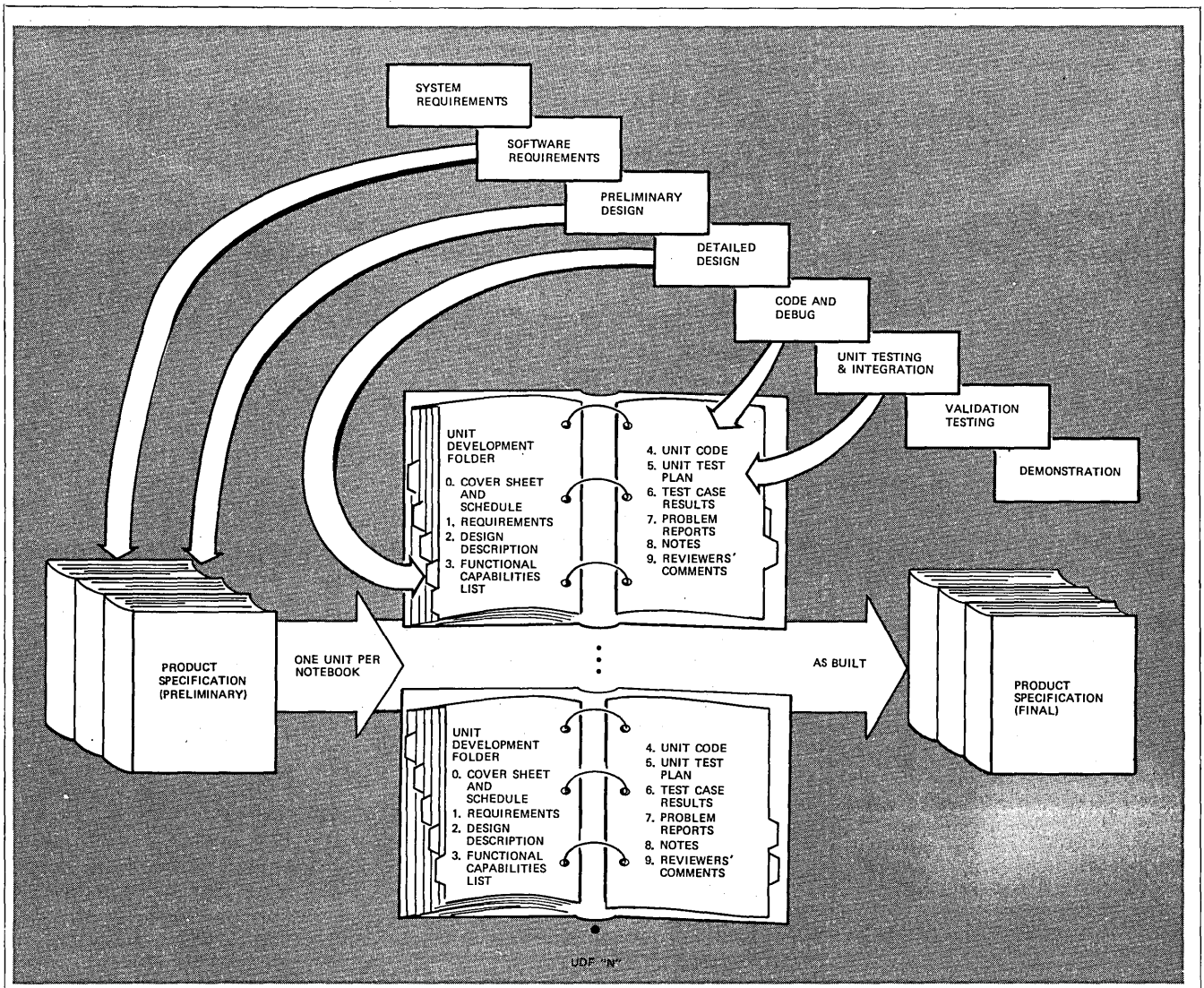

Fig. 1. Some of the best tools are the simplest ones, and the UDF may be a case in point. It imposes a development sequence, establishes a time line, creates an audit trail, assures useful documentation, reduces turnover problems, and even enforces modularity. What more can we ask from a three-ring binder?

description of each test case to be employed. The descriptions must identify any test tools or drivers used, list all required test inputs to the unit (and their values), and detail the expected output and acceptance criteria, including numerical outputs and other demonstrable results.

Before unit testing starts, there should be a review of the plan by a product assurance team (or other test group outside the unit) to be sure the test cases adequately test branch conditions, logic paths, input and output, error handling, and a reasonable range of values and unit performance as stipulated by the requirements.

6. Test case results

This section contains documentation that testing has occurred as set forth in the Unit Test Plan. All current successful test case results and analyses are included. Test output is identified by test case number and listings clearly annotated to facilitate reviews of the results by other qualified individuals.

7. Problem reports

This section contains status logs and copies of the Design Problem Reports, Design Analysis Reports, and Discrepancy Reports (as required) for all design and code problems and changes subsequent to baselining. This ensures a clear and documented accountability for all problems incurred and changes made.

8. Notes

This section contains any memos, notes, reports, etc., which expand on the contents of the unit or relate to problems and issues involved.

9. Reviewers' comments

This last section is a record of reviewers' comments from the section-by-section review and sign-off, and from scheduled independent audits. The comments are also usually provided to the project and line management supervisors responsible for development of the unit.

Cover sheet

The cover sheet provides chronological visibility. It identifies the unit by name, designated custodian, and contents with respect to individual routines. The scheduled due dates and individuals responsible for each of the sections are identified when the UDF is initiated, which generally coincides with completion of the preliminary design reviews. Other items such as a UDF change log sheet or a composite schedule are sometimes included.

The usefulness of the information contained on the cover sheet is a function of how realistic the schedule is, how much participation and commitment management gets from the performers, and the amount of interest and concern that management exhibits in monitoring and achieving these milestones.

It works

The UDF approach has been employed on several software projects at TRW and continues to win converts from the ranks of the initiated. The concept has proved particularly effective when used in conjunction with good programming standards, documentation standards, and a test discipline.

The principal merits of the UDF concept are in summary:

(1) It imposes a development sequence on each unit and clearly establishes the responsibility for each step. Thus the reduction of the software development process into discrete activities is logically extended downward to the unit level.

(2) It establishes a clearly discernible time line for the development of each unit and provides low-level management visibility into schedule problems. The status of the development effort becomes more visible and measurable.

(3) It creates an open and auditable software development en-

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COMBATING

vironment and removes some of the mystery often associated with this activity. The UDF's are normally kept "on the shelf" and open to inspection at any time.

(4) It assures that the documentation is completed and maintained current with development activities. The problem of emerging from the development tunnel with sparse or inadequate documentation is considerably reduced.

(5) It reduces the problems associated with programmer turnover. The discipline and organization inherent in the approach simplify the substitution of personnel at any point in the process without a significant loss of effort.

(6) It supports the principles of modularity. The guidelines given for establishing the unit boundaries assure that at least a minimum level of modularity will result.

It must be emphasized that no device or approach can be effective without a strong management commitment. Every level of management needs to be supportive and aware of its responsibilities. Once the method is established it also needs to be audited for proper implementation and problem resolution. An independent software quality assurance activity can be a valuable asset in helping to define, audit and enforce management requirements.

At TRW the UDF is being used under these cooperative conditions and has proved successful as a valuable bridge between management and software development. ❋

Mr. Ingrassia has been involved in the design and development of software since 1956 when he started programming the IBM 701. He is currently a manager of software product assurance and configuration management at TRW Defense and Space Systems Group in Redondo Beach, Calif.

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Mainframers

PCM Revenues Neared $200 Million in '77

About 160 are installed and more companies are poised to enter the market, as IBM counters with price cuts

Close to 160 plug-compatible mainframes have been installed by independent vendors at the close of 1977, a significant year by any measure for that sector of the computer market. And the rate at which those IBM-compatible machines are being installed continues to increase.

Two of the three suppliers of these systems began shipping last year. San Francisco-based Itel Corp. gets its AS/4 and AS/5s from National Semiconductor, and has between 55 and 60 of them installed. Not only is the production rate of those machines being raised, but Itel this year also will begin shipping the AS/6s being made for them by Hitachi, Ltd.

Control Data Corp. has been shipping its Omega 480-1 mainframe since mid-year and had about eight installed at the end of the year. This year it will also begin shipping the 480-2, both mainframes being supplied to them by IPL Systems, Bedford, Mass.

This year, too, a new supplier is expected to come on-stream. Magnuson Systems Corp., preferring to maintain a low profile for the moment, has told DATAMATION of its intentions during 1978 to begin producing IBM-compatible mainframes that span the 370 line from the 115 through the 158 with five models. And there's an outside chance that another leasing/financial services firm, OPM Leasing Services, Inc., of New York City, will shortly reach an agreement with an unnamed Japanese firm for 370-compatible machines in the middle of that family.

Where the madness started

Still the glamor company of them all is Amdahl Corp., which started all this madness with an economical replacement for the 370/168. Amdahl should have closed the year with about 95 machines installed, and that would mean it shipped 62 during the year. This contrasts with 27 the year before. And this company, too, is increasing its production rate, which is currently five a month. The firm more than doubled its manufacturing square footage during the first nine months of '77, and will more than double that again by mid-'78. In addition, production is scheduled to get underway in Ireland this summer in a temporary 25,000-sq.-ft. facility near Dublin. Within a year after that they're to move to a permanent 60,000 sq. ft. plant nearby.

Based on all this, several observations can be made:

—There definitely has been an acceptance by computer users of the plug-compatible, software-compatible mainframes much as there earlier was of the plug-compatible peripherals.

—The market for these mainframes is now growing at a faster rate than that of compatible peripherals manufacturers in the beginnings of that subindustry.

—The dollars involved have become significant, approaching $200 million in revenues during 1977 and probably close to a half-billion dollars during '78. As an "industry," the value of the three vendors' shipments of only plug-compatible mainframes would place them very high on the DATAMATION Top 50 classification.

Short time frame

"You start looking at the projections of where these people might be in the next two years, and you can see this business becoming as large as the plug-compatible peripherals business," says Robert Colten, who recently joined Gnostic Concepts, Inc. "And that happened in a very short time frame."

To the user's advantage, of course, the entry of competitive mainframe suppliers has forced IBM to cut prices and increase the performance of its computers. This action, prompted by the success of Amdahl, has netted out to a 40% to 60% improvement in price/performance. Colten attributes most of this to the improvement in the cost of memory and the inboarding of channels. While IBM's actions have not visibly hurt Amdahl's profitability, they have significantly af-

> "You can see this business becoming as large as the plug-compatible peripherals business."

IBM VS. THE PCM'S

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138			480-1
148		AS/4	480-2
158-1		AS/5-1	
158-3		AS/5-3	
3031		AS/5, 7031	
168-3	470V/5	AS/6	
3032	470V/6-11		
3033	470V/7		

Changes within a year are expected in this lineup, which shows the comparative power of software-compatible processors without consideration for price. But price changes can also be expected soon.

news in perspective

STOCK of Amdahl Corp., first of the plug-compatible mainframers, was admitted for listing on the American Stock Exchange in December. At opening ceremonies last Dec. 5, Amex specialist William Silver, left, described the initial transaction to Board Chairman Gene Amdahl and Deputy Chairman Eugene White. The stock opened at 47½.

fected the market for computers with that favorable price/performance.

"In fact," says Colten, "the rate of orders on the 3033 surprised everybody. I think that was a major event" last year. He further acknowledges that the tardy delivery schedule on the 303X series has breathed new life into the plug-compatible mainframe vendors. "If IBM could have delivered a year sooner, or at a faster rate, then the plug-compatibles would not have had the success they've had."

Overseas success

The success of the vendors is not restricted to the domestic market. To date, Control Data has installed its Omega machine only in the U.S., but Itel has placed five in Europe, and Amdahl at least four. But in Canada, which has a heavy population of 168s, there are at least nine 470s. "Canada's going like gangbusters," admits an Amdahl spokesman.

Europe? "We expect that market to be very healthy in 1978," says Richard A. Whitcomb, v.p. of systems marketing at Itel. Indeed, the company is marketing its computers through offices in Italy, France, West Germany, Belgium, Sweden, Norway, and the U.K. Whitcomb says the firm is looking at South America, Australia, and Japan (for the AS/4 and 5).

Details on installation figures or shipment rates are becoming hard to come by as the vendors begin to take an IBM-like posture. Itel has never been too open about prices or customer base, but the company's Whitcomb admits they are looking into an addition to the lower end of their product line, specifically an AS/3. The company, of course, has announced the AS/5, model 7031, which is said to be equal to or more powerful than the IBM 3031. First installation is to be in the fourth quarter of this year. "There will be machines above the AS/6 coming from Hitachi," he adds, but that won't necessarily occur in 1978.

Mysterious machine

Mordecai Weissman, president of OPM Leasing, says they have not yet seen the Japanese machine offered to them for this market. "All I can tell you," he says, "is that we did have some people in, we have spoken to them, and if we decide to go further, we'll go to Japan to meet with them." Although this decision won't be made for a month or two, an affirmative decision conceivably could lead to an initial installation later this year.

> Itel is looking into an addition to the lower end of their product line—the AP/3.

At Amdahl Corp., new president John C. Lewis refused to grant an interview, but a spokesman says, "The most popular operating system we're supporting now is MVS." He says not only are their customers requesting MVS with initial delivery but that existing installations running MVT or SVS are also converting to MVS. "The swing is definitely there," he exclaims. It is estimated that from 30% to 40% of their installations are running that operating system, followed by SVS and by MVT, in that order.

And while hardware vendors are loath to discuss their pricing strategies, industry observers say that price changes by the independents can be expected along about the time IBM begins delivering the 3033. It's one of the games these people play.

—Edward K. Yasaki

Marketing

Too Little Too Late

Customers ponder IBM's 3031 and 3032 delivery stretchouts

A number of IBM users with 3031s and 3032s on order received unwelcome news last month when the giant computer manufacturer announced customer delivery dates that in many instances would run considerably beyond what customers had anticipated.

A spot check by this magazine of roughly three dozen customers with approximately one hundred 31s and 32s on order, indicates that only a handful of deliveries will be made next year with the bulk extending into 1979, 1980, and even 1981.

Moreover, a survey conducted privately by a West Coast firm indicates that at just under 200 IBM sites contacted—all of which had at least one 31 or 32 on order—only 15 machines would be delivered in 1978.

To be sure, many lessors and other sources had predicted when IBM made the 31 and 32 announcements that the average delivery time might run as long as 18 months (November 1977, p. 173). But current findings indicate that many customers have received dates that extend well beyond that time frame.

Most are "first day" customers

All of the sources contacted by DATAMATION for this story insisted on

anonymity. Most were "first day" customers who had ordered within 10 days of IBM's 31 and 32 announcements last October. The majority said they'd been looking for delivery by mid 1979 at the latest. However, a national clothing manufacturer, for example, learned he would receive only one of the three machines ordered within that period. The second would be delivered in 1980 and the third in 1981.

Similarly, a "first day" customer in Chicago was given a delivery date for late summer 1980. He was told by an IBM sales rep that the best date in the Chicago region was late 1979, and the "oldest" date fourth quarter, 1981. These dates were for "first day" customers. IBM hadn't begun to schedule deliveries for customers ordering after the first day period lapsed, he was told.

Angry and bitter

Response to the announced delivery schedules, which were based on randomly determined sequencing, left some customers angry and bitter. Frustrated, one 158 user obtained an AS/6 from Itel rather than wait for the 32 he'd ordered.

"We'd counted on getting a 31 early in 1979," another 158 user noted. "But with the delivery now scheduled for late 1980, we have to extend our position on our 158 for another year at least. This makes the cost performance curve for the 31 nowhere near as attractive as it appeared when we ordered. And that curve was the main reason we bought in the first place."

The v.p. of an East Coast leasing firm with several dozen new processors on order expressed similar sentiments. "We're getting a few machines in 1978, but most of them aren't being delivered for 14 to 18 months," he said angrily. "IBM really led us down the path on this one."

One user obtained an AS/6 from Itel rather than wait for his 3032.

An executive with a rival firm, one which had been given a similar delivery schedule for the two dozen or so machines it has on order, was even more outspoken. "This may be the most incredible game of corporate chutzpah I've ever seen," he fumed. "They announce what is essentially a phantom machine, make a few token deliveries in 1978, and string out users who are still shelling out for 158s and 145s each month waiting for a replacement.

"In the interim instead of pricing themselves 15% to 20% under the 158s, the plug compatible manufacturers now have to compete with a machine that no one's seen and that's 55% of the 158's price. IBM's destroying the profits of their competitors and keeping anybody else from coming into the market."

What's behind the delays? One source, a former IBMer who remains close to the company and whose firm has ordered ten new machines, points to possible production difficulties. "They've had problems making delivery dates on some other products, like AP's (attached processors), and they may be running low on component parts," he speculates. "Also they may be very short of production capacity. IBM has been closing down plants and now they've got a horrendously large backlog of orders. They haven't had this kind of backlog since the early 1960s."

Other observers see IBM's snail's pace delivery schedule as deliberate. "What drives IBM is its own financial results," said one industry analyst who asserted the 31 and 32 shipping schedule was structured to have the maximum beneficial impact on the company's revenue picture.

Purchase strategy

IBM, he explains, has made the 303X line more attractive to purchase than buy. This is reflected in a recent survey of 4,200 IBM users by G.S. Grumman/Cowen, a Boston-based investment firm. The study showed that 74% of those planning to install the new processors intended to purchase or go to third-party lease. That's roughly 10% higher than equivalent figures for the top end of the 370 line.

But this purchase-oriented strategy would jeopardize the current rental and lease base if implemented too soon through earlier delivery schedules. Moreover, if IBM can extend the purchase spread out over the next few years, it can maintain steady revenue growth during that period, analysts maintain.

Given this scenario, IBM's deliveries of the 303X line will escalate during late 1979 and 1980—a time when the Grumman survey indicates the remaining bulk of the 370 line will come off lease.

Then IBM should also be about ready to unveil its new line, and would have shown more of its hand on unbundled operating systems.

And with extended schedules, IBM can clear the "water"—those who ordered just to get a place in line—from its books. Already, the computer giant is refusing orders from leasing or computer brokerage firms without an established track record. And no longer can a buyer sign up in order to sell his position.

IBM's purchase-oriented strategy would jeopardize current rental and lease base if implemented too soon.

Once IBM has pruned its order list and worked out production schedules for the entire line, observers believe the company might improve order positions across the board.

Phantom machine

In the meantime, the PCM's and potential new entrants to the market are left dancing in the dark waiting for IBM's next move, though the PCM's may garner some short term benefits from the immediate delivery lags. Further, PCM's and other manufacturers must live with the uncomfortable thought that perhaps they cut profits margins prematurely.

And IBM's customers? They've been given what amounts to a "take it or leave it" choice, with IBM gambling the vast majority will remain in the fold.

—Laton McCartney & Angeline Pantages

International

Looking Beyond Israel

Elbit's small business system is aimed at Europe

A new, competitive and perhaps innovative presence can be expected this year in the lucrative business systems markets of Germany, France, and probably Britain. Elbit Computers Ltd., the Israeli minicomputer firm, has developed its own small business system, PACT, and plans to take full advantage of a recent Common Market agreement that gives Israeli products duty-free access—and a 6% to 7% price advantage over U.S. competitors.

The PACT system, the result of an 18-month development effort that will cost nearly $6 million when completed, uses a disc-based operating system to govern a 16-bit Elbit cpu and up to 32 terminals, local or remote. PACT is the result of an Israeli effort to design a business system that can use standardized hardware for a wide variety of business applications. Elbit has developed a limited operating system "kernal"—standard for all PACT systems—and a series of environment-tailored OS "executives" to adapt the system for specific application programs. If it can be pitted competitively against the Nixdorf or DEC spectrum, the volume manufacturing and maintenance benefits are obvious.

Three announced

Elbit already has announced three of the PACT "executives": KeyPACT, a data entry and data capture system, using diskettes for off-line output and a host communication link on-line; DataPACT,

a standalone, multiterminal business system; and InterPACT, Elbit's distributed processing system, still under development. Two or three more executives will be introduced, say the Israelis, one for a time-sharing system, one for data base management, and another, perhaps in data retrieval.

PACT is the acronym for "programmable asynchronous clustered teleprocessing," according to Elbit president Uzia Galil, but early PACT literature uses a more pedestrian translation: "programmable alphanumeric cluster terminals."

Either way, Elbit will be selling PACT for agile communications in a business environment. It's a growth system with disc capacity expandable from 8.8 MB to 400 MB, and a 256KB memory that can be extended to 512KB. PACT initially will be sold with two high level languages, Fortran IV and RPG II, but other languages are under development.

PACT development was nearly 50% funded by the Israeli Ministry of Commerce and Industry.

Hesitant on prices

Although demo machines already are being tested by European oem's, Elbit marketing v.p. Yehuda Shinahr is hesitant to quote prices. "It's very early to publish prices," he said, "but a very basic PACT system with the CPU, printer, two crt's, 8.9 MB disc, and diskette will be offered to the end user for about $28,000." Volume discounts will, of course, be available, he added. The KeyPACT executive will be offered without charge, but the DataPACT will be priced at about $4,000, and InterPACT at about $7,000.

Elbit is a rather headstrong subsidiary of Control Data Corp., which in 1970 purchased 55% equity for roughly $500,000. Originally formed as a technological spin-off from the Israeli defense establishment in 1967, Elbit was one of the little-known pioneers in minicomputer applications. The Elbit 100, a general purpose mini, was shown at the 1968 Atlantic City computer conference, and while the company attempted to sell commercially, it lacked the marketing muscle. Elbit then was jointly owned by the Israeli Ministry of Defense and Elron, now Israel's leading holding company for high technology venture capitalism.

CDC bought in

The founders decided they needed a big-time Yankee computer firm as a partner, chose CDC, and sold the government share and five percent of the private equity. It was such a lucrative deal that in the Arab world it has been said that Elbit was a gift to CDC to get them on the Arab blacklist and deprive Arabia of CDC technology. With its government business as a crutch, Elbit has never had an unprofitable year (1976–77 net profits after taxes were $1.3 million on sales of $24 million, with $2 million R&D expenses fully absorbed) and both CDC and Elbit have grown in the marriage.

ELBIT'S YEHUDA SHINAHR

Using its own basic hardware development and CDC's operating systems, Elbit has produced more than 1,000 CR17 minicomputers for CDC, a line fully compatible with CDC's 1700. For the past three years, Elbit also has been manufacturing crt terminals for CDC's KES-480 data entry system. But full dependency always has seemed risky and unhealthy for Israeli subsidiaries, explains Elbit's president Galil. The need for an independent identity and independent product lines has become almost a philosophy for Elbit's Israeli investors. Elron, the Israeli holding company with 45% of Elbit, had successful joint projects with both Xerox and Monsanto in electronics and suffered when each of the two giants decided to withdraw from the market.

"Elbit has had two good legs, our work for the government and our work for CDC's product lines," said Galil, "but we think it is important to have a third leg." Looking at Israeli subsidiaries of U.S. firms, he added, "I think the really successful ones are those that have developed independent capabilities." More implied than expressed was Elron's long-range concern for the vagaries of international politics and economics.

IBM-compatible

The PACT development, with its new Elbit-designed OS, cpu, and two new lines of crt terminals, was nearly 50% funded by the Israeli Ministry of Commerce and Industry. The first of the terminals, the tty-compatible DS 1920, was introduced ten months ago. The newer DS 377, a crt fully plug-compatible with IBM's 3277 Model 2, was brought out only three months ago with high hopes for the European market, where tarrif-free entry should allow Elbit to undercut the Americans who are the only firms offering fully IBM-compatible crt's.

Announcement of IBM's System 34 last May was received with some apprehension at the Elbit plant in Haifa, in Northern Israel, because the file management system for the 34 is very similar to Elbit's DataPACT concept.

"There were mixed feelings, actually," said Galil. "The first reaction was the Big Brother syndrome, understandably. But then, on the other side, we found that IBM's similar entry legitimized our DataPACT concept, the use of RPG II, and our use of files and screens. Now I see it as a good door opener. We're not going to be selling in a vacuum."

Export-oriented

The native computer and electronics industry in Israel has always been export-oriented. The Israeli market, while vital and growing, has been seen as too small a pie to justify major commercial manufacturing, and the nation was hungry for foreign exchange. Increasingly, however, the growth of the small business market there and the belated public realization of the minicomputer's potential in dp (as opposed to more developed markets in instrumentation and process control) has awakened Elbit officials to homebound opportunities and caught the attention of government officials who want to displace costly imports with Israeli products.

While it was primarily the new possibilities of the ECC market that led Elbit to invest in the PACT development, said Galil, the company also realized that "the local market potential is considerable and not to be neglected." With Elbit's CDC past, Israel has been in the curious position of exporting minicomputers but importing most of those installed in its own infrastructure. Recent government policy decisions to stress Israeli-made dp purchases—if technologically equivalent, and no more than 10% more costly than competitive imports—should be a boon to Elbit.

"We seem to be welcomed as alternatives in the German and French markets."

But the Eurodollar is still the big bait.

Elbit has already set up sales subsidiaries in both France and Germany, the prime entry markets, and plans to establish a third in Britain. Although it has an arrangement to use CDC service "where economically justified," the company has begun to organize its own maintenance staff, setting up offices in Tel Aviv, Paris, and Cologne.

Welcome alternatives

"We seem to be welcomed as alternatives in the German and French markets," said Shinahr, the marketing v.p., "and I think we will find the same thing in England. I think oem's might be very important because we have such strong hardware and solid basic software." Demonstration models have already been shipped to some oem's, and initial reactions have been "very positive." "We've also been recruiting people with a lot of experience in selling this type of product: IBM and NCR people, very strong," he added.

Elbit is, like many of its American counterparts, very excited about the potential of the huge French market, so much of it centered around Paris. "We feel there is a lot to take there, and local strength is less of a threat. SEMS, the new French company, is not as strong in business applications, and not as strong traditionally in the market as Nixdorf in Germany. . . . I couldn't say the same thing about the U.K.," explained Shinahr. "Which is why for us the U.K. market will be developed after we begin to establish ourselves in France and Germany." Elbit, he said, is looking for distributor arrangements with established firms in Italy, Scandanavia, Spain, and a few other key markets.

Although the PACT system would seem to overlap some of the CDC product line, CDC has apparently smiled paternally upon the Israeli-financed PACT development. Elbit executives stress that the new product effort is complementary to the CDC development plans, and that Elbit remains deeply involved in other CDC-committed work.

Attractive to CDC

"We participated in the development of the Cyber 18 and we're involved in some of the manufacturing, and we've been developing a new line for CDC that I'm not yet free to discuss," said Elbit president Galil. Although at present there might be some overlap, he acknowledged, "we believe that with our own products and our own marketing, we'll be reaching different segments of the market." Elbit's technology might have made a splash at CDC: one senior Israeli government consultant reported that he was told by Elbit executives that CDC might adopt the PACT system and phase out competing lines.

"For the next five years, with the growth of the business market, all this will be very significant for Elbit," said Galil, "but it will still only be a segment of our work. In the long run, for the ten-year span, our real strength I think will be in developing total systems for very specific applications in which Israel can be a leader. Things like resource management, water and energy control. A small company in a small country has two options: they can be a small part of a large market or they can strive for excellence in a very small specialized market. You can take the second choice when you're small, but as you grow, get bigger, I think you have to do both. That's what we're doing here."

—Vin McLellan

(Mr. McLellan, Boston bureau manager, has been traveling in the Mideast, where he visited computer sites and talked with vendors.)

Another Look at Digisat Rates

Users of international data communications soon may be in for big rate reductions through what is called Digisat service. Germany and Brazil have said they're willing to offer the service and France and Spain are on the verge of doing likewise.

Digisat is a digital satellite communication service which can transmit data across a standard 3 KHZ. voice grade channel at speeds up to 56K bps. Because the service is digital rather than analog, it makes far more intensive use of the channel bandwidth, which is why Digisat rates can be less than those for the analog equivalent—alternate voice and data (AVD) service. An AVD circuit has a top speed of 9.6K bps.

Under a tariff already accepted by the Federal Communications Commission, Comsat will charge the U. S. international record carriers (IRC's) $1,250 to $1,860 a month for a Digisat half-circuit between the East Coast of the U. S. and Intelsat's IV or IV-A satellite, poised over the Atlantic at the approximate midpoint of the message path. (The other half of the circuit will be provided by a foreign carrier.) The $1,250 to $1,860 a month charge will depend on the transmission speed of the Digisat subchannel leased by the record carrier. By comparison, Comsat now charges an international record carrier $2,850 a month for an AVD half-circuit.

A user pays the carrier $4,575/month for this AVD half-circuit, about 60% more than the record carrier pays Comsat. In the case of Digisat, two U. S. record carriers—ITT and the French Telegraph Cable Company (FTCC)—have proposed markups of 140% to 180% (see table). But even so, customers who need 2400 or 4800 bps service still would save money compared to what they're now paying for AVD facilities.

French Cable, in a recent statement to the FCC, indicated that it couldn't offer lower Digisat rates because customers of its existing services would migrate to the new one and the company would end up losing money.

Alternative proposed

To make their proposed rates more palatable, French Cable and ITT proposed a "composite" Digisat service based on the use of cable as well as satellite circuits. If one transmission path became inoperative, the other would be available, so the user's message would always get through. FTCC said it would guarantee Digisat channel availability and error performance in writing. The company, which is closely affiliated with the French PTT, added that "by presenting an adequate rate structure consistent with this added value and with comparable existing service rates, such a proposal could be agreed upon by some of the European administrations and consequently facilitate the provision of new trans-Atlantic communication services."

Two carriers propose a composite service based on using cable as well as satellite circuits.

Half-Circuit Rates

	A Comsat charges U. S. IRCs	B IRCs charge their customers		C Markup Percentage (B - A x 100) / A	
AVD (Alternate voice/data circuit. Accommodates data speeds up to 9.6K bps)	$2,850/mo.	$4,575/mo.		60.5%	
Digisat		ITT[1]	FTCC[1]	ITT	FTCC
2400bps	$1,250/mo	$3,000	$3,200	140%	156%
4800bps	$1,455/mo	$4,000	$3,900	175%	168%
9600bps	$1,860/mo	$4,500	$5,200	142%	180%

[1]: Proposed rates

A multiple choice

A multifunction data entry system from Data 100.

(WARNING: there may be more than one right answer to each question)

1. Keybatch is:

(a) a multifunction intelligent key-to-disk data entry system.

(b) a brand new multifunction system from Data 100.

(c) a multifunction system which supports high volume concurrent batch capabilities.

2. Keybatch is also:

(a) a multifunction system offering stand-alone RPG for expanded user flexibility.

(b) a multifunction system that can operate with on-line file inquiry capabilities (3271 compatible) via common key-stations for both data entry and on-line file inquiry.

(c) a system capable of handling mail sorting and other office tasks.

3. As a data entry system:

(a) Keybatch has up to 20 megabyte disk storage capacity.

(b) Keybatch is proven with approximately 900 units now in use.

(c) Keybatch can be configured with 2 to 16 keystations.

4. For the end user:

(a) Keybatch meets short range goals such as appreciable dollar savings.

(b) Keybatch provides for long range system growth.

(c) Keybatch offers both of the above.

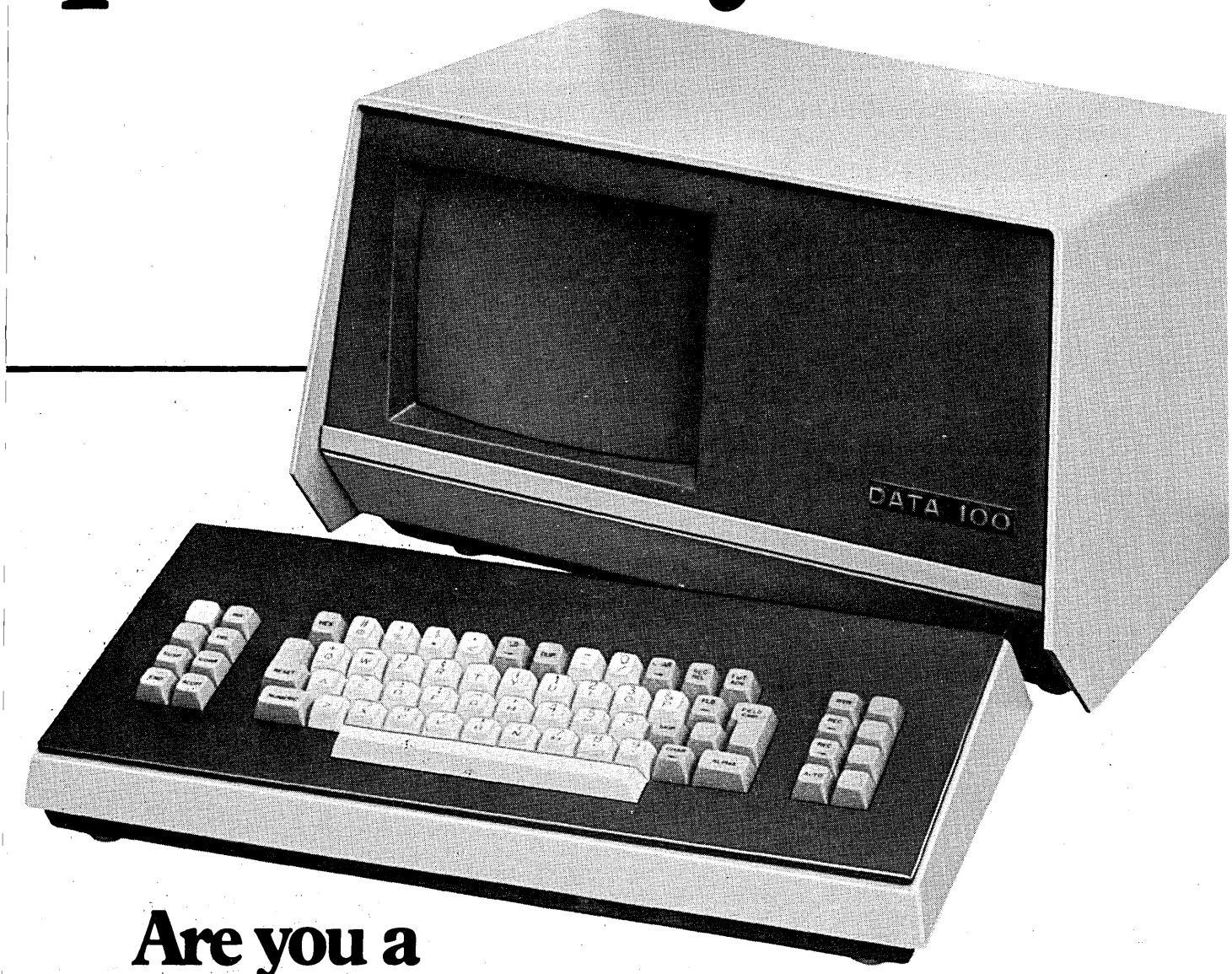
5. For more information on Keybatch, you should:

(a) search frantically through your EDP literature files.

(b) write Data 100 at 6110 Blue Circle Drive, Minnetonka, MN 55343.

(c) call your nearest Data 100 sales office or one of the numbers we've listed.

quiz on Keybatch.®



Are you a multifunction expert? Check these correct answers.

All answers but four are correct.

1b: Keybatch isn't brand new, was introduced in 1974.

2c: Sorry, Keybatch can't do everything.

3b: There are actually 1500 Keybatch systems on the job worldwide.

5a: No need to search when we're so easy to write or phone. Do it now!

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CIRCLE 58 ON READER CARD

Late last November, Comsat told the FCC that "a Digisat-like service probably can be provided by cable," but it "will be different and most likely will be of lower quality" than a satellite-only service. Among other things, the equipment used at each Earth station for a satellite-only service "will provide for the regeneration of the . . . signals, thereby eliminating the additive effects of noise and distortion found in . . . the analog-type repeaters prevalent in transoceanic cable systems."

Cost vs. quality

In a recent interview, a Comsat official contended that there isn't much need for guaranteeing the availability or error performance of Digisat channels because satellite circuits across the Atlantic are inherently of high quality. Also, since there are two satellites in operation, the service already includes backup capability.

> Even if Digisat reduces rates to Europe, the benefits won't last long.

While admitting that transmission performance isn't specifically guaranteed by Comsat, this official wondered whether the added insurance offered by FTCC would be worth the added cost. He thought a "reasonable" price to the end user for a satellite-only version of Digisat would be "under $2,000/month" for 2400 bps service, around $2,800 for 4800 bps service, and approximately $3,600/month for 9600 bps service.

A key question underlying the whole Digisat pricing controversy is the demand for the service. Comsat has surveyed the potential market in the U. S. and abroad and says it has found a large number of prospects. In this country, they include Chase Manhattan Bank, International Paper, Rockwell International, Chrysler, Bank of America, and several dozen other blue chip corporations.

Comsat officials decline to name the overseas prospects; they insist, however, that Germany and Brazil recently offered to provide Digisat service, and France and Spain are likely to do so shortly, largely because of nagging from users in each country.

If this is actually the case, Digisat rates might be reduced even more than is suggested by the rate table. That table assumes the IRC's will lease individual 2.4 to 9.6K bps channels from Comsat and re-lease them to end users. However, TRT—one U. S. record carrier—has told the commission that if there is an immediate requirement for at least 20 discrete 2400 bps circuits to a single country from a single U. S. gateway, it will lease a 50K bps Digisat circuit from Comsat and do the subdivision itself, sharing the resulting subchannels with other IRC's.

The payment to Comsat for each circuit, under this latter arrangement, would be considerably less, and presumably some of the savings would be passed on to end users.

Benefits short lived

One international datacom user argues that even if Digisat reduces rates to Europe, the benefits won't last long. He says the European carriers have decided to do away with flat-rate private line tariffs but realize they can't do it all at once. "So they're going to offer speed-sensitive services like Digisat as the first step; once that concept has been firmly established and a significant number of customers have been weaned away from flat rates, the carriers will impose new charges based even more directly on the volume of bits transmitted. Users will end up paying considerably more for medium- and high-speed services than they're paying now."

At press time, the FCC was considering Section 214 applications, requesting authority to offer Digisat across the Atlantic, from all of the U. S. record carriers. Judging from past history, the commission will authorize the service. It was due largely to a threat from the FCC last summer that the IRC's were persuaded to file the 214s in the first place.

Comsat had proposed Digisat across the Atlantic more than two years earlier, in April 1975. The IRC's, insisting they couldn't find European partners, did nothing about seeking authority to offer the service until the commission, in a rare fit of pique, threatened to let Comsat eliminate the middleman and offer Digisat directly to the public.

While the commissioners seem likely to approve Digisat, it isn't clear whether they will opt for a satellite-only or a composite satellite and cable offering. That's the big question—for both users and carriers.

—Phil Hirsch

(Mr. Hirsch, a free-lance writer, covers communications-related events for this magazine.)

Antitrust

Pre-Trial Maneuvers

Ma Bell questions pre-trial procedures in huge antitrust case

The Justice Dept. has ever underestimated the muscle of its biggest antitrust adversary, the American Telephone & Telegraph Co. But even so, the mighty company's latest courtroom maneuvers gave some of the government's most seasoned trustbusters a sharp surprise and a new awareness of AT&T's "cleverness when cornered."

It also gave them an old problem to worry about: the jurisdictional issue that's been plaguing the government's massive AT&T antitrust suit. After a series of determined but ill-fated attempts to shove the case out of the courts on jurisdictional grounds, AT&T took a second stab at the Supreme Court, hoping this time that it would agree to review the tricky jurisdictional question.

But once again last month, the high court refused to hear the company's arguments, returning the three year old case to the original court, the U. S. District Court in Washington. Obviously prepared for this setback, Bell had a rapid-fire response ready, and a few hours after the disappointing decision the company had turned over to the lower court a series of pre-trial orders on how it would like things to run from here on out.

An important part of AT&T's plans for controlling the troublesome case hinges on stalling the suit over the jurisdictional issue. Bell has contended all along that the fed's case should be thrown out because jurisdiction rests with the Federal Communications Commission and state regulatory bodies. And now it argues that the case should be pruned down to cover only those aspects which are not handled by these regulatory authorities. "Certainly, even if the case is properly before the court," the company declared in its filing, "it can and should be reduced to manageable proportions by dismissing those parts of the government's complaint which relate to matters within the exclusive jurisdiction of regulatory agencies."

> ". . . a somewhat artfully worded attempt to delay things forever."

To make this point even stronger, Bell specifically asked the presiding judge in the case, District Court Judge Joseph C. Waddy, to set aside six months for resolving these jurisdictional boundaries. Dis-

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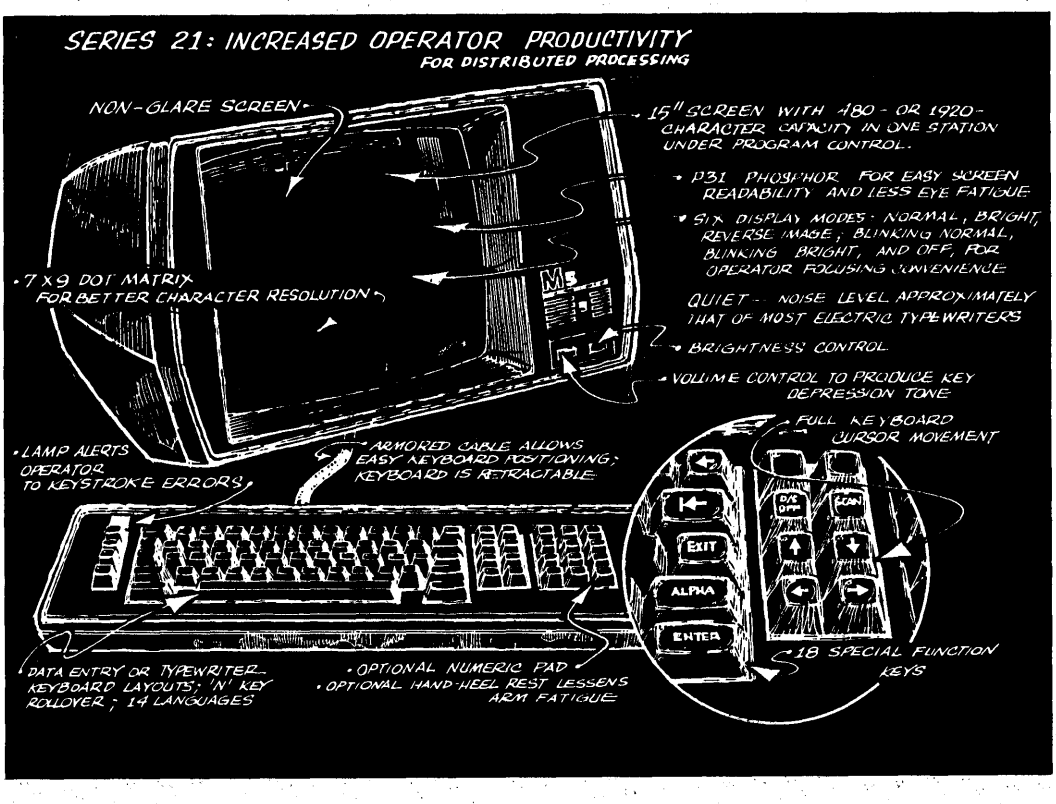

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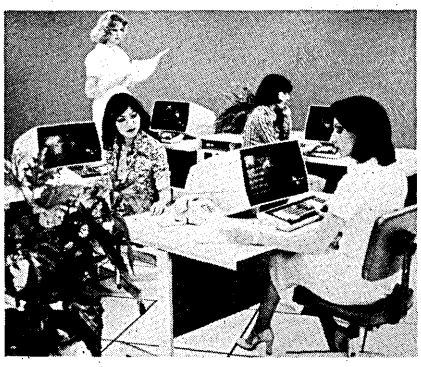

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covery proceedings during that time would be limited to working out this purported problem.

Attempt to delay

A Justice lawyer calls this latest AT&T tactic "very clever. It's nothing more," he insists, "than a somewhat artfully worded attempt to delay things forever." He's cautiously optimistic that since Waddy has already ruled (November 1976) against AT&T on this issue that he will do so again and let discovery in the bogged-down case go forward. But if the judge buys Bell's jurisdictional bluff, he confides, "then we've got a real problem."

And that may be just one of many problems the antitrusters are up against in their square-off with the communications giant. The government's litigation against AT&T is aimed at breaking up the company's long-cherished "integrated system." The pro-competitive panaceas prescribed under its divestiture proposal would sever the company's manufacturing arm, Western Electric, and its R&D subsidiary, Bell Laboratories, from the AT&T establishment. Also targeted for spin-off from the Bell System operating companies would be some of AT&T's Long Lines Div.

Help from elsewhere

This bold relief, should it ever become a reality, could make some of the numerous private antitrust suits against Ma Bell moot. But realistically, this "divestiture dream," as one pragmatic lawyer pointed out, may be a long way off or even impossible. What may not be impossible, however, is a piggybacking strategy where the government could use relevant documents turned up in these private cases, of which there are 40 to date, to bolster its own significantly broader and more complex case. Of particular interest to the trustbusters are discovery documents spawned in the AT&T suits brought by MCI Communications Corp., Wyly Corp., and Litton Systems Inc.

The company's obvious ploy is to frustrate its antitrust foes into apathy.

This piggybacking strategy could prove very helpful to the feds, so helpful that AT&T has found grounds to formally protest against it. In its December court filing, the company asked Judge Waddy not to allow Justice to use this tactic. "In recent months," AT&T was quick to point out, "the government has completely reversed its position on discovery in these private cases and has adopted a course designed to obtain as much of the fruits of this private discovery as possible and, indeed, apparently to rely upon such discovery as the principal basis of its preparation of this case."

One Justice attorney frankly admits that the government has been concentrating more on these private antitrust cases lately. "It's stupid," he reasons, "to replow the same ground." Such a procedure, he argues, would greatly streamline and speed up the laborious discovery process in the massive case. And speeding things up, he points out, is also one of Bell's purported aims.

JUDGE JOSEPH C. WADDY
He'll preside over landmark antitrust case

As for AT&T's allegations that the government will be relying almost solely on these private suit documents in its case preparation, the spokesman denies that the antitrusters will be depending exclusively on this material. This information, he maintains, "will merely be one piece of the mosaic" of discovery evidence that the government will use to prosecute the case.

He also notes that the presiding judges in both the MCI and Litton cases support Justice's right to this data. However, to fortify its stand, AT&T has dug up several recent appellate decisions which it claims forbid the government from using AT&T documents garnered through private antitrust actions. The Justice source admits this could present a problem, particularly if AT&T takes the issue all the way to an appeals court.

Stampeding technique

Another one of Bell's persistent gripes against the government has centered around the fed's alleged attempts to railroad the company into court before it's had enough time to prepare an adequate defense. A major portion of its December filing seeks to remedy this so-called stampeding technique of Justice by asking the judge to lay certain ground rules for "an orderly and reciprocal sequence of discovery."

What Bell basically wants out of that, speculates one government attorney, "is a commitment from the court to make sure that discovery goes forward on a very deliberate, almost one-for-one basis which is absolutely preposterous." The company's obvious ploy, he charges, is to frustrate its antitrust foes into apathy. "If Bell gets its way," he vows, "we would spend so much time wading around in this paper quagmire that we would eventually get tired of it and forget about the whole suit."

Discovery will cover the period following the 1956 consent decree and overlapping into the early 1970s.

The Justice Dept., however, told the court that its streamlined discovery and trial preparation program will permit it to complete its trial work in approximately two years. Justice insiders, though, are doubtful that this tight timetable can be met. (Antitrust chief John Shenefield has said publicly that he would like the case to go to trial one and one-half to two years after discovery gets underway, with a trial target date of mid-1979.) And AT&T also obviously disagrees with this timetable, and gloomily predicts that discovery alone will take more than four years, more than 3,000 people and cost the Bell System as much as $1 billion. The firm's earlier discovery projections pointed to an expenditure of $300 million over a 10-year period.

Justice sources candidly concede that Bell's $1 billion estimate on discovery costs could be right on target, especially if Bell continues to wage discovery battles with the government. In an effort to inch this arduous process forward, the feds issued two document requests—one in December 1976 and a more recent one last February. Bell has yet to respond to either. So Justice in its December filing asked Judge Waddy to make AT&T turn this material over to them.

Battle over "discovery"

AT&T also has asked the judge to lift his pretrial order in the case which hampered the company's efforts to gather communications-related discovery material at a large number of federal agencies.

Naturally Justice believes that AT&T's motives are suspicious. They also feel a big battle may ensue. Deputy antitrust chief Joe Sims sees this "big battle" as a real possibility. He says: "The big question is how much will we be able to hold back AT&T in their discovery of the entire federal government. They want to have a record for every phone, everywhere."

So far, no real discovery on either side has taken place, unless you count the government's lengthy and well-documented answers to AT&T interrogatories which were submitted to the court in December 1976. During the jurisdictional deadlock, Justice conducted a few informal interviews, but nothing substantial really has been done toward discovery.

But they do seem to know what they want, and have pinpointed their discovery drive to cover the period immediately following the 1956 consent decree and overlapping into the early 1970s. In some cases this paper chase, according to the government, could lead back as far as 1930. One Antitrust Div. source explains that this "ancient AT&T" memorabilia would be dredged up only on a limited basis and only to "provide an historical perspective to set the stage" for the landmark case.

Justice is particularly anxious that Judge Waddy set up the discovery ground rules as soon as possible. He has many options in this area and the feds are hoping he won't opt for one of them—and that's forcing the parties to start out by taking depositions.

Whatever discovery framework Waddy sets up, both Justice and AT&T know they will have to abide by it. Waddy's final ruling on this probably will come after he meets with both parties, the get-together expected some time this month. If everything goes smoothly, discovery could begin by mid-February, predicts a Justice lawyer.

Waddy's role in the case at this point, the lawyer emphasizes, is especially crucial. "It's the opening shot of the next round," he declares, "and a good deal of what happens in the foreseeable future is going to be based on what Judge Waddy does right now." Particularly important, he adds, is the judge's "willingness to control the case."

But one government source close to the case confides that he is personally confident that Waddy will take firm control of the case. He also claims the judge is "fully aware of the tricks AT&T is trying to pull." What he's not so sure of, and what could prove to be a problem, he concedes, is Waddy's health. Waddy, who's in his early 60s, has not been in good health for a number of years.

Most complex

There also have been rumors that he may retire. While Justice denies these rumors, one AT&T source seems to believe them. AT&T's own beloved fiery standard bearer, John D. deButts, also faces retirement in a few years. His leanings on this lawsuit, which he describes as "the most complex antitrust litigation in the nation's history," are absolutely clear. "We have been and are," the AT&T chairman emphatically declares, "in conformance with the laws of the land and we propose to defend our position with all the skill and vigor we can summon. We are not going to acquiesce in any settlement that would materially impair our ability to serve the public."

Despite their dismally small staff of two full-time lawyers, the antitrusters seem equally committed to their cause. Explains one of the beleagured attorneys on the case: "We've been through a long down period. But I think we've always been optimistic about our case. We don't feel there's any question that AT&T violated the antitrust laws. That's almost a given. The real question is what do you do about it."

—L.F.

Newest Version of The Bell Bill

"You want choices. And Bell's got them . . ." This prophetic slogan from AT&T's slick new multimillion dollar advertising campaign took on added meaning early last month as the communications giant hit Congress with a "compromise" alternative to its faltering Bell bill (Consumer Communications Reform Act). Put together by Bell and its band of telephone industry allies, the proposed recommendations—sent to the House and Senate communications subcommittees—allegedly are aimed at resolving "many of the controversial issues surrounding intercity telecommunications."

Explaining the new proposal, AT&T's executive v.p. James E. Olson said this "good faith effort" was merely "a telephone industry attempt to strike a public interest balance between the divergent interests of the average customer and the specialized user, such as a large business customer . . ." To strike this balance "between universal service and wider customer choice," the telephone industry task force suggested segmenting telecommunications service and equipment offerings into four distinct categories.

Under the first and most obvious category, all local and long distance telephone services would continue to be doled out by the telephone companies. The usual nationwide rate averaging still would apply to these services to keep down rural costs, according to the telephone coalition. For services supplied by regulated common carriers or individual customers, the telephone team created a second and more controversial category. These special communications network services, which would be "used solely for intracustomer communications," could only be "indirectly" connected to the nationwide dial-up phone network at customer locations through switching gear such as a customer PBX. Also, there would be a telephone company charge for these interconnect arrangements.

No interconnections

The third category of services has even more restrictive interconnect prohibitions. Aimed at private communications networks provided by specialized carriers or users, this category basically covers voice, data, image, text, and graphic network services. All such services would not be allowed to interconnect with the telephone industry's dial-up facilities. Those impacted services would include future offerings by Satellite Business Systems, Southern Pacific Communications Corp.'s Datadial, and Western Union's TWX/Telex services. (Also bundled into this grouping are resale and value-added carriers.)

Direct link-ups to the dial-up network are permitted under the telephone team's fourth and final category. This class of service pertains to various terminating systems and equipment such as customer switchboards and phones.

The would-be revampers graciously acknowledged that their scheme to wipe out the current access arrangements of private system users would take some time. This plan, they conceded, "would have to be implemented over some period of time to avoid serious customer and carrier dislocations." A "phased" transition to the new interconnect/non-interconnect setup, they maintained, "would allow customers and carriers to arrange for orderly reconfiguration of services."

"Preposterous proposal"

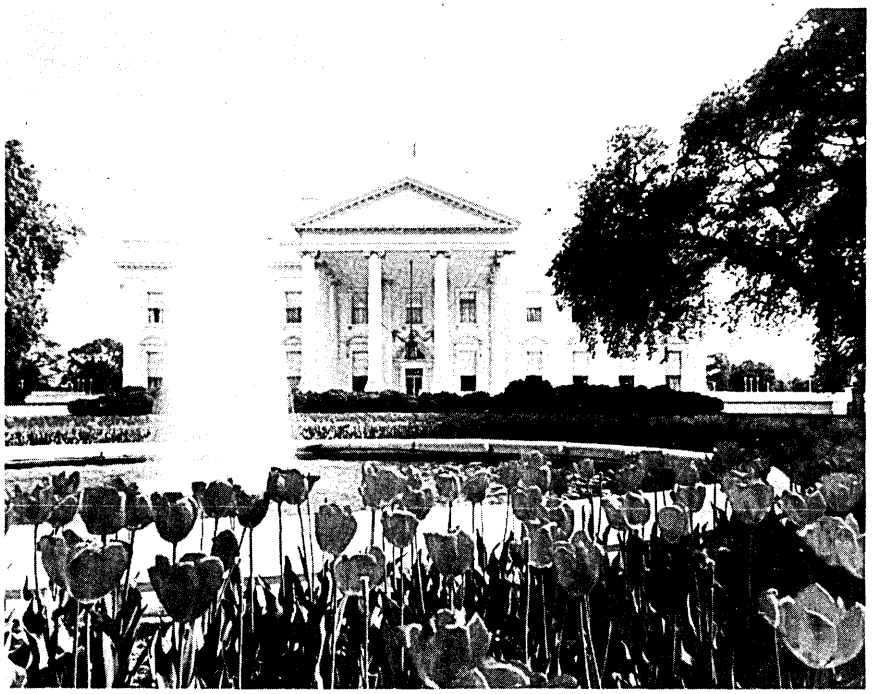
Bell battlers argue that if this "preposterous proposal" goes through, they won't have any services left to reconfigure. Decries the vocal Ad Hoc Committee for Competitive Telecommunications: "Just as surely as the Bell bill, it would put our companies out of business." Particularly incensed by the plan's interconnection bans, the fiesty trade group of specialized carriers contends that these and other stipulations would cause "a drastic restriction of our present market. We would be unable," they insist, "to meet our debt obligations, to utilize efficiently our existing networks or, in short, even to survive."

Computer & Communications Industry Assn. president Jack Biddle is equally outraged by Bell's latest Congressional move. "If Bell and the independents can convince Congress that this proposal is indeed sound public policy," Biddle retorts, "then it will only be a matter of time before they will ask us all to agree that Hush-a-Phones and plastic telephone book covers, too, adversely affect the rate base and must be monopoly offerings." ✲

Government

Automation at the White House

Terminal-Based Systems Will Channel Better Advice to the President



Advice doesn't come cheap, especially when it's being doled out to the biggest boss of them all—the President of the United States. And it's this Presidential advisory process, often arduous and inefficient, that finally has been targeted for automation support. Specifically, the White House automation mavens have set their sights on terminal-based systems which can provide access to pertinent data bases as well as the basic capabilities of text editing and word processing, document control, information storage and retrieval, and electronic mail.

The campaign to get these system tools has been in the works since early last June, and is an outgrowth of the President's Reorganization Project's (PRP) ambitious attempts to overhaul the Executive Office of the President. It's within this high-powered office that the PRP probers dismally discovered the sad state of computer usage among the EOP branches. Pointing to the persistent communication gap among these advisory units, the PRPers noted that this lack of coordination had resulted in "no common inventory of languages, application systems, equipment, staff, or available expertise."

In its June report to the President, the reorganization team also complained of the almost universal difficulty of getting information systems implemented within the EOP. One major stumbling block, they claimed, was "over control. The heavy emphasis on cost justification," they explained, "results in new languages (e.g., data base management systems), new implementation techniques, advanced equipment (e.g., virtual storage systems, distributed systems, dedicated systems for special functions such as word processing) not being available until the need for them is absolutely clear. This coupled with the long and arduous procurement process," they concluded, "means that the tools needed for information system development are often unavailable."

Want central unit

What is needed, the PRPers pointed out, is "one place within EOP to get computer applications developed and to obtain consultation and advice." To get these chores done, they recommended that a central administrative support unit be set up to integrate and coordinate the computer operations of the 12 separate EOP units.

The proposal subsequently was bundled into President Carter's EOP Reorganization Plan No. 1 which went into effect last Oct. 18. But behind-the-scenes planning for this new central administrative unit—now officially called the Office of Administration—got underway in June. As part of these early efforts to organize the new EOP office, special attention was focused on the information systems problem. And much of this "special attention" was coming from Richard Harden, special assistant to the President for budget and organization.

> "Although innovation is encouraged, systems that rely on novel technology should be approached cautiously."

Harden, a CPA by profession, worked closely with Frank Press, the President's science advisor, over the information systems question. Both felt strongly that a follow-on study should be done on this critical area. So the Advisory Group on White House Information Systems was created early last August to brainstorm some guidelines for the new Office of Administration and its fledgling offshoot, the Information Systems Div.

Seek coordination

After three meetings and four months, the six-member advisory panel, chaired by John Gosden, v.p. of Equitable Life Assurance Society, came up in late November with a final set of recommendations detailing how the new setup should be run. While supporting the "strong need for improved and new information systems" as aids in the EOP's decision process, the group warned that "although innovation is encouraged, systems that rely on the use of novel technology should be approached cautiously." One of their chief concerns was that the new Information Systems Div. (ISD) develop an "overall architecture" which would lead to a "coordinated set of systems for the EOP."

This goal is shared by Harden and Carl Calo who, as assistant director for information systems, will head the ISD's dp efforts. (The Office of Administration, created last month, begins operation this month.) Calo, former technical director of the Navy Regional Data Automation Center, sees himself as an "ADP implementor" in the new systems design effort which he is in charge of at the White House.

Differentiating between himself and

the 48 year old Calo, Harden modestly quips, "I stir things up and Carl cleans them up." By stirring things up, Harden will be the brainstormer—the one who comes up with the conceptual ideas of what should be done to service and streamline the EOP's information needs.

And it's these needs that he's tracking particularly closely. He comments: "I came up in the old school where you went in and did the general design. Then you did the detailed design, the programming, the program and systems tests, and the parallel runs. Well, that's not the way this environment operates. It's more evolutionary . . . we have to continuously look at what's needed. If it takes three years to design a system, by the time it's implemented the people who wanted it are long gone or their needs have changed."

"BETTER advice through automation is the goal of Richard Harden, left, and Carl Calo. Says Harden: "I stir things up and Carl cleans them up."

Better communications

The needs of the President's advisors and their assistants, he notes, are specialized and often subject to change. But underlying these needs are communications and not computational capabilities. And it's better communications that Harden is after—at all levels of the sprawling EOP.

So far, Harden favors a networking approach to solve this communications problem. There's no need, space, or money, he stresses, for "some elaborate computer center." And instead of a mass and messy conversion effort on all the existing EOP ADP gear, he believes system applications should be tackled on a project by project basis. The key element in his networking concept, which will be implemented over the next three to five years, is the terminal.

Harden has very specific requirements for this backbone piece of equipment which he says will be used in all EOP internal process management systems (word processing, project management, scheduling and time management, document control, and electronic mail). What Harden wants is a standard compact terminal that starts with a high quality typewriter, adds the ability to use the keyboard with a screen, and allows the printing mechanism to be used as a high quality hardcopy output device. Harden and his special assistant Edward Zimmerman have talked to both IBM and Xerox about EOP's terminal needs, and are hopeful that these companies or some other typewriter or terminal manufacturer can come up with what they want. And if a better terminal strategy is

offered by someone, Harden quickly affirms, "we'll take it."

Share with Congress

The multifunction terminal, Harden adds, must also be able to operate in a freestanding mode and be capable of providing easy access to external data bases available from commercial sources and other executive branch agencies. (The White House and EOP units already have access to about 20 data bases, and plan to add more.) Harden is also anxious to develop a sharing arrangement with Congress—in terms of information systems know-how as well as the Hill's wealth of data bases.

The new information utilities which will be available to the Presidential advisory troops, Harden explains, "are not super-sophisticated. We just need basic 'get it done' kinds of support." However, he does admit that access to some of the necessary external data bases may be "tricky" because of the sensitivity of some of the data and hardware problems.

Both Harden and Zimmerman have been probing outside agencies and non-federal organizations as well to find ways to overcome some of these sticky technology problems. Hopeful that some of the more innovative agencies will share their information technology advances with them, the EOP system planners have zeroed in on NASA, the Census Bureau, and even the intelligence community, among others.

They have been particularly interested in the National Bureau of Standards' network access machine developments which they believe simplify the procedures used to get access to various systems and data bases. But artificial intelligence barriers are still bogging things down, contends Zimmerman. Harden is more optimistic and feels that if there's a demand for access to more and more outside data bases, the various providers of these services will write special interfaces to their systems so the White House can tap in.

Security question

But security is another matter. There's no simple solution, they both concede, to protecting the whole range of sensitive and secure data that continuously flows through the EOP. They're hopeful, however, that continuing industry work on multilevel security systems will help alleviate this potential troublespot.

> They've talked with IBM and Xerox and if a better terminal strategy is offered by someone else, "we'll take it."

One operating arm of the EOP, the National Security Council, seems to have satisfied its security requirements. NSC has its own computer system (run by the Defense Dept. since 1970) which processes classified information through top secret. The mainframe is an IBM 370/145.

Under the new systems game plan, the EOP's Domestic Policy Staff will have access to a domestic policy review system which will serve a similar function as the NSC operation which has been institutionalized within the EOP since the 1940s. With the new document control/tracking system, which is being worked on now, domestic policy advisors and their assistants will be able to track developing legislation and get better interagency communication from the information systems at pertinent agencies such as the Health, Education & Welfare Dept.

While this system is a priority item on ISD's system shopping list, there are other early-on applications opportunities that the White House dpers hope to take advantage of. One example is a Presiden-

tial diary analysis system which is slated to be ready early this year. The system, which is now programmed, will keep track of the time the President spends in several categories, allowing his appointments secretary to make appropriate schedule adjustments. Another system already operational is a Congressional correspondence tracking system.

The need for an EOP-wide financial management system will also soon be satisfied through a specially adapted financial accounting and reporting system (FARS) used by the National Credit Union Administration. The FARS system is being specifically tailored to meet EOP requirements by the original system designer, Computer Data Systems Inc. of Bethesda, Md.

Word processing by year end

By the end of this year, Harden hopes to have some type of word processing and document control setups running throughout the EOP. He also hopes the important domestic policy system will be operational by then. "And beyond that," he reflects, "it will depend somewhat on demand and to what degree we can solve some of the interface problems with the external systems."

As these problems slowly become resolved and as the demand for more data bases and information services increases, Harden foresees possibly, within the next three to five years, replacing all typewriters with the multifunction workstation terminals. He also envisions a selected information distribution arrangement where EOP advisors and aides would be funneled only pertinent information, instead of being bombarded, as they currently are, with tons of irrelevant documents. That would do a lot, he jokes, "to improve the signal-to-noise ratio."

It would also allow the advisors or aides to make better use of their time. Now what 33 year old Harden and others have to do is convince the EOPers that these new automated tools are worthwhile. To do that, he says, "we have to make it easy and convenient for them. We have to enhance their willingness to work with (the new technology). So we have to find the right technology to fit this environment and then make sure the software is such that it doesn't frustrate the hell out of them."

According to Harden, President Carter, while not in on all the details of the new dp scheme, "is in basic agreement" with the project's aims. "He's (Carter) in favor," insists the soft-spoken Georgian, "of any better, cheaper, and more effective way of doing things." And so is Harden, and he firmly believes these goals will be met through a coordinated automation support effort.

Harden envisions a selected information distribution arrangement where aides and advisors are funneled only pertinent information.

"Things should run smoother," he maintains. "There should be more lead time in making decisions, with the right people getting involved in this crucial process at the appropriate times." All of this should add up, he declares, to better advice being channeled to the President from his coterie of counselors. "If it doesn't improve," he vows, "then we haven't really done our job."

—Linda Flato

Agencies

System Overhaul at SBA

Agency Needs Better Data Base on Small Business Community

"I learned at an early age that to build a successful business, you must keep the overhead down, keep the pretenses out, and watch the pencils and paper clips." This is A. Vernon Weaver's folksy but pragmatic formula for small business success. But as the new administrator of the controversial Small Business Administration, the 54 year old free enterprise advocate seems to have turned his attention away from pencil and paper clip watching to computer watching. The computers he's watching the closest are the ones at his own agency. And he hasn't been too happy at what he's seen so far.

Last May, in testimony before Congress, Weaver, a classmate of President Carter at the U.S. Naval Academy, called for a sweeping "overhaul of SBA's information systems." What Weaver astutely realized was that not only are some of these systems not operating in real-time, they're also not operating in the real world due to serious gaps in data.

Pointing to the need to build a better data base of information on the small business community, the SBA chief said the 24 year old agency has no accurate information on the number of loans doled out to former SBA borrowers. "We don't know," he acknowledged, "the number, dollar amount, and average size of loans made in fiscal year 1976 to prior SBA borrowers. This has been the subject of much controversy," he added.

But it's not the only controversy that has surrounded the federal lending authority. Founded in 1953, SBA was given the broad mandate under law to "aid, counsel, assist, and protect . . . the interests of small business concerns in order to preserve free competitive enterprise . . . ." To fulfill this mandate, programs were set up to lend money to needy and deserving small businesses. (Currently, there are 20 of these programs being run by SBA.) Other programs offered management training and counseling and helped these companies get a fair share of government contracts.

Too many programs

These programs are in existence today, as well as a plethora of others that Congress has seen fit to dump on SBA's shoulders. On the surface, all this do-good assistance from the benevolent Big Brother seems laudable. But critics charge that SBA may be loaded down with too many programs—some of which could be handed over to other agencies or completely dropped if they're proven ineffective.

One key to trimming back program requirements, or at least identifying workable ones, may lie in the agency's dp setup. But first the agency has to upgrade it to handle a significantly larger data cache, one that more accurately reflects the real small business world. Says Weaver: "One of my primary objectives at SBA will be to develop a data base to measure the progress of small business, its relative place in the economy; to determine the number of small businesses and what types; to analyze our small business borrowers, and to develop other similar information vital to planning responsive small business assistance programs."

Handed to Theiste

Charged with following through on Weaver's data base expansion crusade is the agency's Planning, Research, and Data Management Div., headed by Harold A. Theiste, a 16-year veteran of Control Data Corp. As assistant administrator of the division, Theiste, 41, also is in charge of developing a new systems game plan which will include the important data base project. A newcomer to government dp, the Minneapolis native admits he and his support staff "have just begun to get our hands on the problem."

One of the toughest problems, he explains, is finding a way to upgrade the system and respond to the new data base needs without interrupting SBA work flow. But like Weaver, Theiste feels the data base expansion effort is a must. Statistics make this even more clear. SBA, during the last fiscal year, shelled out $2.7 billion worth of regular business loans. Currently, the federal assistance authority has 220,000 active loans on file. This unfortunately represents only one-fifth of one percent of the total U.S. small business population, estimated to range

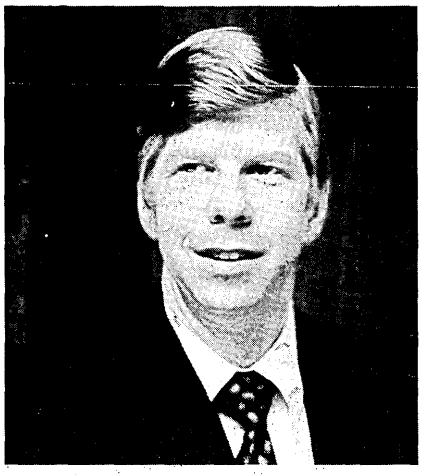
between five and 13 million.

So there's a staggering number of small businesses out there that could be potential SBA clients—under new programs or existing programs. All the agency has to do is determine these companies' needs, and that's where broader data base coverage fits in. Theiste, with his heavy marketing background, tends to see the problem from a marketing perspective.

A marketing problem

He reasons, "It's similar to what a company would do if, for example, it's trying to develop a product. We want to look at the total market (as a company would do) to find what are their needs, what are the effects of such things as inflation, interest rates, and taxes on that total small business community so that we know how to improve our SBA programs to be more responsive to them."

Outside observers say this is a long-needed step in the right direction, but they're saving their kudos until they see exactly what SBA will do. One of the first things on SBA's list of must-do's is, of course, the total system overhaul. The agency, which started out in 1958 with a Univac 120 computer, has upgraded



HAROLD A. THEISTE OF THE SBA. Brought in from Control Data to develop new systems game-plan for the agency.

many times to end up with its current Univac 1106.

The 1106 system, installed four years ago, handles all SBA's basic accounting chores, tracking the agency's accounting activities to make sure, as Theiste points out, "that the money we're loaning out is indeed coming back." It also handles the standard personnel and payroll processing.

Theiste claims the 1106 "is a perfectly capable machine," but he expresses some doubt over how it will fit into the new systems scheme being brainstormed. "It can do," he somewhat cryptically maintains, "all the things we want to do, but whether it can handle the volume and whether it will prove satisfactory in the mix of systems that we want to run, we have no idea at this time."

Two part process

He views the system revamp effort as basically a two part process: "Since our computer system, including the software and programs, is oriented toward performing an accounting function in a traditional data processing sense, we have to do a couple of things. First, we have to expand the data rapidly and make it available on-line as soon as possible. And secondly, we have to convert our existing systems so that we can access that data base in the same way, and then we will tie the two systems together."

Theiste, on the job only four months, seems reluctant to comment on SBA's past dp efforts. But other federal ADPers both in and out of SBA contend the agency has made snail's pace progress in automating. This is particularly attributable, some say, to the lack of a good administrator combined with the lack of leadership in the data management division itself.

Things are looking brighter now that

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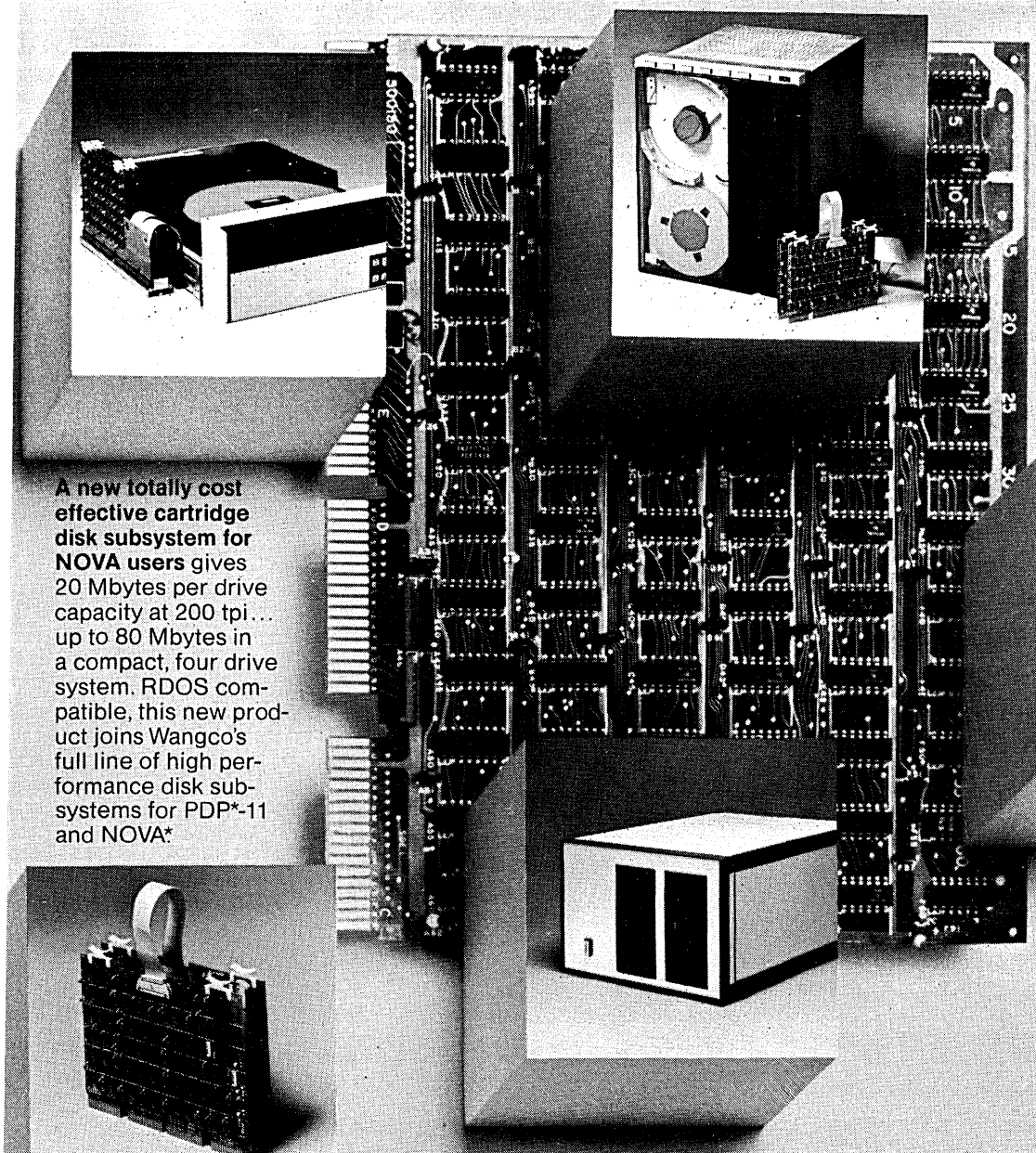

Magnetic Tape Subsystems, vacuum column and tension arm designs, with speeds from 12.5 to 75 ips are offered in one to four drive configurations, formatted in PE, NRZI or dual density. Autoload cartridges or open reel tape from 7 to 10½ inches are available.

A new totally cost effective cartridge disk subsystem for NOVA users gives 20 Mbytes per drive capacity at 200 tpi... up to 80 Mbytes in a compact, four drive system. RDOS compatible, this new product joins Wangco's full line of high performance disk subsystems for PDP*-11 and NOVA*.

Magnetic Tape Formatters, embedded or stand-alone models, provide all necessary logic for reading and writing PE or NRZI formats on both 7-track and 9-track tapes. The space and cost saving microprogrammed embedded formatter is contained on a single multi-layer PWB within the transport.

Flexible Disk Drive Systems for interface to PDP-11 and NOVA computers are available in one to four drive configurations for low cost data storage in IBM compatible format.

Wangco single-source systems feature high-performance PDP-11 and NOVA compatible controllers designed to work at maximum efficiency and lowest cost with Wangco disk and tape transports. Compact controller design requires minimum space in the host computer.

Wangco delivers the broadest line of PDP-11 and NOVA compatible tape and disk subsystems in the industry, including drives, controllers, formatters and diagnostic software, all designed together to work together more reliably and more economically. Whether OEM or end user, Wangco meets your requirements through an extensive network of direct sales, distributors and service/support centers. Contact Wangco for full information. Wangco, a Division of Perkin-Elmer Corporation, 5404 Jandy Place, Los Angeles, California 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

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CIRCLE 8 ON READER CARD

news in perspective

Weaver's in command, says Tom Bresnan, director of SBA's information systems planning staff. "Now, I think," he adds, "we do have the overall support to really move ahead."

Pilot program

In order to move ahead, SBA launched a pilot terminal program two years ago, starting in the Miami district office. Run off a terminal connected to Computer Sciences Corp.'s Infonet time-sharing network, the system performed a financial analysis of a potential borrower's financial statement. The setup was slightly expanded in the St. Louis district office where the terminal also churned out comparative business analyses and additional statistical analyses.

This program culminated in another pilot run in the Dallas district office which tied word processing into the whole setup. This unique word processing/data processing system is specifically designed to speed up the loan approval process which normally is very time-consuming.

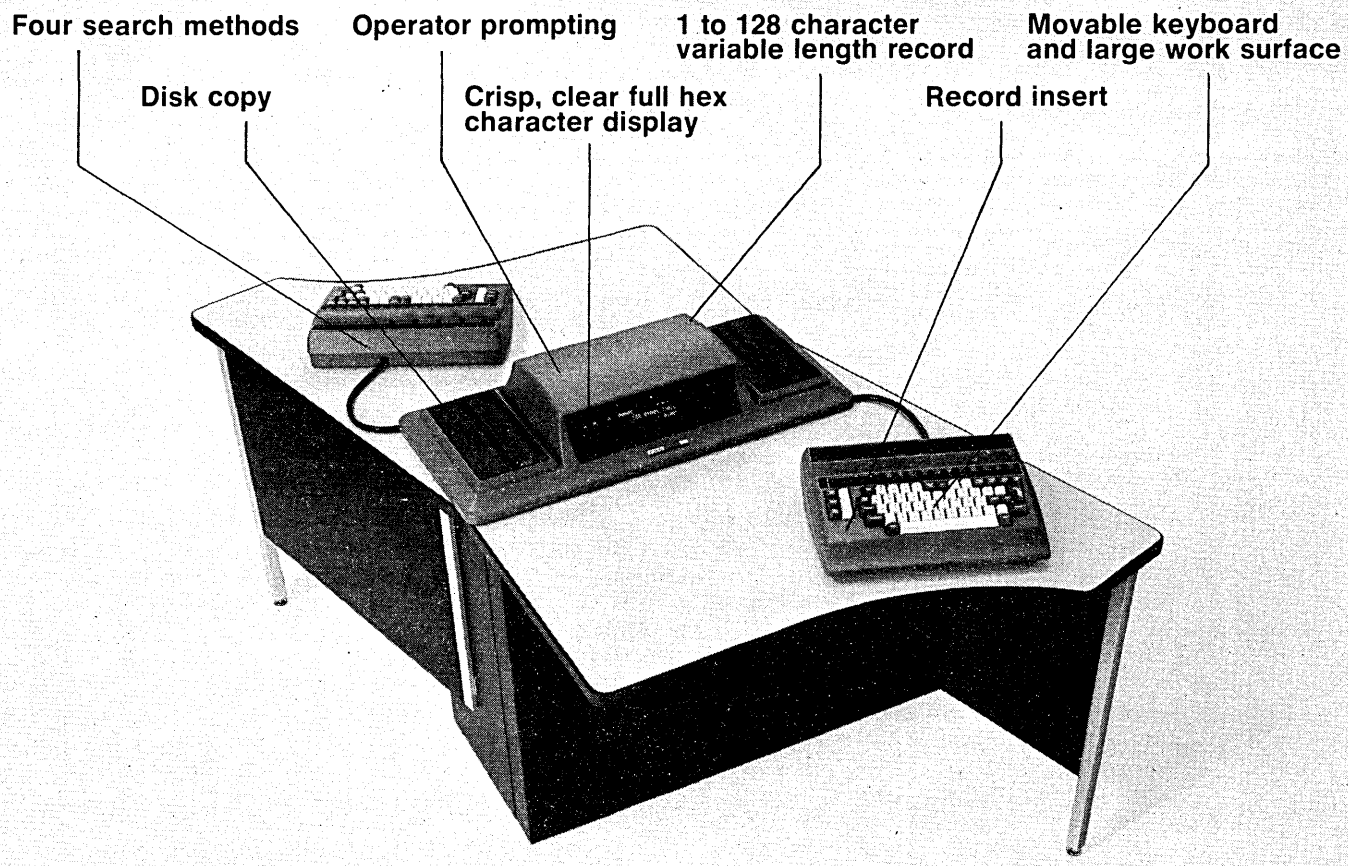
Under this wp/dp link-up, a Lanier word processor, tied into Infonet, takes variable information from the computer, according to Bresnan, "and inserts it and then grinds out various letters and documents." To further explain the potential capabilities of the system, Bresnan notes that "once the '135' (or loan approval document) sets up the individual's record on our master file, the system can store all that information so that when a '135' is created, merging the computer data with the word processing data, it could just as easily shoot that down the line to some collecting point which would then feed it into the 1106."

SBA planners hope to use this hybrid system in various district offices where volume would justify such an arrangement. Once the Dallas pilot "is solid," comments Theiste, the setup will then be

New Tab System 700-

Best price/performance yet in key to diskette entry!

The New Dual Station 702 Has These Standard Features At No Extra Cost



Additional Exclusive Standard Features Assure Better Performance

- **High-speed diskette data searches**
- **Constants from memory and character insert/delete save keystrokes**
- **Operator productivity enhanced with six display lines**
- **Teleprocessing and optional interfaces provide for a wide range of attachments**

Tab's System 700 Will Deliver Increased Throughput for your Dollar

The new TAB 700 System, single or dual station, is designed for operator efficiency and maximum data entry throughput. Our movable keyboard allows operators to select their most comfortable and productive positions. The CRT displays up to 240 characters to each operator, thereby allowing prompting and a complete display of the full 128 character record. In addition, the System 700 features extra large display characters for easy viewing and reference. The tabletop provides space for even the largest of source documents.

Exclusive Uninterrupted Data Keying

With 10 program levels and 84 characters of constants per station, the 702 allows each operator uninterrupted data keying. A data record can be located and displayed in less than sixty seconds. Our field-installable options provide the capability of attaching magnetic tape, printers, and our TAB 501 Microprocessor Punch-Verifier.

Whether your needs are distributed or central, local or remote, TAB offers you a complete key-to-diskette system. Want to know more? Call your Tab representative, or write Tab Products Company, 2690 Hanover Street, Palo Alto, California 94304.

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CIRCLE 145 ON READER CARD

installed in two or three more appropriate offices. To make programming and system checkout easier, SBA's Washington headquarters maintains a duplicate Lanier word processor which does all the programming and compiling work for the Dallas system. The same deal will also be used as other offices are added to the pilot.

Query system

The agency also has a query system running off Univac Uniscope 100 terminals in each of its 10 regional cities. In operation for several years, the system provides real-time inquiry into loan records. SBA also decided to streamline its arduous collection procedures by centralizing them in Denver in the spring of 1971. Originally configured around an RCA Spectra 70/45, the collection operation now runs off Univac's small 9300 RJE cpu which is connected by a telecommunications link to Washington.

All these dp setups will figure into the new systems plan which Theiste expects to be ready by the first of this year. Hesitant to reveal any exact timetables or specific strategies, he insists, this "is not an off-the-cuff, seat-of-the-pants kind of job." He also seems anxious to praise his fellow data management workers and blames SBA's lethargic dp development not on them, but on the lack of divisional leadership.

"There's a lot of talent," he declares, "on the data management side but (in the past) there was no leadership. There are also a lot of good ideas and people doing good work, but there was no way of bringing it all together in a cohesive plan. And that's what we're trying to do now."

—Linda Flato

Mini/Micro

There's a Computer in Everybody's Future

It looks like the Mini/Micro conference is here to stay.

The second edition of the Mini/Micro Computer Conference and Exposition held last month in Anaheim attracted 9,917 attendees, up from 6,949 a year earlier when the show was held in San Francisco. And, by the time the '77 show closed, 47% of the booth space for the next Mini/Micro conference, to be held April 18-20 in Philadelphia, had been sold. Organizers said many of the '77 exhibitors are increasing their space for the '78 event and there has been speculation that a successful show in Philadelphia this spring could mean twice yearly Mini/Micro's with the show moving from coast to coast like the old JCC's.

It was a mixed but serious group that crowded the aisles at Anaheim. They ranged from hobbyists of all ages who flocked to the booths of Radio Shack, Commodore Business Machines, and MITS (Pertec) to small business representatives considering installing their own systems who took in the range of minicomputers, microcomputers, and accessory equipment shown by some 200 manufacturers. Exhibitors, in the main, were pleased. Most said they would be back for the next show. And there were scouts from companies not in the Anaheim show who are seriously considering going into the show in Philadelphia.

Most of the 20 half-day seminars at the Anaheim conference, equally divided between engineering topics and sessions devoted to applications of computers in business and industry, attracted standing-room only audiences who stayed to the bitter end to participate in lively question and answer periods.

The interfacing of peripherals to small

computers was touched on in several sessions.

Ralph Gabai, corporate v.p., Pertec Computer Corp., predicted the emergence of a new concept of "intelligent" peripherals. "In the area of mini/micro peripherals, the trend I see is toward intelligent peripherals—tape drives and discs where more of the control functions are integrated into the peripheral," Gabai said.

Defect compensation

"In disc drives, such functions as error correction and track reassignment will be programmed into the system. That will compensate for media defects as densities—both track and bit—continue to increase."

> Trend is toward intelligent peripherals where more of the control functions are integrated into the peripheral.

Gabai feels one of the most significant advantages of intelligent peripherals will occur in the input/output sections. "I foresee the problem of various interfaces with minicomputers and microcomputers being obviated by a single standard microprogrammable interface for tape and disc drives. This will be accomplished using a microprocessor and some amount of solid state memory."

He predicted that future tape and disc drives will incorporate bus-type interfaces that will be microprogrammed by the oem system manufacturer to match the drive with the I/O channel or cpu. "Fixed logic interfaces will be done away with and oem suppliers will offer fairly universal interfaces."

Gabai said it's been estimated that

AT THE Mini/Micro show in Anaheim: a mixed audience but all were serious.

80% of system costs in the 1980s will be in peripherals. "It's obvious that there will be pressure on peripheral manufacturers to reduce costs. While peripherals are making great strides in price/performance, the fact that there is a high raw material content and sophisticated labor cost associated with its manufacture suggest that cost reductions will not track the same slope as pure semiconductor devices. The concept, however, of intelligent peripherals will, in fact, improve the total cost of ownership when installed in the system."

R. J. Eufinger, applications engineer, Rockwell International Electronic Devices Div., told a Mini/Micro audience that peripheral integration is undergoing a rapid change. "Architectural changes such as memory mapped I/O are increasing the throughput of software peripheral controllers. Previously, for an I/O register to shift or increment, several steps were necessary involving the accumulator where the shifting and incrementing occurred. With memory mapped I/O, shifting and incrementing can now be performed directly on the peripheral ports."

In another session, David I. Caplan, Inforex, Inc., noted that, "the arrival of microprocessors and random access memory in I/O controllers has substantially expanded the options available to source data entry system designers. It permits the designers to significantly unload cpu and main memory and to reduce net parts count in the total system. Trade-offs of software and hardware now have the additional dimension of firmware as an additional place to locate functions."

Floppy discs, it seems, also are important to the small systems of the future. "In this decade," said Larry Fujitani, Shugart Associates, "we have seen the floppy disc drive progress from a low capacity (90 Kb) program load device introduced by IBM in 1971 to the high performance (3 msec track-to-track), high capacity (1.6 mb) floppy disc drive first announced and delivered by Shugart this year. This evolution in performance and capacity has expanded the floppy disc's usefulness to addressing needs for: input/output; system resident disc storage; program load and storage; and fixed disc backup."

Fujitani said "the trend toward increased recording density will continue in future products as system designers continue to demand more memory capacity. It is reasonable" he said, "to expect that the standard floppy will be offered with double track density capability before the end of this decade and that we may enter the next decade with a five megabyte standard floppy since the minifloppy is a technological derivative of the standard floppy, both products will evolve along parallel paths."

Ending his presentation with the observation "there will undoubtedly be a floppy in your future," William R. Miller, director of engineering, Wangco Div., Perkin-Elmer Data Systems, noted, "We are now seeing changes come about in drive designs which allow increased data capacities, greater linear data density, more recording surfaces, and greater track density. This is being accomplished by drives with two recording heads (one on each side of the disc), drives which may also use more efficient encoding techniques and by drives with reduced track-to-track spacing."

Storage needs

And for the future, Miller looks for this: "From programmable tv games on one end to personal computers and specialized test systems on the other, all need to store large amounts of data which can be quickly accessed at a low cost. How about electronic mail which comes to your home over telephone lines and is stored for you to read on your tv screen when you get home?"

He pondered the technologies which would contribute to all this. "Low cost charge-coupled devices (CCD's) may compete with floppy disc drives in some areas, but they are volatile and not easily transported. Diskettes are cheap and you can mail them in a small envelope. Bubble memories are nonvolatile and may be made to operate much like a disc system. Here, for large data bases or multifile systems, the floppy wins because the media for the floppy is cheap and it is the media which determines the capacity. In the bubble memory system you must duplicate the expensive parts to increase the total capacity."

Miller cited as "another area of serious consideration" the low cost floppy disc drive. "With computer technology creeping into every aspect of our lives we may well see a computer of some type in many homes. This will require low cost data storage and a small floppy disc drive may well be the answer here too. It provides a large storage base with low cost and high reliability. To make sense in this market the drive must sell to the end user for less than $100. Media prices can now be projected to well under $5 apiece so that shouldn't be a pricing item."

And, as has come to be expected when minis and micros are talked about, distributed processing comes into the discussion. A paper prepared by J. Leonard Tolman and Mike Sturgill of Billings Computer Corp. was titled "Total Distributed Processing with Micros." One of their conclusions: "Distributed processing with micros . . . allows full utilization of personnel talents, and consequently, greater job satisfaction and employee morale. The user, for example, is not forced to employ a certain unique high level language to communicate with one computer, nor does it force the large multiuser central processor to convert everyone's language into one language for proper processing. Rather, each user is free to select any language he requires for his application case."

If what was seen and heard at the Anaheim Mini/Micro conference means anything, there's a computer of some sort in everyone's future.

—Edith Myers

Small Systems

IBM Should Ship 40,000 S/34s

In the world of small business computers, outfits like Basic Four, Wang, and Hewlett-Packard have been pushing multiuser, interactive systems. By contrast, IBM has been promoting batch processing with its System/32s. The competitive edge this has given the smaller vendors is about to end.

This month IBM is scheduled to begin shipments of its System/34 multiterminal system. It has a performance rated at eight times that of the System/32 but at a 5% to 10% lower price, and twice the performance of a System/3-15 at half the price, says SBS Publishing of San Jose, Calif.

The research firm, in a study also being released this month, projects sales of 40,000 S/34s by the end of 1982, hardware having a value of some $1.7 billion. It is estimated that initial installations will be slowed by a lack of industry applications programs from IBM and tailored packages from software houses. But it is also thought that the hardware vendor will control S/34 sales for a couple of years to minimize the impact on S/32 sales.

It purportedly will start with the wholesaler or distributor marketplace, supplying multiuser, interactive software that IBM previously had not provided, and moving from there to the manufacturing market. There, it is said, IBM will allow users to couple the usual assortment of accounting functions with manufacturing applications programs. And most of the S/34 orders from existing IBM customers are coming from S/32 users who are upgrading to the newer (for small IBM users) capabilities.

Deliveries of the System/34 will also impact independent software firms. Those currently developing applications programs for the S/32 and the S/3 will be called upon to produce interactive programs for the newer environment, a capability not currently possessed by all small shops. ✲

Software

Taxes: Spotlight on California

In California, where many say "it all started," the software tax issue may get its most significant airing next month.

California has been imposing sales and use taxes on software and some services since 1972, setting a precedent that many states have attempted to follow. California more recently has been reinterpreting some sections of its Rule 1502 covering "Automatic Data Processing Services and Equipment" and has been issuing retroactive assessments (May 1977, p. 155).

As a result of this activity a group of "concerned data processing companies" banded together in California as the Sales Tax Action Group (STAG). This group was successful in getting the state's Board of Equalization to schedule a public hearing on Rule 1502 for the week of Feb. 6.

STAG members are encouraged by a November action by the New York State Tax Commission which effectively ex-

empted software, time-sharing, and computer services from sales and use taxes.

"We'd like to cram the New York decision down California's throat," said Albert A. Eisenstat, v.p. and corporate counsel, Tymshare, Inc. Eisenstat's presentation, on behalf of the Assn. of Data Processing Services Organizations (ADAPSO) before the New York commission is credited by many as a key factor in that state's decision so far as time-sharing is concerned.

David Campbell, v.p. of Computer Task Force and chairman of an ADAPSO subcommittee on taxation, said at the time of the New York decision, "This is the first time the Tax Commission of New York State has decided in favor of the taxpayer and stuck with it." He said the state, in making its decision, forfeited some $30 to $40 million in taxes annually.

Whether or not California will opt for a similar loss could be determined next month. Eisenstat, in an address last year before the Computer Law Assn., noted that California's Rule 1502, section 2C, clearly exempts time-sharing services from state sales and use taxes. This section, he said, states "charges made for the use of automatic data processing equipment on a time-sharing basis where access to the equipment is by means of remote facilities, are not subject to tax."

But now, he said, the state is trying to get around this "under the cloak of rental of computer time."

Eisenstat believes that "ultimately our industry will have to become more involved with legislative solutions to our problems." He had a note of warning in his Computer Law Assn. talk. "Some of us in the industry are making decisions on an ad hoc basis—not necessarily for the long term benefit of our industry. Unfortunately, these expeditious decisions may set precedents that all of you will have to live with."

He offered an example. "Recently my own company settled a major assessment issued by the sales tax department in an eastern state. The amount was settled for approximately 2% of the assessed amount. More importantly, however the basis of the assessment, in my opinion, was totally wrong and my only reason for agreeing to this settlement was the legal costs involved in pursuing the fight any further, coupled with the fact that our method of operation changed in the interim and the principles involved in the assessment had no future impact on our company."

Three facets

Eisenstat said the problem relates to all three facets of government—executive, judicial, and legislative.

That different facets can take different tacks on the issue is most obvious in Tennessee. That state's Supreme Court in 1976 held, in Commerce Union Bank vs. Tidwell, that the sale of computer software does not constitute a taxable sale or use of tangible personal property. Commerce Union purchased computer programs to prepare employee payrolls, loan amortization schedules, and other reports. The programs were entered into the bank's computer manually. The court held this to be the transmission of intangible knowledge and information, not subject to sales or use taxes.

In 1977 Tennessee's Dept. of Revenue introduced, and the state's General Assembly passed, Chapter 42 which defines computer software as tangible personal property subject to sales and use taxes.

In a recent letter to members of the Tennessee Taxpayers Assn., Donald Jackson, executive v.p. of the association, said the new ruling "specifically includes customized computer software, which is defined to mean information and directions loaded into a computer which dictate different functions to be performed by the computer, whether contained on

tapes, discs, cards, or other device or material."

Jackson's letter went on to say: "When we discussed this with the Dept. of Revenue, we were of the opinion that it would apply only to purchased software which was customized or packaged by a company specializing in the sale of such software. However, the Dept. of Revenue now insists that the use tax will apply to computer programs developed by employees of the company which uses the software. This means that a bank would be subject to the use tax if an employee in the computer department of the bank developed a new program for computer processing of customer checking accounts. It would mean that if an employee of a manufacturer developed a better computer program for inventory control, this new program would be subject to the use tax."

If an employee of a manufacturer developed a better computer program for inventory control, it would be subject to use tax.

Favors repeal

Jackson noted that it is possible that the courts might hold against the Sales Tax Div. in a further interpretation of Chapter 42, but said, "Our present inclination . . . is to suggest that Chapter 42 should be repealed by the 1978 General Assembly. This would result in a complete exemption of computer software from sales or use tax which would be consistent with the Supreme Court's reasoning that software is really an intangible method of performing an office function."

In the adjacent state of Alabama, another Supreme Court held that software was intangible and nontaxable. Alabama's court affirmed a Circuit Court of Appeals decision in favor of Central Computer Services, Inc. which had fought an assessment of $13,519.91 in use tax on software purchased for $236,400 from University Computing Corp.

In Rhode Island, Puritan Life Insurance Co. has been granted a formal hearing by that state's revenue agency in an assessment it is fighting. "We have to get as close to the revenue agency as possible," said Robert Sherin, legislative advisor to the Data Processing Management Assn. (DPMA) which is working with Puritan in its fight.

Said Sherin of the California hearing next month: "DPMA is delighted that STAG is taking this action. The results should be the same as in New York. We hope a proper approach is taken—that of staking out a whole profession."

—Edith Myers

Companies

Girls and Green and White Mints

A little more than a year ago, when Lore Harp and Carole Ely decided they wanted to start a business, the computer business seemed an unlikely candidate for their attentions.

Both were housewives with children in school, with time, talent, and energies they wanted to put to use. Carole had been a political science major in college and had worked for a while on Wall Street. Lore studied anthropology as an undergraduate and had a semester and one-half of law school. She had never worked.

They thought of travel but "we didn't have the required ticket writing experience," said Lore. It was Lore's husband Bob, a physicist who had designed an 8K static memory board, who got the two women into the computer field.

"If you're really antsy, why don't you try selling this," Lore reports him as saying. That was all they needed. In little more than a year they've parleyed that into a sound company, Vector Graphic Inc., doing $250,000 in sales per month and with an expanded product line which includes two microcomputers and a text editing system.

In the beginning they worked out of Lore's home. They feel their lack of technical background was a plus for them. "We began learning the buzz words, then we got on the phone to dealers (computer stores) all over the country. "We were marketing-oriented." They sold the boards on a C.O.D. basis and asked dealers to buy one on approval with refunds guaranteed. They made no refunds.

The company was incorporated Aug. 23, 1976. Its first purchase order was for more than 100,000 memory chips. "On the day we incorporated," Lore recalls, "we had an appointment to meet a sales rep from Advanced Micro Devices. We didn't want him to come to the house so we agreed to meet him at the Westlake Village (Calif.) Inn."

"He quoted us outrageous prices. We found out later, through the grapevine, that he simply didn't take us seriously."

"He quoted us outrageous prices," said Carole. "We found out later, through

the grapevine, that he simply didn't take us seriously." They've been buying their chips from Fairchild ever since.

They worked out of Lore's home until last December when they occupied 1,200 sq. ft. of office space. Last March they expanded into a 5,000 sq. ft. facility and they expect to outgrow that soon. They have 22 in-house employees and use some 20 outside contractors.

One of the keys to their success, they believe, is "we promise immediate delivery and we deliver." Another, they feel, is the quality of their products, all of which have been designed by Bob Harp. The company has added products since its inception at the rate of one per month.

And they like to credit the fact that "we've been image conscious since the beginning." They launched an immediate, agressive advertising campaign. They heard about exhibits staged regularly by the Southern California Computer Society and attended one even before incorporating. They thought everything looked "grubby." After incorporation they participated in a SCCS exhibit. They adopted green and white as their company colors and appeared at the exhibit wearing green skirts and white tee-shirts, a bowl of green and white mints, and their board displayed with an Imsai computer. "Since then, we've been called the girls with the green and white mints," Lore said.

"We think we package things nicely," said Carole. She recalls their roaming around the 1976 Wescon (Western Electronic Show and Convention), "looking for color coordinated capacitors."

The company was a bootstrap operation from the beginning. Each partner put in $2,000 and, since they get paid within ten days for each sale, expanding sales have financed the expanding product line. Their first computer, the Vector 1, was introduced last January. It is based on the Intel 8080A and the S-100 bus structure. It has 78 basic machine language instructions and a minimum instruction cycle of two microseconds. There is room for up to 64K of directly addressable memory using a parallel 8 bit word/16 bit address, and 256 separate input and output devices can be addressed.

Their second, the Vector 1+ is similar and adds a power supply arrangement and front panel cutout to accommodate a Shugart SA 400 minifloppy or exact size

LORE HARP
Started toward law

CAROLE ELY
Worked on Wall Street

equivalents from other manufacturers. In the wings is the Vector 1++ which will accommodate two floppies.

Their computers and their boards are sold both in kit form and fully assembled.

The Memorite text editor is Vector Graphic's first system but it won't be the last. Coming up is an image processing system. The Memorite, including a Diablo printer, sells for $7,750, and Carole believes the closest price for a comparable system is $15,000.

They remember roaming around the 1976 Wescon looking for color coordinated capacitors. "We think we package things nicely."

The two women, in addition to having to learn the industry buzz words, had something to learn about running a business. "We had to learn to let things go yet still keep informed," Carole said.

"We wanted to be informal," said Lore, "and we still are, but we learned very early that we were the only firm in the Conejo Valley paying hourly workers for their lunch hour." They don't do that any more, and in mid-November, they installed a time clock. ✲

News in Perspective
BENCHMARKS . . .

New Burroughs Chief: Paul S. Mirabito, president and chief operating officer of Burroughs Corp., was named chairman and chief executive, succeeding Ray W. MacDonald who retired Dec. 31 at 65.

PAUL S. MIRABITO

MacDonald announced his retirement plans more than a year ago and indicated Mr. Mirabito was his choice to succeed him. Mirabito, 62, has been with Burroughs since 1951. MacDonald joined the company in 1935. He will remain as a director.

Back to the U.S.: Geoffrey R. Cross, who resigned suddenly as managing director of International Computers, Ltd. (December 1977, p. 203) is returning to the U. S. but still in the employ of a British company. Cross joined GEC, a diversified electronics firm, to help GEC acquire or establish joint ventures with American companies. British-born Cross emigrated to the U. S. 20 years ago and returned to Britain to head ICL five years ago. GEC officials said he will establish headquarters in the San Diego area.

For Small Business: Control Data Corp. formed a venture-capital firm to help small businesses obtain financing. CDC received a license from the Small Business Administration (SBA) to operate as a Small Business Investment Company (SBIC) with an initial capitalization of $1 million. "We believe there will be more jobs provided to people in this country through the survival of a large number of small businesses than through the survival of a small number of large businesses," said E. E. Strickland, president of the new company and v.p. and senior staff officer of Control Data.

Business from China?: Six officials from the People's Bank of China in Hong Kong visited IBM facilities in Japan last month lending credence to reports that the Chinese bank will purchase two IBM 3032 mainframes and some 1,000 terminals. The transaction could be valued at more than $20 million and could be a stepping stone to business with Mainland China where the People's Bank, the country's only bank, operates more than 15,000 branches. The bank has 120 branches in Hong Kong.

After Five Years: Sperry Univac dumped a five year old project to develop a new computer line for the 1980s, opting instead to extend its 1100 and 90 Series families. The abandoned program, called Project Roanoke, called for introduction between 1980 and 1982 of at least three systems, code-named Viking, Thor, and Trident. The systems were to incorporate new architecture, new technology, and a single operating system. They were to span the medium-to-large scale market in the $20,000 to $100,000-plus a month range. The program involved some 600 people in software, circuit design, and engineering. Joseph Kroger, Univac executive v.p. for worldwide marketing and services, said follow-on systems for the 90 and 1100 Series will incorporate a lot of the technology that was planned for Project Roanoke.

Another One for Xerox: Xerox Corp. has acquired Shugart Associates, a northern California manufacturer of memory devices. Shugart will operate as a wholly owned subsidiary. Cost of the acquisition to Xerox approximated $41 million in stock. Shugart had been a privately held firm since its founding in 1973. Its revenues in the first half of the fiscal year beginning May 1, 1977, were more than $19 million. The acquisition brings total Xerox employment in the San Francisco Bay area to more than 4,300.

New Owner for Group/3: Electronic Memories and Magnetics Corp. said it has reached an agreement in principle with Informatics, Inc., to acquire Group/3, a distributor of media products to small business systems users. Ed Farris, EMM group v.p., said "Group/3 is a respected supplier and complements the EMM Caelus marketing organization." Group/3 products include disc packs, disc cartridges, magnetic tape, flexible diskettes, and printer ribbons.

Protection Against Takeover: New rules have been added to Computer Automation's articles of incorporation which make takeover of the company more difficult. They were approved by 53% of the firm's stockholders and opposed by the Great American Insurance Co. which recently increased its Computer Automation holdings to 22%. Under the new rules a company gaining 25% of the company's stock and then seeking a merger must either obtain approval of 51% of the outstanding unaffiliated stock, or follow other procedures that provide for the continuation of some of the old directors on any new board, and the payment of not less than the aggregate earnings per share for four quarters preceding the offer multiplied by the ten-average price-earnings multiple.

Its Own Stock: Pertec Computer Corp. said it intends to acquire some 95,000 shares of its own common stock over the next few months. Ryal R. Poppa, chairman, president, and chief executive officer said the shares will be used for distribution to PCC employees under the company's employee stock purchase plan. He said the company also intends to continue to purchase shares required for the plan but does not anticipate that purchases by the company will exceed 100,000 shares in any six month period.

Into Word Processing: Raytheon Co. said it will pay $15 million in cash to acquire Lexitron Corp., a Chatsworth, Calif., word processing firm. Acquisition of Lexitron will put Raytheon Data Systems Co. (RDS,) the company's commercial electronics arm, firmly into the word processing market, a market the group has been sizing up for more than a year. Lexitron, with 1977 sales estimated at $21 million, has installed thousands of machines, worth some $60 million. ✲

BASIC/FOUR president, Ted J. Smith and his wife, Janice, took part in dedication ceremonies for the company's new $5 million manufacturing and administrative facilities on a 25 acre site in Tustin, Calif. ✲

LOOK AHEAD

(Continued from page 18)
different UPS systems juiced up for an emergency; and general computer room practices. One important result will be guidelines for users to monitor and conserve electrical usage. The other will be standards the vendors will have to meet to obtain government contracts. These may not only become industry standards in the U.S. but also could provide the basis for standards in other countries, since several governments are vitally interested in the study.

The idea came out of Data Switch, a Connecticut manufacturer of gear aimed at improving computer room efficiency and energy usage (CPS-1000 peripheral switch and CEECS energy control system). This ambitious six month old firm seems to be convincing many to join the energy band wagon; CalComp will market its equipment and German and Japanese manufacturers are negotiating to do so.

INA TO CENTRALIZE DP OPERATIONS

While many firms are decentralizing, INA Corp., the Philadelphia based financial services firm, is consolidating its computer operations. The firm is combining the dp operations of a Springfield, Ill., subsidiary into its New Jersey data center where INA has three 168s operating. The Springfield operation had planned to upgrade its 155 to a 158 or possibly twin 158s, but the home office decided consolidating was the more economical route.

WHERE THE EFT COMMISSION LEFT OFF

The Electronic Funds Transfer (EFT) Assn. is a new trade association formed to take over where the EFT Commission left off when it was disbanded following issuance of its final report. "We want to serve as the commission did as a forum for financial institutions and companies working in EFT," said Henry V. Z. Hyde Jr., executive vice president. In late December the group had signed up 14 charter members out of a hoped for 200 and was planning a membership solicitation meeting for Jan. 6. It had a Board of Governors made up of five: Lawrence Ladouceur, senior vice president, The Greenwich Savings Bank, New York City; Robert Chapman, director of financial marketing, SDC Development Corp., a subsidiary of Systems Development Corp., Santa Monica; James Kinney, marketing programs manager, U.S. Postal Service; Lawrence Linden, president, Malco Plastics Corp., Garrison, Md.; and Samuel Shawhan, director of regulatory affairs, GT&E Service Corp. Hyde said additional governors would be named.

PLEDGE OF ALLEGIANCE

A particularly devoted user of the data bases maintained by the Ohio College Library Center is Stephen Pentek, Acquisitions Librarian at Boston University School of Theology Library. Pentek affixed the following to an OCLC terminal in BUSTL's catalog department: "I pledge allegiance to OCLC and to the computer for which it stands, One data base, Machine-readable, With cataloging And holding symbols for all!"

RUMORS AND RAW RANDOM DATA

Five former employees of Wyly Corp.'s ill-fated Data Transmission Co. (Datran) have set up a new company to manufacture digital switches. Called Digital Switch Corp., the firm recently was incorporated in the state of Virginia and now seeks financial backing. John Edwards heads the organization and his executive vice president is Edvin Farinholt, a former Datran executive. The company's biggest targeted market is none other than Ma Bell's nationwide operating companies...Telenet Communications Corp. completed an anticipated public offering (Dec. p. 15) giving the pioneer of independent packet switched networks an $8,325,000 new lease on life. The company's six largest present stockholders purchased 326,087 of the shares in Telenet's first public offering. The remaining 625,000 went to the public at $9 per share instead of the anticipated $16 to $20 per share but Telenet goes on...Heading the National Academy of Sciences special panel to oversee the Social Security Administration's new system overhaul project is Dr. Louis T. Rader, former Univac president and currently professor of electrical engineering and business administration at Univ. of Virginia. It was reported incorrectly (Dec. p. 16) that Dr. J. C. R. Licklider was chairman of the panel. Dr. Licklider, a professor of electrical engineering and computer science at MIT, is deputy chairman of the NAS group.

Take an in-depth look at in-house timesharing:

You know the problems facing the data processing department:

Other departments in your company want faster response, broader capabilities, better service.

And your management wants you to hold down your operating costs.

You're probably looking hard for a solution. A closer look at in-house timesharing could give it to you.

Fast, long-lasting relief

Unlike upgrading a large central computer, expansion to an in-house timesharing system isn't a time-and-money-consuming ordeal.

And unlike buying outside computer time, you're not building in a monthly bill that inevitably keeps building up.

Adding an in-house timesharing capability is a shrewd way to add computer power. Because it won't add significantly to your operating costs; in fact, it can pay for itself by reducing current costs.

Especially if you add the system specifically built for timesharing: our BTI 4000.

A timesharer's timesharer

The BTI 4000 Interactive Timesharing System is made by us:

Basic Timesharing, Inc. We're the computer manufacturer with timeshare experience. Which has helped us produce a computer uniquely right for timesharing.

To help you do more—while helping your company spend less.

Easy to begin, room to grow

You can own your own BTI 4000 for as little as $35,950. For that you get a ready-to-go system with 10 megabytes of storage and 8 ports—just add terminals.

And start-up won't cause a departmental hang-up. The BTI 4000 can be installed and working for you in one working day.

Expanding to do even more work takes even less work. The BTI 4000 features modular construction, so system downtime for expansion is minutes, rather than days. You can add disk storage to 400 megabytes; increase user capacity to 32 ports; add peripherals like industry-compatible magnetic tape and a line printer.

Hard working, always working

The BTI 4000 is a true timesharing system. It allows doing any mix of tasks, all at the same time, all completely independent.

It also gives you continuous system availability, because software housekeeping can be performed while users are on-line.

There's also off-hours jobstream processing. So the BTI 4000 can be working for you, even when no one's around.

The BTI 4000 uses BASIC-X, an unusually powerful extension of the BASIC user language, enhanced for business programming.

What's more, the BTI 4000 offers heirarchal account organization and stringent security so that you can maintain total control over who's using it, and what they can do.

And it does all this without a full-time operator.

Inexpensive help

Used during typical office hours, the operating costs for a BTI 4000, including maintenance, are about $1 per terminal hour. And should you grow to 24 hour usage, your operating costs shrink to less than 10¢ per terminal hour.

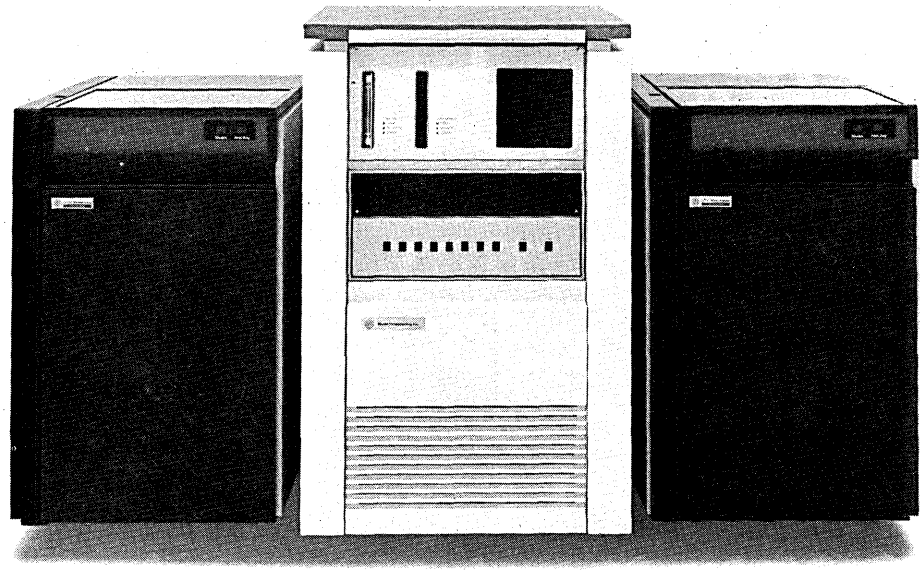
Around-the-clock help

We back our BTI 4000 with any-hour, anywhere, on-line support with dial-up access for problem diagnosis. Yet in a typical installation, our maintenance plan costs less than 1% of the system's purchase price per month.

Look to us

The BTI 4000. The interactive timesharing system that will help your data processing department do more, for less.

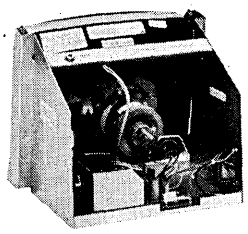
For more information, just look to the Basic Timesharing office nearest you.



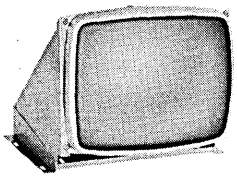
The BTI 4000 Means Business.

Basic Timesharing Inc., 870 W. Maude Ave., Sunnyvale, CA 94086. Sales Offices: East: Cherry Hill, NJ (609) 662-1122; Midwest: Minneapolis, MN (612) 854-1122, Chicago, IL (312) 298-1177; South: Dallas, TX (214) 630-2431; West: Sunnyvale, CA (408) 733-1122, Anaheim, CA (714) 533-7161

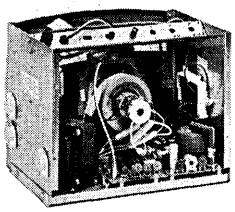
Reliability: Our data displays are outstanding solid-state designs with critically matched magnetics to optimize the performance levels and dependability demanded by your customers. We use the most advanced engineering and production techniques to assure consistency of performance. No data display is built with more deliberate attention to quality and reliability.



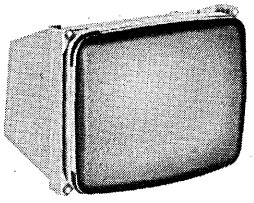
Delivery: We have been in the display electronics business long enough to know about rush orders. If you need it yesterday — we'll try to get it to you yesterday.



Experience: We've built thousands of displays for many of the major manufacturers in the country. Perhaps we already have a unit that would meet your requirements. With slight modifications. It would be less costly than starting from scratch. If you need a new, special package — we'll produce it for you, in the configuration you want, at minimal expense.



Cooperation: If you're developing a new data terminal, we will be glad to cooperate with your terminal design engineers in reviewing your exact specifications and developing the most economical display possible. And quickly! Whatever you need, we have the experience and talent to design it. And improve it.



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You'll come up with your own reasons for using Setchell Carlson CRT display modules.

If you make top-quality data terminals, here are four reasons to use Setchell Carlson CRT display modules in your system.

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hardware

Off-line

Up in Benton Harbor, Mich., home of the Heath Co., work continues on a pair of floppy disc systems for use with the kit-maker's H8 and H11 personal computers. It seems as if the single and dual drive mini-floppy system, for use with the 8080-based H8, will be ready a short while before the full-size floppy units for the LSI-11-based H11. The LSI-11 version will be compatible with any LSI-11, not only the H11, since Heath's processor retains DEC's bus. Operating systems will be offered with both units. Heath and DEC are cooperating on a new operating system, Heath Disc Operating System (HDOS), said to be similar to DEC's RT-11. HDOS will include BASIC and FOCAL. Pricing and delivery dates are not firm at this time, but the second or third quarter of this year look promising for delivery.

IBM's research into bubble memories continues at its San Jose, Calif., Research Lab, where a 1K-bit bubble lattice device is now fully operational. The chip was developed for the study of lattice devices, which are said to promise an order of magnitude increase in storage densities over other types of bubble devices. Unlike existing bubble devices, such as Texas Instruments, TBM0103 (a 92K-bit chip), which stores bits as the presence or absence of a magnetic bubble, the bubble lattice uses the orientation of the bubble's domain wall to signify "one" or "zero."

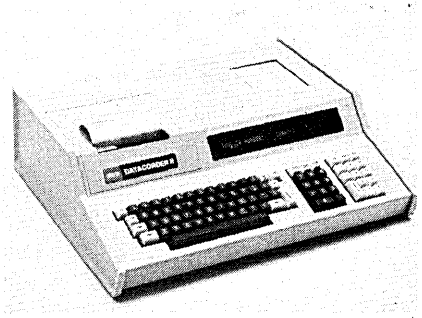
Meanwhile, Creative Strategies, also in San Jose, and also looking at bubble memories, has issued a study on the market outlook, concluding that bubbles won't be a "viable market contender until 1980." The report says bubbles won't take off in the commercial sector until they reach one million-bit per chip densities, IBM's bubble lattice technology seems to promise such densities; the technology used by TI also may reach such densities if electron-beam photolithography comes into play.

We apologize to Teleram for an error made in our September 1977 write-up of its P-1881 portable crt. Its picture somehow managed to migrate five pages to p. 297.

Intelligent Terminal

The Datacorder II, an intelligent data entry terminal, is said to fit a variety of applications. It can be used as a remote batch data entry terminal with validity checks including table lookup and range checking; data entered may be stored on ECMA/ANSI-compatible cassette tape via the unit's integral tape deck. It can function as a low-speed ASR terminal in time-sharing applications. It can work as a store-and-forward communications front end with computers that support only local terminals. And it can perform limited standalone processing; more processing capabilities are on the way in the form of an extended BASIC facility slated for availability in the next few months.

The Datacorder II comprises a Z-80 microprocessor, 1KB of EPROM, 16KB of RAM, cassette tape drive, 40-character plasma display, a 48-column, 240



1pm printer, full ASCII keyboard, and an RS232 interface. Peripherals and options include a choice of line printers, 9-track mag tape, an additional cassette drive, external peripheral ports (serial or parallel), and memory expansion to 64KB.

Current software support includes Quick, the vendor's proprietary language for developing data entry applications, and communications programs which allow the unit to operate under a variety of protocols. A forms generator extension to Quick is expected within a few months.

A single Datacorder II sells for $3,495 and the price drops to $2,395 in quantities of 100. Maintenance, conducted by third parties under contract to the vendor, is $25 per month. INTERNATIONAL ENTRY SYSTEMS INC., Seattle, Wash.
FOR DATA CIRCLE 252 ON READER CARD

Data Encryption

IBM's first commercially available general purpose implementations of the National Bureau of Standards' Data Encryption Standard (DES) consist of a purely hardware offering and a joint hardware and software approach. The hardware devices are used in conjunction with software when data is transferred over communications links, software alone is used when encrypting or decrypting data files.

The 3845 and 3846 data encryption devices encipher data transmitted in point-to-point communications. Both have RS232-C interfaces and connect between modem and terminal or modem and computer. Users need a 3845 or 3846 at both ends of the communications link. The units need no special software support and may be used with terminals and computers from other manufacturers. Various line protocols and codes are accommodated by the two units. These parameters can be altered by a handheld keyboard which also can be used to change the encryption key stored in each unit. The keyboard, which may be used with any number of 3845s and 3846s, sells for $265. Purchase prices for the 3845 (tabletop) and 3846 (rackmount) range from $2,125 to $3,600. Availability is scheduled for the second and third quarters of next year, respectively.

Designed for use in 370s and dp networks, the Cryptographic Subsystem includes two software and one hardware products: the ACF/VTAM encrypt/decrypt feature, the Programmed Cryptographic Facility Program Product, and the encrypt/decrypt feature of for the 3276 control display unit. The third component is used with SNA versions of the 3276. Files can be encrypted by the Cryptographic Program Product. The ACF/VTAM encrypt/decrypt feature handles telecommunications and network functions, while the Cryptographic Program Product handles the actual encryption. The two products carry monthly charges of $125 and $250, respectively. OS/VS2 MVS systems can take delivery as early as the second quarter of next year. OS/VS 1 will have to wait until the third quarter. The terminal encryption/decryption feature goes for $42/month on a two-year lease, or it can be rented for $45/month. Its outright purchase price is $1,710. INTERNATIONAL BUSINESS MACHINES CORP., Data Processing Div., White Plains, N.Y.
FOR DATA CIRCLE 261 ON READER CARD

Polling System

The 704/1 Terminal Polling System (TPS) can poll as many as 200 terminals, collecting data and storing it on 9-

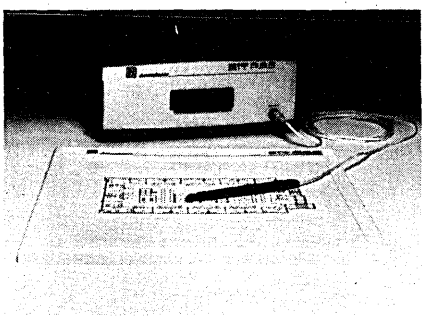
track magnetic tape for later processing by host computer. TPS also can distribute an output tape generated by the host. The system works with this vendor's 770 intelligent terminals and 742 programmable data terminals. It consists of a model 990 minicomputer with 48KB of memory, 9-track 800 bpi or 1600 bpi tape drive, and a model 743 KSR data terminal, all manufactured by the vendor. The 704/1 sells for $22,272; on a one-year lease it goes for $1,400/month. Users and purchasers of ten or more terminals for use in the system can get the 740/1 at reduced rates: $1,050/month or $13,000 for an outright purchase. TEXAS INSTRUMENTS INC., Houston, Texas.
FOR DATA CIRCLE 262 ON READER CARD

Terminal Upgrade

With roughly 90,000 LA36 DECwriters in the field, this vendor feels it has a large potential market for its DS120, a control logic card that allows the 30 cps LA36 to operate at 120 cps. It's not a buffer, it actually supports 120 cps printing. The DS120 card replaces DEC's control card, and is said to be 100% plug-compatible. A microprocessor optimizes print head movement, printing bidirectionally and tabbing over white space. It also provides features for forms handling and interactive communications. It includes an EIA interface, horizontal and vertical tabs, top-of-form, Bell 202 compatibility, double-width characters, self-test mode, and operation at line speeds ranging from 110 bps to 9600 bps. Intended as an economical method for upgrading LA36s, the unit will be sold through distributors. In lots of 25 to 99 units the DS120 sells for $635. The 100-up price is $565. DATASOUTH COMPUTER CORP., Charlotte, N.C.
FOR DATA CIRCLE 256 ON READER CARD

Digitizer

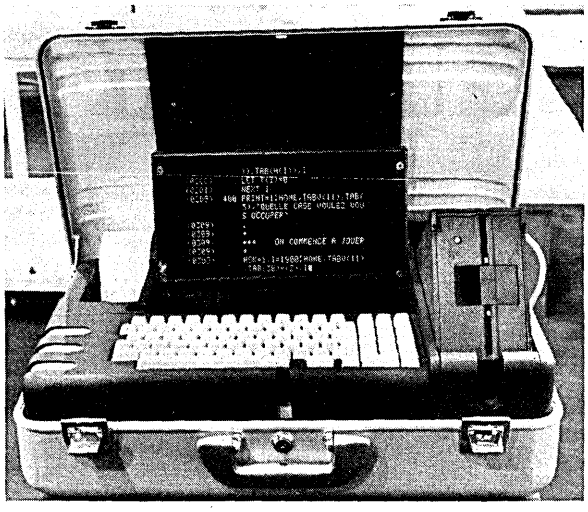
The Bit Pad digitizer looks like it's going to make a dent in some previously untouched markets. At $555 for a



unit that can interface directly to an 8-bit parallel microcomputer port, and with an RS232 interface available for an additional $125, the unit should work with almost any small computer. The unit can operate from the micro's power supply or its own ($95 for this option). Onboard regulators, for use with unregulated power supplies such as those found in S-100 bus micros, sell for $30. The 11-inch square active area may be had with 2,200 x 2,200 lines for 0.005-inch resolution or 2,974 x 2,974 lines for 0.1-mm resolution, at the purchaser's choice.

Output from the unit consists of five bytes: one status, two for the x-coordinate, and two for the y-coordinate. The unit can output single coordinate pairs or a constant stream of coordinates; the output mode can be selected by the computer or by pushing a console switch. The Bit Pad must be ordered directly from the factory; it's not available through the vendor's existing sales network. And, what better way to kick off a new product than with a contest. The vendor is offering $1,000 to any user developing a novel application and publishing its details in a "national computer systems publication." SUMMAGRAPHICS CORP., Fairfield, Conn.
FOR DATA CIRCLE 268 ON READER CARD

product spotlight



Microcomputer

The Micral V is a microcomputer system in a suitcase. And to add to its portability, the system can get its power either from a car's cigarette lighter or from a regular 110 volt wall outlet. The suitcase system includes a cpu with 32KB of RAM (expandable to 64KB), 1KB of ROM, keyboard, 12 line by 40 character display, 32 column alphanumeric printer, and a mini diskette drive capable of storing 160KB. Synchronous or asynchronous communications are available, as are a second, external mini diskette drive, and printers. Software includes BASIC, FORTRAN, and Assembler. Pricing will start in the $5,000 neighborhood when the unit is released in the second quarter of this year. The system is manufactured by the French firm Réalisations Etudes Electroniques (R2E) and will be marketed by R2E's American subsidiary. R2E OF AMERICA, Minneapolis, Minn.
FOR DATA CIRCLE 253 ON READER CARD

Computers

In November this vendor told us it soon would announce a processor in the IBM 3031 class, but at a more attractive price. The reference must have been to the V-8590, said to offer performance comparable to the 3031, but selling for $720,000 in a 2MB configuration. (A 2MB 3031 sells for a cool million.) A smaller processor, the V-8580, said to better a 370/148 in performance, was announced at the same time. At the 1MB level, it carries a price tag of $517,600, compared to a 148 at $689,000.

The entire 8500-series uses emitter-

coupled logic (known for its speed), but the two new processors differ from their predecessors in memory technology; they use 16K-bit chips, are four-way interleaved, and have error detection and correction. And the 8590 uses two processing elements that can share all system resources. The 8580 and 8590 both have processor cycle times of 56 nsec.

Software support for both systems includes the Virtual Resources Executive (VRX), and the COBOL 74, NEAT/VS, FORTRAN, and RPG languages. A firmware option allows the processors to

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CIRCLE 14 ON READER CARD

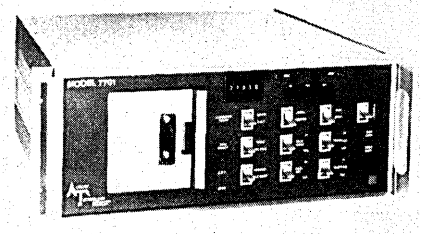
operate in "N" mode, which provides compatibility with th evendor's line of Century processors.

A V-8580 with 1MB of memory (expandable to 4MB) and three I/O trunks leases for $11,385 on a five-year plan; a V-8590 with 2MB (expandable to 6MB) leases for $18,810 for the same term. I/O link controllers (for four links) are used with the 8590. They lease for $1,503/month or sell for $68,040. The 8580 is due in the third quarter of this year, the 8590 in the second half of 1979. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 251 ON READER CARD

Data Acquisition

The ATC Model 7701 is a programmable, microprocessor-based data acquisition system intended primarily for scientific and industrial applications. The unit interfaces to Hewlett-Packard 9800 series calculators via an 8-bit bus, or to other computers, such as Wang's 2200 and IBM's 5100, via an RS232 port. It will accept input from as many as 10 devices using current loop or RS232 interfaces. Input can be synchronous or asynchronous at data rates of up to 19.2K bps. Data entered can be processed by the unit, and an option allows time of day information to be added to the input before it is recorded on the integral cassette tape or routed to one of the I/O ports. Bypassing the tape allows the unit to function as a front end to a processor.

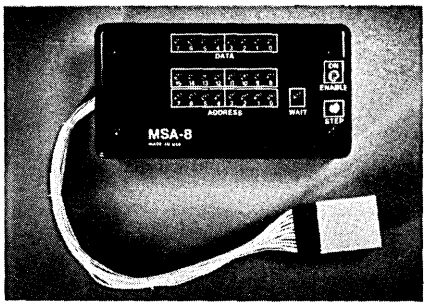


Users can program the unit in BASIC or assembly language. Pricing for the unit ranges from $3,250 to $5,000 depending on the number of ports specified, interfaces required, memory, and options. AUGUST TECHNOLOGY CORP., Orange, Calif.

FOR DATA CIRCLE 266 ON READER CARD

Microprocessor Aid

Designers building systems from 8080A, 8085, or Z-80 chips can use the Microcomputer System Analyzer (MSA-8) during the firmware and hardware debugging phase. The MSA-8 clips onto the microprocessor chip and



provides single step, hardware breakpoint, and oscilloscope trigger capabilities. LED's display the status of the data and address lines. The MSA-8 sells for $249. COMPUTER SYSTEMS DYNAMICS, Salt Lake City, Utah.

FOR DATA CIRCLE 263 ON READER CARD

Printer

End users and personal computer users, as well as systems houses, may be interested in this small, inexpensive ($695 quantity one) ASCII printer. Designated the S-1, the unit prints characters from the 96-character ASCII set on 4¾-inch wide aluminum-coated paper. Characters can be printed 5, 10, or 20 per inch with a maximum of 80 characters per line. The S-1 has an RS232C interface and accepts data at rates ranging from 50 bps to 9600 bps. Dip switches allow the user to select data rate, parity, and number of stop bits; the units come from the factory pre-set for 1200 bps, no parity, and

one stop bit. Character spacing and underlining are under software control. Deliveries are scheduled to begin this quarter. Quantity discounts are available. CENTRONICS DATA COMPUTER CORP., Hudson, N.H.
FOR DATA CIRCLE 259 ON READER CARD

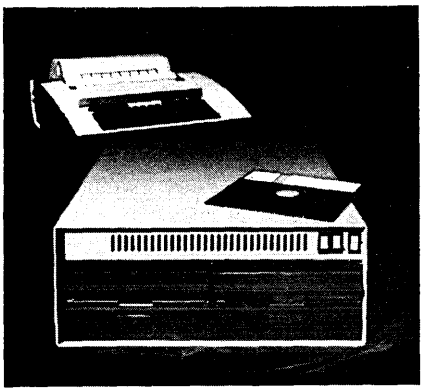
440KB Minidiskette Drive

Take a five and one-quarter inch minifloppy disc, record data on both sides at double density, and you'll wind up with an unformatted capacity of 440KB. And that's just what this flexible disc manufacturer has done. The SA450 operates in single or double-density modes and it has two read/write heads, one on each side of the media. The vendor sees the new drives fitting into word processing systems, intelligent terminals, personal computers, and other applications where "low cost random access storage in a compact space is a requirement."

The $450 (quantity one) SA450 is engineered into a package the same size as the vendor's existing SA400-line of minifloppy drives, so systems builders can begin to use the double-density/double-sided drive as an upgrade. In addition to increased capacity, the new drive offers improved performance specs in comparison to the older SA400. It has a track-to-track seek time of 25 msec and an average seek time of 298 msec. The soft error rate is said to be 10^{-9}. The vendor expects to have a controller available in March or April. Quantity discounts drop the SA450 price to $370 in lots of 50 to 99, and to $290 in lots of 250 to 499. SHUGART ASSOCIATES, Sunnyvale, Calif.
FOR DATA CIRCLE 260 ON READER CARD

Microcomputer

If the Micro-2 bears a striking resemblance to this vendor's floppy drives, there's a simple explanation: it's the same package with a Z-80-based microcomputer added. The unit consists of the processor, 32KB or 64KB of RAM, four RS232 serial interfaces, and a real-time clock, packaged along with a dual drive double density diskette subsystem. Diskettes may be written in IBM 3740 format or a double density format of 517KB per diskette. Optional double-sided drives allow the system to store 2.3MB. Software support for the Micro-2 includes the CP/M operating system, BASIC-E compiler, and hardware diagnostics. FORTRAN, CBASIC, and accounting software are available at extra cost. A Micro-2 system, with 32KB of memory and two single-sided diskette drives sells for $4,995. With 64KB this system sells for $6,090. Versions with double-sided drives sell for $5,695 (32KB) and $6,795 (64KB). The Micro-2 also can be configured with four single-sided drives. A console



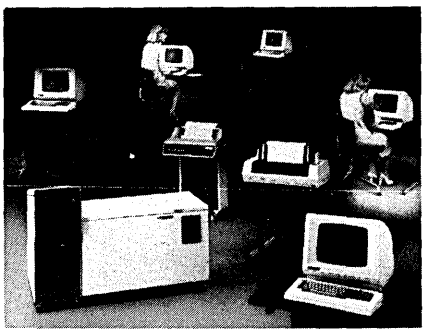
device is available. Dealer and oem discounts are offered. A first-year service contract (covering repair on units returned to the factory) is $125. DIGITAL SYSTEMS, Oakland, Calif.
FOR DATA CIRCLE 254 ON READER CARD

Distributed Processing

The 445 distributed data entry and processing system offers more performance than has previously been available from this vendor's 400-family of products. The new processor is said to be capable of nearly twice the throughput of the previous top of the line 440. A 445 can support as much as 256KB of main memory (the 440 could handle up to 64KB), 70MB of disc, eight 2,000-character crt's, in addition to printers, tape drives, and modems. The 445 uses a multiple processor architecture. Ad-

ditional processors in each peripheral controller relieve the cpu of most I/O overhead. Bisynch and Synchronous Data Link Control (SDLC) communications at speeds of up to 9600 bps are supported. Communications programs are available for remote job entry to mainframes made by Burroughs, Control Data, and IBM. A 3270 emulator allows on-line communications with a host cpu.

A new software package, Sycorlink,



will allow up to nine 445s to be connected over coaxial cable to form a ring network for distributed processing. The package supports shared disc files and the use of remote peripherals.

It's priced at $50/month per 445, or a one-time charge of $1,250. Applications programs for the 445 can be written in COBOL, BASIC, or TAL 2000. A proprietary Terminal Application Language, TAL, is meant for developing data entry applications.

A 64KB 445 system with 5MB of disc, a 5MB cartridge tape drive, four terminals, a bidirectional printer, and a communications adaptor sells for $60,300. On a three and one-half year lease it goes for $1,156/month, including maintenance. Deliveries are scheduled for the third quarter. SYCOR INC., Ann Arbor, Mich.

FOR DATA CIRCLE 257 ON READER CARD

Modem

The LDM 404B is a 4800 bps, medium distance, synchronous modem. The vendor says it's designed for "metropolitan areas where 'unloaded' cable pairs from the telephone company are unavailable." The $1,200 modem is intended for intracity communications of up to 50 miles over standard tariffed 3002 voice-grade leased lines (including T carrier). The full duplex modem has digital and analog local/remote loop back for testing purposes. An integral tuning meter allows nontechnical personnel to align the unit. An option allows it to function in a dual channel 2400 bps configuration. An RS232C interface is standard. GANDALF DATA INC., Wheeling, Ill.

FOR DATA CIRCLE 269 ON READER CARD

Terminal

Concept APL is an APL/ASCII crt terminal with full APL overstrike capabilities. In ASCII-mode, the microprocessor-based terminal has forms capabilities. The terminal sports line drawing graphics, character accents, and text editing features. The RS232C-compatible unit can display 24 lines of 80 characters on its 12-inch diagonal screen. A shared printer feature allows as many as 16 Concept APL terminals to share a single printer for hardcopy output. Switching from APL to ASCII mode can be done by depressing one of the terminal's function keys, or the computer can initiate the change. The crt will be marketed through a network of distributors and representatives; first deliveries are to begin this month. A single Concept APL sells for $1,750; in quantities of 50 the price drops to $1,400. HUMAN DESIGNED SYSTEMS, INC., Philadelphia, Penn.

FOR DATA CIRCLE 270 ON READER CARD ❋

An odd bodkin* down in Killeen
Once made love to a Turing Machine.
From this heinous miscegney
Came numerous progeny
The likes of which had never been seen.

—Wm. J. Wilson

*gay blade

You tell us what your data collection requirements are. We've added more data collection building blocks to satisfy them.

EPIC DATA's Model 1647 data collection terminals and Model 1648 system control units (SCUs), let you configure exactly the data collection system you need. These "building blocks," based on microprocessor architecture and modularity, provide you with simple, practical and flexible terminals or systems for virtually any combination of requirements you may have.

simple. Building blocks can be combined to enable collection of information from a wide variety of pre-prepared and variable data with resulting improved efficiency and reduced errors. No computer knowledge is required for operation. Terminals can be programmed to: provide customized input, output and processing of data; prompt the user through entry steps and validating of data; and enable off-line or on-line operation.

EPIC DATA terminals are rugged, compact and lightweight. They can be wall-mounted or placed on a desk and are easily exchanged during maintenance.

practical. Environmental tests conducted in conformity with MIL-STD-810 plus in-depth, on-site testing assure reliable operation over a broad spectrum of hostile, industrial environments. Simple design and rigorous testing have resulted in an impressive MTBF.

flexible. EPIC DATA terminals can optically read punched badges and 80-column ANSI cards. User-defined keys are available for inputting variable data. Key entry data or time of day is displayed and LEDs are available for prompting.

Terminals can be configured to scan bar codes and magnetic stripes or accommodate other peripherals through RS232 ports. Display options include additional numeric displays, up to 15 LEDs for prompting and a 32-character alpha/numeric display. Serial asynchronous or synchronous communications ports with either RS232 or line driver I/O and a low speed modem may be added. Parallel communications ports are also available. Both PROM and RAM memories are expandable.

Newest Building Block: More to Come in Next Few Months

A self-contained cassette tape recorder providing up to 2.88 megabits of storage for transaction logging or store-and-forward applications is now available. The modular reel-drive tape recorder, like the rest of the building blocks, features high reliability and ease of maintenance. There is no pinch-roller or capstan to wear tape; only the head touches the tape.

SCUs. Model 1648 SCUs can be configured to poll up to 100 terminals, assemble transactions, format data, append time and date, and store or forward collected data to the host.

Tell us what your data collection requirements are. We'll supply the parts. Contact your EPIC DATA representative today or write:

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software & services

Updates

It's taken 12 years, and now the Chemical Abstracts Service has added its four-millionth unique chemical substance to the computer-based Chemical Registry System. The system was developed to determine if a substance in scientific literature had been previously indexed in Chemical Abstracts, and to retrieve the previously assigned index name for substances already in the data base. The data base also is used by the National Library of Medicine to create the CHEMLINE on-line chemical dictionary which is used with its TOXLINE and MEDLINE information retrieval systems.

A medical group in rural Redding, Calif., uses telephone lines to transmit computerized axial tomography (CAT) scans to the Moffitt Hospital at the Univ. of California Medical Center in San Francisco. Shasta Scans sends images showing the cross-section of a patient's head to San Francisco for diagnosis. The communication system, developed by Colorado Video, Inc., of Boulder, sends compressed video signals over conventional voice-grade telephone lines. It takes roughly 78 seconds to send an entire scan.

MUMPS has become ANSI standard X11.1 and now its users' group is offering MUMPS User Group (MUG) t-shirts in standard sizes of small, medium, large, and extra large. The $5.50 t-shirts can be ordered from P.O. Box 208, Bedford, Mass. 01730.

A sophisticated Digital Image Display Control System using a PDP-11/40 has been installed for NASA's Goddard Space Flight Center. The software, developed by FORTH, Inc., in its imageFORTH language, occupies 8K words, and provides general purpose 2D graphics, image library maintenance, and image processing functions, including windowing, combinations, histograms, enhancements, and rotation.

Customer-operated terminals in 26 Kash 'N Karry supermarkets in Florida now perform savings and loan transactions for customers of six different S&Ls. The EFT system, called Modern Money, uses an 80KB Nova 3 minicomputer to perform file and communication processing for the network.

6800 Basic Compiler

Written for 6800-based microcomputers, EPA Compiler BASIC translates programs written in an extended version of BASIC into machine code. Its run time package is said to handle the functions, such as supporting the use of files, normally delegated to an operating system. The source language offers such niceties as decimal arithmetic for business applications (no missing pennies, even with $99,999,999.99), formatted output, strings, long variable names, and disc file I/O. Software floating point also is supported, as are PEEK and POKE operations for accessing specific memory locations.

Program preparation begins with building a BASIC source file using whatever text editing system is available. The compiler then takes the source file and creates an intermediate file, which is processed by an assembler (supplied with the compiler). The assembler's output gets loaded with the run time package and the program can be executed. Generated code also is suitable for loading into ROM. The vendor says that while the package will run in 16KB of memory, it's preferable to have at least 24KB. Available on IBM 3741-compatible diskette, the EPA Compiler BASIC package sells for $330; the user's manual is an additional $15. ELECTRONIC PRODUCT ASSOCIATES, INC., San Diego, Calif.

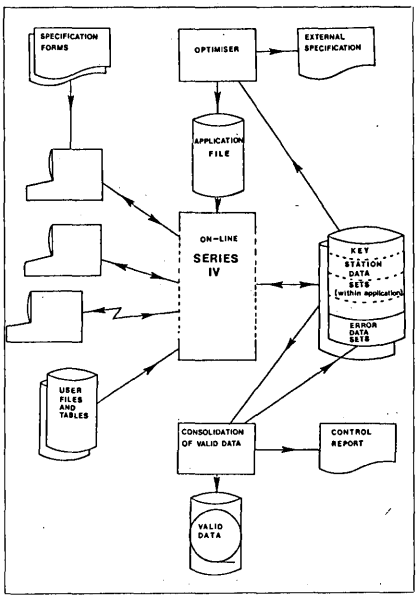
FOR DATA CIRCLE 283 ON READER CARD

Data Entry

Users of DEC's PDP-11 family of minicomputers can use Series IV to develop and implement data validation, edit, and inquiry applications. When developing an application, the user enters specification forms which define formats and validity checks; these forms are entered through a vendor-supplied Series IV application, checked for validity, and stored in a keystation data set. Once the specifications have been accepted, the data set in which they are stored is passed to the optimizer (which some might call a compiler) which generates an executable application file and documentation in the form of an external specification report.

When the application file is defined, Series IV's on-line data entry and validation system allows multiple users to access the application and key in data or make inquiries. Multiple applications can run concurrently.

During validation, non-Series IV user files can be accessed as part of the checking process. If an input record fails validity checking because the source document contains invalid data, the operator can override the system's rejection and put the record in an error data set for later editing, saving the time it would take to rekey the entire record. After correction, data in the error data set can be consolidated into a valid data set, producing a report as a by-product.



The package runs under RSX-11M, IAS, and other DEC operating systems. It requires a minimum of 16K words of memory, and versions are available to support as many as eight or 16 terminals. Series IV is priced at $20,000 for an eight-terminal version, with multiple installation discounts available. INFORMATICS INC., Woodland Hills, Calif.

FOR DATA CIRCLE 275 ON READER CARD

Series/1 G/L

Designed with the accountant who handles a lot of small businesses in mind, this general ledger package runs on IBM Series/1 minis under the RTPS operating system. The package can also handle businesses that organize their books along departmental lines, producing either departmental or consolidated reports. The interactive system can handle local or remote terminals. Transactions are validated and erroneous entries rejected. Transactions can be posted for two accounting periods; a detailed audit trail is maintained. Standard reports include trial balance and charts-of-accounts. A report generator allows users to design their own custom reports. The $4,000

ASI/INQUIRY

The IMS DB/DC QUERY LANGUAGE

USED BY MORE IMS INSTALLATIONS THAN ANY COMPETING PRODUCT

ASI/INQUIRY is an IMS DB/DC query language that operates completely as an interactive Message Processing Program. The design of ASI/INQUIRY is such that the *structure of the data base is transparent to the user*. Moreover, one need not have familiarity with DL/1 segment logic or the complexities of multi-pathing. Extremely rapid response time is assured.

MAJOR HIGHLIGHTS

- ☐ End-user oriented
  - —Easy-to-use language
  - —Requires no knowledge of IMS
  - —Comprehensive diagnostic messages
- ☐ Rapid response time for even the most complex queries
- ☐ Dynamic priority scheduling to maximize system performance
- ☐ Availability of default as well as user-defined screen formatting

Recently delivered, Release 2 of ASI/INQUIRY contained a number of major enhancements, including:

- Development of a TSO-supported version
- Full support of IMS/VS secondary indexing
- Open-ended computational facilities
- Ability to SORT display output

In summary, ASI/INQUIRY represents the state-of-the-art product in an IMS DB/DC or TSO-supported IMS environment. It is the only system combining an easy to use language, complete user flexibility, and rapid response time in a single package. If you want to start answering "What if . . . . " immediately, call or write today for further information.

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Software & Services

package requires 64KB of memory. APPLIED COMPUTER SERVICES, INC., North Hollywood, Calif.
FOR DATA CIRCLE 276 ON READER CARD

On-Line Banking

Of the nation's 14,000 commercial banks, approximately two-thirds have assets under $35 million, and it's to those two-thirds the Community Bank Interactive On-Line System is directed. The package is designed for this vendor's I-8230 and I-8250 small business computers and its minicomputer-based 7750 Distributed Document Processing System. The five-module system brings in-house, on-line banking functions within the reach of small banks that previously relied on outside services or simply did without. The five modules are Demand Deposit Accounting, Check Loan Accounting, Regular Savings Accounting, Certificate of Deposit Accounting, and General Ledger Accounting.

The system can print a customer's checking statement or account balance on demand. It also provides checking overdraft protection for customers with an established line of credit, and handles all associated interest calculations.

The smallest I-8230 that can support the system includes 64K of memory, 9.8MB of disc, cassette tape, terminal, and line printer. A 7750 should have a 96K processor, cassette tape, proof and encoding workstation, 9.8MB of disc, terminal, and line printer.

Total monthly license fee for all five modules is $186, with an initial installation charge of $5,770. Individual applications carry prices ranging from $21 per month and $670 installation fee for General Ledger Accounting to $93 per month and $2,690 installation for both Demand Deposit and Check Loan Accounting. NCR CORP., Financial Systems Div., Dayton, Ohio.
FOR DATA CIRCLE 284 ON READER CARD

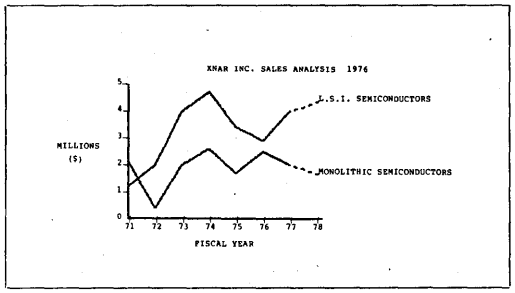
Micro Software

OPUS/TWO is a high-level language said to include features of BASIC, ALGOL, and FORTRAN. It's an enhancement of this vendor's earlier OPUS/ONE, and runs on 8080 and Z-80-based microcomputers having at least 24KB of memory. In addition to being upwardly compatible with its predecessor, OPUS/TWO has extended capabilities for error trapping, external and machine-code subroutines, overlays, substring searching, and file manipulation. Designed to run as a standalone system, OPUS/TWO has an interactive system initialization step during which users can add I/O drivers. The $195 package (manuals are $10) is available on diskette (MITS or 3740-type), paper tape, or MITS cassette. Programs written for standalone OPUS/TWO systems will also run under this vendor's time-sharing operating system, TEMPOS. TEMPOS, which requires 48KB of main memory, vectored interrupts, and a real-time clock, can handle as many as seven terminals. It includes a text editor, assembler, linking loader, and utility programs. TEMPOS sells for $785, which includes OPUS/TWO. User's manuals cost $20. ADMINISTRATIVE SYSTEMS, INC., Denver, Colo.
FOR DATA CIRCLE 277 ON READER CARD

Data Management

A data management system for PDP-11s running under RSTS/E, QDMS

software spotlight



Daisywheel Plotting

Written in standard FORTRAN IV, Escape Plot provides a software interface for driving Diablo 1620 daisywheel terminals in graphics mode. Text may be interspersed with graphics, for such purposes as labeling plots or axis. Additionally, the package can draw 59 different alphanumeric characters in any orientation, and in sizes ranging from ⅓-inch to 12½-inches. Escape Plot operates the terminal as if it were a drum plotter. The package consists of a set of subroutines with the same names and calling conventions as software for CalComp plotters. These subroutines are: PLOT, PLOTS, SYMBOL, NUMBER, AXIS, LINE, FACTOR, and NEWCHAR. Documentation provided includes a user's manual, and source code. A demonstration program also is provided to verify that the package has been properly installed. The package, which occupies roughly 7KB on an IBM 370, is available on cards or paper tape for $200. ESCAPE, LTD., Atlanta, Ga.
FOR DATA CIRCLE 282 ON READER CARD

includes a comprehensive report generation subsystem and provides building blocks for developing applications programs. By creating an index file for each user requiring a different ordering of the data records, QDMS avoids storing redundant data.

Strictly speaking, QDMS is not a data base management system; it doesn't provide for automatically linking records in different files. But the vendor says the user can create such links using the QDMS building blocks. The package is designed to allow non-dp personnel to maintain data files and generate reports from the files. Initial file setup and creation of applications programs using building blocks is still a job for programmers.

The report generator prompts the user whenever it comes to a "What do I do next?" decision. Report specifications can include calculations and totals both down and across fields, table lookups, and COBOL-like print masks. The generator can print n-up labels or form letters.

Security hasn't been overlooked; QDMS provides restricted access to certain accounts or physical terminals. Read and write protection can be specified for each field. If desired, a user can be given a record description omitting fields that should remain private.

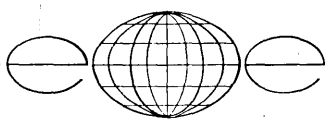
QDMS is an outgrowth of this firm's two and one-half year old GPRS system. The package sells for $5,000 and runs on PDP-11/34 (and up) processors with 64K words of memory. The building blocks of QDMS are written in BASIC PLUS and are supplied in source form. QUODATA CORP., Hartford, Conn.
FOR DATA CIRCLE 279 ON READER CARD

Report Generator

Users of Burroughs B700 computers can use REMAP (Record Extraction Manipulation and Print) to generate reports. Specifications for reports that will be needed more than once may be saved on disc for subsequent use. The two-program system can select records from existing disc files, sort them in a user-specified order, and print user-designed reports. Selection is based on a single key, while sorting can be based on multiple keys. If a report requires record selection based on more than one key, additional passes can be made over the file. The package works with Burroughs sequential, ISAM, and random access files. It also provides arithmetic functions and two levels of totals. REMAP is said to be usable by nonprogrammers. It sells for $1,100. PASCACK DATA SERVICES, INC., Hillsdale, N.J.
FOR DATA CIRCLE 278 ON READER CARD

Series/1 Operating System

A multiuser, multitasking CICS-type operating system known as Sputnic provides IBM Series/1 users with tele-



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processing capabilities. Programmers can develop real-time systems in a device-independent environment using the macro-driven operating system. Sputnic includes an I/O subsystem modeled after IBM's VSAM access method. Asynchronous and bisynch communications are supported, as are basic mapping and extended basic mapping for IBM 4979, 4978, and 3270 crt subsystems. Several Hewlett-Packard and NCR terminals also are supported. Sputnic provides an interface to IBM mainframes running CICS, CICS/VS, or IMS/VS, allowing Series/1 minis to function as nodes in large-scale distributed processing networks. Application development currently must be done in macro assembler; the vendor is evaluating the possibilities of adding support for COBOL and BASIC. The system will run on Series/1 processors with a minimum of 32KB of memory, with the system itself occupying 12KB to 20KB. The package is available for a one-time charge of $3,500 or on a lease basis for $125/month. JONES HEALTH SYSTEMS MANAGEMENT, INC., New York, N.Y.
FOR DATA CIRCLE 280 ON READER CARD

HASP Emulator

After selling HASP emulators for PDP-11s for several years, this vendor has released a version for the LSI-11. And although it may be a fluke, the release coincides with DEC's announcement of a new, half-size LSI-11 (see Hardware). The package supports multiple concurrent I/O streams, automatic data compression, and job control from an operator console at the central site. Instead of associating I/O streams with unit record equipment, this emulator uses run time independent data set specifiers. Users can create input streams from any combination of files and unit record devices. A separate module provides the operator control interface; this module may be supplemented or replaced by other tasks. Interworkstation communication also is supported. The emulator, which is part of the vendor's HASP-11 family, requires 10K words of foreground memory under the RT-11 operating system. Versions for RSX-11S and 11M operating systems also are available. Binary code for the emulator carries a license fee of $3,500 per cpu; source code is available for an additional $1,000. The vendor also offers quantity and oem discounts. DATANET, Eugene, Ore.
FOR DATA CIRCLE 281 ON READER CARD

Disc Utility

Users who need to thoroughly erase disc packs containing sensitive or proprietary data can use SASE, which is said to sanitize disc volumes. The program operates in a standalone mode on large IBM mainframes and overwrites the entire disc, LABEL, VTOC tracks, and all. "SASE is to disc packs as degaussing equipment is to magnetic tape," according to the vendor. The program can also be used to certify disc packs and measure timing variations.

We're told it took an average elapsed time of 18 minutes on an IBM 370/158 to perform a triple overwrite on a 3330 double density volume. The program needs 256K of memory and can overwrite several packs at the same time. The number of packs (2314, 3330, 3340, 3350, or equivalent) is limited by the number of disc channels. The first copy of SASE is priced at $1,750, with discounts for multiple copies. SANDERS ASSOCIATES, INC., Corporate Systems Software Dept., Nashua, N.H.
FOR DATA CIRCLE 285 ON READER CARD

The robot did not have myalgia,
or any known kinds of neuralgia,
but his recall was such
he remembered too much,
and suffered from chronic nostalgia.

A robot who worked like a drone,
into deep melancholia was thrown,
and confessed in analysis
a sense of paralysis
because his will wasn't his own.

—Gloria Maxson

personal computing

Portia Isaacson, Contributing Editor

Machine time on a business personal computer costs less than $5 per day when amortized over a five-year period, and that microcomputer is capable of saving several times its cost by performing the myriad of simple data processing tasks found in almost any company. This simple economic fact is the reason many businesses are finding multitudes of applications for microcomputers.

The savings and loan association is an excellent example of a business with a wealth of applications ideally suited to a microcomputer. Two Dallas savings and loans recently have installed microcomputers for the daily operations of taking deposits, paying interest, and making home loans. The idea and software for these applications was developed by Frank Hoffer, a consultant and former savings and loan dp manager.

The first of the two Dallas companies to install a microcomputer, Exchange Savings and Loan Assn., is a medium-sized savings and loan with $100 million in assets and about 50 employees. Most of Exchange's data processing needs are satisfied by an online system provided by a service bureau. However, there were enough small applications not being done by the service bureau to easily justify the microcomputer. In fact, Exchange estimates a $7,000 annual savings based on just those applications initially delivered.

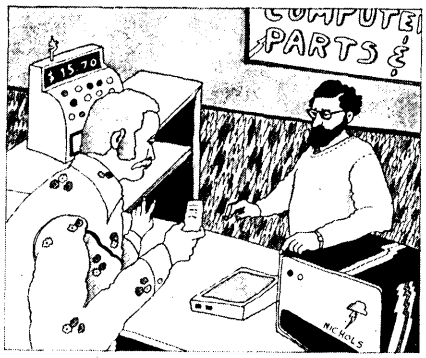
Exchange uses an 8080-based microcomputer with 32KB of main memory, dual 8-inch floppy discs which store 512KB, and an extended BASIC interpreter, all for a total price of $5,000. For input/output a DECwriter LA36 was leased, with maintenance, for $86 per month.

The application software for Exchange was written entirely in BASIC in less than four weeks. The package comprised eight different applications consisting of about 2,700 BASIC statements.

One application at Exchange is the preparation of new account letters and closed account stuffers. Form letters are stored on disc and written on demand to a list of names and addresses entered in a different disc file. Not only do the new account letters give the company a marketing advantage, but a dollar savings is realized on the required twice-yearly audits.

Listing assets

The fixed assets application maintains a password-protected list of furniture, fixtures, and equipment owned by Exchange on disc, and calculates depreciation reports on demand. A description of the asset, asset identification, original cost, salvage value, two accumulated depreciation fields, depreciation calculation method codes,



cost center, date of purchase, and value depreciated to date are maintained for up to 2,000 assets on a single file. The list can be displayed and modified as necessary and a report can be generated on demand showing the depreciation information for each item. The depreciation methods allowed are: no depreciation, straight line, double declining, and sum-of-the-months-digits.

Before buying the microcomputer, Exchange calculated depreciation manually. If you've ever done depreciation calculations, then you know why they used the simplest methods. Now they have increased their profits by taking advantage of more complex depreciation techniques.

Checks and balances

Before the microcomputer, check reconciliation at Exchange occupied all of one employee's time. A list of outstanding checks was maintained on paper. When the monthly statement was received, the 6,000 to 7,000 cancelled checks were marked off and another list was made of the remaining outstanding checks. The technique was time-consuming and error-prone. The check reconciliation program maintains a data base on disc of outstanding checks. When the monthly bank statement is received, the check numbers are entered on the DECwriter's 10-key pad. The program then produces a listing of cancelled checks and balance which should compare exactly with the bank statement. The disc file is purged so that it contains only outstanding checks. This very simple application annually saves Exchange nearly twice the amortized cost of the microcomputer system.

Before the microcomputer, Exchange paid a nearby bank $2 each for mortgage amortization schedules. Typically, a schedule was purchased each day for a customer. Now a 21-statement BASIC program saves numerous trips to the bank and earns Exchange $250 each year in fees paid by customers for amortization schedules. Clearly, the value of this simple application is not determined by the number of program statements required.

Twenty questions

Customers asked questions about accounts; they either were not answered or were answered with a high probability of error. Now the microcomputer provides the answers. The first type of question is, "How much would I have if I put in X dollars each month for the next Y months?" Similar to the first, but specific to self-employment pension plans, the second question is, "How much would I have if I put in X dollars each year for Y years?" Question number three, "How much would I have to put in to end up with X dollars in Y months?" requires the calculation of penalty factors for early withdrawals. This calculation was done manually and was very error-prone.

The importance of all these questions as a service to the customer is obvious. Although a direct savings may not result, a marketing advantage is certainly realized.

Reasonableness tests

Linear regression is used in several types of reasonableness tests in the savings and loan business. For example, monthly interest as a function of average monthly savings balance is expected to be a linear relationship. Routine usage of linear regression in reasonableness tests can provide early detection of errors in the service bureau operation.

Every mortgage loan requires an annual escrow analysis in order to determine if payments into the escrow account will be sufficient for the tax and insurance payments. Exchange's 3,000 escrow analyses originally were done

by their service bureau once each year. After the letters went out, the phones rang off the hook for a few days with questions about escrow accounts. With the new microcomputer, the escrow analyses can be spread out over the year and done at the convenience of the escrow department, which schedules an hour of the minicomputer's time each day. Analyses are done each day as the mortgage insurance comes due.

Paying off

Installment loan payoff quotes are complicated by the fact that interest is taken into income using the rule of 78s. Since all the interest is collected at the time the loan is made, an early payoff may mean a rebate must be made. Additionally, insurance may require a rebate. Hand calculations of payoff are very error-prone, and the service bureau was not being used because the data base wasn't completely trusted. The microcomputer and a simple 150-statement BASIC program now provide quotations.

Wilhelm: part of the team

Several Exchange employees use the microcomputer, including secretaries, accountants, and tellers. They have accepted it as a working member of their team. Soon after its arrival the computer was named Wilhelm. One reason Wilhelm has been so well accepted is the people-oriented user interface. He gently guides the user through the programs. Each program is almost completely self-instructing. Menu selection is used where possible. Messages are clear and occasionally exhibit a sense of humor.

What happens when Wilhelm breaks? The part most likely to fail is the terminal, since it's mechanical. It is leased with a maintenance contract so service is easily obtained. Exchange gets service on the computer and disc at the computer store. Exchange personnel were instructed in disconnecting the equipment and determining which major component failed. If needed, help is available by telephone. The failed component is repaired at the store. Between July and November, there were two failures—the disc and a memory board. In both cases the computer was operational within two hours. In the first case the computer store fixed the memory board, and in the second provided a loaner disc system. The applications presently running on the microcomputer at Exchange are not time-critical. Company business can go on almost as usual even if the computer goes down for a few days, although some operations will be delayed.

The relationship between Exchange and the service bureau has benefited from the purchase of the microcomputer. The Exchange employees have a much better understanding of the data processing operation, and they deal with the service bureau as more knowledgeable users.

The Murray Savings Association installed its microcomputer soon after Exchange. Murray also is a medium-sized savings and loan, has about 35 employees, but uses an in-house IBM System/3 for most of their data processing functions. Several applications, however, were found to be more suited to the microcomputer. Their system is identical to the one at Exchange, uses most of the same software and has six additional applications. Murray's system including hardware and software cost less than $9,000.

Before the microcomputer, a Murray employee spent two days preparing 30 required reports on loans sold to the Federal Home Loan Mortgage Assn. The reports now are prepared in only two hours.

A card file used to keep track of the due date on 10,000 insurance policies was replaced by a seven-page BASIC program that performs the function of the card file and also sorts the policies by insurance agent so that fewer

checks are written—fewer checks mean fewer errors and money saved.

Payroll was done manually by the controller before the microcomputer was installed. Now the controller still does it, but he has a computer to assist him. The payroll program consists of 750 BASIC statements and can handle up to 250 employees. The payroll program maintains a password-protected file of information on employees. The 800 bytes of data maintained on each employee can be displayed and modified as needed.

As the first step in making a payroll run, the program sequences through the list of employees, printing each employee name and asking for input of the pay period information which can include hours worked, overtime worked, taxable extraordinary compensation, and non-taxable extraordinary compensation. After all pay period information has been entered, the payroll master is updated. Calculations are made for the period, federal income tax, FICA, insurance, up to three special withholdings, federal and state employment taxes, quarter-to-date totals, and year-to-date totals. The payroll information then is printed in summary form so that it can be checked for reasonableness. The checks can be printed on command. All the reports needed by the employer for taxes and FICA also are available.

Possibly the most interesting application is a program that selects packages of loans for resale. A buyer of a loan package can specify a wide variety of parameter ranges that must be satisfied by the loans in the package. For example, all loans in a package might be required to be between 8½% and 8¾% as well as satisfying several other constraints. In fact, any combination of twelve unique types of constraints can be applied to a package. Before the microcomputer, up to two days were required to select a loan package. Now it can be done in only twenty minutes, giving Murray a significant competitive advantage when several associations are bidding loan packages to the same buyer. The opinion of the people at Murray is that the use of the loan package selection program alone could easily pay for the computer system.

Before the microcomputer at Murray, a set of ledger cards was used to keep track of the real estate owned by the company. All transactions associated with each piece of property were recorded on the cards. (A transaction may be an expense to be capitalized, such as a roof repair; an expense item such as lawn mowing; or income, in the case of rent.) The microcomputer has replaced the ledger cards. Additionally, the computer provides timely and accurate reports on the status of each piece of real estate.

A tickler file for loan commitments was needed in order to plan cash requirements more accurately. The microcomputer was perfect for this application.

Murray calculated its total savings due to the microcomputer at $450 per month. This compares to $350 per month in expense when the microcomputer is amortized over a three-year period.

What can be learned from these applications?

First, personal computers are being used for serious business applications, not only in small businesses, but also in not-so-small businesses where the application calls for the economy of the microcomputer.

Even if a large computer is available, some applications are more economical on a microcomputer.

Very simple applications can save a lot of money and provide a company with the tools it needs to be competitive.

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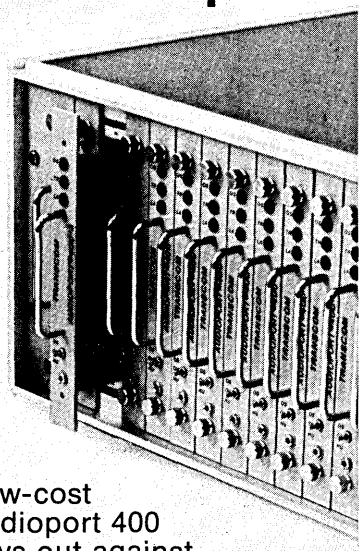

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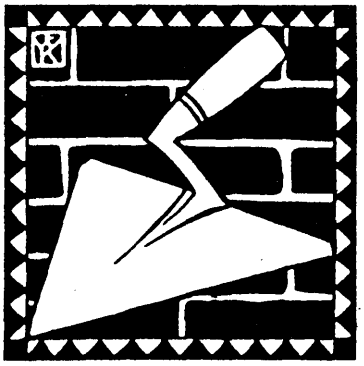
Is There a Future for Programmers?



Personal computing and personal computers are being viewed by some people as the handwriting on the wall for the dp professional. Interesting predictions about personal computing include scenarios in which pocket-sized computers are more common than wristwatches, or in which every home has its "comsole" (a term coined by Arthur C. Clarke meaning a sort of cross between a teletypewriter, television, and telephone—combining current communications technology and personal or home computing). It is being predicted that the personal computer may extend into every facet of daily life, from home to office. And the part that is worrying some people was expressed by Portia Isaacson (Oct. p. 210); she posed the question of the value and prestige of the dp professional in an age when every kid on the block can write a program.

Everyman a programmer?

What are the implications for today's computer programmer? It's a rather startling question. Personal computing developments in the past few years—including the pocket calculator—may be the iceberg-tip of a social upheaval as profound and pervasive as the Industrial Revolution. Or it may not be, although if the rapid acceptance of the pocket calculator by the general public is any indication, it is likely that by the end of the century (a conservative estimate) a computer in the home *will* be as common as a telephone or television.

While personal computers today are nowhere near as simple as the telephone and television, trends seem to indicate that they will soon become so. Small business computers like the ADAM, which is claimed to require no programming, and the development of such "user-friendly" interfaces such as ROBOT point toward a vast simplification in the process of "programming" a personal computer. Currently there are personal computer software packages available to perform such mundane chores as household budgets and menu planning, and there are innumerable business and scientific application packages available in turnkey form for small computers.

Decentralization of computing facilities is progressing in some cases as far as complete dissociation; in many companies today each department has its own minicomputer dedicated to local applications. (It's difficult to say whether this is progress or regression; nevertheless, it is an observed trend.)

It seems rather simple, then, to extrapolate to the day when a businessperson can "program" his or her own applications on his or her own personal computer, using a descriptive or analytical language appropriate to the problem rather than the largely procedural machine-oriented languages in common use today.

Where does that leave the dp professional? The obvious

> We might do our jobs so well that we render ourselves obsolete.

worst case is: on the unemployment line. Ironically, we might be doing our jobs so well that we are rendering ourselves obsolete.

I think this is an extreme view, and that it will probably not come to pass. Compare dp to some other professions: anybody reading these comments is capable of writing English prose, yet how many of these readers are professional authors? How many of them even *want* to spend the majority of their time writing? Similarly, innumerable children play various sports and play them well, yet how many will become professional athletes? In fields such as athletics and the arts, talent has as much influence on professional status as does inclination.

Success in our field also requires a certain amount of talent. (Although many will argue the nature and measurability of that talent, its existence is undeniable.) It is entirely likely that there will be people with neither the knack nor inclination to program their personal computers, thus leaving at least one niche for the professional.

There are other niches, too. Consider all the software that will be needed to support the casual user. Somebody will be needed to develop that software, somebody who knows more about computers than simply which buttons to push. And business applications will most likely remain quite large and complex, continuing to require the services of professionals. Research and development, as always, will remain essentially undisciplined and unpredictable; the dp professional will be needed there, too.

Professionalism in a non-profession?

What *will* change is the *nature* of our job. Programming as we know it will probably become unnecessary. The wide-open potential for new applications and the increasing complexity of information-handling will place greater emphasis on the creative general systems approach and require us to concentrate on systems analysis, architecture, and design.

More important, we will need to be able to provide greater product quality assurance than we can today, since our users will likely be the general consumer who will insist on things like warranties. Thus some additional tangible mark of professionalism may be desired. Certification programs and self-assessment procedures indicate a trend in this direction. Just as the general public typically has more confidence in a medical person with an M.D. degree than one without it, so it may be that our future users will have more confidence in a certified or licensed professional dp practitioner.

And, of course, there are those who are worried about

the forum

our status in society. Will we remain a rather esoteric, somewhat elite, and well-rewarded group? Or are we destined for the same fate those ancient practitioners of the arcane art of arithmetic met when Arabic numerals came into general use?

The answer, I think, will be somewhere in the middle.

Will programmers join the tallow-makers and wheelwrights of yore?

What is certain is that the nature of dp jobs will change, and change profoundly, over the next decade or so. We would do well to speculate on the nature of that change now, and prepare ourselves for it, lest we belatedly discover ourselves stranded in the company of the tallow-makers and wheelwrights of yore.

—Lois A. Rose
Ms. Rose is a senior staff consultant with Yourdon, inc.

Another Risk We Run By Being in This Business

Not long ago, a commercial bank was using its excess computer capacity to run its clients' monthly payrolls. Certain clients had labor arrangements allowing their employees to borrow money from local credit unions and repay it through automatic payroll deductions. Because of a program error the payroll *deductions* were inadvertently *added* to the employees' checks. Some employees quickly took advantage of the situation. By the time the error was discovered, some $10,000 in excess pay had been given to the employees, most of which was unrecoverable. Because of its role in payroll system design and processing, the bank was responsible for the client losses.

In another case, a data processing service bureau was providing a national magazine publisher with distribution lists on which local and regional newsstand deliveries were based. Because of dp error, the distribution listings routed magazines to the wrong newsstands. By the time the magazines could be collected and rerouted, some $20,000 in transportation expenses, stock out, and excess inventory charges were incurred. The service bureau was held responsible for the costs.

Consistent with the growing returns from data processing are even greater risks inherent in the reliance and dependence on dp. Part of the answer in dealing with these risks is the implementation of contingency plans including insurance coverage for potential losses. While issues of externally induced catastrophes and issues of security are important considerations, potentially more critical are the business risks entailed when dp carries part or all the revenue producing responsibility, as the preceding and the following cases point out.

Another bank using its excess capacity to service its customers got into trouble when a software error caused a delayed payroll. One bank customer's union had previously negotiated a penalty for late payroll checks. Because the bank had caused the tardiness, it was held responsible for the $5,000 penalty to the employees.

A service bureau was sued for $135,000 over a fault in the manual-to-computer conversion of a client's billing

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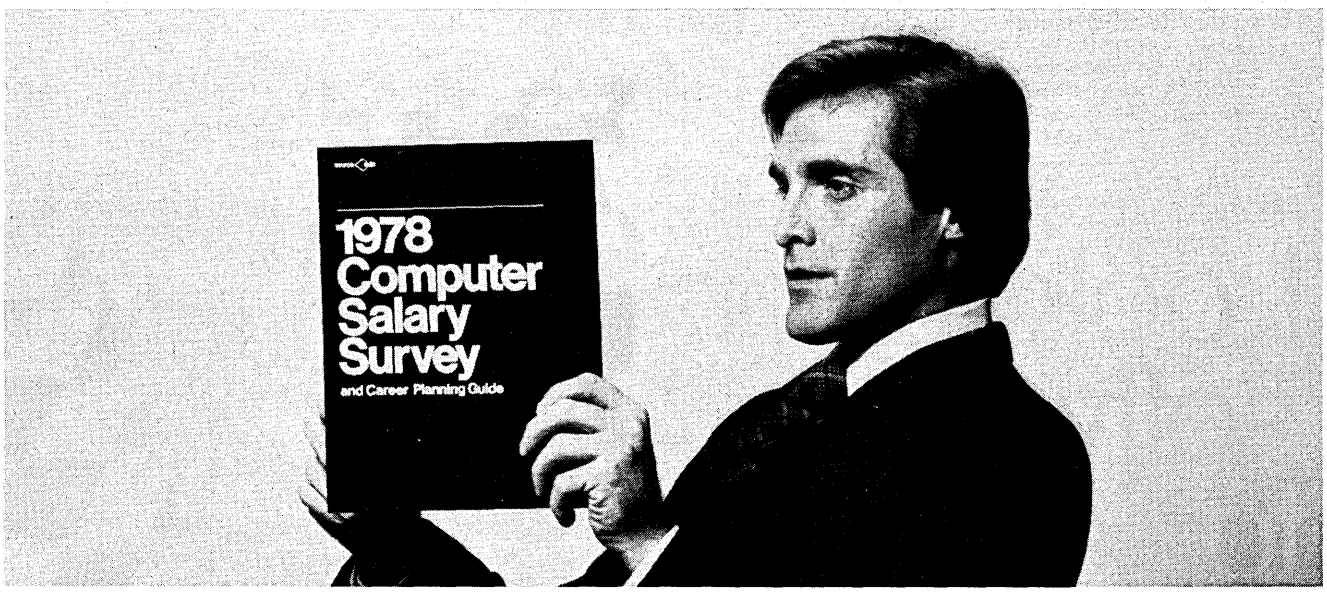

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and accounts receivable system. The client had suffered losses in billings and other damages, and accused the service bureau of negligence in the system conversion process. A $47,500 out-of-court settlement ended this action.

And the consequences of dp error can be serious for other than economic reasons, as in the case of a private hospital having released a patient with a contagious disease.

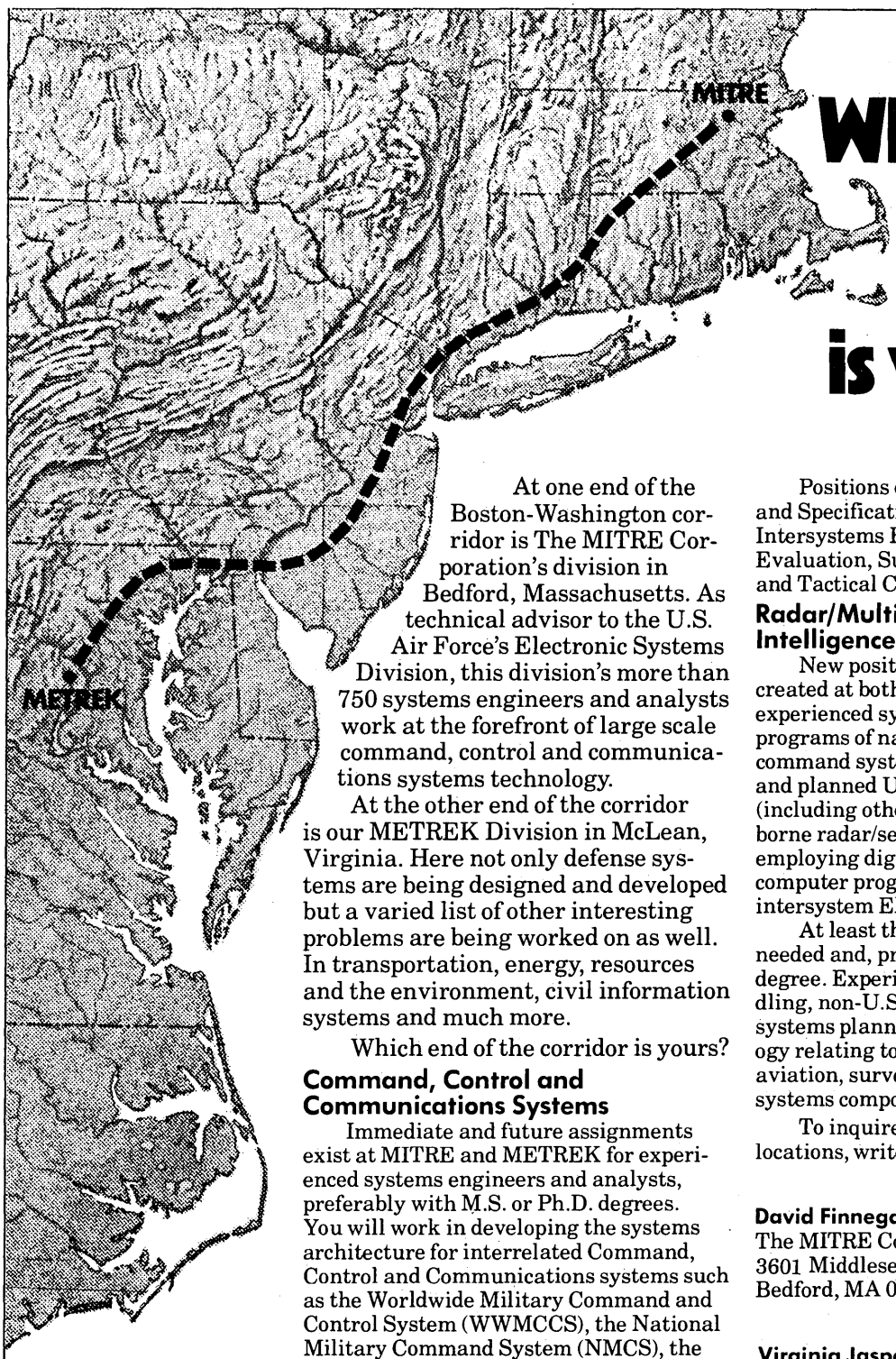
Data processing services sold to outside customers expose the vendor to liability for loss due to errors, omissions, negligence, malicious acts, and dishonesty of employees as well as machine malfunction. Errors or omissions in processing data can cost customers a great deal of money, and, as the preceding cases exemplify, these customers will sue to collect their losses.

Even when the dp facility is used as part of the regular in-house information function, outsiders may be vulnerable to data processing errors or omissions. Such cases can lead

to costly suits, as when a commercial bank using an electronic check processing and bookkeeping system incorrectly refused to pay a check drawn by a business customer, who consequently lost a profitable transaction. Or consider the case of an eastern railroad, which used a computer to classify freight cars, that neglected to designate special handling for a car containing fragile merchandise. Another railroad's dp error caused costly nondelivery of raw materials through the loss of a customer's car. And an engineering firm that relied on a computer to calculate steel girder specifications for a skyscraper neglected to catch an error that caused the building to collapse during construction.

Few firms have attempted to determine the impact of such data processing errors. Costs for reruns and for wasted supplies and manpower hours are easily absorbed internally by dp accounts. The magnitude of the costs is thus buried until the firm considers selling its data processing services to outsiders, then the cost of overcoming the effects of dp error becomes critical.

Even fewer firms have taken specific steps to provide ade-



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quate coverage for errors and omissions. The cases cited came to our attention not because they are unusual but because in each case of dp error the vendor's Errors and Omissions insurance policies paid the claim. Such policies are certainly essential not only for a service bureau, but for any business considering selling its excess computer capacity. But, when errors do occur, insurance is only part and perhaps a small part of the answer. A contingency plan is also necessary, one that takes into account hidden costs. The complications that can arise from dp error—including damage to a firm's reputation, loss of revenue accounts, disruption of other operations, executive time expended, costs of special investigations, court time, and corrective action—make the actual court settlement just the tip of the cost iceberg.

Those who use or sell data processing to service outsiders and depend upon insurance to cover the costs and risks are misled. While obtaining insurance is certainly a necessary beginning, it is even more important that the buried costs of error within the usual dp activity be investigated, and that a contingency plan incorporate procedures for effectively dealing with the inevitable occurrence or dp errors and omissions.

—Donald H. Drury
Dr. Drury is a consultant specializing in evaluation and control problems and an assistant professor of accounting and information systems at McGill Univ., Montreal.

—Albert S. Dexter
Dr. Dexter is a dp consultant to several large Canadian organizations and an associate professor of information systems at the Univ. of British Columbia. ❋

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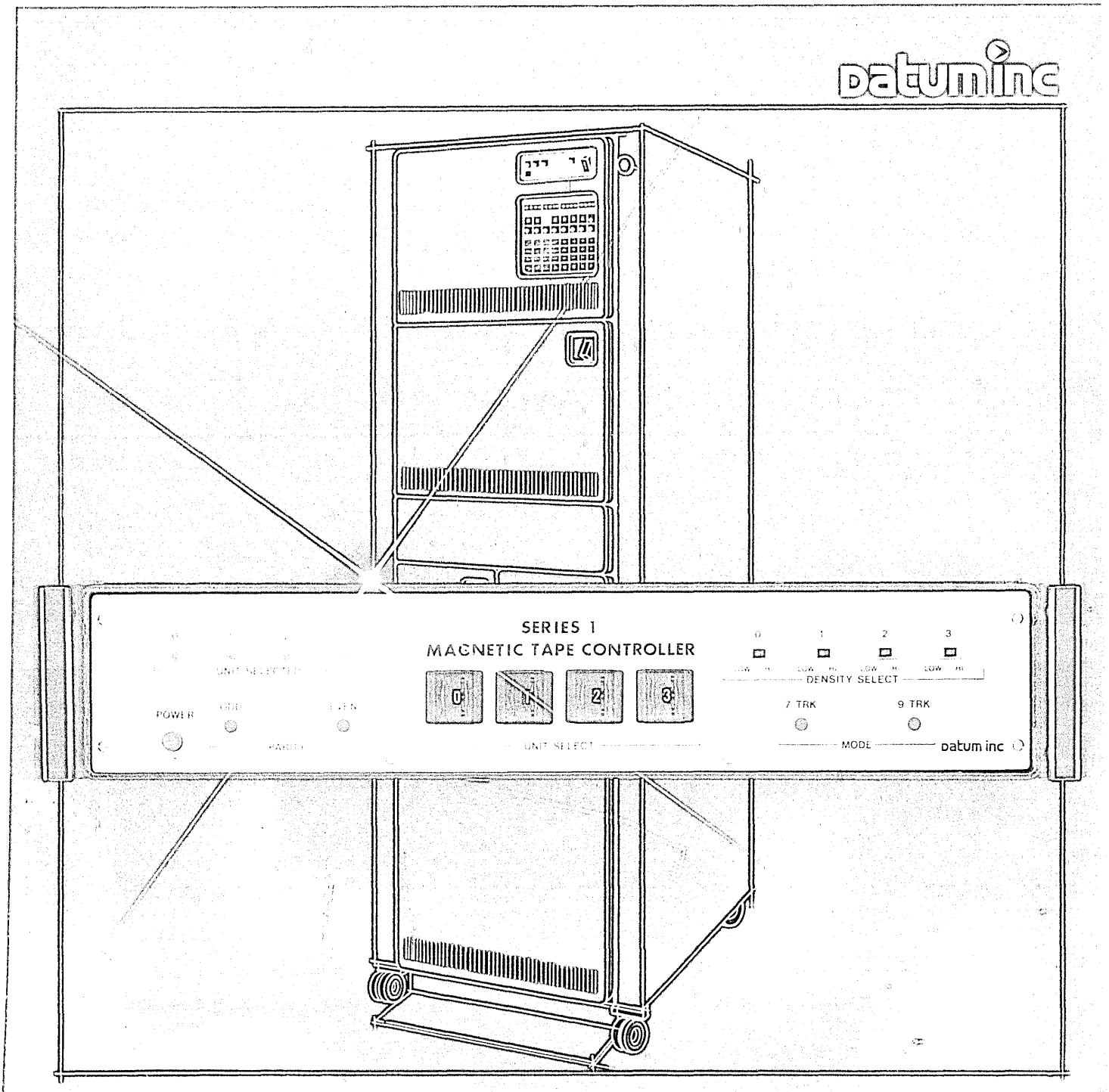
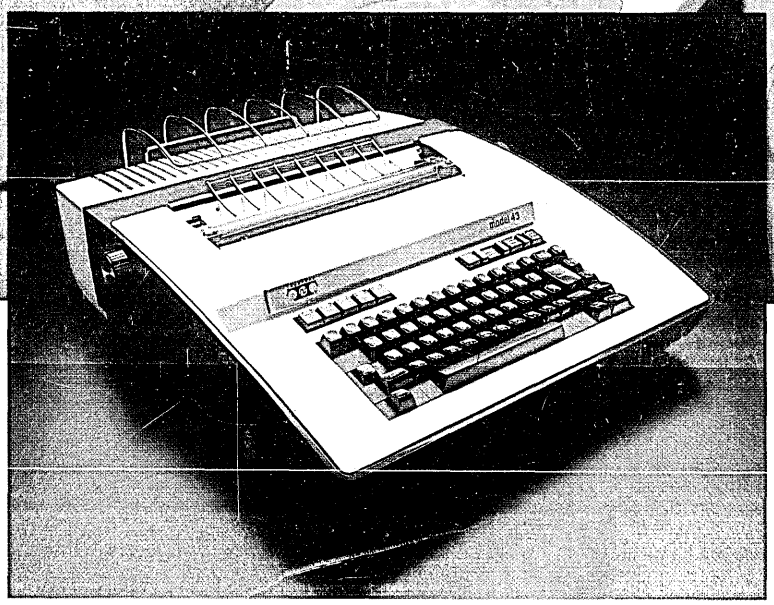
CIRCLE 2 ON READER CARD



THE TELETYPE MODEL 43: ALL THE TALK YOU'VE HEARD ABOUT IT IS TRUE.



When something as good as the Teletype model 43 teleprinter comes along, it naturally generates a lot of talk. And for a lot of good reasons.

Delivering true 30-character per second throughput, upper and lower case printing in a 132-column format, the model 43 has an exclusive, Teletype-developed 9-wire matrix impact printhead mechanism. This unique feature provides superior service life as well as exceptional print quality, even on multiple copies.

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Another convenient cost-saving feature of the model 43 is that it's designed to use 12" wide by 8½" long fanfold paper. Tear off the serrated margins and you've got a 132-character line on the handy 11" x 8½" paper.

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The Teletype model 43. After all the good things you've heard about it, no wonder nothing even comes close.

TELETYPE

CIRCLE 3 ON READER CARD