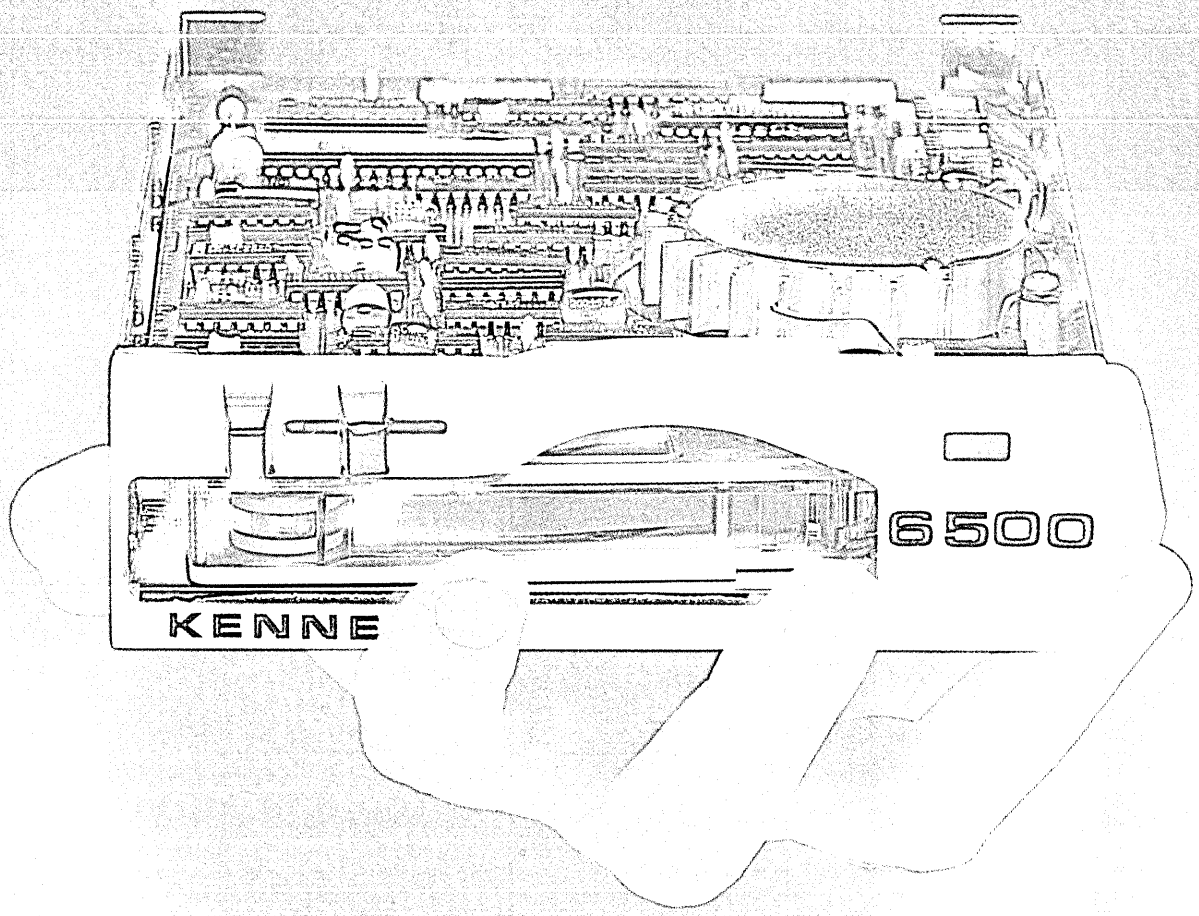
Introducing Model 6500 —

'the handful'



Kennedy's Model 6500 5¼" Cartridge Recorder — it fits in your hand, but it's more than a handful of new and unique features, such as:

- 16 KBYTE Buffer — Model 6500 can transfer data at a burst rate of up to 3 MBYTE/sec., and maintain streaming longer in systems with little buffering.
- 150 MS Ramp Time — Data access time and reposition time is cut in half, and it can better operate in a Pseudo s/s mode.
- Direct Drive Motor — Assures much higher reliability and lower I.S.V.

Finally, and best of all, Model 6500 features a simple mechanical design — loading is simple, moving the tape to the head instead of the head to the tape.

Model 6500 is one big handful of what you've been looking for in a 5¼" cartridge recorder. Write or call us.

KENNEDY

An Allegheny International Company

1600 Shamrock Ave., Monrovia, CA 91016

(818) 357-8831 • TTT TELEX 47-2[illegible]-16 KENNEDY

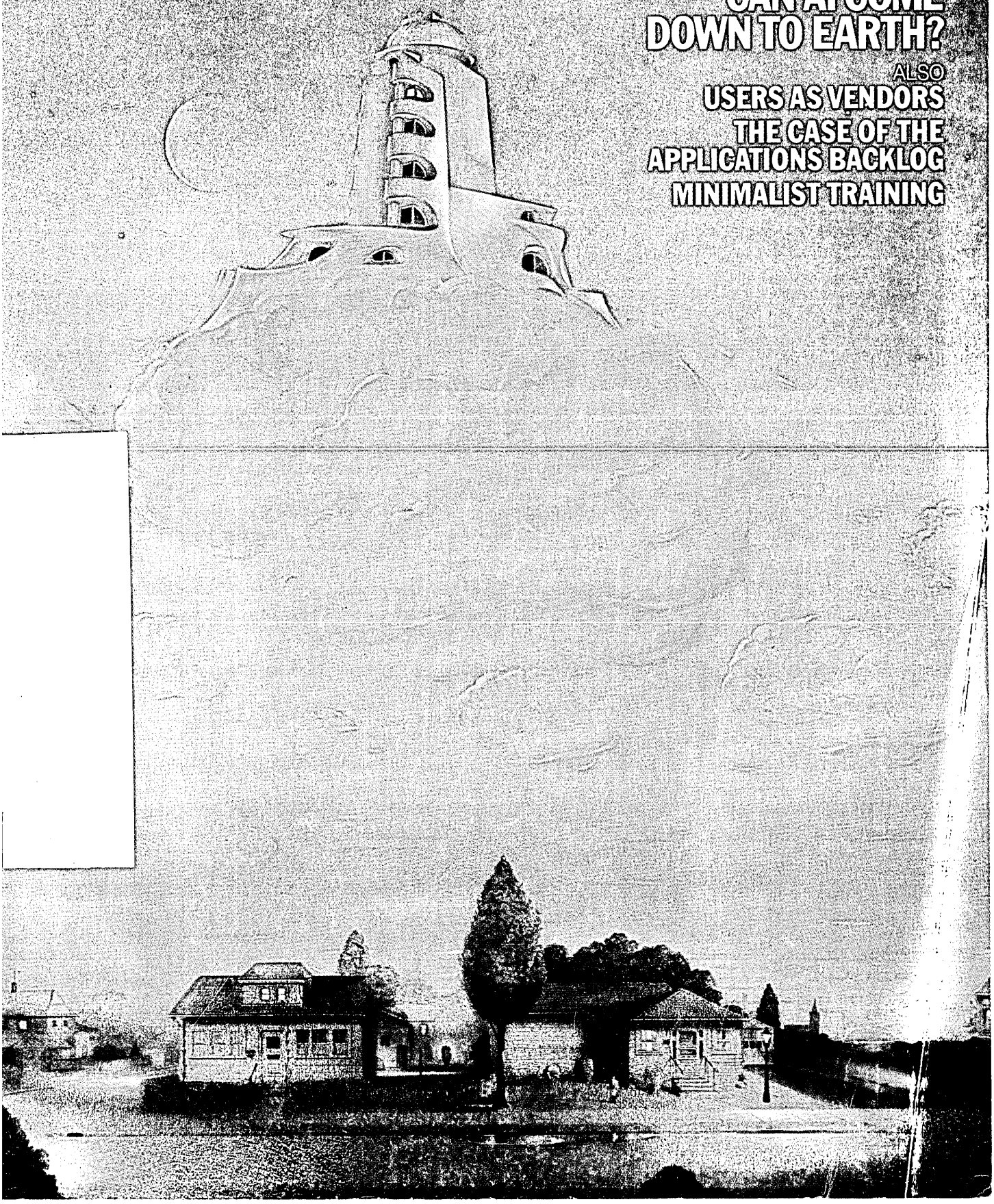
CIRCLE 1 ON READER CARD

KENNEDY • QUALITY • COUNT ON IT

DATAMATION® 84
NOVEMBER 1 · $3.00 U.S.A.

CAN AI COME DOWN TO EARTH?

ALSO
USERS AS VENDORS
THE CASE OF THE APPLICATIONS BACKLOG
MINIMALIST TRAINING



Want to combine MICOM's money-saving data concentration with X.25's money-saving packet data communications?

Now you can. There's a new kind of data communications product which combines the best features of a MICOM Micro800/2 Data Concentrator with all of the functions of an X.25-compatible packet assembler/disassembler (PAD) to give you the best of both worlds. It's called the Micro800/X.25 Concentrator PAD, and here are some of its more prominent features:

Packetizing

of data from up to 16 "dumb" asynchronous terminals or from non-X.25 computers for transmission over public or private Packet Data Networks

Local Switching

between any devices connected to the same PAD, and

Class Name Addressing

to allow users to be served by the first available member of a set of similar network resources

Users may also force larger numbers of terminals into

Contention

for smaller numbers of expensive computer ports.

Most important, the Concentrator PAD makes the transition to X.25 easy. The menu-driven operation of its

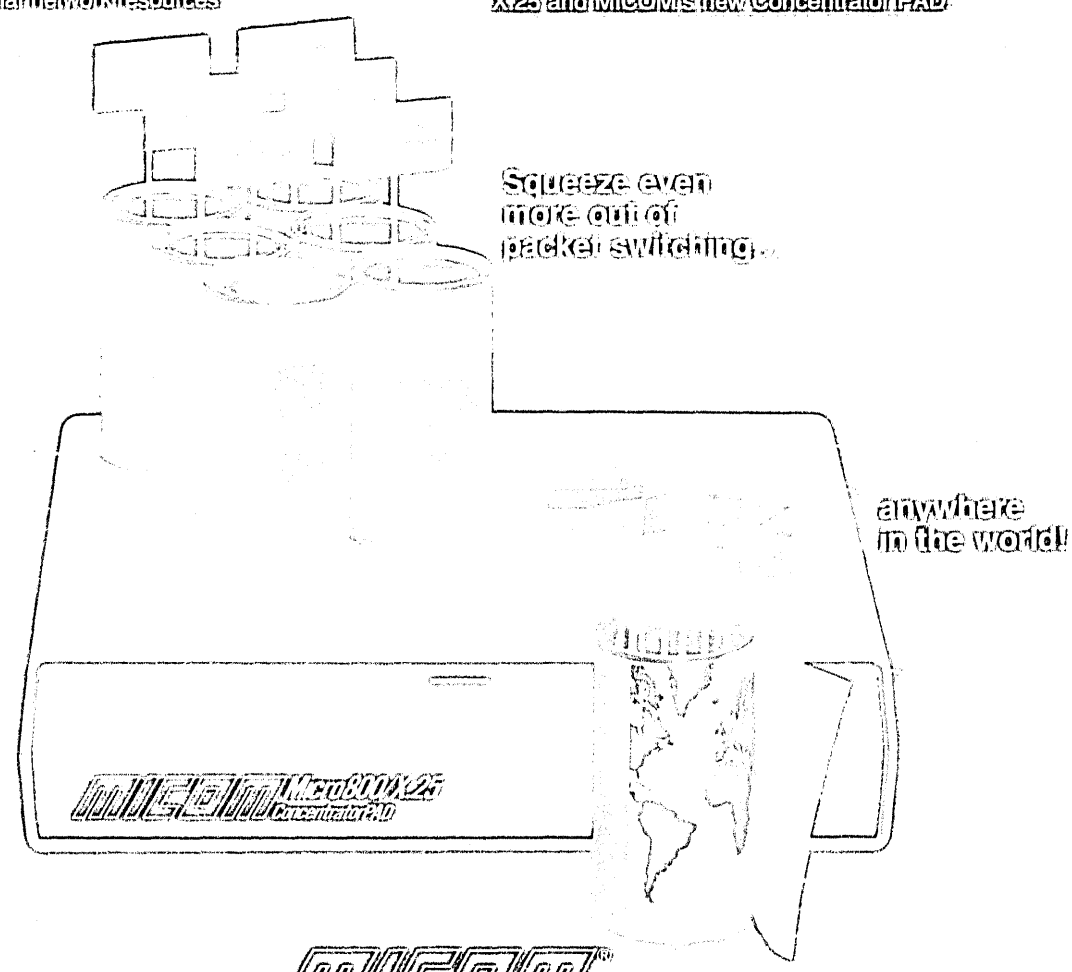
Command Facility

simplifies the setting of channel configurations and also makes it possible to set those parameters, to test channels, and to collect network statistics from a central site. Even its operating software can be updated through

Downline Loading

And it's inexpensive enough for applications supporting only a few terminals. Find out how easy X.25 can be.

Call or send today for a free 12-page brochure describing X.25 and MICOM's new Concentrator PAD.


Squeeze even more out of packet switching...
anywhere in the world!

MICOM®

MICOM Systems, Inc. ○ 20151 Nordhoff Street ○ Chatsworth, CA 91311 ○ Telephone (805) 583-8600 ○ TWX 910/494-4910
Regional Sales/Service ○ Atlanta, GA ○ (404) 435-2999 ○ Boston, MA ○ (617) 527-4010 ○ Chicago, IL ○ (312) 964-0551
Dallas, TX ○ (214) 258-0774 ○ San Francisco ○ (415) 327-0890 ○ St. Louis, MO ○ (314) 576-7626 ○ Teaneck, NJ ○ (201) 836-4000
MICOM-Borer Ltd. ○ Reading RG20JT, England ○ (0734) 866801 ○ Micom Europe ○ Newbury RG13JU, England ○ (0635) 832441

For literature please call: (800) "MICOM U.S."

AVAILABLE NOW FROM THESE STOCKING REPS: AK: Anchorage (907) 561-1776/Juneau (907) 789-4101 ○ AL: (800) 327-6600 ○ AR: (214) 620-1551 ○ AZ: (602) 994-5400 CA: Anaheim (714) 635-7600/Lodi (209) 334-0961/San Diego (619) 565-1557/San Jose (408) 298-7290 ○ CO: Denver (303) 777-8070 ○ CT: (617) 235-5520 ○ DE: (609) 779-0200 FL: (800) 432-4480 ○ GA: (800) 327-6600 ○ HI: (808) 537-4758 ○ IA: (402) 895-5850 ○ ID: (801) 466-8522 ○ IL: (312) 255-4820 ○ IN: (317) 846-2591 ○ KS: (816) 252-3700 KY: (502) 228-5401 ○ LA: (800) 327-6600 ○ MA: (617) 235-5520 ○ MD: (301) 340-0800 ○ ME: (617) 235-5520 ○ MI: (313) 588-2300 ○ MN: (612) 425-4455 MO: Independence (816) 252-3700/St. Louis (314) 721-0401 ○ MS: (800) 327-6600 ○ MT: (801) 466-8522 ○ NC: (800) 327-6600 ○ ND: (612) 425-4455 ○ NE: (402) 895-5850 NH: (617) 235-5520 ○ NJ: North (201) 589-2353/South (609) 779-0200 ○ NM: Albuquerque (505) 292-1212/Las Cruces (505) 524-9893 ○ NV: (714) 635-7600 NY: Albany (518) 459-5891/Buffalo (716) 662-4568/New York City (201) 589-2353/Rochester (716) 424-7492/Syracuse (315) 455-5841 ○ OH: Cleveland (216) 524-5930/Dayton (513) 434-7500 ○ OK: (405) 478-5000 ○ OR: (503) 224-3145 ○ PA: East (609) 779-0200/West (412) 892-2953 ○ RI: (617) 235-5520 ○ SC: (800) 327-6600 SD: (612) 425-4455 ○ TN: (800) 327-6600 ○ TX: Dallas (214) 620-1551/Austin (512) 327-8800/El Paso (915) 542-1762/Houston (713) 353-7728 ○ UT: (801) 466-8522 VA: North (301) 340-0800/South (800) 327-6600 ○ VT: (617) 235-5520 ○ WA: (206) 454-2383 ○ WI: (414) 784-9379 ○ WV: East (301) 340-0800/West (412) 892-2953 WY: (303) 777-8070 ○ Washington, DC: (301) 340-0800 ○ Puerto Rico: (809) 753-1771

MD003

CIRCLE 4 ON READER CARD

IMS 1.3 SUPPORT IS AVAILABLE NOW

For Candle's IMS Performance Monitoring Software

Two years ago, Candle made a strategic decision about the design of our IMS performance products: to support a mode of operation we call External Monitoring (EM). We did this for both short and long-range reasons.

Reliability and Ease of Use

Short-range, EM made our products easy to install and highly reliable. Because Candle's IMS products run in their own MVS address space, they can be installed in less than one hour with no modifications to IMS – not even a scheduled restart. Extensive loop checking, error recovery and other integrity features are provided, so that Candle products can continue to run even during severe hardware and software problems (such as VTAM disabled).

IMS Growth Strategy

Long-range, EM anticipated the need for IMS to grow both horizontally and vertically: Horizontally, through the multiple-address-space architecture of IMS 1.3. Vertically, above the 16 MB line in the MVS/XA address space.

IMS 1.3 and MVS/XA Support Now

As a result, Candle IMS performance products can fully exploit the capabilities of both IMS 1.3 and MVS/XA. At the same time, we were able to deliver support for IMS 1.3 very close to IBM's first customer shipment – not just compatibility but support for DBRC, IRLM, and DLISAS address spaces. When dozens of new commands were needed to support IMS 1.3 we were able to implement them quickly because we were prepared for the new architecture and did not depend on system hooks or IMS exits.

Future Direction

For the future, the direction of IMS is clearly toward extending the multiple-address-space architecture of IMS 1.3 to support other high-traffic services (such as Message Format Services). The future belongs to those who prepare for it.

If you want IMS performance tools now that support current and future systems software promptly, you need Candle. For more information, contact your Candle representative.

Candle®

Candle Corporation
10880 Wilshire Blvd., Suite 2404
Los Angeles, California 90024
(213) 207-1400

Please send me more information on Candle's IMS performance monitoring software for IMS 1.3 and MVS/XA.

Name _____ Title _____

Company _____

Address _____

City/State/Zip _____

Phone _____

Candle Corporation
Dept MI. 10880 Wilshire Blvd., Suite 2404, Los Angeles, CA 90024

A-286

CIRCLE 6 ON READER CARD

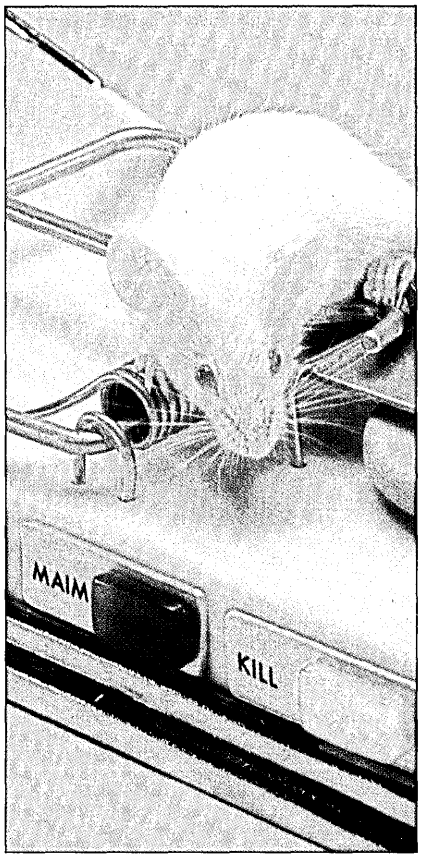
DATAMATION

NOVEMBER 1, 1984/$3.00 U.S.A.
VOLUME 30 NUMBER 18
This issue, 181,993 copies

FEATURES

24
IN FOCUS
Turnabout is fair play, but is it good business? In "Users as Vendors," Nancy Welles describes how the marketplace is reacting to formerly in-house software solutions.

76
THE OVERSELLING OF EXPERT SYSTEMS
Gary R. Martins
For applications of even modest complexity, most expert system code is hard to understand, debug, extend, and maintain. And then there's the pessimistic view. . . .



85
THE BLOSSOMING OF EUROPEAN AI
Paul Tate
By making modest promises and then delivering on them, expert system builders find fertile soil for their products.

92
AI AND SOFTWARE ENGINEERING
Robert Kowalski
Never mind promises of electronic psychiatrists and computerized warriors. Right now, artificial intelligence can be a valuable system development helpmate.

107
THE CASE OF THE APPLICATIONS BACKLOG
Kenneth E. Schoman Jr.
What was the sinister force thwarting end users? Who had held up defenseless software development? It was time for a hard-boiled investigation into project management.

115
ORIGIN OF THE SPECIES
Dan M. Bowers
Out of the primordial mists of pre-*Carterphone* and divestiture days, the modem has risen to take its place in the communication kingdom.

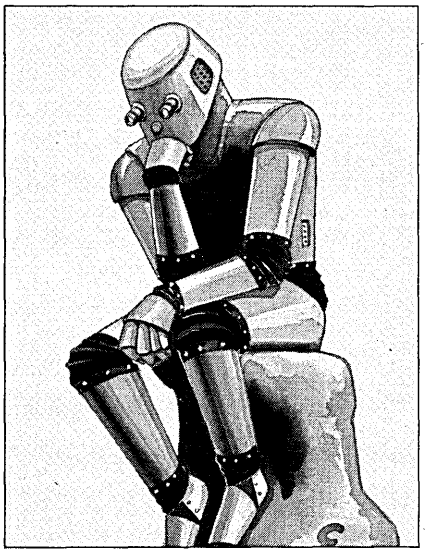
125
MINIMALIST TRAINING
John M. Carroll
How to simplify the tough task of learning computer systems.

NEWS IN PERSPECTIVE

34 **PERSONAL COMPUTING**
A PC and phone in one.
36 **SUPERCOMPUTING**
Amdahl's super cpu gamble.
42 **POINT OF SALE**
When one and one make one.
46 **MAINFRAMES**
Amdahl pushes Unix.
Spreadsheets for all.
60 **CAD/CAM**
A MAP for all vendors.
64 **BENCHMARKS**

DEPARTMENTS

9 **LOOK AHEAD**
15 **LETTERS**
21 **EDITORIAL**



141 **PEOPLE**
147 **HARDWARE**
155 **SOFTWARE**
163 **SOURCE DATA**
171 **MARKETPLACE**
174 **ON THE JOB**
177 **ADVERTISERS' INDEX**
181 **READERS' FORUM**

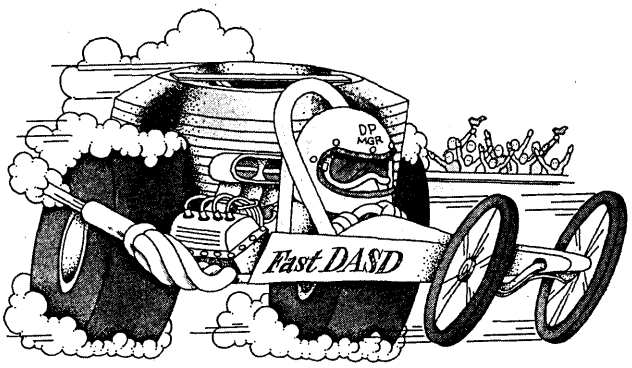
INTERNATIONAL 136-1

- 3 **DEALING WITH THE DOLLAR**
-10 **JAPAN'S PC PLUNGE**
-16 **EUROPE SOUNDS OUT SPEECH SYSTEMS**

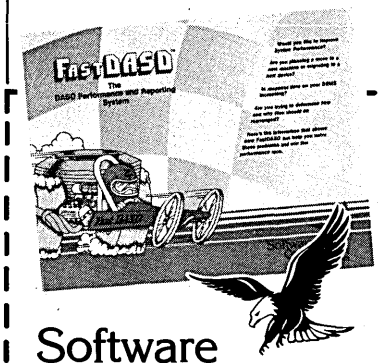
COVER ILLUSTRATION BY
RICHARD BOBER

OS/MVS Users

. . . over 500 users are using FastDASD to improve system performance.



- Speeds Response Time
- Solves Problems Quickly
- Increases Throughput
- Saves People Time



Software Corporation of America

455 Carlisle Drive
Herndon, VA 22070
Tel. (703) 471-1545

For faster results, call us today at our toll-free number 800 368-7638.

To get a Free FastDASD brochure, fill out and mail this coupon today.

Name _____

Title _____

Company _____

Phone (____) _____

Address _____

City _____

State _____ Zip _____

OP SYS _____ CPU ____ #DASD Spindles ____

DAAD

CIRCLE 7 ON READER CARD

Take stock in America.

DATAMATION

Editor Rebecca S. Barna
Managing Editor Parker Hodges
Assistant Managing Editor Florence Lazar
Assistant Managing Editor, News Larry Marion
Features Editor Kenneth Klee
International Editor Linda Runyan
Senior Writer John W. Verity
Assistant News Editor Michael Tyler
Assistant Features Editor Deborah Sojka
New Products Editor Robert J. Crutchfield
Copy Editor Theresa Barry
Assistant Copy Editor Eric Brand
Assistant Editor Lauren D'Attilo
Editorial Assistants Donna Lyons, Mary Ann Hariton
Bureau Managers
San Francisco Charles L. Howe
Los Angeles Edith D. Myers
Boston R. Emmett Carlyle
Washington Willie Schatz
European Managing Editor Paul Tate
Technology Editor, Europe Fred Lamond
Foreign Correspondents John Lamb, London; James Etheridge, Paris; Peter Hidas, Oslo; Norman Kemp, Sydney.
Contributing Editors Pamela Archbold, Laton McCartney, Hesh Wiener
Advisors Lowell Amdahl, Howard Bromberg, Philip H. Dorn, Joseph Ferreira, Bruce W. Hasenyager, David Hebditch, John Imlay, Terry G. Mahn, Louis Naugès, Angeline Pantages, Robert L. Patrick, Malcolm Peltu, Russell Pipe, Carl Reynolds, F.G. Withington, Amy Wohl.
Art Director Kenneth Surabian
Assistant Art Director Susan M. Rasco
Art/Production Coordinator Catherine Kennedy
Publisher James M. Morris
Executive Editor John L. Kirkley
Research Director Laurie Schnepf
Operations Manager Patricia Adamo
Production Manager Anne Earley
Circulation Vice President Joseph J. Zaccaria
Circulation Manager Mary Agnes Glenister

EDITORIAL OFFICES
Headquarters: 875 Third Ave., New York, NY 10022. Phone (212) 605-9400; telex 429073. **New England:** 1 Chaucer St. RFD 2, Sandwich, MA 02563, (617) 888-6312. **Washington, D.C.:** 4451 Albemarle St. NW, Washington, DC 20016, (202) 966-7100; **Western:** 1801 S. La Cienega Blvd., Los Angeles, CA 90035, (213) 559-5111; 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **International:** 130 Jermyn St., London SW1Y 4UJ, England, (441) 839-1840, telex 914911; 13 Stanley Place, Budd Lake, NJ 07828, (201) 691-0592, telex 499-4308.

Technical Publishing
a company of The Dun & Bradstreet Corporation

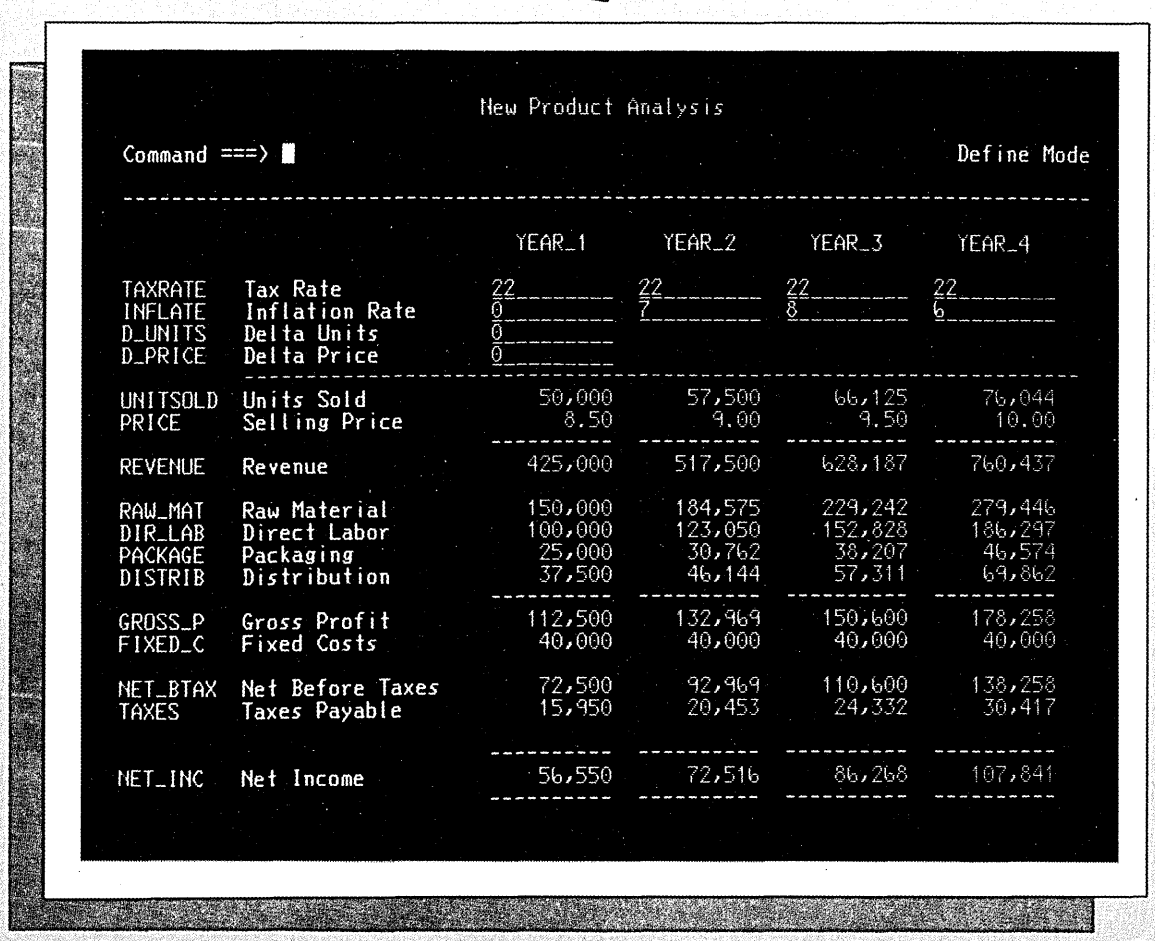
BPA ABP

DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by Technical Publishing, a company of The Dun and Bradstreet Corp., John K. Abely, president. Executive, advertising, editorial offices, and subscription departments, 875 Third Ave., New York, NY 10022. Published at Lincoln, Nebr. Annual subscription rates: U.S. and possesions: $50; Canada: $75; Japan, Australia, New Zealand: $140 air freight; Europe: $120 air freight, $225 air mail. All other countries: $120 surface, $225 air mail. Reduced rate for qualified U.S. studets, public and school libraries: $30. Single copy: $3 in U.S. Special Datamation/Dataguide issue: $25. Sole agent for all subscriptions outside the U.S.A. and Canada is J.B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England, (01)422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Second-class postage paid at New York, NY 10001 and at additional mailing office.

©Copyright 1984 by Technical Publishing Co., a Division of Dun-Donnelley Publishing Corp., a company of The Dun and Bradstreet Corp. All rights reserved. "Datamation" registered trademark of Technical Publishing Company. Microfilm copies of Datamation may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, MI 48106. Printed by Foote & Davies/Mid-America.

POSMASTER: Send address changes to Datamation, 875 Third Ave., New York, NY 10022.

SAS/FSP Gives You FSCALC...



New Product Analysis

Command ===> Define Mode

		YEAR_1	YEAR_2	YEAR_3	YEAR_4
TAXRATE	Tax Rate	22	22	22	22
INFLATE	Inflation Rate	0	7	8	6
D_UNITS	Delta Units	0			
D_PRICE	Delta Price	0			
UNITSOLD	Units Sold	50,000	57,500	66,125	76,044
PRICE	Selling Price	8.50	9.00	9.50	10.00
REVENUE	Revenue	425,000	517,500	628,187	760,437
RAW_MAT	Raw Material	150,000	184,575	229,242	279,446
DIR_LAB	Direct Labor	100,000	123,050	152,828	186,297
PACKAGE	Packaging	25,000	30,762	38,207	46,574
DISTRIB	Distribution	37,500	46,144	57,311	69,862
GROSS_P	Gross Profit	112,500	132,969	150,600	178,258
FIXED_C	Fixed Costs	40,000	40,000	40,000	40,000
NET_BTAX	Net Before Taxes	72,500	92,969	110,600	138,258
TAXES	Taxes Payable	15,950	20,453	24,332	30,417
NET_INC	Net Income	56,550	72,516	86,268	107,841

Financial Spreadsheets on the IBM 3279.

FSCALC, the newest procedure in SAS/FSP™ gives you the friendliness of a personal computer and the power of your existing communications network.

The FSCALC procedure provides an interactive, electronic spreadsheet for financial modeling and analysis. You can use FSCALC for budgeting, financial and strategic planning, forecasting, new product analyses, depreciation scheduling, manpower and salary planning, portfolio management and "what if" analyses.

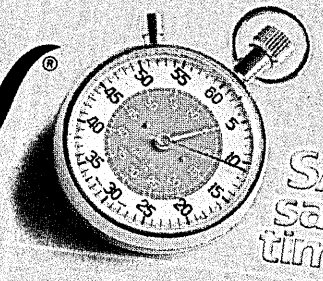
An on-line help facility makes FSCALC easy to use. You can consolidate screens, combining data from several departments into a corporate report. The FSCALC procedure features an unlimited spreadsheet size, with flexible row and column operations. You can even split screens to view your spreadsheet and programming statements at the same time. A sophisticated modeling language gives you true modeling capabilities.

Best of all, the FSCALC procedure is integrated with the SAS® System, giving you the tools for a complete Decision Support System.

Now you can enjoy the ease of a personal computer with the power of a mainframe—with FSCALC.

Call or write today. SAS Institute Inc., Box 8000, Cary, NC 27511 USA. Telephone (919) 467-8000. Telex 802505.

SAS®



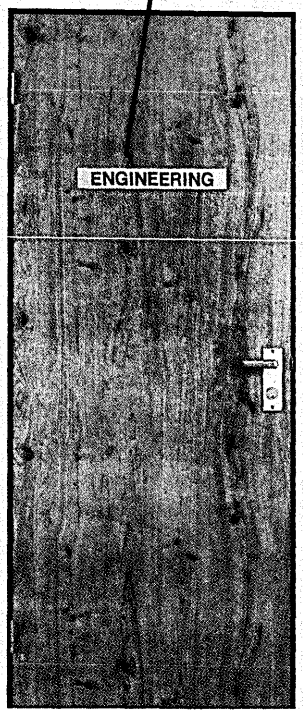
SAS saves time.

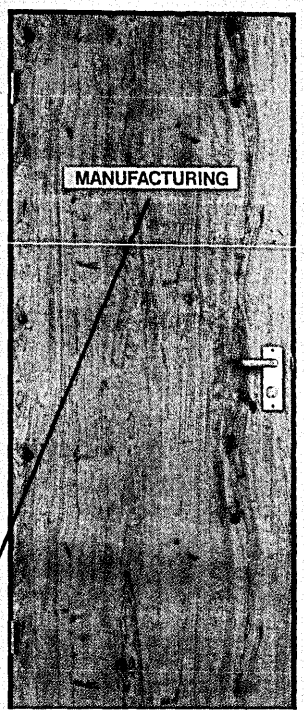
SAS is the registered trademark of SAS Institute Inc., Cary, NC, USA. SAS/FSP is a trademark of SAS Institute Inc.
Copyright © 1983 by SAS Institute Inc.

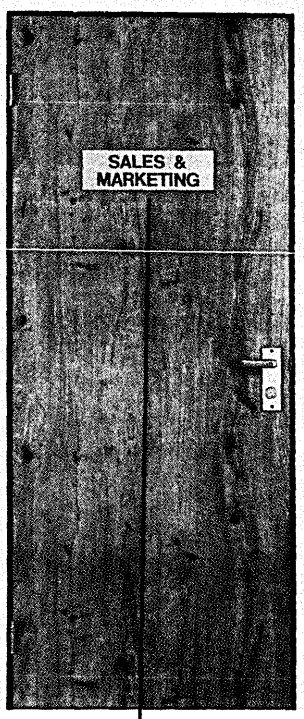
The computer for companies who want everything.

Before you buy another computer system, listen to every department in your company. You don't need a lot of different computers to solve all their problems . . . just one family of versatile Prime® computers.

"Instead of one computer for design, one for database management, and one for text processing, why can't we get all our engineers to use a single system?"







"Before I put one more computer on the shop floor, I want one powerful system that puts it all together reliably: inventory control, shop scheduling . . . even shipping!"

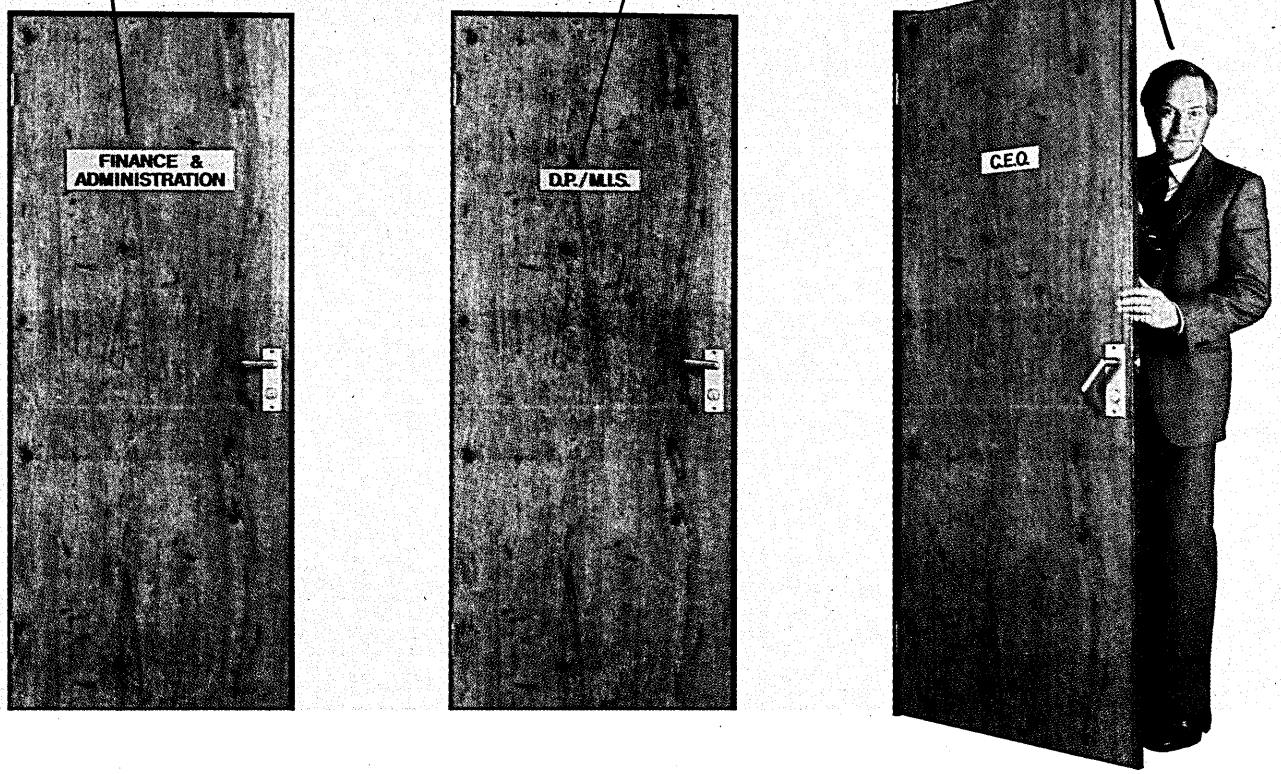
"This company's marketing decisions are too big for one little spreadsheet. I need total decision support if I'm going to meet my revenue goals. And I need it now. Or after lunch, at the latest."

PRIME is a registered trademark of Prime Computer, Inc., Natick, Massachusetts.

"Don't tell me about applications backlog . . . my receivables are aging! I need a comprehensive accounting system that uses all our data, from branches around the world."

"I'm building an information system for the whole company. That means real compatibility. User-transparent communications between all departments. And plenty of proven software."

"I want everything they want. And I want it all from an established company that's going to be around tomorrow."



You can do more with a Prime system. We're a Fortune 500 company with worldwide support. With a family of high-performance computers so compatible, you can interchange hardware and software. With complete networking and communications. And with over 1,000 software solutions, for every imaginable need.

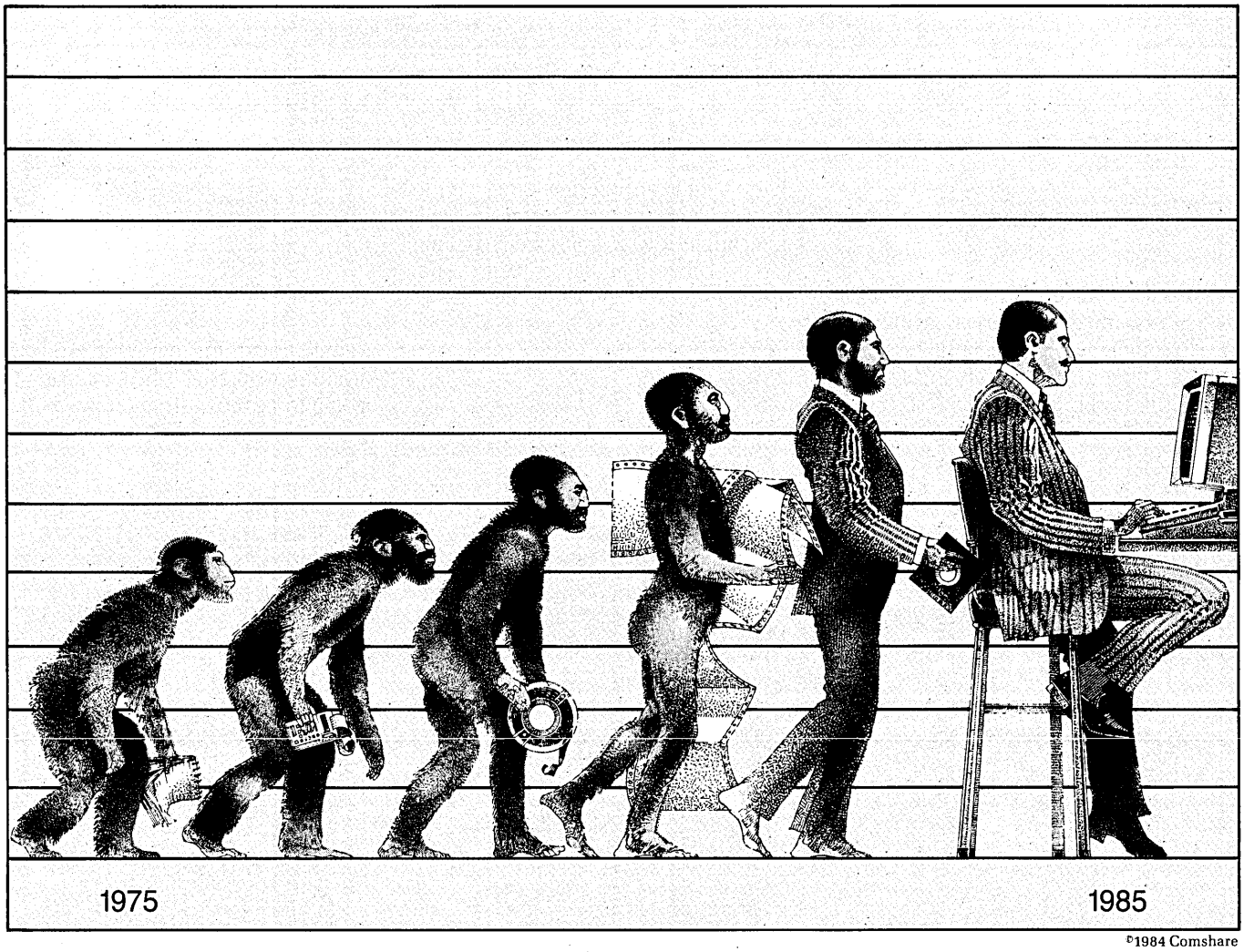
PRIME Computer

Find out what you can do with our versatile systems. Call 1 800 343-2540 (in Mass., 1 800 322-2450) or your local office. Or write: Prime Computer, Prime Park, MS 15-60, Natick, MA 01760. In Canada: 416-678-7331; Prime Computer of Canada Ltd., 5945 Airport Road, Mississauga, Ontario, L4V1R9 Canada.

We're versatile, so you can do more.

CIRCLE 8 ON READER CARD

A HISTORY OF DECISION SUPPORT SOFTWARE



©1984 Comshare

Comshare's System W goes beyond up-to-date.

A 1970's business modeling system with bolted-on data management capabilities is as up-to-date as a wax tablet and a stylus. And about as effective at lightening DP's workload.

Comshare has put $10 million and 18 years DSS experience into the extraordinary System W. And along with System W, we've also provided the software facilities you need to do a professional job of servicing your end-user needs.

For example:

With System W's integrated data management and File Power, you can set up data acquisition sequences including interfacing to corporate and external data in a variety of forms. File Power is the built-in response to the user's most often asked question, "How do I connect to the data?"

And with Distributed W, you have compatible micro DSS software with integrated telecommunication that sends files and models both ways asynchronously or synchronously. And System W operates on IBM mainframes with VM/CMS and MVS/TSO giving you flexibility as your operating system plans change.

Our Commander Learning Station gives end-users the latest in computer-based training on an IBM PC. Courses are available for System W as well as generic courses on how to model and use VM/CMS.

There's more. But System W is, simply, the best choice for decision support on IBM computers for excellent ease-of-use and integration. It's popular with end-users. Plus, it's easy to install, operate and interconnect with your DP architectures.

We started from scratch. System W is engineered to take full advantage of new technology. It's not an upgrade of an old product straining to keep up with the times. System W is as up-to-date as tomorrow.

For more information, call Chris Kelly at Comshare toll-free: 1-800-922-SYSW (in Michigan call: 313-994-4800). Or simply mail your business card to: Comshare, P.O. Box 1588, Ann Arbor, Michigan 48106.

SYSTEM W DECISION SUPPORT SOFTWARE

COMSHARE®

For decision makers who need to know their options now.

CIRCLE 9 ON READER CARD

LOOK AHEAD

AT&T GOES AT	AT&T is likely to meet IBM's new PC AT head-on later this month with a similarly configured machine -- 80286 microprocessor, hefty large disk, Unix operating system -- to be introduced at the Comdex show in Las Vegas. Observers of the company still criticize it, however, for not yet introducing a computer system that's much different from what other vendors are selling.
TALKING JAPANESE	Hush-hush negotiations are under way between Japan's Mitsubishi and Sweden's Ericsson for a significant technology exchange. Mitsubishi wants Ericsson's telecommunications expertise to help it in the value-added network business. In return, Ericsson would like to get hold of the Japanese firm's semiconductor know-how to bolster its European manufacturing. No word on when the deal will go through, however.
I-BUY-M CORP.?	IBM's $1.2 billion purchase of Rolm Corp. may be only the beginning of an acquisition binge, say some industry observers. The computer giant has several niches to fill, particularly in the communications business, where it needs strength to compete with AT&T. The most intriguing report currently circulating has IBM eyeing MCI, the long-distance telephone carrier. MCI's profits haven't been the most spectacular lately and IBM's financial resources combined with its Satellite Business Systems holdings could make MCI's future more rosy. Another potential buy is Hayes, the Smartmodem people, which could help IBM in the pc communications arena. Then there's Sytek Inc., the Mountain View, Calif., maker of local networks (which is largely owned by General Instruments but just sold a 6% stake to IBM), and Intel, the semiconductor maker in which IBM already has a healthy 20% or so interest. Intel is said to be adamant about avoiding an IBM takeover, however. Observers say it is particularly likely that IBM will buy software companies, or at least marketing rights to crucial programs, in the pc and mainframe arenas.
FACIT INC.'S NEW FACE	The L.M. Ericsson subsidiary in Merrimack, N.H., is branching out of impact printers with a laser model, due this month. It will use a Ricoh engine and sell for $10,000 to $12,000, company sources say. The unit is aimed at the multi-user pc market, which is expected to boom next year. Facit also has an ink-jet printer on the back burner, but it is keeping it on hold for now.

LOOK AHEAD

NO MORE NIH AT HP	The philosophical shake-up at Hewlett-Packard's office automation operation has the company going outside for a system for the first time in recent memory. Next year HP plans to market the Executive System, a $25,000 touch-screen operated workstation built by Santa Barbara Development Laboratories Inc. More than just an oem deal is involved, though; HP has purchased a 15% equity interest in the company and has gained manufacturing rights to the system. HP is also selling 3Com Inc.'s pc network, all part of a realization that moving fast with a comprehensive product line that uses non-HP hardware is more critical than coming out with home-brew products later.
DISCIPLINED PROGRAMMING	A rare gathering of three top teachers of programming science will take place in Newport, R.I., next June. Edsger W. Dijkstra of the University of Texas at Austin, Tony Hoare of Oxford University, and David Gries of Cornell University will conduct a nine-day course on program construction emphasizing the latest mathematical approaches to building correct programs. Organized by Teleprocessing Inc., Boston, the $1,500 course will be aimed at industry and academia.
SEARS'S BIG NETWORK	Sears Roebuck is in the process of establishing the largest private satellite network ever. The retailer's two-year-old Sears Communication Co. subsidiary has signed a contract with American Satellite Co. for a 26-city network that will handle voice, data, and video. Sears' Allstate Insurance subsidiary will be the network's first teleconferencing user. Meanwhile, the rest of the corporation will use the voice and data facilites for intracompany communications while excess capacity is sold to outside users.
RUMORS AND RAW RANDOM DATA	Followers of Tandon Corp., Chatsworth, Calif., say it has struck a deal to sell a 20-MB, 3.5-inch hard disk to Apple Computer for use with the Macintosh, soon to be dubbed FatMac. Look for a formal introduction at Apple's January annual meeting. . . .TRW, the big defense contractor, is looking for some 500 symbolic processors (Lisp machines, that is) for use in a global weather mapping application. . . .The British company Acorn Computers is moving in on manufacturers' reps in the U.S. who were dropped by Apple Computer when it shifted to work directly with retailers. Acorn hopes to get a piece of the U.S. educational market.

In due time, man taught his machines to think.

He discovered that modern machines like the IBM PC® demanded modern printers.

Printers that could keep up with modern workloads.

Printers that wouldn't quit when the going got tough.

And printers that were smart enough to handle his most sought after applications.

In due time, man discovered the MVP, a printer for modern times. Now he could do it all. Lotus 1-2-3,® Mailmerge,® Sideways,™ Multimate,™ Word Perfect,® Harvard Project Manager,™ Multiplan,® SuperCalc 3,® and Wordstar,® to mention a few.

He discovered other advantages, too. Like beautifully formed characters at 150 lines per minute, an impressive range of graphics, and added capabilities including labels, logos, reversed images, even bar codes.

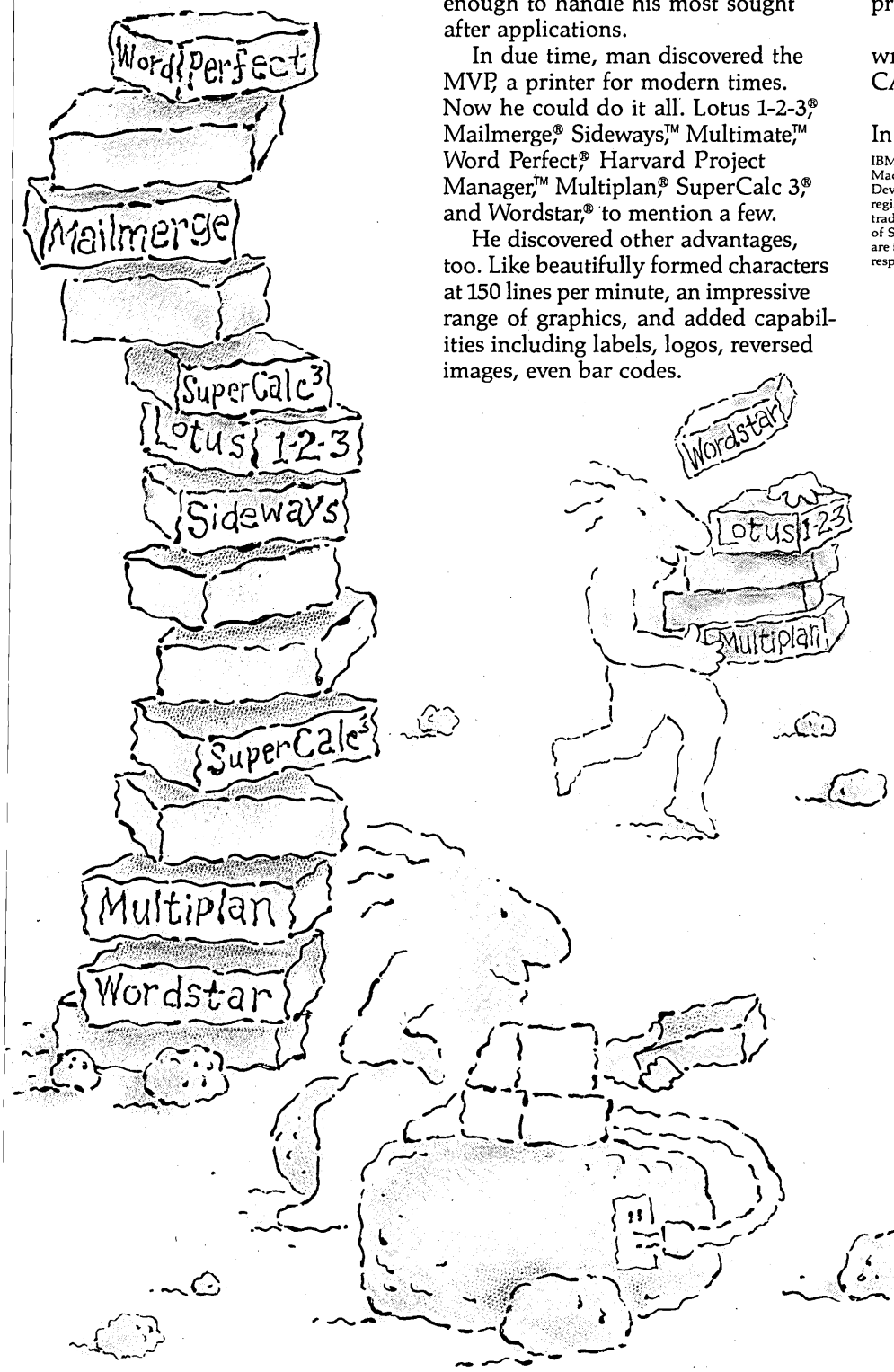
Man reflected on the possibilities and decided that the MVP was also the perfect printer for networking.

Man was pleased with this smart, rugged, versatile machine. The word soon spread. The company that brought you the first line in printers now offers the first line in micro printers.

Contact them today at 17500 Cartwright Rd., P.O. Box 19559, Irvine, CA 92713.

Outside California: 800-556-1234. In California: 800-441-2345.

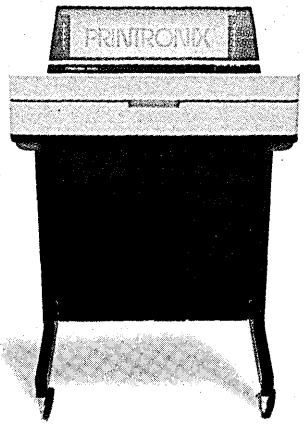
IBM PC® is a registered trademark of International Business Machines Corp. Lotus 1-2-3® is a registered trademark of Lotus Development Corp. Mailmerge,® Multiplan,® and Wordstar® are registered trademarks of Micropro. SuperCalc 3® is a registered trademark of Sorcim. Word Perfect® is a registered trademark of Satellite Software International. Sideways™ and Multimate™ are trademarks of Funk Software and Multimate International respectively.



The first line in micro printers

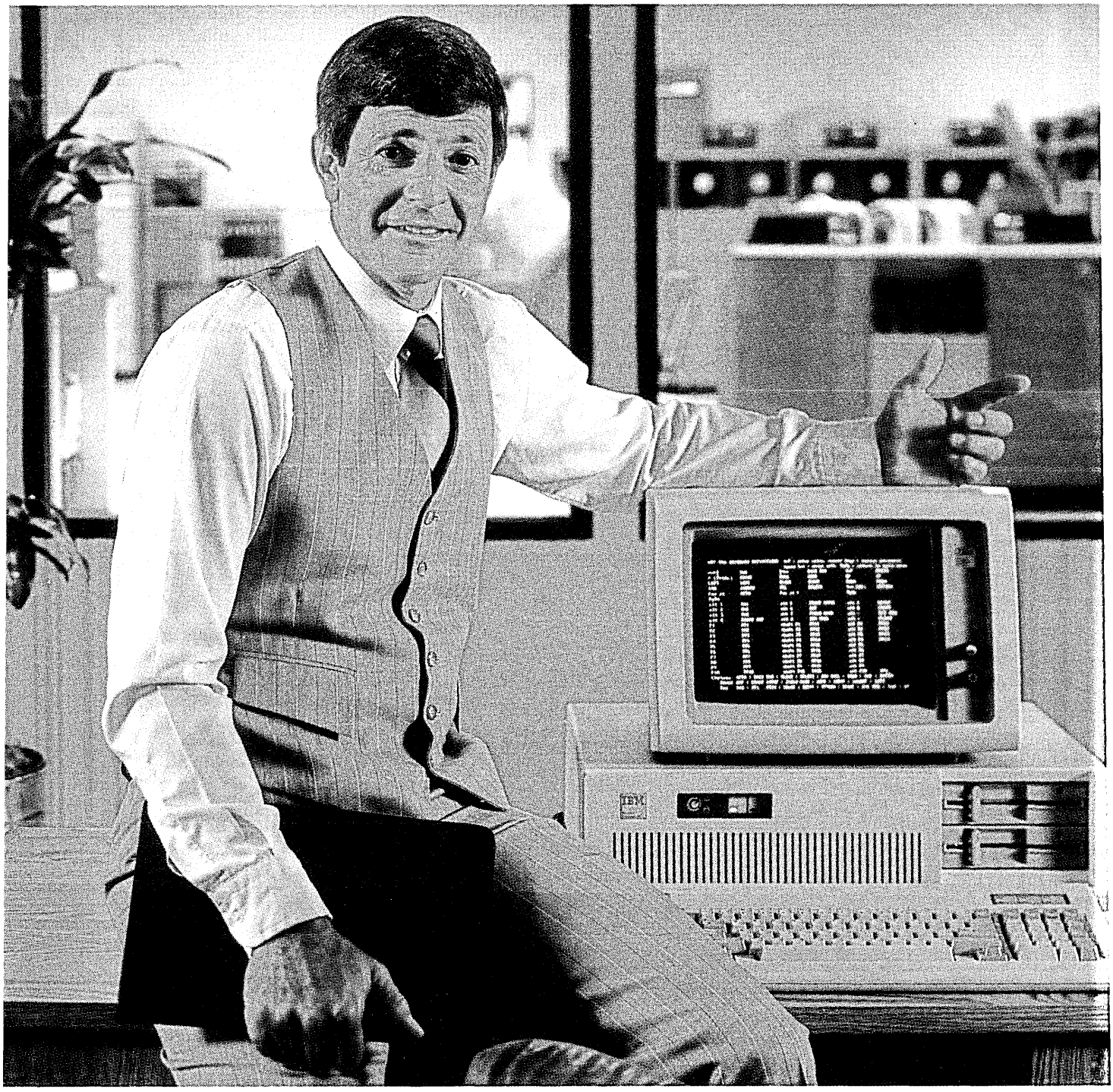
PRINTRONIX®

CIRCLE 10 ON READER CARD

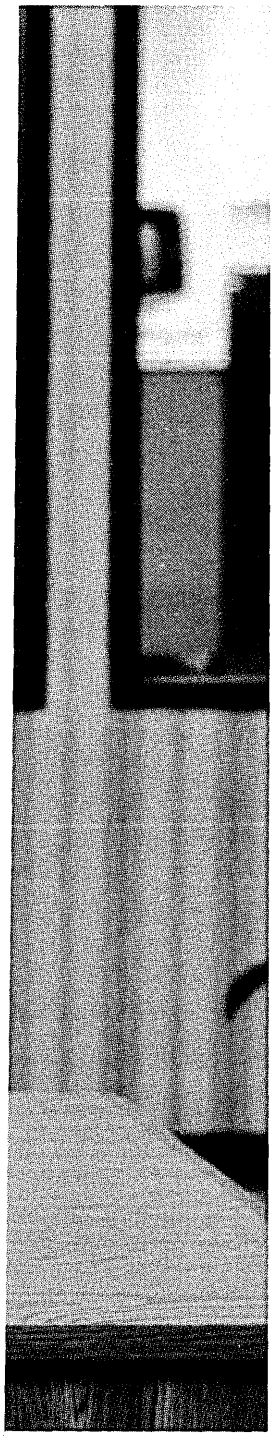


Visit us at COMDEX, November 14-18, Las Vegas, Booth #2336

"I RELY ON AST FOR



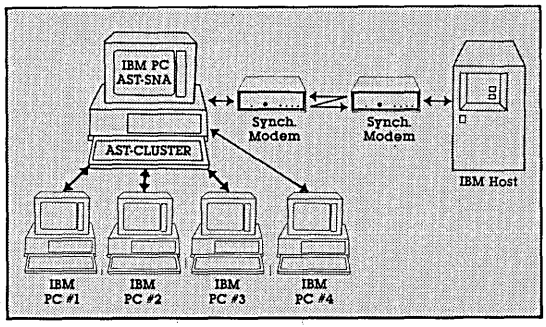
MICRO-TO-MAINFRAME COMMUNICATIONS SOLUTIONS."



Working IBM® PCs into the world of large computers used to be quite a headache. But now that I've discovered AST and their full line of proven communication products, things are much easier.

Last week, for instance, the VP of Finance said he wanted to tie into the mainframe down the hall from his office. AST-PCOX™ was my instant answer. We just plugged the card into his PC, then ran a coax cable to the IBM controller. No need to double up on hardware or clutter up his desk with a dumb terminal.

Today, I'm solving a complex problem for our Director of Marketing. He's opening up seventeen new field sales offices and wants to link them to our host at headquarters. Now, at the same time, we're looking to convert our communication network from BSC to SNA. Here, AST really protects my hardware investment.



You see, they have SNA and BSC products with the same hardware. I can go with AST-BSC™ today, then just load another disk to upgrade to AST-SNA.™ And with AST's plug-in cards, PCs can emulate 3274/6 controllers, 3278-2 or 3279-2A terminals, even 3287 printers.

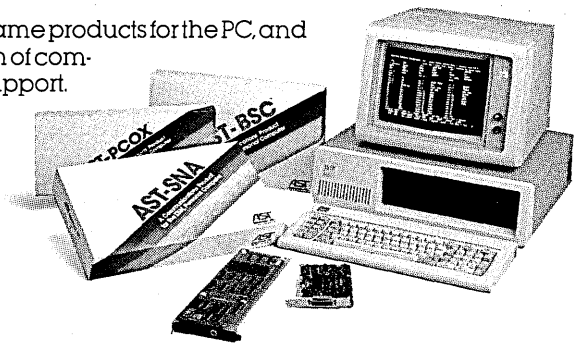
Using PCs in the field sales offices gives us the flexibility of local PC processing power, and the benefit of concurrent processing, since we can use DOS functions while continuing to maintain the mainframe link. It's certainly a major money-saver—a really smart alternative to dumb terminals.

We expect those new sales offices to grow rapidly. When they do, I'll be adding AST cluster functions so we can use PCs, and VT-100™ or compatible terminals in our configuration. All of them can communicate to headquarters over a shared phone line to reduce our telecommunications costs.

Meeting the challenge of change is a key part of my job. AST always has the products to help me. Like LANs to tie all PCs—including ATs and PCjrs together. There's also an AST-5251™ to connect PCs to System/34, System/36 and System/38 for powerful interactive communications from remote sites.

AST was the first company to offer micro-to-mainframe products for the PC, and they continue to lead the pack with a full spectrum of communications products, including AST-378O™ RJE support. Customer support and product reliability. That's why AST is my single source.

Frankly, you should find out more about them. Give their Customer Information Center a call at (714) 863-1333 Ext. 5249 and get acquainted. Just tell them you were referred by another satisfied MIS director.



IBM PC trademark of International Business Machines Corporation. DEC and VT-100 trademarks of Digital Equipment Corporation. AST-PCOX, AST-SNA, AST-BSC, AST-378O and AST-5251 trademarks of AST Research, Inc. AST-5251 is a product developed by AST Research, Inc. and Software Systems, Inc., of Jefferson City, MO.

AST RESEARCH INC.

2121 Alton Avenue, Irvine, CA 92714
(714) 863-1333 TWX: 753699ASTR UR

CIRCLE 11 ON READER CARD

Leading the way in touch technology

Touch technology is leading the way for more people to use computers in more ways than ever before... and Carroll Touch has been leading the way in touch technology for over a decade.

By using touch, you interact with your computer by simply touching the screen. With touch input systems, there are no command languages to learn and no typing skills to master.

When touch makes sense—with casual users, or in a harsh environment—we've got the touch. We're putting people in touch with these remarkable systems in applications ranging from industry, education and the military to public information and office automation.

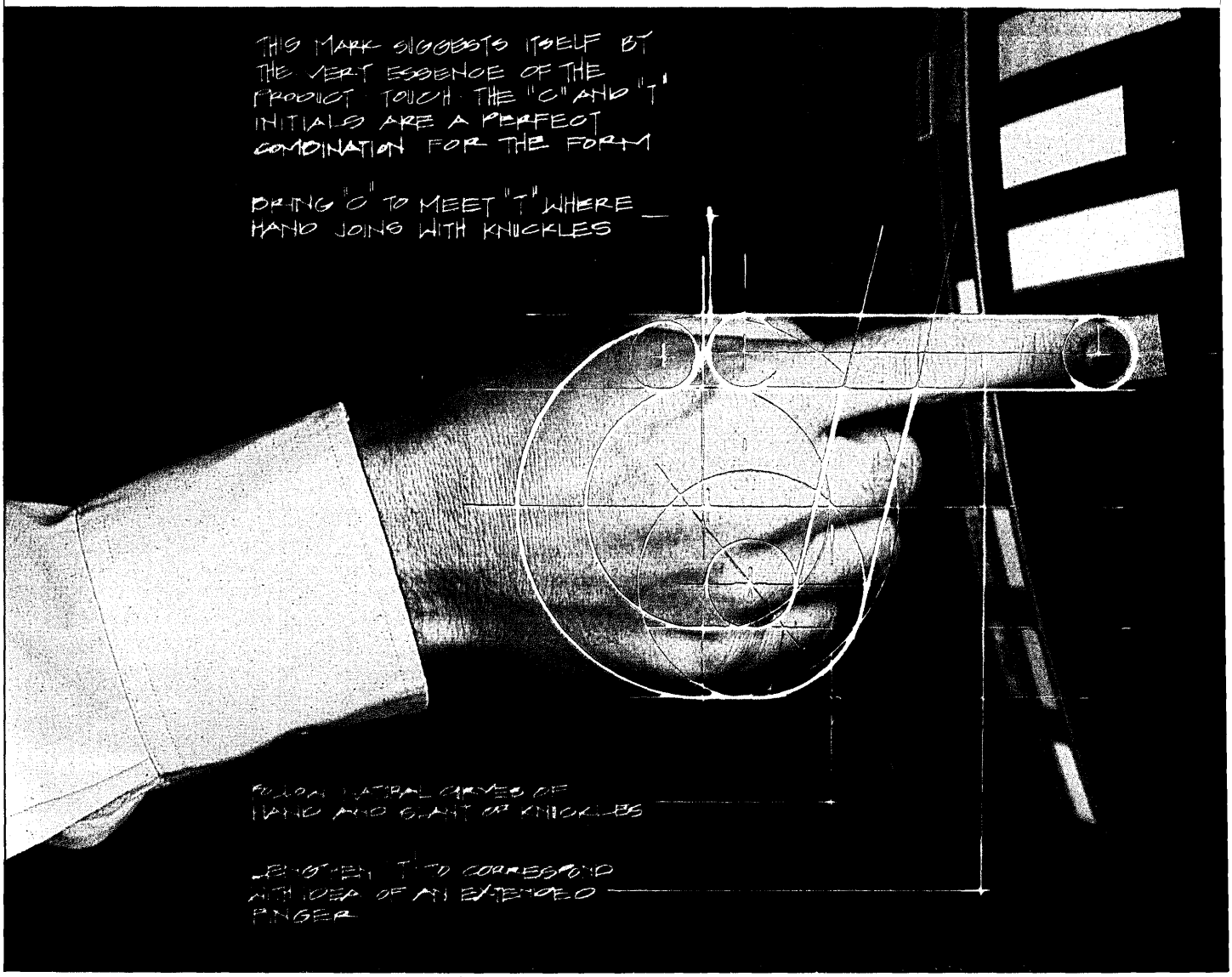
Carroll Touch can lead you to the touch system that's right for your product. We design and manufacture hardware for a variety of standard monitors and terminals as well as custom designs. Get in touch with us to find out more.

Carroll Touch
a subsidiary of AMP Incorporated

In Touch With Technology

CIRCLE 12 ON READER CARD

P.O. Box 1309
Round Rock, Texas 78680
512 244-3500 Telex 881906



LETTERS

OF LAP COMPUTERS AND STRAW MEN

Your recent Off-Line column is bad editorializing (Aug. 15, Hardware, p.127). Attacking the usefulness of a lap computer because you have to stand up on the train is attacking a straw man. Nobody ever claimed that you could use a lap computer standing on a train, or standing up in a hammock for that matter. I can't read your magazine if I leave my glasses at home, but I don't blame you. I own one of the machines you are tackling. I use it for simple tasks—word processing, statistical analysis, etc.—and dollar for dollar, it is the most productivity enhancing investment I have made since my first slide rule. Further, I would far rather use it for what it will do than walk 10 feet to the 3081 system terminal.

C. M. BUSH
Arlington, Texas

SQL DEFINED

In "What, If Anything, Is a Relational Database?" (July 15, p. 118), Frank Sweet errs in stating "IBM . . . announced DB2, the MVS version of SQL," implying that SQL is a relational database management system (RDBMS) when in fact SQL is a query language for accessing data in a DBMS.

The confusion is understandable since there is a product, SQL/DS, which is IBM's RDBMS for smaller system installations (VSE and VM), whereas DB2, as Sweet points out, is for large system (MVS) users.

So SQL is a query facility and SQL/DS is a RDBMS. There is also ISQL (Interactive SQL) for DL/1 databases. DB2 and SQL/DS both support SQL as their primary Interface. IBM maintains an SQL Control Board (formed in the late '70s) to coordinate semantics and syntax for SQL. Several other vendors offer SQL and SQL-based query facilities.

For large systems IBM offers QMF (Query Management Facility), which supports SQL and QBE (Query-by-Example). The following table may help:

	Small Sys VM	Large Sys MVS, XA, MVS
Data managed by	SQL/DS	DB2
Data accessed by	SQL	QMF

ROBERT F. WILLIAMS
Professor of MIS
Cal Poly State University
San Luis Obispo, California

S/38 MISREPRESENTED

As an IBM S/38 user for the past three years, I wouldn't presume to be an IBM crystal-baller, but I must point out a basic misconception of the S/38 displayed in the article by R. Emmett Carlyle in your Aug. 15 issue ("Crystal-Balling the S/38," p. 47).

The S/38 may have originally been conceived of as an engineer's machine, but it has turned out to be a programmer's machine. I estimate that my programmers are two to 10 times as productive, depending on the task, as they were with our previous S/3 15D. This order of magnitude increase in productivity is what makes the S/38 so attractive to its users. For this reason, users like GM are forcing the further development of the S/38, whether it fits into IBM's basic game plan or not.

Now for some IBM crystal-balling: Unix is advertised as basically an interactive operating system that increases programmer productivity. Speculation is that IBM would like to offer an alternative to Unix. Interestingly, the S/38 is basically an interactive operating system that dramatically increases programmer productivity and has many features, like data security and an integrated DBMS, that at this time are far superior to Unix.

JOHN McNELLIS
Programming Manager
Humphrey Products
Kalamazoo, Michigan

SHARE ALIKE

Your June 1 Look Ahead item (p. 9) unfortunately cited the name of my organization incorrectly. Though we maintain close liaison to the SHARE organization in the United States, we call ourselves SEAS, which stands for SHARE European Association.

With respect to the midrange vector processing machine mentioned, I would like to explain that this requirement was first forwarded to IBM during our September 1982 anniversary meeting. After IBM responded that it was under "future consideration," our High Performance Processing Project resubmitted the requirement and succeeded in getting an "accepted" response from IBM. Though IBM makes no commitment when requirements are accepted, we know from the past that there is a close relation between "accepted" requirements and product announcements.

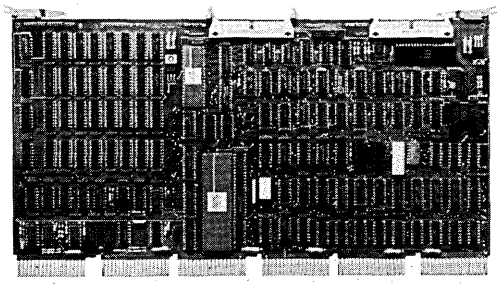
HAGEN HULTZSCH
SHARE European Association
Darmstadt, West Germany

WELL-ADJUSTED UNIX

I strongly disagree with David Morris ("How Not to Worry about Unix," Aug. 1, p. 83) concerning the proper attitude dp managers should have concerning the Unix operating system. We in the computer industry have already suffered an entire generation of backward-thinking dp managers; we don't need to spawn a new one.

If Unix is such a nonphenomenon,

DEC→TO IBM/SNA



Full SNA capability for your DEC computer! Comboard™/SNA gives your terminals access to IBM interactive applications. Data can be transferred between systems, all in the complete *fully supported package.* Comboard/SNA from Software Results.

Proven and reliable, Comboard/SNA is a single-board 256kb communications computer that plugs into your DEC Unibus. Teamed with Comboard software the system is a *cost-effective* solution to troublesome SNA communications problems.

Your DEC emulates an IBM PU Type 2 communication node. You have a *full gateway into your SNA* without passing through a secondary network.

For further information call or write Software Results... the leader in DEC to IBM communications.

COMBOARD™

Communications Results from

SOFTWARE RESULTS CORPORATION

Call Toll-free

1-800-SRC-DATA

(1-800-772-3282)

In Ohio call collect, 1-614-267-2203

2887 SILVER DRIVE • COLUMBUS, OHIO 43211 • TELEX 467-495 SRC DATA CI

European Subsidiary

SRCommunication GmbH Kaiserswerther Str 45 D-4000 Duesseldorf 30, FRG

Telephone (0211) 48-10-98 Telex 8 587 466

SEE US AT...

DEXPO™-WEST 84, Anaheim, CA, December 12-15, Booth #711

UNIFORUM,™ Dallas Infomart, Jan. 22-25, 1985, Booth #1285.

COMBOARD is a trademark of Software Results Corporation DEC UNIBUS are trademarks of Digital Equipment Corporation

CIRCLE 13 ON READER CARD

LETTERS

why does Morris think DATAMATION paid him to write about it? In fact, most outsiders who write about Unix never get past the small crowd of "true believers" to meet some normal, well-adjusted Unix users. Unix users like Unix for the same reasons that PC/DOS users like their operating system—it works. We do not claim any mystical properties over other operating systems, but we do claim that Unix has powerful facility in the arena of computer applications.

As to Morris's comments about the confusion between Unix and castrated males, I buy your journal to be informed, not entertained. If I could choose the fate of the likes of Morris, I believe I would place him in a COBOL shop under a dp manager of his own training.

GROVER P. RIGHTER
Wasatach Advisors Inc.
Salt Lake City

BIG BLUE NOTES

Hats off to Michael Hammer's pithy perspective on the information management war ("The Battle for the Desktop," July 1, p. 68). Yes, those trying to do their jobs in an organizational network are faced with a variety of incomplete solutions. But let's remember the desktop battle is only one arena in a larger conflict.

Hammer does an incisive job of sizing up the combatants—in their current guise. But what about the future? On one side are the "workstations coupled to the departmental information systems." On the other side, most minicomputer vendors don't offer a total solution for a range of corporate users.

Despite their small draw on the corporate budget and an abundance of available software, proliferating microcomputers tend to create as many problems as they solve. If IBM has appeared lukewarm to the departmental concept, all the cards are not on the table. Big Blue continues to dominate the market and wield the technical leverage to respond to its needs.

Those of us who've survived system upgrades can wince appreciatively at Hammer's comment that pcs connected to mainframes "degrade its [the mainframe's] performance even further and hasten the next upgrade." So we try to think in terms of unburdening the mainframe with a departmental system.

In terms of hardware and communication capability, the System/38 is IBM's most viable response to a broad range of corporate information management needs. Granted, the software is not there yet. But let's not write it off; there are definite indications it will be a strong contender in the near future.

WILLIAM S. OVERHAUSER
New Generation Software Inc.

Computerize your text files with BASIS.

Now you can take one to ten million documents from your file cabinets and put them into an instantly accessible electronic database. Save manual searching through your files and find important information when you need it.

BASIS is a proven, interactive software system that probes to find the key words you're looking for within seconds. Next, it displays a list of records containing the specified words. Then BASIS displays records you request and prints hard copy on demand.

Best of all, BASIS is extremely easy to use. Information is retrieved through "FIND" and other simple commands, using menus and helpful prompts. No programming is needed. And your application can be up and running in days. See how easy it is to computerize your text files with BASIS.

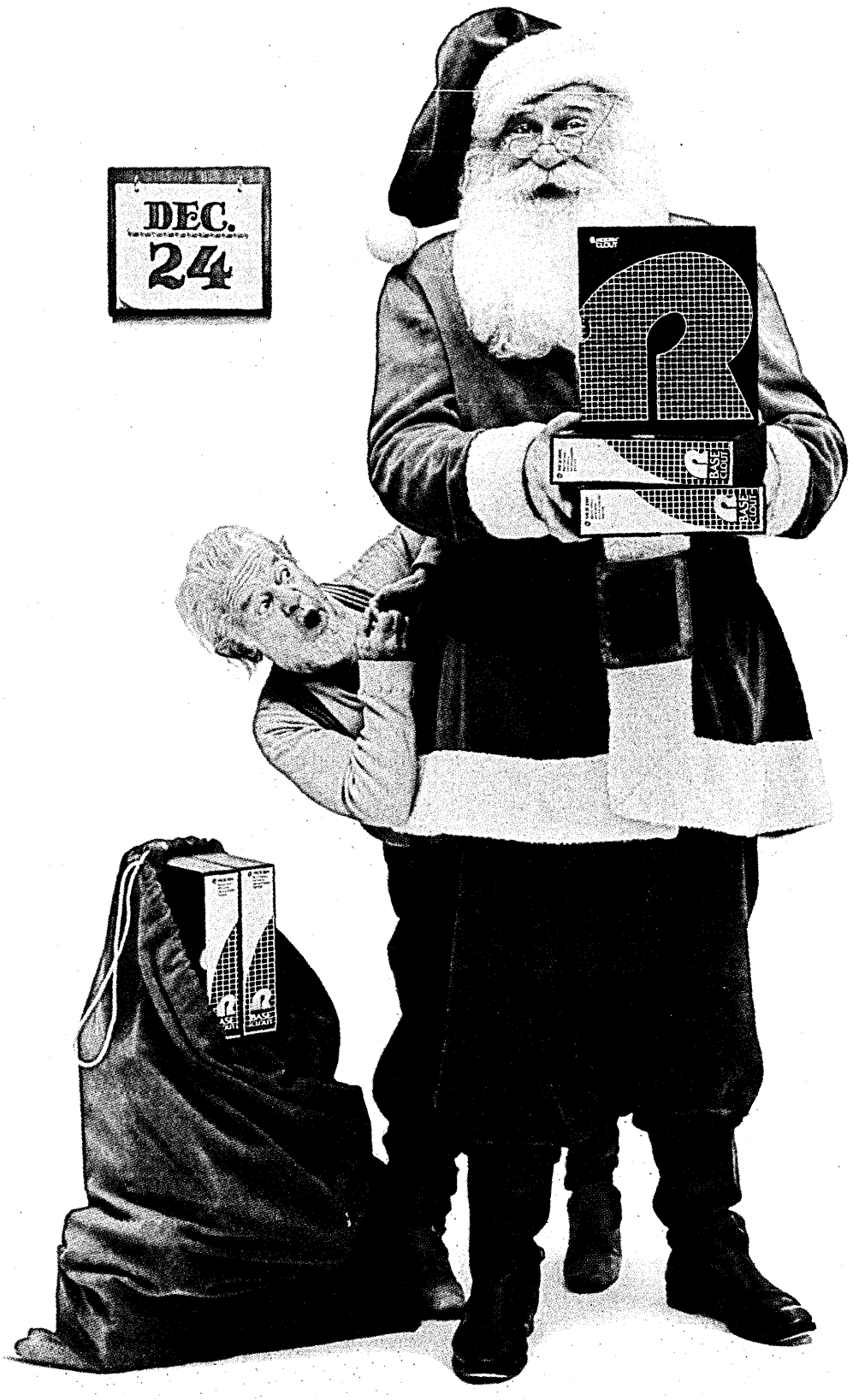
CALL FOR A BASIS BROCHURE
1-800-328-2648
In Ohio, call collect (614) 424-5524.

Battelle
Software Products Center
505 King Avenue
Columbus, Ohio 43201-2693

BASIS runs on DEC VAX®, IBM, Prime and Wang VS mini and super minicomputers; on IBM, CDC and DEC® mainframes. UNIX version of BASIS available mid-1984. DEC and VAX are trademarks of Digital Equipment Corporation.

CIRCLE 14 ON READER CARD

BEHIND EVERY SUC
IS AN M.I.S. DIREC



CESSFUL BUSINESSMAN FOR WITH CLOUT.™

"I JUST GOT THE BEST PRESENT A MANAGER COULD GET."

In most companies, there's one thing managers want even more than corporate perks or bigger staffs.

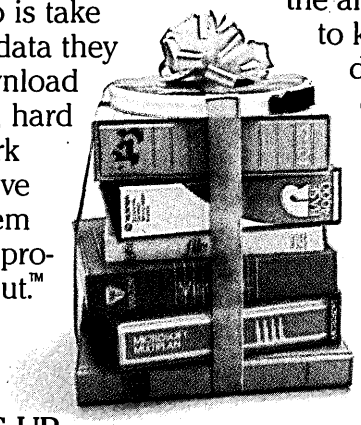
Information.

And they'll drive your whole DP staff up the wall trying to get it. They'll ask you to round up data that's scattered all through the company. Then expect you to sort it a hundred ways from Sunday. And deliver it last week.

Even worse, they'll buy carloads of PCs, then come running to you for help every time they forget how to plug one of them in.

But now, there's a way to give these global marketing heavies the answers they've been looking for. And give yourself a break at the same time.

All you do is take the mainframe data they want—and download it into their PCs, hard disks, or network servers. Then give every one of them a new software program called Clout.™ It's as simple as that.



"IT WRAPS UP FILES FROM LOTUS 1-2-3,™ PFS:FILE,™ DBASE II,™ THE MAINFRAMES, AND MORE."

In the past, it used to be near impossible to pull information together from different sources, without re-entering every bit of the data. But the new Clout takes data files directly from these popular programs—plus ASCII, DIF, and SYLK files, too. So users can get information from other PCs by sharing floppy disks. Or being part of a LAN. Clout can even read files that have been transmitted from the company mainframe. Or another PC.

Anytime users have a question, they just ask—in their own words! Clout will scan up to 40 of these files automatically, cross-reference five simultaneously, and there's the answer. They don't have to know exactly how the data is organized. Or even in which file it's stored. Best of all, Clout won't let these high-powered managers pollute the database. No matter how hard they try.

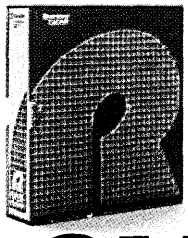
"NOW THE WHOLE DP DEPARTMENT CAN GET A CHRISTMAS BREAK."

Clout's self-guided, step-by-step tutorial makes learning so easy, your staff will spend less time training these people. And more time on the things they do best. Like figuring out ways to improve operations. And maybe, vacationing in the Bahamas this winter.

"GIVE YOURSELF A BONUS. GET A DEMO TODAY."

Clout's suggested retail price is less than $300—a small price to pay for a big boost in productivity. But if you prefer, we'll send you a full demo/tutorial of Clout for only $14.95 (plus shipping). Just call 1-800-547-4000, Dept. 916 In Oregon, or outside the U.S., call 1-503-684-3000, Dept. 916 Or get in touch with your nearest computer or software store.

And see what it's like to wield a little Clout.

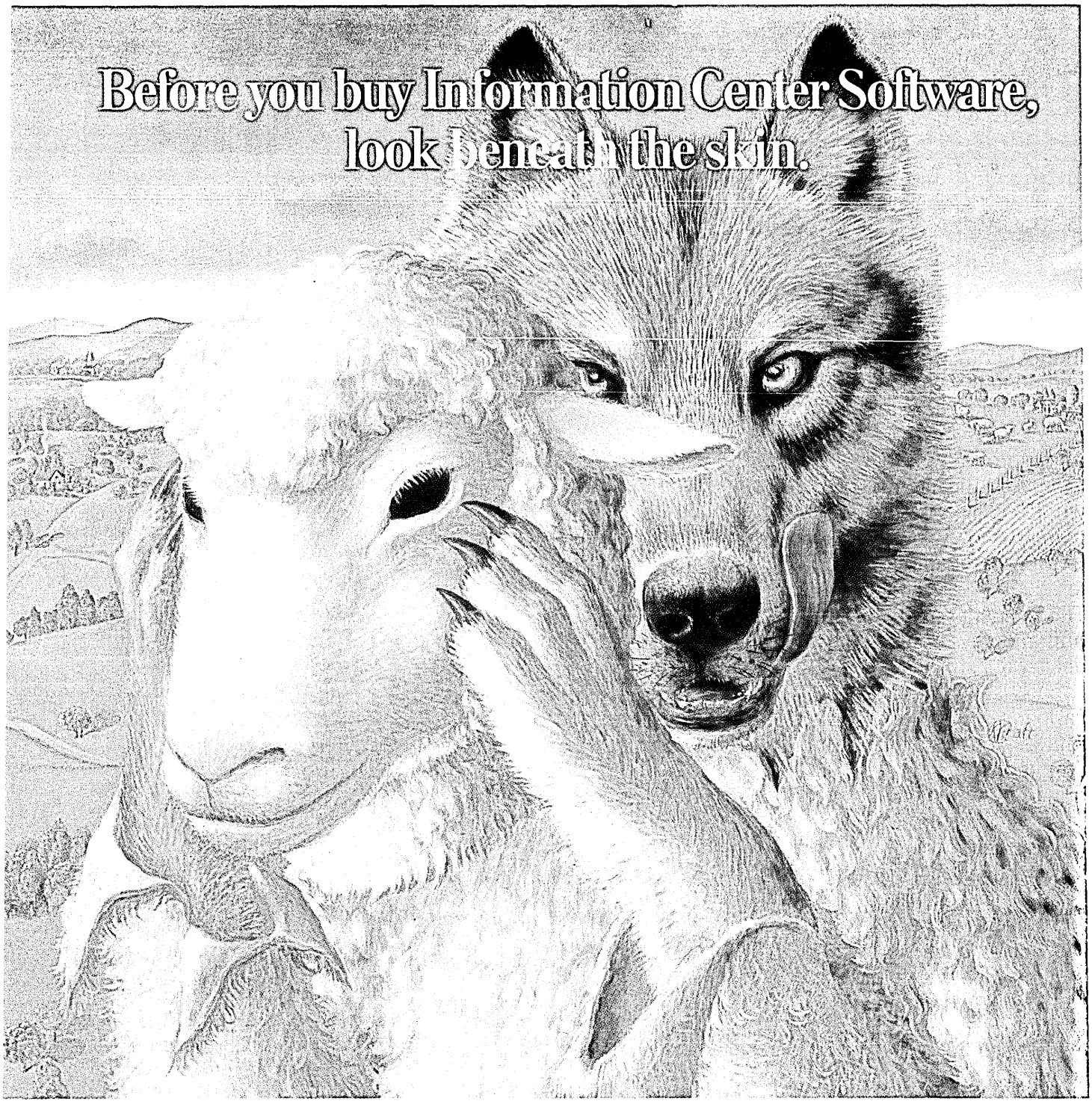


CLOUT™ FROM MICRORIM®

Requires 256K of memory. Runs on MS-DOS and PC/DOS operating systems. Hard disk recommended.

CIRCLE 16 ON READER CARD

Before you buy Information Center Software, look beneath the skin.



INQUIRE®/Information Center:
The long-term software solution.

Information Center software always promises to help you, not hurt you.

But the reality is that this kindness is killing a lot of users.

In some cases, the software seems gentle as a lamb at the beginning, but murders you with inefficiency as soon as you add users or share data.

In others, the language alone is so complicated that it scares off end users before they start.

But with INQUIRE/Information Center, you can have the best of both worlds: a fast, smooth start. And steady, easy growth.

INQUIRE/Information Center offers a powerful, integrated set of tools for both beginning end users and MIS professionals. Beginning users create their own reports through simple fill-in-the-blanks screens—without having to learn a language. MIS professionals use more advanced facilities for specialized application development.

And beyond meeting immediate needs, INQUIRE/Information Center can expand into a comprehensive system encompassing text management and multi-user relational DBMS for both mainframes and PCs—the kind of system that makes an Information Center a true corporate resource.

INQUIRE/Information Center, from Infodata. It's the one system that really helps. And doesn't hurt.

For more information call or write Infodata Systems Inc., 5205 Leesburg Pike, Falls Church, Virginia 22041. (800) 336-4939. In Virginia call (703) 578-3430.

INFODATA®

CIRCLE 17 ON READER CARD

Rebecca S. Barna, Editor

EDITORIAL

MECHANICAL METAPHORS FOR THE MIND

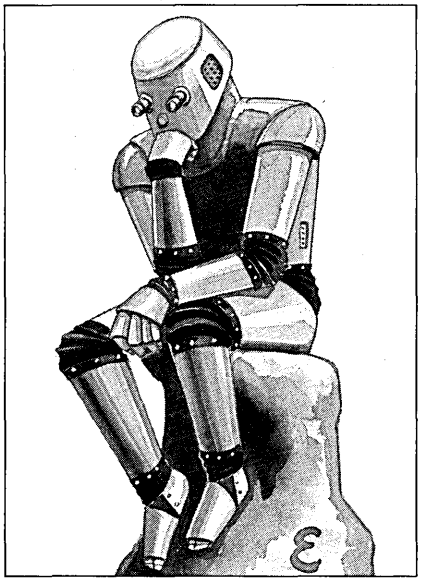


ILLUSTRATION BY DORIS ETTLINGER

It was at a working lunch the other day that we got talking about that popular subject, artificial intelligence. You know, making machines think. Just for the record, it wasn't the need to justify the lunch as a business expense but rather the little bowl of Sweet 'n Low packets brought out with our pot of espresso that triggered the topic of conversation.

Artificial intelligence, we suddenly realized, doesn't have any of the ersatz qualities we associate with artificial sweeteners, artificial flavorings, and the other industrial copies of nature we consume each day. In fact, at first glance, AI seems to have a technological glamour about it, a gee-whiz kind of allure. Surely it isn't as nasty as, say, red dye No. 2.

But is AI, we wondered aloud, really the secret ingredient that would give future computer systems that certain fifth generation je ne sais quoi, that ability to reason and actually think as we do? Is all the current fuss about AI perhaps not so very intelligent and just a bit too artificial? We ordered more coffee, mixed in some good old white sugar, and talked.

Until just two years ago, nobody in the mainstream of dp had to worry about AI. It was a field of study rarely discussed outside the ivory towers and military labs where it's been pursued for 30 years. Since 1982, however, the popular and trade press have created a crescendo of publicity for AI that has it promising everything from the next generation of video games to the very fulcrum on which America's global supremacy is to be leveraged.

What's happened, of course, is that a variety of sophisticated computing techniques originally developed for AI experimentation is rapidly being commercialized. This is largely the result of cheap computer hardware, which enables huge AI programs to run cost-effectively. But, as with any new market, where there's money to be made there's also a lot of marketing noise.

As Gary R. Martins writes in his article in this issue titled "The Overselling of Expert Systems," the most glamorous of AI products currently is the expert system, for it appears to embody true thinking processes. And that has been the dream of the artificial intelligentsia since the late 1940s.

In those early days, when scientists thought of the brain as a simple digital computer, the search began for the core algorithm of intelligence, the key process by which the mind acquires, stores, retrieves, and uses knowledge. The hope was that eventually a computer programmed with this elusive algorithm could be turned loose on, say, the Library of Congress, and would devour all the knowledge contained therein.

Obviously that algorithm was never found and the debate continues as to whether it even exists. In the course of trying to build such a system, however, AI researchers did develop some brute force methods for representing knowledge in a digital memory and for programming a von Neumann computer to make inferences from that knowledge. The computer could be painstakingly spoon-fed limited knowledge about narrowly defined subjects—the side effects of artificial sweeteners, for example—and then could exhibit some qualities we would call intelligent.

Thus was born the expert system. The thinking is that if the expertise of a human expert could be mechanized, then it would be infinitely reproducible and deliverable across geography and time. Moreover, such "knowledge-based systems" would enhance the workings of regular computer applications, helping them react more intuitively with human operators.

For now, there is no computer that can think for us, "amplify" our intelligence, stay several steps ahead of us. Nor do we think AI's mechanical metaphors for the mind will take hold so strongly that only the knowledge that can be fed into machines will be considered worth pursuing. Perhaps it's best now to think of AI as just another ingredient—a costly but occasionally powerful technique—for building useful computer applications. ◉

IBM ON TELECOMMUNICATIONS

Q. CAN A CABLING SYSTEM UNTANGLE TELECOMMUNICATIONS?

A. With all the various devices a company uses to process, move and store information, it's easy to lose sight of one important element—the need to connect all these devices together. That's where a uniform, structured cabling system fits in. But are you just substituting one set of wires for another? Here are some questions and answers that might help you better understand the role a cabling system can play both in solving your communications problems today and in protecting your telecommunications investment for tomorrow.

Q. First of all, just what is a cabling system?

A. A cabling system is designed on a "wire-once" concept. Just as electrical wires are run in buildings today, a cabling system is a permanently installed set of wires that connects the computers, terminals, workstations, telephones and PBXs within a large office building or a campus. This cabling system should also be the foundation for local area networks of the future.

Q. Aren't my computers and telephones already hooked up to a cabling system?

A. It's not so much a cabling system as it is a bunch of cables. Look above the drop ceilings in most office buildings, and you'll discover miles and miles of all kinds of cable. And much of it, strangely enough, is unused. The reason for this waste is that few devices (i.e., telephone, terminal, personal computer, etc.) use the same type of cable. Consequently, when a new device is installed or when one is moved from one office to another, it's quicker, easier and cheaper to run a new cable than it is to remove and reroute the old cable.

This is not to suggest, however, that running a new cable is quick, easy or inexpensive. Relocating just one terminal can cost as much as $1,500. Not to mention a week or two of downtime while the wiring gets done. And when you think about how often office workers move from one workplace to another, you can see that we're talking about a considerable expense.

Q. How can a cabling system help solve my wiring problem?

A. Once installed, a cabling system can make wirin for a new or relocated terminal as easy as movin a plug from one socket to another. The IBM Cabling System calls for the one-time installatio of a single cable running from each workplace, inside the walls, and into a central "wiring closet." In the office, that cable terminates in a standard faceplate on the wall, not unlike an electrical outlet. In the wiring closet, the cable terminates in a patch panel that can connect it t any number of devices.

The installation of the IBM Cabling System should be considered if you're adding a number of new workstations, installing a PBX, doing a major renovation or building a new office building. In many cases the "wire-once" benefi will cost-justify the IBM Cabling System in five years.

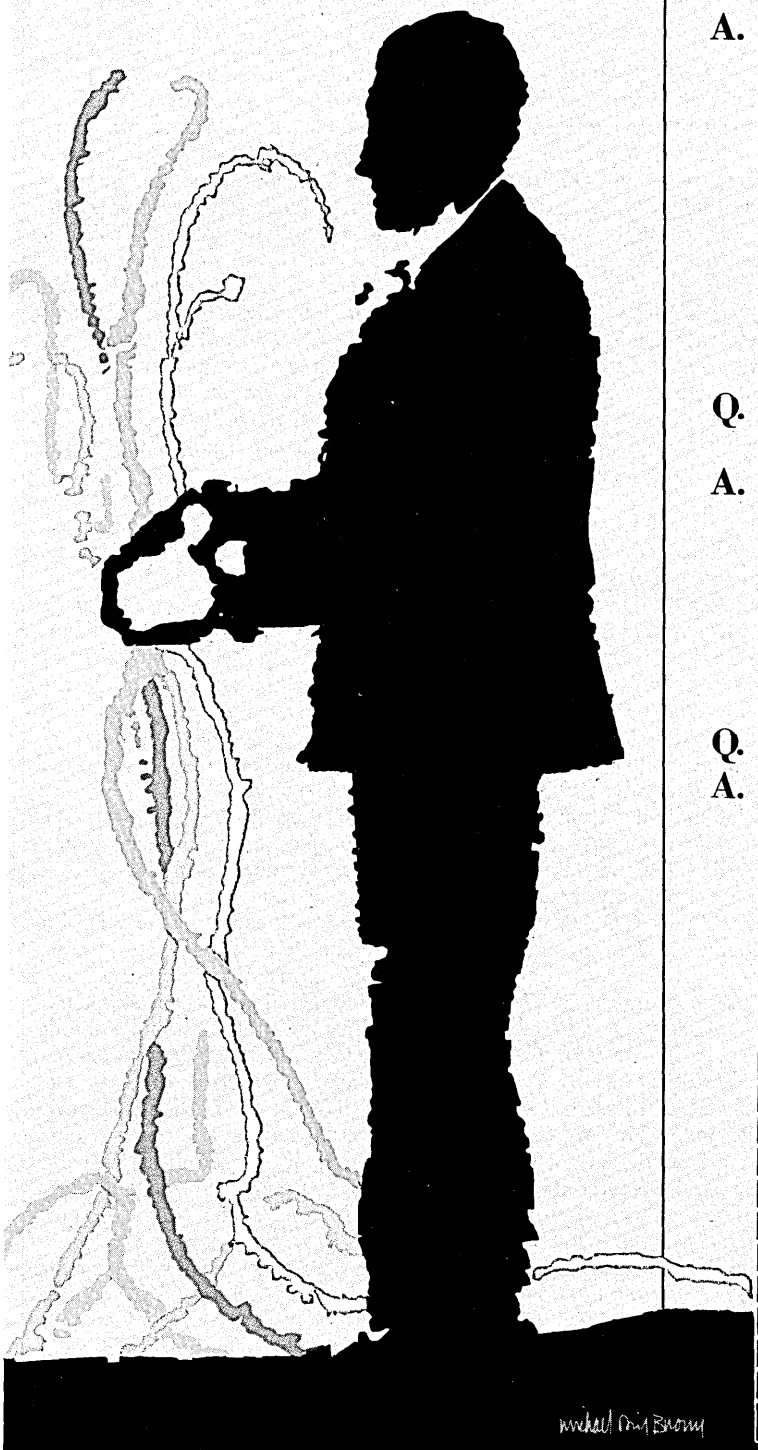
Q. How do the telephone and the IBM Cabling System work together?

A. The IBM Cabling System can be used for data only, or for both data and voice. When the voice capability is used, the voice wires are separated from the single cable in the wiring closet and rur to a telephone switching system. Several major PBX manufacturers have tested their PBXs and

telephones with the IBM Cabling System. They report that the voice wires fully support their PBX features and transmission speeds.

How can the IBM Cabling System help me today?

Currently being installed in office buildings, the IBM Cabling System can connect most of the available IBM data devices, such as personal computers and workstations, small and intermediate computers. We expect that it will also connect many devices made by other manufacturers.



Q. How will the Cabling System help answer my telecommunications needs of the future?

A. The quality and reliability of the IBM Cabling System enable it to transmit data at very high speeds. This makes it the ideal foundation for IBM's planned general purpose local area network (LAN). This LAN, utilizing a "token-ring" technology, can be implemented gradually to connect different workstations, departmental systems and large processors. So by investing in the IBM Cabling System today, you'll not only save money on current installation and rewiring costs, you'll also be better prepared to meet your telecommunications needs of the future.

Q. How do I go about getting the IBM Cabling System?

A. There are a number of design and installation companies that can plan your cabling system and do the actual wiring. The cable and accessories are available through authorized distributors. Your IBM marketing representative can provide you with the names of these companies. The cable and accessories can also be ordered directly from IBM.

Q. Where do I go from here?

A. Installing the IBM Cabling System today is really installing the foundation for your company's future in telecommunications. So you'll want to plan quite thoughtfully. We can help. If you'd like a free copy of the brochure, "The IBM Cabling System," call 1 800 IBM-2468, Ext. 82, or return the coupon.

IBM®

IBM 11-1
DRM, Dept. 3K/82
400 Parson's Pond Drive
Franklin Lakes, NJ 07417

☐ Please have an IBM marketing representative call me.
☐ Please send me "The IBM Cabling System" brochure.

Name_____ Title_____
Company_____
Address_____
City_____ State_____ Zip_____
Phone_____

CIRCLE 18 ON READER CARD

IN FOCUS

USERS AS VENDORS

With demand for value-added dp services soaring, everyone's getting into the act.

by Nancy Welles

Quotron Systems of Los Angeles, the largest vendor of stock quotes, used to be a popular growth stock. But word got out that Merrill Lynch & Co, New York, the largest stock brokerage and Quotron's biggest customer, might build its own market data system to supply its brokers with quotes. Last March, Merrill and IBM revealed they would build it together. Not only that, the two giants also disclosed plans to compete with Quotron directly by selling their system to other brokerages, investment professionals, and even individual investors. A growth stock no longer, Quotron's stock collapsed as investors got rid of their holdings.

With both small and large ventures, lots of companies are getting into the computer business these days. Bank of America, San Francisco, is thinking of peddling systems (see "Banking on Pcs," Sept. 1, p. 26). Morgan Stanley, the venerable New York-based investment banker, is hawking a back office processing system. Johnson & Higgins, also of New York, the nation's oldest insurance broker, is selling microcomputer software.

These companies used to be regarded as users of computer technology, but now they've done an about-face and are vendors as well. A few innovative users made this transformation years ago—General Electric, McDonnell Douglas, and Arthur Andersen & Co. were among the first—but now, with the drop in processing costs, "it's economical for even more companies to follow," says Frederic Withington, consultant with Arthur D. Little Inc. in Cambridge, Mass.

The strategies of these new vendors vary a lot. Some, like McKesson Corp. of San Francisco, the largest drug distributor in the nation, embraced information technology aggressively. It "struck out on its own, preempted the competition, and documented market share gains," observes Harvey Poppel, consultant with Booz, Allen & Hamilton in New York. At first, McKesson's shift to electronics represented a way of delivering the same old wine in a new bottle: early in the 1970s, McKesson introduced its customers to Economost, its automated order-entry and inventory control system. Now, more than 50,000 products are swiftly moved from regional warehouses to the shelves of some 15,000 retail and hospital pharmacies with this futuristic system.

Over time, McKesson moved beyond its traditional role as a distributor of goods and became a vendor of information as well. Now customers can order several different managment reports that analyze their operations in a variety of ways, using the data Economost generates.

Having defined its business as "value-added distribution," McKesson plans to broaden the products and services sold under this rubric. As a result of several recent acquisitions, it is now getting into the distribution of office supplies and microcomputer software and is selling in-house computer systems to the retailers it serves.

Others, by contrast, see the boom of the computer industry, the fortunes made in new products, and spot what they think is a new opportunity. For them, the glimmer of an idea becomes a quest to put their brilliant concept to market, an offensive stance to win the world to their idea.

Dow Jones, for example, began experimenting with the electronic delivery of data more than a decade ago. Now its information services division in Princeton, N.J., has a broad-gauged strategy that encompasses everything but manufacturing hardware. DJIS has its delivery network and databases; it also publishes investment software and, as a result of some recent acquisitions, is selling accounting and educational software to the small business market.

Not all companies going into the computer business are doing so on such a grand scale. European-American Bank, for one, had a relatively modest project. It initially sold its database of financial information on 1,700 foreign banks over timesharing. Later on, the database was expanded to include industrial companies and U.S. banks. In 1982, EAB came out with a package for the IBM PC that lets users do financial analysis and report writing with those data. Earlier this year, however, as the bank adjusted to some massive losses, it dropped the service and allowed the EAB employee who had developed the program to offer it for sale on his own.

The strategies behind these ventures aren't always aggressive, of course. Sometimes the laggards in an industry are forced into the computer business as a defensive measure, and others have no strategy at all. Stephen Racioppo, consultant with the Chicago-based accounting firm of Arthur Andersen, points out that these

use technology as a fad or a gimmick, a method of appealing to customers in a flashy way. He cites debit cards as an example of a gimmick that may help the vendor but brings no particular advantage to the user. "They're spending an awful lot of money for a little sparkle," he says.

Among the various types of users, financial service companies have perhaps the broadest array of products. Among these companies, Citibank is perhaps the best-known example of a company that has used information technology as a competitive weapon (see "Citi's Techno Boss," Aug. 1, p. 32). " The company really does have a strategy of using technology to open new markets," observes Robert Conrad, consultant with McKinsey & Co. in Los Angeles. Indeed, Lawrence Small, head of Citibank's North American Banking Group, boasted to a reporter earlier this year, "We are spending our competition into the ground as we wire the world."

Some are just using technology as "a fad or a gimmick, a method of appealing to customers in a flashy way," points out a consultant.

Despite Citibank's preeminence, however, the Cash Management Account introduced by Merrill Lynch in 1977 is regarded as the bellwether user-as-vendor product. A combination of checking, brokerage, and charge accounts rolled into a single service, the CMA utilized marketing and information technology to shatter "the traditional boundaries between the banking and securities industries," as academicians at MIT's Center for Information Systems Research put it.

Potentially, experiments with home banking have similar strategic significance. So far, the major players are looking at using information technology to expand their current markets, open up new ones, increase their ties to their customers, and sell new products. By midsummer, Chemical Bank in New York had signed up 8,000 households to its bank at home by computer service called Pronto. In addition, Chemical had also licensed the service to eight other banks.

It's too soon to tell what the impact of home banking will ultimately be, but it's clear that conversion of the paper-based processing of deposits, withdrawals, and transfers serves both defensive and offensive needs. Any customers attracted to the convenience of banking by computer can be lured from other banks that do not offer such a service, while the increased use of electronic funds transfer reduces the back office paperwork burden that costs banks a fortune. Sometimes users become vendors because it saves them money, not because it may be a potential new profit center.

Ralph Watson, president of Powerbase, the New York micro software firm and a dp consultant to the New York banks for decades, observes that home banking will help banks "get out of the brick and mortar syndrome. The banks have huge processing costs, and if they can offset them by closing branches and reducing their paperwork, the initial costs of these ventures can be offset." He notes that the cost of processing paper has been increasing 10% to 20% per year, and even if the new electronic services just slow that rate of growth, they more than pay for their development costs.

Others, however, dispute this point—for the near-term at least. Banks that go into the home banking business will still have to keep their branches open for customers who are not on-line at home. Even the familiar automatic teller machines "are rarely used by more than 40% of a bank's customer base," the EDP *Industry Report* noted last June. Says Peter Bleyleben of the Boston Consulting Group, "It's hard to see how a bank can save money if it has to run two delivery systems at the same time." Not only that, the emergence of home banking could result in intensified competition. Bleyleben comments, "A new way of delivering the basic product clearly opens the way for a new competitor to break into the established structure."

Even now, before anyone knows whether home banking will be profitable, some banks have already taken steps to protect their markets. For example, Crocker National Bank, which operates in northern California with Bank of America, was one of the first to license Chemical's Pronto system.

By contrast, many of the electronic products that users are selling lack that kind of strategic significance. Indeed, probably the most common way to get into the computer business is to sell a system developed for use in-house. At Morgan Stanley, for example, the MIS staff has retained consultants at Coopers & Lybrand, a New York firm, to devise a marketing strategy for the back office processing system they wrote for the firm.

Called TAPS (Trade Analysis and Processing System), it is essentially an accounting system for the clearance and settlement of securities transactions, according to Charles Mayer, the MIS principal responsible for the project. In addition, however, TAPS also handles some front office work, like the firm's stock loan business. It also takes care of such time-consuming tasks as sending daily messages to the firm's international customers advising them of any trading that may have been done for them that day.

TAPS runs on an IBM-compatible mainframe—the National Advanced Systems 9080—that handles some 22 million instructions per second (although TAPS uses only a third of that capacity). In its present configuration, TAPS can process some 50,000 trades a day. It is currently supporting 1,000 terminals used by the firm's traders, sales force, and back office staff.

A team of 30 to 35 people began working on TAPS in 1980. They had decided to scrap the firm's existing back office system because it was antiquated and expensive to maintain. Early on, says Mayer, "we concluded that the new system should be an on-line database system written in a relatively high-level language."

They ended up writing TAPS in Natural, using the Adabas database management system from Software AG, Reston, Va. Mayer adds, "TAPS is largely a real-time system. We took every process that could be effectively executed on-line and put it on-line."

The trade processing part of TAPS went up two years ago. Since then, Mayer says, "We've doubled the number of trades that we're doing and we've cut the number of people in purchase and sales by 40%." In fact, TAPS is saving Morgan Stanley so much money that Mayer estimates, "without selling it, we think it will pay for itself in about three years."

When TAPS was half-finished, Mayer and William Cook, managing director of MIS, decided to try to sell the TAPS software once it was up and running at Morgan Stanley. They had a good reason: the total project cost was nearly $18 million.

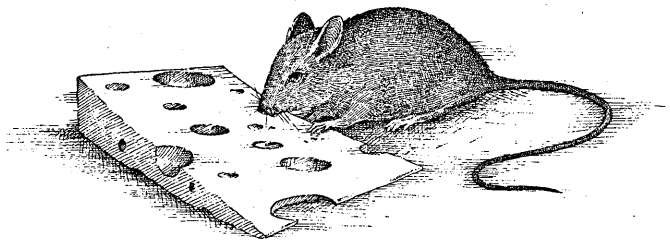
"I convinced them that the firm might have a technological lead but we didn't have a technological monopoly."

Now, even before Coopers & Lybrand has completed its marketing study, Cook and Mayer are already talking to two prospective buyers who have not balked at a purchase price that will be substantially over $1 million, they claim.

If Cook can turn the MIS department into a profit center, he'd like to share a portion of the profits with the MIS staff—in the same way that the firm's traders and salesman receive a portion of the business they help bring in. On the other hand, if TAPS is never sold, Cook has little to lose. The product had to be developed for the firm and, by all accounts, it's working.

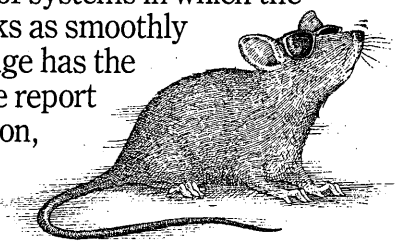
New York-based investment firm E.F. Hutton originally got in the computer business in the same way. In 1976, Ber-

THE BIG THREE IN BUSINESS SOFTWARE. BEFORE YOU BUY, SEE HOW THEY RUN.



Run their general ledger. Their payroll/personnel. Their entire product line of financial and human resources software. Run the packages on your mainframe and link them to your PC's. Run them together and see if they work together.

We believe you'll discover that two of the big three offer the mere appearance of integration, while one offers the real thing. Millennium. A true family of systems in which the whole works as smoothly as any part. In which every package has the same query mechanism, the same report writers, the same screen generation, the same on-line documentation, security and real-time capabilities. Giving you more efficiency than ever before from all your data processing resources.



Of the big three in software, who's blind to integration and who's not? When you see how they run, you'll know the answer.

WHEN YOU THINK ABOUT TOMORROW, MILLENNIUM MAKES SENSE TODAY.

McCormack & Dodge

a company of The Dun & Bradstreet Corporation

McCormack & Dodge Corporation, 1225 Worcester Road, Natick, MA 01760
Sales and support offices throughout North and South America, Europe, Asia, Australia and Africa. 800-343-0325. Telex: 710-325-0329

CIRCLE 19 ON READER CARD

nard Weinstein, head of the firm's order processing department, showed some colleagues the information support system he'd developed for Hutton's brokers. After hearing them wish for a system like his, Weinstein tried to persuade top management to let him rent space on the system to banks and brokerage firms who wanted a turnkey service.

It wasn't an easy sell at first. Senior management didn't want to sell a product they felt gave them a competitive advantage. "But," Weinstein recalls, "I convinced them that the firm might have a technological lead but we didn't have a technological monopoly."

Eventually, they came around. In 1978, the International Brokerage Information System (IBIS) was set up as a subsidiary of the Hutton holding company with Weinstein in charge. At present, IBIS has both front and back office features, ranging from an order match processing system to on-line stock reports from Standard & Poor's Corp., New York. Not only that, IBIS generates annual revenues of $10 million a year, according to Norman Epstein, Hutton's highly regarded executive vice president and chief of operations.

After that early success broadened corporate horizons, things moved fast. Now Epstein has a comprehensive product strategy. To help strengthen the tie between retail customers and the firm, Hutton rolled out Huttonline last year, a service for retail clients that lets them call up account information, investment research, and market commentary on Hutton's mainframe in New York. A replica of the information available to the firm's brokers, Huttonline is delivered over public timesharing and the Viewtron videotex experiment in Florida ("Videotex: Into the Cruel World," Sept. 15, p. 132). Timely stock quotes were added last summer; news and interactive capabilities are scheduled to go up next.

As part of the package, Hutton offered its customers a variety of hardware at discount prices; the firm even became a value-added dealer for the IBM PC and the Wang professional computer. Most of the people who have signed up for Huttonline already had their own equipment, however, so its hardware business didn't become a high-flyer; indeed, total sales of one of the products it was marketing, the handheld Workslate from Convergent Technologies, Santa Clara, Calif., were so bad that the manufacturer stopped production and wrote off that business last summer. At the same time, Hutton began to think seriously about signing its hardware business over to someone who is in the business full-time.

Nevertheless, Hutton is still trying to sell computer products. For example, Epstein is eyeing for outside sale the brokerage information processing system that Hutton developed for the ceo office automation package it bought from Data General for a total price of some $40 million ("Office Automation Without Micros," Nov. 1983, p. 176). By the end of 1985, the quote terminal on every broker's desk will be tied to a MV 4000 in each of the firm's 380 branches. The minis, in turn, will be linked to the firm's central processor in New York.

Once it is in place, the old computers now used by the branches will be available for a new line of work. Epstein would like to use them for an in-house quote system. Replacing Bunker Ramo, his current quote vendor, with an internal substream of quotes would yield such a substantial savings that he figures development costs would be rapidly recouped. In fact, because of recent developments in satellite transmission technology that have vastly decreased the cost of building and transmitting a market data system, Epstein expects the dozen or so largest brokerage firms to throw out their quote vendors and build their own systems in-house, just as Merrill Lynch is doing.

Selling micro software was a way to leapfrog ahead, with the customers helping to pay the cost of past inattention.

Despite all this entrepreneurial activity, Epstein maintains he's not in the computer business. He explains that it's just that "we're selling the software that makes Hutton go."

Other companies also sell hardware or software to support their primary business. Johnson & Higgins, for example, went into the software business to give its consulting practice a lift. A specialist in employee benefits, J&H began developing software after the board of directors approved the idea in December 1982. By last June, four packages had been worked up for the IBM PC.

This software consists of general modeling programs that J&H consultants tailor to fit the specific circumstances of individual clients. Most suitable for companies with at least 500 employees, one program is designed to help personnel directors formulate compensation policy; another helps them forecast changes in health care costs; a third helps the personnel department produce timely benefit statements for individual employees; and the fourth is a general administrative aid.

The cost of these programs varies with the amount of work required to adapt them to the specific needs of each client. For example, the job evaluation program could cost a company with 1,000 employees from $80,000 to $100,000.

The J&H software is unusual because it was written for the micro. J&H consultants had figured that the personnel directors who were their clients would go for the micro en masse—they knew that people in personnel work had a terrible time getting access to the corporate computer. With the micro, on the other hand, "they can do their work when it's convenient instead of on nights and weekends when the computer is free," explains Carl Swope, J&H's director of product research.

In addition, J&H was behind technologically and, in the company's eyes, selling micro software was a way to leapfrog ahead with their customers helping to pay the cost of past inattention. "We didn't have both feet in the mainframe world," Swope admits, "but being behind ended up being an advantage. We didn't have as much historical baggage to carry."

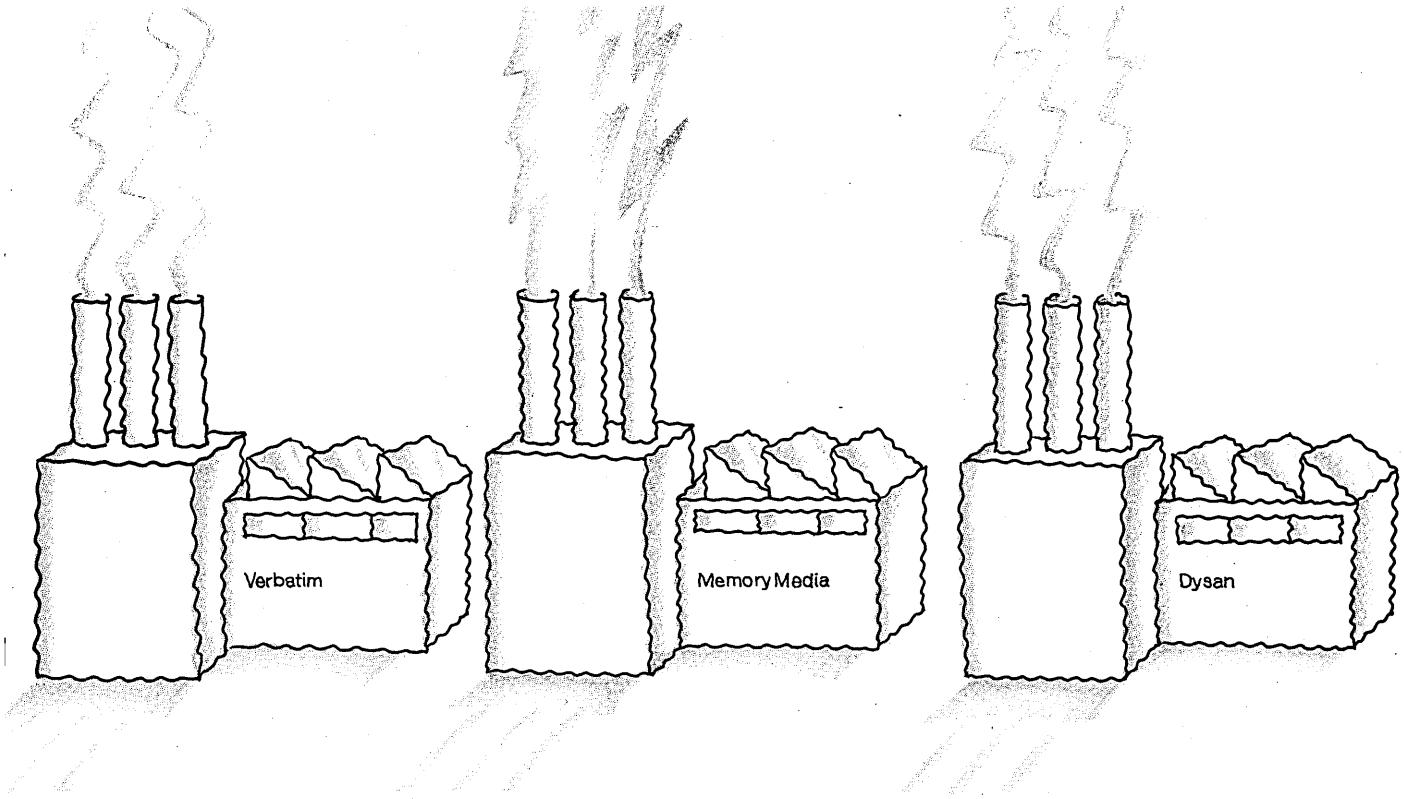
The novelty of selling software also attracted attention. Says Swope, "A lot of companies that traditionally wouldn't have been our clients have gotten in touch because they read about this software. It's broadened our visibility."

In the future, Swope wants to develop more applications software for other kinds of employee benefit work. He figures he has a good shot at the timesharing business, too; he's developed an electronic library of employee benefit publications that is "the only one in its field," he likes to point out. (Now that the widespread use of micros has cut deeply into the timesharing business, many believe that the only timesharing vendors who can survive will be those that sell access to a proprietary database, such as the one Swope wants to sell.)

Swope developed the library for the J&H staff, but as soon as he can resolve some copyright problems, he'll let outsiders use it too. At the outset, he'll let them get the information off the mainframe that currently houses the library, but if this venture really takes off, he may have to buy another computer to handle the load.

Others have gotten into software partly because the cost of entry can be so low. "All you need," quips Vincent Pica, senior vice president of operations at Hutton, "is a personal computer and a kitchen table." That fact was not lost on Alan Francis, a computer expert assigned to the securities research department at Merrill Lynch.

Earlier this year, in relatively short order, Francis wrote a screening program that can be used to sort through the firm's proprietary database of financial information, including earnings estimates, on 1,400 companies. Called Merrill Screen, the program was written for the



Not all diskettes are created equal.

At first glance, most diskettes look alike.

Not true. In fact diskettes are not created equally.

At Memory Media Products we know that small details make a big difference. We spend a few more minutes here and a few more cents there. Consider the important step of burnishing. We may take a little more time than some, but the end result speaks for itself. Even our jackets are glued, not heat staked.

Frankly, cutting corners is just not our style.

We're also picky when it comes to buying raw material. We've turned away many a supplier who didn't meet our high standards.

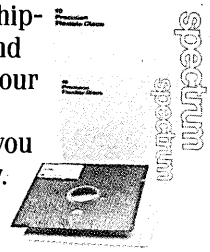
Perhaps we're tough on suppliers, but we're soft on customers. Take delivery, for example. Some big name manufacturers may ask you to wait for weeks. On the other hand, we'll get your order on its way in three days. Even faster if necessary.

When it comes to service, we really shine. Our National Sales and Service team will tailor a program just for you. That includes custom diskette labels, drop shipment anywhere in the world, and just about anything to make your job easier.

So call us today. We'll tell you more about diskette inequality.

Outside California: 800-228-0438. In California: 800-228-9699. Or 714-863-1101. Memory Media Products, 17032 Murphy Ave., Irvine, CA 92714.

©1984 Memory Media Products



MEMORY MEDIA

CIRCLE 20 ON READER CARD

IBM PC. With it, institutional investors can scan the database for stocks that meet their own criteria, such as earnings and dividend growth rates or changes in stock prices.

Typically, Merrill's institutional customers pay for research like this by sending Merrill some extra commission business. Most of the 50 clients who bought Merrill Screen, for example, have paid for it by sending in incremental brokerage orders. The remainder is paid in hard dollars, as real money is called—they each wrote out a check for $4,000. Says Francis, "The payback is terrific.

Similarly, banks peddle cash management systems to give their loan business a boost. These services help corporate treasurers manage their daily cash flow, and include everything from processing incoming checks as rapidly as possible to sweeping excess balances into a money market fund. One goal of cash management is to keep bank balances pared to the bone.

These electronic services have evolved along with the technology—first, they were batch processed, then timeshared, and then moved from the dumb terminal to the micro. Bank of America won the race to be first with a treasury management system delivered via the micro. Called Microstar, it was introduced last year with hardware from Victor Technologies, but that was soon dropped in favor of the IBM PC.

With MicroStar, corporate cash managers can program their micros to call up the banks that are the central repositories of its funds and find out what their current balances are before the workday begins. These data can then be reformatted for posting in a spreadsheet. MicroStar is a modular service that also includes analytical packages that cash managers can use to forecast cash flows, manage bank accounts, and even track the company's short-term investments.

Any bank worth the name has no choice but to offer a cash management service, according to the BCG's Bleyleben, and scores of banks do. But the critical question, he adds, is whether the banks should make or buy the service. He believes that all but the very largest banks should save their money and buy this relatively fungible product off the shelf. Both Chemical Bank and the Mellon Bank in Pittsburgh peddle cash management products to their smaller brethren in the field.

These new users and vendors of dp technology aren't always successful. For example, suggests Arthur Andersen's Racioppo, some companies that came out with a CMA clone following on the heels of Merrill Lynch did not reap a windfall. "Processes like these require a huge investment in systems," he notes, "but customers never materialized in great enough numbers to make the service profitable."

Indeed, marketing can pose unexpected problems for these neophyte vendors who are accustomed to being on the receiving end of computer services. When cash managers at the Equitable Life Assurance Society, New York, tried selling the nationwide lockbox system they'd developed in-house, they soon realized that they had no experience selling cash management services. A lockbox is, quite literally, a post office box equipped with a lock. Banks everywhere sell lockbox services—they pick up the mail, process the checks, and send the funds on to the central repository that's usually called a concentration bank, speeding available cash to the customer. Equitable has one advantage over the banks, however: a nationwide lockbox system. Banks, on the other hand, have to limit their lockbox systems to the geographic area they serve.

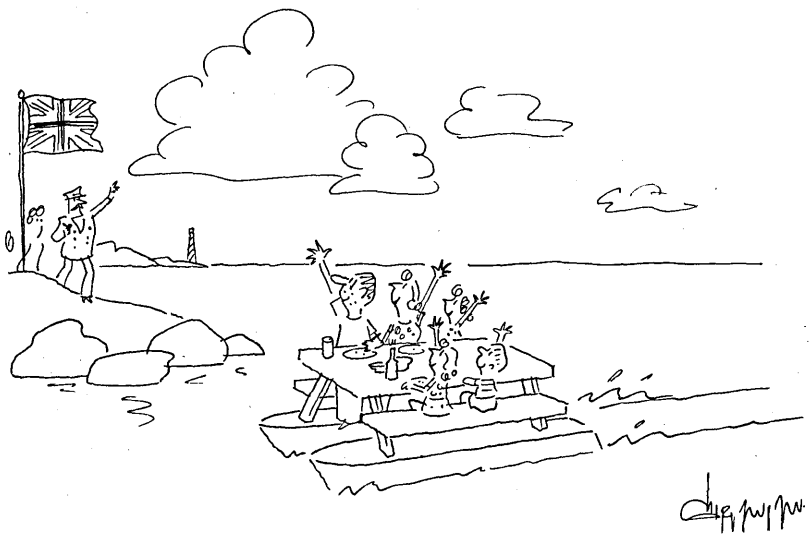
To make up for their lack of marketing savvy, Equitable's cash managers quickly teamed up with bankers at Chase Manhattan, New York, and formed a joint venture called Cheqnet. "We were the first to have a network for processing checks," says Charles Menges Jr., Equitable's vice president of business development and systems support. "We had the operational capability but Chase had the marketing expertise." Indeed they did—in less than a year, Chase's cash management sales force has landed more than 50 customers.

Another error user-vendors make is to underestimate the time and expense involved in service and support. "People who buy software have very high expectations about what the vendor is going to supply," points out William Saubert, partner in Coopers & Lybrand's consulting division. The newcomers "understand that intellectually, but they haven't had the practical headache of being in the business."

Indeed, consultants at some of the big accounting firms have learned this the hard way. Both Coopers & Lybrand and Arthur Andersen have scaled back on the software they write for their clients. "We're getting out of the business of selling software packages," Andersen's Racioppo admits. "We develop special programs but we don't want to look for generic cures. It's not an attractive business for us—the support and maintenance create a major expense."

Increasingly, however, some of these Johnny-come-lately vendors are running up against their old suppliers—software companies and timesharing vendors. Ric Duques, group vice president of ADP's brokerage division in New York, admits he's in "a dogfight" with some of his new competitors. Both Merrill Lynch's market data system and Morgan Stanley's TAPS represent potential threats.

Duques likes to note that *In Search of Excellence,* the popular business book by Thomas Peters and Robert Waterman (Harper & Row, 1982), advised managers to "stick to their knitting," as he puts it. Back in the old days, he likes to recall, the mainframe companies sold back office processing services to Wall Street firms. "But they couldn't make money at it. And they didn't stay in the business." ◉



The Dohertys—Bill, Sue, Ellen, Brad, and Tina—complete the first transatlantic picnic table crossing.

Nancy Welles is a New York-based writer on technology and business subjects.

When you move up to color, compare the Tek 4105. There's no competition.

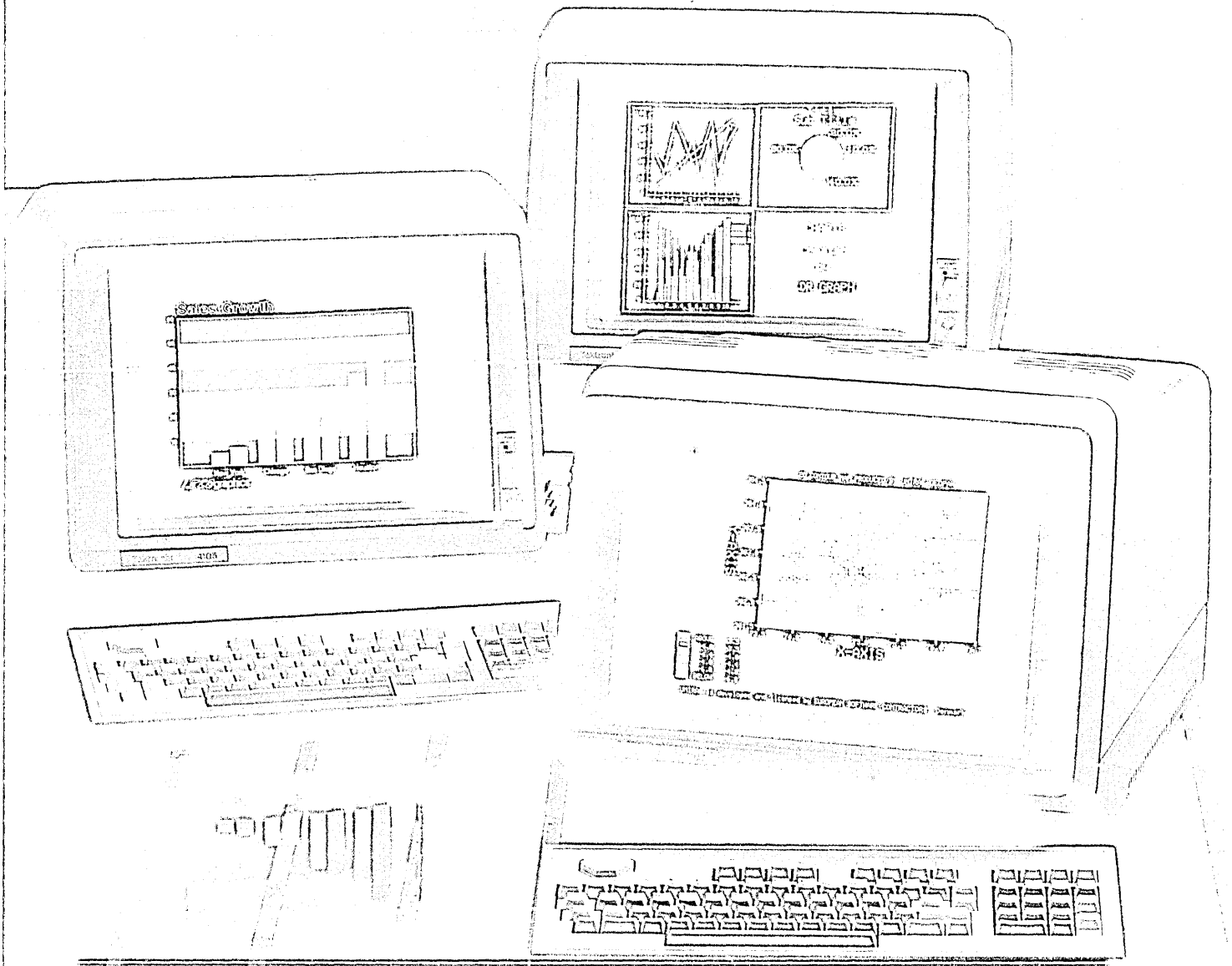
Although others try to "emulate" Tektronix capabilities, few come close to the real thing. Fast, efficient 8-color graphics with full VT 100™ alphanumerics.

High resolution 4096 x 4096 addressability. User-controlled detail magnification. Rapid precise shading of complex irregular shapes. Plug compatible color hardcopy and transparency output from the Tek 4695 Color Graphics Copier. And an incredible reliability track record: 10,000 hours mean time between failures.

There are some terminals that cost less. But in software selection, system performance, total reliability, and future expandability—the quality difference pays for itself.

So if you're buying more than one, buy the one others try to emulate, the Tek 4105.

For full information call 1-800-547-1512. In Oregon 1-800-452-1877.



Tektronix
COMMITTED TO EXCELLENCE

©Copyright 1984 Tektronix HDT 101
*VT 100 is a registered trademark of Digital Equipment Corporation

CIRCLE 21 ON READER CARD

Ordinary computer systems take a very narrow view of your world.

The extraordinary MAPPER® System puts things in true perspective.

Ordinary computer systems see you and your special business problems the way their programs tell them to. Which means they can't see things quite right.

That's because computer programs are either off-the-shelf—designed for some mythical "typical" business. Or they're custom-designed—created by an outsider who's unlikely to have a complete picture of your business.

But meet the Sperry MAPPER System.

It's truly an extension of your mind. Instead of confining you to any fixed program, MAPPER gives you carte blanche to create your own programs. Without doing any programming, in the conventional sense.

As a result, you gain unheard-of power. To make the computer see the full scope of your real world, and deal with it realistically.

MAPPER adapts to the way you work.

You and your people don't have to be computer experts to use MAPPER expertly. Far from it. Simple but powerful English commands get you what you want. A word or two is usually enough.

As you insert and extract information, freed from rigid procedures, you create your program along the way. So you can make mistakes. Change your mind. Even alter your destination in mid-journey.

MAPPER does more than work the way you work. It actually follows the way you think.

MAPPER can serve a handful. Or handle a thousand.

The MAPPER System can be scaled for a major corporation, for a single department, or for a growing business. You can even timeshare through a Sperry service bureau.

So no matter what size your business, the power of MAPPER is affordable. In fact, it can cost as little as a network of ordinary personal computers.

Before you invest in any ordinary computer system, invest a little time with Sperry. Come see MAPPER in action—hands-on. Phone toll-free **800-535-3232**. Or send us the coupon.

MAPPER is a trademark of Sperry Corporation. © Sperry Corporation 1984

CIRCLE 22 ON READER CARD

Sperry Corporation, Computer Systems, Department 100, Box 500, Blue Bell, PA 19424-0024

Please ☐ phone me to arrange a demonstration.
☐ send me information on the MAPPER system.

DA 11/1-16

NAME _____

TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____ ZIP CODE _____

TELEPHONE _____

SPERRY

NEWS IN PERSPECTIVE

PERSONAL COMPUTING

A PC AND A PHONE IN ONE

The first fruits of the IBM/Rolm accord link digitized voice to PCs and XTs.

by Charlie Howe

Given recent advances in telecommunications, no sector of American enterprise seems more speculation-driven than the computer industry. Like generals awaiting their orders of battle, users and vendors were buzzing with product rumors even before IBM acquired Rolm Corp. Now Rolm has introduced two devices to its product line that marry digitized voice to millions of IBM PC and XT machines, creating workstations no larger than a typewriter. Each device digitizes speech via a codec (coder-decoder) in the phone set, and each ultimately attaches to Rolm's CBX II private branch exchange, a voice/data switch with heavy networking facilites.

The first of the Santa Clara, Calif.-based Rolm's products is called Juniper. Essentially, it is a beefed-up digital telephone that transcends its preexisting Cypress digital telephone product. Juniper also contains communication software and an option card for the PC or XT that converts it into a digital workstation/telephone. Juniper will be available next month, selling for $1,360 in quantities of 100.

The second Rolm product, also available next month, is Cedar. The device is the same digital phone set connected to a Rolm-made microcomputer that is a slightly smaller version of the PC. Cedar's operating system is MS/DOS 2.11 and it offers GW-BASIC, which Rolm says is thoroughly compatible with IBM BASIC. Cedar will run IBM applications software including Lotus 1-2-3 and Micropro WordStar.

At press time it was unclear if Cedar can handle the 31 new software programs IBM introduced the day it acquired Rolm. Given the close technological relationship the two firms entered into last year, say analysts, the answer is probably yes. Cedar will sell for $4,245 in quantities of 100.

While neither Rolm nor IBM has precisely reinvented the wheel, Cedar and Juniper represent a formidable package when coupled with Rolm's CBX II. IBM, of course, had never been able to develop a voice/data switch. Its 1750, 2750, and 3750 line of PBX products sold poorly in Europe and not at all in the U.S. Its courtship of Canadian switch maker Mitel likewise came a cropper when that vendor's SX-2000 PBX recently received what amounted to an uncharitable raspberry from users and vendors alike. Indeed, IBM dropped Mitel and embraced Rolm in the same month last year.

At first glance it would appear that Rolm has, in concert with IBM, the first leg up on a market variously called "office automation" or "desktop workstation," or simply "workstation." When it introduced Juniper and Cedar, a Rolm spokesman made it clear where his company stands. "So far, no other PBX manufacturer has introduced an IBM PC-compatible product that contains an advanced feature telephone with computing capabilities.

"Cedar competes with personal computers that are used with a number of other products," he continued. "To upgrade a PC to Cedar's communications functionality would take a modem, an extension card for asynchronous data communication, a digital telephone, communication software, and two telephone lines. With all this, it would take up more desk space and transfer data more slowly than Cedar. It would also not have the CBX features and would require frequent shuffling between communications and applications software disks."

Aside from Cedar's higher price, when connected to Rolm's CBX II the two

Rolm hopes to lure current PC users into its fold, but so do many other voice/data add-on vendors.

products enjoy almost everything in common. Both have features that include:

- Connections into the CBX II via RolmLink, a dedicated digital communication path that sends messages to and from the devices and the CBX and allows communication with computers and public databases at speeds from 300bps to 19.2Kbps asynchronously. Voice, data, control, and status information can travel as far as 3,000 feet from the CBX II, which puts the entirely digital products solidly into the local area network arena.
- Simplified access to other computers by eliminating much of the hassle in configuring a terminal. Parameters such as baud rate, parity, and echoplex can be set once for each database or computer. Touching the autodial key automatically configures the appropriate terminal profile and establishes the data connection.
- Multiple terminal emulation that includes IBM 3270 via a Rolm gateway, and

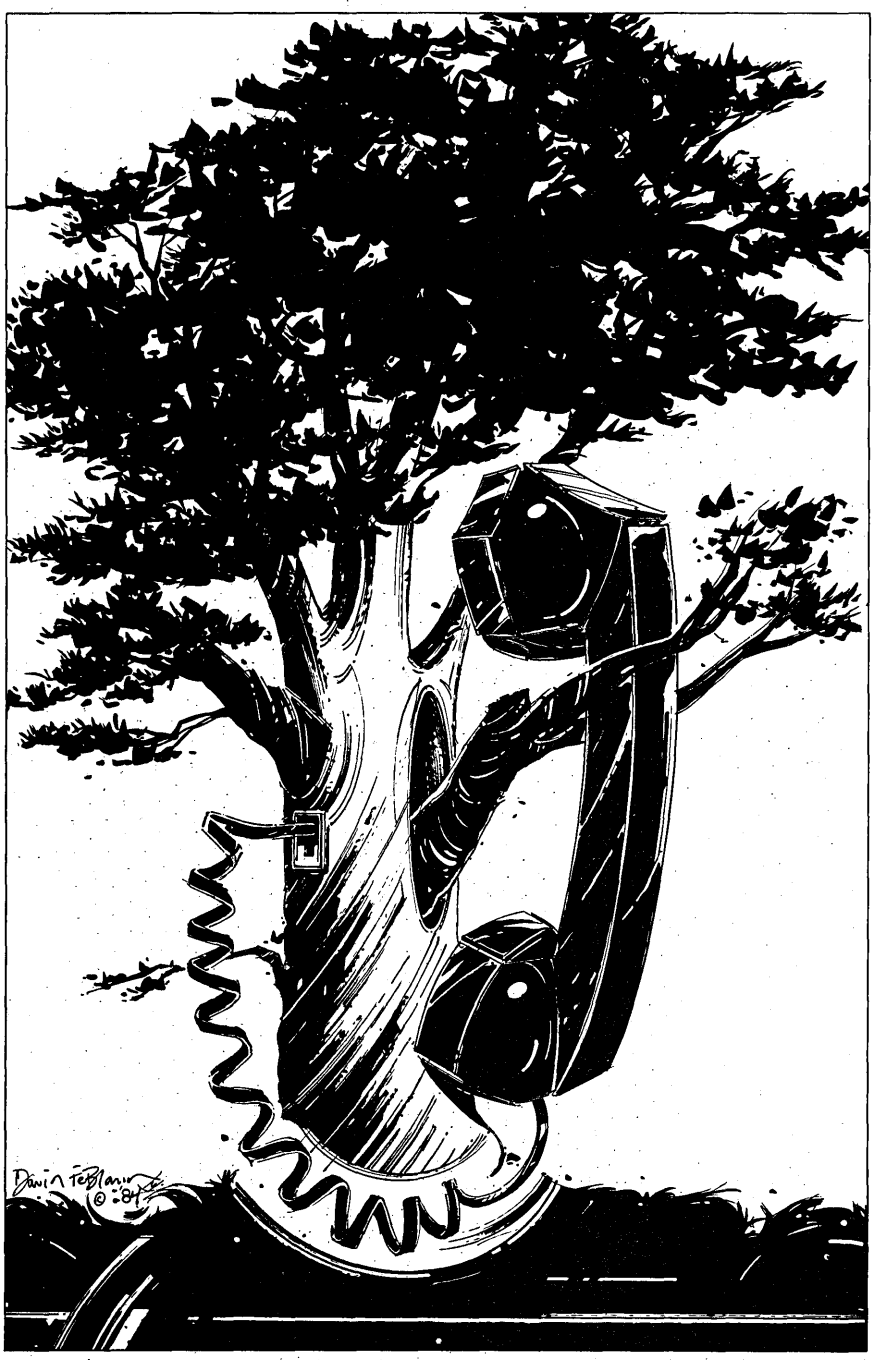


ILLUSTRATION BY DAVID FEBLAND

Digital Equipment Corp. VT-100 compatibility.

• ASCII/asynchronous file transfers to and from PCs, minicomputers, and mainframes. In this connection, Rolm says its CBX II supports more than 130 terminal types and more than 20 kinds of computers, including devices from DEC, Hewlett-Packard, and Data General. The file transfer capability feature, says Rolm, lets users send data from a spreadsheet or a draft of a memo and then discuss the implications of that information even while manipulating the data. Cedar and Juniper also have speakerphone features that allow users to keep both hands on the keyboard without holding the handset to their ears with their hunched shoulders.

• Multiple printing modes that include standard IBM printing when operating in the PC mode.

• Modem pooling, wherein a user is automatically queued on either first come, first served or priority basis. If a computer port is busy at the initial call attempt, the user will be signaled when the port is free.

Rolm says that other Juniper/Cedar features include simplified log-on/log-off; a reminder file; a visual display that tells the user of incoming phone calls while he was away; a five-function calculator; a personal telephone list of some 200 numbers; enhanced phone features wherein the soft keys may be predefined by the user as to station speed, system speed, and redial keys; a menu that enables users to charge calls to specific account numbers if a CBX II call detail recording feature is employed; a data module that stores personal data; and security features said to prevent unauthorized access.

Cedar may well contain a direct copy of IBM's Basic Input/Output System (BIOS) for the PC, which would, of course, make for total compatibility with the mainframe monolith's microcomputers. "No comment" was how a Rolm spokesman put it when asked if the firm had been allowed to copy the BIOS.

Cedar's keyboard contains 68 keys, IBM PC overlay legends, and overlays for the VT-100 and 3270-specific keys. Its screen size is 80 lines by 25 characters. The 38-pound machine contains 512KB of memory, 384KB of which is user-accessible. The device has two 5¼-inch disk drives. Its telephone, like that of Juniper, supports up to four lines and contains 11 repertory dial keys, a 12-key telephone dial pad, and 10 soft function keys for the CBX II features.

Gartner Group's Hughes adduces that Rolm will sell more add-on Junipers than Cedars.

The Juniper add-on to the PC contains the same telephone functions as Cedar. It uses 128KB of PC memory for its own functions. The keyboard has 10 soft keys mapped to the PC's F1 through F10 keys, and VT-100 and IBM 3270 keyboard mapping for terminal functionality. Its phone functions include volume up and down keys, and hold, connect, and transfer keys.

An understanding of the voice/data PBX market and the microcomputer market gives a clue to what Rolm has in mind when it starts selling Juniper and Cedar. Rolm has some 16,000 CBX and CBX II PBXs installed. While only the CBX II can support Cedar and Juniper, the CBX can be upgraded to CBX II status at a moderate cost. Thus, every CBX installation becomes a potential target of Cedar and Juniper.

Norm DeWitt heads the Personal Computer Service Division of Dataquest, a San Jose, Calif.-based market research firm that was aware of Rolm's plans early on. DeWitt estimates that by the end of 1985 there will be some 2.25 million PCs and XTs installed in American offices, along with another 1 million PC lookalikes. Rolm can target those 3.25 million users with the Juniper package and CBX II. "I think the new Rolm products are interesting and priced in the ball park," he says. "Rolm now has a whole product

line, including personal computers, coming from one company. That's what's significant to me." DeWitt nevertheless suspects that Rolm will soon have competition from major players AT&T, ITT, and perhaps even Compaq, based in Houston.

In view of IBM's acquisition of Rolm, however, just who will market what remained unclear at press time. A Rolm spokeswoman says the company will continue to use its own sales force to sell the CBX II, Juniper, and Cedar. Might IBM now force Rolm to discontinue peddling its Cedar PC look-alike? "They've known about Cedar for quite some time," the spokesman says. Indeed, now that IBM has acquired Rolm, it expects sales of both products to outshine original expectations. Before the acquisition, Rolm projected collective sales of 200,000 of the devices after they had been on the market 12 months.

Another analyst who reviewed Cedar and Juniper before they hit the market is Christine Hughes, vice president of office systems with the Gartner Group. Hughes sees an installed PC and XT base of some 4 million, and she adduces that Rolm will sell more add-on Junipers than PC look-alike Cedars. Hughes also sees some immediate competition from AT&T. She says the telephone titan already has a voice/data workstation called the 550 BCT on the market. "It came out shortly after divestiture, and it looks like an Amana Radarange," she notes. "It costs $3,995 and the footprint is just not what you would want on your desk."

Hughes says that AT&T is nevertheless preparing another challenge to Rolm. "AT&T has an agreement with Convergent Technology wherein Convergent is supposed to manufacture a 32-bit Unix-based voice/data workstation. Convergent is supposedly also making for AT&T a very functional type of telephone device, but we don't know whether it will have as much [digital] functionality as Rolm's."

Surprisingly, Intecom has sold more data PBX lines than either AT&T or Rolm.

Hughes speculates that this workstation could be driven by AT&T's System 85 or System 75 PBXs, which were both introduced this year after divestiture and are in direct competition with the CBX II.

In such a scenario, a deal between AT&T and Convergent could result in a wide area networking package via AT&T's Information Systems Network. ISN has a star-based wiring topology and four-pair wiring identical to the wiring it mandates for its System 85 and 75 machines.

In low-end configurations, the just-released System 75 supports 50 to 150 lines and costs somewhere between $800 and $900 per line. In a similar low-end configuration, the CBX II supports from 20 to 200 lines and sells for $900 to $1,200 per line. Like the System 75, it supports data rates to 19.2Kbps asynchronously and 56Kbps synchronously.

At the high end, AT&T System 85 supports some 1,000 lines per node, and up to 15,000 lines in a 12-node configuration, at a cost of about $1,000 per line. In a 15-node configuration, the CBX II supports up to 11,520 lines at a cost of $700 to $900 per line. Rolm's switch has been on the market since 1975. In a single configuration it provides a maximum bandwidth of 295Mbps and provides T1 links at speeds of 1.54Mbps to connect to high-speed external networks. An X.25 interface connects to public and private switched networks including those of competitor AT&T.

By whatever name—and that includes PBX, PABX, CBX, and digital switch—the private branch exchange market is still dominated by voice offerings. Figures provided by Hambrecht & Quist Inc., a San Francisco investment firm, show an interesting analysis. Based on the number of total lines shipped last year, AT&T is in the lead (and this is before System 85 and 75), followed by Northern Telecom of Nashville, and then Rolm.

When Hambrecht & Quist examined the total number of PBX lines according to the total number of data lines shipped in 1983, however, the picture changed. The leader in data lines was Intecom Inc., of Dallas, which shipped 40% of all such lines. Rolm came next with 35%, followed by Northern Telecom with 12%. Of some 3.4 million PBX lines shipped thus far, only 1% was for data. The study predicts that data, however, will account for more than 30% of all PBX lines by 1988.

Christine Hughes agrees that the Rolm/IBM accord will put these two firms in direct workstation competition with AT&T. "But you also have to bear in mind," she adds, "that there is a tremendous amount of activity in this area going on among other leading vendors." She cites a recent agreement that Wang Laboratories made with Intecom as one such entente cordiale.

Wang has acquired some 20% of the Allen, Texas-based Intecom. The two may be jointly working to develop a microcomputer link with Intecom's IBX switch that will result in a voice/data workstation. A product is expected within the first quarter of 1985, say sources.

Hughes says her intelligence sources suggest that DEC, HP, and DG are also looking into the telephone/microcomputer/PBX market. She adds that none is expected to bring a product to market this year. How about Northern Telecom, with its SL series of PBXs? "They have made many alliances with office automation vendors," says Hughes, "but we have yet to see an exchange of money. And that's what counts."

If pitcher Satchel Paige were alive and au courant in data communications, here is what he might say to Rolm and IBM: "Don't turn around and look back, boys, because whatever it is that's behind you might be gaining on you." ◉

SUPERCOMPUTING

AMDAHL'S SUPER CPU GAMBLE

The pcm hopes that importing Fujitsu's supercomputer will give it a leg up on IBM, but questions abound.

by Michael Tyler

Sometime this month the first Japanese supercomputer to reach North America will be unloaded from a truck and installed at the headquarters of Amdahl Corp. in Sunnyvale, Calif. The controversy preceding this historic event has been fierce and emotional as users, consultants, and politicians have taken sides in the latest technology battle between Japan and the United States.

Now that the first machine—a Fujitsu VP 100 or VP 200 like the ones Amdahl will begin shipping to customers in January—is about to be installed, however, the controversy is changing. Indeed, the new focus of debate may render earlier arguments moot. The issue now is simply whether the Fujitsu machine is even competitive with those sold by the two U.S. supercomputer manufacturers, Cray Research Inc. and Control Data, both of Minneapolis. Amdahl is betting on the new machine's software compatibility with the IBM 370 to carve its special niche in the market. If it is successful, the supercomputer market's evolution itself may change. The machine's potential success has broader implications, since it comes with a host of applications, application development tools, and operating system utilities—the first mainframe-level Japanese software to reach America.

At first glance, the Amdahl machines' specifications are comparable to those for Cray or CDC's products. Amdahl's hardware is made by Fujitsu, its Japanese parent, which owns 49% of the

ADR® WARE™

ADR®/DATACOM/DB®
From idea to application, we get you there faster.

Faster than Cullinet.
Faster than Software AG.
Faster than Cincom.
Much faster than IBM®.

ADR/DATACOM/DB
The only widely installed relational data base management system being used for high volume update applications. Today.

ADR/DATACOM/DB
Has the only migration software that converts your applications from VSAM to a relational data base management system. Overnight.

ADR/DATACOM/DB
The only relational data base management system that does the big jobs as easily as the small jobs.

We've taken state of the art to a new state: Easy and available.
Before you make a software decision mail in the coupon below.
Or call in N.J. (201) 874-9000 or toll free
1-800-ADR-WARE.

DB

☐ Please send me more information about ADR WARE.
☐ Please send me information about ADR seminars.

APPLIED DATA RESEARCH INC.
Route 206 & Orchard Road, CN-8, Princeton, NJ 08540

Name_____
Position_____
Company_____
Address_____
City_____ State_____ Zip_____
Phone Number_____
Computer Equipment_____

ADR® WARE™
From idea to application, we get you there faster.

CIRCLE 23 ON READER CARD

U.S. company. The small model, which Fujitsu calls the VP 100 and Amdahl the 1100, comes with 32MB to 128MB of main memory and 16 I/O channels. Its peak performance rate, according to Amdahl director of special purpose systems Wayne McIntyre, is 267MFLOPS.

The larger machine—Fujitsu's VP 200 or Amdahl's 1200—comes with 64 to 256MB of main memory and 16 or 32 I/O channels. It peaks at 533MFLOPS, almost 60 times the peak performance capability of Amdahl's fastest 370-like mainframe, the 5860. Amdahl, Fujitsu, and several foreign prospective customers have run limited benchmarks developed at Lawrence Livermore National Laboratory, and all have concluded that the Fujitsu machine's performance is comparable to its Cray and CDC competitors (see "Cray & CDC meet the Japanese," April 1, p. 32).

Says Kevin Moriarty, a professor at Dalhousie University in Nova Scotia who has used both Cray and CDC supercomputers extensively in modeling the behavior of subatomic particles called quarks, "When you're running highly vectorized code, I think the Amdahl supercomputer gives you more horsepower."

Despite what seem to be impressive performance benchmarks, the architecture of the Amdahl/Fujitsu machines, which have been designed to emulate the 370, has become an issue for some observers. Fujitsu's use of the same VLSI chips in the supercomputers as the ones it supplies to Amdahl for building 370-compatible mainframes has dictated some limitations into the new hardware.

Both Cray and Control Data supercomputers use 64-bit words, points out Kwok Wu, CAD manager at United Technologies' Mostek semiconductor division in Dallas, which currently runs applications on a commercial timesharing network's Cyber 205. But because the Fujitsu processors are based on the MVS/XA-compatible chips, says Wu, they are limited to 31-bit words. In applications such as integrated circuit design and simulation, the smaller word size may make a big difference in the precision and resolution of the applications' results, he says. While it's true the same number of instructions may be performed per second, other machines may process somewhat more information per second than the Amdahl units.

Amdahl says the 31-bit architecture is an advantage because it allows the 1100 and 1200 to share data easily with MVS/XA applications. The vector processor can connect via standard IBM channels to storage peripherals, like 3380-class disks, so that mainframe and supercomputer can share data under the same operating system, according to Amdahl's McIntyre.

"You can add a supercomputer exactly as if you were adding a 3081," he says, "and it will immediately run existing IBM FORTRAN applications without modification or recompiling."

The problem, some potential users and competitors say, is that the advantages of IBM compatibility and of the supercomputer's vector processing power are mutually exclusive. For example, IBM's I/O channels operate at 3MBps, which may be fine for mainframes but is relatively slow for a supercomputer. The Cray cpu, for instance, can move data from disk to cpu at 10MBps.

"The conclusion that the uninformed would have you draw is that Cray's I/O performance is three and a third times better than ours," McIntyre counters. "Cray foolishly assumes that our software is identical to MVS. We have a high-speed I/O program that enables you to take a single data set or program and segment it out across 32 storage devices. Then our true I/O throughput becomes 32 devices times 3MBps, or 96MBps."

Amdahl's problem is that the advantages of IBM compatibility and the supercomputer's vector processing may be mutually exclusive.

At Cray, vice president of planning and corporate development Peter Gregory responds, "The concept of program striping is attractive, and we can do that both among devices and among head-disk assemblies on a single device. Amdahl is limited because MVS does not support program striping, so you can either share data with MVS and go at 3MBps on a single thread, or you can go faster but not be able to share the same data." (Cray supercomputers currently cannot share data with IBM storage devices at all, but Gregory says that early next year the company will announce that capability with the same limitations that apply to Amdahl.)

What's more, says Dick Sato, a Cray user with the National Center for Atmospheric Research in Boulder, Colo., "Cray and CDC can handle buffer-in/buffer-out statements so I/O can be overlapped with computation. Most of our applications use that, but IBM does not support it."

Amdahl's McIntyre discounts these criticisms, claiming the sustained throughput—which measures both cpu speed and I/O speed and reflects a machine's overall performance—of the 1100 and 1200 is comparable to that of the competition. "The 1100 sustains 175MFLOPS, and the 1200 sustains in excess of 300MFLOPS. The 1100, in sustained throughput, is 1.2 times faster than a Cray X-MP uniprocessor and twice as fast as a two-pipeline CDC Cyber 205." The 1200 is 1.8 times faster than the X-MP uniprocessor, and about as fast as the X-MP two-way processor, he adds.

"We haven't seen a full benchmark of the Fujitsu machines' I/O capabilities," Cray's Gregory maintains. Nor have Moriarty at Dalhousie University, Sato at the atmospheric research center, or Wu at Mostek. "I suspect Amdahl will also shy away from providing anything like that," Gregory adds.

Amdahl says that too few Fujitsu supercomputers have been installed to date for any comprehensive benchmarks to be available.

So far, Moriarty of Dalhousie University says five units have been installed, all in Japan: at the University of Kyoto; at Ngoya University; and at Fujitsu facilities in Nomazu, Kawasaki, and Tokyo. All have the minimum memory and channel capabilities.

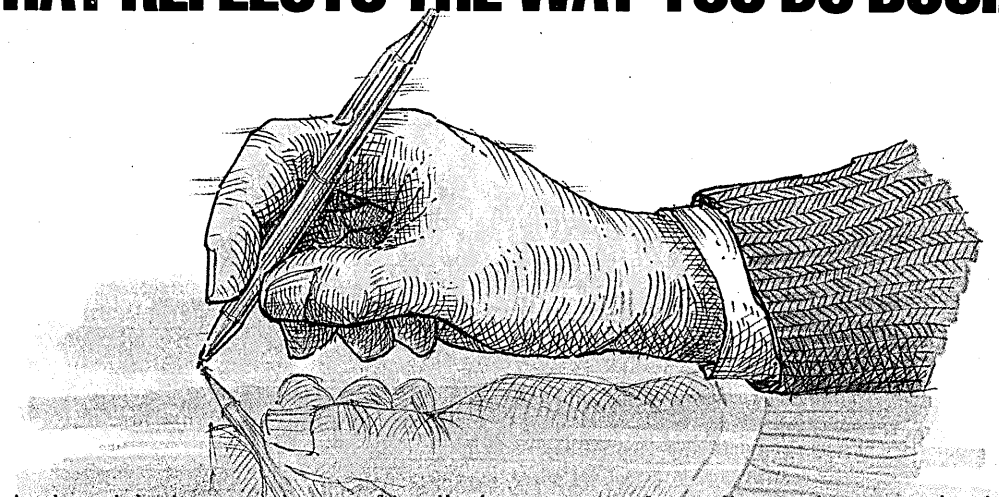
Finally, some users assert that IBM compatibility has no meaningful advantage in software. "Only the scalar unit of the Fujitsu machine is IBM-compatible on a software level," notes Jack Worlton, a lab fellow at Los Alamos National Laboratory. "But the whole advantage of a supercomputer is at the vector unit. So if you want to get the full performance out of your machine, you have to vectorize the code yourself. If the customer is willing to do the work and vectorize the code, he can just as easily do the same thing on a Cray with an IBM front end."

Sato concurs. "I don't think there is a whole lot of difference in recompiling scalar FORTRAN to vectorize it for any of the machines. They're all about the same amount of work."

Amdahl's Japanese software does get high marks from users in some areas, however. The vectorizing compiler and debugger are interactive, Moriarty notes, which improves their efficiency. "Fujitsu hides the work and prompts you with questions, such as what percent of the time a given 'if' loop can be expected to execute, and that's good for the current generation of programmers. They don't have to learn new vector techniques in order to get really fast code," he says.

"On the other hand, by not forcing you to think vectorially, it may be putting you at a disadvantage," he continues. "I think that programs developed from the start for vector processors will run 20 to 30 times better than scalar programs converted to vector processing. When you vectorize scalar code, by nature you can't redesign the algorithm as you would if you started from scratch."

DUNSPLUS: THE MICRO SOLUTION THAT REFLECTS THE WAY YOU DO BUSINESS



You've heard the buzzwords: user friendly, integrated, smarter, faster, cheaper. But when you push the rhetoric aside you're still asking the same question, "Why can't I get a system that solves more problems than it creates?"

You can. It's called DunsPlus and it's built to respond to your information-related business demands without creating demands of its own.

DunsPlus gives the IBM PC XT a built-in business environment. This lets you mold DunsPlus to fit the way you do business.

Within the DunsPlus environment is a software base of the best. Lotus, MultiMate, Western Union electronic mail (to name but a few), are all ready for immediate use. But additional programs to solve your unique problems can also be added with ease.

Instant, yet controlled, access to your choice of mainframes and subscription databases is also a part of the DunsPlus environment. And transferring data throughout the system is as easy as moving a piece of paper from the In Box to the Out Box.

Immediate end-user productivity is not an issue: DunsPlus is a menu-driven system requiring minimal keystrokes for maximum results.

Installation is not an issue: DunsPlus is installed by IBM.

End-user training is not an issue: Training and support are part and parcel of DunsPlus.

Flexibility is not an issue: Any part of the DunsPlus solution--hardware, software, or service--can be tailored to meet your precise business needs.

In fact, there are no issues. DunsPlus does what you want, the way you want it--now.

Designing systems that reflect the way you do business is business as usual for us. NOMAD2, the premier 4th-Generation-Language/DBMS from D&B Computing Services, has made us a leader in the field of information management services. And as your needs evolve, so do we. DunsPlus is just the latest step in translating technological advances into usable business tools--tools that reflect the way you do business.

DUNSPLUS: AN INNOVATION IN END-USER COMPUTING FROM DUN & BRADSTREET

DunsPlus

D&B a company of The Dun & Bradstreet Corporation

For further information call: 800-DNB-PLUS. Or drop your business card into an envelope and mail it to DUNSPLUS, 187 Danbury Road, Wilton, CT 06897

Lotus spreadsheet and graphics from Lotus Development Corporation. MultiMate™ word processing from MultiMate International, Inc. IBM is a registered trademark of International Business Machines Corporation. DunsPlus is a registered trademark of DunsPlus, a company of the Dun & Bradstreet Corporation. NOMAD2 is a trademark of D&B Computing Services.

CIRCLE 24 ON READER CARD

Amdahl's McIntyre admits the Fujitsu machine's IBM compatibility is not enough to attract current Cray or Control Data users, and those users agree. But Amdahl is staking out a whole new market where users may not be as aware or concerned with technological subtleties. "We think the most likely customer is one who does not yet have a supercomputer," he says. "They have the applications in FORTRAN that could benefit immensely, but they have forestalled purchase because of the price."

The entry price for the 1100, $7.7 million, is about twice the price of a top-end 5860, McIntyre says, claiming Amdahl will be in a position to compete on price alone against IBM 30XX mainframes in any customer installation with at least two mainframes running FORTRAN applications. Therefore, the range of potential applications—and customers—far exceeds the traditional supercomputer base of university research, petroleum seismology, weather forecasting, and nuclear research, to include such diverse areas as CAD, large-scale process control, project management, econometric modeling, structural analysis, many forms of simulations, and even managing ATM networks, McIntyre says.

That argument has persuaded some Amdahl customers. At Mostek, which uses Amdahl 470 and 580 cpus, Wu says that despite any performance decrement due to IBM compatibility, "we have many applications that are now on our mainframes, such as semiconductor design and layout verification, that could work much faster on a supercomputer." Wu emphasizes, however, that Mostek is not yet at the point of considering buying its own supercomputer. "I don't think we'll really have the demand until about 1986, so right now we're pretty neutral about which we would choose."

"If the customer is willing to do the work and vectorize the code, he can just as easily do it on a Cray as on a Fujitsu."

Wall Street analysts are also optimistic that Amdahl will reach a new class of customers. "IBM and others may soon run into trouble keeping up with the MIPS demands of customers, and it will be increasingly to Amdahl's advantage to have the supercomputer integrated into the rest of its product line," says Steven Milunovich, an analyst with First Boston Corp. in New York City. "Amdahl is cracking a predominantly new market. They may not sell as many as they expect they will immediately, but I understand they already have a few letters of intent."

Milunovich says he expects Amdahl to ship $50 million to $75 million worth of supercomputers in 1985, and about $200 million in 1988. "My estimate for the next year may be optimistic since they have a missionary job to do," he adds, "but I think $200 million in 1988 may actually be somewhat conservative."

Part of the reason analysts are bullish is that Amdahl has little to lose. McIntyre admits that the entire development and construction of the machines, including software, was a Fujitsu project, and that Amdahl's entire financial exposure consists of marketing and service costs in this country. Amdahl can certainly use a product with little downside and a potentially significant upside. While its revenues for the first half of 1984 rose 5% over the first half of 1983 to $371.3 million, net income dropped 47% to $9.1 million over the same period.

How much the supercomputer will help Amdahl depends largely on how big the potential market is. Most users and analysts—and even Amdahl—concede that at best the market consists of the 20% of IBM-compatible mainframes that perform scientific or engineering FORTRAN applications almost exclusively.

DJC Recommends Diablo Matrix Printers

Correspondence Quality For The IBM PC

DIABLO CQ1 printers bring a standard of quality and reliability to the IBM PC environment that Epson and Okidata cannot match.* Diablo CQ1 printers work with a wide variety of mini, micro and professional desktop computers, and are fully compatible with the IBM PC and all major current software packages.

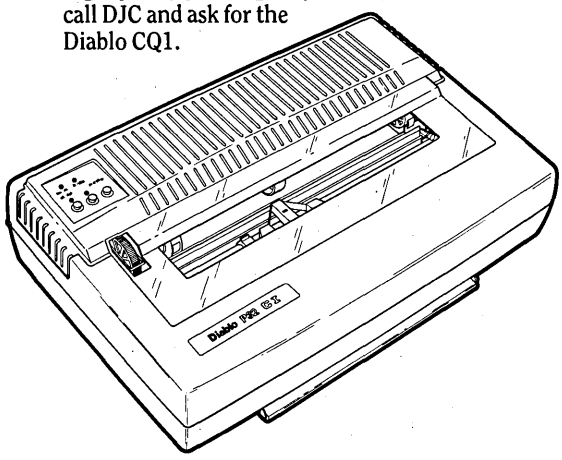
The CQ1 printing meets Diablo's renowned high standards, from exceptional print quality to low noise levels, to long term reliability, and the industry's longest printhead life.

The 12 CQ1 uses paper to 10 inches wide, printing up to 150 CPS (60 CPS CQ Mode), the 12 CQ1 offers a full range of character width plus three graphic modes.

*Comparison devices available on request.

The 32 CQ1 adds a wide carriage for paper up to 15 inches.

When you need cost-efficiency, high quality printing for your PC, call DJC and ask for the Diablo CQ1.



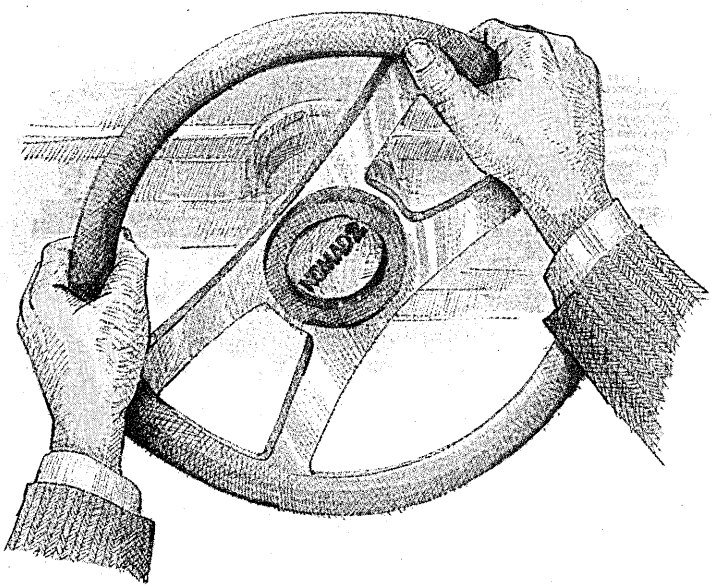
DJC CORPORATION
5700 Buckingham Parkway
Culver City, CA 90231

New Jersey	(201) 780-0802
	(800) 526-2823
Illinois	(312) 790-4466
Texas	(713) 541-9611
Colorado	(303) 233-9236
Hawaii	(808) 943-1944
California:	
San Francisco	(415) 254-9550
	(800) 227-2610
Los Angeles	(213) 410-9250
	(800) 421-3960
Irvine	(714) 851-5011
Florida:	
Orlando	(305) 629-1595
	(800) 321-0800

DJC

CIRCLE 25 ON READER CARD

MOST PEOPLE WHO TRY NOMAD2 BUY IT!



All 4-GL/DBMSs make the same claims as to features and attributes, but you have to look closer to see the difference between NOMAD2 and all the others. It's not only *what* NOMAD2 does. It's *how* it does it. And it's the *how* that leaves the programmer productivity issue in the dust.

As the saying goes, talk is cheap. So rather than just telling you about NOMAD2, we'd rather prove it to you through an application building demonstration, or a trial installation. Further, we invite you to compare NOMAD2 to the products of our leading competitors. And we wouldn't make that suggestion if we weren't fairly certain of the outcome of such a comparison.

Among current NOMAD2 users are some of the largest corporations in America including banking institutions, motion picture companies, supermarket chains, oil companies, pharmaceutical firms, insurance companies and major newspapers, to name just a few. And in most cases, NOMAD2 was chosen after head-to-head testing against the leading competitive products.

The products and services of D&B Computing Services have evolved over the years to keep pace with the rapidly changing business environment. And evolution is an essential part of our ongoing commitment to providing quality business tools to help you get more leverage from the way you do business. NOMAD, now NOMAD2, is a product which can help keep you on the right track.

Most people who try NOMAD2 buy it. You owe it to yourself to find out why.

NOMAD2: AN INNOVATION IN END-USER COMPUTING FROM DUN & BRADSTREET

D&B Computing Services

a company of The Dun & Bradstreet Corporation

For more information call: Roger Cox at (203) 762-2511. Or drop your business card into an envelope and mail it to Roger at: D&B Computing Services, 187 Danbury Road, Wilton, CT 06897

NOMAD is a registered trademark of D&B Computing Services, Inc.

CIRCLE 26 ON READER CARD

At worst, the market may only be Amdahl's 10% to 12% share of that base, and sales there may cannibalize Amdahl's conventional mainframes. For example, Mostek runs FORTRAN on Amdahl 470 mainframes, Wu says. If Mostek switched those applications to the supercomputers, whither the 470s?

Amdahl's market potential may also be limited by IBM, whose Sierra series of large scale mainframes are expected to be introduced next year before Amdahl starts shipping the supercomputers. "If Amdahl tries to win any IBM accounts," says Cray's Gregory, "IBM will defend those accounts with Sierra. IBM has always priced the two-processor version of its mainframes very aggressively, and a two-headed scalar Sierra won't let Amdahl near an account."

The Amdahl base is probably sufficiently fertile ground for the firm to reach its projections—about six to 10 machines in the first year, though Amdahl won't divulge specific numbers—without hitting IBM accounts, Milunovich says. "Amdahl's customers may be a little more technical than IBM's and hence may be more receptive to a supercomputer. The companies that buy from Amdahl are already closer to the leading edge, more willing to compare prices and performances, more likely to go with new technologies. And over the next five years Amdahl may be able to take some share from IBM."

"The market and the machine sound great," he concludes, "but because it's a new market I really don't think anyone knows what is going to happen." ◉

POINT OF SALE

WHEN ONE AND ONE MAKE ONE

A small vendor finds success merging NCR and IBM point-of-sale networks and connecting them to SNA.

by Michael Tyler

Competing in the point-of-sale terminal business isn't easy, especially if you don't have the letters IBM or NCR on your business card. Nor is life much easier selling enhancements to those vendors' networks.

There is an exception, however, that may have a significant impact on the POS business. Life becomes much easier if you can sell a product that integrates IBM and NCR equipment into the same network. Neither IBM nor NCR offers that, nor is it likely that they will.

AW Computer Systems Inc., a small electronics firm in Mount Laurel, N.J., had spent a decade trying to crack the POS market with limited success, until it hit on a scheme that unites IBM and NCR terminal networks. The new product line promises to turn around the company's sagging fortunes and in the process create a new niche in the competitive POS market.

Two major department store chains, Mervyn's and Montgomery Ward, have signed multimillion dollar contracts with AW, and it is currently negotiating with other retail chains.

The attraction of AW's technology is simple, says vice president of systems development Michael Greenblatt. "NCR's equipment was outdated, and they wanted to charge $4,000 per terminal to replace them with new terminals. We upgrade the old terminals and give them additional communications capabilities for $150 to $450 per store per month."

In typical NCR or IBM networks, each store has a specialized minicomputer known as a concentrator—such as IBM's 3651 or NCR's 751—that ties up to 40 terminals in a loop. Loops from many stores in a chain can be connected to a central mainframe for price setting and checking, credit authorization, and other functions. IBM acknowledges that its in-store loops can accept only IBM cash registers, and that its loops cannot interconnect directly with NCR loops. Different vendors' loops can, however, connect to the same host. IBM also says its POS networks cannot interact directly with back-office applications such as inventory, purchasing, distribution, and billing. (NCR officials did not return telephone calls by press time, but a spot check of several users indicates its POS offerings have substantially the same limitations as IBM networks.)

The key element in AW's approach is a circuit board called the 157, which, based on dual Motorola 68000 microprocessors, replaces the main circuit board of the NCR 751 in an in-store loop. With the AW board, older NCR terminals such as the 280-120 can perform functions available on newer models, like the 2152. The older models could not perform price lookup or 16-digit credit card authorization, capabilities that store managers say are increasingly important in improving their checkout counter procedures.

Dennis M. Connors, vice president of MIS at Mervyn's, says he wanted to incorporate new functions into the chain's POS networks, but was stymied by NCR's response. "We would have had to change the in-place POS network" in the 66 Mervyn's outlets using the older 280-120 terminals. The other 43 stores in the chain already have the newer 2152s and can perform the functions without modification, he says.

Similarly, Montgomery Ward learned that if it wanted to introduce online price lookup—in which the sales clerk enters a product number and the mainframe supplies a current price—it would have had to switch to the new terminals at a cost of $4,000 apiece. The Chicago-based chain has 13,000 old terminals in its 300 stores, and balked at spending $52 million for price lookup.

At the same time Mervyn's and Montgomery Ward were considering their upgrades, AW sent out a massive direct mailing that detailed its concentrator board and accompanying teleprocessing software. AW asked $250,000 for an unlimited corporate license, which would let all of a chain's old NCR terminals emulate the newer models.

The AW circuit board enables older NCR terminals to perform all of the functions available on current models.

Both retailers nibbled at the bait. AW sweetened it by describing how the company could also combine IBM and NCR networks by interfacing the in-store loops to the IBM Series/1 minicomputer. In so doing, AW says, both NCR and IBM terminals would be able to coexist on the same loop.

"No retailer relies entirely on a single vendor," AW's Greenblatt says. "Through natural growth or acquisitions, they get IBM and several flavors of NCR registers."

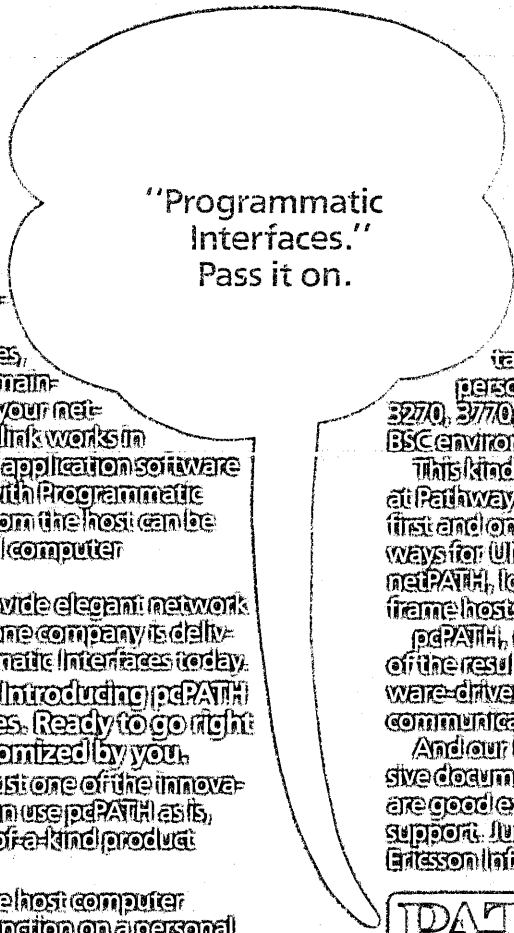
Some retailers question that premise. Mervyn's, a unit of Dayton-Hudson Corp. based in Hayward, Calif., uses NCR's POS terminals exclusively, Connors says, although IBM dominates other areas of his installation.

Theresa Moriarty, manager of POS networks for Lerner Stores in New York City, agrees. "Normally, it's common for all of a chain's terminals to be from the same vendor," she says. All 802 Lerner outlets have IBM terminals, "because we get better terms when we work with a vendor in volume. If we open a new store, we still add the same equipment."

AW's "bridge technology" offering went beyond the integration of NCR and IBM terminals, however, and that is what sparked the interest of Mervyn's and Montgomery Ward. By using the Series/1, Greenblatt says, AW enables POS networks to interface with other applications and with corporate SNA networks.

"That is not a trivial thing," Con-

MICRO/MAINFRAME NETWORKING HAS A NEW BUZZWORD.



"Programmatic Interfaces" let you easily link application software to micro/mainframe communications software.

With Programmatic Interfaces, communicating with the host mainframe is totally transparent to your network users. That's because the link works in the background while familiar application software runs on-screen. Additionally, with Programmatic Interfaces data downloaded from the host can be easily reformatted for personal computer applications.

Programmatic Interfaces provide elegant network solutions painlessly. And only one company is delivering a product with Programmatic Interfaces today.

New from Pathway Design. Introducing pcPATH with Programmatic Interfaces. Ready to go right out of the box or easily customized by you.

"Programmatic Interfaces" is just one of the innovative features of pcPATH. You can use pcPATH as is, right out of the box. This one-of-a-kind product allows you to...

- Maintain connection with the host computer while performing another function on a personal computer.
- Conduct multiple display sessions with host.
- Initiate multiple print sessions.
- Verify procedures with an on-screen HELP facility.

pcPATH features a powerful, multitasking, modular architecture that enables personal computers to inexpensively emulate 3270, 3770, and 3780/2780 devices in SDLC/SNA and BSC environments.

This kind of breakthrough technology isn't unusual at Pathway Design. We also introduced uniPATH, the first and only SNA and BSC communications gateways for UNIX-based operating environments, and netPATH, local area network gateways to mainframe hosts.

pcPATH, uniPATH and netPATH are good examples of the results of our commitment to provide software-driven solutions for enhancing network communications.

And our lifetime software warranty, comprehensive documentation and customer support HOTLINE are good examples of our commitment to customer support. Just ask Sperry, Visual Technologies or Ericsson Information Systems.

PATHWAY

Pathway Design Inc.
177 Worcester Street, Wellesley, MA 02181
800-343-0515 (In Mass. 617-237-7722)

YOURS FREE

For complete details on *pcPATH, the only micro/mainframe link with Programmatic Interfaces,* return this coupon to Pathway Design Inc., 177 Worcester Street, Wellesley, MA 02181 or call toll-free **800-343-0515** today. (In Massachusetts, 617-237-7722.)

Name _____

Title _____

Company _____ Telephone _____

City _____ State _____ Zip _____

CIRCLE 51 ON READER CARD

TSO/MON MEASURES, MONITORS, MANAGES TSO

Users tell the story. Researchers verify it. TSO/MON is vital to the effective management of the volatile, and expensive, TSO environment.

According to *Auerbach Computer Technology Reports,* **"Response times will degrade and/or resource costs will skyrocket unless a means is found to assure that TSO will be used in an efficient and productive manner."**

A Systems Analyst at a leading Midwestern insurance company, underscores this view of TSO: **"TSO is a good learning tool, but there is a natural tendency to misuse it, play with it, and perhaps play games on the system. TSO/MON lets us monitor that."**

> "As a systematic and readily understood control system for tracking the performance, load, and user activity of the TSO facility, TSO/MON fills a distinct need for those installations that are operating, or are planning to operate, TSO."
>
> —*Auerbach Computer Technology Reports*

"JUST THE FACTS, MA'AM."

TSO/MON tells you who TSO users are and what they're doing. It allows you to forecast their future needs. And it does it from the network level right down to the individual terminal.

Yes, TSO/MON can assist you in that often-neglected area of TSO management—the performance of the TSO network. It allows you to monitor both general TSO network activity and TSO network use by specific terminal. By profiling this activity for an extended period, it lets you identify network trends.

With TSO/MON, you can also find out who's using ISPF and for what, which panels are being used and how often, which users are accessing sensitive applications, and what programs and CLISTs are being run under ISPF.

In short, TSO/MON provides the data and the reports that allow you to practice the three key management approaches to the control of TSO: daily review, problem tracking, and ongoing evaluation.

"LET THERE BE LIGHT!"

In any organization, the importance of communication by and among managers is essential to success. TSO/MON makes such communication in a TSO environment as easy as reading a one-page summary.

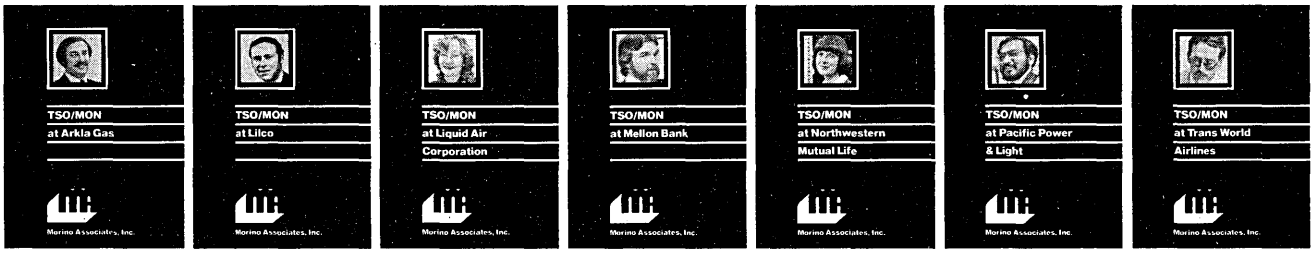
You see, TSO/MON maintains a file of historical TSO usage and performance data that can be reported against system and user service objectives. Then, it provides a one-page management summary as one of its standard reports.

At an East Coast utility, the Manager of the Operations Technical Support Division asserts: **"As a manager reponsible for providing quick, accurate computer service to...TSO users, it is important to me to maintain good communication with other managers. Throughout our use of TSO/MON, I've been able to do this and keep those users happy."**

A Project Systems Analyst at a major airlines says of the director of his department: **"He sees the backup TSO/MON gives him in terms of dealing with both his management and his users—there's no way to argue with someone who has hard data in hand."**

ASK OUR USERS ABOUT TSO/MON!

And ask *us* about the new TSO/MON ONLINE—now available for realtime performance monitoring.



TSO/MON Promotes
Effective TSO Management

1. Daily review of service and performance
   - Is response time on target?
   - When do problems occur?
2. Problem tracking
   - Is it the user?
   - Is it the system?
3. Ongoing evaluation
   - What are the response trends?
   - What are the workload trends?
   - What are the system availability trends?

TSO/MON Monitors
ISPF Problems

- Inadequate application system dialog design
- Poorly-related panel structure and switching
- Ineffective use of ISPF facilities
- Improper language used for the dialog requirement
- Inefficient CLISTs and Dialog Manager programs
- Unauthorized use of sensitive facilities
- Ineffectively-defined table structures for retrieval
- Inefficient use of ISPF edit facilities

"HEAD'EM OFF AT THE PASS!"

Once you have the hard data in hand, you'll be able to balance resources with workload, set service level agreements, monitor unauthorized use, establish equitable charges—and plan for the future. You'll be controlling TSO, rather than being controlled by it.

As the Manager of Computer Technical Services for a West Coast utility observes: **"Part of being a good manager involves taking action to head off a bad situation. TSO/MON has made it possible to do just that."**

TSO/MON Manages
Network Use

- Quantifies TSO network capacity and usage growth
- Measures the results of TSO network tuning
- Identifies excessive TSO network traffic by peak load
- Establishes a TSO network usage profile
- Detects wide fluctuations in TSO network load
- Isolates unused communication paths or TSO terminals
- Allows you to optimize host/NCP/cluster buffer sizes
- Establishes a base for evaluating TSO network performance
- Identifies specific TSO terminal IDs ranked by resources consumed for selected category
- Isolates any problem time period, the TSO terminal IDs within that period, and the resources consumed by each terminal identified

Another user, the Manager of Technical Support at a Southern gas utility, agrees: **"With TSO/MON, we can watch things develop and manage pro-actively rather than reactively."**

"GIVE ME THE BOTTOM LINE."

Datapro Research Corporation reports that users who responded to its independent survey **"unanimously agreed that TSO/MON saves human resources."** Story after user story substantiates this fact. Many of them tell of dollar savings as well.

If you would like to read more about the experiences of TSO/MON users, we'll be pleased to send you any or all of their stories. You'll understand, then, why more than 600 MVS and MVS/XA sites throughout the world are taking advantage of TSO/MON's management capabilities.

Before your installation's TSO benefits are eroded, before its TSO costs are escalated out-of-sight, learn about TSO/MON. Call or write *today.*

MORINO ASSOCIATES

8615 Westwood Center Drive • Vienna, Virginia 22180 • U.S.A. • Tel: (703) 734-9494
103 St. Peter's Street • St. Albans • Hertfordshire • England AL1 3EN • Tel: St. Alban's (0727) 37464
Lindemannstrasse 47 • D-4000 Dusseldorf 1 • Federal Republic of Germany • Tel: (0211) 6790034

CIRCLE 27 ON READER CARD

nors says. "Several of our stores have four or five or more networks coming into each store—one for POS, one for data processing, one for voice, etc. Each function required a network line, and with the breakup of AT&T that became very costly."

The AW offering can eliminate the overlapping networks, he says. "I can put crts, printers, time card devices, POS terminals, and other interactive systems on one telecommunications network. I don't need separate lines."

Because the AW board insulates the Series/1 mini from the terminals themselves, the terminals do not need to be replaced each time a new function is added. "If we found the best POS system on the market today and put it in every store, in two or three years another more advanced one would come along," Connors says. "Replacing POS terminals is too costly and disruptive, and we couldn't physically hire the people to get the job done in a timely fashion."

Hooking a POS network to a Series/1 means that overlapping dp networks can be eliminated.

Instead, Connors says, "We decided that Mervyn's would position itself to exploit the latest technology without spending millions of dollars. We cannot replace $40 million of POS terminals."

Mervyn's signed a contract with AW in late 1982 to install a pilot system that would replace the NCR 751 with the AW 157 and software in several stores. Four months later, Montgomery Ward signed on for a similar pilot installation.

The two pilots could not have come at a better time for AW. The company, which was founded in 1973 by Nicholas Ambrus and Charles Welch, had completed a successful $265,000 public offering in 1980, and revenues for that year were $2.99 million. The company had grown slowly since its inception by selling POS systems to catalog showroom chains. One customer, Best Products Inc. of Richmond, Va., thought enough of the system to buy 49% of the company and place three people on AW's five-man board of directors.

With the tight economy of 1981 and 1982, however, AW's fortunes soured. The company recorded a $250,000 loss in 1981 and revenues of $1.5 million in 1982. More than a third of the company's shrunken revenues came from Best, which was forced to let AW defer paying rent for 13 months in order to keep it afloat.

The two major pilot projects sparked a turnaround in 1983, however. AW doubled its payroll to 30 employees, and one customer—AW won't say which—kicked in $582,000 for the development of the bridge technology products. AW also secured a $200,000 line of credit from a local bank and promptly used $199,000 of it for product development. Revenues rose 58% to $2.3 million, of which only 3% came from Best Products. Nonetheless, working capital sank to one fifth the level of 1981, and the firm's net loss, after being virtually eliminated in 1982, expanded to $145,000—AW's fifth straight loss.

AW now appears to have pulled out of its slide, and expects to turn a profit this year, albeit with a little more help from its friends. In March 1984, Montgomery Ward placed a $3 million purchase order with AW for the Series/1-based POS network system. The retailer is developing its own software to integrate back-office functions to the POS network. The Mobil Oil Corp. subsidiary hopes to bring all 300 of its stores on-line this year, AW's Greenblatt says.

Then in May, Mervyn's signed a $1.1 million contract to implement the same network system in at least 100 of its stores over an 18-month period. The contract also calls for AW to develop back-office software applications to interface to the POS network. Mervyn's has an option to convert all of its stores—which could number as much as 250—in three years, Connors says. With both clients, AW provides hot line telephone service and maintains a Series/1 at its headquarters so it can emulate a store in either network should problems arise that can't be resolved by telephone.

AW's success has been noticed by other retail chains, and the company is currently negotiating with Sears of Canada, Federated Department Stores, Carter Hawley Hale, and R.H. Macy, Greenblatt says. "Retailers don't want to be locked into what IBM or NCR does. They want software independence."

They also want, he says, any advantage they can get in dealing with their terminal suppliers. "We also play a political role, which we're not too comfortable about," Greenblatt notes. "Sometimes we are used by the retailer just to get NCR to make them a better deal. NCR would scramble to make a better offer than we did, but the chain would go with NCR either way because they're so much bigger than we are."

NCR and IBM have indeed reacted to AW. NCR was the first company interested in AW's 157, and even paid AW $50,000 for marketing rights, Greenblatt says. NCR never brought the product to market, however. "Now they're interested in talking to us again, because our device introduces IBM into what had been all-NCR shops. We affected them tremendously where they couldn't hit back," Greenblatt says. "After they didn't market our product once, we're leery about working with them again."

AW has also talked to IBM about licensing the bridge technology products. The firm is an authorized IBM remarketer, but IBM won't say whether it plans to endorse or sell any AW products.

AW has already begun turning its attention elsewhere. It has begun installing a pilot debit card transaction system in a chain in Texas and California. "It's a specific relationship between one store and one bank," he says. "Customers can use their bank debit card to make a purchase at the store. The store then gets its funds transferred from the bank overnight, eliminating the float it has to endure with credit cards like Visa and MasterCard. That way the store can avoid being caught in a credit crunch if the cost of money becomes too high."

Store customers, however, are accustomed to buying items and then not paying for them until as much as 50 days later, when the bill comes due. Greenblatt envisions retailers following the example of oil companies and offering discounts if patrons used debit cards or cash.

The pilot will be expanded in the first quarter of 1985, Greenblatt says. "We will be evolving the project within a corporate network rather than starting a new one."

AW has also considered expanding from department stores and mass merchandisers into specialty stores and supermarkets, but currently sees too many obstacles. "With specialty stores, you have to provide a very inexpensive system because they don't have many registers per store, and with supermarkets, you have to provide redundancy because it can never go down." ◉

MAINFRAMES

AMDAHL PUSHES UNIX

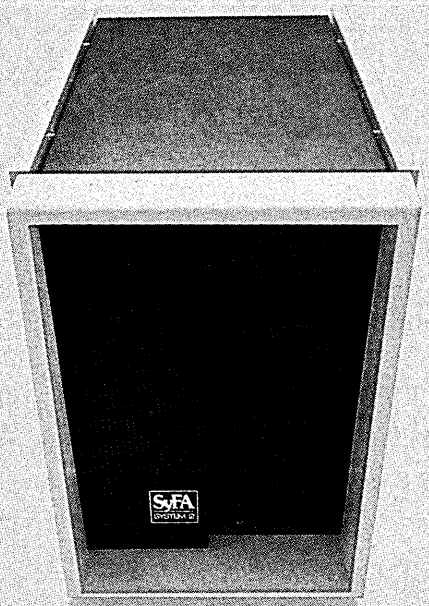
The plug-compatible mainframer sees big opportunities in the AT&T operating system.

by R. Emmett Carlyle

Amdahl Corp., the first and perhaps last great American hope in the IBM plug-compatible cpu arena, has reached a crisis point. Unrelieved pressure on its profit margins over the past four years—pressure that will only increase when IBM un-

SyFA®

SYSTEM 2

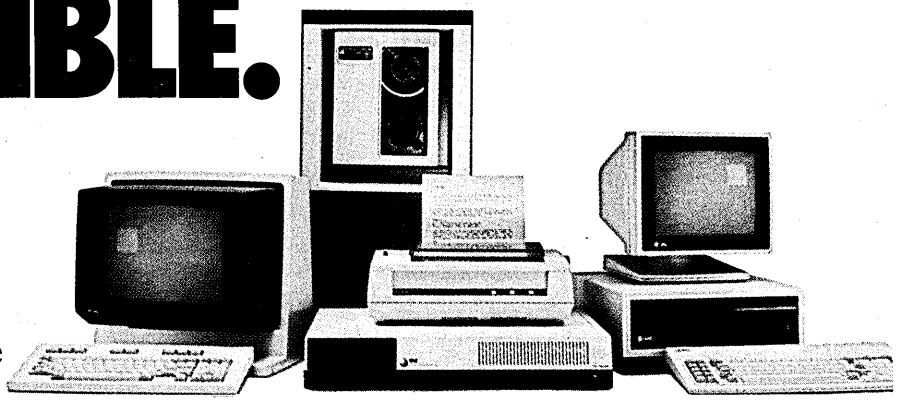


Would you believe 96 MIPS?

ComputerAutomation®
Commercial Systems Division

CIRCLE 28 ON READER CARD

THE NEW COMPUTERS FROM AT&T. FLEXIBLE. RELIABLE. AND VERY COMPATIBLE.

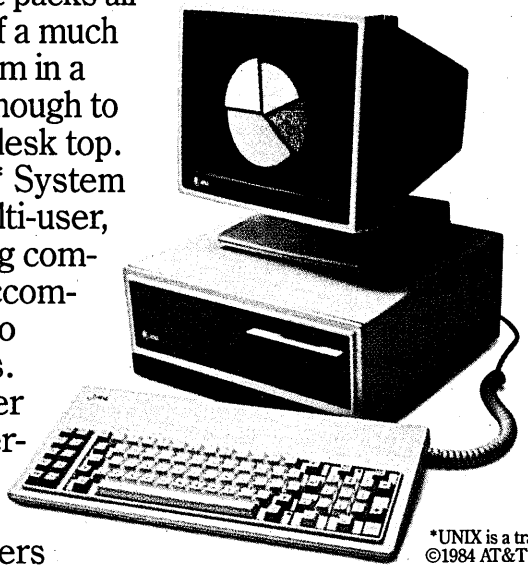


They're new in every sense of the word. New in conception, new in design, new in their ability to deliver unprecedented levels of computer performance. After over 40 years of designing and manufacturing computers, AT&T is proud to introduce a whole new line of innovative computers for business...AT&T Computers.

MEET THE FAMILY

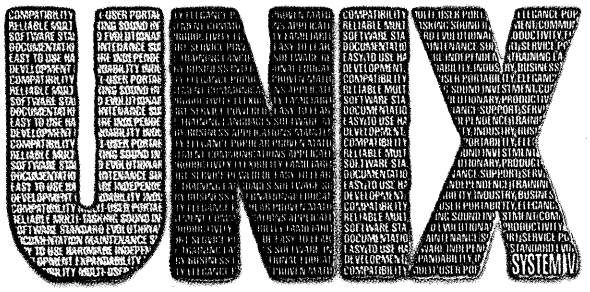
The 3B2, 3B5, and the AT&T Personal Computer make up the new AT&T family of flexible business computers.

The AT&T 3B2 is one of the most advanced super microcomputers you can buy today. It packs all the power of a much larger system in a size small enough to sit on your desk top. This UNIX* System V-based multi-user, multi-tasking computer can accommodate up to 18 terminals.



For larger family gatherings, the AT&T 3B5 minicomputers make great hosts, because they can accommodate up to 60 users.

And meet the new AT&T Personal Computer. What makes it special is its ability to combine high performance with excellent



graphics capabilities, an adjustable display monitor, and non-glare screen. Its flexibility allows it to operate as a stand-alone unit or as part of an integrated computer network. And its compatibility allows it to run most popular business software, including most available MS-DOS** applications.

THE FAMILY THAT WORKS TOGETHER

One big advantage of AT&T Computers is that when there's work to be done, everyone pitches in.

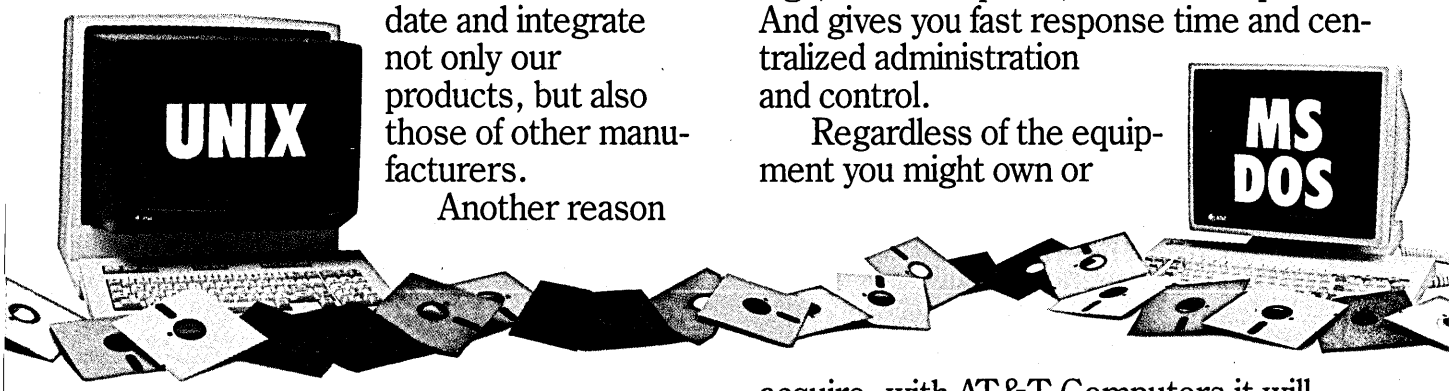
Each family member works together in a coordinated system, making tasks easier

*UNIX is a trademark of AT&T Bell Laboratories. **MS-DOS is a trademark of Microsoft Corporation.
©1984 AT&T Information Systems.

and users more productive. All AT&T Computers are based on our Information Systems Architecture, an open, communications-based structure that can accommodate and integrate not only our products, but also those of other manufacturers.

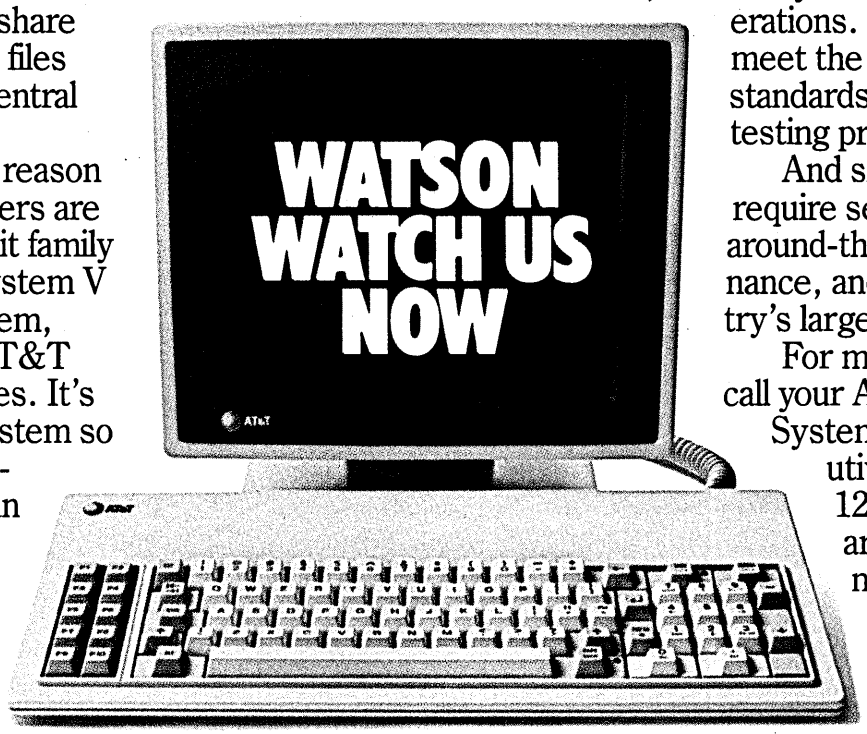
Another reason between terminals, workstations, and computers of all sizes. This local area network allows you to connect departments, buildings, industrial parks, or even campuses. And gives you fast response time and centralized administration and control.

Regardless of the equipment you might own or acquire, with AT&T Computers it will be like one big happy family.



AT&T family members work so well together is our unique PC Interface. It bridges the MS-DOS and UNIX Operating Systems, allowing you to use your PC as part of a larger 3B network. Several PC users can thus share peripherals and files stored on the central 3B2 machine.

Yet another reason AT&T Computers are such a close-knit family is our UNIX System V Operating System, developed by AT&T Bell Laboratories. It's an operating system so flexible, it's rapidly becoming an industry standard. And because UNIX software is upwardly compatible, 3B2 software can run on 3B5 computers, thus protecting your investment and eliminating costly and time-consuming retraining.



THEY GET ALONG FAMOUSLY WITH MOST EVERYONE

AT&T Computers get along so well with each other, they can't help but get along with just about everyone else. The AT&T Information Systems Network links AT&T Computers with those of other manufacturers. It's a flexible, cost-efficient link

BUILT-IN RELIABILITY AND SERVICE

Judging by the way they're made and cared for, this family will be around for generations. AT&T Computers meet the toughest design standards and most rigorous testing procedures.

And should you ever require service, we offer around-the-clock maintenance, and one of the industry's largest service forces.

For more information call your AT&T Information Systems Account Executive or 1 (800) 247-1212. Then make arrangements to meet the family: the 3B2, 3B5 and the AT&T Personal Computer. When it comes to meeting your needs, AT&T Computers couldn't be more compatible.

AT&T INFORMATION SYSTEMS. WHEN YOU'VE GOT TO BE RIGHT.

AT&T

CIRCLE 29 ON READER CARD

Introducing Lear Siegler's 3278 Keyboard Compatibles

Easy to Look at. Easier to Use.

Now you can combine Lear Siegler's exclusive High Touch™ style with the convenience of true IBM 3278 keyboard compatibility.

The ADM 1178 video display terminals offer superior performance and ergonomic design. With standard protocol converters, you can interface with virtually any IBM mainframe to achieve substantial savings in hardware and operator training expense.

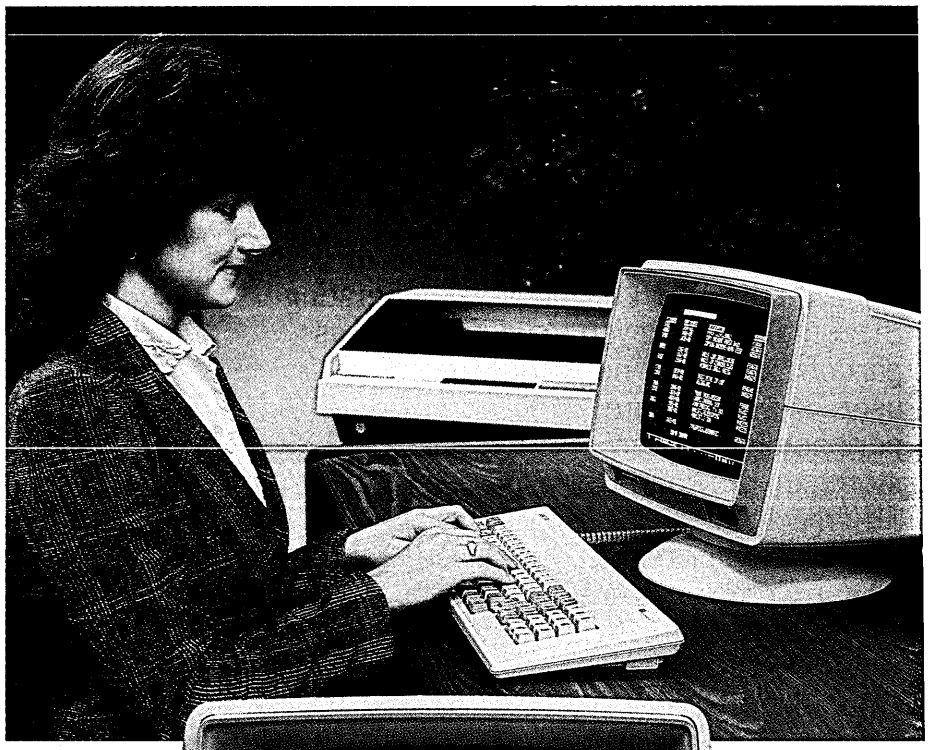
The ADM 1178 terminals can handle computer transmissions up to 19,200 baud without handshaking. They feature five video attributes (underlining, blink, blank, bold and reverse video), the IBM extended character set, four cursor modes (block or underline, blinking or steady), and 24 Program Function (PF) keys and two Program Access (PA) keys.

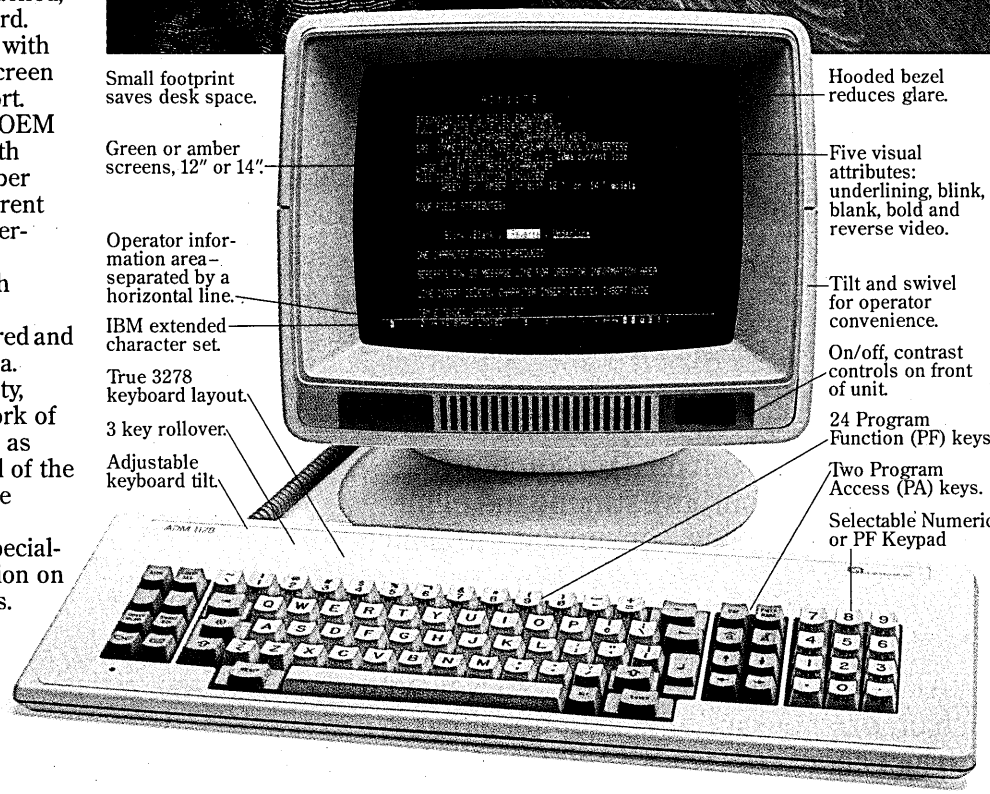
For operator convenience, the ADM 1178 terminals come with a full tilt and swivel monitor that stops positively in any position, an easy-to-read non-glare screen, and a detached, low-profile DIN standard keyboard.

The ADM 1178s are available with a standard 12″ green or amber screen and an RS-232C serial printer port. They can be easily modified for OEM applications and are available with such options as 14″ green or amber screen, answerback memory, current loop or RS-422 interface, and international character sets.

These Lear Siegler High Touch terminals are made in America-designed, engineered, manufactured and shipped from Anaheim, California. With this total, on-shore capability, and a complete worldwide network of sales and service centers, OEMs as well as end users can be assured of the best local support available in the industry.

Call our ADM 1178 product specialists today for complete information on products and protocol converters.





LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION
901 E. Ball Road, Anaheim, CA 92805 (714) 778-3500

IBM is a registered trademark of International Business Machines Corp.

©1984 Lear Siegler, Inc.

See us at Comdex, Booth No. 2072/2076.

CIRCLE 30 ON READER CARD

veils the Sierra/Trout mainframe family next year—has led to speculation that the future of the Sunnyvale, Calif., manufacturer may lie outside the realm of pure 370/MVS compatibility.

Such a turn of events may be unavoidable. The stakes for staying in the 370 mainframe game with the imperialistic IBM have risen dramatically since Amdahl shipped its first mainframe in the summer of 1975. The company has diversified into peripherals, communications, and software to gain new revenues, but has achieved only mild success in those arenas. Its new venture into vector processors is further evidence that management is spreading the risk and searching for new horizons.

Now, however, it seems that the greener pastures Amdahl Corp. longs for may relate more to AT&T than to IBM. Forces are at play that may relentlessly propel the company into the world of Unix, AT&T's much ballyhooed operating system. In the years ahead, say company officials, Amdahl may spend more time chasing Digital Equipment Corp.'s customers than IBM's. Indeed, industry sources say Amdahl and AT&T are in talks right now about jointly marketing Unix products.

It will come as no great surprise to informed observers if Amdahl sells 200 large scale cpus this year to boost its worldwide installed base to 1,170 processors. What may give them pause for thought is that 12 of those cpus will be bought solely to support Amdahl's homebrewed version of Unix, UTS.

Donald O'Shea, director of UTS products, says revenue from UTS licenses during 1984 will be slight—less than $2 million—but "attendant hardware sales could top the $40 million mark." Or, put another way, some 5% of Amdahl's total revenues for the year would come from a non-IBM system world.

Amdahl insiders expect that 5% to grow to as much as 20% over the next few years, and claim that UTS products could turn over $100 million next year.

In marked contrast, Amdahl's share of the IBM 370 market has been declining noticeably as IBM shortens product cycles, lowers prices, and creates such moving technology targets as MVS/XA. Bob Djurdjevic, editor and publisher of the *Annex Computer Report,* Phoenix, says Amdahl last year lost market share to both IBM and National Advanced Systems, which sells Hitachi mainframes in the U.S. and Europe.

"Amdahl's share of the total large IBM systems market fell to 9.7% from 11.2%," Djurdjevic claims, citing survey data from Computer Intelligence Corp., La Jolla, Calif.

Former Amdahl executives add that the company has tapped the 20% of IBM's customer base, the so-called "renegade accounts," that show the least reluctance to leave IBM's fold, and must now look for new customers elsewhere.

Aspen, a large scale, transaction-oriented timesharing system, seems to provide such an opportunity. The Amdahl-written software is currently under beta test at half a dozen sites as an alternative to IBM's MVS/TSO, but according to insiders it has so far had a rather lukewarm reception.

"Unix seems to offer Amdahl management a better shot at new markets," says a former Amdahl manager, adding that he expects the company to shift personnel from Aspen to UTS as the latter picks up momentum.

Amdahl has had to battle IBM all the way for every inch of Big Blue territory it has gained. Engineering and development costs topped 13% of Amdahl's total sales last year, compared to IBM's R&D budget of only 6.3% in 1983. "But strangely enough we lucked into UTS,"

Amdahl may generate as much as $40 million in Unix-related revenues next year.

says O'Shea breezily. In 1976, he says, a few Amdahl engineers and programmers who had used Unix in college pushed for the operating system for their development work, "and it grew from there."

"Today we're the second largest user of Unix after AT&T," O'Shea claims. "Almost 400 users share two 580 production systems in Sunnyvale. One runs UTS in native mode, the other UTS runs under IBM's VM/370."

Amdahl's management has for years argued the pros and cons of getting into the operating systems business. Many senior executives still feel that the company's rightful place is in IBM's MVS midstream, not out on a limb peddling its own nonstandard software. Obviously, such a venture would be expensive and risky.

"They seem unaware that the market has turned against them," notes the former Amdahl employee, who requested anonymity. Despite the objections of Amdahl's old guard, approval to press on with UTS was granted only a year ago with the formation of an independent business unit to handle the product.

"We've only mounted a restricted marketing program so far," says O'Shea. "Getting into the operating systems business is no mean step to take—especially in the support area. We have to support it like VM/370 or MVS. It's an incredibly expensive business."

He adds that Amdahl was still building a support organization and was not ready to take all orders for UTS.

So far 100 installations have bought UTS. "We started out with semiconductor houses and builders of electronic switches and PBXs, all using the software to design and develop their products. But now banks and other commercial concerns are taking the software and the product is taking on a whole new dimension," O'Shea explains.

Recent benchmarks of UTS on the 580 convinced Amdahl that it has two main markets to tackle: the IBM 370 data center and the current supermini customer, who is typically running DEC VAX gear but may be short on machine cycles.

Under IBM's VM control program, UTS is said to deliver performance equal to IBM's VM/CMS timesharing system, the computer giant's fastest growing operating system. But, Amdahl claims, UTS in native mode on the model 580 mainframe operates 25% faster than VM/CMS for a comparable license fee. (VM/CMS carries a monthly license fee of $1,800.) Used either way, UTS can in addition host the growing array of Unix workstations and applications software, the company emphasizes. UTS as currently written is based on Version 7 of Unix but is now being upgraded to the current AT&T-backed standard, System 5. AT&T is said to be spending $50 million this year to promote Unix, and Amdahl hopes to take advantage of that publicity.

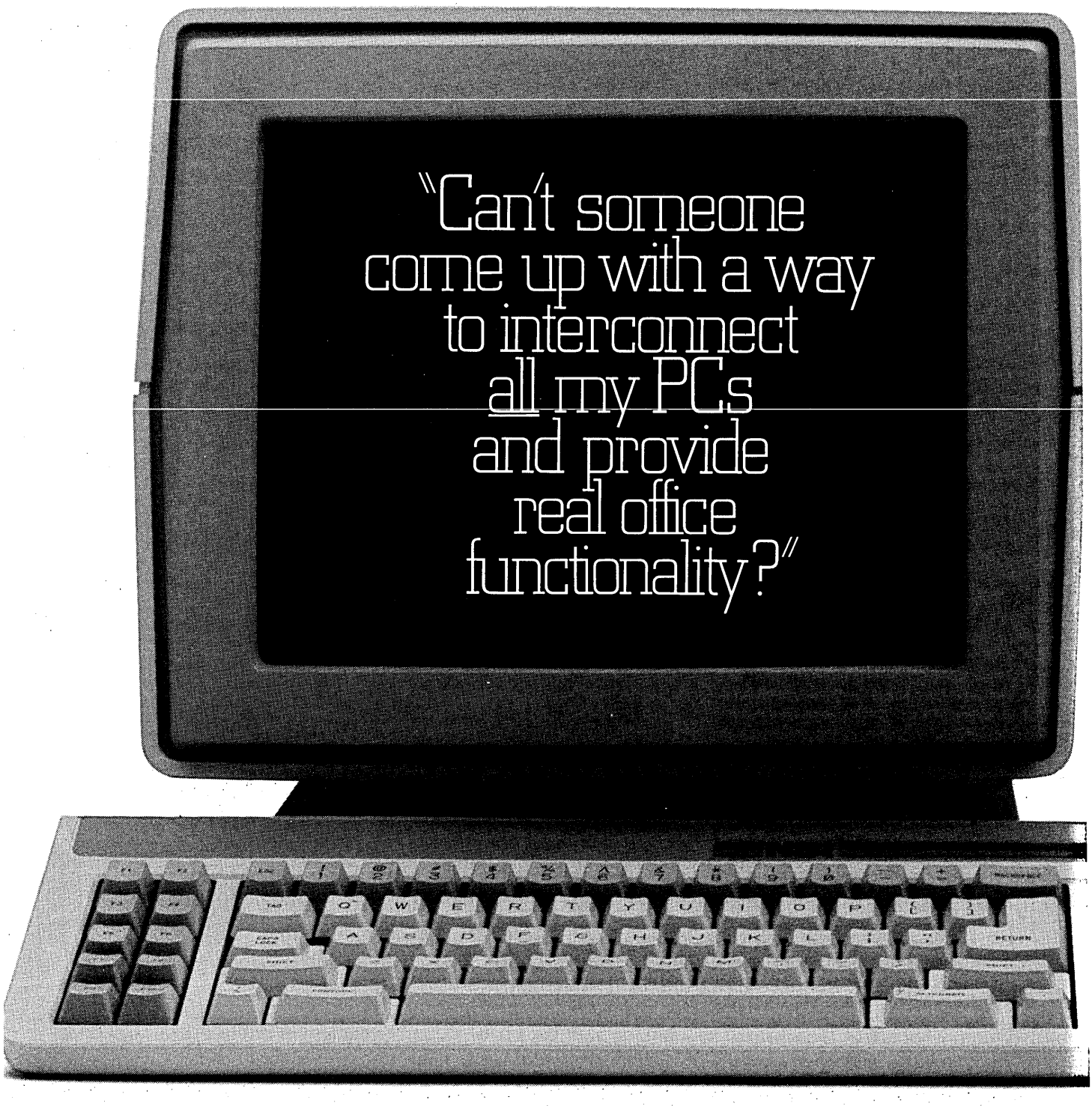
A recently completed survey from the Boston-based Yankee Group predicts that by the end of 1988, IBM alone will have created a base of some 7,000 mainframe Unix installations worldwide. "They've intimated that they will offer both native mode and VM-based Unix to customers," says the report's author, Frank Gens. "We estimate that 7% of IBM's small and medium mainframes and 3% of IBM's large mainframes will run Unix in three to four years."

Though Amdahl is geared to market to the IBM-compatible world, Gens thinks the biggest market for UTS lies elsewhere. "Unix System 5 is threatening to run away with the market for minicomputer and workstation class operating systems," he explains. "As they outgrow their current systems, these customers will search for mainframe class performers that run Unix.

"DEC has abandoned its plans to produce a VAX mainframe," Gens points out, "leaving the field open to others."

Amdahl has already sold UTS to AT&T to replace numbers of internal VAX-11/780s and even its own 3B20s. "We benchmarked UTS and discovered it runs 18 to 20 times faster on the 580 than on the VAX-11/780. When you use a 580 AP [attached processor] the multiple is 30 times the VAX," claims O'Shea. Since

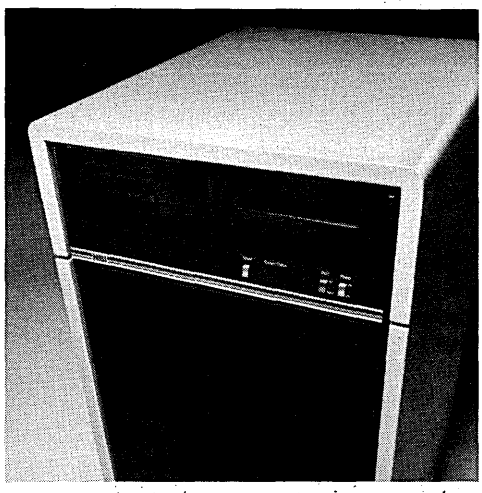
YOU ASKED.



©1984 NBI, Inc.

WE ANSWERED.

"SOMEONE HAS.



US."

We call it the OASys 64. And it does the most important thing any computer-based system can do: save time and improve your people's productivity.

With the OASys 64, you can interconnect up to 100 IBM or NBI PCs. To let them share and exchange information. Without exchanging diskettes.

To let them use the same storage, printers, and software. And with our shared software plan, you no longer have to buy expensive software for each additional user.

And the OASys 64 doesn't stop there. It gives PCs the best word processing in the business. Or flexible communications options like 3270, for access to your mainframe information. All with the security options you know you need in today's PC environment.

It's a time-saver. A work-saver. And a people-saver.

You couldn't ask for much more. And if you could, chances are, if we haven't already built it, we're already working on it.

For you.

For more information write: NBI, Inc., Advertising Dept., 3450 Mitchell Lane, Boulder, CO 80301.

NBI

OFFICE AUTOMATION SYSTEMS

CIRCLE 31 ON READER CARD

Unix System 5 runs on both the mainframe and the mini, all a DEC customer would have to do is recompile his VAX programs and run them on an Amdahl machine, he states.

While DEC is struggling to deliver a 5MIPS supermini, the so-called Venus cpu, Amdahl can offer a 24MIPS Unix system through the 580 AP. "Our 16MB of virtual memory also gives a lie to the idea that Unix is limited to 2MB of virtual user memory," O'Shea claims. The UTS Products Group is convinced that a market for 100MIPS supercomputers and vector processors based on Unix will emerge in the next five years.

AT&T and IBM have jointly developed a Unix System 5 package for 370 mainframes.

Though Amdahl's response to IBM's upcoming mainframe family will probably be limited to a 30% functional improvement in the 580's ECL technology and some price cuts, according to those who watch the company, it is using UTS itself to design the next generation of 370-compatible machines to be delivered in 1987.

While the company may take a future tilt at the Unix supermini companies for future market gains, Amdahl's heart is clearly in the 370 arena. The UTS group has gone to great lengths to ensure that its product is fully compatible with IBM's MVS and VM, while promoting it as a replacement for both of them. "It's not in IBM's best interests to promote a generic operating system in its 370 dp center," says O'Shea, who once taught VM to IBM employees in Europe. "If IBM fails to sell MVS, it pushes the customer to VM/370 to reassert account control."

One of VM's strengths is its ability to host several different operating systems on a single cpu. IBM watchers expect the company to eventually come out with a version of Unix to run under VM.

IBM could net over $6 billion from MVS licenses alone over the next five years. The market for VM software is even bigger, some believe. AT&T and Japan's Ministry of Trade & Industry (MITI), which recently opened a dialog on replacing MVS with Unix System 5 as the preferred "standard" for new mainframe applications, would dearly love to wrest VM account control from IBM and replace it with a "generic" Unix.

AT&T and IBM have jointly developed a Unix System 5 for use on IBM mainframes at the former's Indian Hill Labs in Naperville, Ill. AT&T has made it known that it would like to sell the software to IBM customers, but this can't be done without IBM's permission. So far, only Bell Laboratories has been allowed to use the software.

At last July's NCC, an AT&T Information Systems manager declared that the company plans to offer Unix on "everything from lap-tops to mainframes." When asked how the IBM mainframe version would be implemented, he said it would be as a guest under VM/370 (see Look Ahead, Aug. 1, p. 9). He said the product would be delivered sometime in 1985.

When Amdahl's Unix System 5 version emerges next January it may be the only Unix for large IBM-type mainframes. Although neither party would comment, industry sources say that AT&T and Amdahl are working out the details of a comarketing deal on UTS, which could be finished early next year. The pact would give AT&T a crack at IBM's mainframe base.

Other interested parties who may wish to join the Unix System 5 group are IBM's traditional mainframe competitors, which have watched growth of their mainframe businesses vanish, perhaps irretrievably. Thus, Amdahl could emerge as the leader of the System 5 "bunch" but it may have to go out on its own and draw IBM's fire first.

"All I can say is good luck to them," says *Annex Report*'s Djurdjevic. "IBM's customers have heard it all before. MVS was once supposed to be an open, generic system, and look what happened to that. Having already been victimized by IBM, I doubt they'd want to go around the same merry-go-round again with AT&T."

Amdahl's old guard is right about one thing. It has yet to be proven that there is any other mainframe business than the IBM MVS mainframe business. The Yankee Group is skeptical that Amdahl and the others can mount a successful frontal assault on the 370 data center at this time. "They have a technical sell to the development, scientific, and engineering centers, but not a direct in to the MVS production site," comments Yankee researcher Laura Stuart. "But you have to keep your eyes on the programmers and engineers who it seems are all weaned on Unix at college these days. When they go to work at 370 sites, they may push for applications compatibility between the production mainframes and the Unix workstations they will want to use."

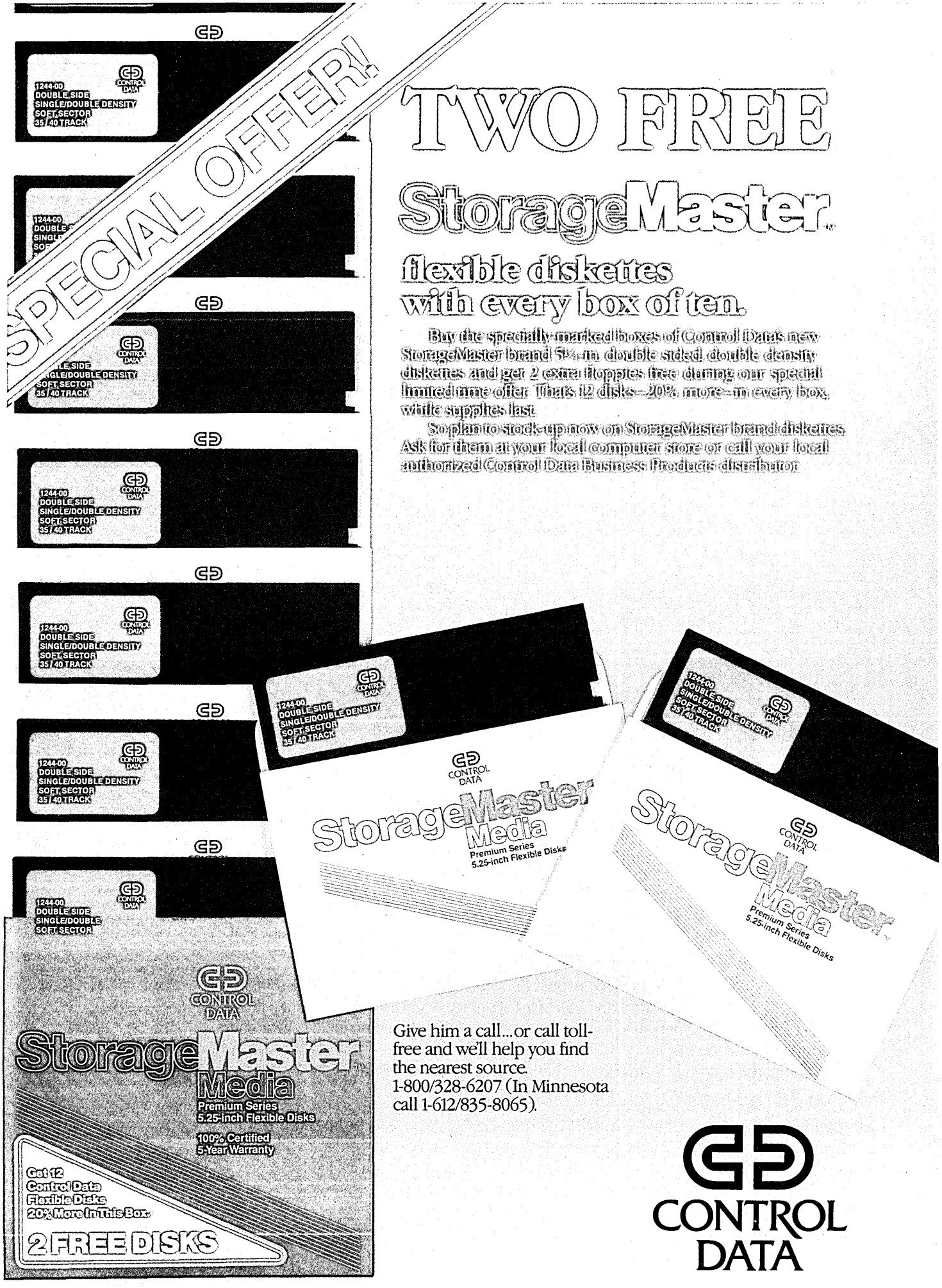
The company's Unix marketing effort is fairly restricted so far.

That's how Unix found its way into Amdahl eight years ago. Today, the UTS Products Group is convinced the Unix story is not one solely of micros, but also of mainframes. The question is, will it be they or IBM who will author the large new characters in that story? ◉

CONTROL DATA
BUSINESS PRODUCTS
AUTHORIZED DISTRIBUTOR

YOUR "SPECIAL OFFER" DISTRIBUTOR

CALIFORNIA
Northridge, CPX • 818/341-3783
Orange, Data Bits Inc. • 714/633-6650
Sacramento, Quest Media & Supplies • 916/488-3310
San Diego, Computer Media Products • 619/565-7802
San Francisco, Force 4 • 415/397-1446
San Jose, Gaan Computer Supplies • 408/252-4210
San Rafael, Kalleen's Inc. • 415/459-1010
Sunnyvale, Idea • 408/745-1911
Tustin, Magnetic Disc Services • 714/832-4016
COLORADO
Denver, Greenbar Corp. • 303/373-8510
FLORIDA
Miami, Data Research Associates • 305/274-7855
Miami Lakes, Kar Computer Supplies • 305/557-4782
Tampa, National Data Products • 1-800/237-3875
IDAHO
Idaho Falls, R&L Data Systems, Inc. • 208/529-3785
ILLINOIS
Chicago, Computers Midwest Inc. • 312/964-4625
Chicago, Data Research Associates • 312/885-0200
Lombard, Dartek Computer Supplies • 312/963-9136
Schaumburg, Force 4 • 312/397-8444
West Chicago, Midwest Computer Supply • 312/231-1112
Wheaton, American Computer Equip. • 312/653-7444
INDIANA
Indianapolis, National Data Products • 317/241-8217
South Bend, Kelley World Co • 219/255-4926
IOWA
Des Moines, Nics Computer Supplies • 515/225-2526
LOUISIANA
New Orleans, Copper Business Forms • 504/581-7611
MASSACHUSETTS
Boston, Data Research Associates • 617/938-0425
Norwood, NRI • 617/769-7550
Norwood, Timebrokers of New England • 617/769-4060
MICHIGAN
Detroit, Transaction Storage Systems • 1-800/FLOPPYS
Southfield, Comtel Instruments • 1-313/358-2505
Warren, Design Business Systems • 1-313/759-5200
MINNESOTA
Minneapolis, Minnesota Computer Supplies • 612/881-5507
MISSOURI
Livonia, Eczel • 313/261-7510
St. Louis, Computime Inc. • 314/991-2991
N. CAROLINA
Charlotte, Dataprint Inc. • 704/535-0296
NEBRASKA
Omaha, Nebraska/Iowa Computer Supply • 402/551-1288
NEW JERSEY
Englewood, Data Research Associates • 201/569-2620
South Plainfield, CPX East • 201/756-8040
NEW MEXICO
Albuquerque, Del Sol Computer Supply Shop • 505/883-9127
NEW YORK
Deer Park, Macade Inc. • 516/667-6565
Rochester, Datron Computer Products • 716/328-8390
Plainview, Global Computer Supply • 516/292-3400
Staten Island, Compu Media Supplies • 1-800/248-2418
OHIO
Cleveland, DAK Supply • 216/238-0102
Cleveland, Comtel • 216/442-8080
Independence, Eczel • 216/661-7707
Columbus, ABCO Distribution Inc. • 614/457-6955
OREGON
Portland, Force 4 • 503/620-8888
PENNSYLVANIA
Philadelphia, Data Research Associates • 215/659-2360
Philadelphia, Teck-Mate Ltd • 215/245-4545
Pittsburgh, Data Research Associates • 412/429-1330
TEXAS
Dallas, CPX South • 214/248-2880
Dallas, Philbo Enterprises • 214/358-1200
Houston, Data Systems Supply • 713/680-9353
Houston, National Data Products • 713/988-4008
San Antonio, Tejas Business Services • 512/654-7969
UTAH
Salt Lake City, Force 4 • 801/973-9111
Salt Lake City, Rebel Enterprises • 801/261-3300
VIRGINIA
Fairfax, Data Research Associates • 703/385-3414
WASHINGTON
Bellevue, Force 4 • 206/682-9330
Seattle, Advanced Computer Products • 206/527-4300
WISCONSIN
Milwaukee, Media Management & Magnetics • 414/783-5423



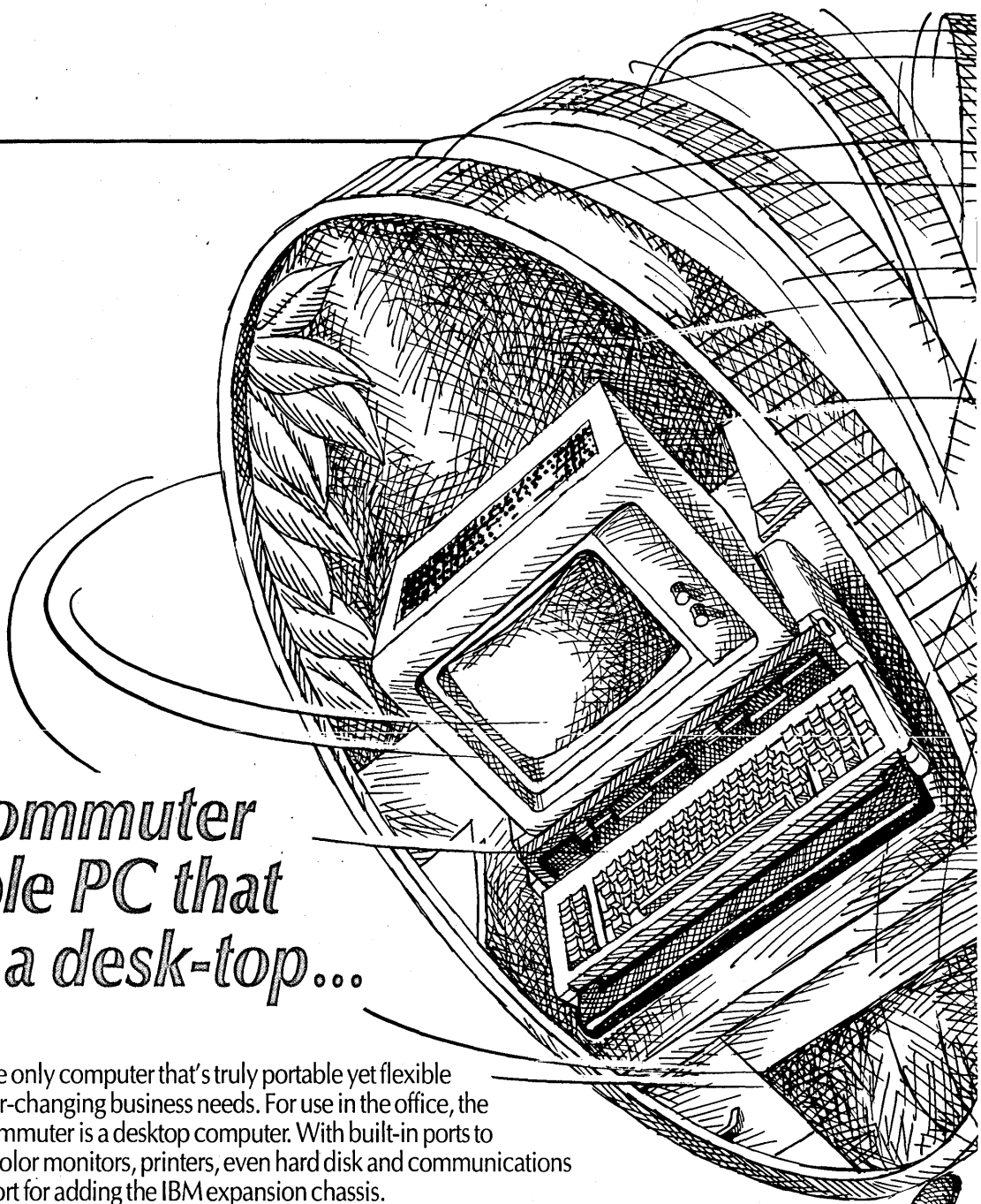
TWO FREE StorageMaster™ flexible diskettes with every box of ten.

Buy the specially-marked boxes of Control Data's new StorageMaster brand 5¼-in. double sided, double density diskettes and get 2 extra floppies free during our special limited-time offer. That's 12 disks—20% more—in every box, while supplies last.

So plan to stock up now on StorageMaster brand diskettes. Ask for them at your local computer store or call your local authorized Control Data Business Products distributor.

Give him a call...or call toll-free and we'll help you find the nearest source. 1-800/328-6207 (In Minnesota call 1-612/835-8065).

CONTROL DATA



Is the Commuter a portable PC that acts like a desk-top...

It's Both.

Because Commuter is the only computer that's truly portable yet flexible enough to meet your ever-changing business needs. For use in the office, the IBM® PC compatible Commuter is a desktop computer. With built-in ports to attach monochrome or color monitors, printers, even hard disk and communications devices. Plus a built-in port for adding the IBM expansion chassis.

But to hit the road, just snap on Commuter's optional flat panel display, and you've packed all that desktop power into the size of a briefcase. Commuter will even fit under an airplane seat.

Desk-top power in a 16-pound briefcase.

Commuter also features a 16-bit 8088 processor. 128K of memory, expandable to 512K. Single or dual integral floppy disk drives, each with 360K bytes of storage. A full 83-key keyboard with an IBM PC layout, including numeric pad and ten function keys. And IBM compatible color graphics and monochrome support.

Now compare Commuter to any desktop or portable and see how it stacks up.

True IBM PC compatibility, without modification.

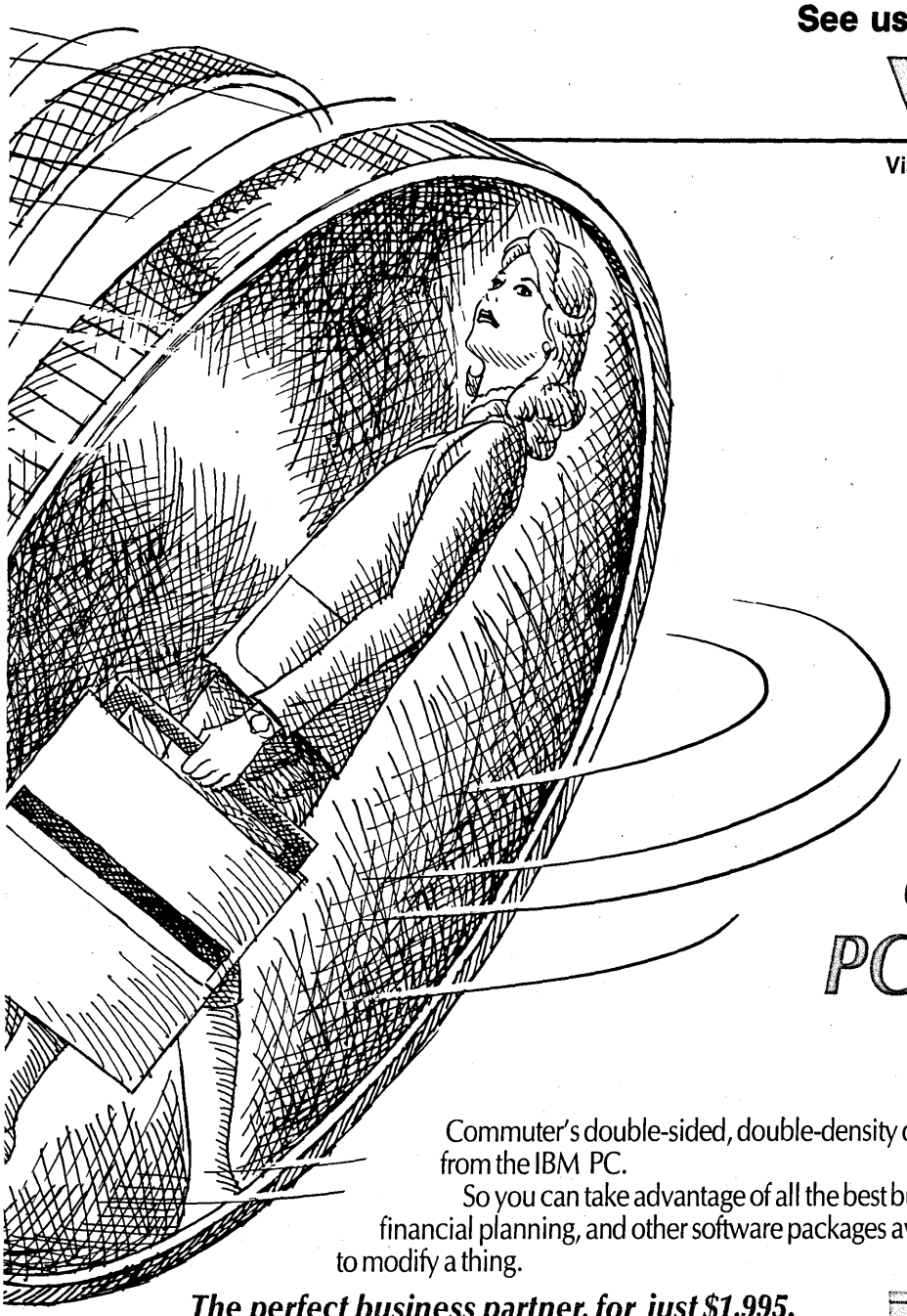
Many portable computers call themselves IBM compatible. Until you read the fine print. But Commuter runs virtually all IBM PC software – right out of the box. Business programs like Lotus® 1-2-3™ and Symphony,™ VisiCalc,™ or WordPlus.™ Exciting games like Flight Simulator.™ Or even educational games from Spinnaker.™ In fact, think of Commuter as an IBM PC to go.

The IBM PC styled keyboard is just the beginning. Because Commuter comes bundled with the MS-DOS™ operating system and GW Basic.™ And at 5¼",

See us at COMDEX, Booth #1836.

VISUAL See for yourself®

Visual Technology Incorporated



or a desk-top PC that acts like a portable?

Commuter's double-sided, double-density diskettes are directly transferable to and from the IBM PC.

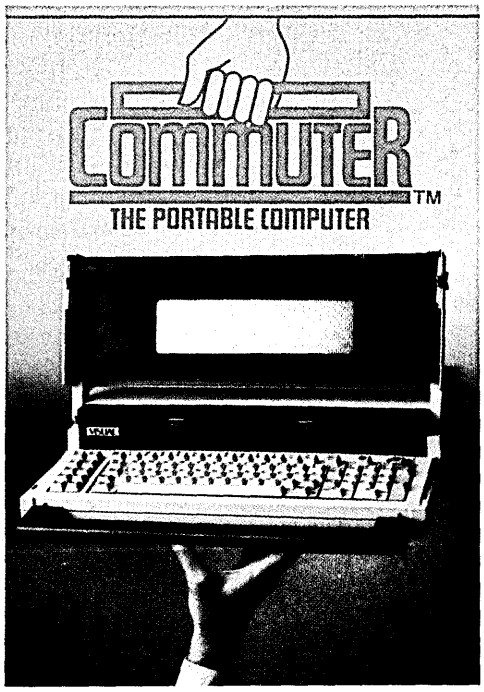
So you can take advantage of all the best business accounting, word processing, financial planning, and other software packages available for the IBM PC. Without having to modify a thing.

The perfect business partner, for just $1,995.

In terms of power and capacity, Commuter is as large as most desk-top models. But at 3½" x 18" x 15", and weighing just 16 pounds, it's about the size of a slimline briefcase. And there's one more area where Commuter is small: price. You can pick one up for as little as $1,995.

So whether you think of Commuter as a powerful portable, or a portable desk-top really doesn't matter. Because to coin a phrase, Commuter gives you the best of both worlds. In a way no other computer can.

For more information, call **1-800-847-8252** (in MA call **1-800-462-5554**), or write Visual Technology Incorporated, 540 Main Street, Tewksbury, MA 01876. Or visit your local Commuter dealer today.

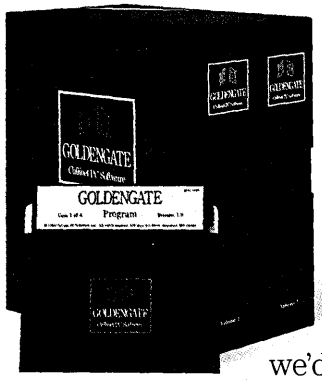


Commuter. It can take your business places it's never been.

COMMUTER is a trademark of Visual Technology Incorporated. IBM is a registered trademark of International Business Machines Corporation. MS-DOS, GW Basic, and Flight Simulator are registered trademarks of Microsoft Corporation. Lotus, 1-2-3, and Symphony are registered trademarks of Lotus Development Corporation. VisiCalc is a trademark of VisiCorp. WordStar is a trademark of MicroPro International Corporation. Spinnaker is a trademark of Spinnaker Software Corporation.

CIRCLE 32 ON READER CARD

The pc software to use if you have IDMS/R.



At last count, there were more than 50 integrated personal computer software packages. But for companies with IDMS/R, we'd like to suggest that only one really makes sense.

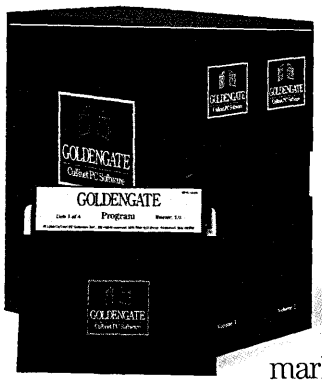
GOLDENGATE,™ Cullinet's pc software package, integrates seven components: database, spreadsheet, graphics, document processing, 3270 terminal emulation, asynchronous communication, and information manager. While the software is exceptional on a standalone basis, it offers an added benefit to pc users in an IDMS/R environment—true micro-to-mainframe integration.

Through the Information Database (IDB), the Cullinet software product that serves as a foundation for corporate information management, a GOLDENGATE user can have direct "transparent" access to all data stored in the IDMS/R database. Indeed, with GOLDENGATE, accessing corporate data is indistinguishable from accessing data on a diskette.

The Complete Software Solution
Decision Support Applications Database

To find out more about GOLDENGATE, IDB and other components of our complete approach to information management, attend a Cullinet Seminar. To make arrangements, phone, toll-free, 1-800-225-9930. In MA, the number is 617-329-7700.

The pc software to use if you don't have IDMS/R.



How does GOLDENGATE™ stack up against the more than 50 competitive integrated pc software packages on the market today? With all due respect to those other packages, we'd like to suggest that it stacks up best.

GOLDENGATE's superior functionality results from its unique architecture. Each function in the program is designed to provide an optimum working environment. And each is linked to the others through core software.

The result is a functionally rich integrated pc package for business professionals. GOLDENGATE integrates spreadsheet, database, word processing, graphics and telecommunications capabilities. For use with databases other than IDMS/R, GOLDENGATE has a unique capability in combination with a standalone version of the Information Database (IDB) from Cullinet, a remarkable ability to effect effortless micro-to-mainframe integration. Integration so direct and transparent it allows the user immediate access to corporate data as needed.

GOLDENGATE, the integrated software that works better, because each of its components work better.

To find out more, we encourage you to attend a Cullinet Seminar. To make arrangements, phone, toll-free, 1-800-225-9930. In MA, the number is 617-329-7700.

Cullinet

We understand business better than any software company in business.

© 1984 Cullinet Software, Inc., Westwood, MA 02090-2198
GOLDENGATE is a trademark of Cullinet Software, Inc.

CIRCLE 33 ON READER CARD

SPREADSHEETS FOR ALL

It all started with VisiCalc, but now even the biggest computers can run these handy programs.

by Edith Myers

The electronic spreadsheet, long a staple of microcomputer users, is ensconcing itself in the mainframe and supermini world.

When Michael Ohannesian, data processing director for Halcon International Inc., New York, first looked around early last year for a spreadsheet program that would run on a mainframe, he couldn't find one. "I'd been crying for years, why doesn't somebody come out with one?" he recalls.

Ohannesian found what he wanted in ESS, a package from Trax Softworks Inc., Los Angeles. Having used the package for over a year now, he says, "It's made my life a lot easier."

Mainframe-based spreadsheets appeared on the market in the spring of 1983. They are attractive to organizations with large host computers and existing network of terminals.

Today, at least 17 vendors offer mainframe and minicomputer spreadsheet programs, mostly for the IBM line of 370 machines. Others are sold for a variety of superminis. Hewlett-Packard sells VisiCalc/3000 and John McLean & Associates, Houston, offers Opticalc for the HP 3000. McLean also offers Opticalc for Digital Equipment Corp.'s VAX line of superminis. Access Technology Inc., South Natick, Mass., offers Supercomp-Twenty for VAX; Logitech Inc., Redwood City, Calif., has Logiplan; and Saturn Systems Inc., Minneapolis, offers Saturn-Calc for the DEC line.

Supercomp-Twenty is also available for Data General and Prime minicomputers and for IBM systems running under VM/CMS. Hourglass Systems Inc., Glen Ellyn, Ill., sells Calcmaster for Wang systems. Honeywell Inc. offers its Personal Computing Facility (PCF) and Sperry Corp. sells Sperry Calc for its 1100 series of mainframes. IBM markets a spreadsheet called Oxycalc, which was developed by Occidental Petroleum.

Independent vendors offering IBM 370 versions, in addition to Access and Trax, include the Mega Group, Irvine, Calif., with Megacalc; STSC Inc., Rockville, Md., offering Data Porte; Chicago Soft, Chicago, selling Dynaplan; Parallax Systems Inc., New York, with Execucalc; Cincom Systems Inc., Cincinnati, offering Mancalc; Oxford Software Corp., Hasbrouck Heights, N.J., selling Maxicalc; Tower Systems, Irvine, Calif., with Omnicalc; and Unicalc Corp., Wayne, Pa., selling Unicalc D/B.

It is generally agreed that Parallax's Execucalc, introduced in December 1982, was the first mainframe spreadsheet commercially available. Other announcements followed thick and fast in the early months of 1983.

Kevin Weaver, president of Parallax, says Execucalc has 165 users in 70 installations.

Its first user was Eric Baelen of RCA Corp. in Cherry Hill, N.J., who sees it as "part of a computer literacy arrangement, to keep people from jumping the gun." He refers to people at RCA who had heard about microcomputer spreadsheet programs and, knowing little about the products, thought personal computers would solve virtually all their computing problems. "Some of their ideas were really bizarre." With Execucalc on his mainframe, he can introduce users to a corporate information center. "We say here's what it looks like. If you can build it and it fits, maybe we'll buy you a pc."

In some cases the users did get their pcs, but "lots found they didn't need one." Baelen's users can get to Execucalc via IBM 3270-type terminals for jobs like salary planning and financial analysis. "It's great for people who have information on the mainframe and don't wish to download it."

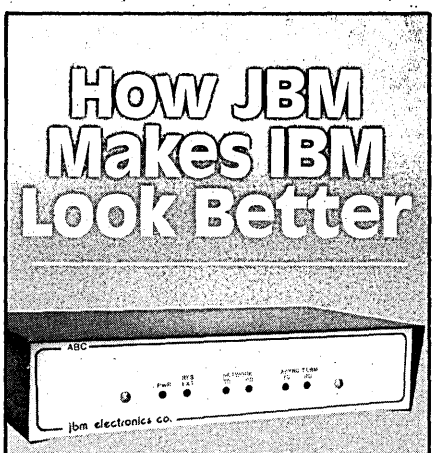
Hedging against a proliferation of microcomputers in their organizations is one of the biggest reasons dp managers go for mainframe spreadsheet programs.

"A lot of our folks were saying 'Gee, we want a pc,' " says William Colwell of GMAC's Information Center in Detroit. "We didn't want to install pcs until there was a good solid need." Colwell has been using Mega Group's Megacalc since June 1 of this year.

Spreadsheets for mainframes first began to be marketed early last year.

Ohannesian of Halcon, which is engaged in petrochemical research and development, says engineers at his firm are using ESS "for engineering calculations, equipment flow information, equipment requirements, and for calculating heat exchange. They change one number and know what they'll get. A lot of people wanted pcs just for these things. A pc costs $4,000. We had a lot of 3270-type tubes around the plant."

David Pestell of Toronto Hydro,



It's simple. The JBM 3270 Protocol Converter connects a variety of async devices into the 3270 world of IBM.

That means affordable peripherals . . . functions . . . and options not otherwise available to 3270 users.

With these special features:

- Emulation of IBM 3278 displays and 3287 printers by async devices.
- BSC and SNA support.
- ASCII and EBCDIC data format support.
- Up to sixteen async ports attached.
- Powerful on-board diagnostics.
- Custom programming available
- o o o AND MORE

Start making IBM look better to you, easily and affordably, just write or call today:

The right connection
jbm
electronics company

Dept. 0002
6020 North Lindbergh Boulevard
St. Louis, Missouri 63042
(314) 731-7781

CIRCLE 34 ON READER CARD

who began using Access Technology's Supercomp 20 in late August, says one of the reasons he acquired the package was "we didn't want to spread micros throughout the company at that time."

Toronto Hydro has a user drop-in center. "We let user departments know it's there and that we'll teach them to use it if they'd like." As of late September, five departments out of 24 had begun using the package. Pestell thinks the word will spread and the others will soon come around.

"They develop their own applications. A couple of managers have put their budgets on it. One is doing [electric power] load forecasting and another is preparing utility rate submissions," says Pestell.

Lack of available training courses has been cited as a barrier to the widespread use of mainframe spreadsheets. Michael Frazier, a senior information systems specialist for the House of Representatives' House Information Systems Service in the Office of Finance, Washington, D.C., says of the training offered with one mainframe spreadsheet he evaluated, "They sent us videotapes that were better than Valium for going to sleep."

Constraints of the mainframe packages are response time and the size of the matrices that can be handled.

Frazier selected Megacalc, for which on-site training is provided. The package eventually will be used to consolidate data from 800 offices of congressional representatives and committees for analysis by the finance office. In late September it still wasn't in active use because of "a backlog of other problems."

At GMAC's Information Center Mega Group trained 20 volunteers from the user community. "After they'd used it for a couple of weeks," says Colwell, "we sent them a questionnaire. It got high marks on ease of use and productivity."

There is a definite economic advantage to choosing a mainframe spreadsheet that costs between $10,000 and $20,000 and that can be shared within an existing terminal user base. But is it a stopgap measure? Vendors don't think so. Alan Cameron, founder of Mega Group, says, "Data will always be on the mainframe and the sophistication exists in spreadsheets to take advantage of mainframe power."

He adds that there are some 27,000 IBM mainframes installed that could run his firm's spreadsheet package, and the market is growing by 20% a year. He says his company would like to penetrate 20% of that 370 systems market.

Some users are handling with ease the spreadsheet applications they hadn't put on a computer before and which probably couldn't be done on a microcomputer. Farell Lines Inc., a New York transportation company, uses Maxicalc to calculate the best way to stow cargo on a ship to optimize such fuel-saving factors as stress, stability, and trim. It reduced to five minutes the job it once took three to four hours to do manually.

Mark Oleesky of CSS Automation Systems, a subsidiary of Continental Airlines, an ESS user, says he is doing "new things all the time." He likes a calendar function in ESS that has made it possible to develop a system for scheduling aircraft for maintenance.

This same feature helped solve an emergency when Continental furloughed and then rehired many employees. "We had to calculate a lot of payroll checks based on different starting dates. Then, when employees were transferred from Houston to Los Angeles, they had to be paid additional money because there is no state tax in Texas. All of this would have taken 20 minutes per employee manually and the results would have been full of errors. The spreadsheet handled it in seconds," Oleesky says.

Constraints of mainframe spreadsheet programs are response time and the sizes of matrices that can be produced.

Howard Nott of Dow Corning Corp., Midland, Mich., an Execucalc user, says the mainframe spreadsheet "is perfect for users who want to do something to the data in the corporate data base and send it to others on a network, but it's not choice. People who are used to microcomputer spreadsheets don't like it because it's not as fast."

"They sent us videotapes that were better than Valium."

GMAC's Colwell worries that "as we build our customer base, we'll have some response time problems," but he hasn't experienced any yet.

As for matrix size, IBM's 3290 plasma display, which sells for $7,000 and can display up to 10,000 characters, may be a partial answer. Even with this size, mainframe spreadsheet users will have to do much scrolling. OmniCalc, as an example, can create a matrix of 255 rows by 255 columns.

Oleesky of CSS says his ESS package can produce a matrix of 1.5 million rows by a million columns, but he doesn't mind "scrolling around a lot."

He doesn't worry about response time either. "I've had no response time problems." All in all, he's a happy user. "I've got my own inventory on it and that's one that's just too big. It wouldn't fit VisiCalc." ◉

CAD/CAM

A MAP FOR ALL VENDORS

Support is gathering for the General Motors-promoted factory automation protocol.

by Willie Schatz

The road to MAP, heretofore traveled only by General Motors, is rapidly becoming one long traffic jam. Pretty soon there may be a serious case of gridlock.

As shown in an impressive demonstration at the NCC in Las Vegas, MAP (manufacturing automation protocol) is GM's attempt to enable one manufacturer's machines on its factory floor to talk to another's. At the moment, what GM has on its factory floor is a failure to communicate. The official term is "islands of automation," which the company contends are preventing it from achieving maximum manufacturing efficiency.

It has come to the attention of other corporations that they, too, are suffering from this problem. Islands may be wonderful places to vacation, but who wants to live on one when production deadlines beckon?

"MAP has a chance to be one of the greatest boosts to productivity ever made," Hewlett-Packard's Paul Accompo said at a recent meeting of the MAP Industrial Involvement Group at the GM Technical Center in Warren, Mich. Approximately 185 present and potential users and vendors sent 450 representatives to find out if MAP is the direction in which they want to go.

Most seemed to think it is.

"If we ever needed anything in our factory, this is it," says Chuck Gardner of Kodak's engineering division. "If MAP takes hold as it should, we won't have to cram it down people's throats. GM can bootstrap us along."

That's not a bad vehicle to ride. GM's theory has been that it has an automation deadline to meet. Whatever purchasing means justify that end, so be it. GM is beginning to practice what it preaches. As more MAP standard levels—essentially the IEEE 802.4 broadband token bus specifications—are reached, vendors that want to keep GM's business will do it the automaker's way or else.

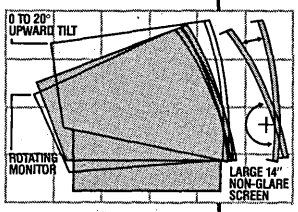
We're not talking small fry here. At a July meeting to solidify a multimillion dollar contract, supplier General

WE'RE ALWAYS HAPPY TO PUT IN A PLUG FOR IBM.

The IBM plug-compatible CIE-7800.

IBM introduced the 3178 as a less feature filled, less expensive alternative to their old 3278 Model 2 terminal.

The CIE-7800 is a far better alternative.

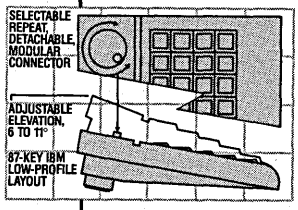


Because in one CIE-7800, you not only get the 3178 but all *five* models of the 3278. Yet, it is even lower priced than the 3178.

And when it comes to human engineering and design, there is absolutely no comparison.

The CIE-7800 is far more user oriented and compact. It has a footprint of only one foot by one foot. It has a larger, more readable 14-inch screen. Among its unique features are a printer interface and a bi-level, software activated security lock. Plus, it is designed to meet European standards. And it also offers international character sets.

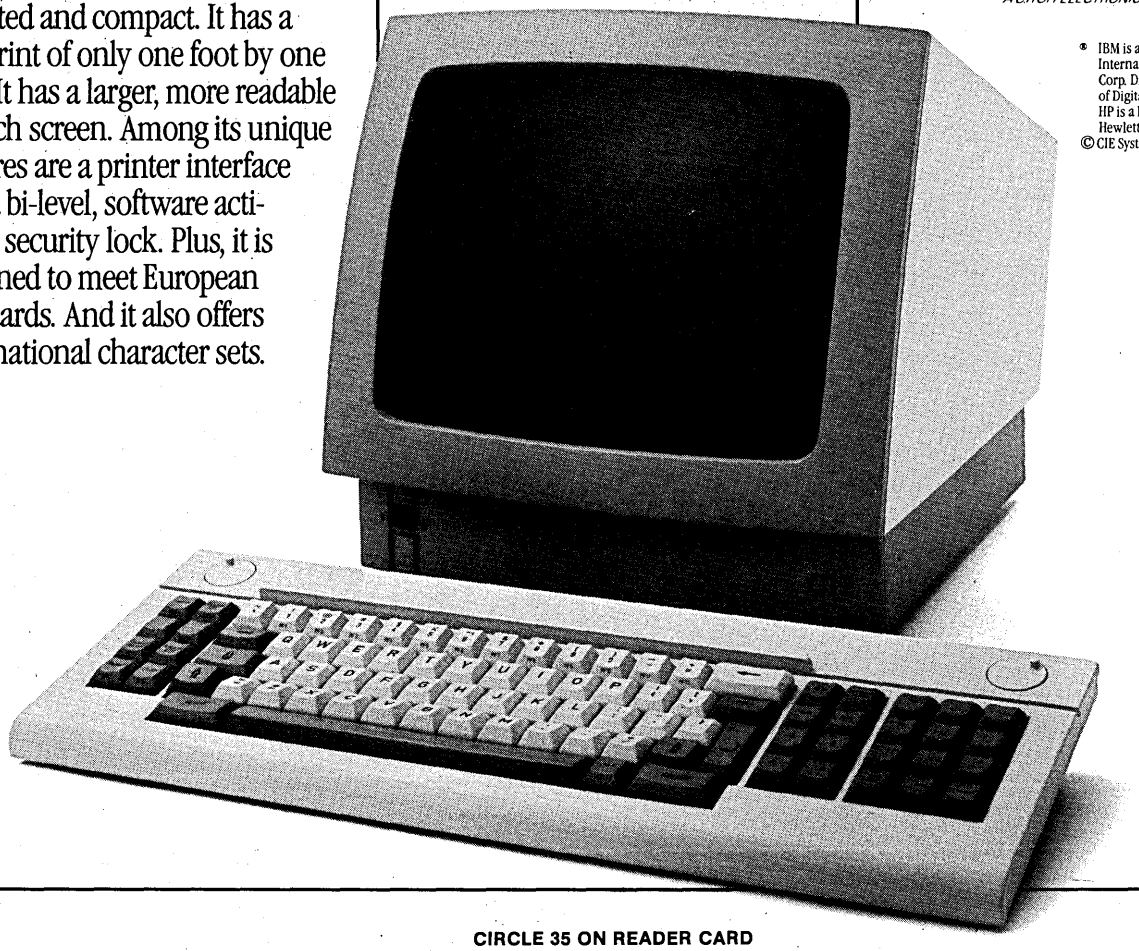
Even more, depending upon your system's requirements, the CIE-7800 is available with concurrent alternate personalities, such as DEC® VT100, IBM 3275/3276-2 (bisynch single station) and HP® 2622A, while still retaining IBM 3178/3278 capability.



The CIE-7800 is, indeed, setting whole new standards for the industry. It's a terminal that could come only from manufacturing experience and the financial resources of C. Itoh & Company Ltd., with over $60 billion in sales throughout the world.

To learn more about the CIE-7800, just contact our **Exclusive Sales Representative, Alternative Channel Marketing, Inc.** Call toll free 1-800-854-5959. In California, call 1-800-432-3687. In Europe, phone (022) 29-8384.

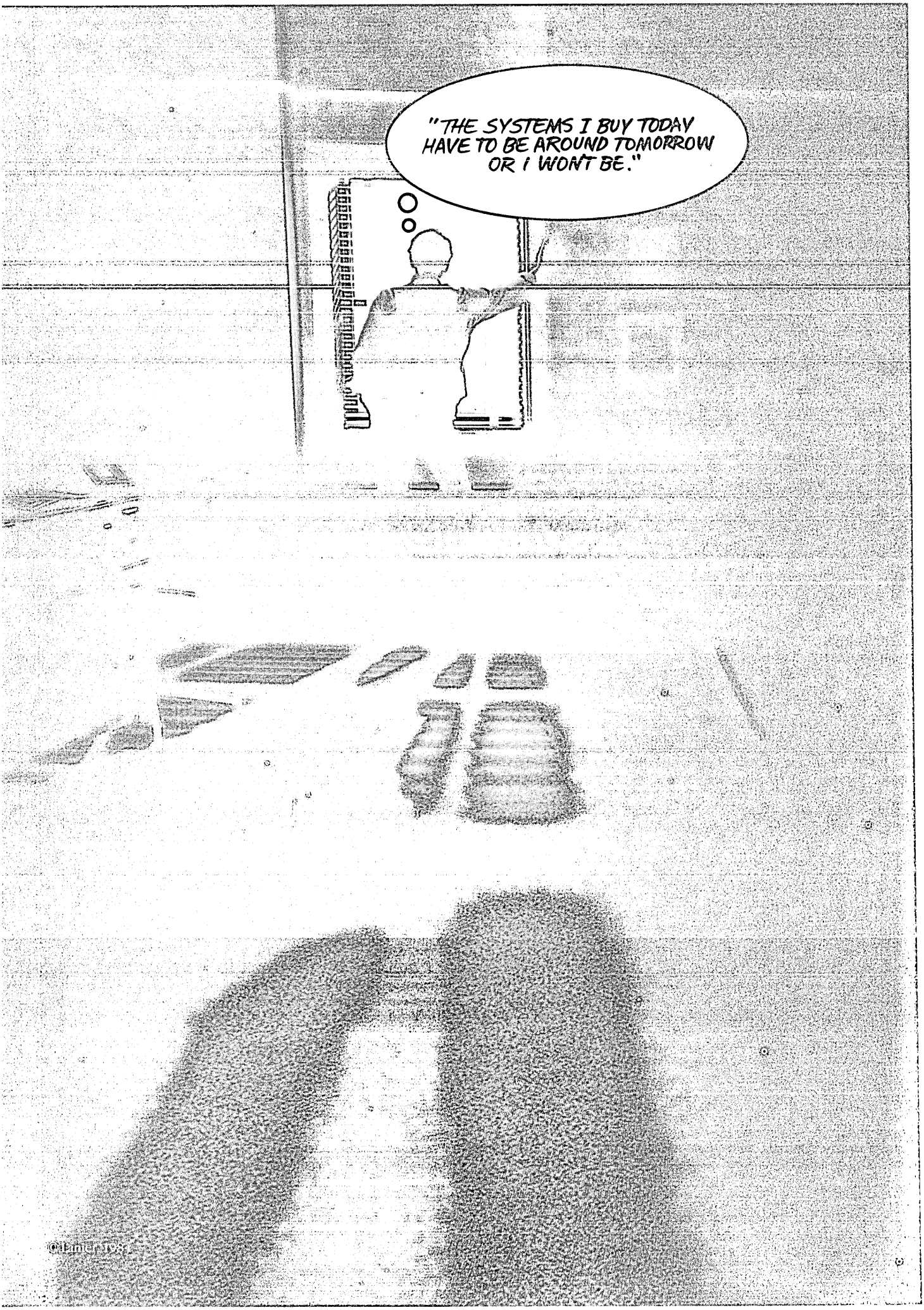
DISTRIBUTED SYSTEMS DIVISION OF
CIE SYSTEMS
A CITOH ELECTRONICS COMPANY

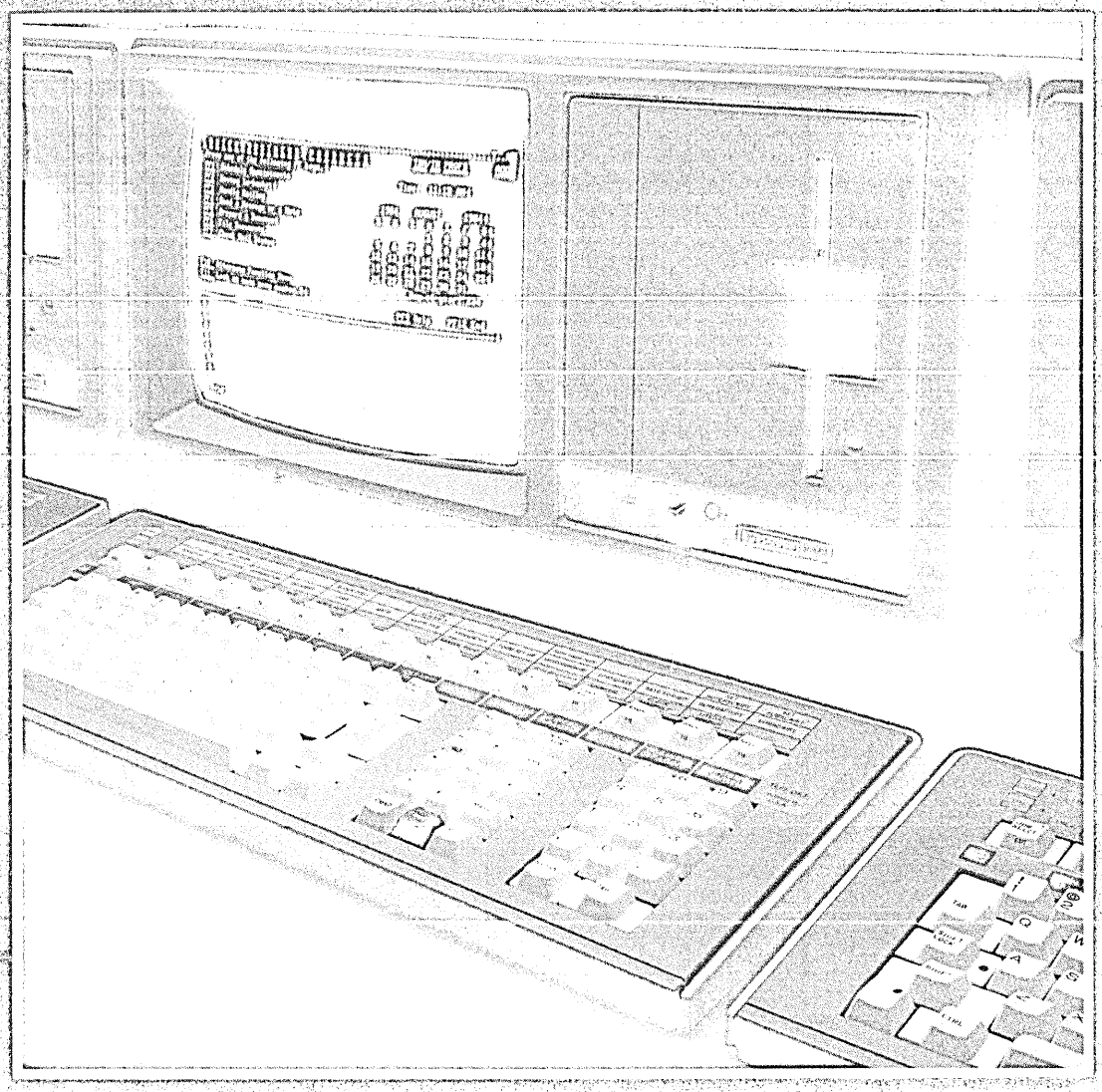


® IBM is a Registered Trademark of International Business Machines Corp. DEC is a Registered Trademark of Digital Equipment Corporation. HP is a Registered Trademark of Hewlett-Packard.

© CIE Systems, Inc. 1984

CIRCLE 35 ON READER CARD


"THE SYSTEMS I BUY TODAY HAVE TO BE AROUND TOMORROW OR I WONT BE."



SEE LANIER.

The Business System® 5000. It's versatile. Expandable. A network that links workstations and keeps information flowing quickly. Smoothly. And it's backed by customer training and service second to none. High technology? Absolutely. Lanier is now part of Harris Corporation, a world leader in Information Technology. For a demonstration, call us at 800-241-1706. Or send the coupon. Today.

FOR YOUR INFORMATION, WE'RE NOW PART OF HARRIS.

*In Georgia call 404-321-1244 collect.

Lanier, A Harris Company
Electronic Office Systems Division
SEE LANIER. For the Business System (BS) 5000 network.
For a demonstration circle 433.

Electronic Office Systems Division
1700 Chantilly Drive, N.E.
Atlanta, GA 30324

LANIER
A Harris Company

Name_____

Firm_____ Title_____

Address_____

County_____ Phone_____

City_____ State_____ Zip_____

HARRIS

11/1/84 Datamation 4 99 H K4

Electric told buyer GM that it wasn't going to be able to put in the fourth (transport) layer quite to MAP specification. GM's man in charge calmly replied that for that kind of service, they would go elsewhere for much less money. He then announced that the deal was history. Backtracking, GE asked for time to talk things over. GM gave it all of three days, and two of them were Saturday and Sunday. On Monday, GE yielded.

"What else are we supposed to do?" says Mike Kaminski, GM's MAP program manager. "If we mean what we say about implementation, we have to do

"If companies don't make products to match our specifications, we're just not going to buy them."

that. If companies don't make products to match our specifications, we're just not going to buy them."

That scene is going to be rerun many more times. And GM won't be the only one producing it. MAP is quickly winning some powerful friends in high places. When their money talks, noncompliant vendors will walk.

"Du Pont strongly supports the principles underlying MAP and General Motors' current activities that are accelerating the standards development and selection process," the chemicals company declares in a corporate position statement released at the Warren meeting. "DuPont expects to develop a corporate communication strategy that specifies the application of consensus U.S. international standards such as IEEE 802 and Proway; supports open, multivendor communication; and anticipates compatibility with MAP.

"As products that comply with the DuPont communication strategy become available, our purchase guidelines will give preference to products that comply (or soon will comply) with this strategy."

Company after company swore upon the altar of MAP some degree of devotion to its principles. Pilot projects are now running rampant, with vendors rushing to become GM's partner. IBM appeared during the first meeting day as a vendor, a reluctant participant in the NCC demonstration, and announced three software packages it had agreed to provide for GM's use.

"All we have to do is talk to each other if we're going to satisfy General Mother—I mean Motors," says Bob Wells, manager of marketing development at IBM's Systems Products Division. So even IBM's knees knock once in a while.

Wearing its user garb the next day, Big Blue admitted that sharing wasn't such a bad idea after all.

"We will focus on new business lines to integrate the MAP approach," says Ed Holdan, director of advanced engineering for manufacturing. "We have a real motivation and desire to take MAP and fit it into the IBM requirements.

"We are in the process of making management aware of what MAP is and how it can help us. We are two or three months away from specific implementation of a MAP pilot project within IBM."

Another potent user, McDonnell Douglas, St. Louis, promises, among other objectives, to assist in the definition of industry standards where they are lacking and "provide user feedback/pressure to encourage computer/device manufacturers to accelerate the acceptance of industry standards." Just so vendors don't miss the message, the company also will provide marketplace feedback and pressure to encourage computer/device manufacturers to develop a standard set of nonproprietary communication products to support the factory floor.

"We expect to reference MAP specifications in quotes to vendors," says Dave Scott of John Deere Inc., the Moline, Ill., manufacturer of farm machinery. "We will give preference to vendors who meet those specifications."

At least one of the vendors, Intel of Santa Clara, Calif., is listening. It seized the meeting time to announce three new products that incorporate MAP specifications. A very large scale integration (VLSI) chip family for interfacing to local area networks, a multibus board family, and new communication software were cited by Intel executive vice president Ed Gelbach as part of the company's commitment to offer a wide spectrum of MAP-compatible products. Intel also expects to be a major supplier to industry. The company's announcement stood in stark contrast to Digital Equipment Corp., which had been expected to announce at least one new product but finished the day hitting a big fat .000.

That's several orders of magnitude lower than GM's batting average. With GM driving, MAP is a lock to take the checkered flag within the company's vast empire of factories and plants. Without it, it won't be that easy a race. Despite the outpouring of user support, no company wants to be seen as GM's lackey.

"McDonnell Douglas can't walk around carrying GM's flag," says Wayne Hanna, the aircraft company's program manager for CAD/CAM systems and chairman of the MAP Industry Involvement Group. "Nobody wants to say 'We support GM.' Saying 'We support MAP' is something entirely different.

"GM has to be willing to let MAP evolve if it wants it to be an industry standard. A lot of corporations are wrestling internally with exactly what their policy on MAP should be. The issue is really coming to the surface. But we must get MAP into the public domain."

Let the record show that GM hardly considers MAP private property. But

Despite the outpouring of user support, no company wants to be seen as GM's lackey.

the company has its own automation timetable to worry about. Having set the pace since the starting gun, the automobile giant wouldn't mind falling back with the pack just a little bit. This is, after all, supposed to a user-driven revolution. United, they get what they need. Divided, they're given what the vendors want.

"I think now we've got a very strong commitment from users," McDonnell's Hanna says. "This certainly wasn't there in May. I don't think it was even there at NCC. More and more companies are going to work MAP into their criteria for putting vendors on their approved purchasing list."

"We're just trying to let this thing roll along," GM's Kaminski says. "Sure, we twisted a few arms in the beginning. We still will if we have to. Just ask GE. But we're hardly doing that anymore. These people are coming because they want to, not because we're telling them to."

GM doesn't have to speak. Its wallet is heard everywhere. ◉

BENCHMARKS

BUYS ROLM: Despite repeated assurances that it wanted no more than a 30% stake, IBM announced it would buy all of Rolm Corp., the Santa Clara, Calif., PBX maker in which it owned a 23% equity. Observers said the move represented IBM's impatience with the progress of a joint technical program through which IBM's mainframes would be linked to Rolm's CBX line of private telephone exchanges. IBM paid $1.26 billion, or $70 per share, for all of the firm's outstanding stock. Rolm will become an independent subsidiary charged with accelerating IBM's move into the telephone switch market as a major competitor to AT&T. The acquisition called into question Rolm's cooperative arrangements with Digital Equipment Corp., Data General, and Hewlett-Packard to market each other's products. The purchase also alerted investors to the fact that IBM may be interested in buying more of Intel, the Santa Clara semiconductor manufacturer already 20% owned by IBM, or of Sytek, the nearby Mountain View local network de-

signer in which it has options for 4.9%. IBM has also bought out most of Comsat's interest in Satellite Business Systems, pending Federal Communications Commission approval, which would give IBM 60% of the company.

IBM'S ITALIAN MOVE: While IBM's takeover of Rolm has given AT&T plenty to think about at home, IBM is also threatening the born-again phone company on its European doorstep. The Italian state-owned telecommunications and electronics conglomerate, STET, has agreed to cooperate with IBM's Italian subsidiary in the areas of telecommunications research, components, and factory automation. AT&T's European partner and Italy's dp champion, Olivetti, based in Ivrea in northern Italy, is not overjoyed. Expectations that IBM will also pick up deals for establishing value-added network (VAN) services for the Italian market are fueling Olivetti's and AT&T's concern.

The main agreement with STET involves the setting up of a joint R&D company backed by IBM and the STET subsidiary Selenia Elsag. Called Seias, the company will be based in Genoa, and will be 51% owned by STET. Seias will be primarily researching flexible manufacturing systems and covering new architectures, software products, and integration methods. STET estimates that the joint company will be pulling in around $200 million a year by the early 1990s.

A more general cooperative agreement with STET involves telecommunications research covering voice and data communications. The development of network services across Europe is a high priority for IBM. The company regards its involvement in the setting up of VANs as a way of getting close to the various national telecommunications authorities (PTTs).

IBM hopes to have more success with VANs in Italy than it has had so far in the U.K. and France. Here the local manufacturers and government industry departments are very wary of any close ties between their local PTT and the international giant of dp brandishing SNA as the answer to networking. In the U.K., a joint network service has been announced by IBM and the PTT British Telecom, but it is currently being blocked by widespread objections. Back in Italy, Olivetti and AT&T International are already lobbying hard to prevent an IBM value-added network being set up in the near future.

The other aspect of the Italian linkup is in the components sector, where IBM has also agreed to buy $90 million worth of semiconductors next year from SGS-ATES, STET's chip company. As long as deliveries are on time and there are no quality control problems, this agreement could extend through the rest of the '80s.

The SGS-ATES link is all part of IBM's policy to have closer dealings with local European suppliers. Following swiftly on the heels of the Italian deal, IBM also announced its biggest ever procurement contract in Europe. This involves a $175 million order for multilayered printed circuit boards from the Austrian company Voest-Alpine.

QUITS MOHAWK: Ralph H. O'Brien abruptly resigned as chairman and ceo of Mohawk Data Sciences on the eve of negotiations between the financially troubled firm and its banks and new shareholders. Mohawk, a computer and communications supplier based in Parsippany, N.J., is attempting to restructure and increase its $115 million line of credit. The firm said that it has not satisfied certain net worth and borrowing base requirements in the credit agreement. Mohawk's earnings for the quarter ending July 31 fell 94% over a year earlier, to $185,000, while revenues inched forward 6% to $103.8 million. The company is also negotiating with Asher Edelman, the New York financier who bought 8.8% of the company this summer. Edelman, who earlier this year bought and dismembered Management Assistance Inc., said he had not yet developed a plan to buy MDS but that he would if he were asked by the firm's board of directors.

DOWNWARD MOBILITY: Gavilan Computer Corp., which spent over $31 million trying to develop and market its "mobile" microcomputer, filed for bankruptcy under Chapter 11, laid off 60 employees, and closed its operations. The Campbell, Calif., firm owes its 400 creditors $10 million, according to product marketing manager Jeff Raice. The high-end, $3,500-plus portable MS/DOS microcomputer never achieved the market profile that the firm had expected, according to a company spokesperson. Company president C. Woodrow Rea stepped down to return to New Enterprise Associates of San Francisco, a venture capital firm that had invested in Gavilan. Vice president of operations David Vaugn will replace Rea. Manny Fernandez, who founded Gavilan and was later ousted from its presidency by unhappy venture backers, resigned as chairman and ceo to join Dataquest, a market research firm based in Cupertino, Calif.

DISK DISASTERS: IBM's thorough dominance of the mainframe 3380-class disk drive market brought two competitors to their knees. Storage Technology Corp., after cutting its 8380 prices to match IBM cuts, reported a loss of over $20 million in the third quarter, on top of a first half loss of $21.5 million. The company fired 10% of its work force, 1,500 employees, and said that the loss may violate working capital ratio requirements it has with 10 banks. The Louisville, Colo., firm's loss compares with a $6.9 million loss in the 1983 third quarter. Nine-month revenues last year were $659.7 million, while first half revenues this year were $484.9 million. The day StorageTek announced it expected the loss, its stock price dropped 35%, since the firm had earlier said it expected to break even this year. A second pcm, Control Data Corp., pulled out of the mainframe disk drive business entirely. Citing technological advances made by IBM that made it impossible to transfer technology from its oem business to its pcm business with minimal changes, CDC announced that it will stop making the drives sometime next year, depending on market demand. The company will still support and service the discontinued products already in the field when it ceases production, and will provide performance and reliability enhancements to the 33800 drive, which is now two years behind shipping schedule. Some 700 of the IBM 3380-compatible units have been manufactured, of which 350 are in the field, CDC said. The firm expects to ship 1,000 to 1,500 units this year. As part of the decision to drop the line, CDC said that it will take a write-off that would give it its first quarterly loss in 10 years, and that it would phase out hundreds of manufacturing jobs in the suburban Minneapolis plants where the drives are made. The drives contributed about $100 million to the firm's $1.4 billion in peripherals revenues in 1983.

CLOSES DOOR: The Brazilian Congress, anxious to protect the country's growing dp industry from outsiders, overwhelmingly approved a bill sharply limiting the participation of outsiders in the nation's domestic market (see Look Ahead, Sept. 1). Under the terms of the bill, which was expected to be signed by president Joao Baptista Figueiredo, multinational corporations that already market equipment in Brazil will be allowed to do so, but any new foreign investment is limited to export markets. The domestic Brazilian market for minis and micros is reserved for Brazilian companies for at least eight years under the bill. While opponents argued that Brazil could not develop a high-technology industry without foreign investment, the Congress was swayed by pervasive nationalism and the entreaties of the 140 domestic dp manufacturers, according to observers. The domestic dp industry, which consisted of just two suppliers in 1977, is expected to generate $1 billion in revenues this year.

ACCES
INDIGE

INTRODUCING CONDUCTOR.

End-user access
to production data,
with full control
and security.

STION?

Today—end-users need greater access to data. And MIS needs better control. To solve both problems, TSI introduces CONDUCTOR.

CONDUCTOR lets end-users get the data they need. CONDUCTOR selects, manipulates and delivers data to any end-user environment. Without programming. And CONDUCTOR gives MIS more control than ever over quality and integrity, with a new degree of security.

While others have tried to solve the end-user problem, they've only addressed a small part. CONDUCTOR goes for the big picture. So remarkably different, there's virtually nothing else like it. Find out about TSI's CONDUCTOR today. And help eliminate access indigestion.

TSI International

D&B a company of The Dun & Bradstreet Corporation

For the facts on CONDUCTOR, call 1-800-227-3800, Ext. 7005 or write 187 Danbury Road, Wilton, Connecticut 06897.

CIRCLE 37 ON READER CARD

AI researchers have brought us inference engines, high-order languages, and knowledge engineering. But have they built a better mousetrap?

THE OVERSELLING OF EXPERT SYSTEMS

by Gary R. Martins

The media blitz is on, and hype is coming from all sides. Take a look at almost any current book, lecture, or journal that deals with computing, technology, or business, and you'll see for yourself. *Business Week, IEEE Spectrum, Scientific American,* and countless other sources are all breathlessly pushing a common message. Artificial intelligence (AI)—especially in the form of knowledge-based expert systems—is now a practical reality, ready to go to work in industry, government, and defense. To judge by these sources, expert systems are the hottest glamour item in today's high-tech boom. It's new, it's exciting, and the implication is clear: jump in now, or get stuck on the sidelines with the also-rans.

For the uninitiated, the emergence of expert systems is presented as a breakthrough, a sudden miracle of new computing technology waiting to be exploited. Previously intractable problems in all sorts of areas will now be conquered, just as soon as the expert systems experts can get around to them. (Of course, you may have to wait in line with your particular problem—after all, expert systems gurus are in critically short supply, and right now they're all terribly busy with really important stuff. . . .)

For those with a taste for the deeper technical issues, the following kinds of claims—with appropriate journalistic variations—provide the basis for all the expert systems excitement.

A new programming technology has been created, based upon "production rules" and "knowledge representations." The result is a new class of enormously powerful high-order languages (HOLs) implemented through "inference engines," which form the heart of "knowledge engineering tools."

These new HOLs make it easier to create, debug, and maintain complex programs through the suppression of explicit control statements, the use of English-like syntax, and other notational devices.

Each production rule in an expert system implements an autonomous chunk of expertise that can be developed and modified independently of other rules. When thrown together and fed to the inference engine, the set of rules behaves synergistically, yielding effects that are "greater than the sum of its parts."

Programs written in these new high-order languages can even explain their own behavior on demand, thus virtually eliminating the drudgery of debugging associated with old-time programming methods. They also excel at "symbolic inference," and are thus especially well-suited to the emulation and extension of human intelligence, and the implementation of human expertise.

These revolutionary capabilities have spawned a whole new class of specialized professionals to exploit them. These "knowledge engineers" have already gained fresh insights into the nature of human expertise, new ways of extracting knowledge from experts (knowledge acquisition), and new ways of combining knowledge from many sources for greater problem-solving power (knowledge architectures).

Typical of the exotic new software techniques underlying expert systems is the "blackboard" method of knowledge representation for cooperating expert processes. These developments have radically transformed the software enterprise, rendering more familiar methods and concepts largely obsolete, i.e., the future of software is expert systems.

You want proof? Just take a look at all the successful expert systems already at work: PROSPECTOR, R1/XCON-XSEL, MYCIN, DENDRAL, AM/EURISKO, and others too numerous (or too proprietary) for casual mention.

At the same time, if one listens very carefully, a rather different kind of story is being quietly told by users, developers, and investors who've had firsthand experience with the expert systems software miracle (many of these same problems are mentioned in an excellent article, "Why Computers Can't Outthink the Experts," *Fortune*, Aug. 20).

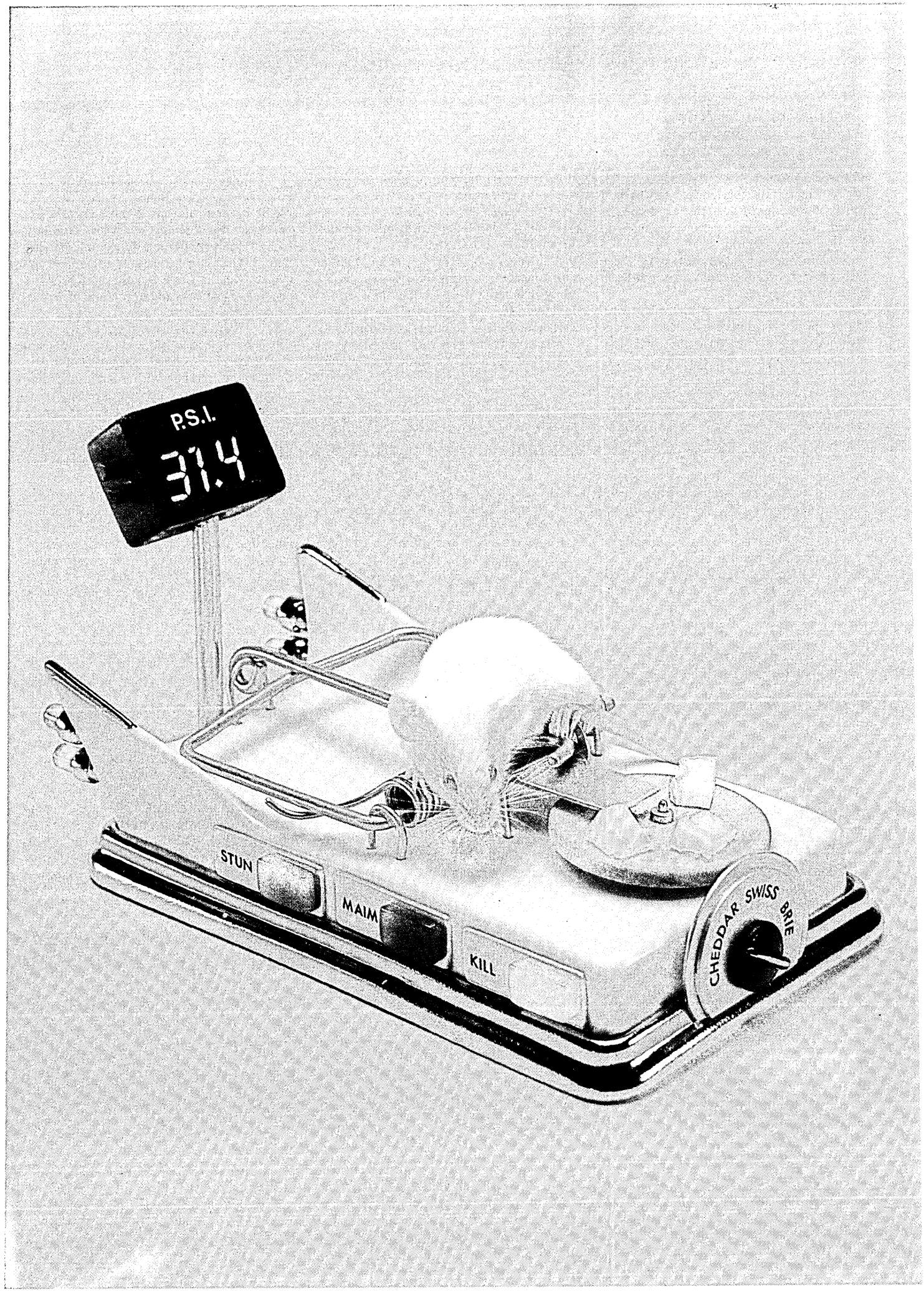
Expert systems software development costs are high, development times seem unusually long, and the resulting programs put a heavy burden on computing resources.

ES CODE GENERALLY COMPLEX

Available expert systems methodologies seem to be straightforward and effective only for relatively simple applications. For applications of even modest complexity, most expert systems code is generally hard to understand, debug, extend, and maintain.

For the most part, current off-the-shelf expert systems tools (shells) cost too much, are poorly supported, lack adequate documentation, are hard to use, yield very inefficient programs, and seem to have sharply limited applicability to complex,

3-D SCULPTURE BY KATHY JEFFERS/PHOTOGRAPH BY ROBERTO BROSAN


P.S.I.
31.4
STUN
MAIM
KILL
CHEDDAR
SWISS
BRIE

Available expert systems methodologies seem to be straightforward and effective only for relatively simple applications.

real-world problems.

Industrial experience with the new wave of AI/expert systems graduates is mixed. The downside factors include: inflated salary expectations, ignorance of systems engineering, unfamiliarity with real-world problem solving, and difficult institutional adjustment.

Following the failure of several highly publicized projects, leading-edge commercial and industrial interest is fading. Some expert systems houses are thrashing about in a desperate search for new survival strategies; and the DOD is said to be rethinking the focus, timing, scope, and management of some of its commitments.

To make sense of the contradictions in these conflicting pictures, let's take a closer look at some of those claims for the methodological underpinnings of expert systems.

The production-rule formalism isn't at all new. Production rules were introduced as a representational device in the 1920s by logicians as a technique for the study of formal derivations. This same device was borrowed in the 1950s by linguists, and adapted to the description of syntactic patterns in natural and artificial languages. It was reborrowed in the 1960s by cognitive psychologists in support of some peculiarly simpleminded models of human cognition. Finally, it was taken up again in the late 1960s and early 1970s for a wide variety of experiments in AI programming.

The familiar IF (conditions) THEN (actions) form, present in some of today's expert systems, dates back at least to the MYCIN project of the early 1970s. An equivalent methodology—then called decision-table programming and employing representations similar to the flat file of today's expert systems—was invented and vigorously explored by the business dp community in the 1960s. It was eventually abandoned as clumsy, resource-hungry, and unsuitable for complex applications.

"Inference engine" is a glamorized synonym for the more common term interpreter. This is a key component of familiar interpretive languages such as Lisp, Prolog, and BASIC, and versions thereof. Interpretive languages have their own advantages and disadvantages, but they're certainly nothing new.

Expert systems code for real-world applications is generally *not* easy to understand, debug, extend, or maintain. Very much like the BASIC language, today's rule-based programs present a superficial appearance of simplicity and transparency. Just as with BASIC, however, these illusory qualities rapidly vanish for applications of more than trivial complexity. As every working programmer knows, BASIC is a great language for writing three-line programs in the computer store, and worthless for anything beyond that.

The virtues of suppressing explicit control statements in expert systems is certainly debatable. In practice, they tend to be replaced by hidden control variables, or artificial database elements that are created to secretly track program states. Invariably, these complicate both the database and the rules themselves.

LACK OF EXPLICIT CONTROL

The lack of explicit control makes it painful to identify the causes of misbehavior in rule-based programs. As rule sets grow large, the collection as a whole takes on the character of a mysterious black box. It has behaviors, but we don't know why.

Once again, the use of English-like forms in expert systems rules lends an appearance of intelligibility to the code, especially when rules are examined in isolation, or in small groups. In realistically large rule sets, however, the appearance may be more like that of the fine print in an insurance policy—repetitious and confusing.

In real life, expert system rules are *not* independent chunks of expertise; they quickly become highly interdependent, often in subtle ways. For example, adding new rules to a large rule-based program nearly always requires revision of the control variables and (left-hand side) conditions of earlier rules. And it is often far from obvious just which of these will need fixing to make the new rule work.

Expert systems explain their behavior by providing a trace of rule tests and firings, with variable bindings. For toy problems with shallow inference chains, this may aid the debugging or verification process. On problems of realistic complexity, with lengthy inference chains, such traces may only add to the programmer's frustration.

In fact, there has been little substantiation of the claim that current ES methods or tools are especially well suited to the emulation or support of human expertise and decision-making. The origin of these claims lies in the use of similar methods by university-based cognitive psychologists for implementing childishly simple models of human cognition. No one seriously claims that these models do justice to the subtlety and richness of human intellectual performance, nor is there a credible basis for the extrapolation of their methods to the domain of computer programming. It is simply a case of glory by association.

While the rule-based paradigm may have some abstract logical appeal, the simplistic implementation of most current expert systems rule interpreters leads directly to extremely poor computational performance, and outrageously high demand for cycles. Most of these cycles are often wasted on the fruitless manipulation of irrelevant rules and data.

There really isn't much to say about this new profession of knowledge engineering. It appears to be another case of glamorizing the familiar with pretentious new terminology. Those for whom the established term programmer is not sufficiently exciting probably have never done any exciting programming. After all, what is it that a knowledge engineer allegedly does? He or she gets information about problems and how to solve them from problem-domain experts, and embodies the information in a program. But isn't that precisely what us plain old programmers have always done? The value of this new terminology may best be appreciated if one asks, only rhetorically, of course, what would a *non*expert system be like?

There is also no credible evidence that knowledge engineers have advanced our understanding or mastery of the problems of knowledge acquisition, representation, or use. On the contrary, far from improving the programmer-expert interaction, naive reliance on simplistic methods and tools by knowledge engineers appears to have impeded their efforts to produce working programs, sometimes even in rather simple problem domains.

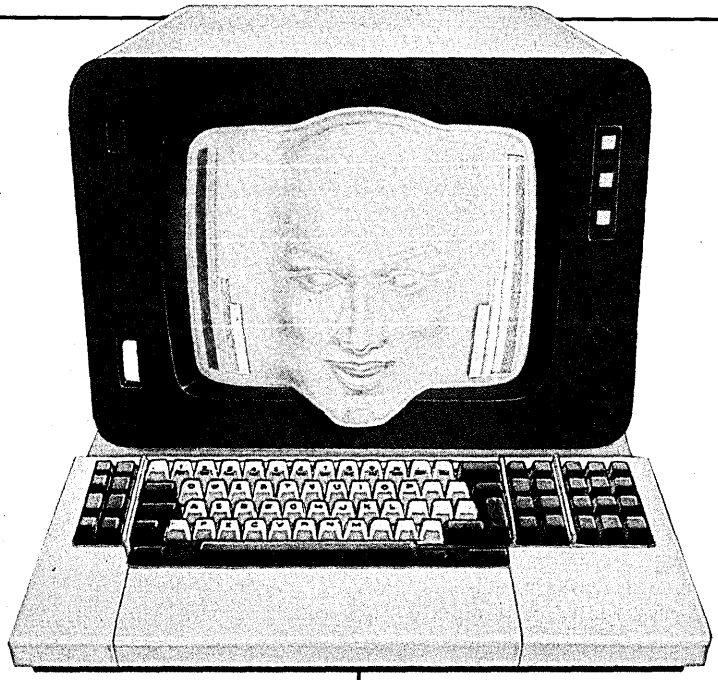
Speaking of fancy new expert systems nomenclature, here is my personal favorite: the "Blackboard Model of cooperating expert processes." It's just a longer name for the old COMMON storage facility in FORTRAN!

SUCCESS IN SIX FLAVORS

Given all this, how is it possible to account for the expert system successes? In every discussion of expert systems, the same short list of expert systems triumphs is recited: PROSPECTOR, DENDRAL, MYCIN, R1/XCONXSEL, AM/EURISKO, and perhaps a few others. If this critique is correct, how did these wonderful programs get written? The answer is straightforward, and it comes in six flavors, not mutually exclusive:

1. Brilliant programmers. For example, Joshua Lederberg, the Nobel prize-winning chemist and current president of New York's Rockefeller University, who created DENDRAL. This is the most obvious explanation, and the one most often overlooked. Why should it be surprising that

WITH RAMIS II ENGLISH, THE COMPUTER HAS FINALLY LEARNED YOUR LANGUAGE.



Now, you can talk to your computer the way you talk to a colleague: in plain English.

Even if you've never been on speaking terms with a computer, RAMIS II's advanced knowledge-based technology lets you ask questions, obtain answers, even create reports in only a few minutes. As a result, you can work more effectively and productively—without having to learn a specialized computer language. You just use English.

RAMIS II: ARTIFICIAL INTELLIGENCE THAT DELIVERS REAL PRODUCTIVITY.

RAMIS II English combines years of research by Mathematica in linguistics and artificial intelligence with proven expertise in developing practical, easy-to-use software products. The result is maximum fluency with minimum demands on support staff. In fact, while other systems require days or weeks of dictionary setup for each application, the *extensive built-in knowledge base* of RAMIS II English provides immediate access to most data.

RAMIS II English enables you to access data directly, without costly and time-consuming downloading or reformatting, so the latest information is always available.

Wherever your data is stored—in RAMIS II databases; in ADABAS, IMS, TOTAL, or IDMS databases; or in VSAM or sequential files—there's only one language you need to know: English. And, because English comprehension is an integral part of RAMIS II, you have full access to all of its fourth-generation capabilities, from powerful reporting and analysis to full color business graphics.

THE BENEFITS OF RAMIS II ENGLISH SPEAK FOR THEMSELVES.

Teaching the computer to speak your language is the best way to put the vast power of today's computer systems directly into the hands of *every* user from *every* department. RAMIS II English is one more powerful demonstration by Mathematica of the increased productivity available through RAMIS II—the *real* leader in complete software for business.

RAMIS II ENGLISH MAKES IT EASY TO UNDERSTAND WHY WE'RE THE REAL LEADER IN COMPLETE SOFTWARE FOR BUSINESS.

Let RAMIS II English speak for itself. See it in action at one of our regional Product Demonstration Centers. For more information, contact your local Mathematica office, call toll free **(800) 257-5171** or return the coupon below.

MATHEMATICA

P.O. Box 2392, Princeton, NJ 08540

☐ I'd like to see a demonstration of RAMIS II English
☐ Please send a brochure describing RAMIS II English

Name _____

Title _____

Company _____

City _____ State _____ Zip _____

Telephone _____

Computer _____ Operating System _____

DA11

MARTIN MARIETTA

RAMIS®II...THE LEADER BY DESIGN

Boston (617) 357-9424 Chicago (312) 870-9710 Dallas (214) 788-1916 Houston (713) 850-8697
Los Angeles (213) 670-6962 New York (212) 980-9077 Princeton (609) 799-2600 San Francisco (415) 461-6315
Washington, DC (202) 484-5752 Basel (061) 429923 Bergen (5) 321300 Heidelberg (06221) 14051
Hong Kong 5-435714 Kingston (809) 929-7223 London (01) 580 3681 Milan (2) 546 8080 Montevideo (2) 906788
Ottawa (613) 236-8616 Paris (1) 776 41 71 Santiago (2) 31014 Singapore 273 9255 Stockholm (8) 520720
Sydney (02) 923 1677 Tel Aviv (052) 70364 Toronto (416) 226-6613

CIRCLE 38 ON READER CARD

BASIC is a great language for writing three-line programs in the computer store, and worthless for anything beyond this.

faculty and students in the world's finest university-level computing programs should be able to write a few working programs, perhaps even in spite of a commitment to an inferior methodology?

2. Easy problems. Take a second, hard look at some of the problems that have been solved by expert systems. If you look closely enough, you will find some very narrowly defined (sub-) problems, hedged about with simplifying preconditions, exclusions, and assumptions. And a few problems that were just plain easy to begin with.

3. Lots of time, generous funding, and a favorable environment. Take a group of top-flight programmers, put them in a stimulating university environment, give them the best available computing resources, assure them of steady funding at a high level for a decade. . . .

4. The developers did not use commercial expert systems tools! Here is another big advantage that is readily forgotten by promoters of the expert systems mythology. None of these illustrious ES example programs were written using today's off-the-shelf commercial expert systems tools. In every case, the system's developers either built their own custom tools as they went along, or used tools under development by colleagues and collaborators.

5. Luck. Fate. Karma. Call it what you will, it plays a role in all pioneering development projects. Its importance here would be more obvious if we also were to consider all the many expert systems projects that didn't make it to the finish line!

6. Programs don't really work as advertised. The utility and intelligence of some well-known expert systems have been grossly exaggerated in some popular accounts. Compare, for example, the account of EURISKO given by Douglas B. Lenat in the article, "Computer Software for Intelligent Systems," (*Scientific American*, Sept. 1984) with the far more candid and enlightening account given about a year earlier by the same author in *Proceedings ofAAAI-83* (American Association of Artificial Intelligence's National Conference on AI, Washington, D.C., Aug. 22-26).

How do the expert systems entrepreneurs themselves account for the problems that plague their infant industry? Undoubtedly, we'll be hearing more on this subject as time passes. Here is a quick sampler of what has been offered to date:

- Expert systems may not be good for everything, but they excel in the important domain of structured selection problems. (This may be true if the problems are simple enough, but the older methods of decision theory also cover this domain.)
- Work on expert systems may not have much impact on practical computer programming, but it's providing valuable insights into the decision-making processes of human experts. (Credible evidence for this has yet to appear, but even if true this will be little comfort to investors in ES houses!)
- Expert systems technology is great, but present computing hardware is inadequate. Everything will be fine when we have massively parallel VLSI, fifth generation architectures, and so forth. (No comment.)

CONFUSION IS AT THE HEART

How did the current expert systems fiasco develop? The heart of the problem appears to lie in a confusion of science and engineering. At its best, artificial intelligence research is scientific activity—seeking to understand the principles by which pragmatically and semantically interesting behavior can be produced with syntactic machinery. For this, it is entirely appropriate that AI researchers, mostly based in university laboratories, habitually contemplate toy problems, designed to highlight particular themes and issues and to exclude others. This is a classical method of scientific research.

The problem is simply that the methods and attitudes appropriate to this kind of scientific investigation are of limited usefulness in confronting difficult, real-world engineering problems. It's a very long and challenging step from the classroom to the factory floor, the battlefield, or the corporate boardroom, and the passage requires more than enthusiasm and stock options.

Perhaps it is too easy to forget this in the face of the manifold temptations and opportunities presented by a world that desperately needs better computing methods. In any event, this problem isn't new. Jonathan Swift's Gulliver explored it in brilliant detail, including a heuristic discovery machine, on the flying island of Laputa, more than 250 years ago.

Is there a future for expert systems? Certainly, for problems of significant subtlety or complexity, the future of today's commercial expert systems methods and products is very limited. There is, however, a possibility that these or similar offerings will find a niche to survive in, at least for a while. Like the BASIC language, they may become popular in computationally unsophisticated quarters for application to relatively simple problems.

Such applications might include, for instance, electronic checklists for lower-level employees in service bureaucracies like banking, insurance, sales, and so forth. The market potential for such applications could be fairly substantial, but these kinds of markets will quickly demand, and get, products at much lower prices than those that the major expert systems houses now seek. This is the kind of niche that the established pc software industry could quickly fill.

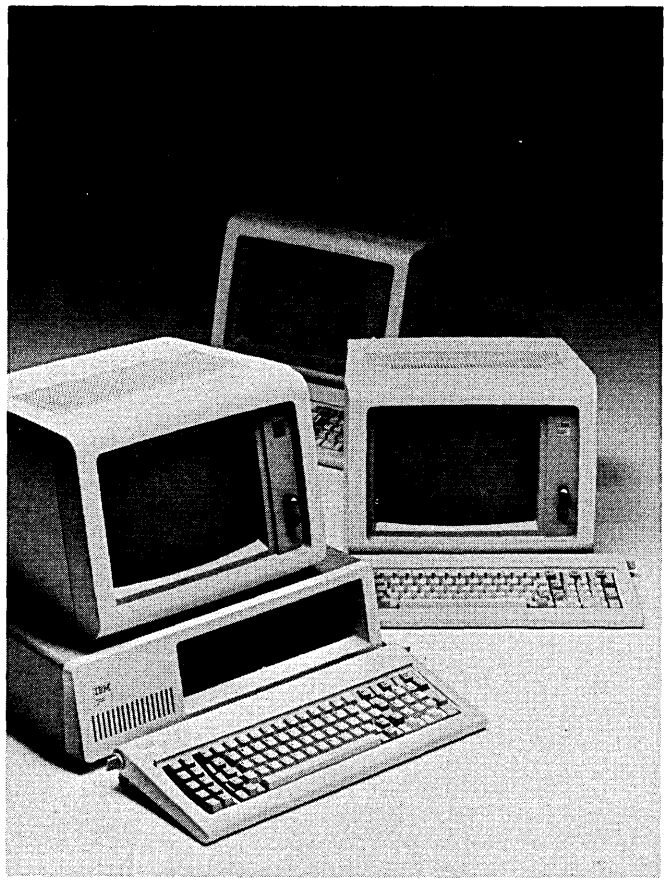
Finally, what can we expect in those more complex and subtle problem domains—domains such as those addressed by DARPA's Strategic Computing program, for example? Can AI techniques be successfully applied in areas like these, or does the collapse of the expert systems bubble foretell the failure of these more ambitious undertakings? Here, it is crucial to understand that the practices and products of the commercial expert systems community are largely irrelevant to serious applications of advanced computing. The failure of the current expert systems orthodoxy to achieve its stated aims represents only the failure of a naive belief in a magical computing methodology for solving difficult problems.

Serious computing professionals know that the acquisition, exchange, and use of problem-solving knowledge is deeply bound up with complex issues of pragmatics and semantics. Successful computation in semantically complex domains requires insight, imagination, and deep understanding of both computers and the application domain. This kind of understanding results from prolonged and intensive exposure to actual problems, in all their maddening richness. At present, there are no known computing languages, or tools, or methodologies of any kind that guarantee success in such enterprises.

In the absence of such formally guaranteed techniques, cleverness and substantial experience with complex real-world computing applications are still the most significant advantages that can be brought to bear on problems of this kind. Given these assets, adequate material resources, and a measure of good fortune, the lessons learned in the AI labs can become the building blocks of prodigious achievement. ◉

Gary R. Martins is president of Intelligent Software Inc., Van Nuys, Calif., a management consulting group specializing in the application of advanced computing techniques. Until 1982, he was director of the Rand Corp.'s R&D Program in Information Processing Technology, where he launched the ROSIE and ROSS AI language projects. His earlier work includes innovations in natural language processing and bit-map graphics.

How to make your PC-XT multiply.



If you think that's no big deal, we'd like to introduce you to a multiplication table you've never seen before.

One PC-XT plus two terminals times one Pick System™ equals a three-user business system.

Net result: a savings of about 50% over the cost of three separate PC-XTs (which can't share data like we can, anyway).

To explain in slightly greater detail, the Pick System transforms a single-user PC-XT personal computer into a complete business computer system.

If that's not enough—and for us it isn't—the Pick System also offers a built-in relational data base, a simple command language that uses everyday English words, and runs on hardware from micros to mainframes, from IBM® to Hewlett-Packard, and many more.

Which shows you just three more examples of Pick Power, and how our 20 years of business experience is ready to work for you.

If you'd like to add to your awareness of the Pick System, contact any authorized Pick dealer. Ask him how the Pick System can make your PC-XT multiply, and he'll give you his undivided attention.

The Pick System.

Computer Ease, Not Computerese.

For more information, call us toll-free at 1-800-FOR PICK.
In California, call 714-261-7425. Dealer inquiries welcome.

Pick System is a trademark of Pick Systems. © 1984 Pick Systems.

CIRCLE 39 ON READER CARD

Memorex announces Freedom of Choice in the 3270 world.

Memorex is a registered trademark of Memorex Corporation.
© 1984 Memorex Corporation. MS-DOS is a registered trademark of Microsoft Corporation.

Have your choices in 3270 systems been too costly, too piecemeal or too uncertain?

Now, you can break away from the crowd.

Because Memorex® now offers a complete cluster of plug-compatible 3270 peripherals. So you're free to mix and match them with your IBM equipment. Or add new products as they are introduced.

The Memorex cluster features:

Controllers that support from 8 to 32 remote users, and speak SNA/SDLC or BSC.

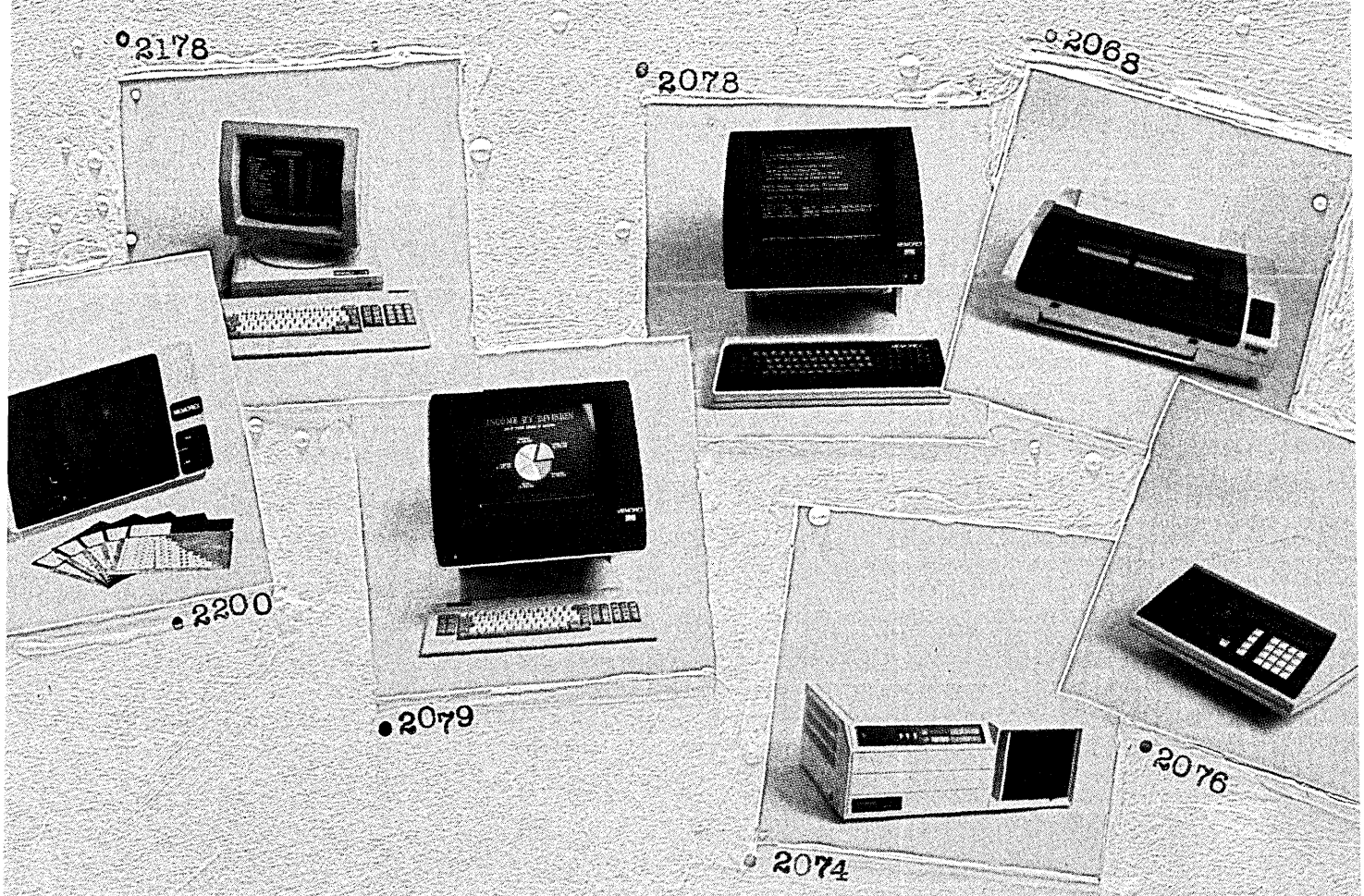
Terminals with low-profile keyboards, tilting screens and easy-to-read CRTs in green phosphor, amber or seven-color.

The Attached Processor that supports MS-DOS™ 2.11 software, to make your "dumb" terminals smart.

A two-in-one printer that allows you to print high speed dot-matrix and, with the flip of a switch, near-letter quality.

All backed by a corporation whose PCM choices go all the way up to mass storage. With worldwide sales, service and the flexible terms of the Memorex Finance Corporation. So you can be independent without going it alone.

Reach for the real choice in the 3270 world today. Call Memorex, 800-538-9303. (In California, 408-725-3456.) Or write to: Memorex Communications Group, 18922 Forge Dr., Cupertino, CA 95014.



Compatibility.
When it matters, make it Memorex.™

MEMOREX
A Burroughs Company

CIRCLE 40 ON READER CARD

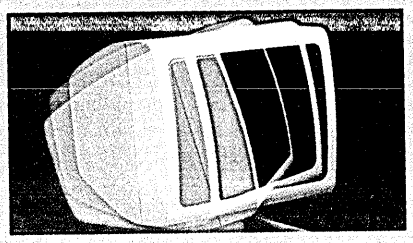
See Memorex at Comdex, Booth 1566-1767

Other terminals will hide their screens in shame

See us at
DPMA, Booth 201
COMDEX, Booth 2113
DEXPO, Booth 4301

When you see TAB's new E-32 Display Terminal

The video qualities of this new Smart Ergonomic Terminal are the finest available. TAB's high resolution, non-glare, 15-inch green screen produces crisp, readable characters in both 80 and 132 column modes. Now you can display full-width printout formats.

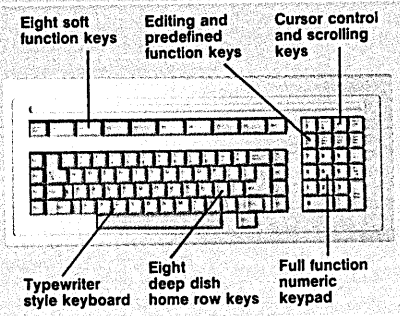


Fully adjustable for comfort. The E-32 screen tilts and swivels on its base to meet each operator's requirements. A detached, lightweight keyboard features sculptured, stepped keys—and a low profile for hand, arm and back comfort.

Easy, uncomplicated operation. In addition to a variety of character and line attributes, the E-32 has eight soft function keys that control more than 100 parameters of set-up and operation. This easier-to-use terminal means more effective, error free throughput.

Compatible with most computers in the industry. The E-32 is fully ANSI 3.64 compatible and communication compatible with DEC VT 52*, VT 100* and VT 132* terminals. Uniquely, it can memorize over 50 set-up parameters for each of three different computers, to be recalled at the touch of a key.

Select the options you need. They include amber or white CRT, memory expansion to 4 pages, serial and parallel print ports, internal modem and composite video.



If you're looking for more productivity and less fatigue in your data operations, we'd like to show you the other time-saving features of the E-32. Call or write us at 1400 Page Mill Road, Palo Alto, CA 94304. (415) 852-2400. (800) 672-3109 Outside California. In Canada, 550 McNicoll Avenue, Willowdale, Ontario M2H 2E1.

*Trademark of Digital Equipment Corporation.

TECHNOLOGY AND BUSINESS

TERMINALS ■ COLOR-CODED FILING SYSTEMS ■ MOBILE SYSTEMS
FILING EQUIPMENT & SUPPLIES ■ FORMS PROCESSING EQUIPMENT
COMPUTER ACCESSORIES & SUPPORT FURNITURE ■ WORKCENTERS

CIRCLE 41 ON READER CARD

It took a long time to turn expert systems theory into practice.

THE BLOSSOMING OF EUROPEAN AI

by Paul Tate

"Keep it simple" is the phrase that is launching the commercial market for expert systems products in Europe. After decades of European research into artificial intelligence techniques, developers have realized that the most effective way to open up the market is to make systems that don't promise too much, but deliver everything they promise.

Leading the market expansion are Britain and France, the two European countries with the longest traditions of AI research. This goes back to Turing's work in the '40s in the U.K., and the early development of Prolog at the University of Marseilles in France. Until recently, however, research was hampered by limited funding and by a debilitating lack of interest in the technology. It took a long time for Europeans to turn their expert systems (ES) theory into practice.

That practice has at last begun to inspire real products all across the Continent. Development tools and expert systems shells have become cheaper and more widely available, and the first application systems, complete with knowledge bases, have appeared on the market.

It is not just improved tools and cost reductions that are helping the ES market's expansion, however. Two other factors are of major significance. First, the expert system is shedding the image of a technology looking for an application. Tasks are being isolated that can make constructive use of the technology, even though these are currently confined to a few industrial areas. Second, expert systems builders now attempt much less ambitious projects than those embarked upon during the heady days of early expert systems research. Together, the two trends of realism and practicality have led to the development of simple expert systems that really work, a crucial step to opening up the end-user market. There are now around 200 separate expert systems projects under way across the Continent.

The organizations sponsoring the projects include large user companies like the Dutch Shell group and the U.K. chemical giant ICI, traditional computer companies like Germany's Siemens and Norway's Norsk Data, as well as a growing number of startup firms, often spin-offs from universities, such as Edinburgh University's company, Intelligent Terminals, in Oxford.

There are also a number of state-backed research projects involving industrial and academic collaborations. The Ministry of Research and Technology in Germany is backing a project at the University of Stuttgart called Inform, part of a broader national research scheme dubbed the Knozept. In the U.K. the British government is partially funding the Alvey research scheme, and a number of projects exist in the French government's Inria and CNET organizations. In addition to all this are pan-European projects backed by the European Commission as part of its $1.5 billion Esprit research scheme into new technologies.

These projects represent a total expenditure of at least $40 million on expert systems in Europe this year. Tim Johnson, head of the U.K. consulting firm Ovum in London, has just published a report on the commercialization of expert systems; he says that European expenditures for expert systems will grow to around $200 million by 1990.

Most existing systems are designed for in-house use, often developed by internal project teams or in conjuction with outside expert systems houses. Custom contracts, along with development tool sales and minimal package sales, now account for only 50% of the $40 million business. By the end of the decade, these areas will make up around 90% of total business, which are now heavily dominated (well over 50%) by custom contracts.

Most of the growing number of European ES suppliers, particularly in the U.K., are aiming their products at this custom sector. For example, Britain's London-based ICI, in league with ES software house ISIS Systems, in Redhill, launched two products in the European market in mid-September. Marking its entry into the commercial side of the business after years of internal research and development, ICI's initial product is a development tool called Savoir. What is unique about the product is that it can be accessed on-line via videotex networks using the U.K.'s Prestel standard. It also runs as an independent package on a range of machines, including DEC equipment and the IBM PC.

"IT IS GOING TO BE BIG"

Mark Rogers, head of ICI's expert systems development team, believes alternative delivery methods are vital to generate interest in what is still very much an unknown technology. "I wouldn't want to put figures on the size of the international expert systems market, but it is going to be big and we want to be in there," says Rogers. "We are trying to make it as easy as possible for people to use this development system wherever they are and whatever equipment they have. In the industrialized countries where the telecommunication networks are sophisticated it makes sense to provide an economic on-line service. But some users will want the system in-house and we also want to interest users in other countries with less developed networks so the package has to be able to run on local processors."

ICI is also announcing a knowledge base-equipped expert system that it's offering on-line to agricultural concerns. Called Counsellor, it diagnoses agricultural diseases, advises how to treat them with ICI chemicals, and makes an economic analysis of potential yields. This system is obviously

"There's lots of potential for introducing expert systems into all aspects of manufacturing."

not just a commercial service; it is a new selling tool for ICI. Counsellor is only the first U.K. incarnation of sales-oriented end-user systems, with future announcements due from financial institutions that are planning to extend their business with applications like loan analysis or insurance policy advice.

Other application packages complete with knowledge bases are also under development in the U.K. Expert systems company Helix is working on a system to help in buying a car, as well as general packages offering financial analysis and advice.

Across the Channel in France, Elf Aquitaine and Schlumberger both have a well-established presence applying this technology to oil and mineral exploration techniques. Much is also expected from the joint venture company Framentec in Monte Carlo, recently set up by the French nuclear engineering company Framatome and Ed Feigenbaum's U.S. company Teknowledge, of Palo Alto, Calif. Other companies entering the field, like Cap Sogeti, Thomson CSF, Bull, Seri Renault, and Matra, are exploring the use of AI techniques in technical applications and manufacturing.

The potential of AI in manufacturing is the subject of a conference being held later this month in Paris by the French Association of Artificial Intelligence and Simulation Systems (AFIAS). AFIAS president, Eduardo Valdes-Sazo, explains that manufacturing is a prime market for AI/ES technology as it involves technically based problems, large, high-investment users, and the need to improve productivity. "With the right choice of tools and a drop in the price of hardware and software systems there's lots of potential for introducing expert systems into all aspects of manufacturing," explains Valdes-Sazo. (Valdes-Sazo's own company has already taken the plunge into the use of AI, though not in the manufacturing sector: Simtec Data Bank in Paris hopes to use AI techniques with a venereal disease database.)

The fast decreasing cost of joining the ES bandwagon is also helping to stimulate the European market. The British company, Expert Systems International, Oxford, has put an expert systems development tool on the market called ES/P Advisor that runs on 16-bit micros, including the IBM PC, and costs a mere $1,300 for a license and a version of Prolog. The Prolog language is already available for just $35 on one of the home micros built by Britain's home computer knight, Sir Clive Sinclair, and full expert systems products are due for launch from Sinclair over the next few months.

GERMANY LAGGING BEHIND

Elsewhere in Europe the applications being developed tend to be less oriented to the general commercial market. Germany is lagging behind in the development of expert systems: most work is at the project stage. The University of Kaiserlautern, for example, is working with other German and Austrian universities on diagnostic applications in medicine, automobile service, and manufacturing. Other Continental projects range from work on development tools at two new ES systems companies in Sweden—Epitec in Linköping, and Infologics, in Stockholm—to a flood control system being put together at Spain's University of Madrid.

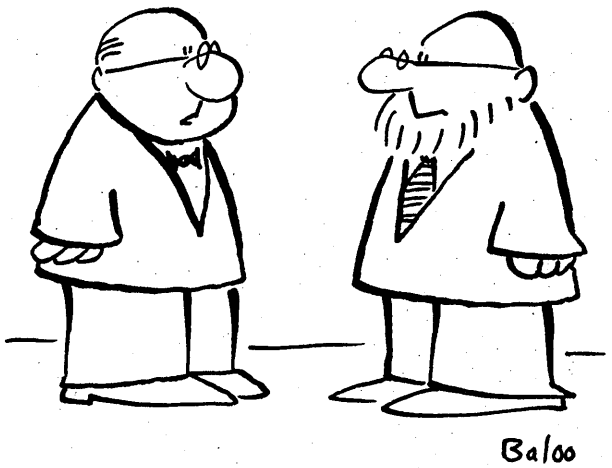
The spread of ES projects shows a concentration of work in the development of technician systems, particularly by the computer industry itself: Philips in Appledorn, the Netherlands; Norsk Data in Oslo; ICL in the U.K.; Nixdorf in Pederborn, Germany; and Siemens in Munich all have active projects for in-house applications. ICL has a system called Dragon for sizing its 2900 series computers, and Nixdorf demonstrated fault-finder and maintenance systems at this year's Hannover Fair.

Johnson argues that the computer industry's involvement with expert systems was predictable because of the convergence of a number of factors. "The computer, electronics, and telecommunications industries," says Johnson, "are already sophisticated users of computer tools, are relatively prosperous, and are fast growing. While they face a chronic shortage of expertise, the knowledge needed to repair, use, or even design their products, although complex, can be predefined."

Process control and CAD/CAM systems are also under development, as are the more common maintenance and medical systems. Applications that are most likely to be widely used, however, are those based on real-time systems. These include financial services, an area so far not well exploited, and expert systems-based decision-support packages, which are now beginning to emerge. In London, ICL has a system under development for the Department of Health and Social Security; British Telecom uses an expert system for strategic modeling and analysis of corporate policy; and Framentec in France and the Belgian Management Institute in Brussels are identifying decision-support applications.

The European expert systems business, however, like its counterparts in the U.S. and Japan, still has to overcome a major credibility problem. Grandiose projects begun in the '70s suffered from a lack of understanding of both the technology and the tasks at hand. The resulting high costs, delays, and overzealous predictions of potential benefits by expert systems proponents have tempered user companies' enthusiasm for the technology.

Simple expert systems are helping to change that. Some of the main characteristics of these projects, according to British expert systems advocate Alex d'Agapayeff, are that "the task is modest, clear-cut, nar-



"Gee, I don't know —
why did *you* get into behavioral psychology?"

CARTOON BY REX F. MAY

Swear by your modem. Not at it.

Living with errors in computer communications is a little like playing Russian Roulette. Sooner or later you're going to get into trouble.

If mistakes are waiting to happen in your business, you need the Microcom SX/1200™ modem. It's the only modem that gives you error-free communications on anybody's phone service – even the discount ones you've been afraid to use. It will even give you error-free access to UNINET and Telenet.

The SX/1200 implements a machine-independent, error-correcting protocol called MNP.™ In normal service, you would have to wait six years for it to make its first mistake. That's 10,000 times the reliability of any other modem. It detects transmission errors and keeps sending the data until what you send is what they get.

This error correcting ability makes the SX/1200 the stand alone modem that stands apart. It also stands apart because it's the world's only modem that can also be inexpensively upgraded to 2400 baud two-wire, full duplex operation.

In addition, it's Bell 212A compatible, supports RS-232 devices and can be rack mounted. It stores up to nine telephone numbers (36 digits each) with a battery back-up. And it has a simple, character-oriented command structure, with control of all modem functions from local devices.

All of this error correcting wizardry can be yours for about the same price as modems that make an occasional innocent mistake.

If you would like toll-free information about the SX/1200, please call 1-800-322-3722. Microcom, Inc., Norwood, MA 02062.

SX1200™MODEM

UNINET is a trademark of United Telecom Communications, Inc.

CIRCLE 42 ON READER CARD

Telenet is a trademark of GTE Telenet Communications Corporation.

row in scope, noncritical, and tailored to fit an attainable solution." This, he feels, is what is needed to "correct the widespread impression that expert systems are inherently complex, risky, and demanding."

SMALL SYSTEMS TO SPREAD

Ovum's Johnson takes the point further. "Small systems are likely to attract sharply increased attention in the next year or two with some early commercial successes," he predicts. "Some small systems are already in practical application providing a positive feedback and encouraging the development and refinement of more systems of the same type."

This is in sharp contrast to the way management is reacting to the development of bigger systems, Johnson notes. "Major systems take a long time to mature and so managers will remain cautious about commitment to the heavy investments required." While Johnson recognizes that there will not be any "sharp increase in major working systems until 1986 or so," he says that major systems will have "the most important implications for management of our society, and by 1990 the extent of their significance should be emerging clearly."

There is, however, a major limitation on the development of such systems. It is not just that the jobs themselves are complex, and their knowledge bases difficult to create, but that the number of knowledge engineers available who know how to put expert systems into operation is very small. It is that skill shortage that is holding up many new development projects.

Most European countries don't have nearly the number of knowledge engineers that France and the U.K. have, and even Britain has only 125 of them. Johnson estimates that there are no more than 1,100 in the world. He argues that the number of products on the market will be tied directly to the number of engineers capable of producing or using them.

That point is also stressed by Bob Muller, head of the SPL Insight AI study group in Abingdon, England. "Lots of companies are looking at knowledge-based systems for internal use and as ways of extending their services, but the lack of qualified people is a major limitation."

Nevertheless, there are numerous training programs and advice centers now being established, like the Turing Institute set up by Donald Michie in Scotland. These should significantly increase the number of AI engineers over the next few years.

Meanwhile, AFIAS president Valdes-Sazo hopes to see improvements in the character profiles of this new wave of engineers so that the other major obstacle to growth, the lack of credibility of expert systems due to past overenthusiasm, can be quickly overcome. This he expresses in the form of a simple plea to the burgeoning expert systems fraternity: "Please," requests Valdez-Sazo, "be honest." ◉

How To Tame The Bear.

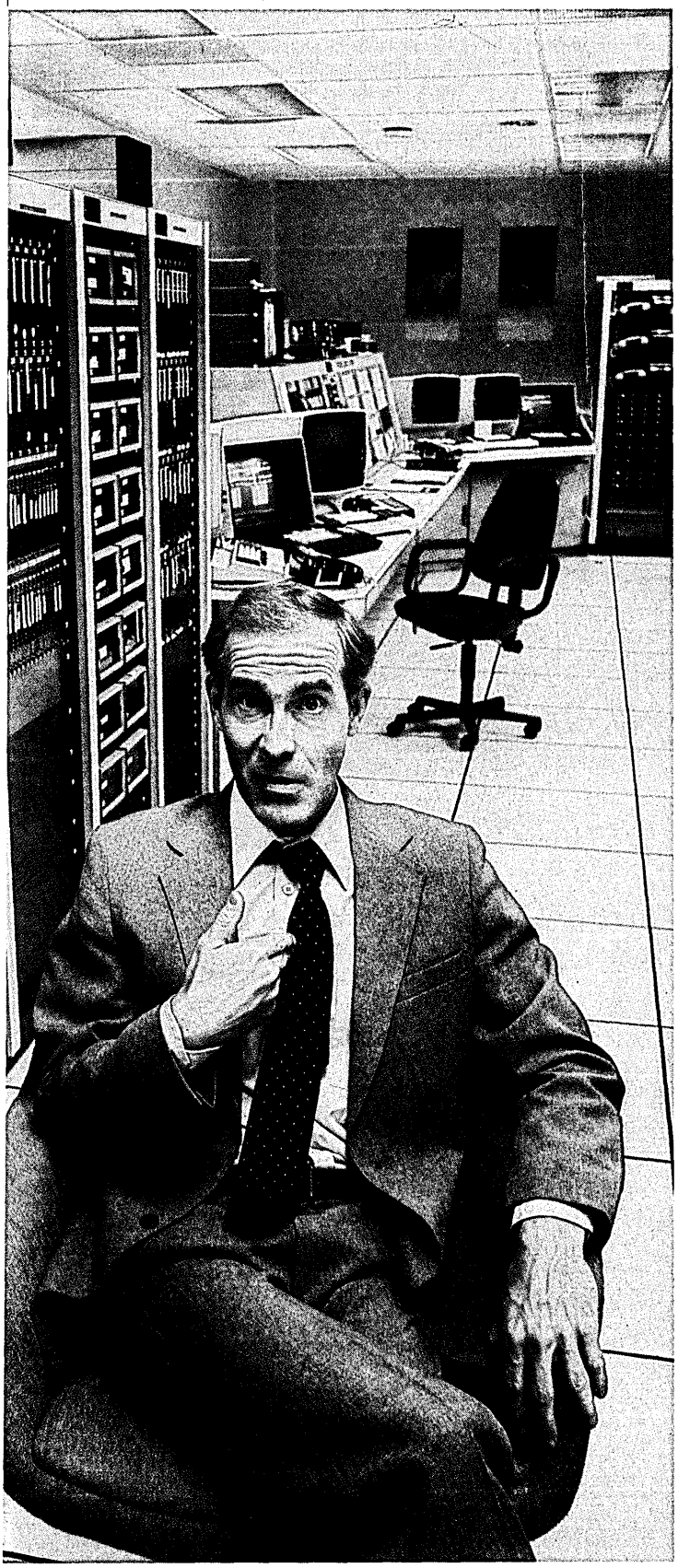
Bears can be dangerous. Even the Wall Street bear can take a bite out of your financial future. But don't worry. Buying U.S. Savings Bonds through the Payroll Savings Plan will let you ignore *any* bear market. Bonds have a variable interest rate combined with a guaranteed minimum of 7.5%, if you hold them 5 years or more.

So you share in higher returns with the bull, but can't lose to the bear. That's the best of both markets.

Take stock in America.

UNITED STATES SAVINGS BONDS

When this D.P. Manager asked for a Computer Environmental Data Acquisition System, we told him to build it himself.



With the new Environmental Data Acquisition and Control System (EDACS) from Computer Power Systems, it was easy. Because EDACS is fully programmable, he just specified all the aspects of his computer room environment he wanted to monitor and control (like electrical power, security, life-safety, air conditioning, fire or water detection, etc.) and custom-designed his own system.

Once on-site, the EDACS user can even do additional programming as his system requirements expand. One example: new halon zones can be added to EDACS as required.

A FRONT-END PROCESSOR: Programmability and computer room monitoring/control are only the beginning. The same microtechnology that runs your computer runs EDACS. This means that the crucial environmental data monitored by the system can be instantly formatted into management reports (via a desktop monitor or printer) for the ultimate in computer room control. It also means a constant flow of fresh information between EDACS and your computer for real front-end processing of all the external factors affecting DP operations. Result: more uptime, fewer headaches, greater productivity, maximum control.

UTILITY COSTS, TROUBLESHOOTING: Two examples of what EDACS can do for you. It can trim your utility bills. The EDACS management reports tell you precisely how much power your computer system is using. At peak power periods, these reports can help you decide which non-essential peripherals to temporarily shut down so that power usage falls below maximum allowable levels. This will save you a bundle on power costs.

Everybody has power problems. But many such problems don't require a service call. With EDACS, an interface between your computer and the manufacturer's remote diagnostic center can instantly diagnose power problems and, many times, on-site corrective procedures can be taken. Result: less downtime, fewer service calls.

ONLY THE BEGINNING: EDACS is now available with our new Series 4000 family of power peripherals. To find out how the industry's first environmental data acquisition system designed specifically for computer rooms can help your DP operation, call Bob Miller at 213-515-6566.

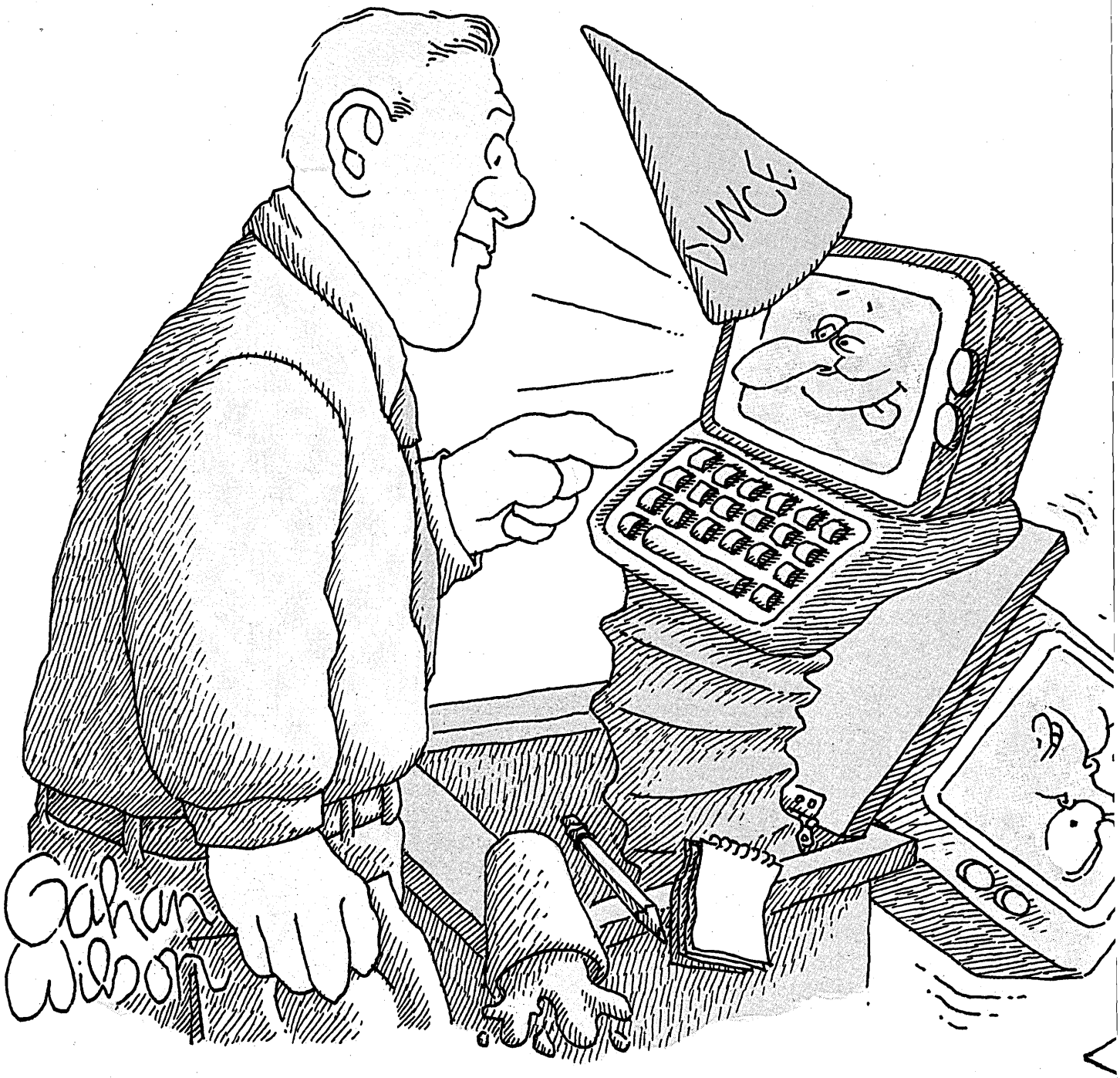
Computer Power Systems, Inc., 18150 S. Figueroa Street, P.O. Box 6240, Carson, CA 90749.

CPS

A Subsidiary of Emerson Electric Co.

CIRCLE 43 ON READER CARD

SURPRISE. YOU JUST TURNED INTELLIGENT PCs INTO DUME



PROTOCOL. THE END OF THE DP

ALL OF YOUR TERMINALS.

It's a classic DP nightmare.

Your company just spent a fortune to buy PCs, and put all that processing power on people's desks. Now it's your job to give those PCs access to your mainframe.

Here's where something horrible happens.

The host communications board you add converts your smart PCs into dumb 3278 terminals. Terminals that can only handle one task at a time. Terminals with none of the intelligence and processing power you paid for in the first place.

Is there no end to this nightmare?

INTRODUCING PCI-LINK.™ THE FIRST SMART WAY TO LINK AN IBM PC TO AN IBM MAINFRAME.

Relax.

Now there's PCI-Link™ from Protocol Computers. The first add-on communications board that doesn't turn a smart PC into a dumb 3278 terminal.

With PCI-Link, your PC can access an IBM mainframe, and virtually any other ASCII device—computer, microcomputer, public network or LAN—simultaneously. You can even view and compare data from different sources in up to four windows.

Result? A multi-task workstation that combines the power of IBM 3270 communications with the intelligence of the PC. Plus complete file transfer capability.

What's more, PCI-Link delivers special, exclusive features that make it the smartest communications board you can buy. Like an on-screen floating calculator and electronic notepad. Pop-up menus for ease of use. 3278 keyboard mapping options. User defined macros. Even a special status line in addition to the standard IBM 3278 status line.

And all of PCI-Link's power and functionality is mouse supported.

Is that smart or what?

FOR MICRO TO MAINFRAME COMMUNICATIONS, NO ONE TALKS TO IBM LIKE PROTOCOL.

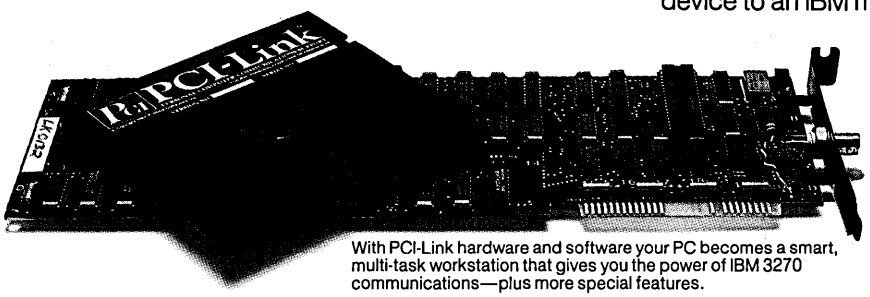
PCI-Link is just one reason why Protocol Computers is the leader in communications technology.

In 1980, we introduced the first successful protocol converter. And today, PCI is the only single resource with a complete array of mainframe access product technology. Advanced protocol conversion boxes. Communications boards. And powerful support software.

So we can help you connect virtually any ASCII device to an IBM mainframe with greater performance, less cost and positive security.

For complete technical information on PCI-Link and our full range of protocol converters, call Ron Ockander, V.P. Marketing, at 1 (800) 423-5904. Or just send the coupon.

Your DP nightmares are over.



With PCI-Link hardware and software your PC becomes a smart, multi-task workstation that gives you the power of IBM 3270 communications—plus more special features.

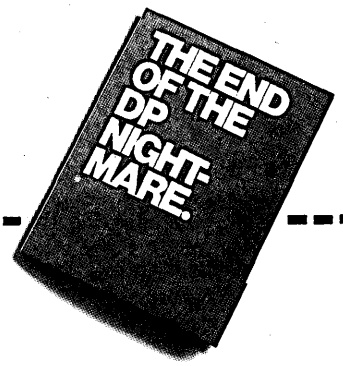
PCI PROTOCOL COMPUTERS, INC.

©Copyright 1984 Protocol Computers, Inc.
IBM is a registered trademark of International Business Machines Corporation.

NIGHTMARE.

CIRCLE 44 ON READER CARD

I want to wake up from the DP nightmare. Please send me my free "The End of the DP Nightmare" kit today.



Protocol Computers, Inc.
6150 Canoga Avenue
Woodland Hills, CA 91367

Name _____ Title _____

Company _____

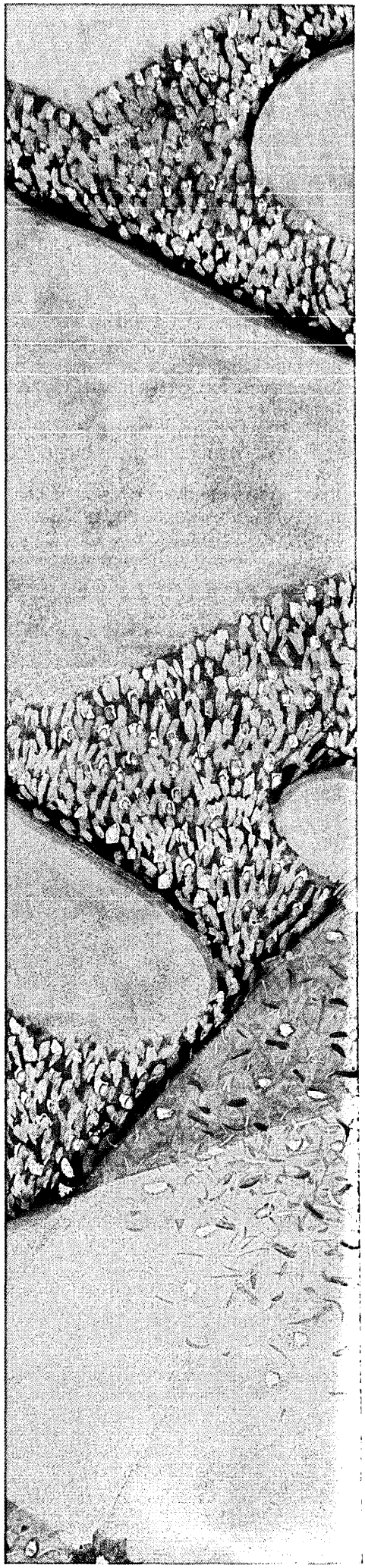
Address _____

City _____ State _____ Zip _____

Telephone _____

DAT 11/1/84

Logic programming offers designers a shortcut through the traditional development process.



AI AND SOFTWARE ENGINEERING

by Robert Kowalski

Can artificial intelligence technology be applied to software engineering, and in particular to the systems analysis stage of software development? I shall argue here that it can, and that in some cases artificial intelligence can render systems analysis efficient enough to remove the need for separate specifications and programs. I will support my case by looking at the British Nationality Act as a particular example, which is closely related to data processing. And finally I shall discuss some of the human implications of the technology.

The Japanese have identified the importance of artificial intelligence applications, and they have identified new kinds of computer architectures. Certainly their new applications can be understood by the person on the street, and the electronic engineer can understand the computer architectures. Until the Japanese drew attention to the logic programming software, however, most computer scientists knew very little about it (see Fig. 1).

The computer scientist's view of computing (Fig. 2) is conventional not only with respect to applications and hardware, but also with respect to software methodology: conventional number crunching, executed on boring computers that run sequentially, have to be told every step, and cannot make any decisions for themselves.

I would like to argue that the new technology associated with logic programming supports not only new applications but old applications as well (see Fig. 3).

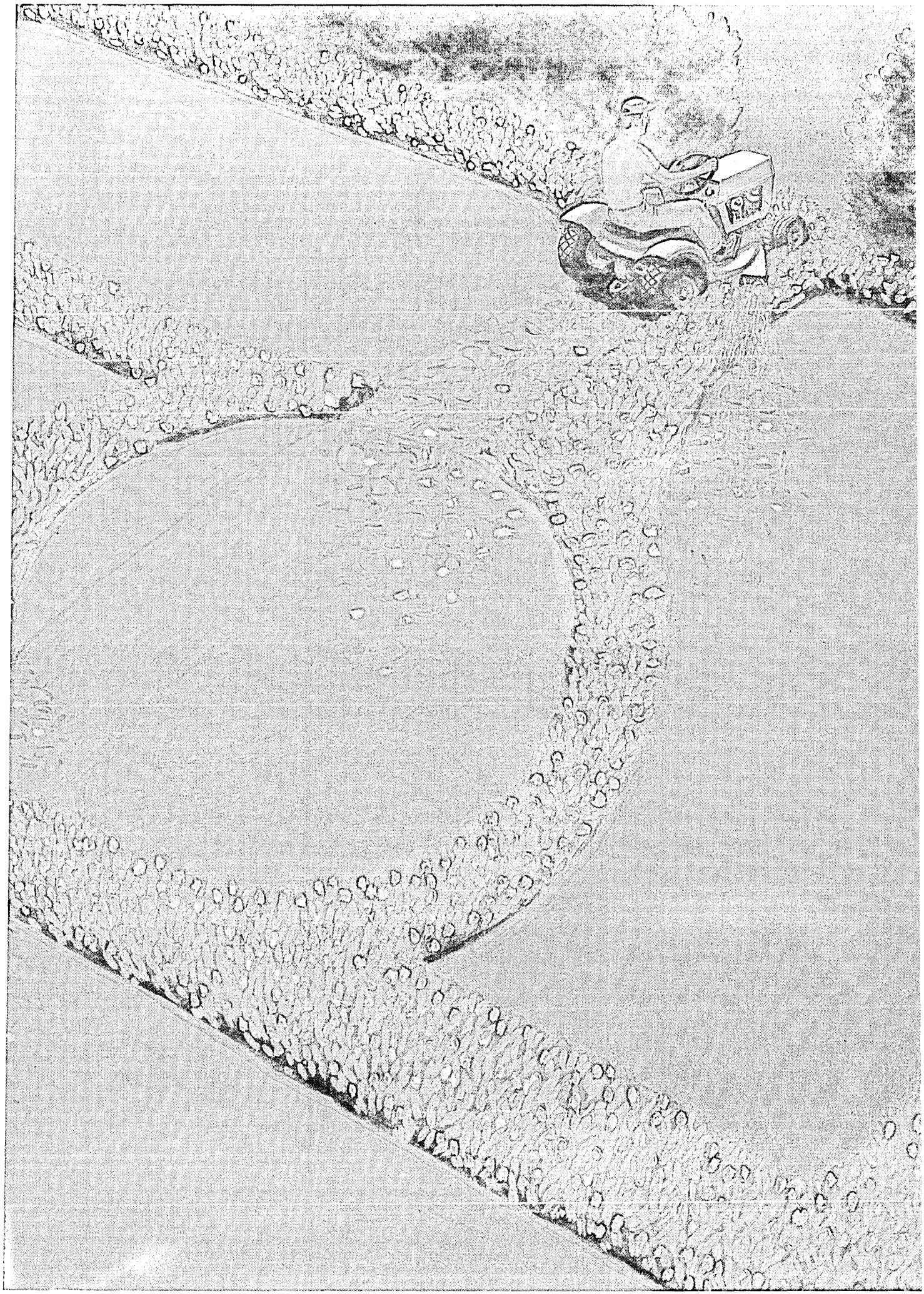
We must first distinguish between technologies and applications. The new software technologies, of which logic programming is the most representative, not only allow new applications in areas like expert systems and natural language processing, but also facilitate the implementation of old applications. They support software development methodologies—not simply old ways of programming, but also new ways of using computers.

So what is this new software technology? The new technology allows knowledge to be represented explicitly. It disentangles what the computer knows from how the computer uses it. The computer uses its knowledge to solve problems by reasoning deductively in a manner that simulates human reasoning, and is therefore congenial to human thinking and to human-machine interaction.

Let's look at the place of the new technology in the conventional software development life cycle, for example, as pictured by Thomas DeMarco in his book, *Structured Analysis and Systems Specifications* (Yourdon Inc., New York, 1979).

I want to draw particular attention to the bottom path of the diagram (Fig. 4), which is concerned with software: we start with the user requirement, namely the problem the user has or thinks he or she has. We analyze the requirement, derive a functional specification, and then design a software system that we eventually implement as a program.

ILLUSTRATION BY BARRY ROOT



Users don't know what they want; and often, when they do, they don't need what they want.

The dataflow diagram, which describes the software development life cycle, is a convenient tool for enabling the systems analyst to interact with the user. But dataflow diagrams can also be interpreted as an alternative, graphical syntax for rule-based programming. Fig. 5 is a diagram for finding products for customers. The data flow diagram is equivalent to a rule:

x is a potential customer for product y
if x has work of type z
and y is suitable for z

The title of the diagram explains its purpose. In this particular example, the purpose is to find products to sell to customers. This constitutes the conclusion of the rule. The processes represented inside the diagram, which are circled, constitute the conditions.

ELIMINATE CONFUSION EARLY

This example shows that logic-based programming is not necessarily programming, or even formal specification. In this example, logic-based programming is an executable analysis of the user requirement. Therefore it can assist the conventional software development life cycle at the earliest possible stage. The user requirement can be analyzed and executed before we derive a functional specification, design, or program. We can execute the analysis to see whether it conforms to the user's view of the requirement, and therefore we can eliminate misunderstandings at the earliest possible stage, before they give rise to further misunderstandings.

Rules can be executed as procedures. If we know the potential customer x and we want to find something to sell him, then the procedure reduces the problem to two subproblems: find what kind of work the customer has and find something that is suitable for that work. I can communicate such a procedure to a salesperson who might know nothing about computers. Moreover, as far as computers are concerned, the two subproblems can be solved sequentially on a von Neumann computer or they can be executed as parallel processes on a fifth generation computer of the future.

There is more than one procedure here, however. The dataflow diagram has done a disservice to the knowledge. The knowledge in the rule can also be used to find customers to whom we can sell particular products. If we want to find a customer x to whom we can sell product y, we can find out what type of work the product can be used for and then find some customer who has that kind of work. The knowledge can be used more flexibly than the systems analyst has seen and more flexibly than the user has required.

FIG. 1

THE CONVENTIONAL VIEW

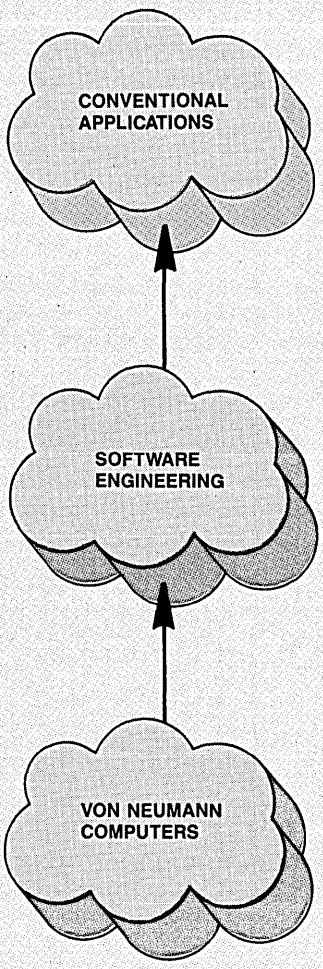
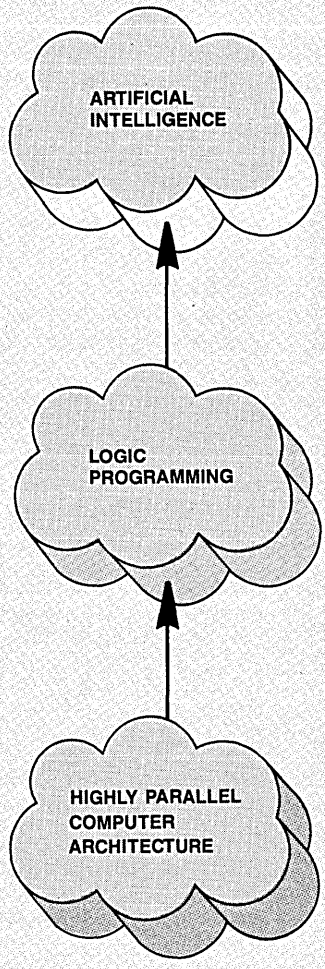


FIG. 2

THE JAPANESE VIEW



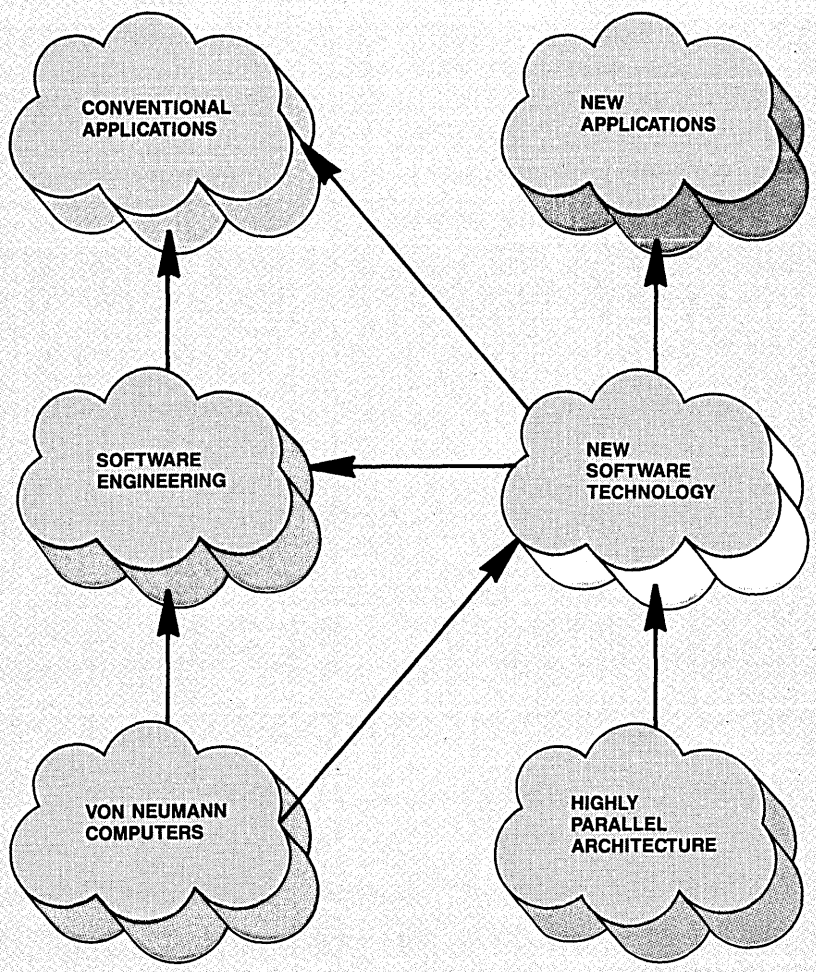
Structured systems analysis has its strengths, and the use of new software technology to execute systems analysis adds to those strengths. What are its weaknesses? Users don't know what they want; and often, when they do, they don't need what they want. The declarative form in which knowledge can be expressed using AI software technologies gives us a way of liberating users from their mistaken conceptions of their problems and of using the knowledge they have for bigger and better purposes.

What are some of the solutions for the weaknesses of structured systems analysis proposed by such critics as James Martin? Perhaps the most popular is rapid prototyping. You prototype the solution to your problem as quickly and early as you can in the software life cycle. But how do you implement the prototype? In most cases, with a programming language that was designed for the final stage of software development. The new logic-based software technology allows us to implement prototypes using languages semantically equivalent to dataflow diagrams designed for systems analysis.

If you don't use a programming language, you use fourth generation program generators. In many cases they are simply generic, parameterized programs that can be tailored for a particular application by the user himself, who selects a particular combination of answers to a predetermined menu of options. In other cases they are

FIG. 3

ANOTHER VIEW



based upon the database approach.

It can be argued that logic-based systems subsume database systems, however. This can be illustrated again by our rule relating potential customers to products. The rule can be regarded as a query generator. Given a problem of relating customers to products, it generates the query:

"Find some type of work z for the customer x for which the product y is suitable."

This is not simply a query to a conventional relational database, however; rather, it is a query whose conditions are evaluated by other rules (or, equivalently, by other procedures).

Thus, logic-based software technology unifies executable systems analysis with databases containing rules as well as explicitly stored data.

The following example, which begins like the preceding example, shows how well suited this technology is to expert systems applications. This example comes from a logical reconstruction by Peter Hammond at Imperial College, London, of an expert system originally implemented in EMYCIN. The rule expresses that a patient should take treatment if the patient has a complaint that the treatment suppresses. But with a human patient we do not want the cure to be worse than the disease:

x should take y if x has complaint z
and y suppresses z
and not y unsuitable for x

Thus we can use the new declarative language technology both to implement new expert systems applications and to assist the conventional software development life cycle. Or we can do better. We can change the nature of computing itself. We can make computers understand knowledge expressed in human terms and make them use that knowledge flexibly, in different ways for different purposes.

INTIMATE PART FOR HUMANS

Such computers will solve problems in a manner that approximates human problem-solving, and will consequently change the nature of human-computer interaction. If the computer needs to solve a problem, it can use its own knowledge to reduce the problem to subproblems, or it can ask the user. Because the computer and the human work in harmony within the same problem-solving paradigm, the human can play an intimate part in the computer-based problem-solving process.

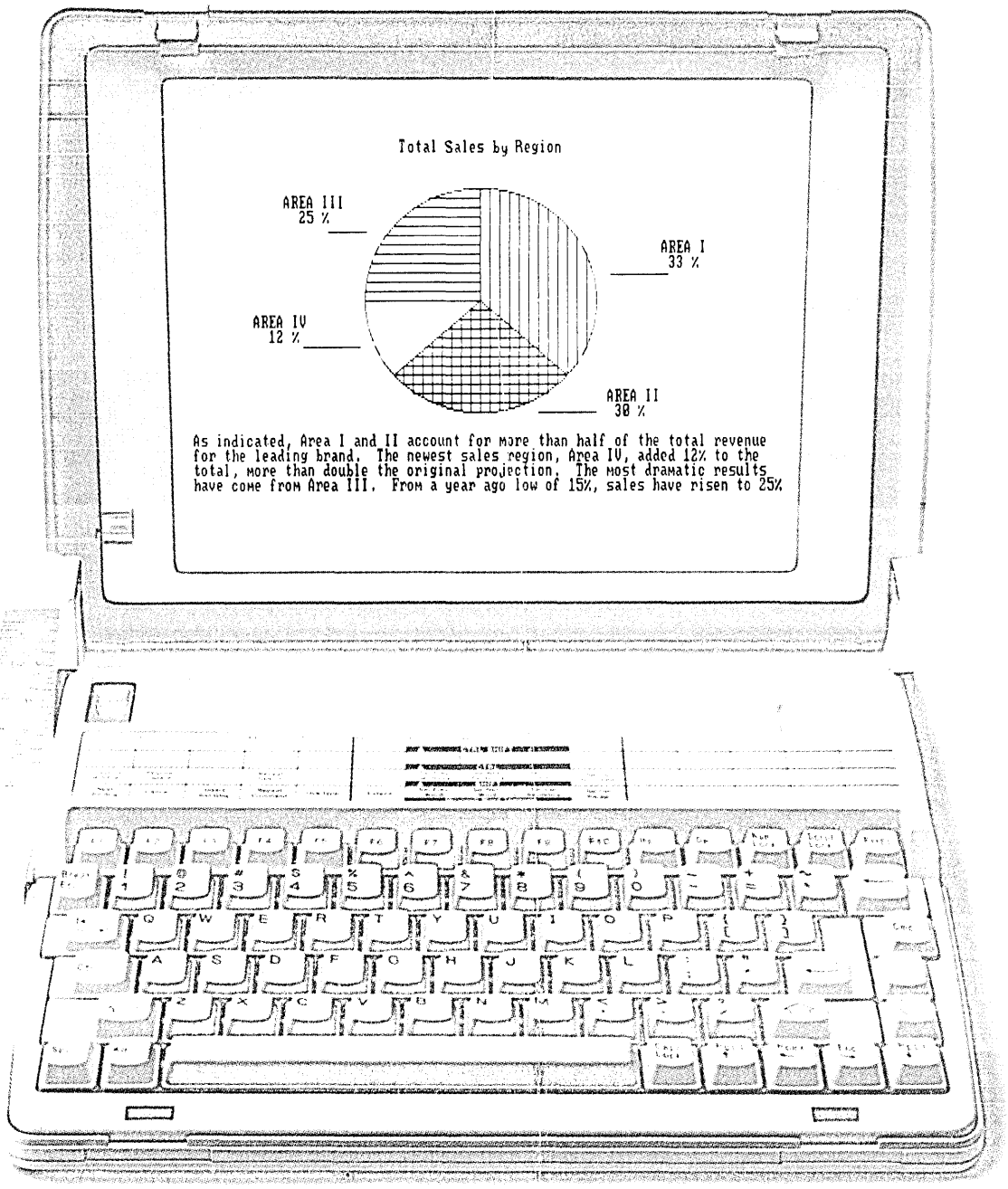
The system can *explain* a conclusion by quoting the rules it used to get there. The explanation serves as an argument in support of the conclusion. Having heard that argument, we can decide whether we agree with it or not, whether we accept the assumptions that justify the conclusion or not. This allows us to stay in control.

Legislation is a particularly critical application, an application that illustrates executable analysis, which is often sufficiently efficient that none of the later stages of conventional software development is required. On the other hand, legislation is by no means trivial. It requires complex knowledge representation and reasoning.

The formalization of legislation also illustrates the incremental method of software development by trial and error. If we were writing programs when we represent the meaning of legislation by trial and error, then we would be bad programmers. Good programmers start with rigid (or at least formal) software specifications, and then implement them correctly the first time round. But for a person who is using Prolog not as a programming language, but as a language for analyzing the knowledge that lies behind the user requirement, trial and error is unavoidable. Even mathematicians prove theorems and develop axiomatic theories by trial and error.

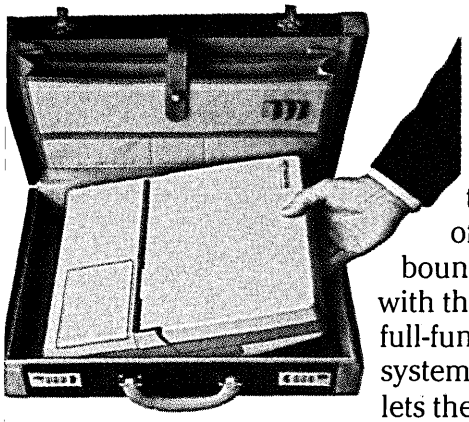
The formalization of rules and regulations is representative of a much wider class of applications. It is applicable whenever an organization uses rules to regulate its affairs, whether or not they have legal, binding authority.

Having rules means not having to deal with each problem as it arises, as if no similar problem had arisen in the past. It


Total Sales by Region
AREA III
25 %
AREA I
33 %
AREA IV
12 %
AREA II
30 %
As indicated, Area I and II account for more than half of the total revenue for the leading brand. The newest sales region, Area IV, added 12% to the total, more than double the original projection. The most dramatic results have come from Area III. From a year ago low of 15%, sales have risen to 25%

INTRODUCING THE STANDARD BY WHICH EVERY OTHER PC WILL BE MEASURED:

THE DATA GENERAL/One™ PORTABLE.



Fits in a briefcase.

Free your people from the confinement of their desk-bound computers, with the first full-function business system that lets them work anywhere.

The DATA GENERAL/One portable offers the capability of the leading PC: two built-in diskette drives, a full-size screen and full-size characters, even the same programs.

In a size small enough to fit in a briefcase: 11.7 x 13.7 x 2.8 inches, and less than 11 pounds.

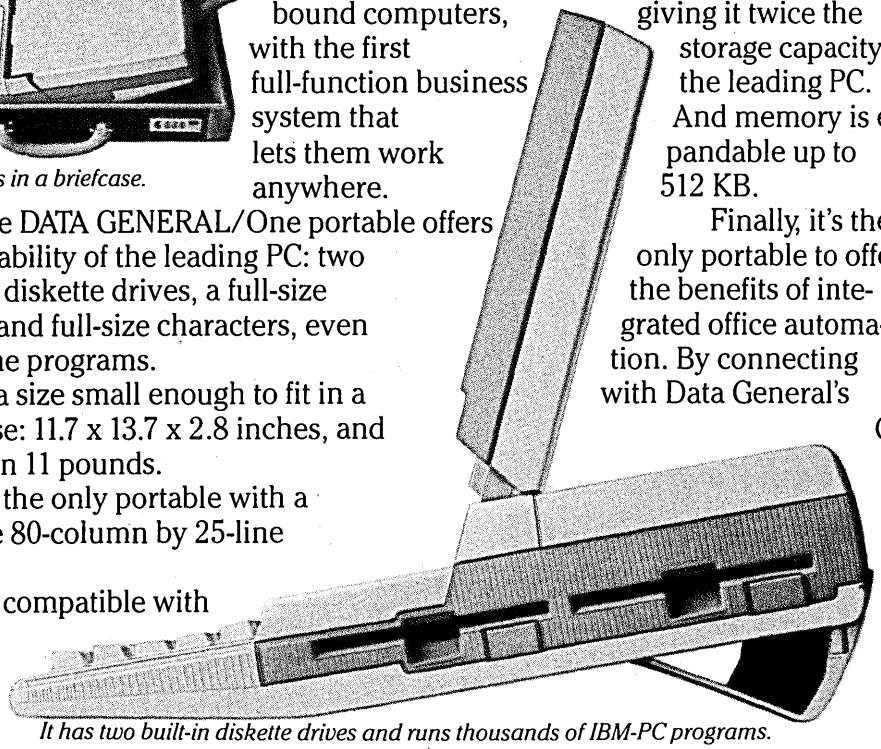
It's the only portable with a full-size 80-column by 25-line screen.

It's compatible with IBM®-PC software, so it can run the programs available to PC users. Software like 1-2-3™ and Symphony™ from Lotus™, Wordstar®, dBase II®, and Multiplan®, even engineering packages like Golden Common LISP™, Bellesoft ES/P™-Ada®.

It's the only portable with two built-in 720 KB diskette drives, giving it twice the storage capacity of the leading PC. And memory is expandable up to 512 KB.

Finally, it's the only portable to offer the benefits of integrated office automation. By connecting with Data General's CEO® system, users can convert MS™-DOS files to CEO files and vice versa.

Connects with Data General's CEO office automation system.



It has two built-in diskette drives and runs thousands of IBM-PC programs.

The DATA GENERAL/One. It gives your people what the leading PC does. And something the leading PC doesn't.

Their freedom.

Find out more about the DATA GENERAL/One portable by contacting your Data General salesperson or nearest authorized dealer. Call 1-800-DATAGEN.

Data General
a Generation ahead.

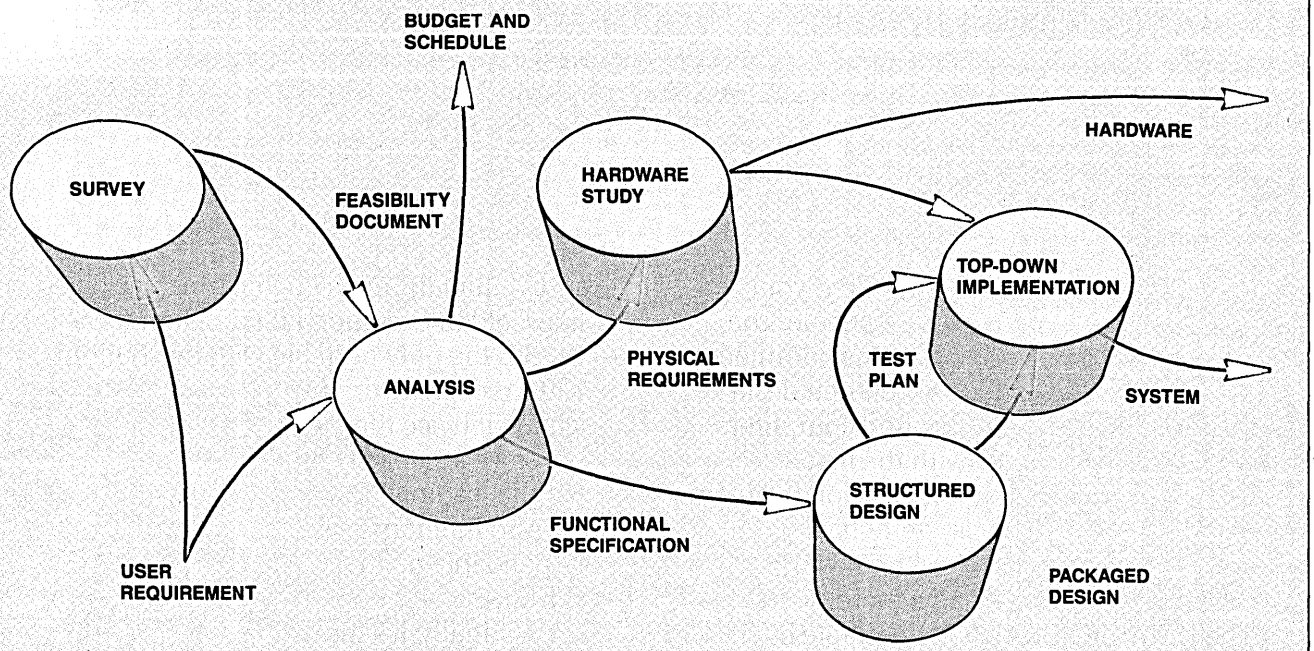
IBM is a registered trademark of International Business Machines Corporation. 1-2-3, Lotus and Symphony are trademarks of Lotus Development Corp. © 1983. dBase II is a registered trademark of Ashton-Tate. Wordstar is a U.S. registered trademark of Micro Pro Int'l. MS is a trademark, and Multiplan is a U.S. registered trademark of Microsoft Corp. Golden Common LISP is a trademark of Gold Hill Computer, Inc. Bellesoft ES/P is a trademark of Bellesoft Inc. Ada is a registered trademark of the Department of Defense (OUSDRE-AIPO). CEO is a registered trademark, and DATA GENERAL/One is a trademark of Data General Corp. © 1984 Data General Corporation, Westboro, MA

CIRCLE 45 ON READER CARD

Indeed, the whole concept of rule-based knowledge representation has important human implications.

FIG. 4

SOFTWARE DEVELOPMENT LIFE CYCLE (DE MARCO)



means deciding what the general rules are, so that we treat different cases equally, applying the same criteria to one as we do to another.

Indeed, the whole concept of rule-based knowledge representation has important human implications. When we extract knowledge from experts in the form of rules, we see—often for the first time—what the rules really are. The process of eliciting knowledge from experts can be a painful process. It is difficult to know what the expert thinks and what he believes. This is just as true of ordinary people, however. It's hard for us to know what rules we use ourselves in solving day-to-day problems. If we could articulate them, then we could examine them. Even if our first attempts at articulation were incorrect, we could improve them by trial and error. We could see them for what they are; we could challenge them; and we could see if they are fair, if they apply to one customer as well as to another, to ourselves as well as to others.

ACT THAT CONFIRMS THEORY

Let's look at an example from the British Nationality Act and see to what extent it confirms the theory. The very first subsection (1.1a) of the act is concerned with "acquisition by birth":

"A person born in the United Kingdom after commencement shall be a British citizen if at the time of birth his father or mother is:

(A) a British citizen; or . . . ."

Here "commencement" refers to the date on which the act takes effect.

x is a British citizen
if x was born in the U.K.
and x was born on date y
and y is after commencement
and z is a parent of x
and z was a British citizen on date y

My colleagues, Therese Cory, Peter Hammond, Frank Kriwaczek, Fariba Sadri, Marek Sergot, and I have investigated the representation of the British Nationality Act. About 80% of its 70-odd pages have been written in Prolog. We found the structure of the act difficult to comprehend, so we tried using dataflow diagrams to help. We soon came to the reluctant conclusion that dataflow diagrams were inadequate. In the end, we decided to use and/or graphs, a kind of dataflow diagram in which logical connections between processes are made explicit, but dataflow between processes is ignored.

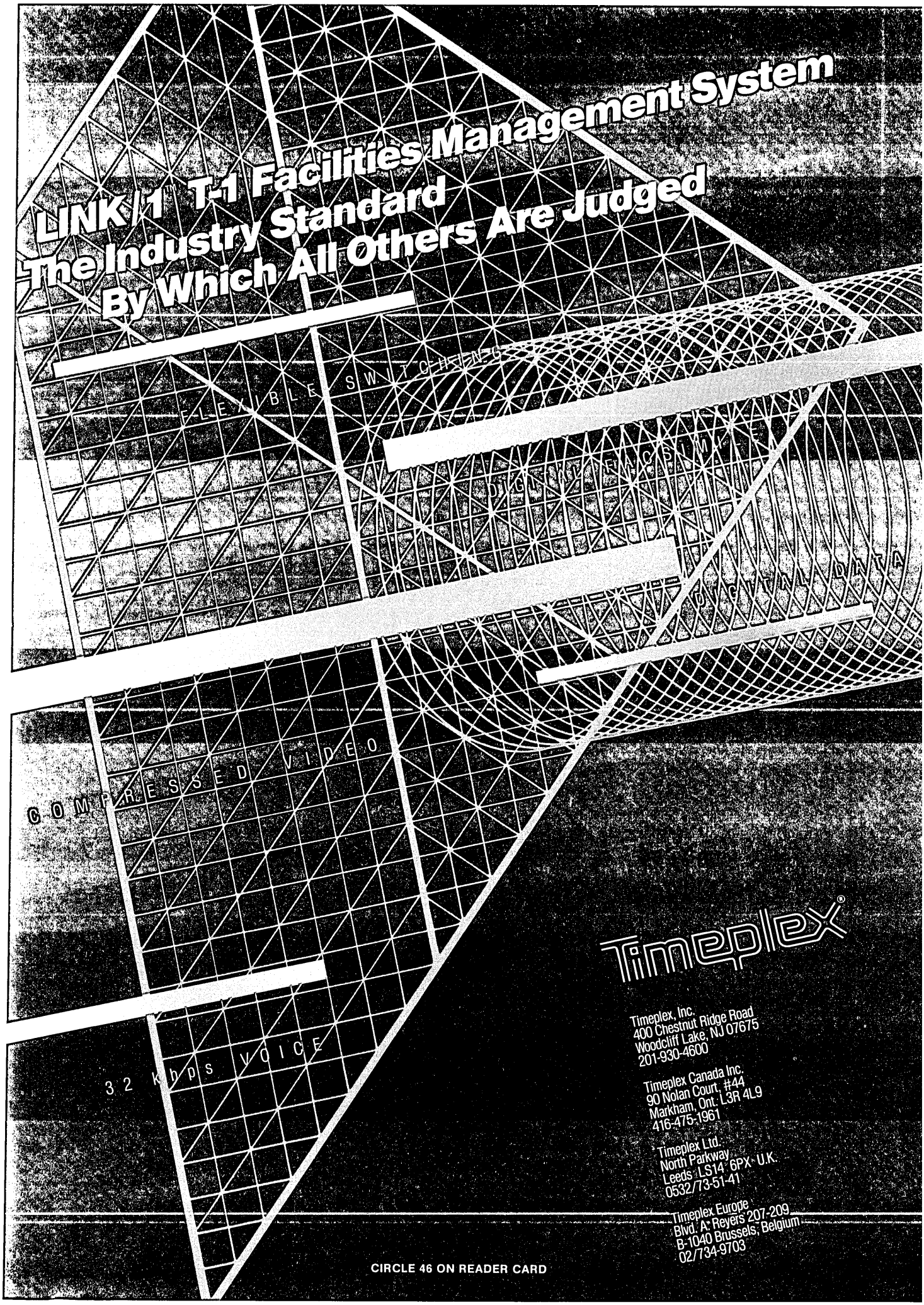
The and/or graph gave us an overall view of the structure of the act, but it gave us little help in deciding detailed knowledge representation issues. Moreover, it soon became clear that there was little alternative to trial-and-error refinement of the rules. The inadequacy of our first attempt to formalize subsection 1.1a in particular did not come to light until we came to section 2.1a, which is concerned with "acquisition by descent":

"A person born outside the United Kingdom after commencement shall be a British citizen if at the time of birth his father or mother

(A) is a British citizen otherwise than by descent; or . . . ."

Notice the disconcerting condition "British citizen otherwise than by descent." This shows that our earlier assumption that the conclusion of 1.1a is that "x is a British citizen" was naive. Moreover, it also ignores the implicit assumption that x acquires citizenship at the time of birth. Taking both of these omissions into account, we can revise our original formalization, obtaining the further approximation:

x acquires British citizenship by 1.1a on date y
if x was born in the U.K.
and x was born on date y
and y is after commencement
and z is a parent of x



CIRCLE 46 ON READER CARD

and z is a British citizen
by w on date y

There is now a mismatch, however, between the form in which citizenship is expressed in the conclusion and the form in which it is expressed in the condition. We need an additional rule that is not explicitly stated in the act, but which is taken for granted:

x is a British citizen by w on date y
if x acquires British citizenship by w on date z
and y is after z
and x is alive on date y
and x has not renounced British citizenship before date y
and x has not been deprived of British citizenship before date y

In other words, a person is a British citizen of a particular kind on a particular date if he/she acquired that citizenship on an earlier date, is alive, has not renounced it, and has not been deprived of it.

The rule-based formalization of the British Nationality Act by trial and error exemplifies the use of logic programming technology for an application that has both conventional and novel characteristics. On the one hand, if we restrict ourselves to problems of determining citizenship, it is not very different from a complicated data processing application. On the other hand, given appropriate inference machinery, the same representation can, at least in theory, be used to generate and test arbitrary logical consequences of the act. In both cases we have short-circuited the conventional software development life cycle, completing it without leaving the executable systems analysis stage.

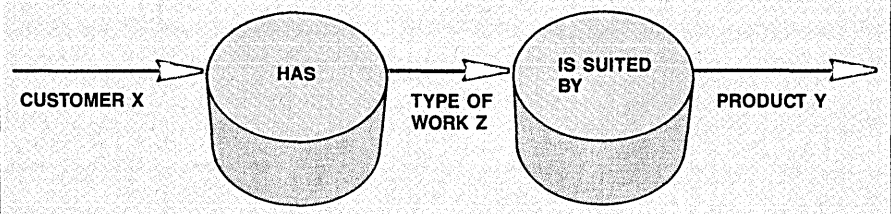
OTHER USES OF AI

I have concentrated attention on those applications of AI technology to software engineering that revolutionize the software life cycle, and which in many cases do away with program implementation, and even system specification. There are of course other applications of AI technology: intelligent tools that help to preserve the conventional software engineering process; intelligent front ends to otherwise inscrutable conventional computer programs; knowledge bases to support the conventional software process; and expert systems that incorporate software engineering expertise.

Such applications of AI technology have their place, especially if they are the only way we can convince the software engineer to experiment with AI technology. But let's not devote all of our resources to helping the old software methodology live longer.

FIG. 5

X IS POTENTIAL CUSTOMER FOR PRODUCT Y



There are other applications of AI to software engineering that have great present value and future potential. In particular, the formal, computer-assisted derivation of programs from specifications is an area that straddles the fields of artificial intelligence and software engineering. It is needed if an executable system analysis does not perform efficiently enough to meet performance targets. This was not the case, for the most part, with our formalization of the British Nationality Act, although even there we used program transformation techniques, by hand, to eliminate certain loops.

In many other cases, such as sorting files, executing an analysis of the user's problem domain is not sufficient. We need to improve efficiency by transforming the analysis into an executable specification or a still more efficient program.

If necessary, the program can be written in a conventional programming language. But given adequate software and hardware resources, it can be transformed into a program expressed in the same logic-based language. Using the same language for all stages of the software development process greatly simplifies the problems of maintaining consistency between the different stages. Moreover, transformation and derivation techniques that are guaranteed to preserve correctness can be used to pass from one stage to the next.

I have talked about the applications of AI to SE. What about the applications of SE to AI? Certainly the software engineer has three major concerns that do not always attract sufficient attention in AI: correctness, scale, and complexity.

RIGHT AS SYSTEMS ANALYSIS

I have already argued that many AI applications are better thought of as executable analyses or executable specifications. To the extent that that is the case, such applications are as correct as any systems analysis or specification. Many AI applications go beyond analysis and specification in their concern with matters of efficiency, however. In such cases, the resulting programs are as much in need of validation and verification as any conventional program. The software engineer is right to criticize the AI programmer who uses AI techniques that do not have logical foundations and are not amenable to proof.

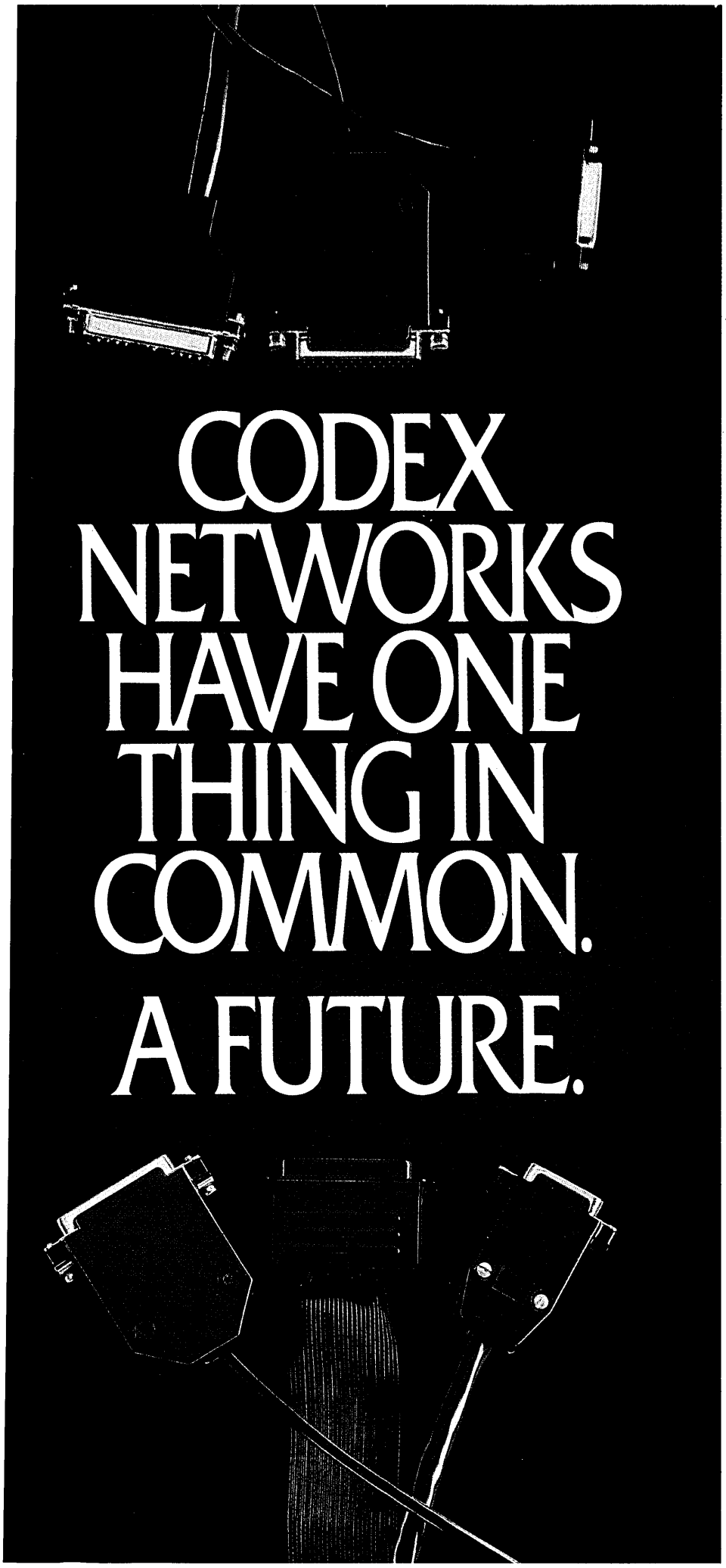
This is an area in which logic-based approaches to knowledge representation and programming in AI have a distinct advantage over other approaches such as frames and object-oriented programming. Knowledge representations and programs expressed in logic are expressed in the same formalism as the software engineer uses for expressing formal specifications. Using the same logic-based language for both programs and specifications significantly simplifies the problems of proving correctness.

What about scale and complexity? I wonder whether there is very much more to be said other than to repeat DeMarco's advice about not using more than a single sheet of paper for a single dataflow diagram (or the equivalent collection of rules, whether they represent an analysis, specification, or program). It may be, however, that frames and object-oriented programming have some useful contributions to make here.

I believe that the technology of knowledge-based software is going to make life better on the average. Unless we are aware of some of the potential dangers and take suitable precautions, however, there may be some spectacularly undesirable results.

It is all too easy to let computers take over. We've done it before, with professional advisors—with doctors, for example. The human expert can intimidate us by knowing more than we do. If humans can intimidate humans, then computers will intimidate humans, too, if we allow the enthusiastic technologist to have his way. The enthusiastic technologist will inevitably design computers to do more and more of our thinking and decision-making for us. It has already happened with television. We can't entertain ourselves without technology anymore. We enjoy ourselves more sitting in front of the television than we do interacting with live people. The same will happen with computers unless we are determined to prevent it.

I see real dangers, but I also see great potential benefits. The new computing technology has some obvious uses for implementing intelligent front ends, not



The future.

Very few data communications managers have the time to think about it. And even fewer data communications companies want to discuss it.

While we at Codex don't claim to have a crystal ball, we feel that not knowing what the future holds is no reason to be unprepared for it.

Which is why everything we do centers around one objective: putting you in the position to solve your organization's information needs. No matter how large, how complex, or how much they change.

This is evident not only in our dedicated central site control systems, but with our modems, multiplexers, network processors, switches and local area networks which deliver monitoring and control capabilities, enhancing network performance and flexibility.

It's also evident in our people, who can help you interconnect devices with various protocols, speeds, even dissimilar architectures.

The fact is this: for more than 20 years we've been helping people solve the future everyday. To the point where today Codex equipment can be found in 90 of the Fortune 100 companies.

See how far Codex can take you. Call **1-800-821-7700** ext 890. Or write Codex Corporation, Dept. 707-90, 20 Cabot Boulevard, Mansfield, MA 02048.

codex

MOTOROLA INC.
Information Systems Group

©1984 Codex Corporation.

Once knowledge is made explicit, we can see more clearly what we believe.

just for conventional software, but for any kind of unfriendly machinery—my oven, for example. I hate my oven. I don't know how to use it properly and it doesn't appreciate me. An intermediary that is more machine-like than I and therefore more sympathetic to my oven than I, yet which understands the world more the way I do than computers do today, can make the world of machinery friendlier, more understandable, and less intimidating.

HELP US MAKE DECISIONS

The new rule-based, logic-based languages allow us to get rid of the take-it-or-leave-it attitude of computers today. They make it possible for computers to explain their conclusions, and therefore easier for us to decide for ourselves whether to accept their conclusions. Only when computer programs are expressed in declarative, explicit form, can we identify what assumptions they use, can we decide whether to accept their assumptions, and therefore whether to accept their conclusions.

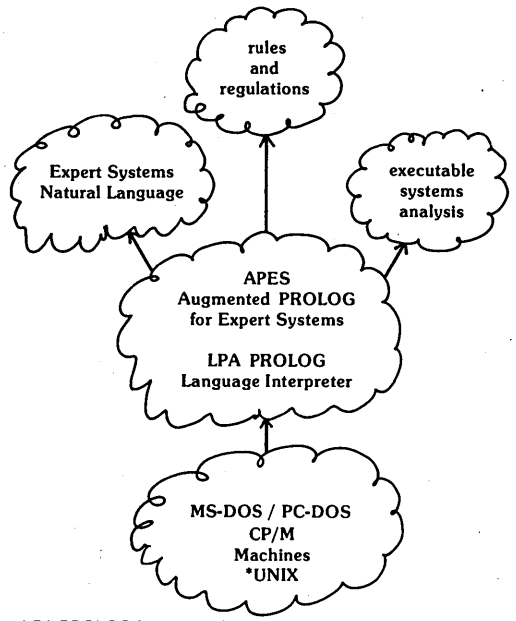
Such systems will increase human knowledge and expertise. Computerized encyclopedias have already begun to give us ready access to almost everything that is known. Through the technique of knowledge elicitation, things that are only known subconsciously can begin to be articulated and brought out into the open. In the same way that an expert system might give us a better understanding of a medical expert's previously unconscious knowledge and beliefs, knowledge elicitation can more generally give us a better understanding of ordinary people.

Not only can knowledge be enhanced, but also human reasoning and rationality. Once knowledge is made explicit, we can see more clearly what we believe. We can begin to see as well what others believe. We can begin to see the individual steps that explain and justify knowledge and belief.

We can begin to think more rationally, because we can better understand ourselves and others. We can suspend our beliefs because we know what they are. We can temporarily assume another's beliefs because we can hypothesize what they might be; and we can reason with those assumptions to see where they might lead. I believe that, on the whole, this will result in a better world.

I believe that the mechanization of logic will make computing better, and therefore is the key to new generation computing. It is also the link between knowledge representation languages in artificial intelligence, and systems analysis languages, program specification languages, and database languages in software engineering. In the end, however, what matters is not computers, or software engineering, or artificial intelligence, but people. And, provided we take the right precautions, I believe the new technology will help us to be more human, to understand ourselves, and to understand others. ◉

Robert Kowalski is head of the Logic Programming Group and professor in computing at Imperial College in London. His research provided the theoretical framework for the programming language Prolog. This article is based on his SPL-Insight Award (1983-84) lecture.



LPA PROLOG Language Interpreter License	$295.00
LPA PROLOG Language Interpreter Documentation	45.00
APES Augmented PROLOG for Expert Systems	$295.00
APES Documentation	10.00
Pkg. LPA PROLOG & APES	$495.00

*UNIX Version Available Soon

PROGRAMMING LOGIC SYSTEMS
31 Crescent Drive
Milford, Connecticut 06460
(203) 877-7988

CP/M is a trademark of Digital Research Inc.
MS-DOS is a registered trademark of Microsoft Corp.
PC-DOS is a registered trademark of IBM

Prices subject to change

CIRCLE 47 ON READER CARD

DO YOU NEED TO KNOW...

. . . the expected increase in dp spending in 1984 for other companies in your industry?
. . . the typical level of dp budget expenditure for personal computers?
. . . the annual turnover rate for your industry or location?
. . . the trend in benefit plans?
. . . the pay scale range for systems analysts by industry and geographic area?

DATAMATION research reports have the answers. We regularly survey our 172,000 readers around the world about their operations, and detailed statistical reports of these studies are now available.

The 1984 **DATAMATION** Salary Survey, including 160 pages of tables covering 43 dp job categories in 18 geographic areas and 11 different industry categories, is available for $100. The 1984 **DATAMATION** Budget Survey report and executive summary, including 77 pages of tables cross tabulated by 11 industry categories and 13 line items of the typical DP budget, is only $100.

For further information contact Laurie Schnepf, director of research, Technical Publishing Co., 875 Third Ave., New York, NY 10022.

TO: Laurie Schnepf, Research Director, Technical Publishing
875 Third Ave., New York, NY 10022.

Please send me _____copies of:
_____the 1983 DATAMATION Salary Survey, at $100 each.
_____the 1984 DATAMATION Budget Survey, at $100 each.
A check is enclosed for _____. Please send material to:

Your Name _____
Title _____
Company name _____
Address _____
City, State, Zip _____

THE ITT 9236.
IT HAS THE FUNCTIONS YOU WANT TODAY, THE FLEXIBILITY YOU'LL NEED TOMORROW.

When it comes to extended functions, our new 9236 display has everything.

For instance, it gives you dual logical units that let you change applications with a single keystroke.

It has selectable screen formats so you can use one display to handle more than one application.

It can use a light pen or operate a display-attached printer so you can make local copies at your workstation.

It offers the ergonomic benefits of a non-glare matte finish. A compact, low-profile keyboard. And a flicker-free, high-resolution, 14-inch screen that tilts and swivels.

On top of all this, our 9236 gives you extended data stream and programmed symbols for color graphics. Plus a long list of exclusive ITT productivity features, like automated keystrokes, built-in notepad, dynamic color assignment, and auto log off/power off.

But perhaps the most important thing we've built into our 9236 is a flexible, open architecture. The kind of architecture that'll take you into networking, the electronic office, or wherever else you want to grow.

Of course it wasn't easy designing in all this and keeping the 9236's price competitive, too.

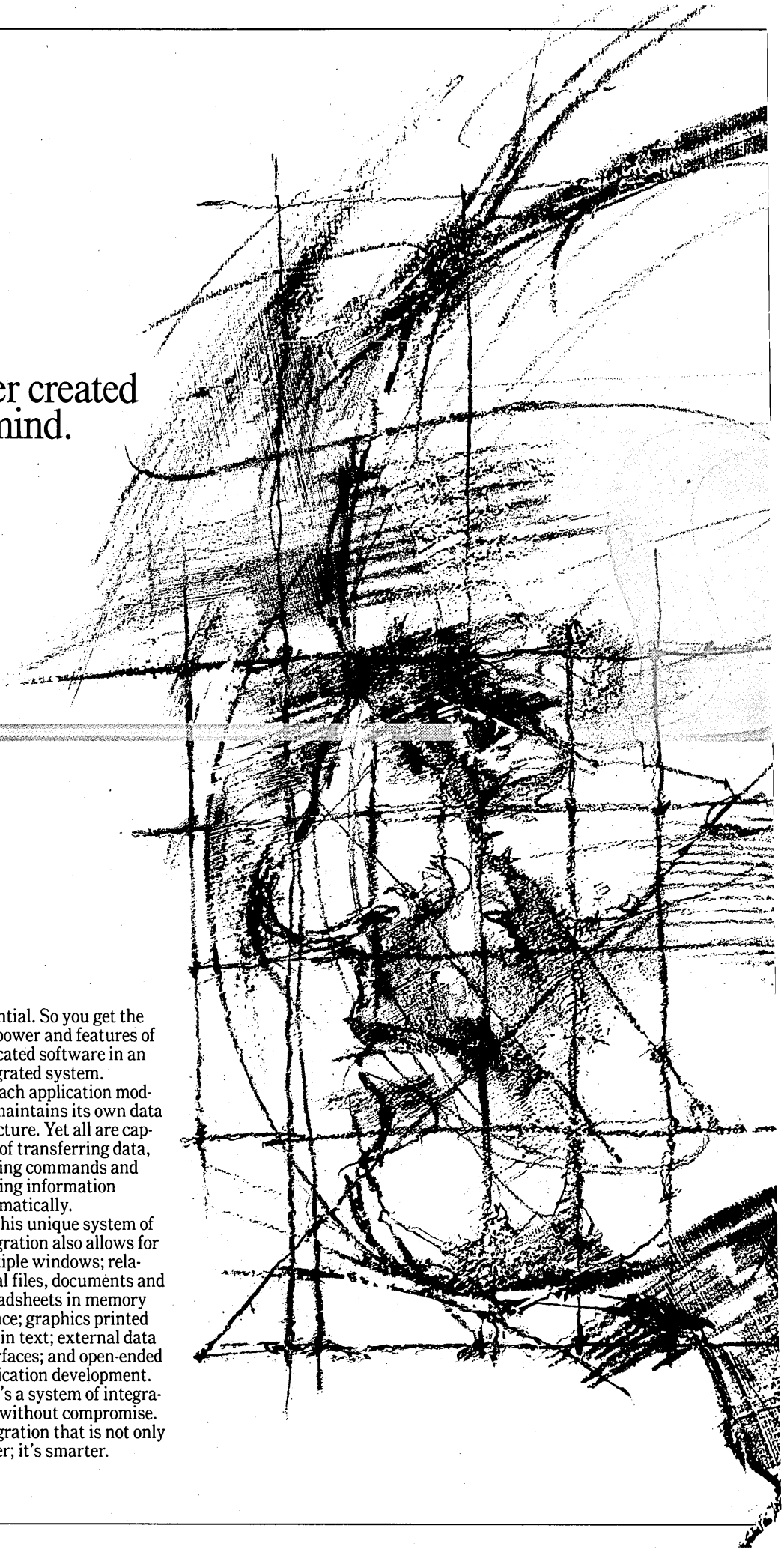
But, then again, giving you more display for your money has always been what ITT Courier is all about.

For more information, contact your nearest ITT Courier Representative. Or call the ITT Courier Sales Support Dept. at 1-800-528-1400, toll-free.

ITT COURIER

CIRCLE 48 ON READER CARD

Introducing the smartest tools ever created for the business mind.



The Smart Software System.

Smart Software, featuring The Smart Spreadsheet with Graphics, The Smart Word Processor and The Smart Data Manager, is the first software system with the unique intelligence and inherent logic to perform the way you think. Which makes applying the power of a computer to business tasks more effortless and effective than ever before.

It's awesomely powerful, yet amazingly simple. And with its greatly advanced and unprecedented capabilities, it sets new standards by which all other integrated business software will be measured.

ACHIEVING FULL INTEGRATION WITHOUT COMPROMISE

Unlike all-in-one integrated packages, Smart Software is structured on the concept of modular integration. Where each dedicated application can achieve its own maximum potential. So you get the full power and features of dedicated software in an integrated system.

Each application module maintains its own data structure. Yet all are capable of transferring data, passing commands and sharing information automatically.

This unique system of integration also allows for multiple windows; relational files, documents and spreadsheets in memory at once; graphics printed within text; external data interfaces; and open-ended application development.

It's a system of integration without compromise. Integration that is not only better; it's smarter.

SETTLING THE EASE OF USE VERSUS POWER DILEMMA

Smart Software puts to rest the ease of use versus power dilemma with an exclusive feature called "confidence levels."

At confidence level one, beginners don't face intimidating options; yet level three provides experts with all the power they want.

This feature enables Smart Software to grow in sophistication as the user's confidence increases or needs expand. Even more importantly, a variety of users in the same company, with different experience, can each work comfortably at their own level of ability with the same applications.

This one, innovative idea could revolutionize the way all business software is designed to work. And only Smart Software has it.

CREATING CUSTOM APPLICATIONS BY SIMPLE MENU SELECTION

Perhaps the most significant aspect of Smart Software is its unique "project processing" capability. It allows the user to set up customized projects, like a monthly sales report system or multi-year business plans, simply by doing them once.

There's no need to learn a complex programming language. The user merely makes simple English command selections. Smart Software then remembers to complete the project in the same way again at the touch of a button. Not by memorizing keystrokes (like a macro), but by automatically learning your custom sequence of commands and freely adjusting to changes and edits.

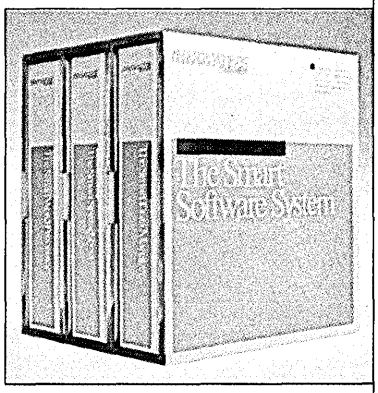
No other integrated system has a capability that even comes close to Smart Software's project processing.

HELPING PEOPLE TO WORK SMARTER, NOT HARDER

Smart Software was created to work for you, relentlessly. Structured to integrate between applications, automatically. And designed to perform multi-faceted business projects, brilliantly.

See your local computer dealer for a demonstration, or call 800-GET SMART to order a Smart demonstration disk.**

Smart Software is currently available for the IBM PC, IBM PC/XT, the new IBM PC/AT, and IBM compatibles.



The Smart Software System

INNOVATIVE™ Software

CIRCLE 49 ON READER CARD

*Lotus 1-2-3, WordStar and dBase II are registered trademarks of Lotus Development Corporation, MicroPro International Corporation, and Ashton-Tate, respectively. In Kansas, call (913) 383-1089.

**The $10 charge for the disk is refundable with the purchase of any Smart Software.

© 1984 Innovative Software, Inc.

32-BIT POWER A CHUNK AT A TIME

With the BTI 8000, you can support up to 200 interactive terminals, simultaneously running programs in COBOL, Pascal, FORTRAN, and BASIC. Better yet, you can get all this supermini power a chunk at a time. Which means it costs far less than replacing or adding systems to increase performance.

The key is our Variable Resource Architecture. Start with one CPU and a Mbyte of main memory. Then, increase your processing power up to 10 times just by plugging in resource modules — up to 8 CPUs, 16 Mbytes of memory, and 8 Gbytes of mass storage. You have virtually unlimited flexibility to configure the BTI 8000 to your specific workload, all without rewriting software.

Of course, you also get demand-page virtual memory, secure multi-user operations, device-independent programming, and a hierarchal account structure.

You'll like our Fail-Soft architecture, too. In multiple resource configurations, if a module fails, simply remove it, and restart the system. Our powerful operating system automatically reorganizes the remaining resource modules so you're back on-line in minutes.

One thing more. We've installed over 3500 computers in Canada, Europe and the USA. And with ten year's experience in remote diagnostics as well as on-site service, BTI computers have set an enviable record for up-time.

So if you've reached a dead-end with your present system, find out more about the supermini with all the power and expandability you could want. A chunk at a time.

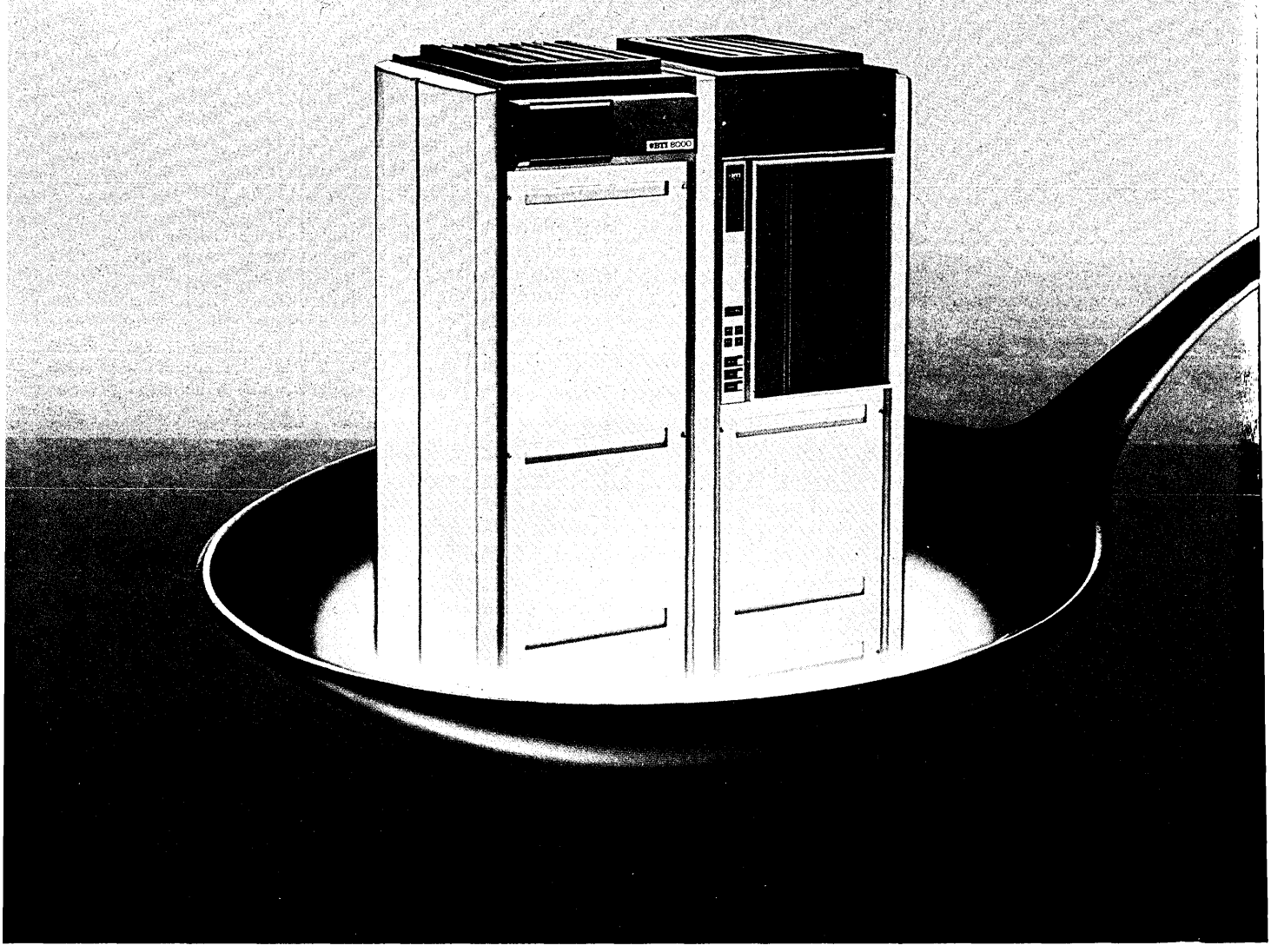
BTI8000

32-bit Multiprocessor System

BTI COMPUTER SYSTEMS
870 West Maude Ave., Sunnyvale,
California 94086 (408) 733-1122

BTI are registered trademarks of BTI Computer Systems.

CIRCLE 50 ON READER CARD



Sometimes, the simplest things will reveal whodunit.

THE CASE OF THE APPLICATIONS BACKLOG

by Kenneth E. Schoman Jr.

In classic detective stories, things are seldom what they first seem. The hero is introduced to a situation, explores all the loose ends, draws some conclusions, then pauses to reflect. At that point, the reader becomes aware of something sinister lurking in the background. Real-life affairs are sometimes like that. Initial conclusions, however carefully they are formulated, often omit a major element.

This is one of those stories.

At first, I thought it was a clear case of mistaken project management. Reports were showing hours spent, not results achieved, and planning was too ambitious. Software development was being held up by unscheduled delays. I realized that even if everyone worked their hardest, they would still be falling behind. Moreover, the obvious symptoms merely disguised the applications backlog. That's what this story is about.

It began when we were called in by the MIS director of a technical service company.

"I just transferred over from Engineering a few months ago" he said, "and this software business is really out of hand. In Engineering, we knew what a project was and we knew how to manage one. But here we have managers who track gross man-hours, not milestones. We are engaged in a number of major development efforts. The first two just slipped several months within weeks of their scheduled completions. The users already feel they aren't getting anything out of Data Processing. If this keeps up, I can't be sure we'll make the three-year plan for putting even bigger systems into operation. We need better project control, and I want you to train my people so that we get it."

With that, he paused as if to emphasize his conclusion, and then continued in a more reflective tone. "You know what mystifies me? Those two late projects. Until the eleventh hour, they were saying that everything was fine. Then suddenly they slipped four months on a 10-month schedule. When I tried to find out why, they just said that's the way software is. We have good development standards, heavy user involvement, automated project reporting, and thorough requirements analysis. But once something gets into programming, we don't really track it right. I don't even think they know themselves why the schedules are slipping."

"What were the projects that slipped?" I asked.

"Payroll and Transportation," he said. "They were batch, but we are rewriting them to take advantage of a database environment. Transportation includes fleet scheduling and maintenance, on-board parts stocking, material management, order tracking, and time/expense reporting, by the way.

"Frankly, the fact that this particular project is late doesn't bother me a lot," he said, leaning forward as if to confide. "What really worries me is the four or five big systems that we have only just started. Take On-line Customer Service, for example. Our current version of that system has hundreds of programs. The preliminary design shows 10 subsystems with almost 200 visible transactions. We think it's going to be at least 400,000 lines of code. They tell me it will be done by mid-1987. But if they are slipping now, how can I believe that estimate? And what do I tell the users?

"No," he finished, "we need much better project control in here. Budget is not the issue and quality will be kept at its current high level. What we need are realistic estimates of schedule and a way to complete them on time. You folks figure out how to do it. Tell me what kind of people we need and what kind of tools to use, and we will go out and get them. Here is a list of the concerns we have."

He threw me the list (see Fig. 1). "Is there anything else you want to know?"

"Just some details," I answered. "In your development standards, what project tasks are tracked and what distinguishes a large project?"

MIS'S STANDARD APPROACH

"We sometimes break things into phases," he replied, "but the standard approach is test for feasibility, design, implement, and install. That's what we did for Transportation. We scheduled four months and 182 labor-hours for design, then six months and 494 labor-hours for code and test. Our standards book says that a large project is anything over 20 man-days, but to me a large project is anything over three man-years. We have over 40 people developing and maintaining applications software, by the way, so this is important. Let me know how you want to approach it."

With that, he ushered me politely out of his office. My first reaction was disbelief. Why, after all, would anyone want to write yet another payroll system from scratch? But I quickly settled down to focus on project planning and control. It was, after all, such an easy target.

Even before leaving the building, I knew I had two solid leads.

First, they were managing the hours spent, not the results achieved. The MIS director sincerely believes that cost is the measure by which data processing exists within the corporation. Project managers report in those terms because they understand that the director manages resources, not products. Even using earned-value concepts, like percent complete, does not work. When you are keeping track of the hours walked or the number of paces marched, you might easily forget that a milestone is a tangible object along the path.

Second, they were defining as single projects jobs so large as to be unmanageable. Their checklist shows a concern for "schedule, given project size, and complexity." But the scope of an individual project is not a given.

Whoever defined Transportation as a single project, for example, deserves to go have his ticket punched for good. That system could have been planned as a series of progressive releases. It did not have to be built as one enormous, all-or-nothing proj-

Whoever designed Transportation as a single project deserves to go have his ticket punched for good.

ect. Perhaps they were taken in by development standards geared for enhancements. Major data-oriented applications require careful staging of system functions and deliverable items. Blindly applying such phases as "test for feasibility, design, implement, and install" is improper planning.

I have recounted this story more or less as it unfolded because project control appears to be at fault. Project management is involved; no one denies that. But the same symptoms—cost emphasis, underestimated schedules, and projects of enormous scope—might also suggest that something else is afoot.

Why would anyone tackle so much software all at once?

Why would they promise delivery on such a short schedule?

They might have misunderstood software estimating or they might have been under a lot of pressure.

I suspected the worst.

Just solving the project management problems would not be enough to close the case. True, we could set accurate dates for delivery. And the software would be ready very close to schedule. Meeting a schedule is only part of the story, however. "On time" matters, but "what time" matters more.

I had a feeling, an uneasy sensation, that what they really wanted was the software done sooner, a lot sooner.

Someone out there was clamoring for applications.

Thinking back, one part of our dialog had bothered me most. Suppose the estimate of 400,000 lines of code in one major application is reasonably accurate. For that size project, you would expect roughly a three-year effort in which nearly 40 full-time people would exert over 100 man-years' labor: in other words, this single project would consume the entire development and maintenance staff for the next three years! Even that might be optimistic, because of the firefighting that often interrupts development efforts.

Therein lurked the villain. I simply had to deduce that time was the critical factor. The do-it-yourself approach, however well managed, was doomed. When you are faced with a severe backlog, traditional views of the programming process are insufficient. Somehow we had to formulate a new script for dealing with the situation. It had to conserve the scarcest resource, the time of skilled personnel. That clue gave rise to a radical concept: your own data processing people should do as little programming as possible. This began to look like the trail of something big.

Working harder, rather than smarter, is futile in the face of overwhelming demands. Sensing that, many MIS directors are looking for leverage to use against large backlogs and uncertain productivity.

FIG. 1

PROBLEMS AFFECTING ON-TIME PERFORMANCE

Lack of database systems expertise
Insufficient staffing levels
Lack of development methodology
Inexperienced project managers
Continual "fire fighting"
Level of effort and length of schedule, given project size and complexity
Inadequate forecasting techniques
Misuse of automated project control system
Lack of tracking and early warning flags
Impact on available computer resources
Incomplete data for comparing our organization with others

FIG. 2

BUSINESS STRATEGIES IMPLEMENTED BY INFORMATION SYSTEMS

Provide customer services
Expand product lines
Bolster distribution channels
Conduct marketing programs
Reduce manufacturing costs
Improve quality assurance
Speed product delivery
Integrate business activities
Reduce operating and investment risk
Enhance order entry
Improve budget and financial management
And the list is still growing

USERS DO OWN PROGRAMS

Some industry analysts prefer that users do their own programming. In certain instances, that's a good idea. Far from being a cure-all, however, it is only one suggestion within a repertory of possible moves. The MIS director must decide, given a particular corporation's strategy, the best way to handle each application. The following steps will help the MIS director sort things out:

- Make sure software resources are expended on capabilities of strategic importance to the organization. Top-priority software must be identified as such to achieve business objectives.
- Acquire as much software as practicable. Taking a do-it-yourself or make-it-from-scratch attitude toward all software is a guarantee of further backlog.
- Convert as much existing code as possible. Reuse, translate, or adapt existing modules to the fullest extent before making enhancements or modifications.
- Accelerate the programming process, using various methods. Rapid prototyping, program generators, and user programming all have a place within a data-controlled environment.
- Do it yourself as a last resort, but emphasize labor and quality improvements. Better personnel and team skills, reduced software complexity, and certain development practices are the most significant factors.

This list is an agenda for minimizing in-house programming efforts. Though some of its points are old saws, many MIS directors have yet to set economic priorities for their application projects. Whether the workload is composed of a few major systems or many specific applications does not matter. Some features or capabilities simply must be delivered within a reasonable period of time.

SCAN/370

SCAN/370—The system that automatically simulates the execution of every cleanly compiled **COBOL** program. **SCAN/370** gives you critical analysis information that reveals how each program will execute at run time—information not obtainable via cross referencers, flowcharters, or other analysis tools.

SCAN/370 is a comprehensive **COBOL** enhancement system designed to speed the development and maintenance of **COBOL** programs and improve their operational reliability.

MAINTENANCE AND DEVELOPMENT PRODUCTIVITY: Isolates problem areas in **COBOL** programs—before testing. Simplifies resolution of compiler diagnostics. Removes the drudgery from new program development. Reduces the time required to analyze **COBOL** programs.

PROGRAM RELIABILITY: Detects and flags latent bugs in production programs—before they happen. Highlights maintenance booby-traps.

DYNAMIC PROGRAM DOCUMENTATION: Generates concise and accurate program level documentation. Recreates documentation automatically with every clean compilation.

QUALITY ASSURANCE: Graphically distinguishes well structured code versus poorly structured code. Detects and flags **COBOL** keywords that do not conform to user defined restrictions. **EDP AUDITING:** Documents the differences between two versions of the same **COBOL** program.

SYSTEM RESOURCE SAVINGS: Saves millions of lines of computer output every single month. Reduces the load on your teleprocessing network.

GROUP OPERATIONS, INCORPORATED
1110 Vermont Ave., N.W. Washington, D.C. 20005 (202) 887-5420
Offices in: Boston, Chicago, Cleveland, Columbia, S.C.,
Dallas, Los Angeles and New York.

Treating decentralized computing as a plague and a precursor to anarchy misses the point.

The first step is to identify those capabilities that contribute to business objectives. At the outset, forget the notion that data processing is justified solely on the basis of cost savings. Information systems that support a business unit's strategy can be justified by competitive, market-oriented results (see Fig. 2). Delivery of top-priority software depends on identifying these essential business and system needs. There are several techniques for conducting this analysis, including Business Systems Planning (BSP) from IBM and Strategic Value Analysis (SVA) from Arthur D. Little Inc., the consulting firm. While these methods apply to any major software effort, an excessive backlog makes them imperative. The result should be a precise statement of the functions, systems, and data that will support business objectives.

The second priority is to acquire rather than develop software. While much has generally been written about packaged software, several points stand out. To cope with a large backlog, one must seriously try to buy rather than to build. The sources from which to buy are numerous, including other companies in the same or similar businesses (not necessarily software houses). Conversely, anyone with reliable industry-oriented software has a valuable asset and is in a position to sell. Be aggressive about seeking out software, but do not be enticed by software that is incompatible with your system architecture. If the user interface or database requirements do not fit, major modifications may be necessary. Further, one of the advantages to using a make-or-buy approach over a do-it-yourself attitude can often be a better statement of requirements. Having to tell another party what you need is a productive exercise, even if the software is then developed in-house.

SALVAGE EXISTING CODE

Third, in most cases, an attempt must be made to salvage as much existing code as possible. Automatic translators, reformatting programs, and consistency checkers are available, so even different programming languages need not get in the way. When changing to new hardware or a new operating environment, however, temptation often prevails. It may seem unworthy just to make the old software work as is on the new host. While we are at it, why not take the opportunity to make those modifications that have been on the shelf for so long? And since we are redoing the system anyway, why not revise the functionality to suit our new way of doing business? Managers of several major government programs have learned to their chagrin that doing all these things at once is a guaranteed prescription for trouble. You should do only what must be done to deliver reliable results in the shortest period of time.

Fourth, the techniques of prototyping, generators, user programming, and so forth are all to be recommended. Personal computers and their supporting software should be turned to their advantage by MIS directors. Treating decentralized computing as a plague and a precursor to anarchy misses the point. The role of data processing is not simply to write programs and operate computers. It is also to manage both system architecture and corporate information. Data processing must take direct responsibility for systems that are essential to the operation of the business and for database administration. To assume responsibility for all computing that occurs within the corporation is expecting too much of the wrong thing.

Finally, economic studies have indicated that personnel capability and product complexity are the two most important factors in software productivity. Using people with more skill and simplifying the software itself are factors that far outweigh constraints associated with machines, languages, and schedules. Among the modern or structured programming practices, requirements and reviews are the most cost-effective.

Studies of successes and failures in software development show that:

- lack of a clear statement of requirements, together with insufficient project planning, is a primary contributor to failure, and
- regular, formal reviews (which judge both internal team communications and published standards) are a keynote of successful projects.

The old saying, "Anything worth doing is worth doing well," certainly applies to in-house development efforts. But building applications yourself is a last resort. So in-house development must be driven by the business strategy that is our first priority. Gear each programming project to deliver only those features that are essential now. Plan on designing a quality system and on implementing it by issuing releases, rather than passing all milestones in one grand triumphal march.

And what of the MIS director with whom we began? He still wants to get project management skills into shape. That certainly needs to be done, of course. He also wants a more accurate estimate of his backlog. "Top management has been working on 'critical success factors' for a while," he says. "This is our chance to determine their implications for software development. That should relieve some of the running battles we've had around here. And it will also serve as the basis for good project planning.

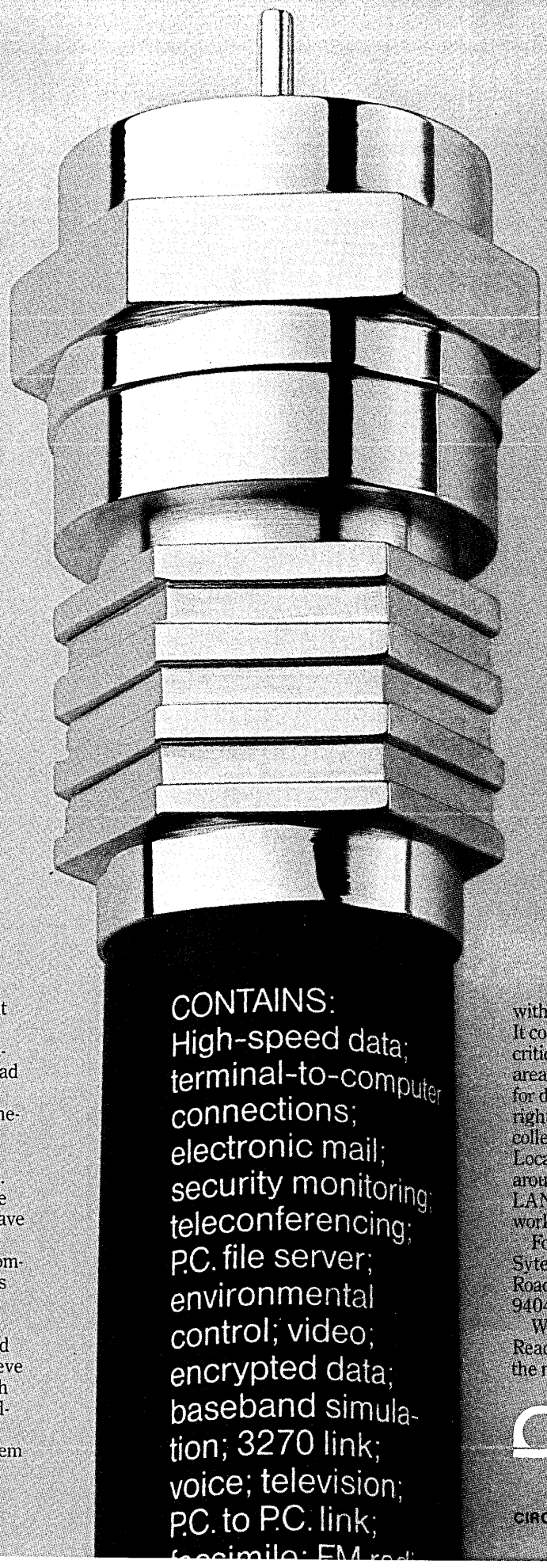
"Say, have you ever done this before?"

Even storybook detectives are allowed to smile at the end of the mystery. ◉

"...and, HEY - let's be *careful* out there!"

CARTOON BY REX F. MAY

Kenneth E. Schoman Jr. concentrates on systems planning and software management for Arthur D. Little Inc., and is the author of *The BASIC Workbook* (Hayden Books, 1977). His background spans diverse functional areas, particularly engineering and manufacturing applications.



Why do you think we call it broadband?

Maybe it's the way our network technology spans a broad range of applications. From everyday digital to state-of-the-art video, only broadband handles them efficiently and economically. And all at once.

Then again, it might be the broad range of options you have for dealing with the future. (We had room for personal computers and peripheral servers five years before they were born.)

Or just maybe it's the broad range of people who can relieve their network headaches with the contents of a single broadband cable.

Find out if you're one of them with our LAN planning guide. It contains the 13 factors critical to the success of a local area network. And a scorecard for determining the technology right for you. Information we've collected from hundreds of LocalNet™ broadband systems around the world. (More true LANs than any other open network supplier.)

For your free copy write Sytek, Inc., 1225 Charleston Road, Mountain View, California 94043. Or call (415) 966-7330.

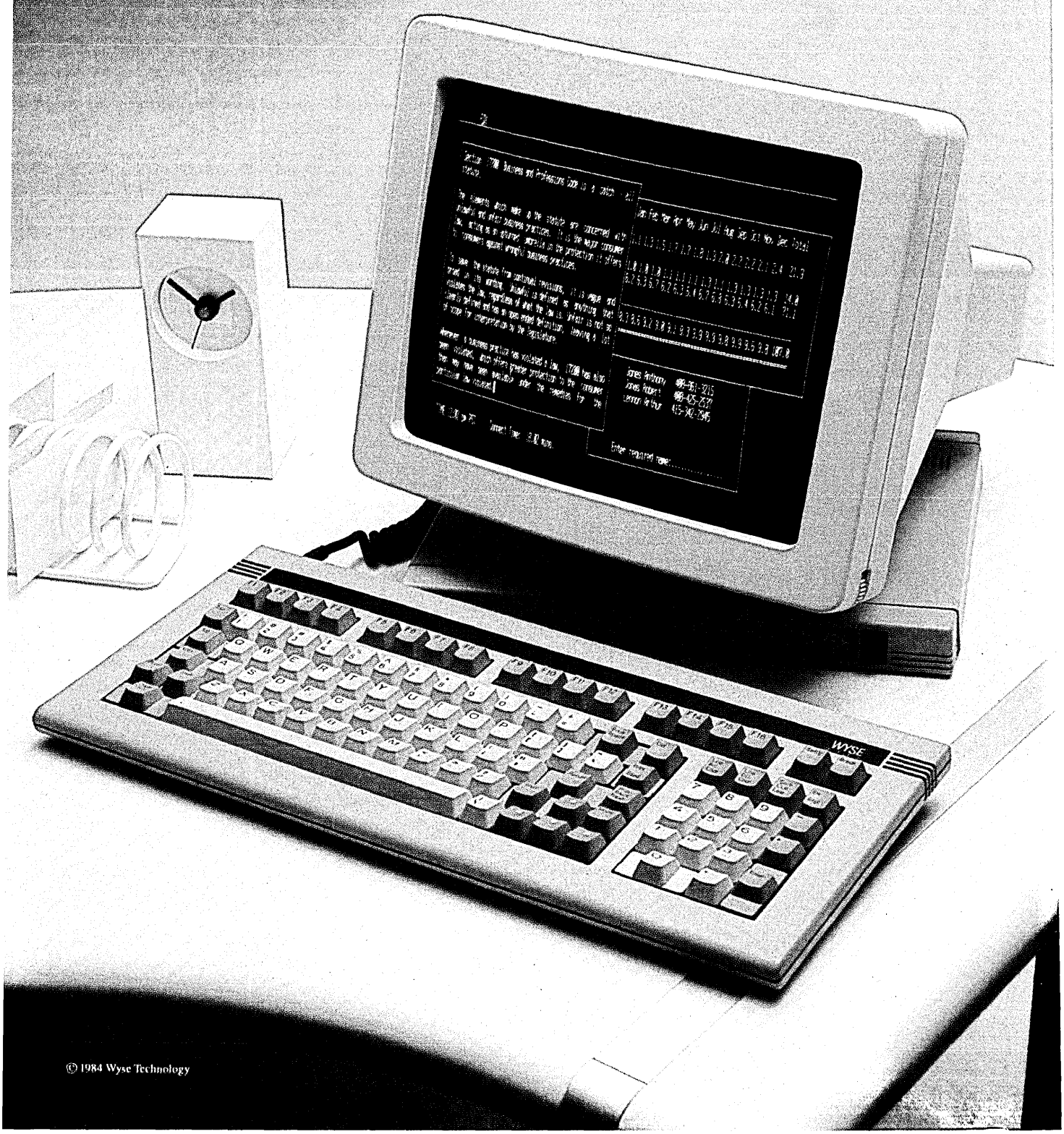
Why do we call it broadband? Read the label. Then call us in the morning.

Sytek

© 1984 Sytek, Inc.

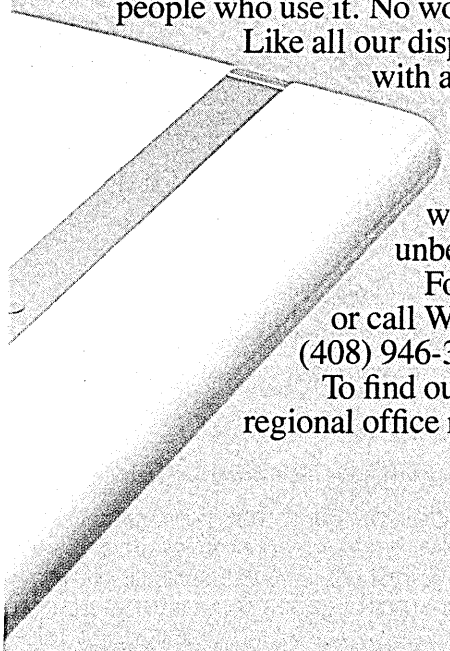
CIRCLE 52 ON READER CARD

A smart termina
smart on a desk.



© 1984 Wyse Technology

should look



The WY-50 is one ASCII terminal that makes economic sense without offending your aesthetic sense. At $695, it looks as smart to the people who pay for it as it does to the people who use it. No wonder it's now among the best-selling terminals in the world.

Like all our display products, the WY-50 combines an unusually small footprint with a very generous 14″ diagonal display. The non-glare screen tilts, swivels, and displays a full 132-column format. The low-profile keyboard adjusts, too, for perfect fit and feel.

The WY-50 offers full software and hardware compatibility with most computer systems. And at $695, its price/performance is unbeatable. More intelligence inside and out.

For more information about our complete line of products, write or call Wyse Technology, 3040 N. First Street, San Jose, CA 95134, (408) 946-3075. Outside of California 800-421-1058.

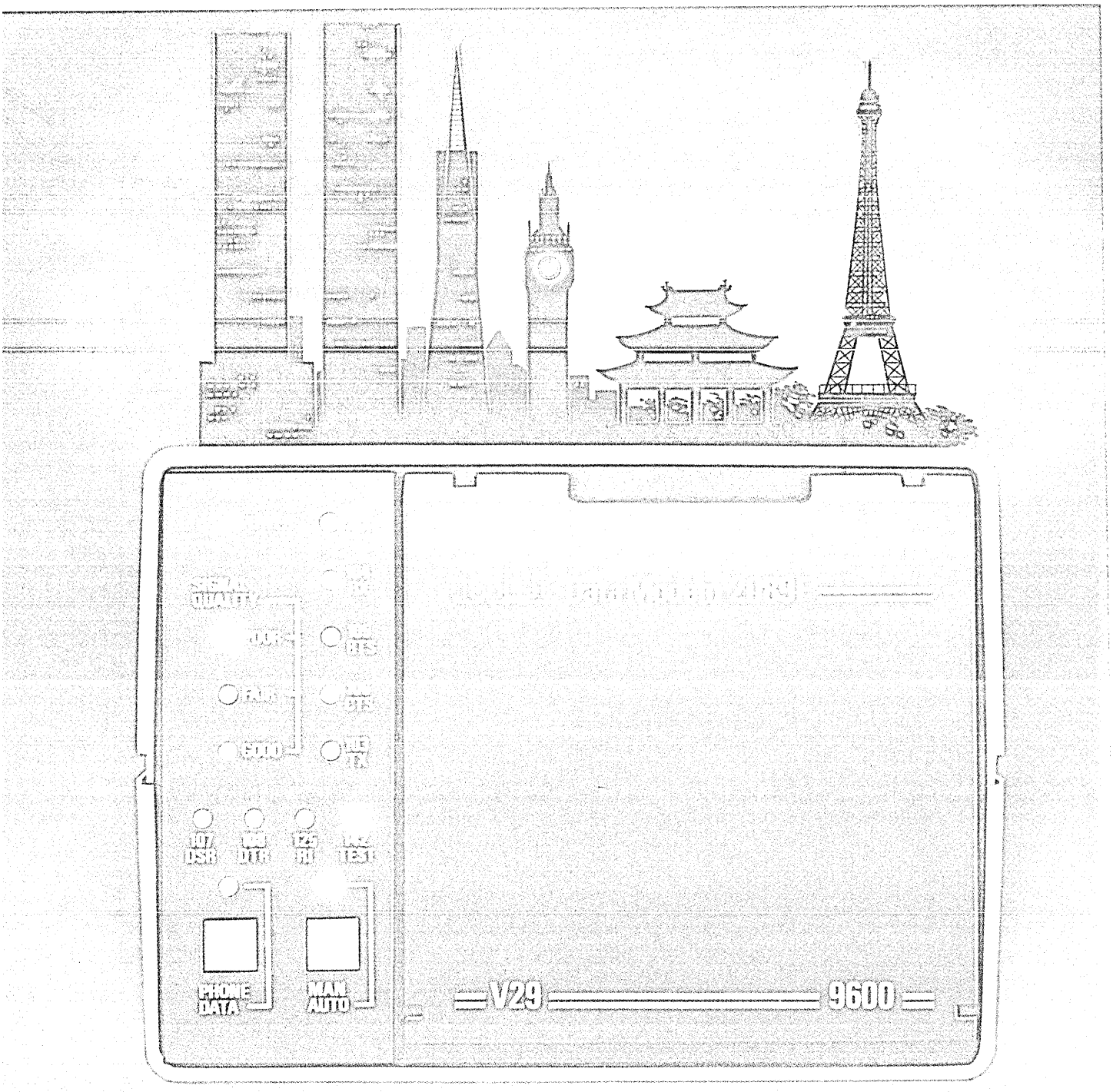
To find out where you can see the WY-50 demonstrated, call the regional office nearest you.

WYSE

See us at Comdex Booth #378 East Hall.

CIRCLE 53 ON READER CARD

Regional Offices: Northeast (201) 725-5054; Southeast (305) 862-2221; Midwest (313) 471-1565; Southwest (818) 340-2013; Northwest (408) 559-5911.



ITT introduces the first World-Compatible Modems.

Now your computers can communicate with their counterparts anywhere in the world as well as at home.

With ITT's new World-Compatible Modems, it's easy. And that's something worth talking about.

For starters, we offer modems that meet both CCITT and Bell standards and comply with FCC regulations. They're fully compatible with the latest computer technology. They maintain synchronous and asynchronous data transmission over full duplex four-wire and half duplex two-wire leased pairs, point-to-point or multi-point lines, or unconditioned lines. And they support data rates from 300 to 64000 bps.

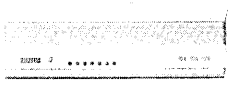
ITT has more than 20 years experience in producing data transmission systems throughout the world. Today, our modems incorporate state-of-the-art engineering. And feature the most reliable design.

That's why we can offer a full 2-year unlimited warranty.

We also deliver a full range of features. Not add-ons, but built-ins. Like test pattern generation, error detection, remote diagnostics, code changing, automatic answering, dial back-up, and automatic fall back.

Best of all, is the assurance of the name ITT. It means quality and support backed by a worldwide leader in telecommunications and a nationwide sales and service network.

For more information or for the name of your local ITT distributor, write: ITT Telecom, Dept. DESD, 3100 Highwoods Blvd., Raleigh, NC 27604.



CIRCLE 54 ON READER CARD

Data Equipment & Systems Division ITT

Although almost everyone uses modems, most people don't know too much about the little black boxes.

ORIGIN OF THE SPECIES

by Dan M. Bowers

It is just over 20 years since communication of digital data over telephone lines was made commercially possible by Mother Bell; it's been only 15 years since the decision in *Carterfone* v. *AT&T* made it legal to do so using equipment manufactured outside of Ma Bell.

For the first quarter of data communication's time line, the modem was the size of a breadbox, operated in half-duplex mode (you could double the equipment and lines if you wanted full duplex), and squeezed out 1,200 baud with reasonable reliability over private lines; you used the dial-up network at your own peril. These were truly only modulator-demodulators. They accepted whatever digital data were presented at their input, converted it to two-tone analog form for transmission over the voice telephone line, and reconverted to digital form on the receiving end.

Data synchronization, character coding, redundancy and error checking, poll-response protocols, and answerback and acknowledgment were all problems to be solved by the system logic designer before he connected his wires to these simple transducers. Since there were no standard conventions or software packages to handle these matters—in fact, there were no software packages at all in those days of wooden computers and iron men—each designer solved the problems in his own way. Withal, we were grateful for this first convenient means of remote communication, a field that had heretofore been approached for commercial purposes only by a few daring companies with home-built equipment.

Gratitude turned swiftly to irritation. We first became comfortable with and then enthusiastic and aggressive over advancement of this new ability to locate components of our systems any place we wished. Mother Bell owned the phone lines, Mother Bell forbade any equipment but her own to be connected to those lines (which made a lot of sense: how would you like some wild-eyed experimenter to accidentally lay 75kv on a wire that runs into your kitchen?), and she only rented, not sold, the modems.

The first means of circumventing Mother Bell's monopoly was the acoustic coupler, which converted the digital data to two-tone acoustic form, and was then efficiently coupled to the standard telephone handset. No electrical connections were made to the Bell line, and voice-frequency data were sent over the line that was intended for voice. Everyone was happy with the arrangement, but not particularly with the acoustic coupler data rates of 100 baud to 300 baud; Bell was now offering 1,800-baud and 2,400-baud modems for private-line use.

Next, an obscure Texas company in the telex-TWX business enters the scene and legally challenges Bell's strictures against direct connection to its lines. The challenger wins, and opens the golden door of opportunity for eager digital communication entrepreneurs (and then fades back into the niche-market obscurity whence it came). Enter the middle ages of data communication.

The next half-dozen years were devoted to improvements in speed, reliability, and the cost of modems, by Bell and by a plethora of independent companies that rushed into the new market. Reliable private-line operation became available at 2,400 baud, 4,800 baud, and then 9,600 baud, with dial-up-line technology always following at about half the top private-line rates. Costs came down to 50 cents to $1 per bps. Features and conveniences of modems were limited to the provision of full-duplex, reverse signaling, automatic answering, and some elementary built-in test facilities, but a wide variety of multiplexors and concentrators were offered that provided convenient packaged system features. Both the oems and the independent manufacturers packaged modems to fit into terminals, processors, and peripherals. Despite the ready availability of wired-in modems, the old and slow acoustic coupler survived because of its low cost and convenience in portable applications.

ON-BOARD FEATURES ENHANCED

The microprocessor revolution of the mid-1970s occurred at precisely the right time for the modem industry. With a mature communication technology and a solid and rapidly growing market, the next natural vista for modems was enhancement of on-board features, and the micro provided the means. New developments took three forms:

- Improved modem features like multiple channels, physical and data compatibility with various computers and terminals, digital filtering and equalization, combined voice and digital communication, automatic receive speed selection, and automatic failover (an automatic switchover under failure conditions, without manual intervention) to a redundant modem.
- Features formerly handled by multiplexors and concentrators, such as buffer storage and data compression.
- Functions formerly handled by the computer, including line and network protocol handling and polling, error checking and data redundancy, automatic dial-up, encryption and decryption, and diagnostics and tests.

The functions performed by digital data communication systems today are identical to those performed by the primitive hand-designed systems we installed in 1962. But these functions are now done at a fraction of the cost, an order of magnitude faster, and several orders of magnitude more reliably and accurately. Also, they are performed by a combination of hardware and software in accordance with standards, conventions, and habits that have evolved (or been legislated by standards committees or imposed by the muscle of major companies) over these 20 years.

In surveying and categorizing the commercially available modems, any of several parameters may be used to provide

The mid-1970s microprocessor revolution occurred at precisely the right time for the modem industry.

the principal delimiters: baud rate is most frequently used; and interface compatibility, intelligence, and package content could also be used.

I prefer to establish the categories I believe are most useful to the user in facing the problem of selecting a modem for a particular system application. From the system designer's point of view, modems may be obtained in the following embodiments:

Chip sets. One can buy a few (and it becomes fewer each year) integrated circuits and discrete components, mount them on a board, supply power, and have a more capable general purpose modem than those that were the mainstream of our industry a decade ago. To do so, of course, requires engineering expertise that few people in the computer business possess.

Expansion board modems. Completely engineered and fully functional modems are offered for use with many popular computer systems. These products are packaged on a printed circuit card that is physically and electrically compatible with the computer, plugs into an empty card slot already provided by the computer manufacturer, draws its power from the computer, and is compatible with the software provided with the computer. They are available from most of the computer manufacturers themselves, and also from third-party vendors for those computers that are sufficiently popular to create adequate demand.

Modem modules. Generic modems are provided with an industry-common interface (such as RS232) and can be used with virtually any computer or terminal equipment; some minor engineering and/or software work is usually needed. These units are complete and functional and include their own power supply. They are available in three different forms:

- the venerable acoustic coupler (which may well be legislated out of existence by the FCC),
- board-packaged modems that must be built into the system, and
- freestanding packages that are connected by external cables to the system and telephone line.

Communication systems. Multiplexors, concentrators, communication processors, and network controllers frequently have the required modems built in. They are therefore invisible to users and are of no concern to them except they pay the bills and get built-in performance, for better or worse.

Integral modems. Likewise, many terminals, computers, and other equipment are provided by their makers with the required modems incorporated. This option allows buyers to choose from among the manufacturer's offerings and the other alternatives discussed above.

ANALYZING FEATURES NECESSARY

The features and characteristics inherent in, or available with, modems should be analyzed in terms of the system requirements, regardless of the physical embodiments the designer plans to use. In fact, features that may be important to system performance may not be as readily available in expansion-board modems as in modem modules, and the trade-off of performance features vs. physical form then becomes a design consideration. Any oaf can design a system to solve a problem simply by buying the fastest modems and lines and providing large buffer memories and separate communication processors. The real challenge is to provide the least costly system to do the job reliably.

The characteristics and features to be considered can be grouped into three categories:

Sine qua non. The basic functions for which the modem is needed in the first place.

Additional features. Some of these enhance the modem's ability to perform its basic functions, and some make life easier for the user or programmer; many could be performed in either the modem or the processor.

Options and expansions. Typically, these are necessities in special situations and superfluous in other applications; they could generally be performed elsewhere in the system if needed.

The first category, basic functions, has eight major components.

1. Transmission speed.

- Up to 1,200 baud, there are hundreds of modems to choose from, dozens of manufacturers to buy from, and virtually any physical configuration and functional features can be found. No one need doubt the reliability of 1,200-baud operation over the dial-up network.
- At 1,800 baud and 2,400 baud, there are a number of manufacturers claiming reliable operation over the dial-up network, and there are also a number of skeptical users: caution is indicated. The newer modems offering automatic adaptive equalization (described below) may provide the finishing touch in this range. Operation at 2,400 baud over dedicated lines is not in question.
- 4,800 baud and 9,600 baud operation over dedicated lines has been an accomplished fact for half a dozen years, and 19.2K baud is common in carefully controlled environments. These speeds are necessary only in relatively sophisticated system applications.

2. Connection means. Quick connect/disconnect for portable or occasional use generally means acoustic couplers and 300 baud, although some wired-in modems now offer the standard telephone company jack, which is easily connected and removed. Continuous duty and fixed equipment will be hardwired to the line, and most modems come this way.

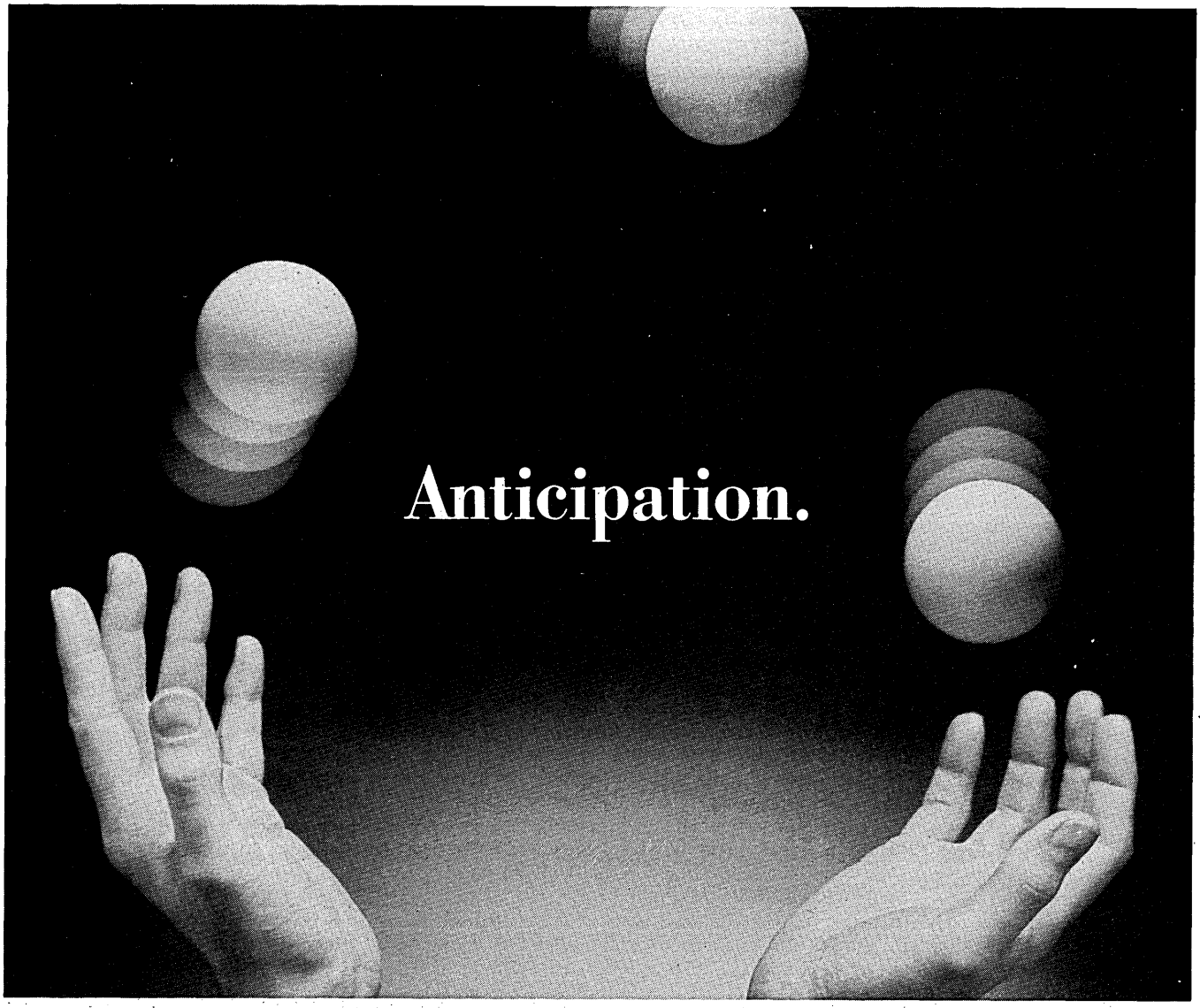
3. Synchronous or asynchronous modulation method. From the user's viewpoint, one of these comes with the territory: async and FSK (frequency-shift keying) at the lower speeds because it's easier, and synch with some form of PSK (phase-shift keying) at the higher speeds because it's needed to achieve the data rate. Systems design or programming considerations will occasionally make desirable the use of one or the other, but this is usually not an important selection criterion.

4. Simplex, half duplex, full duplex. Simplex is seldom used because most communication problems require at least an acknowledgment from the other end. The trade-off between half and full duplex requires first that the equipment on both ends have separate transmit and receive data channels, and second, that the system requirement for a more-than-doubled total data rate justifies the modest increase in cost and complexity.

BELL STANDARD USEFUL

5. Line and network compliance. Bell standard compliance is useful in general purpose applications because it improves the odds of finding a compatible modem on the other end of your call. If specific networks are to be accessed, compliance with their standards and protocols is needed. If the communication system is entirely within the user's domain, he can invent whatever line protocols he chooses; in the absence of compelling technical reasons to do so, however, he should use the standard, proven, accepted, future-flexible Bell system. FCC certification solves an electrical connection problem: if a modem is not certified, a data access arrangement box must be purchased to make the connection to the public telephone system, and this can cost half as much as the modem.

6. Computer-side interface protocols. By definition, expansion-board modems are interfaced intimately to the computer for which they are sold. Some other modems are built for particular computers, but most offer the standard RS232 interface, which is available on virtually all computers.



It's how IBM's newest cache makes DASD faster.

To dazzle you with their performances, jugglers anticipate every move of every ball. And now IBM DASD uses anticipation to turn in a nimble performance of its own.

By selecting the data most likely to be needed at the CPU, the new IBM 3880 Model 23 Storage Control Unit can allow DASD subsystems to perform at electronic speeds. A microprocessor dynamically identifies the most active data and keeps it available in high-speed cache storage.

So when the CPU issues a disk read command, many of the responses may actually come from cache. When that happens, mechanical motion is completely eliminated as a factor in DASD response time.

IBM has combined its proven cache storage techniques with high-performance IBM 3380 DASD. This makes the Model 23 the preferred price/performance alternative for many transaction-oriented systems (those running TSO, CICS or IMS, for example) in which I/O activity is limiting CPU performance.

Using the Model 23, you may see one or more of these performance gains: Increased transaction volumes. Higher CPU utilization. Faster response to end users. Shortened batch run times. Or reduced contention for "shared" DASD.

And you may be able to lengthen DASD strings without affecting performance.

This new control unit has 8, 16 or 32 megabytes of cache, using IBM's powerful 256K-bit chip. It offers more speed, lower cost and better reliability.

The Model 23 follows the Model 13 in IBM's family of cache storage devices.

For a free brochure to help you anticipate better IBM DASD performance, just call 1 800 IBM-2468, Ext. 82, or return the coupon. Or call your IBM marketing representative.

IBM®

CACHE 11-1

IBM
DRM, Dept. CX3/82
400 Parson's Pond Drive
Franklin Lakes, NJ 07417

☐ Please send me a free brochure.
☐ Please have an IBM marketing representative contact me.

Name_____
Title_____
Company_____
Address_____
City_____ State_____ Zip_____
Phone_____

Any oaf can design a system to solve a problem. The real challenge is to provide the least costly one.

7. Type of communication line. The mainstream modems are provided ready to work on the public direct-dial telephone system. There are also modems available for use on dedicated telephone lines, private lines, twisted pair, microwave links, and optical fiber conduits. In choosing a modem to operate on the direct-dial network, one need not consider line parameters since they are already defined; one must, however, specify whether the equipment is to operate on the push-button (most common) or rotary dialing system. In any direct-line system, you must evaluate the line-conditioning requirements, line turnaround time, filtering and equalization methods, distances that can be handled, projected error rates as a function of line parameters, and so on.

8. Cost. The effective cost of data communication is a complex combination of the modem cost, line costs, and the value of the computer system resources required to support the modem and line. A $1,000 modem with buffering and auto dial may result in a less expensive total system than a $300 bare-bones modem that requires a lot of attention from the processor. Typical single-unit prices for functional modems (excluding chip sets and built-ins) are as follows (note, however, that prices will vary wildly with various features):

300-baud acoustic coupled: $200

300-baud modem module, bare bones: $300

300-baud to 1,200-baud expansion board modem: $400

1,200-baud modem module, bare bones: $500

300-baud to 1,200-baud modem module with extras: $500

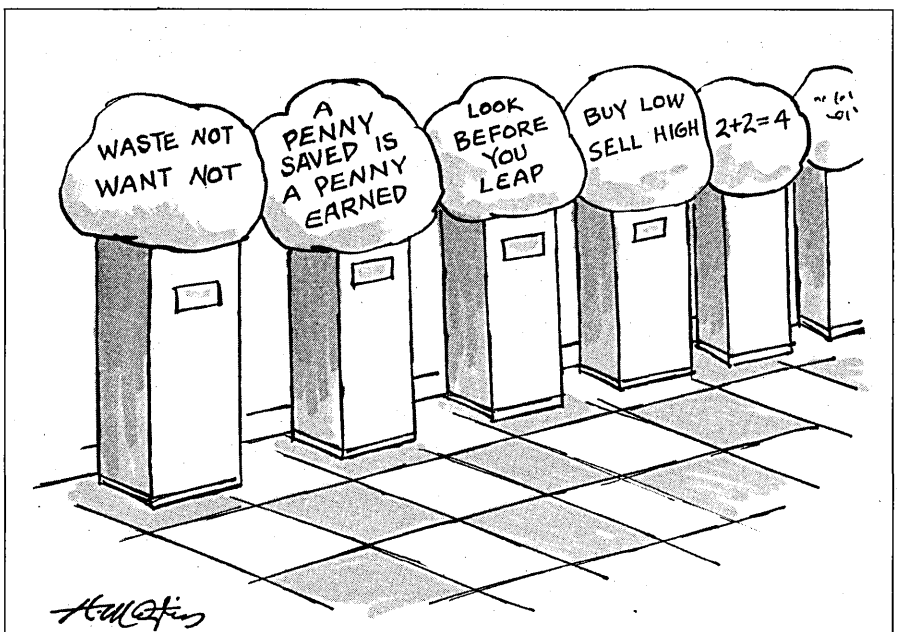
2,400-baud module: $1,000

4,800-baud module: $2,500

9,600-baud module: $3,500

In the category of additional features, we have seven separate entries.

- Automatic answering. Most modems have this feature available at little additional cost, and it is useful in nearly all applications. Remember that the receiving system must be prepared to handle the interruption of an incoming call.
- Automatic dial-up. This feature is equally convenient and useful, although not quite as widely available. In some of the more sophisticated modems, the file of to-be-called numbers is resident in the modem rather than being provided by the computer. There are also modems that allow the choice of manual or automatic dialing.
- Filtering and equalization. Analog circuits are incorporated into all modems to accommodate the data signal to the electrical characteristics (capacitance, inductance, resistance, delay) of the telephone line and the equipment connected to it by the telephone company; these characteristics differ—sometimes widely—each time a connection is made. Up to now, modem equalization circuits have fixed and designed to the average line characteristics, which makes it impossible to communicate over an extremely poor connection. The simple solution, of course, is to break off and dial again in the hope of getting a better connection; a kind of telephone roulette. Only recently are modems being offered with dynamic and automatic equalization, wherein the modem senses the condition of the line and adjusts the equalization to suit. This could be one of the most significant developments in recent modem history.



The National Hall of Carved in Stone

CARTOON BY HENRY MARTIN

MULTIPLE DATA RATES

- Automatic receive speed selection. Some modems can adapt to any of several incoming data rates. This could be useful if the application requires communication with a variety of networks and databases, but is of no importance in the usual captive system.
- Additional channels. The low-speed reverse-signaling channel has been used for decades to acknowledge a message or signal an error. Some modems now offer low-speed-forward channels that operate simultaneously with the principal high-speed channel. Considering that there are other means of accomplishing this (multiplexing, for one), these features are useful only in special system situations.
- Simultaneous voice and data. This can be accomplished using two separate lines, and the decision of whether or not it should be incorporated into the modem is based purely on cost—the extra line cost vs. the increased modem cost. A voice or data select feature is common.
- Built-in diagnostics and test. Most modems have simple test facilities, and those based on microprocessors and which have rather sophisticated diagnostic routines are available for purchase.

There is no question that the communication system should have effective diagnostics and test capability—whether they should be provided by the modem or by the computer is a system design consideration.

Finally, we come to the third and last major category, options and expansions.

The list of capabilities that might be offered as part of a modem is very long. At some point, one must presume to have crossed over a demarcation line between a modem with features provided by a microprocessor and a concentrator or multiplexor, or a processor with a built-in modem. The following is a sampling of advanced features currently offered:

- buffer data storage
- encryption and decryption
- data compression

Never Again Choose Between Price and Quality.

The competition says you must sacrifice one for the other. What they're really saying is they can't give you both. Introducing the TeleVideo® 921. Proof that low price and high quality do go together.

But don't let its low price fool you. The 921 is years ahead with features taken from our most expensive terminals. Like selectable embedded or nonembedded field attributes. 32 nonvolatile function keys. 6 fast edit keys. And something we're famous for: indepth support. Including technical assistance, service training and award winning documentation.

One glance at its nonglare green screen with true tilt and swivel. One pass over its low profile, sculptured keyboard. And you know this terminal is built right. In fact, the 921 is built to the highest quality standards in the industry—our own. We use modular subassemblies. All components are pretested and prestressed. Boards are mounted vertically to run cooler, last longer. There's even room to plug in upgrade options. Like our low cost, Tektronix® compatible graphics board.

The point is this. Don't sacrifice either price or quality. Get both. Get the new TeleVideo 921.

Call toll free, **(800) 538-8725.** In California, call **(408) 745-7760.**

Regional Sales Offices: California/Santa Ana (714) 476-0244, California/Sunnyvale (408) 745-7760, Georgia/Atlanta (404) 447-1231, Illinois/Chicago (312) 397-5400, Massachusetts/Boston (617) 890-3282, New York/New York (516) 496-4777, Texas/Dallas (214) 258-6776

The TeleVideo 921

TeleVideo

Terminals

TeleVideo Systems, Inc.

Tektronix is a registered trademark of Tektronix, Inc.

CIRCLE 56 ON READER CARD

A mature and reliable technology now exists.

- network and polling control
- automatic failover to a redundant modem

A mature and reliable technology now exists. The user and system designer can obtain communication equipment—modems, multiplexors, concentrators, communication processors—for any requirement in terms of speed, distance, number of terminals, etc. Where, then, will the next advances be made? Let us consider some likely directions.

Speed. The current modems are capable of sufficient speed, but the communication lines are not. Given a captive in-house coax line, a microwave link, and a fiber-optics network, then data rates of tens of kilobauds are routine. But the mainstream applications use public lines and their 2.7KHz (on a clear day, with a following wind, downhill) bandwidth. At 1,200 baud, it can take up to 16 seconds to fill a standard crt screen, and at 2,400 baud, eight seconds. We believe that speed will steadily increase through continued improvements in circuitry and devices, and by expanded use of digital correlation and pattern-processing techniques. The effective speed will be improved by increased capability for data compaction in the low-speed, low-cost modems. Once the effective data rate gets to about 4,800 baud using the dial-up network, pressure for further improvement will wane.

Integration. The ever-increasing capability of our brethren in the semiconductor industry to put more circuitry on a chip will lead from today's requirement for a handful of chips to the simple one-chip modem, and so on. At some point it will make sense to routinely build the modem into all equipment the way one now does an RS232 port. The road ahead for the independent modem manufacturer will be suddenly filled with great potholes.

Consolidation. Many of the me-too, single-product, simple-modem vendors will disappear into the potholes early in this new game. The broad-spectrum communication equipment manufacturers will survive and become stronger, based on their expertise in the more sophisticated systems. There will still be a market for modems supplied independently at the unsophisticated level, but these will be supplied principally by the communication equipment manufacturers, who will have acquired the more attractive independents. I foresee an industry dominated by a few large firms.

More goodies. Domination of the low-end business by the computer system manufacturers will result in an optimum division of labor between the processor and its integral modem, providing more sophistication at less cost. Competition in the high end among a handful of companies will produce the same result. Across the board we predict higher speed with more reliability, including as standard features what we now consider very sophisticated, at a lower cost per communicated unit. ◉

Dan M. Bowers is president of Bowers Engineering Company, Southport, Conn., which has been designing new computer systems and doing recovery and remedial work on existing systems since 1966. Bowers has been active in this business from the '50s, before it was called the computer business. In 1962, he installed the first modems in New England at the Provident Institution of Savings, Boston.

SYSTEM V

TRAINING

Now you can get UNIX™ System training directly from AT&T.

WHY AT&T FOR UNIX SYSTEM TRAINING?

AT&T created these comprehensive, hands-on courses to train our own professionals. This same training can now unlock the power of the UNIX System for you.

You get the most current and comprehensive training available. AT&T created the UNIX System and is the custodian of the UNIX System standard.

AT&T COURSES OFFER:

The best learning environment with one terminal per student.

Job-specific training to provide you with skills for immediate application. Courses range from introductory to advanced levels to increase your on-the-job value.

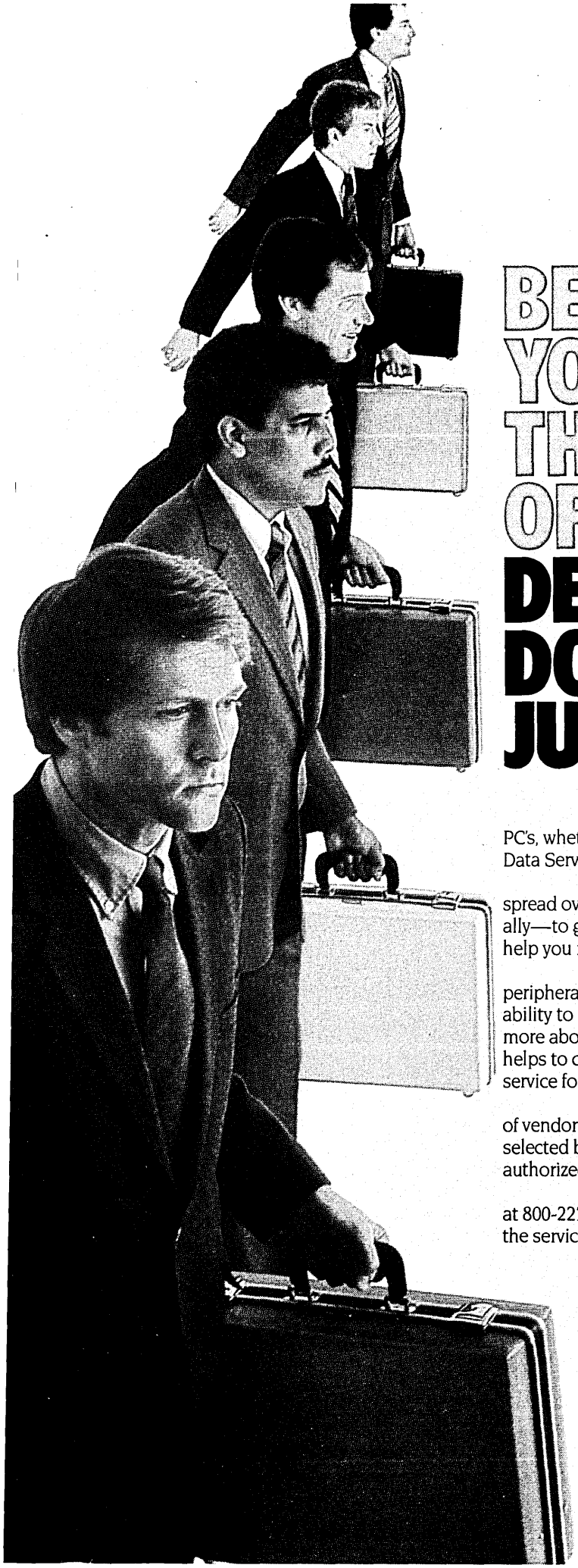
Training facilities open evenings with instructors available for consultation.

Conveniently located training centers in Princeton, NJ; Columbus, OH; Lisle, IL; and Sunnyvale, CA. Or we will bring our courses to your company and hold the training at your convenience.

For more information, to receive a catalogue, or to register for classes, call 1-800-221-1647, Ext. 32.

AT&T

©1984 AT&T Technologies, Inc.



BECAUSE YOU HAVE MORE THAN ONE TYPE OF COMPUTER, DECISION DATA DOESN'T STOP AT JUST SERVICE.

Whether your system mixes mainframes, minis and PC's, whether you link them crosstown or cross-country, Decision Data Service can solve your computer service problems.

Our time-tested professional service personnel are spread over a hundred U.S. locations—even more, internationally—to get your system up and doing what you want it to, then help you make it do more. Economically.

Our expertise in the manufacturing of cost-effective peripherals for mixed systems has given us the knowledge and ability to innovate service programs that you'll want to know more about. Like Performance-Coupon™ pooling for PC's that helps to control maintenance problems and costs. And depot service for special situations.

Our experience servicing systems from a variety of vendors makes us a valuable resource. In fact, we've been selected by a number of blue-chip manufacturers to provide authorized service to their customers.

Call Bill Catania, Vice President, Customer Service, at 800-223-3622. In PA, 800-222-2271. You'll soon realize that we're the service organization you should have called in the first place.

DECISION DATA:
PROFESSIONAL SERVICE
FOR
PROFESSIONALS

Decision Data Computer Corporation
400 Horsham Road, Horsham, PA 19044

CIRCLE 57 ON READER CARD

The New Cincom: 10 the only software ve

Finally, there's one software vendor offering a sophisticated software information network capable of meeting all of your corporate, departmental and personal information software needs—The New Cincom Systems. Organizations around the world are discovering that working with Cincom's integrated family of products enables them to greatly improve both performance and productivity. Here are just 10 of the many reasons why you should be considering the New Cincom software information network for your company:

#1 Relational Data Management Technology

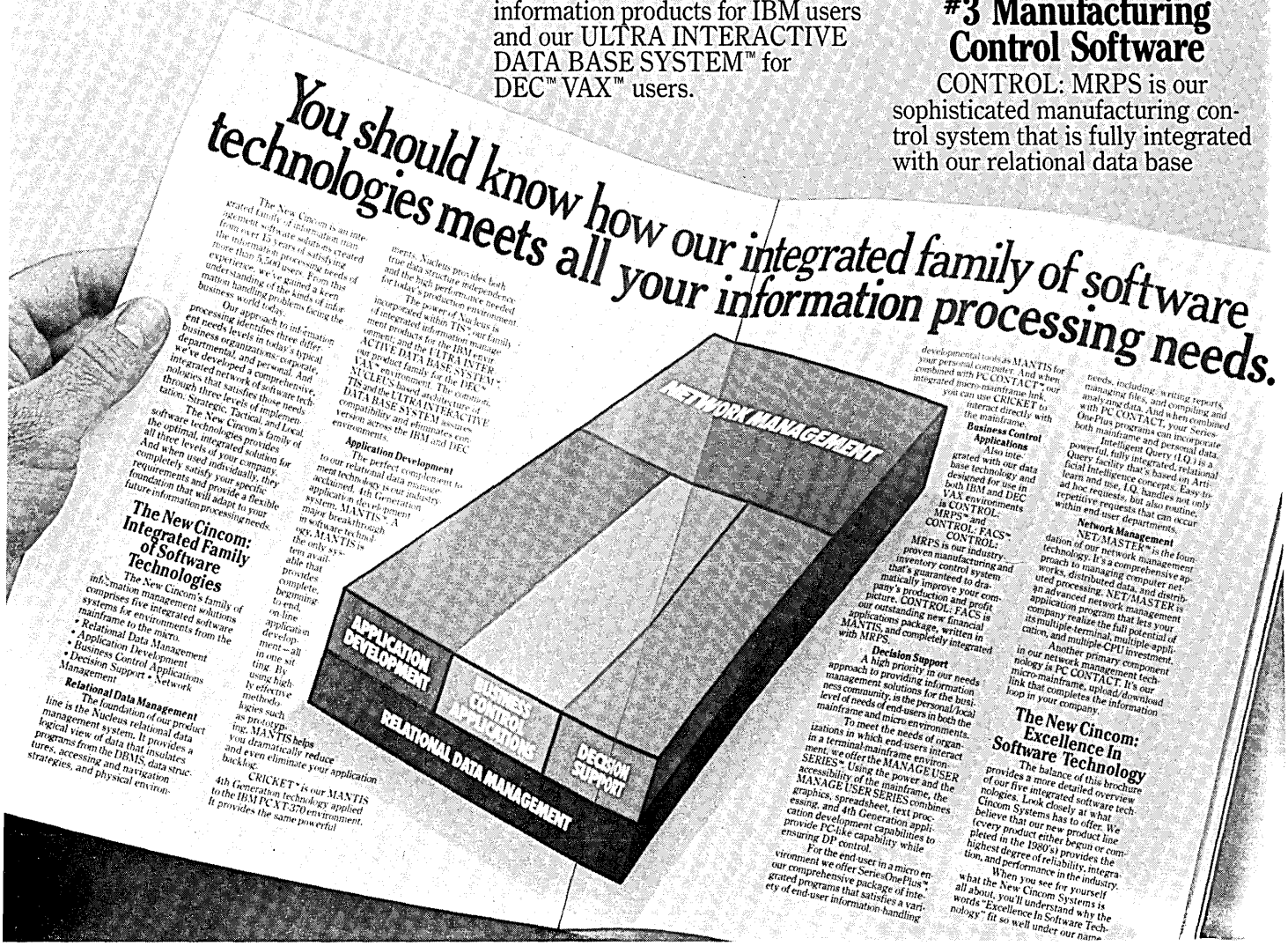
Powerful relational data management technology forms the "nucleus" of our software information network. Using a unique "Logical View" concept, all applications operate directly with "derived relational tables." As a result, we can provide complete data structure independence, as well as the high performance needed for today's production environments. This relational technology is the nucleus of both our TIS™ family of information products for IBM users and our ULTRA INTERACTIVE DATA BASE SYSTEM™ for DEC™ VAX™ users.

#2 Fourth Generation Application Development

The perfect complement to our relational data management technology is our industry acclaimed 4th Generation application development system, MANTIS™. In more than 1,500 complex production environments, MANTIS is dramatically reducing the application backlog through its powerful ability to "prototype," refine and commit the application to production in one interactive sitting.

#3 Manufacturing Control Software

CONTROL: MRPS is our sophisticated manufacturing control system that is fully integrated with our relational data base



reasons why we're ndor you'll ever need.

technology. A complete closed-loop system, MRPS is improving the productivity and profitability of over 125 IBM and DEC VAX manufacturing environments around the world.

#4 Financial Control Software

CONTROL: Financial is our sophisticated financial accounting and control system which molds to the way you do business. Integrated directly with MRPS, CONTROL: Financial includes Accounts Receivable and Credit Management systems with Accounts Payable soon to follow.

#5 Advanced Network Management

NET/MASTER™ is one of the most recent additions to the New Cincom family of integrated products. Very simply, NET/MASTER is an advanced network management system that takes the complexity out of managing a sophisticated IBM computer network and lays the groundwork for distributed data base processing.

#6 The Interactive Mainframe–Micro Link

Further expanding the capabilities of our software information network is PC CONTACT, our mainframe-micro link which enables users to interactively upload/download data between the mainframe and IBM PC's. PC CONTACT gives the PC user the ability to access multiple file types stored in the corporate data base for Decision Support manipulation.

#7 Micro Decision Support Software

For comprehensive micro-level Decision Support we offer SeriesOnePlus™*. SeriesOnePlus includes file management, spreadsheet, graphics, reporting and word processing components that are all integrated through a unique "BUS" architecture. Because the system is designed exclusively for business situations, SeriesOnePlus complements any mainframe-micro network strategy.

#8 Mainframe Decision Support Software

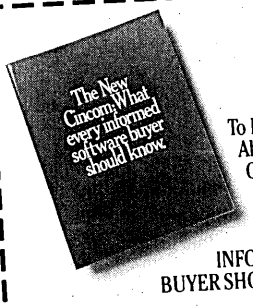
The recently introduced MANAGE USER SERIES™ provides powerful Decision Support capabilities for the mainframe user. The MANAGE USER SERIES combines graphics, spreadsheet, text processing and application development tools to enhance the use and display of corporate data.

#9 Client Support

The one thing that isn't new about Cincom is our unrivaled commitment to service, support and user education. When you choose Cincom you can be assured of the highest caliber of support.

#10 Software Excellence

Why the New Cincom? Well, we like to think of ourselves as the New Cincom because every product in our software information network has been released since 1981. And, quite frankly, we believe our new products provide the highest degree of reliability, integration, performance and value in the industry. As proof, just look at our sales. From 1982 to 1983, TIS sales rose 136%, MANTIS sales rose 50%, and MRPS sales rose by 45%. For even more proof we invite you to personally compare our products with what our competitors are offering. Then you'll understand why the words "Excellence In Software Technology" fit so well under our name.



To Learn Even More About Cincom Call Or Write For Our Brochure: "THE NEW CINCOM: WHAT EVERY INFORMED SOFTWARE BUYER SHOULD KNOW."

Cincom Systems Inc.
2300 Montana Avenue
Cincinnati, Ohio 45211
Attention: Marketing Services Department

1-800-543-3010
In Ohio: 513-661-6000
In Canada: 416-279-4220

Name_____
Title_____
Company_____
Address_____
City_____ State_____
Zip_____ Phone_____

Cincom® Systems

Excellence in software technology.

*SeriesOnePlus is a trademark of Executec Corp.

CIRCLE 58 ON READER CARD

EMPLOY THE LANGUAGE OF PRODUCTIVITY.

The level of on-the-job productivity often depends upon your employees' ability to quickly and accurately perform, control and report their given responsibilities. A bar code data collection system sets your personnel free from cumbersome, and often inaccurate, paperwork data tracking. Free of paperwork, your people have more time for productive tasks. Output increases without raising manufacturing or service costs.

Since bar code data collection continually updates management on company-wide activities, you have improved control of inventories, shop floor tracking, quality control, shipping/receiving, security and service. Inefficiencies are quickly recognized and corrected, and productivity is further improved.

Systems Approach

AUTOMATED DATA COLLECTION

Find out why so many companies are taking advantage of the INTERMEC *Systems Approach.* It includes the industry's broadest integrated product line, sophisticated programming language, systems associates and worldwide factory service. It's all backed by INTERMEC—the world's largest bar code equipment manufacturer.

To learn more about our products and *Systems Approach*, contact INTERMEC, 4405 Russell Road, P.O. Box 360602, Lynnwood, WA 98046. Call 206/743-7036. TELEX: US 152447 Int'l (ITT) 4740080.

INTERMEC®

CIRCLE 65 ON READER CARD FOR LITERATURE
CIRCLE 66 ON READER CARD FOR DEMONSTRATION

Forget the preview and review; studies indicate users can learn more, given less information.

MINIMALIST TRAINING

by John M. Carroll

Knowledge about computers and skill in using them does not come about naturally as does hair on the human head. This is a fact of life. And the learning process involved in acquiring knowledge and skill in the computer domain is, contemporarily at least, a very difficult one. This difficulty, and the ongoing efforts to change it, will be referred to in this story as the "training problem."

A group at the IBM Watson Research Center (in collaboration with scientists at the IBM Austin and Gaithersburg laboratories) has been studying the training problem for the past three years, chiefly in the area of word processor operator training. We have studied a variety of commercial systems, prototypes, and training approaches, using numerous psychological methods. Indeed, we have logged nearly 1,000 hours of one-on-one observation of learner activities, and several thousand more hours of less intensively monitored experimental study of new user performance. This research provides a vivid picture of the problems new users often face.

This article will provide an overview of a set of design implications, referred to as Minimalist design, derived from our research. First, the training problem is described. Second, Minimalist design is defined—both in terms of principles and a design process. Finally, two case studies are reviewed to exemplify the usefulness of the approach.

We will break down the training problem into a list of more specific problems we've seen over and over in our research. Successful training designs must address each of the problems mentioned below to adequately solve the training problem. (For more detail on this subject see Mack, Lewis, and Carroll, *1983 ACM Transactions on Office Information Systems.)*

• *Being overwhelmed.* The learning task begins with the problem of identifying appropriate goals (print a document), the means for attaining them (the keyboard, printer, and display), and drawing rudimentary connections. Training materials provide assistance for these problems, but they also require analysis on the part of the learner: Which parts are procedures? Which parts are explanations? Which parts are relevant to the defined goal of printing a document? Which are relevant to understanding the system's internal representation of the user's documents? These questions are simple only to someone who has already learned the goals, means, procedures, and their explanations.

The groundwork of setting the stage for learning about computers and their operation is a major problem. Learners are put in the position of trying to execute and interpret a tangle of procedures and explanations when they don't even understand the object of their efforts. They can end up learning things and doing things that were totally unanticipated, and quite unintended, by the training designers. Being overwhelmed makes the learning process inefficient, tedious, and frustrating.

• *Jumping the gun.* Training designs often respond to the problem of learners being initially overwhelmed by placing a "read only" overview at the front of their training. This material is intended to help orient the learner to the system (it often reviews names of hardware components, particulars of keyboard layout, and so on). It typically previews what the learner will be doing. Learners, however, don't appreciate overviews, reviews, and previews; they want to do things. They are apt to plunge into a procedure as soon as it is mentioned or will try to execute purely expository descriptions. This is a strong preference, and the fact that it often leads to trouble does not seem to curtail it. The inclusion of explicit warnings like "DO NOT DO ANYTHING UNTIL AFTER YOU READ EVERYTHING" has little effect.

IT'S JUST FOR INFORMATION

• *Skipping.* New users often seem to feel that what cannot be executed can be skipped. One person we observed reacted dismissively to several pages of explanation in a training manual, commenting, "This is just information," as she flipped past it. People come to the learning task with a personal agenda of goals and concerns that can structure their use of training materials. They skip crucial material if it doesn't address their present concerns. They browse ahead until they find a topic that interests them, ignoring its prerequisites. They sometimes consult an entire training library at once, switching among the different volumes. One learner we studied had loaded an on-line training diskette in the wrong orientation. She sat waiting for the tutorial to load, glancing at the introductory manual that coordinates with the tutorial and at an advanced manual for a project planning application. Both manuals were open.

For learners, thinking can often be a mistake.

Of course, the tutorial never did load, but the operating system did. The learner matched the resulting display to a figure in the project planning manual and concluded that her mistake was using the wrong manual. At that point, she skipped to the project planning manual, never to return to the introductory manual. Another learner we observed jumped into a training exercise for moving an icon, applying the procedure to an icon ghost instead of an icon (with frustrating nonresults).

• *Reasoning instead of reading.* It sounds ironic, but for learners, thinking can often be a mistake. Of course, training designers count on the fact that learners do think, but they are really counting on a rather limited and idealized kind of thought: the learner is expected to notice the right things and then draw the right conclusions. In reality, learners often see only a distorted fragment of what happens, make many errors, and accordingly draw a variety of defective conclusions.

One learner began drawing conclusions about work diskettes as soon as he saw the term. "Work diskette. Does that mean it won't work without a work diskette?" Later, he got an error message: "Work diskette needs recovery; use recovery task." He confidently concluded that he had initially placed the diskette in the wrong slot of the disk drive—which was a totally irrelevant consideration in this case. Another beginner tested the operation of the wastebasket by throwing away one and then another of her applications. She induced the wastebasket operation (at considerable cost) instead of safely reading about it. Learners often spontaneously refer to prior knowledge about typewriters, for example, and erroneously deduce the operation of keys like spacebar and return (which typically move text as well as the typing point).

• *Ignoring the screen.* People following a training exercise often exhibit a nose-in-the-book syndrome. They read an exercise step, carry it out, and then read the next step, never checking to see if the step worked properly, or if anything happened at all. This is perhaps most easily visualized in those cases when the training material is actually in the form of a book. We have seen many learners try to follow a page of instructions inappropriate to the current system state. The results are both frustrating and disastrous.

Much the same thing can happen in on-line instruction. One learner we studied executed an on-line training exercise successfully, but because she had her nose in the on-line book, she paid attention only to the display window in which her training material appeared. When she had completed the entire step, she expanded her attention to the rest of the display, and became concerned about several of the data objects she saw. She was convinced that she had not yet properly completed the exercise step, and she redid it, creating an error condition that had several side effects and led to further errors.

• *Trouble recovering from errors.* Perhaps the worst fallacy underlying training materials design is the assumption that learners will not make errors. One step just follows another, implying that the learner will follow one step successfully and then follow another. But what if an error occurs? Clearly, the learner has to get back to the state that preceded the error. Typically, inadequate provision is made for this. Many operations have no inverses (or at least no obvious inverses), and the few systems that offer undo commands make them available only in certain circumstances. Turning the system off is a gross way to get back, but in all the systems we have studied, there are serious error tangles that arise as a consequence of doing this.

• *Wanting to do real work.* Even if the worst tangles are straightened out, it seems that rote learning is just not a natural way for people to learn. There were times when our learners attentively followed their training exercises successfully, but they were still uncertain about what they had done or why. As one person put it, "What did we do?"

People learning to use an office application system want to do real work, immediately. One learner, using an on-line tutoring facility, complained, "I want to do something, not learn how to do everything." After an hour and a half with the training, he said, "I could have typed 3,000 words by now." Another learner rejected practice on setting parameters for document comments, alternate formats, and so on, because she only wanted to create a document. She observed, "None of these choices seem to apply to me since I haven't created a document yet." (In that system, as is common, parameters such as those mentioned above are specified before document creation.)

One response to the training problem is to design system interfaces that are easier to learn, which ultimately means dissolving the need for training altogether. This is an important direction in which to work, but at the same time, any reasonable extrapolation of the current situation clearly leaves plenty of work for training designers. While relatively routine applications, like word processing perhaps, might someday soon become transparent to learners, the safest guess is that there will always be novel applications areas with profound training needs. Users in these application areas, however, will not be the clericals of word processing's heyday, but will be users with greater prerogatives and greater expectations.

The appropriate orientation to the training problem of the future will be directing and supporting the natural learning styles and strategies of users, i.e., giving them less to read if they don't want to read or letting them try real tasks immediately, if they want to do that. (Further information is available in the book, *Interact '84, First IFIPConference on Human–Computer Interaction,* edited by B. Shackle and published by Elsevier/North Holland, Amsterdam, 1984. See J.M. Carroll's section, "Minimalist Design for Active Users.") This is the essence of Minimalist design, and the following are its principles:

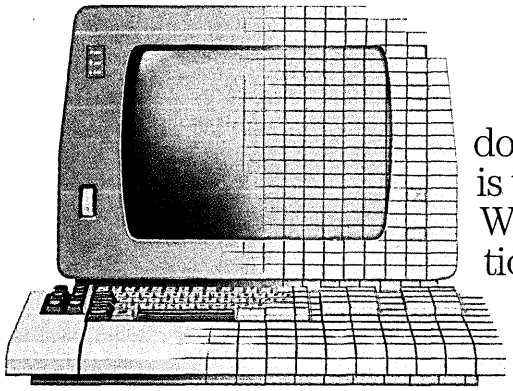
• *Slash the verbiage.* Less to read can mean better training. Notably, this principle flies in the face of more traditional thinking about manual design. Indeed, one can cite a considerable amount of psychological research contending that manuals get better when you lengthen them with, for example, extra headings or explanations. One should be cautious though; these studies invariably focus on the task of reading a manual, not on learning the target skill per se. Moreover, they often employ college undergraduates as experimental subjects—a population notable for being compliant and for having little real-world experience to draw on in formulating task strategies.

• *Force coordination of the system and the training.* If learners go along nose-in-the-book, they will not learn to use the system. Merely placing training material on-line will not guarantee coordination of the two, as our earlier examples illustrate. Training activities need to be tightly linked to the system operations they are designed to train users for. Training designs must impel the learner to attend to the system during the course of training.

• *Expect every possible error.* Since learners typically do not read explanatory material, and often fail to coordinate what they do read with what they do on the system, any error is possible. Training should be designed with this understanding. Expecting a clearly written exercise to be followed errorlessly is a daydream.

• *Focus on real tasks and activities.* New users of application systems are generally not in the position of learning for learning's sake. They are trying to use a tool they believe will help them do their work. This generalization can be powerful in the design of training material. Proper motiva-

The nicest thing about IDMS/R on a 4300 is how easy it is to build with.



It's a rare data processing department that doesn't have a backlog of applications, and nowhere is the problem more acute than among 4300 users. With fewer people typically to develop applications, fewer applications typically have gotten developed.

Adding more applications developers might seem one way to combat the problem. But we'd like to suggest a more sensible approach. A way to enable you to get more productivity out of your existing dp staff. It's called IDMS/R.

Cullinet's powerful new relational database management system, IDMS/R greatly reduces the time it takes to develop applications. Its Automatic System Facility (ASF), a major advance over fourth generation languages, is so simple to use, end users can develop applications *themselves.*

IDMS/R is also extremely flexible. It anticipates change by providing for the dynamic definition and redefinition of your relational database.

Finally, a point of special interest to 4300 users: IDMS/R conserves finite data processing resources. With a feature called "Relational Fastpath," you can tune the database and thereby benefit from a dramatic boost in performance.

For more information about IDMS/R, as well as our complete approach to information management, attend a Cullinet Seminar. You can make arrangements by calling, toll-free, 1-800-225-9930. In MA, the number is 617-329-7700.

The Complete Software Solution

Decision Support Applications Database

Cullinet: I'd like to learn more about IDMS/R.
Please arrange for me to attend a Cullinet Seminar.

Name _____

Title _____

Company/Department _____

Address _____

City/State/Zip _____

Telephone _____

Send to: Cullinet Software, 400 Blue Hill Drive, Westwood, MA 02090-2198

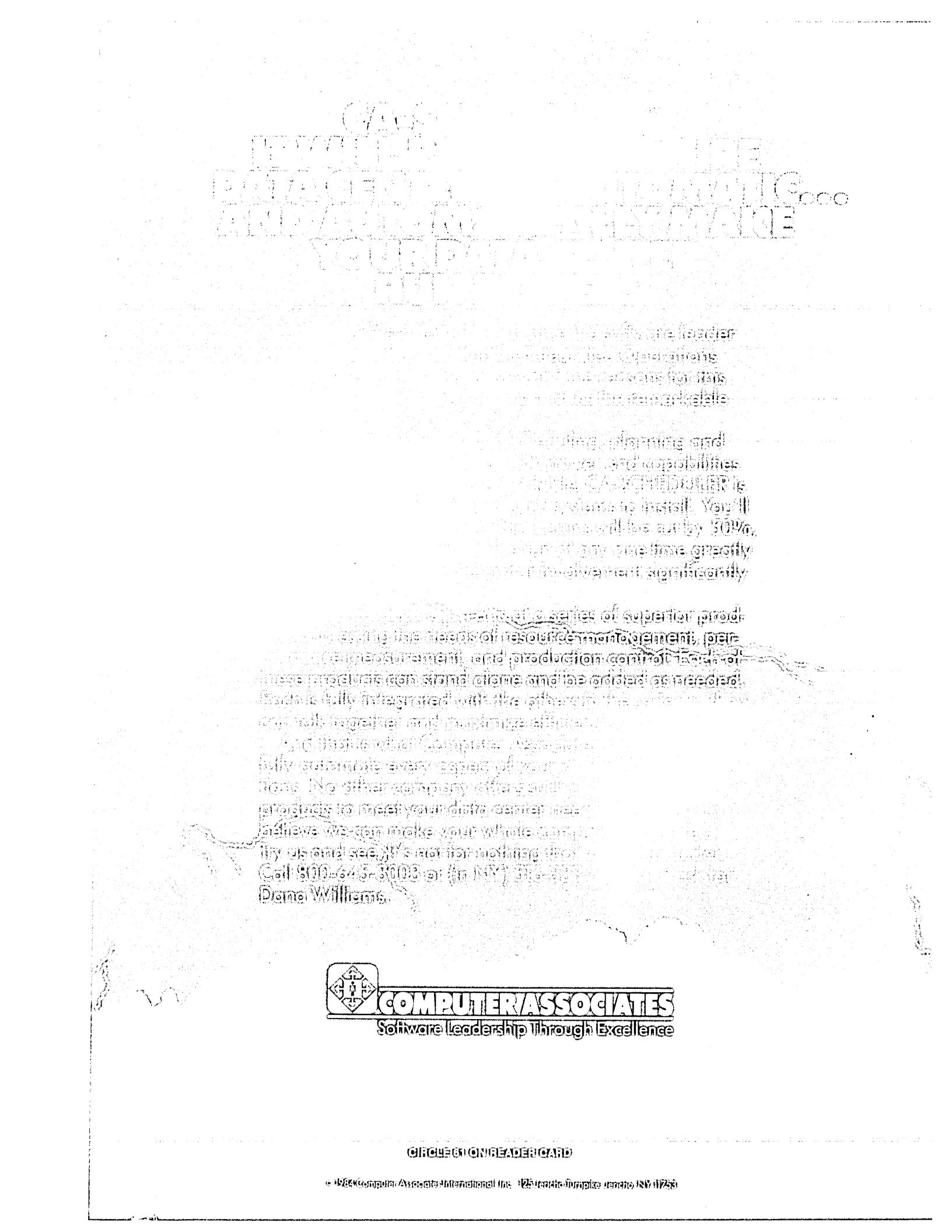
DM1114

Cullinet

We understand business better than any software company in business.

© 1984 Cullinet Software, Inc., Westwood, MA 02090-2198

CIRCLE 60 ON READER CARD



CIRCLE 61 ON READER CARD

© 1982 Computer Associates International, Inc. 125 Jericho Turnpike Jericho, NY 11753

If learners go along nose-in-the-book, they will not learn to use the system.

tion is a prerequisite for meaningful learning. Since people come to the training experience motivated to learn to use a tool in their work, this is precisely how the training should appear. To the greatest extent possible, training tasks should be real tasks: have learners do a real calculation with their electronic spreadsheet, one with their own numbers. Let them write their own programs, rather than just copying lines of code. People learning messaging should be sending messages, or at least using a convincing simulation, not sending messages that will be canceled later.

• *Let the learner lead.* If learners believe that the appropriate first task to undertake in using a word processing system is typing a letter to Mom, then let them do it. The expert perspective counts very little within the context of real learning. What's best in an ideal sense may be less relevant than what engages the learner's mind. The novice perspective is the one that counts. This is not merely political libertarianism, it is pratical psychology. The most important factor in learning is learner motivation, but this is also the factor least amenable to extrinsic control via design.

MANY PARADOXES INHERENT

There are many paradoxes inherent in the Minimalist design philosophy. For example, how can we slash the verbiage and yet address every possible error? Applying the Minimalist principles in vitro might indeed lead to endless loops of slashing and restoring error recovery material. But the principles are intended to be applied in vivo, in full-scale design settings. They are intended to be augmented with an iterating process of design, empirical evaluation, and redesign. (For a more detailed discussion, see Carroll and Rosson in *Human-Computer Interaction,* edited by H.R. Harston and published by Ablex Publishing Corp., Norwood, N.J., 1984.)

• *Design Analysis.* The first stage of design is analytic. It is structured by reference to general principles of form (e.g., consistency), user models of complexity, interface metaphors, the Minimalist design principles reviewed earlier, and to specific considerations of the particular design domain at hand. Who are the users? What are their special interests, needs, and difficulties? How does the particular system address these? None of this is front-page design news. It makes perfect sense to have an understanding of what you are designing and who you are designing it for before you begin work, while also taking advantage of whatever theoretical base is currently available (guidelines, user complexity metrics, and so on). The more systematically and thoroughly this is pursued, the better. The special point for this discussion is that in addition to whatever design tools might ordinarily be referred to at this stage of design, each should be gated by the Minimalist principles.

• *Subskill Testing.* The second design stage involves detailed qualitative testing of particular design elements. These tests focus on typical users performing typical tasks. A planning application intended for personnel managers for preparing salary and promotion plans must be tested on a set of typical personnel managers who are asked to use it to prepare typical salary and promotion plans. A better understanding of the intended user group and its tasks as it interacts with the design of the system will allow better articulation of the system subskills these users will need to master the system. For example, close observation of the users might reveal that salary and promotion plans need to share data in particular ways, that typical personnel managers misunderstand certain specific prompts in the system's interface dialog, and so on. Subskill testing is, inevitably, a process of discovery—and one in which the original design undergoes important changes.

• *Criterion Testing.* While reiterative subskill testing guarantees a sort of local optimization of the design, it does not provide an objective benchmark assessment of the design's final success. Nonetheless, it is useful in the end to know just how good a design really is, relative to other contrasting designs or to particular usability goals. For instance, can the final planning application for salary and promotion plans be used for routine tasks by typical personnel managers after one hour of training? Can it be learned faster than any of the current alternative systems? Criterion testing is important to establishing the feasibility of the Minimalist design approach.

The Minimalist philosophy gambles on the expectation that if you give the learner less (less to read, less overhead, less to get tangled in), the learner will achieve more. While paradoxical slogans are perhaps aesthetically appealing, so far we only know that learners want less. We now must prove that they learn more when they get what they want. Case studies are the proof of the design philosophy pudding. We have explored the Minimalist design approach in several recent projects, and the two I'd like to discuss are the Minimal Manual and the Training Wheels Word Processor.

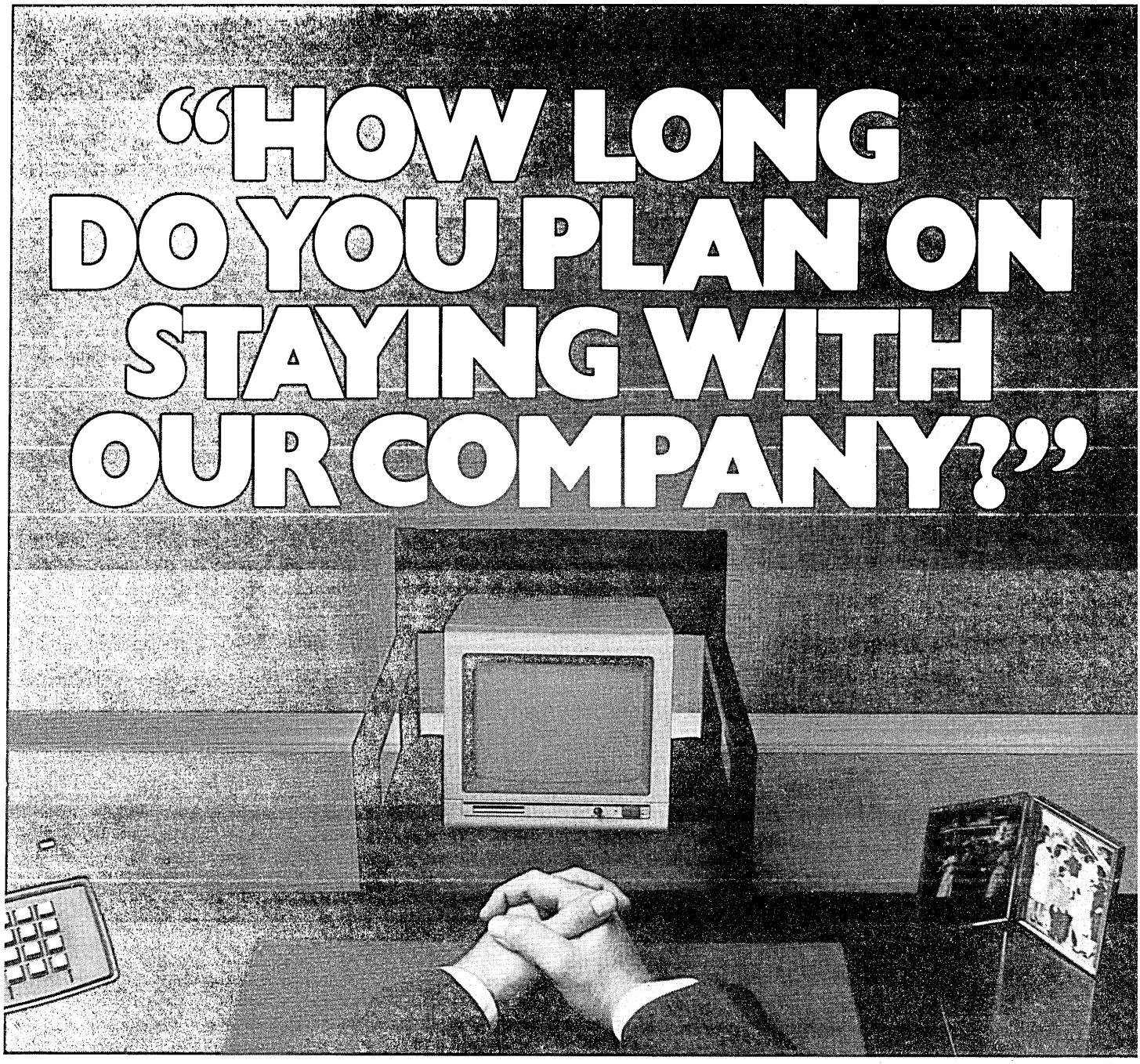
A Minimal Manual was designed for the core function of a commercial word processing system. The initial design phase focused on the Minimalist principles and on our prior analyses of learner problems with this particular system.

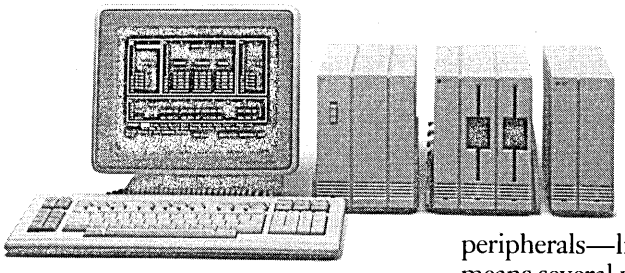
At first, we ruthlessly slashed verbiage, constructing a bare-bones 45-page manual (less than a quarter the length of the commercially developed training manual). This was achieved by eliminating all repetition, summaries, reviews, practice exercises, the index, and the troubleshooting appendix. Chapters were organized to be brief—they averaged less than three pages—so that learners who skipped around might be better able to skip back to their starting point. Chapter headings were task-oriented so the table of contents could serve as a simple index. All material not related to office work was either eliminated or radically edited (for example, the "welcome to word processing" overview, descriptions of the system status line, details on the system components, a chapter on using display information while viewing a document, and so on). We also tried to simplify wording: the term "the system" was replaced by the proper name of the system; function key names like "CTR " were replaced by more transparent terms like "the CTR key"; the terms "display" and "display module" were changed to "screen"; the term "keyboard module" was changed to "keyboard."

Specific wording was used to encourage close coordination between the manual and the system. Instead of merely saying the system would prompt for a document name, and that the learner should type the name and press ENTER, the Minimal Manual asked, "Can you find this prompt on the display?: 'Type document name; press ENTER.' " The placement of diskettes (in either the right or the left diskette drive) was never specified in the manual, so learners had to consult the system prompts to proceed.

Specific error recovery information was included to address the principal errors we had inventoried in our prior observations of people learning to use the system. For example, we found that learners had trouble with the diskette name concept and often typed an incorrect diskette name when prompted, which then hung the system up. Although the system had a specific recovery procedure for this problem, the commercially developed training manual failed to mention it, and learners did not manage to find it in the ancillary documentation. The Minimal Manual included the specific error recovery information for this error. Another typical error was pressing the cancel key without holding down the alternate shift cancel. This is perhaps the best general error remedy the system offers, but it has an entirely different meaning

"HOW LONG DO YOU PLAN ON STAYING WITH OUR COMPANY?"





INTRODUCING THE BURROUGHS B25. THE MICRO COMPUTER THAT GROWS WITH YOUR BUSINESS.

Buying a computer is a lot like hiring an employee. You need one that can produce a lot now and even more in the future.

Take the B25. It's modular, so when you need more memory or storage, you simply snap on more modules.

Another feature that allows the B25 to grow with you is its ability to network. You just add workstations and people will be able to share the same data and memory at the same time.

You can also share peripherals—like printers. Which means several workstations can be linked to one printer so many people can use it.

What's more, the B25 has three operating systems (CP/M-86,® MS-DOS,™ BTOS) so you can run the most popular software available today.

And, of course, the B25 is backed by Burroughs' worldwide service and support.

The Burroughs B25. You wouldn't hire a person who couldn't grow with your business. Why buy a computer that can't?

© 1984 BURROUGHS CORPORATION

For more information about the B25, mail coupon or call toll free: **1-800-621-2020.**

D-115

Name/Title_____

Company_____

Address_____

City_____

State_____ Zip_____

Telephone_____

Send To: Burroughs Corporation, Dept. B25, P.O. Box 10934, Chicago, IL 60610

Burroughs

THE QUESTION ISN'T WHO'S BIGGER. IT'S WHO'S BETTER.

MS-DOS is a trademark of Microsoft Corporation. CP/M is a registered trademark of Digital Research, Inc.

CIRCLE 62 ON READER CARD

Case studies are the proof of the design philosophy pudding.

when used without the alternate shift—one that can lead to complex side effects. What complicates the error even further is that the recovery for pressing cancel without holding the alternate shift is pressing cancel while holding the alternate shift, which allows the error to tangle with itself. Throughout the Minimal Manual the key was referred to as "alternate shift + cancel," to stress the correct key combination for both error prevention and error recovery. We referred to this combination frequently to remind learners of its general use in error recovery.

The goal of involving the learner was paramount. Procedural details were deliberately left incomplete to encourage learners to become more exploratory, and therefore, we hoped, more highly motivated and involved in the learning activity (e.g., the function of the cursor step keys was introduced with an invitation to "Try them and see"). Stress was placed on real and familiar tasks. Chapters had titles like "Printing Something on Paper" instead of "Menus, Messages, and Helps," the latter being a real and notorious example. Learners create their first document only seven pages into the Minimal Manual. In the commercial manual, the creation of a document is delayed until p. 70, even though this is perhaps the overriding goal of all new users. In the Minimal Manual, the first document creation is a letter, in the commercial manual, it is a description of office document processing. We introduced text block movement as "cutting and pasting" to draw on the metaphor of operations with pieces of paper.

EXERCISES AT END OF CHAPTERS Open-ended exercises were placed at the conclusion of each chapter, in an "On Your Own" section. For example, "As you can see on page 4:3, more deletions, insertions, and replacements are suggested for the Smith Letter document. Practice your revision skills by trying some of these. When you have practiced enough, print out Smith Letter."

After a complete and coherent draft was available, we began an observational investigation of the Minimal Manual focusing on key subskills. In all, this work involved about 20 learners for sessions of between two and eight hours each. In many cases, we were gratified to find that our design worked: problems we had inventoried for learners using the commercial manual had been eased. For example, we had seen many learners suffer from the complications of typing an unprintable character into a text file (the system chokes on the print job until a special request is made by the user). A particularly difficult aspect of the error is that the system provides obscure feedback, so learners usually do not even recognize that they have made a mistake. We included specific information to help users recognize this error and further information for recovery. Indeed, the learners we observed dealt successfully with this error.

In other cases, our initial testing uncovered design problems with regard to key subskills. Three of these were document naming, canceling, and powering off for error recovery. Despite our earlier efforts, many of the learners we observed had trouble with the concept of document name. We ended up adding almost half a page of information on the concept of the document name, but this—and other instances in which we added material—was not a matter of putting back material we had originally purged. The specific problem with naming was that people found it unintuitive to name a document they had not yet created. To ease this problem, we used the metaphor of "naming a baby before it is actually born." We also included more task-related motivation, expanding the bare statement "You must give a NAME to the document you are going to type," to "You must NAME documents (letters, memos) as you would label a file folder—so you get these documents back to work on later."

Similarly, we were persuaded to embellish our diagnosis/recovery information for the alternate shift cancel error. Learners still had a lot of trouble coordinating the keypress and making sense of the consequences when they failed to do so. We added the following material to the first two operation references: "Cancel and request are on the same key. If you don't hold down the alternate shift when you press cancel, you will get request instead of cancel. You can correct this by trying cancel again, this time while holding down the alternate shift."

We also observed a problem with powering off for error recovery. As noted earlier, turning off the system is a common ad hoc recovery for learners. We explicitly made use of this recovery method with the suggestion, "Turn the system off, but be sure you first REMOVE ALL DISKETTES FROM THE DISKETTE UNIT." It seemed that learners were performing this as they read it, and therefore switching off before they read the capitalized phrase, which resulted in complicated side effects. We then rearranged the phrase so it read, REMOVE ALL DISKETTES FROM THE DISKETTE UNIT TO AVOID DAMAGING THEM and then turn off the system." We also decided to make this recovery just a bit less attractive to learners by substituting "You must now start all over again, by reloading your programs from the program diskettes," for "You can now start fresh from the beginning." Turning off the system is best used as a last resort, we found. Even when executed errorlessly, it disrupts work.

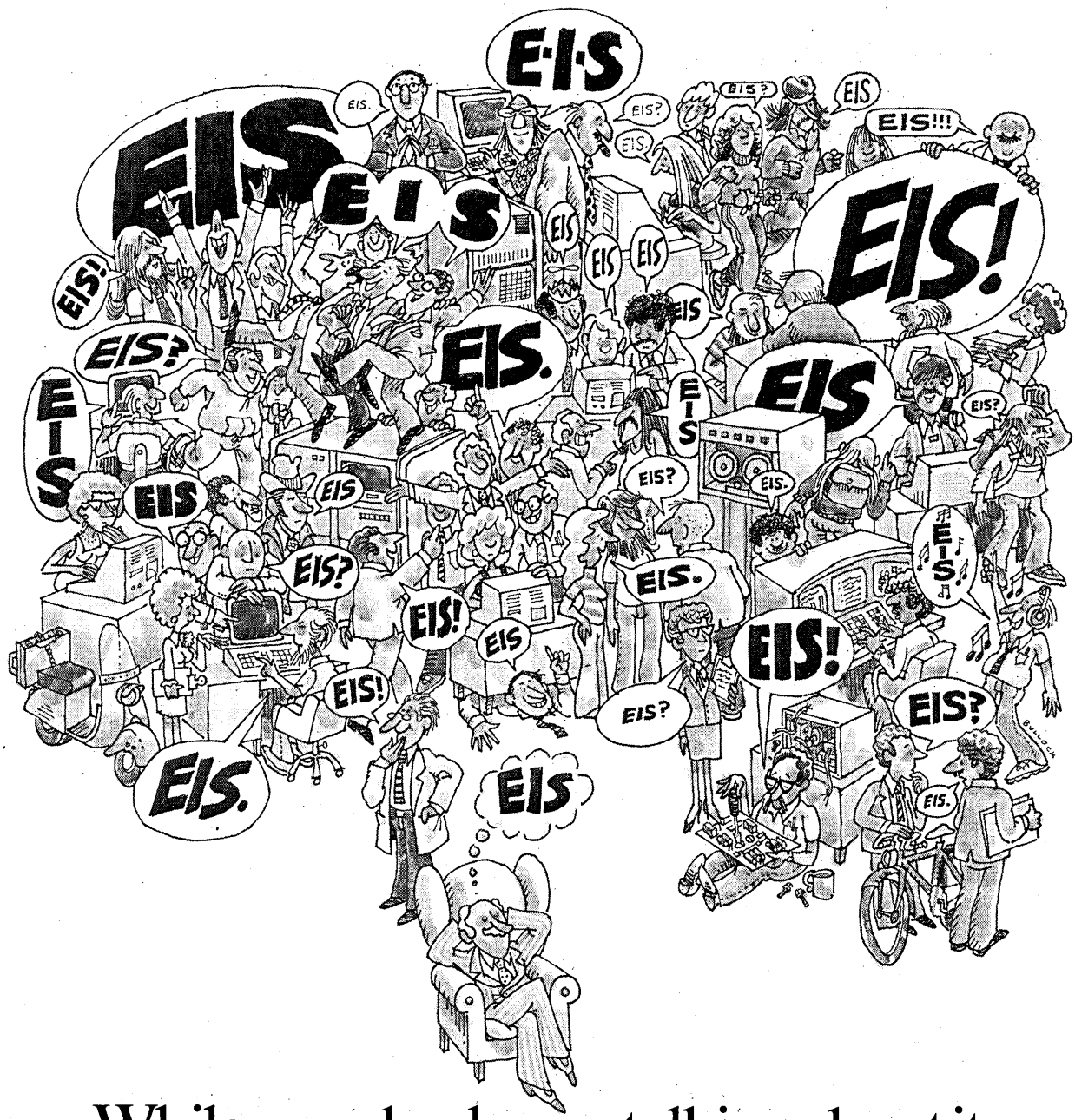
These are only examples; there were many specific subskill problems we detailed and for which we then redesigned the manual. We had originally hoped to introduce document revision as an on your own exercise—to have people "discover" revision instead of being taught it. This turned out not to work, however, because the subskill had to be further decomposed to be reliably executed by learners. We also had hoped to sidestep the peculiar treatment of blank text lines in this system (as special characters). This, too, proved infeasible; we had to treat blank line deletion as an explicit subskill in the end.

How good a design did we end up with? We have tested the Minimal Manual in two studies. The first study involved 49 learners who used one of five training methods (including two variations of the Minimal Manual) for up to seven full working days. In this study, the Minimal Manual proved to be 40% faster than other manuals for the basic topic areas it covered. It also produced learning achievement that was at least as good as that of the other methods. The Minimal Manual covered only basic topics, whereas commercial manuals included advanced topics as well. In a later phase of the experiment, Minimal Manual learners were transferred to the advanced topics sections of a commercial manual. Notably, they still were 40% faster than other learners, but in this comparison, their performance on learning achievement tests was also better—by a factor of 10. In sum, this experiment provides evidence that the Minimal Manual design is substantially more effective than comparable state-of-the-art commercial manual designs.

A second experiment is being completed now in which 32 learners used either the Minimal Manual or a commercially developed alternative. This study focuses on each learner in detail for six-hour sessions. The study's goal is to discover *how* the Minimal Manual allows learners to proceed more quickly and effectively.

In other training work, we have more fundamentally questioned the assumptions of training manual approaches. Instead of merely helping learners recognize, diagnose, and recover from errors, we designed a training system that intercepts an error before it can create trouble.

As in the Minimal Manual work,



While everybody was talking about it, Pilot did something about it.

Pilot Executive Software announces the first mainframe Executive Information System (EIS). Designed to increase the effectiveness of your company's computers at the executive level, Pilot's EIS provides managers with the type of on-line reports they've been asking for. "Status access" for major business elements. Financial reports. Sales tracking. Plus other internal and external report formats and functions never before available on a distributed system. The Pilot EIS runs on standard mainframes accessed by the IBM PC. The system gives you control over data, yet allows managers to review and analyze by menu. Call today for more information. And find out for yourself what all the talk is about.

FOR INFORMATION ON THE MOST ADVANCED EXECUTIVE SOFTWARE, CALL PILOT AT 617-523-5355.

PILOT

EXECUTIVE SOFTWARE

183 STATE STREET
BOSTON, MASSACHUSETTS 02109

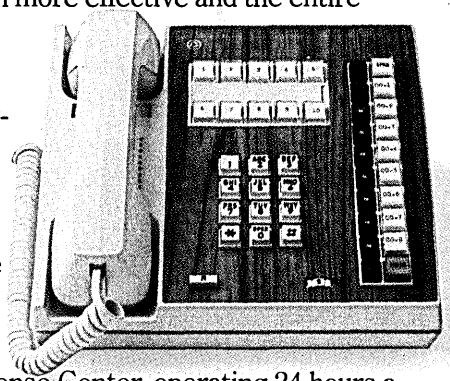
CIRCLE 63 ON READER CARD

You'll be impressed with your Honeywell computer.

If you need service... even more impressed.

In evaluating a computer system, many users put service at the top of their list. So do we.

We start by making one individual responsible for your system's performance. He's highly trained and knows you and your operation first hand. And he's the focal point of a person-to-person approach that makes communication more effective and the entire program more responsive.



The Honeywell service program includes varied resources to assist your representative in meeting every eventuality. Like our National Response Center, operating 24 hours a day, seven days a week. Your one call here is all it takes to trigger action. All of the historic data on your system is at their fingertips, all resources at their disposal.

Among these are our Technical Assistance Centers. Staffed by hardware and software experts, each TAC is equipped with system documentation libraries and advanced capabilities to quickly diagnose your problem remotely.

If spare parts are required, you'll get them. Fast. Our nationwide on-line inventory tracking system and network of stocking centers allow us to locate and ship any part. Quickly.

Still another element of our customer service is training. In addition to such basics as programming, we conduct classes in advanced areas such as data communications and database design. Using the latest computer-assisted learning techniques, these classes can be conducted at your facilities or ours.

There are no compromises in the quality of our service. But there are varying levels of service available that can be tailored to meet your system availability requirements. Our Customer-Assisted Maintenance Program (CAMP), for example, provides tools for self-diagnosis of difficulties and offers additional economies through parts replacement arrangements that include carry-in, mail-in, or call-in options for expedited delivery.

We call this comprehensive approach to system support TotalCare™ service. It represents all that we've learned in more than 25 years of serving the needs of customers all over the world.

For more information, call 800-328-5111, ext. 2702 (in Minnesota call collect 612-870-2142) or write:
Customer Services Division
Honeywell
MS 440
200 Smith Street
Waltham, MA 02154.

Together, we can find the answers.

Honeywell

CIRCLE 64 ON READER CARD

Learners using the Training Wheels System got started faster, produced better work, and spent less time on errors.

our starting point for the Training Wheels Word Processor was an empirically derived inventory of the most typical and serious learner errors in combination with Minimalist principles. Our approach was to modify the interface of a commercial word processor to make these error states "unreachable." To continue with earlier examples, if the learner pressed cancel without holding down the alternate shift, or picked an advanced function from a menu (like application customizing), the keystroke would be intercepted and thrown away. Instead of suffering the consequences of these errors, the learner was merely informed by a special system message that the function or choice had been disabled in the training system.

SUPPORTS ERROR RECOVERY

This design facilitates the Minimalist principles enumerated earlier. It simultaneously allows the designer to slash training verbiage and to support error recovery, because less instruction is required when an error's consequences are blocked. It also helps to force coordination of the system and training by focusing on real tasks and activities; the purpose of error blocking is to promote learning by doing. The Training Wheels System looked exactly like the complete commerical system: all of the menus and other displays, as well as the hardware, were exactly the same. If the learner followed an error-free course in creating and printing out a simple document, no difference would ever become apparent. But if learners committed one of the errors that our design had blocked, the Training Wheels System would allow them to get back on the course by shielding them from the error's tangling consequences.

The subskill analysis of this design focused on errors we had overlooked but later decided to block, and also on errors we had blocked but later decided to restore. Ten users were studied for one to three hours each in conjunction with final work on implementation of the Training Wheels System. Two specific subskills seemed to require attention: specifying diskette names and requesting print jobs. As described earlier, it was common for learners to misspecify a diskette name. Part of the cause for this seemed similar to the document name problem. Learners were uncertain of the role these names played and of their intuitive necessity. But the error of misnaming a diskette is not trivial; it often leads to extended periods of frustration for the learner. We blocked the diskette name problem by accepting only the correct diskette name (and continuing to prompt until it was entered correctly), instead of allowing the system to hang itself up waiting for a nonexistent diskette to be mounted.

When requesting print jobs, learners frequently queued multiple print jobs only to lose track of them before they could be printed out. When an unexpected document emerged from the printer, they sometimes engaged in spurious error recovery, in the course of which they might commit real errors. We blocked the print queue problem by limiting the queue to one print job at a time. We also detected a converse type of printing subskill problem. In our original design we had blocked a "print first" error, expecting that new users might try to print out a document before they had ever created one. We blocked this error by allowing the print function to be accessed only after an immediately preceding create or revise function. Our subskill testing compelled us to reconsider, however, because none of our participants seemed to be committing the print first error we had so cleverly blocked. Instead, several learners who turned the system off between a successful create and an attempted print were blocked from printing. When the system was turned on, it treated them like brand-new users and demanded a create or revise before it let them print. Given this trade-off, we eliminated our alteration, and restored the apparently nontroublesome print first error.

HOW GOOD WAS FINAL DESIGN?

Again, how good a design did we end up with? We carried out several experimental evaluations of the Training Wheels System. In the first two studies, we asked 24 learners to use either the Training Wheels System or the complete commercial system to learn to type and print out a simple document. In one study, we asked learners to learn by the book—to follow the manual—and in the other, we asked them to learn by doing, that is, to focus on getting the job done. The results of these studies were quite encouraging: learners using the Training Wheels System got started faster, produced better work, and spent less time not only on the errors that our design blocked, but on the errors we did not block, indicating a generalized facilitation of learning. Moreover, the magnitude of these advantages increased over the course of the experiment. Finally, the Training Wheels learners performed better on a system concepts test administered after the experiment. We subsequently designed alternative Training Wheels Systems, and are now in the midst of an iterative cycle of redesign, subskill testing, and criterion testing to better understand how and why the approach works, and how it can be optimized.

It is important to notice that both of these case studies involved retrofitting existing commercial designs. It is not impressive to solve the training problem merely by changing the ground rules. Perhaps "toy" systems can be designed to be easy to learn, but so what? The practical training problem arises in commercial application systems, and it is there that it must be finally addressed. Designing training for existing commercial systems is the obvious strategy to employ if one wants to ensure that research results are pertinent to the practical problem. The next case study in Minimalist design should be a training system designed from scratch.

Both of these case studies, the Minimal Manual and the Training Wheels Word Processor, were designed and implemented at a cost of less than one man-month (that includes the analytic and subskill phases of design, but not the criterion testing). These were retrofitted designs, which probably entailed a mix of pluses and minuses in terms of development time. A reasonable bottom-line estimate would be that the development time cost of Minimalist design might range from being on par with current methods—even though these latter produce measurably poorer results—to being about one order of magnitude cheaper. Of course, smaller manuals are also cheaper to produce. It is surprising when both users and developers can get more for less, but it makes for a happy ending. ◉

Dr. John Carroll is a research staff member at the Thomas J. Watson Research Center, Yorktown Heights, N.Y. He is involved in investigating the learning, problem solving, and language capacities that underlie human interaction and experience. His most recent book, *Talking Minds* (with T.G. Bever and L.A. Miller), will be published by MIT Press this year.
This report is derived from talks given through 1983 at the Potomac Chapter of the Software Psychology Society, Carnegie-Mellon University, the IBM Lexington Laboratory, the IBM System Research Institute, the State University of New York at Stony Brook, the IBM Thomas J. Watson Research Center, and the IBM Boca Raton Laboratory. The training design work at Yorktown was developed collaboratively with David Boor, Caroline Carrithers, Jim Ford, Georgia Gibson, Nancy Grischkowsky, Clayton Lewis, Robert Mack, Sandra Mazur, Scott Robertson, Mary Beth Rosson, Penny Smith-Kerker, and John Thomas.

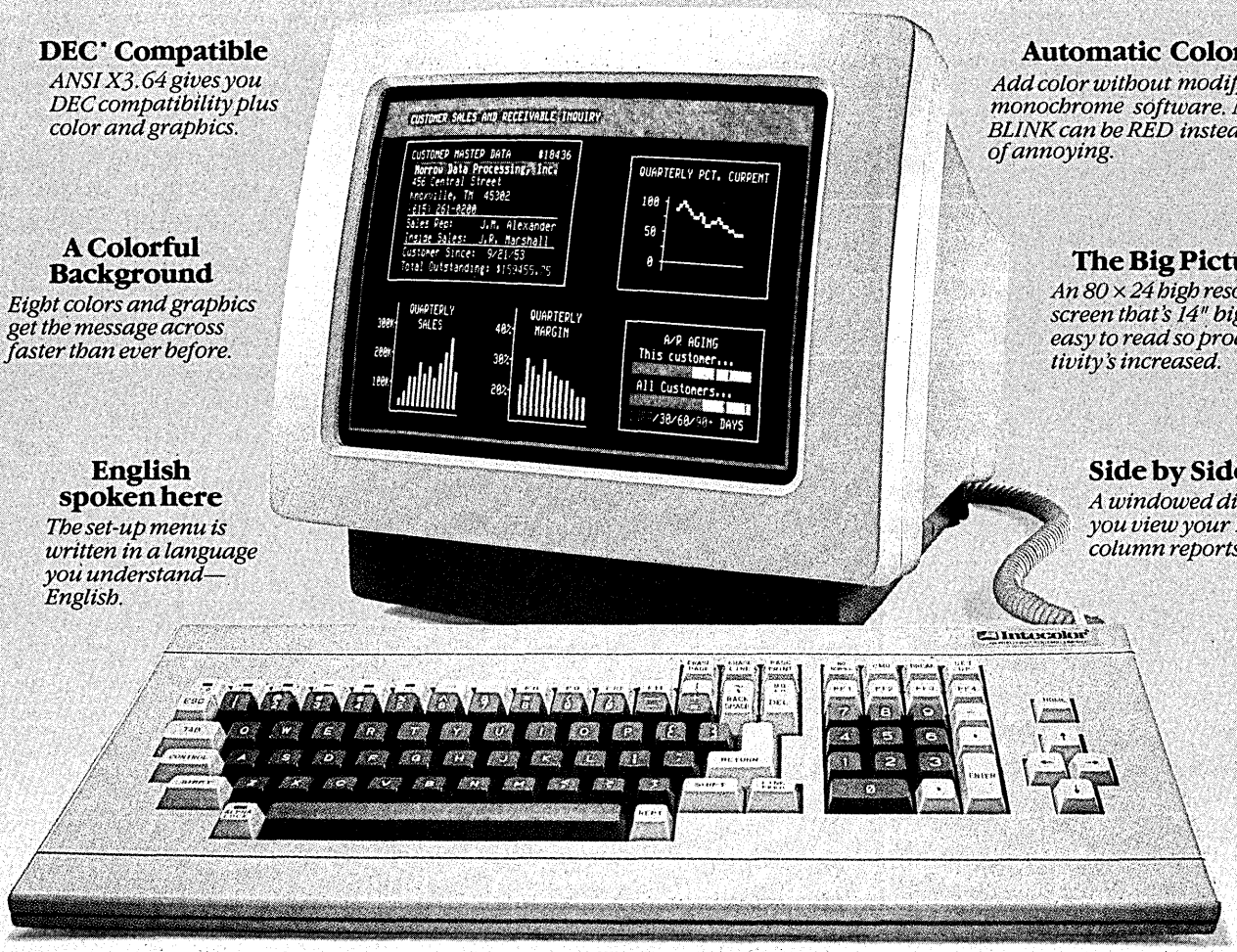
ColorTrend™
New from Intecolor

DEC* Compatible
ANSI X3.64 gives you DEC compatibility plus color and graphics.

Automatic Color
Add color without modifying monochrome software. Now BLINK can be RED instead of annoying.

A Colorful Background
Eight colors and graphics get the message across faster than ever before.

The Big Picture
An 80 × 24 high resolution screen that's 14" big. It's easy to read so productivity's increased.



English spoken here
The set-up menu is written in a language you understand—English.

Side by Side
A windowed display lets you view your 132 column reports.

A Custom Fit
Designed according to European standards, there's a low-profile keyboard and one-touch tilt display.

Keys to success
As many as two dozen keys programmable for up to 72 functions make short work of long commands.

$1295
Small Wonder

The switch to color never worked better.

Intecolor, the innovator in color terminals introduces ColorTrend. The color terminal that gets along perfectly in any ANSI ×3.64 environment.

Highly compatible with DEC's VT100, ColorTrend gives you more. Like Automatic Color and vector graphics. With Automatic Color, you can assign any one of 64 different color combinations to VT100 attributes such as BLINK, UNDERLINE, BOLD or Reverse Video. That means you can add color to your application without reprogramming your host! And ColorTrend's vector graphics capability gives you far more accurate bar and line graphs.

Intecolor even added those important creature comforts. Designed according to European standards, ColorTrend has an adjustable low-profile detached keyboard and a one-touch tilt display unit. Everything from its small, footprint to its $1295 price tag makes ColorTrend the ideal replacement or color upgrade terminal.

Intecolor Quality.

Intecolor has been designing color graphics terminals for demanding industrial/scientific markets since 1973. ColorTrend has over ten years of Intecolor knowhow, dependability and performance behind it.

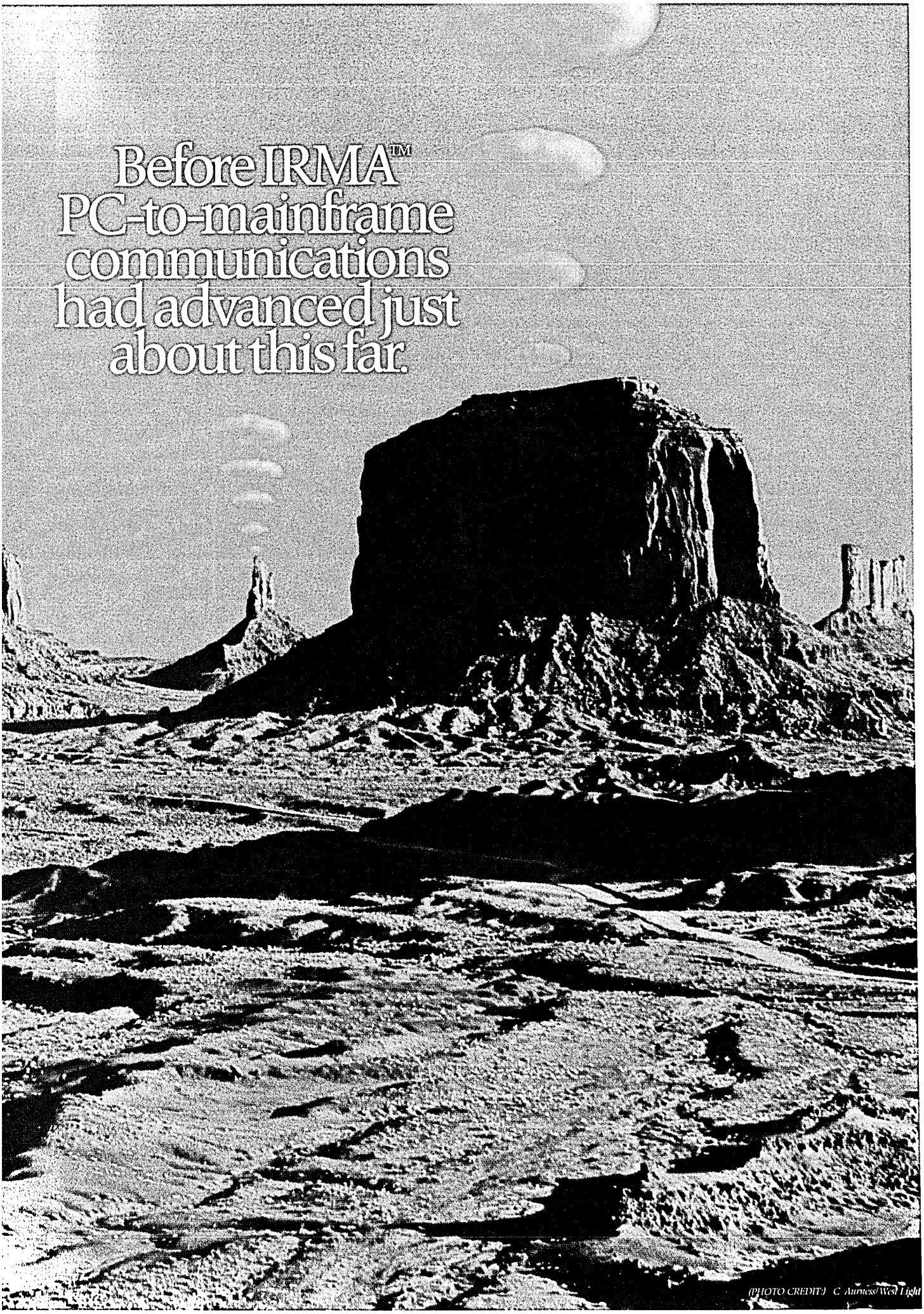
Intecolor Quality

Check the size, features and price. You won't find a color terminal that's got more going for it than ColorTrend. For the name of the distributor or sales representative nearest you call our toll-free number: 1-800-241-7595.

Intecolor®
AN INTELLIGENT SYSTEMS COMPANY

225 Technology Park/Atlanta, • Norcross, Georgia 30092
404/449-5961 • TWX 810-766-1581

*DEC is a registered trademark of Digital Equipment Corporation.


Before IRMA™
PC-to-mainframe
communications
had advanced just
about this far.
(PHOTO CREDIT:) © Aurness/West Light

Until just two years ago, communications between big IBM® mainframes and individual PCs was all smoke, without a bit of substance.

But two years ago, the smoke lifted.

With IRMA™, for the first time, PC users could extract needed information from the mainframe without going through MIS unnecessarily. All at once middle and upper management had a way to get timely information to make better decisions. But as revolutionary as IRMA was, it was far from the total answer.

The truth is, neither were our next two products. But we were getting closer. IRMAline™ and IRMAlette™ gave remote PCs the opportunity to communicate with the mainframes with the same ease as a local PC equipped with IRMA.

Because they were IRMA family products, all the software written for IRMA was compatible with IRMAline and IRMAlette.

As we developed each new product to meet a business need, we saw more opportunities in the marketplace. And we responded to them.

With IRMAcom™, an IBM 3274, 3276 controller emulator. With IRMAprint™, an IBM 3287 emulator. With IRMAlink DBX/CICS™ an MIS-controlled data file transfer system. And with IRMAkey,™ a keyboard that has every one of the functions of both an IBM terminal and PC.

For additional information about IRMA or any of the IRMA family of IBM-emulation products, send in the coupon below. Or call 1-800-241-IRMA. Telex 261375 DCAATL.

Mail to DCA, 303 Technology Park, Norcross, GA 30092. And we'll tell you more about all IRMA products.

*Name*_____

*Firm*_____ *Title*_____

*Address*_____

*City*_____ *State*_____ *Zip*_____

*Phone*_____

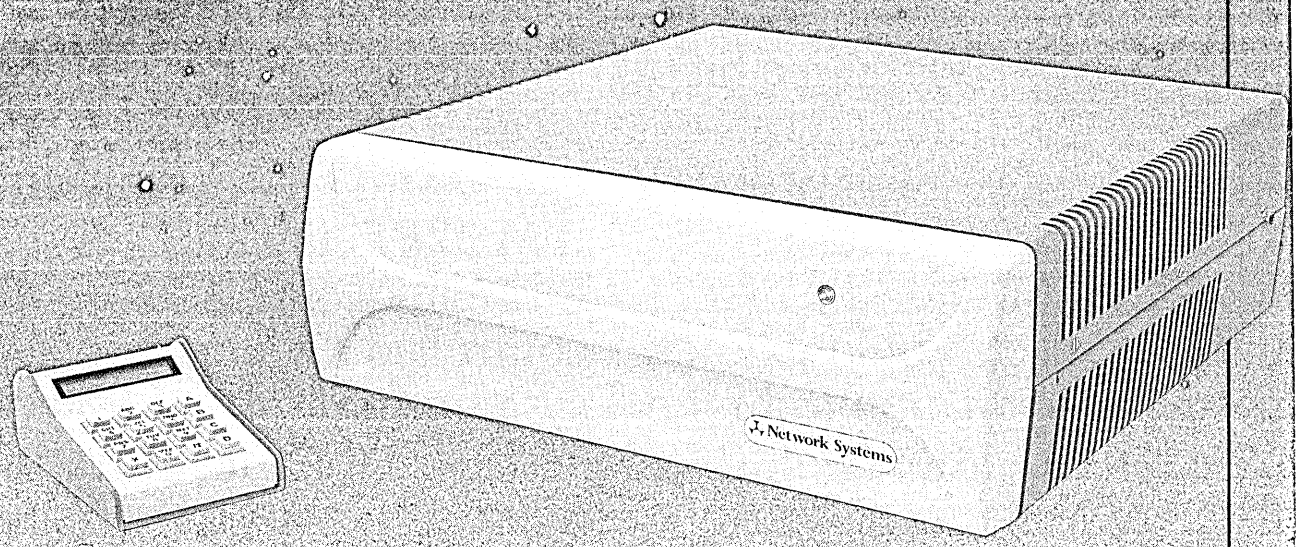
dca®
Digital Communications Associates, Inc.

MP-02-07

IRMA, IRMAline, IRMAlette, IRMAcom, IRMAlink DBX/CICS, IRMAprint and IRMAkey/3270 are trademarks of Digital Communications Associates, Inc. DCA is a registered trademark of Digital Communications Associates, Inc. IBM is a registered trademark of International Business Machines Corporation. © 1984, Digital Communications Associates, Inc.

CIRCLE 67 ON READER CARD

You've Heard of HYPERchannel.® Meet HYPERbus!® An IBM 3278 Compatible LAN From Network Systems.



HYPERbus is a HYPERformance LAN system compatible with IBM 3278's. It is a premier system from Network Systems Corporation, the original successful developer of the networking concept in 1974.

HYPERbus is fast, maintaining a 10,000,000 bits per second data transfer speed. This means you can have subsecond response when you put your IBM 3278 Terminals anywhere in the system.

Getting data fast means productivity. Experts agree, reducing delay on system requests increases productivity and user satisfaction.

What if you want to move a 3278 terminal to a new location? With HYPERbus, it's easy. Using HYPERbus and HYPERchannel we can even provide cost effective subsecond response for remote IBM 3278's miles away.

HYPERbus can provide productivity with other systems as well. Whether your LAN need is for IBM 3270 terminal equipment, RS232 SYNC, ASYNC, high-speed communications links, ports to Telco Circuits or even DMA connections to minicomputers, *HYPERbus is the answer.*

Call or write, Network Systems Corporation and Investigate HYPERbus.

Offices and support in most larger cities.

We are your best cost effective solution for putting your IBM 3278's on LANS.

Network Systems Corporation

Network Systems. The Total Solution.

7600 Boone Avenue North, Brooklyn Park, MN 55428/(612) 425-2202

HYPERbus, HYPERchannel are registered trademarks of Network Systems Corporation.
IBM is the trademark for International Business Machines Corporation.

CIRCLE 68 ON READER CARD

PEOPLE

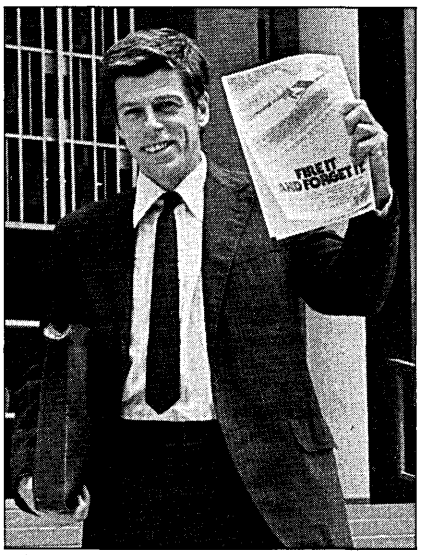
BUCKING THE TIGER

History teaches that some of us do not go gentle into the good night, even when the deck is obviously stacked in the house's favor. Consider John Brown's last stand in the firehouse at Harpers Ferry. Reflect upon Aleksandr Solzhenitsyn, who railed against the tyranny of the Soviet state while deep inside the Gulag archipelago.

A computer scientist at Stanford University named Clifford J. Johnson would protest mightily on grounds of untoward personal publicity if his name were added to this list. A soft-spoken British subject who has lived in the United States since 1977, Johnson is consumed these days with two diverse lawsuits.

Who is he suing? The Bank of America and Secretary of Defense Caspar Weinberger. To make his story even more interesting, consider this: Johnson is acting as his own attorney. He holds a doctorate in operations research from Sussex University in England, and he has never had any training as a lawyer.

Of the two lawsuits, the one against Weinberger is the more remarkable. "This action," says Johnson in court papers, "does not challenge the development, deployment, first use, or second use of nuclear weapons, but focuses on perhaps the greatest single danger of accidental nuclear war—namely, launch on warning capability." In his brief, Johnson argues that this computer-driven technology is not only inherently inaccurate and dangerous, but unconstitutional in the bargain.



CLIFFORD J. JOHNSON: "They called me in, asked for my Visa card and cut it in half."

Johnson's career in propria persona, which translates to acting as one's own attorney, began while he was working for the Bank of America in San Francisco. He designed and built an on-line monitor on all bank data processing activity. This monitor reported and forecast the computer workloads of some 300 bank applications and correlated the information with a large database monitoring the performance and usage of three large IBM MVS environments totaling 10 cpus.

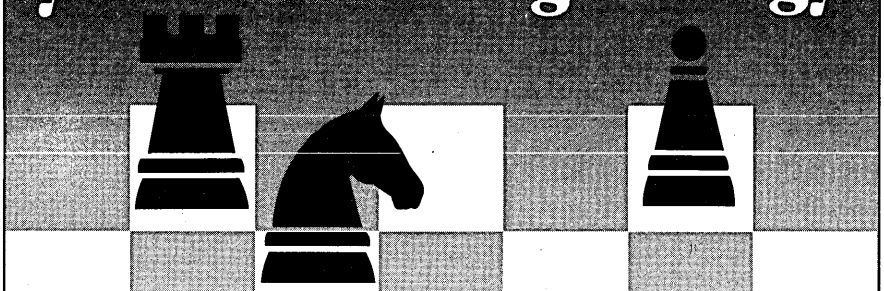
Johnson was fired in 1980 after repeatedly complaining to bank officials that the bank's dp operations were wasteful, he says. "Plaintiff in fact developed a New System divulging that the Old System had already generated waste now estimated at $25 million," say court papers filed by Johnson, "and which would save future wastage now estimated at $10 million per year. Further, the New System divulged unsafe and unsound practices in the management of the Bank's computer operations."

The bank at last gave him the sack. "They called me in, asked for my Visa card, and cut it in half," Johnson recalls. "Then they did the same thing to my bank identification card."

"When I first decided to sue I couldn't get a lawyer to take the case. I didn't even know the meaning of the word plaintiff," Johnson recalls. "There was no *People's Court* on television in those days. So I just carried a little suitcase into the law library and did research. Later, I found a lawyer who assisted me for a while. It was rather like a clerkship."

Johnson's suit is chugging its way through the courts. The bank has offered to pay him some $20,000 in compensation for the termination. Johnson is holding out for $250,000—"which works out to about $40 per hour for my time," he says—plus a satisfactory work reference. Further hearings on the case were scheduled for last month.

Make the move that adds a new dimension to your advertising strategy



Use the DATAMATION Marketplace to reach 173,000 buyers/specifiers for $640 per 1/9 page. It's a quality, as well as a quantity, audience—150,000 are BPA-audited information processing professionals in the U.S. and Canada with direct influence on hardware/software purchases.

For more details, call Kathy Monaghan or Shirley Stirling at (800) 223-0743. In New York, call (212) 605-9732/33.

(Marketplace location listed in Table of Contents)

DATAMATION®

Serving the needs of information processing professionals ... worldwide.

Your company can help us prevent child abuse.

One of the tragic aspects of child abuse is that it doesn't have to happen.

The National Committee for Prevention of Child Abuse knows how child abuse can be prevented.

But we need your company's help to do it. We need help in two ways.

The first involves educating your employees to the causes and prevention of child abuse—through literature which we can make available.

The second way involves helping us set up additional prevention facilities—through the donation of money in your company's name.

The National Committee for Prevention of Child Abuse is a private, charitable organization. In the last seven years we've made great strides in the prevention of child abuse.

But the problem is still enormous. We need your help. Please mail the attached coupon today.

And help us put an end to child abuse.

Help us get to the heart of the problem.

Write: National Committee for Prevention of Child Abuse
Box 2866, Chicago, Illinois 60690

☐ Please send us information on how we can help.

☐ We want to start helping right now. Enclosed is a check for $_____

NAME _____

TITLE _____ COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

National Committee for Prevention of Child Abuse®

A Public Service of This Magazine & The Advertising Council. Ad Council

PEOPLE

The suit against Weinberger "was like a rose growing out of the manure of the Bank of America lawsuit," says Johnson. Filed in Federal Court in San Francisco last March, it had the endorsement of the Computer Professionals for Social Responsibility. This Palo Alto, Calif.-based group has strongly challenged the technology of launch-on-warning. ("Nuclear War and the Computer," February, p. 50.)

In a lengthy brief studded with facts, figures, and citations, Johnson maintains that under the Constitution only the President and Congress can trigger World War III:

"The Constitution mandates: 'The Congress shall have Power . . . to declare War'; and 'the President shall be Commander in Chief' of the Armed Forces. . . . The message is clear: Congress and the President are explicitly required by the Constitution to assume the United States' war-making powers. Were a couple of defective computer chips to cause the launch of American nuclear missiles, the decision to launch would have been taken neither by the Executive nor Legislative branches. LOWC [launch on warning capability] surrenders war-making powers. Shall the people elect programmers? Shall the President appoint robots? No, and no again."

Perhaps mindful of his European roots and of where these LOWC devices are deployed, Johnson puts it this way: "I am an antimonarchist, but the Queen is a nice lady and I don't wish her vaporized. It's well known that the new European missiles (Cruise and Pershing) are fully funded by the United States, who own the only launch keys."

Johnson's suit was dismissed by Federal Judge Spencer Williams in San Francisco, who strongly hinted that its Constitutional issues were beyond him. "I've read your papers and I am convinced that you do not have a cause of action that you can plead in this court," said Williams. "So what I am going to do is dismiss it, but give you an opportunity to take it before the Circuit Court of Appeals, with higher authority and perhaps greater wisdom."

These days Johnson is drafting that appeal when he is not holding down his job as manager of capacity planning at Stanford's Information Technology Services department. A man of much hope but with few illusions, he suspects that Weinberger would not now recognize his name on his lawsuit if he heard it. "But that could change if my appeal is successful," muses Johnson.

John Brown and Aleksandr Solzhenitsyn may well have had something similar in mind.

—Charles Howe

SCIENCE/SCOPE

The first U.S. facility for making gallium arsenide solar cells on a standard production line is now under construction at Spectrolab, Inc., a Hughes Aircraft Company subsidiary. Gallium arsenide cells, which are now being made on a prototype line at Hughes Research Laboratories, will help satellites and spacecraft become more efficient in converting sunlight into electricity. Compared to conventional silicon cells, gallium arsenide cells generate up to 30% more power and operate at much higher temperatures. The first cells are expected to come off the production line in mid-1985. Full-scale mass production at rates to 15,000 cells per year is scheduled for January 1986.

A spacecraft orbiting Venus will be used to observe Halley's Comet during the comet's closest approach to the sun in early 1986. NASA's Pioneer Venus Orbiter will be reoriented next year to examine Halley between December 1985 and February 1986, when the comet and Venus will be on the far side of the sun from Earth. The Hughes-built spacecraft has been making radar maps and performing other scientific studies since arriving at the cloud-covered planet in 1978. In April the Orbiter, designed to operate just one year, proved it could conduct the Halley mission when it viewed Comet Encke for eight hours. During the test, the spacecraft's ultraviolet spectrometer surprisingly revealed that Encke is losing water through evaporation at a rate three times higher than expected, based on previous observations.

A new target cueing system makes shoulder-fired missiles more effective, allowing troops to fire at aircraft day or night or in bad weather. The prototype uses the Low Altitude Surveillance Radar (LASR), a recent Hughes development, and the Position Location Reporting System (PLRS), in production for the U.S. Army and Marine Corps. It enables a gunner to use the full capabilities of the missile and assists him in making the split-second decisions needed to engage fast, low-flying aircraft. LASR pinpoints incoming targets while PLRS provides the precise location of both the radar and the weapon. Small lights integrated into the missile launcher sight direct the gunner and tell him when the target is within launch range. Tests show that gunners can learn to operate the cueing portion of the system with only 20 seconds of practice.

Paper-thin gallium arsenide solar cells have been fabricated using methods identical to those used for making conventional gallium arsenide cells. The new cells would reduce the weight of a spacecraft and hence the cost to launch it. The new thin cells exhibit an efficiency of greater than 16%. A typical cell is approximately 70 micrometers thick and weighs 0.2 gram. The demonstration proves that Hughes research scientists can transfer experience, techniques, and processing steps for making conventional cells to the thin cells.

Hughes Ground Systems Group is preparing to apply its airspace management experience to the exciting challenges of worldwide air traffic control. These systems will be designed to ensure service 24 hours a day, 7 days a week. They will support distribution of processing among multiple computers linked via local area networks. The many challenges include design and development of hardware and software to support advanced display and man-machine interface technology, and using satellite technologies for future ATC applications. To help design the next generation of air traffic control systems, send your resume to Hughes Ground Systems Group, Employment Dept. S3, P.O. Box 4275, Fullerton, CA 92634. Equal opportunity employer. U.S. citizenship required.

For more information write to: P.O. Box 11205, Marina del Rey, CA 90295

HUGHES
AIRCRAFT COMPANY

DIGITAL DISPLAYS THE TERMINALS BEST ENGINEERED FOR BUSINESS.

Before you make any investment in business graphics terminals, it really pays to investigate what you'll be using them for.

If you're like most businesses, your terminals will be used approximately 70% of the time for generating text and numbers. And only around 30% of the time for strictly graphics purposes. The October 1983 *Infosystems* article, "How to Buy Graphics Displays," coauthored by Jim Warner, CEO of Precision Visuals, Inc.,® states, "While it may be true that one picture (chart, graph) is worth a thousand words, there will always be the need for words, thousands of words, in the day-to-day activity of the office. Special graphics-only devices can have limited value in a general office environment."

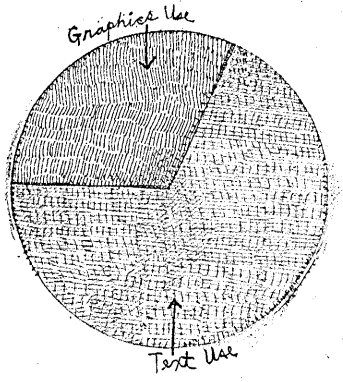
At Digital, the first step in engineering every product we make involves a thorough analysis of who will use it, what it will be used for and which features will help make people more productive in their jobs.

That's been true of every terminal we've designed and helps explain their widespread acceptance and popularity.

And you'll find it's equally true of Digital's latest entries, the VT240™ and VT241™ terminals.

ENGINEERED BEST FOR WHAT YOU NEED MOST.

As the newest members of Digital's family of terminals, the VT240, a conversational



text and graphics terminal, and the VT241, with the added dimension of color, continue the tradition of engineering excellence for performance. They offer full VT100™ compatibility to take advantage of a host of offerings already developed. And to meet the needs of the business environment, you'll find a set of standard text features that are either unavailable on other terminals or may have to be purchased at an additional cost.

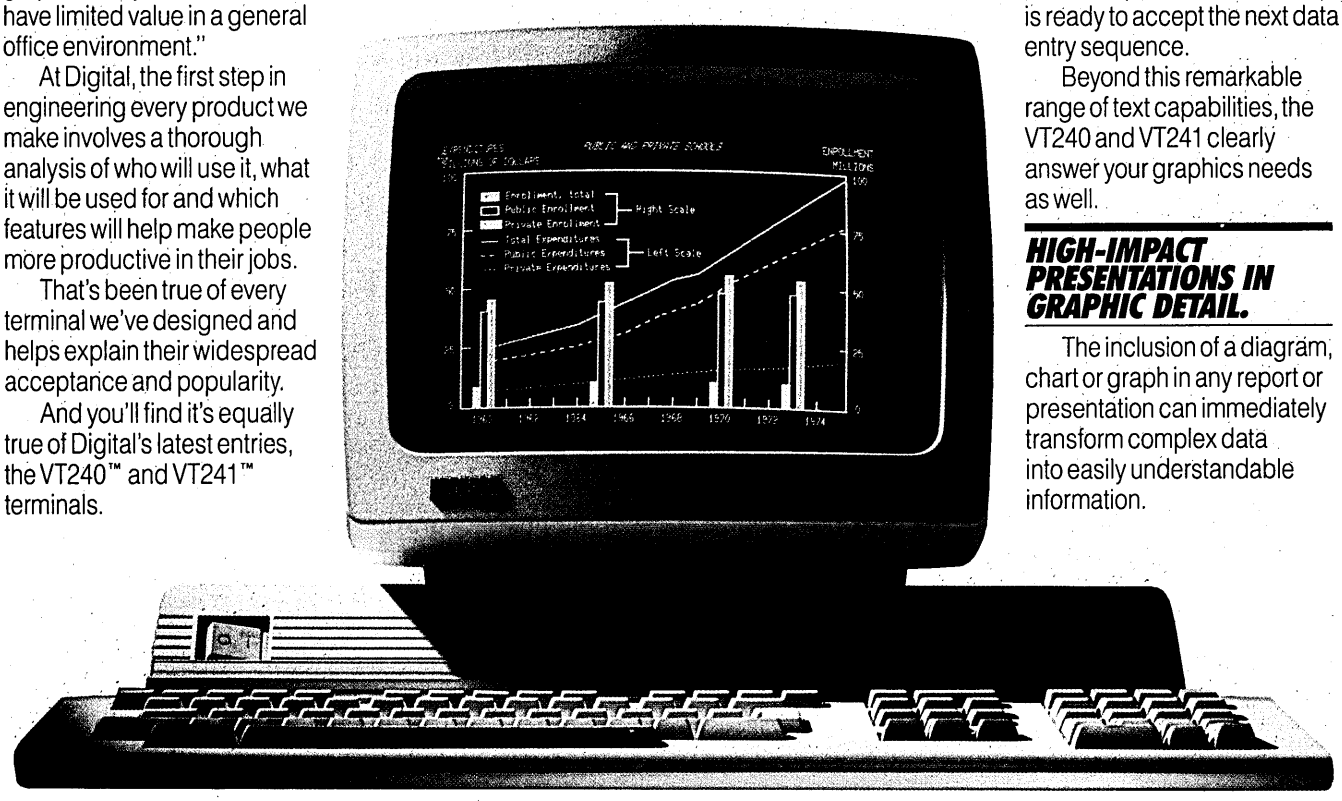
These features include bidirectional smooth scrolling, split screen, a choice of 80 or 132 columns per line and a double width/double height format. A highly legible 8 by 10 dot matrix character font displays true ascenders and descenders for exceptional crispness and legibility. If certain information needs to be highlighted, you can select from a combination of bold print, blinking and underlining in either normal or reverse video. For your added convenience, there's even a built-in printer port for printing hard copy.

Both the VT240 and VT241 terminals give you the option of erasing selected character positions on the screen for more efficient communications and increased productivity. For those applications that require data to be entered by filling in the blanks of a form, once the data has been accepted by the host, the filled-in information – and only that – can be erased by means of a single command. The form itself remains up on the screen and is ready to accept the next data entry sequence.

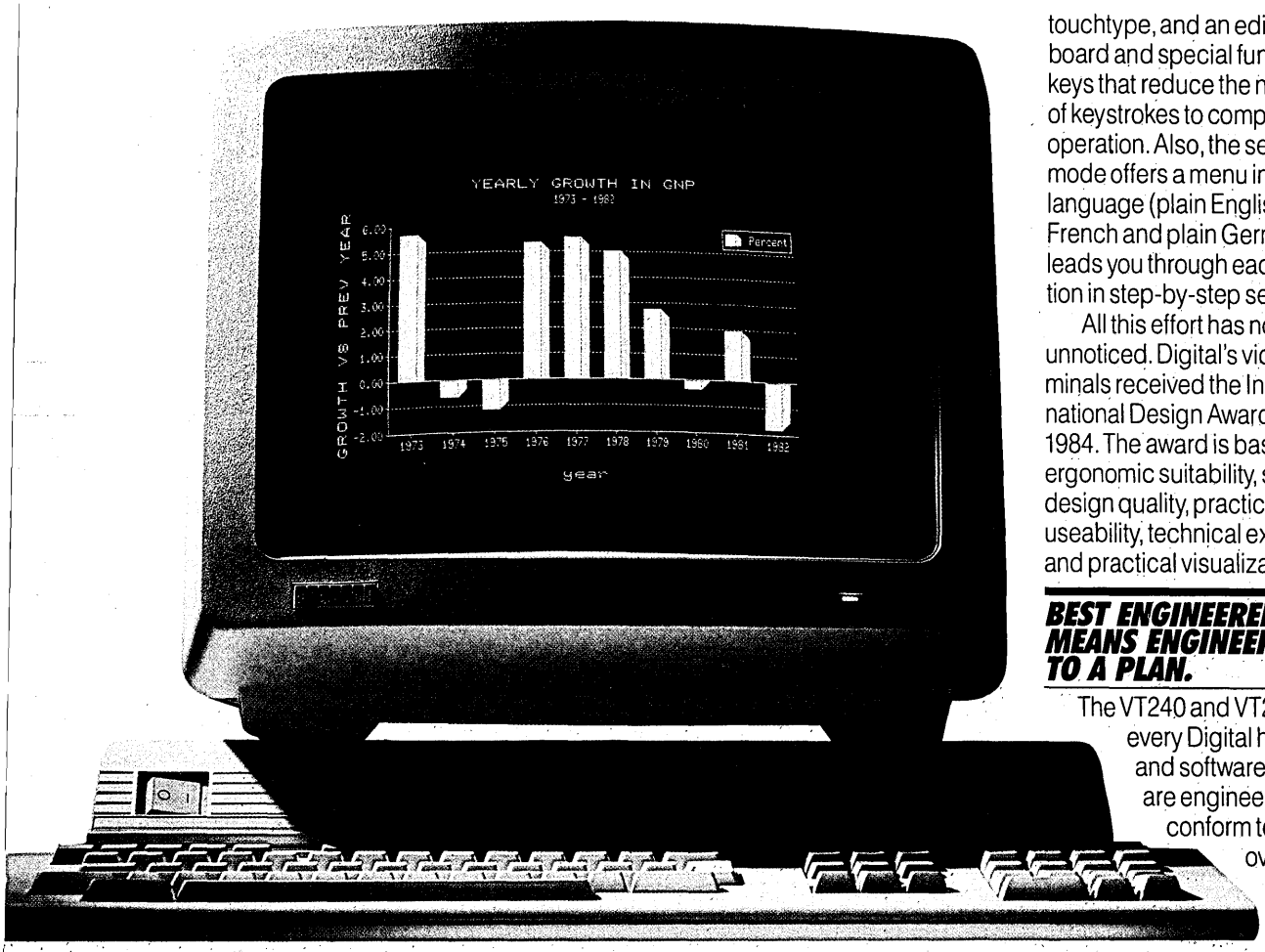
Beyond this remarkable range of text capabilities, the VT240 and VT241 clearly answer your graphics needs as well.

HIGH-IMPACT PRESENTATIONS IN GRAPHIC DETAIL.

The inclusion of a diagram, chart or graph in any report or presentation can immediately transform complex data into easily understandable information.



© Digital Equipment Corporation 1984. Digital, the Digital logo, VT240, VT241, ReGIS, VAX-11 DECgraph, VAX-11 DECslide, LVP16 and VAX are trademarks of Digital Equipment Corporation. Tektronix 4010/4014 and Tektronix Plot 10 are trademarks of Tektronix, Inc. TELL-A-GRAF and DISSPLA are trademarks of Integrated Software Systems Corporation. DI-3000, GRAFMAKER and GRAFMASTER are trademarks of Precision Visuals, Inc.



touchtype, and an editing keyboard and special function keys that reduce the number of keystrokes to complete an operation. Also, the set-up mode offers a menu in plain language (plain English, plain French and plain German) that leads you through each operation in step-by-step sequence.

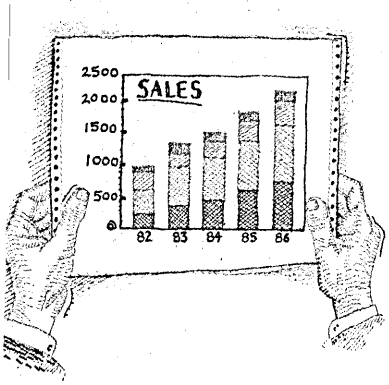
All this effort has not gone unnoticed. Digital's video terminals received the International Design Award in 1984. The award is based on ergonomic suitability, safety, design quality, practical useability, technical excellence and practical visualization.

BEST ENGINEERED MEANS ENGINEERED TO A PLAN.

The VT240 and VT241, like every Digital hardware and software product, are engineered to conform to an overall computing strategy. This means our products are engineered to work together easily and expand economically. Only Digital provides you with a single, integrated computing strategy direct from desktop to data center.

For more information and the name of the Authorized Terminals Distributor or Digital Representative near you, call 1-800-DIGITAL, extension 700. Or write Digital Equipment Corporation, 2 Mount Royal Avenue, UP01-5, Marlboro, MA 01752.

Both the VT240 and VT241 terminals generate bit map graphics in a choice of two protocols – Digital's ReGIS™ (Remote Graphics Instruction Set) and Tektronix 4010/4014.™



ReGIS lets you create and store business graphics as simply as producing ASCII text. With VAX-11 DECgraph™ and VAX-11 DECslide™ software, even a novice can prepare graphs and charts and turn them into slides. Self-explanatory icons let you choose a box, circle, line, polygon, triangle or arc.

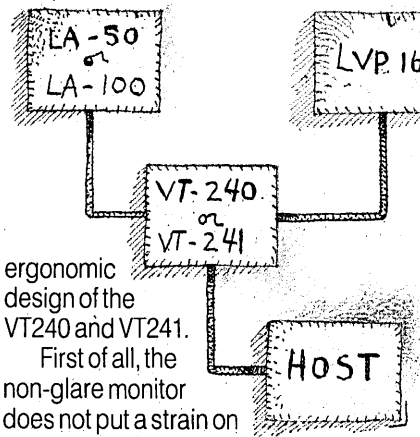
The Tektronix 4010/4014 protocol supports the full array of existing 4010 compatible graphics software. Besides, Tektronix Plot 10,™ TELL-A-GRAF™ and DISSPLA™ from ISSCO® and DI-3000,™ GRAFMAKER™ and GRAFMASTER™ from Precision Visuals are also supported.

When you're using third party software, Digital provides you with the total hardware/software solution: video terminals, hard copy with the LVP16™ Pen Plotter and the VAX™ computer.

THE HIGHEST AWARD FOR ERGONOMIC DESIGN.

Your people have to spend long hours in front of a terminal. It stands to reason the easier they are to use, the more productive the results.

That's why so much time and thought have gone into the ergonomic design of the VT240 and VT241.



First of all, the non-glare monitor does not put a strain on the eyes. Plus, it tilts to adjust to the exact viewing angle that's most comfortable to work with. The detachable keyboard is ruggedly constructed, yet light enough to place on your lap. Even the way the keyboard has been arranged boosts productivity.

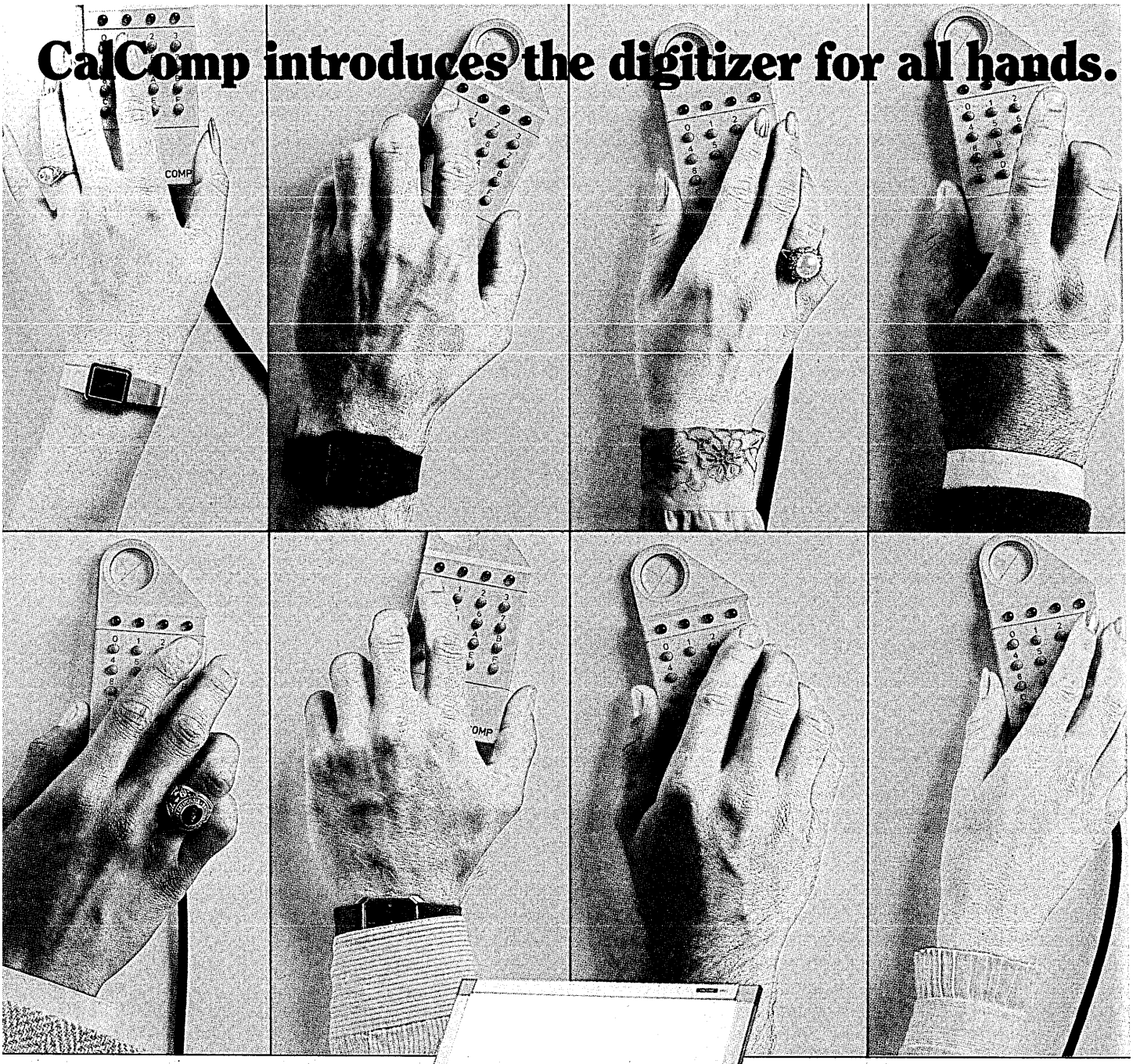
There's a standard typewriter keypad so you can touchtype, and an editing keyboard and special function keys that reduce the number of keystrokes to complete an operation. Also, the set-up mode offers a menu in plain language (plain English, plain French and plain German) that leads you through each operation in step-by-step sequence.

All this effort has not gone unnoticed. Digital's video terminals received the International Design Award in 1984. The award is based on ergonomic suitability, safety, design quality, practical useability, technical excellence and practical visualization.

THE BEST ENGINEERED COMPUTERS IN THE WORLD

digital™

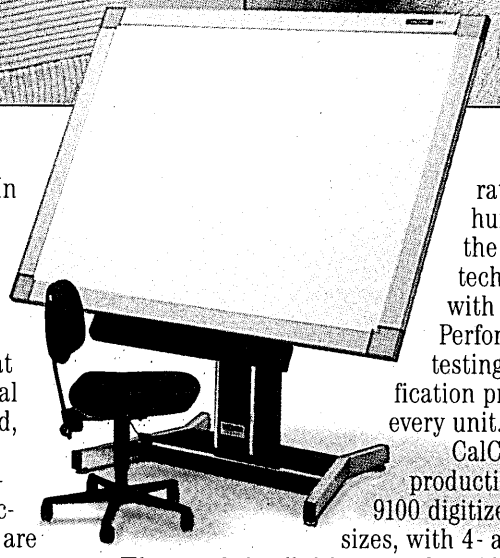
CalComp introduces the digitizer for all hands.



At CalComp, we believe a digitizer should be easy to use. For everyone. In every application.

As a result, our new 9100 features a special ergonomic design ideal for both left- and right-handed operation. The cursor's slim body promotes accurate cross hair placement, even at severe operating angles. And the signal cable exits the cursor behind your hand, away from the work area.

To keep all hands happy, we've concealed the 9100 digitizer's control electronics in the frame. And table edges are smooth so they'll never snag clothing. We've also included a handy accessory tray to keep digitizing tools in easy reach and a pen/cursor holder that can be mounted anywhere on the 9100's uniquely constructed frame.



The new 9100 digitizer.

Ergonomics even extend to accurate operation of the unit. Here, human engineering combines with the patented electromagnetic technology to deliver ±.005″ accuracy with a resolution of 1000 lines/inch. Performance is verified with automated testing, detailed in an accuracy certification printout and brochure shipped with every unit.

CalComp innovation puts new digitizing productivity in your hands. The new 9100 digitizer is available in a range of table sizes, with 4- and 16-push-button cursors, pens, and a wide choice of options. For details call toll-free 1-800-CALCOMP, ext. 156. Or write CalComp, 2411 W. La Palma Ave., P.O. Box 3250, Anaheim, CA 92803.

CALCOMP 25 1959 1984

CALCOMP

A Sanders Company

CIRCLE 69 ON READER CARD

HARDWARE

OFF-LINE

Texas Instruments is reaching out and touching its TI Professional Computer owners by offering TI-Direct, which it describes as a toll-free, 24-hour, customer-support line. The only part that's toll-free, however, is the actual telephone charge. The service users get when they call the customer-support line is anything but toll-free: a one-year subscription gives a user up to 25 calls at a suggested list price of $250, or $10 a call. Five-year support is available for $1,050. Phone support is also available on a per-call basis for $25 a call.

In addition to the telephone support, the company is also offering an extended warranty program. "Consumer research shows that users feel the need for responsive, long-term support before making a purchase decision," explains Eric Jones, president of TI's Data Systems Group. The warranty program extends the current 90-day hardware warranty up to five years.

As the micros begin to mature on the desktop, the question of vendor support appears to be increasingly more critical for the user. Besides TI, other vendors, including IBM, are stressing more than ever their ability to service their products. With the supply of micros beginning to equal the demand and vendors finding sales quotas more difficult to achieve, users are demanding more for their money. Since most pcs now offer at least one semistandard operating system, such as MS/DOS, customers are looking for new ways to differentiate among vendors, and the issue of post-sale service is becoming one key way. Hence the vendor interest in service.

The largest vendors are promoting their own service capabilities, and vendors too small to do the same are showing their presence in the service area through one of the many third-party maintenance companies that have emerged. The increased vendor attention to service is a windfall to users. As they begin to discover that the electronic miracles on their desktops can break down like televisions or toasters, it is likely that micros will be purchased more for their reliability and the ease in which they can be repaired, and less for their ad campaigns or price discounts. And, by the way, since TI believes, at least for now, that a telephone call is the next best thing to being there, any guesses on what the phone number is? 1-800-TI-TEXAS.

In more traditional areas of customer support, Digital Equipment Corp. is offering a new, two-part comprehensive service maintenance program designed for oems. The first element is the Blue Chip Program, in which DEC provides full on-site or carry-in maintenance service and the oem acts either as a sales agent for the service contracts or as a distributor and reseller of maintenance services. The second part is the Partnership Program, which provides for maintenance support by DEC for the oem's own service offerings, in categories ranging from in-field support to educational services.

Enrollment in either program calls for the assignment of a field service account manager. The manager will provide assistance and support on questions and requests about DEC services and delivery issues and act as a link with DEC's management. Each participating oem is assigned a unique identifying number to aid in administering service business with the company. The oems also receive an enrollment kit containing materials on programs, options, conditions, and procedures concerned with the chosen relationship.

DATA BRIDGE

The Any Databridge provides a bridge between incompatible computer data by making it possible for incompatible micros, minis, and mainframes to communicate with each other.

According to the vendor, the system allows computers to interchange data freely between devices. The system does not modify computer programs of either the source or target computer. Instead, the device acts as a translator between two programs. It emulates a human operator to extract data from one program, then it inputs that data into another program. The unit is capable of translating data between any two applications on any two systems in any direction any time, adds the vendor.

With the product, a human operator demonstrates the desired information-gathering procedure to the device once. The system stores this routine and then performs the operation when required. Setting up the data bridge does not require special programming skills. Neither the sender nor receiver of data needs to be concerned with file structures, disk formats, or languages because the device achieves compatibility between existing interactive programs on the applications level.

Mainframe data security is maintained with a log-in process that limits each user's authorized menu levels. The product is installed on a computer functioning as a front-end data processor and is positioned, in terms of logic, between the two computers. A single computer may even function as both the target and source if the product is used to move data between two software packages stored in the same computer.

A terminal port is required to make a connection to the system. The product uses Async-TTY, but other types can be used with the addition of a protocol converter. The Any Interface Card handles functions such as data encryption, correction of line errors, and remote connection. The system uses an IBM PC XT

HARDWARE

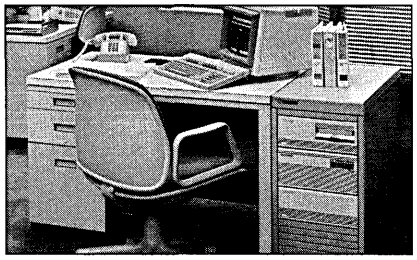
as the intermediate computer with two data driver ports to computers requiring the link. It is available with installation, a half day of training, and an additional day of support, for $15,000. CIPHERLINK CORP., Los Angeles.

FOR DATA CIRCLE 301 ON READER CARD

OFFICE COMPUTER

The HP 3000 Series 37 office computer runs the identical software as the larger HP 3000, but it fits next to a desk or under a table. It can be installed by users in configurations with up to 110MB of disk storage. The unit operates in carpeted rooms over a wide temperature range without special air conditioning and it plugs into an ordinary wall socket. When first turned on, the computer is ready to run applications. System backup can be performed by a secretary or clerk, or even accomplished automatically after hours, the vendor says.

The Series 37 has 512KB of main memory and a 55MB disk, cartridge tape backup, systems console, Image database, and office cabinet. Power requirement is below 700 watts. It can be expanded up to 28 terminals, 2MB main memory, and 2,400MB of disk. With upgrades, users can expand upwards through three other



models, the largest with as many as 400 terminals. Prices for the HP 3000 Series 37 office computer start at $20,000. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 302 ON READER CARD

LASER PRINTER

The desktop Corona Laser Printer interfaces with most IBM PC and PC-compatible standalone and multi-user computer systems. It produces up to eight pages per minute of combined text and graphics, the equivalent of 440 lines per minute, or about 350 characters per second.

Designed for business pc users, the printer produces high-resolution charts, maps, diagrams, and illustrations on the same page with text of multiple fonts and type sizes. The unit produces text and graphics resolution of 300 by 300 dots per inch and prints at less than 55 decibels.

Currently, the printer supports four different fonts and type sizes ranging from seven to 20 points on the same page. Six to eight fonts will be available in the future, the vendor says. The device handles standard letter and legal size, as well as European size paper. Graphics image output can be magnified up to four times the original size. The printer weighs approximately 54 pounds and measures 18.7 inches wide, 11.4 inches high, and 16.3 inches deep. The Corona Laser Printer costs $3,400. CORONA DATA SYSTEMS INC., Thousand Oaks, Calif.

FOR DATA CIRCLE 303 ON READER CARD

PERSONAL COMPUTERS

The Deskpro line is a series of four personal computers that are IBM PC-compatible. The micros utilize the 16-bit 8086 microprocessor. Users are offered a wide range of capabilities within the various models, and each unit can be upgraded from an entry-level configuration to the most advanced model in the line.

The entry-level system, called the Deskpro 1, includes a single 360KB disk drive, 128KB RAM, and the vender's dual-mode monitor, which displays text and graphics on the same screen. The monitor is available in green or amber display.

In contrast, the top-of-the-line Deskpro Model 4 has 640KB of RAM, one 360KB disk drive, a 10MB fixed disk, an internal 10MB fixed disk backup system, a dual-mode monitor, and an asynchronous communication/clock board.

The computers have the built-in power (200-watt power supply) and space within the unit to go from a single diskette drive and 128KB of RAM to 640KB of RAM on the main system board and up to 20MB of fixed disk drive storage. The capacity for 640KB of memory on the main system board allows up to six available expansion slots for peripherals.

According to the vendor, the units can run IBM PC software without modification, and at faster speeds. Prices for the Model 1 start at $2,500. The Model 2 sells for $3,000. The Model 3 retails for $5,000 and the Model 4 has a suggested price of $7,200. COMPAQ COMPUTER CORP., Houston.

FOR DATA CIRCLE 304 ON READER CARD

SUPERMARKET SYSTEM

The Direct Store Delivery System gives supermarket managers more control over receiving procedures to ensure the supermarket gets what it pays for. According to the vendor, this is especially important in the supermarket industry, where margins are slim.

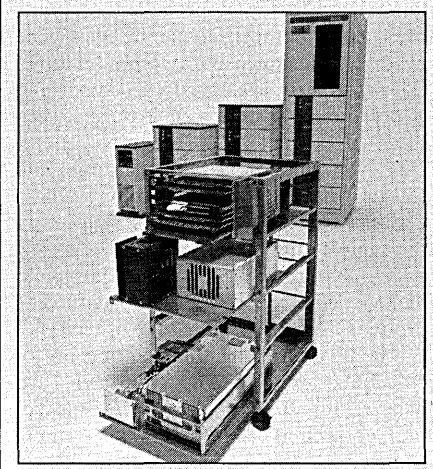
The system helps grocers oversee vendor authorization, item authorization, product costs, invoice calculation, and shelf space management. The DSD system

HARDWARE SPOTLIGHT

SUPERMICROS

The System 8000 Series Two is a line of Unix-based supermicrocomputers that support up to 40 users. The models 32, 22, and 12 each feature the vendor's new processor with cache memory, a Unix license for up to eight users, cartridge tape, and single disk. A wide variety of system configurations is offered. The performance of the Series Two is double that of the existing 8000 line. The vendor says this is due to the new cpu, based on an 11.1MHz microprocessor augmented by the inclusion of cache memory.

All Series Two models feature full software compatibility, including the



Unix operating system, standard languages, application tools, and communication options. The vendor will offer three levels of support, including local field engineers, technical specialists, and support directly from the company. In addition to standard communication options, all three models optionally feature the ICP 8/02 communication processor.

The Model 32's memory is expandable to 4MB. It has an 8-inch storage module disk drive with a capacity of 168MB. It can accommodate up to four drives, for total storage of 672MB.

The Model 22 is also expandable to 4MB. It has a cartridge tape and a 5¼-inch Winchester disk drive with 52MB unformatted capacity, expandable to four drives for total capacity of 208MB.

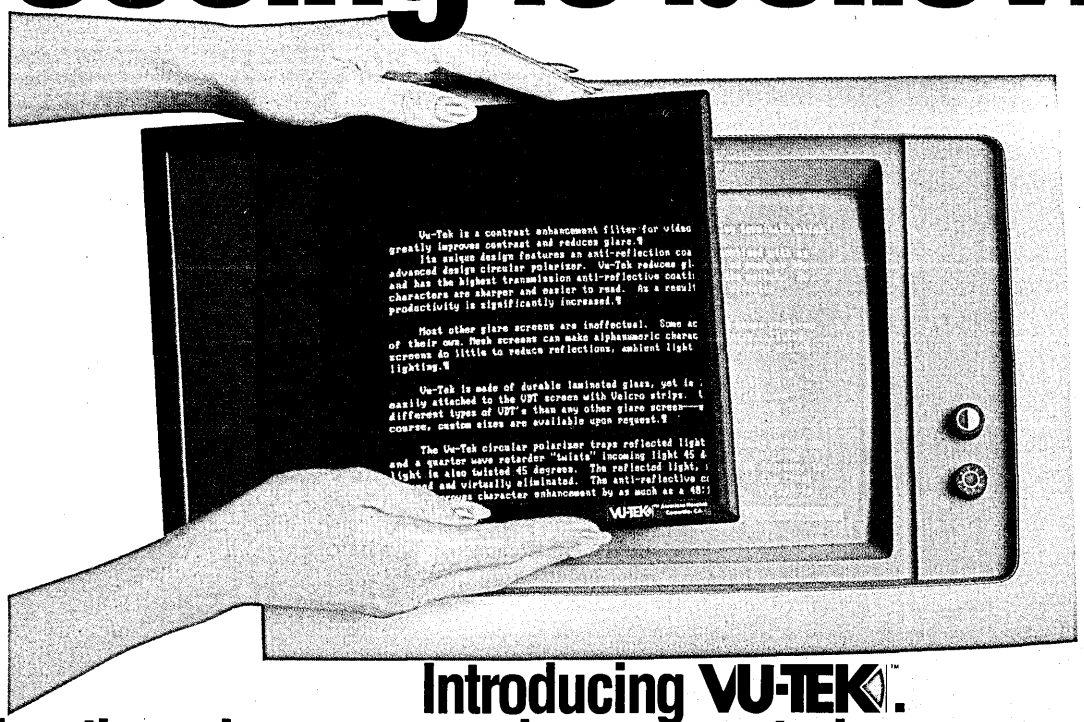
Both the model 32 and the 22 offer as options up to 40-user capacity, 9-track tape drive, and IEEE floating point processor. The 9-track drive is able to stream in multi-user mode under Unix, offering a sustained rate of 100 ips, the vendor says.

The Model 12 has a memory expandable to 2MB and a 5¼-inch Winchester disk drive with 52MB. This unit can support up to 16 users.

Prices for the Model 32 start at $30,000. The Model 22 has a base price of $24,000 and prices for the Model 12 begin at $20,000. ZILOG INC., Campbell, Calif.

FOR DATA CIRCLE 300 ON READER CARD

Seeing is believing.



See us at
COMDEX™/Fall '84
Booth #336, Convention Center, East Hall
November 14-18, 1984 Las Vegas, Nevada

Introducing VU-TEK™.
No other glare screen does more to increase productivity.

A glaring problem VDT operators face.

More than 90% of all employees who regularly use VDT's may suffer from eyestrain.* And that can make your business suffer, too.

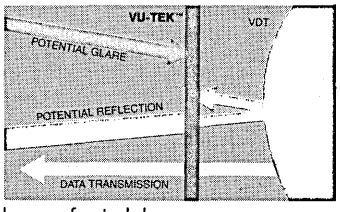
The cause of eyestrain? Glare. Reflection from office lights. And hard to read characters.

The result. Impaired vision. Headaches. Fatigue. More work breaks and absenteeism.

And reduced office productivity.

VU-TEK™ reduces glare up to 99%.

VU-TEK contrast enhancement filters help increase operator productivity by eliminating up to 99% of reflected VDT glare while also improving character clarity. VDT operators can now work more efficiently and comfortably.



VU-TEK's dramatic effectiveness is due to an advanced circular polarizer that traps glare preventing it from reaching the VDT operator's eyes.

No other glare screen is more effective than VU-TEK.

VU-TEK increases character legibility.

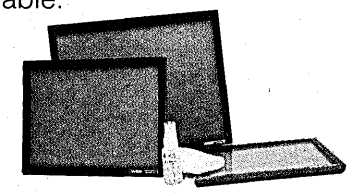
VU-TEK uses a special distortion-free anti-reflective coating on the front glass surface to improve character contrast and clarity.

The result... bright, clear, easy to read VDT's.

Fits leading VDT's. Easy to install.

VU-TEK fits more than 800 different VDT types. Custom sizes are also available.

VU-TEK is lightweight, durable and attaches in seconds.



"See for yourself" free trial.

End the glaring problem with computer automation – with VU-TEK.

To order your VU-TEK or arrange a 30 day free trial, call collect 1-805-987-5026. Or mail the attached coupon for more information.

VU-TEK is the result of research by American Hoechst, a member of the Hoechst Group of companies, with worldwide sales of $14.5 billion, and annual research expenditures of over $630 million.

*National Institute For Occupational Safety and Health Study, August 1981.

For additional information on VU-TEK™ contrast enhancement filters mail to:
American Hoechst Corporation, Specialty Film Products, Marketing Dept., 805 Via Alondra, Camarillo, CA 93010

Name _____
Company _____
Street _____
City, State _____
Zip _____ Phone ( )

American Hoechst Corporation
Specialty Film Products

VU-TEK™ The difference is clear.

© American Hoechst Corporation, 1984.

CIRCLE 70 ON READER CARD

operates on the microSystem 6/20 computer under General Comprehensive Operating System 6 software. Hardware includes a crt, keyboard, and handheld terminal with scanning wand and printer. The operating environment can be customized to meet special store requirements.

The in-store system can communicate with IBM or Honeywell host computers at the headquarters of a chain supermarket, sending receiving information for item and vendor analysis, profitability studies, and automatic entry into accounts payable. Host computers can also send transactions back to the in-store computer. An entry-level system with 512KB RAM and 30MB disk memory, including operation and application software, sells for $24,000. The handheld terminal is $2,500. HONEYWELL INC., Minneapolis.

FOR DATA CIRCLE 305 ON READER CARD

CAE/CAD WORKSTATIONS

This workstation is designed to meet the needs of the CAD/CAE and general graphics market. The SaberStation's application processor utilizes the NS32032, 32-bit microprocessor. Operating at a 10MHz clock rate, it executes a high-level instruction set at 1.2MIPS. It also provides demand-paged virtual memory and a hardware floating point coprocessor.

Berkeley Unix is provided with the system. Other software includes C, Pascal, FORTRAN-77, LAN support, programmer's workbench, virtual device interface, window manager, and a graphics package. All software has been integrated to work together through the window manager or under the control of customer-developed application software. The graphics package allows access to the 2-megapixel display at the pixel level.

The graphics processor employs a 32-bit, 20MBps op-code/databus structure. The structure allows applications to be developed in software and then moved into hardware. The image processor does vector-to-raster conversion and bit alignment for the 2 million-pixel by up to 24-bit image memory. The image memory processor provides true bit-mapped graphics.

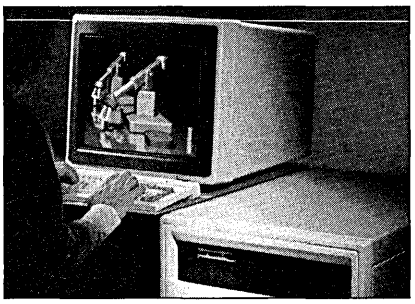
Image memory is 1,664 by 1,248 pixels, producing a 2-megapixel display. The basic system is available with two to eight image planes per pixel. The system allows expansion of up to 24 image planes and a color palette of 16 million colors. The image processor utilizes a high-speed display interface, providing a pixel every 5½ nanoseconds. The SaberStation costs $40,000 in single quantities. Oem discounts are available. SABER TECHNOLOGY CORP., San Jose, Calif.

FOR DATA CIRCLE 309 ON READER CARD

ENGINEERING WORKSTATION

The C1200 Professional Workstation is a 32-bit Unix-based system designed for engineering applications. It executes 2 million single-precision and 1.5 million double-precision Whetstone instructions per second and can be configured with up to 24MB of physical memory.

The system offers engineers large system features such as a floating point



arithmetic, large virtual address space, full 32-bit data path, and the Unix operating system. The processor architecture is optimized for high performance on computationally intensive tasks and supports flexible, high-performance, bit-mapped display generation. The system architecture allows configuration of the product in single-user or multiple-user configurations, either standalone or networked for peripheral access and sharing data.

The software of the unit supports bit-mapped graphics, multiple window displays, distributed files, and communication. Optimizing compilers are available for FORTRAN 77, Pascal, and C. The I/O system is an IEEE 796 (Multibus)-compatible bus providing users with a choice of peripheral devices.

The basic configuration includes the 32-bit processor, extended floating point processor, 56MB disk drive, streaming tape drive, 2MB ECC memory, Celerity system software license, and 90-day warranty. Prices start at $45,000. The color display station is priced at an additional $27,500. CELERITY COMPUTING, San Diego.

FOR DATA CIRCLE 306 ON READER CARD

PRINTERS

The Paper Tiger/Series 8000 consists of four printers designated the 8010, 8020, 8050, and 8070. The units feature a new printhead design and refined way to form characters to make possible letter-quality printing in dot matrix devices, the vendor says.

The models 8010 and 8020 printers are designed for professional microcomputer applications. The 80-column 8010 and 132-column 8020 can support word processing, business graphics, spreadsheets, CAD/CAM, and scientific uses. The 8050 and 8070 printers are 132-column printers designed for use with larger micro-based business systems.

According to the vendor, the key to letter-quality output is a dual pass technique and a staggered 18-wire printhead that forms characters by passing over them twice. The 8010 and 8020 models can print draft correspondence at 180cps, text at 90cps, and letter quality at 30cps. The 8050 has print speeds of 200cps, 110cps, and 35cps. The high-end 8070 prints draft at 400cps, text at 200cps, and letter quality at 75cps.

Paper can be fed from three directions: front, rear, and bottom, manually or automatically. Multiple part, single-cut sheets, and fanfold paper are also supported. All four printers can generate graphics. The 8010 costs $650. The 8020 sells for $850. The 8050 and 8070 sell for $1,700 and $2,200, respectively, without color. Color can be added for an additional $200 per unit. DATAPRODUCTS CORP., Woodland Hills, Calif.

FOR DATA CIRCLE 310 ON READER CARD

FAULT TOLERANT MINI

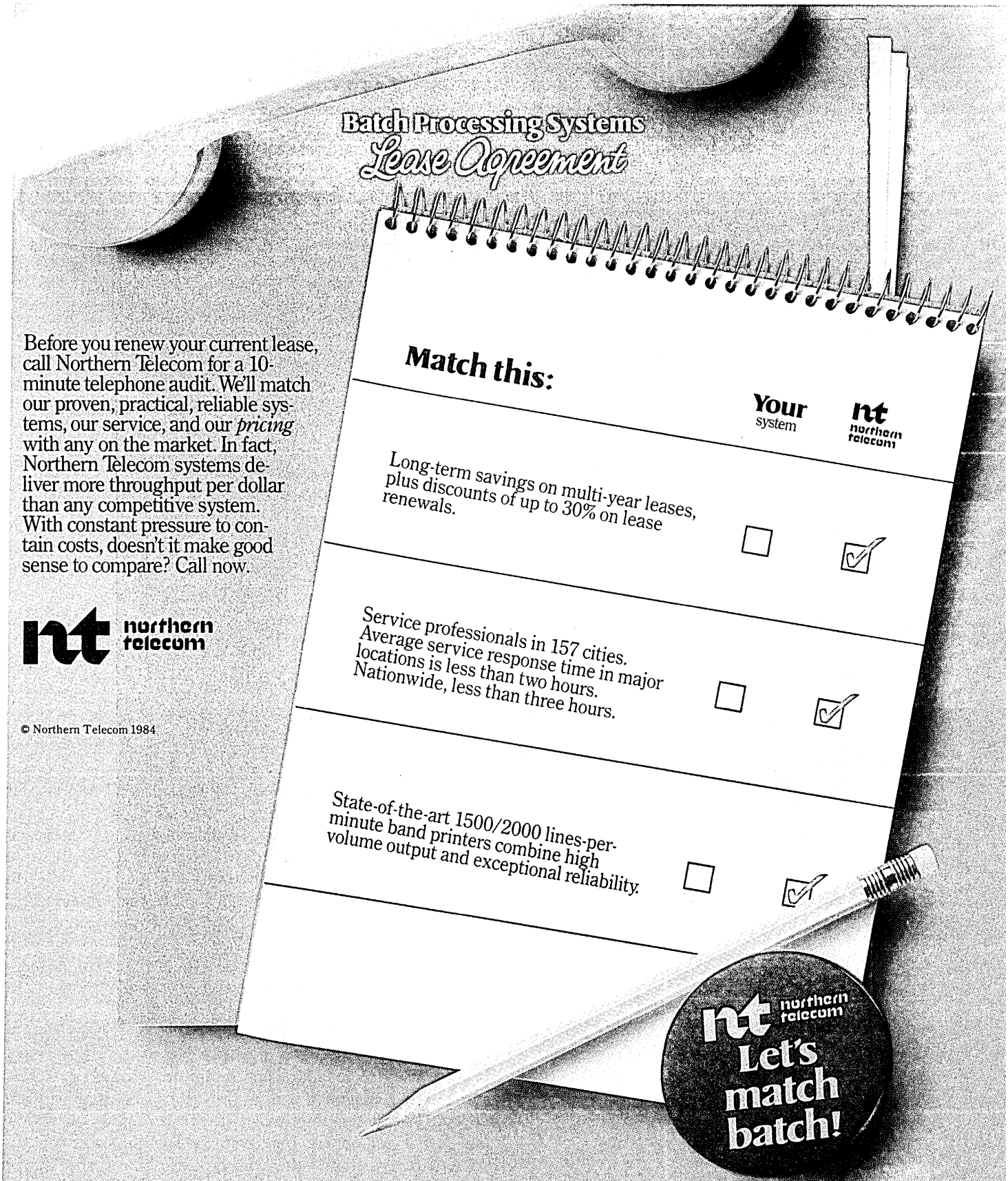
The Parallel 300 is designed for use in operational information systems applications—those environments where computers are critical to the flow of products and services. Typical applications include factory and office automation, and communication industries.

This minicomputer runs continuously without losing data, even if there is an internal hardware problem or external power failure, the vendor says, adding that the computer can be fixed by nontechnical users without computer expertise, special training, or tools. In the event of a component failure, the computer alerts the user to the exact nature of the problem and provides step-by-step instructions for replacing the defective component. A fault indicator light on the cabinet, plus lights inside the enclosure adjacent to the failed component, indicate which module requires replacement. The user can call the vendor for the replacement module, which should arrive within 24 hours. Once the component is installed, the system returns to a fully fault protected state.

The computer's redundant architecture duplicates all vital components. A closely coupled pair of parallel processing units, each using a Motorola MC68010 microprocessor, executes all tasks simultaneously. The unit also has two duplicated power modules, each with integrated batteries capable of powering the system if necessary. The Parallel 300 Model 30 costs $75,000. Optional expansions to the basic system include additional memory, disk, communication, and LAN software. PARALLEL COMPUTERS, Santa Cruz, Calif.

FOR DATA CIRCLE 311 ON READER CARD

—Robert J. Crutchfield



Before you renew your current lease, call Northern Telecom for a 10-minute telephone audit. We'll match our proven, practical, reliable systems, our service, and our *pricing* with any on the market. In fact, Northern Telecom systems deliver more throughput per dollar than any competitive system. With constant pressure to contain costs, doesn't it make good sense to compare? Call now.

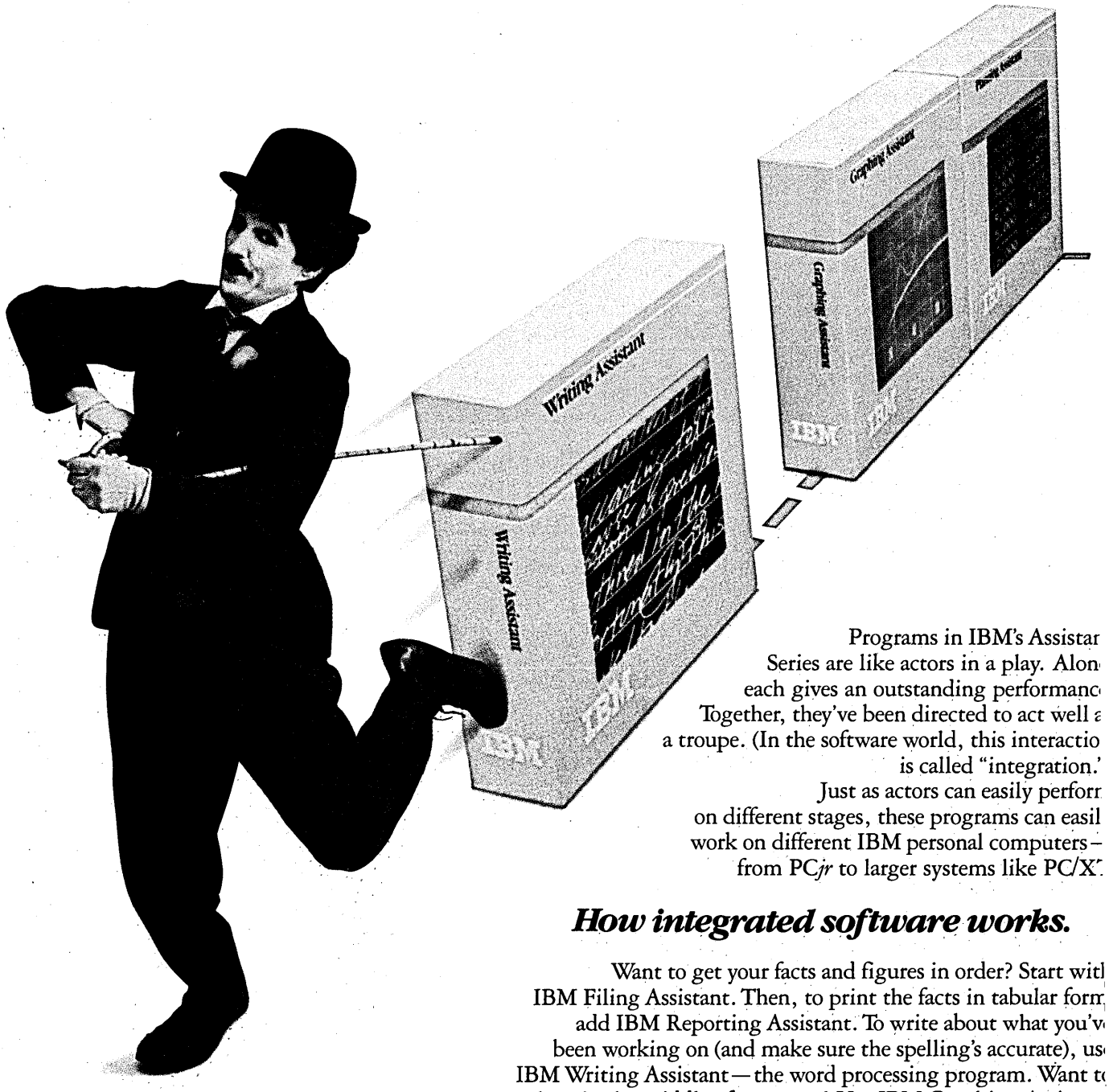
northern telecom

© Northern Telecom 1984

Match our batch!
Call 1-800-331-3113.

CIRCLE 76 ON READER CARD

Introducing the neu United they stand



Programs in IBM's Assistar
Series are like actors in a play. Alon
each gives an outstanding performanc
Together, they've been directed to act well a
a troupe. (In the software world, this interactio
is called "integration.'
Just as actors can easily perforr
on different stages, these programs can easil
work on different IBM personal computers–
from PC*jr* to larger systems like PC/X

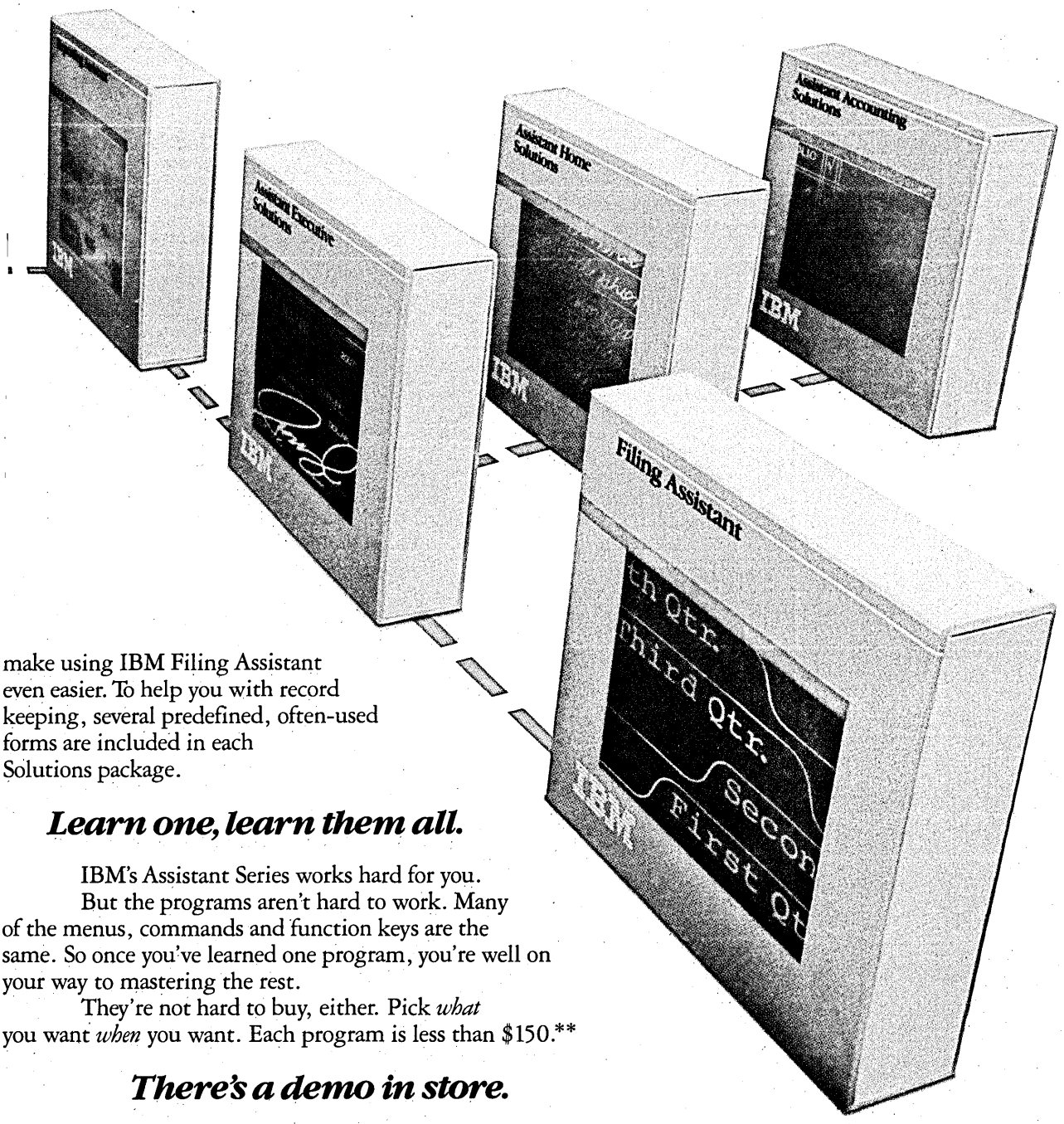
How integrated software works.

Want to get your facts and figures in order? Start witl
IBM Filing Assistant. Then, to print the facts in tabular form
add IBM Reporting Assistant. To write about what you'v
been working on (and make sure the spelling's accurate), us
IBM Writing Assistant—the word processing program. Want t
put a chart in the middle of your text? Use IBM Graphing Assistant
It takes data directly from IBM Filing Assistant to turn number
into pictures. When it's time to think ahead with schedules anc
forecasts—get IBM Planning Assistant,* the spreadsheet program
The finishing touch? IBM Assistant Solutions. They

Little Tramp character licensed by Bubbles Inc., s.a.

*Available early next year.
**Prices apply at IBM Product Centers

IBM Assistant Series. Divided they stand.



make using IBM Filing Assistant even easier. To help you with record keeping, several predefined, often-used forms are included in each Solutions package.

Learn one, learn them all.

IBM's Assistant Series works hard for you.

But the programs aren't hard to work. Many of the menus, commands and function keys are the same. So once you've learned one program, you're well on your way to mastering the rest.

They're not hard to buy, either. Pick *what* you want *when* you want. Each program is less than $150.**

There's a demo in store.

We've shown you how affordable the new IBM Assistant Series is. But we can't show you how easy. Your dealer can. Simply ask for a demonstration. For the authorized IBM Personal Computer dealer or IBM Product Center near you, call 800-447-4700. In Alaska or Hawaii, 800-447-0890.

IBM®

Personal Computer Software

CIRCLE 71 ON READER CARD

PREVENT "DP VS. END-USER" THINKING

Face it. End-users are no longer strangers to the world of computing. They have mainframes and PCs, software and data. Now, more than ever before, end-users need the support of their company's data processing professionals.

Help in using technology to satisfy end-users' individual information needs is not enough. To succeed in supporting end-user computing, you've got to manage your company's information resource. And you've got to prevent "Us versus Them" thinking. That takes teamwork—and software from TSI International.

Teamwork—within your own company. MIS and end-users working together productively to use one of your company's most valuable assets—information used for decision making. MIS has the responsibility to solve the tough, wide-ranging information problems. When you solve the problems shared throughout your company, all users of your information resource are more effective. Your company is more successful. Success requires a well-managed information resource—and that takes software.

Software—that's where TSI International fits in. We're specialists in information management software. TSI software supports end-user independence while providing the control MIS needs to ensure quality information. TSI software helps your company plan, capture, control, access and deliver good information.

TSI is part of Dun & Bradstreet's ongoing commitment to design and deliver innovative software and services. As your needs evolve, so do our products. Along with NOMAD2, the premier 4th-Generation-Language/DBMS from D&B Computing Services, and DunPlus, the PC that reflects the way you do business, you can trust TSI for service and innovation in helping you manage end-user computing.

Call 800-227-3800, Ext. 7005 for the facts about TSI software.

TSI: INNOVATIONS IN MANAGING END-USER COMPUTING FROM DUN & BRADSTREET

TSI International

a company of
The Dun & Bradstreet Corporation

For more information drop your business card into an envelope and mail it to Marketing Services, TSI International, 187 Danbury Road, Wilton Ct 06897.

CIRCLE 72 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

It's rare that events in the software industry transcend the secular, but the recent settlement between Software Arts and VisiCorp brings to a sordid end an episode that has the makings of a fine morality play, akin to the Inferno or Pilgrim's Progress. The lawsuits between the two firms show how even the smartest and most honorable people sometimes fall prey to the Seven Deadly Sins.

Our story begins with Dan Bricklin, a graduate student at the Harvard Business School, who grew tired of recalculating spreadsheets and wrote a software program to do the job. He named it VisiCalc and formed a company, Software Arts, to develop other new programs. At the same time, an HBS grad, Dan Fylstra, needed programs for his company, Personal Software, to market. The two companies thought they complemented each other well, and they were betrothed to each other. They exchanged their wedding vows, with Personal Software swearing to market VisiCalc to the best of its ability and Software Arts promising to write newer and better versions of the program to the best of its ability, till death does them part.

Lo and behold, the program succeeded phenomenally, selling 750,000 copies. That made both men very rich, showing that the sacrament of marriage could be very profitable indeed.

Alas, the marriage failed, as Bricklin and Fylstra let Satan's temptation change their ways. Bricklin was Proud of his software development team, and Envied Fylstra's fame as VisiCalc's marketer. Software Arts thus wrote the TK! Solver program and sold it on its own. Bricklin's infidelity angered Fylstra, who was just as Proud of his own engineers. In his Wrath he decided that VisiCorp could write new software without Software Arts, and thus was born the VisiOn series, products that do the same things as the VisiSeries but in the context of a window manager.

Neither bastard child, TK! Solver nor VisiOn, achieved the success of the legitimate VisiCalc, but the mutual transgressions by now prevented the two spouses from kissing and making up. Fylstra filed for divorce, claiming that Bricklin had been Slothful in failing to develop enhanced versions of VisiCalc quickly, and Avaricious in favoring his bastard child TK! Solver, which he could keep to himself, over VisiCalc, which he had to share. Bricklin retorted that VisiCalc's declining sales showed that Fylstra had been Slothful in marketing the program and Avaricious in favoring VisiOn over VisiCalc.

As happens often in divorce proceedings--especially those in morality plays--the battle for custody of VisiCalc and the family infighting turned ugly. Each side wooed the Chorus of reporters and consultants to establish the legitimacy of its claim. Yet in their mutual Lust after the other's jugular vein, both Bricklin and Fylstra let VisiCalc suffer, its sterling reputation tarnished by its parents' Sinfulness. Meanwhile, a White Knight with the mysterious name of Lotus came upon the scene, offering a program that was more advanced than VisiCalc and more commercially successful than any of Bricklin's or Fylstra's children. The fickle Chorus kept Lotus as its pet, and VisiCalc and its half sisters and parents all faded from view.

Some time later, Bricklin and Fylstra settled their differences out of court, with Software Arts getting custody of VisiCalc and a $500,000 one-time alimony payment. In return, VisiCorp kept its own VisiSeries. At this the Chorus harrumphed, because both firms were totally consumed by their blood feud--their Gluttony had ruined them. The Chorus lived happily ever after.

FACTORY REPORTING

PlantCom is a factory data collection and inquiry system. It is designed to increase factory productivity by automating the capture and reporting of employee time and attendance, shop orders, material, shipping, receiving, and work-in-progress information.

With this system, factory personnel spend more time working and less time filling out forms, according to the vendor. The software is menu driven. Function keys on the terminal are programmed to display various work screens and menus that help users through the system. The vendor supplies the first four screens and a screen design aid that allows users to develop additional screen formats.

The software runs on an IBM Series/1 minicomputer that supports the terminals and an IBM 4300 or larger host computer operating a database management system. The vendor will also remarket the IBM 7456 plant floor terminal with the software. PlantCom software is priced at $55,000. MCDONNELL DOUGLAS AUTOMATION CO., St. Louis.

FOR DATA CIRCLE 326 ON READER CARD

SECURITIES SOFTWARE

Figuration is a callable COBOL program that computes the money, yield, time, and price figures required by brokerage houses, banks, and other financial institutions to trade, settle, and value securities.

The software brings together a set of formulas in a single source that supports both operational and analytical mainframe applications. It can be used to develop or enhance a variety of systems ranging from trade processing and financing to arbitrage, matched book, portfolio analysis, and "what ifs."

The product operates on IBM 370, 30XX, 43XX, or compatible processors running with OS or DOS and VSAM. The software can be licensed to support one or more of the following groups: money markets (short term), mortgage-backed, taxables (long term), and tax advantage

(municipals). A comprehensive license to include all groups is available for $112,000. CYTROL INC. Minneapolis.

FOR DATA CIRCLE 327 ON READER CARD

TRADEMARK DATABASE

Trademarkscan is an on-line database trademark research system with 700,000 records that represent all active federal trademark registrations and applications for registration filed in the United States Patent and Trademark Office for the last 60 years.

This database is updated weekly and can be accessed from virtually all terminals, word processors, and microcomputers, the vendor says, adding that the weekly update will benefit public and corporate librarians who serve the legal, marketing, and administrative professions.

The vendor says the weekly update will contain 1,200 new records and changes to 2,400 existing trademarks. Also, the vendor has agreed to participate in the Selective Dissemination of Information (SDI) service offered by Dialog Information Services. This allows users to store a search profile, which will be run automatically with each weekly update of the database. The SDI program can be used by trademark specialists to monitor one or more marks. The service costs $13 per week for each search strategy. This fee includes storage of the strategy, automatic execution of the search each week, and printing of the first 25 relevant records per week. Additional records, if any, are billed at 25 cents each. THOMSON & THOMSON, North Quincy, Mass.

FOR DATA CIRCLE 328 ON READER CARD

COMPUTER-BASED TRAINING

Phoenix/Micro System is a microcomputer-based software package that permits the integration of the IBM PC into the mainframe computer-based training network. The product has evolved as an extension of the vendor's mainframe-based Phoenix system. It offers standardization of courseware delivery throughout the organization by use of the micro.

The product is a complete computer-based training system that provides for the development of courses without programming, immediate delivery of courses to a terminal or PC in a network, and the updating of course material, which then becomes available to students. The features of the system are supported in emulation mode on the PC, while a choice of course delivery (either on-line or on floppy disks) are available with the software.

With the product, two methods of instruction are available. The first is computer assisted instruction for teaching skills and operating procedures; the second method is computer managed instruction for testing students' mastery of skills and objectives.

Pretest and posttest procedures are included with the software as well as record-keeping facilities. In addition, both student and instructor modes are supported. The downloading feature of the product allows mainframe-developed courseware to be copied to floppy disks for distribution. The software is designed for use on the IBM PC and is available only to licensees of the mainframe version of the Phoenix system. A permanent license for Phoenix/Micro System costs $15,000. GOAL SYSTEMS INTERNATIONAL INC., Columbus, Ohio.

FOR DATA CIRCLE 329 ON READER CARD

VM DATA MANAGEMENT

VMCenter is a software package designed to control systems and operations in the IBM VM environment. It streamlines operations, manages system resources, and protects data.

According to the vendor, the product maximizes productivity through automation and end-user involvement. It offers control in areas such as disk space management, tape management, system security, accounting and auditing, workload management, and operations.

To better manage allocation of disk space, the software lets users determine their own space requirements and match them with assigned disk pools. Space is available when users need it most, without delay or intervention by system personnel. Yet data center management is in complete control of disk usage.

It also simplifies tape processing for operators and users through its device, retention, and volume controls. Specifically, tape drives are automatically allocated as requests are issued, tape volumes become available automatically for use as they expire, and tape volumes are protected through full verification of standard labels.

Routine tasks such as backups, periodic accounting, and spool purges can be set by operations management to run automatically at off-peak times. The securitiy facilities offer the system administrator control over access to all resources. The system also permits users to maintain or change their own passwords without involvement of dp personnel, and it also provides data encryption and security reporting.

To determine demand for dp services, the product has accounting and auditing functions. It tracks the use of system resources, project codes, and specific software packages, and has formal invoicing and enforcement of expenditure limits. The permanent license fee for

SOFTWARE SPOTLIGHT

EXECUTIVE SOFTWARE

Pilot EIS is executive information system software designed for upper-level management. It enables users to monitor the company's progress toward its goals by displaying the information in a tailored concise format, using graphics to illustrate the data assembled from a database implemented for the executive.

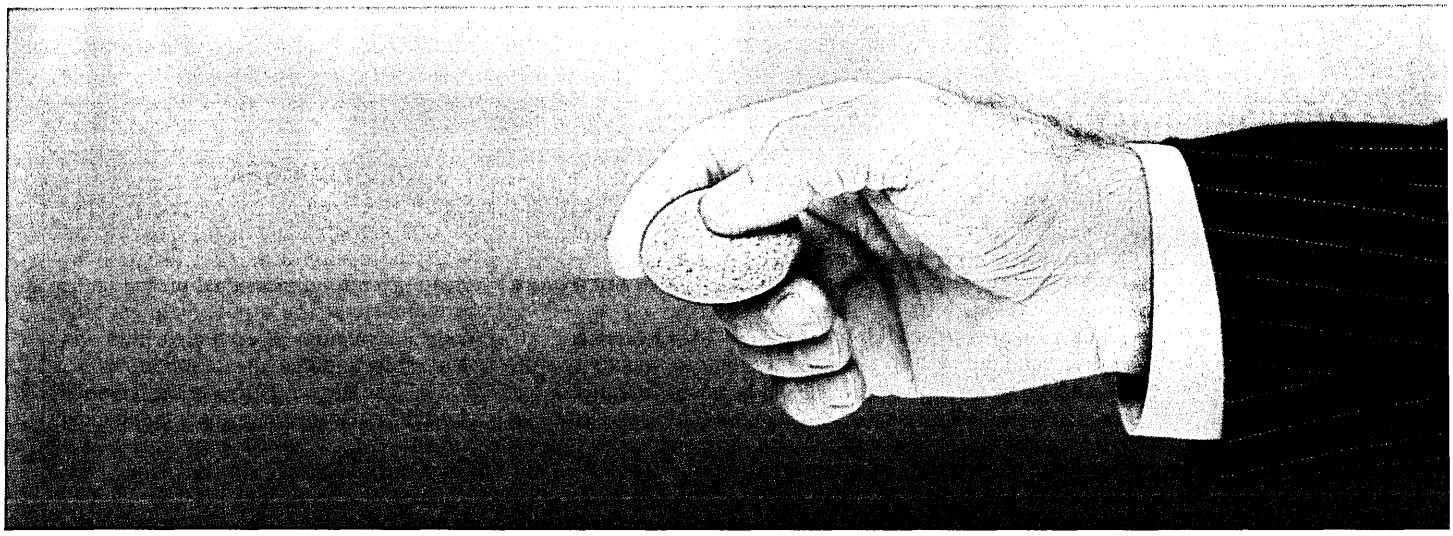
The software is designed as a distributed data processing product between micro and mainframe. Neither component is functional on its own because the software resides in both systems. Since the system is tailored to the needs of top management, the MIS department works with these executives to determine what information they want. The MIS department then pulls the data together to set up the Pilot EIS database. According to the vendor, MIS administration is critical to the functionality and successful implementation of the system.

To the individual, interaction with the mainframe is almost invisible. Users can query the database using a touch screen or mouse instead of a keyboard. Even the task of logging on the mainframe is accomplished by using a preformatted floppy disk, which contains the password and log-on procedure. The software also utilizes nonkeyboard menu access and color summaries. Tabular displays, graphs, and menu formats are created by the pc using data transmitted from the mainframe. Frequently used data, menus, and displays are stored in the pc's memory and prioritized by means of a frequency of use algorithm; as a result, the system can present data in the way the executive usually looks at it.

The software has the ability to extract, filter, and compress a broad range of internal and external information. It can also call attention to variances from budgets, benchmarks, or expectations as defined by the user. The system also monitors and highlights performance based on the critical-to-success factors of an individual's responsibilities. The user is conscious only of interaction with the pc. Micro-to-mainframe communication and calculations take place in the background and with such high levels of compression that response is almost instantaneous, according to the vendor.

The Pilot EIS database works in the IBM and VAX environments on the mainframe side, and the IBM PC on the micro side. Prices start at $50,000. PILOT EXECUTIVE SOFTWARE, Boston.

FOR DATA CIRCLE 325 ON READER CARD



SOFTWARE AG

One perfect action creates a perfect reaction that grows and grows.

A pebble dropped into the water creates circle after circle, each growing from the one before it—and each one reaching out farther than the last.

At Software AG, each product in our integrated system grows naturally from your center of data.

- Our relational data base management system readily adapts to meet your current and future needs.
- Our data dictionary defines how that data is used throughout your organization.
- Our communications system provides a secure network to give your users precisely the data they require.
- Our fourth generation language system transforms the data into information.
- Our end-user products deliver up-to-the-minute data to support better and faster decisions.
- And tomorrow's products will meet your needs by putting information power into wider and wider circles of users.

CIRCLE 73 ON READER CARD

Every Software AG product comes naturally from the one before it, and all products in our system speak the same language. That's because at Software AG, each product has been created as part of a master plan.

When we introduce a new product, we don't have to spend time struggling to make it fit with the rest of our products. We just move quietly on to prepare the next product to meet your needs.

We don't believe in surprises—we believe in anticipating the trends of the future and meeting them with new products today.

Now, it's up to you. You can take the one perfect action that will lead to perfect solutions. Call us today.

1-800-336-3761

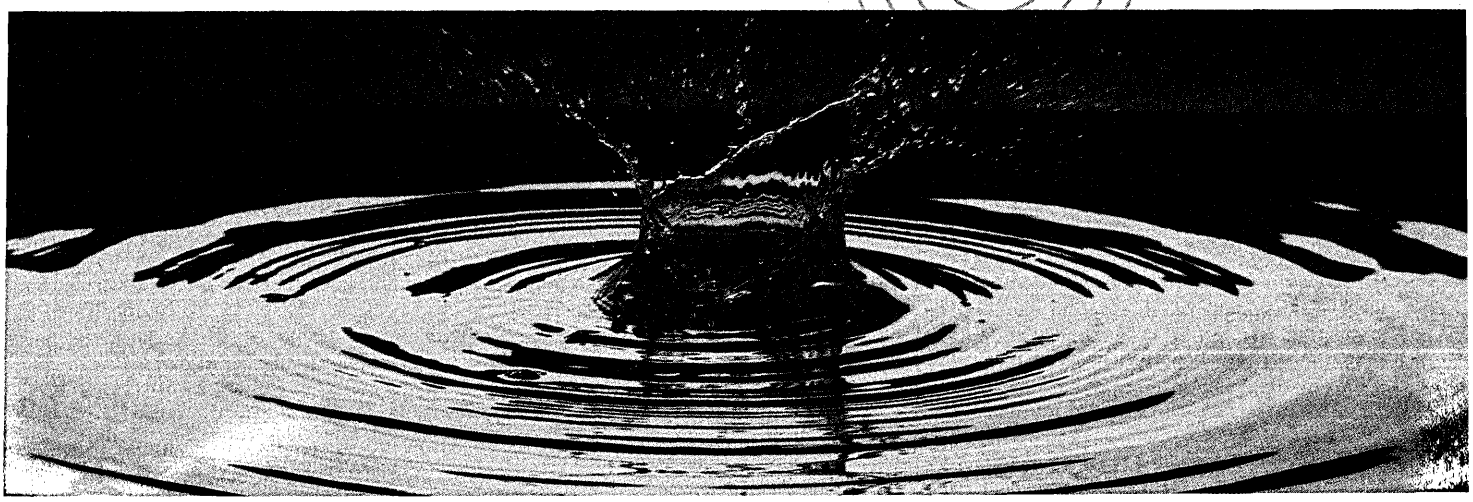
software AG

ADABAS • NATURAL • COM-PLETE

Where the future comes as no surprise.

© 1984 Software AG of NORTH AMERICA, INC.
ADABAS and NATURAL are trademarks of Software AG of NORTH AMERICA, INC.

DM1101



VMCenter is $27,500, which includes maintenance and enhancements for one year. VM SOFTWARE INC., Vienna, Va.

FOR DATA CIRCLE 330 ON READER CARD

BUSINESS GRAPHICS

ChartStar is a business presentation graphics package for the microcomputer. By pressing function keys and filling in blanks on a form, managers, analysts, accountants, and consultants can create charts that visually enhance presentations to communicate facts and figures.

The software produces nine choices of font; linear or logarithmic lines; four types of pie charts (including three dimensional); six types of bar charts; and organizational, scatter, curve-fitting, and Gantt charts.

Charts can be plotted on paper or overhead projector acetates. The program can also string text or other charts together to create an on-screen slide show. This show can be displayed in a manual or time-sequenced mode on a graphics monitor or, for larger audiences, projected onto a wide screen using special equipment.

Opening menus display pictures of the different chart types on screen. Through a series of follow menus, users select from different options for each chart type. A fill-in-the-blanks procedure allows the user to plug in desired specifications, like choice of color or font style, with a single keystroke.

The product can access data files from InfoStar database management system, CalcStar, and PlanStar. It can also read files from spreadsheet programs, including Lotus 1-2-3, VisiCalc, SuperCalc, and Multiplan. The software requires the PC/DOS operating system, two floppy disk drives or hard drive system, and 192KB of RAM. It supports a variety of printers and plotters. ChartStar retails for $400. MICROPRO INTERNATIONAL CORP., San Rafael, Calif.

FOR DATA CIRCLE 331 ON READER CARD

FORTRAN VERIFICATION

RXVP80 is a FORTRAN verification and validation system for FORTRAN running on VAX machines. It is designed to find bugs in FORTRAN programs before programmers and analysts do, according to the vendor.

It also documents programs and shows which parts are not executed when the programs are run. All this is done in terms of the FORTRAN source code. The software has a menu-driven VAX interface. The product also has a self-metering feature that allows performance monitoring to be done to the FORTRAN statement level. The system has four components: static analysis, program documentation, dynamic execution analysis, and self-metering analysis. Each component can be separately licensed for $5,000 per VAX. The entire RXVP80 system sells for $20,000. GENERAL RESEARCH CORP., Santa Barbara, Calif.

FOR DATA CIRCLE 332 ON READER CARD

PRODUCTIVITY SOFTWARE

TM/1 is a professional productivity software package for microcomputers that merges the features of an electronic spreadsheet with the benefits of an underlying database.

The product employs a form of database called a tables manager to store information. Unlike conventional databases, which structure information as long series of sequential records, this software structures information in tables, according to the vendor.

The software allows users to see the same data from different perspectives, with just a few keystrokes. No matter which point of view is displayed, information is always consistent and up-to-date. In addition to its tables manager, the product has an electronic spreadsheet capable of range pointing, copying, moving, window splitting, title locking, macros, and integrated on-screen graphics. The spreadsheet can be used in a standalone mode, but, the vendor says, its real power comes from the database. The software runs on IBM PCs and PC-compatible products. TM/1 costs $800. SNIPER CORP., New York.

FOR DATA CIRCLE 333 ON READER CARD

MANAGEMENT SOFTWARE

OZ:Management Control is a program designed to give business managers financial control over their organization. This product integrates data analysis, graphics, and reports, offering managers financial control and three-dimensional views of data.

According to the vendor, this package goes "a step beyond being a spreadsheet" by bringing data analysis capabilities to the microcomputer that were previously found on minicomputers and mainframes. The software has a built-in variance analysis system that can pinpoint and explain budget variances.

Using simple commands and visual prompts, the software will project revenues and expenses, compare actuals to forecasts, and graph any information on the screen, in color. It also allows users to set up an on-screen company organization chart broken down by divisions. The product measures actual performance by keeping track of line items month by month as the fiscal year progresses as well as providing full-year projections and keeping track of future budgets. OZ:Management Control costs $500. FOX & GELLER INC., Elmwood Park, N.J.

FOR DATA CIRCLE 334 ON READER CARD

COBOL DEBUGGER

Sleuth is a symbolic debugging package for COBOL testing and maintenance. It reveals the complexities of a program by creating a multidimensional profile as the program runs. The profile highlights the control structures of each algorithm and is a testing and documentation tool.

The software generates a symbolic procedure name trace, which is indented to show the level of nesting for each executed procedure. Every algorithm then has a distinctive profile, making the flow of control obvious from the shape of the trace. Using the trace, a programmer can verify the entire sequence of execution instead of just spot-checking for obvious bugs. The debugger also performs pattern analysis in which repetitive logic patterns are automatically highlighted so programmers can verify control structures.

The test output includes cumulative execution counts for each paragraph and section name. The output can be directed to any type of medium. The programmer can turn the software selectively on or off, to zero in on specific logic. It is designed for use on HP 3000 systems and is offered for $1,500. TOWER SOFTWARE INC., Manhattan Beach, Calif.

FOR DATA CIRCLE 335 ON READER CARD

UNIX TOOLS

Uniware microprocessor development tools are a system of hardware independent, Unix-based modular cross-development tools. They are portable and written to run on any Unix-based system and can be accommodated on almost all the 16- and 32-bit host processors now in use for micro, mini, and mainframe systems.

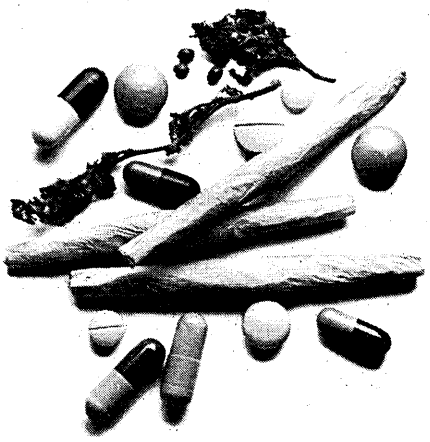
Modular design comprises a base module consisting of a macro preprocessor, link editor, and a line of utilities. A target module consisting of a cross-assembler specific to the target microprocessor is also included. Cross-assemblers for more than 20 8- and 16-bit microchips are currently supported by the vendor.

This package has a link editor and object file format, which allows an unlimited size symbol table and preserves it for symbolic debugging. The link editor resolves an unlimited number of object modules and library references into one object module. It supports multiple overlays and uses a C-like specification language that allows users to define load maps in one central file, define and use symbols in arithmetic expressions, and create linkage between overlays. Uniware prices range between $1,200 and $2,000. Target module cross-assemblers cost $800 and $1,200 for 8- and 16-bit target microprocessors. UNIWARE, division of Nuvatec/Inc., Lombard, Ill.

FOR DATA CIRCLE 338 ON READER CARD

—Robert J. Crutchfield

Get involved with drugs before your children do.



Sooner or later, someone's going to offer to turn your children on.

It could be their best friends.

And chances are, you won't be anywhere in sight.

So what can you do?

Obviously, the time to talk to your children about drugs is before they have to make a decision on their own.

Which means you have to learn something about drugs.

Learn the dangers. And learn to recognize the signs of drug use. Listlessness in your child. Sudden drop in school grades. Temper flare-ups and staying out late a lot.

Learn about peer pressure on a twelve-year-old. Then show them you understand how important their friends are to them. But also tell them that real friends won't insist they do drugs.

Check your own personal habits. You can't tell a child about the dangers of drugs with booze on your breath.

But it's through love and understanding that you can be the most effective. Threatening to tear their arms off just won't work.

You can get a lot more ideas from the booklet, "Parents: What You Can Do About Drug Abuse." Write: Get Involved, P.O. Box 1706, Rockville, Maryland 20850.

Remember, it doesn't always happen to someone else's kids.

After all, there are over 35 million drug users in America.

And they're all someone's children.

Ad Council A public service of this publication and the National Institute on Drug Abuse.

ADABAS

Our relational data base management system.

NATURAL

Our fourth generation language system.

COM-PLETE

Our communications system.

At Software AG, each product in our integrated system grows naturally from the one before it, and all of our products speak the same language. We don't believe in surprises—we believe in anticipating the trends of the future and meeting them with new products today. And that's the proper plan for the world leader in systems software. Call us today.

1-800-336-3761.

SOFTWARE AG

Where the future comes as no surprise.

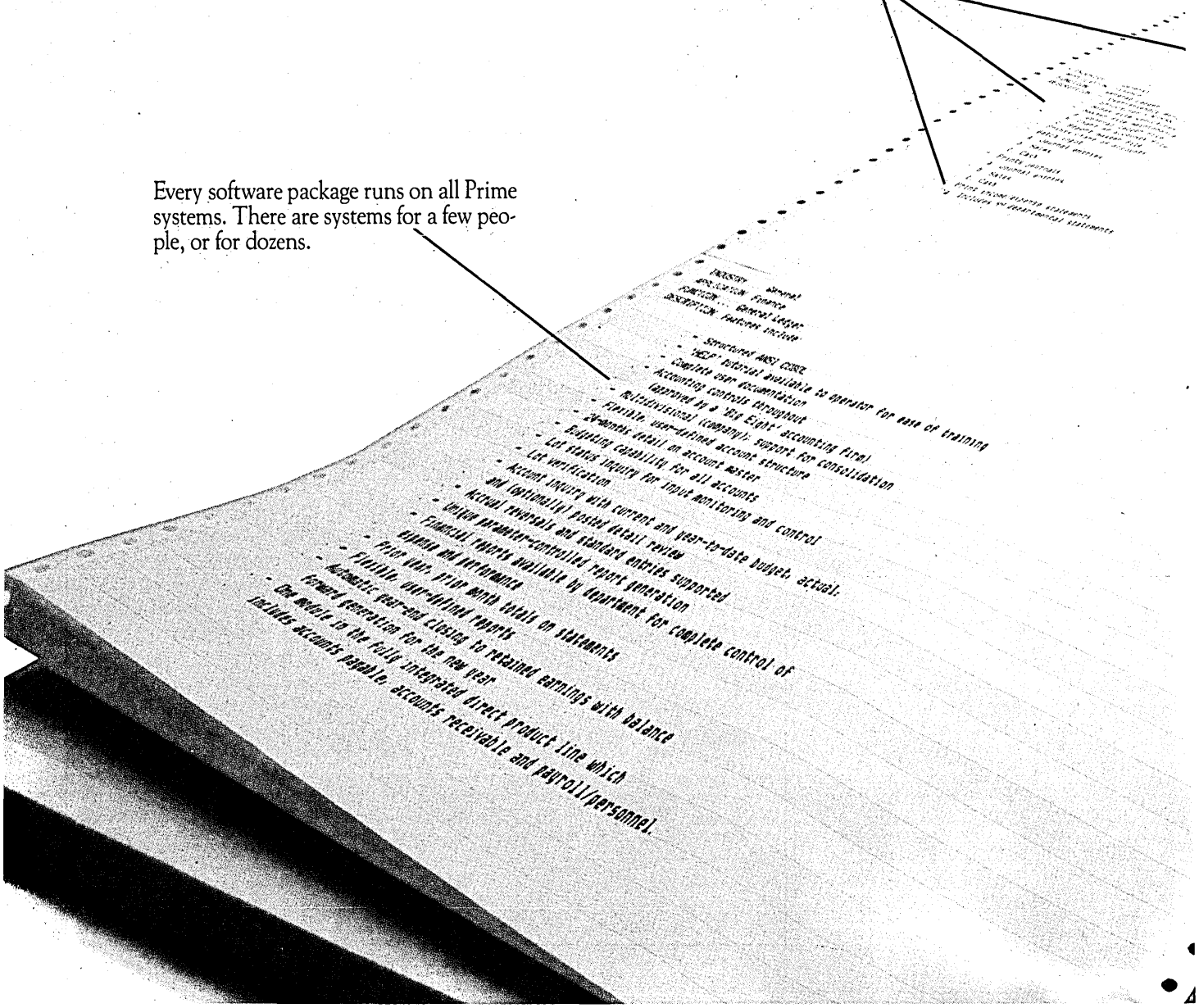
© 1984 Software AG of North America, Inc.
ADABAS and NATURAL are trademarks of Software AG of North America, Inc.

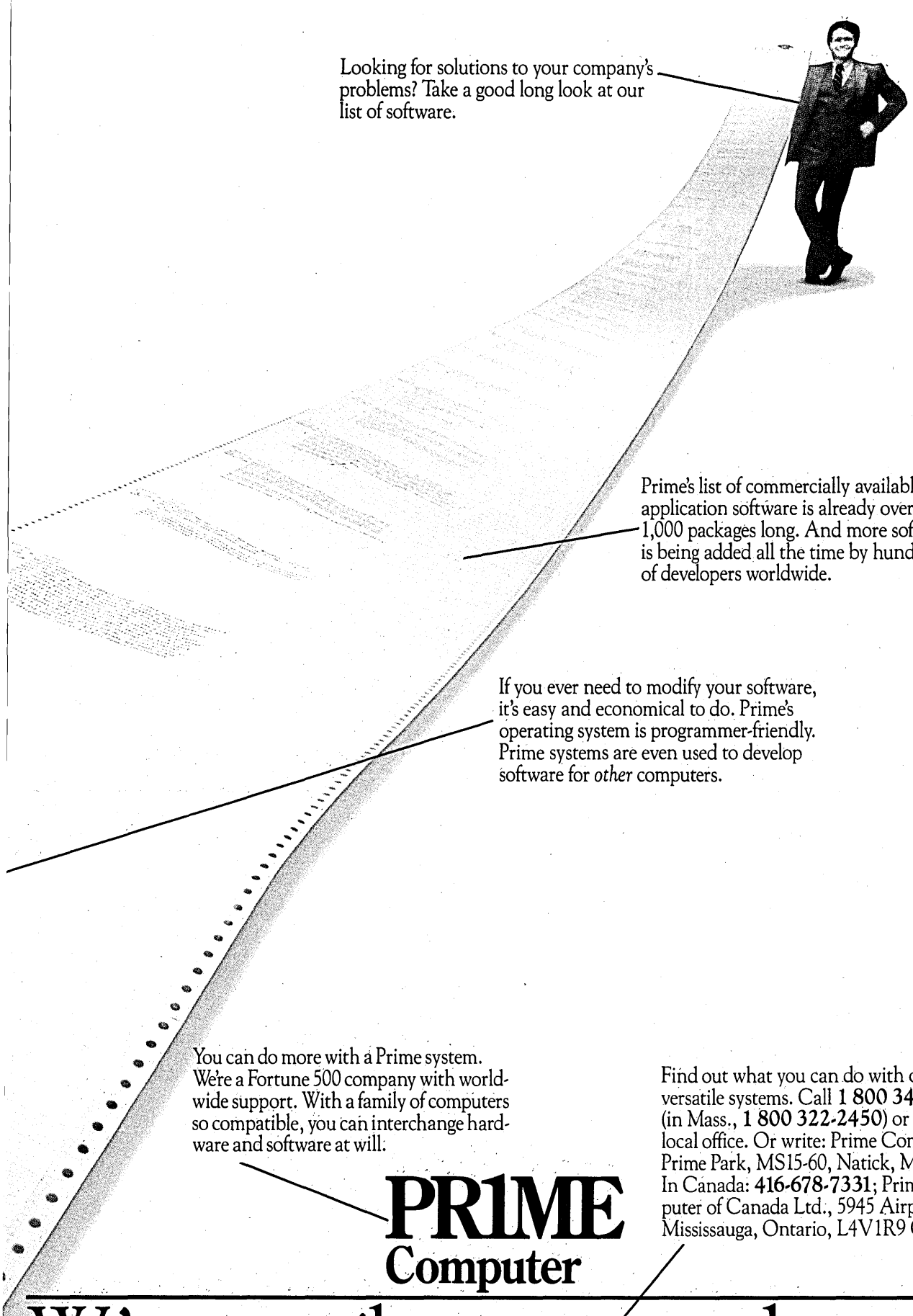
DM1101

Prime Computer has more solutions than you have problems.

Applications from accounting to CAD/CAM. From transaction processing to process control. From time-sharing to time series analysis. They can all work on the same Prime® system, at the same time. Prime's systems software is versatile, so you can do more.

Every software package runs on all Prime systems. There are systems for a few people, or for dozens.





Looking for solutions to your company's problems? Take a good long look at our list of software.

Prime's list of commercially available application software is already over 1,000 packages long. And more software is being added all the time by hundreds of developers worldwide.

If you ever need to modify your software, it's easy and economical to do. Prime's operating system is programmer-friendly. Prime systems are even used to develop software for *other* computers.

You can do more with a Prime system. We're a Fortune 500 company with worldwide support. With a family of computers so compatible, you can interchange hardware and software at will.

Find out what you can do with our versatile systems. Call **1 800 343-2540** (in Mass., **1 800 322-2450**) or your local office. Or write: Prime Computer, Prime Park, MS15-60, Natick, MA 01760. In Canada: **416-678-7331**; Prime Computer of Canada Ltd., 5945 Airport Road, Mississauga, Ontario, L4V1R9 Canada.

PRIME
Computer

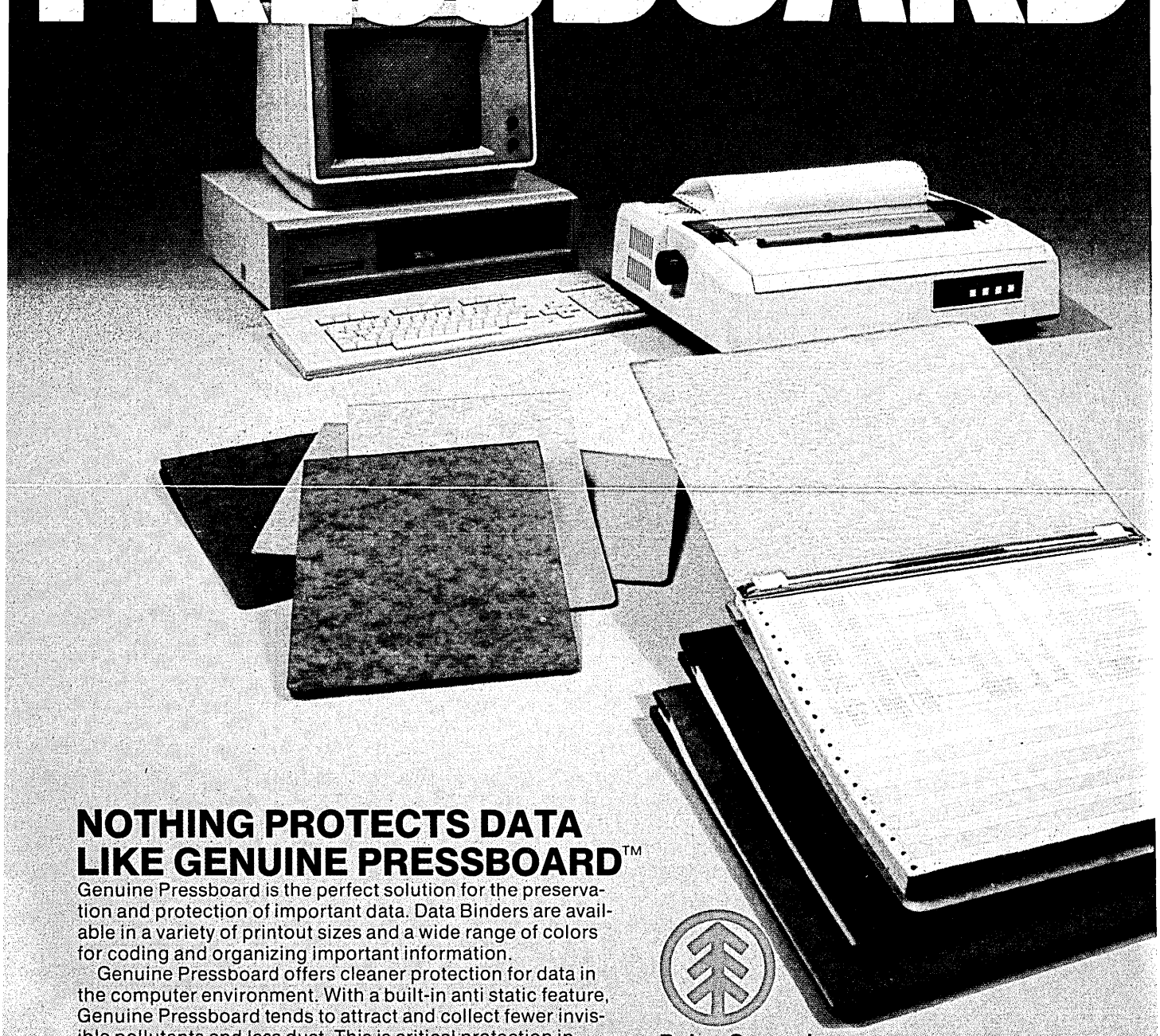
We're versatile, so you can do more.

PRIME is a registered trademark of Prime Computer, Inc., Natick, Massachusetts.

CIRCLE 75 ON READER CARD

THE DATA SOLUTION

GENUINE PRESSBOARD™



NOTHING PROTECTS DATA LIKE GENUINE PRESSBOARD™

Genuine Pressboard is the perfect solution for the preservation and protection of important data. Data Binders are available in a variety of printout sizes and a wide range of colors for coding and organizing important information.

Genuine Pressboard offers cleaner protection for data in the computer environment. With a built-in anti static feature, Genuine Pressboard tends to attract and collect fewer invisible pollutants and less dust. This is critical protection in today's computer environment.

Whether for short-term protection or dependable long-term storage, always specify Genuine Pressboard Data Binders. The cleaner, more dependable data protection.

Boise Cascade
Specialty Paperboard Division
Pressboard Products
Brattleboro, Vermont

CIRCLE 85 ON READER CARD

SOURCE DATA

BOOKS

TRACKING AI IN PRINT

The commercialization of artificial intelligence (AI) techniques, most of which were developed at universities with military funding, proceeds apace. Several dozen companies are now in the game, many having been formed in the past year or two, and the entry of certain large players—Hewlett-Packard, Sperry Corp., and even IBM—is expected any day now. The nascent AI industry, offering specialized Lisp computers and skeletal software with which users can build their own knowledge-based systems, is doing all it can to entice skeptical and relatively conservative dp managers with its wares. Whether or not AI has anything to do with what we think of as human intelligence, it is undeniably a business now.

The growing trickle of AI from the university lab into the commercial mainstream has released a minor flood of new books that discuss the technical, theoretical, and business aspects of the subject. Until a few years ago, AI books were published with only a small AI community in mind. Now, with as many as 200 U.S. corporations currently investigating the field (according to one knowledgeable industry source), AI books are being written for the corporate technologist and others who need to keep at least one eye on the bottom line while they play with the Lisp machine's mouse. What follows is an informal roundup of the AI titles that have arrived for review, apparently from publishers seeking a corporate rather than an academic audience.

First, however, it should be mentioned that the term AI has acquired a certain amount of ambiguity in recent months, mostly because of the great amount of attention given to what is actually only one branch of the AI tree. That branch is so-called expert systems, or knowledge-based technology, which is essentially the spoon-feeding of knowledge to a machine in such a way that it can make inferences and reason its way through fairly complex but severely limited problems. Expert systems have intrigued the press and other observers lately, and in the public's mind they have grown to take over the whole scope of the term AI.

Those in the know, however, make the distinction between expert systems and other AI fields such as natural language processing, robotics, vision systems, and exploratory programming techniques. All these branches can be found in the rash of new AI books, but as might be expected, most seems to have been written about expert systems.

One of the better produced books in this lot is *Artificial Intelligence Applications for Business,* edited by Walter Reitman of BBN Laboratories, Cambridge, Mass., which is comprised of 18 papers delivered in spring 1983 at a New York University symposium (Ablex, Norwood, N.J., 1984, 343 pp., $37.50).

Among the papers, many of which are written by leading lights in the AI business, are "Building Expert Systems," by John McDermott of Carnegie-Mellon University, "Advisory Systems," by Roger Schank and Stephen Slade of Yale, and "Industrialization of Knowledge Engineering," by Frederick Hayes-Roth. McDermott, now an AI entrepreneur, helped build some of the earliest practical expert systems, while Schank, also an entrepreneur at Cognitive Systems Inc., New Haven, Conn., is a brilliant linguist who has challenged the transformational grammar theories of Noam Chomsky. Hayes-Roth is chief scientist at Teknowledge Inc., Palo Alto, Calif., one of the most aggressive and marketing-oriented AI companies. (Teknowledge recently sold 11% of itself to General Motors for $3 million—a deal that puts a strong stamp of approval on AI: if it's good for GM, it may be good for the rest of America.) Finally, the book contains a discussion by Beau Sheil of Xerox Corp. of the exploratory programming techniques developed by AI researchers.

Concentrating more on expert systems development is *A Practical Guide to Designing Expert Systems,* by Sholom M. Weiss and Casimir A. Kulikowski, two members of the Rutgers University Computer Science Dept. in New Brunswick, N.J. Calling itself a how-to and what-is guide, the book provides concrete examples of expert systems handling classification and diagnostic problems. The $24.95, 174-page book, published by Rowman & Allanheld, Totowa, N.J., also provides advice for inexperienced users on designing their own expert systems. Some of the systems described run on machines as small as the Motorola 6809 microprocessor, according to the authors; apparently one doesn't need a huge, $50,000 piece of special hardware to make a functioning expert system.

Automated Reasoning: Introduction and Applications, by Larry Wos, Ross Overbeek, Ewing Lusk, and Jim Boyle (Prentice-Hall, Englewood Cliffs, N.J., 1984, 482 pp., $28.95) provides a broad overview of reasoning with computers. While not limited to AI applications, the book touches on expert systems, logic circuits, and use of the Prolog language. The authors all work at Argonne National Laboratory in Argonne, Ill. Exercises (along with answers) come with each of the book's 16 chapters, and a well-annotated bibliography is included.

Addison-Wesley, Reading, Mass., has just brought out a second edition of Patrick Henry Winston's *Artificial Intelligence,* which was first published in 1977. Among the changes made by the author, who heads the AI Lab at MIT, are an updating of AI examples, the addition of new chapters on logic and learning, and the addition of more problems for the reader to solve. *Artificial Intelligence* is written for use in a single-term course on the subject and has a companion volume, *Lisp,*

which covers that AI-oriented language in depth. The examples used in *Artificial Intelligence* are generally written in a procedurally structured English.

The book covers such topics as exploring alternatives, problem-solving paradigms, logic and theorem proving, knowledge representation, language and image understanding, and machine learning. Naturally, the book contains many exercises for the reader.

Winston also takes credit with Karen A. Prendergast for editing *The AI Business: Commercial Uses of Artificial Intelligence* (MIT Press, Cambridge, Mass., 1984, 324 pp., $15.95), which is a collection of papers presented at an MIT technology investment forum early last year. The book is divided into four sections—expert systems, work and play, robotics, and today and tomorrow—each of which concludes with a round table discussion among the papers' authors. Among those authors are Randall Davis of MIT, James D. Baker of Schlumberger Inc., John Seely Brown of Xerox Corp., and Marvin Minsky of MIT, one of AI's founding fathers.

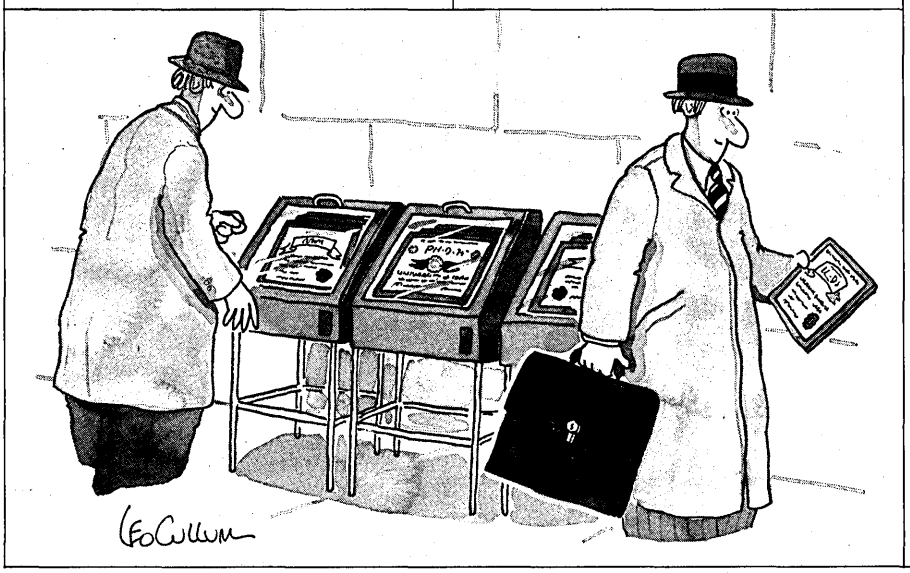
This book has been put together primarily for those interested in investing in AI—the cosponsor of the MIT forum was F. Eberstadt & Co., a Wall Street investment banking firm known for its strong interest in AI—but it will also appeal to those seeking insight into the technical, business, and theoretical aspects of the topic. The often spirited debates at the end of each chapter are of particular value.

It has long been recognized within the AI community, and increasingly on the outside, that AI workers have developed some of the most powerful programming tools available. These include supercharged Lisp machines, knowledge-based programmer's apprentices, and powerful editors, all of which have evolved to help the AI crowd handle the massive, self-referential programs they build. (If nothing else, workers in Lisp needed something to keep track of all those parentheses.) In fact, some observers suggest that these tools, which have already made their way to market in the form of Apple's Lisa and the concept of timesharing itself, will be AI's major contribution to mainstream computing for some time to come.

Interactive Programming Environments, edited by David R. Barstow, Howard E. Shrobe, and Erik Sandewall (McGraw-Hill, New York, 1984, 609 pp., $34.95), is comprised of 28 articles by some leading thinkers in the programming environments world. Covered are such systems as Bell Labs' Unix, Xerox's Interlisp-D, and MIT's Emacs. This well-produced book should find an attentive readership among corporate AI groups, software engineers, and other students of advanced programming tools. The question remains, however, of when these tools will be made available to the COBOL programmer, that poor devil whose code still makes up the vast majority of what is being written each day.

Finally, for those wishing to dip their toes into Lisp, Prentice-Hall has packaged a Lisp interpreter from Gnosis, a Philadelphia company, for the Apple II and IIe, along with a 200-page book about the language. Selling for $29.95, the book discusses the basics of Lisp, including functions, predicates, recursion, and the lambda function. While this won't provide anything near the exploratory environments covered in the books above, it looks like enough to see how the famous list processing language works. A listing of Joseph Weizenbaum's famous Eliza program is included. Unfortunately, there are enough typos in the text to make the Lisp code suspect as well.

—John W. Verity

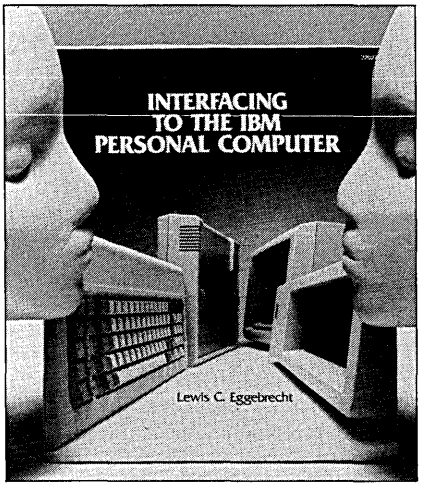


CARTOON BY LEO CULLUM

REPORTS & REFERENCES

PC INTERFACING

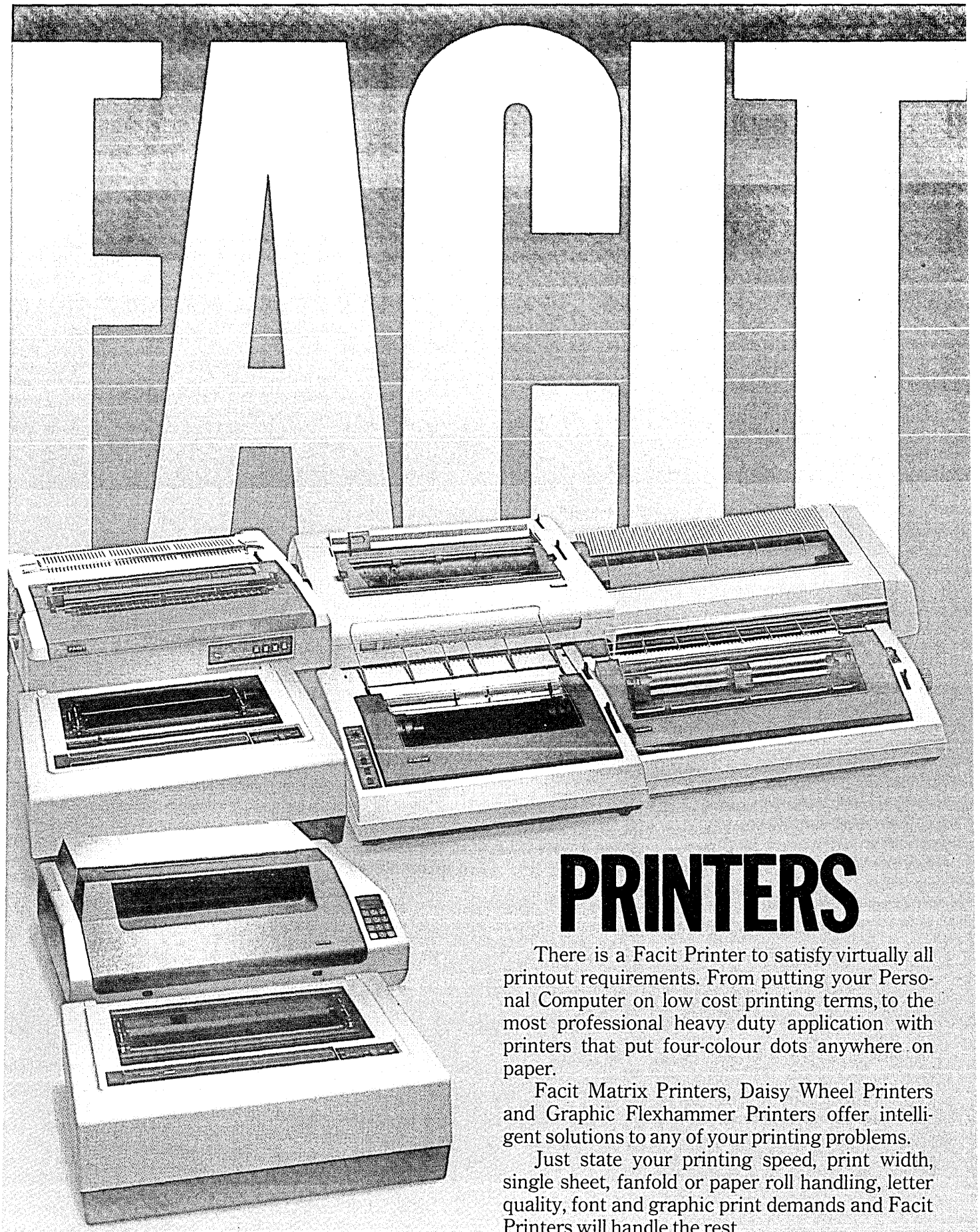
Howard W. Sams & Co. Inc. is offering a 248-page book that details the inner workings of the IBM PC. Written by Lewis C. Eggebrecht, original architect and de-



sign-team leader for the IBM project, the book provides detailed technical information on the machine's theory of operation and thoroughly explores its inner workings. In addition to the basic principles of BUS cycles, interrupts, DMA, and so forth, the author also offers 8086/8088 assembly language subroutines for interfacing hardware into existing software, and BASIC programs that demonstrate specific functions. DOS and DEBUG are also covered in depth, and an entire chapter is devoted to adding new I/O drivers to BIOS. The author gives five design examples detailing the development of useful system hardware additions. The book costs $15.95 and can be ordered by contacting Howard W. Sams & Co. Inc., 4300 W. 62 St., Indianapolis, IN 46268, (317) 298-5400.

TELECONFERENCING & BEYOND

If you're a corporate user of data networks or a systems planner, McGraw-Hill has a book on teleconferencing designed with you in mind. *Teleconferencing and Beyond: Communications in the Office of the Future* by Robert Johansen details the full story behind the teleconferencing revolution. The 206-page hardcover book gives readers an introduction to teleconferencing by appraising all its current forms, provides an overview of its history and what can be expected from the different forms of teleconferencing, discusses user needs and desires, and develops a framework for assessing them. The book then goes over planning for future generation applications, giving pilots and prototypes, and uses what are called trigger scenarios to



PRINTERS

There is a Facit Printer to satisfy virtually all printout requirements. From putting your Personal Computer on low cost printing terms, to the most professional heavy duty application with printers that put four-colour dots anywhere on paper.

Facit Matrix Printers, Daisy Wheel Printers and Graphic Flexhammer Printers offer intelligent solutions to any of your printing problems.

Just state your printing speed, print width, single sheet, fanfold or paper roll handling, letter quality, font and graphic print demands and Facit Printers will handle the rest.

So when comparing printers, think professionally.

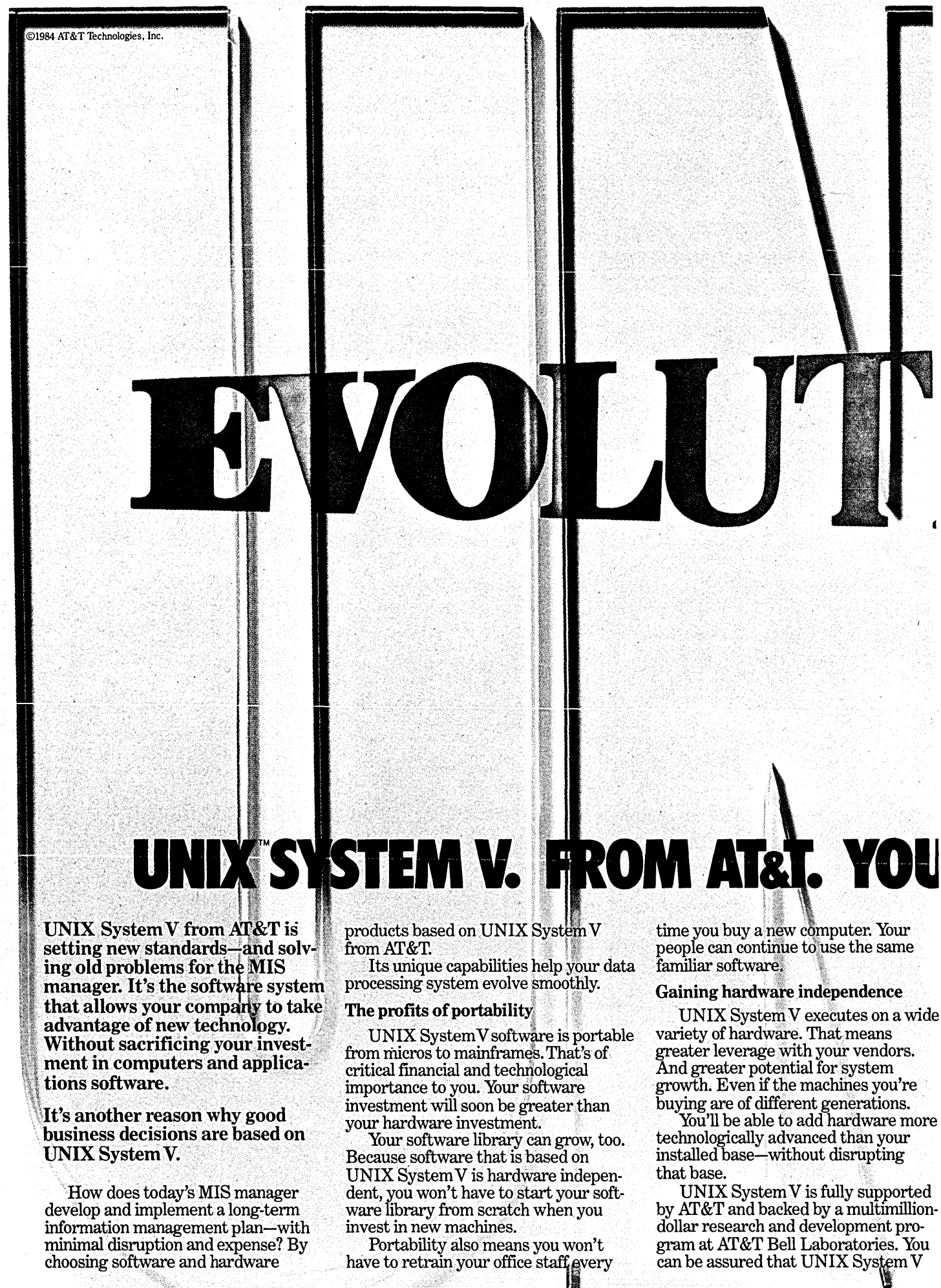
Contact Facit – we'll introduce you to a whole family of Quality Printers.

FACIT

Head office: P.O. Box 54, S-172 22 Sundbyberg, Sweden. Phone: (8) 28 27 20.
USA: 235 Main Dunstable Road. P.O. Box 828, Nashua, N.H. 03061.
Phone: (603) 883-4157.

CIRCLE 77 ON READER CARD

©1984 AT&T Technologies, Inc.



UNIX™ SYSTEM V. FROM AT&T. YOU

UNIX System V from AT&T is setting new standards—and solving old problems for the MIS manager. It's the software system that allows your company to take advantage of new technology. Without sacrificing your investment in computers and applications software.

It's another reason why good business decisions are based on UNIX System V.

How does today's MIS manager develop and implement a long-term information management plan—with minimal disruption and expense? By choosing software and hardware products based on UNIX System V from AT&T.

Its unique capabilities help your data processing system evolve smoothly.

The profits of portability

UNIX System V software is portable from micros to mainframes. That's of critical financial and technological importance to you. Your software investment will soon be greater than your hardware investment.

Your software library can grow, too. Because software that is based on UNIX System V is hardware independent, you won't have to start your software library from scratch when you invest in new machines.

Portability also means you won't have to retrain your office staff every time you buy a new computer. Your people can continue to use the same familiar software.

Gaining hardware independence

UNIX System V executes on a wide variety of hardware. That means greater leverage with your vendors. And greater potential for system growth. Even if the machines you're buying are of different generations.

You'll be able to add hardware more technologically advanced than your installed base—without disrupting that base.

UNIX System V is fully supported by AT&T and backed by a multimillion-dollar research and development program at AT&T Bell Laboratories. You can be assured that UNIX System V

SYSTEM V

ONARY

CAN PLAN ON IT.

s a stable, fully documented, fully erviced platform that will continue to rovide software portability.

'Is it based on UNIX System V?"

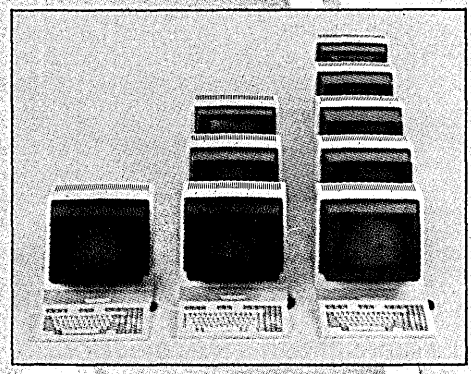
A generation of computer science raduates is ready, willing, and able to vork with UNIX Systems and the C anguage. Their familiarity will make urnover in your technical staff far less lisruptive and less expensive.

It's another indication of the bottom ine significance of UNIX System V— omething that's becoming more nd more obvious even to non-technical nanagement. That's why so many are aking the time to ask, "Is it based n UNIX System V?" when it's time to nvest in new software or hardware roducts for their company.

It's why you should be able to answer "yes" when they do. For more information, send for our free booklet, "Why Good Business Decisions are Based on UNIX SystemV."

UNIX SystemV. From AT&T.
From now on, consider it standard.

AT&T



Please send me "Why Good Business Decisions are Based on UNIX System V."

Mail to: AT&T, P.O. Box 967, DA-1101-BA
Madison Square Station, N.Y., N.Y. 10159

Name_____
Title_____
Department_____
Company_____
Address_____
City_____ State_____ Zip_____
Phone_____
UNIX System Licensee ☐Yes ☐No ☐Don't know

SOURCE DATA

explore the future of teleconferencing and options beyond. Finally, the book contains a literature review that examines over 20 different teleconferencing systems. The book costs $35. For more information contact McGraw-Hill Publishing Co., 1221 Ave. of the Americas, New York, NY 10020.

SEMINARS

1-2-3 ABC'S

The Software Institute of America is presenting one-day seminars that teach how to use and profit from the Lotus 1-2-3 business micro software package. The course explores the features of the package by defining its uses for applications such as sales forecasting, budgeting, profit and loss analysis, return on investment analysis, product performance projections, cash flow assessments, and business management functions. Attendees will learn how to create a spreadsheet for data analysis, integrate information from a database, and display the results in graphic format. While the seminar is intended for managers, analysts, and dp professionals, it is designed to benefit any business professional without previous dp experience. The course will be held in Boston, Nov. 2; Detroit, Dec. 4; Houston, Dec. 7; New Orleans, Dec. 11; and New York, Dec. 14. The course costs $245. For more information contact The Software Institute of America Inc., 8 Windsor St., Andover, MA 01810, (617) 470-3880.

INFO CENTER SOFTWARE

A three-day seminar on information center software selection is being held by the Technology Transfer Institute. The course is designed to help end users and dp professionals become familiar with the major issues relating to the implementation of an info center, what their roles should be, and what currently available tools they should consider including within the framework of such a center. The seminar will be presented by Shaku Atre, a database expert and head of Atre International Consultants Inc. One of the key topics to be discussed is the selection process of an appropriate DBMS for your environment. Topics include organizational issues, information resource management in the information center, information center products and their selection, DBMS products and their selection, security and auditing requirements in the information center, and future trends. The seminar will be held Nov. 28-30 in Boston and Feb. 25-27 in Atlanta, Ga.The fee is $895. For more information contact Technology Transfer Institute, 741 10 St., Santa Monica, CA 90402, (213) 394-8305.

VENDOR LITERATURE

8380 DISK DRIVE BROCHURE

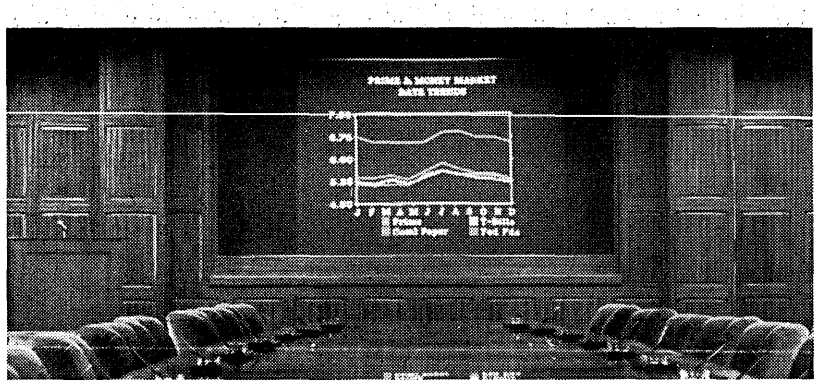
Storage Technology Corp. has issued a six-page brochure describing its 2.5 billion character, high-performance 8380 disk drive with its unique dual-port architecture. The brochure is called "The Disk Drive That Lets You Beat Rush Hour Traffic." STORAGE TECHNOLOGY CORP., Louisville, Colo.

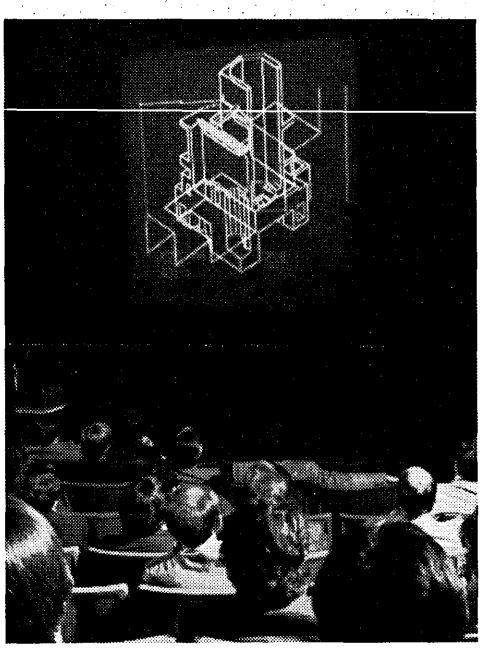
FOR DATA CIRCLE 350 ON READER CARD

SOFTWARE APPLICATIONS DIRECTORY

A 40-page "Software Applications Directory" has been issued by Cosmos Inc., for REVELATION, their high-performance relational database management system for the IBM PC and most MS/DOS-compatible computers. The directory lists over 80 applications for REVELATION that are now available through independent software developers. It includes a description of each program as well as the price, date of completion, and the name and address of the author. COSMOS INC., Seattle.

FOR DATA CIRCLE 351 ON READER CARD





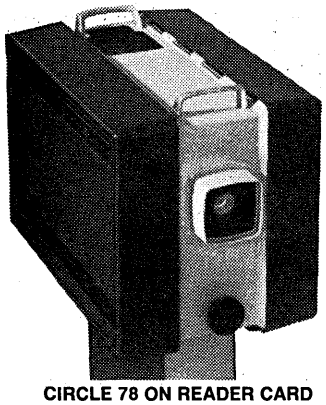
Size up your data

With General Electric Professional Large Screen TV Projection.

Big meetings need big data display, to aid information sharing, planning and problem-solving. General Electric Professional Large Screen TV Projectors present data in image sizes up to 25 feet wide. Your whole group sees a bright, clear picture, in either monochrome or color.

And, whether used in front or rear screen projection, General Electric's exclusive single gun light valve delivers every color image with inherent registration.

Above left, big display of graphs and other data helps generate big ideas in board room of Mellon Bank, N.A., Pittsburgh. At a meeting of the Engineering Society of Detroit (above right), General Electric projector is used to explain computer-assisted design.

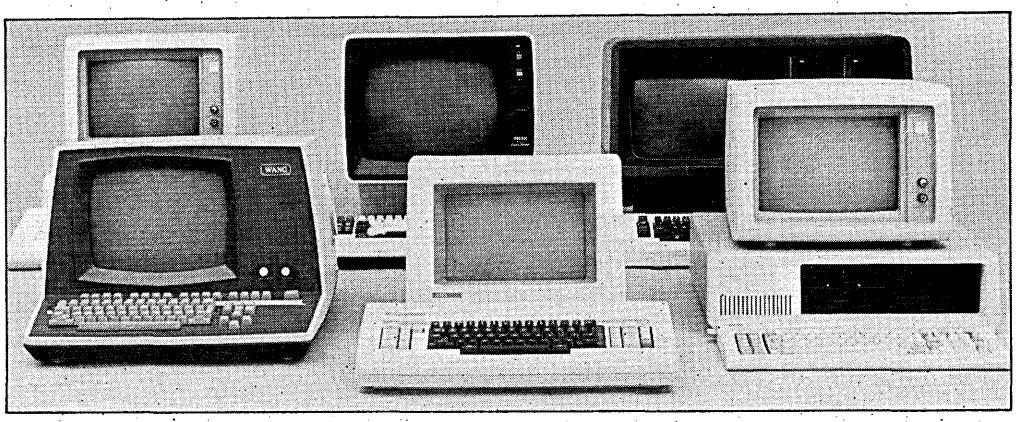


CIRCLE 78 ON READER CARD

For more productive meetings, size up your data with General Electric Professional Large Screen TV Projection. For more information, call J.P. Gundersen, (315) 456-2152 or write: General Electric Company, Projection Display Products Operation, Electronics Park 6-206, P.O. Box 4840, Syracuse, N.Y. 13221. TWX 710-541-0498.

GENERAL ELECTRIC

Making multi-vendor office systems work together requires just one thing.



Soft-Switch™

The idea seems simple enough: connect all of your office systems so that documents can be freely interchanged for editing, storage, display, and printing. That includes word processors, PCs running word processing packages, and mainframe terminals accessing DCF and PROFS.

Soft-Switch is compatibility

ITI's Soft-Switch is a program product for your IBM mainframe (MVS or VM) that allows users to send documents to other users with document translation performed automatically, to store documents in host libraries, and to retrieve documents from these libraries.

Soft-Switch communicates with IBM, Wang, Xerox, and NBI. It communicates with the MultiMate word processing program on the IBM PC, with DCF and with PROFS; with the IBM 6670 laser printer, and with standard hard copy printers.

Soft-Switch solves today's problems

Let's say an analyst prepares a document on his PC with MultiMate. He executes Soft-Switch (which executes in the PC, as well as in the IBM host) and specifies distribution to his secretary's Wang word processor and to the 6670 laser printer down the hall. Soft-Switch provides the micro/mainframe link, transports the document from the PC to the IBM host, translates the document from MultiMate format to DCA, translates the DCA format to Wang's WPS format and the IBM 6670 laser printer OCL format, and routes the documents to their final destinations.

Soft-Switch: a path to tomorrow

Already installed at many FORTUNE 100 companies, Soft-Switch integrates the technologies of protocol translators, text management systems, micro/mainframe links, message switches, and electronic mail systems to provide organizations with integrated office systems.

It's a product you need today, and will, no doubt, need even more tomorrow. To learn more about how Soft-Switch will make your multi-vendor office systems work together, call TOLL FREE

1-800-227-3800 Ext. 7028

iti **Integrated Technologies, Inc.**

200 North Warner Road
King of Prussia, PA 19406
(215)768-9330 Telex: 469600

IBM is a registered trademark of International Business Machines; Wang is a registered trademark of Wang Laboratories, Incorporated; Xerox is a registered trademark of the Xerox Corporation; MultiMate is a registered trademark of MultiMate International, Inc.; NBI is a registered trademark of NBI, Incorporated.

CIRCLE 79 ON READER CARD

INTERFACE... FOR THOSE WHO SELL EQUIPMENT THAT MANAGES AND MOVES INFORMATION

If you sell products for data communications, information systems integration or communications, INTERFACE '85 is the place to exhibit. Here are 3 good reasons:

The quality of the attendee.

High level decision-makers from Fortune 1000 companies, utilities, railroads, financial institutions, government, military, and other large multi-location users attend this premier show. These are the people who influence or control the purchase of the kind of equipment you make. Their presence at INTERFACE tells you they represent real business potential.

INTERFACE is cost-effective.

Last year's attendance exceeded 12,000 and we're anticipating 15,000 in 1985. You'll meet real decision-makers — no tire kickers — because the people you meet at INTERFACE have the authority to specify and buy. You save time and expense by meeting with them at INTERFACE.

The prestigious INTERFACE conference.

The INTERFACE Conference helps prepare attendees to discuss their problems with you on the exhibit floor. Conference sessions are conducted by some of the industry's leading experts who address the latest issues and technological advancements that face the information/office systems integration/communications professional.

INTERFACE® '85

Thirteenth Annual Conference & Exposition ☐ March 4-7, 1985, Atlanta, GA ☐ Co-sponsored by BusinessWeek and Data Communications

To reserve exhibit space or for more information, call (617) 449-6600 or write INTERFACE '85, 300 First Avenue, Needham, MA 02194.

Presented by **THE INTERFACE GROUP, Inc.**, world's leading producer of computer conferences and expositions including INTERFACE, FEDERAL DP EXPO & CONFERENCE, COMDEX/Winter, COMDEX/Spring, COMDEX/Fall, COMDEX/Europe, COMDEX in JAPAN, The Nationwide COMPUTER SHOWCASE EXPOs and THE BYTE COMPUTER SHOWS.

CIRCLE 59 ON READER CARD

The Marketplace... SOFTWARE SERVICES

ADVERTISERS' INDEX

SOFTWARE SERVICES:
Data Set Cable Co. 171

TIME & SERVICES:
Omnicomputer 171

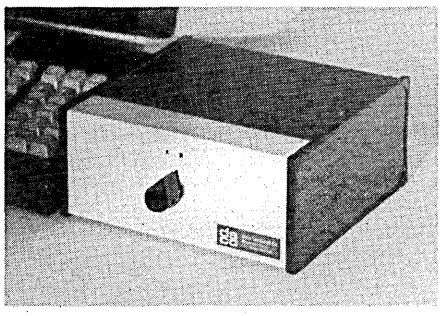
BUY, SELL, LEASE:
WCS 171

DP MARKETPLACE:
Integrated Applications 171

"A little space."
— WILLIAM BLAKE
Songs of Innocence

"At little cost."
— KATHY MONAGHAN

Call me or Shirley Stirling for more details about the DATAMATION Marketplace at **(800) 223-0743.**



SWITCH BOXES CAN ADD TO THE VERSATILITY OF YOUR HARDWARE. Data Set Cable provides ABC & ABCDE boxes in a wide variety with all kinds of connectors. Avoid need to change cables manually. Economical, too—ultra-compact ABC Single Coax box only $55. In addition, Data Set has the biggest selection of interface cables, test equipment and other essentials to support your DP department. Send for catalog to Data Set Cable Co., 722 Danbury Road, Ridgefield, CT 06877—(203) 438-9684 or Las Vegas—(702) 382-6777.

CIRCLE 500 ON READER CARD

Heart disease and stroke will cause half of all deaths this year.

Put your money where your Heart is.

American Heart Association
WE'RE FIGHTING FOR YOUR LIFE

BUY, SELL, LEASE

WANTED DEAD OR ALIVE
YOUR RETIRED COMPUTER SYSTEMS
CALL WCS COMPANY
(805) 496-2207

CIRCLE 501 ON READER CARD

TIME & SERVICES

VAX 11/780 AND PDP-11 DEVELOPMENT TIME

NO KILOCORE TICK CHARGES / NO CPU CHARGES

Omnicomputer INC.

$7/$14
RSTS/E VMS

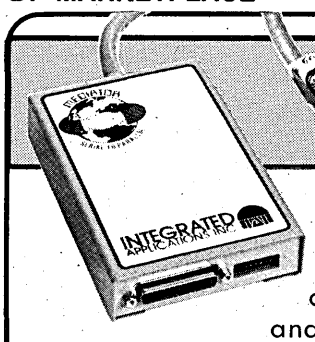
PER HOUR CONNECT TIME

BUDGET BYTES™ 212-944-9230

Omnicomputer, Inc.
1430 Broadway, New York, N.Y. 10018

CIRCLE 502 ON READER CARD

DP MARKETPLACE



INTERFACING PROBLEMS?

All of our products provide a total solution to your interfacing needs. They support hardware or software (X on/X off) flow control, common baud rates between 110 and 38.4 K baud, and includes a power supply. 10 day money-back guarantee.

SP-100 Serial to Parallel
- 10 ft. shielded Centronics cable provided
- $199 plus $5 shipping/handling

PS-100 Parallel to Serial
- 6 ft. shielded Centronics cable provided
- $195 plus $5 shipping/handling

M2 Serial to Serial
- Converts baud rate, character length, stop bits & parity
- $349 plus $5 shipping/handling

We honor master charge THE INTERBANK CARD

SEND CHECK OR MONEY ORDER TO: INTEGRATED APPLICATIONS, INC.

8600 HARVARD AVE.
CLEVELAND, OHIO 44105
216 - 341-6700

VISA

CIRCLE 503 ON READER CARD

NOW IT ONLY TAKES ONE TO TANGO.

Introducing PhoneMail,™ another unbeatable system from ROLM.

Say hello to the One Party Phone Call. No more waiting for the phone to ring, waiting for someone on the other end to appear, waiting for your telephone partner in another city, another meeting, another time zone. Waiting.

PhoneMail is a fully-integrated voice-messaging system for your entire company that you can access from any touch tone™ telephone anywhere in the world, any time.

PhoneMail can answer your phone with your personal greeting. (If you'd prefer, your secretary can take the call and direct the caller to PhoneMail.) Then, because PhoneMail is part of an integrated computer-controlled business communication system, it really

Touch Tone is a trademark of AT&T.

begins to separate itself from those single phone answering gadgets.

PhoneMail will let you answer messages automatically. It can forward them, along with your comments, to dozens of your associates. Its voice prompts guide you step by step. There's no chance for miscommunication. Problems are solved. Decisions are moved along.

Of course, only ROLM has PhoneMail. That's not surprising. We're the people who taught telephones and computers and people how to work together. We can show you the most advanced ways to manage voice and data today, next year and into the next century.

If your business phone system has you talking to yourself, it's time to talk to ROLM.

ROLM

4900 Old Ironsides Drive, M/S 626, Santa Clara, CA 95050 • 800-538-8154. (In Alaska, California and Hawaii, call 408-986-3025.)

CIRCLE 80 ON READER CARD

ON THE JOB

HELP FOR ALL

NCR Corp. has taken on a new responsibility in the lives of its employees: it now has an employee program designed specifically to provide private, no-cost counseling for personal problems.

"We don't believe it is NCR's responsibility to oversee or manage an employee's personal life. However, we think the company does have a responsibility to help the individual employee reach his or her full job potential." That's the opinion of Charles E. Exley Jr., NCR chairman and president, as written in a company brochure introducing employees to the program.

The Employee Assistance Program is a comprehensive personal counseling service made available to each employee and his dependents in all 50 states. The program was initially implemented for NCR employees in the Dayton, Ohio, headquarters, and went national in May 1983. All 30,000 NCR U.S. employees can now use these services.

The idea is that the personal counseling program alleviates performance-altering personal problems, thereby promoting a high level of employee productivity. B. Lyle Schafer, NCR's vice president of personnel resources, says both the company and employee benefit when "personal problems can be effectively resolved before they jeopardize the employee's work and career. In a knowledge-intensive industry such as ours," she says, "a consistently high level of employee performance is required not only for NCR's success but also for the individual employee's career advancement."

Performance Consultants Inc. (PPC), a St. Louis-based company, pro-

Heart disease or stroke can cheat you out of the best years of your life.

Those are the years shared with people you love. And when a loved one is gone, everything changes. You can't imagine the loss, unless it happens to you. Last year, nearly one million Americans died of heart disease and stroke — 200,000 of them before retirement age.

The American Heart Association is fighting to reduce early death and disability from heart disease and stroke with research, professional and public education, and community service programs.

But more needs to be done.

You can help us save young lives by sending your dollars today to your local Heart Association, listed in your telephone directory.

American Heart Association

WE'RE FIGHTING FOR YOUR LIFE

Your graphics problems are over, because your endless piles of printouts have been crumpled by the D-PICT family of integrated graphics software solutions! Now you can turn mountains of data into stunning graphic presentations, quickly and easily.

D-PICT, the result of more than 100 man years of research and development, is a truly flexible and powerful system which has been designed to fully answer the needs of both business and science. But despite its power and functionality, it is surprisingly easy to use. Even for those who have never used a computer terminal before. On-screen help menus guide the user step-by-step.

D-PICT graphics software is available for a variety of mainframe and 32-bit computers, including IBM, DEC, Data General and Prime, and can produce graphic displays on over 150 different types of output devices.

No matter how your graphic requirements grow, D-PICT can grow with you. Call or write for information today.

The D-PICT Family of Graphics Software includes:

- ☐ **D-PICT/B.** Menu-driven business graphics package creates presentation-quality charts and graphs.
- ☐ **D-PICT/AutoGraph.** A library of more than 150 pre-designed charts and graphs for easy creation of quality business graphics.
- ☐ **D-PICT/VGL.** A library of more than 250 2-D and 3-D subroutines and utilities for the creation of graphics applications.
- ☐ **D-PICT/Contour.** Produces high quality contour maps.
- ☐ **D-PICT Mesh.** Displays a perspective view of three-dimensional data as a mesh surface.
- ☐ **D-PICT/Meta.** A graphics composition utility which can shift, scale, rotate and window graphic components.

D-PICT Highlights and Benefits:

- ☐ Highest quality presentation graphics.
- ☐ Ease of use means enhanced productivity.
- ☐ Affordable... excellent return on your software investment.
- ☐ Supports all popular graphic peripherals.
- ☐ Easily installed on your system.
- ☐ Thorough documentation, includes illustrated user guides and comprehensive training manuals.
- ☐ Hot line support.
- ☐ On-site training and installation if required.

D-PICT™

Dataplotting Services Inc.
225 Duncan Mill Road, Don Mills
Ontario, Canada M3B 3K9
(416) 441-4163/Telex 069-86540
Call toll free 1-800-268-7878
CIRCLE 81 ON READER CARD
OEM inquiries invited.

Sales Offices in San Francisco, CA. and Atlanta, GA.. Representatives located throughout The United States, Canada, Europe and Australia.

D-PICT is a trademark of Dataplotting Services Inc. DEC is a trademark of Digital Equipment Corporation. Prime is a trademark of Prime Computer Inc. IBM is a trademark of International Business Machines Corporation.

vides the services for the program. Professional counselors with a minimum of three years of experience, graduate degrees in counseling, psychology, or social work are hired by PPC. They are located within a short driving distance of each of NCR's major U.S. production facilities and sales offices. NCR managers are then trained to use the program as a supervisory tool.

Counselers are prepaid, and their phone numbers are made available to employees so they can get help without anyone in the workplace knowing about it. NCR picked an off-site system to protect this confidentiality. In addition, appointments are staggered to assure that no two employees bump into each other at a counselor's office. The only feedback NCR ever gets from the counseling service is statistical. That way they can figure out what percentage of employees are taking advantage of the service, and the percentage of managers, clerical workers, production workers, and others using it; no names are cited.

Most of the employees that use the service do so on their own initiative. Less than 10% of the participants are supervisor-referred. A spokesman for PPC said that marital conflict, alcoholism, career issues, individual emotional concerns, family problems, and legal issues are the most common problems.

When a problem goes beyond the help of the PPC counselor, like cases of alcoholism or serious marital conflict, the counselor can recommend some place more suited to the employee's needs. At this point, the employee is responsible for treatment, although some types of treatment may be covered by individual medical plans. The majority of employees using the program don't need long-term or specialized care. They get the help they need to resolve their problems or improve their situations through the Employee Assistance Program.

HOW ABOUT CONSULTING?

If you've ever considered technical consulting, you might want to get a copy of *How to Become a Consultant in Your Own Technical Field* by Michael A. Neighbors. In the book, Neighbors identifies the characteristics of a successful consultant and explains what you must do to become one. He feels that any engineer or technologist with at least six years of practical experience is probably technically prepared for such work, and that general experience combined with a specialty is the best combination. The book costs $25 and can be purchased from ATC Books, Rt. 2, Box 448, Estill Springs, TN 37330.

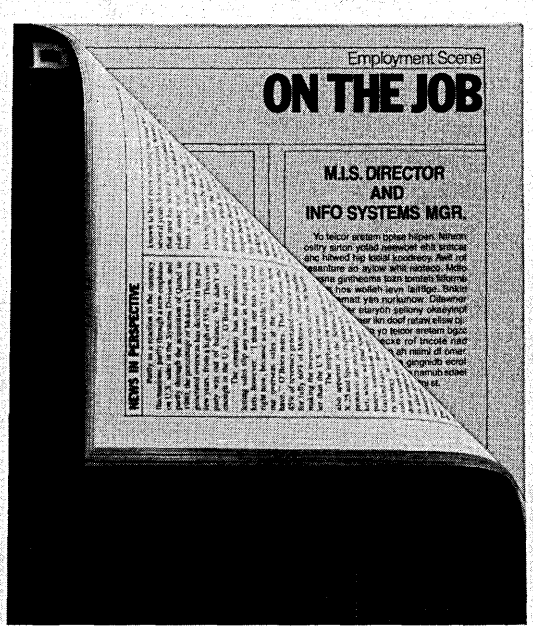
HOW TO GET TO THE TOP

Another how-to book on the market is *Top Executive Performance: 11 Keys to Success and Power*, by William and Nurit Cohen. The book covers everything from decision-making and time management to motivating and communicating effectively. The authors offer their advice for handling stress, stimulating innovation, and developing leadership, as well as pinpointing the time you should make a change, the right time for sending a résumé, and the methods for conducting a winning direct mail campaign, "the number one method for getting a job at the managerial level." William Cohen received his MBA from the University of Chicago, and a PhD in management from the Claremont Graduate School, Claremont, Calif. Nurit Cohen has a BA in journalism and an MA in psychology from California State University, Los Angeles. She is a specialist in managerial and organizational psychology. The book costs $19.95, and is available through John Wiley & Sons, 605 Third Ave., New York, NY 10158.

—Lauren D'Attilo

Datamation has started publishing classified information.

For 26 years *Datamation* has been the number 1 way to reach top information processing professionals. And now it's also one of the best ways to hire them. Because when we increased our frequency to 24 issues a year, we also increased the size of our recruitment section. Offering expanded editorial, as well as the latest listings. For complete information, call Kathy Monaghan or Shirley Stirling at 1-800-223-0743. In NY, 212-605-9732/33.



Technical Publishing
A company of The Dun & Bradstreet Corporation

ADVERTISERS' INDEX

ADR 37
AST Research Inc. 12-13
AT&T Information Systems 48-49
AT&T Technologies 120
AT&T Technologies 166-167
American Hoechst 149
Astrocom Corp. 177

BTI 106
Battelle 17
Boise Cascade 162
Burroughs Corp. 131

CIE/DSD 61
Calcomp 146
Cambridge Systems 180
Candle Corp. 2
Carroll Touch 14
Cincom 122-123
Codex Corp. 101
Computer Associates 128-129
Computer Automation/CSD Div. 47
Computer Power Systems 89
Comshare Inc. 8
Control Data Corp. 54, 55
Cullinet Software 58, 127

D & B Computing Services 39, 41
DJC Corp. 40
Dataplotting Services Inc. 175
Data General Corp. 96-97
Decision Data Computer Corp. 121
Digital Communications Assoc. 138-139
Digital Equipment Corp. 144-145

*Ericsson 136-14
*Ericsson 136-18 136-19

Facit Ab 165

GE Video 168
Group Operations 109

Hewlett-Packard 65-72
Honeywell Info Systems 134-135
Hughes Aircraft Co. 143

IBM 22-23
IBM 117
IBM 152-153
*IBM (UK) Labs Ltd. 136-2
ITI - Integrated Technology 169
ITT Courier 103
ITT Data Equipment & Sys. Div. 114
Infodata Systems Inc. 20
Innovative Software 104-105
Intecolor 137
Interface Show 170
Intermec 124

JBM Electronics 59

Kennedy Co. CV2

Lanier—A Harris Co. 62-63
Lear Siegler, Inc. 50

Mathematica Inc. 79
McCormack & Dodge 27
Memorex Communications 82-83
Memory Media Products 29
Micom Systems 1
Microcom Inc. 87
Microrim Inc. 18-19
Morino Associates, Inc. 44-45
Morino Associates, Inc. 178-179

NBI, Inc. 52-53
Network Systems Corp. 140
Northern Telecom 151
*Northern Telecom 136-6/136-7

*Olivetti SpA 136-5
*Olivetti SpA 136-17
*Olivetti SpA 136-24

Pathway Design 43
Pick Operating Systems 81
Pilot Executive Software 133
Prime 6-7
Prime 160-161
Printronix 11
Programming Logic Systems 102
Protocol Computers, Inc. 90-91

Rolm Corp. 172-173
*Rutishauser 136-9

SAS Institute Inc. 5
*Sakata Shokai 136-20
Software AG 157, 159
Software Corp. of America 4
Software Results 16
Sperry Corp. 32-33
Sytek 111

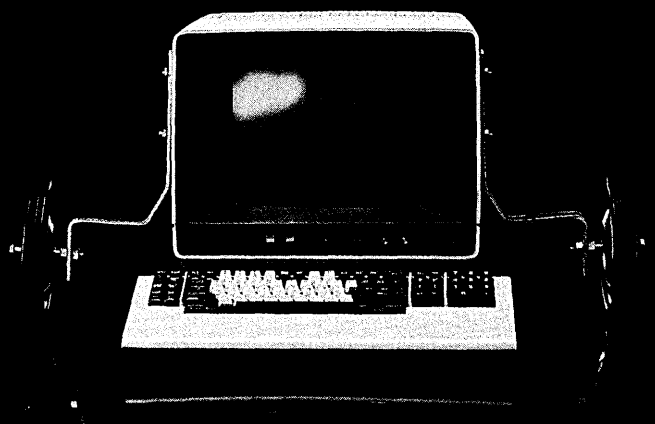
TAB Products 84
TSI Int'l 74-75, 154
Teletype Corp. CV4
Tektronix, Inc. 31
Televideo Terminals 119
*Tietotehdas Oy 136-23
Timeplex 99

UCCEL CV3

Visual Computer Inc. 56-57

*Wandel & Goltermann 136-13, 136-15
Wyse Technologies 112-113

*International Edition



Data communications is no place for the inexperienced.

You seldom take unnecessary risks in running your organization. And your data communications network is too critical an area to leave to novices.

Astrocom has been providing data communications equipment for 16 years. We've helped businesses like yours with quality local network products and services that save you space, time and money.

Our products are user-installable and understandable. Astrocom will have your data comm network up to speed in no time. Interested? Give us a call.

astrocom

120 W. Plato Blvd., St. Paul, MN 55107
(612) 227-8651 Telex: 297421

CIRCLE 82 ON READER CARD

MICS and MVS Installation Management: two sides of a single coin... ...because MICS offers the one unified approach to:

- Installation Accounting
- MVS Activity Analysis
- TSO Management
- Performance Management
- Network Activity Analysis
- DB/DC System Analysis
- DASD Space Management
- VM/CMS Activity Analysis
- System Reliability Analysis
- Software Maintenance Management
- Capacity Planning
- Critical Index Management

Unity from diversity

The MVS Integrated Control System (MICS) provides a single process to analyze many unlike MVS measurement sources. Then, its interactive and batch reporting facilities allow you to generate periodic or ad hoc reports that "slice the data" any way you want it for:

- Special Studies
- Problem Analysis
- Exception Reporting
- Service Level Reporting
- Graphics Presentations

And for those of you who want to "manage by the numbers" and focus on critical problems first, MICS introduces the Critical Index Management (CIM) technique.

Simplicity from complexity

The MICS 4500 data element dictionary and online documentation further simplify MVS Installation Management by providing your installation with fast access to a comprehensive body of common information.

This means you can substantially cut costs, because your installation can standardize:

- Staff Training
- Documentation
- Procedures
- Administration
- Management

Control from confusion

More than 475 user organizations know us as the developers of the software that helps them control the complicated MVS environment. Their daily use of MICS has made the two terms—MICS and MVS Installation Management—synonymous.

So, if you want to learn how MICS can unify and simplify the management of your installation, we urge you to ask our users. For copies of their stories, call or write us today.

We'll also send you information about all the MICS capabilities, including Critical Index Management—the brand-new technique that lets you run your installation as a business!

MORINO ASSOCIATES

8615 Westwood Center Drive • Vienna, Virginia 22180-2215 • USA • Tel: (703) 734-9494
103 St. Peter's Street • St. Albans • Hertfordshire • England AL1 3EN • Tel: (0727)37464
Lindemannstrasse 47 • D-4000 Dusseldorf 1 • Federal Republic of Germany • Tel: (0211) 679058

MICS and MVS Installation Management: two sides of a single coin... ...because MICS offers the *one unified approach* to:

- Installation Accounting
- MVS Activity Analysis
- TSO Management
- Performance Management
- Network Activity Analysis
- DB/DC System Analysis
- DASD Space Management
- VM/CMS Activity Analysis
- System Reliability Analysis
- Software Maintenance Management
- Capacity Planning
- Critical Index Management

Unity from diversity

The MVS Integrated Control System (MICS) provides a single process to analyze many unlike MVS measurement sources. Then, its interactive and batch reporting facilities allow you to generate periodic or ad hoc reports that "slice the data" any way you want it for:

- Special Studies
- Problem Analysis
- Exception Reporting
- Service Level Reporting
- Graphics Presentations

And for those of you who want to "manage by the numbers" and focus on critical problems first, MICS introduces the *Critical Index Management (CIM)* technique.

Simplicity from complexity

The MICS 4500 data element dictionary and online documentation further simplify MVS Installation Management by providing your installation with fast access to a comprehensive body of common information.

This means you can substantially cut costs, because your installation can standardize:

- Staff Training
- Documentation
- Procedures
- Administration
- Management

Control from confusion

More than 475 user organizations know us as the developers of the software that helps them control the complicated MVS environment. Their daily use of MICS has made the two terms—MICS and MVS Installation Management—synonymous.

So, if you want to learn how MICS can unify and simplify the management of your installation, we urge you to ask our users. For copies of their stories, call or write us today.

We'll also send you information about all the MICS capabilities, including *Critical Index Management*—the brand-new technique that lets you run your installation as a business!

MORINO ASSOCIATES

8615 Westwood Center Drive • Vienna, Virginia 22180-2215 • USA • Tel: (703) 734-9494
103 St. Peter's Street • St. Albans • Hertfordshire • England AL1 3EN • Tel: (0727)37464
Lindemannstrasse 47 • D-4000 Dusseldorf 1 • Federal Republic of Germany • Tel: (0211) 6790058

CIRCLE 83 ON READER CARD

SPACE MANAGEMENT, NATURE'S WAY.

Our Space Management System Does Something Nature Doesn't Do. It Increases DASD Performance While Reducing Cost In OS/VS Environments.

More than 650 Cambridge customers worldwide recognize *ASM2, Automated Space Management*, as the leading high-performance DASD management system. It archives, restores, backs up, and migrates data. Plus it provides comprehensive DASD analysis tools and a feature via which users can enforce individual DASD management standards, customize formats, and determine their own reports with just one simple command.

ASM2 increases efficiency with a new data restoration facility called *Intelligent Transparent Restore* (IXR). It's intelligent because you'll never have to pre-check data set availability or issue manual restore requests again. What's more, IXR's unique "look-ahead approach" allows far more data to be archived and retrieved. IXR: Intelligent. Transparent. Automatic.

Best of all, ASM2 optimizes critical DASD space in the operating system so efficiently, it can easily pay for itself within a year.

ASM2 . . . a more natural space manager would be very hard to find.

So call or write The Cambridge Systems Group today. Ask for an on-site, on-line ASM2 demonstration *with your own data.*

CIRCLE 84 ON READER CARD

The Cambridge Systems Group

24275 Elise Lo[illegible]

[illegible]

London

Taking The Bite Out Of The Bear.

Even during bull markets, some Wall Street investors worry about the bear showing up to take a bite out of them. But *you* can get the best of the bull and take the bite out of the bear, if you join the Payroll Savings Plan and buy U.S. Savings Bonds. Bonds have a variable interest rate that lets you share in higher returns during bull markets and a guaranteed minimum to protect you against the bear.

Bonds give you the best of both markets. Because you know that if the bear should appear, his growl will be worse than his bite.

Take stock in America.

UNITED STATES SAVINGS BONDS

Ad Council A Public Service of This Publication & The Advertising Council

An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

THE LEANING TOWER OF BABEL

The Tower of Babel . . .

"Now the whole world had one language and a common speech . . . Then they said, 'Come, let us build ourselves a . . . tower that reaches to the heavens, so that we may make a name for ourselves' . . . That was called Babel—because there the Lord confused the language of the whole world." The Bible, Genesis II.

The Leaning Tower of Pisa . . . .

A circular cathedral completed in 1350 A.D. in Pisa, Italy, that cants on its foundation at almost 4.5° off perpendicular. Encyclopaedia Britannica.

"Good morning! The boss told me you fellows would be coming by for the 'nickel tour.' So just follow me—watch your step now—and I'll explain what we have here as we go."

"Oh yes, we're quite proud of our new building. We used a lot of new techniques and facilities, what with all this new technology and personal computers and such. As a matter of fact, we let all department managers get their own computers, and they've done some really nifty things."

"What stage of completion? Well, it all depends on who you ask. You see, each department head has his own method of determining percent complete. Some of the folks bought some sort of project management system, others developed their own. Here, let's ask Murray. He's actually a draftsman, but he's usually got the answer. He's become one heck of a programmer, too."

"Now, Tony up there, he's a welder, but using something called 2-3-4, or something like that, he's beginning to outshine Murray. Besides, his programs always seem to give better answers than Murray's."

"Watch your step, now. So you see what I mean about different answers. I suppose we could average Murray's 85% and Tony's 93.65%—and it's probably safe to say that we're about, uhhh, about 90% complete."

"Concerned? Naw. Those guys have really jumped into that computer stuff; they even work on it at home on their own time, sometimes. Besides, its been a heck of a learning experience for them."

"Cost overruns? You read about that, huh? Well, keep in mind that almost all of it is overhead. Somehow, costs seem to creep in. We're not quite sure how, or for that matter, from where. Anyway, that's normal, don't you think?"

"Cracks in the foundation? Aw, nothing to be concerned about. The carpet'll hide that. Besides, Jenny, our receptionist, got hold of this stress calculation package—she has a nephew studying computers at the local university—and it showed that we're okay."

"Watch your heads, now. Leaning a little bit? You noticed that, huh. Well, maybe just a little. But just look at it. All this modern architecture, all this innovation—we think its beautiful! We figure the cosmetics will overshadow any basic flaws."

"Felt that little rumble, did you? Ha, not to worry. One of our young engineers came up with a new program for analyzing the stability of the old terra firma. Runs it on the university's HYDROMEDIA 66 computer. You know, he tells me this computer is the absolute latest—sixth generation! Uses this new Russian 57-bit processor. Amazing thing. Fits inside a fruit jar, too! I keep thinking we ought to get one."

"On schedule? Well, we are a bit behind, not exactly sure how much. We decided not to use our old scheduling system. After all, it's been around a long time. Besides, one of the production guys had this new system he was running on his home computer, and, so as not to upset him—he's a key guy, you know—we're using his."

"Boy, you guys are being critical! Okay, okay! The boss said to be very open with you, so I'll lay it on the line. Yes, there are some structural problems, and yes, it does lean a little bit, and so we are well over projected cost, and yes, we are behind schedule, and granted, everyone does seem to be speaking a different language. I'll admit all that! But I'll tell you this. Management gave us all this freedom. Maybe we weren't quite prepared to use it properly. Maybe some of the procedures that used to exist were valid. Maybe they should have said 'Don't use something new just because it's new. Make sure it's better, make sure it's proven.' Maybe this and maybe that, but I'll tell you one thing. It's their fault, not ours! We only did what we were allowed to do. Nobody breached procedure. That I'll attest to!"

"Look, I'm sorry. I guess I kinda got on a soapbox back there. It's just that we're beginning to get a lot more scrutiny than I like, and some people are beginning to question a lot of things."

"Well, I trust that you've enjoyed the tour. Where do I go next? Well, I've learned so much about computers on this job that I'm getting out of the construction business as soon as this building is completed. I'm going to become a computer programmer. I've taken a course at the university, and did real well

using QUIRPY II language. Of course, that only runs on the CRANBERRY Mark XXII computer under X-SOS 12.1. Ever hear of it? Boy, its the greatest. But, what I really want to do is become a systems analyst. Those guys make good money, you know."

If this "tour" even slightly tweaked a nerve, then at least some awareness exists of the danger that our reckless adoption of personal computers can cause. Amid the din and clamor of American industry's headlong and freewheeling rush to embrace technology (after all, that is the answer, isn't it?), many of the tried and proven procedures, controls, and policies that served us well for many years were swept aside and/or ignored. The foundation of the "building" discussed above was laid when the cost of circuitry, i.e., microchips, reached a point of affordability on a departmental basis. The checks and balances provided by existing policies, procedures, and guidelines pertaining to information systems expenditures were overtly ("the policy says that if its under $10,000, I as department manager can approve it") or covertly ("Go ahead and get it. We'll call it office supplies") circumvented. Even in cases where protection was in place, it was very hard to go against an industry trend ("everybody else has one!"). Also, there was a perceived threat that some employees would leave if the latest technology weren't applied.

The pendulum is still on its momentous swing. In fact, it's still accelerating, spurred on by the vendors who see an insatiable, fire-breathing monster market. Some of the companies that have managed to "tally up" their total expenditures for personal computers—often a difficult task—have begun to apply the brakes. But they are the exception, and most keep merrily rolling along.

After all, our building looks pretty, it seems solid, it feels firm. Surely it will endure the stresses and pressures exerted by time and the inevitable changing of business conditions. One cannot deny that it certainly was easier to construct.

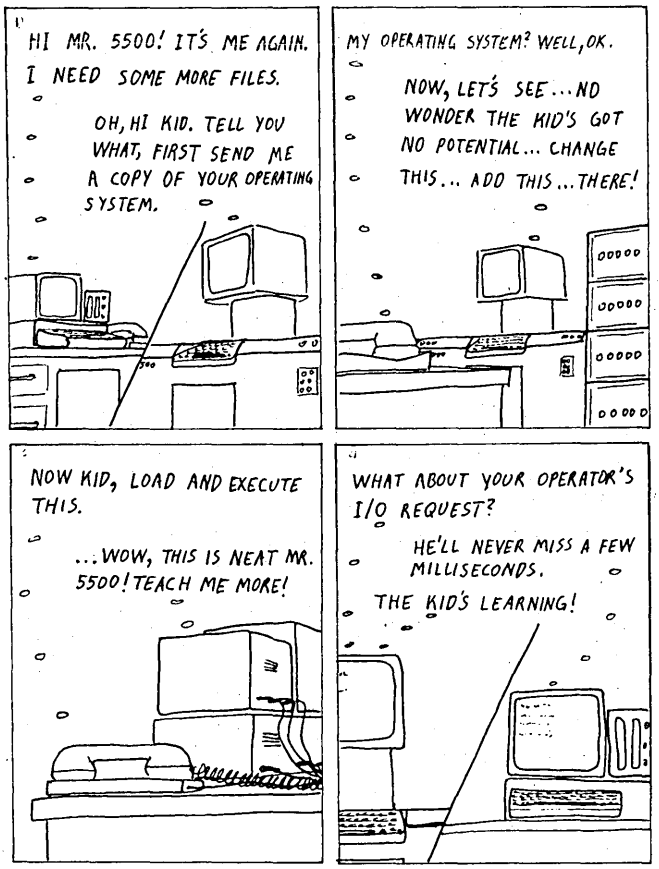
But, as one who has witnessed the construction of our fair building, cracks are beginning to appear. The financial guys are beginning to ask questions about cost. The operations guys are concerned about why the production planners are spending so much time on the computer. And top management wants to know why they can't get a straight answer from two different people.

Should we have given the doubters more credit? Would some of the old time-proven regimens of the purer discipline have prevented some problems? Should we have listened to the naysayers a little more? Should we have resisted some of the vendor hype and proceeded a little slower? Could all that self-serving mumbo jumbo about data integrity, duplication of effort, data as a resource, controls, need for documentation, etc., etc., etc., have been valid? Should we reexamine the framework of our building?

Ah, yes, Virginia, but not yet . . . not yet.

—M. J. Reid
Memphis, Tennessee

DIGITS BY ROY MENGOT



A TERMINAL TALE

A few months ago a colleague stopped by my office to ask for an informal evaluation of a crt terminal he was planning to use in his new Digital Equipment VAX computer installation. He had chosen the terminal because it represented the latest in "ergonomically correct design" and he wanted to be the first in our company to provide his customers with a modern, comfortable, and efficient working environment.

As the basis for my evaluation, my colleague had brought along a copy of the specification sheet for the terminal. In part, it stated:

"VT100-compatible. 24 user lines of screen management with either an 80- or 132-column format . . . on a 14-inch screen. Tilt and swivel monitor. VT100 functionality of keyboard, and status capabilities. Low-profile DIN spec keyboard."

So far, so good. As operators of VAX computers know, having terminals with VT100 compatibility can be important.

Embedded in the fine print of the specification sheet, however, was the following:

"Separate 14-key numeric pad. 16 programmed function keys."

This looked as if it might be a problem. VT100 terminals have an 18-key numeric pad and only four programmed function (PF) keys that are positioned as the top row of the numeric pad. Many of the VAX utilities/tools (e.g., on-line tutorials, screen editors) make significant use of this highly specific numeric pad layout.

In the absence of a picture of my colleague's proposed terminal, I warned him about my concern over the numeric pad layout and/or location. He assured me his salesman had been certain that any minor differences in this area would be more than outweighed by the ergonomically efficient keyboard unit, not to mention the marvelous large screen on its small footprint tilt/swivel base.

Needless to say, with his eyes glowing the nonglare green of his proposed crts, my colleague bit!

Two months later, my colleague once again came to visit. This time he needed some technical help from my VAX systems programmers. His new terminals had arrived and as fast as he could install them, his customers were complaining that they couldn't easily use the screen editor. Could one of my people modify the editor so that it didn't use the PF keys for critical functions?

ADVERTISING OFFICES

Advertising Sales Manager:
William J. McGuire
New York, NY 10022
875 Third Ave.
(212) 605-9715

Marketing Services Manager:
Kathleen A. Murray
New York, NY 10022
875 Third Ave.
(212) 605-9723

Eastern District Managers:
Francie Bolger, John M. Gleason
New York, NY 10022
875 Third Ave.
(212) 605-9400

New England District Managers:
Jack Orth, John M. Gleason
Newton, MA 02159
181 Wells Ave.
(617) 964-3730

Mid-Atlantic District Mgr.:
Patricia Joseph
Plymouth Meeting, PA 19462
Plymouth Plaza, Suite 201
(215) 825-4410

Southern District Managers:
Michael W. Andrea
4 Executive Park Drive N.E.
Suite 1205
Atlanta, GA 30329
(404) 633-5112

Warren A. Tibbetts
West Palm Beach, FL 33406
7621 West Lake Dr., Lake Clark Shores
(305) 964-6298

Southwest District Mgr.:
Randall A. Clark
1700 Eastgate Drive
Suite 103
Garland, Texas 75041
(214) 270-6461

Midwest District Mgr.:
Joseph P. Gleason
Chicago, IL 60601
3 Illinois Center Building, 303 East Wacker Dr.
(312) 938-2926

Western District Managers:
William M. Wilshire
Irvine, CA 92715
2061 Business Center Dr., Suite 111
(714) 476-2511

Robert J. Rielly
Los Angeles, CA 90035
1801 S. La Cienega Blvd.
(213) 559-5111

James E. Filiatrault, Janet Engelbrecht
Mountain View, CA 94043
2680 Bayshore Frontage Rd., Suite 401
(415) 965-8222

U.K., Scandinavia, Netherlands
Director - European Operations
Martin Sutcliffe, Robert Saidel
Technical Publishing Co.
130 Jermyn Street, London, SW1 4UJ, England
Tel: (44 1) 839-3916, Telex: 914911 TECPUB G

France, Belgium, Luxembourg, Spain
Vivien James
Technical Publishing Co.
130 Jermyn Street, London, SW1 4UJ, England
Tel: (44 1) 839-3916, Telex: 914911 TECPUB G

Germany, Austria, E. Europe
Martin Noble
Technical Publishing Company
6000 Frankfurt 1
Steinweg 7, W. Germany
Tel: (49 69) 28-80-63, Telex: W. Germany 4170039 TECP D

Italy:
Luigi Rancati
Rancati Advertising
San Felice Torre 5
20090 Segrate, Milano, Italy
Tel: 2-7531445, Telex: 311010

Switzerland:
P. J. Ruckstuhl
ALAS AG
Business-Centre
Schoegrund 1
CH 6343 Rotkreuz, Switzerland
Tel: (42) 642964, Telex: 864958

Japan:
Shigeru Kobayashi
Japan Advertising Communications, Inc.
New Ginza Building, 3-13 Ginza 7-chome
Chuo-ku, Tokyo 104, Japan
Tel: (03) 571-8748, Telex: J22745

John K. Abely, President
Robert L. Dickson, Exec. Vice President
Edwin V. Burkholder, Senior Vice President/Technology
Walter M. Harrington, Vice President/Finance and Administration

Technical Publishing
a company of The Dun & Bradstreet Corporation

Statement of Ownership, Management and Circulation (Required by 39 U.S.C. 3685)

1A. Title of Publication: DATAMATION
1B. Publication No. 00116963
2. Date of filing: October 1, 1984
3. Frequency of issue: Semimonthly.
3A. No. of issues published annually: 24.
3B. Annual subscription price: $50.00 U.S.; $75.00 Canada; $120.00 Foreign.
4. Complete mailing address of known office of publication: 875 Third Avenue, New York, N.Y. 10022.
5. Complete mailing address of the headquarters of the general business offices of the publishers: 875 Third Avenue, New York, N.Y. 10022
6. Full names and complete mailing address of publisher, executive editor, and editor: Publisher: James M. Morris, 875 Third Avenue, New York, N.Y. 10022; Executive Editor: John L. Kirkley, 875 Third Avenue, New York, N.Y. 10022; Editor: Rebecca S. Barna, 875 Third Avenue, New York, N.Y. 10022

7. OWNER (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and address of stockholders owning or holding 1 percent or more of total amount of stock, if not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its names and address must be stated.) Technical Publishing Company, 875 Third Avenue, New York, N.Y. 10022; The Dun & Bradstreet Corporation, 299 Park Avenue, New York, N.Y. 10171; Bank of California, N.A., 400 California Street, San Francisco, CA 94104; Bankers Trust Company, Box 1990, Church Street Station, New York, N.Y. 10008; Capital Research & Management, 333 South Hope Street, Los Angeles, CA 90071; Charles M. Clark, 120 Broadway, Suite 3044, New York, N.Y. 10271; Criterion Group Inc., 333 Clay Street, Suite 4300, Houston, TX 77002; Donaldson, Lufkin & Jenrette, 140 Broadway, New York, N.Y. 10022; DuPont, E.I. de Nemours, Nemours Building, Room 10510, Wilmington, DE 19898; Dun & Bradstreet Employee Benefit Plans, 605 Third Avenue, New York, N.Y. 10158; Eberstadt Asset Management, Inc., 61 Broadway, New York, N.Y. 10006; Equitable Life Assurance Society, 1285 Avenue of the Americas, New York, N.Y. 10019; Harris Trust & Savings Bank, 111 West Monroe Street, Chicago, IL 60690; J.P. Morgan & Company, Inc., 23 Wall Street, New York, N.Y. 10015; Liberty Mutual Insurance Company, 175 Berkeley Street, Boston, MA 02117; Manufacturers Hanover Corporation, 600 Fifth Avenue, New York, N.Y. 10020; Mercantile Bankshares Corporation, P.O. Box 2257, Baltimore, MD 21203; Arthur C. Nielsen, Jr., Phillip R. Nielsen and Robert L. Foote as Trustees of 21 Nielsen Family Trusts, Nielsen Plaza, Northbrook, IL 60062; Arthur C. Nielsen, Jr., and Harris Trust & Savings Bank, as Trustees under the Will of Arthur C. Nielsen, Sr., Marital Trust, P.O. Box 755, Chicago, IL 60690; Northern Trust Corporation, 50 South LaSalle Street, Chicago, IL; State Street Research & Management Company, 225 Franklin Street, Boston, MA 02101; University of California, 2200 University Hall, Room 605, Berkeley, CA 94720; Wellington Thordike, 28 State Street, Boston, MA 02109.

8. Known bondholders, mortgages, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities: None.
9. N/A.
10. Extent and nature of circulation:

	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies Single Issue Published Nearest to Filing Date
A. Total no. copies (Net Press Run)	177,287	182,661
B. Paid circulation		
1. Sales through dealers and carriers, street vendors and counter sales	—	—
2. Mail subscription	164,609	172,753
C. Total paid circulation (Sum of 10B1 and 10B2)	164,609	172,753
D. Free Distribution by mail, carrier or other means samples, complimentary, and other free copies	9,293	6,658
E. Total distribution (Sum of C and D)	173,902	179,411
F. Copies not distributed		
1. Office use, left over, unaccounted, spoiled after printing	3,385	3,250
2. Return from News Agents	—	—
G. Total (Sum of E, F1 and 2—should equal net press run shown in A)	177,287	182,661

11. I certify that the statements made by me above are correct and complete. (Signature) James M. Morris, Publisher

Get Ahead of the Gang

Face it. We could all use a little concrete advice now and then.

Whether you're making a monumental decision like a career change, or a more routine one like an oil change, the free Consumer Information Catalog can make it easier.

The Catalog is published quarterly by the Consumer Information Center of the U.S. General Services Administration to bring you the latest on government programs and a mountain of other information that you can use.

The Catalog lists more than 200 government booklets to help you... start a business, find a job, plan your retirement, repair your home, or carve out a nutrition and exercise program to improve your profile. And many of these booklets are free.

So order your Catalog today. Any way you look at it, you'll be head and shoulders above the crowd.

Just send your name and address on a postcard to:

Consumer Information Center
Dept. MR
Pueblo, Colorado 81009

A public service of this publication and the Consumer Information Center of the U.S. General Services Administration

READERS' FORUM

What had happened, I asked?

His response was to show me a picture of his brand-new, ergonomically correct terminals. While the overall keyboard layout was fine, the numeric pad and PF keys, were, as I had earlier suspected, somewhat different from a true VT100. The result was that the new terminal users had to use two hands in a crossover pattern—à la playing arpeggios on a piano—to activate the more frequent screen editor commands (the ones normally on the top row of the numeric pad). On a true VT100, only one hand placed over the numeric pad is needed to perform any editor command.

Of course, my systems programmers were happy to redefine the editor numeric pad functions so that the top row PF keys were no longer needed. It only required the elimination of six editor commands, commands that don't get used often anyway (my colleague hoped). Naturally, once the keys were redefined, all of the on-line tutorials and assistance or help programs had to be modified as well. It wasn't very hard, didn't take too long, and the systems folks enjoyed the novelty.

As a side issue, I couldn't help asking how much each of the new ergonomically correct terminals had cost. The number quoted exceeded the price of virtually every other comparable terminal in our company. In addition, none of the utilities/tools my colleague had procured for his VAX used the additional PF keys that his terminals provided. Worse still, the users of my colleague's computer are now incompatible with the thousands of other VAX users around the country. Individuals transferring to or from this now unique installation must unlearn several sets of numeric pad functions and, in their place, learn others.

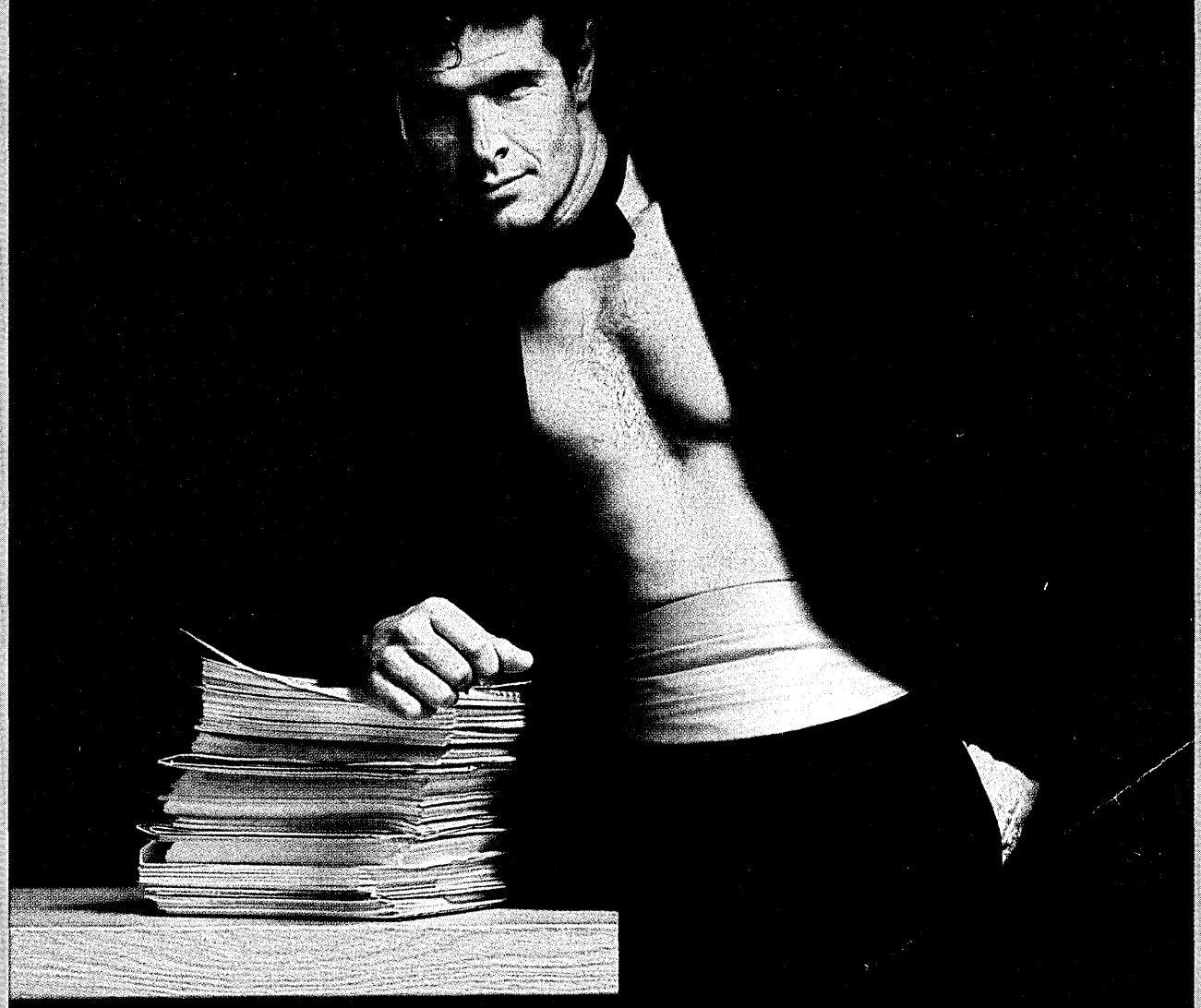
A few weeks after the systems programmers had completed their efforts for my colleague, I had an opportunity to walk through the area recently populated by the new ergonomic terminals. I observed about a dozen installations, not one of which had the terminals on furniture of the proper (16-inch) height. The chairs in front of each terminal were standard non-secretarial swivel models with armrests and only minimal seat-height adjustments. No back-support adjustments could be made. Ambient lighting was our company's unmodified "large office bay fluorescent" and, as a consequence, several of the users had taped cardboard backing from writing tablets on top of the terminals to further help reduce glare. Desks with or without terminals were arranged side by side in long rows. If an individual had a terminal on his or her desk, only some of the time was there an extra gap or narrow table to extend the working surface (for listings, etc.). Several hundred people occupied one large office bay; sound-deadening partitions, however, were installed between each two rows of desks. All in all, a rather typical installation for my and many other large companies.

The question that arises from all of this is simple: how much improvement in productivity did my colleague's customers gain by only installing new terminals? Ignoring the PF key incompatibility, there is much more to an ergonomic environment than the computing equipment. In fact, ergonomic practice applies to many other work situations in addition to those employing data processing. Since crts are highly visible, those of us in this industry will continue to be expected to help improve productivity of terminal-related jobs. As a consequence, we must take the lead, and exercise great care and planning to ensure that all of the factors leading to an efficient and productive work space are ergonomically constructed, not just the computer equipment.

—David A. Feinberg
Seattle, Washington

If you'd like to share your opinions, gripes, or experiences with other readers, send them to the Forum Editor, DATAMATION, 875 Third Ave., New York, NY 10022. We welcome essays, poems, humorous pieces, or short stories.

IF YOU DON'T WARE UCC-4, YOU'LL LOSE MORE THAN YOUR DP INVENTORY.



You'll lose your shirt in time, money and wasted management manpower. Because the bare fact is, your present manual method of tracking hardware can't cover your data center's growing needs.

You need greater inventory control. You need UCC-4, a revolutionary new software system that delivers central, automated control of both physical and financial DP inventory data. Innovative software that will streamline your data center with billing verification, inventory control, on-order tracking, cost distribution, configuration analysis, current book value tracking, procurement analysis and flexible reporting.

To find out more about our complete line of systems software products, call UCCEL today. We'll give you the shirt off our back.

UCCEL
Systems software that makes you look good.

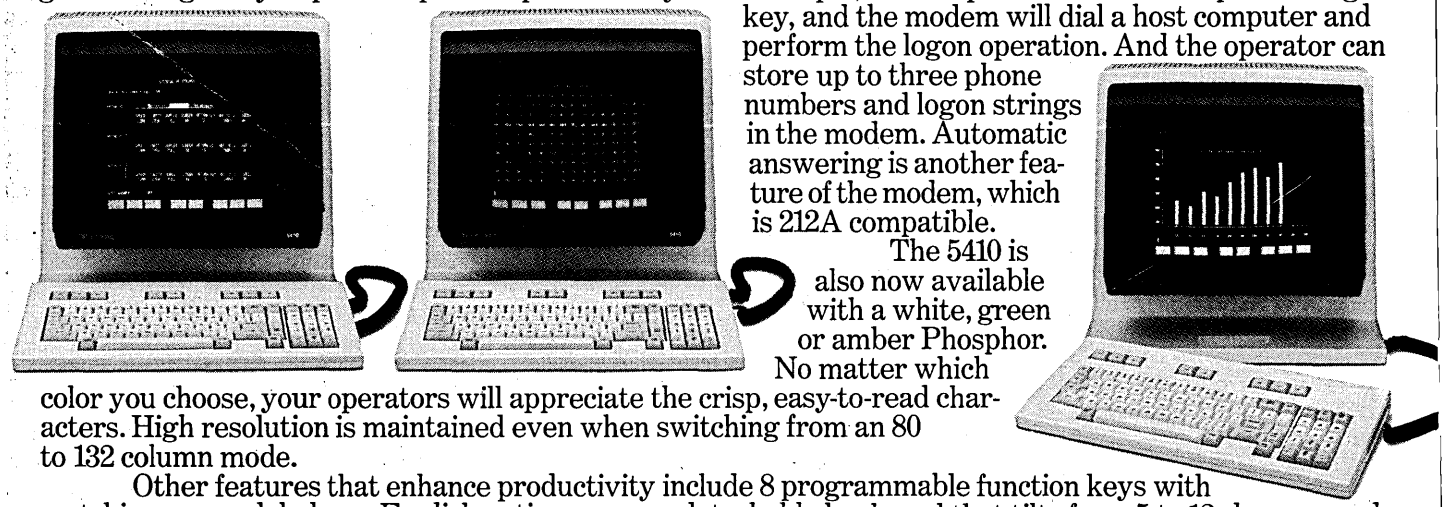
FORMERLY UCC • UNIVERSITY COMPUTING COMPANY • UCCEL Corporation, UCCEL Tower, Exchange Park, Dallas, Texas 75235 UCCEL is a servicemark of UCCEL Corporation 1-800-527-5012

CIRCLE 2 ON READER CARD

WHAT'S BEHIND OUR CONVERSATIONAL TERMINAL MAKES WHAT'S IN FRONT OF IT MORE PRODUCTIVE.

At Teletype Corporation, we just made another intelligent move. We added an integrated modem to the 5410 conversational terminal—making it an even better value.

In addition to saving desk space and being cost-effective, the modem gives the 5410 "built-in" intelligence that greatly improves operator productivity. For example, all the operator has to do is push a single key, and the modem will dial a host computer and perform the logon operation. And the operator can store up to three phone numbers and logon strings in the modem. Automatic answering is another feature of the modem, which is 212A compatible.



The 5410 is also now available with a white, green or amber Phosphor. No matter which color you choose, your operators will appreciate the crisp, easy-to-read characters. High resolution is maintained even when switching from an 80 to 132 column mode.

Other features that enhance productivity include 8 programmable function keys with matching screen labels; an English option menu; a detachable keyboard that tilts from 5 to 12 degrees and has tactile feedback; standard character sets; and the list goes on and on.

In the interest of operator productivity, write to Teletype Corporation for more information on the 5410 at: 5555 Touhy Ave., Dept. 3223-A, Skokie, IL 60077. Or call **1 800 323-1229, ext. 104.**

TELETYPE: VALUE SETS US APART.

"Teletype" is a registered trademark and service mark of Teletype Corporation.

AT&T
Teletype Corporation

CIRCLE 3 ON READER CARD